

Auxiliary 1 Database and Documentation Production Release 4.0

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AUXILIARY 1 DATABASE AND DOCUMENTATION PRODUCTION RELEASE 4.0

**CONTRACT NO. 68-W-99-002
TASK ORDER NO. 007**

Prepared for:

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1.0 INTRODUCTION

1.1 Introduction

The United States Environmental Protection Agency (EPA) Office of Ground Water and Drinking Water (OGWDW) is responsible for implementing the Public Water System Supervision (PWSS) Program established under the auspices of the Safe Drinking Water Act (SDWA) of 1974 (Public Law 93-523) and the 1996 reauthorization of the Act. Two of OGWDW's major responsibilities under the Act are to set national standards for drinking water quality and to ensure that the states that have assumed primary enforcement responsibility (Primacy) are enforcing these standards.

In February 1994, OGWDW proposed an Information Collection Rule (ICR) requiring certain Public Water Systems (PWS) to generate and provide the Agency with specific microbiological contaminant and Disinfection By-Product (DBP) monitoring data, general water quality data, and treatment plant design and operating information characterizing their water systems. OGWDW began developing a Data Management System (DMS) to support the PWSS Program Information Systems Modernization (ISM) Effort. The purpose was to provide contractor support to complete the development of and provide support for the following automated systems:

- The ICR Water Utility Database System.
- The ICR Laboratory Quality Control (QC) Database System.
- The ICR Federal Database System.
- ICR Data Analysis Database 1 (i.e., Auxiliary 1 Database) and accompanying Query Tool.

These systems are described collectively as the ICR DMS. The ICR Water Utility Database System allows water utilities to report required data via software directly to EPA. The Laboratory QC Database System enables the analytical laboratories that are approved to perform sample analyses under the ICR to report data directly to the Agency. Capabilities of the ICR Federal Database include data population, or the capability to upload data from utilities and laboratories to the central database;

validation of Sample Analytical Result (SAR) data according to standards established by EPA; and support for tracking the approval status of analytical laboratories. A diagram of the ICR DMS System Concept appears as Exhibit 1 on the following page.

After data are loaded into the ICR Federal Database, the data will be analyzed by a number of researchers and analysts. The ICR DMS Team was tasked with gathering requirements for and designing seven Data Analysis Databases (Auxiliary Databases 1 through 7), which stores subsets of data extracted from the ICR Federal Database System. With the exception of Auxiliary 1 Database, the auxiliary databases will be constructed and implemented under a separate EPA contract. The ICR DMS Team was also tasked with gathering requirements for, designing, and developing a Query Tool, which performs complex analytical queries against Auxiliary 1 Database to support analysis of the ICR data.

Analysts will use the ICR data to develop regulations to assure public health protection from DBPs and disease causing microbes (pathogens), including Cryptosporidium, Giardia, and Viruses.

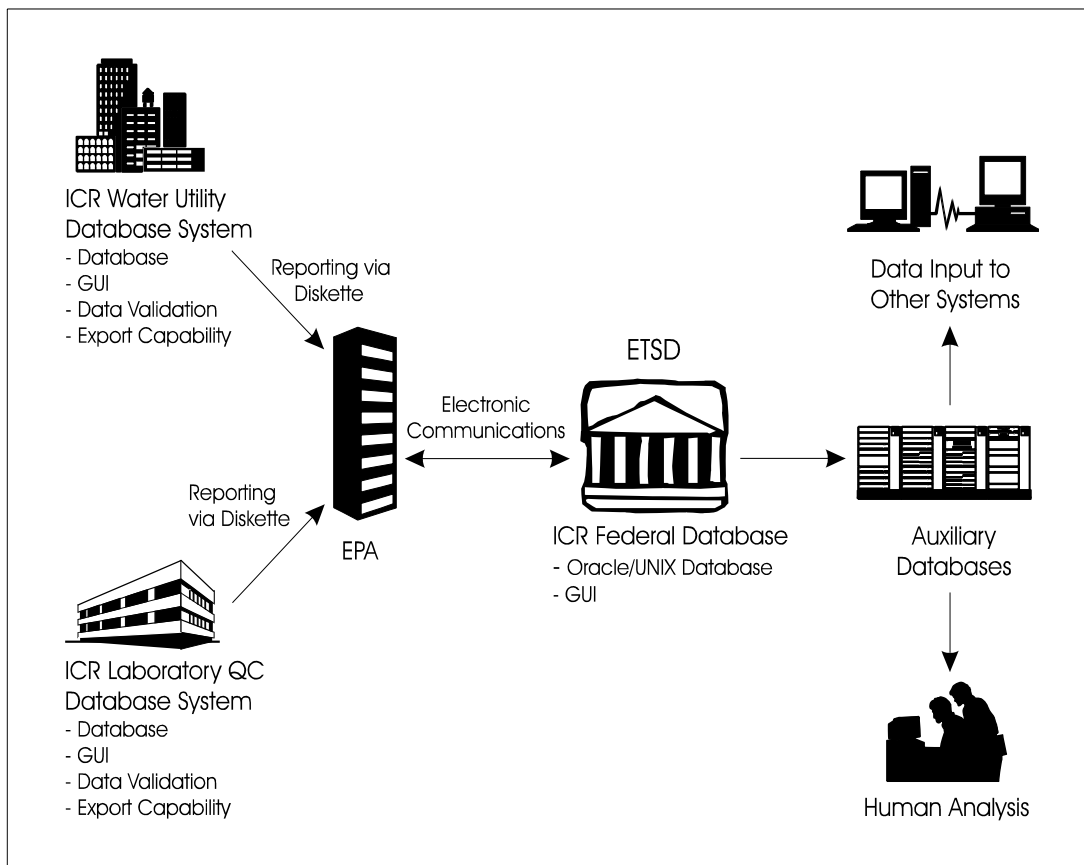


Exhibit 1. ICR DMS System Concept

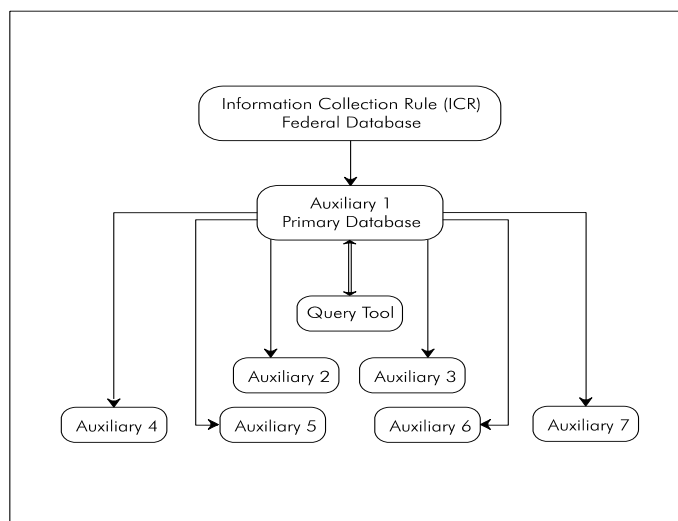
1.1.1 Purpose

This user documentation provides a comprehensive and accurate description of the structure and contents of Auxiliary 1 Database. An understanding of its structure and contents is essential to using Auxiliary 1 Database and the Query Tool effectively in the analysis of ICR data.

This document is intended to be used by Auxiliary 1 Database and Query Tool users as a reference providing: details of the structure of Auxiliary 1 Database, definitions of the data contained by the database, and delineation of the relationships between data in Auxiliary 1 Database and its source, the ICR Federal Database.

The primary users of the Auxiliary 1 Database and the Query Tool will be personnel involved with developing national standards for drinking water quality. The DBP and Microbial Technical Working Groups (TWG), and other related interested parties will be performing the majority of the analyses of ICR data. The probable composition of the overall user community who will utilize the Auxiliary Database is expected to include:

- EPA analysts.
- Stakeholder interest groups involved with rule development.
- Water utilities.
- Environmental groups.
- Public health officials.
- Analysts supporting public interest groups.



Researchers.

- University.
- Private.

1.1.2 Scope

A diagram of the Auxiliary Database System Concept appears as Exhibit 2 on the following page. The purpose of each Auxiliary Database is to provide researchers and analysts with a smaller, yet comprehensive version of the ICR Federal Database. Auxiliary 1 Database was designed to serve as the master auxiliary database from which other auxiliary databases are created. This document presents detailed descriptions of the structure and content of Auxiliary 1 Database (also called the Primary Auxiliary Database) and the Query Tool. Similar information for Auxiliary Databases 2 through 7 will be addressed under a separate EPA contract.

Exhibit 2. Auxiliary Database System Concept

1.1.3 Identification

Requirements planning, design, and database development for the analysis portion of the ICR is sponsored by OGWDW's PWSS Program ISM Effort. Requirements planning and analysis for Auxiliary 1 Database was conducted under Delivery Order (DO) 83, *Information Systems Development and User Support for the Public Water System Supervision (PWSS) Program's Information Collection Rule (ICR)*, of the Mission Oriented Systems Engineering Support (MOSES) contract at the Systems Development Center (SDC). EPA Contract #68-W1-0055 DO 83 ended on December 30, 1998. Task Order (TO) 007 under EPA Contract #68-W-99-002 began on December 31, 1998 and will continue to support the ICR.

1.1.4 Structure of the Document

This document consists of the requirements for Auxiliary 1 Database and the Query Tool. A set of appendices provides supporting details necessary for complete understanding of the structure and contents of the database and their relationship to the ICR Federal Database. The information presented in this document represents a cumulative update of information contained in the *Primary Auxiliary Database Chapter of the Information Collection Rule (ICR) Data Extraction Requirements Specification*, incorporating changes and corrections resulting from the design and implementation of the Auxiliary 1 Database and the Query Tool.

The following is a brief description of the appendices:

- Appendix A—Contains the Entity Relationship Diagram (ERD) for the Auxiliary 1 Database. The diagram details the relationships between the tables created for the Auxiliary 1 Database.
- Appendix B—Lists all of the fields in the Auxiliary 1 Database sorted by their corresponding *MS Access Alias*.
- Appendix C—Contains a series of tables (one for each physical table in the Auxiliary 1 Database) that provides data mapping for each field included in the database to its source in the ICR Federal Database. In addition, Appendix C includes for each field, the attribute name, *MS Access Alias*, and definition. The *MS Access Alias* contains the text that will be inserted into the *Caption* property in Microsoft® Access™ 97. The *Caption* property will be used to display unabbreviated column names for each field in the Auxiliary 1 Database.
- Appendix D—Lists the tables in the Auxiliary 1 Database and the primary keys in each table.
- Appendix E—Contains the formulas that were used to create the requirements for calculated fields in the Auxiliary 1 Database.

Note: The formulas in Appendix E were provided to the ICR DMS Team by EPA and EPA stakeholders.

- Appendix F—Identifies the algorithms for normalizing disinfectant addition formulas.
- Appendix G—Identifies the algorithms for normalizing chemical feed formulas.

1.2 References

The following documents are applicable to this user documentation. They include ICR DMS project documents, as well as government and industry materials used to develop this document.

Note: The documents are listed in reverse chronological order.

- *Auxiliary 1 User Documentation, Version 3.0.* SDC; SDC-0002-007-EB-2007; September 22, 1999.
- *Revised Project Plan for Information Systems Development and User Support for the Public Water System Supervision (PWSS) Program's Information Collection Rule (ICR).* SDC; SDC-0002-007-HB-2001; August 20, 1999.
- *Auxiliary 1 User Documentation, Version 2.0.* SDC; SDC-0002-007-EB-1026; July 28, 1999.
- *Revised Information Collection Rule (ICR) Data Management System (DMS) System Manual.* SDC; SDC-0002-007-SS-1021; July 2, 1999.
- *Auxiliary 1 User Documentation.* SDC; SDC-0002-007-EB-1005B; June 7, 1999.
- *Auxiliary 1 User Documentation (Beta Version).* SDC; SDC-0002-007-EB-1005A; February 28, 1999.
- *Technical Summary for the Information Collection Rule (ICR) Data Extraction Joint Application Design (JAD) Meeting, August 17-19, 1998.* EPA SDC; SDC-0055-083-BN-7027; September 23, 1998.
- *Primary Auxiliary Database Chapter of the Information Collection Rule (ICR) Data Extraction Design Specification,* EPA SDC; SDC-0055-083-FH-7026; August 21, 1998.

- *Primary Auxiliary Database Chapter of the Information Collection Rule (ICR) Data Extraction Requirements Specification.* EPA SDC; SDC-0055-083-EB-7022A; July 24, 1998.
- *Technical Summary for the Information Collection Rule (ICR) Data Extraction Joint Application Design (JAD) Meeting, June 15-17, 1998.* EPA SDC; SDC-0055-083-MH-7023; July 6, 1998.
- *Technical Information (ICR) Data Planning May 19-20,* *Summary for the Collection Rule Extraction Joint Requirements (JRP) Meeting, 1998.* EPA SDC; SDC-0055-083-MH-7021; June 1, 1998.
- *Revised Technical Summary for the Information Collection Rule (ICR) Data Extraction Joint Requirements Planning (JRP) Meeting, April 14-16, 1998.* EPA SDC; SDC-0055-083-EB-7019A; May 22, 1998.
- *Information Collection Rule (ICR) Data Extraction Joint Requirements Planning (JRP) Meeting, February 20, 1998.* EPA SDC; SDC-0055-083-MH-7015; March 6, 1998.
- *IEEE Recommended Practice for Software Requirements Specifications,* Institute of Electrical and Electronics Engineers, Inc., IEEE Std 830-1993; April 8, 1994.

1.3 Naming Conventions for Requirements

Each requirement is identified by a unique requirement number. The naming convention for the requirement numbers is presented in Exhibit 3.

Table Name refers to the table used for data modeling. Each table name begins with the prefix "TUX," which represents "table auxiliary." However, the "TUX" prefix is dropped in the requirement number. For example, requirements for the *Utility Design* table begins with "UTDES," not "TUXUTDES." For Auxiliary 1 Database, requirements that do not apply to a specific table are categorized as general requirements and begin with the prefix "GR."

Aux. # refers to the auxiliary database number associated with the requirement. For example, all requirements for the *Utility Design* table in the Auxiliary 1 Database begin with "UTDES01." All requirements for Sludge Production, Auxiliary Database 3, begin with "SLGPRO03."

Release # refers to the release for which the requirement is planned. For example, requirements for the *Utility Design* table for the first release of the Auxiliary 1 Database begin with *UTDES01100*. Requirements for the *Utility Design* table for the second release of the Auxiliary 1 Database begin with *UTDES01200*.

Serial # refers to the number of the requirement. The first requirement for the *Utility Design* table in *Section 2.2.1* is *UTDES011000010*. The second requirement for the *Utility Design* table is *UTDES011000020*. The numbering convention allows for new requirements to be added in an orderly manner. For example, if a new requirement

must be added to the *Utility Design* table and it logically falls between requirement *UTDES011000010* and *UTDES011000020*, it will be inserted as *UTDES011000015*.

2.0 AUXILIARY 1 DATABASE

2.1 General Requirements for the Auxiliary 1 Database

This section defines the general requirements for the Auxiliary 1 Database. Requirements are numbered according to the conventions enumerated in *Section 1.3* of this document.

- *GR011000009*—The ICR DMS shall produce a reference manual for the Auxiliary 1 Database.
- *GR011000010*—The ICR DMS shall produce a reference manual for the Auxiliary 1 Database that shall provide information regarding the relationships between each table.
- *GR011000020*—The ICR DMS shall produce a reference manual for the Auxiliary 1 Database that shall provide a definition of each field, including the units of measurement.

