ICR TREATMENT STUDY ANALYSIS

Base Analysis and Data Review Comments

Treatment Study ID 3002

Study Protocol Bench-Scale GAC Treatment Study

Plant ICR Number 435

PWS Name St. Louis County Water Company

City, State, Zip St. Louis, MO 63141-6875

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

Major comments:

1. In general, GAC effluent formed DBP concentrations were high relative to formed GAC influent levels. The high levels seemed to be driven by the formation of brominated DBP species, as mentioned in the Summary Report. See specific comments below.

2. Full-scale processes that potentially remove DBP precursors located after the treatment study sampling point were not simulated. Presettled water was sampled (to avoid chlorine addition), which included a ferric sulfate dose. However, later in the treatment process, the water goes through rapid mix/flocculation/sedimentation with more ferric sulfate addition. Bench-scale pretreatment only included filtration.

General Comments:

1. Quarter 1: Although influent concentrations were variable, GAC effluent formed DBP levels reached high levels in comparison to influent concentrations, exceeding them for THM4, HAA6 (10 minute EBCT), and TOX (20 minute EBCT).

2. Quarter 2: For both columns and all SDS-DBPs, effluent levels exceeded influent formed levels (except 20 minute EBCT SDS-HAA6).

3. Quarter 2: Relatively fast breakthrough to high levels of THM and HAA species, followed by constant or decreasing concentrations (except for TCAA). Fast breakthrough trends match those seen for TOC.

4. Quarter 3: GAC effluent SDS-THM4 exceeds formed influent concentration after 10-15 days of operation (for both 10 and 20 minute EBCTs). Almost all samples measured are 100 - 140% of formed GAC influent levels. GAC effluent SDS-HAA6 exceeded GAC influent

levels in the 10 minute EBCT run and reached 90-100% of influent levels during the 20 minute EBCT run. SDS-TOX levels also reached 90-100% of influent levels during both EBCT runs. High levels of THMs and HAAs were driven by formation of brominated species.

5. Quarter 4: For the 10 minute EBCT run, GAC effluent SDS-THM4 and SDS-HAA6 reached influent levels towards the end of the run (effluent levels reached 90% of influent levels during the 20 minute EBCT run).

6. Quarters 3 and 4: GAC influent and effluent chlorine doses were fairly constant throughout the run (typ. 2.0 -2.2 mg/L). The GAC influent chlorine residual was usually lower than GAC effluent samples, especially at the beginning of the run, where the GAC influent chlorine residual was 1.0 mg/L less than GAC effluent chlorine residuals. The constant dose as opposed to constant residual approach may have partially contributed to relatively low GAC influent formed DBPs.

Oultier Data:

16 outliers removed, none were HAA9.

Cell: A1
Comment: 3002-SAS.xls 2/16/00 00:40

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

Cell: C2
Comment: 3002-10-01 - Run 1 (BCAA) 2/15/00 23:46
Original value (CoefA0) = -3.525 New value = -3.5201
Peak curve fit with S = 0. Refit to type 1 curve fit by iterative curve fit procedure.

Cell: D2
Comment: 3002-10-01 - Run 1 (BCAA) 2/15/00 23:46
Original value (CoefAf) = 10.575 New value = 9.4641
Peak curve fit with S = 0. Refit to type 1 curve fit by iterative curve fit procedure.

Cell: E2
Comment: 3002-10-01 - Run 1 (BCAA) 2/15/00 23:46
Original value (CoefB) = 1.3033 New value = 1.2353
Peak curve fit with S = 0. Refit to type 1 curve fit by iterative curve fit procedure.

Cell: F2
Comment: 3002-10-01 - Run 1 (BCAA) 2/15/00 23:46
Original value (CoefD) = 0.04 New value = 0.0692
Peak curve fit with S = 0. Refit to type 1 curve fit by iterative curve fit procedure.

Cell: J2
Comment: 3002-10-01 - Run 1 (BCAA) 2/15/00 23:46
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: C3
Comment: 3002-10-01 - Run 1 (BDCM) 2/15/00 23:51
Original value (CoefA0) = -2.0747 New value = -2.0747
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: D3
Comment: 3002-10-01 - Run 1 (BDCM) 2/15/00 23:51
Original value (CoefAf) = 23.9529 New value = 23.9529
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: E3
Comment: 3002-10-01 - Run 1 (BDCM) 2/15/00 23:51
Original value (CoefB) = 2.9778 New value = 2.9778
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: F3
Comment: 3002-10-01 - Run 1 (BDCM) 2/15/00 23:51
Original value (CoefD) = 0.0376 New value = 0.0376
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: J3
Comment: 3002-10-01 - Run 1 (BDCM) 2/15/00 23:51
Original value (S) = 0 New value = -0.099
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: C5
Comment: 3002-10-01 - Run 1 (CHBr3) 2/15/00 23:52
Original value (CoefA0) = 0 New value = 1.6432
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: D5
Comment: 3002-10-01 - Run 1 (CHBr3) 2/15/00 23:52
Original value (CoefAf) = 6.65 New value = 5.1524
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: E5
Comment: 3002-10-01 - Run 1 (CHBr3) 2/15/00 23:52
Original value (CoefB) = 10 New value = 19.9377
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: F5
Comment: 3002-10-01 - Run 1 (CHBr3) 2/15/00 23:52
Original value (CoefD) = 0.15 New value = 1.4719
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: J5
Comment: 3002-10-01 - Run 1 (CHBr3) 2/15/00 23:52
Original value (S) = 0 New value = -0.0632
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: C7
Comment: 3002-10-01 - Run 1 (Cl2-D) 2/15/00 23:47
Original value (CoefA0) = 0.6213 New value = 0.59
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: D7
Comment: 3002-10-01 - Run 1 (Cl2-D) 2/15/00 23:47
Original value (CoefAf) = 1.2234 New value = 1.9048
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: E7
Comment: 3002-10-01 - Run 1 (Cl2-D) 2/15/00 23:47
Original value (CoefB) = 9.9675 New value = 20.1359
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: F7
Comment: 3002-10-01 - Run 1 (Cl2-D) 2/15/00 23:47
Original value (CoefD) = 0.0367 New value = 0.0449
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: J7

Comment: 3002-10-01 - Run 1 (Cl2-D) 2/15/00 23:47
Original value (S) = -0.0144 New value = -0.019
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: C9
Comment: 3002-10-01 - Run 1 (DBCM) 2/15/00 23:44
Original value (CoefA0) = -5.5586 New value = -7.6142
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: D9
Comment: 3002-10-01 - Run 1 (DBCM) 2/15/00 23:44
Original value (CoefAf) = 27.5979 New value = 51.1812
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: E9
Comment: 3002-10-01 - Run 1 (DBCM) 2/15/00 23:44
Original value (CoefB) = 2.3449 New value = 3.8641
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: F9
Comment: 3002-10-01 - Run 1 (DBCM) 2/15/00 23:44
Original value (CoefD) = 0.0374 New value = 0.0205
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: J9
Comment: 3002-10-01 - Run 1 (DBCM) 2/15/00 23:44
Original value (S) = -0.0375 New value = -0.3605
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: C27
Comment: 3002-10-02 - Run 3 (CHBr3) 2/16/00 00:05
Original value (CoefA0) = 0 New value = -0.1653
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: D27
Comment: 3002-10-02 - Run 3 (CHBr3) 2/16/00 00:05
Original value (CoefAf) = 2.97 New value = 3.2682
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: E27
Comment: 3002-10-02 - Run 3 (CHBr3) 2/16/00 00:05
Original value (CoefB) = 10 New value = 19.9999
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: F27
Comment: 3002-10-02 - Run 3 (CHBr3) 2/16/00 00:05
Original value (CoefD) = 0.15 New value = 0.6223
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: J27
Comment: 3002-10-02 - Run 3 (CHBr3) 2/16/00 00:05

Original value (S) = 0 New value = -0.0301
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: C30
Comment: 3002-10-02 - Run 3 (DBAA) 2/16/00 00:04
Original value (CoefA0) = -0.2456 New value = -0.1812
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: D30
Comment: 3002-10-02 - Run 3 (DBAA) 2/16/00 00:04
Original value (CoefAf) = 4.2555 New value = 3.3098
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: E30
Comment: 3002-10-02 - Run 3 (DBAA) 2/16/00 00:04
Original value (CoefB) = 4.2468 New value = 19.2909
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: F30
Comment: 3002-10-02 - Run 3 (DBAA) 2/16/00 00:04
Original value (CoefD) = 0.1414 New value = 0.8711
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: J30
Comment: 3002-10-02 - Run 3 (DBAA) 2/16/00 00:04
Original value (S) = 0 New value = -0.0143
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: C37
Comment: 3002-10-02 - Run 3 (MBAA) 2/16/00 00:03
Original value (CoefA0) = 0 New value = -0.9992
Fewer than 6 points above MRL. Data was fit to peak curve by iterative curve fit procedure.

Cell: D37
Comment: 3002-10-02 - Run 3 (MBAA) 2/16/00 00:03
Original value (CoefAf) = 0 New value = 264.9181
Fewer than 6 points above MRL. Data was fit to peak curve by iterative curve fit procedure.

Cell: E37
Comment: 3002-10-02 - Run 3 (MBAA) 2/16/00 00:03
Original value (CoefB) = 0 New value = 562.0469
Fewer than 6 points above MRL. Data was fit to peak curve by iterative curve fit procedure.

Cell: F37
Comment: 3002-10-02 - Run 3 (MBAA) 2/16/00 00:03
Original value (CoefD) = 0 New value = 0.0498
Fewer than 6 points above MRL. Data was fit to peak curve by iterative curve fit procedure.

Cell: J37
Comment: 3002-10-02 - Run 3 (MBAA) 2/16/00 00:03
Original value (S) = 0 New value = -0.0506

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

Cell: C49
Comment: 3002-10-03 - Run 5 (CHBr3) 2/16/00 00:09
Original value (CoefA0) = -4.0553 New value = -0.7459
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: D49
Comment: 3002-10-03 - Run 5 (CHBr3) 2/16/00 00:09
Original value (CoefAf) = 24.887 New value = 28.0187
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: E49
Comment: 3002-10-03 - Run 5 (CHBr3) 2/16/00 00:09
Original value (CoefB) = 2.3648 New value = 21.6694
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: F49
Comment: 3002-10-03 - Run 5 (CHBr3) 2/16/00 00:09
Original value (CoefD) = 0.1456 New value = 0.3609
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: J49
Comment: 3002-10-03 - Run 5 (CHBr3) 2/16/00 00:09
Original value (S) = -0.094 New value = -0.2197
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: C52
Comment: 3002-10-03 - Run 5 (DBAA) 2/16/00 00:10
Original value (CoefA0) = -4.55 New value = -0.4484
Peak curve fit with S = 0. Refit to type 1 curve fit by iterative curve fit procedure.

Cell: D52
Comment: 3002-10-03 - Run 5 (DBAA) 2/16/00 00:10
Original value (CoefAf) = 13.262 New value = 8.9475
Peak curve fit with S = 0. Refit to type 1 curve fit by iterative curve fit procedure.

