

ICR TREATMENT STUDY ANALYSIS

Base Analysis and Data Review Comments

Treatment Study ID	1039
Study Protocol	GAC RSSCT treatment study
Plant ICR Number	221
PWS Name	Sweetwater Authority
City, State, Zip	Chula Vista, CA 91912-2328

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

Major comments:

None

General Comments:

1. 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.

Response: Values below the MRL in the Data Collection Spreadsheets are estimates. A comment indicating this has been added to the Data Collection Spreadsheets.

2. Seasonal variability was evaluated over three quarters – spring, summer and fall. During the fall, two sessions were conducted: one to evaluate conventional treatment prior to GAC and one to evaluate enhanced coagulation prior to GAC.
3. During the spring and fall (conventional treatment) sessions, influent water to the treatment study was sampled after full-scale sand filtration. During summer, pre-chlorination could not be turned off and the raw plant source water was sampled and batch treated in the lab to simulate full-scale treatment. During the fall (enhanced coagulation) session, the raw plant source water was sampled and batch treated in the lab to simulate enhanced coagulation.

4. During the spring session, SDS-TCAA occurred at higher concentration than observed during the other three sessions. This may be related to the slightly lower feed bromide concentrations observed during the spring session
5. During the summer session, batch pretreatment resulted in 27% TOC removal. However, the target TOC removal for conventional treatment was 11%. Thus, TOC removal during the summer session more closely matched enhanced coagulation conditions rather than conventional treatment. However, the TOC, UV-254 and influent pH were significantly lower during the enhanced coagulation fall session compared to the summer session.
6. In Table 66 of the Summary Report, please verify the RPD data for SDS-MBAA.

Response: Due to a systematic error, QA/QC data reported in Table 66 of the Treatment Study Summary Report were incorrect. The values have been corrected, and the updated version of Table 66 has been added to the hard copy and to the electronic version (PDF) of the report.

Outlier Data:

No outliers removed.

Cell: A1

Comment: 1039-SAS.xls 2/12/00 18:57

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

Cell: C4

Comment: 1039-10-01 - Run 1 (CDBAA) 2/12/00 17:29
Original value (CoefA0) = 0 New value = -0.9421
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: D4

Comment: 1039-10-01 - Run 1 (CDBAA) 2/12/00 17:29
Original value (CoefAf) = 13.0281 New value = 14.2328
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: E4

Comment: 1039-10-01 - Run 1 (CDBAA) 2/12/00 17:29
Original value (CoefB) = 10 New value = 251.6582
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: F4

Comment: 1039-10-01 - Run 1 (CDBAA) 2/12/00 17:29
Original value (CoefD) = 0.15 New value = 0.4793
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: J4

Comment: 1039-10-01 - Run 1 (CDBAA) 2/12/00 17:29
Original value (S) = 0 New value = -0.2129
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: C5

Comment: 1039-10-01 - Run 1 (CHBr3) 2/12/00 17:25
Original value (CoefA0) = 0 New value = 0.2145
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: D5

Comment: 1039-10-01 - Run 1 (CHBr3) 2/12/00 17:25
Original value (CoefAf) = 29.9 New value = 53.6246
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: E5

Comment: 1039-10-01 - Run 1 (CHBr3) 2/12/00 17:25
Original value (CoefB) = 10 New value = 59.4815
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: F5

Comment: 1039-10-01 - Run 1 (CHBr3) 2/12/00 17:25
Original value (CoefD) = 0.15 New value = 0.4121
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: J5

Comment: 1039-10-01 - Run 1 (CHBr3) 2/12/00 17:25
Original value (S) = 0 New value = -0.7635
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: C8

Comment: 1039-10-01 - Run 1 (DBAA) 2/12/00 17:27
Original value (CoefA0) = 0 New value = -1.4692
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: D8

Comment: 1039-10-01 - Run 1 (DBAA) 2/12/00 17:27
Original value (CoefAf) = 14.621 New value = 17.1191
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: E8

Comment: 1039-10-01 - Run 1 (DBAA) 2/12/00 17:27
Original value (CoefB) = 10 New value = 38.2966
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: F8

Comment: 1039-10-01 - Run 1 (DBAA) 2/12/00 17:27
Original value (CoefD) = 0.15 New value = 0.4095
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: J8

Comment: 1039-10-01 - Run 1 (DBAA) 2/12/00 17:27
Original value (S) = 0 New value = -0.2649
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: C18

Comment: 1039-10-01 - Run 1 (TCAA) 2/12/00 17:26
Original value (CoefA0) = 0 New value = -0.6971
Fewer than 6 points above MRL. Logistic function (type 1) applied.

Cell: D18

Comment: 1039-10-01 - Run 1 (TCAA) 2/12/00 17:26
Original value (CoefAf) = 0 New value = 14.8217
Fewer than 6 points above MRL. Logistic function (type 1) applied.

Cell: E18

Comment: 1039-10-01 - Run 1 (TCAA) 2/12/00 17:26
Original value (CoefB) = 0 New value = 166.5981
Fewer than 6 points above MRL. Logistic function (type 1) applied.

Cell: F18

Comment: 1039-10-01 - Run 1 (TCAA) 2/12/00 17:26
Original value (CoefD) = 0 New value = 0.2492
Fewer than 6 points above MRL. Logistic function (type 1) applied.

Cell: J18

Comment: 1039-10-01 - Run 1 (TCAA) 2/12/00 17:26
Original value (S) = 0 New value = 0
Fewer than 6 points above MRL. Logistic function (type 1) applied.

