Johnson and Iowa County Watershed Coalition Snapshot and Rapid Creek Watershed Quality Assurance Project Plan

QA/WM/07-01

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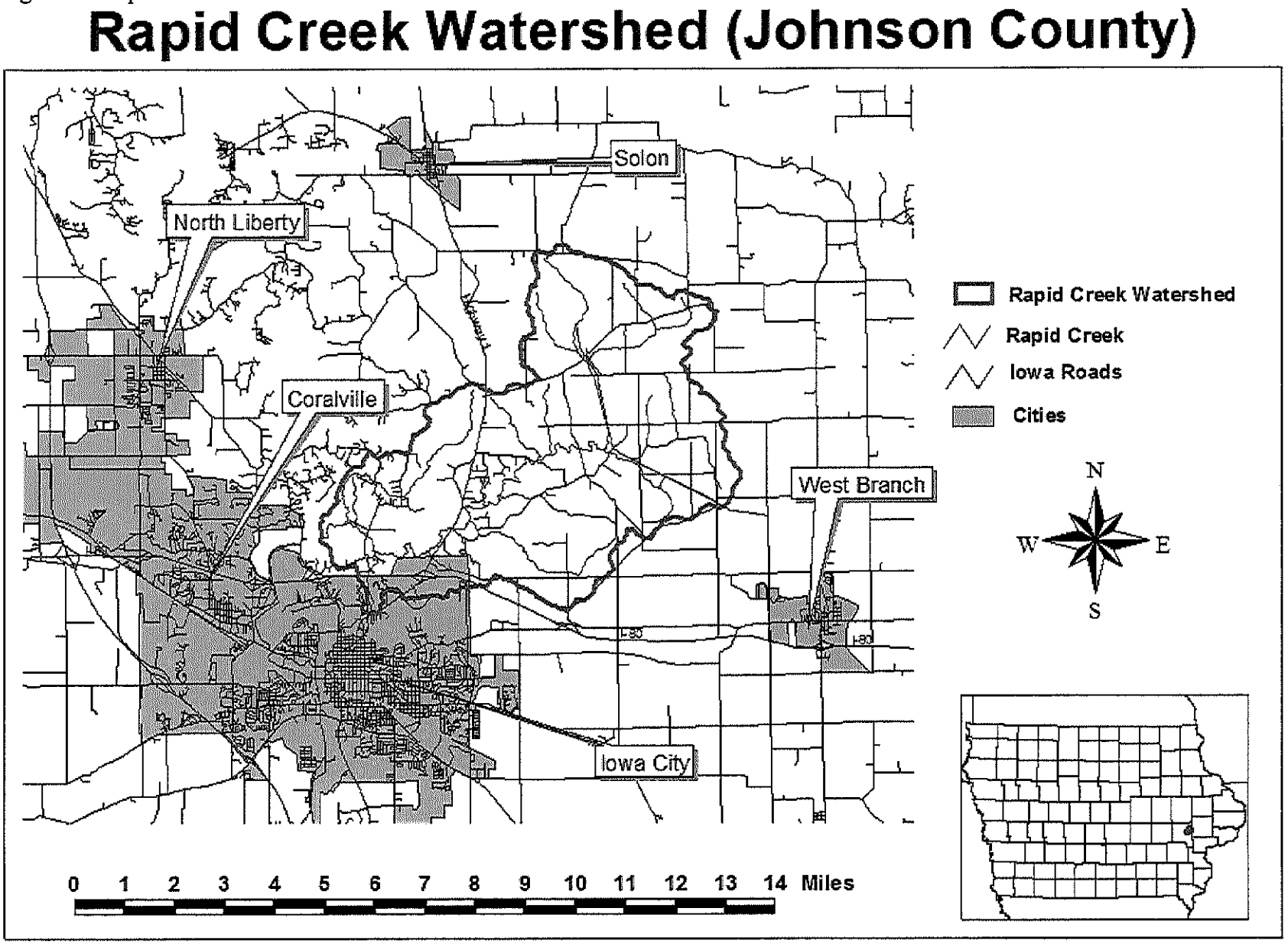
Figure 1. Rapid Creek



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A1. APPROVAL SIGNATURE PAGE

Gary Arner, JAICWC, Chairman — Date: 1-29-09

David Ratliff, JAICWC, Project Coordinator — Date: 1/29/09

Eric O'Brien, Iowa DNR, Environmental Program Supervisor for the Watershed Monitoring and Assessment Section — Date: 2/3/09

Lynette Seigley, Iowa DNR, Quality Assurance Officer — Date: 2/3/09

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DOCUMENT CONTROL

This document has been prepared according to the United States Environmental Protection Agency publication EPA Requirements for Quality Assurance Project Plans, dated March 2001 (QA/R-5) with direction from Guidance for Quality Assurance Project Plans, dated December 2002 (QA/G-5). This Quality Assurance Project Plan (QAPP) will be reviewed annually and updated as needed. Updated versions of this QAPP will bear a new (x + 1) revision number. The IOWATER Program Coordinator will assume responsibility for archiving outdated versions of this QAPP, which will be retained for a minimum of ten years from the date of archival. Archived versions of the QAPP will be kept at the main office of the Iowa Department of Natural Resources.