Note: EPA shall provide the ICR DMS Team with a definition of each field, including the units of measurement to be incorporated in the reference manual.

- *GR011000030*—The ICR DMS shall produce a reference manual for the Auxiliary 1 Database that shall provide a data mapping that indicates where data in the Auxiliary 1 Database were extracted from the ICR Federal Database.
- *GR011000040*—The ICR DMS shall produce a reference manual for the Auxiliary 1 Database that shall provide a list of formulas used to calculate fields that did not exist in the Federal Database, as well as any formulas used to normalize the data.

Note: The reference manual that shall accompany the Auxiliary 1 Database shall include an updated copy of the requirements specification.

- *GR011000050*—The ICR DMS Team shall conduct a beta test for stakeholders.
- *GR011000060*—The Auxiliary 1 Database shall contain all of the data elements necessary to create Auxiliary Databases 2 through 8.
- *GR011000070*—Only samples and Sample Analytical Results (SAR) with EPA_QA_Codes of "A" and QA_Codes of "A" or "Q" shall be extracted into the Auxiliary 1 Database.
- *GR011000075*—At least one sample in an Event ID shall have an EPA_QA_Code of "A" and a QA_Code of "A" or "Q," and at least one analyte in the sample shall have an EPA_QA_Code of "A" and a QA_Code of "A" or "Q."
- *GR011000080*—Any table that includes analytical results shall include a field that flags whether or not an analyte result or sample in the row was associated with a comment.
- *GR011000090*—Any table that includes analytical results shall include a field that flags whether or not an analyte result or sample in the row was associated with a QA_Code of "Q" from the utility.
- *GR011000100*—A Microsoft® Access™ 97 report shall be created to show the percentage of "Q" versus "A" QA_Codes at the analyte level.

Note: The report shall be issued each time the Auxiliary 1 Database is released.

- *GR011000110*—The Auxiliary 1 Database shall contain all comment data from the utility at the sample and analyte level.
- *GR011000120*—The Auxiliary 1 Database shall contain all questionable result (QA_Codes of "Q") data from the utility at the sample and analyte level.

- *GR011000130*—The 21-character ICR Utility Identifier shall be used in the Auxiliary 1 Database. The 9-character PWS ID shall only be added to the *Utility Design* table.
- *GR012000140*—A "-999" shall be entered as the result in the Auxiliary 1 Database for any analytical result that is below the Minimum Reporting Level (MRL).
- *GR011000150*—The extractions for the Auxiliary 1 Database shall be cumulative.
- *GR011000160*—The *Sample Event ID* is a unique code to identify sampling event in a plant. It consists of the Water Treatment Plant (WTP) ID (2 or 3 digits shown as "I"), Sample Location ID (2 digits shown as "L"), and Sample Period (2 digits shown as "P" as follows: "III LL PP."

Note: *Sample Event IDs* for blended plants shall contain a 2-digit WTP ID.

- *GR011000170*—The *Caption* property in Microsoft® Access™ 97 shall be used to display the unabbreviated column names for the tables in the Auxiliary 1 Database.

Note: EPA shall provide the unabbreviated column names for the tables in the Auxiliary 1 Database to the ICR DMS Team.

- *GR011000180*—The Auxiliary 1 Database shall only contain validated utility field sample data from the ICR Water Utility Database System.
- *GR011000190*—The Microsoft® Access™ 97 column names for the tables in the Auxiliary 1 Database shall be less than or equal to eight characters.
- *GR011000200*—Initial Sampling Plans (ISP) shall be represented as Sampling Period "0."
- *GR011000210*—Final designs shall be represented as Sampling Period "19."

2.2 Detailed Requirements for the Auxiliary 1 Database

This section defines the requirements in the Auxiliary 1 Database that are related to each functional table. The requirement number and any field names mentioned in the requirement description are italicized. Tables names are also italicized.

2.2.1 Utility Design (TUXUTDES)

The *Utility Design* table contains design distribution system information such as disinfectant booster station counts and doses for Chlorine, Chloramine, Chlorine Dioxide, and Hypochlorite. Basic utility information such as PWSID, Utility Name, and EPA Region is also included in the *Utility Design* table. The *Utility Design* table contains data for Sampling Periods 0 and 19.

- *UTDES011000010*—The *Utility Design* table shall only contain information from the ISPs and the final designs.
- *UTDES011000019*—The *EPA Region* shall be a calculated field with Values 1 through 10.
- *UTDES011000020*—The *EPA Region* shall be calculated using the first two characters of the TIRPWS_ID_NUM, which is a state designation.
- *UTDES011000030*—*EPA Region 1* shall represent the following states: Connecticut (CT), Maine (ME), Massachusetts (MA), New Hampshire (NH), Rhode Island (RI), and Vermont (VT).
- *UTDES011000040*—*EPA Region 2* shall represent the following states: New Jersey (NJ), New York (NY), Puerto Rico (PR), and Virgin Islands (VI).
- *UTDES011000050*—*EPA Region 3* shall represent the following states: Delaware (DE), District of Columbia (DC), Maryland (MD), Pennsylvania (PA), Virginia (VA), and West Virginia (WV).

- *UTDES011000060—EPA Region 4* shall represent the following states: Alabama (AL), Florida (FL), Georgia (GA), Kentucky (KY), Mississippi (MS), North Carolina (NC), South Carolina (SC), and Tennessee (TN).
- *UTDES011000070—EPA Region 5* shall represent the following states: Illinois (IL), Indiana (IN), Michigan (MI), Minnesota (MN), Ohio (OH), and Wisconsin (WI).
- *UTDES011000080—EPA Region 6* shall represent the following states: Arkansas (AR), Louisiana (LA), New Mexico (NM), Oklahoma (OK), and Texas (TX).
- *UTDES011000090—EPA Region 7* shall represent the following states: Iowa (IA), Kansas (KS), Missouri (MO), and Nebraska (NE).
- *UTDES011000100—EPA Region 8* shall represent the following states: Colorado (CO), Montana (MT), North Dakota (ND), South Dakota (SD), Utah (UT), and Wyoming (WY).
- *UTDES011000110—EPA Region 9* shall represent the following states: American Samoa (AS), Arizona (AZ), California (CA), Guam (GU), Hawaii (HI), Nevada (NV), and North Bay Regional Water Treatment Plant (IC).

Note: *EPA Region 9* contains the state abbreviation "IC" because the TIRPWS_ID_NUM for the North Bay Regional Water Treatment Plant is IC0000001960613140909. The North Bay Regional Water Treatment Plant was assigned the prefix "IC" because it did not have an existing PWS ID prior to the ICR.

- *UTDES011000120—EPA Region 10* shall represent the following states: Alaska (AK), Idaho (ID), Oregon (OR), and Washington (WA).

Note: Exhibit 4 shows the EPA regions based on state.

Region	States
1	CT, ME, MA, NH, RI, VT

2	NJ, NY, PR, VI
3	DE, DC, MD, PA, VA, WV
4	AL, FL, GA, KY, MS, NC, SC, TN
5	IL, IN, MI, MN, OH, WI
6	AR, LA, NM, OK, TX
7	IA, KS, MO, NE
8	CO, MT, ND, SD, UT, WY
9	AS, AZ, CA, GU, HI, NV, IC
10	AK, ID, OR, WA

Exhibit 4. EPA Region Assignments Based on State

2.2.2 Utility Monthly (TUXUTMON)

The *Utility Monthly* table contains operational distribution system information such as disinfectant booster station counts and doses for Chlorine, Chloramine, Chlorine Dioxide, and Hypochlorite. Monthly utility information such as the start and end date of each sampling period, retail and wholesale population, and retail and wholesale flow rates is also included in the *Utility Monthly* table. The *Utility Monthly* table contains data for Sampling Periods 1 through 18.

- *UTMON011000010*—One record in the *Utility Monthly* table may be associated with one or more records in the *Wholesale Information* table.
- *UTMON011000020*—One record in the *Utility Monthly* table shall be associated with one or more records in the *Plant Monthly* table.
- *UTMON011000030*—The *Utility Monthly* table shall contain information for Sampling Periods 1 through 18.
- *UTMON011000040*—*Total Population Served* is a calculated field that shall equal the sum of the *Retail Population on Day of Sampling* and the *Wholesale Population on Day of Sampling*.

- *UTMON011000049*—The *Population Size Category* shall be a calculated field with values 1 through 12.
- *UTMON011000050*—*Population Size Category* is a calculated field that shall equal "1," if the *Total Population Served* is greater than or equal to zero and less than or equal to 100.
- *UTMON011000060*—*Population Size Category* is a calculated field that shall equal "2," if the *Total Population Served* is greater than or equal to 101 and less than or equal to 500.
- *UTMON011000070*—*Population Size Category* is a calculated field that shall equal "3," if the *Total Population Served* is greater than or equal to 501 and less than or equal to 1,000.
- *UTMON011000080*—*Population Size Category* is a calculated field that shall equal "4," if the *Total Population Served* is greater than or equal to 1,001 and less than or equal to 2,500.
- *UTMON011000090*—*Population Size Category* is a calculated field that shall equal "5," if the *Total Population Served* is greater than or equal to 2,501 and less than or equal to 3,300.
- *UTMON011000100*—*Population Size Category* is a calculated field that shall equal "6," if the *Total Population Served* is greater than or equal to 3,301 and less than or equal to 5,000.
- *UTMON011000110*—*Population Size Category* is a calculated field that shall equal "7," if the *Total Population Served* is greater than or equal to 5,001 and less than or equal to 10,000.
- *UTMON011000120*—*Population Size Category* is a calculated field that shall equal "8," if the *Total Population Served* is greater than or equal to 10,001 and less than or equal to 50,000.

- *UTMON011000130—Population Size Category* is a calculated field that shall equal "9," if the *Total Population Served* is greater than equal than or equal to 50,001 and less than or equal to 75,000.
- *UTMON011000140—Population Size Category* is a calculated field that shall equal "10," if the *Total Population Served* is greater than or equal to 75,001 and less than or equal to 100,000.
- *UTMON011000150—Population Size Category* is a calculated field that shall equal "11," if the *Total Population Served* is greater than or equal to 100,001 and less than or equal to 1,000,000.
- *UTMON011000160—Population Size Category* is a calculated field that shall equal "12," if the *Total Population Served* is greater than or equal to 1,000,001.

Note: Exhibit 5 shows the population size categories.

Size Category	Total Population	
	Minimum	Maximum
1	0	100
2	101	500
3	501	1,000
4	1,001	2,500
5	2,501	3,300
6	3,301	5,000
7	5,001	10,000
8	10,001	50,000
9	50,001	75,000
10	75,001	100,000
11	100,001	1,000,000

12	1,000,001	> 1,000,001
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Exhibit 5. Population Size Category

2.2.3 Wholesale Information (TUXWPURC)

The *Wholesale Information* table contains the name and PWSID of each utility that purchased finished water from a utility in the *Utility Monthly* table.

- *WPURC011000010*—One or more records in the *Wholesale Information* table shall be associated with one record in the *Utility Monthly* table.
- *WPURC011000020*—The *Wholesale Information* table shall contain information associated with utilities that purchased water from the utilities in the *Utility Monthly* table.
- *WPURC011000030*—The *Wholesale Information* table shall contain wholesale information for Sampling Periods 1 through 18.

2.2.4 Plant Design (TUXPLTDES)

The *Plant Design* table contains basic plant design information such as plant name and category. Clearwell unit process information such as liquid volume, indicator code, and baffling type is also included in the *Plant Design* table. The *Plant Design* table contains data for Sampling Periods 0 and 19.

- *PLTDES011000010*—One record in the *Plant Design* table shall be associated with one or more records in the *Process Train Design* table.
- *PLTDES011000020*—One record in the *Plant Design* table shall be associated with one or more records in the *Water Resource Design* table.
- *PLTDES011000030*—The *Plant Design* table shall only contain information from the ISPs and the final designs.
- *PLTDES011000040*—*# of Process Trains* is a calculated field that shall equal the number of process trains associated with each plant's ISP or final design.

- *PLTDES011000050—Average Percent Solids* is a calculated field that shall equal the average of the *Percent Solids in Sludge* for the Sampling Periods available for extraction.

Note: The ICR Federal Database does not contain the *Percent Solids in Sludge* for plant design data. *Percent Solids in Sludge* is used in the normalization formulas for *Sludge Handling Capacity* and *Sludge Solids Production*. Therefore, *Average Percent Solids*, a calculated field in the *Plant Design* table, was created in order to normalize the *Sludge Handling Capacity* values for ISP and final design data. *Average Percent Solids* cannot be calculated until table TUXPLTMON is populated with data. *Average Percent Solids* shall be updated each time the Auxiliary 1 Database is delivered.

- *PLTDES011000059—Sludge Handling Capacity* shall be normalized to dry tons per day.
- *PLTDES011000060—Sludge Handling Capacity* shall be normalized from dry pounds per day to dry tons per day by multiplying *Sludge Handling Capacity* by 0.0005.
- *PLTDES011000070—Sludge Handling Capacity* shall be normalized from wet pounds per day to dry tons per day by multiplying *Sludge Handling Capacity* by *Average Percent Solids* by $(5 * 10^{-6})$.
- *PLTDES011000080—Sludge Handling Capacity* shall be normalized from dry tons per day to dry tons per day by multiplying *Sludge Handling Capacity* by one.
- *PLTDES011000090—Sludge Handling Capacity* shall be normalized from wet tons per day to dry tons per day by multiplying *Sludge Handling Capacity* by *Average Percent Solids* by 0.01.
- *PLTDES011000100—Sludge Handling Capacity* shall be normalized from gallons per day to dry tons per day by multiplying *Sludge Handling Capacity* by *Average Percent Solids* by $(4.2 * 10^{-5})$.
- *PLTDES011000110—*The clearwell unit process with the greatest liquid volume shall be added to the *Plant Design* table, if a plant has more than one clearwell unit process.

- *PLTDES011000111*—The clearwell unit process with the lowest sequence number shall be added to the *Plant Design* table, if a plant has more than one clearwell unit process and the liquid volumes are equal.

2.2.5 Water Resource Design (TUXWRDES)

The *Water Resource Design* table contains water resource and intake information associated with each plant in the *Plant Design* table.

- *WRDES011000010*—One or more records in the *Water Resource Design* table shall be associated with one record in the *Plant Design* table.
- *WRDES011000020*—The *Water Resource Design* table shall only contain information from the ISPs and the final designs.
- *WRDES011000030*—*Intake Hydrologic Unit Code (HUC)* shall be supplied to the ICR DMS Team by EPA.

2.2.6 Process Train Design (TUXPTRAIN)

The *Process Train Design* table contains the unit process name and train type associated with each plant in the *Plant Design* table.

- *PTRAIN011000010*—One or more records in the *Process Train Design* table shall be associated with one record in the *Plant Design* table.
- *PTRAIN011000020*—The *Process Train Design* table shall only contain information from the ISPs and the final designs.

2.2.7 Plant Monthly (TUXPLTMON)

The *Plant Monthly* table contains basic operational plant information for Sampling Periods 1 through 18. Plant information such as plant name, plant category, influent flow, and finished water flow is stored in the *Plant Monthly* table. Unit process information associated with the plant such as the unit process name, unit process type, and the number of sampled unit process trains is also stored in the *Plant Monthly* table. In addition, additional water source and washwater return unit process information is stored in the *Plant Monthly* table. The *Plant Monthly* table contains a number of

calculated fields designed for the analysis of ICR data. A calculated chlorine demand result and associated Event ID is stored in the *Plant Monthly* table. The chlorine demand Event ID will have a matching Event ID in the *Sampling Event* table. A matching record must exist in the *Sampling Event* table in order to retain comment and Quality Assurance (QA) Code information in Auxiliary 1 Database.