Cell: C27

Comment: 1039-10-02 - Run 3 (CHBr3) 2/12/00 18:43
Original value (CoefA0) = 1.4035 New value = -0.5404
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: D27

Comment: 1039-10-02 - Run 3 (CHBr3) 2/12/00 18:43
Original value (CoefAf) = 53.5191 New value = 118.1911
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: E27

Comment: 1039-10-02 - Run 3 (CHBr3) 2/12/00 18:43
Original value (CoefB) = 30.4956 New value = 96.8168
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: F27

Comment: 1039-10-02 - Run 3 (CHBr3) 2/12/00 18:43
Original value (CoefD) = 0.1728 New value = 0.169
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: J27

Comment: 1039-10-02 - Run 3 (CHBr3) 2/12/00 18:43
Original value (S) = -0.3055 New value = -0.5312
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: C49

Comment: 1039-10-03 - Run 5 (CHBr3) 2/12/00 18:44
Original value (CoefA0) = 0 New value = 0.1716
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: D49

Comment: 1039-10-03 - Run 5 (CHBr3) 2/12/00 18:44
Original value (CoefAf) = 38.4 New value = 55.4664
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: E49

Comment: 1039-10-03 - Run 5 (CHBr3) 2/12/00 18:44
Original value (CoefB) = 10 New value = 49.3014
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: F49

Comment: 1039-10-03 - Run 5 (CHBr3) 2/12/00 18:44
Original value (CoefD) = 0.15 New value = 0.2195
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: J49

Comment: 1039-10-03 - Run 5 (CHBr3) 2/12/00 18:44

Original value (S) = 0 New value = -0.2528
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: C84

Comment: 1039-10-04 - Run 7 (TCAA) 2/12/00 18:46
Original value (CoefA0) = 0 New value = -0.0818
Fewer than 6 points above MRL. Logistic function (type 1) applied.

Cell: D84

Comment: 1039-10-04 - Run 7 (TCAA) 2/12/00 18:46
Original value (CoefAf) = 0 New value = 2.2516
Fewer than 6 points above MRL. Logistic function (type 1) applied.

Cell: E84

Comment: 1039-10-04 - Run 7 (TCAA) 2/12/00 18:46
Original value (CoefB) = 0 New value = 2199.9496
Fewer than 6 points above MRL. Logistic function (type 1) applied.

Cell: F84

Comment: 1039-10-04 - Run 7 (TCAA) 2/12/00 18:46
Original value (CoefD) = 0 New value = 0.1439
Fewer than 6 points above MRL. Logistic function (type 1) applied.

Cell: J84

Comment: 1039-10-04 - Run 7 (TCAA) 2/12/00 18:46
Original value (S) = 0 New value = 0
Fewer than 6 points above MRL. Logistic function (type 1) applied.

Cell: C103

Comment: 1039-20-01 - Run 2 (MBAA) 2/12/00 17:18
Original value (CoefA0) = 0 New value = 1.2347
Fewer than 6 points above MRL. Step function applied.

Cell: D103

Comment: 1039-20-01 - Run 2 (MBAA) 2/12/00 17:18
Original value (CoefAf) = 0 New value = 0
Fewer than 6 points above MRL. Step function applied.

Cell: E103

Comment: 1039-20-01 - Run 2 (MBAA) 2/12/00 17:18
Original value (CoefB) = 0 New value = 0
Fewer than 6 points above MRL. Step function applied.

Cell: F103

Comment: 1039-20-01 - Run 2 (MBAA) 2/12/00 17:18
Original value (CoefD) = 0 New value = 0
Fewer than 6 points above MRL. Step function applied.

Cell: J103

Comment: 1039-20-01 - Run 2 (MBAA) 2/12/00 17:18
Original value (S) = 0 New value = 0

Fewer than 6 points above MRL. Step function applied.

Cell: K103

Comment: 1039-20-01 - Run 2 (MBAA) 2/12/00 17:18
Original value (t0) = 0 New value = 40.4019
Fewer than 6 points above MRL. Step function applied.

Cell: C105

Comment: 1039-20-01 - Run 2 (TBAA) 2/12/00 18:41
Original value (CoefA0) = 0 New value = 0
Fewer than 6 points above MRL. Peak curve/step function combination applied.

Cell: D105

Comment: 1039-20-01 - Run 2 (TBAA) 2/12/00 18:41
Original value (CoefAf) = 0 New value = 4.7
Fewer than 6 points above MRL. Peak curve/step function combination applied.

Cell: E105

Comment: 1039-20-01 - Run 2 (TBAA) 2/12/00 18:41
Original value (CoefB) = 0 New value = 0
Fewer than 6 points above MRL. Peak curve/step function combination applied.

Cell: F105

Comment: 1039-20-01 - Run 2 (TBAA) 2/12/00 18:41
Original value (CoefD) = 0 New value = 0
Fewer than 6 points above MRL. Peak curve/step function combination applied.

Cell: J105

Comment: 1039-20-01 - Run 2 (TBAA) 2/12/00 18:41
Original value (S) = 0 New value = -0.1512
Fewer than 6 points above MRL. Peak curve/step function combination applied.

Cell: C106

Comment: 1039-20-01 - Run 2 (TCAA) 2/12/00 17:31
Original value (CoefA0) = 0 New value = -0.8766
Fewer than 6 points above MRL. Logistic function (type 1) applied.

Cell: D106

Comment: 1039-20-01 - Run 2 (TCAA) 2/12/00 17:31
Original value (CoefAf) = 0 New value = 19.5109
Fewer than 6 points above MRL. Logistic function (type 1) applied.

Cell: E106

Comment: 1039-20-01 - Run 2 (TCAA) 2/12/00 17:31
Original value (CoefB) = 0 New value = 423.0213
Fewer than 6 points above MRL. Logistic function (type 1) applied.

Cell: F106

Comment: 1039-20-01 - Run 2 (TCAA) 2/12/00 17:31
Original value (CoefD) = 0 New value = 0.1103
Fewer than 6 points above MRL. Logistic function (type 1) applied.

Cell: J106

Comment: 1039-20-01 - Run 2 (TCAA) 2/12/00 17:31
Original value (S) = 0 New value = 0
Fewer than 6 points above MRL. Logistic function (type 1) applied.

Cell: C171

Comment: 1039-20-04 - Run 8 (TBAA) 2/12/00 18:48
Original value (CoefA0) = 0 New value = -1.8138
Fewer than 6 points above MRL. Logistic function (type 1) applied.

Cell: D171

Comment: 1039-20-04 - Run 8 (TBAA) 2/12/00 18:48
Original value (CoefAf) = 0 New value = 11.8727
Fewer than 6 points above MRL. Logistic function (type 1) applied.