CONTRIBUTING ORGANIZATIONS

Information and data in the Johnson and Iowa County Watershed Coalition Snapshot and Rapid Creek Watershed Quality Assurance Project Plan were collected from the following sources:

- Johnson County Soil & Water Conservation District
- Iowa County Soil & Water Conservation District
- Johnson and Iowa County Watershed Coalition (JAICWC)
- Iowa Department of Natural Resources (Iowa DNR) IOWATER Program
- University of Iowa Hygienic Laboratory (UHL)

SECTION A – PROJECT MANAGEMENT

A3. DISTRIBUTION LIST

Each person listed on the Approval Signature page and each person listed in Table 1 will receive a copy of the final approved version of this Quality Assurance Project Plan as well as any subsequent revisions. A copy will also be made available to individuals taking part in the project and to other interested parties.

Table 1. Distribution List.

Name/Organization	Title	Phone Number
Dave Ratliff JAICWC	JAICWC Project Coordinator	(319) 430-3586
Gary Arner, JAICWC	JAICWC Chairman	(319) 688-9092
Wendell Jones, Johnson County Soil & Water Conservation District	District Conservationist	(319) 337-2322, ext. 3
Kelley Putman, Johnson County Soil & Water Conservation District	Commissioner Chair	(319) 337-2322, ext. 3
Steve Johnston, Iowa County Soil & Water Conservation District	District Conservationist	(319) 668-2359
Bob Faber, Iowa County Soil & Water Conservation District	Commissioner Chair	(319) 668-2359
Eric O'Brien, Iowa DNR	Environmental Program Supervisor for the Watershed Monitoring and Assessment Section	(319) 353-2835
Lynette Seigley, Iowa DNR	IOWATER Snapshot Event Coordinator	(319) 335-1598
Jacklyn Gautsch, Iowa DNR	IOWATER Field Coordinator	(319) 335-1761
Lynette Seigley, Iowa DNR	IOWATER QA/QC Officer	(319) 335-1598
Joost Korpel, Iowa DNR	IOWATER Database Manager	(319) 335-4019

A4. PROJECT/TASK ORGANIZATION

Water monitoring activities of the Iowa Department of Natural Resources' Watershed Monitoring and Assessment Program are funded by Iowa Infrastructure – Environment First Fund appropriations, as well as grants provided by the U.S. Environmental Protection Agency from Sections 106 and 319 of the Clean Water Act. The Watershed Monitoring and Assessment Program is responsible for the design, implementation, and management of Iowa's Ambient Water Monitoring Program. The purpose of the program is to develop and deliver consistent, unbiased information about the condition of Iowa's surface and groundwater resources so that decisions regarding the development, management, and protection of these resources may be improved.

Within the Watershed Monitoring and Assessment Program is the IOWATER Program, Iowa's citizen volunteer water quality monitoring program. Established in 1998, its mission is to protect and improve water quality by raising awareness about Iowa's watersheds, supporting and encouraging the growth of and networking of the state's volunteer water monitoring communities, and promoting monitoring activities as a means of assessing and understanding Iowa's aquatic resources. IOWATER provides training to citizens across Iowa who are interested in learning how to monitor water resources in their local area. IOWATER also promotes snapshot events in counties and watersheds across Iowa. During these snapshot events, multiple sites throughout a geographic area are sampled within a short period of time, thus providing a picture in time of water quality. Most of these snapshot events are initiated, coordinated, and conducted by volunteers through the IOWATER Program. Individuals or watershed groups locally often times have an interest in better understanding water quality in their area. From this interest, a partnership is formed with IOWATER to provide the support, training, technical, and financial resources to gather water quality information for a particular area. Data collected are used to document baseline conditions for water bodies throughout the geographic area and, with repeated snapshot events, data collected can be used to document seasonal and annual trends.

Personnel involved in the implementation of the Johnson and Iowa County Watershed Coalition snapshot event (henceforth referred to as JAICWC Snapshot) include the JAICWC Project Coordinator and Chairman, the IOWATER Program Coordinator, IOWATER Snapshot Event Coordinator, IOWATER volunteers, and the general public. Iowa DNR personnel are responsible for information synthesis, dissemination, data collection, processing, and analysis.

The Johnson and Iowa County Watershed Coalition (JAICWC) Project Coordinator and Chairman are responsible for identifying monitoring sites, parameters to monitor, generation of maps and field forms, and conducting the JAICWC Snapshot. Funding to support the JAICWC snapshot event (including IOWATER equipment, lab analyses, and staff) are provided through the DNR's Watershed Monitoring and Assessment Program.

