Jean B. Sweeney
Vice President

3M Environmental, Health and Safety Operations

3M Center, Building 0224-05-W-03
St. Paul, MN 55144-1000
651 737 3569

8EHQ-0598-00373

November 9, 2009

NO CBI

AR226-3936

3M

CERTIFIED MAIL

Document Processing Center
EPA East – Room 6428 Attn: Section 8(e)
Office of Pollution Prevention and Toxics, U.S. EPA
1200 Pennsylvania Avenue NW
Washington, DC 20460-0001

Re: TSCA 8(e) Substantial Risk Notice: Sulfonate-based and Carboxylic-based Fluorochemicals, Docket 8EHQ-0598-373 - Results from 2009 Analyses of Fish and Surface Water from the Mississippi River

Dear Sir or Madam:

3M is submitting this notice to supplement previous submissions on sulfonyl and carboxylic-based fluorochemicals (FCs), and more specifically our June 20, 2006 submittal concerning fish data generated by the Minnesota Pollution Control Agency (MPCA). 3M is providing analytical summary sheets recently received from the MPCA and final analytical reports for a subset of sample analyses generated by the 3M Environmental Laboratory. These documents pertain to a fish and surface water sampling program conducted by the MPCA for Pool 2 of the Mississippi River in 2009. The following summarizes key aspects of the state-directed study:

- The study was designed to be representative of the entirety of Pool 2 from Lock and Dam No. 1 (RM 847.6) to Lock and Dam No. 2 (RM 815.2).
- For this study, Pool 2 was divided into four distinct reaches. These are generally identified as Reaches 1-4.
- Fish sampling was conducted by the Minnesota Department of Natural Resources. These samples were apparently collected in a late May – early June 2009 timeframe.
- Water sampling was coordinated by the MPCA. 3M provided a contractor (Pace Analytical) to assist in this effort. Surface water samples were collected on July 8, 2009. Three locations within each of the four reaches were sampled. These were numbered sequentially Location 1 through Location 12.
- Five fish species were evaluated: bluegill sunfish, smallmouth bass, common carp, white bass and freshwater drum. Nominally fifteen fish of each species were collected from each of the four reaches. The total number of fish collected was 297.
- For analytical validation purposes, approximately 10 percent of the fish samples and all twelve of the water samples were split with 3M.
- Analytes included: C4-C12 perfluorocarboxylates; C4, C6 and C8 perfluorosulfonates; and perfluorooctanesulfonamide.

Study results are summarized in the following documents that have been copied to the enclosed CD:

322851

CONTAINS NO CBI

- An Excel file, provided to 3M by the MPCA, entitled "Miss R POOL 2 JULY 2009 water sampling.xls". This file contains the surface water data generated by the contract laboratory hired by the MPCA for this work.
- An Excel file, provided to 3M by the MPCA, entitled "PFCs MissPool2 Fish all years.xls". This file contains fish data from the 2009 study that is the subject of this submittal, in addition to data previously obtained by the MPCA. In this spreadsheet, the aforementioned reaches are identified as "UM- 8-1" through UM- 8-4".
- 3M Environmental Laboratory Report No. E09-0365, Fluorochemical Characterization of Surface Water Samples, Mississippi River – Pool 2; July 2009. This report contains results for split samples corresponding to the MPCA surface water sampling Excel spreadsheet (noted above).
- 3M Environmental Laboratory Report No. E09-0372, Fluorochemical Analysis of Fish Fillet Homogenates Collected from the Mississippi River by the Minnesota Pollution Control Agency May 2009 – Phase 1: PFOS. In this report, the aforementioned reaches are referred to as "Section 1" through "Section 4". This report contains results for split samples corresponding to a 10% subset of the data contained in the MPCA fish sampling Excel spreadsheet (noted above). Sample identification numbers in the two documents can be cross-referenced to compare split sample results.
- A *3M Project Summary* report, prepared by Pace Analytical to document the field work associated with 3M Environmental Laboratory Report No. E09-0365. Of note, this report contains several maps, provided by the MPCA, intended to document the various study sampling locations.

As this was a state-directed study, 3M is not in a position to provide specific information on sampling rationale(s), field sampling procedures pertaining to fish collection, specific fish sample locations, or on analytical techniques, data quality objectives*, or Quality Assurance/Quality Control outcomes, for the MPCA-generated data.

While 3M does not believe that any of these data taken alone or cumulatively meet the "substantial risk" reporting threshold, and 3M was not responsible for the generation of this information (other than the 3M analytical data provided here), we nevertheless recognize the ongoing work by U.S. EPA to assess fluorochemical exposure pathways. Therefore, we are placing these results in the 8(e) docket as a supplement to previous submissions.

If you have any questions, please do not hesitate to contact Deanna Luebker at 651-737-1374 or djluebker@mmm.com.

Sincerely,

Jean B. Sweeney (KBL)

Jean B. Sweeney
Vice President
Environmental, Health and Safety Operations

Enclosure

qualified samples (coded as "E" for estimated)

sample	PFC
090068	PFBA
090122	ALL
090139	PFOSA
090141	PFOSA
090142	PFOSA
090151	PFBA
090197	PFOSA
090203	PFOSA
090215	PFOSA
090219	PFOSA
090220	PFOSA
090222	PFOSA
090223	PFOSA
090227	PFOA
090229	PFOA
090231	PFOA
090233	PFOA
090234	PFOA
090236	PFOA, PFHxS, PFOSA
090237	PFOA, PFHxS
090247	PFOS, PFOSA

allfish_format_2009

SAMPLEN	WATERWAY	LOCATION	FCARVRLOC	DOWID
041315	MISSISSIPPI R.	Pool 2	UM- 8	
041316	MISSISSIPPI R.	Pool 2	UM- 8	
041317	MISSISSIPPI R.	Pool 2	UM- 8	
051128	MISSISSIPPI R.	Pool 2	UM- 8	
051129	MISSISSIPPI R.	Pool 2	UM- 8	
051130	MISSISSIPPI R.	Pool 2	UM- 8	
051131	MISSISSIPPI R.	Pool 2	UM- 8	
051132	MISSISSIPPI R.	Pool 2	UM- 8	
051133	MISSISSIPPI R.	Pool 2	UM- 8	
051134	MISSISSIPPI R.	Pool 2	UM- 8	
051135	MISSISSIPPI R.	Pool 2	UM- 8	
051136	MISSISSIPPI R.	Pool 2	UM- 8	
051137	MISSISSIPPI R.	Pool 2	UM- 8	
051138	MISSISSIPPI R.	Pool 2	UM- 8	
051139	MISSISSIPPI R.	Pool 2	UM- 8	
051140	MISSISSIPPI R.	Pool 2	UM- 8	
051141	MISSISSIPPI R.	Pool 2	UM- 8	
051142	MISSISSIPPI R.	Pool 2	UM- 8	
051143	MISSISSIPPI R.	Pool 2	UM- 8	
051144	MISSISSIPPI R.	Pool 2	UM- 8	
051145	MISSISSIPPI R.	Pool 2	UM- 8	
051146	MISSISSIPPI R.	Pool 2	UM- 8	
051147	MISSISSIPPI R.	Pool 2	UM- 8	
051148	MISSISSIPPI R.	Pool 2	UM- 8	
062158	MISSISSIPPI R.	Pool 2Reach1	UM- 8	
062159	MISSISSIPPI R.	Pool 2Reach1	UM- 8	
062160	MISSISSIPPI R.	Pool 2Reach1	UM- 8	
062161	MISSISSIPPI R.	Pool 2Reach1	UM- 8	
062162	MISSISSIPPI R.	Pool 2Reach1	UM- 8	
062163	MISSISSIPPI R.	Pool 2Reach1	UM- 8	
062164	MISSISSIPPI R.	Pool 2Reach1	UM- 8	
062165	MISSISSIPPI R.	Pool 2Reach1	UM- 8	
062166	MISSISSIPPI R.	Pool 2Reach1	UM- 8	
062167	MISSISSIPPI R.	Pool 2Reach1	UM- 8	
062168	MISSISSIPPI R.	Pool 2Reach1	UM- 8	
062169	MISSISSIPPI R.	Pool 2Reach1	UM- 8	
062171	MISSISSIPPI R.	Pool 2Reach3	UM- 8	
062172	MISSISSIPPI R.	Pool 2Reach3	UM- 8	
062173	MISSISSIPPI R.	Pool 2Reach3	UM- 8	
062174	MISSISSIPPI R.	Pool 2Reach3	UM- 8	
062175	MISSISSIPPI R.	Pool 2Reach3	UM- 8	
062176	MISSISSIPPI R.	Pool 2Reach3	UM- 8	
062177	MISSISSIPPI R.	Pool 2Reach3	UM- 8	
062178	MISSISSIPPI R.	Pool 2Reach3	UM- 8	
062180	MISSISSIPPI R.	Pool 2Reach3	UM- 8	
062181	MISSISSIPPI R.	Pool 2Reach3	UM- 8	
062183	MISSISSIPPI R.	Pool 2Reach5	UM- 8	
062184	MISSISSIPPI R.	Pool 2Reach5	UM- 8	
062185	MISSISSIPPI R.	Pool 2Reach5	UM- 8	
062186	MISSISSIPPI R.	Pool 2Reach5	UM- 8	
062187	MISSISSIPPI R.	Pool 2Reach5	UM- 8	

062188	MISSISSIPPI R.	Pool 2Reach5	UM- 8
062189	MISSISSIPPI R.	Pool 2Reach5	UM- 8
062190	MISSISSIPPI R.	Pool 2Reach5	UM- 8
062192	MISSISSIPPI R.	Pool 2Reach5	UM- 8
062193	MISSISSIPPI R.	Pool 2Reach5	UM- 8
082715	MISSISSIPPI RIVER	pool 2	UM- 8
082716	MISSISSIPPI RIVER	pool 2	UM- 8
082717	MISSISSIPPI RIVER	pool 2	UM- 8
082718	MISSISSIPPI RIVER	pool 2	UM- 8
082719	MISSISSIPPI RIVER	pool 2	UM- 8
082720	MISSISSIPPI RIVER	pool 2	UM- 8
082721	MISSISSIPPI RIVER	pool 2	UM- 8
082722	MISSISSIPPI RIVER	pool 2	UM- 8
082723	MISSISSIPPI RIVER	pool 2	UM- 8
082724	MISSISSIPPI RIVER	pool 2	UM- 8
082725	MISSISSIPPI RIVER	pool 2	UM- 8
082726	MISSISSIPPI RIVER	pool 2	UM- 8
082727	MISSISSIPPI RIVER	pool 2	UM- 8
082728	MISSISSIPPI RIVER	pool 2	UM- 8
082729	MISSISSIPPI RIVER	pool 2	UM- 8
082730	MISSISSIPPI RIVER	pool 2	UM- 8
082731	MISSISSIPPI RIVER	pool 2	UM- 8
090001	MISSISSIPPI R.	Pool 2	UM- 8-1
090002	MISSISSIPPI R.	Pool 2	UM- 8-1
090003	MISSISSIPPI R.	Pool 2	UM- 8-1
090004	MISSISSIPPI R.	Pool 2	UM- 8-1
090005	MISSISSIPPI R.	Pool 2	UM- 8-1
090006	MISSISSIPPI R.	Pool 2	UM- 8-1
090007	MISSISSIPPI R.	Pool 2	UM- 8-1
090008	MISSISSIPPI R.	Pool 2	UM- 8-1
090009	MISSISSIPPI R.	Pool 2	UM- 8-1
090010	MISSISSIPPI R.	Pool 2	UM- 8-1
090011	MISSISSIPPI R.	Pool 2	UM- 8-1
090012	MISSISSIPPI R.	Pool 2	UM- 8-1
090013	MISSISSIPPI R.	Pool 2	UM- 8-1
090014	MISSISSIPPI R.	Pool 2	UM- 8-1
090015	MISSISSIPPI R.	Pool 2	UM- 8-1
090016	MISSISSIPPI R.	Pool 2	UM- 8-1
090017	MISSISSIPPI R.	Pool 2	UM- 8-1
090018	MISSISSIPPI R.	Pool 2	UM- 8-1
090019	MISSISSIPPI R.	Pool 2	UM- 8-1
090020	MISSISSIPPI R.	Pool 2	UM- 8-1
090021	MISSISSIPPI R.	Pool 2	UM- 8-1
090022	MISSISSIPPI R.	Pool 2	UM- 8-1
090023	MISSISSIPPI R.	Pool 2	UM- 8-1
090024	MISSISSIPPI R.	Pool 2	UM- 8-1
090025	MISSISSIPPI R.	Pool 2	UM- 8-1
090026	MISSISSIPPI R.	Pool 2	UM- 8-1
090027	MISSISSIPPI R.	Pool 2	UM- 8-1
090028	MISSISSIPPI R.	Pool 2	UM- 8-1
090029	MISSISSIPPI R.	Pool 2	UM- 8-1
090030	MISSISSIPPI R.	Pool 2	UM- 8-1

090031	MISSISSIPPI R.	Pool 2	UM- 8-1
090032	MISSISSIPPI R.	Pool 2	UM- 8-1
090033	MISSISSIPPI R.	Pool 2	UM- 8-1
090034	MISSISSIPPI R.	Pool 2	UM- 8-1
090035	MISSISSIPPI R.	Pool 2	UM- 8-1
090036	MISSISSIPPI R.	Pool 2	UM- 8-1
090037	MISSISSIPPI R.	Pool 2	UM- 8-1
090038	MISSISSIPPI R.	Pool 2	UM- 8-1
090039	MISSISSIPPI R.	Pool 2	UM- 8-1
090040	MISSISSIPPI R.	Pool 2	UM- 8-1
090041	MISSISSIPPI R.	Pool 2	UM- 8-1
090042	MISSISSIPPI R.	Pool 2	UM- 8-1
090043	MISSISSIPPI R.	Pool 2	UM- 8-1
090044	MISSISSIPPI R.	Pool 2	UM- 8-1
090045	MISSISSIPPI R.	Pool 2	UM- 8-1
090046	MISSISSIPPI R.	Pool 2	UM- 8-1
090047	MISSISSIPPI R.	Pool 2	UM- 8-1
090048	MISSISSIPPI R.	Pool 2	UM- 8-1
090049	MISSISSIPPI R.	Pool 2	UM- 8-1
090050	MISSISSIPPI R.	Pool 2	UM- 8-1
090051	MISSISSIPPI R.	Pool 2	UM- 8-1
090052	MISSISSIPPI R.	Pool 2	UM- 8-1
090053	MISSISSIPPI R.	Pool 2	UM- 8-1
090054	MISSISSIPPI R.	Pool 2	UM- 8-1
090055	MISSISSIPPI R.	Pool 2	UM- 8-1
090056	MISSISSIPPI R.	Pool 2	UM- 8-1
090057	MISSISSIPPI R.	Pool 2	UM- 8-1
090058	MISSISSIPPI R.	Pool 2	UM- 8-1
090059	MISSISSIPPI R.	Pool 2	UM- 8-1
090060	MISSISSIPPI R.	Pool 2	UM- 8-1
090061	MISSISSIPPI R.	Pool 2	UM- 8-1
090062	MISSISSIPPI R.	Pool 2	UM- 8-2
090063	MISSISSIPPI R.	Pool 2	UM- 8-2
090064	MISSISSIPPI R.	Pool 2	UM- 8-2
090065	MISSISSIPPI R.	Pool 2	UM- 8-2
090066	MISSISSIPPI R.	Pool 2	UM- 8-2
090067	MISSISSIPPI R.	Pool 2	UM- 8-2
090068	MISSISSIPPI R.	Pool 2	UM- 8-2
090069	MISSISSIPPI R.	Pool 2	UM- 8-2
090070	MISSISSIPPI R.	Pool 2	UM- 8-2
090071	MISSISSIPPI R.	Pool 2	UM- 8-2
090072	MISSISSIPPI R.	Pool 2	UM- 8-2
090073	MISSISSIPPI R.	Pool 2	UM- 8-2
090074	MISSISSIPPI R.	Pool 2	UM- 8-2
090075	MISSISSIPPI R.	Pool 2	UM- 8-2
090076	MISSISSIPPI R.	Pool 2	UM- 8-2
090077	MISSISSIPPI R.	Pool 2	UM- 8-2
090078	MISSISSIPPI R.	Pool 2	UM- 8-2
090079	MISSISSIPPI R.	Pool 2	UM- 8-2
090080	MISSISSIPPI R.	Pool 2	UM- 8-2
090081	MISSISSIPPI R.	Pool 2	UM- 8-2
090082	MISSISSIPPI R.	Pool 2	UM- 8-2

090083	MISSISSIPPI R.	Pool 2	UM- 8-2
090084	MISSISSIPPI R.	Pool 2	UM- 8-2
090085	MISSISSIPPI R.	Pool 2	UM- 8-2
090086	MISSISSIPPI R.	Pool 2	UM- 8-2
090087	MISSISSIPPI R.	Pool 2	UM- 8-2
090088	MISSISSIPPI R.	Pool 2	UM- 8-2
090089	MISSISSIPPI R.	Pool 2	UM- 8-2
090090	MISSISSIPPI R.	Pool 2	UM- 8-2
090091	MISSISSIPPI R.	Pool 2	UM- 8-2
090092	MISSISSIPPI R.	Pool 2	UM- 8-2
090093	MISSISSIPPI R.	Pool 2	UM- 8-2
090094	MISSISSIPPI R.	Pool 2	UM- 8-2
090095	MISSISSIPPI R.	Pool 2	UM- 8-2
090096	MISSISSIPPI R.	Pool 2	UM- 8-2
090097	MISSISSIPPI R.	Pool 2	UM- 8-2
090098	MISSISSIPPI R.	Pool 2	UM- 8-2
090099	MISSISSIPPI R.	Pool 2	UM- 8-2
090100	MISSISSIPPI R.	Pool 2	UM- 8-2
090101	MISSISSIPPI R.	Pool 2	UM- 8-2
090102	MISSISSIPPI R.	Pool 2	UM- 8-2
090103	MISSISSIPPI R.	Pool 2	UM- 8-2
090104	MISSISSIPPI R.	Pool 2	UM- 8-2
090105	MISSISSIPPI R.	Pool 2	UM- 8-2
090106	MISSISSIPPI R.	Pool 2	UM- 8-2
090107	MISSISSIPPI R.	Pool 2	UM- 8-2
090108	MISSISSIPPI R.	Pool 2	UM- 8-2
090109	MISSISSIPPI R.	Pool 2	UM- 8-2
090110	MISSISSIPPI R.	Pool 2	UM- 8-2
090111	MISSISSIPPI R.	Pool 2	UM- 8-2
090112	MISSISSIPPI R.	Pool 2	UM- 8-2
090113	MISSISSIPPI R.	Pool 2	UM- 8-2
090114	MISSISSIPPI R.	Pool 2	UM- 8-2
090115	MISSISSIPPI R.	Pool 2	UM- 8-2
090116	MISSISSIPPI R.	Pool 2	UM- 8-2
090117	MISSISSIPPI R.	Pool 2	UM- 8-2
090118	MISSISSIPPI R.	Pool 2	UM- 8-2
090119	MISSISSIPPI R.	Pool 2	UM- 8-2
090120	MISSISSIPPI R.	Pool 2	UM- 8-2
090121	MISSISSIPPI R.	Pool 2	UM- 8-2
090122	MISSISSIPPI R.	Pool 2	UM- 8-2
090123	MISSISSIPPI R.	Pool 2	UM- 8-2
090124	MISSISSIPPI R.	Pool 2	UM- 8-2
090125	MISSISSIPPI R.	Pool 2	UM- 8-2
090126	MISSISSIPPI R.	Pool 2	UM- 8-2
090127	MISSISSIPPI R.	Pool 2	UM- 8-2
090128	MISSISSIPPI R.	Pool 2	UM- 8-2
090129	MISSISSIPPI R.	Pool 2	UM- 8-2
090130	MISSISSIPPI R.	Pool 2	UM- 8-2
090131	MISSISSIPPI R.	Pool 2	UM- 8-2
090132	MISSISSIPPI R.	Pool 2	UM- 8-2
090133	MISSISSIPPI R.	Pool 2	UM- 8-2
090134	MISSISSIPPI R.	Pool 2	UM- 8-2

090135	MISSISSIPPI R.	Pool 2	UM- 8-2
090136	MISSISSIPPI R.	Pool 2	UM- 8-2
090137	MISSISSIPPI R.	Pool 2	UM- 8-1
090138	MISSISSIPPI R.	Pool 2	UM- 8-3
090139	MISSISSIPPI R.	Pool 2	UM- 8-3
090140	MISSISSIPPI R.	Pool 2	UM- 8-3
090141	MISSISSIPPI R.	Pool 2	UM- 8-3
090142	MISSISSIPPI R.	Pool 2	UM- 8-3
090143	MISSISSIPPI R.	Pool 2	UM- 8-3
090144	MISSISSIPPI R.	Pool 2	UM- 8-3
090145	MISSISSIPPI R.	Pool 2	UM- 8-3
090146	MISSISSIPPI R.	Pool 2	UM- 8-3
090147	MISSISSIPPI R.	Pool 2	UM- 8-3
090148	MISSISSIPPI R.	Pool 2	UM- 8-3
090149	MISSISSIPPI R.	Pool 2	UM- 8-3
090150	MISSISSIPPI R.	Pool 2	UM- 8-3
090151	MISSISSIPPI R.	Pool 2	UM- 8-3
090152	MISSISSIPPI R.	Pool 2	UM- 8-3
090153	MISSISSIPPI R.	Pool 2	UM- 8-3
090154	MISSISSIPPI R.	Pool 2	UM- 8-3
090155	MISSISSIPPI R.	Pool 2	UM- 8-3
090156	MISSISSIPPI R.	Pool 2	UM- 8-3
090157	MISSISSIPPI R.	Pool 2	UM- 8-3
090158	MISSISSIPPI R.	Pool 2	UM- 8-3
090159	MISSISSIPPI R.	Pool 2	UM- 8-3
090160	MISSISSIPPI R.	Pool 2	UM- 8-3
090161	MISSISSIPPI R.	Pool 2	UM- 8-3
090162	MISSISSIPPI R.	Pool 2	UM- 8-3
090163	MISSISSIPPI R.	Pool 2	UM- 8-3
090164	MISSISSIPPI R.	Pool 2	UM- 8-3
090165	MISSISSIPPI R.	Pool 2	UM- 8-3
090166	MISSISSIPPI R.	Pool 2	UM- 8-3
090167	MISSISSIPPI R.	Pool 2	UM- 8-3
090168	MISSISSIPPI R.	Pool 2	UM- 8-3
090169	MISSISSIPPI R.	Pool 2	UM- 8-3
090170	MISSISSIPPI R.	Pool 2	UM- 8-3
090171	MISSISSIPPI R.	Pool 2	UM- 8-3
090172	MISSISSIPPI R.	Pool 2	UM- 8-3
090173	MISSISSIPPI R.	Pool 2	UM- 8-3
090174	MISSISSIPPI R.	Pool 2	UM- 8-3
090175	MISSISSIPPI R.	Pool 2	UM- 8-3
090176	MISSISSIPPI R.	Pool 2	UM- 8-3
090177	MISSISSIPPI R.	Pool 2	UM- 8-3
090178	MISSISSIPPI R.	Pool 2	UM- 8-3
090179	MISSISSIPPI R.	Pool 2	UM- 8-3
090180	MISSISSIPPI R.	Pool 2	UM- 8-3
090181	MISSISSIPPI R.	Pool 2	UM- 8-3
090182	MISSISSIPPI R.	Pool 2	UM- 8-3
090183	MISSISSIPPI R.	Pool 2	UM- 8-3
090184	MISSISSIPPI R.	Pool 2	UM- 8-3
090185	MISSISSIPPI R.	Pool 2	UM- 8-3
090186	MISSISSIPPI R.	Pool 2	UM- 8-3

090187	MISSISSIPPI R.	Pool 2	UM- 8-3
090188	MISSISSIPPI R.	Pool 2	UM- 8-3
090189	MISSISSIPPI R.	Pool 2	UM- 8-3
090190	MISSISSIPPI R.	Pool 2	UM- 8-3
090191	MISSISSIPPI R.	Pool 2	UM- 8-3
090192	MISSISSIPPI R.	Pool 2	UM- 8-3
090193	MISSISSIPPI R.	Pool 2	UM- 8-3
090194	MISSISSIPPI R.	Pool 2	UM- 8-3
090195	MISSISSIPPI R.	Pool 2	UM- 8-3
090196	MISSISSIPPI R.	Pool 2	UM- 8-3
090197	MISSISSIPPI R.	Pool 2	UM- 8-4
090198	MISSISSIPPI R.	Pool 2	UM- 8-4
090199	MISSISSIPPI R.	Pool 2	UM- 8-4
090200	MISSISSIPPI R.	Pool 2	UM- 8-4
090201	MISSISSIPPI R.	Pool 2	UM- 8-4
090202	MISSISSIPPI R.	Pool 2	UM- 8-4
090203	MISSISSIPPI R.	Pool 2	UM- 8-4
090204	MISSISSIPPI R.	Pool 2	UM- 8-4
090205	MISSISSIPPI R.	Pool 2	UM- 8-4
090206	MISSISSIPPI R.	Pool 2	UM- 8-4
090207	MISSISSIPPI R.	Pool 2	UM- 8-4
090208	MISSISSIPPI R.	Pool 2	UM- 8-4
090209	MISSISSIPPI R.	Pool 2	UM- 8-4
090210	MISSISSIPPI R.	Pool 2	UM- 8-4
090211	MISSISSIPPI R.	Pool 2	UM- 8-4
090212	MISSISSIPPI R.	Pool 2	UM- 8-4
090213	MISSISSIPPI R.	Pool 2	UM- 8-4
090214	MISSISSIPPI R.	Pool 2	UM- 8-4
090215	MISSISSIPPI R.	Pool 2	UM- 8-4
090216	MISSISSIPPI R.	Pool 2	UM- 8-4
090217	MISSISSIPPI R.	Pool 2	UM- 8-4
090218	MISSISSIPPI R.	Pool 2	UM- 8-4
090219	MISSISSIPPI R.	Pool 2	UM- 8-4
090220	MISSISSIPPI R.	Pool 2	UM- 8-4
090221	MISSISSIPPI R.	Pool 2	UM- 8-4
090222	MISSISSIPPI R.	Pool 2	UM- 8-4
090223	MISSISSIPPI R.	Pool 2	UM- 8-4
090224	MISSISSIPPI R.	Pool 2	UM- 8-4
090225	MISSISSIPPI R.	Pool 2	UM- 8-4
090226	MISSISSIPPI R.	Pool 2	UM- 8-4
090227	MISSISSIPPI R.	Pool 2	UM- 8-4
090228	MISSISSIPPI R.	Pool 2	UM- 8-4
090229	MISSISSIPPI R.	Pool 2	UM- 8-4
090230	MISSISSIPPI R.	Pool 2	UM- 8-4
090231	MISSISSIPPI R.	Pool 2	UM- 8-4
090232	MISSISSIPPI R.	Pool 2	UM- 8-4
090233	MISSISSIPPI R.	Pool 2	UM- 8-4
090234	MISSISSIPPI R.	Pool 2	UM- 8-4
090235	MISSISSIPPI R.	Pool 2	UM- 8-4
090236	MISSISSIPPI R.	Pool 2	UM- 8-4
090237	MISSISSIPPI R.	Pool 2	UM- 8-4
090238	MISSISSIPPI R.	Pool 2	UM- 8-4

090239	MISSISSIPPI R.	Pool 2	UM- 8-4
090240	MISSISSIPPI R.	Pool 2	UM- 8-4
090241	MISSISSIPPI R.	Pool 2	UM- 8-4
090242	MISSISSIPPI R.	Pool 2	UM- 8-4
090243	MISSISSIPPI R.	Pool 2	UM- 8-4
090244	MISSISSIPPI R.	Pool 2	UM- 8-4
090245	MISSISSIPPI R.	Pool 2	UM- 8-4
090246	MISSISSIPPI R.	Pool 2	UM- 8-4
090247	MISSISSIPPI R.	Pool 2	UM- 8-4
090248	MISSISSIPPI R.	Pool 2	UM- 8-4
090249	MISSISSIPPI R.	Pool 2	UM- 8-4
090250	MISSISSIPPI R.	Pool 2	UM- 8-4
090251	MISSISSIPPI R.	Pool 2	UM- 8-4
090252	MISSISSIPPI R.	Pool 2	UM- 8-4
090253	MISSISSIPPI R.	Pool 2	UM- 8-4
090254	MISSISSIPPI R.	Pool 2	UM- 8-4
090255	MISSISSIPPI R.	Pool 2	UM- 8-4
090256	MISSISSIPPI R.	Pool 2	UM- 8-4
090257	MISSISSIPPI R.	Pool 2	UM- 8-3
090258	MISSISSIPPI R.	Pool 2	UM- 8-3
090259	MISSISSIPPI R.	Pool 2	UM- 8-3
090260	MISSISSIPPI R.	Pool 2	UM- 8-3
090261	MISSISSIPPI R.	Pool 2	UM- 8-3
090262	MISSISSIPPI R.	Pool 2	UM- 8-3
090263	MISSISSIPPI R.	Pool 2	UM- 8-3
090264	MISSISSIPPI R.	Pool 2	UM- 8-3
090265	MISSISSIPPI R.	Pool 2	UM- 8-3
090266	MISSISSIPPI R.	Pool 2	UM- 8-3
090267	MISSISSIPPI R.	Pool 2	UM- 8-3
090268	MISSISSIPPI R.	Pool 2	UM- 8-3
090269	MISSISSIPPI R.	Pool 2	UM- 8-3
090270	MISSISSIPPI R.	Pool 2	UM- 8-3
090271	MISSISSIPPI R.	Pool 2	UM- 8-3
090272	MISSISSIPPI R.	Pool 2	UM- 8-3
090273	MISSISSIPPI R.	Pool 2	UM- 8-3
090274	MISSISSIPPI R.	Pool 2	UM- 8-4
090275	MISSISSIPPI R.	Pool 2	UM- 8-4
090276	MISSISSIPPI R.	Pool 2	UM- 8-4
090277	MISSISSIPPI R.	Pool 2	UM- 8-4
090278	MISSISSIPPI R.	Pool 2	UM- 8-4
090279	MISSISSIPPI R.	Pool 2	UM- 8-4
090280	MISSISSIPPI R.	Pool 2	UM- 8-4
090281	MISSISSIPPI R.	Pool 2	UM- 8-4
090282	MISSISSIPPI R.	Pool 2	UM- 8-4
090283	MISSISSIPPI R.	Pool 2	UM- 8-4
090284	MISSISSIPPI R.	Pool 2	UM- 8-4
090285	MISSISSIPPI R.	Pool 2	UM- 8-4
090286	MISSISSIPPI R.	Pool 2	UM- 8-4
090287	MISSISSIPPI R.	Pool 2	UM- 8-4
090288	MISSISSIPPI R.	Pool 2	UM- 8-4
090289	MISSISSIPPI R.	Pool 2	UM- 8-1
090290	MISSISSIPPI R.	Pool 2	UM- 8-1

090291	MISSISSIPPI R.	Pool 2	UM- 8-1
090292	MISSISSIPPI R.	Pool 2	UM- 8-1
090293	MISSISSIPPI R.	Pool 2	UM- 8-1
090294	MISSISSIPPI R.	Pool 2	UM- 8-1
090295	MISSISSIPPI R.	Pool 2	UM- 8-1
090296	MISSISSIPPI R.	Pool 2	UM- 8-1
090297	MISSISSIPPI R.	Pool 2	UM- 8-1

allfish_format_2009

CTY	AREA	DATECOL	SPEC	FISHID	ANAT	NOFISH	LGTHIN	WTLB
		20040831	SMB		FILSK	1	15.5	
		20040831	SMB		FILSK	1	10.5	
		20040831	WHB		FILSK	4	14.5	
		20051003	WE		FILSK	1	27.55906	
		20051003	WE		FILSK	1	21.25984	
		20051003	WE		FILSK	1	19.29134	
		20051003	WE		FILSK	1	27.55906	
		20051003	C		FILSK	1	20.86614	
		20051003	C		FILSK	1	21.65354	
		20051003	C		FILSK	1	22.44094	
		20051003	C		FILSK	1	24.01575	
		20051003	C		FILSK	1	24.40945	
		20051003	SMB		FILSK	1	10.23622	
		20051003	SMB		FILSK	1	10.23622	
		20051003	SMB		FILSK	1	8.661417	
		20051003	SMB		FILSK	1	11.02362	
		20051003	SMB		FILSK	1	8.661417	
		20051003	SMB		FILSK	1	10.23622	
		20051003	WHB		FILSK	1	12.20472	
		20051003	WHB		FILSK	1	14.56693	
		20051003	WHB		FILSK	1	12.59843	
		20051003	WHB		FILSK	1	9.448819	
		20051003	WHB		FILSK	1	14.96063	
		20051003	SMB		FILSK	1	19.29134	
		200608xx	CHC		FILSK	1	29.52756	
		200608xx	CHC		FILSK	1	27.55906	
		200608xx	CHC		FILSK	1	21.25984	
		200608xx	CHC		FILSK	1	25.98425	
		200608xx	CHC		FILSK	1	22.12598	
		200608xx	SMB		FILSK	1	15.23622	
		200608xx	SMB		FILSK	1	12.59843	
		200608xx	SMB		FILSK	1	9.094488	
		200608xx	SMB		FILSK	1	8.976378	
		200608xx	SMB		FILSK	1	9.055118	
		200608xx	BGS		FILSK	1	7.086614	
		200608xx	BGS		FILSK	1	6.102362	
		200608xx	CHC		FILSK	1	24.6063	
		200608xx	CHC		FILSK	1	25.19685	
		200608xx	CHC		FILSK	1	27.55906	
		200608xx	CHC		FILSK	1	29.92126	
		200608xx	CHC		FILSK	1	25.19685	
		200608xx	SMB		FILSK	1	6.299213	
		200608xx	SMB		FILSK	1	8.937008	
		200608xx	SMB		FILSK	1	8.740157	
		200608xx	BGS		FILSK	1	5.708661	
		200608xx	BGS		FILSK	1	5.905512	
		200608xx	CHC		FILSK	1	22.04724	
		200608xx	CHC		FILSK	1	26.37795	
		200608xx	CHC		FILSK	1	26.77165	
		200608xx	CHC		FILSK	1	26.45669	
		200608xx	CHC		FILSK	1	24.40945	

		200608xx	SMB	FILSK	1 8.661417
		200608xx	SMB	FILSK	1 9.84252
		200608xx	SMB	FILSK	1 9.448819
		200608xx	BGS	FILSK	1 5.511811
		200608xx	BGS	FILSK	1 5.472441
		20080609	BGS	FILSK	1 7.677165
		20080609	BGS	FILSK	1 7.480315
		20080609	BGS	FILSK	1 7.283465
		20080609	BGS	FILSK	1 7.480315
		20080609	BGS	FILSK	1 6.692913
		20080609	BKS	FILSK	1 11.02362
		20080609	SAG	FILSK	1 13.38583
		20080609	SAG	FILSK	1 18.11024
		20080609	SMB	FILSK	1 7.677165
		20080609	SMB	FILSK	1 8.661417
		20080609	SMB	FILSK	1 9.055118
		20080609	SMB	FILSK	1 8.858268
		20080609	SMB	FILSK	1 8.267717
		20080609	WE	FILSK	1 20.47244
		20080609	WE	FILSK	1 20.47244
		20080609	WE	FILSK	1 9.448819
		20080609	WE	FILSK	1 13.38583
62	RM 844-84	20090528	FWD	FILSK	1 13.0
62	RM 844-84	20090528	FWD	FILSK	1 13.8
62	RM 844-84	20090528	FWD	FILSK	1 13.4
62	RM 844-84	20090528	FWD	FILSK	1 14.2
62	RM 844-84	20090528	FWD	FILSK	1 14.2
62	RM 844-84	20090528	FWD	FILSK	1 15.0
62	RM 844-84	20090528	FWD	FILSK	1 18.1
62	RM 844-84	20090528	FWD	FILSK	1 14.6
62	RM 844-84	20090528	FWD	FILSK	1 13.0
62	RM 844-84	20090528	FWD	FILSK	1 12.6
62	RM 844-84	20090528	FWD	FILSK	1 13.0
62	RM 844-84	20090528	FWD	FILSK	1 11.0
62	RM 844-84	20090528	FWD	FILSK	1 13.4
62	RM 844-84	20090528	FWD	FILSK	1 14.4
62	RM 844-84	20090528	WHB	FILSK	1 12.6
62	RM 844-84	20090528	WHB	FILSK	1 11.0
62	RM 844-84	20090528	WHB	FILSK	1 13.4
62	RM 844-84	20090528	WHB	FILSK	1 12.6
62	RM 844-84	20090528	WHB	FILSK	1 13.8
62	RM 844-84	20090528	WHB	FILSK	1 14.2
62	RM 844-84	20090528	WHB	FILSK	1 14.6
62	RM 844-84	20090528	WHB	FILSK	1 12.2
62	RM 844-84	20090528	WHB	FILSK	1 12.6
62	RM 844-84	20090528	WHB	FILSK	1 12.2
62	RM 844-84	20090528	WHB	FILSK	1 12.6
62	RM 844-84	20090528	WHB	FILSK	1 13.8
62	RM 844-84	20090528	WHB	FILSK	1 13.4
62	RM 844-84	20090528	WHB	FILSK	1 14.6
62	RM 844-84	20090528	WHB	FILSK	1 14.6
62	RM 844-84	20090528	SMB	FILSK	1 15.0

62 RM 844-84 20090528 SMB	FILSK	1	15.7
62 RM 844-84 20090528 SMB	FILSK	1	13.8
62 RM 844-84 20090528 SMB	FILSK	1	13.0
62 RM 844-84 20090528 SMB	FILSK	1	16.1
62 RM 844-84 20090528 SMB	FILSK	1	11.4
62 RM 844-84 20090528 SMB	FILSK	1	13.8
62 RM 844-84 20090528 SMB	FILSK	1	13.0
62 RM 844-84 20090528 SMB	FILSK	1	15.0
62 RM 844-84 20090528 SMB	FILSK	1	15.0
62 RM 844-84 20090528 SMB	FILSK	1	14.6
62 RM 844-84 20090528 SMB	FILSK	1	16.5
62 RM 844-84 20090528 SMB	FILSK	1	14.2
62 RM 844-84 20090528 SMB	FILSK	1	12.2
62 RM 844-84 20090528 SMB	FILSK	1	11.0
62 RM 844-84 20090528 C	FILSK	1	21.3
62 RM 844-84 20090528 C	FILSK	1	18.9
62 RM 844-84 20090528 C	FILSK	1	17.7
62 RM 844-84 20090528 C	FILSK	1	27.2
62 RM 844-84 20090528 C	FILSK	1	23.6
62 RM 844-84 20090528 C	FILSK	1	21.3
62 RM 844-84 20090528 C	FILSK	1	18.9
62 RM 844-84 20090528 C	FILSK	1	22.0
62 RM 844-84 20090528 C	FILSK	1	19.7
62 RM 844-84 20090528 C	FILSK	1	19.7
62 RM 844-84 20090528 C	FILSK	1	21.3
62 RM 844-84 20090528 C	FILSK	1	19.7
62 RM 844-84 20090528 C	FILSK	1	22.4
62 RM 844-84 20090528 C	FILSK	1	15.4
62 RM 844-84 20090528 BGS	FILSK	1	7.5
62 RM 844-84 20090528 BGS	FILSK	1	5.1
62 RM 844-84 20090528 BGS	FILSK	1	6.1
62 RM 836-84 20090529 WHB	FILSK	1	11.8
62 RM 836-84 20090529 WHB	FILSK	1	12.6
62 RM 836-84 20090529 WHB	FILSK	1	14.6
62 RM 836-84 20090529 WHB	FILSK	1	11.8
62 RM 836-84 20090529 WHB	FILSK	1	13.8
62 RM 836-84 20090529 WHB	FILSK	1	11.4
62 RM 836-84 20090529 WHB	FILSK	1	14.2
62 RM 836-84 20090529 WHB	FILSK	1	13.0
62 RM 836-84 20090529 WHB	FILSK	1	12.2
62 RM 836-84 20090529 WHB	FILSK	1	10.2
62 RM 836-84 20090529 WHB	FILSK	1	15.0
62 RM 836-84 20090529 WHB	FILSK	1	10.2
62 RM 836-84 20090529 WHB	FILSK	1	12.2
62 RM 836-84 20090529 WHB	FILSK	1	11.4
62 RM 836-84 20090529 WHB	FILSK	1	12.2
62 RM 836-84 20090529 FWD	FILSK	1	11.8
62 RM 836-84 20090529 FWD	FILSK	1	11.8
62 RM 836-84 20090529 FWD	FILSK	1	13.0
62 RM 836-84 20090529 FWD	FILSK	1	13.8
62 RM 836-84 20090529 FWD	FILSK	1	12.2
62 RM 836-84 20090529 FWD	FILSK	1	10.2

62 RM 836-84 20090529 FWD	FILSK	1	12.6
62 RM 836-84 20090529 FWD	FILSK	1	12.2
62 RM 836-84 20090529 FWD	FILSK	1	14.2
62 RM 836-84 20090529 FWD	FILSK	1	11.2
62 RM 836-84 20090529 FWD	FILSK	1	16.3
62 RM 836-84 20090529 FWD	FILSK	1	13.2
62 RM 836-84 20090529 FWD	FILSK	1	16.9
62 RM 836-84 20090529 FWD	FILSK	1	13.6
62 RM 836-84 20090529 FWD	FILSK	1	12.2
62 RM 836-84 20090529 SMB	FILSK	1	13.6
62 RM 836-84 20090529 SMB	FILSK	1	13.8
62 RM 836-84 20090529 SMB	FILSK	1	9.3
62 RM 836-84 20090529 SMB	FILSK	1	9.1
62 RM 836-84 20090529 SMB	FILSK	1	11.4
62 RM 836-84 20090529 SMB	FILSK	1	10.6
62 RM 836-84 20090529 SMB	FILSK	1	10.0
62 RM 836-84 20090529 SMB	FILSK	1	14.2
62 RM 836-84 20090529 SMB	FILSK	1	12.2
62 RM 836-84 20090529 SMB	FILSK	1	13.0
62 RM 836-84 20090529 SMB	FILSK	1	11.0
62 RM 836-84 20090529 SMB	FILSK	1	10.2
62 RM 836-84 20090529 SMB	FILSK	1	12.6
62 RM 836-84 20090529 SMB	FILSK	1	13.4
62 RM 836-84 20090529 SMB	FILSK	1	11.4
62 RM 836-84 20090529 BGS	FILSK	1	6.9
62 RM 836-84 20090529 BGS	FILSK	1	5.3
62 RM 836-84 20090529 BGS	FILSK	1	5.7
62 RM 836-84 20090529 BGS	FILSK	1	5.3
62 RM 836-84 20090529 BGS	FILSK	1	4.9
62 RM 836-84 20090529 BGS	FILSK	1	6.5
62 RM 836-84 20090529 BGS	FILSK	1	5.5
62 RM 836-84 20090529 BGS	FILSK	1	6.1
62 RM 836-84 20090529 BGS	FILSK	1	5.1
62 RM 836-84 20090529 BGS	FILSK	1	4.9
62 RM 836-84 20090529 BGS	FILSK	1	5.5
62 RM 836-84 20090529 BGS	FILSK	1	5.5
62 RM 836-84 20090529 BGS	FILSK	1	5.9
62 RM 836-84 20090529 BGS	FILSK	1	5.1
62 RM 836-84 20090529 BGS	FILSK	1	5.1
62 RM 836-84 20090529 C	FILSK	1	22.8
62 RM 836-84 20090529 C	FILSK	1	18.5
62 RM 836-84 20090529 C	FILSK	1	20.1
62 RM 836-84 20090529 C	FILSK	1	19.3
62 RM 836-84 20090529 C	FILSK	1	20.5
62 RM 836-84 20090529 C	FILSK	1	17.7
62 RM 836-84 20090529 C	FILSK	1	22.0
62 RM 836-84 20090529 C	FILSK	1	21.7
62 RM 836-84 20090529 C	FILSK	1	18.5
62 RM 836-84 20090529 C	FILSK	1	17.7
62 RM 836-84 20090529 C	FILSK	1	15.4
62 RM 836-84 20090529 C	FILSK	1	21.7
62 RM 836-84 20090529 C	FILSK	1	18.5

