

# ICR TREATMENT STUDY ANALYSIS

## Base Analysis and Data Review Comments

<b>Treatment Study ID</b>	1066
<b>Study Protocol</b>	GAC bench-scale treatment study
<b>Plant ICR Number</b>	402
<b>PWS Name</b>	City of Brockton
<b>City, State, Zip</b>	Brockton, MA 02401

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

### Major comments:

1. During the first quarter of testing, only 25 percent breakthrough reached in 20 minute EBCT due to headloss problems, as the RSSCT influent batch was not prefiltered using a cartridge filter. In subsequent quarters, the influent batch water was prefiltered with a cartridge filter. However, headloss problems continued in the second quarter, but 70 percent TOC breakthrough was reached in both columns. During the third quarter of testing, an in-line 3  $\mu\text{m}$  filter was installed to mitigate pressure buildup problems. The Summary Report describes the headloss difficulties and what was done to correct them on pages 9 and 10.

### General Comments:

1. Pretreatment included full-scale filtration through GAC (F300). The GAC had been in place for "a number of years." The GAC depth is 27 inches.
2. During autumn/winter quarter run (November) an SDS temperature of 20°C was mistakenly used. As a result, formed DBPs during this quarter should be higher than those formed under a autumn/winter SDS incubation temperature (10°C). Run time estimates based on these data will be conservative.
3. Quarter 1: SDS-TOX breakthrough curve for both EBCT columns is erratic.
4. Quarter 2: During the 20 minute EBCT run, SDS-MCAA levels ranged from BMRL to 6.9  $\mu\text{g/L}$ , and breakthrough behavior was erratic. The average GAC influent SDS-MCAA was 2.7  $\mu\text{g/L}$ . SDS-MCAA was not measured in the GAC effluent during any other quarter of testing.

5. Quarter 3: For both the 10 and 20 minute EBCT runs, SDS-DCAA showed relatively high levels of immediate breakthrough (3 - 4 µg/L). After a rough plateau for 40 - 50 days (both EBCTs), effluent SDS-DCAA levels decreased. Towards the end of both runs, SDS-DCAA levels increased again, to approximately 2 µg/L in the 10 minute EBCT effluent, and to approximately 9 µg/L in the 20 minute EBCT effluent. This high immediate breakthrough, followed by a decrease to levels below the MRL, and then by a second breakthrough for SDS-DCAA is unusual.

### **Outlier Data:**

Two outliers removed.

1<sup>st</sup> quarter 10- and 20-minute TOX data changed to NCF.

**Cell:** A1

**Comment:** 1066-SAS.xls 2/13/00 13:43

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

**Cell:** C22

**Comment:** 1066-10-01 - Run 1 (TSUVA) 2/13/00 13:20

Original value (CoefA0) = 0 New value = 0.8274

Peak curve fit with S = 0. Refit to type 1 curve fit by iterative curve fit procedure.

**Cell:** D22

**Comment:** 1066-10-01 - Run 1 (TSUVA) 2/13/00 13:20

Original value (CoefAf) = 1.8987 New value = 0.4285

Peak curve fit with S = 0. Refit to type 1 curve fit by iterative curve fit procedure.

**Cell:** E22

**Comment:** 1066-10-01 - Run 1 (TSUVA) 2/13/00 13:20

Original value (CoefB) = 10 New value = 71.107

Peak curve fit with S = 0. Refit to type 1 curve fit by iterative curve fit procedure.

**Cell:** F22

**Comment:** 1066-10-01 - Run 1 (TSUVA) 2/13/00 13:20

Original value (CoefD) = 0.15 New value = 0.4408

Peak curve fit with S = 0. Refit to type 1 curve fit by iterative curve fit procedure.

**Cell:** J22

**Comment:** 1066-10-01 - Run 1 (TSUVA) 2/13/00 13:20

Original value (S) = 0 New value = 0

Peak curve fit with S = 0. Refit to type 1 curve fit by iterative curve fit procedure.

**Cell:** C24

**Comment:** 1066-10-02 - Run 3 (BCAA) 2/13/00 13:09

Original value (CoefA0) = 0 New value = 1.7

Fewer than 6 points above MRL. Step function applied.

**Cell:** D24

**Comment:** 1066-10-02 - Run 3 (BCAA) 2/13/00 13:09

Original value (CoefAf) = 0 New value = 0

Fewer than 6 points above MRL. Step function applied.

**Cell:** E24

**Comment:** 1066-10-02 - Run 3 (BCAA) 2/13/00 13:09

Original value (CoefB) = 0 New value = 0

Fewer than 6 points above MRL. Step function applied.

**Cell:** F24

**Comment:** 1066-10-02 - Run 3 (BCAA) 2/13/00 13:09

Original value (CoefD) = 0 New value = 0

Fewer than 6 points above MRL. Step function applied.

**Cell:** J24

**Comment:** 1066-10-02 - Run 3 (BCAA) 2/13/00 13:09  
Original value (S) = 0 New value = 0  
Fewer than 6 points above MRL. Step function applied.

**Cell:** K24

**Comment:** 1066-10-02 - Run 3 (BCAA) 2/13/00 13:09  
Original value (t0) = 0 New value = 59.5442  
Fewer than 6 points above MRL. Step function applied.

**Cell:** C31

**Comment:** 1066-10-02 - Run 3 (DBCM) 2/13/00 13:09  
Original value (CoefA0) = 0 New value = 1.3  
Fewer than 6 points above MRL. Step function applied.

**Cell:** D31

**Comment:** 1066-10-02 - Run 3 (DBCM) 2/13/00 13:09  
Original value (CoefAf) = 0 New value = 0  
Fewer than 6 points above MRL. Step function applied.

**Cell:** E31

**Comment:** 1066-10-02 - Run 3 (DBCM) 2/13/00 13:09  
Original value (CoefB) = 0 New value = 0  
Fewer than 6 points above MRL. Step function applied.

**Cell:** F31

**Comment:** 1066-10-02 - Run 3 (DBCM) 2/13/00 13:09  
Original value (CoefD) = 0 New value = 0  
Fewer than 6 points above MRL. Step function applied.

**Cell:** J31

**Comment:** 1066-10-02 - Run 3 (DBCM) 2/13/00 13:09  
Original value (S) = 0 New value = 0  
Fewer than 6 points above MRL. Step function applied.

**Cell:** K31

**Comment:** 1066-10-02 - Run 3 (DBCM) 2/13/00 13:09  
Original value (t0) = 0 New value = 67.8278  
Fewer than 6 points above MRL. Step function applied.

**Cell:** C47

**Comment:** 1066-10-03 - Run 5 (BDCM) 2/13/00 13:15  
Original value (CoefA0) = 0 New value = 1.7333  
Fewer than 6 points above MRL. Step function applied.

**Cell:** D47

**Comment:** 1066-10-03 - Run 5 (BDCM) 2/13/00 13:15  
Original value (CoefAf) = 0 New value = 0  
Fewer than 6 points above MRL. Step function applied.

**Cell:** E47

**Comment:** 1066-10-03 - Run 5 (BDCM) 2/13/00 13:15  
Original value (CoefB) = 0 New value = 0  
Fewer than 6 points above MRL. Step function applied.

**Cell:** F47

**Comment:** 1066-10-03 - Run 5 (BDCM) 2/13/00 13:15  
Original value (CoefD) = 0 New value = 0  
Fewer than 6 points above MRL. Step function applied.

**Cell:** J47

**Comment:** 1066-10-03 - Run 5 (BDCM) 2/13/00 13:15  
Original value (S) = 0 New value = 0  
Fewer than 6 points above MRL. Step function applied.