Cell: E171

Comment: 1039-20-04 - Run 8 (TBAA) 2/12/00 18:48
Original value (CoefB) = 0 New value = 28.452
Fewer than 6 points above MRL. Logistic function (type 1) applied.

Cell: F171

Comment: 1039-20-04 - Run 8 (TBAA) 2/12/00 18:48
Original value (CoefD) = 0 New value = 0.029
Fewer than 6 points above MRL. Logistic function (type 1) applied.

Cell: J171

Comment: 1039-20-04 - Run 8 (TBAA) 2/12/00 18:48
Original value (S) = 0 New value = 0
Fewer than 6 points above MRL. Logistic function (type 1) applied.

Cell: C172

Comment: 1039-20-04 - Run 8 (TCAA) 2/12/00 18:47
Original value (CoefA0) = 0 New value = -0.4561
Fewer than 6 points above MRL. Logistic function (type 1) applied.

Cell: D172

Comment: 1039-20-04 - Run 8 (TCAA) 2/12/00 18:47
Original value (CoefAf) = 0 New value = 5.8986
Fewer than 6 points above MRL. Logistic function (type 1) applied.

Cell: E172

Comment: 1039-20-04 - Run 8 (TCAA) 2/12/00 18:47
Original value (CoefB) = 0 New value = 42.8558
Fewer than 6 points above MRL. Logistic function (type 1) applied.

Cell: F172

Comment: 1039-20-04 - Run 8 (TCAA) 2/12/00 18:47
Original value (CoefD) = 0 New value = 0.0187
Fewer than 6 points above MRL. Logistic function (type 1) applied.

Cell: J172

Comment: 1039-20-04 - Run 8 (TCAA) 2/12/00 18:47

Original value (S) = 0 New value = 0

Fewer than 6 points above MRL. Logistic function (type 1) applied.

ICR Information

ID / ICR#: CA3710025 / 221
ICR Contact: Don Thomson, Water Quality Superintendent
Phone No.: (619) 475-9047
Period: 5/14/98 - 5/25/98 (10 B-S days)

Design Information

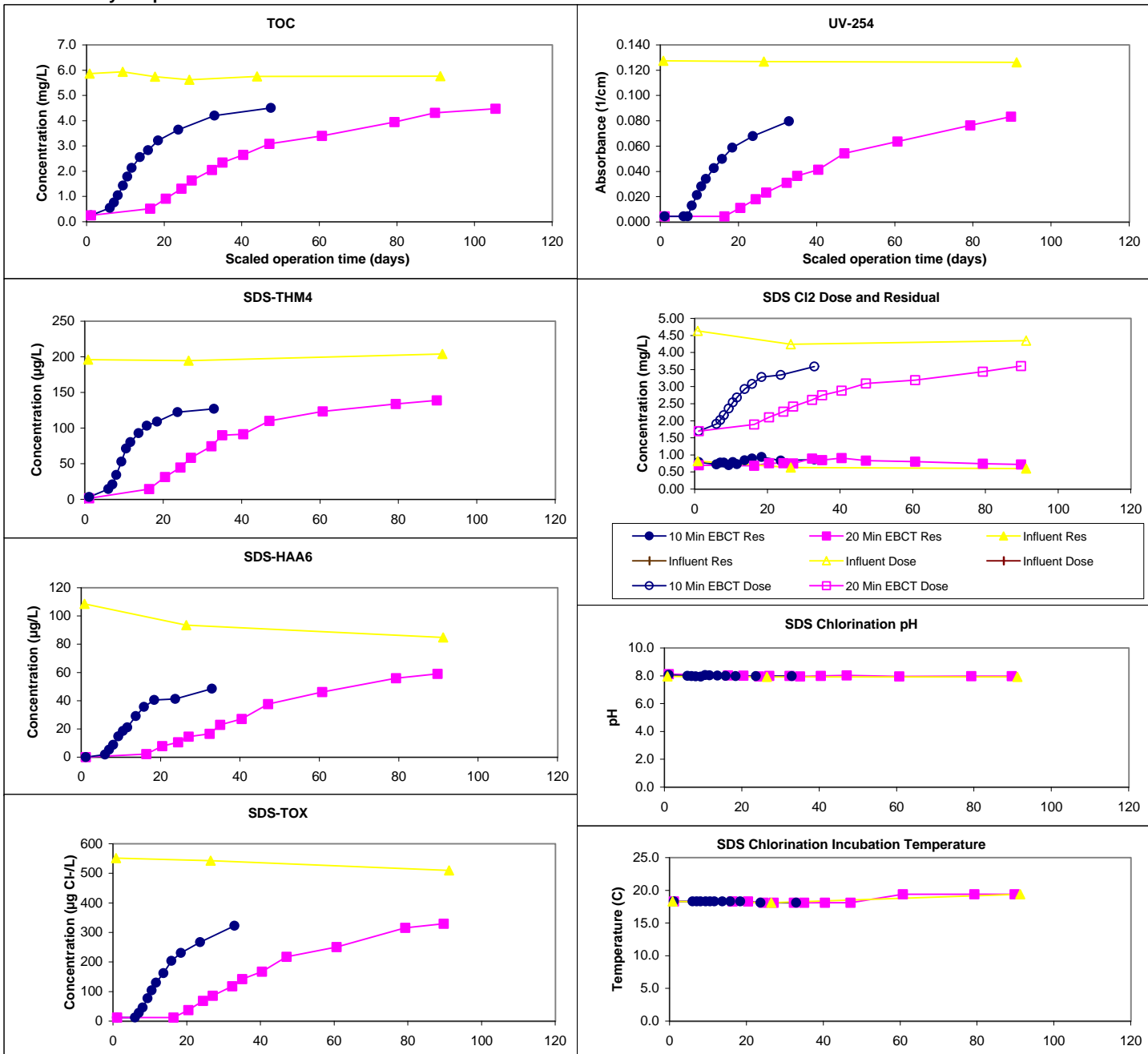
Design TOC: 5.5 mg/L
Coil Diameter: 12.6 mm
Min Reynolds#: 0.55
Full-Scale Temp: 20.0 C