- *PLTMON011000010*—One record in the *Plant Monthly* table shall be associated with one or more records in the *Unit Process* table.
- *PLTMON011000020*—One record in the *Plant Monthly* table shall be associated with one or more records in the *Sampling Event* table.
- *PLTMON011000030*—One record in the *Plant Monthly* table may be associated with one record in the *Hypochlorite Stock Solution* table.
- *PLTMON011000040*—One record in the *Plant Monthly* table shall be associated with one or more records in the *Water Resource Monthly* table.
- *PLTMON011000050*—The *Plant Monthly* table shall contain information for Sampling Periods 1 through 18.
- *PLTMON011000060*—*Aluminum-based Coagulant Dose* is a calculated field that shall equal the sum of all normalized chemical feed dosages in the sampled process train where the chemical feed name is "ALUM."
- *PLTMON011000070*—*Iron-based Coagulant Dose* is a calculated field that shall equal the sum of all normalized chemical feed dosages in the sampled process train where the chemical feed name is "IRON."
- *PLTMON011000079*—*Coagulant Type* shall be a calculated field.
- *PLTMON011000080*—*Coagulant Type* is a calculated field that shall equal "AL," if the *Aluminum-based Coagulant Dose* is greater than zero and the *Iron-based Coagulant Dose* is equal to zero.

- *PLTMON011000090—Coagulant Type* is a calculated field that shall equal "IRON," if the *Iron-based Coagulant Dose* is greater than zero and the *Aluminum-based Coagulant Dose* is equal to zero.
- *PLTMON011000100—Coagulant Type* is a calculated field that shall equal "MIX," if the *Aluminum-based Coagulant Dose* and the *Iron-based Coagulant Dose* are greater than zero.
- *PLTMON011000110—The Number of Sampled Process Trains* is a calculated field that shall equal the number of process trains sampled during a sampling period for a plant.

Note: The algorithm for this field does not accurately calculate the number of sampled process trains for plants with more than one process train that share a sampled unit process. For example, if a plant has three process trains and only one process train is sampled, the *Number of Sampled Process Trains* shall equal three if one of the sampled unit processes is shared by the three trains. The calculation works correctly as long as none of the process trains in a plant share a sampled unit process.

- *PLTMON011000120—The Plant Monthly* table shall only contain information for the process train that was sampled.
- *PLTMON011000121—The process train with the greatest number of samples* shall be added to the *Plant Monthly* table, if more than one process train was sampled.
- *PLTMON011000122—The process train with the greatest flow (Water Flow into Basin [MGD])* for the first unit process with a water flow shall be added to the *Plant Monthly* table, if more than one process train was sampled and the number of samples are equal.
- *PLTMON011000123—If more than one process train was sampled and the number of samples are equal and the flows (Water Flow into Basin [MGD]) are equal*, the process train shall be sorted in ascending order by process train name. The first process train in the sort shall be added to the *Plant Monthly* table.

- *PLTMON012000129—Water Resource Category* shall be a calculated field that shall equal one of the following values:
 - Surface Water (SW).
 - Groundwater (GW).
 - Purchased Water (PUR).
 - Mixed (MIX).
 - Null.
- *PLTMON011000130—Water Resource Category* is a calculated field that shall equal "SW," if the percent of water flow for surface water resource categories is greater than 80 percent.

Note: The types of surface water resource categories in the ICR Federal Database are listed as follows:

- Flowing Stream (FS).
 - Reservoir/Lake (RL).
 - Groundwater under the direct influence of surface water (GI).
 - Non-Fresh Water (NF).
- *PLTMON011000140—Water Resource Category* is a calculated field that shall equal "GW," if the percent of water flow for groundwater is greater than 80 percent.

Note: GW is the only groundwater resource category in the ICR Federal Database.

- *PLTMON011000150—Water Resource Category* is a calculated field that shall equal "PUR," if a plant purchases finished water from another plant.
- *PLTMON012000155—Water Resource Category* is a calculated field that shall remain null, if all of the intake flows associated the plant are null and/or equal to zero.
- *PLTMON012000160—Water Resource Category* is a calculated field that shall equal "MIX," if it is not null or not assigned to "SW," "GW," or "PUR."

- *PLTMON012000169—Surface Water Resource Category* shall be a calculated field that shall equal one of the following values:
 - FS (Flowing Stream).
 - RL (Reservoir/Lake).
 - GI (Groundwater under the direct influence of surface water).
 - NF (Non-Fresh Water).
 - Mixed (MIX).
 - Null.
- *PLTMON011000170—Surface Water Resource Category* is a calculated field that shall equal "FS," if the *Water Resource Category* equals "SW" and the percent of water flow for FS is greater than 80 percent.
- *PLTMON011000180—Surface Water Resource Category* is a calculated field that shall equal "RL," if the *Water Resource Category* equals "SW" and the percent of water flow for RL is greater than 80 percent.
- *PLTMON011000190—Surface Water Resource Category* is a calculated field that shall equal "GI," if the *Water Resource Category* equals "SW" and the percent of water flow for GI is greater than 80 percent.
- *PLTMON011000200—Surface Water Resource Category* is a calculated field that shall equal "NF," if the *Water Resource Category* equals "SW" and the percent of water flow for NF is greater than 80 percent.
- *PLTMON012000205—Surface Water Resource Category* is a calculated field that shall remain null, if the *Water Resource Category* is not equal to "SW."
- *PLTMON012000210—Surface Water Resource Category* is a calculated field that shall equal "MIX," if the *Water Resource Category* equals "SW" and the *Surface Water Resource Category* is not null or not assigned to "FS," "RL," "GI," or "NF."
- *PLTMON011000220—Sludge Solids Production* shall be normalized from dry pounds per day to dry tons per day by multiplying *Sludge Solids Production* by 0.0005.

- *PLTMON011000230—Sludge Solids Production* shall be normalized from wet pounds per day to dry tons per day by multiplying *Sludge Solids Production* by *Percent Solids in Sludge* by $(5 * 10^{-6})$.
- *PLTMON011000240—Sludge Solids Production* shall be normalized from dry tons per day to dry tons per day by multiplying *Sludge Solids Production* by one.
- *PLTMON011000250—Sludge Solids Production* shall be normalized from wet tons per day to dry tons per day by multiplying *Sludge Solids Production* by *Percent Solids in Sludge* by 0.01.
- *PLTMON011000260—Sludge Solids Production* shall be normalized from gallons per day to dry tons per day by multiplying *Sludge Solids Production* by *Percent Solids in Sludge* by $(4.2 * 10^{-5})$.
- *PLTMON011000269—Plant Disinfectant Type* is a calculated field that shall equal one of the following values:
 - O3.
 - CLX.
 - CL2.
 - CLM.
 - CL2_CLM.
 - Null.
- *PLTMON011000270—Plant Disinfectant Type* is a calculated field that shall equal "O3," if there is at least one Ozone disinfectant addition with a dose greater than zero.
- *PLTMON011000280—Plant Disinfectant Type* is a calculated field that shall equal "CLX," if there are no Ozone disinfectant additions with a doses greater than zero and there is at least one Chlorine Dioxide (CLO2) disinfectant addition with a dose greater than zero.
- *PLTMON011000290—Plant Disinfectant Type* is a calculated field that shall equal "CL2," if all of the disinfectant addition unit processes with doses greater than zero whose sequence numbers are less than the sequence number associated with the

last unit process having a liquid volume greater than zero are equal to any combination of "CL2" or "SOY."

- *PLTMON011000291—Plant Disinfectant Type* is a calculated field that shall remain null, if the influent flow (*Plant Influent Flow at Time of Sampling [MGD]*) is equal to zero.
- *PLTMON011000292—Plant Disinfectant Type* is a calculated field that shall remain null, if all of the disinfectant addition unit processes with sequence numbers less than the sequence number associated with the last unit process having a liquid volume greater than zero have doses equal to zero.
- *PLTMON011000293—Plant Disinfectant Type* is a calculated field that shall remain null, if the sampled process train does not contain any disinfectant addition unit processes.
- *PLTMON011000294—Plant Disinfectant Type* is a calculated field that shall remain null, if the sampled process train does not contain a unit process with a volume greater than zero.
- *PLTMON011000295—Plant Disinfectant Type* is a calculated field that shall remain null, if there are no disinfectant addition unit processes with sequence numbers less than the sequence number associated with the last unit process having a liquid volume greater than zero.
- *PLTMON011000300—Plant Disinfectant Type* is a calculated field that shall equal "CLM," if neither Ozone nor Chloride Dioxide is used as a disinfectant addition in the plant and the first disinfectant addition unit process contains a dose of Ammonia (NH₃_N) that is greater than zero.
- *PLTMON011000310—Plant Disinfectant Type* is a calculated field that shall equal "CLM," if Ozone or Chloride Dioxide is not used as a disinfectant addition in the plant and the second disinfectant addition unit process contains a dose of NH₃_N that is greater than zero and none of the upstream unit processes have a volume greater than zero.

- *PLTMON011000320—Plant Disinfectant Type* is a calculated field that shall equal "CL2_CLM," if it is not null or not assigned to "O3," "CLX," "CL2," or "CLM."
- *PLTMON011000329—Distribution System Disinfectant Type* is a calculated field that shall equal one of the following values:
 - CLM.
 - CL2.
 - Null.
- *PLTMON011000330—Distribution System Disinfectant Type* is a calculated field that shall equal "CLM," if the plant has at least one disinfection unit process using NH3_N with a dose greater than zero.
- *PLTMON011000340—Distribution System Disinfectant Type* is a calculated field that shall equal "CL2," if the plant has no disinfection unit processes using NH3_N and has at least one disinfectant addition unit process with a dose greater than zero.
- *PLTMON012000335—Distribution System Disinfectant Type* is a calculated field that shall equal "CLM," if the plant does not contain a sampled unit process train and has an Event ID at the finished water location where Total Chlorine was sampled.
- *PLTMON012000345—Distribution System Disinfectant Type* is a calculated field that shall equal "CL2," if the plant does not contain a sampled unit process train and has an Event ID at the finished water location where Free Chlorine or Free Chlorine and Total Chlorine were sampled.
- *PLTMON011000349—Chlorine Demand* shall be a calculated field.
- *PLTMON011000350—Chlorine Demand* is a calculated field that shall equal Chlorine Dose - Chlorine Residual, if Chlorine Residual ≥ 0.2 mg/L and ≤ 1.5 mg/L and the Contact Time is ≤ 10 minutes.
- *PLTMON011000351—Chlorine Demand* field shall remain null, if Chlorine Residual < 0.2 mg/L and > 1.5 mg/L and the Contact Time is > 10 minutes.

- *PLTMON011000360*—The Chlorine Demand sample that is at the influent or closest to the influent shall be entered in the *Plant Monthly* table, if there is more than one Chlorine Demand sample taken per month.
- *PLTMON011000370*—The washwater return with the greatest water flow (*WWR Flow at Sample Time [MGD]*) shall be contained in the *Plant Monthly* table, if there is more than one washwater return unit process in a process train.
- *PLTMON011000371*—The washwater unit process with the lowest sequence number shall be added to the *Plant Monthly* table, if there is more than one washwater return unit process and the water flows (*WWR Flow at Sample Time [MGD]*) are equal.
- *PLTMON011000379*—*WWR Treatment Type* is a calculated field that shall equal one of the following values:
 - NONE.
 - SETTLE.
 - FILT.
 - CONV.
 - DIS.
 - CONV_DIS.
 - OTHER.
- *PLTMON011000380*—*WWR Treatment Type* is a calculated field that shall equal "NONE," if *WWR Plain Sedimentation*, *WWR Coagulation/Sedimentation*, *WWR Filtration*, and *WWR Disinfection* are equal to "N" and *WWR Other Treatment* is null.
- *PLTMON011000390*—*WWR Treatment Type* is a calculated field that shall equal "SETTLE," if *WWR Plain Sedimentation* or *WWR Coagulation/Sedimentation* are equal to "Y."
- *PLTMON011000400*—*WWR Treatment Type* is a calculated field that shall equal "FILT," if only *WWR Filtration* is equal to "Y."

- *PLTMON011000410*—*WWR Treatment Type* is a calculated field that shall equal "CONV," if only *WWR Filtration* and *WWR Coagulation/Sedimentation* are equal to "Y."
- *PLTMON011000420*—*WWR Treatment Type* is a calculated field that shall equal "DIS," if only *WWR Disinfection* is equal to "Y."
- *PLTMON011000430*—*WWR Treatment Type* is a calculated field that shall equal "CONV_DIS," if only *WWR Filtration*, *WWR Coagulation/Sedimentation*, and *WWR Disinfection* are equal to "Y."
- *PLTMON011000440*—*WWR Treatment Type* is a calculated field that shall equal "OTHER," if it is not assigned to "NONE," "SETTLE," "FILT," "CONV," "DIS," or "CONV_DIS."
- *PLTMON011000450*—The additional water resource with the greatest water flow (*Additional Water Source Flow at Time of Sampling [MGD]*) shall be contained in the *Plant Monthly* table, if there is more than one additional water resource unit process in a process train.
- *PLTMON011000451*—The unit process with the lowest sequence number shall be added to the *Plant Monthly* table, if there is more than one additional water resource unit process and the water flows (*Additional Water Flow at Time of Sampling [MGD]*) are equal.
- *PLTMON011000452*—*AWSDAYQ* shall represent the flow for the additional water resource sampling point (ASP).
- *PLTMON011000453*—The ASP that corresponds with the additional water resource unit process shall be added to the *Plant Monthly* table. The ASP that corresponds with the additional water resource unit process is the first ASP located after the additional water resource unit process.

- *PLTMON011000460*—Overall Plant Baffling Factor for one plant during a given sampling period shall equal the sum of all the *T10* values divided by the sum of all the *T50* values.

$$\text{Overall Plant Baffling Factor} = \frac{\text{Sum of } T10 \text{ (for all unit processes)}}{\text{Sum of } T50 \text{ (for all unit processes)}}$$

2.2.8 Water Resource Monthly (TUXWRMON)

The *Water Resource Monthly* table contains water resource and intake information associated with each plant in the *Plant Monthly* table.

- *WRMON011000010*—One or more records in the *Water Resource Monthly* table shall be associated with one record in the *Plant Monthly* table.

2.2.9 Hypochlorite Stock Solution (TUXHYPO)

The *Hypochlorite Stock Solution* table contains the sample analytical results associated with samples taken from the hypochlorite stock solution. The *Hypochlorite Stock Solution* table is related to the *Plant Monthly* table. The *Sampling Event* table does not contain Event IDs for hypochlorite samples. Therefore, no comment text or QA Code information exists in Auxiliary 1 Database for hypochlorite samples.

- *HYPO011000010*—One record in the *Hypochlorite Stock Solution* table shall be associated with one record in the *Plant Monthly* table.

2.2.10 Sampling Event (TUXSAMPLE)

The *Sampling Event* table contains information associated with sample events such as Sample Location ID, Sample Event Sequence Number, Sample Event Name, and Sample Event Type.

A sampling event represents all of the samples taken at a certain location within a plant for a specific sampling period. The *Sampling Event* table does not contain Event IDs for hypochlorite samples. The Sample Event ID shall be comprised of the Plant ID, Sample Location ID, and Sampling Period. The confidence level and contact time from effluent are also included for sample events associated with distribution system locations. Each record in the *Sampling Event* table contains a match in at least one of the analytical result tables, except for records associated with chlorine demand samples.