62	RM 836-84	20090529	C	FILSK	1	20.5
62	RM 836-84	20090529	C	FILSK	1	21.7
62	RM 844-84	20090528	FWD	FILSK	1	13.0
62	RM 833.5-8	20090529	WHB	FILSK	1	13.8
62	RM 833.5-8	20090529	WHB	FILSK	1	13.0
62	RM 833.5-8	20090529	WHB	FILSK	1	14.2
62	RM 833.5-8	20090529	WHB	FILSK	1	13.0
62	RM 833.5-8	20090529	WHB	FILSK	1	14.2
62	RM 833.5-8	20090529	WHB	FILSK	1	12.6
62	RM 833.5-8	20090529	WHB	FILSK	1	13.4
62	RM 833.5-8	20090529	WHB	FILSK	1	13.8
62	RM 833.5-8	20090529	WHB	FILSK	1	14.2
62	RM 833.5-8	20090529	WHB	FILSK	1	13.8
62	RM 833.5-8	20090529	WHB	FILSK	1	11.8
62	RM 833.5-8	20090529	WHB	FILSK	1	14.6
62	RM 833.5-8	20090529	WHB	FILSK	1	13.0
62	RM 833.5-8	20090529	WHB	FILSK	1	11.8
62	RM 833.5-8	20090529	WHB	FILSK	1	12.2
19	RM 827-83	20090601	FWD	FILSK	1	13.0
19	RM 827-83	20090601	FWD	FILSK	1	11.8
19	RM 827-83	20090601	FWD	FILSK	1	16.1
19	RM 827-83	20090601	FWD	FILSK	1	13.4
19	RM 827-83	20090601	FWD	FILSK	1	14.2
19	RM 827-83	20090601	FWD	FILSK	1	14.2
19	RM 827-83	20090601	FWD	FILSK	1	12.6
19	RM 827-83	20090601	FWD	FILSK	1	12.2
19	RM 827-83	20090601	FWD	FILSK	1	13.4
19	RM 827-83	20090601	FWD	FILSK	1	13.2
19	RM 827-83	20090601	FWD	FILSK	1	12.8
19	RM 827-83	20090601	FWD	FILSK	1	13.0
19	RM 827-83	20090601	FWD	FILSK	1	13.0
19	RM 827-83	20090601	FWD	FILSK	1	10.6
19	RM 827-83	20090601	FWD	FILSK	1	14.0
19	RM 827-83	20090601	SMB	FILSK	1	9.4
19	RM 827-83	20090601	SMB	FILSK	1	12.2
19	RM 827-83	20090601	SMB	FILSK	1	14.2
19	RM 827-83	20090601	SMB	FILSK	1	11.0
19	RM 827-83	20090601	SMB	FILSK	1	11.0
19	RM 827-83	20090601	SMB	FILSK	1	9.8
19	RM 827-83	20090601	SMB	FILSK	1	10.2
19	RM 827-83	20090601	SMB	FILSK	1	15.0
19	RM 827-83	20090601	SMB	FILSK	1	9.8
19	RM 827-83	20090601	SMB	FILSK	1	12.6
19	RM 827-83	20090601	SMB	FILSK	1	12.6
19	RM 827-83	20090601	SMB	FILSK	1	9.8
19	RM 827-83	20090601	SMB	FILSK	1	10.2
19	RM 827-83	20090601	SMB	FILSK	1	13.4
19	RM 827-83	20090601	SMB	FILSK	1	10.2
62	RM 833.5-8	20090528	C	FILSK	1	18.5
62	RM 833.5-8	20090528	C	FILSK	1	21.3
62	RM 833.5-8	20090528	C	FILSK	1	22.0
62	RM 833.5-8	20090528	C	FILSK	1	15.0

62 RM 833.5-(	20090528 C	FILSK	1	23.6
62 RM 833.5-(	20090528 C	FILSK	1	18.5
62 RM 833.5-(	20090528 C	FILSK	1	15.0
62 RM 833.5-(	20090528 C	FILSK	1	23.2
62 RM 833.5-(	20090528 C	FILSK	1	19.3
62 RM 833.5-(	20090528 C	FILSK	1	18.1
62 RM 833.5-(	20090528 C	FILSK	1	22.0
62 RM 833.5-(	20090528 C	FILSK	1	19.3
62 RM 833.5-(	20090528 C	FILSK	1	15.7
62 RM 833.5-(	20090528 C	FILSK	1	15.7
19 RM 815-82	20090601 BGS	FILSK	1	6.1
19 RM 815-82	20090601 BGS	FILSK	1	3.9
19 RM 815-82	20090601 BGS	FILSK	1	4.9
19 RM 815-82	20090601 BGS	FILSK	1	6.9
19 RM 815-82	20090601 BGS	FILSK	1	6.9
19 RM 815-82	20090601 BGS	FILSK	1	5.9
19 RM 815-82	20090601 BGS	FILSK	1	6.7
19 RM 815-82	20090601 BGS	FILSK	1	5.5
19 RM 815-82	20090601 BGS	FILSK	1	4.3
19 RM 815-82	20090601 BGS	FILSK	1	5.9
19 RM 815-82	20090601 BGS	FILSK	1	6.7
19 RM 815-82	20090601 BGS	FILSK	1	3.9
19 RM 815-82	20090601 BGS	FILSK	1	5.1
19 RM 815-82	20090601 BGS	FILSK	1	5.3
19 RM 815-82	20090601 BGS	FILSK	1	6.7
19 RM 815-82	20090601 WHB	FILSK	1	13.8
19 RM 815-82	20090601 WHB	FILSK	1	13.4
19 RM 815-82	20090601 WHB	FILSK	1	12.6
19 RM 815-82	20090601 WHB	FILSK	1	12.2
19 RM 815-82	20090601 WHB	FILSK	1	14.6
19 RM 815-82	20090601 WHB	FILSK	1	13.8
19 RM 815-82	20090601 WHB	FILSK	1	11.8
19 RM 815-82	20090601 WHB	FILSK	1	12.6
19 RM 815-82	20090601 WHB	FILSK	1	12.2
19 RM 815-82	20090601 WHB	FILSK	1	14.2
19 RM 815-82	20090601 WHB	FILSK	1	14.6
19 RM 815-82	20090601 WHB	FILSK	1	11.0
19 RM 815-82	20090601 WHB	FILSK	1	13.4
19 RM 815-82	20090601 WHB	FILSK	1	13.4
19 RM 815-82	20090601 WHB	FILSK	1	14.2
19 RM 815-82	20090601 FWD	FILSK	1	11.0
19 RM 815-82	20090601 FWD	FILSK	1	13.6
19 RM 815-82	20090601 FWD	FILSK	1	14.2
19 RM 815-82	20090601 FWD	FILSK	1	10.6
19 RM 815-82	20090601 FWD	FILSK	1	13.2
19 RM 815-82	20090601 FWD	FILSK	1	15.4
19 RM 815-82	20090601 FWD	FILSK	1	13.0
19 RM 815-82	20090601 FWD	FILSK	1	12.2
19 RM 815-82	20090601 FWD	FILSK	1	12.0
19 RM 815-82	20090601 FWD	FILSK	1	15.4
19 RM 815-82	20090601 FWD	FILSK	1	14.6
19 RM 815-82	20090601 FWD	FILSK	1	14.6

19 RM 815-82 20090601 FWD	FILSK	1	14.2
19 RM 815-82 20090601 FWD	FILSK	1	14.2
19 RM 815-82 20090601 FWD	FILSK	1	13.4
19 RM 815-82 20090601 SMB	FILSK	1	13.0
19 RM 815-82 20090601 SMB	FILSK	1	11.0
19 RM 815-82 20090601 SMB	FILSK	1	11.8
19 RM 815-82 20090601 SMB	FILSK	1	10.6
19 RM 815-82 20090601 SMB	FILSK	1	11.8
19 RM 815-82 20090601 SMB	FILSK	1	13.0
19 RM 815-82 20090601 SMB	FILSK	1	15.7
19 RM 815-82 20090601 SMB	FILSK	1	11.6
19 RM 815-82 20090601 SMB	FILSK	1	10.0
19 RM 815-82 20090601 SMB	FILSK	1	11.0
19 RM 815-82 20090601 SMB	FILSK	1	16.3
19 RM 815-82 20090601 SMB	FILSK	1	14.6
19 RM 815-82 20090601 SMB	FILSK	1	8.7
19 RM 815-82 20090601 SMB	FILSK	1	10.6
19 RM 815-82 20090601 SMB	FILSK	1	10.6
62 RM 833.5-8 20090528 BGS	FILSK	1	5.3
62 RM 833.5-8 20090528 BGS	FILSK	1	5.5
62 RM 833.5-8 20090528 BGS	FILSK	1	5.3
62 RM 833.5-8 20090528 BGS	FILSK	1	5.1
62 RM 833.5-8 20090528 BGS	FILSK	1	5.1
62 RM 833.5-8 20090528 BGS	FILSK	1	5.3
62 RM 833.5-8 20090528 BGS	FILSK	1	5.1
62 RM 833.5-8 20090528 BGS	FILSK	1	6.5
62 RM 833.5-8 20090528 BGS	FILSK	1	6.3
62 RM 833.5-8 20090528 BGS	FILSK	1	5.9
62 RM 833.5-8 20090528 BGS	FILSK	1	4.9
62 RM 833.5-8 20090528 BGS	FILSK	1	5.5
62 RM 833.5-8 20090528 BGS	FILSK	1	5.5
62 RM 833.5-8 20090528 BGS	FILSK	1	6.7
62 RM 833.5-8 20090528 BGS	FILSK	1	5.1
62 RM 833.5-8 20090528 C	FILSK	1	22.0
62 RM 833.5-8 20090528 C	FILSK	1	18.9
19 RM 815-82 20090601 C	FILSK	1	18.1
19 RM 815-82 20090601 C	FILSK	1	20.9
19 RM 815-82 20090601 C	FILSK	1	16.9
19 RM 815-82 20090601 C	FILSK	1	20.1
19 RM 815-82 20090601 C	FILSK	1	18.5
19 RM 815-82 20090601 C	FILSK	1	19.3
19 RM 815-82 20090601 C	FILSK	1	13.4
19 RM 815-82 20090601 C	FILSK	1	15.0
19 RM 815-82 20090601 C	FILSK	1	17.3
19 RM 815-82 20090601 C	FILSK	1	18.9
19 RM 815-82 20090601 C	FILSK	1	15.0
19 RM 815-82 20090601 C	FILSK	1	18.5
19 RM 815-82 20090601 C	FILSK	1	14.2
19 RM 815-82 20090601 C	FILSK	1	21.3
19 RM 815-82 20090601 C	FILSK	1	20.5
62 RM 844-84 20090528 BGS	FILSK	1	3.1
62 RM 844-84 20090528 BGS	FILSK	1	3.9

62 RM 844-84 20090528 BGS	FILSK	1	3.9
62 RM 844-84 20090528 BGS	FILSK	1	3.9
62 RM 844-84 20090528 BGS	FILSK	1	3.7
62 RM 844-84 20090528 BGS	FILSK	1	3.7
62 RM 844-84 20090528 BGS	FILSK	1	3.1
62 RM 844-84 20090528 BGS	FILSK	1	3.7
62 RM 844-84 20090528 BGS	FILSK	1	3.1

allfish_format_2009

WTKG	LAT	LONG	AGE	SEX	LIPPCT	PFOAPPB	PFOACOD	PFOSPPB
						0.453	K	950
						0.631	K	105
						0.668	K	138
3.275			7	M		0.581	K	13.1
1.079			3	F		0.614	K	75.5
1.23			2	F		0.591	K	180
3.125			7	F		0.538	K	45.5
1.771			4	M		1.24		347
2.532			5	F		0.602	K	73.5
2.416			5	M		0.59	K	175
4.675			6	F		0.608	K	420
5.175			6	F		0.605	K	66.4
0.285			5	M		0.619	K	269
0.252			4	M		0.596	K	336
0.165			4	F		0.607	K	167
0.303			5	M		0.615	K	158
0.135			4	F		0.591	K	122
0.215			4	F		0.578	K	156
0.416			2	F		0.609	K	510
0.78			4	F		0.6	K	102
0.441			2	F		0.605	K	240
0.219			1	F		1.17		1860
0.665			4	F		0.602	K	83.6
2.633				F		0.605	K	374
4.5						0.5	K	2.97
2.8						0.5	K	2.34
1.75						0.5	K	4.02
2.5						0.5	K	9.08
1.75						0.5	K	11.7
0.692						0.948		178
0.454						0.972		89.8
0.178						0.856		19
0.162						0.796		53.2
0.166						0.904		45
0.155							NR	32.3
0.092							NR	30.3
2.25						0.5	K	8.54
2.5						0.5	K	95.2
3.25						0.5	K	5.6
3.5						0.5	K	6.18
3						0.5	K	10.7
0.063							NR	589
0.175							NR	110
0.175							NR	1320
0.065							NR	709
0.075							NR	59.7
2						0.622		69.2
2.5						0.5	K	11.7
3.25						1.16		2.86
3.25						1.71		42
2						1.34		7.74

0.158					NR	290
0.274					NR	5150
0.214					NR	884
0.072					NR	331
0.069					NR	330
0.193	3	M	0.34	2.4	K	165
0.144	3	F	0.4	2.46	K	102
0.13	3	M	0.4	2.42	K	157
0.161	3	F	0.59	2.43	K	317
0.1003	3	M	0.51	2.48	K	122
0.292	5	M	0.32	2.51	K	46
0.346	5	M	2.42	2.49	K	31
0.876	7	F	3.28	2.43	K	36.2
0.103	3	U	0.52	2.48	K	48.8
0.149	5	F	0.47	2.37	K	380
0.187	5	M	0.5	2.35	K	118
0.162	5	F	0.37	2.48	K	120
0.137	4	F	0.61	2.46	K	143
1.264	9	M	1.87	2.49	K	28.6
1.599	9	F	2.6	2.45	K	44.8
0.03119	3	U	0.73	2.49	K	69.6
0.34	5	U	0.75	2.45	K	40.5
0.374	5	J	1.1	2.49	K	72.8
0.505	5	F	1.89	2.42	K	123
0.509	5	J	2.78	2.38	K	62.9
0.421	6	M	0.71	2.48	K	111
0.571	6	M	0.37	2.46	K	30.1
0.530	7	M	0.76	2.5	K	53.9
1.006	10	M	1.87	2.46	K	34
0.651	6	F	0.55	2.44	K	5.3
0.348	5	F	0.96	2.48	K	15.7
0.399	4	F	2.25	2.45	K	74
0.403	5	M	0.61	2.5	K	75.7
0.313	3	F	1.08	2.48	K	31
0.538	5	M	0.81	2.45	K	60
0.499	6	M	4.24	2.4	K	29.6
0.301	3	M	0.81	2.48	K	89.9
0.229	2	M	0.86	2.48	K	61.5
0.519	4	F	1.78	2.36	K	85.5
0.412	3	M	3.15	2.5	K	71.1
0.525	4	F	2.4	2.44	K	60.1
0.563	5	M	3.49	2.45	K	146
0.763	6	F	3.83	2.43	K	51.5
0.449	3	F	3.55	2.39	K	90.6
0.549	3	F	3.24	2.39	K	58.3
0.434	3	M	1.01	2.43	K	44.5
0.416	3	M	1.08	2.4	K	62.7
0.648	4	F	2.03	2.45	K	71
0.601	4	M	3.59	2.46	K	90.3
0.869	6	F	4.77	2.46	K	66.4
0.765	6	M	0.95	2.45	K	95.1
0.846	7	M	1.21	2.45	K	38.2

0.968	8	M	0.89	2.44	K	86.5
0.667	7	M	0.72	2.44	K	24.8
0.527	5	M	0.7	2.48	K	17.2
1.072	9	F	0.56	2.23	K	107
0.406	4	F	0.53	2.48	K	30.9
0.727	6	M	0.94	2.49	K	23.1
0.568	5	M	1	2.39	K	21.5
0.873	7	F	0.92	2.34	K	58.2
1.023	7	M	1.29	2.34	K	49.3
0.805	7	F	0.74	2.42	K	59.2
1.189	9	M	1.56	2.48	K	35.6
0.712	7	F	0.33	2.48	K	14.4
0.548	5	F	0.83	2.36	K	13.6
0.352	3	F	0.44	2.46	K	26.4
2.074	6	M	7.32	2.39	K	93.1
1.781	5	M	6.05	2.37	K	42.7
1.176	5	M	4.66	2.16	K	12.3
4.268	9	F	6.38	2.14	K	24.9
2.393	7	M	4.49	2.42	K	32.4
1.980	6	M	3.62	2.35	K	13.6
1.447	5	M	2.78	2.21	K	11.5
2.467	6	M	6	2.26	K	71.1
1.760	5	M	4.38	2.37	K	6.86
1.883	5	M	4.67	2.16	K	32
2.106	6	M	11.6	2.15	K	29.9
1.690	5	M	4.53	2.5	K	7.02
2.186	7	M	1.98	2.46	K	29.1
0.719	4	J	0.86	2.4	K	14.2
0.160	7	F	0.5	2.44	K	17.5
0.049	3	M	0.63	2.5	K	11.9
0.075	5	M	0.48	2.46	K	144
0.440	3	F	3.02	2.44	K	75.6
0.486	3	F	2.82	2.4	K	71.4
0.760	5	F	2.82	2.49	K	57.7
0.362	3	F	1.27	2.49	K	75.2
0.819	4	M	4.45	2.43	K	79.7
0.342	2	F	0.88	2.5	K	59.3
0.744	5	F	1.01	2.4	K	94.7
0.633	4	F	3.28	2.4	K	61.9
0.430	3	F	2.53	2.48	K	130
0.290	2	F	2.95	2.43	K	77.5
0.779	6	F	2.52	2.5	K	63.1
0.239	2	F	2.78	2.44	K	73.5
0.482	3	M	1.01	2.42	K	46.8
0.310	2	F	1.11	2.42	K	37.7
0.393	3	F	1.4	2.45	K	71.3
0.368	4	F	2.21	2.46	K	90.1
0.376	4	J	1.39	2.44	K	77.9
0.402	5	F	11.2	2.39	K	4.78
0.496	5	M	1.25	2.49	K	104
0.329	4	M	2.11	2.43	K	39.3
0.201	2	J	0.38	2.39	K	41.8

0.400	4	F	2.26	2.46	K	36.6
0.316	4	M	2.62	2.44	K	22.9
0.550	6	M	4.23	2.38	K	67.6
0.335	3	J	1.41	2.44	K	52.3
0.755	8	M	2.78	2.48	K	71.8
0.484	5	M	2.77	2.43	K	38.8
1.302	9	F	0.61	2.39	K	4.78
0.561	5	F	1.6	2.46	K	64.4
0.405	4	M	1	2.34	K	19.1
0.689	6	M	1.04	2.46	K	39
0.750	7	F	1.13	2.44	K	30.2
0.164	2	F	0.28	2.36	K	12.6
0.196	2	M	0.54	2.36	K	30.8
0.374	4	M	1.07	2.48	K	22.5
0.292	3	M	0.7	2.49	K	13.3
0.222	3	F	0.36	2.42	K	14
0.642	7	M	0.8	2.45	K	14.9
0.468	5	F	0.55	2.26	K	19.2
0.573	5	M	0.81	2.49	K	59.6
0.438	3	M	0.93	2.29	K	30.6
0.256	3	F	0.54	2.31	K	25
0.513	5	M	0.46	2.49	K	13.1
0.662	6	M	0.64	2.43	K	38.1
0.358	4	F	0.47	2.25	K	25.1
0.118	6	F	0.41	2.51	K	46.5
0.052	3	F	0.6	2.37	K	25.9
0.066	4	F	0.34	2.38	K	24.6
0.043	3	F	0.37	2.51	K	45.4
0.042	3	J	1.31	2.39	K	55.9
0.099	6	M	0.42	2.38	K	30.3
0.061	4	M	0.57	2.49	K	44.1
0.059	5	J	0.61	2.46	K	44.1
0.051	3	M	0.53	2.48	K	43.8
0.048	3	F	0.65	2.38	K	50.9
0.061	4	F	0.5	2.31	K	37.8
0.084	4	M	0.49	2.5	K	47.9
0.076	4	M	0.62	2.26	K	36.4
0.046	3	F	0.61	2.34	K	18.6
0.056	3	F	0.59	2.42	K	55.4
2.365	7	M	2.73	2.4	K,E	41.8
1.502	5	F	4.09	2.44	K	19.2
1.704	5	M	2.95	2.36	K	32.3
1.439	5	M	3.66	2.49	K	26.1
1.922	6	M	2.48	2.5	K	12.4
1.073	5	M	3.25	2.45	K	15.1
2.455	6	F	2.63	2.3	K	13.7
2.427	6	M	4.49	2.46	K	11.1
1.693	5	M	4.59	2.19	K	16.6
1.023	5	F	1.15	2.35	K	4.69
0.883	4	M	2.2	2.49	K	5.57
2.488	6	M	8.04	2.49	K	10.8
1.538	5	M	1.2	2.38	K	10.7

1.705	6	F	1.57	2.39	K	4.78
2.872	6	F	3.17	2.43	K	12.9
0.340	5	J	0.79	2.44	K	46.3
0.615	4	M	2.34	2.48	K	105
0.587	4	F	3.28	2.45	K	61.6
0.639	5	M	1.57	2.44	K	71.2
0.435	4	F	1.13	2.49	K	69.6
0.617	5	F	1.53	2.44	K	73.9
0.516	3	M	2.07	2.44	K	114
0.541	4	M	2.19	2.4	K	90.2
0.611	4	F	3.41	2.49	K	57.6
0.809	5	F	2.66	2.37	K	111
0.597	4	F	0.5	2.45	K	63.1
0.418	3	F	1.9	2.43	K	68.9
0.748	5	M	4.37	2.37	K	106
0.552	4	F	1.85	2.43	K	60.6
0.369	3	M	2.29	2.5	K	85.9
0.430	3	F	1.99	2.37	K	101
0.459	5	F	0.55	2.49	K	106
0.297	4	M	0.77	2.5	K	137
0.925	8	F	0.48	2.48	K	63.3
0.495	5	F	0.65	2.5	K	38.8
0.461	6	F	0.66	2.43	K	57.9
0.537	6	F	0.6	2.5	K	31.8
0.383	4	F	0.35	2.44	K	27
0.353	4	M	0.69	2.44	K	45.7
0.478	5	F	0.57	2.49	K	103
0.457	5	F	0.35	2.45	K	99
0.335	5	F	0.76	2.4	K	57.5
0.448	5	F	0.47	2.4	K	104
0.400	5	F	0.61	2.4	K	11.4
0.273	3	M	1.39	2.49	K	92.4
0.530		F	0.54	2.37	K	98.3
0.191	2	J	0.59	2.34	K	44.9
0.432	5	M	0.36	2.4	K	52.6
0.673	7	F	0.53	2.13	K	30.8
0.299	4	F	0.38	2.34	K	32.6
0.358	4	F	0.27	2.38	K	27.9
0.235	3	M	0.43	2.24	K	46
0.251	3	M	0.3	2.18	K	37.6
0.833	7	F	0.47	2.26	K	60.3
0.269	3	F	0.54	2.45	K	70.3
0.445	5	M	0.33	2.43	K	60.9
0.511	5	M	0.46	2.36	K	111
0.229	3	F	0.57	2.39	K	37.1
0.255	3	J	0.56	2.33	K	49.3
0.560	6	F	0.37	2.39	K	25.9
0.327	3	M	0.59	2.5	K	48.6
1.560	5	M	3.56	2.48	K	52.3
2.208	6	M	4.88	2.5	K	25.7
2.178	6	M	2.37	2.48	K	10.2
0.652	4	F	0.43	4.69		27.1

2.734	7	M	4.86	2.46	K	45.2
1.379	5	F	0.57	2.48	K	7.29
0.824	4	F	2.04	2.48	K	38.7
2.452	7	M	3.23	2.48	K	18.9
1.822	5	M	3.67	2.49	K	58.8
1.684	5	F	1.72	2.5	K	30.6
2.199	6	M	5.43	2.38	K	57.3
1.659	5	F	5.62	2.48	K	23.9
1.032	4	M	11.8	2.5	K	90.6
0.968	4	M	3.27	2.48	K	23.6
0.095	5	M	0.45	2.44	K	313
0.021	2	J	0.77	2.5	K	32.3
0.039	3	J	0.66	2.44	K	39.2
0.134	6	M	0.77	2.46	K	37.8
0.148	6	M	0.38	2.45	K	36.1
0.077	4	F	0.4	2.48	K	451
0.114	6	M	0.38	2.49	K	399
0.060	4	M	0.76	2.24	K	53.1
0.031	2	F		2.2	K	84.8
0.079	4	F	0.98	2.19	K	48.1
0.131	6	F	0.73	2.5	K	39.5
0.020	2	F		2.46	K	910
0.047	3	J	0.61	2.46	K	65.4
0.063	3	J	0.77	2.4	K	1350
0.089	5	M	0.81	2.5	K	42.3
0.514	4	F	1.17	2.46	K	56.8
0.539	4	F	2.73	2.49	K	87.4
0.389	2	M	2.23	2.45	K	65.3
0.394	3	F	3.26	2.39	K	230
0.684	5	F	3.33	2.44	K	80.7
0.614	4	F	4.2	2.5	K	174
0.363	3	M	3.42	2.4	K	44
0.364	3	F	1.48	2.4	K	82
0.423	3	F	1.92	2.5	K	81.3
0.620	5	M	1.13	2.42	K	163
0.704	5	F	2.67	2.38	K	128
0.233	2	F	2.57	2.46	K	764
0.535	4	M	1.05	2.48	K	171
0.645	4	F	2.98	2.5	K	88.1
0.621	6	F	3.06	2.44	K	162
0.391	3	M	0.72	9.39	E	2850
0.519	5	M	1.55	2.48	K	49.8
0.608	6	F	1.8	12.6	E	997
0.375	3	F	0.91	9.19		441
0.510	5	M	0.88	6.88	E	1090
0.791	8	F	1.71	2.42	K	30.2
0.430	5	F	0.63	16.8	E	592
0.365	4	M	1.76	5.01	E	210
0.344	4	F	1.4	2.38	K	91.6
0.788	8	F	3.14	17.5	E	3580
0.669	6	F	1.24	27.6	E	632
0.714	6	F	0.41	2.46	K	29.8

0.868	6	F	0.76	7.87		401
0.684	6	J	1.62	2.33	K	67.6
0.750	5	F	1.79	2.48	K	24.2
0.547	5	F	0.44	2.49	K	436
0.372	3	F	0.49	2.49	K	76.5
0.432	4	F	0.38	2.97		561
0.293	3	F	0.48	2.5	K	495
0.419	4	M	0.4	2.49	K	259
0.436	5	F	0.4	2.5	K	42
0.990	8	F	0.46	2.35	K	612
0.382	4	F	0.34	2.46	K	52.1
0.236	3	F	0.28	2.37	K	92.8
0.360	4	M	0.39	2.43	K	219
0.911	9	F	0.54	2.46	K	71.7
0.886	7	M	0.3	2.49	K	521
0.200	2	M	0.67	2.48	K	98.6
0.231	3	F	0.22	2.48	K	210
0.308	3	J	1.01	2.4	K	153
0.049	3	F	0.34	2.46	K	155
0.069	3	M	0.44	2.46	K	34
0.048	3	F	0.47	2.46	K	55.9
0.050	3	F	0.86	2.44	K	71.3
0.043	3	M	0.47	2.49	K	80.7
0.068	3	F	0.86	2.51	K	143
0.042	3	M	0.72	2.37	K	74.6
0.126	5	M	1.16	2.5	K	204
0.095	5	M	0.36	2.46	K	84.4
0.079	4	F	0.98	2.48	K	37.6
0.048	2	M	0.85	2.48	K	63.6
0.052	4	J	0.52	2.44	K	201
0.063	4	M	0.26	2.37	K	94.6
0.118	6	M	0.72	2.39	K	82.3
0.047	3	F	1.01	2.43	K	105
2.296	6	M	4.99	2.48	K	65.5
1.603	5	M	3.77	2.49	K	53.3
1.633	5	F	4.29	2.37	K	8.68
2.124	6	M	3.97	2.49	K	130
0.952	5	M	3.24	12.1		1340
1.594	6	M	3.21	2.35	K	52.6
1.411	5	F	0.79	4.2		283
1.597	5	F	2.66	2.24	K	874
0.700	2	M	2.67	2.34	K	27.1
0.896	2	M	2.09	2.44	K	56.4
1.015	5	F	0.77	2.42	K	19.6
1.450	5	F	3.26	2.26	K	58.6
0.815	4	M	2.54	2.43	K	117
1.432	6	F	6.92	2.33	K	86.9
0.754	3	J	1.28	2.12	K	37.9
1.918	6	M	0.95	2.21	K	106
2.010	6	F	11	2.45	K	158
0.007	1	J	N	2.5	K	16.8
0.020	1	J	N	2.49	K	10.5

0.018	1	J	N	2.5	K	9.14
0.021	1	J	N	2.49	K	9.21
0.013	1	J	N	2.46	K	8.31
0.016	1	J	N	2.5	K	11.5
0.007	1	J	N	2.58	K	11.3
0.013	1	J	N	2.48	K	13.9
0.009	1	J	N	2.49	K	18.1

PFOSCOD	PFOSCMMT	PFBSPPB	PFBSCOD	PFHSPPB	PFHSCOD	PFOSAPPI	PFOSACO
	MPCAMiss R Pool2-SMB #1 fillet L7474-38 (A)						33.1
	MPCAMiss R Pool2 -SMB #2 fillet L7474-39 (A)						5.04
	MPCAMiss R Pool2-WB #2, #3, #4, #5- fillet composite L7474-40 (A)						4.54
	MPCA L8616-25WE-1						
	MPCA L8616-26WE-2						
	MPCA L8616-27WE-3						
	MPCA L8616-28WE-4						
	MPCA L8616-6Carp-1						
	MPCA L8616-7Carp-2						
	MPCA L8616-8Carp-3						
	MPCA L8616-9Carp-4						
	MPCA L8616-10Carp-5						
	MPCA L8616-29SMB-1						
	MPCA L8616-30SMB-2						
	MPCA L8616-31SMB-3						
	MPCA L8616-32SMB-4						
	MPCA L8616-33SMB-5						
	MPCA L8616-34SMB-6						
	MPCA L8616-20WB-1						
	MPCA L8616-21WB-2						
	MPCA L8616-22WB-3						
	MPCA L8616-23WB-4						
	MPCA L8616-24WB-5						
	MPCA L8616-11SMBuffalo						
	3MChannel catfish 6	0.5	K			K	
	3MChannel catfish 7	0.5	K			K	
	3MChannel catfish 8	0.5	K			K	
	3MChannel catfish 9	0.5	K			K	
	3MChannel catfish 10	0.5	K			K	
	3MSmallmouth bass 1	0.5	K			K	
	3MSmallmouth bass 2	0.5	K			K	
	3MSmallmouth bass 3	0.5	K			K	
	3MSmallmouth bass 4	0.5	K			K	
	3MSmallmouth bass 5	0.5	K			K	
	3MBluegill sunfish 6	0.5	K			K	
	3MBluegill sunfish 7	0.5		K		K	
	3MChannel catfish 16	0.5	K			K	
	3MChannel catfish 17	0.5	K			K	
	3MChannel catfish 18	0.5	K			K	
	3MChannel catfish 19	0.5	K			K	
	3MChannel catfish 20	0.5	K			K	
	3MSmallmouth bass 6	0.5	K			K	
	3MSmallmouth bass 7	0.5	K			K	
	3MSmallmouth bass 8	0.5	K			K	
	3MBluegill sunfish 13	0.5	K			K	
	3MBluegill sunfish 14	0.5	K			K	
	3MChannel catfish 26	0.5	K			K	
	3MChannel catfish 27	0.5	K			K	
	3MChannel catfish 28	0.5	K			K	
	3MChannel catfish 29	0.5	K			K	
	3MChannel catfish 30	0.5	K			K	

	3MSmallmouth bass 9	3.33		K			
	3MSmalimouth bass 10	0.5	K	K			
	3MSmallmouth bass 11	0.5	K	K			
	3MBluegill sunfish 20	0.5	K	K			
	3MBluegill sunfish 21	0.5	K	K			
	AxysL11311-13 R	4.81	K		3.41	J	
	AxysL11311-14 R	4.93	K		2.46	K	
	AxysL11311-15 R	4.83	K		3.05	J	
	AxysL11311-16 R	4.85	K		5.78	J	
	AxysL11311-17 R	4.95	K		3.82		
	AxysL11311-12 R	5.03	K		2.51	K	
	AxysL11311-5 R	4.98	K		2.49	K	
	AxysL11311-6 R	4.85	K		3.09	J	
	AxysL11311-7 R	4.95	K		5.87	J	
	AxysL11311-8 R	4.74	K		2.37	K	
	AxysL11311-9 R	4.69	K		13.8	J	
	AxysL11311-10 R	4.95	K		9.86	J	
	AxysL11311-11 R	4.93	K		13.5	J	
	AxysL11311-1 R	4.98	K		2.49	K	
M	AxysL11311-2 R (A)	4.9	K		3.32	J	
	AxysL11311-3 R	4.98	K		2.82	J	
	AxysL11311-4 R	4.9	K		2.45	K	
	AXYS_L12945-22	4.98	K		2.49	K	
	AXYS_L12945-23	4.83	K		2.42	K	
	AXYS_L12945-24	4.76	K		2.38	K	
	AXYS_L12945-25	4.95	K		2.48	K	
	AXYS_L12945-26	4.93	K		2.46	K	
	AXYS_L12945-27	5	K		2.5	K	
	AXYS_L12945-28 (A)	4.93	K		2.46	K	
	AXYS_L12945-29	4.88	K		2.44	K	
	AXYS_L12945-30	4.95	K		2.48	K	
	AXYS_L12946-1	4.9	K		2.45	K	
	AXYS_L12946-2	5	K		2.5	K	
	AXYS_L12945-5	4.95	K		2.48	K	
	AXYS_L12945-6	4.9	K		2.45	K	
	AXYS_L12945-7	4.81	K		2.4	K	
	AXYS_L12934-16	4.95	K		2.48	K	
	AXYS_L12934-17	4.95	K		2.48	K	
	AXYS_L12934-18	4.72	K		2.55		
	AXYS_L12934-19	5	K		2.65		
	AXYS_L12934-20	4.88	K		6.47		
	AXYS_L12934-21	4.9	K		2.92		
	AXYS_L12934-22 (A)	4.85	K		2.43	K	
	AXYS_L12934-23	4.78	K		2.78		
	AXYS_L12934-9	4.78	K		2.43		
	AXYS_L12934-10	4.85	K		2.43	K	
	AXYS_L12934-11	4.81	K		2.4	K	
	AXYS_L12934-12	4.9	K		2.45	K	
	AXYS_L12934-13	4.93	K		2.46	K	
	AXYS_L12934-14	4.93	K		5.74		
	AXYS_L12934-15	4.9	K		2.45	K	
	AXYS_L12931-12	4.9	K		2.45	K	

AXYS_L12931-13	4.88	K	2.44	K
AXYS_L12931-14 (A)	4.88	K	2.44	K
AXYS_L12931-15	4.95	K	2.48	K
AXYS_L12931-16	4.46	K	2.23	K
AXYS_L12931-17	4.95	K	2.48	K
AXYS_L12931-18	4.98	K	2.49	K
AXYS_L12931-19 (A)	4.78	K	2.39	K
AXYS_L12931-20	4.67	K	2.34	K
AXYS_L12931-21	4.67	K	2.34	K
AXYS_L12931-22	4.83	K	2.42	K
AXYS_L12932-8	4.95	K	2.48	K
AXYS_L12932-9	4.95	K	2.48	K
AXYS_L12932-10	4.72	K	7.19	
AXYS_L12932-11	4.93	K	2.46	K
AXYS_L12916-17	4.78	K	2.39	K
AXYS_L12916-18	4.74	K	2.37	K
AXYS_L12916-19	4.33	K	2.16	K
AXYS_L12916-20	4.27	K	2.14	K
AXYS_L12916-21	4.83	K	2.42	K
AXYS_L12917-13	4.69	K	2.35	K
AXYS_L12917-14	4.42	K	2.21	K
AXYS_L12916-22 (A)	4.52	K	2.26	K
AXYS_L12916-23	4.74	K	2.37	K
AXYS_L12916-24	4.31	K	2.16	K
AXYS_L12916-25	4.29	K	2.15	K
AXYS_L12916-26	5	K	2.5	K
AXYS_L12917-15	4.93	K	2.46	K
AXYS_L12916-27	4.81	K	2.4	K
AXYS_L12948-15 (A)	4.88	K	2.44	K
AXYS_L12948-16	5	K	2.5	K
AXYS_L12948-17	4.93	K	2.46	K
AXYS_L12933-16	4.88	K	2.44	K
AXYS_L12933-17	4.81	K	3.39	
AXYS_L12933-18 (A)	4.98	K	22.3	
AXYS_L12933-19	4.98	K	2.49	K
AXYS_L12933-20	4.85	K	2.43	K
AXYS_L12933-21	5	K	5.96	
AXYS_L12933-22	4.81	K	6.85	
AXYS_L12933-23	4.81	K	2.4	K
AXYS_L12933-24	4.95	K	2.71	
AXYS_L12933-25	4.85	K	2.43	K
AXYS_L12933-26	5	K	11.8	
AXYS_L12934-27	4.88	K	3.02	
AXYS_L12934-28	4.83	K	3.08	
AXYS_L12934-29	4.83	K	2.42	K
AXYS_L12934-30	4.9	K	3.84	
AXYS_L12945-15	4.93	K	2.46	K
AXYS_L12945-16	4.88	K	2.44	K
AXYS_L12945-17	4.78	K	2.39	K
AXYS_L12945-18	4.98	K	2.49	K
AXYS_L12945-19	4.85	K	2.43	K
AXYS_L12945-20	4.78	K	2.39	K

	AXYS_L12945-21	4.93	K	2.46	K
	AXYS_L12946-25	4.88	K	2.44	K
	AXYS_L12946-26	4.76	K	2.38	K
	AXYS_L12946-27	4.88	K	2.44	K
	AXYS_L12946-28	4.95	K	2.48	K
	AXYS_L12946-29	4.85	K	2.43	K
K	AXYS_L12945-8	4.78	K	2.39	K
	AXYS_L12945-9	4.93	K	2.46	K
	AXYS_L12945-10	4.67	K	2.34	K
	AXYS_L12931-30	4.93	K	2.46	K
	AXYS_L12932-1	4.88	K	2.44	K
	AXYS_L12932-2	4.72	K	2.36	K
	AXYS_L12932-3	4.72	K	2.36	K
	AXYS_L12932-4	4.95	K	2.48	K
	AXYS_L12932-5	4.98	K	2.49	K
	AXYS_L12932-6	4.83	K	2.42	K
	AXYS_L12932-7	4.9	K	2.45	K
	AXYS_L12931-23	4.52	K	2.26	K
	AXYS_L12931-24	4.98	K	2.49	K
	AXYS_L12931-25	4.59	K	2.29	K
	AXYS_L12931-26	4.63	K	2.31	K
	AXYS_L12931-27	4.98	K	2.49	K
	AXYS_L12931-28	4.85	K	2.43	K
	AXYS_L12931-29	4.5	K	2.25	K
	AXYS_L12948-8	5.03	K	2.51	K
	AXYS_L12948-9	4.74	K	2.37	K
	AXYS_L12948-10	4.76	K	2.38	K
	AXYS_L12948-11	5.03	K	2.51	K
	AXYS_L12947-13	4.78	K	2.39	K
	AXYS_L12947-14	4.76	K	2.38	K
	AXYS_L12947-15	4.98	K	2.49	K
	AXYS_L12947-16	4.93	K	2.46	K
	AXYS_L12947-17	4.95	K	2.48	K
	AXYS_L12947-18	4.76	K	2.38	K
	AXYS_L12947-19	4.63	K	2.31	K
	AXYS_L12947-20	5	K	2.5	K
	AXYS_L12947-21	4.52	K	2.26	K
	AXYS_L12947-22	4.67	K	3.68	
	AXYS_L12947-23	4.83	K	2.42	K
E	AXYS_L12917-16	4.81	K, E	2.4	K, E
	AXYS_L12917-17	4.88	K	2.44	K
	AXYS_L12917-18	4.72	K	2.36	K
	AXYS_L12917-19	4.98	K	2.49	K
	AXYS_L12917-20	5	K	2.5	K
	AXYS_L12917-21	4.9	K	2.45	K
	AXYS_L12917-22	4.61	K	2.3	K
	AXYS_L12917-23 (A)	4.93	K	2.46	K
	AXYS_L12917-24	4.39	K	2.19	K
K	AXYS_L12917-25	4.69	K	2.35	K
	AXYS_L12917-26	4.98	K	2.49	K
	AXYS_L12917-27	4.98	K	2.49	K
	AXYS_L12917-28	4.76	K	2.38	K

K	AXYS_L12917-29	4.78	K	2.39	K
	AXYS_L12917-30	4.85	K	2.43	K
	AXYS_L12946-30	4.88	K	2.44	K
	AXYS_L12933-10	4.95	K	2.48	K
	AXYS_L12933-11 (A)	4.9	K	2.71	E
	AXYS_L12933-12	4.88	K	2.44	K
	AXYS_L12933-13	4.98	K	2.97	E
	AXYS_L12933-14	4.88	K	3.4	E
	AXYS_L12933-15	4.88	K	2.44	K
	AXYS_L12933-27	4.81	K	5.27	
	AXYS_L12933-28	4.98	K	4.07	
	AXYS_L12933-29	4.74	K	4.2	
	AXYS_L12933-30	4.9	K	2.74	
	AXYS_L12934-1	4.85	K	3.35	
	AXYS_L12934-2	4.74	K	2.6	
	AXYS_L12934-3 (A)	4.85	K	2.54	
	AXYS_L12934-4	5	K	2.5	K
	AXYS_L12934-5	4.74	K	3.77	
	AXYS_L12945-1	4.98	K	2.49	K
	AXYS_L12945-2	5	K	2.5	K
	AXYS_L12946-14	4.95	K	2.48	K
	AXYS_L12946-15	5	K	2.5	K
	AXYS_L12946-16	4.85	K	2.43	K
	AXYS_L12946-17	5	K	2.5	K
	AXYS_L12946-18	4.88	K	2.44	K
	AXYS_L12946-19	4.88	K	2.44	K
	AXYS_L12946-20	4.98	K	2.49	K
	AXYS_L12946-21	4.9	K	2.45	K
	AXYS_L12946-22	4.81	K	2.4	K
	AXYS_L12946-23 (A)	4.81	K	2.4	K
	AXYS_L12946-24	4.81	K	2.4	K
	AXYS_L12945-3	4.98	K	2.49	K
	AXYS_L12945-4	4.74	K	2.37	K
	AXYS_L12931-1	4.67	K	2.34	K
	AXYS_L12931-2	4.81	K	2.4	K
	AXYS_L12931-3	4.26	K	2.13	K
	AXYS_L12931-4	4.67	K	2.34	K
	AXYS_L12931-5	4.76	K	2.38	K
	AXYS_L12931-6	4.48	K	2.24	K
	AXYS_L12931-7	4.37	K	2.18	K
	AXYS_L12931-8	4.52	K	2.26	K
	AXYS_L12931-9	4.9	K	2.45	K
	AXYS_L12931-10	4.85	K	2.43	K
	AXYS_L12931-11	4.72	K	2.36	K
	AXYS_L12932-27	4.78	K	2.39	K
	AXYS_L12932-28	4.65	K	2.33	K
	AXYS_L12932-29	4.78	K	2.39	K
	AXYS_L12932-30	5	K	2.5	K
	AXYS_L12916-6	4.95	K	2.48	K
	AXYS_L12916-7	5	K	2.5	K
	AXYS_L12916-8	4.95	K	2.48	K
	AXYS_L12916-9	4.98	K	2.49	K

AXYS_L12916-10	4.93	K	2.46	K
AXYS_L12916-11	4.95	K	2.48	K
AXYS_L12916-12	4.95	K	2.48	K
AXYS_L12916-13	4.95	K	2.48	K
AXYS_L12916-14	4.98	K	2.49	K
AXYS_L12916-15 (A)	5	K	2.5	K
AXYS_L12916-16	4.76	K	2.38	K
AXYS_L12916-1	4.95	K	2.48	K
AXYS_L12916-2	5	K	3.49	
AXYS_L12916-3	4.95	K	2.48	K
AXYS_L12948-1	4.88	K	5.33	E
AXYS_L12948-2	5	K	2.5	K
AXYS_L12948-3	4.88	K	2.44	K
AXYS_L12948-4	4.93	K	2.46	K
AXYS_L12948-5	4.9	K	2.45	K
AXYS_L12948-6	4.95	K	2.48	K
AXYS_L12948-7	4.98	K	2.96	E
AXYS_L12947-24	4.48	K	2.24	K
AXYS_L12947-25	4.41	K	2.57	
AXYS_L12947-26	4.39	K	2.19	K
AXYS_L12947-27	5	K	2.5	K
AXYS_L12947-28	4.93	K	13.3	
AXYS_L12947-29	4.93	K	2.46	K
AXYS_L12947-30	4.81	K	13.3	
AXYS_L12947-31 (A)	5	K	2.5	K
AXYS_L12934-24	4.93	K	2.46	K
AXYS_L12934-25	4.98	K	2.58	
AXYS_L12934-26	4.9	K	2.62	
AXYS_L12933-1	4.78	K	7.2	E
AXYS_L12933-2	4.88	K	2.44	K
AXYS_L12933-3	5	K	2.5	K
AXYS_L12933-4	4.81	K	2.4	K
AXYS_L12933-5	4.81	K	3.79	E
AXYS_L12933-6	5	K	2.75	E
AXYS_L12933-7	4.83	K	2.42	K
AXYS_L12933-8	4.76	K	5.46	E
AXYS_L12933-9	4.93	K	32.2	E
AXYS_L12934-6	4.95	K	2.97	
AXYS_L12934-7	5	K	3.18	
AXYS_L12934-8	4.88	K	6.82	
AXYS_L12946-3	4.98	K	23.2	
AXYS_L12946-4	4.95	K	2.48	K
AXYS_L12946-5	4.88	K	17.3	
AXYS_L12946-6	4.95	K	4.28	
AXYS_L12946-7	4.98	K	40.3	
AXYS_L12946-8	4.83	K	2.42	K
AXYS_L12946-9	4.93	K	2.46	K
AXYS_L12946-10	4.98	K	2.49	K
AXYS_L12946-11	4.76	K	2.38	K
AXYS_L12946-12 (A)	4.95	K	48.3	E
AXYS_L12946-13	4.83	K	6.35	
AXYS_L12945-11	4.93	K	2.46	K