Full-Scale GAC Size: 12x40 Bituminous
Bench-Scale GAC Size: 100x200
Scaling Factor: 9.44
Meas Dry Bed Density: 0.52 g/cm3

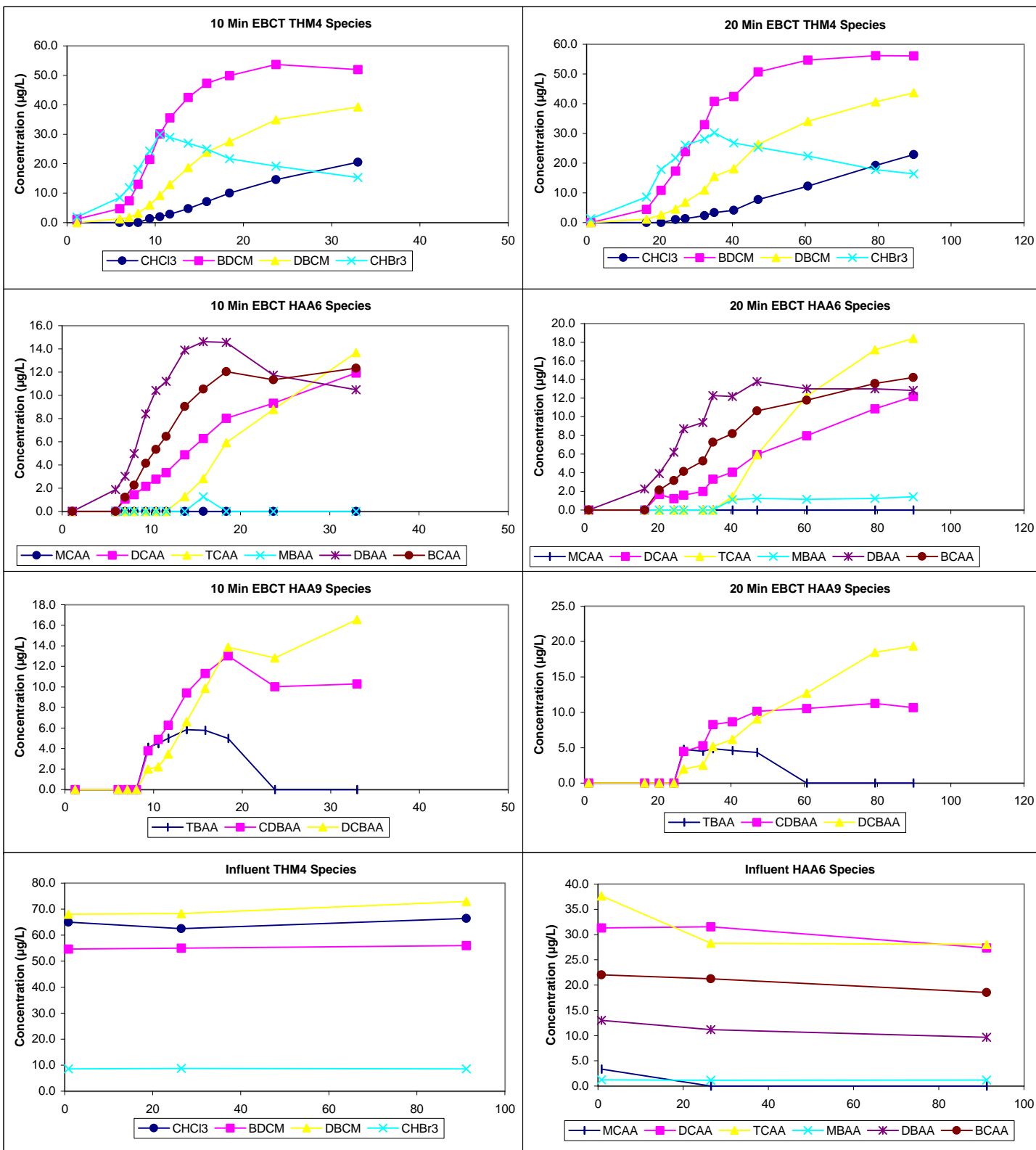
Water Quality Summary

Influent	Influent				Influent				Res (0)	Mean	SD	Count	Min/Max
	Mean	SD/RD	Count	Min/Max	Mean	SD/RD	Count	Min/Max					
TOC	5.8	0.1	6	5.6 - 5.9									
pH	8.0	0.0	6	7.9 - 8.0									
UV254	0.127	0.001	3	0.126 - 0.127									
SUVA	2.21	0.04	3	2.17 - 2.26									
Bromide	200	0	2	200 - 200									
SDS-TOX	535	22	3	510 - 551									
SDS-THM4	198	5	3	195 - 204									
SDS-HAA6	96	12	3	85 - 109									
Effluent	10 Min EBCT (5 B-S days)				20 Min EBCT (11 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	8.2	0.1	13	8.2 - 8.5	8.2	0.3	13	7.4 - 8.5					
Effluent Temp	22.5	1.0	13	21.0 - 23.9	21.3	1.0	13	20.3 - 23.4					

Water Quality Graphs



Water Quality Graphs (Continued)



ICR Information

ID / ICR#: CA3710025 / 221
ICR Contact: Don Thomson, Water Quality Superintendent
Phone No.: (619) 475-9047
Period: 8/17/98 - 9/9/98 (22 B-S days)