- *SAMPLE011000010*—One or more records in the *Sampling Event* table shall be associated with one record in the *Plant Monthly* table.
- *SAMPLE011000020*—One record in the *Sampling Event* table shall be associated with one or more records in the *Sample Event/Sample ID Associative (SESA)* table.
- *SAMPLE011000030*—One record in the *Sampling Event* table may be associated with one record in the *Microbiology* table.
- *SAMPLE011000040*—One record in the *Sampling Event* table may be associated with one record in the *Water Quality Parameters (WQP)* table.

- *SAMPLE011000050*—One record in the *Sampling Event* table may be associated with one record in the *Disinfectant Residuals* table.
- *SAMPLE011000060*—One record in the *Sampling Event* table may be associated with one record in the *Disinfection By-Products (DBP)* table.
- *SAMPLE011000070*—One record in the *Sampling Event* table may be associated with one record in the *Cyanogen Chloride* table.
- *SAMPLE011000080*—One record in the *Sampling Event* table may be associated with one record in the *Chlorite/Chlorate* table.
- *SAMPLE011000090*—One record in the *Sampling Event* table may be associated with one record in the *Chlorine Dioxide/Ozone Disinfection By-Products (DBP)* table.
- *SAMPLE011000100*—One record in the *Sampling Event* table may be associated with one record in the *Assimilable Organic Carbon/Biodegradable Organic Carbon (AOC/BDOC)* table.
- *SAMPLE011000110*—One record in the *Sampling Event* table shall be associated with one record in the *Unit Process* table.
- *SAMPLE011000119*—The *Sample Quarter* field shall be a calculated field with Values 1 through 6.
- *SAMPLE011000120*—*Sample Quarter 1* shall represent Sampling Periods 1 through 3.
- *SAMPLE011000130*—*Sample Quarter 2* shall represent Sampling Periods 4 through 6.
- *SAMPLE011000140*—*Sample Quarter 3* shall represent Sampling Periods 7 through 9.
- *SAMPLE011000150*—*Sample Quarter 4* shall represent Sampling Periods 10 through 12.

- *SAMPLE011000160*—*Sample Quarter 5* shall represent Sampling Periods 13 through 15.
- *SAMPLE011000170*—*Sample Quarter 6* shall represent Sampling Periods 16 through 18.
- *SAMPLE011000179*—The *Sample Location ID* field shall be derived.
- *SAMPLE011000180*—*Sample Location ID* shall be derived from the *TIRUNPRO* table in the ICR Federal Database, if the samples are taken from the unit process train.
- *SAMPLE011000190*—*Sample Location ID* shall be derived from the *TIRWFSP* table in the ICR Federal Database, if the samples are taken from the influent.
- *SAMPLE011000200*—*Sample Location ID* shall be derived from the *TIRWFSP* table in the ICR Federal Database, if the samples are taken from the distribution system.
- *SAMPLE011000210*—*Sample Location ID* shall be derived from the *TIRWFSP* table in the ICR Federal Database, if the samples are taken from finished water.
- *SAMPLE011000219*—The *Sample Event Sequence Number* field shall be derived.
- *SAMPLE011000220*—*Sample Event Sequence Number* shall be derived from the *TIRPTA* table in the ICR Federal Database, if the samples are taken from the unit process train.
- *SAMPLE011000230*—*Sample Event Sequence Number* for blended and non-blended plants shall be calculated if the samples are taken from the influent, distribution system, or finished water.
- *SAMPLE011000231*—*Sample Event Sequence Number* shall be calculated for non-blended plants, if the samples are taken from the influent (i.e., Sample Location = Influent), as: *Sample Event Sequence Number* = 0.
- *SAMPLE011000232*—*Sample Event Sequence Number* shall be calculated for

non-blended plants, if the samples are taken from the finished water (i.e., Sample Location = Finished Water), as: *Sample Event Sequence Number* = Maximum Unit Process Sequence Number + 1.

- *SAMPLE011000233*—*Sample Event Sequence Number* shall be calculated for non-blended plants, if the samples are taken from the Distribution System Equivalent system location (i.e., Sample Location = DSE) as: *Sample Event Sequence Number* = Finished Water Sample Event Sequence Number + 1.
- *SAMPLE011000234*—*Sample Event Sequence Number* shall be calculated for non-blended plants, if the samples are taken from the first average detention time distribution system sample location (i.e., Sample Location =AVG1), as: *Sample Event Sequence Number* = Finished Water Sequence Number + 2.
- *SAMPLE011000235*—*Sample Event Sequence Number* shall be calculated for non-blended plants, if the samples are taken from the second average detention time distribution system sample location (i.e., Sample Location =AVG2), as: *Sample Event Sequence Number* = Finished Water Sequence Number + 3.

Note: Exhibit 6 is a reference to determine the *Sample Event Sequence Number* for non-blended plants.

Sample Location	Sample Event Sequence Number
Influent	0
Through-the-Plant	Associated with the Unit Process Sequence Number
Finished Water (FW)	Maximum Unit Process Sequence Number + 1
Distribution System Equivalent (DSE) Samples	Finished Water Sample Sequence Number + 1
Average Detention Time (AVG1)	Finished Water Sample Sequence Number + 2
Average Detention Time (AVG2)	Finished Water Sample Sequence Number + 3
Maximum Detention Time (MAX)	Finished Water Sample Sequence Number + 4
Simulated Distribution System (SDS) Samples	Finished Water Sample Sequence Number + 5
Near First Customer (NFC)	Finished Water Sample Sequence Number + 6

Exhibit 6. Calculations for the *Sample Event Sequence Number* for Non-Blended Plants

- *SAMPLE011000236*—*Sample Event Sequence Number* shall be calculated for non-blended plants, if the samples are taken from the maximum detention time distribution system sample location (i.e., Sample Location = MAX), as: *Sample Event Sequence Number* = Finished Water Sequence Number + 4.

- *SAMPLE011000237*—*Sample Event Sequence Number* shall be calculated for non-blended plants, if the samples are taken from a simulated distribution system sample location (i.e., Sample Location = SDS), as: *Sample Event Sequence Number* = Finished Water Sequence Number + 5.
- *SAMPLE011000238*—*Sample Event Sequence Number* shall be calculated for non-blended plants, if the samples are taken from the Near First Customer distribution system sample location (i.e., Sample Location = NFC), as: *Sample Event Sequence Number* = Finished Water Sequence Number + 6.
- *SAMPLE011000239*—*Sample Event Sequence Number* shall be calculated for blended plants, if the samples are taken from the Entry Point to the Distribution System sample location (i.e., Sample Location = ENT), as: *Sample Event Sequence Number* = 200.

Note: If there is no Entry Point to the Distribution System sample, the next sample location will have a *Sample Event Sequence Number* = 201.

- *SAMPLE011000240*—The two AVG distribution samples with the lowest sample sequence numbers shall be added to the *Sampling Event* table, if a non-blending plant has more than two AVG distribution samples per sampling period.
- *SAMPLE011000241*—*Sample Event Sequence Number* shall be calculated for blended plants, if the samples are taken from the Distribution System Equivalent sample location (i.e., Sample Location = DSE), as: *Sample Event Sequence Number* = ENT + 1 through ENT + (# of plants).
- *SAMPLE011000242*—*Sample Event Sequence Number* shall be calculated for blended plants, if the samples are taken from the average detention time distribution system sample location (i.e., Sample Location = AVG1 or AVG2), as: *Sample Event Sequence Number* = Max DSE + 1 through Max DSE + (2 * [# of plants]).
- *SAMPLE011000243*—*Sample Event Sequence Number* shall be calculated for blended plants, if the samples are taken from the maximum detention time distribution system sample location (i.e., Sample Location = MAX), as: *Sample Event Sequence Number* = Max AVG + 1 through Max AVG + (# of plants).

- *SAMPLE011000244*—Sample Event Sequence Number shall be calculated for blended plants, if the samples are taken from a Simulated Distribution System distribution system sample location (i.e., Sample Location = SDS), as: *Sample Event Sequence Number* = Max MAX + 1 through Max MAX + (# of plants).
- *SAMPLE011000245*—*Sample Event Sequence Number* shall be calculated for blended plants, if the samples are taken from the Near First Customer distribution system sample location (i.e., Sample Location = NFC), as: *Sample Event Sequence Number* = Max SDS + 1 through Max SDS + (# of plants).
- *SAMPLE011000246*—The number of AVG distribution samples added to the *Sampling Event* table shall equal two times the number of plants that are blending water in a blended distribution system

Note: Exhibit 7 is a reference to determine the *Sample Event Sequence Number* for blended plants.

Note: If any of the samples in Exhibit 7 are missing, the next sample will be numbered sequentially. The only exception is Entry Point to the Distribution System samples. If the Entry Point to the Distribution System sample is missing, *Sample Event Sequence Number* 200 will be skipped and the next sample location will have a *Sample Event Sequence Number* =201.

Sample Location	Sample Event Sequence Number
Entry Point to the Distribution System (ENT)	200
Distribution System Equivalent (DSE) Samples	ENT+ 1 through ENT + (# of plants)
Average Detention Time (AVG)	Max DSE + 1 through Max DSE + 2 * (# of plants)
Maximum Detention Time (MAX)	Max AVG + 1 through Max AVG + (# of plants)
Simulated Distribution System (SDS) Samples	Max MAX + 1 through Max MAX + (# of plants)

Near First Customer (NFC)	Max SDS + 1 through Max SDS + (# of plants)
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Exhibit 7. Calculations for the Sample Event Sequence Number for Blended Plants

- *SAMPLE011000247*—The AVG distribution samples with the lowest sample sequence numbers shall be added to the *Sampling Event* table, if a plant in a blended distribution system has more than two AVG distribution samples per plant.
- *SAMPLE011000249*—*Sample Event Name* shall be derived based upon the Sample Location Type.
- *SAMPLE011000250*—*Sample Event Name* shall represent the unit process name, if the Sample Event is associated with a unit process.
- *SAMPLE011000260*—*Sample Event Name* shall contain "INFLUENT," if the Sample Event is associated with the influent.
- *SAMPLE011000270*—*Sample Event Name* shall contain "FINISH," if the Sample Event is associated with finished water.
- *SAMPLE011000280*—*Sample Event Name* shall contain the name of the distribution system sample location type, if the Sample Event is associated with the distribution system.
- *SAMPLE011000281*—Distribution system sample location types shall be equal to one of the following values:
 - ENT = Entry Point to the Distribution System.
 - DSE = Distribution System Equivalent Samples.
 - AVG1 = First Average Detention Time Sample.
 - AVG2 = Second Average Detention Time Sample.
 - MAX = Maximum Detention Time.
 - SDS = Simulated Distribution System.
 - NFC = Near First Customer.

- *SAMPLE011000290*—The *Sample Event Type* shall represent the unit process type, if the Sample Event is associated with a unit process.
- *SAMPLE011000300*—The *Sample Event Type* shall contain "INFLUENT," if the Sample Event is associated with the influent.
- *SAMPLE011000310*—The *Sample Event Type* shall contain "FINISH," if the Sample Event is associated with finished water.
- *SAMPLE011000320*—The *Sample Event Type* shall contain the name of the distribution system sample location type for the following types of distribution samples: ENT, DSE, MAX, SDS, and NFC.
- *SAMPLE011000321*—The *Confidence Level* shall only be populated for the following types of distribution system sample locations: DSE, AVG, MAX, and NFC. These fields will be null for all other types of sample locations.
- *SAMPLE011000322*—The *Contact Time from Effluent* shall only be populated for the following types of distribution system sample locations: DSE, AVG1, AVG2, MAX, SDS, and NFC.
- *SAMPLE011000323*—The *Sample Event Type* shall equal "AVG" for AVG distribution system samples that belong to blended distribution systems.
- *SAMPLE011000324*—The *Sample Event Type* shall equal "AVG1" for the AVG distribution system sample with the lowest sequence number in a non-blending plant.
- *SAMPLE011000325*—The *Sample Event Type* shall equal "AVG2" for the AVG distribution system sample with the second lowest sequence number in a non-blending plant.

2.2.11 Sample Event/Sample ID Associative (SESA) (TUXSESA)

The *Sample Event/Sample ID Associative (SESA)* table contains a record for each Event ID in the *Sampling Event* table. The corresponding Sample ID in the ICR Federal Database is stored for each Event ID. If one Event ID is associated with more than one Sample ID, there will be multiple records for the Event ID in the *Sample Event/Sample ID Associative (SESA)* table.

- *SESA011000010*—One or more records in the *Sample Event/Sample ID Associative (SESA)* table shall be associated with one record in the *Sampling Event* table.
- *SESA011000020*—One record in the *Sample Event/Sample ID Associative (SESA)* table may be associated with one record in the *Sample Comments* table.
- *SESA011000030*—One record in the *Sample Event/Sample ID Associative (SESA)* table may be associated with one or more records in the *Analyte Comments* table.
- *SESA011000040*—The *Sample Event/Sample ID Associative (SESA)* table shall contain a record for every ICR Federal Database Sample ID associated with each Sample Event ID in the *Sampling Event* table.

2.2.12 Sample Comments (TUXSCMMT)

The *Sample Comments* table contains the comment text and QA Code associated with each Sample ID in the *Sample Event/Sample ID Associative (SESA)* table. If a Sample ID has no comment text and the QA Code is not equal to "Q," a record will not be created in the *Sample Comments* table.

- *SCMMT011000010*—One record in the *Sample Comments* table shall be associated with one record in the *Sample Event/Sample ID Associative (SESA)* table.
- *SCMMT011000020*—A record shall be created in the *Sample Comments* table, if a *Sample ID* in the *Sample Event/Sample ID Associative (SESA)* table is associated with a comment.

2.2.13 Analyte Comments (TUXACMMT)

The *Analyte Comments* table contains the comment text and QA Code associated with each analyte associated with a Sample ID in the *Sample Event/Sample ID Associative (SESA)* table. If an analyte has no comment text and the QA Code is not equal to "Q," a record will not be created for that analyte in the *Analyte Comments* table.

- *ACMMT011000010*—One or more records in the *Analyte Comments* table shall be associated with one record in the *Sample Event/Sample ID Associative (SESA)* table.
- *ACMMT011000020*—A record shall be created in the *Analyte Comments* table if an analyte belonging to a Sample ID in the *Sample Event/Sample ID Associative (SESA)* table is associated with a comment.

2.2.14 Microbiology (TUXMICRO)

The *Microbiology* table contains the sample analytical results associated with virus, coliform, and protozoan samples.

- *MICRO011000010*—One record in the *Microbiology* table shall be associated with one record in the *Sampling Event* table.
- *MICRO012000020*—A "-999" shall be entered as the result for any microbial analytical result that is below the detection limit.
- *MICRO012000030*—PROTO_DL shall equal the numeric result in the first result field for either a Giardia or Cryptosporidium analyte that is below the detection limit.
- *MICRO013000040*—PROTO_DL shall be equal to the inverse of the Volume Assayed ($[1/\text{Volume Assayed}] * 100$), if all of the Giardia and Cryptosporidium analytes are above the detection limit.
- *MICRO012000050*—TCOLIBDL, FCOLIBDL, and ECOLIBDL shall remain null, if the analytical result is above the detection limit.

- *MICRO012000060*—TCOLIBDL, FCOLIBDL, and ECOLIBDL shall contain the value of the analytical result, if the result is below the detection limit.
- *MICRO012000070*—VIR_BDL shall contain the value of the analytical result, if the result is below the detection limit.
- *MICRO013000080*—VIR_BDL shall be equal to the inverse of the Volume Assayed ($[1/\text{Volume Assayed}] * 100$), if the result is above the detection limit.