The Iowa Department of Agriculture and Land Stewardship – Division of Soil Conservation provides funds to support Watershed Development and Planning Assistance Grant Applications. The Johnson County Soil and Water Conservation District applied for and received funds to evaluate the Rapid Creek Watershed in Johnson County. The goals of this project, henceforth referred to as the Rapid Creek Watershed Project, are to identify

water quality concerns in the watershed, inventory the watershed by collecting and analyzing data, and formulate alternatives to solve identified water resource problems. The Johnson County Soil and Water Conservation District is responsible for completing the requirements of this grant. Sites monitored as part of this project are also included in the JAICWC Snapshot.

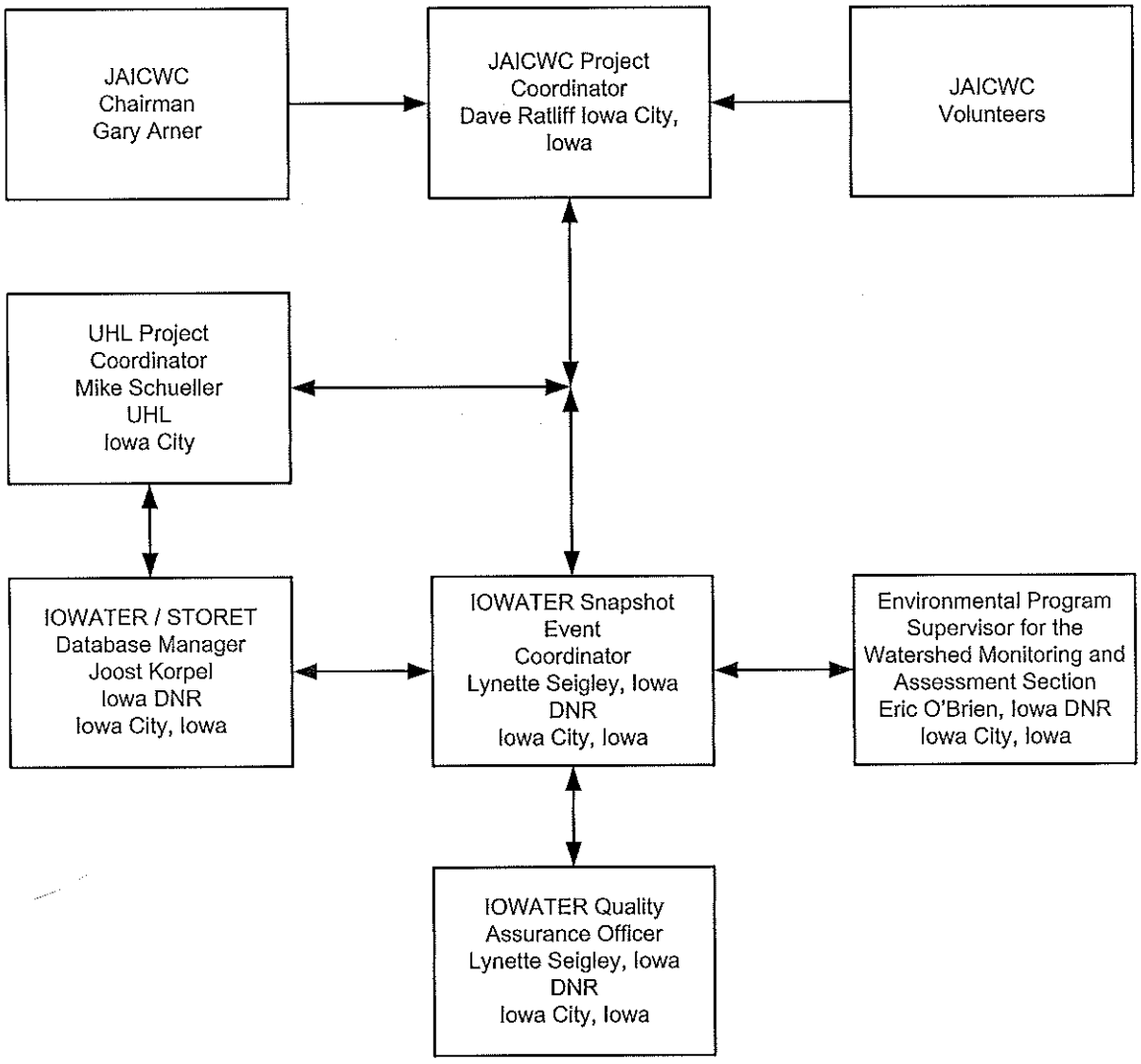
This QAPP covers water quality data collected for both the JAICWC Snapshots and the Rapid Creek Watershed Project.

The IOWATER Program Coordinator is responsible for maintaining the official, approved version of this Quality Assurance Project Plan.

Table 2. Project Personnel.