Design Information

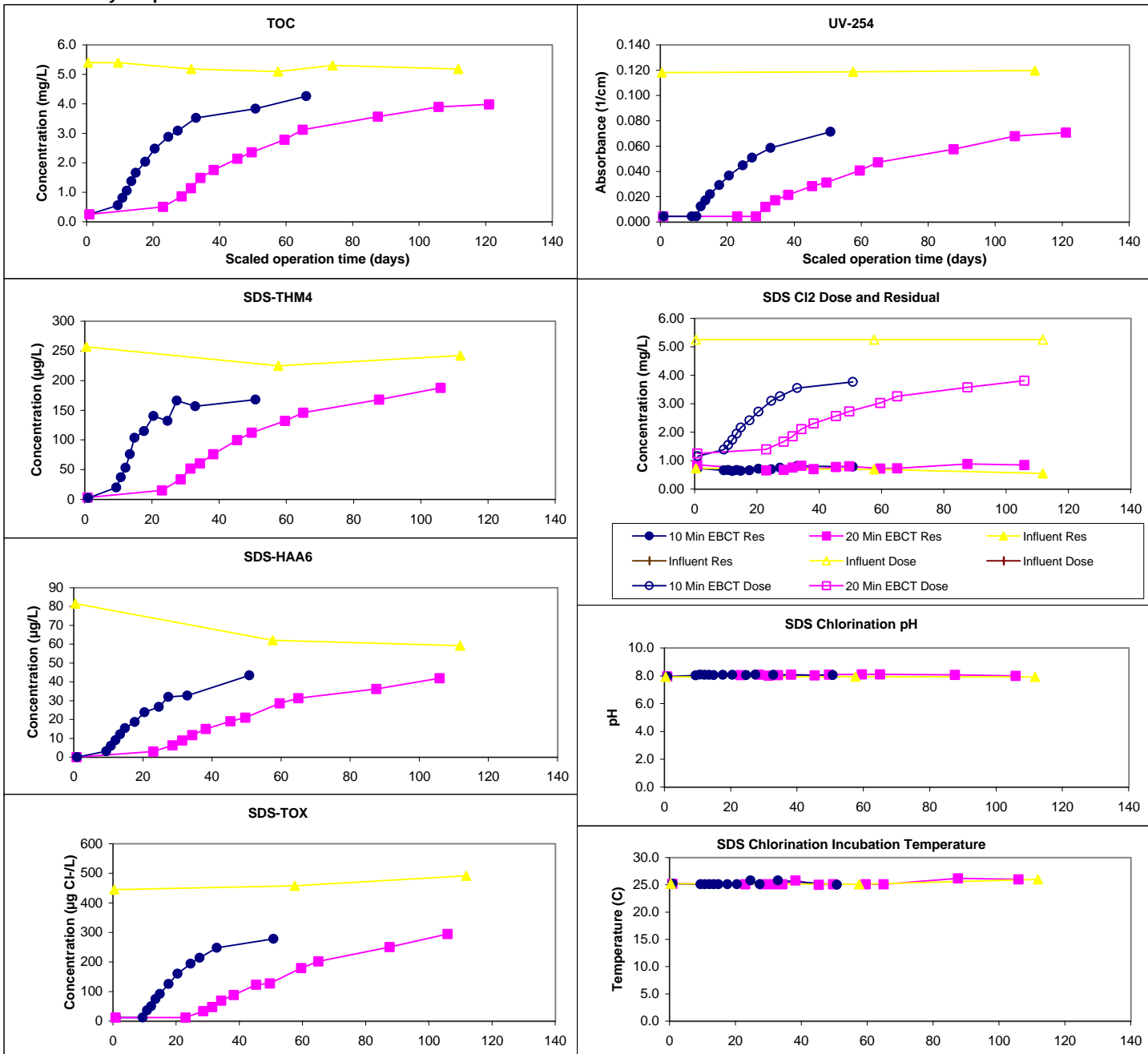
Design TOC: 5.4 mg/L
Colt Diameter: 12.6 mm
Min Reynolds#: 0.60
Full-Scale Temp: 26.0 C

Full-Scale GAC Size: 12x40 Bituminous
Bench-Scale GAC Size: 60x100
Scaling Factor: 5.31
Meas Dry Bed Density: 0.48 g/cm3