2.2.15 Water Quality Parameters (WQP) (TUXWQP)

The *Water Quality Parameters (WQP)* table contains the sample analytical results associated with WQP, Total Organic Halides (TOX), Total Organic Carbon (TOC), Bromide, Ammonia, and Ultraviolet Absorbance (UV-254) samples.

- *WQP011000010*—One record in the *Water Quality Parameters (WQP)* table shall be associated with one record in the *Sampling Event* table.
- *WQP011000020*—The average of the initial and duplicate results shall be entered as the result in the Auxiliary 1 Database for TOC.
- *WQP011000021*—The result for TOC shall be null, if one of the initial or duplicate TOC results is missing from the Auxiliary 1 Database.
- *WQP011000030*—The MRL shall be used to calculate the average, if one or both of the results for an initial or duplicate TOC sample is below the MRL.
- *WQP011000040*—A "-999" shall be inserted as the result in the Auxiliary 1 Database, if at least one of the TOC results is below the MRL and the average of the initial and duplicate results for the TOC samples is equal to the MRL.
- *WQP011000050*—The average of the initial and duplicate results shall be entered as the result in the Auxiliary 1 Database for TOX.
- *WQP011000060*—The result for TOX shall be null, if one of the initial or duplicate TOX results is missing from the Auxiliary 1 Database.

- *WQP011000070*—The MRL shall be used to calculate the average, if one or both of the results for an initial or duplicate TOX sample is below the MRL.
- *WQP011000080*—A "-999" shall be inserted as the result in the Auxiliary 1 Database Auxiliary Database, if at least one of the TOX results is below the MRL and the average of the initial and duplicate results for the TOX samples is equal to the MRL.
- *WQP011000090*—The average of the initial and duplicate results shall be entered as the result in the Auxiliary 1 Database for UV-254.
- *WQP011000091*—The result for UV-254 shall be null, if one of the initial or duplicate UV-254 results is missing from the Auxiliary 1 Database.
- *WQP011000100*—The MRL shall be used to calculate the average, if one or both of the results for an initial or duplicate UV-254 sample is below the MRL.
- *WQP011000110*—A "-999" shall be inserted as the result in the Auxiliary 1 Database, if at least one of the UV-254 results is below the MRL and the average of the initial and duplicate results for the UV-254 samples is equal to the MRL.
- *WQP011000120*—*TOX Relative Percent Difference (RPD)* ($\mu\text{g Cl /L}$) is a calculated field that shall equal $(\text{TOX difference} / \text{TOX average}) * 100$.
- *WQP011000121*—*TOX difference* shall equal the initial TOX result minus the duplicate TOX result.
- *WQP011000122*—*TOX average* shall equal the initial TOX result plus the duplicate TOX result divided by two.
- *WQP011000123*—The MRL for TOX shall be used in the *TOX Relative Percent Difference (RPD)* calculations, if the initial or duplicate result is below the MRL.
- *WQP011000124*—*TOX Relative Percent Difference (RPD)* shall only be calculated if the Auxiliary 1 Database contains both the initial and duplicate TOX results.

- *WQP011000130*—The ICR DMS Team shall insert a "-333" in *Ammonia*, if the result value is 0.1 and there is a comment associated with the analytical result or the result value is zero. In all other cases, the result value shall be used.
- *WQP011000140*—*Expert Result for Ammonia* shall equal *Ammonia* prior to expert intervention.
- *WQP011000150*—The ICR DMS Team shall create a Microsoft® Access™ 97 table for *Ammonia* results of -333 with a minimum of three fields: *Result*, *Comment*, and *Expert Result for Ammonia*.

Note: Requirements *WQP011000130* through *WQP011000150* and *DISFRES011000020* through *DISFRES011000130* were created because the Water Utility Database System does not allow users to enter values less than 0.1 for Ammonia, Ozone Residual, Chlorine Dioxide Residual, Free Chlorine Residual, or Total Chlorine Residual. However, it is possible to have results less than 0.1. In addition, the Water Utility Database System allows users to enter zero for values for Ammonia, Ozone Residual, Chlorine Dioxide Residual, Free Chlorine Residual, or Total Chlorine Residual. Zero results are not valid for the five analytes.

In order to mitigate this problem, EPA Technical Support Center (TSC) instructed users to insert a "0.1" in the result field, set the QA_Code to "Q," and add the numeric value result in the comment field, if the result was below 0.1. In many cases, the users did not enter the numeric value result in the comment field. Instead, the users entered text such as "less than 0.1" or "< .9" or "The result is 0.45." In addition, users entered a QA_Code of "A" and added the numeric value result in the comment field, if the actual result was below 0.1. This, combined with the fact that users entered result values of zero, makes it difficult to extract the actual result. Therefore, it was decided that an expert must examine each record that has a result value of 0.1 and a comment or a result value of zero to determine an *Expert Result* value for each of the five analytes.

If one of the five analytes has a result value of 0.1 and a comment or a result value of zero, a -333 will be inserted as the result. Five expert result tables, one for each analyte, will be created and delivered to an analyst who shall examine the comment fields to determine if there is a more appropriate value. If there is a

valid value for the analyte, then the expert will update the *Expert Result* field in the expert result table. The expert shall insert a "-999" in the *Expert Result* field for all records that contain a "-333" and a less than value in the comments field. Once the analyst determines the most accurate results for the five analytes and edits the *Expert Result* field, the tables shall be sent back to the ICR DMS Team. The data in the edited *Expert Result* fields for all five analytes shall be inserted into the appropriate fields in the *Water Quality Parameters (WQP)* table and the *Disinfectant Residuals* table.

2.2.16 Disinfectant Residuals (TUXDISFRES)

The *Disinfectant Residuals* table contains the sample analytical results associated with Chlorine, Chlorine Dioxide, and Ozone samples.

- *DISFRES011000010*—One record in the *Disinfectant Residuals* table shall be associated with one record in the *Sampling Event* table.
- *DISFRES011000020*—The ICR DMS Team shall insert a "-333" in *Free Chlorine Residual*, if the result value is 0.1 and there is a comment associated with the analytical result or the result value is zero. In all other cases, the result value shall be used.
- *DISFRES011000030*—*Expert Result for Free Chlorine Residual* shall equal *Free Chlorine Residual* prior to expert intervention.
- *DISFRES011000040*—The ICR DMS Team shall create a Microsoft® Access™ 97 table for *Free Chlorine Residual* results of "-333" with a minimum of three fields: *Result*, *Comment*, and *Expert Result for Free Chlorine Residual*.
- *DISFRES011000050*—The ICR DMS Team shall insert a "-333" in *Total Chlorine Residual*, if the result value is 0.1 and there is a comment associated with the analytical result or the result value is zero. In all other cases, the result value shall be used.
- *DISFRES011000060*—*Expert Result for Total Chlorine Residual* shall equal *Total Chlorine Residual* prior to expert intervention.

- *DISFRES011000070*—The ICR DMS Team shall create a Microsoft® Access™ 97 table for *Total Chlorine Residual* results of "-333" with a minimum of three fields: *Result*, *Comment*, and *Expert Result for Total Chlorine Residual*.
- *DISFRES011000080*—The ICR DMS Team shall insert a "-333" in *Chlorine Dioxide Residual*, if the result value is 0.1 and there is a comment associated with the analytical result or the result value is zero. In all other cases, the result value shall be used.
- *DISFRES011000090*—*Expert Result for Chlorine Dioxide Residual* shall equal *Chlorine Dioxide Residual* prior to expert intervention.
- *DISFRES011000100*—The ICR DMS Team shall create a Microsoft® Access™ 97 table for *Chlorine Dioxide Residual* results of "-333" with a minimum of three fields: *Result*, *Comment*, and *Expert Result for Chlorine Dioxide Residual*.
- *DISFRES011000110*—The ICR DMS Team shall insert a "-333" in the result field for *Ozone Residual*, if the result value is 0.1 and there is a comment associated with the analytical result or the result value is zero. In all other cases, the result value shall be used.
- *DISFRES011000120*—*Expert Result for Ozone Residual* shall equal *Ozone Residual* prior to expert intervention.
- *DISFRES011000130*—The ICR DMS Team shall create a Microsoft® Access™ 97 table for *Ozone Residual* results of "-333" with a minimum of three fields: *Result*, *Comment*, and *Expert Result for Ozone Residual*.

2.2.17 Disinfection By-Products (DBP) (TUXDBP)

The *Disinfection By-Products (DBP)* table contains the sample analytical results associated with the following analyte groups:

- Trihalomethanes (THM).
 - Haloacetic Acids (HAA).
 - Haloacetonitriles (HAN).
 - Chloral Hydrate (CH).
 - Chloropicrin (CP).
 - Haloketones (HK).
-
- *DBP011000010*—One record in the *Disinfection By-Products (DBP)* shall be associated with one record in the *Sampling Event* table.
 - *DBP011000020*—*Total THM4* is a calculated field that shall represent the sum of $\text{CHCL3} + \text{BDCM} + \text{DBCM} + \text{CHBR3}$.
 - *DBP011000030*—*Total THM4* shall not be calculated if any of the four analytes ($\text{CHCL3} + \text{BDCM} + \text{DBCM} + \text{CHBR3}$) are missing a numeric value for reasons other than the less than MRL criteria.
 - *DBP011000040*—A zero value shall be used to replace any analyte that is less than the MRL when calculating *Total THM4*.
 - *DBP011000041*—A "-999" shall be the result of *Total THM4*, if all of the analytes are less than the MRL.
 - *DBP011000050*—*Total HAA5* is a calculated field that shall represent the sum of $\text{MCAA} + \text{DCAA} + \text{TCAA} + \text{MBAA} + \text{DBAA}$.
 - *DBP011000060*—*Total HAA5* shall not be calculated if any of the five analytes ($\text{MCAA} + \text{DCAA} + \text{TCAA} + \text{MBAA} + \text{DBAA}$) are missing a numeric value for reasons other than the less than MRL criteria.

- *DBP011000070*—A zero value shall be used to replace any analyte that is less than the MRL when calculating *Total HAA5*.
- *DBP011000071*—A "-999" shall be the result of *Total HAA5*, if all of the analytes are less than the MRL.
- *DBP011000080*—*Total HAA6* is a calculated field that shall represent the sum of MCAA + DCAA + TCAA + MBAA + DBAA + BCAA.
- *DBP011000090*—*Total HAA6* shall not be calculated if any of the six analytes (MCAA + DCAA + TCAA + MBAA + DBAA + BCAA) are missing a numeric value for reasons other than the less than MRL criteria.
- *DBP011000100*—A zero value shall be used to replace any analyte that is less than the MRL when calculating *Total HAA6*.
- *DBP011000101*—A "-999" shall be the result of *Total HAA6*, if all of the analytes are less than the MRL.
- *DBP0110000110*—*Total HAA9* is a calculated field that shall equal the sum of MCAA + DCAA + TCAA + MBAA + DBAA + BCAA + BDCAA + CDBAA + TBAA.
- *DBP011000120*—*Total HAA9* shall not be calculated if any of the nine analytes (MCAA + DCAA + TCAA + MBAA + DBAA + BCAA + BDCAA + CDBAA + TBAA) are missing a numeric value for reasons other than the less than MRL criteria.
- *DBP011000130*—A zero value shall be used to replace any analyte that is less than the MRL when calculating *Total HAA9*.
- *DBP011000131*—A "-999" shall be the result of *Total HAA9*, if all of the analytes are less than the MRL.
- *DBP011000140*—*Total HAN4* is a calculated field that shall equal the sum of DCAN + TCAN + BCAN + DBAN.

- *DBP011000150*—*Total HAN4* shall not be calculated if any of the four analytes (DCAN + TCAN + BCAN + DBAN) are missing a numeric value for reasons other than the less than MRL criteria.
- *DBP011000160*—A zero value shall be used to replace any analyte that is less than the MRL when calculating *Total HAN4*.
- *DBP011000161*—A "-999" shall be the result of *Total HAN4*, if all of the analytes are less than the MRL.

Note: The full names of the analytes used to calculate *Total THM4*, *Total HAA5*, *Total HAA6*, *Total HAA9*, and *Total HAN4* are included in Appendix C. DBP samples are taken on a quarterly basis; therefore, *Total THM4*, *Total HAA5*, *Total HAA6*, *Total HAA9*, and *Total HAN4* shall be calculated on a quarterly basis. The calculations of *Total THM4*, *Total HAA5*, *Total HAA6*, *Total HAA9*, and *Total HAN4* shall be based on the assumption that all of the quarterly samples are taken at the same sample event.

2.2.18 Cyanogen Chloride (TUXCNCL)

The *Cyanogen Chloride* table contains the sample analytical results associated with Cyanogen Chloride samples.

- *CNCL011000010*—One record in the *Cyanogen Chloride* table shall be associated with one record in the *Sampling Event* table.

2.2.19 Chlorite/Chlorate (TUXCHLORS)

The *Chlorite/Chlorate* table contains the Chlorite and Chlorate analytical results associated with DBP ion samples.

- *CHLORS011000010*—One record in the *Chlorate/Chlorite* table shall be associated with one record in the *Sampling Event* table.

2.2.20 Chlorine Dioxide/Ozone Disinfection By-Products (DBP) (TUXCLDIOX)

The *Chlorine Dioxide/Ozone Disinfection By-Products (DBP)* table contains the sample analytical results associated with Low Level Bromate and Aldehyde samples. It also contains Bromate analytical results associated with DBP ion samples. Only the required analytes for Aldehyde samples are included in the *Chlorine Dioxide/Ozone Disinfection By-Products (DBP)* table.

- *CLDIOX011000010*—One record in the *Chlorine Dioxide/Ozone Disinfection By-Products (DBP)* table shall be associated with one record in the *Sampling Event* table.

2.2.21 Assimilable Organic Carbon/Biodegradable Organic Carbon (AOC/BDOC) (TUXABDOC)

The *Assimilable Organic Carbon/Biodegradable Organic Carbon (AOC/BDOC)* table contains the analytical results associated with AOC and BDOC samples.

- *ABDOC011000010*—One record in the *Assimilable Organic Carbon/Biodegradable Organic Carbon (AOC/BDOC)* table shall be associated with one record in the *Sampling Event* table.

2.2.22 Unit Process (TUXUNPRO)

The *Unit Process* table contains information associated with each unit process such as unit process name, type, and identification number. Media type, media depth, and Granular Activated Carbon (GAC) are included for filtration unit processes. The normalized dose rate and normalized disinfectant name are included for disinfectant addition unit processes. The Event ID will be populated in the *Unit Process* table for all unit process associated with an Event ID in the *Sampling Event* table.

- *UNPRO011000010*—One or more records in the *Unit Process* table shall be associated with one record in the *Plant Monthly* table.
- *UNPRO011000020*—One record in the *Unit Process* table may be associated with one record in the *Ozone Chamber* table.