Name/Title	Project Responsibility
Dave Ratliff, JAICWC Project Coordinator	Work with IOWATER Snapshot Event Coordinator to organize the event. Assist in the selection of sampling sites and water quality parameters. Publicize the event. Identify and arrange for centralized locations where volunteers will meet the day of the event. Generate field packets, including maps and field sheets. Provide review of the spreadsheet data and lab results. Coordinate the collection of data as part of the Rapid Creek Watershed Project. Work with the Johnson County SWCD to analyze and summarize the Rapid Creek Watershed Project data.
Gary Arner, JAICWC Chairman	Work with the JAICWC Project Coordinator to identify monitoring sites and parameters to measure, generate maps and field forms, and conduct the snapshot event.
Lynette Seigley, IOWATER Snapshot Event Coordinator	Work with JAICWC Snapshot Coordinator and UHL Project Coordinator to organize the JAICWC event. Assist in the selection of sampling sites and water quality parameters. Publicize the event through the IOWATER newsletter and email list. Compile field equipment and lab bottles for the day of the JAICWC event. Ensure event participants are trained in sample collection procedures. Confirm field sheets and lab samples are completed and collected correctly. Deliver samples to the lab. Ensure snapshot data collected are entered into a spreadsheet. Provide review of the spreadsheet data and lab results. Generate graphs, maps, and tables summarizing the data. Write summary reports of the data as requested. Provide presentations about the snapshot results as needed.
Joost Korpel, IOWATER/STORET Database Manager	Develop a useable database to store the data for the JAICWC events and Rapid Creek Watershed project. Write the code/software for the database. Check the database for proper operation during set-up and initial operations. Document the results of the database development.
Mike Schueller, UHL Project Coordinator	Oversee the activities performed by UHL staff for these project. Specifically oversee the analysis of water quality samples. Receive, track, and analyze scheduled samples. Responsible for corrective actions related to sample analyses. Provide electronic results to the IOWATER Snapshot Event Coordinator and electronic results to the JAICWC Project Coordinator.
Lynette Seigley, IOWATER Quality Assurance Officer	Ensure information collected meets data quality standards. Provide review of graphs, maps, and reports generated which summarize the snapshot data.
Eric O'Brien, Iowa DNR, Environmental Program Supervisor for the Watershed Monitoring and Assessment Section	Oversee the activities performed by the IOWATER Snapshot Event Coordinator as part of the JAICWC event. Oversees activities of the Iowa DNR Water Lab for analyses performed as part of this monitoring. Promote snapshot events. Responsible for corrective actions necessary as they relate to the snapshot planning process. Provide review of graphs, maps, and reports generated which summarize the snapshot data.

Figure 2. JAICWC Snapshot Organizational Chart.



A5. PROBLEM DEFINITION/BACKGROUND

Since September 2003, the JAICWC has organized snapshot events to monitor streams throughout Johnson and Iowa counties. These JAICWC events have included several sites in the Rapid Creek Watershed. The snapshots are intended to provide baseline water quality throughout specific watersheds (i.e., Old Mans Creek, Clear Creek, Muddy Creek), as well as information on other streams throughout both counties. In addition, more frequent monitoring of sites in the Rapid Creek Watershed began in March 2008 as part of the Rapid Creek Watershed Project.

The Rapid Creek Watershed is a 33.9 square mile watershed located within Johnson County in eastern Iowa. Rapid Creek is a left-hand tributary to the Iowa River.

Current land use within the Rapid Creek watershed is listed in Table 3.

Table 3. 2002 Land Use within the Rapid Creek Watershed.

Land Cover Class	Acres	%
unclassified	0.00	0.00%
water	6.12	0.03%
wetland	64.66	0.30%
bottomland forest	0.33	0.00%
coniferous forest	161.13	0.75%
deciduous forest	3797.34	17.64%
ungrazed grassland	5465.19	25.38%
grazed grassland	613.98	2.85%
CRP grassland	683.92	3.18%
alfalfa	581.84	2.70%
corn	5211.10	24.20%
soybeans	4349.38	20.20%
other rowcrop	5.06	0.02%
roads	392.19	1.82%
commercial industrial	189.93	0.88%
residential	8.45	0.04%
barren	1.28	0.01%
clouds / shadow / no data	0.00	0.00%

The goal of this monitoring is to design and implement a series of sampling events that will assess the water quality and general health of the Rapid Creek Watershed and water quality throughout other watersheds in Johnson and Iowa counties. Specific objectives of these monitoring events include:

- Establish baseline conditions for determining stream health based on chemical, physical, habitat, and biological parameters.
- Assess the health of the watershed and target areas within the watershed in need of water quality improvement.
- Assist local watershed councils and partners in making environmental management decisions in their local and regional watersheds.

- Enlist community involvement in their local watershed.
- Collect data that may aid in the prioritization of watershed areas for Best Management Practices (BMPs).