**Cell:** K47

**Comment:** 1066-10-03 - Run 5 (BDCM) 2/13/00 13:15  
Original value (t0) = 0 New value = 87.9032  
Fewer than 6 points above MRL. Step function applied.

**Cell:** C54

**Comment:** 1066-10-03 - Run 5 (DCAA) 2/13/00 13:23  
Original value (CoefA0) = 0.0934 New value = 2.3857  
Poor peak curve fit. Data was refit by iterative curve fit procedure.

**Cell:** D54

**Comment:** 1066-10-03 - Run 5 (DCAA) 2/13/00 13:23  
Original value (CoefAf) = 3.1015 New value = 2.1815  
Poor peak curve fit. Data was refit by iterative curve fit procedure.

**Cell:** E54

**Comment:** 1066-10-03 - Run 5 (DCAA) 2/13/00 13:23  
Original value (CoefB) = 10.2399 New value = 20.6997  
Poor peak curve fit. Data was refit by iterative curve fit procedure.

**Cell:** F54

**Comment:** 1066-10-03 - Run 5 (DCAA) 2/13/00 13:23  
Original value (CoefD) = 0.0565 New value = 0.0723  
Poor peak curve fit. Data was refit by iterative curve fit procedure.

**Cell:** J54

**Comment:** 1066-10-03 - Run 5 (DCAA) 2/13/00 13:23  
Original value (S) = -0.0062 New value = -0.0315  
Poor peak curve fit. Data was refit by iterative curve fit procedure.

**Cell:** C62

**Comment:** 1066-10-03 - Run 5 (TCAA) 2/13/00 13:24  
Original value (CoefA0) = 0 New value = 0.1272  
Fewer than 6 points above MRL. Logistic function (type 1) applied.

**Cell:** D62

**Comment:** 1066-10-03 - Run 5 (TCAA) 2/13/00 13:24

Original value (CoefAf) = 0 New value = 4.59  
Fewer than 6 points above MRL. Logistic function (type 1) applied.

**Cell:** E62

**Comment:** 1066-10-03 - Run 5 (TCAA) 2/13/00 13:24  
Original value (CoefB) = 0 New value = 157.7946  
Fewer than 6 points above MRL. Logistic function (type 1) applied.

**Cell:** F62

**Comment:** 1066-10-03 - Run 5 (TCAA) 2/13/00 13:24  
Original value (CoefD) = 0 New value = 0.0347  
Fewer than 6 points above MRL. Logistic function (type 1) applied.

**Cell:** J62

**Comment:** 1066-10-03 - Run 5 (TCAA) 2/13/00 13:24  
Original value (S) = 0 New value = 0  
Fewer than 6 points above MRL. Logistic function (type 1) applied.

**Cell:** C73

**Comment:** 1066-10-04 - Run 7 (CI2-D) 2/13/00 13:26  
Original value (CoefA0) = 0.0332 New value = 0.3169  
Peak curve fit with S = 0. Refit to type 1 curve fit by iterative curve fit procedure.

**Cell:** D73

**Comment:** 1066-10-04 - Run 7 (CI2-D) 2/13/00 13:26  
Original value (CoefAf) = 1.905 New value = 0.4946  
Peak curve fit with S = 0. Refit to type 1 curve fit by iterative curve fit procedure.

**Cell:** E73

**Comment:** 1066-10-04 - Run 7 (CI2-D) 2/13/00 13:26  
Original value (CoefB) = 10.3382 New value = 2306.0302  
Peak curve fit with S = 0. Refit to type 1 curve fit by iterative curve fit procedure.

**Cell:** F73

**Comment:** 1066-10-04 - Run 7 (CI2-D) 2/13/00 13:26  
Original value (CoefD) = 0.0363 New value = 0.2075  
Peak curve fit with S = 0. Refit to type 1 curve fit by iterative curve fit procedure.

**Cell:** J73

**Comment:** 1066-10-04 - Run 7 (CI2-D) 2/13/00 13:26  
Original value (S) = 0 New value = 0  
Peak curve fit with S = 0. Refit to type 1 curve fit by iterative curve fit procedure.

**Cell:** C122

**Comment:** 1066-20-02 - Run 4 (HAA5) 2/13/00 13:12  
Original value (CoefA0) = 0 New value = 3.22  
Fewer than 6 points above MRL. Step function applied.

**Cell:** D122

**Comment:** 1066-20-02 - Run 4 (HAA5) 2/13/00 13:12  
Original value (CoefAf) = 0 New value = 0

Fewer than 6 points above MRL. Step function applied.

**Cell:** E122

**Comment:** 1066-20-02 - Run 4 (HAA5) 2/13/00 13:12  
Original value (CoefB) = 0 New value = 0  
Fewer than 6 points above MRL. Step function applied.

**Cell:** F122

**Comment:** 1066-20-02 - Run 4 (HAA5) 2/13/00 13:12  
Original value (CoefD) = 0 New value = 0  
Fewer than 6 points above MRL. Step function applied.

**Cell:** J122

**Comment:** 1066-20-02 - Run 4 (HAA5) 2/13/00 13:12  
Original value (S) = 0 New value = 0  
Fewer than 6 points above MRL. Step function applied.

**Cell:** K122

**Comment:** 1066-20-02 - Run 4 (HAA5) 2/13/00 13:12  
Original value (t0) = 0 New value = 30.3081  
Fewer than 6 points above MRL. Step function applied.

**Cell:** C123

**Comment:** 1066-20-02 - Run 4 (HAA6) 2/13/00 13:13  
Original value (CoefA0) = 0 New value = 3.22  
Fewer than 6 points above MRL. Step function applied.

**Cell:** D123

**Comment:** 1066-20-02 - Run 4 (HAA6) 2/13/00 13:13  
Original value (CoefAf) = 0 New value = 0  
Fewer than 6 points above MRL. Step function applied.

**Cell:** E123

**Comment:** 1066-20-02 - Run 4 (HAA6) 2/13/00 13:13  
Original value (CoefB) = 0 New value = 0  
Fewer than 6 points above MRL. Step function applied.

**Cell:** F123

**Comment:** 1066-20-02 - Run 4 (HAA6) 2/13/00 13:13  
Original value (CoefD) = 0 New value = 0  
Fewer than 6 points above MRL. Step function applied.

**Cell:** J123

**Comment:** 1066-20-02 - Run 4 (HAA6) 2/13/00 13:13  
Original value (S) = 0 New value = 0  
Fewer than 6 points above MRL. Step function applied.

**Cell:** K123

**Comment:** 1066-20-02 - Run 4 (HAA6) 2/13/00 13:13  
Original value (t0) = 0 New value = 30.3081  
Fewer than 6 points above MRL. Step function applied.

**Cell:** C131

**Comment:** 1066-20-02 - Run 4 (TOX) 2/13/00 13:22  
Original value (CoefA0) = 2.3154 New value = 15.0193  
Peak curve fit with S = 0. Refit to type 1 curve fit by iterative curve fit procedure.

**Cell:** D131

**Comment:** 1066-20-02 - Run 4 (TOX) 2/13/00 13:22  
Original value (CoefAf) = 78 New value = 18.739  
Peak curve fit with S = 0. Refit to type 1 curve fit by iterative curve fit procedure.

**Cell:** E131

**Comment:** 1066-20-02 - Run 4 (TOX) 2/13/00 13:22  
Original value (CoefB) = 8.0062 New value = 239.5414  
Peak curve fit with S = 0. Refit to type 1 curve fit by iterative curve fit procedure.