	AXYS_L12945-12 (A)	4.9	K		6.61	
	AXYS_L12945-13	4.65	K		2.45	
	AXYS_L12945-14	4.95	K		2.48	K
	AXYS_L12932-20	4.98	K		38.5	
	AXYS_L12932-21	4.98	K		2.85	
	AXYS_L12932-22	4.93	K		18.9	
	AXYS_L12932-23	5	K		17.6	
	AXYS_L12932-24 (A)	4.98	K		5.12	
E	AXYS_L12932-25	5	K		2.52	E
	AXYS_L12932-26	4.69	K		37.5	
	AXYS_L12932-12	4.93	K		2.46	K
	AXYS_L12932-13	4.74	K		6.95	
	AXYS_L12932-14	4.85	K		8.03	
	AXYS_L12932-15 (A)	4.93	K		4.76	
	AXYS_L12932-16	4.98	K		4.07	
	AXYS_L12932-17	4.95	K		3.09	
	AXYS_L12932-18	4.95	K		2.72	
	AXYS_L12932-19	4.81	K		9.83	
	AXYS_L12948-12	4.93	K		2.46	K
	AXYS_L12948-13	4.93	K		2.46	K
	AXYS_L12948-14	4.93	K		2.46	K
	AXYS_L12947-1	4.88	K		2.44	K
	AXYS_L12947-2	4.98	K		2.49	K
	AXYS_L12947-3	5.03	K		2.51	K
	AXYS_L12947-4	4.74	K		2.37	K
	AXYS_L12947-5 (A)	5	K		2.63	
	AXYS_L12947-6	4.93	K		2.46	K
	AXYS_L12947-7	4.95	K		2.48	K
	AXYS_L12947-8	4.95	K		2.48	K
	AXYS_L12947-9	4.88	K		6.06	
	AXYS_L12947-10	4.74	K		2.37	K
	AXYS_L12947-11	4.78	K		2.39	K
	AXYS_L12947-12	4.85	K		2.43	K
	AXYS_L12916-4	4.95	K		2.48	K
	AXYS_L12916-5	4.98	K		2.49	K
	AXYS_L12917-2	4.74	K		2.37	K
	AXYS_L12917-3 (A)	4.98	K		2.49	K
	AXYS_L12917-4	4.46	K		4.66	
	AXYS_L12917-5	4.69	K		2.35	K
	AXYS_L12917-6	4.81	K		2.4	K
	AXYS_L12917-7	4.48	K		33.5	
	AXYS_L12917-8	4.67	K		2.34	K
	AXYS_L12917-9	4.88	K		2.44	K
	AXYS_L12917-10	4.83	K		2.42	K
	AXYS_L12917-11	4.52	K		2.26	K
	AXYS_L12917-12	4.85	K		2.43	K
	AXYS_L12916-28	4.65	K		2.33	K
	AXYS_L12916-29	4.24	K		2.12	K
	AXYS_L12916-30	4.42	K		2.21	K
	AXYS_L12917-1	4.9	K		2.45	K
	AXYS_L13148-1	5	K		2.5	K
	AXYS_L13148-2	4.98	K		2.49	K

AXYS_L13148-3	5	K	2.5	K
AXYS_L13148-4	4.98	K	2.49	K
AXYS_L13148-5	4.93	K	2.46	K
AXYS_L13148-6	5	K	2.5	K
AXYS_L13148-7	5.15	K	2.58	K
AXYS_L13148-8	4.95	K	2.48	K
AXYS_L13148-9	4.98	K	2.49	K

PFPeAPPE	PFPeACOI	PFDAPPB	PFDACOD	PFUnAPPE	PFUnACOI	PFDoAPPE	PFDoACOI	PFHxAPPE
		2.97	2.4			4.73		0.558
		2.42	2.23			2.53		0.65
		4.1	1.63			1.62		0.767

2.4	K	2.4	K	2.64		3.69		2.4	
2.46	K	2.63		2.46	K	2.46	K	2.46	
2.42	K	3.83		3		2.42	K	2.42	
2.43	K	7.8		4.74		2.5		2.43	
2.48	K	2.48	K	2.48	K	2.48	K	2.48	
2.51	K	2.51	K	2.51	K	2.51	K	2.51	
2.49	K	2.49	K	2.49	K	2.49	K	2.49	
2.43	K	2.43	K	2.43	K	2.43	K	2.43	
2.48	K	2.48	K	2.48	K	2.48	K	2.48	
2.37	K	2.44		2.37	K	2.37	K	2.37	
2.35	K	3.29		3.45		3.08		2.35	
2.48	K	2.48		2.48		2.48	K	2.48	
2.46	K	3.21		3.32		2.89		2.46	
2.49	K	2.49	K	2.49	K	2.49	K	2.49	
2.45	K	2.45	K	2.45	K	2.45	K	2.45	
2.49	K	2.49	K	2.49	K	2.49	K	2.49	
2.45	K	2.45	K	2.45	K	2.45	K	2.45	
2.49	K	2.49	K	2.49	K	2.49	K	2.49	
2.42	K	2.42	K	2.42	K	2.42	K	2.42	
2.38	K	2.38	K	2.38	K	2.38	K	2.38	
2.48	K	2.92		2.48	K	2.48	K	2.48	
2.46	K	2.46	K	2.46	K	2.46	K	2.46	
2.5	K	2.5	K	2.5	K	2.5	K	2.5	
2.46	K	2.46	K	2.46	K	2.46	K	2.46	
2.44	K	2.44	K	2.44	K	2.44	K	2.44	
2.48	K	2.48	K	2.48	K	2.48	K	2.48	
2.45	K	2.45	K	2.45	K	2.45	K	2.45	
2.5	K	2.5	K	2.5	K	2.5	K	2.5	
2.48	K	2.48	K	2.48	K	2.48	K	2.48	
2.45	K	2.45	K	2.45	K	2.45	K	2.45	
2.4	K	2.4	K	2.4	K	2.4	K	2.4	
2.48	K	2.98		2.48	K	2.48	K	2.48	
2.48	K	2.92		2.48	K	2.48	K	2.48	
2.36	K	2.54		2.36	K	2.36	K	2.36	
2.5	K	2.5	K	2.5	K	2.5	K	2.5	
2.44	K	2.44	K	2.44	K	2.44	K	2.44	
2.45	K	6.69		4.37		2.7		2.45	
2.43	K	3.21		2.43	K	2.43	K	2.43	
2.39	K	3.67		2.39	K	2.39	K	2.39	
2.39	K	2.63		2.39	K	2.39	K	2.39	
2.43	K	2.71		2.43	K	2.43	K	2.43	
2.4	K	2.69		2.4	K	2.43		2.4	
2.45	K	2.88		2.45	K	2.45	K	2.45	
2.46	K	3.29		2.46	K	2.46	K	2.46	
2.46	K	2.46	K	2.46	K	2.46	K	2.46	
2.45	K	3.17		2.45	K	2.45	K	2.45	
2.45	K	2.45	K	2.45	K	2.45	K	2.45	

2.44	K	2.78		3.84		2.44	K	2.44	
2.44	K	2.44	K	2.44	K	2.44	K	2.44	
2.48	K	2.48	K	2.48	K	2.48	K	2.48	
2.23	K	2.58		2.23	K	2.23	K	2.23	
2.48	K	2.48	K	2.48	K	2.48	K	2.48	
2.49	K	2.49	K	2.49	K	2.49	K	2.49	
2.39	K	2.39	K	2.39	K	2.39	K	2.39	
2.34	K	2.34	K	2.34	K	2.34	K	2.34	
2.34	K	2.34	K	2.34	K	2.34	K	2.34	
2.42	K	2.42	K	2.42	K	2.42	K	2.42	
2.48	K	2.48	K	2.48	K	2.48	K	2.48	
2.48	K	2.48	K	2.48	K	2.48	K	2.48	
2.36	K	2.36	K	2.36	K	2.36	K	2.36	
2.46	K	2.46	K	2.46	K	2.46	K	2.46	
2.39	K	2.39	K	2.39	K	2.39	K	2.39	
2.37	K	2.37	K	2.37	K	2.37	K	2.37	
2.16	K	2.16	K	2.16	K	2.16	K	2.16	
2.14	K	2.14	K	2.14	K	2.14	K	2.14	
2.42	K	2.42	K	2.42	K	2.42	K	2.42	
2.35	K	2.35	K	2.35	K	2.35	K	2.35	
2.21	K	2.21	K	2.21	K	2.21	K	2.21	
2.26	K	2.26	K	2.26	K	2.26	K	2.26	
2.37	K	2.66		2.37	K	2.37	K	2.37	
2.16	K	2.16	K	2.16	K	2.16	K	2.16	
2.15	K	2.15	K	2.15	K	2.15	K	2.15	
2.5	K	2.5	K	2.5	K	2.5	K	2.5	
2.46	K	2.46	K	2.46	K	2.46	K	2.46	
2.4	K	2.4	K	2.4	K	2.4	K	2.4	
2.44	K	2.44	K	2.44	K	2.44	K	2.44	
2.5	K	2.5	K	2.5	K	2.5	K	2.5	
2.46	K	2.46	K	2.46	K	2.46	K	2.46	
2.44	K	2.52		2.44	K	2.44	K	2.44	
2.4	K	2.71		2.4	K	2.4	K	2.4	
2.49	K	3.33		6.7		29.8		2.49	
2.49	K	3.81		2.49	K	2.49	K	2.49	
2.43	K	2.43	K	2.43	K	2.43	K	2.43	
2.5	K	2.5	K	2.5	K	2.5	K	2.5	
2.4	K	3.52		2.4	K	2.4	K	2.4	
2.4	K	3.24		2.41		2.4	K	2.4	
2.48	K	3.45		2.48	K	2.48	K	2.48	
2.43	K	2.99		2.43	K	2.43	K	2.43	
2.5	K	2.5	K	4.16		11.8		2.5	
2.44	K	2.44	K	2.44	K	2.44	K	2.44	
2.42	K	3.2		4.38		9.44		2.42	
2.42	K	2.42	K	2.42	K	2.42	K	2.42	
2.45	K	2.45	K	2.45	K	2.45	K	2.45	
2.46	K	2.46	K	2.46	K	2.46	K	2.46	
2.44	K	2.44	K	2.44	K	2.44	K	2.44	
2.39	K	2.39	K	2.39	K	2.39	K	2.39	
2.49	K	2.49	K	2.49	K	2.49	K	2.49	
2.43	K	2.43	K	2.43	K	2.43	K	2.43	
2.39	K	2.39	K	2.39	K	2.39	K	2.39	

2.46	K	2.46	K	2.46	K	2.46	K	2.46
2.44	K	2.44	K	2.44	K	2.44	K	2.44
2.38	K	2.38	K	2.38	K	2.38	K	2.38
2.44	K	2.44	K	2.44	K	2.44	K	2.44
2.48	K	2.48	K	2.48	K	2.48	K	2.48
2.43	K	2.43	K	2.43	K	2.43	K	2.43
2.39	K	2.39	K	2.39	K	2.39	K	2.39
2.46	K	2.46	K	2.46	K	2.46	K	2.46
2.34	K	2.34	K	2.34	K	2.34	K	2.34
2.46	K	2.46	K	2.46	K	2.46	K	2.46
2.44	K	2.44	K	2.44	K	2.44	K	2.44
2.36	K	2.36	K	2.36	K	2.36	K	2.36
2.36	K	2.36	K	2.36	K	2.36	K	2.36
2.48	K	2.48	K	2.48	K	2.48	K	2.48
2.49	K	2.49	K	2.49	K	2.49	K	2.49
2.42	K	2.42	K	2.42	K	2.42	K	2.42
2.45	K	2.45	K	2.45	K	2.45	K	2.45
2.26	K	2.26	K	2.26	K	2.26	K	2.26
2.49	K	2.49	K	2.49	K	2.49	K	2.49
2.29	K	2.29	K	2.29	K	2.29	K	2.29
2.31	K	2.31	K	2.31	K	2.31	K	2.31
2.49	K	2.49	K	2.49	K	2.49	K	2.49
2.43	K	2.43	K	2.43	K	2.43	K	2.43
2.25	K	2.25	K	2.25	K	2.25	K	2.25
2.51	K	2.51	K	2.51	K	2.51	K	2.51
2.37	K	2.37	K	2.37	K	2.37	K	2.37
2.38	K	2.38	K	2.38	K	2.38	K	2.38
2.51	K	2.51	K	2.51	K	2.51	K	2.51
2.39	K	2.39	K	2.39	K	2.39	K	2.39
2.38	K	2.38	K	2.38	K	2.38	K	2.38
2.49	K	2.49	K	2.49	K	2.49	K	2.49
2.46	K	2.46	K	2.46	K	2.46	K	2.46
2.48	K	2.48	K	2.48	K	2.48	K	2.48
2.38	K	2.38		2.38	K	2.38	K	2.38
2.31	K	2.31	K	2.31	K	2.31	K	2.31
2.5	K	2.5	K	2.5	K	2.5	K	2.5
2.26	K	2.33		2.26	K	2.26	K	2.26
2.34	K	3.95		5.13		4		2.34
2.42	K	3.31		2.42	K	2.42	K	2.42
2.4	K, E	2.4	K, E	2.4	K, E	2.4	K, E	2.4
2.44	K	2.44	K	2.44	K	2.44	K	2.44
2.36	K	2.36	K	2.36	K	2.36	K	2.36
2.49	K	2.49	K	2.49	K	2.49	K	2.49
2.5	K	2.5	K	2.5	K	2.5	K	2.5
2.45	K	2.45	K	2.45	K	2.45	K	2.45
2.3	K	2.3	K	2.3	K	2.3	K	2.3
2.46	K	2.46	K	2.46	K	2.46	K	2.46
2.19	K	2.19	K	2.19	K	2.19	K	2.19
2.35	K	2.35	K	2.35	K	2.35	K	2.35
2.49	K	2.49	K	2.49	K	2.49	K	2.49
2.49	K	2.49	K	2.49	K	2.49	K	2.49
2.38	K	2.38	K	2.38	K	2.38	K	2.38

2.39	K	2.39	K	2.39	K	2.39	K	2.39	
2.43	K	2.43	K	2.43	K	2.43	K	2.43	
2.44	K	2.44	K	2.44	K	2.44	K	2.44	
2.48	K	3.18		2.48	K	2.48	K	2.48	
2.45	K	2.45	K	2.45	K	2.45	K	2.45	
2.44	K	2.44	K	2.44	K	2.44	K	2.44	
2.49	K	2.49	K	2.49	K	2.49	K	2.49	
2.44	K	2.44	K	2.44	K	2.44	K	2.44	
2.44	K	2.52		2.44	K	2.44	K	2.44	
2.4	K	2.4	K	2.4	K	2.4	K	2.4	
2.49	K	2.49	K	2.49	K	2.49	K	2.49	
2.37	K	2.37	K	2.37	K	2.37	K	2.37	
2.45	K	2.45	K	2.45	K	2.45	K	2.45	
2.43	K	2.43	K	2.43	K	2.43	K	2.43	
2.37	K	3.32		2.37	K	2.37	K	2.37	
2.43	K	2.43	K	2.43	K	2.43	K	2.43	
2.5	K	3.75		2.5	K	2.5	K	2.5	
2.37	K	2.37	K	2.37	K	2.37	K	2.37	
2.49	K	3.19		2.49	K	2.49	K	2.49	
2.5	K	2.51		2.5	K	2.5	K	2.5	
2.48	K	2.92		2.48	K	2.48	K	2.48	
2.5	K	2.5	K	2.5	K	2.5	K	2.5	
2.43	K	2.43	K	2.43	K	2.43	K	2.43	
2.5	K	2.5	K	2.5	K	2.5	K	2.5	
2.44	K	2.44	K	2.44	K	2.44	K	2.44	
2.44	K	2.44	K	2.44	K	2.44	K	2.44	
2.49	K	2.68		2.49	K	2.49	K	2.49	
2.45	K	2.55		2.45	K	2.45	K	2.45	
2.4	K	2.4	K	2.4	K	2.4	K	2.4	
2.4	K	2.49		2.4	K	2.4	K	2.4	
2.4	K	2.4	K	2.4	K	2.4	K	2.4	
2.49	K	2.49	K	2.49	K	2.49	K	2.49	
2.37	K	2.47		2.37	K	2.37	K	2.37	
2.34	K	2.34	K	2.34	K	2.34	K	2.34	
2.4	K	2.4	K	2.4	K	2.4	K	2.4	
2.13	K	2.13	K	2.13	K	2.13	K	2.13	
2.34	K	2.34	K	2.34	K	2.34	K	2.34	
2.38	K	2.38	K	2.38	K	2.38	K	2.38	
2.24	K	2.24	K	2.24	K	2.24	K	2.24	
2.18	K	2.18	K	2.18	K	2.18	K	2.18	
2.26	K	2.26	K	2.26	K	2.26	K	2.26	
2.45	K	3.04		2.63		2.45	K	2.45	
2.43	K	2.43	K	2.43	K	2.43	K	2.43	
2.36	K	2.36	K	2.36	K	2.36	K	2.36	
2.39	K	2.39	K	2.39	K	2.39	K	2.39	
2.33	K	2.33	K	2.33	K	2.33	K	2.33	
2.39	K	2.39	K	2.39	K	2.39	K	2.39	
2.5	K	2.5	K	2.5	K	2.5	K	2.5	
2.48	K	2.48	K	2.48	K	2.48	K	2.48	
2.5	K	2.5	K	2.5	K	2.5	K	2.5	
2.48	K	2.48	K	2.48	K	2.48	K	2.48	
2.49	K	4.51		2.49	K	2.49	K	5.94	

2.46	K	2.46	K	2.46	K	2.46	K	2.46	
2.48	K	2.48	K	2.48	K	2.48	K	2.48	
2.48	K	2.48	K	2.48	K	2.48	K	2.48	
2.48	K	3.51		2.48	K	2.48	K	2.48	
2.49	K	2.49	K	2.49	K	2.49	K	2.49	
2.5	K	2.5	K	2.5	K	2.5	K	2.5	
2.38	K	2.38	K	2.38	K	2.38	K	2.38	
2.48	K	2.48	K	2.48	K	2.48	K	2.48	
2.5	K	3.91		8.69		2.5	K	2.5	
2.48	K	2.48	K	2.48	K	2.48	K	2.48	
2.44	K	2.44	K	2.44	K	2.44	K	2.44	
2.5	K	2.5	K	2.5	K	2.5	K	2.5	
2.44	K	2.44	K	2.44	K	2.44	K	2.44	
2.46	K	2.46	K	2.46	K	2.46	K	2.46	
2.45	K	2.45	K	2.45	K	2.45	K	2.45	
2.48	K	4.72		3.94		2.48	K	2.48	
2.49	K	6.16		7.35		4.65		2.49	
2.24	K	2.36		2.24	K	2.24	K	2.24	
2.2	K	3.38		2.2	K	2.2	K	2.2	
2.19	K	2.19	K	2.19	K	2.19	K	2.19	
2.5	K	2.7		2.5	K	2.5	K	2.5	
2.46	K	5.5		2.46	K	2.46	K	2.46	
2.46	K	2.46	K	2.46	K	2.46	K	2.46	
2.4	K	13.5		8.12		2.86		2.4	
2.5	K	2.5	K	2.5	K	2.5	K	2.5	
2.46	K	2.46	K	2.46	K	2.46	K	2.46	
2.49	K	2.49	K	2.49	K	2.49	K	2.49	
2.45	K	2.45	K	2.45	K	2.45	K	2.45	
2.39	K	2.59		2.39	K	2.39	K	2.39	
2.44	K	2.44	K	2.44	K	2.44	K	2.44	
2.5	K	4.39		2.6		2.5	K	2.5	
2.4	K	2.4	K	2.4	K	2.4	K	2.4	
2.4	K	2.4	K	2.4	K	2.4	K	2.4	
2.5	K	2.5	K	2.5	K	2.5	K	2.5	
2.42	K	2.79		2.42	K	2.42	K	2.42	
2.38	K	2.38	K	2.38	K	2.38	K	2.38	
2.46	K	6.55		4.16		2.98		2.46	
2.48	K	3.48		2.48	K	2.48	K	2.48	
2.5	K	3.94		2.5	K	2.5	K	2.5	
2.44	K	3.42		2.44	K	2.44	K	2.44	
2.49	K	23.4		8.27		7.31		2.49	
2.48	K	3.82		4		3.02		2.48	
2.44	K	8.18		3.54		3.82		2.44	
2.48	K	3.53		2.48	K	2.48	K	2.48	
2.49	K	14.6		8.98		6.72		2.49	
2.42	K	2.42	K	2.42	K	2.42	K	2.42	
2.46	K	3.51		2.46	K	2.46	K	2.46	
2.49	K	2.49	K	2.49	K	2.49	K	2.49	
2.38	K	2.38	K	2.38	K	2.38	K	2.38	
2.48	K	32.1		11.8		9.3		2.48	
2.42	K	4.83		2.42	K	2.42	K	2.42	
2.46	K	3.47		2.95		2.46	K	2.46	

2.45	K	5.31		2.45	K	2.45	K	2.45	
2.33	K	2.33	K	2.53		2.66		2.33	
2.48	K	3.02		3.01		2.48	K	2.48	
2.49	K	4.73		4.92		3.01		2.49	
2.49	K	2.57		3.06		2.49	K	2.49	
2.46	K	4.52		3.26		3.74		2.46	
2.5	K	4.4		2.79		2.93		2.5	
2.49	K	2.85		3.92		2.97		2.49	
2.5	K	2.5	K	2.5	K	2.5	K	2.5	
2.35	K	4.25		3.37		4.09		2.35	
2.46	K	2.46	K	2.46	K	2.46	K	2.46	
2.37	K	3.17		4.36		3.47		2.37	
2.43	K	2.43	K	3.28		2.66		2.43	
2.46	K	2.46	K	2.46	K	2.46	K	2.46	
2.49	K	3.42		5.05		3.87		2.49	
2.48	K	2.99		3.48		2.58		2.48	
2.48	K	2.75		2.48	K	2.48	K	2.48	
2.4	K	2.6		3.33		2.92		2.4	
2.46	K	4.35		2.88		2.46	K	2.46	
2.46	K	2.46	K	2.46	K	2.46	K	2.46	
2.46	K	2.46	K	2.46	K	2.46	K	2.46	
2.44	K	3.02		2.44	K	2.44	K	2.44	
2.49	K	2.49	K	2.49	K	2.49	K	2.49	
2.51	K	3.03		2.65		2.51	K	2.51	
2.37	K	2.37	K	2.37	K	2.37	K	2.37	
2.5	K	5.13		3.8		2.5	K	2.5	
2.46	K	2.46	K	2.46	K	2.46	K	2.46	
2.48	K	2.48	K	2.48	K	2.48	K	2.48	
2.48	K	2.48	K	2.48	K	2.48	K	2.48	
2.44	K	2.44	K	2.44	K	2.44	K	2.44	
2.37	K	2.37	K	2.37	K	2.37	K	2.37	
2.39	K	2.39	K	2.39	K	2.39	K	2.39	
2.43	K	2.43	K	2.43	K	2.43	K	2.43	
2.48	K	2.48	K	2.48	K	2.48	K	2.48	
2.49	K	3.21		2.49	K	2.49	K	2.49	
2.37	K	2.37	K	2.37	K	2.37	K	2.37	
2.49	K	2.49	K	2.49	K	2.49	K	2.49	
2.23	K	8.44		3.64		2.27		2.23	
2.35	K	2.35	K	2.35	K	2.35	K	2.35	
2.4	K	2.4	K	2.4	K	2.4	K	2.4	
2.24	K	3.43		4.2		8.49		2.24	
2.34	K	2.34	K	2.34	K	2.34	K	2.34	
2.44	K	2.47		2.44	K	2.44	K	2.44	
2.42	K	2.42	K	2.42	K	2.42	K	2.42	
2.26	K	2.26	K	2.26	K	2.26	K	2.26	
2.43	K	2.43	K	2.43	K	2.43	K	2.43	
2.33	K	2.33	K	2.33	K	2.33	K	2.33	
2.12	K	2.12	K	2.12	K	2.12	K	2.12	
2.21	K	2.52		2.21	K	2.21	K	2.21	
2.45	K	2.45	K	2.45	K	2.45	K	2.45	
2.5	K	2.5	K	2.5	K	2.5	K	2.5	
2.49	K	2.49	K	2.49	K	2.49	K	2.49	

2.5	K	2.5	K	2.5	K	2.5	K	2.5	
2.49	K	2.49	K	2.49	K	2.49	K	2.49	
2.46	K	2.46	K	2.46	K	2.46	K	2.46	
2.5	K	2.5	K	2.5	K	2.5	K	2.5	
2.58	K	2.58	K	2.58	K	2.58	K	2.58	
2.48	K	2.55		2.48	K	2.48	K	2.48	
2.49	K	2.49	K	2.49	K	2.49	K	2.49	

PFHxACOI	PFHpAPPE	PFHpACOI	PFNAPPB	PFNACOD	PFHxSPPE	PFHxSCOI	PFBAPPB	PFBACOD
K	0.491 K		0.495 K		2.06 K			
K	0.803 K		0.576 K		5.23 K			
K	0.75 K		0.68 K		1.24 K			

K	2.4	K	2.4	K	4.81	K	2.4	K	
K	2.46	K	2.46	K	4.93	K	2.46	K	
K	2.42	K	2.42	K	4.83	K	2.42	K	
K	2.43	K	2.43	K	4.85	K	2.43	K	
K	2.48	K	2.48	K	4.95	K	2.48	K	
K	2.51	K	2.51	K	5.03	K	2.51	K	
K	2.49	K	2.49	K	4.98	K	2.49	K	
K	2.43	K	2.43	K	4.85	K	2.43	K	
K	2.48	K	2.48	K	4.95	K	2.48	K	
K	2.37	K	2.37	K	4.74	K	2.37	K	
K	2.35	K	2.35	K	4.69	K	2.35	K	
K	2.48	K	2.48	K	4.95	K	2.48	K	
K	2.46	K	2.46	K	4.93	K	2.46	K	
K	2.49	K	2.49	K	4.98	K	2.49	K	
K	2.45	K	2.45	K	4.9	K	2.45	K	
K	2.49	K	2.49	K	4.98	K	2.49	K	
K	2.45	K	2.45	K	4.9	K	2.45	K	
K	2.49	K	2.49	K	4.98	K	2.49	K	
K	2.42	K	2.42	K	4.83	K	2.42	K	
K	2.38	K	2.38	K	4.76	K	2.38	K	
K	2.48	K	2.48	K	4.95	K	2.48	K	
K	2.46	K	2.46	K	4.93	K	2.46	K	
K	2.5	K	2.5	K	5	K	2.5	K	
K	2.46	K	2.46	K	4.93	K	2.46	K	
K	2.44	K	2.44	K	4.88	K	2.44	K	
K	2.48	K	2.48	K	4.95	K	2.48	K	
K	2.45	K	2.45	K	4.9	K	2.45	K	
K	2.5	K	2.5	K	5	K	2.5	K	
K	2.48	K	2.48	K	4.95	K	2.48	K	
K	2.45	K	2.45	K	4.9	K	2.45	K	
K	2.4	K	2.4	K	4.81	K	2.4	K	
K	2.48	K	2.48	K	4.95	K	2.48	K	
K	2.48	K	2.48	K	4.95	K	2.48	K	
K	2.36	K	2.36	K	4.72	K	2.36	K	
K	2.5	K	2.5	K	5	K	2.5	K	
K	2.44	K	2.44	K	4.88	K	2.44	K	
K	2.45	K	2.45	K	4.9	K	2.45	K	
K	2.43	K	2.43	K	4.85	K	2.43	K	
K	2.39	K	2.39	K	4.78	K	2.39	K	
K	2.39	K	2.39	K	4.78	K	2.39	K	
K	2.43	K	2.43	K	4.85	K	2.43	K	
K	2.4	K	2.4	K	4.81	K	2.4	K	
K	2.45	K	2.45	K	4.9	K	2.45	K	
K	2.46	K	2.46	K	4.93	K	2.46	K	
K	2.46	K	2.46	K	4.93	K	2.46	K	
K	2.45	K	2.45	K	4.9	K	2.45	K	
K	2.45	K	2.45	K	4.9	K	2.45	K	

K	2.44	K	2.44	K	4.88	K	2.44	K			
K	2.44	K	2.44	K	4.88	K	2.44	K			
K	2.48	K	2.48	K	4.95	K	2.48	K			
K	2.23	K	2.23	K	4.46	K	2.23	K			
K	2.48	K	2.48	K	4.95	K	2.48	K			
K	2.49	K	2.49	K	4.98	K	2.49	K			
K	2.39	K	2.39	K	4.78	K	2.39	K			
K	2.34	K	2.34	K	4.67	K	2.34	K			
K	2.34	K	2.34	K	4.67	K	2.34	K			
K	2.42	K	2.42	K	4.83	K	2.42	K			
K	2.48	K	2.48	K	4.95	K	2.48	K			
K	2.48	K	2.48	K	4.95	K	2.48	K			
K	2.36	K	2.36	K	4.72	K	2.36	K			
K	2.46	K	2.46	K	4.93	K	2.46	K			
K	2.39	K	2.39	K	4.78	K	2.39	K			
K	2.37	K	2.37	K	4.74	K	2.37	K			
K	2.16	K	2.16	K	4.33	K	2.16	K			
K	2.14	K	2.14	K	4.27	K	2.14	K			
K	2.42	K	2.42	K	4.83	K	2.42	K			
K	2.35	K	2.35	K	4.69	K	2.35	K			
K	2.21	K	2.21	K	4.42	K	2.21	K			
K	2.26	K	2.26	K	4.52	K	2.26	K			
K	2.37	K	2.37	K	4.74	K	2.37	K			
K	2.16	K	2.16	K	4.31	K	2.16	K			
K	2.15	K	2.15	K	4.29	K	2.15	K			
K	2.5	K	2.5	K	5	K	2.5	K			
K	2.46	K	2.46	K	4.93	K	2.46	K			
K	2.4	K	2.4	K	4.81	K	2.4	K			
K	2.44	K	2.44	K	4.88	K	2.44	K			
K	2.5	K	2.5	K	5	K	2.5	K			
K	2.46	K	2.46	K	4.93	K	2.46	K			
K	2.44	K	2.44	K	4.88	K	2.44	K			
K	2.4	K	2.4	K	4.81	K	2.4	K			
K	2.49	K	2.49	K	4.98	K	2.49	K			
K	2.49	K	2.49	K	4.98	K	2.49	K			
K	2.43	K	2.43	K	4.85	K	2.43	K			
K	2.5	K	2.5	K	5	K	2.5	K			
K	2.4	K	2.4	K	4.81	K	2.4	K, E			
K	2.4	K	2.4	K	4.81	K	2.4	K			
K	2.48	K	2.48	K	4.95	K	2.48	K			
K	2.43	K	2.43	K	4.85	K	2.43	K			
K	2.5	K	2.5	K	5	K	2.5	K			
K	2.44	K	2.44	K	4.88	K	2.44	K			
K	2.42	K	2.42	K	4.83	K	2.42	K			
K	2.42	K	2.42	K	4.83	K	2.42	K			
K	2.45	K	2.45	K	4.9	K	2.45	K			
K	2.46	K	2.46	K	4.93	K	2.46	K			
K	2.44	K	2.44	K	4.88	K	2.44	K			
K	2.39	K	2.39	K	4.78	K	2.39	K			
K	2.49	K	2.49	K	4.98	K	2.49	K			
K	2.43	K	2.43	K	4.85	K	2.43	K			
K	2.39	K	2.39	K	4.78	K	2.39	K			

K	2.46	K	2.46	K	4.93	K	2.46	K
K	2.44	K	2.44	K	4.88	K	2.44	K
K	2.38	K	2.38	K	4.76	K	2.38	K
K	2.44	K	2.44	K	4.88	K	2.44	K
K	2.48	K	2.48	K	4.95	K	2.48	K
K	2.43	K	2.43	K	4.85	K	2.43	K
K	2.39	K	2.39	K	4.78	K	2.39	K
K	2.46	K	2.46	K	4.93	K	2.46	K
K	2.34	K	2.34	K	4.67	K	2.34	K
K	2.46	K	2.46	K	4.93	K	2.46	K
K	2.44	K	2.44	K	4.88	K	2.44	K
K	2.36	K	2.36	K	4.72	K	2.36	K
K	2.36	K	2.36	K	4.72	K	2.36	K
K	2.48	K	2.48	K	4.95	K	2.48	K
K	2.49	K	2.49	K	4.98	K	2.49	K
K	2.42	K	2.42	K	4.83	K	2.42	K
K	2.45	K	2.45	K	4.9	K	2.45	K
K	2.26	K	2.26	K	4.52	K	2.26	K
K	2.49	K	2.49	K	4.98	K	2.49	K
K	2.29	K	2.29	K	4.59	K	2.29	K
K	2.31	K	2.31	K	4.63	K	2.31	K
K	2.49	K	2.49	K	4.98	K	2.49	K
K	2.43	K	2.43	K	4.85	K	2.43	K
K	2.25	K	2.25	K	4.5	K	2.25	K
K	2.51	K	2.51	K	5.03	K	2.51	K
K	2.37	K	2.37	K	4.74	K	2.37	K
K	2.38	K	2.38	K	4.76	K	2.38	K
K	2.51	K	2.51	K	5.03	K	2.51	K
K	2.39	K	2.39	K	4.78	K	2.39	K
K	2.38	K	2.38	K	4.76	K	2.38	K
K	2.49	K	2.49	K	4.98	K	2.49	K
K	2.46	K	2.46	K	4.93	K	2.46	K
K	2.48	K	2.48	K	4.95	K	2.48	K
K	2.38	K	2.38	K	4.76	K	2.38	K
K	2.31	K	2.31	K	4.63	K	2.31	K
K	2.5	K	2.5	K	5	K	2.5	K
K	2.26	K	2.26	K	4.52	K	2.26	K
K	2.34	K	2.34	K	4.67	K	2.34	K
K	2.42	K	2.42	K	4.83	K	2.42	K
K, E	2.4	K, E	2.4	K, E	4.81	K, E	2.4	K, E
K	2.44	K	2.44	K	4.88	K	2.44	K
K	2.36	K	2.36	K	4.72	K	2.36	K
K	2.49	K	2.49	K	4.98	K	2.49	K
K	2.5	K	2.5	K	5	K	2.5	K
K	2.45	K	2.45	K	4.9	K	2.45	K
K	2.3	K	2.3	K	4.61	K	2.3	K
K	2.46	K	2.46	K	4.93	K	2.46	K
K	2.19	K	2.19	K	4.39	K	2.19	K
K	2.35	K	2.35	K	4.69	K	2.35	K
K	2.49	K	2.49	K	4.98	K	2.49	K
K	2.49	K	2.49	K	4.98	K	2.49	K
K	2.38	K	2.38	K	4.76	K	2.38	K

K	2.39	K	2.39	K	4.78	K	2.39	K
K	2.43	K	2.43	K	4.85	K	2.43	K
K	2.44	K	2.44	K	4.88	K	2.44	K
K	2.48	K	2.48	K	4.95	K	2.48	K
K	2.45	K	2.45	K	4.9	K	2.45	K
K	2.44	K	2.44	K	4.88	K	2.44	K
K	2.49	K	2.49	K	4.98	K	2.49	K
K	2.44	K	2.44	K	4.88	K	2.44	K
K	2.44	K	2.44	K	4.88	K	2.44	K
K	2.4	K	2.4	K	4.81	K	2.4	K
K	2.49	K	2.49	K	4.98	K	2.49	K
K	2.37	K	2.37	K	4.74	K	2.37	K
K	2.45	K	2.45	K	4.9	K	2.45	K
K	2.43	K	2.43	K	4.85	K	2.43	K
K	2.37	K	2.37	K	4.74	K	2.37	K
K	2.43	K	2.43	K	4.85	K	2.43	K
K	2.5	K	2.5	K	5	K	2.5	K, E
K	2.37	K	2.37	K	4.74	K	2.37	K
K	2.49	K	2.49	K	4.98	K	2.49	K
K	2.5	K	2.5	K	5	K	2.5	K
K	2.48	K	2.48	K	4.95	K	2.48	K
K	2.5	K	2.5	K	5	K	2.5	K
K	2.43	K	2.43	K	4.85	K	2.43	K
K	2.5	K	2.5	K	5	K	2.5	K
K	2.44	K	2.44	K	4.88	K	2.44	K
K	2.44	K	2.44	K	4.88	K	2.44	K
K	2.49	K	2.49	K	4.98	K	2.49	K
K	2.45	K	2.45	K	4.9	K	2.45	K
K	2.4	K	2.4	K	4.81	K	2.4	K
K	2.4	K	2.4	K	4.81	K	2.4	K
K	2.4	K	2.4	K	4.81	K	2.4	K
K	2.49	K	2.49	K	4.98	K	2.49	K
K	2.37	K	2.37	K	4.74	K	2.37	K
K	2.34	K	2.34	K	4.67	K	2.34	K
K	2.4	K	2.4	K	4.81	K	2.4	K
K	2.13	K	2.13	K	4.26	K	2.13	K
K	2.34	K	2.34	K	4.67	K	2.34	K
K	2.38	K	2.38	K	4.76	K	2.38	K
K	2.24	K	2.24	K	4.48	K	2.24	K
K	2.18	K	2.18	K	4.37	K	2.18	K
K	2.26	K	2.26	K	4.52	K	2.26	K
K	2.45	K	2.45	K	4.9	K	2.45	K
K	2.43	K	2.43	K	4.85	K	2.43	K
K	2.36	K	2.36	K	4.72	K	2.36	K
K	2.39	K	2.39	K	4.78	K	2.39	K
K	2.33	K	2.33	K	4.65	K	2.33	K
K	2.39	K	2.39	K	4.78	K	2.39	K
K	2.5	K	2.5	K	5	K	2.5	K
K	2.48	K	2.48	K	4.95	K	2.48	K
K	2.5	K	2.5	K	5	K	2.5	K
K	2.48	K	2.48	K	4.95	K	2.48	K
	4.66		4.91		4.98	K	2.67	

K	2.46	K	2.46	K	4.93	K	2.46	K
K	2.48	K	2.48	K	4.95	K	2.48	K
K	2.48	K	2.48	K	4.95	K	2.48	K
K	2.48	K	2.48	K	4.95	K	2.48	K
K	2.49	K	2.49	K	4.98	K	2.49	K
K	2.5	K	2.5	K	5	K	2.5	K
K	2.38	K	2.38	K	4.76	K	2.38	K
K	2.48	K	2.48	K	4.95	K	2.48	K
K	2.5	K	2.5	K	5	K	2.5	K
K	2.48	K	2.48	K	4.95	K	2.48	K
K	2.44	K	2.44	K	4.88	K	2.44	K
K	2.5	K	2.5	K	5	K	2.5	K
K	2.44	K	2.44	K	4.88	K	2.44	K
K	2.46	K	2.46	K	4.93	K	2.46	K
K	2.45	K	2.45	K	4.9	K	2.45	K
K	2.48	K	2.48	K	4.95	K	2.48	K
K	2.49	K	2.49	K	4.98	K	2.49	K
K	2.24	K	2.24	K	4.48	K	2.24	K
K	2.2	K	2.2	K	4.41	K	2.2	K
K	2.19	K	2.19	K	4.39	K	2.19	K
K	2.5	K	2.5	K	5	K	2.5	K
K	2.46	K	2.46	K	4.93	K	2.46	K
K	2.46	K	2.46	K	4.93	K	2.46	K
K	2.4	K	2.4	K	4.81	K	2.4	K
K	2.5	K	2.5	K	5	K	2.5	K
K	2.46	K	2.46	K	4.93	K	2.46	K
K	2.49	K	2.49	K	4.98	K	2.49	K
K	2.45	K	2.45	K	4.9	K	2.45	K
K	2.39	K	2.39	K	4.78	K	2.39	K
K	2.44	K	2.44	K	4.88	K	2.44	K
K	2.5	K	2.5	K	5	K	2.5	K
K	2.4	K	2.4	K	4.81	K	2.4	K
K	2.4	K	2.4	K	4.81	K	2.4	K
K	2.5	K	2.5	K	5	K	2.5	K
K	2.42	K	2.42	K	4.83	K	2.42	K
K	2.38	K	2.38	K	4.76	K	2.38	K
K	2.46	K	2.46	K	4.93	K	2.46	K
K	2.48	K	2.48	K	4.95	K	2.48	K
K	2.5	K	2.5	K	5	K	2.5	K
K	2.44	K	2.44	K	4.88	K	2.44	K
K	2.49	K	2.49	K	4.98	K	3.88	
K	2.48	K	2.48	K	4.95	K	2.48	K
K	2.44	K	2.44	K	4.88	K	2.44	K
K	2.48	K	2.48	K	4.95	K	2.48	K
K	2.49	K	2.49	K	7.32		3.82	
K	2.42	K	2.42	K	4.83	K	2.42	K
K	2.46	K	2.46	K	5.5		2.46	K
K	2.49	K	2.49	K	4.98	K	2.49	K
K	2.38	K	2.38	K	4.76	K	2.38	K
K	2.48	K	2.48	K	7.27	E	2.48	K
K	2.42	K	2.42	K	6.04	E	3.78	
K	2.46	K	2.46	K	4.93	K	2.46	K

K	2.45	K	2.45	K	4.9	K	2.45	K	
K	2.33	K	2.33	K	4.65	K	2.33	K	
K	2.48	K	2.48	K	4.95	K	2.48	K	
K	2.49	K	2.49	K	4.98	K	2.79		
K	2.49	K	2.49	K	4.98	K	2.49	K	
K	2.46	K	2.46	K	4.93	K	2.46	K	
K	2.5	K	2.5	K	5	K	2.5	K	
K	2.49	K	2.49	K	4.98	K	2.49	K	
K	2.5	K	2.5	K	5	K	2.5	K	
K	2.35	K	2.35	K	4.69	K	2.35	K	
K	2.46	K	2.46	K	4.93	K	2.46	K	
K	2.37	K	2.37	K	4.74	K	2.37	K	
K	2.43	K	2.43	K	4.85	K	2.43	K	
K	2.46	K	2.46	K	4.93	K	2.46	K	
K	2.49	K	2.49	K	4.98	K	2.49	K	
K	2.48	K	2.48	K	4.95	K	2.48	K	
K	2.48	K	2.48	K	4.95	K	2.48	K	
K	2.4	K	2.4	K	4.81	K	2.4	K	
K	2.46	K	2.46	K	4.93	K	2.46	K	
K	2.46	K	2.46	K	4.93	K	2.46	K	
K	2.46	K	2.46	K	4.93	K	2.46	K	
K	2.44	K	2.44	K	4.88	K	2.44	K	
K	2.49	K	2.49	K	4.98	K	2.49	K	
K	2.51	K	2.51	K	5.03	K	2.51	K	
K	2.37	K	2.37	K	4.74	K	2.37	K	
K	2.5	K	2.5	K	5	K	2.5	K	
K	2.46	K	2.46	K	4.93	K	2.46	K	
K	2.48	K	2.48	K	4.95	K	2.48	K	
K	2.48	K	2.48	K	4.95	K	2.48	K	
K	2.44	K	2.44	K	4.88	K	2.44	K	
K	2.37	K	2.37	K	4.74	K	2.37	K	
K	2.39	K	2.39	K	4.78	K	2.39	K	
K	2.43	K	2.43	K	4.85	K	2.43	K	
K	2.48	K	2.48	K	4.95	K	2.48	K	
K	2.49	K	2.49	K	4.98	K	2.49	K	
K	2.37	K	2.37	K	4.74	K	2.37	K	
K	2.49	K	2.49	K	4.98	K	2.49	K	
K	2.23	K	2.23	K	4.66		6.01		
K	2.35	K	2.35	K	4.69	K	2.35	K	
K	2.4	K	2.4	K	4.81	K	2.4	K	
K	2.24	K	2.24	K	4.58		10.4		
K	2.34	K	2.34	K	4.67	K	2.34	K	
K	2.44	K	2.44	K	4.88	K	2.44	K	
K	2.42	K	2.42	K	4.83	K	2.42	K	
K	2.26	K	2.26	K	4.52	K	2.26	K	
K	2.43	K	2.43	K	4.85	K	2.43	K	
K	2.33	K	2.33	K	4.65	K	2.33	K	
K	2.12	K	2.12	K	4.24	K	2.12	K	
K	2.21	K	2.21	K	4.42	K	2.21	K	
K	2.45	K	2.45	K	4.9	K	2.45	K	
K	2.5	K	2.5	K	5	K	2.5	K	
K	2.49	K	2.49	K	4.98	K	2.49	K	

K	2.5	K	2.5	K	5	K	2.5	K
K	2.49	K	2.49	K	4.98	K	2.49	K
K	2.46	K	2.46	K	4.93	K	2.46	K
K	2.5	K	2.5	K	5	K	2.5	K
K	2.58	K	2.58	K	5.15	K	2.58	K
K	2.48	K	2.48	K	4.95	K	2.48	K
K	2.49	K	2.49	K	4.98	K	2.49	K

DOWLKNL RNAME ALT_NAME

MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5
MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5
MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5
MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5
MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5
MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5
MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5
MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5
MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5
MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5
MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5
MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5
MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5
MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5
MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5
MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5
MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5
MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5
MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5
MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5
MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5
MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5
MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5
MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5
MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5
MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5
MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5
MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5
MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5
MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5
MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5
MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5
MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5
MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5

MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5
MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5
MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5
MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5
MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5
MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5
MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5
MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5
MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5
MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5
MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5
MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5
MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5
MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5
MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5
MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5
MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5
MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5
MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5
MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5
MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5
MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5
MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5
MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5
MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5
MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5
MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5
MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5
MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5
MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5
MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5
MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5
MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5
MISSISSIPPI R. Pool 2 (UM- 8-2) RM 836-843
MISSISSIPPI R. Pool 2 (UM- 8-2) RM 836-843
MISSISSIPPI R. Pool 2 (UM- 8-2) RM 836-843
MISSISSIPPI R. Pool 2 (UM- 8-2) RM 836-843
MISSISSIPPI R. Pool 2 (UM- 8-2) RM 836-843
MISSISSIPPI R. Pool 2 (UM- 8-2) RM 836-843
MISSISSIPPI R. Pool 2 (UM- 8-2) RM 836-843
MISSISSIPPI R. Pool 2 (UM- 8-2) RM 836-843
MISSISSIPPI R. Pool 2 (UM- 8-2) RM 836-843
MISSISSIPPI R. Pool 2 (UM- 8-2) RM 836-843
MISSISSIPPI R. Pool 2 (UM- 8-2) RM 836-843
MISSISSIPPI R. Pool 2 (UM- 8-2) RM 836-843
MISSISSIPPI R. Pool 2 (UM- 8-2) RM 836-843
MISSISSIPPI R. Pool 2 (UM- 8-2) RM 836-843
MISSISSIPPI R. Pool 2 (UM- 8-2) RM 836-843
MISSISSIPPI R. Pool 2 (UM- 8-2) RM 836-843
MISSISSIPPI R. Pool 2 (UM- 8-2) RM 836-843
MISSISSIPPI R. Pool 2 (UM- 8-2) RM 836-843
MISSISSIPPI R. Pool 2 (UM- 8-2) RM 836-843
MISSISSIPPI R. Pool 2 (UM- 8-2) RM 836-843
MISSISSIPPI R. Pool 2 (UM- 8-2) RM 836-843
MISSISSIPPI R. Pool 2 (UM- 8-2) RM 836-843
MISSISSIPPI R. Pool 2 (UM- 8-2) RM 836-843
MISSISSIPPI R. Pool 2 (UM- 8-2) RM 836-843

MISSISSIPPI R. Pool 2 (UM- 8-2) RM 836-843

MISSISSIPPI R. Pool 2 (UM- 8-2) RM 836-843
MISSISSIPPI R. Pool 2 (UM- 8-2) RM 836-843
MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5
MISSISSIPPI R. Pool 2 (UM- 8-3) RM 833.5-834

MISSISSIPPI R. Pool 2 (UM- 8-3) RM 833.5-834
MISSISSIPPI R. Pool 2 (UM- 8-3) RM 833.5-834
MISSISSIPPI R. Pool 2 (UM- 8-3) RM 833.5-834
MISSISSIPPI R. Pool 2 (UM- 8-3) RM 833.5-834
MISSISSIPPI R. Pool 2 (UM- 8-3) RM 833.5-834
MISSISSIPPI R. Pool 2 (UM- 8-3) RM 833.5-834
MISSISSIPPI R. Pool 2 (UM- 8-3) RM 833.5-834
MISSISSIPPI R. Pool 2 (UM- 8-3) RM 833.5-834
MISSISSIPPI R. Pool 2 (UM- 8-3) RM 833.5-834
MISSISSIPPI R. Pool 2 (UM- 8-3) RM 833.5-834
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820

MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-3) RM 833.5-834
MISSISSIPPI R. Pool 2 (UM- 8-3) RM 833.5-834
MISSISSIPPI R. Pool 2 (UM- 8-3) RM 833.5-834
MISSISSIPPI R. Pool 2 (UM- 8-3) RM 833.5-834
MISSISSIPPI R. Pool 2 (UM- 8-3) RM 833.5-834
MISSISSIPPI R. Pool 2 (UM- 8-3) RM 833.5-834
MISSISSIPPI R. Pool 2 (UM- 8-3) RM 833.5-834
MISSISSIPPI R. Pool 2 (UM- 8-3) RM 833.5-834
MISSISSIPPI R. Pool 2 (UM- 8-3) RM 833.5-834
MISSISSIPPI R. Pool 2 (UM- 8-3) RM 833.5-834
MISSISSIPPI R. Pool 2 (UM- 8-3) RM 833.5-834
MISSISSIPPI R. Pool 2 (UM- 8-3) RM 833.5-834
MISSISSIPPI R. Pool 2 (UM- 8-3) RM 833.5-834
MISSISSIPPI R. Pool 2 (UM- 8-3) RM 833.5-834
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-4) RM 815-820
MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5
MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5

MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5
MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5
MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5
MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5
MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5
MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5
MISSISSIPPI R. Pool 2 (UM- 8-1) RM 844-847.5

qualified samples (coded as "E" for estimated)

sample	PFC
090068	PFBA
090122	ALL
090139	PFOSA
090141	PFOSA
090142	PFOSA
090151	PFBA
090197	PFOSA
090203	PFOSA
090215	PFOSA
090219	PFOSA
090220	PFOSA
090222	PFOSA
090223	PFOSA
090227	PFOA
090229	PFOA
090231	PFOA
090233	PFOA
090234	PFOA
090236	PFOA, PFHxS, PFOSA
090237	PFOA, PFHxS
090247	PFOS, PFOSA

Final Report

Fluorochemical Characterization of Surface Water Samples, Mississippi River – Pool 2; July 2009

Laboratory Request Number: E09-0365

Method Requirement: 3M Method ETS-8-154.3

ETS-8-154.3: "Determination of Perfluorinated Acids, Alcohols, Amides, and Sulfonates in Water by Solid Phase Extraction and High Performance Liquid Chromatography/Mass Spectrometry"

Report Date – August 12, 2009

Testing Laboratory

3M EHS Operations
3M Environmental Laboratory
Building 260-5N-17
Maplewood, MN 55144-1000

Requester

Gary Hohenstein
3M Building 224-5W-03
Saint Paul, MN 55144-1000
Phone: (651) 737-3570

ACCREDITED

The testing reported herein meet the requirements of ISO/IEC 17025-2005 "General Requirements for the Competence of Testing and Calibration Laboratories", in accordance with the A2LA Certificate #2052-01. Testing that complies with this International Standard also operate in accordance with ISO 9001:2000.