This Quality Assurance Project Plan will describe how resources will be used to obtain quality, usable data for documenting the water quality within the Rapid Creek Watershed and throughout Johnson and Iowa counties. Data will be compared to state water quality standards; to other stream data collected as part of the JAICWC snapshots; and to data collected from a network of streams sampled statewide as part of Iowa's Ambient Water Monitoring Program. Success of this project will be determined or measured by the successful collection of samples throughout the watershed following the protocols and procedures outlined in this QAPP.

A6. PROJECT/TASK DESCRIPTION

This project will initiate a sampling of sites throughout Johnson and Iowa counties, as well as within the Rapid Creek Watershed to access baseline conditions and general stream health for nutrients, bacteria, transparency, water temperature, pH, chloride and dissolved oxygen. Data generated by this project will be reviewed by the Iowa DNR after being entered into the IOWATER and STORET databases. Project results will be incorporated into watershed efforts and any future planned snapshot events. Tables 4 and 5 provide milestone charts for the project.

Measurement processes and techniques utilized for parameters sampled during the JAICWC snapshots and Rapid Creek Watershed Project are outlined in Table 6.

Table 4. Milestone Chart for 2008

Task	Jan '08	Feb '08	Mar '08	Apr '08	May '08	June '08	July '08	Aug '08	Sep '08	Oct '08	Nov '08	Dec '08
Site Selection	•	•										
Training	•	•	•	•	•	•	•	•	•	•	•	•
Monitoring – stream assessment tudies				•	•	•			•	•		
Monitoring – IOWATER Methods			•	•	•	•	•	•	•	•	•	•
Monitoring - Bioassessment								•	•	•		
Monitoring – Lab analysis as part of the JAICWC snapshots					•		•			•		
Monitoring – Lab analysis as part of the Rapid Creek Watershed Project			•	•	•	•	•	•	•	•		
Process Data				•		•		•	•	•		
Report										•		

Table 5. Milestone Chart for 2009

Task	Jan '09	Feb '09	Mar '09	Apr '09	May '09	June '09	July '09	Aug '09	Sep '09	Oct '09	Nov '09	Dec '09
Site Selection	•	•										
Training	•	•	•	•	•	•	•	•	•	•	•	•
Monitoring – stream assessment studies			•	•	•					•	•	
Monitoring – IOWATER Methods			•	•	•	•	•	•	•	•	•	
Monitoring - Bioassessment								•	•	•		
Monitoring – Lab analysis as part of the JAICWC snapshots					•		•			•		
Process Data				•		•		•	•	•		
Report										•		

Figure 3. Rapid Creek Watershed Project Monitoring Sites.