**Cell:** F131

**Comment:** 1066-20-02 - Run 4 (TOX) 2/13/00 13:22  
Original value (CoefD) = 0.0266 New value = 0.1188  
Peak curve fit with S = 0. Refit to type 1 curve fit by iterative curve fit procedure.

**Cell:** J131

**Comment:** 1066-20-02 - Run 4 (TOX) 2/13/00 13:22  
Original value (S) = 0 New value = 0  
Peak curve fit with S = 0. Refit to type 1 curve fit by iterative curve fit procedure.

**Cell:** C133

**Comment:** 1066-20-02 - Run 4 (UV254) 2/13/00 13:21  
Original value (CoefA0) = 0.0045 New value = 0.0046  
Peak curve fit with S = 0. Refit to type 1 curve fit by iterative curve fit procedure.

**Cell:** D133

**Comment:** 1066-20-02 - Run 4 (UV254) 2/13/00 13:21  
Original value (CoefAf) = 0.0315 New value = 0.0121  
Peak curve fit with S = 0. Refit to type 1 curve fit by iterative curve fit procedure.

**Cell:** E133

**Comment:** 1066-20-02 - Run 4 (UV254) 2/13/00 13:21  
Original value (CoefB) = 41.5896 New value = 20.0001  
Peak curve fit with S = 0. Refit to type 1 curve fit by iterative curve fit procedure.

**Cell:** F133

**Comment:** 1066-20-02 - Run 4 (UV254) 2/13/00 13:21  
Original value (CoefD) = 0.0298 New value = 0.0402  
Peak curve fit with S = 0. Refit to type 1 curve fit by iterative curve fit procedure.

**Cell:** J133

**Comment:** 1066-20-02 - Run 4 (UV254) 2/13/00 13:21  
Original value (S) = 0 New value = 0  
Peak curve fit with S = 0. Refit to type 1 curve fit by iterative curve fit procedure.

**Cell:** C156



**Comment:** 1066-20-04 - Run 8 (BCAA) 2/13/00 13:30  
Original value (CoefA0) = 0 New value = -0.2772  
Fewer than 6 points above MRL. Data was fit to peak curve by iterative curve fit procedure.

**Cell:** D156

**Comment:** 1066-20-04 - Run 8 (BCAA) 2/13/00 13:30  
Original value (CoefAf) = 0 New value = 5.7605  
Fewer than 6 points above MRL. Data was fit to peak curve by iterative curve fit procedure.

**Cell:** E156

**Comment:** 1066-20-04 - Run 8 (BCAA) 2/13/00 13:30  
Original value (CoefB) = 0 New value = 66.5593  
Fewer than 6 points above MRL. Data was fit to peak curve by iterative curve fit procedure.

**Cell:** F156

**Comment:** 1066-20-04 - Run 8 (BCAA) 2/13/00 13:30  
Original value (CoefD) = 0 New value = 0.0212  
Fewer than 6 points above MRL. Data was fit to peak curve by iterative curve fit procedure.

**Cell:** J156

**Comment:** 1066-20-04 - Run 8 (BCAA) 2/13/00 13:30  
Original value (S) = 0 New value = -0.0072  
Fewer than 6 points above MRL. Data was fit to peak curve by iterative curve fit procedure.

**Cell:** C164

**Comment:** 1066-20-04 - Run 8 (DCAA) 2/13/00 13:29  
Original value (CoefA0) = 0.0793 New value = -0.2691  
Poor peak curve fit. Data was refit by iterative curve fit procedure.

**Cell:** D164

**Comment:** 1066-20-04 - Run 8 (DCAA) 2/13/00 13:29  
Original value (CoefAf) = 4.5697 New value = 6.9353  
Poor peak curve fit. Data was refit by iterative curve fit procedure.

**Cell:** E164

**Comment:** 1066-20-04 - Run 8 (DCAA) 2/13/00 13:29  
Original value (CoefB) = 65.184 New value = 149.8899  
Poor peak curve fit. Data was refit by iterative curve fit procedure.

**Cell:** F164

**Comment:** 1066-20-04 - Run 8 (DCAA) 2/13/00 13:29  
Original value (CoefD) = 0.0263 New value = 0.0332  
Poor peak curve fit. Data was refit by iterative curve fit procedure.

**Cell:** J164

**Comment:** 1066-20-04 - Run 8 (DCAA) 2/13/00 13:29  
Original value (S) = -0.0069 New value = -0.0106  
Poor peak curve fit. Data was refit by iterative curve fit procedure.

**Cell:** C166

**Comment:** 1066-20-04 - Run 8 (HAA5) 2/13/00 13:31

Original value (CoefA0) = -0.4961 New value = -0.4078  
Poor peak curve fit. Data was refit by iterative curve fit procedure.

**Cell:** D166

**Comment:** 1066-20-04 - Run 8 (HAA5) 2/13/00 13:31  
Original value (CoefAf) = 8.4719 New value = 13.2467  
Poor peak curve fit. Data was refit by iterative curve fit procedure.

**Cell:** E166

**Comment:** 1066-20-04 - Run 8 (HAA5) 2/13/00 13:31  
Original value (CoefB) = 12.9202 New value = 269.7652  
Poor peak curve fit. Data was refit by iterative curve fit procedure.

**Cell:** F166

**Comment:** 1066-20-04 - Run 8 (HAA5) 2/13/00 13:32  
Original value (CoefD) = 0.0153 New value = 0.0361  
Poor peak curve fit. Data was refit by iterative curve fit procedure.

**Cell:** J166

**Comment:** 1066-20-04 - Run 8 (HAA5) 2/13/00 13:32  
Original value (S) = -0.001 New value = -0.0187  
Poor peak curve fit. Data was refit by iterative curve fit procedure.

**Cell:** C167

**Comment:** 1066-20-04 - Run 8 (HAA6) 2/13/00 13:34  
Original value (CoefA0) = 0.3914 New value = -0.5133  
Poor peak curve fit. Data was refit by iterative curve fit procedure.

**Cell:** D167

**Comment:** 1066-20-04 - Run 8 (HAA6) 2/13/00 13:35  
Original value (CoefAf) = 11.2007 New value = 17.3636  
Poor peak curve fit. Data was refit by iterative curve fit procedure.

**Cell:** E167

**Comment:** 1066-20-04 - Run 8 (HAA6) 2/13/00 13:35  
Original value (CoefB) = 30.2804 New value = 299.9661  
Poor peak curve fit. Data was refit by iterative curve fit procedure.

**Cell:** F167

**Comment:** 1066-20-04 - Run 8 (HAA6) 2/13/00 13:35  
Original value (CoefD) = 0.024 New value = 0.0364  
Poor peak curve fit. Data was refit by iterative curve fit procedure.

**Cell:** J167

**Comment:** 1066-20-04 - Run 8 (HAA6) 2/13/00 13:35  
Original value (S) = -0.0232 New value = -0.0224  
Poor peak curve fit. Data was refit by iterative curve fit procedure.

**Cell:** C172

**Comment:** 1066-20-04 - Run 8 (TCAA) 2/13/00 13:33  
Original value (CoefA0) = 0 New value = -0.2112

Fewer than 6 points above MRL. Data was fit to peak curve by iterative curve fit procedure.

**Cell:** D172

**Comment:** 1066-20-04 - Run 8 (TCAA) 2/13/00 13:33

Original value (CoefAf) = 0 New value = 15.2542

Fewer than 6 points above MRL. Data was fit to peak curve by iterative curve fit procedure.