Cell: E52
Comment: 3002-10-03 - Run 5 (DBAA) 2/16/00 00:10
Original value (CoefB) = 1.9765 New value = 20.6348
Peak curve fit with S = 0. Refit to type 1 curve fit by iterative curve fit procedure.

Cell: F52
Comment: 3002-10-03 - Run 5 (DBAA) 2/16/00 00:10
Original value (CoefD) = 0.2463 New value = 0.4612
Peak curve fit with S = 0. Refit to type 1 curve fit by iterative curve fit procedure.

Cell: J52
Comment: 3002-10-03 - Run 5 (DBAA) 2/16/00 00:10
Original value (S) = -0.2055 New value = 0
Peak curve fit with S = 0. Refit to type 1 curve fit by iterative curve fit procedure.

Cell: C71
Comment: 3002-10-04 - Run 7 (CHBr3) 2/16/00 00:14
Original value (CoefA0) = 0 New value = 2.037
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: D71
Comment: 3002-10-04 - Run 7 (CHBr3) 2/16/00 00:14
Original value (CoefAf) = 5.38 New value = 5.01
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: E71
Comment: 3002-10-04 - Run 7 (CHBr3) 2/16/00 00:14
Original value (CoefB) = 10 New value = 19.9533
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: F71
Comment: 3002-10-04 - Run 7 (CHBr3) 2/16/00 00:14
Original value (CoefD) = 0.15 New value = 0.8717
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: J71
Comment: 3002-10-04 - Run 7 (CHBr3) 2/16/00 00:14
Original value (S) = 0 New value = -0.0666
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: C74
Comment: 3002-10-04 - Run 7 (DBAA) 2/16/00 00:15
Original value (CoefA0) = -0.3118 New value = -0.2739
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: D74
Comment: 3002-10-04 - Run 7 (DBAA) 2/16/00 00:15
Original value (CoefAf) = 2.318 New value = 4.374
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: E74
Comment: 3002-10-04 - Run 7 (DBAA) 2/16/00 00:15
Original value (CoefB) = 1.2656 New value = 20.0355
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: F74
Comment: 3002-10-04 - Run 7 (DBAA) 2/16/00 00:15
Original value (CoefD) = 0.1495 New value = 1.4258
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: J74
Comment: 3002-10-04 - Run 7 (DBAA) 2/16/00 00:15
Original value (S) = 0 New value = -0.0219
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: C75

Comment: 3002-10-04 - Run 7 (DBCM) 2/16/00 00:12
Original value (CoefA0) = -0.3452 New value = 1.6952
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: D75
Comment: 3002-10-04 - Run 7 (DBCM) 2/16/00 00:12
Original value (CoefAf) = 6.0347 New value = 11.01
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: E75
Comment: 3002-10-04 - Run 7 (DBCM) 2/16/00 00:12
Original value (CoefB) = 0.8334 New value = 20.3753
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: F75
Comment: 3002-10-04 - Run 7 (DBCM) 2/16/00 00:12
Original value (CoefD) = 0.1498 New value = 1.2302
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: J75
Comment: 3002-10-04 - Run 7 (DBCM) 2/16/00 00:12
Original value (S) = 0 New value = -0.0587
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: C91
Comment: 3002-20-01 - Run 2 (BDCM) 2/15/00 23:58
Original value (CoefA0) = -9.15 New value = -5.9244
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: D91
Comment: 3002-20-01 - Run 2 (BDCM) 2/15/00 23:58
Original value (CoefAf) = 27.45 New value = 36.1872
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: E91
Comment: 3002-20-01 - Run 2 (BDCM) 2/15/00 23:58
Original value (CoefB) = 1.5171 New value = 3.4521
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: F91
Comment: 3002-20-01 - Run 2 (BDCM) 2/15/00 23:58
Original value (CoefD) = 0.0404 New value = 0.0291
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: J91
Comment: 3002-20-01 - Run 2 (BDCM) 2/15/00 23:58
Original value (S) = -0.2272 New value = -0.3469
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: C93
Comment: 3002-20-01 - Run 2 (CHBr3) 2/15/00 23:59

Original value (CoefA0) = -1.4756 New value = -0.355
Poor peak curve fit. Data was refit by iterative curve fit procedure.

3002-20-01 - Run 2 (CHBr3) 2/16/00 00:36
Original value (CoefA0) = -0.355 New value = 4.5
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: D93
Comment: 3002-20-01 - Run 2 (CHBr3) 2/15/00 23:59
Original value (CoefAf) = 11.04 New value = 6.2334
Poor peak curve fit. Data was refit by iterative curve fit procedure.

3002-20-01 - Run 2 (CHBr3) 2/16/00 00:36
Original value (CoefAf) = 6.2334 New value = 2.8
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: E93
Comment: 3002-20-01 - Run 2 (CHBr3) 2/15/00 23:59
Original value (CoefB) = 1.0193 New value = 20.221
Poor peak curve fit. Data was refit by iterative curve fit procedure.

3002-20-01 - Run 2 (CHBr3) 2/16/00 00:36
Original value (CoefB) = 20.221 New value = 63
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: F93
Comment: 3002-20-01 - Run 2 (CHBr3) 2/15/00 23:59
Original value (CoefD) = 0.0078 New value = 0.9809
Poor peak curve fit. Data was refit by iterative curve fit procedure.

3002-20-01 - Run 2 (CHBr3) 2/16/00 00:36
Original value (CoefD) = 0.9809 New value = 0.1
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: J93
Comment: 3002-20-01 - Run 2 (CHBr3) 2/15/00 23:59
Original value (S) = 0 New value = -0.064
Poor peak curve fit. Data was refit by iterative curve fit procedure.

3002-20-01 - Run 2 (CHBr3) 2/16/00 00:36
Original value (S) = -0.064 New value = -0.0997
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: C94
Comment: 3002-20-01 - Run 2 (CHCl3) 2/15/00 23:53
Original value (CoefA0) = -3.9719 New value = -0.0489
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: D94
Comment: 3002-20-01 - Run 2 (CHCl3) 2/15/00 23:53
Original value (CoefAf) = 12.36 New value = 19.6587

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

Cell: E94
Comment: 3002-20-01 - Run 2 (CHCl3) 2/15/00 23:53
Original value (CoefB) = 2.0079 New value = 29.8616
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: F94
Comment: 3002-20-01 - Run 2 (CHCl3) 2/15/00 23:53
Original value (CoefD) = 0.0306 New value = 0.0443
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: J94
Comment: 3002-20-01 - Run 2 (CHCl3) 2/15/00 23:53
Original value (S) = -0.0902 New value = -0.1797
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: C95
Comment: 3002-20-01 - Run 2 (Cl2-D) 2/15/00 23:56
Original value (CoefA0) = -0.1411 New value = 0.635
Peak curve fit with S = 0. Refit to type 1 curve fit by iterative curve fit procedure.

Cell: D95
Comment: 3002-20-01 - Run 2 (Cl2-D) 2/15/00 23:56
Original value (CoefAf) = 1.95 New value = 0.3244
Peak curve fit with S = 0. Refit to type 1 curve fit by iterative curve fit procedure.

Cell: E95
Comment: 3002-20-01 - Run 2 (Cl2-D) 2/15/00 23:56
Original value (CoefB) = 1.2931 New value = 19.9849
Peak curve fit with S = 0. Refit to type 1 curve fit by iterative curve fit procedure.

Cell: F95
Comment: 3002-20-01 - Run 2 (Cl2-D) 2/15/00 23:56
Original value (CoefD) = 0.0099 New value = 0.1372
Peak curve fit with S = 0. Refit to type 1 curve fit by iterative curve fit procedure.

Cell: J95
Comment: 3002-20-01 - Run 2 (Cl2-D) 2/15/00 23:56
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: C96
Comment: 3002-20-01 - Run 2 (DBAA) 2/16/00 00:01
Original value (CoefA0) = -2.65 New value = -4.7717
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: D96
Comment: 3002-20-01 - Run 2 (DBAA) 2/16/00 00:01
Original value (CoefAf) = 7.95 New value = 9.7617
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: E96
Comment: 3002-20-01 - Run 2 (DBAA) 2/16/00 00:01
Original value (CoefB) = 1.0854 New value = 0.8674
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: F96
Comment: 3002-20-01 - Run 2 (DBAA) 2/16/00 00:01
Original value (CoefD) = 0.0362 New value = 0.0663
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: J96
Comment: 3002-20-01 - Run 2 (DBAA) 2/16/00 00:01
Original value (S) = 0 New value = -0.0454
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: C97
Comment: 3002-20-01 - Run 2 (DBCM) 2/15/00 23:54
Original value (CoefA0) = -7.15 New value = -3.6567
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: D97
Comment: 3002-20-01 - Run 2 (DBCM) 2/15/00 23:54
Original value (CoefAf) = 21.45 New value = 38.4105
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: E97
Comment: 3002-20-01 - Run 2 (DBCM) 2/15/00 23:54
Original value (CoefB) = 1.7459 New value = 7.16
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: F97
Comment: 3002-20-01 - Run 2 (DBCM) 2/15/00 23:54
Original value (CoefD) = 0.036 New value = 0.0268
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: J97
Comment: 3002-20-01 - Run 2 (DBCM) 2/15/00 23:54
Original value (S) = -0.1471 New value = -0.2653
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: C107
Comment: 3002-20-01 - Run 2 (THM4) 2/15/00 23:56
Original value (CoefA0) = -23.83 New value = -31.7939
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: D107
Comment: 3002-20-01 - Run 2 (THM4) 2/15/00 23:56
Original value (CoefAf) = 67.036 New value = 145.3582
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: E107

Comment: 3002-20-01 - Run 2 (THM4) 2/15/00 23:56
Original value (CoefB) = 1.3684 New value = 2.8879
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: F107
Comment: 3002-20-01 - Run 2 (THM4) 2/15/00 23:56
Original value (CoefD) = 0.0435 New value = 0.0181
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: J107
Comment: 3002-20-01 - Run 2 (THM4) 2/15/00 23:56
Original value (S) = -0.5439 New value = -0.9108
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: C115
Comment: 3002-20-02 - Run 4 (CHBr3) 2/16/00 00:08
Original value (CoefA0) = 0 New value = -0.2479
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: D115
Comment: 3002-20-02 - Run 4 (CHBr3) 2/16/00 00:08
Original value (CoefAf) = 4.75 New value = 5.0262
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: E115
Comment: 3002-20-02 - Run 4 (CHBr3) 2/16/00 00:08
Original value (CoefB) = 10 New value = 20.1082
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: F115
Comment: 3002-20-02 - Run 4 (CHBr3) 2/16/00 00:08
Original value (CoefD) = 0.15 New value = 0.4153
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: J115
Comment: 3002-20-02 - Run 4 (CHBr3) 2/16/00 00:08
Original value (S) = 0 New value = -0.0361
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: C117
Comment: 3002-20-02 - Run 4 (Cl2-D) 2/16/00 00:07
Original value (CoefA0) = 0.8974 New value = 0.8416
Poor peak curve fit. Data was refit to type 1 curve fit by iterative curve fit procedure.