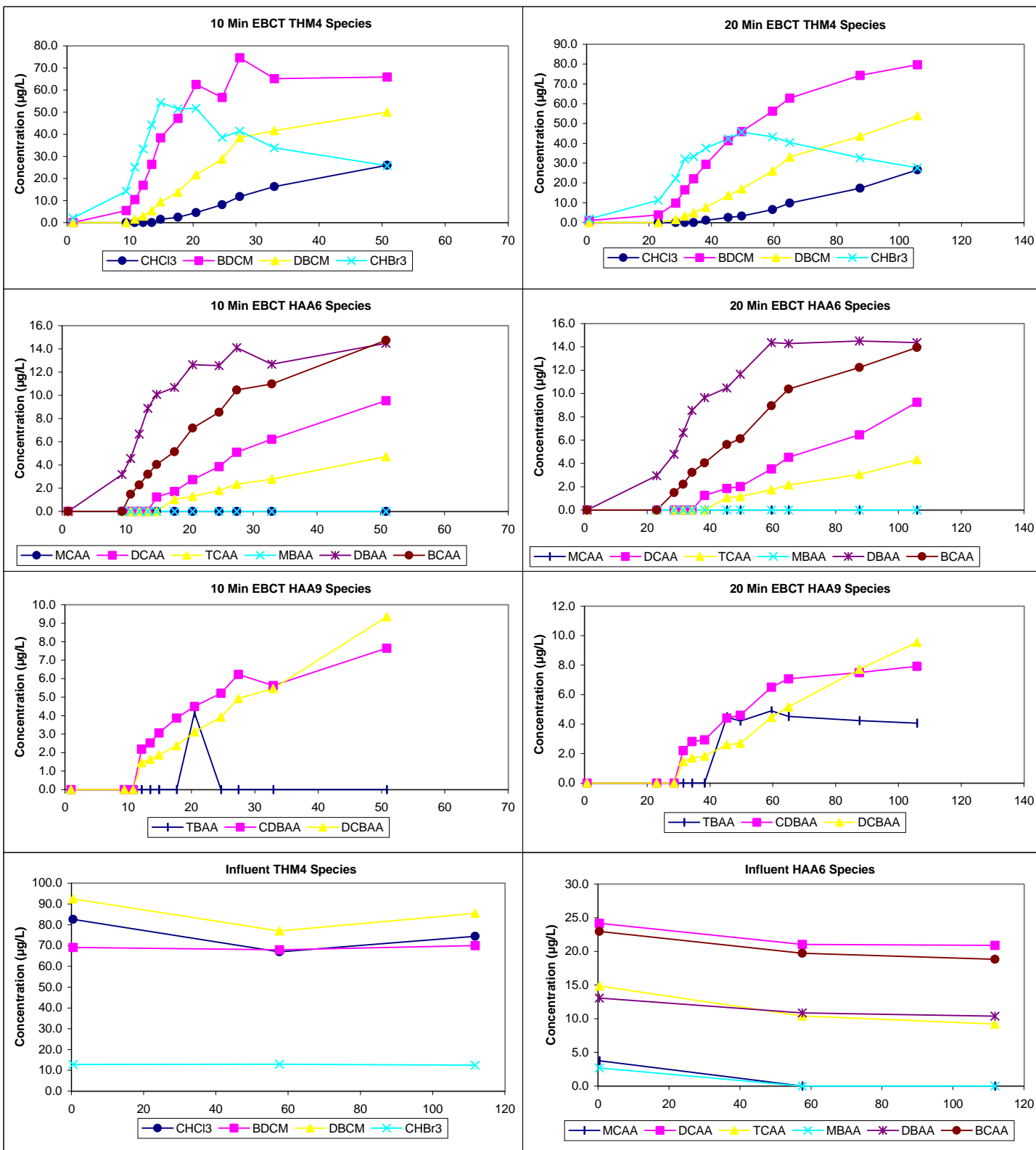
Water Quality Summary

Influent	Influent				Influent				Res (0)	Mean	SD	Count	Min/Max
	Mean	SD/RD	Count	Min/Max	Mean	SD/RD	Count	Min/Max					
TOC	5.3	0.1	6	5.1 - 5.4									
pH	7.4	0.1	6	7.4 - 7.6									
UV254	0.119	0.001	3	0.118 - 0.120									
SUVA	2.28	0.08	3	2.19 - 2.33									
Bromide	275	30	2	260 - 290									
SDS-TOX	465	24	3	445 - 492									
SDS-THM4	241	16	3	225 - 257									
SDS-HAA6	68	12	3	59 - 82									
Effluent	10 Min EBCT (13 B-S days)				20 Min EBCT (23 B-S days)				Chart Legend:	<div><div><div></div><div>10 Min EBCT</div></div><div><div></div><div>20 Min EBCT</div></div><div><div></div><div>Influent</div></div><div><div></div><div>Influent</div></div></div>			
	Effluent pH	8.1	0.1	13	7.9 - 8.3	8.1	0.2	13					
Effluent Temp	22.6	0.8	13	21.1 - 24.0	22.3	0.8	13	20.9 - 23.5					

Water Quality Graphs



Water Quality Graphs (Continued)



ICR Information

ID / ICR#: CA3710025 / 221
ICR Contact: Don Thomson, Water Quality Superintendent
Phone No.: (619) 475-9047
Period: 11/3/98 - 11/18/98 (14 B-S days)

Design Information

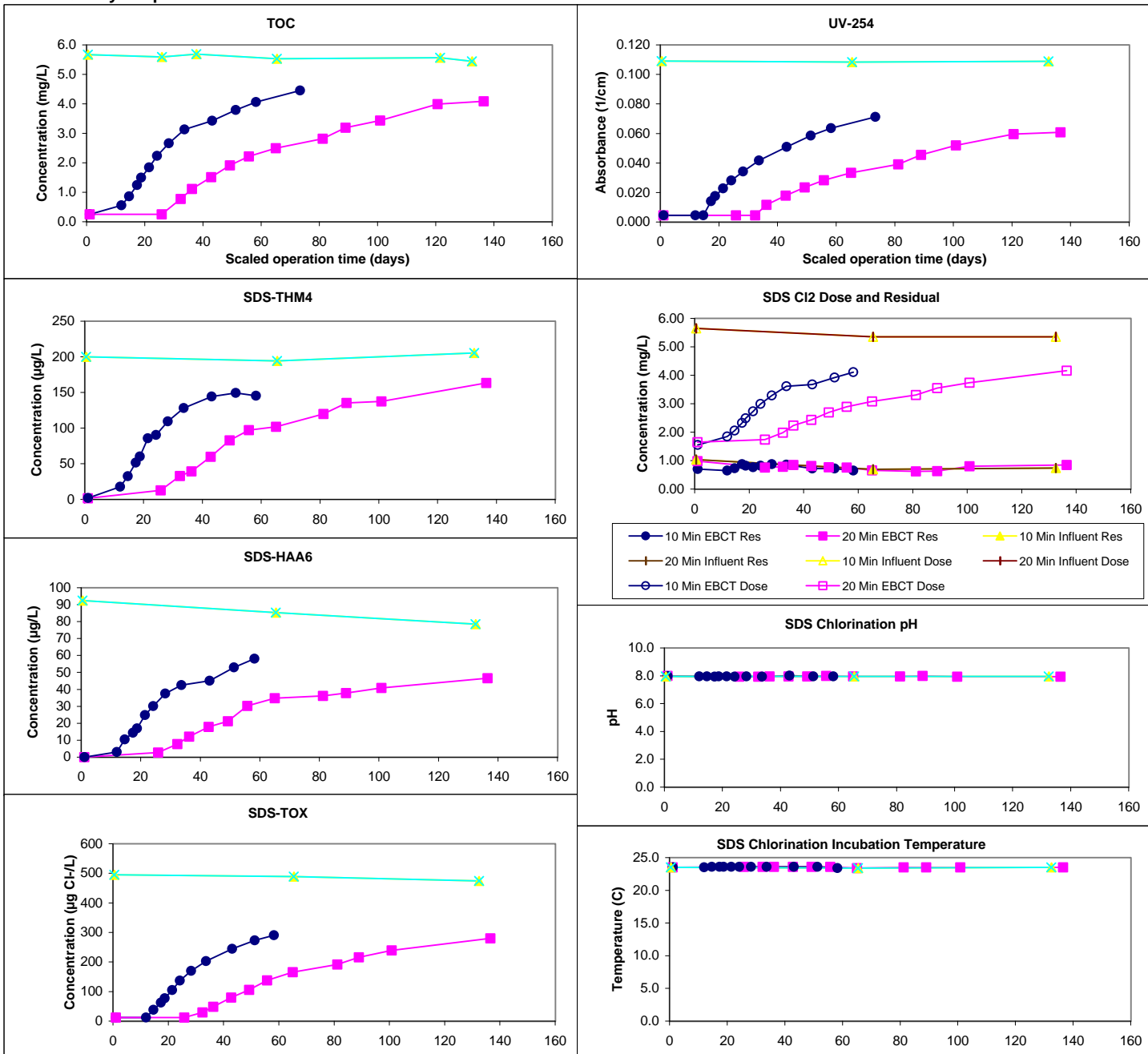
Design TOC: 5.6 mg/L
Colt Diameter: 12.6 mm
Min Reynolds#: 0.60
Full-Scale Temp: 24.0 C