Certificate #2052-01

3M Environmental Laboratory

3M Environmental Laboratory Manager: William K. Reagen, Ph.D.
3M Principal Analytical Investigator and Report Author: Susan Wolf

Analytical Report E09-0365

Fluorochemical Characterization of Surface Water Samples, Mississippi River – Pool 2; July 2009

Report Date: August 12, 2009

1 Introduction/Summary

The 3M Environmental Laboratory prepared and analyzed surface water samples collected by PACE Analytical Services personnel from Pool 2 on the Mississippi River. Samples were collected on July 8, 2009. Samples were returned to the 3M Environmental Laboratory on July 8 at ambient conditions for the analysis for thirteen fluorochemical compounds under laboratory project number E09-0365.

The 3M Environmental Laboratory prepared sample containers for twelve sampling locations. Each sample set consisted of a field sample, field sample duplicate, and a 25 ppt field spike. Each empty container was marked with a "fill to here" line that corresponded to a final volume of 200 mL. Containers reserved for field matrix spikes were fortified with an appropriate matrix spike solution containing all analytes prior to being sent to the field for sample collection.

Samples were prepared and analyzed using method ETS-8-154.3 "Determination of Perfluorinated Acids, Alcohols, Amides, and Sulfonates in Water by Solid Phase Extraction and High Performance Liquid Chromatography/Mass Spectrometry".

Table 1 summarizes the sample results using the analytical method identified above. All results for quality control samples prepared and analyzed with the samples will be reported and discussed elsewhere in this report.

ACCREDITED

The testing reported herein meet the requirements of ISO/IEC 17025-2005 "General Requirements for the Competence of Testing and Calibration Laboratories", in accordance with the A2LA Certificate #2052-01. Testing that complies with this International Standard also operate in accordance with ISO 9001:2000.

Certificate #2052-01

Table 1. Sample Results Summary[1]

		Sample Concentration (ng/L)												
3M LIMS ID	Sample Description	PFBA	PFPeA	PFHxA	PFHpA	PFOA	PFNA	PFDA	PFUnA	PFDoA	PFBS	PFHS	PFOS	PFOSA
E09-0365-001	Reach 1 Location 1 Sample	4.84	<2.53	<2.53	<2.53	<3.00	<2.50	<2.49	<2.50	<3.00	<3.06	<2.50	<2.50	<2.99
E09-0365-002	Reach 1 Location 1 Sample Dup	4.76	<2.53	<2.53	<2.53	<3.00	<2.50	<2.49	<2.50	<3.00	<3.06	<2.50	<2.50	<2.99
	Average	**4.80**	**<2.53**	**<2.53**	**<2.53**	**<3.00**	**<2.50**	**<2.49**	**<2.50**	**<3.00**	**<3.06**	**<2.50**	**<2.50**	**<2.99**
	%RPD Sample/Sample Duplicate	**1.7**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**
E09-0365-004	Reach 1 Location 2 Sample	6.36	<2.53	<2.53	<2.53	<3.00	<2.50	<2.49	<2.50	<3.00	<3.06	<2.50	<2.50	<2.99
E09-0365-005	Reach 1 Location 2 Sample Dup	6.50	<2.53	<2.53	<2.53	<3.00	<2.50	<2.49	<2.50	<3.00	<3.06	<2.50	<2.50	<2.99
	Average	**6.43**	**<2.53**	**<2.53**	**<2.53**	**<3.00**	**<2.50**	**<2.49**	**<2.50**	**<3.00**	**<3.06**	**<2.50**	**<2.50**	**<2.99**
	%RPD Sample/Sample Duplicate	**2.2**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**
E09-0365-007	Reach 1 Location 3 Sample	5.37	<2.53	<2.53	<2.53	<3.00	<2.50	<2.49	<2.50	<3.00	<3.06	<2.50	<2.50	<2.99
E09-0365-008	Reach 1 Location 3 Sample Dup	5.17	<2.53	<2.53	<2.53	<3.00	<2.50	<2.49	<2.50	<3.00	<3.06	<2.50	<2.50	<2.99
	Average	**5.27**	**<2.53**	**<2.53**	**<2.53**	**<3.00**	**<2.50**	**<2.49**	**<2.50**	**<3.00**	**<3.06**	**<2.50**	**<2.50**	**<2.99**
	%RPD Sample/Sample Duplicate	**3.8**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**
E09-0365-010	Reach 2 Location 4 Sample	4.86	<2.53	<2.53	<2.53	<3.00	<2.50	<2.49	<2.50	<3.00	<3.06	<2.50	<2.50	<2.99
E09-0365-011	Reach 2 Location 4 Sample Dup	5.32	<2.53	<2.53	<2.53	<3.00	<2.50	<2.49	<2.50	<3.00	<3.06	<2.50	<2.50	<2.99
	Average	**5.09**	**<2.53**	**<2.53**	**<2.53**	**<3.00**	**<2.50**	**<2.49**	**<2.50**	**<3.00**	**<3.06**	**<2.50**	**<2.50**	**<2.99**
	%RPD Sample/Sample Duplicate	**9.0**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

Table 1 continued. Sample Results Summary[1]

		Sample Concentration (ng/L)												
3M LIMS ID	Sample Description	PFBA	PFPeA	PFHxA	PFHpA	PFOA	PFNA	PFDA	PFUnA	PFDoA	PFBS	PFHS	PFOS	PFOSA
E09-0365-013	Reach 2 Location 5 Sample	5.45	<2.53	<2.53	<2.53	<3.00	<2.50	<2.49	<2.50	<3.00	<3.06	<2.50	<2.50	<2.99
E09-0365-014	Reach 2 Location 5 Sample Dup	4.97	<2.53	<2.53	<2.53	<3.00	<2.50	<2.49	<2.50	<3.00	<3.06	<2.50	<2.50	<2.99
	Average	**5.21**	**<2.53**	**<2.53**	**<2.53**	**<3.00**	**<2.50**	**<2.49[4]**	**<2.50**	**<3.00**	**<3.06**	**<2.50**	**<2.50**	**<2.99**
	%RPD Sample/Sample Duplicate	**9.2**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**
E09-0365-016	Reach 2 Location 6 Sample	7.05	<2.53	<2.53	<2.53	3.97	<2.50	<2.49	<2.50	<3.00	<3.06	<2.50	8.48	<2.99
E09-0365-017	Reach 2 Location 6 Sample Dup	7.46	<2.53	<2.53	<2.53	3.66	<2.50	<2.49	<2.50	<3.00	<3.06	<2.50	8.59	<2.99
	Average	**7.26**	**<2.53**	**<2.53**	**<2.53**	**3.82**	**<2.50**	**<2.49**	**<2.50**	**<3.00**	**<3.06**	**<2.50**	**8.54**	**<2.99**
	%RPD Sample/Sample Duplicate	**5.7**	**NA**	**NA**	**NA**	**8.1**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**1.3**	**NA**
E09-0365-019	Reach 3 Location 7 Sample	9.34	<2.53	<2.53	<2.53	5.38	<2.50	<2.49	<2.50	<3.00	4.77	<2.50	12.4	<2.99
E09-0365-020	Reach 3 Location 7 Sample Dup	10.2	<2.53	<2.53	<2.53	6.10	<2.50	<2.49	<2.50	<3.00	5.76	<2.50	13.1	<2.99
	Average	**9.77[4]**	**<2.53**	**<2.53**	**<2.53**	**5.74**	**<2.50**	**<2.49[4]**	**<2.50**	**<3.00**	**5.27**	**<2.50**	**12.8[4]**	**<2.99**
	%RPD Sample/Sample Duplicate	**8.8**	**NA**	**NA**	**NA**	**13**	**NA**	**NA**	**NA**	**NA**	**19**	**NA**	**5.5**	**NA**
E09-0365-022	Reach 3 Location 8 Sample	8.13	<2.53	<2.53	<2.53	5.79	<2.50	<2.49	<2.50	<3.00	5.24	<2.50	11.2	<2.99
E09-0365-023	Reach 3 Location 8 Sample Dup	8.25	2.55	<2.53	<2.53	4.30	<2.50	<2.49	<2.50	<3.00	4.59	<2.50	9.76	<2.99
	Average	**8.19**	**2.55**	**<2.53**	**<2.53**	**5.05**	**<2.50**	**<2.49**	**<2.50**	**<3.00**	**4.92**	**<2.50**	**10.5**	**<2.99**
	%RPD Sample/Sample Duplicate	**1.5**	**NC[2]**	**NA**	**NA**	**30[3]**	**NA**	**NA**	**NA**	**NA**	**13**	**NA**	**14**	**NA**

Table 1 continued. Sample Results Summary[1]

		Sample Concentration (ng/L)												
3M LIMS ID	**Sample Description**	**PFBA**	**PFPeA**	**PFHxA**	**PFHpA**	**PFOA**	**PFNA**	**PFDA**	**PFUnA**	**PFDoA**	**PFBS**	**PFHS**	**PFOS**	**PFOSA**
E09-0365-025	Reach 3 Location 9 Sample	10.3	2.86	<2.53	<2.53	5.43	<2.50	<2.49	<2.50	<3.00	<3.06	<2.50	4.35	<2.99
E09-0365-026	Reach 3 Location 9 Sample Dup	10.5	<2.53	<2.53	<2.53	4.78	<2.50	<2.49	<2.50	<3.00	<3.06	<2.50	3.90	<2.99
	Average	**10.4**	**2.86**	**<2.53**	**<2.53**	**5.11**	**<2.50**	**<2.49**	**<2.50**	**<3.00**	**<3.06**	**<2.50**	**4.13**	**<2.99**
	%RPD Sample/Sample Duplicate	**1.9**	**NC[2]**	**NA**	**NA**	**13**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**11**	**NA**
E09-0365-028	Reach 4 Location 10 Sample	9.92	3.03	<2.53	<2.53	4.45	<2.50	<2.49	<2.50	<3.00	<3.06	<2.50	4.33	<2.99
E09-0365-029	Reach 4 Location 10 Sample Dup	9.86	2.66	<2.53	<2.53	3.77	<2.50	<2.49	<2.50	<3.00	<3.06	<2.50	4.11	<2.99
	Average	**9.89**	**2.85**	**<2.53**	**<2.53**	**4.11**	**<2.50**	**<2.49**	**<2.50**	**<3.00**	**<3.06**	**<2.50**	**4.22**	**<2.99**
	%RPD Sample/Sample Duplicate	**0.61**	**13**	**NA**	**NA**	**17**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**5.2**	**NA**
E09-0365-031	Reach 4 Location 11 Sample	144	21.8	17.1	8.18	113	<2.50	<2.49	<2.50	<3.00	106	37.0	108	3.67
E09-0365-032	Reach 4 Location 11 Sample Dup	119	26.4	19.8	10.0	125	<2.50	<2.49	<2.50	<3.00	70.9	42.1	120	4.08
	Average	**132**	**24.1**	**18.5**	**9.09**	**119**	**<2.50**	**<2.49**	**<2.50**	**<3.00**	**88.5**	**39.6**	**114**	**3.88**
	%RPD Sample/Sample Duplicate	**19**	**19**	**15**	**20**	**10**	**NA**	**NA**	**NA**	**NA**	**40[3]**	**13**	**11**	**11**
E09-0365-034	Reach 4 Location 12 Sample	35.9	7.43	5.91	2.55	21.7	<2.50	<2.49	<2.50	<3.00	24.4	15.6	23.0	<2.99
E09-0365-035	Reach 4 Location 12 Sample Dup	45.1	8.23	5.88	<2.53	24.9	<2.50	<2.49	<2.50	<3.00	29.4	18.6	26.5	<2.99
	Average	**40.5**	**7.83**	**5.90**	**2.55**	**23.3**	**<2.50**	**<2.49**	**<2.50**	**<3.00**	**26.9**	**17.1**	**24.8[4]**	**<2.99**
	%RPD Sample/Sample Duplicate	**23[3]**	**10**	**0.51**	**NC[2]**	**14**	**NA**	**NA**	**NA**	**NA**	**19**	**18**	**14**	**NA**

NA = Not Applicable

(1) The analytical method uncertainties associated with the reported results are as follows: PFBA 100% ± 19%, PFPeA 100% ± 21%, PFHxA 100% ± 19%, PFHpA 100% ± 18%, PFOA 100% ± 21%, PFNA 100% ± 21%, PFDA 100%± 17%, PFUnA 100% ± 18%, PFDoA, 100% ± 25%, PFBS 100% ± 20%, PFHS 100% ± 23%, PFOS 100% ± 27% and PFOSA 100% ± 22%.

(2) Not Calculated; The sample and sample duplicate produced one result above the LOQ and one result below the LOQ. The reported average concentration represents only the result above the LOQ. A true average was not calculated.

(3) The relative percent difference (RPD) between the sample and sample duplicate exceeded method acceptance criteria of ≤20%.

(4) The analytical uncertainty has been expanded due to field matrix spike recovery. See section 4 of the report for additional information.

2 *Methods - Analytical and Preparatory*

2.1 Methods

Analysis was completed following 3M Environmental Laboratory method ETS-8-154.3 "Determination of Perfluorinated Acids, Alcohols, Amides, and Sulfonates in Water by Solid Phase Extraction and High Performance Liquid Chromatography/Mass Spectrometry".

Target Analytes	*Acronym*	*Reference Material Structure*
Perfluorobutanesulfonate (C4 Sulfonate)	PFBS	Linear
Perfluorohexanesulfonate (C6 Sulfonate)	PFHS	Linear
Perfluorooctanesulfonate (C8 Sulfonate)	PFOS	Linear
Perfluorobutanoic Acid (C4 Acid)	PFBA	Linear
Perfluoropentanoic Acid (C5 Acid)	PFPeA	Linear
Perfluorohexanoic Acid (C6 Acid)	PFHxA	Linear
Perfluoroheptanoic Acid (C7 Acid)	PFHpA	Linear
Perfluorooctanoic Acid (C8 Acid)	PFOA	Linear
Perfluorononanoic Acid (C9 Acid)	PFNA	Linear
Perfluorodecanoic Acid (C10 Acid)	PFDA	Linear
Perfluoroundecanoic Acid (C11 Acid)	PFUnA	Linear
Perfluorododecanoic Acid (C12 Acid)	PFDoA	Linear
Perfluorooctanesulfonamide	PFOSA	Branched

2.2 Sample Collection

Samples were collected on July 8, 2009 in Nalgene™ (high-density polyethylene) bottles prepared at the 3M Environmental Laboratory. Prior to sample collection, bottles designated for field matrix spikes were spiked in the laboratory with a known volume of an appropriate matrix spiking solution containing the analytes of interest. Collected sample bottles were returned to the laboratory at ambient conditions on July 8, 2009.

2.3 Sample Preparation

All samples, calibration standards, and associated quality control samples were extracted following ETS-8-154.3. Briefly, 50 mL of sample were loaded onto a pre-conditioned Waters tC18 solid-phase extraction (SPE) cartridge (1.0 g, 6 cc) using a vacuum manifold. The loaded SPE cartridges were then eluted with 2.5 mL of methanol. This extraction procedure concentrates the samples by a factor of twenty-five. (Initial volume = 50 mL, final volume = 2.5 mL).

2.4 Analysis

All samples and quality control samples were analyzed for thirteen target analytes using high performance liquid chromatography/tandem mass spectrometry (HPLC/MS/MS). Pertinent instrument parameters, the liquid chromatography gradient program, and the specific mass transitions analyzed are described in the tables below.

Sample results for PFBA were analyzed on 7/31/09
Sample results for PFPeA, PFHxA, PFHpA, PFOA, PFNA, PFBA, PFHS, PFOS, and PFOSA were analyzed 7/21/09.
Sample results for PFDA, PFUnA, and PFDoA were analyzed 7/28/09.
Sample results for sampling location Reach 4 Location 11, PFBA, PFOA, PFBS, and PFOS were analyzed 7/23/09.

Table 2. Instrument Parameters.

Instrument Name	ETS Ginger/Jonas	ETS Ollie
Liquid Chromatograph	Agilent 1100	Agilent 1100
Analytes	All analytes[1]	PFBA
Guard column	Betasil C18 (2.1 mm X 100 mm), 5 µ	Prism RP (2.1 mm X 50 mm), 5 µ
Analytical column	Betasil C18 (2.1 mm X 100 mm), 5 µ	Prism RP (2.1 mm X 50 mm), 5 µ
Injection Volume	5 µL	20 µL
Mass Spectrometer	Applied Biosystems API 5000	Applied Biosystems API 4000
Ion Source	Turbo Spray	Turbo Spray
Polarity	Negative	Negative
Software	Analyst 1.4.2	Analyst 1.4.2

(1) PFBA was analyzed using ETS Ollie for all samples with the exception of Reach 4 Location 11, which was reported from ETS Jonas.

Table 3. Liquid Chromatography Gradient Program.

ETS Ginger and ETS Jonas				
Step Number	*Total Time (min)*	*Flow Rate (µL/min)*	*Percent A (2 mM ammonium acetate)*	*Percent B (Methanol)*
0	0.0	300	90.0	10.0
1	3.5	300	40.0	60.0
2	11.0	300	40.0	60.0
3	13.5	300	10.0	90.0
4	15.0	300	10.0	90.0
5	17.5	300	90.0	10.0
6	21.0	300	90.0	10.0
ETS Ginger (PFDA, PFUnA, and PFDA)				
0	0.0	300	90.0	10.0
1	2.0	300	90.0	10.0
2	14.5	300	10.0	90.0
3	15.5	300	10.0	90.0
4	16.5	300	90.0	10.0
5	20.0	300	90.0	10.0

Table 3 continued. Liquid Chromatography Gradient Program.

ETS Ollie (PFBA)				
Step Number	Total Time (min)	Flow Rate (µL/min)	Percent A (5 mM ammonium acetate with 0.01% Acetic Acid)	Percent B (Methanol)
0	0.0	300	90.0	10.0
1	3.0	300	90.0	10.0
2	12	200	10.0	90.0
3	13	300	10.0	90.0
4	14	300	90.0	10.0
5	17	300	90.0	10.0

Table 4. Mass Transitions

Analyte	Mass Transition Q1/Q3	Analyte	Mass Transition Q1/Q3
PFBA	213/169	PFUnA	563/519
PFPeA	263/219		563/269
PFHxA	313/119		563/219
	313/269	PFDoA	613/569
PFHpA	363/319		613/319
	363/169		613/169
PFOA	413/369	PFBS	299/80
	413/219		299/99
	413/169	PFHS	399/80
PFNA	463/419		399/99
	463/169	PFOS	499/99
	463/219		499/80
PFDA	513/469		499/130
	513/269	PFOSA	498/78
	513/219		

Dwell time varied by run from 50 - 100 msec for each transition analyzed. The acquisition method used for the initial analysis where all analytes were analyzed in a single run, was broken into two time periods to accommodate the number of transitions being monitored.

3 Data Analysis

3.1 Calibration

Calibration standards were prepared by spiking known amounts of stock solutions containing the analytes of interest into 50 mL of reverse-osmosis purified water. Each spiked water standard was then extracted in the same manner as the collected samples. A total of thirteen spiked standards ranging from a nominal concentration of 0.0025 ng/mL (2.5 ng/L) to 5 ng/mL (5000 ng/L) were prepared. A quadratic, 1/x weighted, calibration curve was used to fit the data for each analyte. The data were not forced through zero during the fitting process. Calculating the standard concentration using the peak area counts and the resultant calibration curve confirmed accuracy of each curve point.

Each curve point was quantitated using the overall calibration curve and reviewed for accuracy. Method calibration accuracy requirements of 100±25% (100±30% for the lowest curve point) were met for all analytes. The correlation coefficient (r) was greater than 0.995 for all analytes.

3.2 System Suitability

A calibration standard was analyzed four times at the beginning of the analytical sequence to demonstrate overall system suitability. All analytes met the acceptance criteria of less than or equal to 5% relative standard deviation (RSD) for peak area and retention time criteria of less than or equal to 2% RSD with the exception of PFOSA which had an area count RSD of 11%. A method deviation is filed with the raw data.

3.3 Limit of Quantitation (LOQ)

The LOQ as defined in method ETS-8-154.3 is the lowest non-zero calibration standard in the curve that meets linearity and accuracy requirements and for which the area counts are at least twice those of the appropriate blanks. The LOQs associated with the sample analysis are listed in the table below.

Table 5. LOQ

Analyte	*LOQ, ng/L*
PFBA(1)	*3.03*
PFPeA	*2.53*
PFHxA	*2.53*
PFHpA	*2.53*
PFOA(1)	*3.00*
PFNA	*2.50*
PFDA	*2.49*
PFUnA	*2.50*
PFDoA	*3.00*
PFBS(1)	*3.06*
PFHS	*2.50*
PFOS(1)	*2.50*
PFOSA	*2.99*

(1) Sampling location Reach 4 Location 11 was re-extracted with a LMS. The reported results for this location has a LOQ for PFBA of 101 ng/L, PFOA at 25.0 ng/L, PFBS at, 25.5 ng/L, and PFOS at 25.0 ng/L.

3.4 Continuing Calibration

During the course of the analytical sequence, several continuing calibration verification samples (CCVs) were analyzed to confirm that the instrument response and the initial calibration curve were still in control. The method acceptance criteria of 100% ± 25% was met for all analytes.

3.5 Blanks

Three types of blanks were prepared and analyzed with the samples: method blanks, solvent blanks, and field/trip blanks. Each blank result was reviewed and used to evaluate method performance to determine the LOQ for each analyte.

3.6 Lab Control Spikes (LCSs)

Low and high lab control spikes were prepared and analyzed in triplicate. LCSs were prepared by spiking known amounts of the analytes into 40 mL of reverse-osmosis matrix matched blank water to produce the desired concentration. The spiked water samples were then extracted and analyzed in the same manner as the samples. Analysis of triplicate LCSs at the two specified levels cross-validates the analytical method as used here for any modifications/deviations from ETS 8-154.3. The method acceptance criteria states that the average recovery of all LCS be between 80%-120% with a RSD

≤20%. All LCS samples met method acceptance criteria and were used in the determination of analytical uncertainty where applicable.

As the reference materials used for quantitation of PFOA and PFOS are predominantly linear, and the analytes present in the water samples are comprised of branched isomers, LCS samples of branched PFOA and PFOS were prepared in triplicate, at two concentrations to evaluate the potential for analytical bias. The average recovery and RSD values for branched PFOA and PFOS met method acceptance criteria.

The following calculations were used to generate data in Table 6.

$$\text{LCS Percent Recovery} = \frac{\text{Calculated Concentration}}{\text{Spike Concentration}} * 100\%$$

$$\text{LCS\% RSD} = \frac{\text{standard deviation LCS replicates}}{\text{average LCS recovery}} * 100\%$$

Table 6. Lab Control Spike Results.

ETS-8-154.3	PFBA			PFPeA			PFHxA		
Lab ID	Spiked Concentration (ng/L)	Calculated Concentration (ng/L)	%Recovery	Spiked Concentration (ng/L)	Calculated Concentration (ng/L)	%Recovery	Spiked Concentration (ng/L)	Calculated Concentration (ng/L)	%Recovery
LCS-090713-1	25.3	24.5	96.9	25.3	26.5	105	25.3	24.6	97.1
LCS-090713-2	25.3	23.3	91.9	25.3	23.8	94.0	25.3	22.3	88.1
LCS-090713-3	25.3	27.5	109	25.3	25.3	100	25.3	22.3	88.1
LCS-090713-4	1010	894	88.5	1010	1030	102	1010	1030	102
LCS-090713-5	1010	942	93.2	1010	1120	110	1010	1110	109
LCS-090713-6	1010	1040	103	1010	1150	114	1010	1130	112
Average ± %RSD	97.1% ± 7.9%			104% ± 6.9%			99.4% ± 10%		

ETS-8-154.3	PFHpA			PFOA			PFNA		
Lab ID	Spiked Concentration (ng/L)	Calculated Concentration (ng/L)	%Recovery	Spiked Concentration (ng/L)	Calculated Concentration (ng/L)	%Recovery	Spiked Concentration (ng/L)	Calculated Concentration (ng/L)	%Recovery
LCS-090713-1	25.3	26.0	103	25.0	27.3	109	25.0	28.6	115
LCS-090713-2	25.3	23.9	94.5	25.0	25.5	102	25.0	25.3	101
LCS-090713-3	25.3	24.1	95.2	25.0	25.4	102	25.0	25.2	101
LCS-090713-4	1010	1040	103	999	1040	104	1000	1090	109
LCS-090713-5	1010	1120	111	999	1110	111	1000	1180	118
LCS-090713-6	1010	1150	114	999	1140	114	1000	1190	119
Average ± %RSD	103% ± 7.7%			107% ± 4.7%			111% ± 7.4%		

Table 6 continued. Lab Control Spike Results.

ETS-8-154.3	PFDA			PFUnA			PFDoA		
Lab ID	Spiked Concentration (ng/L)	Calculated Concentration (ng/L)	%Recovery	Spiked Concentration (ng/L)	Calculated Concentration (ng/L)	%Recovery	Spiked Concentration (ng/L)	Calculated Concentration (ng/L)	%Recovery
LCS-090713-1	24.9	25.9	104	25.0	26.3	105	25.0	25.7	103
LCS-090713-2	24.9	23.4	93.9	25.0	24.2	96.7	25.0	22.4	89.8
LCS-090713-3	24.9	22.8	91.4	25.0	23.8	95.3	25.0	23.3	93.3
LCS-090713-4	997	971	97.4	999	1010	101	1000	939	93.9
LCS-090713-5	997	1060	106	999	1110	111	1000	1080	108
LCS-090713-6	997	1090	110	999	1130	113	1000	1080	108
Average ± %RSD	100% ± 7.3%			104% ± 7.1%			99.3% ± 8.1%		

ETS-8-154.3	PFBS			PFHS			PFOS		
Lab ID	Spiked Concentration (ng/L)	Calculated Concentration (ng/L)	%Recovery	Spiked Concentration (ng/L)	Calculated Concentration (ng/L)	%Recovery	Spiked Concentration (ng/L)	Calculated Concentration (ng/L)	%Recovery
LCS-090713-1	25.5	26.8	105	25.0	26.9	108	25.0	27.3	109
LCS-090713-2	25.5	24.8	97.2	25.0	24.3	97.0	25.0	25.2	101
LCS-090713-3	25.5	24.7	96.8	25.0	24.7	98.7	25.0	25.4	102
LCS-090713-4	1020	1020	100	1000	998	99.8	1000	1030	103
LCS-090713-5	1020	1080	106	1000	1090	109	1000	1110	111
LCS-090713-6	1020	1120	110	1000	1100	110	1000	1120	112
Average ± %RSD	103% ± 5.2%			104% ± 5.6%			106% ± 4.6%		

Table 6 continued. Lab Control Spike Results.

ETS-8-154.3	PFOSA		
Lab ID	Spiked Concentration (ng/L)	Calculated Concentration (ng/L)	%Recovery
LCS-090713-1	24.9	29.3	118
LCS-090713-2	24.9	26.1	105
LCS-090713-3	24.9	25.6	103
LCS-090713-4	1000	954	95.8
LCS-090713-5	1000	1070	107
LCS-090713-6	1000	987	99.1
Average ± %RSD	105% ± 7.3%		

ETS-8-154.3	PFBA			PFOA			PFBS		
Lab ID	Spiked Concentration (ng/L)	Calculated Concentration (ng/L)	%Recovery	Spiked Concentration (ng/L)	Calculated Concentration (ng/L)	%Recovery	Spiked Concentration (ng/L)	Calculated Concentration (ng/L)	%Recovery
LCS-090722-1	202	192	95.2	200	197	98.6	204	220	108
LCS-090722-2	202	185	91.5	200	221	110	204	248	122
LCS-090722-3	202	183	90.4	200	217	108	204	254	125
LCS-090722-4	5050	4490	89.0	5000	4110	82.2	5100	4420	86.7
LCS-090722-5	5050	5810	115	5000	5110	102	5100	5540	109
LCS-090722-6	5050	5880	117	5000	5290	106	5100	5410	106
Average ± %RSD	100% ± 13%			101% ± 10%			109% ± 12%		

Table 6 continued. Lab Control Spike Results.

ETS-8-154.3	PFOS		
Lab ID	Spiked Concentration (ng/L)	Calculated Concentration (ng/L)	%Recovery
LCS-090722-1	200	192	95.8
LCS-090722-2	200	214	107
LCS-090722-3	200	227	113
LCS-090722-4	5000	4760	95.3
LCS-090722-5	5000	5780	116
LCS-090722-6	5000	5490	110
Average ± %RSD	106% ± 8.3%		

ETS-8-154.3	PFOA			PFOS		
Lab ID	Spiked Concentration (ng/mL)	Calculated Concentration (ng/mL)	%Recovery	Spiked Concentration (ng/mL)	Calculated Concentration (ng/mL)	%Recovery
LCS-090722-7 ECF	200	225	113	199	207	104
LCS-090722-8 ECF	200	229	115	199	205	103
LCS-090722-9 ECF	200	231	116	199	213	107
LCS-090722-10 ECF	5000	5950	119	4980	5500	110
LCS-090722-11 ECF	5000	5800	116	4980	5580	112
LCS-090722-12 ECF	5000	6210	124	4980	5510	111
Average ± %RSD	117% ± 3.3%			108% ± 3.5%		

3.7 Analytical Method Uncertainty

Analytical uncertainty is based on historical QC data that is control charted and used to evaluate method accuracy and precision. The method uncertainty is calculated following ETS-12-012.2. The standard deviation is calculated for the set of accuracy results (in %) obtained for the QC samples. The expanded uncertainty is calculated by multiplying the standard deviation by a factor of 2, which corresponds to a confidence level of 95%. Fifty data points were used to determine method uncertainty by this method.

Table 7. Analytical Method Uncertainty.

Analyte	Standard Deviation	Method Uncertainty
PFBA	9.51	100%±19%
PFPeA	10.3	100%±21%
PFHxA	9.41	100%±19%
PFHpA	8.73	100%±18%
PFOA	10.3	100%±21%
PFNA	10.3	100%±21%
PFDA	8.27	100%±17%
PFUnA	8.91	100%±18%
PFDoA	12.4	100%±25%
PFBS	9.86	100%±20%
PFHS	11.5	100%±23%
PFOS	13.6	100%±27%
PFOSA	11.2	100%±22%

3.8 Laboratory Matrix Spike (LMS)

A laboratory matrix spike at a nominal concentration of 200 ppt was prepared for sample locations Reach 4 Location 11, as the field matrix spike level (25ppt) did not accurately reflect the concentration detected in the samples of PFBA, PFOA, PFBS, and PFOS. A laboratory matrix spike was prepared on an aliquot of sample E09-0365-031 prior to sample extraction by ETS-8-154.3. LMS recoveries on this sample are presented in Table 18.

Laboratory matrix spike recoveries within method acceptance criteria of 100±30% confirm that "unknown" components in the sample matrix do not significantly interfere with the extraction and analysis.

$$\text{LMS Recovery} = \frac{(\text{LMS Sample Concentration} - \text{Average Concentration : Sample \& Sample Dup.})}{\text{LMS Spike Concentraton}} * 100\%$$

3.9 Field Matrix Spikes (FMS)

A 25ppt (nominal) field matrix spike was collected at each sampling point to verify that the analytical method is applicable to the collected matrix. The field matrix spike was generated by adding a measured volume of field sample to a container spiked by the laboratory with the target analytes prior to shipping sample containers for sample collection. Field matrix spike recoveries within method acceptance criteria of 100±30% confirm that "unknown" components in the sample matrix do not significantly interfere with the extraction and analysis of the analytes of interest. Field matrix spikes are presented in the section 4 of this report.

Five field matrix spike sample bottles were filled more than 10% over the 200mL fill line. The field matrix spike true value was adjusted accordingly. Sample bottles that were overfilled include: E09-0365-009 (225mL), E09-0365-012 (225 mL), E09-0365-018 (225 mL), E09-0365-024 (231 mL), and E09-0365-036 (225 mL).

$$\text{FMS Recovery} = \frac{(\text{Sample Concentration of FMS} - \text{Average Concentration : Field Sample \& Field Sample Dup.})}{\text{Spike Concentraton}} * 100\%$$

4 Data Summary and Discussion

The tables below summarize the sample results and field matrix spike recovery for the twelve locations as well as the Trip Blank. Each table provides the average concentration and the relative percent difference (%RPD) of the sample and sample duplicate. Results and average values are rounded to three significant figures. Percent relative difference (%RPD) values are rounded to two significant figures. Because of rounding, values may vary slightly from those listed in the raw data. Field matrix spikes meeting the method acceptance criteria of ± 30%, demonstrate that the method is appropriate for the given matrix.

Reach 2 Location 5 – The 25 ppt FMS recovery for PFDA did not meet method acceptance criteria of 100% ± 30% with a recovery of 68.2%. The analytical uncertainty has been adjusted accordingly for PFDA to 100% ± 32%.

Reach 3 Location 7 – The 25 ppt FMS recovery for PFBA, PFDA, and PFOS did not meet method acceptance criteria of 100% ± 30% with recoveries of 67.4%, 63.0%, and 67.8%, respectively. The analytical uncertainty has been adjusted accordingly for PFBA to 100% ± 33%, for PFDA to 100% ± 37%, and for PFOS to 100% ± 32%.

Reach 4 Location 12 – The 25 ppt FMS recovery for PFOS did not meet method acceptance criteria of 100% ± 30% with a recovery of 64.1%. The analytical uncertainty has been adjusted accordingly for PFOS to 100% ± 36%.

Table 8. Reach 1 Location 1.

		PFBA		PFPeA		PFHxA		PFHpA	
3M LIMS ID	Description	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery
E09-0365-001	Reach 1 Loc 1 Sample	4.84	NA	<2.53	NA	<2.53	NA	<2.53	NA
E09-0365-002	Reach 1 Loc 1 Sample Dup	4.76	NA	<2.53	NA	<2.53	NA	<2.53	NA
E09-0365-003	Reach 1 Loc 1 Spike	25.7	82.8	27.8	110	24.6	97.4	26.4	105
Average Concentration (ng/mL) ± %RPD		4.80 ng/L ± 1.7%		<2.53 ng/L		<2.53 ng/L		<2.53 ng/L	

		PFOA		PFNA		PFDA		PFUnA	
3M LIMS ID	Description	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery
E09-0365-001	Reach 1 Loc 1 Sample	<3.00	NA	<2.50	NA	<2.49	NA	<2.50	NA
E09-0365-002	Reach 1 Loc 1 Sample Dup	<3.00	NA	<2.50	NA	<2.49	NA	<2.50	NA
E09-0365-003	Reach 1 Loc 1 Spike	26.6	107	24.2	96.8	19.9	79.8	20.0	80.1
Average Concentration (ng/mL) ± %RPD		<3.00 ng/L		<2.50 ng/L		<2.49 ng/L		<2.50 ng/L	

		PFDoA		PFBS		PFHS		PFOS		PFOSA	
3M LIMS ID	Description	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery
E09-0365-001	Reach 1 Loc 1 Sample	<3.00	NA	<3.06	NA	<2.50	NA	<2.50	NA	<2.99	NA
E09-0365-002	Reach 1 Loc 1 Sample Dup	<3.00	NA	<3.06	NA	<2.50	NA	<2.50	NA	<2.99	NA
E09-0365-003	Reach 1 Loc 1 Spike	24.9	100	27.7	109	25.1	100	21.9	87.6	30.1	121
Average Concentration (ng/mL) ± %RPD		<3.00 ng/L		<3.06 ng/L		<2.50 ng/L		<2.50 ng/L		<2.99 ng/L	

NA = Not Applicable

Table 9. Reach 1 Location 2.

		PFBA		PFPeA		PFHxA		PFHpA	
3M LIMS ID	Description	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery
E09-0365-004	Reach 1 Loc 2 Sample	6.36	NA	<2.53	NA	<2.53	NA	<2.53	NA
E09-0365-005	Reach 1 Loc 2 Sample Dup	6.50	NA	<2.53	NA	<2.53	NA	<2.53	NA
E09-0365-006	Reach 1 Loc 2 Spike	24.6	71.8	27.2	108	25.3	100	25.8	102
Average Concentration (ng/mL) ± %RPD		6.43 ng/L ± 2.2%		<2.53 ng/L		<2.53 ng/L		<2.53 ng/L	

		PFOA		PFNA		PFDA		PFUnA	
3M LIMS ID	Description	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery
E09-0365-004	Reach 1 Loc 2 Sample	<3.00	NA	<2.50	NA	<2.49	NA	<2.50	NA
E09-0365-005	Reach 1 Loc 2 Sample Dup	<3.00	NA	<2.50	NA	<2.49	NA	<2.50	NA
E09-0365-006	Reach 1 Loc 2 Spike	25.3	101	22.6	90.4	18.7	75.0	18.1	72.5
Average Concentration (ng/mL) ± %RPD		<3.00 ng/L		<2.50 ng/L		<2.49 ng/L		<2.50 ng/L	

		PFDoA		PFBS		PFHS		PFOS		PFOSA	
3M LIMS ID	Description	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery
E09-0365-004	Reach 1 Loc 2 Sample	<3.00	NA	<3.06	NA	<2.50	NA	<2.50	NA	<2.99	NA
E09-0365-005	Reach 1 Loc 2 Sample Dup	<3.00	NA	<3.06	NA	<2.50	NA	<2.50	NA	<2.99	NA
E09-0365-006	Reach 1 Loc 2 Spike	22.1	88.4	27.2	107	24.4	97.6	20.2	80.8	27.5	110
Average Concentration (ng/mL) ± %RPD		<3.00 ng/L		<3.06 ng/L		<2.50 ng/L		<2.50 ng/L		<2.99 ng/L	

NA = Not Applicable

Table 10. Reach 1 Location 3.

		PFBA		PFPeA		PFHxA		PFHpA	
3M LIMS ID	Description	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery
E09-0365-007	Reach 1 Loc 3 Sample	5.37	NA	<2.53	NA	<2.53	NA	<2.53	NA
E09-0365-008	Reach 1 Loc 3 Sample Dup	5.17	NA	<2.53	NA	<2.53	NA	<2.53	NA
E09-0365-009[1]	Reach 1 Loc 3 Spike	25.1	88.5	26.5	118	23.7	106	25.9	115
Average Concentration (ng/mL) ± %RPD		5.27 ng/mL ± 3.8%		<2.53 ng/L		<2.53 ng/L		<2.53 ng/L	

		PFOA		PFNA		PFDA		PFUnA	
3M LIMS ID	Description	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery
E09-0365-007	Reach 1 Loc 3 Sample	<3.00	NA	<2.50	NA	<2.49	NA	<2.50	NA
E09-0365-008	Reach 1 Loc 3 Sample Dup	<3.00	NA	<2.50	NA	<2.49	NA	<2.50	NA
E09-0365-009[1]	Reach 1 Loc 3 Spike	23.8	107	22.1	99.5	17.9	80.6	17.7	79.7
Average Concentration (ng/mL) ± %RPD		<3.00 ng/L		<2.50 ng/L		<2.49 ng/L		<2.50 ng/L	

		PFDoA		PFBS		PFHS		PFOS		PFOSA	
3M LIMS ID	Description	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery
E09-0365-007	Reach 1 Loc 3 Sample	<3.00	NA	<3.06	NA	<2.50	NA	<2.50	NA	<2.99	NA
E09-0365-008	Reach 1 Loc 3 Sample Dup	<3.00	NA	<3.06	NA	<2.50	NA	<2.50	NA	<2.99	NA
E09-0365-009[1]	Reach 1 Loc 3 Spike	22.0	99.1	26.9	119	24.7	111	20.1	90.5	26.8	121
Average Concentration (ng/mL) ± %RPD		<3.00 ng/L		<3.06 ng/L		<2.50 ng/L		<2.50 ng/L		<2.99 ng/L	

NA = Not Applicable
(1) The FMS sample bottle was overfilled and the spike level was corrected accordingly.

Table 11. Reach 2 Location 4.