Cell: D117
Comment: 3002-20-02 - Run 4 (Cl2-D) 2/16/00 00:07
Original value (CoefAf) = 0.8574 New value = 0.8529
Poor peak curve fit. Data was refit to type 1 curve fit by iterative curve fit procedure.

Cell: E117
Comment: 3002-20-02 - Run 4 (Cl2-D) 2/16/00 00:07

Original value (CoefB) = 280934.621449426 New value = 281.7642
Poor peak curve fit. Data was refit to type 1 curve fit by iterative curve fit procedure.

Cell: F117
Comment: 3002-20-02 - Run 4 (Cl2-D) 2/16/00 00:07
Original value (CoefD) = 0.3882 New value = 0.2022
Poor peak curve fit. Data was refit to type 1 curve fit by iterative curve fit procedure.

Cell: J117
Comment: 3002-20-02 - Run 4 (Cl2-D) 2/16/00 00:07
Original value (S) = -0.0191 New value = 0
Poor peak curve fit. Data was refit to type 1 curve fit by iterative curve fit procedure.

Cell: C125
Comment: 3002-20-02 - Run 4 (MBAA) 2/16/00 00:06
Original value (CoefA0) = 0 New value = -0.0288
Fewer than 6 points above MRL. Logistic function (type 1) applied.

Cell: D125
Comment: 3002-20-02 - Run 4 (MBAA) 2/16/00 00:06
Original value (CoefAf) = 0 New value = 1.4439
Fewer than 6 points above MRL. Logistic function (type 1) applied.

Cell: E125
Comment: 3002-20-02 - Run 4 (MBAA) 2/16/00 00:06
Original value (CoefB) = 0 New value = 29.1568
Fewer than 6 points above MRL. Logistic function (type 1) applied.

Cell: F125
Comment: 3002-20-02 - Run 4 (MBAA) 2/16/00 00:06
Original value (CoefD) = 0 New value = 0.0419
Fewer than 6 points above MRL. Logistic function (type 1) applied.

Cell: J125
Comment: 3002-20-02 - Run 4 (MBAA) 2/16/00 00:06
Original value (S) = 0 New value = 0
Fewer than 6 points above MRL. Logistic function (type 1) applied.

Cell: C132
Comment: 3002-20-02 - Run 4 (TSUVA) 2/16/00 00:06
Original value (CoefA0) = 0 New value = -0.2199
Peak curve fit with S = 0. Refit to type 1 curve fit by iterative curve fit procedure.

Cell: D132
Comment: 3002-20-02 - Run 4 (TSUVA) 2/16/00 00:06
Original value (CoefAf) = 2.4324 New value = 2.276
Peak curve fit with S = 0. Refit to type 1 curve fit by iterative curve fit procedure.

Cell: E132
Comment: 3002-20-02 - Run 4 (TSUVA) 2/16/00 00:06
Original value (CoefB) = 10 New value = 19.9857

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

Cell: F132
Comment: 3002-20-02 - Run 4 (TSUVA) 2/16/00 00:06
Original value (CoefD) = 0.15 New value = 7.4485
Peak curve fit with S = 0. Refit to type 1 curve fit by iterative curve fit procedure.

Cell: J132
Comment: 3002-20-02 - Run 4 (TSUVA) 2/16/00 00:06
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: C137
Comment: 3002-20-03 - Run 6 (CHBr3) 2/16/00 00:12
Original value (CoefA0) = -4.0437 New value = -1.486
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: D137
Comment: 3002-20-03 - Run 6 (CHBr3) 2/16/00 00:12
Original value (CoefAf) = 27.1367 New value = 29.9019
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: E137
Comment: 3002-20-03 - Run 6 (CHBr3) 2/16/00 00:12
Original value (CoefB) = 2.708 New value = 20.3543
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: F137
Comment: 3002-20-03 - Run 6 (CHBr3) 2/16/00 00:12
Original value (CoefD) = 0.105 New value = 0.306
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: J137
Comment: 3002-20-03 - Run 6 (CHBr3) 2/16/00 00:12
Original value (S) = -0.0697 New value = -0.1314
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: C139
Comment: 3002-20-03 - Run 6 (Cl2-D) 2/16/00 00:11
Original value (CoefA0) = -0.7 New value = 0.1471
Peak curve fit with S = 0. Refit to type 1 curve fit by iterative curve fit procedure.

Cell: D139
Comment: 3002-20-03 - Run 6 (Cl2-D) 2/16/00 00:11
Original value (CoefAf) = 1.9424 New value = 1.0489
Peak curve fit with S = 0. Refit to type 1 curve fit by iterative curve fit procedure.

Cell: E139
Comment: 3002-20-03 - Run 6 (Cl2-D) 2/16/00 00:11
Original value (CoefB) = 1.0316 New value = 19.9017
Peak curve fit with S = 0. Refit to type 1 curve fit by iterative curve fit procedure.

Cell: F139
Comment: 3002-20-03 - Run 6 (Cl2-D) 2/16/00 00:11
Original value (CoefD) = 0.0743 New value = 0.31
Peak curve fit with S = 0. Refit to type 1 curve fit by iterative curve fit procedure.

Cell: J139
Comment: 3002-20-03 - Run 6 (Cl2-D) 2/16/00 00:11
Original value (S) = -0.005 New value = 0
Peak curve fit with S = 0. Refit to type 1 curve fit by iterative curve fit procedure.

Cell: C159
Comment: 3002-20-04 - Run 8 (CHBr3) 2/16/00 00:17
Original value (CoefA0) = -0.0043 New value = -0.3482
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: D159
Comment: 3002-20-04 - Run 8 (CHBr3) 2/16/00 00:17
Original value (CoefAf) = 5.68 New value = 6.0412
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: E159
Comment: 3002-20-04 - Run 8 (CHBr3) 2/16/00 00:17
Original value (CoefB) = 10 New value = 20.0088
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: F159
Comment: 3002-20-04 - Run 8 (CHBr3) 2/16/00 00:17
Original value (CoefD) = 0.152 New value = 0.9902
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: J159
Comment: 3002-20-04 - Run 8 (CHBr3) 2/16/00 00:17
Original value (S) = -0.0026 New value = -0.0454
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: C161
Comment: 3002-20-04 - Run 8 (Cl2-D) 2/16/00 00:16
Original value (CoefA0) = -0.3059 New value = -0.0339
Peak curve fit with S = 0. Refit to type 1 curve fit by iterative curve fit procedure.

Cell: D161
Comment: 3002-20-04 - Run 8 (Cl2-D) 2/16/00 00:16
Original value (CoefAf) = 2.4 New value = 1.5832
Peak curve fit with S = 0. Refit to type 1 curve fit by iterative curve fit procedure.

Cell: E161
Comment: 3002-20-04 - Run 8 (Cl2-D) 2/16/00 00:16
Original value (CoefB) = 1.5061 New value = 1.4476
Peak curve fit with S = 0. Refit to type 1 curve fit by iterative curve fit procedure.

Cell: F161

Comment: 3002-20-04 - Run 8 (Cl2-D) 2/16/00 00:16
Original value (CoefD) = 0.0124 New value = 0.0242
Peak curve fit with S = 0. Refit to type 1 curve fit by iterative curve fit procedure.

Cell: J161
Comment: 3002-20-04 - Run 8 (Cl2-D) 2/16/00 00:16
Original value (S) = -0.0111 New value = 0
Peak curve fit with S = 0. Refit to type 1 curve fit by iterative curve fit procedure.

Cell: C162
Comment: 3002-20-04 - Run 8 (DBAA) 2/16/00 00:18
Original value (CoefA0) = 0.0083 New value = -0.2293
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: D162
Comment: 3002-20-04 - Run 8 (DBAA) 2/16/00 00:18
Original value (CoefAf) = 4.0246 New value = 4.3799
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: E162
Comment: 3002-20-04 - Run 8 (DBAA) 2/16/00 00:18
Original value (CoefB) = 10 New value = 20.0278
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: F162
Comment: 3002-20-04 - Run 8 (DBAA) 2/16/00 00:18
Original value (CoefD) = 0.1557 New value = 0.4955
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: J162
Comment: 3002-20-04 - Run 8 (DBAA) 2/16/00 00:18
Original value (S) = -0.0041 New value = -0.0134
Poor peak curve fit. Data was refit by iterative curve fit procedure.

St. Louis County Water Company | **Bench-Scale RSSCT Treatment Study Summary** | **Quarter:** 1

ICR Information

ID / ICR#: MO6010716 / 435
ICR Contact: Paul Keck
Phone No.: (314) 542-6419
Period: 3/23/98 - 4/23/98 (31 B-S days)

Design Information

Design TOC: 2.8 mg/L
Col Diameter: 15.0 mm
Min Reynolds#: 0.39
Full-Scale Temp: 5.6 C

Full-Scale GAC Size: 12x40 Lignite Coal Ba
Bench-Scale GAC Size: 60x80
Scaling Factor: 4.90
Meas Dry Bed Density: 0.39 g/cm3

Water Quality Summary

	10 Min Influent				20 Min Influent			
Influent	Mean	SD/RD	Count	Min/Max	Mean	SD/RD	Count	Min/Max
TOC	3.1	0.1	3	3.0 - 3.3	3.1	0.1	3	3.0 - 3.2
pH	9.3	0.1	3	9.2 - 9.4	9.3	0.1	3	9.2 - 9.4
UV254	0.068	0.001	2	0.067 - 0.068	0.069	0.002	3	0.067 - 0.071
SUVA	2.19	0.11	2	2.14 - 2.25	2.24	0.09	3	2.14 - 2.32
Bromide	75	10	2	70 - 80	75	10	2	70 - 80
SDS-TOX	144	47	3	96 - 189	151	57	3	96 - 210
SDS-THM4	44	25	3	18 - 68	33	13	3	18 - 45
SDS-HAA6	19	5	3	14 - 23	20	6	3	14 - 24
Effluent	**10 Min EBCT**			(21 B-S days)	**20 Min EBCT**			(31 B-S days)
Effluent pH	9.1	0.3	14	8.6 - 9.6	8.9	0.4	17	7.8 - 9.5
Effluent Temp	22.0	1.3	12	19.4 - 23.5	21.9	1.3	16	19.4 - 23.0