Full-Scale GAC Size: 12x40 Bituminous
Bench-Scale GAC Size: 100x200
Scaling Factor: 9.44
Meas Dry Bed Density: 0.47 g/cm3

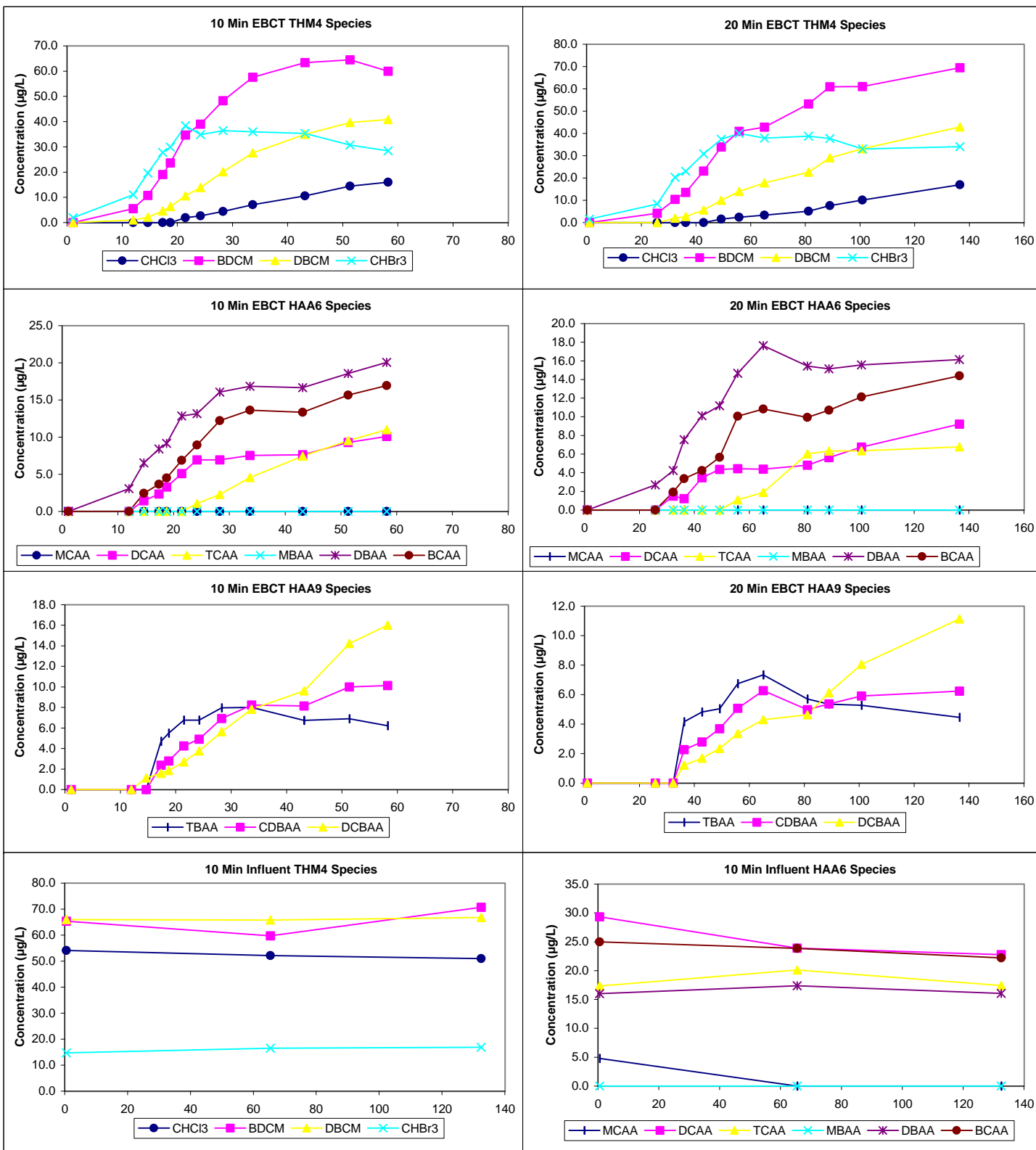
Water Quality Summary

Influent	10 Min Influent				20 Min Influent				Res (0)	Mean	SD	Count	Min/Max
	Mean	SD/RD	Count	Min/Max	Mean	SD/RD	Count	Min/Max					
TOC	5.6	0.1	6	5.4 - 5.7	5.6	0.1	6	5.4 - 5.7	Temp	23.5	0.1	30	23.4 - 23.6
pH	7.7	0.2	6	7.6 - 8.0	7.7	0.2	6	7.6 - 8.0	pH	8.0	0.0	30	7.9 - 8.0
UV254	0.109	0.000	3	0.108 - 0.109	0.109	0.000	3	0.108 - 0.109	Time	23.9	0.2	30	23.6 - 24.2
SUVA	1.96	0.04	3	1.92 - 2.00	1.96	0.04	3	1.92 - 2.00	Comments:				
Bromide	300	0	2	300 - 300	300	0	2	300 - 300					
SDS-TOX	486	11	3	474 - 495	486	11	3	474 - 495					
SDS-THM4	200	6	3	194 - 205	200	6	3	194 - 205					
SDS-HAA6	85	7	3	78 - 92	85	7	3	78 - 92	Chart Legend:				
Effluent	10 Min EBCT (8 B-S days)				20 Min EBCT (15 B-S days)								
Effluent pH	8.1	0.1	13	8.0 - 8.4	8.1	0.3	13	8.0 - 8.9					
Effluent Temp	21.5	0.4	13	21.0 - 22.4	21.4	0.7	13	20.2 - 23.1					