**Cell:** E172

**Comment:** 1066-20-04 - Run 8 (TCAA) 2/13/00 13:33

Original value (CoefB) = 0 New value = 503.285

Fewer than 6 points above MRL. Data was fit to peak curve by iterative curve fit procedure.

**Cell:** F172

**Comment:** 1066-20-04 - Run 8 (TCAA) 2/13/00 13:33

Original value (CoefD) = 0 New value = 0.0308

Fewer than 6 points above MRL. Data was fit to peak curve by iterative curve fit procedure.

**Cell:** J172

**Comment:** 1066-20-04 - Run 8 (TCAA) 2/13/00 13:33

Original value (S) = 0 New value = -0.0081

Fewer than 6 points above MRL. Data was fit to peak curve by iterative curve fit procedure.

**Cell:** C176

**Comment:** 1066-20-04 - Run 8 (TSUVA) 2/13/00 13:27

Original value (CoefA0) = -0.8846 New value = -0.0644

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

**Cell:** D176

**Comment:** 1066-20-04 - Run 8 (TSUVA) 2/13/00 13:27

Original value (CoefAf) = 2.6538 New value = 2.5615

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

**Cell:** E176

**Comment:** 1066-20-04 - Run 8 (TSUVA) 2/13/00 13:27

Original value (CoefB) = 1.1654 New value = 20.0038

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

**Cell:** F176

**Comment:** 1066-20-04 - Run 8 (TSUVA) 2/13/00 13:27

Original value (CoefD) = 0.0087 New value = 0.0245

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

**Cell:** J176

**Comment:** 1066-20-04 - Run 8 (TSUVA) 2/13/00 13:27

Original value (S) = 0 New value = -0.0073

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

## ICR Information

ID / ICR#: MA4044000 / 402  
 ICR Contact: James Muylle  
 Phone No.: 781/294-8597  
 Period: 5/7/98 - 5/20/98 (12 B-S days)

## Design Information

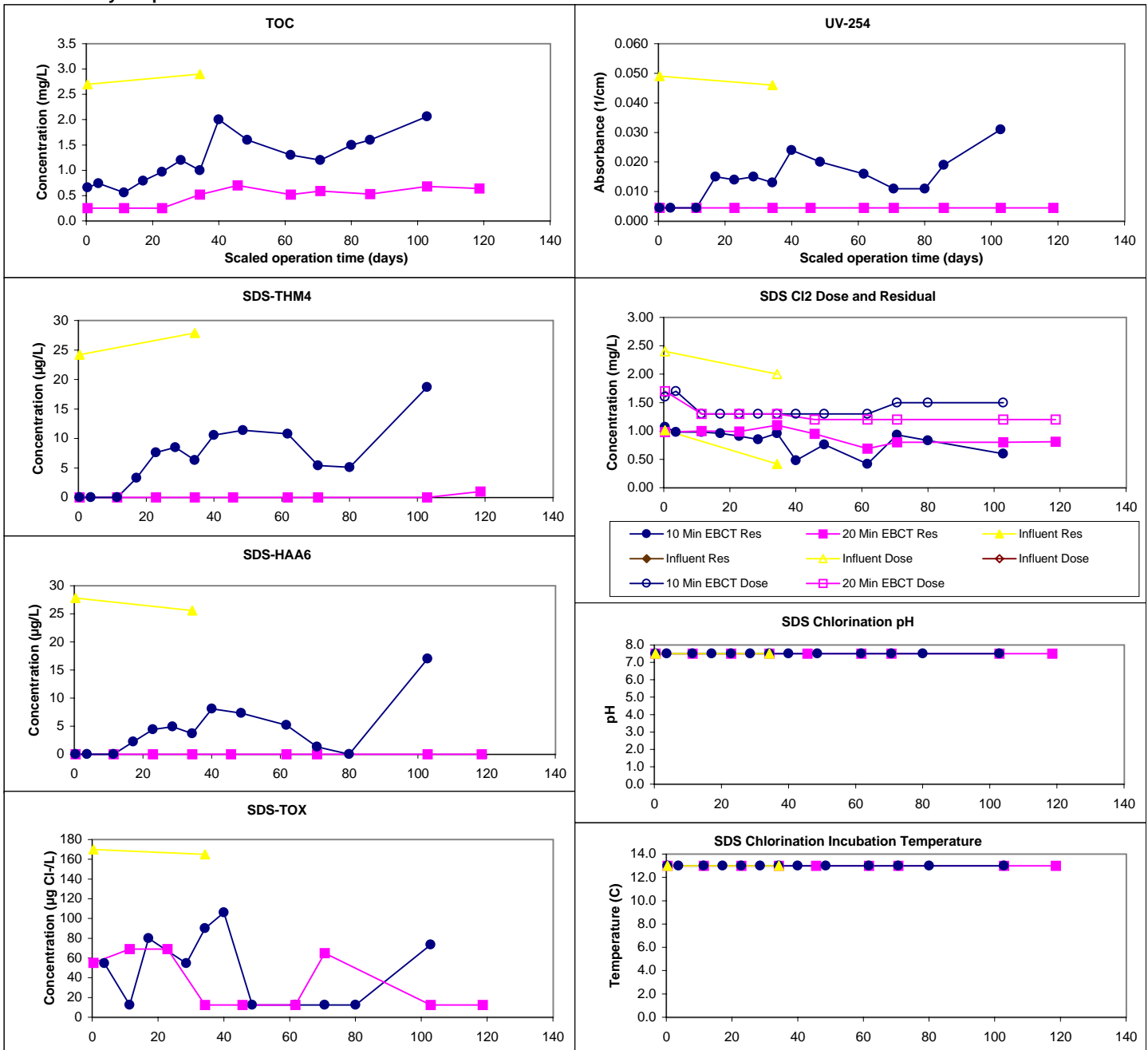
Design TOC: 2.7 mg/L  
 Col Diameter: 8.0 mm  
 Min Reynolds#: 0.50  
 Full-Scale Temp: 18.5 C

Full-Scale GAC Size: 12x40 Bituminous  
 Bench-Scale GAC Size: 100x200  
 Scaling Factor: 9.36  
 Meas Dry Bed Density: 0.49 g/cm3