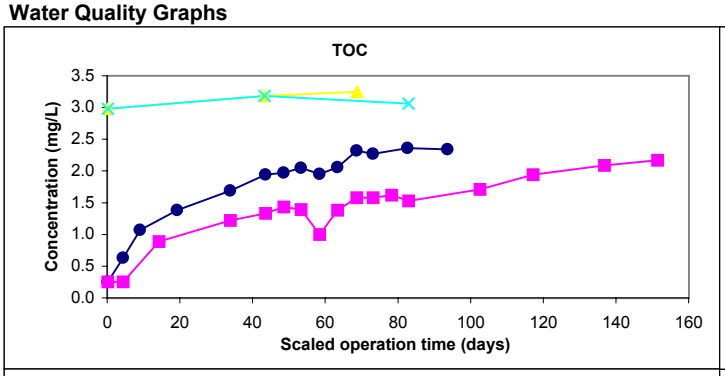
Cumulative SDS Conditions

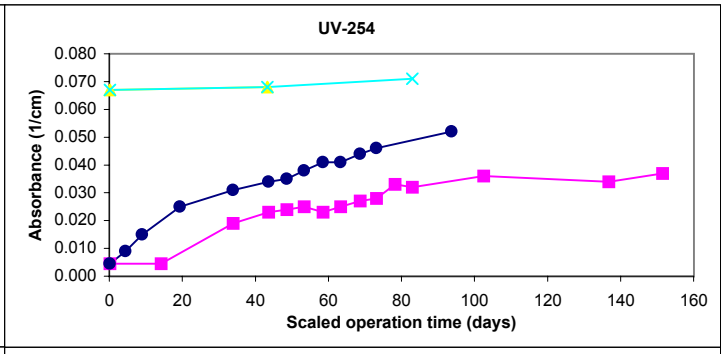
	Mean	SD	Count	Min/Max
Res (0)	1.03	0.41	35	0.20 - 1.60
Temp	1.0	0.0	37	1.0 - 1.0
pH	9.0	0.4	29	7.6 - 9.5
Time	19.0	0.0	34	19.0 - 19.0

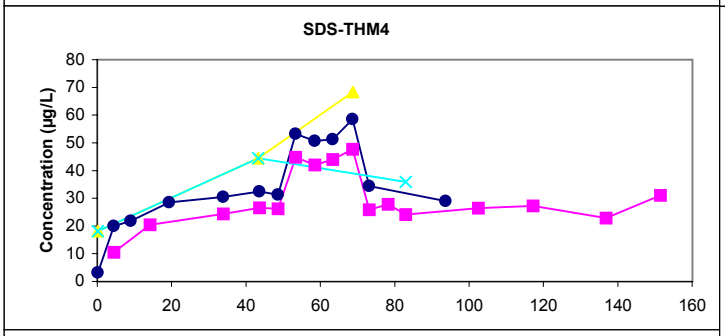
Comments:

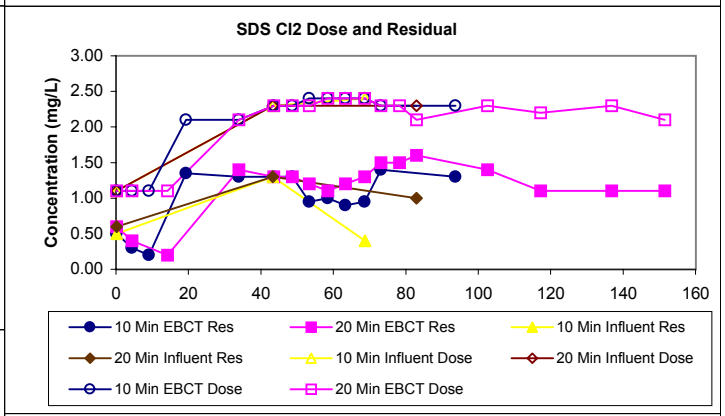
Chart Legend: 10 Min EBCT; 20 Min EBCT; 10 Min Influent; 20 Min Influent

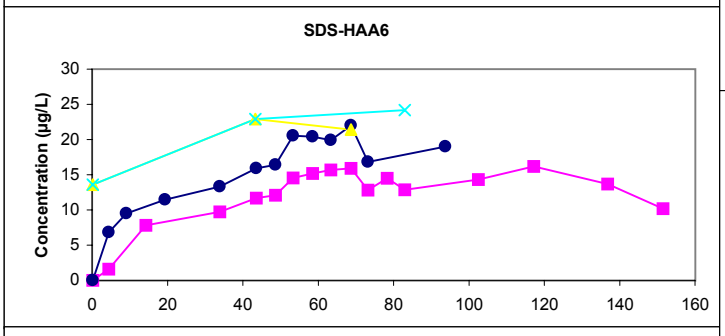
Water Quality Graphs

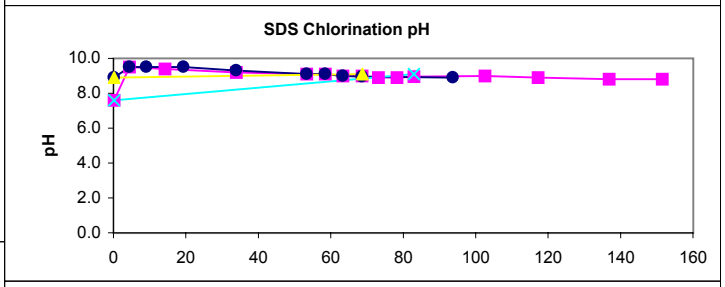


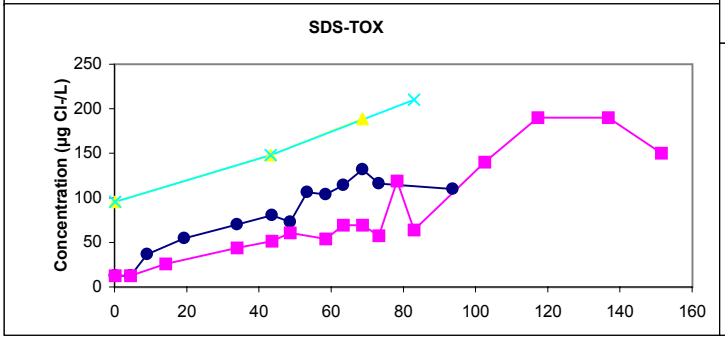


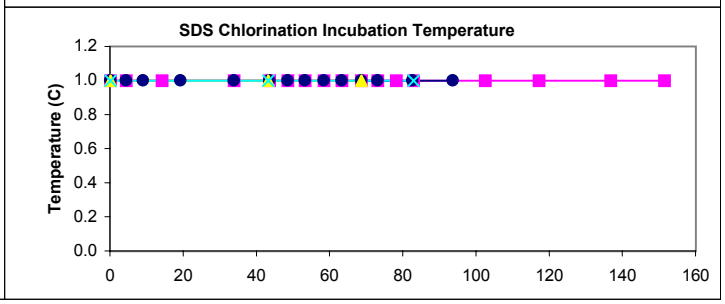




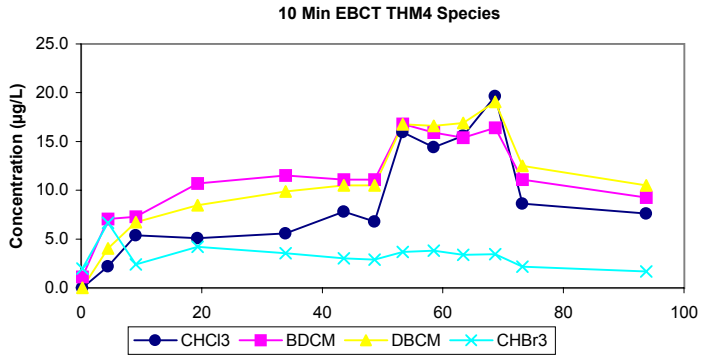


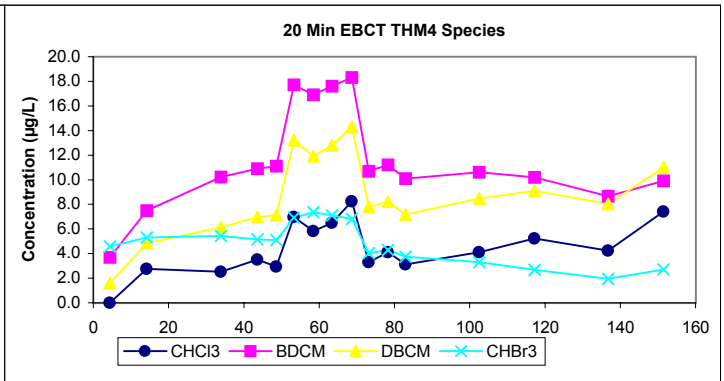


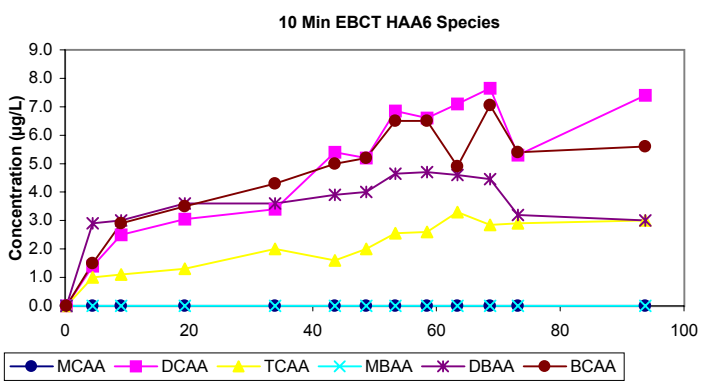


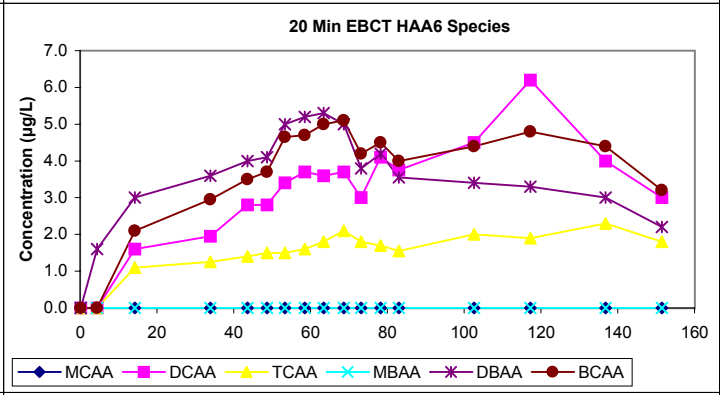


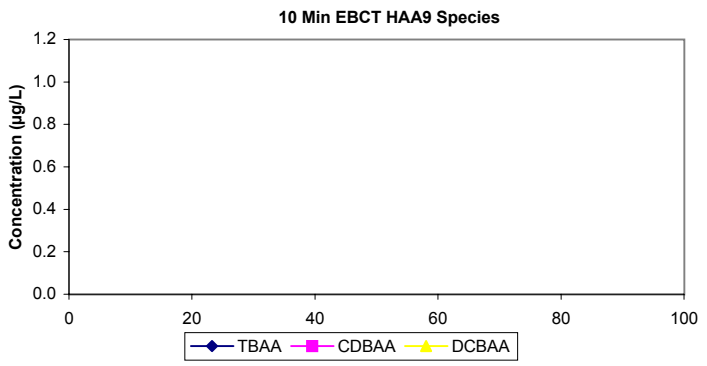
Water Quality Graphs (Continued)