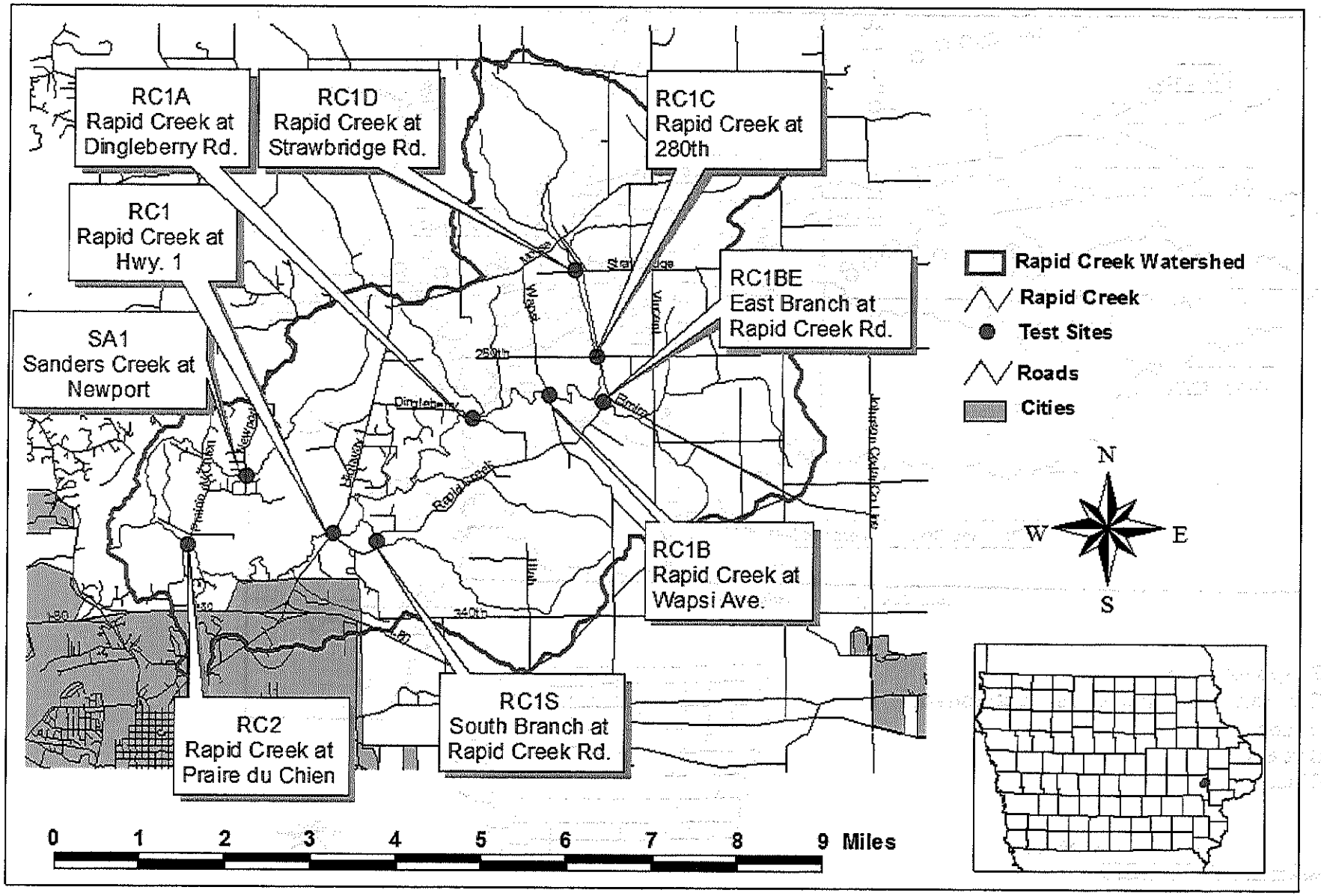


Figure 4. Johnson and Iowa County Watershed Coalition Snapshot Sites.

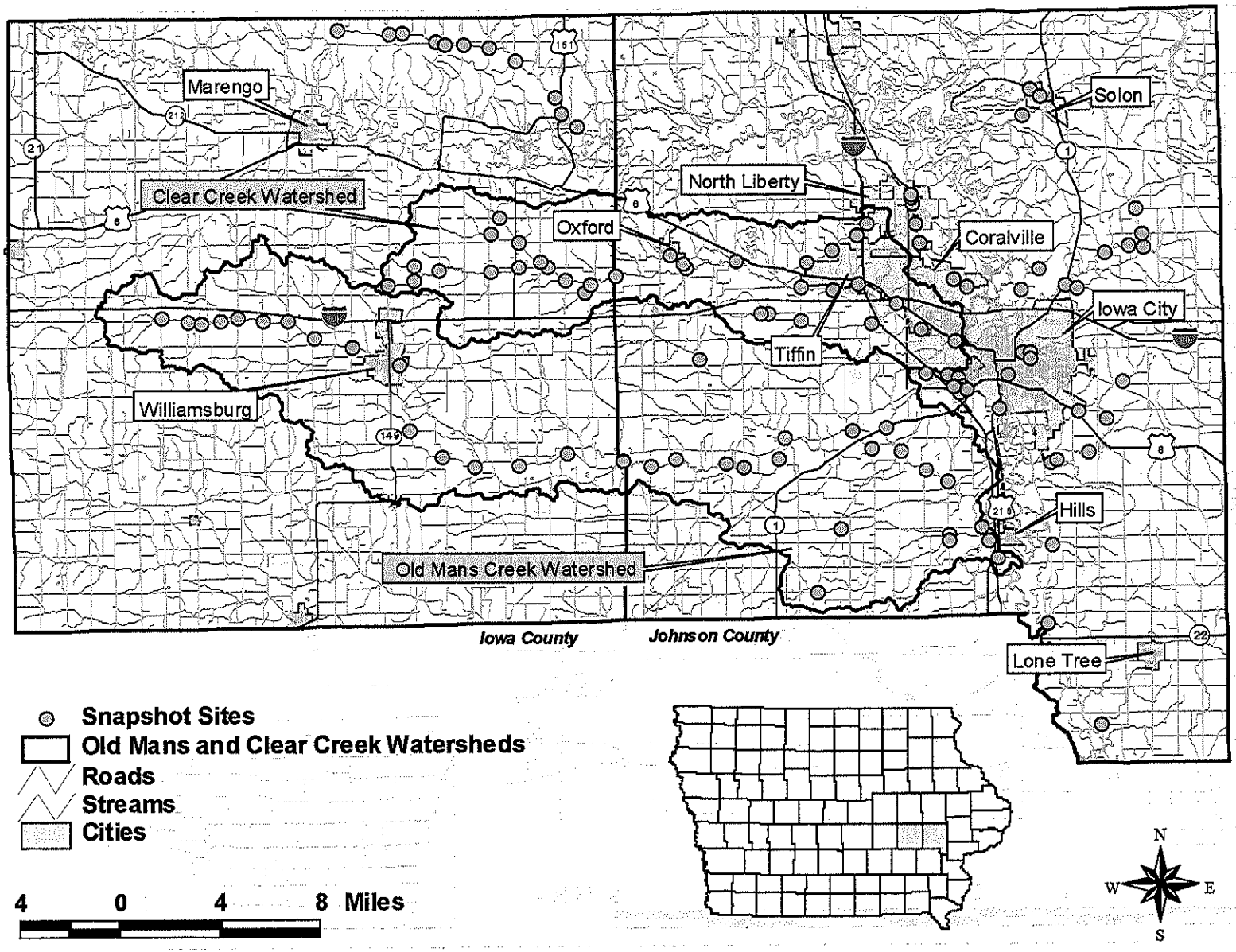


Table 6. Parameter List.