		PFBA		PFPeA		PFHxA		PFHpA	
3M LIMS ID	Description	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery
E09-0365-010	Reach 2 Loc 4 Sample	4.86	NA	<2.53	NA	<2.53	NA	<2.53	NA
E09-0365-011	Reach 2 Loc 4 Sample Dup	5.32	NA	<2.53	NA	<2.53	NA	<2.53	NA
E09-0365-012[1]	Reach 2 Loc 4 Spike	26.2	94.2	26.5	118	24.1	107	25.4	113
Average Concentration (ng/mL) ± %RPD		5.09 ng/L ± 9.0%		<2.53 ng/L		<2.53 ng/L		<2.53 ng/L	

		PFOA		PFNA		PFDA		PFUnA	
3M LIMS ID	Description	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery
E09-0365-010	Reach 2 Loc 4 Sample	<3.00	NA	<2.50	NA	<2.49	NA	<2.50	NA
E09-0365-011	Reach 2 Loc 4 Sample Dup	<3.00	NA	<2.50	NA	<2.49	NA	<2.50	NA
E09-0365-012[1]	Reach 2 Loc 4 Spike	23.9	108	21.4	96.3	18.0	81.1	19.6	88.3
Average Concentration (ng/mL) ± %RPD		<3.00 ng/L		<2.50 ng/L		<2.49 ng/L		<2.50 ng/L	

		PFDoA		PFBS		PFHS		PFOS		PFOSA	
3M LIMS ID	Description	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery
E09-0365-010	Reach 2 Loc 4 Sample	<3.00	NA	<3.06	NA	<2.50	NA	<2.50	NA	<2.99	NA
E09-0365-011	Reach 2 Loc 4 Sample Dup	<3.00	NA	<3.06	NA	<2.50	NA	<2.50	NA	<2.99	NA
E09-0365-012[1]	Reach 2 Loc 4 Spike	24.6	111	25.8	114	23.9	108	19.7	88.7	25.4	114
Average Concentration (ng/mL) ± %RPD		<3.00 ng/L		<3.06 ng/L		<2.50 ng/L		<2.50 ng/L		<2.99 ng/L	

NA = Not Applicable

(1) The FMS sample bottle was overfilled and the spike level was corrected accordingly.

Table 12. Reach 2 Location 5.

		PFBA		PFPeA		PFHxA		PFHpA	
3M LIMS ID	Description	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery
E09-0365-013	Reach 2 Loc 5 Sample	5.45	NA	<2.53	NA	<2.53	NA	<2.53	NA
E09-0365-014	Reach 2 Loc 5 Sample Dup	4.97	NA	<2.53	NA	<2.53	NA	<2.53	NA
E09-0365-015	Reach 2 Loc 5 Spike	23.7	73.1	27.6	109	25.5	101	27.0	107
Average Concentration (ng/mL) ± %RPD		5.21 ng/L ± 9.2%		<2.53 ng/L		<2.53 ng/L		<2.53 ng/L	

		PFOA		PFNA		PFDA		PFUnA	
3M LIMS ID	Description	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery
E09-0365-013	Reach 2 Loc 5 Sample	<3.00	NA	<2.50	NA	<2.49	NA	<2.50	NA
E09-0365-014	Reach 2 Loc 5 Sample Dup	<3.00	NA	<2.50	NA	<2.49	NA	<2.50	NA
E09-0365-015	Reach 2 Loc 5 Spike	24.0	96.1	21.0	84.0	17.0	68.2(1)	17.7	70.9
Average Concentration (ng/mL) ± %RPD		<3.00 ng/L		<2.50 ng/L		<2.49 ng/L(2)		<2.50 ng/L	

		PFDoA		PFBS		PFHS		PFOS		PFOSA	
3M LIMS ID	Description	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery
E09-0365-013	Reach 2 Loc 5 Sample	<3.00	NA	<3.06	NA	<2.50	NA	<2.50	NA	<2.99	NA
E09-0365-014	Reach 2 Loc 5 Sample Dup	<3.00	NA	<3.06	NA	<2.50	NA	<2.50	NA	<2.99	NA
E09-0365-015	Reach 2 Loc 5 Spike	22.6	90.4	27.9	109	25.1	100	19.0	76.0	28.1	113
Average Concentration (ng/mL) ± %RPD		<3.00 ng/L		<3.06 ng/L		<2.50 ng/L		<2.50 ng/L		<2.99 ng/L	

NA = Not Applicable
(1) Field matrix spike did not meet method acceptance criteria of 100% ± 30%.
(2) The analytical uncertainty has been adjusted for the recovery of the FMS for PFDA to ‘00% ± 32%.

Table 13. Reach 2 Location 6.

		PFBA		PFPeA		PFHxA		PFHpA	
3M LIMS ID	Description	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery
E09-0365-016	Reach 2 Loc 6 Sample	7.05	NA	<2.53	NA	<2.53	NA	<2.53	NA
E09-0365-017	Reach 2 Loc 6 Sample Dup	7.46	NA	<2.53	NA	<2.53	NA	<2.53	NA
E09-0365-018[1]	Reach 2 Loc 6 Spike	24.4	76.5	27.5	123	25.9	115	26.2	117
Average Concentration (ng/mL) ± %RPD		7.26 ng/mL ± 5.7%		<2.53 ng/L		<2.53 ng/L		<2.53 ng/L	

		PFOA		PFNA		PFDA		PFUnA	
3M LIMS ID	Description	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery
E09-0365-016	Reach 2 Loc 6 Sample	3.97	NA	<2.50	NA	<2.49	NA	<2.50	NA
E09-0365-017	Reach 2 Loc 6 Sample Dup	3.66	NA	<2.50	NA	<2.49	NA	<2.50	NA
E09-0365-018[1]	Reach 2 Loc 6 Spike	26.9	104	22.7	102	18.7	84.2	19.2	86.5
Average Concentration (ng/mL) ± %RPD		3.82 ng/L± 8.1%		<2.50 ng/L		<2.49 ng/L		<2.50 ng/L	

		PFDoA		PFBS		PFHS		PFOS		PFOSA	
3M LIMS ID	Description	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery
E09-0365-016	Reach 2 Loc 6 Sample	<3.00	NA	<3.06	NA	<2.50	NA	8.48	NA	<2.99	NA
E09-0365-017	Reach 2 Loc 6 Sample Dup	<3.00	NA	<3.06	NA	<2.50	NA	8.59	NA	<2.99	NA
E09-0365-018[1]	Reach 2 Loc 6 Spike	24.2	109	29.0	128	25.5	115	27.3	84.4	28.4	128
Average Concentration (ng/mL) ± %RPD		<3.00 ng/L		<3.06 ng/L		<2.50 ng/L		8.54 ng/L± 1.3%		<2.99 ng/L	

NA = Not Applicable
(1) The FMS sample bottle was overfilled and the spike level was corrected accordingly.

Table 14. Reach 3 Location 7.

		PFBA		PFPeA		PFHxA		PFHpA	
3M LIMS ID	Description	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery
E09-0365-019	Reach 3 Loc 7 Sample	9.34	NA	<2.53	NA	<2.53	NA	<2.53	NA
E09-0365-020[1]	Reach 3 Loc 7 Sample Dup	26.8	67.4[2]	26.3	104	25.2	100	25.7	102
E09-0365-021	Reach 3 Loc 7 Spike	10.2	NA	<2.53	NA	<2.53	NA	<2.53	NA
Average Concentration (ng/mL) ± %RPD		9.77 ng/mL ± 8.8%[3]		<2.53 ng/L		<2.53 ng/L		<2.53 ng/L	

		PFOA		PFNA		PFDA		PFUnA	
3M LIMS ID	Description	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery
E09-0365-019	Reach 3 Loc 7 Sample	5.38	NA	<2.50	NA	<2.49	NA	<2.50	NA
E09-0365-020[1]	Reach 3 Loc 7 Sample Dup	27.9	88.7	20.8	83.2	15.9	63.8[2]	17.8	71.3
E09-0365-021	Reach 3 Loc 7 Spike	6.10	NA	<2.50	NA	<2.49	NA	<2.50	NA
Average Concentration (ng/mL) ± %RPD		5.74 ng/L± 13%		<2.50 ng/L		<2.49 ng/L[3]		<2.50 ng/L	

		PFDoA		PFBS		PFHS		PFOS		PFOSA	
3M LIMS ID	Description	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery
E09-0365-019	Reach 3 Loc 7 Sample	<3.00	NA	4.77	NA	<2.50	NA	12.4	NA	<2.99	NA
E09-0365-020[1]	Reach 3 Loc 7 Sample Dup	24.0	96.0	30.8	100	26.2	105	29.7	67.8[2]	21.6	86.7
E09-0365-021	Reach 3 Loc 7 Spike	<3.00	NA	5.76	NA	<2.50	NA	13.1	NA	<2.99	NA
Average Concentration (ng/mL) ± %RPD		<3.00 ng/L		5.27 ng/L± 19%		<2.50 ng/L		12.8 ng/L± 5.5%[3]		<2.99 ng/L	

NA = Not Applicable
(1) Sample duplicate bottle and FMS bottle were switched during either bottle or sample prep. The sample results are presented based on this assumption.
(2) Field matrix spike did not meet method acceptance criteria of 100% ± 30%.
(3) The analytical uncertainty has been adjusted for the recovery of the FMS for PFBA to 100% ± 33%, PFDA to 100% ± 36% and for PFOS to 100% ± 32%.

Table 15. Reach 3 Location 8.

		PFBA		PFPeA		PFHxA		PFHpA	
3M LIMS ID	Description	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery
E09-0365-022	Reach 3 Loc 8 Sample	8.13	NA	<2.53	NA	<2.53	NA	<2.53	NA
E09-0365-023	Reach 3 Loc 8 Sample Dup	8.25	NA	2.55	NA	<2.53	NA	<2.53	NA
E09-0365-024[1]	Reach 3 Loc 8 Spike	24.9	76.3	27.5	113	25.7	118	25.8	118
Average Concentration (ng/mL) ± %RPD		8.19 ng/L ± 1.5%		2.55 ng/L[2]		<2.53 ng/L		<2.53 ng/L	

		PFOA		PFNA		PFDA		PFUnA	
3M LIMS ID	Description	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery
E09-0365-022	Reach 3 Loc 8 Sample	5.79	NA	<2.50	NA	<2.49	NA	<2.50	NA
E09-0365-023	Reach 3 Loc 8 Sample Dup	4.30	NA	<2.50	NA	<2.49	NA	<2.50	NA
E09-0365-024[1]	Reach 3 Loc 8 Spike	27.5	104	21.2	97.9	17.5	81.0	19.2	88.9
Average Concentration (ng/mL) ± %RPD		5.05 ng/L± 30%[3]		<2.50 ng/L		<2.49 ng/L		<2.50 ng/L	

NA = Not Applicable

(1) The FMS sample bottle was overfilled and the spike level was corrected accordingly.

(2) The sample and sample duplicate produced one result above the LOQ and one result below the LOQ. The reported average concentration represents only the result above the LOQ. A true average was not calculated.

(3) The relative percent difference (RPD) between the sample and sample duplicate exceeded method acceptance criteria of ≤20%.

Table 15 continued. Reach 3 Location 8.

		PFDoA		PFBS		PFHS		PFOS		PFOSA	
3M LIMS ID	Description	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery
E09-0365-022	Reach 3 Loc 8 Sample	<3.00	NA	5.24	NA	<2.50	NA	11.2	NA	<2.99	NA
E09-0365-023	Reach 3 Loc 8 Sample Dup	<3.00	NA	4.59	NA	<2.50	NA	9.76	NA	<2.99	NA
E09-0365-024[1]	Reach 3 Loc 8 Spike	25.0	116	29.6	112	25.7	119	28.5	83.3	24.6	114
Average Concentration (ng/mL) ± %RPD		<3.00 ng/L		4.92 ng/L± 13%		<2.50 ng/L		10.5 ng/L± 14%		<2.99 ng/L	

NA = Not Applicable

(1) The FMS sample bottle was overfilled and the spike level was corrected accordingly.

(2) The sample and sample duplicate produced one result above the LOQ and one result below the LOQ. The reported average concentration represents only the result above the LOQ. A true average was not calculated.

(3) The relative percent difference (RPD) between the sample and sample duplicate exceeded method acceptance criteria of ≤20%.

Table 16. Reach 3 Location 9.

		PFBA		PFPeA		PFHxA		PFHpA	
3M LIMS ID	Description	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery
E09-0365-025	Reach 3 Loc 9 Sample	10.3	NA	2.86	NA	<2.53	NA	<2.53	NA
E09-0365-026	Reach 3 Loc 9 Sample Dup	10.5	NA	<2.53	NA	<2.53	NA	<2.53	NA
E09-0365-027	Reach 3 Loc 9 Spike	30.9	81.0	28.4	101	26.5	105	26.5	105
Average Concentration (ng/mL) ± %RPD		10.4 ng/L ± 1.9%		2.86 ng/L(1)		<2.53 ng/L		<2.53 ng/L	

		PFOA		PFNA		PFDA		PFUnA	
3M LIMS ID	Description	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery
E09-0365-025	Reach 3 Loc 9 Sample	5.43	NA	<2.50	NA	<2.49	NA	<2.50	NA
E09-0365-026	Reach 3 Loc 9 Sample Dup	4.78	NA	<2.50	NA	<2.49	NA	<2.50	NA
E09-0365-027	Reach 3 Loc 9 Spike	29.8	98.9	23.0	92.0	18.7	75.0	20.4	81.7
Average Concentration (ng/mL) ± %RPD		5.11 ng/L ± 13%		<2.50 ng/L		<2.49 ng/L		<2.50 ng/L	

		PFDoA		PFBS		PFHS		PFOS		PFOSA	
3M LIMS ID	Description	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery
E09-0365-025	Reach 3 Loc 9 Sample	<3.00	NA	<3.06	NA	<2.50	NA	4.35	NA	<2.99	NA
E09-0365-026	Reach 3 Loc 9 Sample Dup	<3.00	NA	<3.06	NA	<2.50	NA	3.90	NA	<2.99	NA
E09-0365-027	Reach 3 Loc 9 Spike	24.4	97.6	28.6	112	28.0	112	24.8	82.7	27.9	112
Average Concentration (ng/mL) ± %RPD		<3.00 ng/L		<3.06 ng/L		<2.50 ng/L		4.13 ng/L ± 11%		<2.99 ng/L	

NA = Not Applicable

(1) The sample and sample duplicate produced one result above the LOQ and one result below the LOQ. The reported average concentration represents only the result above the LOQ. A true average was not calculated.

Table 17. Reach 4 Location 10.

		PFBA		PFPeA		PFHxA		PFHpA	
3M LIMS ID	Description	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery
E09-0365-028	Reach 4 Loc 10 Sample	9.92	NA	3.03	NA	<2.53	NA	<2.53	NA
E09-0365-029	Reach 4 Loc 10 Sample Dup	9.86	NA	2.66	NA	<2.53	NA	<2.53	NA
E09-0365-030	Reach 4 Loc 10 Spike	31.2	84.2	30.1	108	27.5	109	27.5	109
Average Concentration (ng/mL) ± %RPD		9.89 ng/L ± 0.61%		2.85 ng/L ± 13%		<2.53 ng/L		<2.53 ng/L	

		PFOA		PFNA		PFDA		PFUnA	
3M LIMS ID	Description	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery
E09-0365-028	Reach 4 Loc 10 Sample	4.45	NA	<2.50	NA	<2.49	NA	<2.50	NA
E09-0365-029	Reach 4 Loc 10 Sample Dup	3.77	NA	<2.50	NA	<2.49	NA	<2.50	NA
E09-0365-030	Reach 4 Loc 10 Spike	29.0	99.7	22.4	89.6	17.6	70.6	18.5	74.1
Average Concentration (ng/mL) ± %RPD		4.11 ng/L ± 17%		<2.50 ng/L		<2.49 ng/L		<2.50 ng/L	

		PFDoA		PFBS		PFHS		PFOS		PFOSA	
3M LIMS ID	Description	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery
E09-0365-028	Reach 4 Loc 10 Sample	<3.00	NA	<3.06	NA	<2.50	NA	4.33	NA	<2.99	NA
E09-0365-029	Reach 4 Loc 10 Sample Dup	<3.00	NA	<3.06	NA	<2.50	NA	4.11	NA	<2.99	NA
E09-0365-030	Reach 4 Loc 10 Spike	23.6	94.4	28.5	112	27.9	112	23.2	75.9	26.3	106
Average Concentration (ng/mL) ± %RPD		<3.00 ng/L		<3.06 ng/L		<2.50 ng/L		4.22 ng/L ± 5.2%		<2.99 ng/L	

NA = Not Applicable

Table 18. Reach 4 Location 11.

		PFBA		PFPeA		PFHxA		PFHpA	
3M LIMS ID	Description	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery
E09-0365-031	Reach 4 Loc 11 Sample	144	NA	21.8	NA	17.1	NA	8.18	NA
E09-0365-032	Reach 4 Loc 11 Sample Dup	119	NA	26.4	NA	19.8	NA	10.0	NA
E09-0365-033	Reach 4 Loc 11 Spike	NC	NC	51.8	110	44.3	102	36.3	108
E09-0365-031 200ppt LMS	Reach 4 Loc 11 Sample – 200ppt LMS	291	79.0	NA	NA	NA	NA	NA	NA
Average Concentration (ng/mL) ± %RPD		132 ng/L ± 19%		24.1 ng/L ± 19%		18.5 ng/L ± 15%		9.09 ng/L ± 20%	

		PFOA		PFNA		PFDA		PFUnA	
3M LIMS ID	Description	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery
E09-0365-031	Reach 4 Loc 11 Sample	113	NA	<2.50	NA	<2.49	NA	<2.50	NA
E09-0365-032	Reach 4 Loc 11 Sample Dup	125	NA	<2.50	NA	<2.49	NA	<2.50	NA
E09-0365-033	Reach 4 Loc 11 Spike	NC	NC	22.7	90.8	19.3	77.4	18.4	73.7
E09-0365-031 200ppt LMS	Reach 4 Loc 11 Sample – 200ppt LMS	308	94.5	NA	NA	NA	NA	NA	NA
Average Concentration (ng/mL) ± %RPD		119 ng/L ± 10%		<2.50 ng/L		<2.49 ng/L		<2.50 ng/L	

NA = Not Applicable
NC= Not Calculated; Endogenous level greater than 2x spike level.
(1) The relative percent difference (RPD) between the sample and sample duplicate exceeded method acceptance criteria of ≤20%.

Table 18 continued. Reach 4 Location 11.

		PFDoA		PFBS		PFHS		PFOS		PFOSA	
3M LIMS ID	Description	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery
E09-0365-031	Reach 4 Loc 11 Sample	<3.00	NA	106	NA	37.0	NA	108	NA	3.67	NA
E09-0365-032	Reach 4 Loc 11 Sample Dup	<3.00	NA	70.9	NA	42.1	NA	120	NA	4.08	NA
E09-0365-033	Reach 4 Loc 11 Spike	22.7	90.8	NC	NC	64.0	97.8	NC	NC	30.2	106
E09-0365-031 200ppt LMS	Reach 4 Loc 11 Sample – 200ppt LMS	NA	NA	296	102	NA	NA	289	87.5	NA	NA
Average Concentration (ng/mL) ± %RPD		***<3.00 ng/L***		***88.5 ng/L ± 40%(1)***		***39.6 ng/L ± 13%***		***114 ng/L ± 11%***		***3.88 ng/L ± 11%***	

NA = Not Applicable

(1) The relative percent difference (RPD) between the sample and sample duplicate exceeded method acceptance criteria of ≤20%.

Table 19. Reach 4 Location 12.

		PFBA		PFPeA		PFHxA		PFHpA	
3M LIMS ID	Description	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery
E09-0365-034	Reach 4 Loc 12 Sample	35.9	NA	7.43	NA	5.91	NA	2.55	NA
E09-0365-035	Reach 4 Loc 12 Sample Dup	45.1	NA	8.23	NA	5.88	NA	<2.53	NA
E09-0365-036[1]	Reach 4 Loc 12 Spike	60.4	88.8	32.3	109	31.3	113	28.3	115
Average Concentration (ng/mL) ± %RPD		40.5 ng/mL ± 23%[2]		7.83 ng/L± 10%		5.90 ng/L± 0.51%		2.55 ng/L[3]	

		PFOA		PFNA		PFDA		PFUnA	
3M LIMS ID	Description	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery
E09-0365-034	Reach 4 Loc 12 Sample	21.7	NA	<2.50	NA	<2.49	NA	<2.50	NA
E09-0365-035	Reach 4 Loc 12 Sample Dup	24.9	NA	<2.50	NA	<2.49	NA	<2.50	NA
E09-0365-036[1]	Reach 4 Loc 12 Spike	44.1	93.7	21.2	95.4	16.7	75.2	15.7	70.7
Average Concentration (ng/mL) ± %RPD		23.3 ng/L± 14%		<2.50 ng/L		<2.49 ng/L		<2.50 ng/L	

		PFDoA		PFBS		PFHS		PFOS		PFOSA	
3M LIMS ID	Description	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery
E09-0365-034	Reach 4 Loc 12 Sample	<3.00	NA	24.4	NA	15.6	NA	23.0	NA	<2.99	NA
E09-0365-035	Reach 4 Loc 12 Sample Dup	<3.00	NA	29.4	NA	18.6	NA	26.5	NA	<2.99	NA
E09-0365-036[1]	Reach 4 Loc 12 Spike	18.5	83.3	49.7	101	41.5	101	39.0	64.1[4]	25.8	116
Average Concentration (ng/mL) ± %RPD		<3.00 ng/L		26.9 ng/L± 19%		17.1 ng/L± 18%		24.8 ng/L± 14%[5]		<2.99 ng/L	

NA = Not Applicable

(1) The FMS sample bottle was overfilled and the spike level was corrected accordingly.

(2) The relative percent difference (RPD) between the sample and sample duplicate exceeded method acceptance criteria of ≤20%.

(3) The sample and sample duplicate produced one result above the LOQ and one result below the LOQ. The reported average concentration represents only the result above the LOQ. A true average was not calculated.

(4) Field matrix spike did not meet method acceptance criteria of 100% ± 30%.

(5) The analytical uncertainty has been adjusted for the recovery of the FMS for PFOS to 100% ± 36%.

Table 20. Trip Blank.

		PFBA		PFPeA		PFHxA		PFHpA	
3M LIMS ID	Description	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery
E09-0365-037	Trip Blank Sample	<3.03	NA	<2.53	NA	<2.53	NA	<2.53	NA
E09-0365-038	Trip Blank 25 ppt Spike	26.3	104	27.5	109	27.0	107	27.7	110

		PFOA		PFNA		PFDA		PFUnA	
3M LIMS ID	Description	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery
E09-0365-037	Trip Blank Sample	<3.00	NA	<2.50	NA	<2.49	NA	<2.50	NA
E09-0365-038	Trip Blank 25 ppt Spike	26.6	107	22.4	89.6	18.3	73.4	16.5	66.1(1)

		PFDoA		PFBS		PFHS		PFOS		PFOSA	
3M LIMS ID	Description	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery	Concentration (ng/L)	%Recovery
E09-0365-037	Trip Blank Sample	<3.00	NA	<3.06	NA	<2.50	NA	<2.50	NA	<2.99	NA
E09-0365-038	Trip Blank 25 ppt Spike	12.1	48.3(1)	28.9	113	28.0	112	21.3	85.2	17.9	71.7

NA = Not Applicable
(1) Field matrix spike did not meet method acceptance criteria of 100% ± 30%.

5 Conclusion

Laboratory control spikes were used to determine the analytical method accuracy and precision for all analytes. The accuracy and precision were then used to estimate the method uncertainty for the results. Field or lab matrix spike recoveries demonstrated that the analytical method was appropriate for the given sample matrix. Analysis was completed following 3M Environmental Laboratory method ETS-8-154.3 "Determination of Perfluorinated Acids, Alcohols, Amides, and Sulfonates in Water by Solid Phase Extraction and High Performance Liquid Chromatography/Mass Spectrometry". Analytical results are reported in Table 1, 8, through 20 of this report.

6 Data / Sample Retention

All remaining sample and associated project data (hardcopy and electronic) will be archived according to 3M Environmental Laboratory standard operating procedures.

7 Signatures

8/13/09

Susan T. Wolf, 3M Principal Analytical Investigator — Date

13 AUG 2009

William K. Reagen, Ph.D., 3M Environmental Laboratory Manager — Date

The 3M Environmental Laboratory's Quality Assurance Unit has audited the data and report for this project.

08/12/09

Quality Assurance Representative — Date

Final Analytical Report

Perfluorochemical Analysis of Fish Fillet Homogenates Collected from the Mississippi River by the Minnesota Pollution Control Agency May 2009 – Phase I: PFOS

Laboratory Request Number: E09-0372

Method Requirement: ETS 8-45.0

Testing Laboratory

3M EHS Operations
3M Environmental Laboratory
3M Center
Building 260-5N-17
Maplewood, MN 55144

Requester

Gary Hohenstein
3M EHS Operations
3M Center
Building 224-5W-03
Maplewood, MN 55144

ACCREDITED
Certificate #2052-01

The testing reported herein meet the requirements of ISO/IEC 17025-2005 "General Requirements for the Competence of Testing and Calibration Laboratories", in accordance with the A2LA Certificate #2052-01. Testing that complies with this International Standard also operate in accordance with ISO 9001:2000.

3M Environmental Laboratory
3M Environmental Laboratory Manager: William K. Reagen, Ph.D.
3M Principal Analytical Investigator and Report Author: Michelle D. Malinsky, Ph.D.

Analytical Report E09-0372

Perfluorochemical Analysis of Fish Fillet Homogenates Collected from the Mississippi River by the Minnesota Pollution Control Agency May 2009 – Phase I: PFOS

Report Date: Upon Signing

1 Introduction

The Minnesota Pollution Control Agency (MPCA) submitted thirty fish fillet homogenates to the 3M Environmental Laboratory for perfluorochemical analysis under project number E09-0372. The thirty submitted samples represented an approximate ten percent split of the total samples collected during a May 2009 fish sampling campaign from Pool 2 of the Mississippi River. Five samples from six different species comprised the sample set. The fillet homogenates were extracted and analyzed using method ETS 8-45.0 "Determination of Fluorochemicals via Protein Precipitation of Fish Tissues (Fillet or Whole Body) and Analysis by High Performance Liquid Chromatography with Tandem Mass Spectrometry". The target analytes for this study included perfluoroalkane carboxylic acids ranging from C4 to C12, perfluoroalkane sulfonates (C4, C6, and C8), and perfluorooctanesulfonamide. This Phase report summarizes the results for perfluorooctane sulfonate (PFOS) only. The results for the other target analytes will be issued in a subsequent Phase II report.

The 3M Environmental Laboratory maintains A2LA accreditation to ISO/IEC 17025 for the specific tests/calibrations listed in A2LA Certificate #2052-01 and meets the relevant quality systems requirements of ISO 9001:2000. ETS 8-45.0 falls under the laboratory's current scope of accreditation. The data and final report were audited for compliance to laboratory's ISO/IEC17025 quality system.

Table 1 below summarizes the PFOS results. All results for quality control samples prepared and analyzed with the samples will be reported and discussed elsewhere in this report.

ACCREDITED

The testing reported herein meet the requirements of ISO/IEC 17025-2005 "General Requirements for the Competence of Testing and Calibration Laboratories", in accordance with the A2LA Certificate #2052-01. Testing that complies with this International Standard also operate in accordance with ISO 9001:2000.

Certificate #2052-01

Table 1. Sample Results Summary: PFOS

3M LIMS Number	*Sample Description*	*Species*	*River Location*	*[1]PFOS Conc. (ng/g)*
E09-0372-001	Axys ID- L12916-14, Client ID- 090191	Carp	Section 3	45.0
E09-0372-001 Dup	Axys ID- L12916-14, Client ID- 090191 Dup			46.5
			Average	**45.8**
			%RPD	**3.2**
E09-0372-002	Axys ID- L12916-24, Client ID- 090054	Carp	Section 1	27.1
E09-0372-002 Dup	Axys ID- L12916-24, Client ID- 090054 Dup			25.4
			Average	**26.3**
			%RPD	**6.3**
E09-0372-003	Axys ID- L12916-26, Client ID- 090056	Carp	Section 1	4.90
E09-0372-003 Dup	Axys ID- L12916-26, Client ID- 090056 Dup			5.79
			Average	**5.35**
			%RPD	**17**
E09-0372-004	Axys ID- L12917-3, Client ID- 090275	Carp	Section 4	96.1
E09-0372-004 Dup	Axys ID- L12917-3, Client ID- 090275 Dup			94.3
			Average	**95.2**
			%RPD	**1.9**
E09-0372-005	Axys ID- L12917-10, Client ID- 090282	Carp	Section 4	15.6
E09-0372-005 Dup	Axys ID- L12917-10, Client ID- 090282 Dup			17.0
			Average	**16.3**
			%RPD	**8.5**
E09-0372-006	Axys ID- L12917-17, Client ID- 090123	Carp	Section 2	17.9
E09-0372-006 Dup	Axys ID- L12917-17, Client ID- 090123 Dup			18.1
			Average	**18.0**
			%RPD	**1.2**
E09-0372-007	Axys ID- L12931-6, Client ID- 090173	Smallmouth Bass	Section 3	41.3
E09-0372-007 Dup	Axys ID- L12931-6, Client ID- 090173 Dup			39.8
			Average	**40.6**
			%RPD	**3.8**
E09-0372-008	Axys ID- L12931-14, Client ID- 090032	Smallmouth Bass	Section 1	26.9
E09-0372-008 Dup	Axys ID- L12931-14, Client ID- 090032 Dup			31.7
			Average	**29.3**
			%RPD	**16**
E09-0372-009	Axys ID- L12932-2, Client ID- 090094	Smallmouth Bass	Section 2	10.8
E09-0372-009 Dup	Axys ID- L12932-2, Client ID- 090094 Dup			13.2
			Average	**12.0**
			%RPD	**20**
E09-0372-010	Axys ID- L12932-4, Client ID- 090096	Smallmouth Bass	Section 2	15.1
E09-0372-010 Dup	Axys ID- L12932-4, Client ID- 090096 Dup			14.4
			Average	**14.8**
			%RPD	**4.2**

Table 1 Continued.

3M LIMS Number	*Sample Description*	*Species*	*River Location*	*[1]PFOS Conc. (ng/g)*
E09-0372-011	Axys ID- L12932-9, Client ID- 090042	Smallmouth Bass	Section 1	13.7
E09-0372-011 Dup	Axys ID- L12932-9, Client ID- 090042 Dup			15.3
			Average	**14.5**
			%RPD	**11**
E09-0372-012	Axys ID- L12932-26, Client ID- 090248	Smallmouth Bass	Section 4	[2]581
E09-0372-012 Dup	Axys ID- L12932-26, Client ID- 090248 Dup			[2]558
			Average	**[2]570**
			%RPD	**4.0**
E09-0372-013	Axys ID- L12933-18, Client ID- 090064	White Bass	Section 2	52.0
E09-0372-013 Dup	Axys ID- L12933-18, Client ID- 090064 Dup			56.4
			Average	**54.2**
			%RPD	**8.1**
E09-0372-014	Axys ID- L12933-20, Client ID- 090066	White Bass	Section 2	71.5
E09-0372-014 Dup	Axys ID- L12933-20, Client ID- 090066 Dup			71.0
			Average	**71.3**
			%RPD	**0.82**
E09-0372-015	Axys ID- L12933-25, Client ID- 090071	White Bass	Section 2	65.0
E09-0372-015 Dup	Axys ID- L12933-25, Client ID- 090071 Dup			62.2
			Average	**63.6**
			%RPD	**4.5**
E09-0372-016	Axys ID- L12934-10, Client ID- 090024	White Bass	Section 1	47.7
E09-0372-016 Dup	Axys ID- L12934-10, Client ID- 090024 Dup			50.9
			Average	**49.3**
			%RPD	**6.6**
E09-0372-017	Axys ID- L12934-12, Client ID- 090026	White Bass	Section 1	71.7
E09-0372-017 Dup	Axys ID- L12934-12, Client ID- 090026 Dup			65.8
			Average	**68.7**
			%RPD	**8.5**
E09-0372-018	Axys ID- L12934-18, Client ID- 090017	White Bass	Section 1	86.4
E09-0372-018 Dup	Axys ID- L12934-18, Client ID- 090017 Dup			82.4
			Average	**84.4**
			%RPD	**4.7**
E09-0372-019	Axys ID- L12945-1, Client ID- 090153	Fresh Water Drum	Section 3	113
E09-0372-019 Dup	Axys ID- L12945-1, Client ID- 090153 Dup			103
			Average	**108**
			%RPD	**9.1**
E09-0372-020	Axys ID- L12945-4, Client ID- 090167	Fresh Water Drum	Section 3	82.1
E09-0372-020 Dup	Axys ID- L12945-4, Client ID- 090167 Dup			82.3
			Average	**82.2**
			%RPD	**0.24**

Table 1 Continued.

3M LIMS Number	*Sample Description*	*Species*	*River Location*	*[1]PFOS Conc. (ng/g)*
E09-0372-021	Axys ID- L12945-14, Client ID- 090241	Fresh Water Drum	Section 4	24.6
E09-0372-021 Dup	Axys ID- L12945-14, Client ID- 090241 Dup			22.5
			Average	**23.6**
			%RPD	**8.9**
E09-0372-022	Axys ID- L12945-16, Client ID- 090078	Fresh Water Drum	Section 2	74.9
E09-0372-022 Dup	Axys ID- L12945-16, Client ID- 090078 Dup			80.4
			Average	**77.7**
			%RPD	**7.2**
E09-0372-023	Axys ID- L12945-19, Client ID- 090081	Fresh Water Drum	Section 2	41.3
E09-0372-023 Dup	Axys ID- L12945-19, Client ID- 090081 Dup			32.9
			Average	**37.1**
			%RPD	**23**
E09-0372-024	Axys ID- L12945-30, Client ID- 090009	Fresh Water Drum	Section 1	14.7
E09-0372-024 Dup	Axys ID- L12945-30, Client ID- 090009 Dup			13.7
			Average	**14.2**
			%RPD	**7.0**
E09-0372-025	Axys ID- L12947-7, Client ID- 090266	Bluegill Sunfish	Section 3	34.5
E09-0372-025 Dup	Axys ID- L12947-7, Client ID- 090266 Dup			32.1
			Average	**33.3**
			%RPD	**7.2**
E09-0372-026	Axys ID- L12947-8, Client ID- 090267	Bluegill Sunfish	Section 3	55.1
E09-0372-026 Dup	Axys ID- L12947-8, Client ID- 090267 Dup			55.5
			Average	**55.3**
			%RPD	**0.75**
E09-0372-027	Axys ID- L12947-13, Client ID- 090111	Bluegill Sunfish	Section 2	40.6
E09-0372-027 Dup	Axys ID- L12947-13, Client ID- 090111 Dup			40.0
			Average	**40.3**
			%RPD	**1.5**
E09-0372-028	Axys ID- L12947-25, Client ID- 090205	Bluegill Sunfish	Section 4	93.2
E09-0372-028 Dup	Axys ID- L12947-25, Client ID- 090205 Dup			80.6
			Average	**86.9**
			%RPD	**14**
E09-0372-029	Axys ID- L12947-26, Client ID- 090206	Bluegill Sunfish	Section 4	31.4
E09-0372-029 Dup	Axys ID- L12947-26, Client ID- 090206 Dup			28.2
			Average	**29.8**
			%RPD	**11**
E09-0372-030	Axys ID- L12948-17, Client ID- 090061	Bluegill Sunfish	Section 1	[3]129
E09-0372-030 Dup	Axys ID- L12948-17, Client ID- 090061 Dup			[3]141
			Average	**[3]135**
			%RPD	**8.9**

(1) Unless otherwise specified, the recovery of associated laboratory matrix spike (LMS) was within 100±30% which meets ETS 8-45.0 method acceptance criteria. Sample results are considered accurate to within the overall analytical method uncertainty 100±18% (PFOS). See Section 4.9 *Determination of Analytical Method Uncertainty* for more information. Sample results are reported to three significant figures and %RPD to two significant figures. Additional significant

figures were used to calculate the average, %RPD, and %recovery. Values in the raw data may vary slightly due to rounding.
(2) Sample results were reported from a 1:100 post-extraction dilution.
(3) LMS recovery was 67.4%, sample accuracy has been adjusted to 100±50%.

2 Study and Sample Information

2.1 Target Analytes.

Table 2 below provides pertinent information regarding the target analytes, internal standards, and surrogate recovery standards investigated in this study. Surrogate recovery standards were separate isotopically compounds spiked into each sample aliquot prior to extraction. The recovery of the surrogate was used to evaluate the overall extraction process and any potential matrix effects.

Table 2. Target Analyte Summary.

Compound Name	*Synonym or Acronym*	*Formula*	*Analytical Purpose*	*Reference Standard Source*
Perfluorobutanoic acid	PFBA (C4 Acid)	C_3F_7COOH	Target	Aldrich
Perfluoropentanoic acid	PFPeA (C5 Acid)	C_4F_9COOH	Target	Alfa Aesar
Perfluorohexanoic acid	PFHxA (C6 Acid)	$C_5F_{11}COOH$	Target	Oakwood Products
Perfluoroheptanoic acid	PFHpA (C7 Acid)	$C_6F_{13}COOH$	Target	Aldrich
Perfluorooctanoic acid	PFOA (C8 Acid)	$C_7F_{15}COOH$	Target	L-PFOA (linear) Wellington Labs
		$C_7F_{15}COO^-NH_4^+$		ECF PFOA (branched) 3M Production Lot 332
Perfluorononanoic acid	PFNA (C9 Acid)	$C_8F_{17}COOH$	Target	Oakwood Products
Perfluorodecanoic acid	PFDA (C10 Acid)	$C_9F_{19}COOH$	Target	Oakwood Products
Perfluoroundecanoic acid	PFUnA (C11 Acid)	$C_{10}F_{21}COOH$	Target	Oakwood Products
Perfluorododecanoic acid	PFDoA (C12 Acid)	$C_{11}F_{23}COOH$	Target	Oakwood Products
Perfluorobutane sulfonate	PFBS (C4 Sulfonate)	$C_4F_9SO_3^-K^+$	Target	3M Production Lot 2
Perfluorohexane sulfonate	PFHS (C6 Sulfonate)	$C_6F_{13}SO_3^-Na^+$	Target	L-PFHS (linear) Wellington Labs
Perfluorooctane sulfonate	PFOS (C8 Sulfonate)	$C_8F_{17}SO_3^-K^+$	Target	L-PFOS (linear) Wellington Labs
		$C_8F_{17}SO_3^-K^+$		ECF PFOS (branched) 3M Production Lot 217
Perfluorooctanesulfonamide	FOSA (C8 Sulfonamide)	$C_8F_{17}SO_2NH_2$	Target	3M (L-15709)

Table 2 Continued.

Compound Name	*Synonym or Acronym*	*Formula*	*Analytical Purpose*	*Reference Standard Source*
$^{13}C_4$-Perfluorobutanoic acid	[1,2,3,4-$^{13}C_4$]PFBA	$^{13}CF_3(^{13}CF_2)_2{}^{13}COOH$	IS	Wellington Labs
$^{13}C_2$-Perfluorohexanoic acid	[1,2 -$^{13}C_2$]PFHxA	$CF_3(CF_2)_3(^{13}CF_2)^{13}COOH$	IS	Wellington Labs
$^{13}C_4$-Perfluorooctanoic acid	[1,2,3,4-$^{13}C_4$]PFOA	$CF_3(CF_2)_3(^{13}CF_2)_3{}^{13}COOH$	IS	Wellington Labs
$^{13}C_5$-Perfluorononanoic acid	[1,2,3,4,5-$^{13}C_5$]PFNA	$CF_3(CF_2)_3(^{13}CF_2)_4{}^{13}COOH$	IS	Wellington Labs
$^{13}C_2$-Perfluorodecanoic acid	[1,2 -$^{13}C_2$]PFDA	$CF_3(CF_2)_7(^{13}CF_2)^{13}COOH$	IS	Wellington Labs
$^{13}C_2$-Perfluoroundecanoic acid	[1,2 -$^{13}C_2$]PFUnA	$CF_3(CF_2)_8(^{13}CF_2)^{13}COOH$	IS	Wellington Labs
$^{13}C_2$-Perfluorododecanoic acid	[1,2 -$^{13}C_2$]PFDoA	$CF_3(CF_2)_9(^{13}CF_2)^{13}COOH$	IS	Wellington Labs
$^{18}O_2$-Ammonium Perfluorobutane sulfonate	[$^{18}O_2$]PFBS	$[C_4F_9S^{18}O_2O]^-NH_4^+$	IS	RTI International
$^{18}O_2$-Ammonium Perfluorohexane sulfonate	[$^{18}O_2$]PFHS	$[C_6F_{13}S^{18}O_2O]^-NH_4^+$	IS	Wellington Labs
$^{13}C_4$-Sodium Perfluorooctane sulfonate	[1,2,3,4-$^{13}C_4$]PFOS	$CF_3(CF_2)_3(^{13}CF_2)_3{}^{13}CF_2SO_3^-$ Na^+	IS	Wellington Labs
$^{18}O_2$-Perfluorooctanesulfonamide	[$^{18}O_2$]FOSA	$[C_8F_{17}S^{18}O_2NH_2]$	IS	RTI International
$^{13}C_2$-Perfluorooctanoic acid	[1,2-$^{13}C_2$]PFOA	$CF_3(CF_2)_5(^{13}CF_2)^{13}COOH$	Surrogate	Perkin Elmer
$^{18}O_2$-Ammonium Perfluorooctane sulfonate	[$^{18}O_2$]PFOS	$[C_8F_{17}S^{18}O_2O]^-NH_4^+$	Surrogate	RTI International

2.2 Sample Collection and Receipt.

On August 6, 2009, the 3M Environmental Laboratory received the homogenized fillet samples in Nalgene bottles on dry ice. The samples were logged into the 3M Environmental Laboratory LIMS system under project E09-0372 and placed in frozen storage. No information was provided regarding the sampling date.

It should be noted that these fish samples have been previously handled and analyzed at another laboratory under contract by the MPCA. It is unknown how these samples have been handled and if the integrity of these samples has been comprised prior to receipt.

3M Environmental Laboratory personnel removed the homogenized fish tissue from the sample container by cutting the bottle away from the frozen sample mass using a clean utility knife. The frozen sample mass was then rehomogenized before extraction. See Section 3.1 for more information. Based on the sample consistency in the Nalgene bottles, it appeared that the sample homogenates had thawed at some point before they arrived at the 3M Environmental Laboratory. (Homogenized tissue had refrozen into a solid mass that could not be broken up while frozen in the container.)

3 Methods - Analytical and Preparatory

3.1 Tissue Preparation

Each submitted sample and bluegill fillet control tissue (TN08-0220-1/1) purchased from Osage Catfisheries, Inc. (Osage Beach, MO) were rehomogenized frozen using dry ice.

Frozen fish homogenate was added to a pre-chilled stainless steel bowl of a Robot Coupe RSI 2Y-1 vertical batch processor and homogenized with dry ice until a fine powder consistency was reached. After homogenization, the ground fish tissue was transferred to a polyethylene bag which was placed in the freezer at -20°C unsealed overnight to allow the residual carbon dioxide to sublime. After sublimation, the bag was sealed and homogenates were kept frozen.

3.2 Sample Extraction

A 0.25 g sub-sample of the fish tissue homogenate was accurately weighed in a 50 mL polyethylene centrifuge tube. Tissue aliquots were then spiked with internal standards (ISs) and surrogates to produce an approximate concentration of 1 ng/g. Samples designated as lab matrix spikes or matrix-matched calibration standards were additionally spiked with the target and surrogate analytes at appropriate levels to produce the desired tissue concentrations. Samples intended for laboratory QC (laboratory control matrix spikes) were spiked with surrogates at 1 ng/g and the other target analytes at approximately 0.5 ng/g, 1.5 ng/g, and 8 ng/g. After spiking, the tissue homogenates were allowed to sit for 30 minutes before 2.5 mL of acetonitrile was added. The samples were then thoroughly homogenized with the acetonitrile using an Omni Prep multi-place homogenizer with disposable plastic probes (15,000 rpm for 2 minutes). The acetonitrile/tissue extracts were then placed in a freezer at -20°C for at least one hour. Upon removal from the freezer, sample extracts were centrifuged at a targeted temperature of -5°C for 20 minutes at 3000 rpm.

After centrifugation, 1 mL of clarified supernatant was transferred to a 2 mL autovial spiked with 10 µL of 10% formic acid. Autovials were then capped and vortex mixed.

Samples were extracted in three separate batches. For each submitted sample, a sample, sample duplicate, and laboratory matrix spike (LMS) were prepared. Each extraction batch included the following quality control samples:

- a thirteen point extracted matrix calibration curve using the purchased bluegill fillet control tissue
- triplicate lab control spikes of the bluegill fillet control tissue at three levels of all target analytes (0.5 ng/g, 1.5 ng/g, and 8 ng/g)
- triplicate lab control spikes of 3M electrochemical fluorination (ECF) PFOA and PFOS at 5 ng/g
- triplicate lab control spikes of PFOS only at 100 ng/g
- duplicate control matrix blanks with and without internal standards and surrogates
- duplicate method (aqueous) blanks with and without internal standards and surrogates

The table below summarizes the preparation dates and samples prepared in each batch.

Table 3. Sample Preparation Summary.