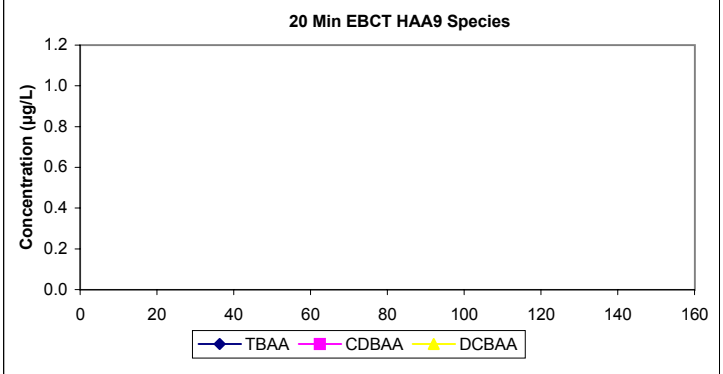


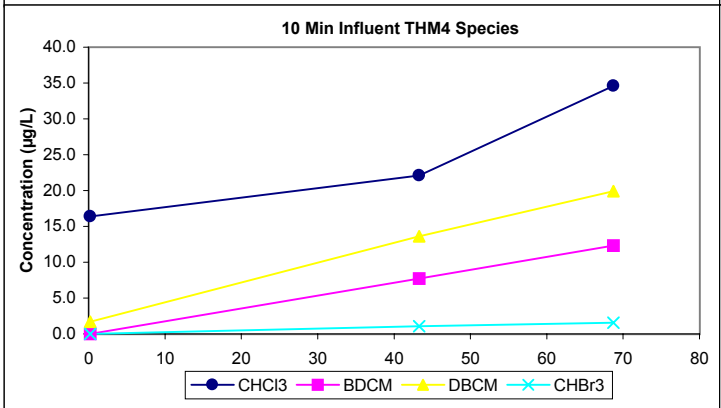


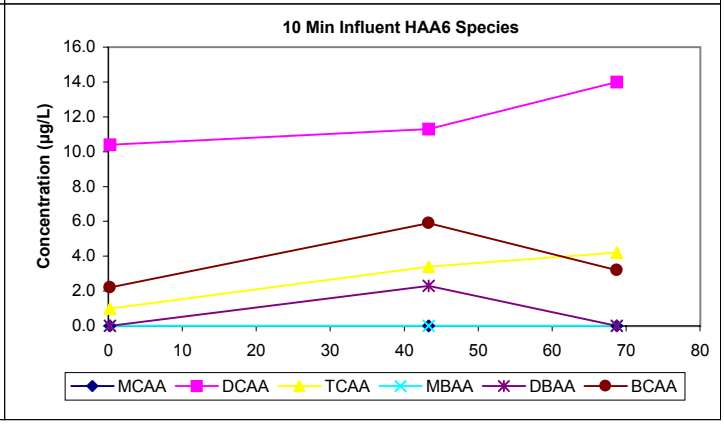












St. Louis County Water Company | **Bench-Scale RSSCT Treatment Study Summary** | **Quarter:** 2

ICR Information

ID / ICR#: MO6010716 / 435
ICR Contact: Paul Keck
Phone No.: (314) 542-6419
Period: 6/15/98 - 7/20/98 (35 B-S days)

Design Information

Design TOC: 2.8 mg/L
Col Diameter: 15.0 mm
Min Reynolds#: 0.61
Full-Scale Temp: 23.0 C

Full-Scale GAC Size: 12x40 Lignite Coal Ba
Bench-Scale GAC Size: 60x80
Scaling Factor: 4.90
Meas Dry Bed Density: 0.40 g/cm3

Water Quality Summary

	10 Min Influent				20 Min Influent			
Influent	Mean	SD/RD	Count	Min/Max	Mean	SD/RD	Count	Min/Max
TOC	3.3	0.3	3	3.1 - 3.6	3.3	0.3	3	3.1 - 3.6
pH	9.1	0.5	3	8.7 - 9.6	9.1	0.6	3	8.5 - 9.6
UV254	0.085	0.005	3	0.080 - 0.089	0.087	0.007	3	0.080 - 0.093
SUVA	2.59	0.34	3	2.20 - 2.82	2.66	0.40	3	2.20 - 2.95
Bromide	47	0	2	47 - 47	47	0	2	47 - 47
SDS-TOX	191	14	3	175 - 200	215	19	3	200 - 236
SDS-THM4	26	7	3	19 - 31	27	5	3	21 - 31
SDS-HAA6	22	2	3	19 - 23	22	2	3	20 - 23
Effluent	**10 Min EBCT**			(21 B-S days)	**20 Min EBCT**			(35 B-S days)
Effluent pH	8.8	0.4	13	8.2 - 9.4	8.5	0.5	14	8.0 - 9.4
Effluent Temp	23.1	1.0	13	21.0 - 24.0	23.3	0.9	14	21.0 - 24.0

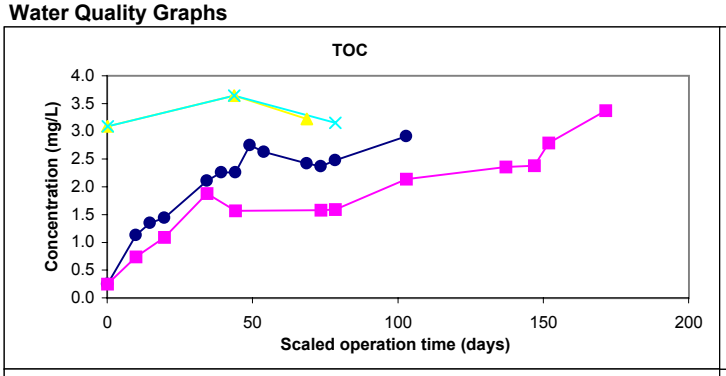
Cumulative SDS Conditions

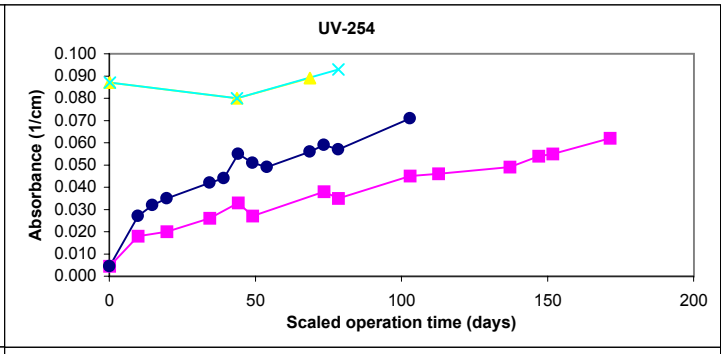
	Mean	SD	Count	Min/Max
Res (0)	1.03	0.30	33	0.50 - 1.70
Temp	20.3	7.2	32	4.0 - 24.0
pH	8.8	0.5	33	8.2 - 9.6
Time	16.0	0.0	32	16.0 - 16.0

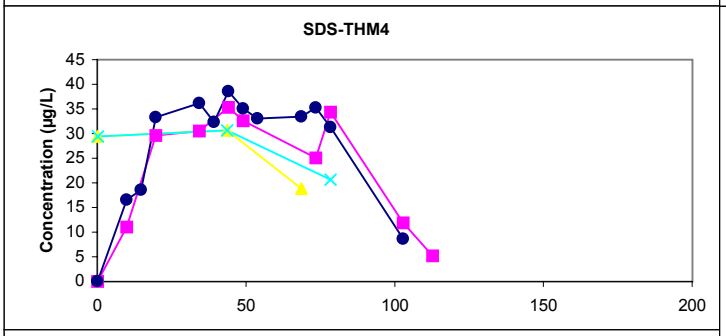
Comments:

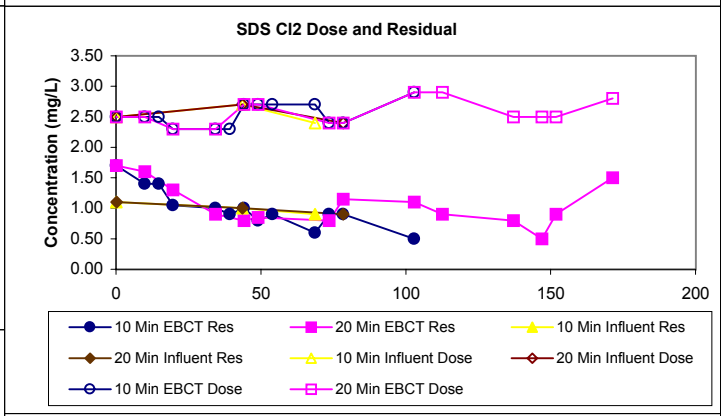
Chart Legend: 10 Min EBCT; 20 Min EBCT; 10 Min Influent; 20 Min Influent