Analyte	Matrix	Sample Container	Preservative	Holding Time	Analytical Method
Ammonia Nitrogen as N	Water	250 ml plastic	H2SO4 to pH <2; Cool to 4 ◦C	28 days	LAC10-107-06-1J
Chloride, Field	Water	None	None	Immediate	Hach® brand, silver nitrate titrant, Range: 30-600 mg/L
E. coli Bacteria (UHL)	Water	120 ml clear plastic	0.008% NA2S2O3; Cool to 4 ◦C	<6 hours; >6 still report	EPA 1603 (modified mTEC)
E. coli Bacteria (DNR)	Water	15 ml clear plastic	None	24 hours	SM 9223B
Nitrate+Nitrite Nitrogen	Water	250 ml plastic	H2SO4 to pH <2; Cool to 4 ◦C	Immediate	EPA 353.2
Nitrate Nitrogen, Field	Water	None	None	Immediate	Hach® brand, nitrate test strip, Range: 0-50 mg/L
Nitrite Nitrogen Field	Water	None	None	Immediate	Hach® brand, nitrite test strip, Range: 0-3 mg/L
Dissolved Oxygen, Field	Water	None	None	Immediate	Chemetric® brand test kit, Indigo Carmine Method, Range: 1-12 mg/L
pH, Field	Water	None	None	Immediate	Hach® brand, pH test strip, Range: 4-9
Phosphate, Ortho-, Field	Water	None	None	Immediate	Chemetric® brand test kit, Stannous Chloride Method, Range: 0-1 & 1-10 mg/L
Temperature, Field	Water	None	None	Immediate	Enviro-Safe® Armor-Case thermometer containing safe, non-mercury liquid.
Transparency, Field	Water	None	None	Immediate	60 cm polycarbonate tube with 4.5 cm standard Secchi disk design in bottom.

C – Celsius
cm – centimeter
ml – milliliter
mg/L – milligrams per liter

A7. DATA QUALITY OBJECTIVES FOR MEASUREMENT DATA

The goal of the JAICWC snapshot is to design, initiate, and complete a snapshot survey that will assess the water quality health of streams throughout Johnson and Iowa counties. A goal of the Rapid Creek Watershed Project is to collect more frequent water quality data to identify specific water quality concerns. Data collected for both projects will be used to assess nutrient concentrations and bacteria levels throughout Johnson and Iowa counties, as well as the Rapid Creek Watershed; determine if the dissolved oxygen standard is violated; gather baseline information for chloride, pH, water temperature, and transparency in order to compare water quality in the Rapid Creek Watershed to streams elsewhere in Johnson and Iowa counties, as well as statewide; document landscape features of the watershed that may impact water quality; and specifically for Rapid Creek, assess its recreational use.

Success of the project will be determined or measured by the collection of data from sites throughout the watershed and counties under various flow conditions to assess water quality.

Measurement ranges and increments associated with IOWATER field test kit methods for chloride, nitrate-N, nitrite-N, dissolved oxygen, orthophosphate, pH, water temperature and transparency are listed below in Table 7.

Table 7. Measurement Ranges and Increments for Field Test Kit Parameters.

Sample Matrix	Parameter	Measurement Range	Increments
Surface Water	Chloride	<30-600 mg/L	All whole numbers within the range
Surface Water	Nitrate-N	0-50 mg/L	0, 1, 2, 5, 10, 20, 50
Surface Water	Nitrite-N	0.3.0 mg/L	0, 0.15, 0.3, 1, 1.5, 3.0
Surface Water	Dissolved Oxygen	1-12 mg/L	1, 2, 3, 4, 5, 6, 8, 10, 12
Surface Water	Orthophosphate	0-1 & 1-10 mg/L	0, 0.1, 0.2, 0.3, 0.4, 0.6, 0.8, 1 & 1, 2, 3, 4, 5, 6, 7, 8, 10
Surface Water	pH	4-9	4, 5, 6, 7, 8, 9
Surface Water	Water Temperature	35-125 °F	All whole numbers within the range
Surface Water	Transparency	0-60 cm	All whole numbers within the range

cm – centimeters
F – Fahrenheit
mg/L – milligrams per liter

In addition to data collected by the JAICWC as part of the Rapid Creek Watershed Project, historical data collected from the Rapid Creek Watershed by the JAICWC during organized snapshot events will be used to assess Rapid Creek. The ranges and increments for parameters monitored during JAICWC snapshot events and as part of the Rapid Creek Watershed Project which are analyzed in the lab can be found in the University of Iowa Hygienic Laboratory Quality Assurance Project Plan and Standard Operating Procedures (2001, 2002, 2003).