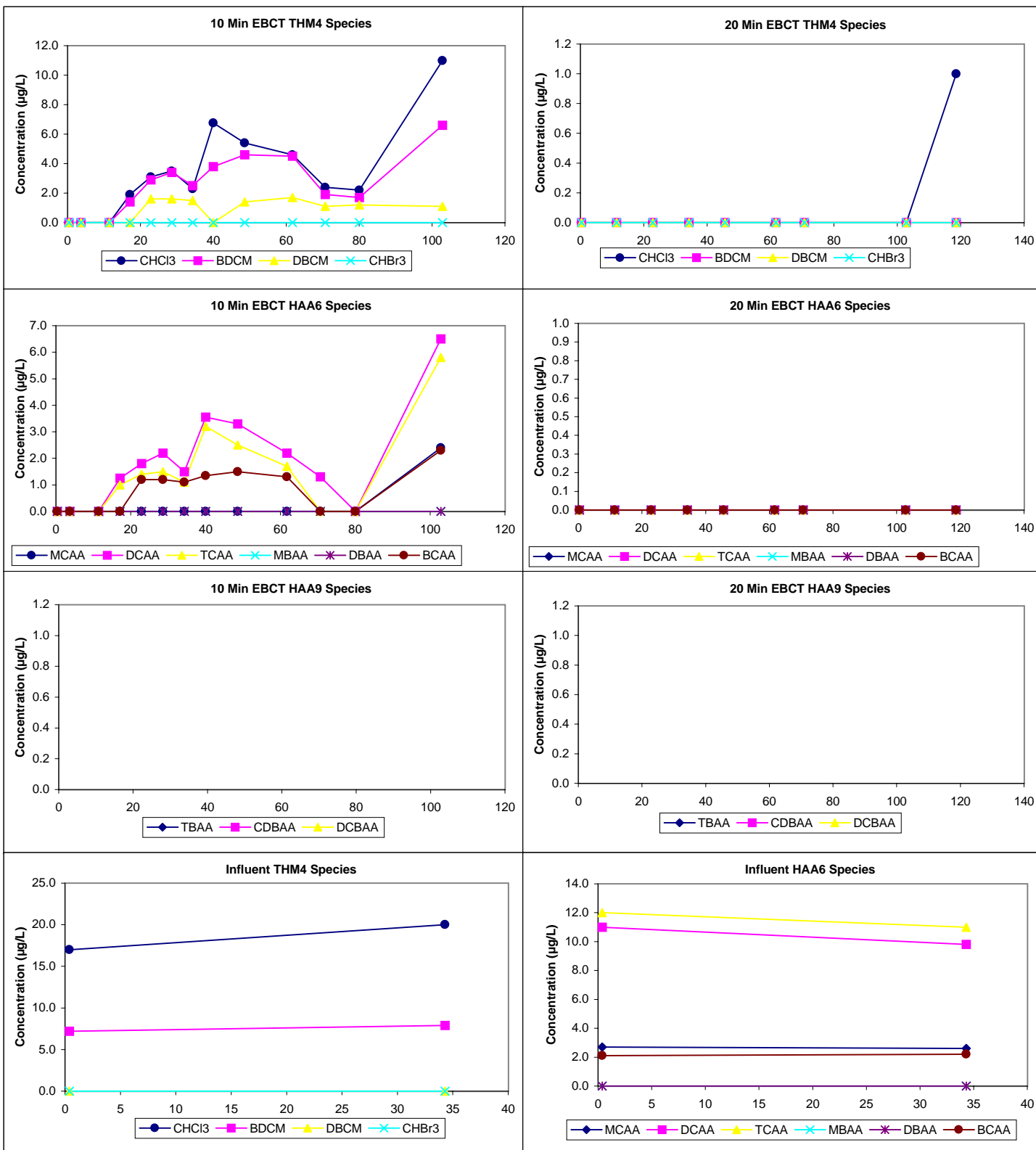
## Water Quality Summary

Influent	Influent				Influent				Res (0)	Mean	SD	Count	Min/Max
	Mean	SD/RD	Count	Min/Max	Mean	SD/RD	Count	Min/Max					
TOC	2.8	0.2	2	2.7 - 2.9									
pH	6.4	0.8	2	6.0 - 6.8					Temp	13.0	0.0	24	13.0 - 13.0
UV254	0.048	0.003	2	0.046 - 0.049					pH	7.5	0.0	24	7.5 - 7.5
SUVA	1.70	0.23	2	1.59 - 1.81					Time	6.0	0.0	24	6.0 - 6.0
Bromide	28	7	2	24 - 31					Comments:				
SDS-TOX	168	5	2	165 - 170									
SDS-THM4	26	4	2	24 - 28									
SDS-HAA6	27	2	2	26 - 28									
Effluent	10 Min EBCT (11 B-S days)				20 Min EBCT (13 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	6.5	0.3	14	6.0 - 7.2	6.4	0.3	10	6.0 - 7.1					
Effluent Temp	21.5	1.0	14	19.7 - 23.1	21.6	0.9	10	20.0 - 23.1					

## Water Quality Graphs



## Water Quality Graphs (Continued)



## ICR Information

ID / ICR#: MA4044000 / 402  
 ICR Contact: James Muylle  
 Phone No.: 781/294-8597  
 Period: 8/29/98 - 9/12/98 (13 B-S days)

## Design Information

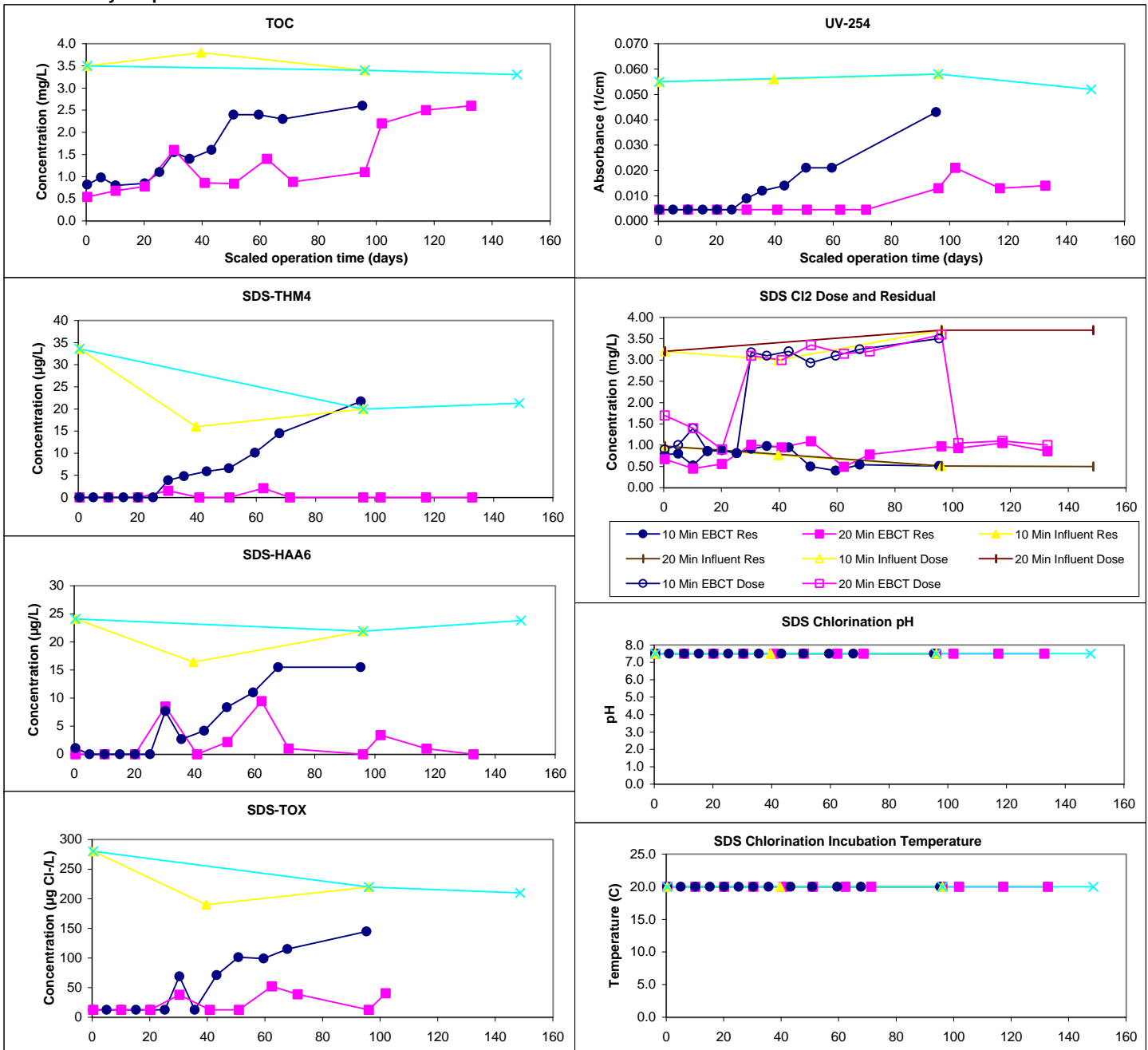
Design TOC: 2.9 mg/L  
 Col Diameter: 8.0 mm  
 Min Reynolds#: 0.50  
 Full-Scale Temp: 24.3 C