Water Quality Graphs



Water Quality Graphs (Continued)



ICR Information

ID / ICR#: CA3710025 / 221
ICR Contact: Don Thomson, Water Quality Superintendent
Phone No.: (619) 475-9047
Period: 11/6/98 - 11/24/98 (17 B-S days)

Design Information

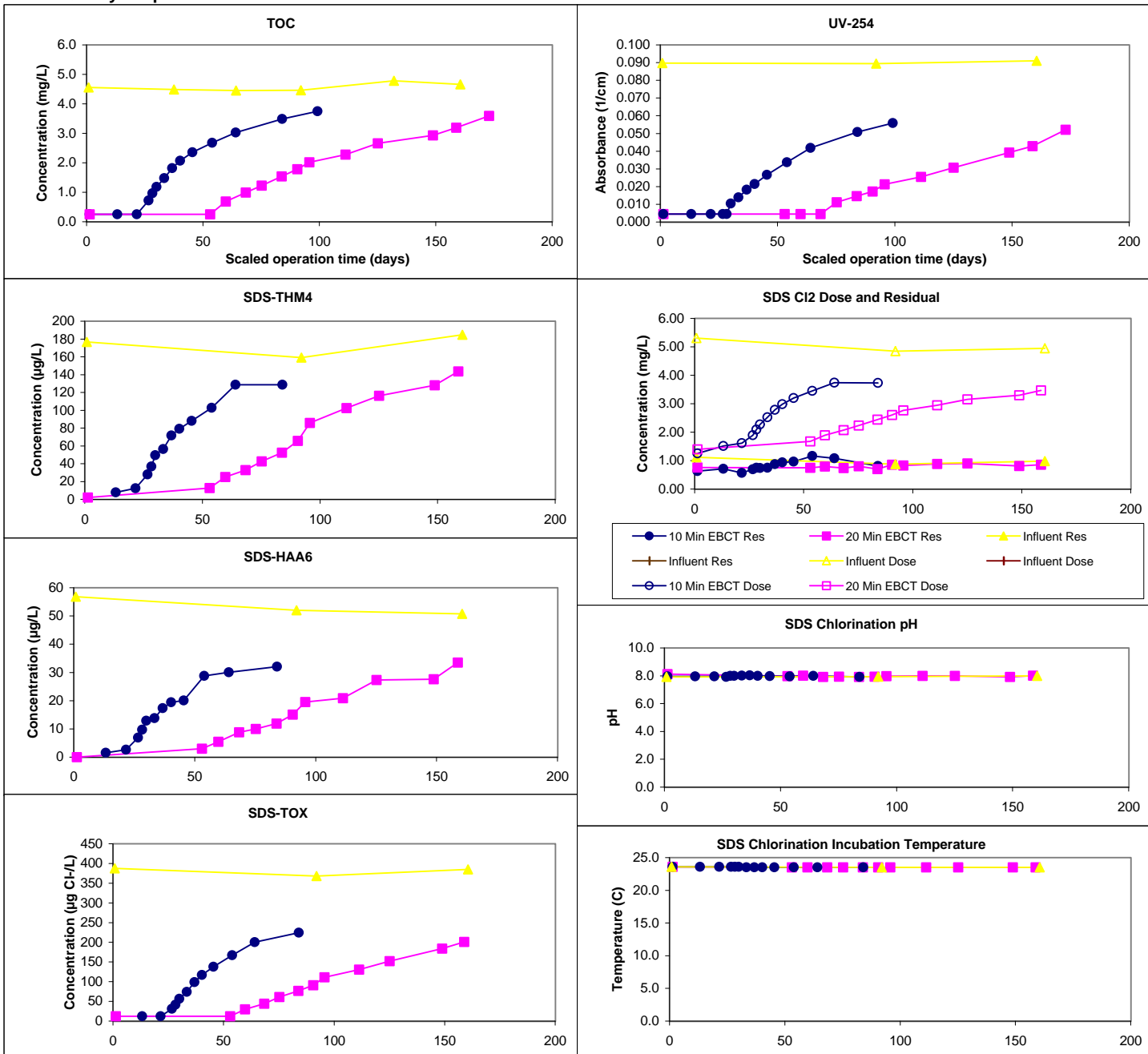
Design TOC: 4.5 mg/L
Colt Diameter: 11.0 mm
Min Reynolds#: 0.60
Full-Scale Temp: 24.0 C

Full-Scale GAC Size: 12x40 Bituminous
Bench-Scale GAC Size: 100x200
Scaling Factor: 9.44
Meas Dry Bed Density: 0.47 g/cm3

Water Quality Summary

Influent	Influent				Influent	Influent	Influent	Influent	Cumulative SDS Conditions			
	Mean	SD/RD	Count	Min/Max	Mean	SD/RD	Count	Min/Max				
TOC	4.6	0.1	6	4.5 - 4.8					Res (0)	0.83	0.14	28 0.57 - 1.16
pH	6.8	0.1	6	6.7 - 6.9					Temp	23.5	0.0	28 23.5 - 23.6
UV254	0.090	0.001	3	0.089 - 0.091					pH	8.0	0.0	28 7.9 - 8.1
SUVA	1.98	0.03	3	1.95 - 2.00					Time	24.0	0.3	28 23.5 - 24.5
Bromide	335	10	2	330 - 340					Comments:			
SDS-TOX	380	11	3	368 - 388								
SDS-THM4	173	13	3	159 - 185					Chart Legend:			
SDS-HAA6	53	3	3	51 - 57								
Effluent	10 Min EBCT				20 Min EBCT				Chart Legend:			
				(11 B-S days)				(18 B-S days)				
Effluent pH	7.5	0.1	14	7.4 - 7.6	7.5	0.2	13	7.3 - 7.9				
Effluent Temp	20.8	0.7	14	19.4 - 21.9	20.8	0.7	13	20.0 - 22.4				

Water Quality Graphs



Water Quality Graphs (Continued)