Batch Number	*Preparation Dates*	*Samples*
Batch 1	8/25/2009 – 8/26/2009	E09-0372-001 to E09-0372-010
Batch 2	8/27/2009 – 8/28/2009	E09-0372-021 to E09-0372-030
Batch 3	8/31/2009 – 9/1/2009	E09-0372-011 to E09-0372-020

3.3 Analysis

Analysis for the PFCs listed in Table 2 was performed using high performance liquid chromatography-tandem mass spectrometry (HPLC/MS/MS). For this investigation, samples were analyzed using an Agilent 1100 series (Palo Alto, CA) HPLC system interfaced to either a PE SCIEX API 4000 triple quadrupole or SCIEX API 4000 Q-Trap mass spectrometer (Foster City, CA). Both instruments were equipped with a SCIEX Turbo V ion-spray interface operating in the negative ion MS/MS mode using multiple reaction monitoring (MRM). Analyst™ 1.4.2 software was used for all data collection and

reduction. Table 4 lists the MRM transitions monitored for each analyte. A Thermo Scientific PRISM RP guard column (2.1mm × 50 mm; 5µ particle size) was placed in-line after the purge valve and before the sample injection port to trap any PFC contaminants coming from the HPLC instrument and/or the mobile phases. This sufficiently separated the elution of the "system" PFC peaks from those present in the sample extracts.

Table 4. MRM Transition Summary.

Compound	*Analyte Description*	*(1)MRM Transition(s)*	*Dwell Time (ms)*
PFBA (C4 Acid)	Target	213>169	100
PFPeA (C5 Acid)	Target	263>219	100
PFHxA (C6 Acid)	Target	313>269	100
		313>119	100
PFHpA (C7 Acid)	Target	363>319	50
		363>169	50
PFOA (C8 Acid)	Target	413>369	50
		413>219	50
		413>169	50
PFNA (C9 Acid)	Target	463>419	50
		463>219	50
		463>169	50
PFDA (C10 Acid)	Target	513>469	50
		513>269	50
		513>219	50
PFUnA (C11 Acid)	Target	563>519	50
		563>269	50
		563>219	50
PFDoA (C12 Acid)	Target	613>569	50
		613>319	50
		613>169	50
PFBS (C4 Sulfonate)	Target	299>80	50
		299>99	50
PFHS (C6 Sulfonate)	Target	399>80	50
		399>99	50
PFOS (C8 Sulfonate)	Target	499>80	50
		499>99	50
		499>130	50
FOSA (C8 Sulfonamide)	Target	498>78	50
[1,2,3,4 -$^{13}C_4$]PFBA	IS for PFBA and PFPeA	217>172	100
[1,2 -$^{13}C_2$]PFHxA	IS for PFHxA	315>270	100
[1,2,3,4-$^{13}C_4$]PFOA	IS for PFHpA and PFOA	417>372	50
[1,2,3,4,5-$^{13}C_5$]PFNA	IS for PFNA	468>423	50
[1,2 -$^{13}C_2$]PFDA	IS for PFDA	515>470	50
[1,2 -$^{13}C_2$]PFUnA	IS for PFUnA	565>520	50
[1,2 -$^{13}C_2$]PFDoA	IS for PFDoA	615>570	50
[$^{18}O_2$]PFBS	IS for PFBS	303>84	50
[$^{18}O_2$]PFHS	IS for PFHS	403>84	50
[1,2,3,4- $^{13}C_4$]PFOS	IS for PFOS	503>80	50
[$^{18}O_2$]FOSA	IS for FOSA	502>82	50
[1,2 - $^{13}C_2$]PFOA	Surrogate (Acids)	415>370	50
[$^{18}O_2$]PFOS	Surrogate(Sulfonates, FOSA)	503>84	50

Analysis of the short-chain acids (C4 through C6) was performed using a Thermo Scientific PRISM RP column (2.1mm × 50 mm; 5 μ particle size) held at 30°C with the mobile phase system consisting of 5 mM ammonium acetate with 0.01% acetic acid in water (A) and methanol (B). The gradient used to elute the analytes of interest is presented in Table 5. The flow rate was held at 300 μL/min throughout the run and a 20 μL injection volume was used. The outlet of the analytical column was directed to a column switching valve where the first three minutes of the run were diverted to waste. After three minutes, the valve was switched to direct the effluent to the mass spectrometer for analysis.

The large-chain acids (C7 through C12), the sulfonates, and FOSA were analyzed using a Thermo Scientific Betasil™ C18 analytical column (2.1mm × 100 mm; 5μ particle size) held at 30°C with the mobile phase system consisting of 2 mM ammonium acetate in water (A) and acetonitrile (B). The gradient used is also provided in Table 5. The flow rate was held at 400 μL/min throughout the run and a 25 μL injection volume was used. Samples were injected onto a Waters (Milford, MA) Oasis® HLB on-line extraction column (3.0 mm × 20 mm, 25 μ particle size) with the outlet directed to a column switching valve where the first five minutes were diverted to waste. After five minutes, the valve was switched and the effluent was directed to the analytical column for separation of the target analytes and analysis by the mass spectrometer.

Table 5. LC Gradient Parameters.

Small Acids: C4-C6				*Large Acids: C7-C12; Sulfonates, FOSA*			
Step	*Total Time (min)*	*%A*	*%B*	*Step*	*Total Time (min)*	*%A*	*%B*
0	0.0	90	10	0	0.0	97	3.0
1	3.0	90	10	1	3.0	97	3.0
2	3.5	30	70	2	3.5	70	30
3	9.0	5.0	95	3	13.5	40	60
4	15.0	5.0	95	4	15.5	40	60
5	15.1	90	10	5	16.0	10	90
6	19.0	90	10	6	18.0	10	90
				7	18.3	97	3.0
				8	21.0	97	3.0
A	5 mM ammonium acetate with 0.01% acetic acid (aq)			A	2 mM ammonium acetate (aq)		
B	Methanol			B	Acetonitrile		

To manage the large number of transitions required for the large acids, sulfonates, and FOSA, a multiperiod method was constructed. The *first period (time=0 minutes to 11 minutes) collected the transitions for PFBS, PFHpA, PFOA, [1,2 - $^{13}C_2$]PFOA, PFHS, PFNA and their respective ISs. The second period (time=11 min to 21.0 minutes) collected the transitions for PFDA, PFUnA, PFOS, [$^{18}O_2$]PFOS, PFDoA, and FOSA and their respective ISs. For analytes where more than one transition was acquired, a total ion chromatogram (TIC) which summed the respective transitions for that analyte was used analyze the data.

*Exact location of the period break may vary as individual analytical columns may perform differently or if instrument tubing is changed.

4 Data Analysis

4.1 Calibration

Extracted *matrix-matched calibration standards and QCs were prepared by spiking known amounts of target analytes, surrogates, and internal standards into individual 0.25 g aliquots of bluegill fillet control tissue (TN08-0202-1/1) fish tissue homogenate. Each spiked fish aliquot was then extracted using the procedures outlined in Section 3.2. A total of thirteen spiked standards ranging from 0.25 ng/g to 300 ng/g (nominal) were prepared. Additionally, an unextracted acetonitrile solvent curve ranging from 0.0025 ng/mL to 50 ng/mL was also prepared which is equivalent to 0.025 ng/g to 500 ng/g tissue concentration. All sample results for PFOS and [$^{18}O_2$]PFOS were quantitated against the extracted, matrix-matched calibration curve. To demonstrate equivalency, the laboratory control QC samples were quantitated using the solvent curve. The recoveries of the QC samples quantitated against the unextracted acetonitrile calibration curve are provided in the Supplemental Information Section 10.2 .

A quadratic, 1/x weighted calibration curve was used to fit the data for PFOS and [$^{18}O_2$]PFOS. Internal standard quantitation was used. The data was not forced through zero during the fitting process. The accuracy of each curve point was verified by back-calculating the concentration using the area count ratio of the target analyte to the internal standard. Each solvent calibration standard used to generate the final calibration curve met the method calibration accuracy requirement of 100±25%, except the LOQ standard (100±30%). The coefficients of determination (r^2) were greater than 0.990 for all analytes. As required by ETS 8-45, a minimum of six calibration points were used to generate the final calibration curve.

For PFHS, PFOS, and PFOA, the reference standard used for calibration and lab control spikes was comprised predominantly of the linear isomer. A separate set of LCSs using an electrochemical fluorination (ECF) source of PFOS and PFOA was also included.

*As fish matrix can vary greatly from species to species, the control matrix used to generate the extracted calibration curve and laboratory control QC samples is considered to be matrix-matched for the bluegill samples only. The laboratory control matrix should be considered as a "surrogate" control matrix for the other species investigated in this study.

4.2 Limit of Quantitation (LOQ)

The LOQ as defined in ETS 8-45 is the lowest non-zero calibration standard in the curve in which the area counts of the target analyte are at least twice those of the matrix blank(s). Since PFOS was detected in the control matrix at a measurable level, the method of standard addition was used to determine the endogenous concentration. The resultant endogenous concentration was then used to correct the PFOS concentration in the extracted calibration standards and QC samples.

4.3 System Suitability

Three replicate injections of a solvent calibration standard were analyzed at the beginning of the analytical sequence to demonstrate overall system suitability. Method criteria states that system suitability injections shall produce a RSD of less than 7% for the ratio of target analyte area counts to internal standard area counts and an RSD of less than 2% for the retention time. Method acceptance criteria were met for both PFOS and [$^{18}O_2$]PFOS for the samples analyzed in the first and third prep batches. The %RSDs of the area count ratio in the second prep batch analysis were 10% and 11% for PFOS and [$^{18}O_2$]PFOS, respectively.

A method deviation has been issued and is included in the data package. The overall impact to the sample results is considered minimal. An increase in variability in the area count precision is often observed with an increased number of MRM transitions collected within a given period of the data acquisition method. With a large number of MRMs, fewer scans across the chromatographic peak are collected and overall peak shape can vary more from injection to injection. However, the calibration

curve, QCs, and samples all experience the same conditions. Any increased variability observed in the system suitability injections would also be observed in the LCS data which is used to determine overall method uncertainty. Thus, the variability is accounted for in the assigned method uncertainty reported with the sample results.

4.4 Continuing Calibration

During the course of the analytical sequence, several continuing calibration verification samples (CCVs) were analyzed to confirm that the instrument response from initial calibration curve was still in control. CCV injections produced recoveries of PFOS and [$^{18}O_2$]PFOS within 100%±25%, which met method criteria.

4.5 Blanks

Five types of blanks were prepared and analyzed with the samples: matrix blanks of bluegill fillet control tissue (two with IS and surrogate, two without IS and surrogate), aqueous method blanks (two with IS and surrogate, two without IS and surrogate), acidified acetonitrile solvent blanks, acetonitrile blanks with internal standards and surrogates, and acetonitrile solvent blanks (unmodified). Each blank result was reviewed and used to evaluate method performance to determine the LOQ for each analyte. Surrogate recoveries of spiked blanks are provided in the Supplemental Information Section 10.3.

4.6 Lab Control Spikes (LCSs)

Triplicate lab control spikes of the purchased bluegill fillet control matrix at three different levels for all analytes were prepared each extraction day to determine analytical method uncertainty (See Section 4.9). For PFHS, PFOS, and PFOA, the standard reference material used for the LCS spikes was the linear isomer, which was the same used for the calibration curves. Additional triplicate PFOS LCSs at 100 ng/g were prepared. Separate 3M electrochemical fluorination (ECF) spikes of branched PFOS and PFOA were prepared to evaluate any potential bias from quantitation against a linear standard. Lab control spikes were prepared to evaluate method accuracy and precision and were used to determine analytical method uncertainty (See Section 4.9). The [$^{18}O_2$]PFOS surrogate was spiked at a consistent 1 ng/g (0.1 ng/mL) for all LCS samples. For PFOS, the spiked concentration was corrected for the average PFOS concentration determined for the control matrix in the same extraction batch. Lab control spike recoveries are provided in the Supplemental Information (Section 10.1). For both PFOS and [$^{18}O_2$]PFOS, all replicates (N=45) produced recoveries within method acceptance criteria 100%±25%.

4.7 Sample Concentration Calculation

The extracted calibration curve used for quantitation provided extract concentration in units of ng/mL. The following equation was used to convert the extract concentration to sample tissue concentration in units of ng/g.

$$\text{Tissue Concentration}\left(\frac{ng}{g}\right) = \frac{\text{Extract Concentration}\left(\frac{ng}{mL}\right) * \text{ExtractionVolume(mL)}}{\text{Extracted Mass (g)}}$$

Extraction Volume = 2.5 mL
Extracted Mass ~0.25 g

4.8 Lab Matrix Spikes (LMSs)

For each submitted sample, a separate laboratory matrix spike was prepared by extracting a separate aliquot of the fillet tissue that was spiked with the target analytes. For each LMS, all target analytes were spiked at a nominal concentration of 10 ng/g except PFOS, which was spiked at a concentration of approximately 110 ng/g. The recovery of the LMS was calculated using the following equation.

$$\text{LMS \%Recovery} = \frac{\left(\text{Extract Conc.}\left(\frac{\text{ng}}{\text{mL}}\right) * \text{ExtractionVolume(mL)}\right) - \left(\text{Average Sample Conc.}\left(\frac{\text{ng}}{\text{g}}\right) * \text{LMS Sample Mass (g)}\right)}{\text{Spike Amount (ng)}} * 100\%$$

Although ETS 8-45.0 does not provide specific criteria for the lab matrix spike concentrations, the 3M Environmental Laboratory uses a general guideline that lab matrix spike concentration should be at least half the endogenous concentration before the spike is considered "appropriate" for the given matrix. For PFOS, the LMS was 27.6 ng (~110 ng/g tissue concentration) except for samples E09-0372-012 where the LMS was 128 ng (~510 ng/g tissue concentration). The [$^{18}O_2$]PFOS surrogate was spiked at 0.261 ng (~1 ng/g tissue concentration).

4.9 Analytical Uncertainty

ETS 8-45.0 states that the analytical method uncertainty will be determined by statistical evaluation of the individual analyte recoveries in LCSs. Current project QC results, as well as historical values, are used in the evaluation until a maximum of fifty points (minimum of twenty, if possible) are included. For ETS 8-45.0, the historical LCSs are categorized by tissue type: whole-body or fillet unless there is strong evidence suggesting that a species-specific matrix effect is present and that results from these species should be considered separately. The standard deviation of the collective recovery results (in %) is calculated. The expanded uncertainty is then calculated by multiplying the standard deviation by a factor of two, which corresponds to the 95% confidence limit. Table 6 below provides the analytical uncertainty for PFOS and the [$^{18}O_2$]PFOS surrogate.

Table 6. Analytical Method Uncertainty

	PFOS	*[$^{18}O_2$]PFOS Surrogate*
Average % Recovery	101	106
Standard Deviation	9.17	8.73
2*Standard Deviation	18.3	17.46
N	50 (45 Bluegill fillets, 5 Walleye fillets)	50 (45 Bluegill fillets, 5 Walleye fillets)
Analytical Uncertainty	***±18%***	***±17%***

5 Data Summary and Discussion

Table 7 below provides the sample and lab matrix spike results for PFOS and the [$^{18}O_2$]PFOS surrogate quantitated using the extracted calibration curve prepared in bluegill fillet control tissue. All samples produced PFOS LMS recoveries within method acceptance criteria of 100±30% except for . E09-0372-030 (67.4%). The analytical uncertainty for this sample has been adjusted to 100±50%. In general, most samples produced surrogate recoveries within 100±30%. Exceptions have been flagged appropriately in the data table. ETS 8-45.0 specifies no acceptance criteria for surrogate recoveries as the intent of the surrogate is to evaluate systematic biases or interferences that may be present.

The recoveries of the 3M ECF LCSs prepared with each extraction batch (N=9 for the study) ranged from 98.9% to 114% with a calculated average of 107% (4.7% RSD). See Section 10.1. The results of the ECF QC spikes demonstrated that there is no discernible bias when PFOS ECF isomers are quantitated against the predominantly linear reference standard. Therefore, the reported PFOS values are considered accurate to within the stated method uncertainty regardless of the degree of branched PFOS isomers present in the sample extracts.

Table 7. Sample and Lab Matrix Spike Results: PFOS and [$^{18}O_2$]PFOS surrogate.

3M LIMS Number	*Sample Description*	*Species*	*River Location*	*Mass Extracted (g)*	*(1)PFOS Conc. (ng/g)*	*PFOS LMS % Recovery*	*%Recovery [$^{18}O_2$]PFOS*
E09-0372-001	Axys ID- L12916-14, Client ID- 090191	Carp	Section 3	0.2403	45.0	NA	95.8
E09-0372-001 Dup	Axys ID- L12916-14, Client ID- 090191 Dup			0.2344	46.5	NA	89.8
E09-0372-001 LMS	Axys ID- L12916-14, Client ID- 090191 LMS			0.2584	168	115	98.7
			Average		**45.8**		**94.8**
			%RPD/%RSD		**3.2**		**4.8**
E09-0372-002	Axys ID- L12916-24, Client ID- 090054	Carp	Section 1	0.2555	27.1	NA	104
E09-0372-002 Dup	Axys ID- L12916-24, Client ID- 090054 Dup			0.2613	25.4	NA	86.8
E09-0372-002 LMS	Axys ID- L12916-24, Client ID- 090054 LMS			0.2475	152	112	98.7
			Average		**26.3**		**96.6**
			%RPD/%RSD		**6.3**		**9.3**
E09-0372-003	Axys ID- L12916-26, Client ID- 090056	Carp	Section 1	0.2468	4.90	NA	95.6
E09-0372-003 Dup	Axys ID- L12916-26, Client ID- 090056 Dup			0.2328	5.79	NA	106
E09-0372-003 LMS	Axys ID- L12916-26, Client ID- 090056 LMS			0.2508	124	108	103
			Average		**5.35**		**101**
			%RPD/%RSD		**17**		**5.4**
E09-0372-004	Axys ID- L12917-3, Client ID- 090275	Carp	Section 4	0.2364	96.1	NA	96.8
E09-0372-004 Dup	Axys ID- L12917-3, Client ID- 090275 Dup			0.2512	94.3	NA	95.8
E09-0372-004 LMS	Axys ID- L12917-3, Client ID- 090275 LMS			0.2633	221	120	103
			Average		**95.2**		**98.4**
			%RPD/%RSD		**1.9**		**3.7**
E09-0372-005	Axys ID- L12917-10, Client ID- 090282	Carp	Section 4	0.2690	15.6	NA	95.4
E09-0372-005 Dup	Axys ID- L12917-10, Client ID- 090282 Dup			0.2604	17.0	NA	94.2
E09-0372-005 LMS	Axys ID- L12917-10, Client ID- 090282 LMS			0.2632	124	103	95.8
			Average		**16.3**		**95.1**
			%RPD/%RSD		**8.5**		**0.90**

Table 7 Continued.

3M LIMS Number	Sample Description	Species	River Location	Mass Extracted (g)	(1)PFOS Conc. (ng/g)	PFOS LMS % Recovery	%Recovery [$^{18}O_2$]PFOS
E09-0372-006	Axys ID- L12917-17, Client ID- 090123	Carp	Section 2	0.2638	17.9	NA	95.8
E09-0372-006 Dup	Axys ID- L12917-17, Client ID- 090123 Dup			0.2482	18.1	NA	82.9
E09-0372-006 LMS	Axys ID- L12917-17, Client ID- 090123 LMS			0.2594	119	94.5	89.9
			Average		**18.0**		**89.5**
			%RPD/%RSD		**1.2**		**7.2**
E09-0372-007	Axys ID- L12931-6, Client ID- 090173	Smallmouth Bass	Section 3	0.2414	41.3	NA	88.6
E09-0372-007 Dup	Axys ID- L12931-6, Client ID- 090173 Dup			0.2563	39.8	NA	88.1
E09-0372-007 LMS	Axys ID- L12931-6, Client ID- 090173 LMS			0.2689	139	96.4	91.4
			Average		**40.6**		**89.4**
			%RPD/%RSD		**3.8**		**2.0**
E09-0372-008	Axys ID- L12931-14, Client ID- 090032	Smallmouth Bass	Section 1	0.2607	26.9	NA	97.7
E09-0372-008 Dup	Axys ID- L12931-14, Client ID- 090032 Dup			0.2507	31.7	NA	118
E09-0372-008 LMS	Axys ID- L12931-14, Client ID- 090032 LMS			0.2601	134	98.3	101
			Average		**29.3**		**105**
			%RPD/%RSD		**16**		**10**
E09-0372-009	Axys ID- L12932-2, Client ID- 090094	Smallmouth Bass	Section 2	0.2375	10.8	NA	90.5
E09-0372-009 Dup	Axys ID- L12932-2, Client ID- 090094 Dup			0.2699	13.2	NA	101
E09-0372-009 LMS	Axys ID- L12932-2, Client ID- 090094 LMS			0.2688	113	97.9	98.7
			Average		**12.0**		**96.6**
			%RPD/%RSD		**20**		**5.5**
E09-0372-010	Axys ID- L12932-4, Client ID- 090096	Smallmouth Bass	Section 2	0.2622	15.1	NA	103
E09-0372-010 Dup	Axys ID- L12932-4, Client ID- 090096 Dup			0.2561	14.4	NA	105
E09-0372-010 LMS	Axys ID- L12932-4, Client ID- 090096 LMS			0.2434	130	102	106
			Average		**14.8**		**105**
			%RPD/%RSD		**4.2**		**1.4**
E09-0372-011	Axys ID- L12932-9, Client ID- 090042	Smallmouth Bass	Section 1	0.2430	13.7	NA	101
E09-0372-011 Dup	Axys ID- L12932-9, Client ID- 090042 Dup			0.2548	15.3	NA	116
E09-0372-011 LMS	Axys ID- L12932-9, Client ID- 090042 LMS			0.2483	134	107	111
			Average		**14.5**		**109**
			%RPD/%RSD		**11**		**7.2**

Table 7 Continued.

3M LIMS Number	Sample Description	Species	River Location	Mass Extracted (g)	[1]PFOS Conc. (ng/g)	PFOS LMS % Recovery	%Recovery [$^{18}O_2$]PFOS
E09-0372-012	Axys ID- L12932-26, Client ID- 090248	Smallmouth Bass	Section 4	0.2646	[2]581	NA	[2]112
E09-0372-012 Dup;	Axys ID- L12932-26, Client ID- 090248 Dup			0.2602	[2]558	NA	[2]103
E09-0372-012 LMS;	Axys ID- L12932-26, Client ID- 090248 LMS			0.2667	[2]914	72.0	[2]104
			Average		[2]**570**		[2]**106**
			%RPD/%RSD		**4.0**		**4.4**
E09-0372-013	Axys ID- L12933-18, Client ID- 090064	White Bass	Section 2	0.2433	52.0	NA	117
E09-0372-013 Dup	Axys ID- L12933-18, Client ID- 090064 Dup			0.2599	56.4	NA	118
E09-0372-013 LMS	Axys ID- L12933-18, Client ID- 090064 LMS			0.2547	150	88.6	110
			Average		**54.2**		**115**
			%RPD/%RSD		**8.1**		**3.6**
E09-0372-014	Axys ID- L12933-20, Client ID- 090066	White Bass	Section 2	0.2488	71.5	NA	103
E09-0372-014 Dup	Axys ID- L12933-20, Client ID- 090066 Dup			0.2424	71.0	NA	106
E09-0372-014 LMS	Axys ID- L12933-20, Client ID- 090066 LMS			0.2666	185	110	113
			Average		**71.3**		**107**
			%RPD/%RSD		**0.82**		**5.0**
E09-0372-015	Axys ID- L12933-25, Client ID- 090071	White Bass	Section 2	0.2518	65.0	NA	111
E09-0372-015 Dup	Axys ID- L12933-25, Client ID- 090071 Dup			0.2492	62.2	NA	108
E09-0372-015 LMS	Axys ID- L12933-25, Client ID- 090071 LMS			0.2461	178	102	106
			Average		**63.6**		**109**
			%RPD/%RSD		**4.5**		**2.2**
E09-0372-016	Axys ID- L12934-10, Client ID- 090024	White Bass	Section 1	0.2570	47.7	NA	96.8
E09-0372-016 Dup	Axys ID- L12934-10, Client ID- 090024 Dup			0.2436	50.9	NA	117
E09-0372-016 LMS	Axys ID- L12934-10, Client ID- 090024 LMS			0.2633	148	94.3	113
			Average		**49.3**		**109**
			%RPD/%RSD		**6.6**		**9.8**
E09-0372-017	Axys ID- L12934-12, Client ID- 090026	White Bass	Section 1	0.2442	71.7	NA	114
E09-0372-017 Dup	Axys ID- L12934-12, Client ID- 090026 Dup			0.2545	65.8	NA	111
E09-0372-017 LMS	Axys ID- L12934-12, Client ID- 090026 LMS			0.2528	176	98.3	124
			Average		**68.7**		**116**
			%RPD/%RSD		**8.5**		**5.6**

Table 7 Continued.

3M LIMS Number	Sample Description	Species	River Location	Mass Extracted (g)	(1)PFOS Conc. (ng/g)	PFOS LMS % Recovery	%Recovery [$^{18}O_2$]PFOS
E09-0372-018	Axys ID- L12934-18, Client ID- 090017	White Bass	Section 1	0.2640	86.4	NA	120
E09-0372-018 Dup	Axys ID- L12934-18, Client ID- 090017 Dup			0.2433	82.4	NA	102
E09-0372-018 LMS	Axys ID- L12934-18, Client ID- 090017 LMS			0.2549	191	98.7	124
			Average		**84.4**		**115**
			%RPD/%RSD		**4.7**		**10**
E09-0372-019	Axys ID- L12945-1, Client ID- 090153	Fresh Water Drum	Section 3	0.2568	113	NA	121
E09-0372-019 Dup	Axys ID- L12945-1, Client ID- 090153 Dup			0.2473	103	NA	109
E09-0372-019 LMS	Axys ID- L12945-1, Client ID- 090153 LMS			0.2478	224	104	126
			Average		**108**		**118**
			%RPD/%RSD		**9.1**		**7.1**
E09-0372-020	Axys ID- L12945-4, Client ID- 090167	Fresh Water Drum	Section 3	0.2372	82.1	NA	115
E09-0372-020 Dup	Axys ID- L12945-4, Client ID- 090167 Dup			0.2509	82.3	NA	111
E09-0372-020 LMS	Axys ID- L12945-4, Client ID- 090167 LMS			0.2618	176	88.7	112
			Average		**82.2**		**113**
			%RPD/%RSD		**0.24**		**1.8**
E09-0372-021	Axys ID- L12945-14, Client ID- 090241	Fresh Water Drum	Section 4	0.2375	24.6	NA	97.7
E09-0372-021 Dup	Axys ID- L12945-14, Client ID- 090241 Dup			0.2574	22.5	NA	103
E09-0372-021 LMS	Axys ID- L12945-14, Client ID- 090241 LMS			0.2341	155	111	126
			Average		**23.6**		**109**
			%RPD/%RSD		**8.9**		**14**
E09-0372-022	Axys ID- L12945-16, Client ID- 090078	Fresh Water Drum	Section 2	0.2468	74.9	NA	92.5
E09-0372-022 Dup	Axys ID- L12945-16, Client ID- 090078 Dup			0.2657	80.4	NA	120
E09-0372-022 LMS	Axys ID- L12945-16, Client ID- 090078 LMS			0.2533	154	70.1	107
			Average		**77.7**		**107**
			%RPD/%RSD		**7.2**		**13**
E09-0372-023	Axys ID- L12945-19, Client ID- 090081	Fresh Water Drum	Section 2	0.2345	41.3	NA	104
E09-0372-023 Dup	Axys ID- L12945-19, Client ID- 090081 Dup			0.2537	32.9	NA	103
E09-0372-023 LMS	Axys ID- L12945-19, Client ID- 090081 LMS			0.2528	132	86.5	97.7
			Average		**37.1**		**102**
			%RPD/%RSD		**23**		**3.6**

Table 7 Continued.

3M LIMS Number	Sample Description	Species	River Location	Mass Extracted (g)	[1]PFOS Conc. (ng/g)	PFOS LMS % Recovery	%Recovery [$^{18}O_2$]PFOS
E09-0372-024	Axys ID- L12945-30, Client ID- 090009	Fresh Water Drum	Section 1	0.2385	14.7	NA	102
E09-0372-024 Dup	Axys ID- L12945-30, Client ID- 090009 Dup			0.2430	13.7	NA	107
E09-0372-024 LMS	Axys ID- L12945-30, Client ID- 090009 LMS			0.2470	116	91.5	109
			Average		**14.2**		**106**
			%RPD/%RSD		**7.0**		**3.8**
E09-0372-025	Axys ID- L12947-7, Client ID- 090266	Bluegill Sunfish	Section 3	0.2338	34.5	NA	99.6
E09-0372-025 Dup	Axys ID- L12947-7, Client ID- 090266 Dup			0.2583	32.1	NA	112
E09-0372-025 LMS	Axys ID- L12947-7, Client ID- 090266 LMS			0.2576	171	128	119
			Average		**33.3**		**110**
			%RPD/%RSD		**7.2**		**8.8**
E09-0372-026	Axys ID- L12947-8, Client ID- 090267	Bluegill Sunfish	Section 3	0.2355	55.1	NA	106
E09-0372-026 Dup	Axys ID- L12947-8, Client ID- 090267 Dup			0.2495	55.5	NA	111
E09-0372-026 LMS	Axys ID- L12947-8, Client ID- 090267 LMS			0.2502	153	88.5	104
			Average		**55.3**		**107**
			%RPD/%RSD		**0.75**		**3.2**
E09-0372-027	Axys ID- L12947-13, Client ID- 090111	Bluegill Sunfish	Section 2	0.2610	40.6	NA	110
E09-0372-027 Dup	Axys ID- L12947-13, Client ID- 090111 Dup			0.2581	40.0	NA	95.7
E09-0372-027 LMS	Axys ID- L12947-13, Client ID- 090111 LMS			0.2691	147	104	114
			Average		**40.3**		**107**
			%RPD/%RSD		**1.5**		**9.1**
E09-0372-028	Axys ID- L12947-25, Client ID- 090205	Bluegill Sunfish	Section 4	0.2455	93.2	NA	98.7
E09-0372-028 Dup	Axys ID- L12947-25, Client ID- 090205 Dup			0.2524	80.6	NA	103
E09-0372-028 LMS	Axys ID- L12947-25, Client ID- 090205 LMS			0.2488	167	72.1	106
			Average		**86.9**		**103**
			%RPD/%RSD		**14**		**3.7**
E09-0372-029	Axys ID- L12947-26, Client ID- 090206	Bluegill Sunfish	Section 4	0.2421	31.4	NA	[4]135
E09-0372-029 Dup	Axys ID- L12947-26, Client ID- 090206 Dup			0.2479	28.2	NA	[4]137
E09-0372-029 LMS	Axys ID- L12947-26, Client ID- 090206 LMS			0.2397	136	91.9	129
			Average		**29.8**		[4]**134**
			%RPD/%RSD		**11**		**3.0**

Table 7 Continued.

3M LIMS Number	Sample Description	Species	River Location	Mass Extracted (g)	[1]PFOS Conc. (ng/g)	PFOS LMS % Recovery	%Recovery [$^{18}O_2$]PFOS
E09-0372-030	Axys ID- L12948-17, Client ID- 090061	Bluegill Sunfish	Section 1	0.2544	129	NA	116
E09-0372-030 Dup	Axys ID- L12948-17, Client ID- 090061 Dup			0.2577	141	NA	[4]132
E09-0372-030 LMS	Axys ID- L12948-17, Client ID- 090061 LMS			0.2350	214	[3]67.4	101
			Average		**135**		**116**
			%RPD/%RSD		**8.9**		**14**

(1) Unless otherwise specified, the recovery of associated PFOS laboratory matrix spike (LMS) was within 100±30% which meets ETS 8-45.0 method acceptance criteria. Sample results are considered accurate to within the overall analytical method uncertainty 100±18% for PFOS and 100±17% for [$^{18}O_2$]PFOS. See Section 4.9 *Determination of Analytical Method Uncertainty* for more information. Sample results are reported to three significant figures and %RPD to two significant figures. Additional significant figures were used to calculate the average, %RPD, and %recovery. Values in the raw data may vary slightly due to rounding.

(2) Sample results were reported from a 1:100 post-extraction dilution.

(3) LMS recovery was 67.4%, sample accuracy has been adjusted to 100±50%.

(4) [$^{18}O_2$]PFOS surrogate recovery exceeded 130%.

6 Conclusions

The PFOS sample results presented in and Table 7 are considered accurate within the overall method uncertainty of 100±18%. The accuracy (% recovery) and precision (%RSD) of 3M ECF (branched) PFOS laboratory control spikes quantitated against the predominantly linear reference standard demonstrated that the isomers produce no discernable quantitative bias.

Results for the other target analytes will be forthcoming in a subsequent report.

7 Data/Sample Retention

All remaining sample and associated project data (hardcopy and electronic) will be archived according to 3M Environmental Laboratory standard operating procedures.

8 Analytical Personnel

8.1 3M Environmental Laboratory

Michelle D. Malinsky, Ph.D Research Specialist

8.2 Pace Lab Ops

Jonathan Steege

9 Signatures

Michelle D. Malinsky, Ph.D, 3M Research Specialist, Principal Analytical Investigator — Date: 10/5/2009

William K. Reagen, Ph.D., Environmental Laboratory Management — Date: 10/5/2009

Cliffton B. Jacoby, Ph.D., 3M Technical Reviewer — Date: 6 Oct. 2009

The 3M Environmental Laboratory's Quality Assurance Unit has audited the data and report for this project.

QAI Representative — Date: 10-6-09

10 Supplemental Information

10.1 Lab Control Spike Recoveries by Extracted Matrix-Matched Calibration with IS Quantitation.

Table 8. LCS Recoveries for Extraction Batch 1 Using Extracted Matrix-Matched Calibration.

			PFOS			[$^{13}O_2$]PFOS		
Sample ID	Sample Description	Extracted Mass (g)	[1]Corrected Spike Conc. (ng/mL)	Calc. Conc. (ng/mL)	% Recovery	Spike Conc. (ng/mL)	Calc. Conc. (ng/mL)	% Recovery
090826 BGF LCS Low 1	LCS Low 1	0.2663	0.107	0.104	97.3	0.104	0.101	97.5
090826 BGF LCS Low 2	LCS Low 2	0.2594	0.106	0.106	100	0.104	0.109	104
090826 BGF LCS Low 3	LCS Low 3	0.2596	0.106	0.121	115	0.104	0.124	119
090826 BGF LCS Mid 1	LCS Mid 1	0.2676	0.210	0.205	97.8	0.104	0.117	113
090826 BGF LCS Mid 2	LCS Mid 2	0.2523	0.207	0.184	89.1	0.104	0.105	101
090826 BGF LCS Mid 3	LCS Mid 3	0.2557	0.207	0.194	93.6	0.104	0.100	96.2
090826 BGF LCS High 1	LCS High 1	0.2666	0.864	0.766	88.7	0.104	0.097	93.3
090826 BGF LCS High 2	LCS High 2	0.2586	0.862	0.705	81.8	0.104	0.0968	93.1
090826 BGF LCS High 3	LCS High 3	0.2687	0.864	0.709	82.0	0.104	0.106	101
090826 BGF ECF LCS 1	ECF LCS 1	0.2577	0.574	0.568	98.9	0.104	0.110	106
090826 BGF ECF LCS 2	ECF LCS 2	0.2585	0.574	0.612	107	0.104	0.112	107
090826 BGF ECF LCS 3	ECF LCS 3	0.2474	0.572	0.587	103	0.104	0.109	105
090826 BGF PFOS LCS 1	PFOS LCS 1	0.2615	10.6	10.6	100	0.104	0.0914	87.9
090826 BGF PFOS LCS 2	PFOS LCS 2	0.2639	10.6	10.5	99.4	0.104	0.104	99.6
090826 BGF PFOS LCS 3	PFOS LCS 3	0.2589	10.6	11.7	111	0.104	0.108	104
	Average				***97.6***			***102***
	%RSD				***9.7***			***7.8***

(1) Spike concentration corrected for the endogenous PFOS concentration in the bluegill fillet (BGF) control matrix as determined by method of standard addition = 0.525 ng/g.

Table 9. LCS Recoveries for Extraction Batch 2 Using Extracted Matrix-Matched Calibration.

			PFOS			$[^{18}O_2]$PFOS		
Sample ID	Sample Description	Extracted Mass (g)	(1)Corrected Spike Conc. (ng/mL)	Calc. Conc. (ng/mL)	% Recovery	Spike Conc. (ng/mL)	Calc. Conc. (ng/mL)	% Recovery
090828 BGF LCS Low 1	LCS Low 1	0.2538	0.102	0.116	113	0.104	0.111	106
090828 BGF LCS Low 2	LCS Low 2	0.2641	0.105	0.114	109	0.104	0.113	109
090828 BGF LCS Low 3	LCS Low 3	0.2439	0.100	0.119	118	0.104	0.119	114
090828 BGF LCS Mid 1	LCS Mid 1	0.2609	0.206	0.185	89.6	0.104	0.106	102
090828 BGF LCS Mid 2	LCS Mid 2	0.2567	0.206	0.213	104	0.104	0.102	98.5
090828 BGF LCS Mid 3	LCS Mid 3	0.2637	0.207	0.207	100	0.104	0.0975	93.7
090828 BGF LCS High 1	LCS High 1	0.2526	0.859	0.785	91.4	0.104	0.106	102
090828 BGF LCS High 2	LCS High 2	0.2634	0.861	0.758	88.0	0.104	0.112	107
090828 BGF LCS High 3	LCS High 3	0.2576	0.860	0.796	92.5	0.104	0.111	107
090828 BGF ECF LCS 1	ECF LCS 1	0.2605	0.573	0.638	111	0.104	0.122	118
090828 BGF ECF LCS 2	ECF LCS 2	0.2531	0.571	0.605	106	0.104	0.115	110
090828 BGF ECF LCS 3	ECF LCS 3	0.2635	0.573	0.653	114	0.104	0.126	121
090828 BGF PFOS LCS 1	PFOS LCS 1	0.2569	10.6	11.2	106	0.104	0.119	114
090828 BGF PFOS LCS 2	PFOS LCS 2	0.2430	10.6	11.2	106	0.104	0.111	107
090828 BGF PFOS LCS 3	PFOS LCS 3	0.2596	10.6	12.2	116	0.104	0.122	117
	Average				***104***			***108***
	%RSD				***9.5***			***7.0***

(1) Spike concentration corrected for the endogenous PFOS concentration in the bluegill fillet (BGF) control matrix as determined by method of standard addition = 0.507 ng/g.

Table 10. LCS Recoveries for Extraction Batch 3 Using Extracted Matrix-Matched Calibration.

			PFOS			[$^{18}O_2$]PFOS		
Sample ID	Sample Description	Extracted Mass (g)	(1)Corrected Spike Conc. (ng/mL)	Calc. Conc. (ng/mL)	% Recovery	Spike Conc. (ng/mL)	Calc. Conc. (ng/mL)	% Recovery
090901 BGF LCS Low 1	LCS Low 1	0.2424	0.0992	0.0982	99.0	0.104	0.0946	91.0
090901 BGF LCS Low 2	LCS Low 2	0.2589	0.102	0.0983	95.9	0.104	0.116	112
090901 BGF LCS Low 3	LCS Low 3	0.2642	0.104	0.110	106	0.104	0.118	114
090901 BGF LCS Mid 1	LCS Mid 1	0.2641	0.206	0.229	111	0.104	0.126	121
090901 BGF LCS Mid 2	LCS Mid 2	0.2498	0.203	0.217	107	0.104	0.124	120
090901 BGF LCS Mid 3	LCS Mid 3	0.257	0.205	0.185	90.4	0.104	0.105	101
090901 BGF LCS High 1	LCS High 1	0.2676	0.861	0.861	100	0.104	0.115	110
090901 BGF LCS High 2	LCS High 2	0.262	0.860	0.889	103	0.104	0.106	102
090901 BGF LCS High 3	LCS High 3	0.2586	0.859	0.841	97.9	0.104	0.112	107
090901 BGF ECF LCS 1	ECF LCS 1	0.2482	0.569	0.616	108	0.104	0.102	98.0
090901 BGF ECF LCS 2	ECF LCS 2	0.258	0.571	0.649	114	0.104	0.123	118
090901 BGF ECF LCS 3	ECF LCS 3	0.25	0.570	0.593	104	0.104	0.104	99.8
090901 BGF PFOS LCS 1	PFOS LCS 1	0.2427	10.6	11.4	108	0.104	0.128	123
090901 BGF PFOS LCS 2	PFOS LCS 2	0.2495	10.6	11.7	111	0.104	0.116	111
090901 BGF PFOS LCS 3	PFOS LCS 3	0.241	10.6	10.5	100	0.104	0.113	108
	Average				***104***			***109***
	%RSD				***6.2***			***8.6***

(1) Spike concentration corrected for the endogenous PFOS concentration in the bluegill fillet (BGF) control matrix as determined by method of standard addition = 0.497 ng/g.

10.2 Lab Control Spike Recoveries by Unextracted Acetonitrile Calibration using IS Quantitation.

Table 11. LCS Recoveries for Extraction Batch 1 Using Unextracted Acetonitrile Calibration.

			PFOS			$[^{18}O_2]$PFOS		
Sample ID	Sample Description	Extracted Mass (g)	(1)Corrected Spike Conc. (ng/mL)	Calc. Conc. (ng/mL)	% Recovery	Spike Conc. (ng/mL)	Calc. Conc. (ng/mL)	% Recovery
090826 BGF LCS Low 1	LCS Low 1	0.2663	0.109	0.0965	88.7	0.104	0.104	100
090826 BGF LCS Low 2	LCS Low 2	0.2594	0.107	0.0985	91.8	0.104	0.112	108
090826 BGF LCS Low 3	LCS Low 3	0.2596	0.107	0.113	105	0.104	0.128	123
090826 BGF LCS Mid 1	LCS Mid 1	0.2676	0.212	0.200	94.3	0.104	0.121	117
090826 BGF LCS Mid 2	LCS Mid 2	0.2523	0.209	0.178	85.3	0.104	0.108	104
090826 BGF LCS Mid 3	LCS Mid 3	0.2557	0.210	0.188	89.7	0.104	0.103	99.0
090826 BGF LCS High 1	LCS High 1	0.2666	0.868	0.773	89.1	0.104	0.0997	95.9
090826 BGF LCS High 2	LCS High 2	0.2586	0.866	0.710	82.0	0.104	0.0995	95.7
090826 BGF LCS High 3	LCS High 3	0.2687	0.868	0.714	82.2	0.104	0.109	105
090826 BGF ECF LCS 1	ECF LCS 1	0.2577	0.574	0.570	99.3	0.104	0.114	110
090826 BGF ECF LCS 2	ECF LCS 2	0.2585	0.574	0.615	107	0.104	0.115	111
090826 BGF ECF LCS 3	ECF LCS 3	0.2474	0.572	0.590	103	0.104	0.112	108
090826 BGF PFOS LCS 1	ECF LCS 4	0.2615	10.6	10.5	99.5	0.104	0.0938	90.2
090826 BGF PFOS LCS 2	ECF LCS 5	0.2639	10.6	10.4	98.5	0.104	0.107	103
090826 BGF PFOS LCS 3	ECF LCS 6	0.2589	10.6	11.5	109	0.104	0.112	107
	Average				**95.0**			**105**
	%RSD				**9.4**			**8.1**

(1) Spike concentration corrected for the endogenous PFOS concentration in the bluegill fillet (BGF) control matrix as determined by quantitation of the matrix blanks = 0.543 ng/g.

Table 12. LCS Recoveries for Extraction Batch 2 Using Unextracted Acetonitrile Calibration.

			PFOS			[$^{18}O_2$]PFOS		
Sample ID	Sample Description	Extracted Mass (g)	(1)Corrected Spike Conc. (ng/mL)	Calc. Conc. (ng/mL)	% Recovery	Spike Conc. (ng/mL)	Calc. Conc. (ng/mL)	% Recovery
090828 BGF LCS Low 1	LCS Low 1	0.2538	0.109	0.114	105	0.104	0.0984	94.6
090828 BGF LCS Low 2	LCS Low 2	0.2641	0.111	0.112	101	0.104	0.101	96.9
090828 BGF LCS Low 3	LCS Low 3	0.2439	0.106	0.117	110	0.104	0.106	102
090828 BGF LCS Mid 1	LCS Mid 1	0.2609	0.213	0.189	88.6	0.104	0.0944	90.7
090828 BGF LCS Mid 2	LCS Mid 2	0.2567	0.212	0.219	103	0.104	0.0907	87.2
090828 BGF LCS Mid 3	LCS Mid 3	0.2637	0.214	0.213	99.6	0.104	0.0860	82.7
090828 BGF LCS High 1	LCS High 1	0.2526	0.867	0.836	96.4	0.104	0.0940	90.4
090828 BGF LCS High 2	LCS High 2	0.2634	0.870	0.807	92.8	0.104	0.0992	95.4
090828 BGF LCS High 3	LCS High 3	0.2576	0.869	0.848	97.6	0.104	0.0990	95.2
090828 BGF ECF LCS 1	ECF LCS 1	0.2605	0.577	0.677	117	0.104	0.109	105
090828 BGF ECF LCS 2	ECF LCS 2	0.2531	0.575	0.642	112	0.104	0.102	98.2
090828 BGF ECF LCS 3	ECF LCS 3	0.2635	0.578	0.694	120	0.104	0.113	109
090828 BGF PFOS LCS 1	ECF LCS 4	0.2569	10.6	11.9	113	0.104	0.106	102
090828 BGF PFOS LCS 2	ECF LCS 5	0.2430	10.6	11.9	113	0.104	0.0987	94.9
090828 BGF PFOS LCS 3	ECF LCS 6	0.2596	10.6	13.0	123	0.104	0.109	105
	Average				**106**			**96.6**
	%RSD				**9.7**			**7.4**

(1) Spike concentration corrected for the endogenous PFOS concentration in the bluegill fillet (BGF) control matrix as determined by quantitation of the matrix blanks = 0.568 ng/g.

Table 13. LCS Recoveries for Extraction Batch 3 Using Unextracted Acetonitrile Calibration.