Full-Scale GAC Size: 12x40 Bituminous  
 Bench-Scale GAC Size: 100x200  
 Scaling Factor: 9.36  
 Meas Dry Bed Density: 0.45 g/cm3

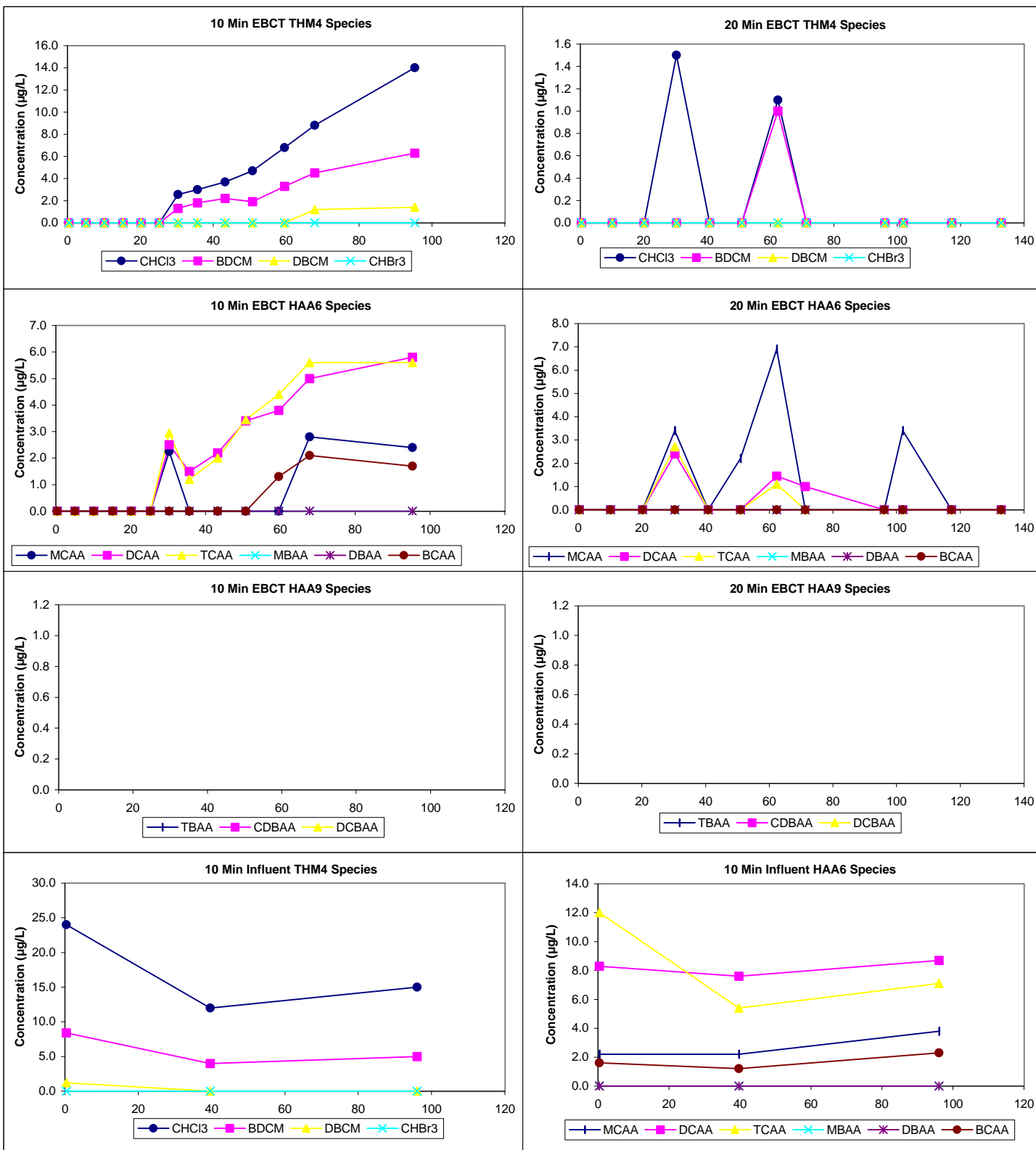
## Water Quality Summary

Influent	10 Min Influent				20 Min Influent								
	Mean	SD/RD	Count	Min/Max	Mean	SD/RD	Count	Min/Max		Mean	SD	Count	Min/Max
TOC	3.6	0.2	3	3.4 - 3.8	3.4	0.1	3	3.3 - 3.5	Res (0)	0.76	0.21	31	0.40 - 1.09
pH	6.8	1.4	3	6.0 - 8.4	6.8	1.3	3	6.1 - 8.4	Temp	20.0	0.0	31	20.0 - 20.0
UV254	0.056	0.002	3	0.055 - 0.058	0.055	0.003	3	0.052 - 0.058	pH	7.5	0.0	31	7.5 - 7.5
SUVA	1.58	0.12	3	1.47 - 1.71	1.62	0.08	3	1.57 - 1.71	Time	6.0	0.0	31	6.0 - 6.0
Bromide	28	3	2	26 - 29	27	2	2	26 - 28	Comments:				
SDS-TOX	230	46	3	190 - 280	237	38	3	210 - 280					
SDS-THM4	23	9	3	16 - 34	25	8	3	20 - 34					
SDS-HAA6	21	4	3	16 - 24	23	1	3	22 - 24	<div>Chart Legend:</div> <div><div><div></div><div>10 Min EBCT</div></div><div><div></div><div>20 Min EBCT</div></div><div><div></div><div>10 Min Influent</div></div><div><div></div><div>20 Min Influent</div></div></div>				
Effluent	10 Min EBCT (10 B-S days)				20 Min EBCT (14 B-S days)								
Effluent pH	6.5	0.7	13	5.6 - 8.4	6.5	0.7	10	5.9 - 8.4					
Effluent Temp	22.2	0.5	13	21.5 - 22.9	21.9	0.7	10	20.4 - 22.7					

## Water Quality Graphs



## Water Quality Graphs (Continued)



## ICR Information

ID / ICR#: MA4044000 / 402  
 ICR Contact: James Muylle  
 Phone No.: 781/294-8597  
 Period: 11/29/98 - 1/3/99 (34 B-S days)