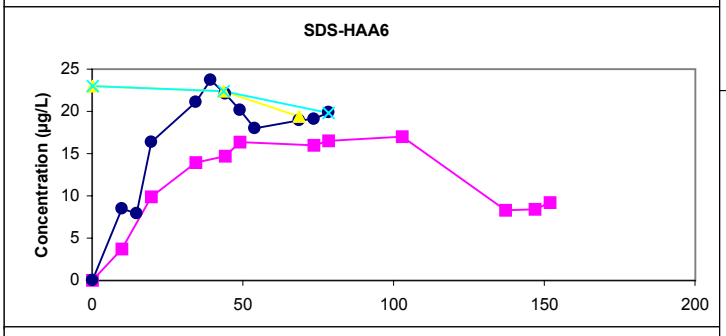
Water Quality Graphs

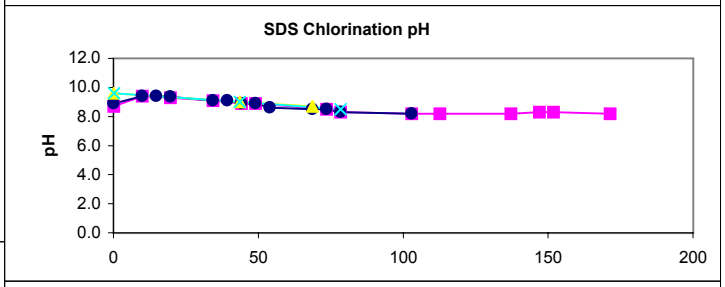


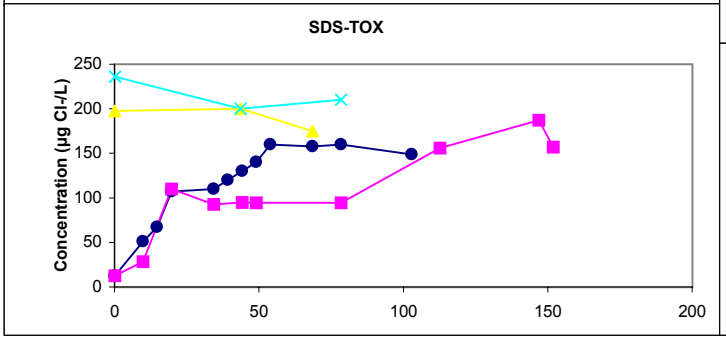


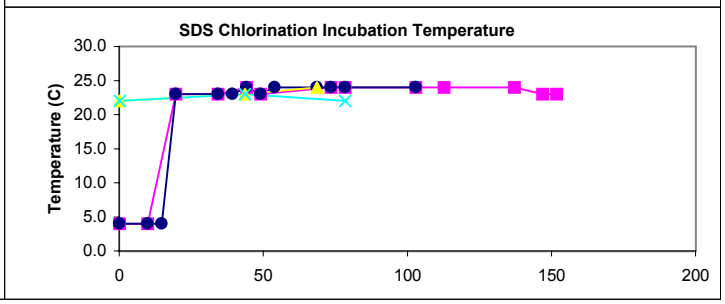




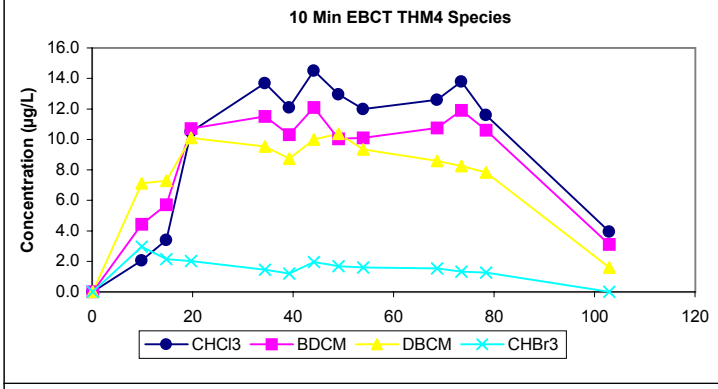


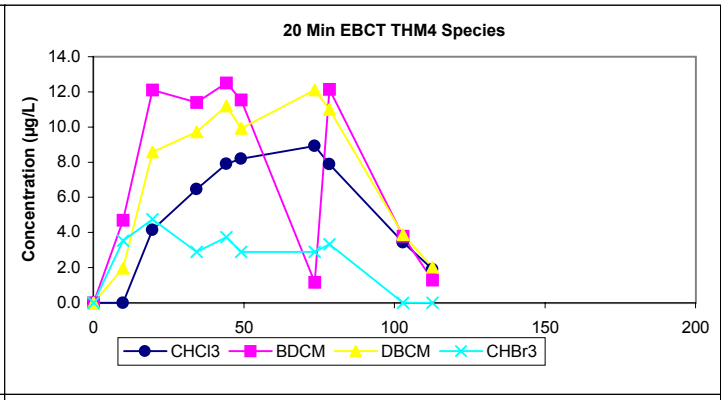


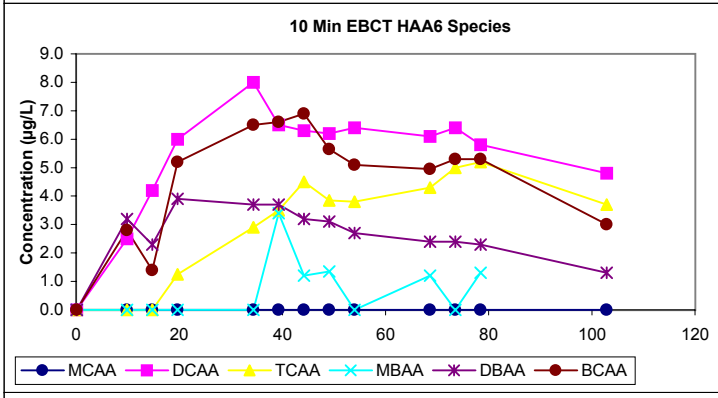


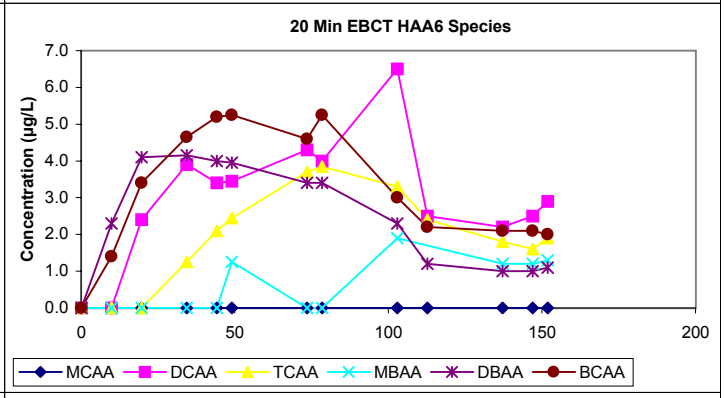


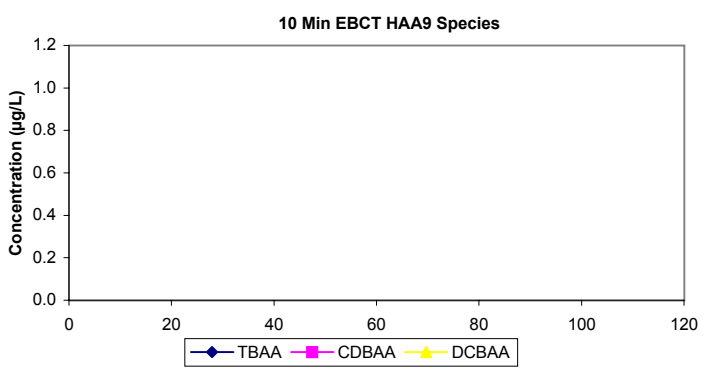
Water Quality Graphs (Continued)

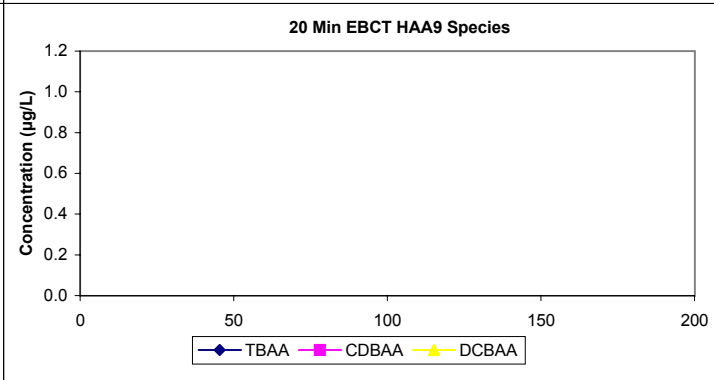


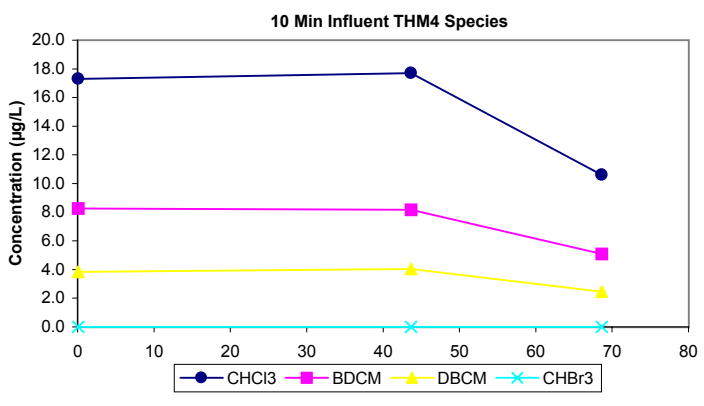


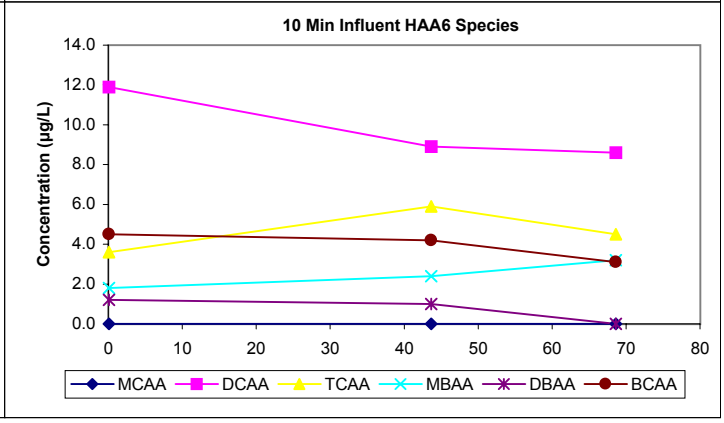












St. Louis County Water Company | **Bench-Scale RSSCT Treatment Study Summary** | **Quarter:** 3

ICR Information

ID / ICR#: MO6010716 / 435
ICR Contact: Paul Keck
Phone No.: (314) 542-6419
Period: 9/15/98 - 10/21/98 (36 B-S days)

Design Information

Design TOC:	2.8 mg/L	**Full-Scale GAC Size:**	12x40 Lignite Coal Ba
Col Diameter:	15.0 mm	**Bench-Scale GAC Size:**	60x80
Min Reynolds#:	0.65	**Scaling Factor:**	4.90
Full-Scale Temp:	26.0 C	**Meas Dry Bed Density:**	0.40 g/cm3

Water Quality Summary

	10 Min Influent				20 Min Influent			
Influent	Mean	SD/RD	Count	Min/Max	Mean	SD/RD	Count	Min/Max
TOC	2.6	0.2	2	2.6 - 2.7	2.7	0.3	2	2.6 - 2.8
pH	9.4	0.2	3	9.3 - 9.7	9.4	0.3	3	9.1 - 9.7
UV254	0.073	0.006	3	0.069 - 0.080	0.071	0.003	3	0.069 - 0.075
SUVA	2.82	0.24	2	2.71 - 2.94	2.68	0.05	2	2.66 - 2.71
Bromide	137	7	2	133 - 140	137	7	2	133 - 140
SDS-TOX	111	34	3	72 - 133	137	13	3	127 - 152
SDS-THM4	41	6	3	35 - 46	46	11	3	35 - 57
SDS-HAA6	29	2	3	28 - 31	30	3	3	28 - 33
Effluent	**10 Min EBCT**			(23 B-S days)	**20 Min EBCT**			(36 B-S days)
Effluent pH	9.1	0.5	13	7.6 - 9.8	9.1	0.6	15	7.2 - 9.7
Effluent Temp	22.4	1.3	13	20.0 - 24.0	22.6	1.1	15	21.0 - 24.0