- *UNPRO011000030*—One record in the *Unit Process* table may be associated with one record in the *Sample Event* table.
- *UNPRO011000031*—The *Sample Event ID* shall be null, if the unit process is not associated with a sample.
- *UNPRO011000040*—One record in the *Unit Process* table may be associated with one or more records in the *Chemical Feeds* table.
- *UNPRO011000050*—Feeder Chemicals shall not appear in the *Unit Process* table.
- *UNPRO011000060*—Only unit processes from the process train that is sampled shall be included in the *Unit Process* table.
- *UNPRO011000070*—*Filter Surface Area* shall only contain data for filtration unit processes.
- *UNPRO011000080*—*Filter Media Type* shall only contain data for filtration unit processes.
- *UNPRO011000090*—*Filter Media Depth* shall only contain data for filtration unit processes.
- *UNPRO011000100*—*Filter Granular Activated Carbon (GAC) Depth* shall only contain data for filtration unit processes.
- *UNPRO011000110*—Disinfectant addition unit processes shall be included in the *Unit Process* table.
- *UNPRO011000120*—*Disinfectant Name* shall only contain data for disinfectant addition unit processes.
- *UNPRO011000130*—*Dose Rate* shall only contain data for disinfectant addition unit processes.

- *UNPRO011000140*—*Disinfectant Name* shall be normalized using the reference table, *Normalization Calculations for Unique Chemical Formulas for Disinfectants in the ICR Initial Sampling Plan* (Appendix F).
- *UNPRO011000150*—*Dose Rate* for the *Disinfectant Name* shall be normalized using the reference table, *Normalization Calculations for Unique Chemical Formulas for Disinfectants* in the ICR Initial Sampling Plan (Appendix F).
- *UNPRO011000160*—An exception report shall be created for *Disinfectant Name* values that cannot be normalized using the reference table provided in Appendix F.
- *UNPRO011000170*—*T50* is a calculated field that shall equal *Liquid Volume (gal)* divided by (*Water Flow into Basin (MGD)* * 694.44 gpm/mgd), if the *T50* result is not entered by the utility.
- *UNPRO011000175*—*UP_V* shall be normalized from cubic feet to gallons for Ozone unit processes by multiplying *Liquid Volume (gal)* by 7.48 gal/cuft.
- *UNPRO011000180*—*T10* is a calculated field for Ozone chamber unit processes that shall equal (*T50* * 0.7), if the *Ozone Gas Flow to Each Chamber* equals zero.
- *UNPRO011000190*—*T10* is a calculated field for Ozone chamber unit processes that shall equal (*T50* * 0.1), if the percent *Ozone Gas Flow to Each Chamber* does not equal zero.

2.2.23 Chemical Feeds (TUXCHEMFDS)

The *Chemical Feeds* table contains the normalized dose rate and normalized chemical name for the feeder chemicals added to each unit process.

- *CHEMFDS011000010*—One or more records in the *Chemical Feeds* table shall be associated with one record in the *Unit Process* table.

- *CHEMFDS011000020—Chemical Feed Name* shall be normalized using the reference table, *Normalization Calculations for Unique Chemical Formulas for Chemical Feeds in the ICR Initial Sampling Plan* (Appendix G).
- *CHEMFDS011000021—Dose Rate* shall be normalized using the reference table, *Normalization Calculations for Unique Chemical Formulas for Chemical Feeds in the ICR Initial Sampling Plan* (Appendix G).
- *CHEMFDS 011000030*—An exception report shall be created for *Chemical Feed Name* values that cannot be normalized using the reference table, *Normalization Calculations for Unique Chemical Formulas for Chemical Feeds in the ICR Initial Sampling Plan* (Appendix G).

2.2.24 Ozone Chamber (TUXOZCHM)

The *Ozone Chamber* table contains Ozone unit process information such as water/ozone flow regime and percent ozone gas flow. Other basic unit process information associated with Ozone chambers is located in the *Unit Process* table.

- *OZCHM011000010*—One or more records in the *Ozone Chamber* table shall be associated with one record in the *Ozone Contactor* table.
- *OZCHM011000020*—One record in the *Ozone Chamber* table shall be associated with one record in the *Unit Process* table.

2.2.25 Ozone Contactor (TUXOZCON)

The *Ozone Contactor* table contains information associated with each Ozone contactor. Each Ozone contactor is associated with at least one Ozone chamber.

- *OZCON011000010*—One record in the *Ozone Contactor* table shall be associated with one or more records in the *Ozone Chamber* table.
- *OZCON011000020*—The *Ozone Contactor* table shall contain information for Sampling Periods 1 through 18.

- *OZCON011000030—Number of Chambers* is a calculated field that shall equal the number of chambers associated with each Ozone contactor.
- *OZCON011000040—Total Ozone Applied Dose (mg/L)* is a calculated field that shall equal the sum of all Ozone doses for all disinfectant addition unit processes associated with an Ozone contactor.
- *OZCON011000041*—Disinfectant addition unit processes associated with the first Ozone contactor shall equal the disinfectant addition unit processes with sequence numbers lower than the maximum sequence number of the chamber associated with the first Ozone contactor.
- *OZCON011000042*—Disinfectant addition unit processes associated with a second Ozone contactor shall equal the disinfectant addition unit processes with sequence numbers higher than the maximum sequence number of the chamber associated with the first Ozone contactor and lower than the maximum sequence number of the chamber associated with the second Ozone contactor.

2.2.26 Analyte ID Reference Table (TUXANLYT)

The *Analyte ID Reference* table provides a list of the analytes in Auxiliary 1 Database. The Analyte ID in the *Analyte ID Reference* table is linked to the Analyte ID in the *Analyte Comments* table. The *Analyte ID Reference* table lists the analyte name, the abbreviated analyte name, the minimum reporting level, and the unit of measurement for the analyte.

2.2.27 EPA Region Reference Table (TUXEPAREG)

The *EPA Region Reference* table associates each state with an EPA Region.

2.2.28 Sample Quarter Reference Table (TUXQTR)

The *Sample Quarter Reference* table associates each month with a sample quarter. ICR data were collected for 18 months; therefore, there are 6 quarters of data in Auxiliary 1 Database. Each quarter represents 3 months of data.

2.2.29 HUC Code Reference Table (TUXUSGS)

The *HUC Code Reference* table lists the HUC code for each intake in the ICR Federal Database. This table also includes the PWSID, intake ID, intake name, and latitude and longitude measurements.

2.2.30 Disinfectant Addition Normalization Table (TUXDISINF_NORM)

The *Disinfectant Addition Normalization* table is used to normalize the disinfectant name and dose rate in the *Unit Process* table. It contains a record for each disinfectant that has been normalized. The original disinfectant name and formula are stored in this table, as well as the multiplication factor used to normalize the dose rate, the normalized disinfectant name, and the unit of measurement for the normalized disinfectant.

2.2.31 Feeder Chemical Normalization Table (TUXFDCHEM_NORM)

The *Feeder Chemical Normalization* table is used to normalize the chemical name and dose rate in the *Chemical Feeds* table. It contains a record for each chemical feed that has been normalized. The original chemical name and formula are stored in this table, as well as the multiplication factor used to normalize the dose rate, the normalized chemical name, and the unit of measurement for the normalized chemical.

3.0 THE QUERY TOOL

The Auxiliary 1 Database is designed to allow the ICR data analysts to examine a single variable across all plants (e.g., TTHM concentration at the finished water sample point in chlorination plants). It is more difficult, although not impossible, to examine a single variable through a single plant (e.g., change in TOC concentration through a specific plant practicing enhanced coagulation). The Query Tool provides a means by ICR data analysts can aggregate plant data in a horizontal fashion. The Query Tool allows analysts to perform through-the-plant analyses without having an in-depth knowledge of database execution, such as creating table joins and/or queries in Microsoft Access.

Due to the varying degrees of technical expertise of the proposed user community, the Query Tool is designed to meet certain minimum performance requirements. At the

first JAD, meeting attendees agreed on a number of general characteristics for the structure of the Query Tool that will be utilized to augment the query capabilities of Microsoft® Access™ 97 in selecting data from the Auxiliary 1 Database. At the second JAD, a strawman of the Query Tool was presented to EPA and EPA stakeholders by the ICR DMS Team. The following Query Tool requirements were derived from discussions that took place during the first and second JAD meetings.

- *QT081000010*—The Query Tool shall be designed to work with the Auxiliary 1 Database.
- *QT081000020*—The Query Tool shall provide a graphical user interface (GUI).
- *QT081000030*—The Query Tool shall allow the user to select data by *ICR PWSID#*.
- *QT081000040*—The Query Tool shall allow the user to select data by *ICR Treatment Plant ID No.*
- *QT081000050*—The Query Tool shall allow the user to select data by *Sampling Period* or *Sample Quarter*.
- *QT081000060*—The Query Tool shall provide the user with the capability to enter ranges as part of the selection criteria (i.e., =, <, >, <=, >=) for the *Sample Quarter* or *Sampling Period*.
- *QT081000070*—The Query Tool shall allow the user to select data by *EPA Region*.
- *QT081000080*—The Query Tool shall allow the user to select data by *Plant Category*.
- *QT081000090*—The Query Tool shall allow the user to select data by *Coagulant Type*.
- *QT081000100*—The four categories in the pick list for *Coagulant Type* shall be "MIX," "AL," "IRON", and "OTHER."

- *QT081000110*—The “OTHER” category for *Coagulant Type* shall represent the null values for *Coagulant Type* in the Auxiliary 1 Database.
- *QT081000120*—The Query Tool shall allow the user to select data by *Plant Disinfectant Type*.
- *QT081000130*—The Query Tool shall allow the user to select data by *Distribution System Disinfectant Type*.
- *QT0810000140*—The Query Tool shall allow the user to select data by *Water Resource Category*.
- *QT081000150*—The Query Tool shall allow the user to select data by *Surface Water Resource Category*.
- *QT081000160*—The pick list for *Plant Disinfectant Type*, *Distribution System Disinfectant Type*, *Water Resource Category*, and *Surface Water Resource Category* shall contain the full category name, not abbreviations.
- *QT081000170*—The Query Tool shall allow the user to select data by the presence or absence of a washwater return unit process for a plant.
- *QT081000180*—The Query Tool shall allow the user to select multiple tables to create a query.
- *QT081000190*—The Query Tool shall allow the user to select the columns from tables to be included in a query.
- *QT08100200*—The Query Tool shall rename the columns to ensure that each column contains a unique name.
- *QT081000210*—The Query Tool shall allow the user to select the following sample locations to be included in a query: Influent, All Distribution System Locations, ENT, DSE, AVG1, AVG2, MAX, SDS, NFC, Finished Water.
- *QT081000220*—All Distribution System Locations shall represent all of the distribution sample location types: ENT, DSE, AVG1, AVG2, MAX, SDS, NFC.

- *QT081000230*—The Query Tool shall allow the user to select all of the types of sampling locations that exist in the Auxiliary 1 Database, except for the following five unit processes: ozone, additional water source, additional water source sampling point, washwater return, and washwater return sampling point.
- *QT081000241*—The Query Tool shall provide the user with the capability to select multiple sampling locations. If the sampling location is associated with a unit process, then the unit process data shall also be included in the Query Tool results.
- *QT081000242*—Only unit processes associated with samples shall be included in the Query Tool results.
- *QT081000250*—The unit process with the lowest sequence number shall be used by the Query Tool, if a plant has more than one unit process of the same type and the unit process is not a clearwell or disinfection contact basin unit process.
- *QT081000260*—The clearwell or disinfection contact basin unit process with the highest sequence number shall be used by the Query Tool, if a plant has more than one clearwell or disinfection contact basin unit process.
- *QT081000270*—The Query Tool shall allow the user to save the output of query as a Microsoft® Access™ 97 table or a Microsoft® Excel™ spreadsheet.

Note: Microsoft® Access™ 97 tables are limited to 255 columns.

- *QT081000290*—The Query Tool shall include a link to the Envirofacts ICR homepage and to the OGWDW ICR homepage.
- *QT081000300*—The Query Tool shall include the data dictionary for the Auxiliary 1 Database.
- *QT081000310*—The Query Tool shall include a time/date stamp, User ID, Query Name and Comments in each query definition.

- *QT081000340*—If a user hits the F1 key while the cursor is a selection criteria field, online help will appear to explain how to select the criteria for the current field.
- *QT081000350*—The Query Tool shall contain the entity relationship diagram (ERD) for the Auxiliary 1 Database on the *Select Tables* screen.
- *QT081000360*—The Query Tool help shall contain the definition of each field that appears on the *Select Fields* screen.
- *QT081000370*—The Query Tool shall not display sample analytical results for blended plants.

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APPENDIX A

ICR Auxiliary 1 Database Structure

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APPENDIX B

Auxiliary 1 Database Fields Sorted by MS Access Alias Name

MS Access Alias Name	Attribute Name	Table Name
Abbreviated_Name	ABBREVIATED_NAME	TUXANLYT
Acetald_ppb	ACETAL	TUXCLDIOX
Add_Water_Source_Avg_Flow_MGD	AWSAVGQ	TUXPLTMON
Add_Water_Source_Day_Flow_MGD	AWSDAYQ	TUXPLTMON
Add_Water_Source_Type	AWSTYPE	TUXPLTMON
Alk_ppmCaCO3	ALK	TUXWQP
Alum_dose_ppmAl	AL_DOSE	TUXPLTMON
Amor_Crypto_per100L	CRY_AS	TUXMICRO
Amor_Giardia_per100L	GIA_AS	TUXMICRO
Analyte_Comment	ANAL_COM	TUXACMMT
Analyte_ID	ANAL_ID	TUXACMMT
Analyte_ID	ANAL_ID	TUXANLYT
Analyte_Name	ANAL_NAME	TUXANLYT

MS Access Alias Name	Attribute Name	Table Name
Analyte_QA_Flag	ANAL_QA	TUXACMMT
AOC-BDOC_ Comment_flag	COMFLG10	TUXABDOC
AOC-BDOC_QA_Flag	QAFLG10	TUXABDOC
Avg_Residence_Time_days	SRCAVGTM	TUXWRMON
BCAA_ppb	BCAA	TUXDBP
BCAN_ppb	BCAN	TUXDBP
BDCAA_ppb	BDCAA	TUXDBP
BDCM_ppb	BDCM	TUXDBP
BDOC_Final_DOC_ppmC	DOC_FIN	TUXABDOC
BDOC_Incubat_Time_days	REATMDAY	TUXABDOC
BDOC_Initial_DOC_ppmC	DOC_IN	TUXABDOC
BDOC_Initial_TOC_ppmC	TOC_IN	TUXABDOC
BDOC_Method	BDOC_MET	TUXABDOC
Blend_Flag	BLNDFLAG	TUXPLTMON

MS Access Alias Name	Attribute Name	Table Name
Br_ppmBr	BROMIDE	TUXWQP
BrO3_ppb	BRO3UTIL	TUXCLDIOX
Butanal_ppb	BUTANAL	TUXCLDIOX
Ca_HARD_ppmCaCO3	CA_HARD	TUXWQP
CDBAA_ppb	CDBAA	TUXDBP
CH_ppb	CH	TUXDBP
Chamber_ID	CHMB_ID	TUXOZCHM
CHBR3_ppb	CHBR3	TUXDBP
CHCL3_ppb	CHCL3	TUXDBP
Chem_Feed_ name	NORM_CHEMNAME	TUXDISINF_NORM
Chem_Feed_ name	NORM_CHEMNAME	TUXFDCHEM_NORM
Chem_Feed_ name	CHM_NAME	TUXCHEMFDS
Chemical_Feed_ID	CHEMFDID	TUXCHEMFDS