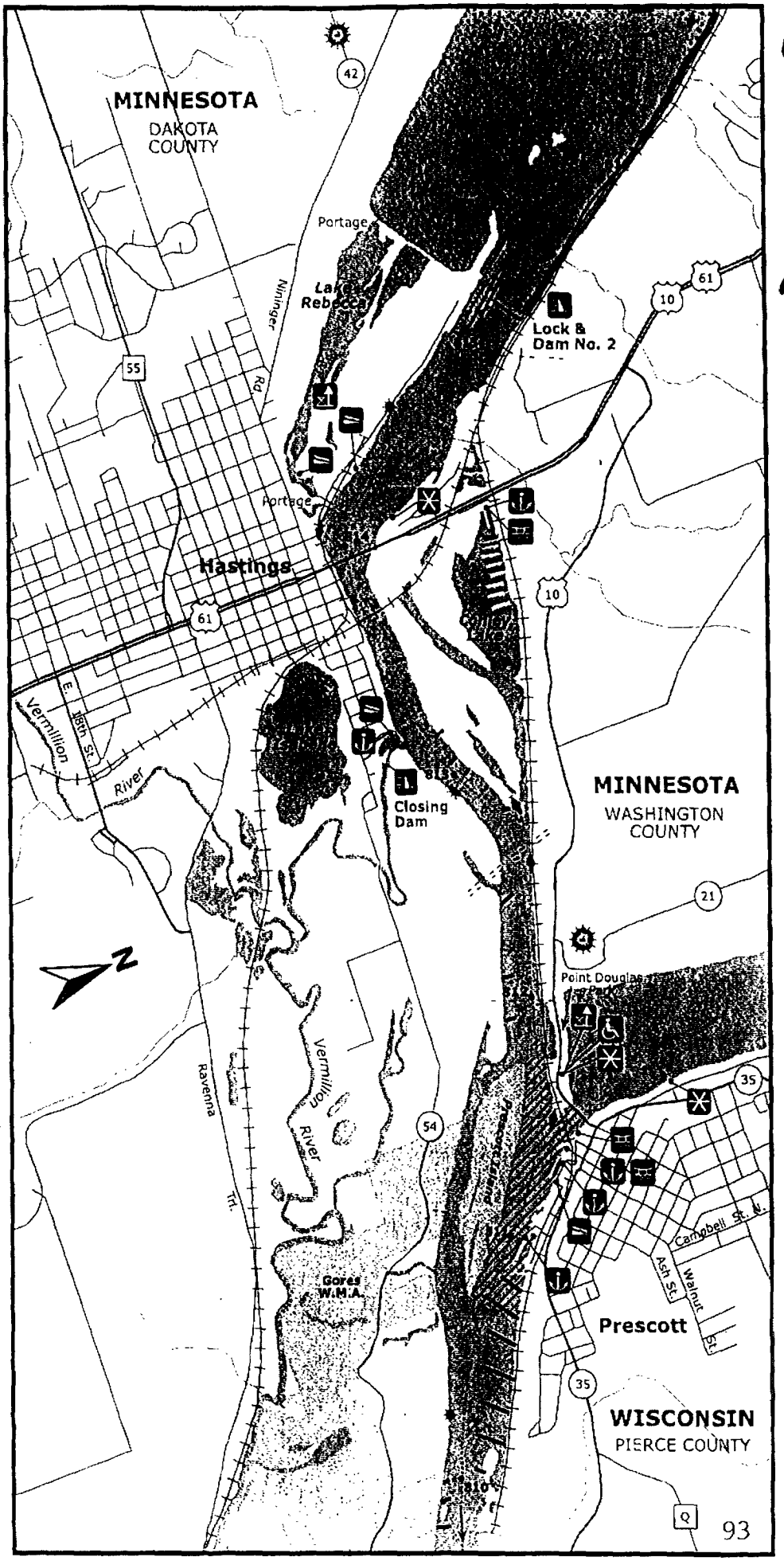
			PFOS			[$^{18}O_2$]PFOS		
Sample ID	Sample Description	Extracted Mass (g)	(1)Corrected Spike Conc. (ng/mL)	Calc. Conc. (ng/mL)	% Recovery	Spike Conc. (ng/mL)	Calc. Conc. (ng/mL)	% Recovery
090901 BGF LCS Low 1	LCS Low 1	0.2424	0.0916	0.0754	82.3	0.104	0.0906	87.1
090901 BGF LCS Low 2	LCS Low 2	0.2589	0.0944	0.0755	80.0	0.104	0.111	107
090901 BGF LCS Low 3	LCS Low 3	0.2642	0.0953	0.0870	91.3	0.104	0.114	109
090901 BGF LCS Mid 1	LCS Mid 1	0.2641	0.198	0.199	100	0.104	0.121	116
090901 BGF LCS Mid 2	LCS Mid 2	0.2498	0.196	0.188	96.0	0.104	0.120	115
090901 BGF LCS Mid 3	LCS Mid 3	0.2570	0.197	0.158	80.2	0.104	0.100	97.0
090901 BGF LCS High 1	LCS High 1	0.2676	0.855	0.802	93.8	0.104	0.110	106
090901 BGF LCS High 2	LCS High 2	0.2620	0.854	0.829	97.1	0.104	0.102	97.9
090901 BGF LCS High 3	LCS High 3	0.2586	0.853	0.783	91.8	0.104	0.107	103
090901 BGF ECF LCS 1	ECF LCS 1	0.2482	0.560	0.568	102	0.104	0.0977	94.0
090901 BGF ECF LCS 2	ECF LCS 2	0.2580	0.561	0.600	107	0.104	0.118	113
090901 BGF ECF LCS 3	ECF LCS 3	0.2500	0.560	0.546	97.5	0.104	0.0995	95.7
090901 BGF PFOS LCS 1	ECF LCS 4	0.2427	10.5	11.3	107	0.104	0.123	N/A
090901 BGF PFOS LCS 2	ECF LCS 5	0.2495	10.5	11.5	109	0.104	0.111	N/A
090901 BGF PFOS LCS 3	ECF LCS 6	0.2410	10.5	10.4	98.7	0.104	0.108	N/A
	Average				**95.6**			**103**
	%RSD				**9.7**			**8.9**

(1) Spike concentration corrected for the endogenous PFOS concentration in the bluegill fillet (BGF) control matrix as determined by quantitation of the matrix blanks = 0.419 ng/g.

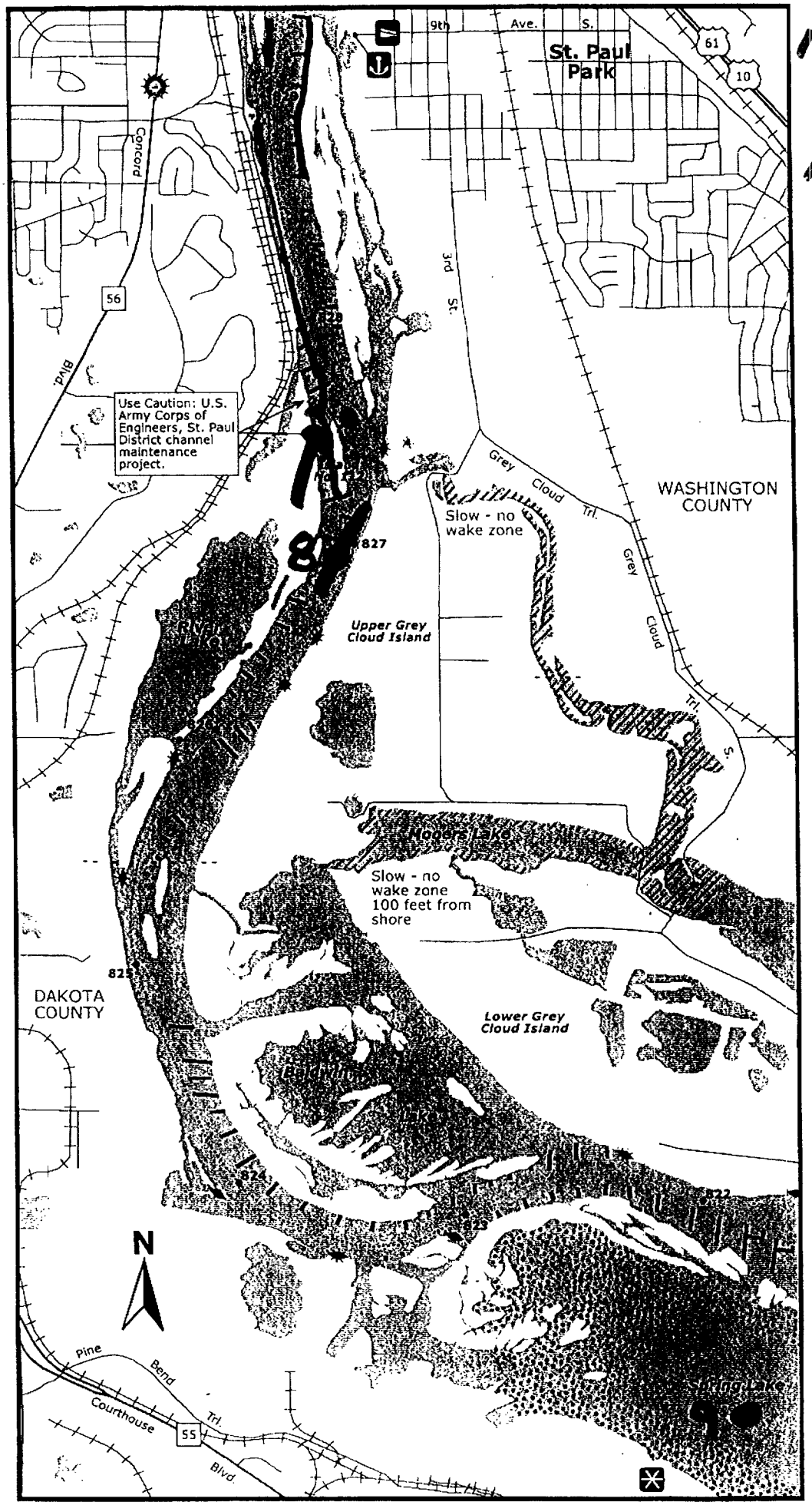
10.3 Surrogate Recoveries in Spiked Blanks.

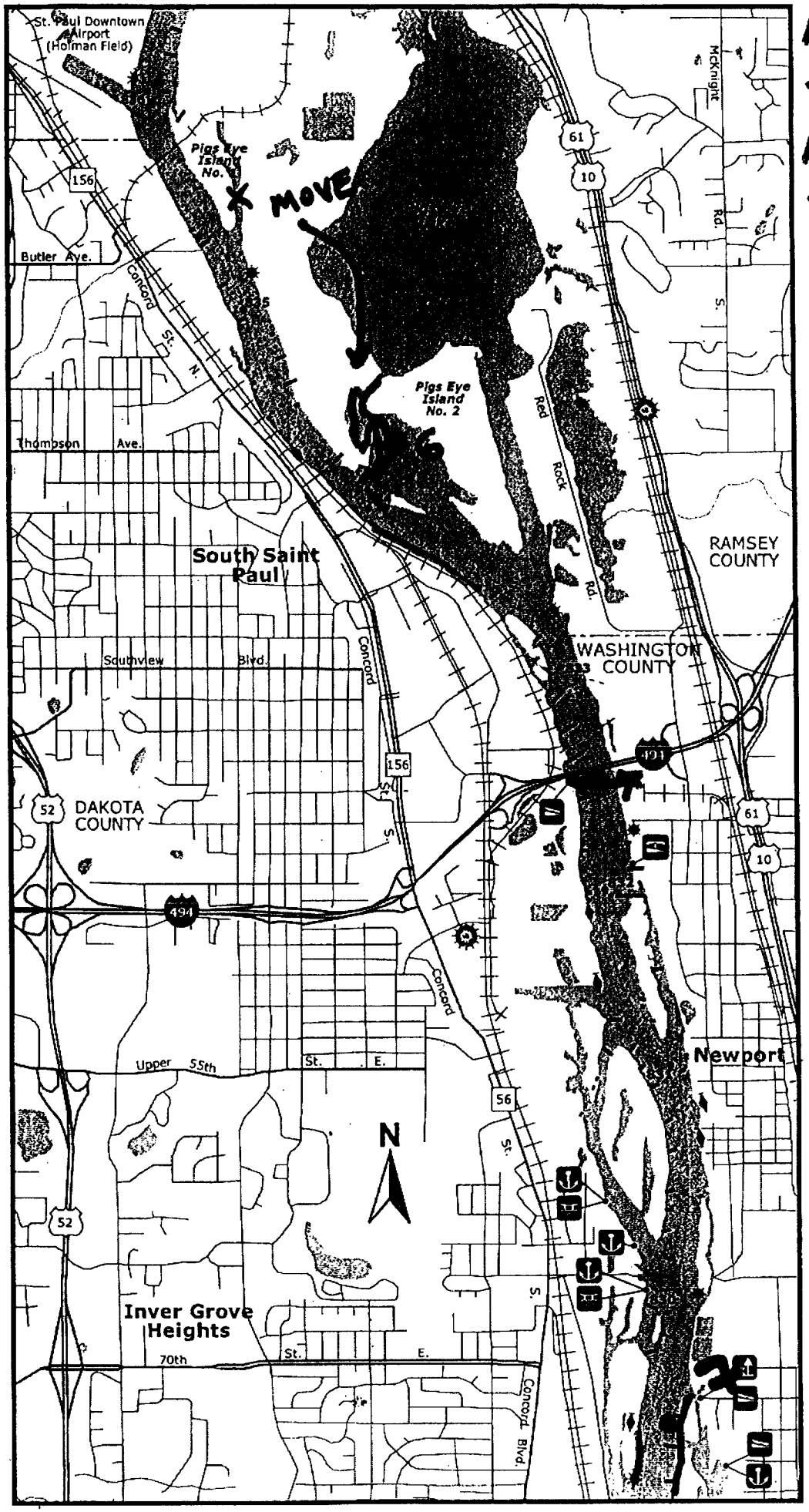
Batch 1		[$^{18}O_2$]PFOS		
Sample ID	**Sample Description**	*Spike Conc. (ng/mL)*	*Calc. Conc. (ng/mL)*	*%Rec*
090826 BGF Matrix Blank-1	(with IS/surr)	0.104	0.112	108
090826 BGF Matrix Blank-2	(with IS/surr)	0.104	0.121	116
090826 Aqueous Blank-1	(with IS/surr)	0.104	0.0810	77.9
090826 Aqueous Blank-2	(with IS/surr)	0.104	0.110	106
Acetonitrile Blank with IS & Surr	08 007-145	0.0956	0.0995	104
Acetonitrile Blank with IS & Surr	08 007-145	0.0956	0.0948	99.2
Batch 2				
090828 BGF Matrix Blank-1	(with IS/surr)	0.104	0.101	97.1
090828 BGF Matrix Blank-2	(with IS/surr)	0.104	0.107	103
090828 Aqueous Blank-1	(with IS/surr)	0.104	0.0998	96.0
090828 Aqueous Blank-2	(with IS/surr)	0.104	0.118	113
Acetonitrile Blank with IS & Surr.	08 007-145	0.0956	0.109	114
Acetonitrile Blank with IS & Surr.	08 007-145	0.0956	0.125	131
Batch 3				
090901 BGF Matrix Blank-1	(with IS/surr)	0.104	0.109	105
090901 BGF Matrix Blank-2	(with IS/surr)	0.104	0.112	108
090901 Aqueous Blank-1	(with IS/surr)	0.104	0.112	108
090901 Aqueous Blank-2	(with IS/surr)	0.104	0.109	105
Acetonitrile Blank with IS & Surr.	08 007-145	0.0956	0.105	110
Acetonitrile Blank with IS & Surr.	08 007-145	0.0956	0.110	115

MS Pool 2
SEC 4
6-1-09
FISH
MAP 2 of 2



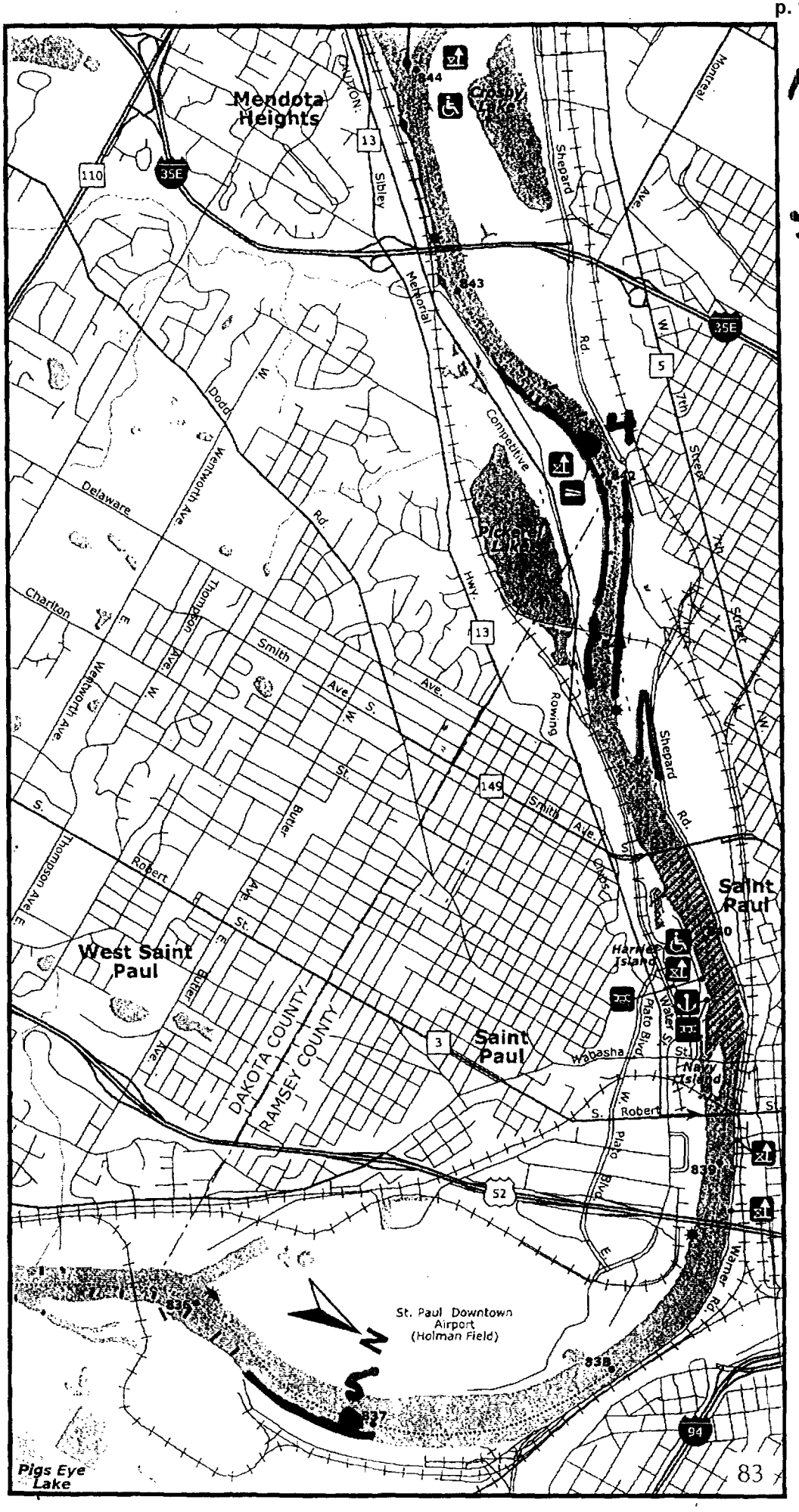
Ms Pool 2
SEC 3
MAP 2 of 2
6-1-09
FISH

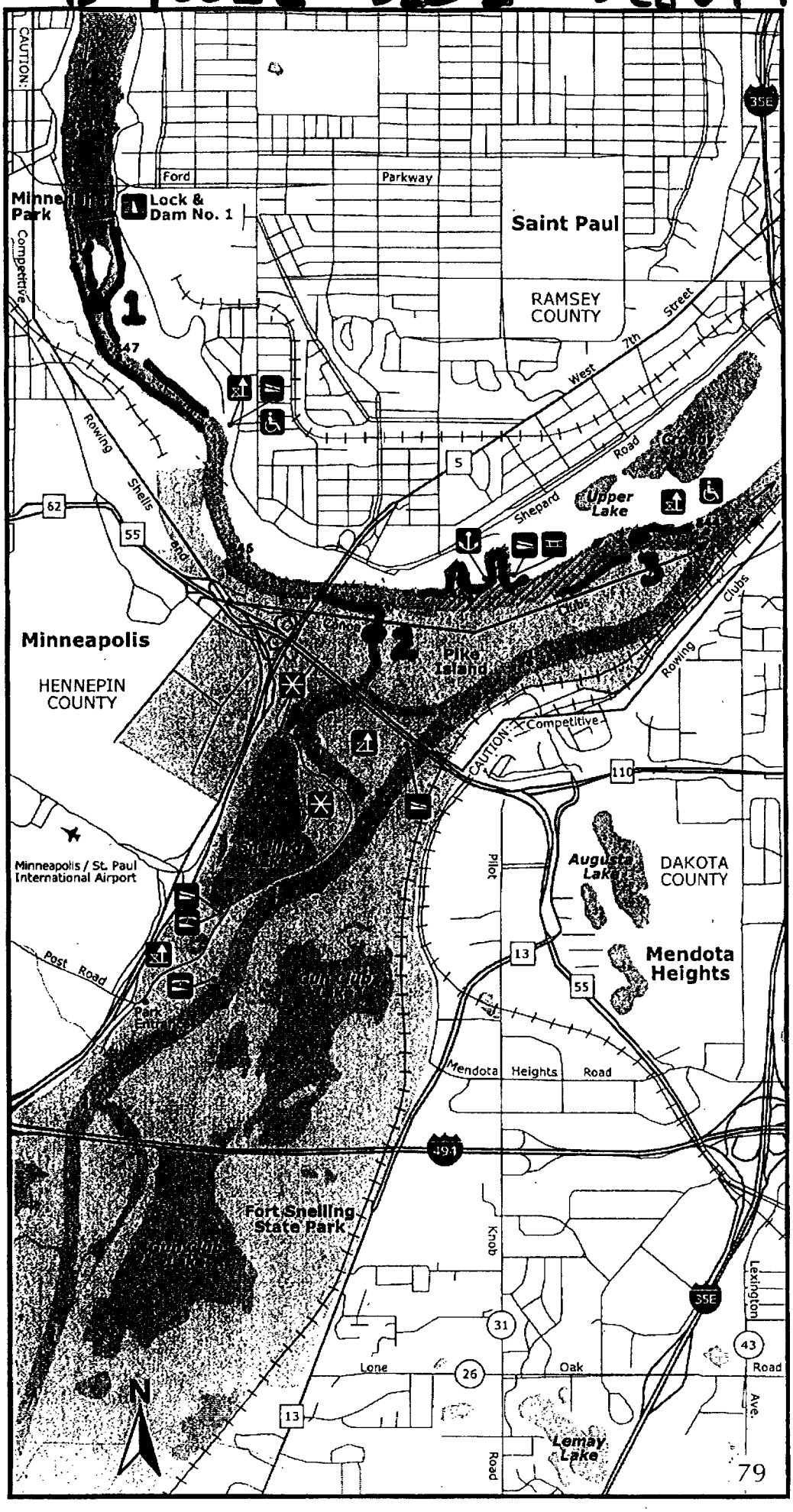




MS POOL 2
SEC 3
MAP 1 of 2
5.29.09
FISH

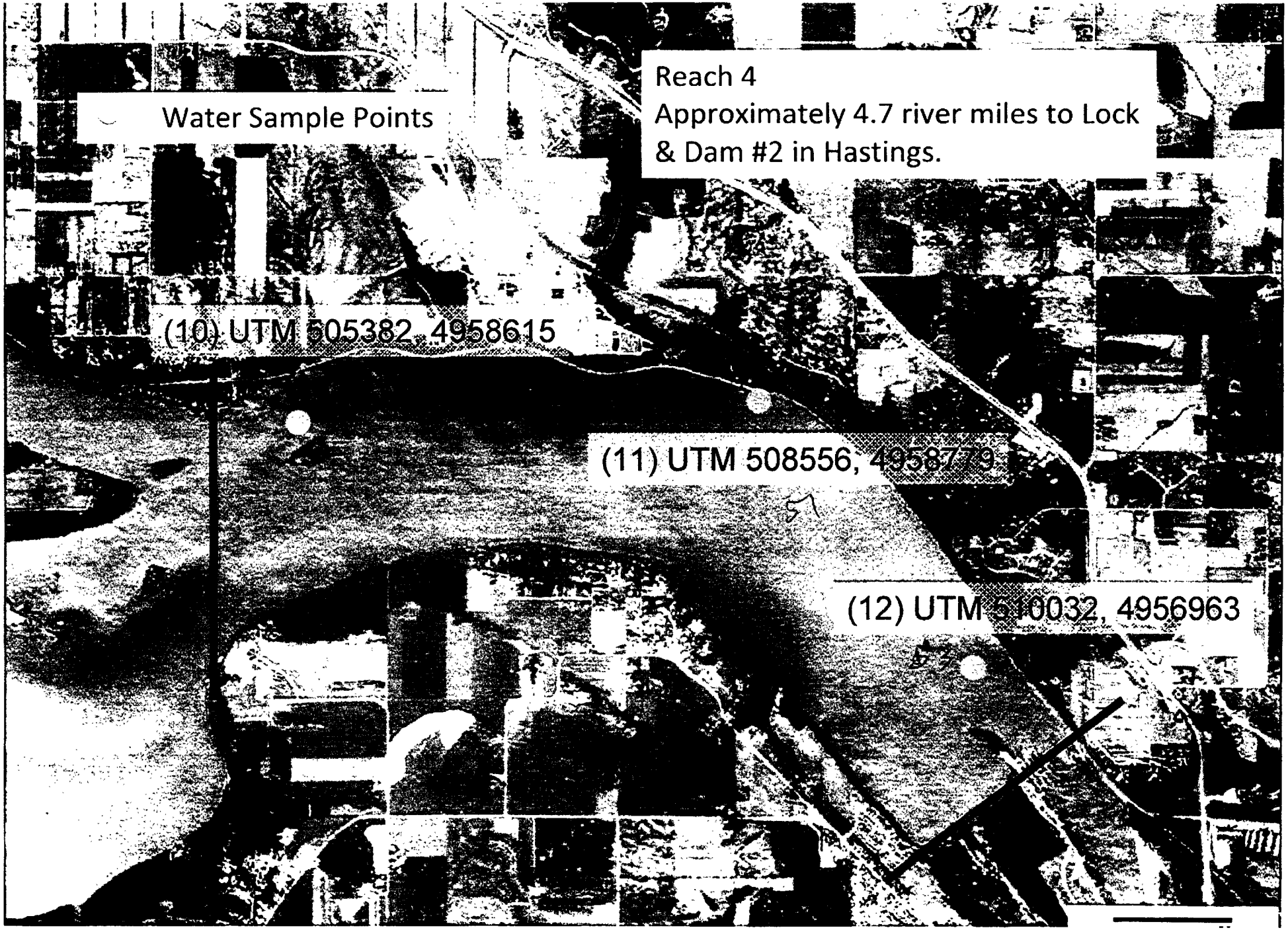
MS POOL 2
SEC 2
5.29.09
FISH

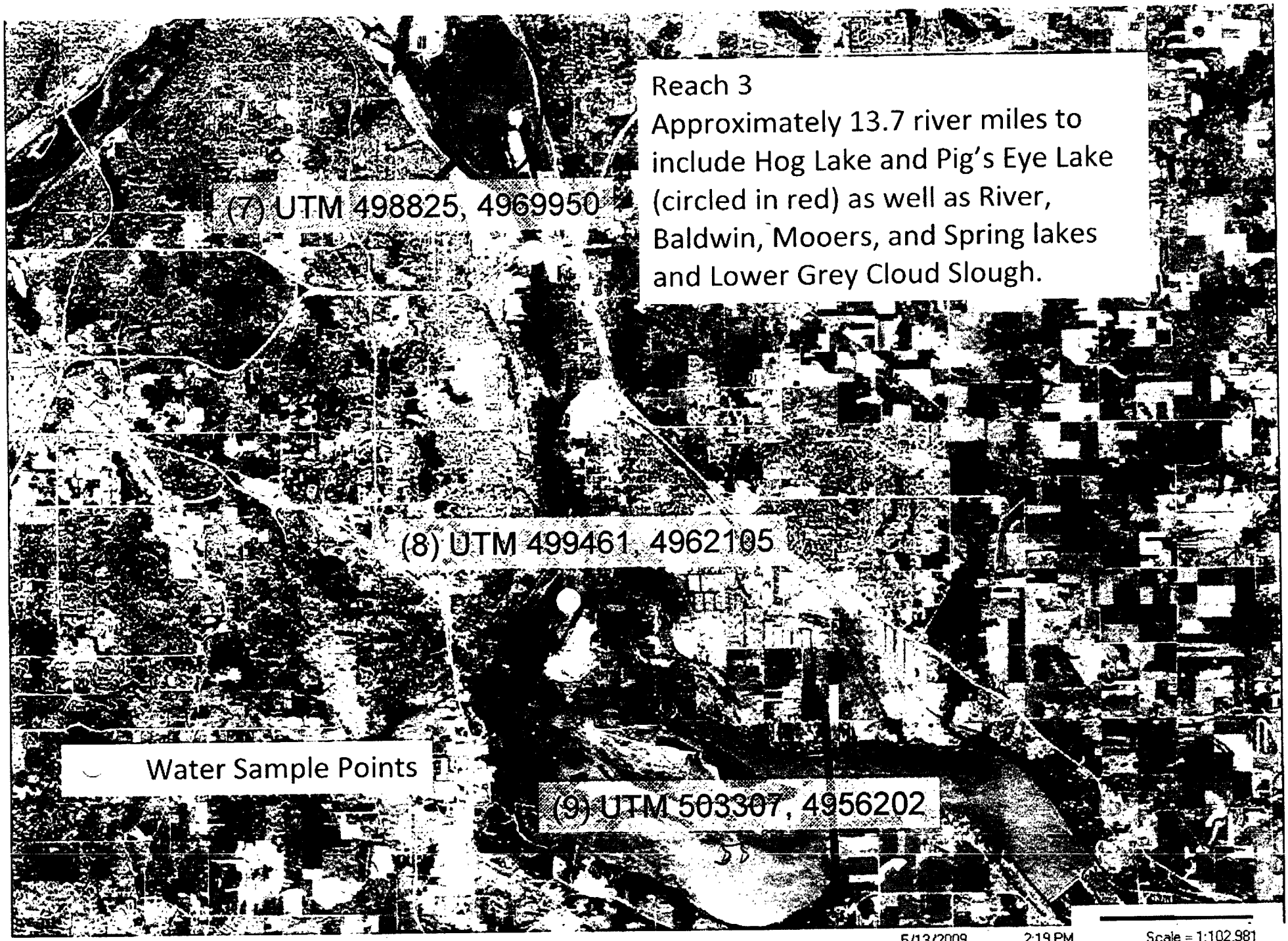



CAUTION: Competitive Rowing Shells and Crews
Ford Parkway
Minneapolis Park
Lock & Dam No. 1
Saint Paul
RAMSEY COUNTY
West 7th Street
Shepard Road
Upper Lake
Minneapolis
HENNEPIN COUNTY
Pike Island
Clubs
Rowing
CAUTION: Competitive
Minneapolis / St. Paul International Airport
Post Road
Fort Snelling State Park
Augusta Lake
DAKOTA COUNTY
Mendota Heights
Pilot Knob Road
Mendota Heights Road
Lone Oak Road
Lexington Ave.
Lemay Lake
35E
494
62
55
5
110
13
31
26
43
N

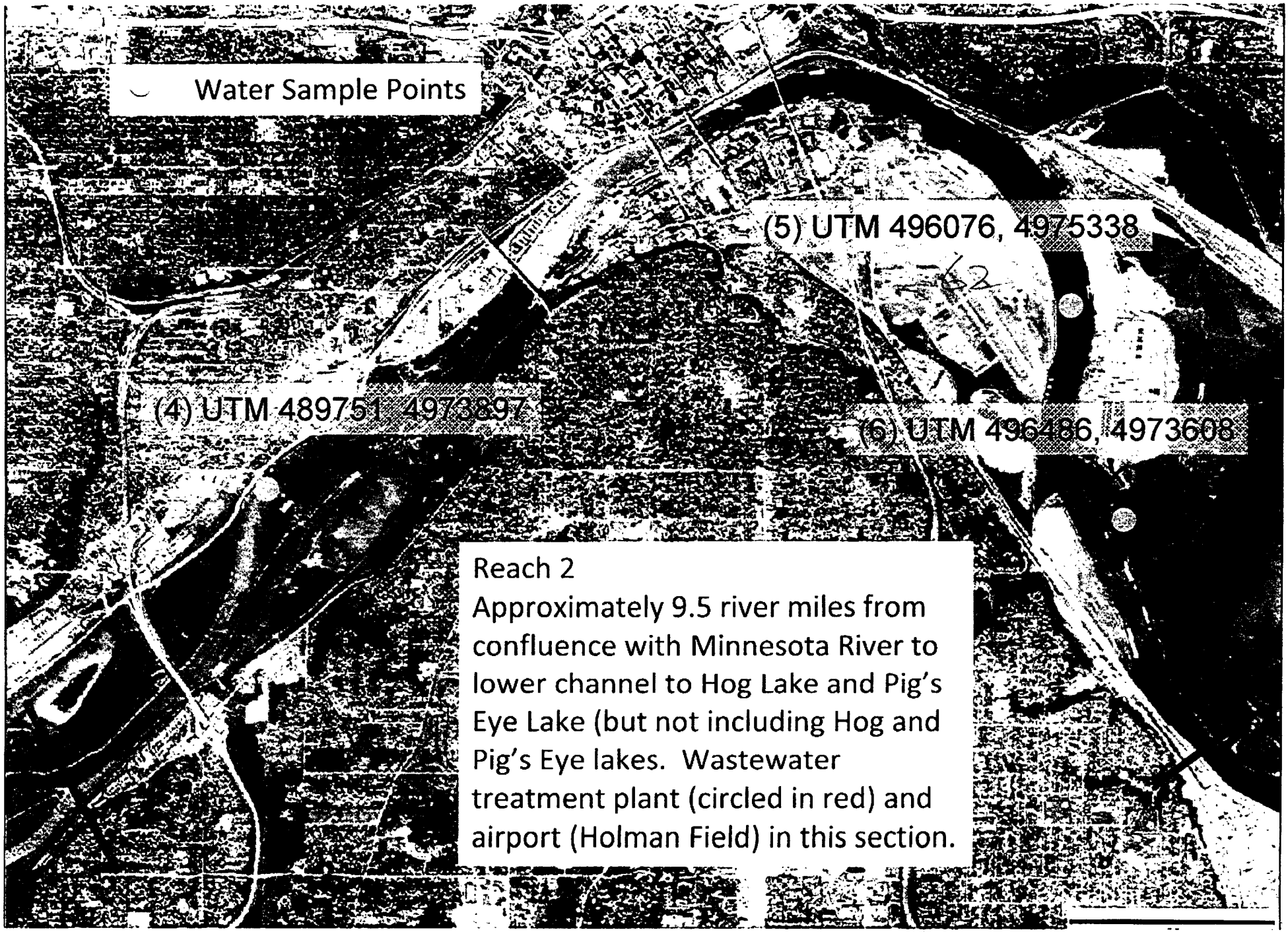
Mississippi River Pool 2 Surface Water

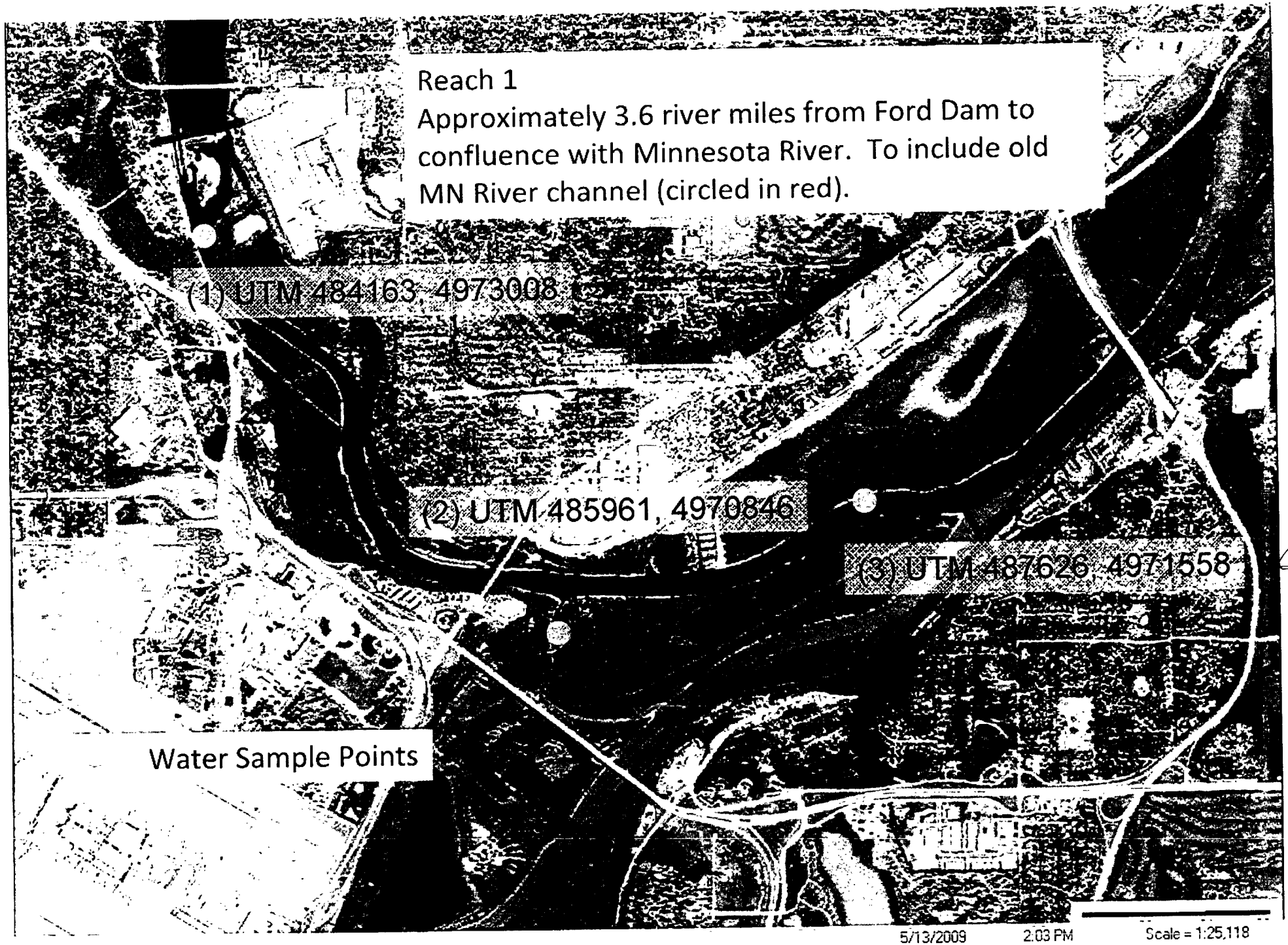
Maps (received onsite from Bruce Monson)

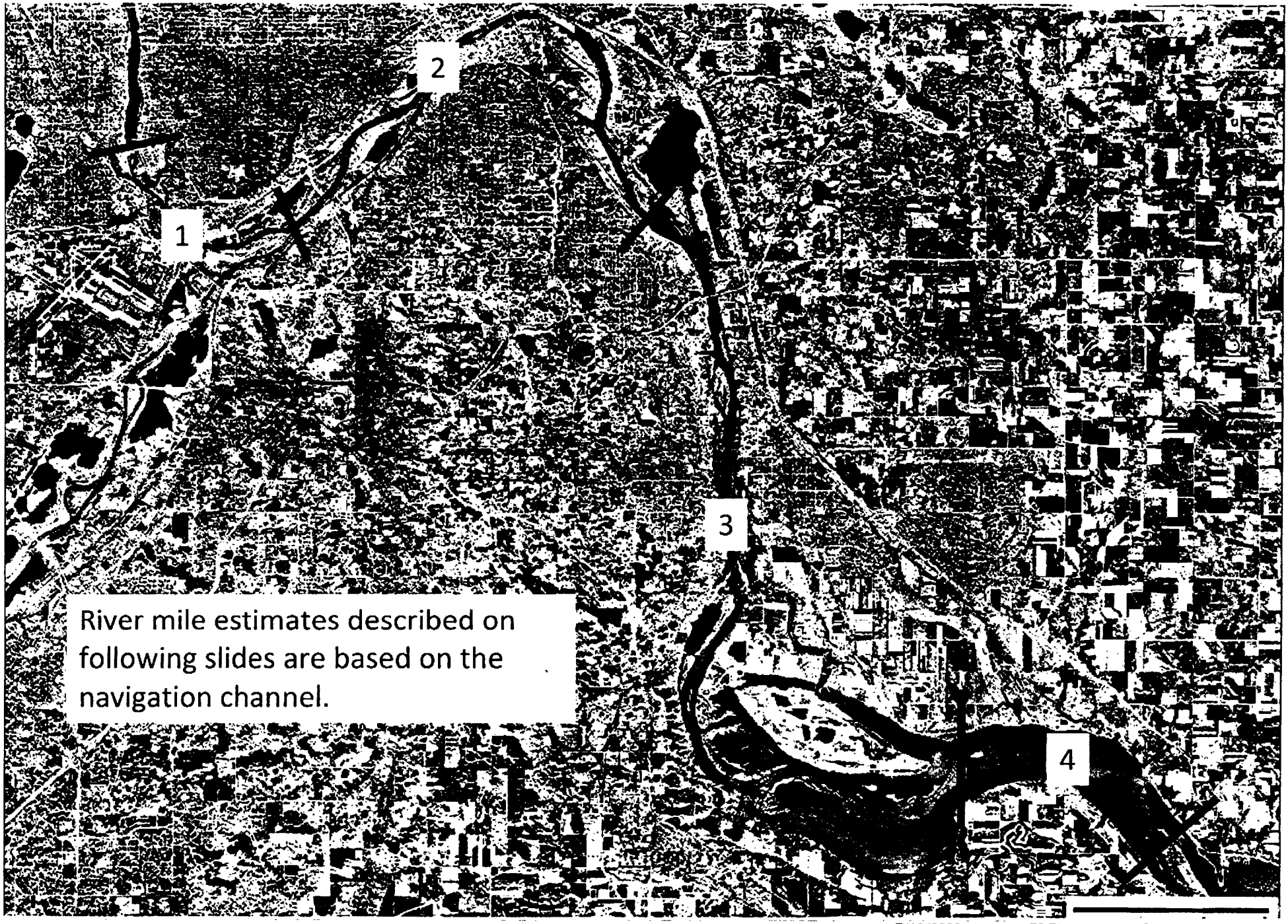

Water Sample Points
Reach 4
Approximately 4.7 river miles to Lock & Dam #2 in Hastings.
(10) UTM 505382, 4958615
(11) UTM 508556, 4958779
(12) UTM 510032, 4956963
t or 0.00 Miles
5/13/2009
2:28 PM
Scale = 1:32,892



ise to Zoom In


Water Sample Points
(5) UTM 496076, 4975338
(4) UTM 489751, 4973897
(6) UTM 496486, 4973608
Reach 2
Approximately 9.5 river miles from confluence with Minnesota River to lower channel to Hog Lake and Pig's Eye Lake (but not including Hog and Pig's Eye lakes. Wastewater treatment plant (circled in red) and airport (Holman Field) in this section.
ıse to Zoom In
5/13/2009
2:12 PM
Scale = 1:37,962


Reach 1
Approximately 3.6 river miles from Ford Dam to confluence with Minnesota River. To include old MN River channel (circled in red).
(1) UTM 484163, 4973008
(2) UTM 485961, 4970846
(3) UTM 487626, 4971558
Water Sample Points
5/13/2009
2:03 PM
Scale = 1:25,118


2
1
3
River mile estimates described on following slides are based on the navigation channel.
4
5/13/2009
1:52 PM
Scale = 1:120,784

Mississippi River Pool 2 Surface Water

Maps (from Bruce Monson 07-01-09 email)

Mississippi River Pool 2 – July 2009 Surface Water Event

Reach 4-Location 11 (moving away from the site)

Reach 4-Location 12

Mississippi River Pool 2 – July 2009 Surface Water Event

Reach 3-Location 9

Reach 4-Location 10

Mississippi River Pool 2 – July 2009 Surface Water Event

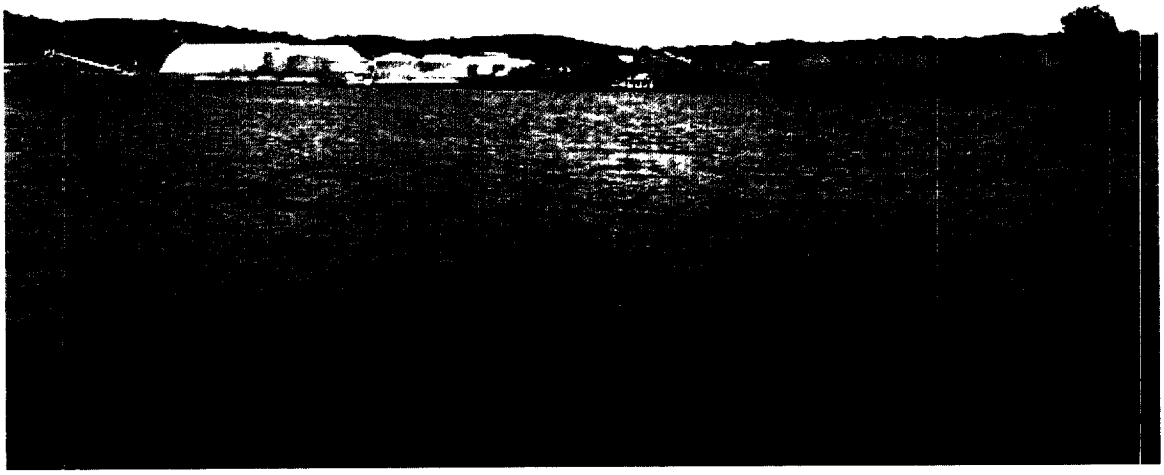
Reach 3-Location 7

Missed Photo

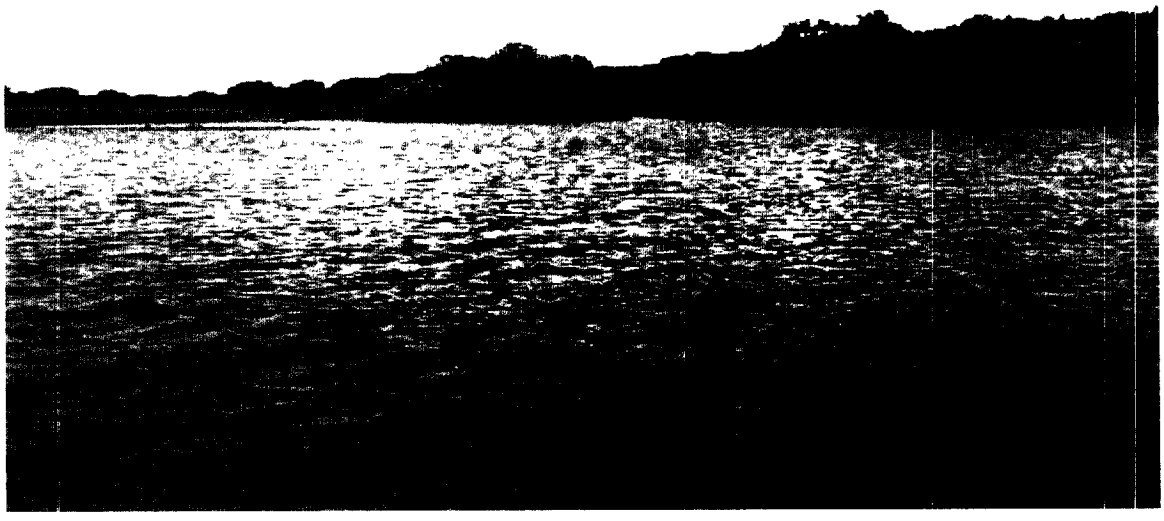
Reach 3-Location 8

Mississippi River Pool 2 – July 2009 Surface Water Event

Reach 2-Location 5



Reach 2-Location 6



Mississippi River Pool 2 – July 2009 Surface Water Event

Reach 1-Location 3

Reach 2-Location 4

Mississippi River Pool 2 – July 2009 Surface Water Event

Reach1-Location 1

Reach1-Location 2

Mississippi River Pool 2 Surface Water

Site Photographs

3M Environmental Laboratory

Chain of Custody / Request for Laboratory Analytical Services

3M Env. Lab Project #
For Internal Use Only
E09-0365

Shipping Address:
3M Center
Bldg. 260-5N-17
St. Paul, MN 55144

Telephone:
Sample Receiving: (651) 736-6559
Alternate: (651) 733-9873
FAX: (651) 733-5982

Project ID/Project Name	Mississippi River Pool 2 Surface Water Sampling July 2009
Template #	Final Report Due Date
Project Lead	*Sue Wolf* — Internal Due Date
Dept. # (main)	452090 — Class/Job/Project # 0040152373

Report To

Contact Name	*Gary Hohenstein*
Company	*3M Company*
Mailing Address	
City, State, Zip	
Telephone #	FAX #

Date Available	
Date Due	
Contract Lab	*3M Environmental Lab*

Special Instructions and/or Specific Regulatory Requirements:
(method, limit of detection, rep

Preservatives: HNO_3 | H_2SO_4 | VOCs | None | Other:

Total Number of Containers

Analysis Requested:
Complete below. Attach any associated information.
See Attached Lab Request

Item #	Client Sample Identification	3M LIMS #	Date Sampled	Time Sampled	Matrix/ media	Enter the number of containers of each					Total Number of Containers	(Enter an 'X' in the box below to indicate request)
1.	*Reach 4 - Loc 11 Sample*	*031*	10:25	7/8/09	*W*				1		1	
2.	*Reach 4 - Loc 11 Sample Dup*	*032*	↓	↓	*W*				1		1	
3.	*Reach 4 - Loc 11 Spike*	*033*	↓		*W*				1		1	
4.	*Reach 4 - Loc 12 Sample*	*034*	10:50		*W*				1		1	
5.	*Reach 4 - Loc 12 Sample Dup*	*035*	↓		*W*				1		1	
6.	*Reach 4 - Loc 12 Spike*	*036*	↓	↓	*W*				1		1	
7.	*Trip Blank Sample*	*037*	*	*	*W*				1		1	
8.	*Trip Blank 25 ppt Spike*	*038*	*	*	*W*				1		1	
9.	NA				BG							
10.												