## Design Information

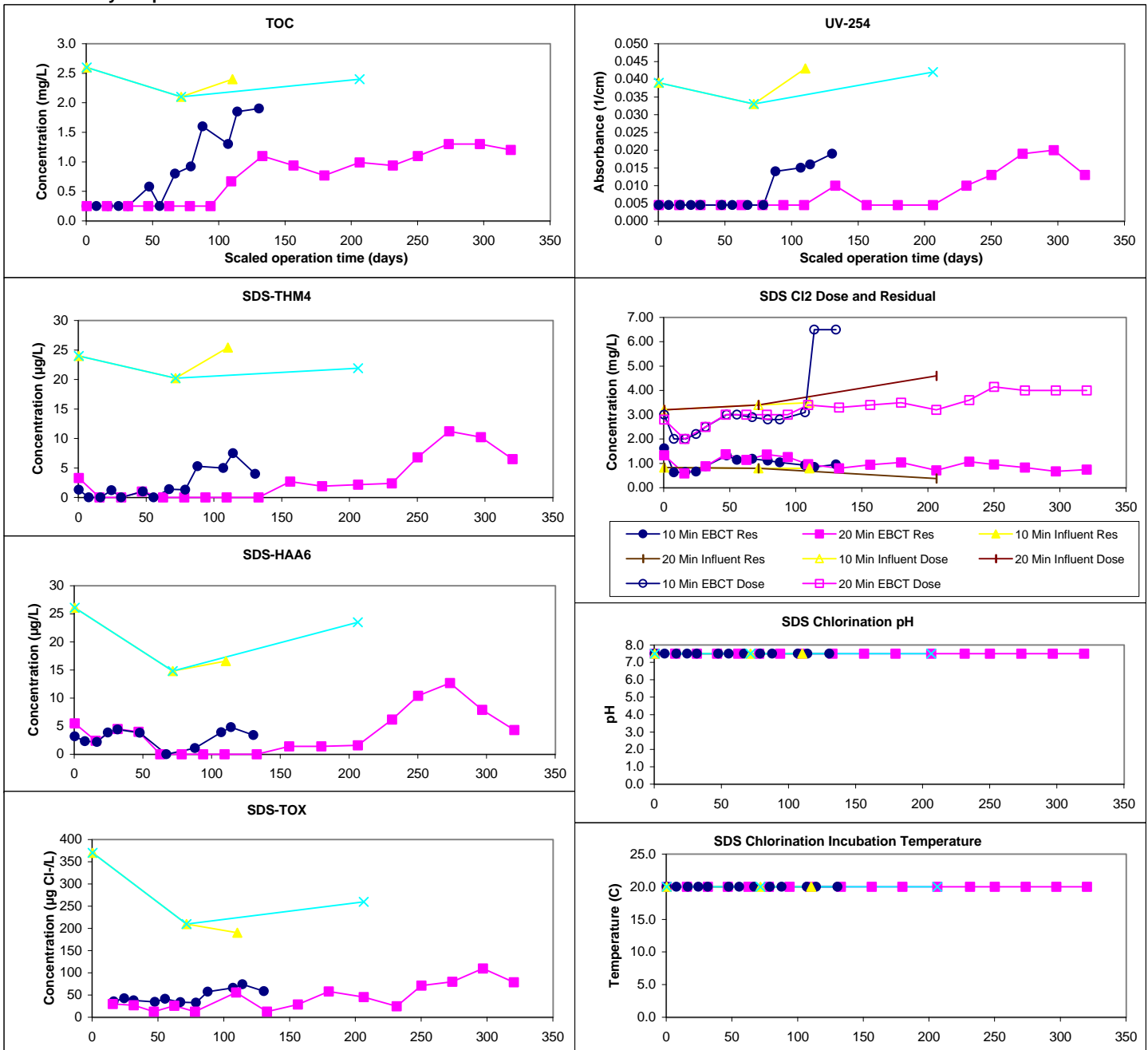
Design TOC: 2.1 mg/L  
 Col Diameter: 8.0 mm  
 Min Reynolds#: 0.50  
 Full-Scale Temp: 10.6 C

Full-Scale GAC Size: 12x40 Bituminous  
 Bench-Scale GAC Size: 100x200  
 Scaling Factor: 9.36  
 Meas Dry Bed Density: 0.44 g/cm3

## Water Quality Summary

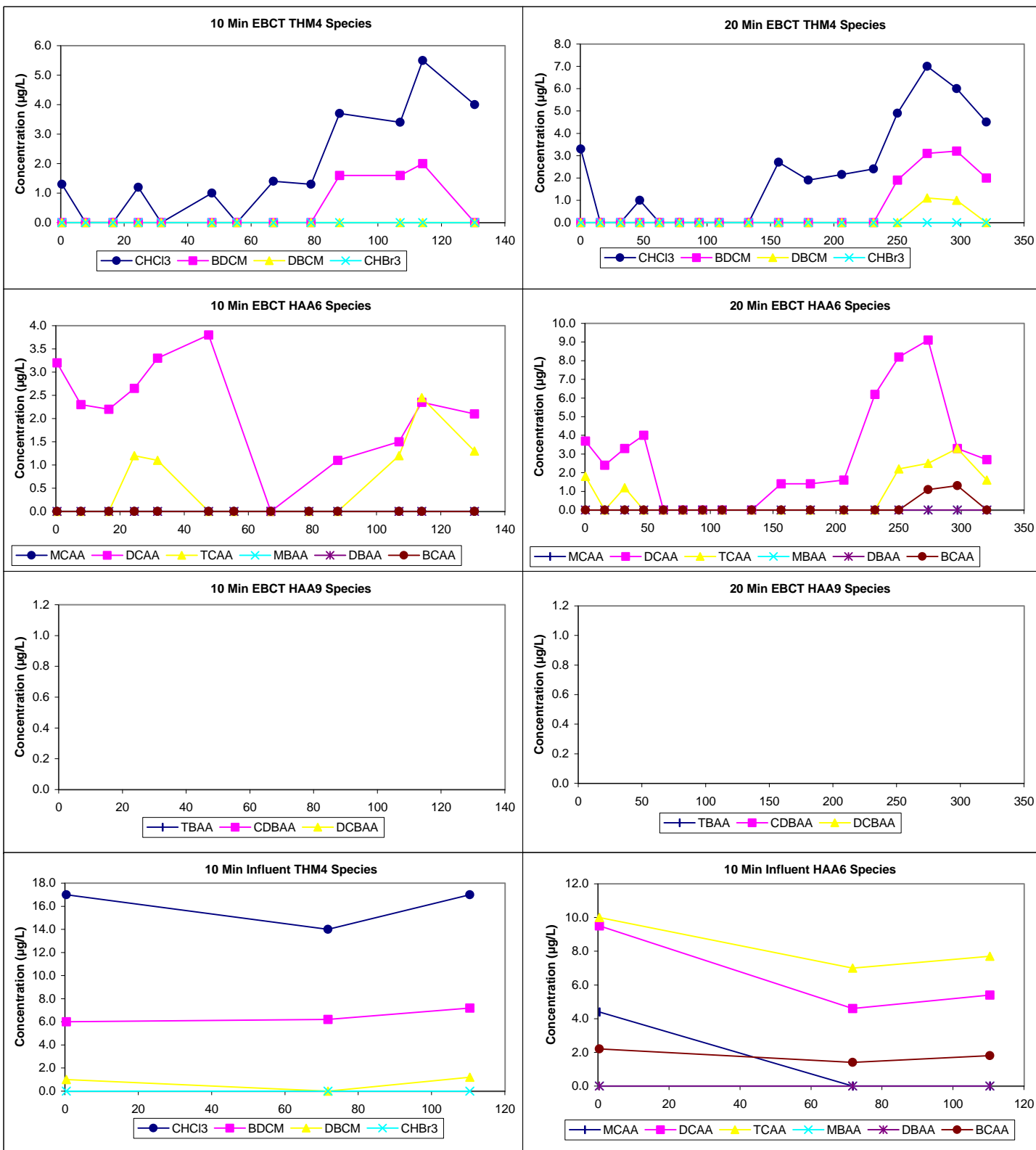
Influent	10 Min Influent				20 Min Influent				Res (0)	Mean	SD	Count	Min/Max
	Mean	SD/RD	Count	Min/Max	Mean	SD/RD	Count	Min/Max					
TOC	2.4	0.3	3	2.1 - 2.6	2.4	0.3	3	2.1 - 2.6		0.95	0.26	35	0.38 - 1.62
pH	6.8	0.1	3	6.7 - 6.9	6.6	0.2	3	6.4 - 6.7	Temp	20.0	0.0	36	20.0 - 20.0
UV254	0.038	0.005	3	0.033 - 0.043	0.038	0.005	3	0.033 - 0.042	pH	7.5	0.0	36	7.5 - 7.5
SUVA	1.62	0.15	3	1.50 - 1.79	1.61	0.13	3	1.50 - 1.75	Time	6.0	0.0	36	6.0 - 6.0
Bromide	31	1	2	30 - 31	31	2	2	30 - 32	Comments:				
SDS-TOX	257	99	3	190 - 370	280	82	3	210 - 370					
SDS-THM4	23	3	3	20 - 25	22	2	3	20 - 24					
SDS-HAA6	19	6	3	15 - 26	21	6	3	15 - 26					
Effluent	10 Min EBCT (14 B-S days)				20 Min EBCT (35 B-S days)				Chart Legend:	<div><div></div>10 Min EBCT</div> <div><div></div>20 Min EBCT</div> <div><div></div>10 Min Influent</div> <div><div></div>20 Min Influent</div>			
Effluent pH	6.9	0.3	13	6.2 - 7.4	6.8	0.4	17	5.9 - 7.4					
Effluent Temp	21.5	1.0	13	20.1 - 23.0	21.3	1.0	17	19.2 - 22.6					