MS Access Alias Name	Attribute Name	Table Name
Chemical_Formula	ICR_FORMULA	TUXFDCHEM_NORM
Chemical_Formula	ICR_FORMULA	TUXDISINF_NORM
Chlorate_ppb	CLO3	TUXCHLORS
Chlorite_ppb	CHLORITE	TUXCHLORS
CL2_Demand_ppmCL2	CLD	TUXPLTMON
CLO2-3_Comment_Flag	COMFLG08	TUXCHLORS
CLO2-3_QA_Flag	QAFLG08	TUXCHLORS
Clrwell_Baffle_Type	CWBFTYPE	TUXPLTDES
Clrwell_Cover	CWCCODE	TUXPLTDES
Clrwell_Min_Vol_gal	CWMLV	TUXPLTDES
CLX_Res_ppmCL2	CLXRES	TUXDISFRES
CNCL_comment_flag	COMFLG07	TUXCNCL
CNCL_ppb	CNCL	TUXCNCL
CNCL_QA_flag	QAFLG07	TUXCNCL

MS Access Alias Name	Attribute Name	Table Name
Coagulant_Type	COAGTYPE	TUXPLTMON
Coli_Lab_ID	COLILAB	TUXMICRO
Coli_Method	COLI_MET	TUXMICRO
Confidence_Level	DSCFDLVL	TUXSAMPLE
CP_ppb	CP	TUXDBP
D_Approve_WTP_Cap_MGD	DAPPCAPQ	TUXPLTDES
D_Ave_Percent_Solids	DAVGPSOL	TUXPLTDES
D_Cl2_boost_high_dose_ppmCL2	DCL2BSDH	TUXUTDES
D_Cl2_boost_low_dose_ppmCL2	DCL2BSDL	TUXUTDES
D_CLM_boost_high_dose_ppmCL2	DCLMBSDH	TUXUTDES
D_CLM_boost_low_dose_ppmCL2	DCLMBSDL	TUXUTDES
D_CLX_boost_high_dose_ppmCLO2	DCLXBSDH	TUXUTDES
D_CLX_boost_low_dose_ppmCLO2	DCLXBSDL	TUXUTDES

MS Access Alias Name	Attribute Name	Table Name
D_Dist_Sys_Avg_Time_days	DDSAVGTM	TUXUTDES
D_Dist_Sys_Max_Time_days	DDSMAXTM	TUXUTDES
D_Hyp_boost_high_dose_ppmCL2	DHYPBSDH	TUXUTDES
D_Hyp_boost_low_dose_ppmCL2	DHYPBSDL	TUXUTDES
D_No_CL2_boost_station	DCL2BSN	TUXUTDES
D_No_CLM_boost_station	DCLMBSN	TUXUTDES
D_No_CLX_boost_station	DCLXBSN	TUXUTDES
D_No_Hyp_boost_station	DHYPBSN	TUXUTDES
D_Proc_Train_Name	DPTNAME	TUXPTRAIN
D_Proc_Train_Type	DPT_TYPE	TUXPTRAIN
D_Solid_Hand_Cap_DTD	DSL DG CAP	TUXPLTDES
D_Source_Type	DSRCTYPE	TUXWRDES
D_Vol_dist_sys_storage_MGD	DSSTOR_V	TUXUTDES
D_WTP_Type	DWTPTYPE	TUXPLTDES

MS Access Alias Name	Attribute Name	Table Name
DBAA_ppb	DBAA	TUXDBP
DBAN_ppb	DBAN	TUXDBP
DBCM_ppb	DBCM	TUXDBP
DBP_Comment_Flag	COMFLG06	TUXDBP
DBP_O3-CIO3_ QA_Flag	QAFLG09	TUXCLDIOX
DBP_O3-CIO3_Comment_Flag	COMFLG09	TUXCLDIOX
DBP_QA_Flag	QAFLG06	TUXDBP
DCAA_ppb	DCAA	TUXDBP
DCAN_ppb	DCAN	TUXDBP
DCP_HK_ppb	DCP_HK	TUXDBP
Disinf_Dose_ppm	DIS_DOSE	TUXUNPRO
Disinf_Name	DIS_NAME	TUXUNPRO
Disinf_Res_Comment_Flag	COMFLG05	TUXDISFRES

MS Access Alias Name	Attribute Name	Table Name
Disinf_Res_QA_Flag	QAFLG05	TUXDISFRES
Dist_Sys_Disinf_Type	DS_DIS	TUXPLTMON
Dist_Sys_Time_hrs	DSCNT_TM	TUXSAMPLE
Ecoli_BDL_per100mL	ECOLIBDL	TUXMICRO
Fcoli_BDL_per100mL	FCOLIBDL	TUXMICRO
Tcoli_BDL_per100mL	TCOLIBDL	TUXMICRO
Dose_ppm	CHM_DOSE	TUXCHEMFDS
Ecoli_per100mL	ECOLI	TUXMICRO
Empty_Crypto_per100L	CRYEMPTY	TUXMICRO
Empty_Giardia_per100L	GIAEMPTY	TUXMICRO
EPA_region	EPAREG	TUXUTDES
EPA_region	EPAREG	TUXEPAREG
Event_ID	EVENT_ID	TUXCLDIOX
Event_ID	EVENT_ID	TUXABDOC

MS Access Alias Name	Attribute Name	Table Name
Event_ID	EVENT_ID	TUXWQP
Event_ID	EVENT_ID	TUXHYPO
Event_ID	EVENT_ID	TUXCNCL
Event_ID	EVENT_ID	TUXOZCHM
Event_ID	EVENT_ID	TUXCHLORS
Event_ID	EVENT_ID	TUXMICRO
Event_ID	EVENT_ID	TUXDBP
Event_ID	EVENT_ID	TUXPLTMON
Event_ID	EVENT_ID	TUXSESA
Event_ID	EVENT_ID	TUXDISFRES
Event_ID	EVENT_ID	TUXUNPRO
Event_ID	EVENT_ID	TUXSAMPLE
Event_Name	EVNTNAME	TUXSAMPLE

MS Access Alias Name	Attribute Name	Table Name
Event_Seq_No	EVENTSEQ	TUXSAMPLE
Event_Type	EVNTTYPE	TUXSAMPLE
EXP_CLX_Res_ppmCL2	EXCLXRES	TUXDISFRES
EXP_Free_CL2_Res_ppmCL2	EXFCLRES	TUXDISFRES
EXP_NH3_ppmN	EXPNH3_N	TUXWQP
EXP_O3_Res_ppmO3	EXO3RES	TUXDISFRES
EXP_Tot_CL@_Res_ppmCL2	EXTCLRES	TUXDISFRES
FColi_per100mL	FCOLI	TUXMICRO
Filt_Media_Type	FLTMEDIA	TUXUNPRO
Filt_surf_area_sqft	UP_SA	TUXUNPRO
Filt_Total_Media_Depth_inch	FLTDEPTH	TUXUNPRO
Formald_ppb	FORMAL	TUXCLDIOX
Free_CL2_Res_ppmCL2	FCL2RES	TUXDISFRES
GAC_depth_inch	GACDEPTH	TUXUNPRO

MS Access Alias Name	Attribute Name	Table Name
Glyoxal_ppb	GLYOXAL	TUXCLDIOX
HAA5_ppb	HAA5	TUXDBP
HAA6_ppb	HAA6	TUXDBP
HAA9_ppb	HAA9	TUXDBP
HAN4_ppb	HAN4	TUXDBP
Historic_Min_Temp_C	DHSMIN_T	TUXPLTDES
Hypo_Chlorate_gperLCIO3	HYPCL03G	TUXHYPO
Hypo_Free_gperLCL2	HYPCL2_G	TUXHYPO
Hypo_pH	HYPO_PH	TUXHYPO
Hypo_Temp_C	HYPO_T	TUXHYPO
ICR_PWSID	ICRPWSID	TUXUTDES
ICR_PWSID	ICRPWSID	TUXWPURC
ICR_PWSID	ICRPWSID	TUXPTRAIN

MS Access Alias Name	Attribute Name	Table Name
ICR_PWSID	ICRPWSID	TUXUTMON
ICR_PWSID	ICRPWSID	TUXCHEMFDS
ICR_PWSID	ICRPWSID	TUXUSGS
ICR_PWSID	ICRPWSID	TUXSAMPLE
ICR_PWSID	ICRPWSID	TUXWRDES
ICR_PWSID	ICRPWSID	TUXPLTDES
ICR_PWSID	ICRPWSID	TUXOZCHM
ICR_PWSID	ICRPWSID	TUXPLTMON
ICR_PWSID	ICRPWSID	TUXWRMON
ICR_PWSID	ICRPWSID	TUXUNPRO
ICR_WTP_ID	ICRWTPID	TUXSAMPLE
ICR_WTP_ID	ICRWTPID	TUXCHEMFDS
ICR_WTP_ID	ICRWTPID	TUXPLTDES
ICR_WTP_ID	ICRWTPID	TUXOZCON

MS Access Alias Name	Attribute Name	Table Name
ICR_WTP_ID	ICRWTPID	TUXPTRAIN
ICR_WTP_ID	ICRWTPID	TUXWRMON
ICR_WTP_ID	ICRWTPID	TUXHYPO
ICR_WTP_ID	ICRWTPID	TUXUNPRO
ICR_WTP_ID	ICRWTPID	TUXWRDES
ICR_WTP_ID	ICRWTPID	TUXPLTMON
ICR_WTP_ID	ICRWTPID	TUXOZCHM
Incubate_Temp_C	INC_TEMP	TUXABDOC
Incubate_time_days	INCTMDAY	TUXABDOC
Intake_Day_Flow_MGD	INTKDAYQ	TUXWRMON
Intake_HUC	INTK_HUC	TUXWRDES
Intake_HUC	HUC	TUXUSGS
Intake_ID_Number	WSFIDNUM	TUXUSGS

MS Access Alias Name	Attribute Name	Table Name
Intake_Name_D	DINTKNAM	TUXWRDES
Intake_Name_M	MINTKNAM	TUXWRMON
Intake_ReachCode	INTKSRC	TUXWRDES
Intake_River_Mile	INTKRMIN	TUXWRDES
Intern_Crypto_per100L	CRYGTIS	TUXMICRO
Intern_GT1_Giardia_per100L	GIAGTIS	TUXMICRO
Intern1_Giardia_per100L	GIA_IS	TUXMICRO
Iron_dose_ppmFe	FE_DOSE	TUXPLTMON
Lat_degree	LATDEG	TUXWRDES
Lat_Equat_Code	LATEQCD	TUXWRDES
Lat_minute	LATMINUT	TUXWRDES
Lat_second	LATSECND	TUXWRDES
Latitude_deg/min	LAT_DD	TUXUSGS
Long_Code	LONMERC	TUXWRDES

MS Access Alias Name	Attribute Name	Table Name
Long_degree	LONDEG	TUXWRDES
Long_minute	LONMINUT	TUXWRDES
Long_second	LONSECND	TUXWRDES
Longitude_deg/min	LONG_DD	TUXUSGS
LowLevel_BrO3_ppb	BRO3_EPA	TUXCLDIOX
M_Avg_Fin_Flow_MGD	FINAVGQ	TUXPLTMON
M_Avg_Inft_Flow_MGD	INFLAVGQ	TUXPLTMON
M_Avg_Retail_Flow_MGD	UMAVGRQ	TUXUTMON
M_Avg_Whole_Flow_MGD	UMAVGWQ	TUXUTMON
M_Cl2_boost_high_dose_ppmCL2	MCL2BSDH	TUXUTMON
M_Cl2_boost_low_dose_ppmCL2	MCL2BSDL	TUXUTMON
M_CLM_boost_high_dose_ppmCL2	MCLMBSDH	TUXUTMON
M_CLM_boost_low_dose_ppmCL2	MCLMBSDL	TUXUTMON

MS Access Alias Name	Attribute Name	Table Name
M_CLX_boost_high_dose_ppmCLO2	MCLXBSDH	TUXUTMON
M_CLX_boost_low_dose_ppmCLO2	MCLXBSDL	TUXUTMON
M_Dist_Sys_Avg_Time_days	MDSAVGTM	TUXUTMON
M_Dist_Sys_Max_Time_days	MDSMAXTM	TUXUTMON
M_Hyp_boost_high_dose_ppmCL2	MHYPBSDH	TUXUTMON
M_Hyp_boost_low_dose_ppmCL2	MHYPBSDL	TUXUTMON
M_No_CL2_boost_station	MCL2BSN	TUXUTMON
M_No_CLM_boost_station	MCLMBSN	TUXUTMON
M_No_CLX_boost_station	MCLXBSN	TUXUTMON
M_No_Hyp_boost_station	MHYPBSN	TUXUTMON
M_Proc_Train_Name	MPTNAME	TUXPLTMON
M_Proc_Train_Type	MPT_TYPE	TUXPLTMON
M_Source_Cat	MSRC_CAT	TUXPLTMON
M_SW_Cat	MSWCAT	TUXPLTMON

MS Access Alias Name	Attribute Name	Table Name
M_WTP_Comment_Flag	COMFLG01	TUXPLTMON
M_WTP_QA_Flag	QAFLG01	TUXPLTMON
M_WTP_Type	MWTPTYPE	TUXPLTMON
MBAA_ppb	MBAA	TUXDBP
MCAA_ppb	MCAA	TUXDBP
Me_Glyoxal_ppb	ME_GLY	TUXCLDIOX
Mean_NOX_CFUperml	MEAN_NOX	TUXABDOC
Mean_P17_CFUperml	MEAN_P17	TUXABDOC
Micro_Comment_Flag	COMFLG03	TUXMICRO
Micro_QA_Flag	QAFLG03	TUXMICRO
Minimum_Reporting_Level	MIN_RPRTNG_LVL_MSR	TUXANLYT
Multiplication_Factor	M_FACTOR	TUXDISINF_NORM
Multiplication_Factor	M_FACTOR	TUXFDCHEM_NORM

MS Access Alias Name	Attribute Name	Table Name
NH3_ppmN	NH3_N	TUXWQP
No_O3_chamber	O3CHMB_N	TUXOZCON
No_Proc_Train_Sampled	SAMPPTN	TUXPLTMON
No_Process_Trains	DPRTRN_N	TUXPLTDES
Norm_Chem_ID#	TUXFDCHEM_ID_NUM	TUXFDCHEM_NORM
Norm_Disinf_ID#	TUXDISINF_ID_NUM	TUXDISINF_NORM
Normalized_Units	NORM_UNITS	TUXFDCHEM_NORM
Normalized_Units	NORM_UNITS	TUXDISINF_NORM
NOX_AOC_ppbACETeq	NOX_AOC	TUXABDOC
O3_Contactor_ID	O3CONTID	TUXOZCON
O3_Contactor_ID	O3CONTID	TUXOZCHM
O3_contactor_type	O3_TYPE	TUXOZCON
O3_Feed_gas_type	O3FDTYPE	TUXOZCON
O3_Feed_ppm_%	O3FDCONC	TUXOZCON

MS Access Alias Name	Attribute Name	Table Name
O3_gas_flow_scfm	O3_GASQ	TUXOZCON
O3_Logs_Giardia	O3GIALOG	TUXOZCON
O3_Logs_Virus	O3VIRLOG	TUXOZCON
O3_Regime	QREGIME	TUXOZCHM
O3_Res_ppmO3	O3RES	TUXDISFRES
Open_storage_surf_area_sqft	DSOPENSA	TUXUTDES
Original_Chemical_Name	ICR_CHEM	TUXFDCHEM_NORM
Original_Chemical_Name	ICR_CHEM	TUXDISINF_NORM
Ozone_CT_ppm-min	O3_CT	TUXOZCON
P17_AOC_ppbACETeq	P17_AOC	TUXABDOC
Pentanal_ppb	PENTANAL	TUXCLDIOX
Percent_O3_Gas_Flow	PGASQ	TUXOZCHM
pH	PH	TUXWQP