7/8/09

Collected by (print): Brad Jacobson
Collector's signature: Brad Jacobson

Relinquished By/Affiliation

Item #	Relinquished By/Affiliation	Time	Date	Shipped Via:	Received By/Affiliation	Time	Date
1-8	Brad Jacobson / Pace	1644	7/8/09	BG-Pace	Scott Anderson 3M/Pace	16:44	7/8/09

Sample Condition Upon Receipt: ☒ Acceptable ○ Other:
Temperature: RT °C ○ Received on Ice (Ice not required for this project (RAS-Pace))
Other Associated CoCs:
Copies to:

Comments: * = *Blanks are pre-filled by Pace Life Sciences and accompany the study bottles for the duration of the field sampling.*

Original - Accompanying Samples — Last Page - Originator — See Reverse Side for Instructions

3M Environmental Laboratory

Chain of Custody / Request for Laboratory Analytical Services

Shipping Address:
3M Center
Bldg. 260-5N-17
St. Paul, MN 55144

Telephone:
Sample Receiving: (651) 736-6569
Alternate: (651) 733-9673
FAX: (651) 733-5982

Project ID/Project Name	Mississippi River Pool 2 Surface Water Sampling July 2009
Template #	Final Report Due Date
Project Lead	*Sue Wolf* — Internal Due Date
Dept. # (main)	452090 — Class/Job/Project # 0040152373

3M Env. Lab Project # (For Internal Use Only)

E09-0365

Contact Name	*Gary Hohenstein*	Date Available	
Company	*3M Company*	Date Due	
Mailing Address		Contract Lab	*3M Environmental Lab*
City, State, Zip			
Telephone #	FAX #		

Special Instructions and/or Specific Regulatory Requirements:
(method, limit of detection, rep

Time BEJ (Pace) 7/8/09 Date

Preservatives: (HNO_3, H_2SO_4, VOCs, None, Other: — Enter the number of containers of each)

Total Number of Containers

Analysis Requested:
Complete below. Attach any associated information.

See Attached Lab Request

(Enter an 'X' in the box below to indicate request)

Item #	Client Sample Identification	3M LIMS #	Date Sampled	Time Sampled	Matrix/ media	Containers	
1.	*Reach 3 - Loc 7 Spike*	*021*	0850	7/8/09	*W*	1	
2.	*Reach 3 - Loc 8 Sample*	*022*	0910		*W*	1	
3.	*Reach 3 - Loc 8 Sample Dup*	*023*			*W*	1	
4.	*Reach 3 - Loc 8 Spike*	*024*			*W*	1	
5.	*Reach 3 - Loc 9 Sample*	*025*	0945		*W*	1	
6.	*Reach 3 - Loc 9 Sample Dup*	*026*			*W*	1	
7.	*Reach 3 - Loc 9 Spike*	*027*			*W*	1	
8.	*Reach 4 - Loc 10 Sample*	*028*	0955		*W*	1	
9.	*Reach 4 - Loc 10 Sample Dup*	*029*			*W*	1	
10.	*Reach 4 - Loc 10 Spike*	*030*			*W*	1	

Collected by (print): Brad Jacobson

Collector's signature: Brad Jacobson

Item #	Relinquished by/Affiliation	Time	Date	Shipped Via:	Received By/Affiliation	Time	Date
1-10	Brad Jacobson /Pace	1644	7/8/09	BEJ-Pace	Linda Anderson 3M/Pace	1644	7/8/09

Sample Condition Upon Receipt: X Acceptable O Other:

Temperature: RT °C O Received on Ice (Ice not required for this project (RAS-Pace))

Other Associated CoCs:

Copies to:

Comments:

3M Environmental Laboratory

Chain of Custody / Request for Laboratory Analytical Services

3M Env. Lab Project #
For Internal Use Only
E09-0365

Shipping Address:
3M Center
Bldg. 260-5N-17
St. Paul, MN 55144

Telephone:
Sample Receiving: (651) 736-6559
Alternate: (651) 733-9873
FAX: (651) 733-5962

Project ID/Project Name	Mississippi River Pool 2 Surface Water Sampling July 2009
Template #	Final Report Due Date
Project Lead	*Sue Wolf* — Internal Due Date
Dept. # (main)	452090 — Class/Job/Project # 0040152373

Report To

Contact Name	*Gary Hohenstein*
Company	*3M Company*
Mailing Address	
City, State, Zip	
Telephone #	FAX #

Date Available	
Date Due	
Contract Lab	*3M Environmental Lab*

Special Instructions and/or Specific Regulatory Requirements:
(method, limit of detection, rep

Preservatives: HNO_3 | H_2SO_4 | VOCs | None | Other:

Total Number of Containers

Analysis Requested:
Complete below. Attach any associated information.

See Attached Lab Request

Item #	Client Sample Identification	3M LIMS #	Date Sampled	Time Sampled	Matrix/ media	Enter the number of containers of each					Total Number of Containers	(Enter an 'X' in the box below to indicate request)
1.	*Reach 2 - Loc 4 Sample Dup*	*011*	7/8/09	1318	W				1		1	
2.	*Reach 2 - Loc 4 Spike*	*012*	"	↓	W				1		1	
3.	*Reach 2 - Loc 5 Sample*	*013*	"	1250	W				1		1	
4.	*Reach 2 - Loc 5 Sample Dup*	*014*	"	"	W				1		1	
5.	*Reach 2 - Loc 5 Spike*	*015*	"	↓	W				1		1	
6.	*Reach 2 - Loc 6 Sample*	*016*	"	1233	W				1		1	
7.	*Reach 2 - Loc 6 Sample Dup*	*017*	"	"	W				1		1	
8.	*Reach 2 - Loc 6 Spike*	*018*	"	↓	W				1		1	
9.	*Reach 3 - Loc 7 Sample*	*019*	"	0850	W				1		1	
10.	*Reach 3 - Loc 7 Sample Dup*	*020*	↓	↓	W				1		1	

Collected by (print): Brad Jacobsen
Collector's signature: Brad Jacobsen

Item #	Relinquished By/Affiliation	Time	Date	Shipped Via:	Received By/Affiliation	Time	Date
1-10	Brad Jacobsen / Pace	1644	7/8/09	GSJ-Pace	Scott Anchen 3M Lab	1644	7/8/09

Sample Condition Upon Receipt: X Acceptable O Other:
Temperature: 4 °C O Received on Ice (Ice not required for this project (RAS-Pace))
Other Associated CoCs:
Copies to:

3M Environmental Laboratory

Chain of Custody / Request for Laboratory Analytical Services

Shipping Address:
3M Center
Bldg. 260-5N-17
St. Paul, MN 55144

Telephone:
Sample Receiving: (651) 736-6559
Alternate: (651) 733-9673
FAX: (651) 733-5962

Project ID/Project Name	Mississippi River Pool 2 Surface Water Sampling July 2009
Template #	
Project Lead	Sue Wolf
Dept. # (main)	452090
Final Report Due Date	
Internal Due Date	
Class/Job/Project #	0040152373

3M EHL Lab Project # For 3M Internal Use Only

E09-0365

Contact Name	Gary Hohenstein
Company	3M Company
Mailing Address	
City, State, Zip	
Telephone #	FAX #
Date Available	
Date Due	
Contract Lab	3M Environmental Lab

Special Instructions and/or Specific Regulatory Requirements:
(method, limit of detection, reporting units, etc.)

Preservatives: HNO_3 | H_2SO_4 | VOCs | None | Other:

Total Number of Containers

Analysis Requested:
Complete below. Attach any associated information.

See Attached Lab Request

(Enter an 'X' in the box below to indicate request)

Item #	Client Sample Identification	3M LIMS #	Date Sampled	Time Sampled	Matrix/ media	Enter the number of containers of each	Total Number of Containers
1.	Reach 1 - Loc 1 Sample	001	7/8/09	1410	W	1	1
2.	Reach 1 - Loc 1 Sample Dup	002	"	"	W	1	1
3.	Reach 1 - Loc 1 Spike	003	"	"	W	1	1
4.	Reach 1 - Loc 2 Sample	004	"	1355	W	1	1
5.	Reach 1 - Loc 2 Sample Dup	005	"	"	W	1	1
6.	Reach 1 - Loc 2 Spike	006	"	"	W	1	1
7.	Reach 1 - Loc 3 Sample	007	"	1335	W	1	1
8.	Reach 1 - Loc 3 Sample Dup	008	"	"	W	1	1
9.	Reach 1 - Loc 3 Spike	009	"	"	W	1	1
10.	Reach 2 - Loc 4 Sample	010	"	1318	W	1	1

Collected by (print): Brad Jacobson

Collector's signature: Brad Jacobson

Item #	Relinquished by/Affiliation	Time	Date	Shipped Via:	Received by/Affiliation	Time	Date
1-10	Brad Jacobson /Pace	1644	7/8/09	GS-Pace	Linda Andrews 3M/Pace	1644	7/8/09

Sample Condition Upon Receipt: ☒ Acceptable ☐ Other:

Temperature: RT °C ☐ Received on Ice (Ice not required for this project (RAS-Pace))

Other Associated CoCs:

Copies to:

Comments:

Mississippi River Pool 2 Surface Water

Chain of Custody Forms

Pace Analytical
Field Services Division

Mississippi River Pool 2 Surface Water Sampling
Lab Request Number: B09-0369

Field Sampling Notes

Site Identification: Reach 1 - Loc 2
GPS Coordinates:
Proposed UTM 485961, 4970846
Actual UTM 0486067, 4971149

Date Collected: 7/8/09
Time Collected: 1355
Collected By: BGJ
Signature:

Observations

- Subsurface (~4-6"): Dip Bottle #1 3m Sample, 3m Spike, MPCA Primary
Dip Bottle #2 3m Dup, MPCA Dup
MPCA Lined Dip Triplicate
BGJ 7/8/09

Field Measurements

Wind Direction: est SE
- River Depth: 10 ~~B~~ Re (ft.)

- Ambient Temp.: ~75 (°C)
- Water Temp.: 25.2 (°C)

Field Sampling Notes

Site Identification: Reach 1 - Loc 1
GPS Coordinates:
Proposed UTM 484163, 4973008
Actual UTM 0484143 4973007

Date Collected: 7/8/09
Time Collected: 1410
Collected By: BGJ
Signature:

Observations

- Subsurface (~4-6"): Dip Bottle #1 8m sample, 3m spike, MPCA Primary
Dip Bottle #2 3m Dup, MPCA Dup
- MPCA Lined Filled Triplicate - comb Dip 1 + Dip 2 Extr + Dipped 1 more times
BGJ 7/8/09

Field Measurements

Wind Direction: SE
- River Depth: 13 (ft.)

- Ambient Temp.: ~75 (°C)
- Water Temp.: 25.7 (°C)

Pace Analytical
Field Services Division

Mississippi River Pool 2 Surface Water Sampling
Lab Request Number: E01-0365

Field Sampling Notes

Site Identification: Reach 2 - Loc 4
GPS Coordinates:
Proposed UTM 489751, 4973897
Actual UTM 489727, 4973910

Date Collected: 7/18/07
Time Collected: 1318
Collected By: BGJ
Signature:

Observations

- Subsurface (~4-6"): Dip Bottle #1 3m Sample 3m Spike, MPCA Primary
Dip Bottle #2 3m Dup, MPCA Dup
- MPCA Direct Fill their Triplicate bottle
BGJ 7/18/07

Field Measurements

Wind Direction: SE
- River Depth: 22 (ft.)

- Ambient Temp.: est ~75 (°C)
- Water Temp.: 24.8 (°C)

Field Sampling Notes

Site Identification: Reach 1 - Loc 3
GPS Coordinates:
Proposed UTM 487626, 4971558
Actual UTM 0487624, 4971560

Date Collected: 7/18/07
Time Collected: 1335
Collected By: BGJ
Signature:

Observations

- Subsurface (~4-6"): MN River [redacted] more Fol. - No much visible diff. now -
Dip Bottle #1 3m Sample, 3m Spike, MPCA Primary
Dip Bottle #2 3m Dup, MPCA Dup
MPCA Direct Dip Triplicate
BGJ 7/18/07

Field Measurements

Wind Direction: SE
- River Depth: 12' (ft.)

- Ambient Temp.: est ~75 (°C)
- Water Temp.: 24.9 (°C)

Pace Analytical
Field Services Division

Mississippi River Pool 2 Surface Water Sampling
Lab Request Number: 6071-0365

Field Sampling Notes

Site Identification: Reach 2 - Loc 6
GPS Coordinates:
Proposed UTM —
Actual UTM 0497900, 4971442

Date Collected: 7/8/09
Time Collected: 1233
Collected By: BGJ
Signature:

Observations

- Subsurface (~4-6"): Dip Bottle #1 3m Sample, 3m Spike, MPCA Primary
Photo 6 Dip Bottle #2 3m Dup, MPCA Dup
MPCA direct dip Triplicate
BGJ 7/8/09

Field Measurements

Wind Direction: SE
- River Depth: 4 (ft.)

- Ambient Temp.: ~70 (°F)
- Water Temp.: 25.0 (°C)

Field Sampling Notes

Site Identification: Reach 2 - Loc 5
GPS Coordinates:
Proposed UTM 0496076 4975338
Actual UTM 0496075, 4975266

Date Collected: 7/8/09
Time Collected: 1250
Collected By: BGJ
Signature:

Observations

- Subsurface (~4-6"): Dip Bottle #1 3m Sample, 3m Spike, MPCA Primary
Photo 7 Dip Bottle #2 3m Dup MPCA Dup
MPCA direct dip Triplicate
BGJ 7/8/09

Field Measurements

Wind Direction: SE
- River Depth: 13 (ft.)

- Ambient Temp.: ~70 (°C)
- Water Temp.: 25.5 (°C)

Pace Analytical
Field Services Division

Mississippi River Pool 2 Surface Water Sampling
Lab Request Number: E09-0365

Field Sampling Notes

Site Identification: Reach 4 - Loc 11
GPS Coordinates:
Proposed UTM 508556, 4958779
Actual UTM 508545, 4958789

Date Collected: 7/8/09
Time Collected: 1025
Collected By: BGS
Signature: [signature]

Observations

- Subsurface (~4-6"): MPC collected MS Dups at this Point
Photo 4 Dip Bottle #1 3m Sample, Spike, MPCA Primary
Taken as Dip Bottle #2 3m Dup MPCA Dup
departing - combined xtra # Dipped bottle #1 1 more time for MPCA MSD.
Almost missed BGS 7/8/09
Sonde A

Field Measurements

Wind Direction: SE - Light
- River Depth: 4-6 (ft.) - closer to 6
- Ambient Temp.: ~65 (°C)
- Water Temp.: ~~23.8~~ 23.9 (°C) BGS

Field Sampling Notes

Site Identification: Reach 4 - Loc 12
GPS Coordinates:
Proposed UTM 510032, 4956963
Actual UTM 510018, 4956960

Date Collected: 7/8/09
Time Collected: 1050
Collected By: BGS
Signature: [signature]

Observations

- Subsurface (~4-6"): Dip Bottle #1 3m Sample, Spike & MPCA Primary
Photo 5 D.P " 2 3m Dup, MPCA Dup
MPCA Used Dip Triplicate
BGS 7/8/09

Field Measurements

w/ Thermometer
Wind Direction: SE
- River Depth: 14-17 (ft.)
- Ambient Temp.: 24 (°C)
- Water Temp.: 24.3 (°C)

Pace Analytical
Field Services Division

Mississippi River Pool 2 Surface Water Sampling
Lab Request Number: E09-0365

Field Sampling Notes

Site Identification: Reach 3 - Loc 9
GPS Coordinates:
Proposed UTM 503307, 4956202
Actual UTM 0503642, 4956878

Date Collected: 7/8/09
Time Collected: 0745
Collected By: BGJ
Signature:

Observations

- Subsurface (~4-6"): Dip container 1 - 3m sample, 3M spike, MPCA primary
Photo 2 " " 2 3M Dup, MPCA Dup
MPCA direct dip Triplicate
BGJ 7/8/09

Field Measurements

Wind Direction: moderate ~ SE
- River Depth: 9 (ft.)
- Ambient Temp.: ~65 (°C)
- Water Temp.: 24.4 (°C)

Field Sampling Notes

Site Identification: Reach 4 - Loc 10
GPS Coordinates:
Proposed UTM 505382, 4958615
Actual UTM ~~0505371, 4958645~~ BGJ 7/8/09
0505348, 4958622

Date Collected: 7/8/09
Time Collected: 0955
Collected By: BGJ
Signature:

Observations

- Subsurface (~4-6"): Dip cont. 1 - 3m sample, 3m spike, MPCA prim
Photo 3 " " 2 3M Dup, MPCA DUP
MPCA direct dip triplicate
BGJ 7/8/09

Field Measurements

Wind Direction: SE
- River Depth: 12' (ft.)
- Ambient Temp.: ~65 (°C)
- Water Temp.: 23.9 (°C)

Pace Analytical
Field Services Division

Mississippi River Pool 2 Surface Water Sampling
Lab Request Number: E09-0365

Field Sampling Notes

Site Identification: Reach 3 - Loc 7
Date Collected: 7/8/09
GPS Coordinates:
Time Collected: 0850
Proposed UTM —
Collected By: BGJ
Actual UTM 15T 0499081, 4965125
Signature: Bruce Hanson

* Participants: Bruce Hanson
Harold Weigner
Marvin Hora
* For project duration.

Observations

- Subsurface (~4-6"): 1st Site
- Used 2L Dipping Bottles
- Dip 1 MPCA Primary - 3m Sample, Dup & Spike
- MPCA Dip discard for their Dup & Triplicate
- AXYS Bottles Sent w/ Blue Ice Packs
- IDLED Boat Forward as collected.
- Tinted water; not much particulate visible
- missed photo

Field Measurements

Wind Direction: Light SE
- Ambient Temp.: ~65 (°F)
- River Depth: ~11 (ft.)
- Water Temp.: 24.7 (°C)

Field Sampling Notes

Site Identification: Reach 3 - Loc 8
Date Collected: 7/8/09
GPS Coordinates:
Time Collected: 0910
Proposed UTM —
Collected By: BGJ
Actual UTM 0499272, 4963328
Signature: Bruce Hanson

Observations

- Subsurface (~4-6"): 1st Dip Bottle - 3m sample, 3m Spike MPCA Primary
Photo #1 2nd Dip Bottle - ~~3m~~ Dup MPCA Dup & MPCA Diversit Dip Trip
- ~~Not Used~~ 7/9

BGJ 7/8/09

Field Measurements

Wind Direction: Light SE
- Ambient Temp.: ~65 (°C)
- River Depth: 12 (ft.)
- Water Temp.: 24.7 (°C)

Mississippi River Pool 2 Surface Water

Field Data Log Sheet(s)

Mississippi River Pool 2 Surface Water Sampling
Sampling Matrix Report Summary July 8, 2009
3M Lab Request E09-0365

Sample ID	Description	GPS Coordinates	3M Samples - 0.25 L			MPCA Samples - 1.0 L					
			Sample	Sample Dup	Spike	Primary	Duplicate	Triplicate	MS-1	MS-2	MS-3
Reach 1 - Loc 1	Main Channel Depth to Bottom: 13 feet / Water Temp.: 25.7 °C	Proposed UTM 484163, 4973008 Actual UTM 484143, 4973007	1	1	1	1	1	1	1	1	1
Reach 1 - Loc 2	Old MN River Channel Depth to Bottom: 10 feet / Water Temp.: 25.2 °C	Proposed UTM 485961, 4970846 Actual UTM 486067, 4971149	1	1	1	1	1	1	---	---	---
Reach 1 - Loc 3	Main channel before confluence w/ MN River Depth to Bottom: 12 feet / Water Temp.: 24.9 °C	Proposed UTM 487626, 4971558 Actual UTM 487624, 4971560	1	1	1	1	1	1	---	---	---
Reach 2 - Loc 4	Main channel out from boat launch Depth to Bottom: 22 feet / Water Temp.: 24.8 °C	Proposed UTM 489751, 4973897 Actual UTM 489727, 4973910	1	1	1	1	1	1	---	---	---
Reach 2 - Loc 5	Main channel adjacent to Holman Field Depth to Bottom: 13 feet / Water Temp.: 25.5 °C	Proposed UTM 496076, 4975338 Actual UTM 496075, 4975266	1	1	1	1	1	1	---	---	---
Reach 2 - Loc 6	Bay downstream of Pigs Eye Lake Depth to Bottom: 4 feet / Water Temp.: 25.0 °C	Proposed UTM --- --- Actual UTM 497900, 4971442	1	1	1	1	1	1	---	---	---
Reach 3 - Loc 7	Just south of boat landing - south of Newport Depth to Bottom: 11 feet / Water Temp.: 24.7 °C	Proposed UTM --- --- Actual UTM 499081, 4965125	1	1	1	1	1	1	---	---	---
Reach 3 - Loc 8	Above the small Island No. 112 Depth to Bottom: 12 feet / Water Temp.: 24.7 °C	Proposed UTM --- --- Actual UTM 499272, 4963328	1	1	1	1	1	1	---	---	---
Reach 3 - Loc 9	Middle of Spring Lake Depth to Bottom: 9 feet / Water Temp.: 24.4 °C	Proposed UTM 503307, 4956202 Actual UTM 503642, 4956878	1	1	1	1	1	1	---	---	---
Reach 4 - Loc 10	Main Nav. Channel dwnstrm of Grey Cloud Slough Depth to Bottom: 12 feet / Water Temp.: 23.9 °C	Proposed UTM 505382, 4958615 Actual UTM 505348, 4958622	1	1	1	1	1	1	---	---	---
Reach 4 - Loc 11	In vicinity just downstream of 3M CG discharge Depth to Bottom: 6 feet / Water Temp.: 23.9 °C	Proposed UTM 508556, 4958779 Actual UTM 508545, 4958789	1	1	1	1	1	1	1	1	1
Reach 4 - Loc 12	Main Nav. channel just upstream of Lock & Dam #2 Depth to Bottom: 14 feet / Water Temp.: 24.3 °C	Proposed UTM 510032, 4956963 Actual UTM 510018, 4956960	1	1	1	1	1	1	---	---	---

Pace Analytical
Field Services Division

3M PROJECT SUMMARY

Project Name: Mississippi River Pool 2 Surface Water
Lab Request: E09-0365
Monitoring Date: 7/8/2009
Prepared By: Brad Jacobson (BGJ)
Date: 7/22/2009

3M Requester: Gary Hohenstein
3M Project Lead: Sue Wolf

ITEM	INCLUDED	N/A	COMMENTS
Laboratory Results		X	Samples submitted directly to 3M Env. Lab
Sampling Matrix Report Summary Table	X		
Field Data Log Sheet(s)	X		
Chain of Custody Form(s)	X		
Site Photographs	X		
Maps (from Bruce Monson 07-01-09 email)	X		
Maps (received onsite from Bruce Monson)	X		

General Field Sampling Summary

1. Sample bottles were prepared by the 3M Environmental Lab. The pre-filled trip blank and trip blank spike accompanied the sample bottles for the project duration.
2. Project was mobilized from the public landing located at the intersection of 7th Ave and Forest St in St. Paul Park, MN.
3. Onsite Personnel: Brad Jacobson (Pace) and State representatives Bruce Monson, Harold Wiegner and Marvin Hora.
4. Collection Method: Samples were collected by submerging a 2-liter plastic transfer (dipping) container in the river, uncapping the container and allowing it to fill while the boat was slowly idled forward into fresh water. A second 2-liter container was filled in the same fashion. The 3M "Sample", 3M "Spike" and MPCA "Primary" samples were filled from the first dipping container. The 3M "Duplicate" and MPCA "Duplicate" were filled from the second dipping container. MPCA direct dipped the sample container for the MPCA "Triplicate" sample. A new pair of nitrile gloves were worn during the collection procedure at each site.
5. MPCA collected additional volume for three matrix spike samples at Reach 1-Location 1 and Reach 4-Location 11.
6. Due to expected windy, rough conditions on the "big water" areas, the plan to sample from the point of lowest expected concentration to highest was not adhered to.
7. The sample containers, and samples remained in the custody of the Pace field technician until delivery to the 3M Environmental laboratory.

1700 Elm Street, Suite 200
Minneapolis, MN 55414
TEL: 612-607-1700
FAX: 612-607-6444

Mississippi River Pool 2

Surface Water Sampling - MPCA WATER SAMPLES FOR PFCs

DATE 7/8/09

SAMPLEID	REACH	LOCATION	REPLICATE	Vol (L)	TIME (HH:MM)	Water Depth (ft)	Quanta Sonde Temp	Quanta Sonde SpC	Quanta Sonde DO	Quanta Sonde pH	UTM Coordinates	
1-01-1	Reach1	Location 1	Primary	1	14:08	13	25.74	378	9.24	6.89	0484143	4973007
1-01-2			Duplicate	1						*pH probe not calibrated*		
1-01-3			Triplicate	1								
1-01-1S			MS-1	1								
1-01-2S			MS-2	1								
1-01-3S			MS-3	1								
1-02-1		Location 2	Primary	1	13:51	10	25.21	380	9.28	6.84	0486067	4971149
1-02-2			Duplicate	1								
1-02-3			Triplicate	1								
1-03-1		Location 3	Primary	1	13:30	12	24.93	382	8.93	6.81	0487624	4971560
1-03-2			Duplicate	1								
1-03-3			Triplicate	1								
2-04-1	Reach 2	Location 4	Primary	1	13:17	22	24.21	536	8.67	6.1	0489737	4973910
2-04-2			Duplicate	1								
2-04-3			Triplicate	1								
2-05-1		Location 5	Primary	1	12:47	13	25.52	525	9.46	6.78	0496075	4975366
2-05-2			Duplicate	1								
2-05-3			Triplicate	1								
2-06-1		Location 6	Primary	1	12:30	4	25.03	580	8.72	6.74	0497900	4971442
2-06-2			Duplicate	1								
2-06-3			Triplicate	1								
3-07-1	Reach3	Location 7	Primary	1	8:43	11	24.71	587	7.96	6.45	0499081	4965125
3-07-2			Duplicate	1								
3-07-3			Triplicate	1								
3-08-1		Location 8	Primary	1	9:06	12	24.73	576	7.82	6.3	0499272	4963280
3-08-2			Duplicate	1								
3-08-3			Triplicate	1								
3-09-1		Location 9	Primary	1	9:40	9	24.38	579	7.85	6.4	0503642	4956878
3-09-2			Duplicate	1								
3-09-3			Triplicate	1								
4-10-1	Reach 4	Location 10	Primary	1	9:58	12	23.87	579	7.41	6.54	0505348	4958622
4-10-2			Duplicate	1								
4-10-3			Triplicate	1								
4-11-1		Location 11	Primary	1	10:24	4	23.86	566	7.92	6.72	0508545	4958789
4-11-2			Duplicate	1								
4-11-3			Triplicate	1								
4-11-1S			MS-1	1								
4-11-2S			MS-2	1								
4-11-3S			MS-3	1								
4-12-1		Location 12	Primary	1	10:47	17	24.28	574	7.26	6.56	0510018	4956960
4-12-2			Duplicate	1								
4-12-3			Triplicate	1								

Random MS/MSD Site Selection

LOCATION	Rand #	
1	0.051	x
11	0.194	x
9	0.225	
10	0.266	
5	0.276	
7	0.380	
3	0.426	
8	0.538	
2	0.554	
6	0.856	
12	0.869	
4	0.965	

Mississippi River Pool 2
Surface Water Sampling
July 2009

Reach-Location-Replicate
example: '1-01-1

		MPCA Sample Bottles				3M Sample Bottles				Sample Collection ("dipping") Containers	
		Vol (L)			Vol (L)	Vol (L)			Vol (L)	Vol (L)	Comments on Use
Reach1											
	Location 1										
		Primary	1	Spike for primary	1	Primary	0.25	Spike	0.25	2	Container will be dipped twice to fill all four bottles, then discarded.
		Duplicate	1	Spike for duplicate	1	Duplicate	0.25			2	Container will be dipped twice to fill all three bottles, then discarded.
		Triplicate	1	Spike for triplicate	1					2	Container will be dipped once to fill both bottles, then discarded.
	Location 2										
		Primary	1			Primary	0.25	Spike	0.25	2	Container will be dipped once to fill all three bottles, then discarded.
		Duplicate	1			Duplicate	0.25			2	Container will be dipped once to fill both bottles, then discarded.
		Triplicate	1							Use triplicate bottle	Sample bottle itself can serve as "dipping" container.
	Location 3										
		Primary	1			Primary	0.25	Spike	0.25	2	Container will be dipped once to fill all three bottles, then discarded.
		Duplicate	1			Duplicate	0.25			2	Container will be dipped once to fill both bottles, then discarded.
		Triplicate	1							Use triplicate bottle	Sample bottle itself can serve as "dipping" container.
Reach 2											
	Location 4										
		Primary	1			Primary	0.25	Spike	0.25	2	Container will be dipped once to fill all three bottles, then discarded.
		Duplicate	1			Duplicate	0.25			2	Container will be dipped once to fill both bottles, then discarded.
		Triplicate	1							Use triplicate bottle	Sample bottle itself can serve as "dipping" container.
	Location 5										
		Primary	1			Primary	0.25	Spike		2	Container will be dipped once to fill all three bottles, then discarded.
		Duplicate	1			Duplicate	0.25			2	Container will be dipped once to fill both bottles, then discarded.
		Triplicate	1							Use triplicate bottle	Sample bottle itself can serve as "dipping" container.
	Location 6										
		Primary	1			Primary	0.25	Spike		2	Container will be dipped once to fill all three bottles, then discarded.
		Duplicate	1			Duplicate	0.25			2	Container will be dipped once to fill both bottles, then discarded.
		Triplicate	1							Use triplicate bottle	Sample bottle itself can serve as "dipping" container.
Reach3											
	Location 7										
		Primary	1	Spike for primary	1	Primary	0.25	Spike	0.25	2	Container will be dipped twice to fill all four bottles, then discarded.
		Duplicate	1	Spike for duplicate	1	Duplicate	0.25			2	Container will be dipped twice to fill all three bottles, then discarded.
		Triplicate	1	Spike for triplicate	1					2	Container will be dipped once to fill both bottles, then discarded.
	Location 8										
		Primary	1			Primary	0.25	Spike	0.25	2	Container will be dipped once to fill all three bottles, then discarded.
		Duplicate	1			Duplicate	0.25			2	Container will be dipped once to fill both bottles, then discarded.
		Triplicate	1							Use triplicate bottle	Sample bottle itself can serve as "dipping" container.
	Location 9										
		Primary	1			Primary	0.25	Spike	0.25	2	Container will be dipped once to fill all three bottles, then discarded.
		Duplicate	1			Duplicate	0.25			2	Container will be dipped once to fill both bottles, then discarded.
		Triplicate	1							Use triplicate bottle	Sample bottle itself can serve as "dipping" container.
Reach 4											
	Location 10										
		Primary	1			Primary	0.25	Spike	0.25	2	Container will be dipped once to fill all three bottles, then discarded.
		Duplicate	1			Duplicate	0.25			2	Container will be dipped once to fill both bottles, then discarded.
		Triplicate	1							Use triplicate bottle	Sample bottle itself can serve as "dipping" container.
	Location 11										
		Primary	1			Primary	0.25	Spike		2	Container will be dipped once to fill all three bottles, then discarded.
		Duplicate	1			Duplicate	0.25			2	Container will be dipped once to fill both bottles, then discarded.
		Triplicate	1							Use triplicate bottle	Sample bottle itself can serve as "dipping" container.
	Location 12										
		Primary	1			Primary	0.25	Spike		2	Container will be dipped once to fill all three bottles, then discarded.
		Duplicate	1			Duplicate	0.25			2	Container will be dipped once to fill both bottles, then discarded.
		Triplicate	1							Use triplicate bottle	Sample bottle itself can serve as "dipping" container.

Number of 1 L bottles required = 42
Number of 0.25 L bottles required = 36
Number of 2 L bottles required = 26

Note: locations for additional spike bottles for MPCA samples have been arbitrarily assumed - key is that 2 of 12 locations will be sampled in this manner.

Rec'd 8/24/09

CLIENT ID	UNITS	PFBA	PFPeA	PFHxA	PFHpA	PFOA	PFNA	PFDA	PFUnA	PFDoA	PFBS	PFHxS	PFOSA	PFOS	PFOS	PFOS-avg	PFOS-avg
1-01-1	ng/L	3.76	< 2.56	< 2.56	< 2.56	< 2.56	< 2.56	< 2.56	< 2.56	< 2.56	< 5.12	< 5.12	< 2.56	< 5.12	2.56	2.56	2.54
1-01-2	ng/L	4.33	< 2.57	< 2.57	< 2.57	< 2.57	< 2.57	< 2.57	< 2.57	< 2.57	< 5.14	< 5.14	< 2.57	< 5.14	2.57		
1-01-3	ng/L	5.16	< 2.54	< 2.54	< 2.54	< 2.54	< 2.54	< 2.54	< 2.54	< 2.54	< 5.08	< 5.08	< 2.54	< 5.08	2.54		
1-02-1	ng/L	4.4	< 2.54	< 2.54	< 2.54	< 2.54	< 2.54	< 2.54	< 2.54	< 2.54	< 5.08	< 5.08	< 2.54	< 5.08	2.54	2.53	
1-02-2	ng/L	4.16	< 2.55	< 2.55	< 2.55	< 2.55	< 2.55	< 2.55	< 2.55	< 2.55	< 5.10	< 5.10	< 2.55	< 5.10	2.55		
1-02-3	ng/L	5.38	< 2.51	< 2.51	< 2.51	< 2.51	< 2.51	< 2.51	< 2.51	< 2.51	< 5.02	< 5.02	< 2.51	< 5.02	2.51		
1-03-1	ng/L	6.79	< 2.58	< 2.58	< 2.58	< 2.58	< 2.58	< 2.58	< 2.58	< 2.58	< 5.15	< 5.15	< 2.58	< 5.15	2.58	2.53	
1-03-2	ng/L	5.01	< 2.52	< 2.52	< 2.52	< 2.52	< 2.52	< 2.52	< 2.52	< 2.52	< 5.03	< 5.03	< 2.52	< 5.03	2.52		
1-03-3	ng/L	5.08	< 2.49	< 2.49	< 2.49	< 2.49	< 2.49	< 2.49	< 2.49	< 2.49	< 4.97	< 4.97	< 2.49	< 4.97	2.49		
2-04-1	ng/L	3.96	< 2.51	< 2.51	< 2.51	< 2.51	< 2.51	< 2.51	< 2.51	< 2.51	< 5.03	< 5.03	< 2.51	< 5.03	2.52	2.53	4.25
2-04-2	ng/L	4.81	< 2.55	< 2.55	< 2.55	< 2.55	< 2.55	< 2.55	< 2.55	< 2.55	< 5.09	< 5.09	< 2.55	< 5.09	2.55		
2-04-3	ng/L	4.45	< 2.52	< 2.52	< 2.52	< 2.52	< 2.52	< 2.52	< 2.52	< 2.52	< 5.04	< 5.04	< 2.52	< 5.04	2.52		
2-05-1	ng/L	4.87	< 2.54	< 2.54	< 2.54	< 2.54	< 2.54	< 2.54	< 2.54	< 2.54	< 5.07	< 5.07	< 2.54	< 5.07	2.54	2.52	
2-05-2	ng/L	5.25	< 2.56	< 2.56	< 2.56	< 2.56	< 2.56	< 2.56	< 2.56	< 2.56	< 5.11	< 5.11	< 2.56	< 5.11	2.56		
2-05-3	ng/L	5.23	< 2.46	< 2.46	< 2.46	2.51	< 2.46	< 2.46	< 2.46	< 2.46	< 4.93	< 4.93	< 2.46	< 4.93	2.47		
2-06-1	ng/L	8.95	< 2.50	< 2.50	< 2.50	3.74	< 2.50	< 2.50	< 2.50	< 2.50	< 5.01	< 5.01	< 2.50	7.1	7.10	7.71	
2-06-2	ng/L	8.61	< 2.52	2.63	< 2.52	3.94	< 2.52	< 2.52	< 2.52	< 2.52	< 5.05	< 5.05	< 2.52	7.8	7.80		
2-06-3	ng/L	5.79	< 2.55	< 2.55	< 2.55	3.2	< 2.55	< 2.55	< 2.55	< 2.55	< 5.09	< 5.09	< 2.55	8.24	8.24		
3-07-1	ng/L	10.6	< 2.53	3	< 2.53	4.48	< 2.53	< 2.53	< 2.53	< 2.53	< 5.06	< 5.06	< 2.53	10.5	10.50	10.30	7.12
3-07-2	ng/L	10.7	< 2.49	3.58	< 2.49	5.01	< 2.49	< 2.49	< 2.49	< 2.49	< 4.98	< 4.98	< 2.49	10.5	10.50		
3-07-3	ng/L	9.82	< 2.53	2.57	< 2.53	4.75	< 2.53	< 2.53	< 2.53	< 2.53	< 5.07	< 5.07	< 2.53	9.91	9.91		
3-08-1	ng/L	11	< 2.55	3.14	< 2.55	5.42	< 2.55	< 2.55	< 2.55	< 2.55	< 5.10	< 5.10	< 2.55	8.74	8.74	8.51	
3-08-2	ng/L	9.63	< 2.55	< 2.55	< 2.55	3.91	< 2.55	< 2.55	< 2.55	< 2.55	< 5.09	< 5.09	< 2.55	8.4	8.40		
3-08-3	ng/L	9.44	< 2.56	2.77	< 2.56	4.5	< 2.56	< 2.56	< 2.56	< 2.56	< 5.11	< 5.11	< 2.56	8.4	8.40		
3-09-1	ng/L	13.2	< 2.52	3.06	< 2.52	4.22	< 2.52	< 2.52	< 2.52	< 2.52	< 5.05	< 5.05	< 2.52	< 5.05	2.53	2.54	
3-09-2	ng/L	13.3	< 2.52	2.76	< 2.52	4.63	< 2.52	< 2.52	< 2.52	< 2.52	< 5.04	< 5.04	< 2.52	< 5.04	2.52		
3-09-3	ng/L	11.9	< 2.59	3.12	< 2.59	5.03	< 2.59	< 2.59	< 2.59	< 2.59	< 5.17	< 5.17	< 2.59	< 5.17	2.59		
4-10-1	ng/L	14.8	< 2.54	2.91	< 2.54	3.91	< 2.54	< 2.54	< 2.54	< 2.54	< 5.07	< 5.07	< 2.54	< 5.07	2.54	2.52	35.92
4-10-2	ng/L	12.9	< 2.53	2.93	< 2.53	4.21	< 2.53	< 2.53	< 2.53	< 2.53	< 5.05	< 5.05	< 2.53	< 5.05	2.53		
4-10-3	ng/L	9.81	< 2.48	< 2.48	< 2.48	4.07	< 2.48	< 2.48	< 2.48	< 2.48	< 4.97	< 4.97	< 2.48	< 4.97	2.49		
4-11-1	ng/L	161	14.7	16.7	5.77	88.1	< 2.54	< 2.54	< 2.54	< 2.54	40.2	28.8	< 2.54	84.4	84.40	90.07	
4-11-2	ng/L	155	15.3	17.9	5.83	95.8	< 2.59	< 2.59	< 2.59	< 2.59	41.7	27.7	< 2.59	91.3	91.30		
4-11-3	ng/L	189	16.9	18	6.05	98.4	< 2.48	< 2.48	< 2.48	< 2.48	41.9	27.9	< 2.48	94.5	94.50		
4-12-1	ng/L	48.6	5.78	5.23	< 2.54	17.5	< 2.54	< 2.54	< 2.54	< 2.54	12.9	11.8	< 2.54	15.1	15.10	15.17	
4-12-2	ng/L	51.6	6.15	6.85	2.91	21.3	< 2.55	< 2.55	< 2.55	< 2.55	16.1	13.1	< 2.55	19.2	19.20		
4-12-3	ng/L	31.4	3.18	4.6	< 2.53	11.3	< 2.53	< 2.53	< 2.53	< 2.53	7.69	5.64	< 2.53	11.2	11.20		
Lab Blank	ng/L	< 2.50	< 2.50	< 2.50	< 2.50	< 2.50	< 2.50	< 2.50	< 2.50	< 2.50	< 5.00	< 5.00	< 2.50	< 5.00	< 5.00		

using 1/2 DL

section	station	PFOS-avg
1	1	2.56
1	2	2.53
1	3	2.53
2	4	2.53
2	5	2.52
2	6	7.71
3	7	10.30
3	8	8.51
3	9	2.54
4	10	2.52
4	11	90.07
4	12	15.17

section	PFOS-avg
1	2.54
2	4.25
3	7.12
4	35.92

section 4 median
15.10