## Water Quality Graphs





## Water Quality Graphs (Continued)



## ICR Information

ID / ICR#: MA4044000 / 402  
 ICR Contact: James Muylle  
 Phone No.: 781/294-8597  
 Period: 3/29/99 - 4/30/99 (31 B-S days)

## Design Information

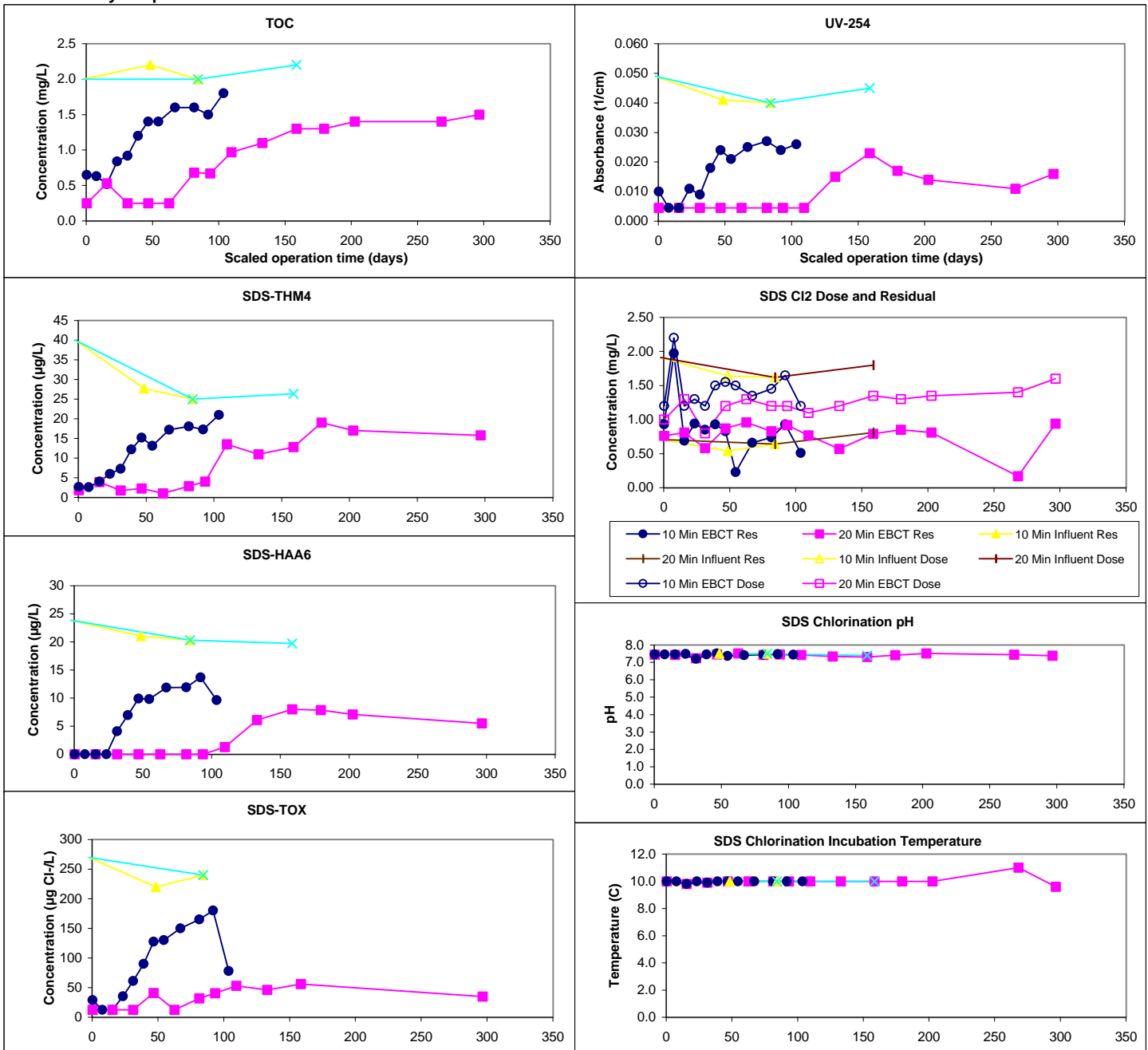
Design TOC: 2.1 mg/L  
 Col Diameter: 8.0 mm  
 Min Reynolds#: 0.50  
 Full-Scale Temp: 6.5 C

Full-Scale GAC Size: 12x40 Bituminous  
 Bench-Scale GAC Size: 100x200  
 Scaling Factor: 9.36  
 Meas Dry Bed Density: 0.44 g/cm3

## Water Quality Summary

Influent	10 Min Influent				20 Min Influent				Cumulative SDS Conditions			
	Mean	SD/RD	Count	Min/Max	Mean	SD/RD	Count	Min/Max	Res (0)	Mean	SD	Count
TOC	2.1	0.1	3	2.0 - 2.2	2.1	0.1	3	2.0 - 2.2	0.78	0.29		32
pH	6.1	0.4	3	5.8 - 6.5	6.2	0.3	3	5.8 - 6.5	Temp	10.0	0.2	32
UV254	0.043	0.005	3	0.040 - 0.049	0.045	0.005	3	0.040 - 0.049	pH	7.4	0.1	32
SUVA	2.10	0.31	3	1.86 - 2.45	2.17	0.25	3	2.00 - 2.45	Time	6.0	0.0	32
Bromide	10	0	2	10 - 10	10	0	2	10 - 10	Comments:			
SDS-TOX	243	25	3	220 - 270	255	30	2	240 - 270				
SDS-THM4	31	8	3	25 - 40	30	8	3	25 - 40	Chart Legend:			
SDS-HAA6	22	2	3	20 - 24	21	2	3	20 - 24				
Effluent	10 Min EBCT				20 Min EBCT				Chart Legend:			
	Mean	SD/RD	Count	Min/Max	Mean	SD/RD	Count	Min/Max				
Effluent pH	6.1	0.5	12	5.7 - 7.6	6.3	0.8	14	5.8 - 8.7				
Effluent Temp	20.8	1.7	12	18.2 - 25.0	20.7	1.8	14	17.5 - 25.0				

## Water Quality Graphs



## Water Quality Graphs (Continued)