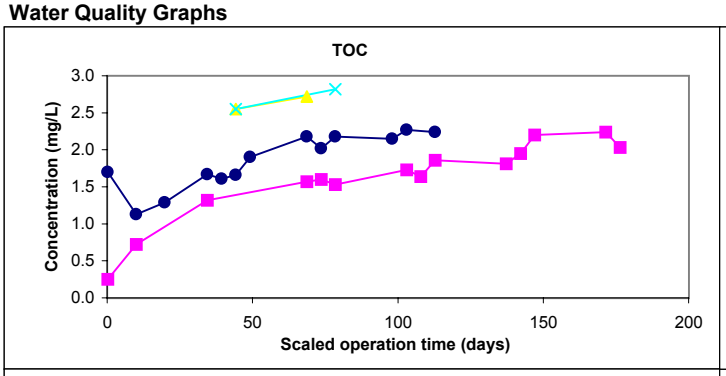
Cumulative SDS Conditions

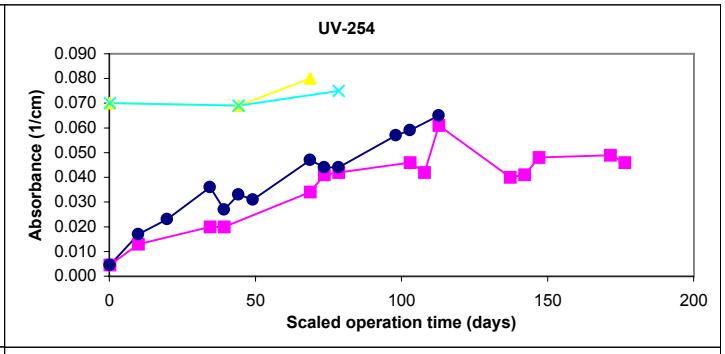
	Mean	SD	Count	Min/Max
Res (0)	0.80	0.34	34	0.40 - 1.80
Temp	23.5	1.1	34	20.0 - 24.0
pH	9.2	0.4	34	7.6 - 9.8
Time	16.0	0.0	34	16.0 - 16.0

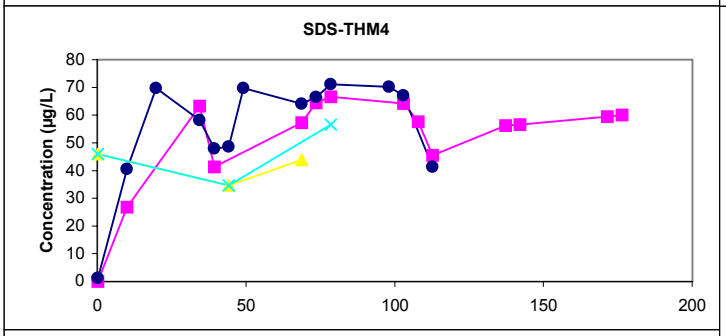
Comments:

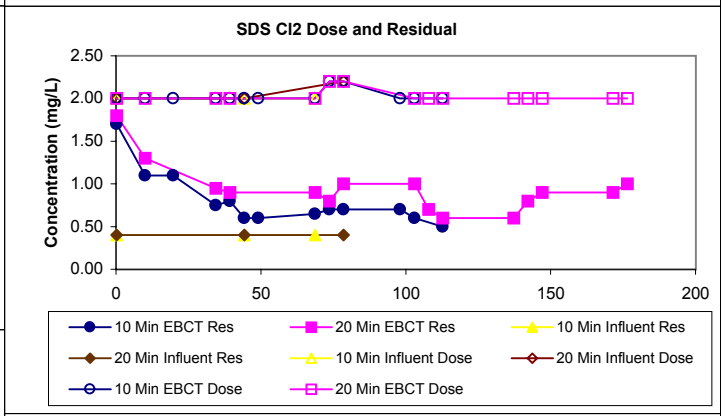
Chart Legend: 10 Min EBCT; 20 Min EBCT; 10 Min Influent; 20 Min Influent

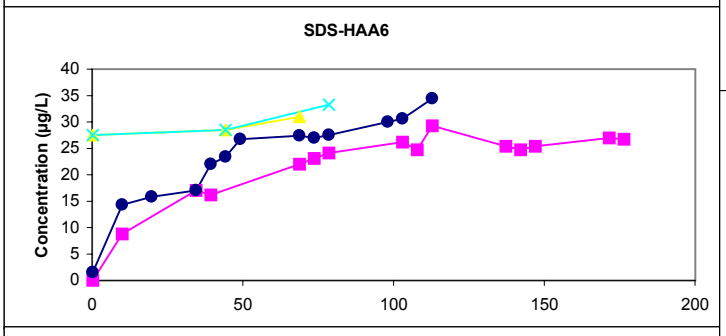
Water Quality Graphs

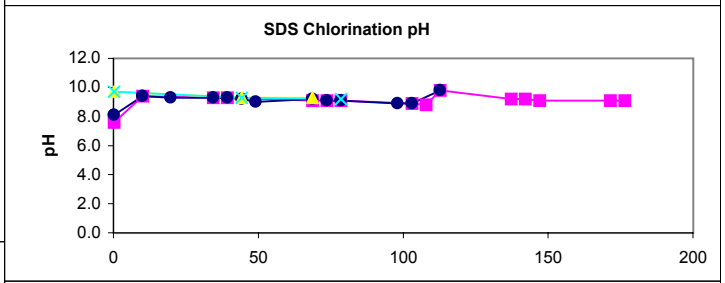


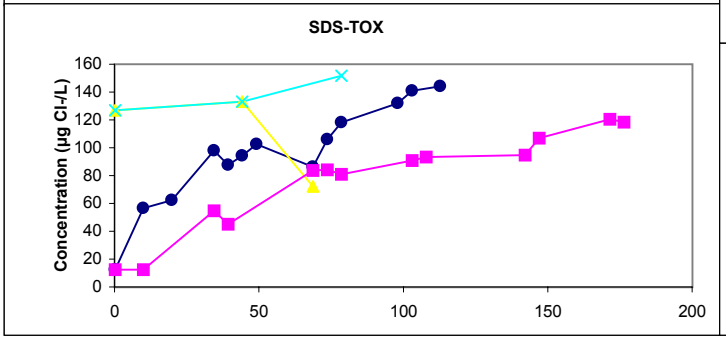


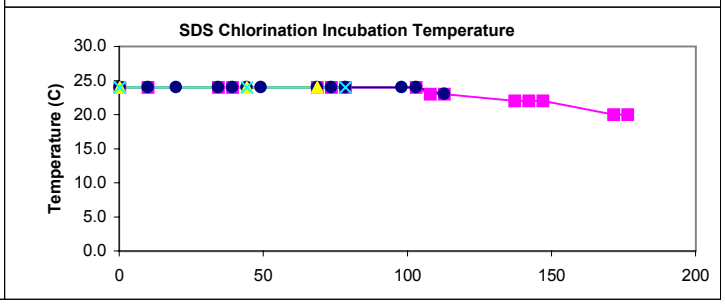




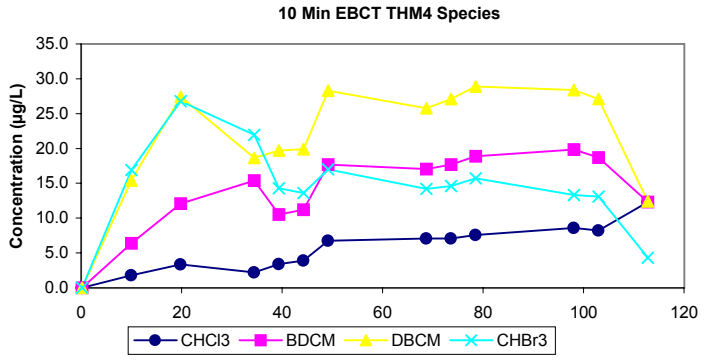


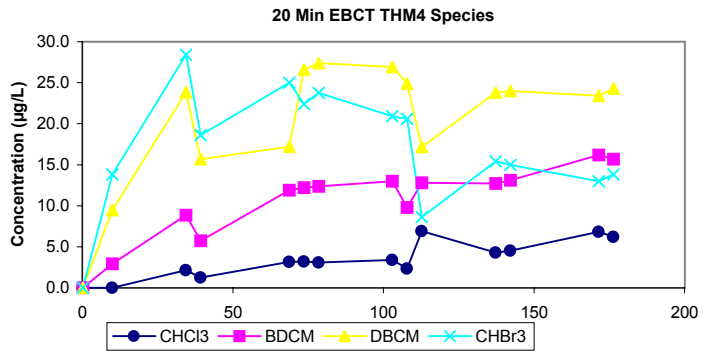


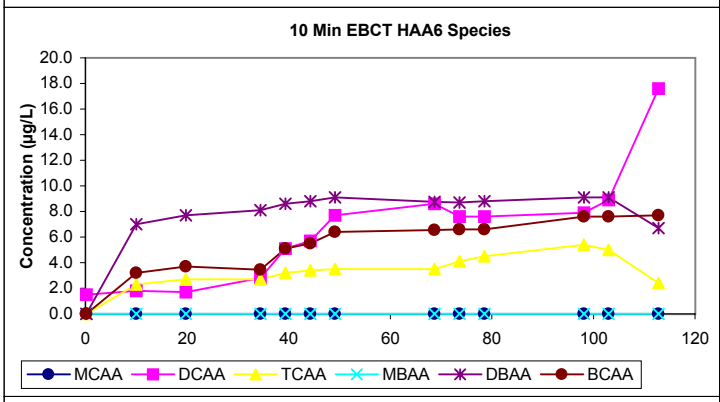


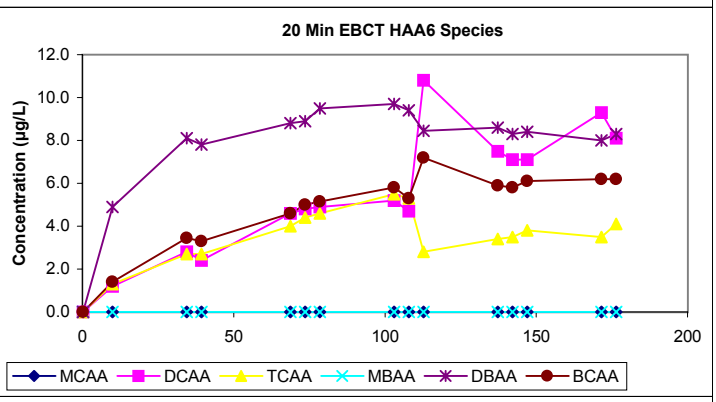


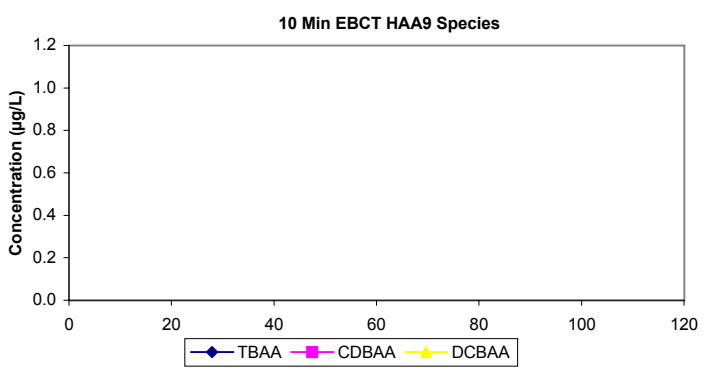
Water Quality Graphs (Continued)