MS Access Alias Name	Attribute Name	Table Name
Pop_Cat	POPCAT	TUXUTMON
Process_flow_MGD	UP_Q	TUXUNPRO
Process_ID	UP_ID	TUXUNPRO
Process_ID	UP_ID	TUXCHEMFDS
Process_Name	UP_NAME	TUXUNPRO
Process_Name	UP_NAME	TUXCHEMFDS
Process_Seq_No	UP_SEQ	TUXUNPRO
Process_Type	UP_TYPE	TUXUNPRO
Propanal_ppb	PROPANAL	TUXCLDIOX
Prot_Analyst_ID	PROTANLT	TUXMICRO
Prot_Lab_ID	PROTLAB	TUXMICRO
Prot_Vol_Assay_L	PROTVASS	TUXMICRO
Prot_Vol_Collect_L	PROTVCOL	TUXMICRO
Proto_DL_Cysts	PROTO_DL	TUXMICRO

MS Access Alias Name	Attribute Name	Table Name
PWSID	PWSID	TUXUTDES
Retail_ pop	RPOP	TUXUTMON
Sample Quarter	SAMP_QTR	TUXSAMPLE
Sample Quarter	SAMP_QTR	TUXQTR
Sample_Comment	SAMP_COM	TUXSCMMT
Sample_Day_Fin_Flow_MGD	FINMAXQ	TUXPLTMON
Sample_Day_Infl_Flow_MGD	INFLDAYQ	TUXPLTMON
Sample_end_date	END_DATE	TUXUTMON
Sample_ID	SAMP_ID	TUXSESA
Sample_ID	SAMP_ID	TUXSCMMT
Sample_ID	SAMP_ID	TUXACMMT
Sample_Loc_ID	SAMP_LOC	TUXSAMPLE
Sample_Period	SAMP_PER	TUXOZCON

MS Access Alias Name	Attribute Name	Table Name
Sample_Period	SAMP_PER	TUXPTRAIN
Sample_Period	SAMP_PER	TUXCHEMFDS
Sample_Period	SAMP_PER	TUXPLTMON
Sample_Period	SAMP_PER	TUXUTDES
Sample_Period	SAMP_PER	TUXPLTDES
Sample_Period	SAMP_PER	TUXUTMON
Sample_Period	SAMP_PER	TUXOZCHM
Sample_Period	SAMP_PER	TUXQTR
Sample_Period	SAMP_PER	TUXHYPO
Sample_Period	SAMP_PER	TUXWRMON
Sample_Period	SAMP_PER	TUXWRDES
Sample_Period	SAMP_PER	TUXSAMPLE
Sample_Period	SAMP_PER	TUXWPURC
Sample_Period	SAMP_PER	TUXUNPRO

MS Access Alias Name	Attribute Name	Table Name
Sample_QA_Flag	SAMP_QA	TUXSCMMT
Sample_start_date	STRTDATE	TUXUTMON
Sludge_Percent_Solids	SLDGPSOL	TUXPLTMON
Sludge_Prod_DTD	SLDGPROD	TUXPLTMON
Source_Name	MSRCNAME	TUXWRMON
Source_Name	DSRCNAME	TUXWRDES
Source_Type	MSRCTYPE	TUXWRMON
State_Abbreviation	STATE_CD	TUXEPAREG
T10_min	T10	TUXUNPRO
T50_min	T50	TUXUNPRO
TBAA_ppb	TBAA	TUXDBP
TCAA_ppb	TCAA	TUXDBP
TCAN_ppb	TCAN	TUXDBP

MS Access Alias Name	Attribute Name	Table Name
TColi_per100mL	TCOLI	TUXMICRO
TCP_HK_ppb	TCP_HK	TUXDBP
TEMP_C	TEMP	TUXWQP
TOC_ppmC	TOC	TUXWQP
Tot_AOC_ppbC	TOT_AOC	TUXABDOC
Tot_CL2_Res_ppmCL2	TCL2RES	TUXDISFRES
Tot_Crypto_per100L	TCRYPTO	TUXMICRO
Tot_Giardia_per100L	TGIARDIA	TUXMICRO
Tot_HARD_ppmCaCO3	T_HARD	TUXWQP
Tot_O3_dose_ppm	O3TDOSE	TUXOZCON
Tot_Virus_MPNper100L	VIRUS	TUXMICRO
Total_pop	TPOP	TUXUTMON
TOX_ppbCl	TOX	TUXWQP
TOX_RPD_percent	TOXRPD	TUXWQP

MS Access Alias Name	Attribute Name	Table Name
TTHM_ppb	TTHM	TUXDBP
TURB_NTU	TURB	TUXWQP
Unit_of_Measurement	CNCNTRTN_UNIT_CDE	TUXANLYT
Utility_name	NAME	TUXUSGS
Utility_name	UTILNAME	TUXUTDES
UV_cm-1	UV_254	TUXWQP
Virus_95LCL_MPNper100L	VIR_LCL	TUXMICRO
Virus_95UCL_MPNper100L	VIR_UCL	TUXMICRO
Virus_Analyst_ID	VIR_ANLT	TUXMICRO
Virus_BDL_MPNper100L	VIR_BDL	TUXMICRO
Virus_Lab_ID	VIR_LAB	TUXMICRO
Virus_Vol_Assay_L	VIR_VASS	TUXMICRO
Virus_Vol_Collect_L	VIR_VCOL	TUXMICRO

MS Access Alias Name	Attribute Name	Table Name
Vol_gal	UP_V	TUXUNPRO
Wellhead_Protect	WHEADPRT	TUXWRDES
Whole_Purchase_Flow_MGD	WPURQ	TUXWPURC
Whole_Purchase_ID	WPURID	TUXWPURC
Whole_Purchase_Name	WPURNAME	TUXWPURC
Wholesale_pop	WPOP	TUXUTMON
WQP_Comment_Flag	COMFLG04	TUXWQP
WQP_QA_Flag	QAFLG04	TUXWQP
WTP_Baffling_Factor	BFCOMP	TUXPLTMON
WTP_Disinf_Type	WTP_DIS	TUXPLTMON
WTP_Name	DWTPNAME	TUXPLTDES
Wtrshed_Control	WSHDCTRL	TUXWRDES
WWR_24hr_Avg_Flow_MGD	WWRAVGQ	TUXPLTMON
WWR_Coag	WWRCOAG	TUXPLTMON

MS Access Alias Name	Attribute Name	Table Name
WWR_Disinf	WWRDIS	TUXPLTMON
WWR_Filter	WWRFILT	TUXPLTMON
WWR_Other	WWROTH	TUXPLTMON
WWR_Sample_Day_Flow_MGD	WWRDAYQ	TUXPLTMON
WWR_Sed	WWRSED	TUXPLTMON
WWR_Treat_Type	WWRTYPE	TUXPLTMON

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APPENDIX C

Data Mapping of the Auxiliary 1 Database to the ICR Federal Database

APPENDIX D

Primary Key Reference Tables

**Entity Type Name: Assimilable Organic Carbon/Biodegradable Organic Carbon
(AOC/BDOC)**

Table Name: TUXABDOC

Attribute Name	TUXABDOC Field Name
Sample Event ID	EVENT_ID number (7) not null(PK)

Entity Type Name: Analyte Comments

Table Name: TUXACMMT

Attribute Name	TUXACMMT Field Name
Sample ID	SAMP_ID char (28) (PK)
Analyte ID Number	ANAL_ID number (3) (PK)

Entity Type Name: Analyte ID Reference Table

Table Name: TUXANLYT

Attribute Name	TUXANLYT Field Name
Analyte ID Number	ANAL_ID number (3) (PK)

Entity Type Name: Chemical Feeds

Table Name: TUXCHEMFDS

Attribute Name	TUXCHEMFDS Field Name
Chemical Feed ID	CHEMFDID

Attribute Name	TUXCHEMFDS Field Name
	number (6) not null(PK)

Entity Type Name: Chlorite/Chlorate

Table Name: TUXCHLORS

Attribute Name	TUXCHLORS Field Name
Sample Event ID	EVENT_ID number (7) not null (PK)

Entity Type Name: Chlorine Dioxide/Ozone Disinfection By-Products (DBP)

Table Name: TUXCLDIOX

Attribute Name	TUXCLDIOX Field Name
Sample Event ID	EVENT_ID number (7) not null (PK)

Entity Type Name: Cyanogen Chloride

Table Name: TUXCNCL

Attribute Name	TUXCNCL Field Name
Sample Event ID	EVENT_ID number (7) not null (PK)

Entity Type Name: Disinfection By-Products (DBP)

Table Name: TUXDBP

Attribute Name	TUXDBP Field Name
Sample Event ID	EVENT_ID

Attribute Name	TUXDBP Field Name
	number (7) not null (PK)

Entity Type Name: Disinfectant Residuals

Table Name: TUXDISFRES

Attribute Name	TUXDISFRES Field Name
Sample Event ID	EVENT_ID number (7) not null (PK)

Entity Type Name: Disinfectant Addition Normalization Table

Table Name: TUXDISINF_NORM

Attribute Name	TUXDISINF_NORM Field Name
Disinfectant Addition Normalization ID	TUXDISINF_ID_NUM number (10) not null (PK)

Entity Type Name: EPA Region Reference Table

Table Name: TUXEPAREG

Attribute Name	TUXEPAREG Field Name
State Abbreviation	ST_CODE char (2) (PK)

Entity Type Name: Feeder Chemical Normalization Table

Table Name: TUXFDCHEM_NORM

Attribute Name	TUXFDCHEM Field Name
Chemical Normalization ID	TUXCHEM_ID_NUM

Attribute Name	TUXFDCHEM Field Name
	number (10) not null (PK)

Entity Type Name: Hypochlorite Stock Solution

Table Name:TUXHYPO

Attribute Name	TUXHYPO Field Name
ICR Treatment Plant ID No.	ICRWTPID number (3) not null(PK)
Sampling Period	SAMP_PER number (2) not null(PK)

Entity Type Name: Microbiology

Table Name TUXMICRO

Attribute Name	TUXMICRO Field Name
Sample Event ID	EVENT_ID number (7) not null (PK)

Entity Type Name: Ozone Chamber

Table Name:TUXOZCHM

Attribute Name	TUXOZCHMB Field Name
	ICRWTPID

Attribute Name	TUXOZCHMB Field Name
ICR Treatment Plant ID No.	number (3) not null(PK)
Chamber ID	CHMB_ID number (6) not null(PK)
Sampling Period	SAMP_PER number (2) not null(PK)

Entity Type Name: Ozone Contactor

Table Name: TUXOZCON

Attribute Name	TUXOZCON Field Name
ICR Treatment Plant ID No.	ICRWTPID number (3) not null(PK)
Contactor ID	O3CONTID number (6) not null(PK)
Sampling Period	SAMP_PER number (2) not null(PK)

Entity Type Name: Plant Design

Table Name: TUXPLTDES

Attribute Name	TUXPLTDES Field Name
PWS ID Number	ICRPWSID char (21) not null(PK)
ICR Treatment Plant ID	ICRWTPID

Attribute Name	TUXPLTDES Field Name
No.	number (3) not null(PK)
Sampling Period	SAMP_PER number (2) not null(PK)

Entity Type Name: Plant Monthly

Table Name: TUXPLTMON

Attribute Name	TUXPLTMON Field Name
PWS ID Number	ICRPWSID char (21) not null (PK)
ICR Treatment Plant ID No.	ICRWTPID number (3) not null (PK)
Sampling Period	SAMP_PER number (2) not null (PK)

Entity Type Name: Process Train Design

Table Name: TUXPTRAIN

Attribute Name	TUXPTRAIN Field Name
Process Train Name	DPTNAME char (40) not null(PK)
PWS ID Number	ICRPWSID char (21) not null(PK)
ICR Treatment Plant ID No.	ICRWTPID number (3) not null(PK)

Attribute Name	TUXPTRAIN Field Name
Sampling Period	SAMP_PER number (2) not null(PK)
Process Train Type	DPT_TYPE char (10) (PK)

Entity Type Name: Sample Quarter Reference Table

Table Name: TUXQTR

Attribute Name	TUXQTR Field Name
Sampling Period	SAMP_PER number (2) not null (PK)

Entity Type Name: Sampling Event

Table Name: TUXSAMPLE

Attribute Name	TUXSAMPLE Field Name
Sample Event ID	EVENT_ID number (7) not null (PK)

Entity Type Name: Sample Comments

Table Name: TUXSCMMT

Attribute Name	TUXSCMMT Field Name
Sample ID	SAMP_ID char (28) (PK)

Entity Type Name: Sample Event/Sample ID Associative (SESA)

Table Name:TUXSESA

Attribute Name	TUXSESA Field Name
Sample ID	SAMP_ID char (28)(PK)

Entity Type Name: Unit Process

Table Name:TUXUNPRO

Attribute Name	TUXUNPRO Field Name
ICR Treatment Plant ID No.	ICRWTPID number (3) not null(PK)
Unit Process ID	UP_ID number (6) not null(PK)
Sampling Period	SAMP_PER number (2) not null(PK)

Entity Type Name: HUC Code Reference Table

Table Name: TUXUSGS

Attribute Name	TUXUSGS Field Name
PWS ID Number	ICRPWSID char (21) not null(PK)
Intake ID Number	WSFIDNUM number (3) not null(PK)

Entity Type Name: Utility Design

Table Name: TUXUTDES

Data Element	TUXUTDES Attribute
PWS ID Number	ICRPWSID char (21) not null(PK)
Sampling Period	SAMP_PER number (2) not null(PK)

Entity Type Name: Utility Monthly

Table Name: TUXUTMON

Attribute Name	TUXUTMON Field Name
PWS ID Number	ICRPWSID char (21) not null (PK)
Sampling Period	SAMP_PER number (2) not null (PK)

Entity Type Name: Wholesale Information

Table Name: TUXWPURC

Attribute Name	TUXWPURC Field Name
Wholesale Purchaser PWSID#	WPURID char (9) not null(PK)
PWS ID Number	ICRPWSID char (21) not null (PK)
Sampling Period	SAMP_PER number (2) not null (PK)

Entity Type Name: Water Quality Parameters (WQP)

Table Name: TUXWQP

Attribute Name	TUXWQP Field Name
Sample Event ID	EVENT_ID number (7) not null (PK)

Entity Type Name: Water Resource Design

Table Name: TUXWRDES

Attribute Name	TUXWRDES Field Name
Water Resource Name	DSRCNAME char (30) not null (PK)
PWSID#	ICRPWSID char (21) not null (PK)
ICR Treatment Plant ID No.	ICRWTPID number (3) not null (PK)
Sampling Period (0–Initial or 19–Final)	SAMP_PER number (2) not null (PK)
Intake Name	DINTKNAM char (40) not null (PK)

Entity Type Name: Water Resource Monthly

Table Name: TUXWRMON

Attribute Name	TUXWRMON Field Name
Water Resource Name	MSRCNAME

Attribute Name	TUXWRMON Field Name
	char (30) not null (PK)
PWSID#	ICRPWSID char (21) not null (PK)
ICR Treatment Plant ID No.	ICRWTPID number (3) not null (PK)
Sampling Period (0–Initial or 19–Final)	SAMP_PER number (2) not null (PK)
Intake Name	MINTKNAM char (40) not null (PK)

APPENDIX E

Calculated Attributes for the ICR Auxiliary 1 Database

APPENDIX F

Normalization Calculations for Unique Chemical Formulas
for Disinfectants in the ICR Initial Sampling Plan

APPENDIX G

Normalization Calculations for Unique Chemical Formulas
for Chemical Feeds in the ICR Initial Sampling Plan