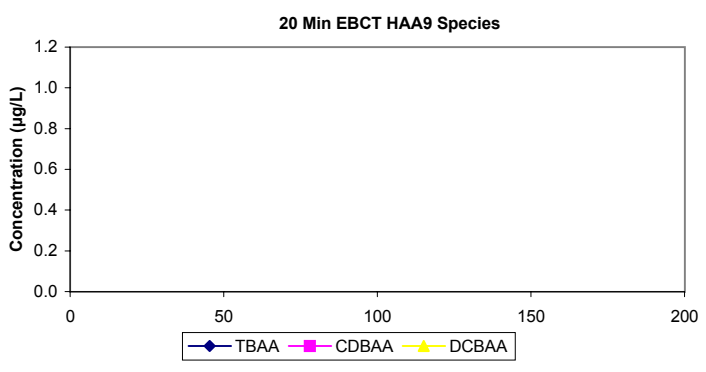


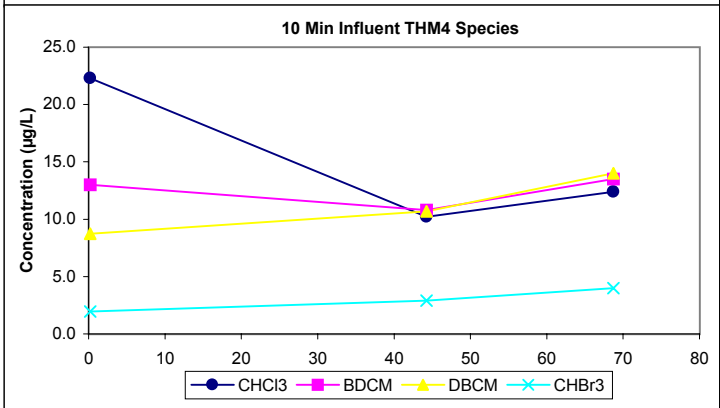


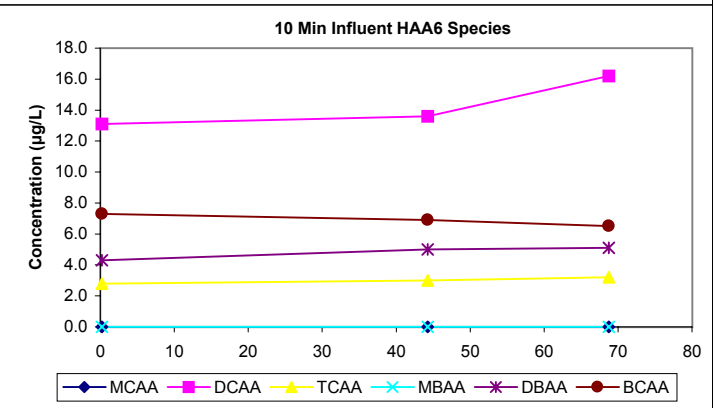












St. Louis County Water Company | **Bench-Scale RSSCT Treatment Study Summary** | **Quarter:** 4

ICR Information

ID / ICR#: MO6010716 / 435
ICR Contact: Paul Keck
Phone No.: (314) 542-6419
Period: 12/2/98 - 1/5/99 (34 B-S days)

Design Information

Design TOC: 2.8 mg/L
Col Diameter: 15.0 mm
Min Reynolds#: 0.46
Full-Scale Temp: 12.0 C
Full-Scale GAC Size: 12x40 Lignite Coal Ba
Bench-Scale GAC Size: 60x80
Scaling Factor: 4.90
Meas Dry Bed Density: 0.42 g/cm3

Water Quality Summary

	Influent				Influent			
Influent	Mean	SD/RD	Count	Min/Max	Mean	SD/RD	Count	Min/Max
TOC	3.0	0.1	3	2.8 - 3.1				
pH	9.5	0.2	3	9.4 - 9.7				
UV254	0.085	0.002	3	0.083 - 0.087				
SUVA	2.87	0.06	3	2.80 - 2.92				
Bromide	71	3	2	69 - 72				
SDS-TOX	196	21	3	182 - 220				
SDS-THM4	56	4	3	52 - 59				
SDS-HAA6	27	2	3	25 - 29				
Effluent	**10 Min EBCT**			(20 B-S days)	**20 Min EBCT**			(34 B-S days)
Effluent pH	9.3	0.2	13	8.7 - 9.6	9.1	0.4	15	7.7 - 9.4
Effluent Temp	21.1	1.7	13	17.0 - 24.0	20.7	2.0	15	17.0 - 24.0

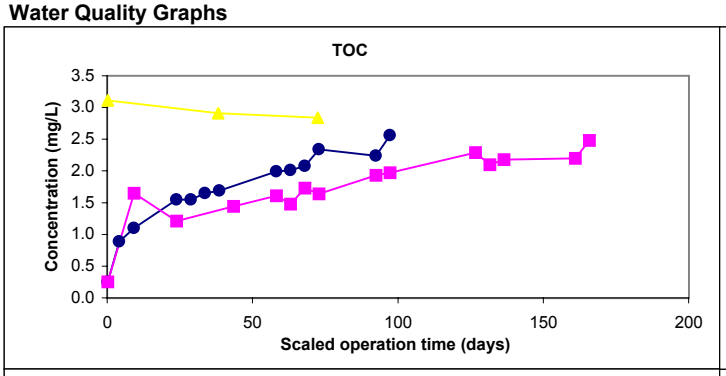
Cumulative SDS Conditions

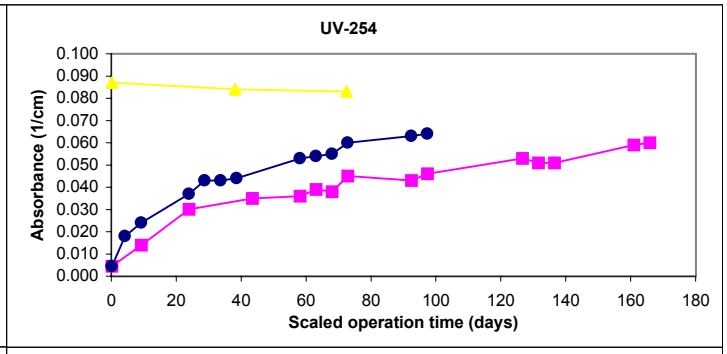
	Mean	SD	Count	Min/Max
Res (0)	0.98	0.29	30	0.40 - 1.70
Temp	13.7	1.0	30	11.1 - 15.0
pH	9.4	0.2	30	8.9 - 9.7
Time	17.2	2.4	30	16.0 - 23.0

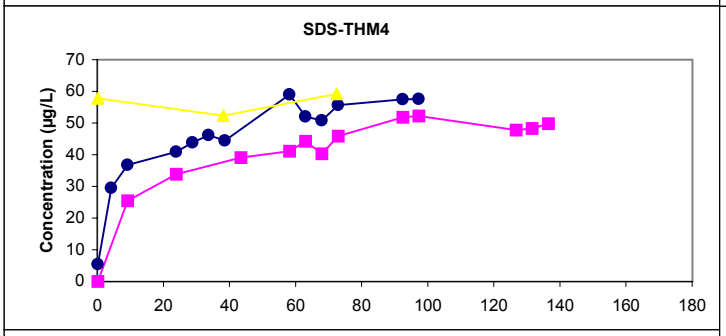
Comments:

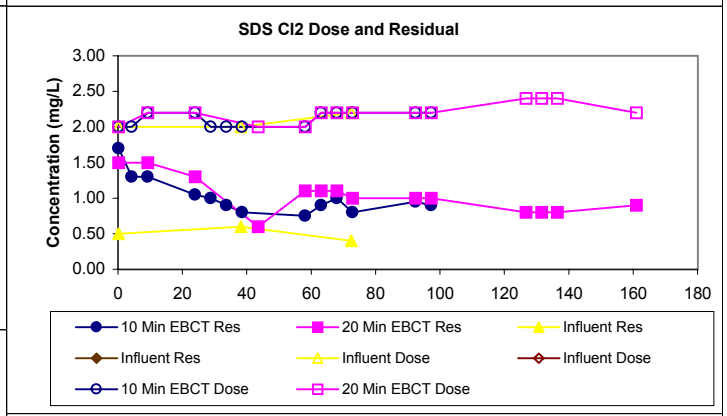
Chart Legend: 10 Min EBCT; 20 Min EBCT; Influent; Influent

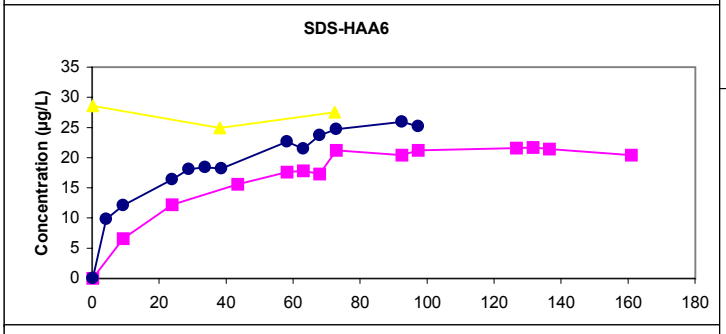
Water Quality Graphs

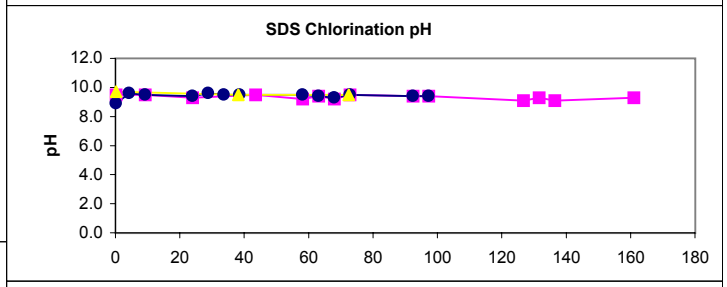


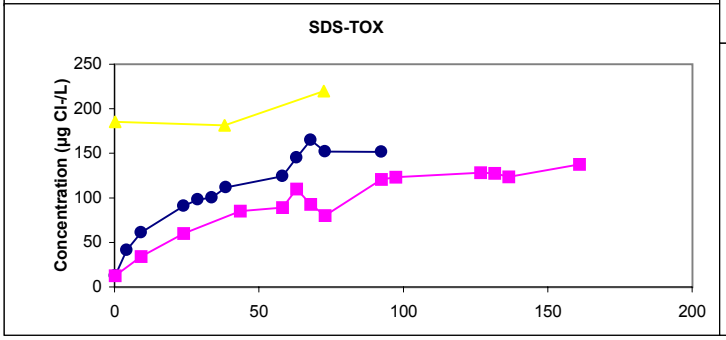


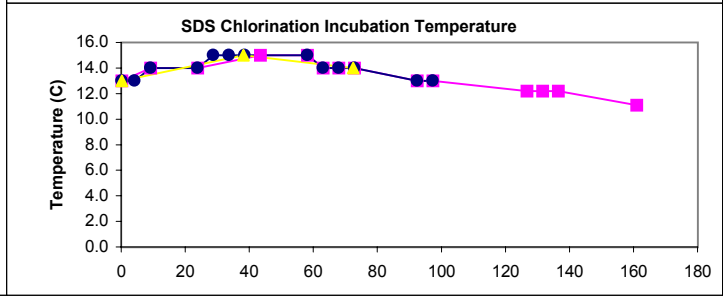












Water Quality Graphs (Continued)