During the JAICWC snapshot event and Rapid Creek Watershed Project, some water samples are collected in the field for later analysis at either the University of Iowa Hygienic Lab or the Iowa DNR Water Lab. The standards for precision, bias, accuracy, and

sensitivity associated with those parameters analyzed by UHL can be found in the UHL Standard Operating Procedures Manuals. All of the standards for parameters measured by UHL and the Iowa DNR Water Lab for JAICWC snapshot events are also outlined in Table 8. These standards also apply for water samples collected as part of the Rapid Creek Watershed Project.

Table 8. Parameter Objectives for Lab Analyses.

Analyte	Matrix	Method Detection Limit	Estimated Accuracy of True Value	Accuracy Protocol	Estimated Precision (Relative % Difference)
Ammonia Nitrogen as N	Water	0.05 mg/L	+ 14%	Recovery on spikes	RDP < 20%
E. coli Bacteria (UHL)	Water	10 CFU	NA	Colony verification (if necessary)	Precision criteria Established for 2006 = 0.2068
E. coli Bacteria (DNR)	Water	10 *E. coli* / 100 ml at 1:10 dilution	NA	Analyst count verification (if necessary)	Precision criteria Established for 2008 = < 0.20
Nitrate+Nitrite Nitrogen	Water	0.05 mg/L	±0.1 low level	Recovery on spikes	RDP < 20%

CFU – Colony Forming Unit
mg/L – milligrams per liter
NA – not applicable
RPD - Relative % Difference

A8. SPECIAL TRAINING/CERTIFICATION

Volunteers assisting with the JAICWC Snapshot event and the Rapid Creek Watershed Project are encouraged to attend a ten-hour Level 1 IOWATER Workshop. During an IOWATER workshop, monitors are trained and equipped to assess water quality by completing four assessments: chemical, physical, habitat, and biological. These training sessions occur in a variety of settings, both indoors and outdoors. The first half is conducted in a classroom-type setting, while the second half is predominantly spent in a nearby stream where monitors have the opportunity to complete the four field assessment forms and to use the field test kits. This ten-hour workshop incorporates:

- An introduction to the history and goals of the IOWATER Program
- The importance of water quality with a focus on protecting Iowa's waters
- Education of, and hands-on training with, chemical, physical, habitat, and biological parameters
- Education of watershed dynamics
- A focus on the importance of teamwork, safety, liability, and credibility
- How to start and design a monitoring plan
- The "why-tos" and "how-tos" of water monitoring
- What to do with the data
- Networking with others concerned about water quality
- What to do if abnormal results, fish kills, toxic spills, or illegal activities are discovered

Upon completion of the Level 1 IOWATER Workshop, an individual becomes certified as a Level 1 IOWATER Monitor and receives an IOWATER monitor ID.

IOWATER volunteers who assist with the JAICWC Snapshot and the Rapid Creek Watershed Project are already trained in the IOWATER field test kits that are used during snapshot events; trained in the proper IOWATER sample collection procedures; and experienced in the completion of the Field Forms.

Snapshot volunteers without IOWATER training are paired with experienced IOWATER monitors to ensure that quality data are obtained. In addition, a brief refresher course is conducted before each snapshot event. During the refresher course, volunteers are instructed in the proper use of field kits and completion of the Field Form. After data are collected as part of the JAICWC snapshot, volunteers return to the meeting location to transfer paperwork. The Snapshot Coordinator reviews the paperwork to ensure that everything has been properly sampled and recorded.

Volunteers who assist with the Rapid Creek Watershed Project water monitoring do so under the direct supervision of the JAICWC Project Coordinator. Each has been instructed in the proper sampling procedures, trained in the completion of field and lab forms, and instructed in the procedures for delivery of samples to the lab.

Volunteers conducting the Rapid Creek Watershed Project Stream Assessment will do so under the direct supervision of the JAICWC Project Coordinator who has been trained in the use of the RASCAL© unit by Johnson County Soil and Water Conservation District staff. Procedures for this assessment can be found in the RASCAL© unit Standard Operating Procedures manual at http://www.iowadnr.com/water/watershed/devgrants.html.

A9. DOCUMENTATION and RECORDS

IOWATER volunteers participating in the JAICWC snapshot are instructed on how to properly complete the snapshot field form, a copy of which can be found in Appendix 3. This form is completed on-site at the time sampling occurs. Recorded on each field assessment form are the site number, date and time of sampling, weather conditions, visual observations of water color and odor, presence of animals or tile lines, stream bank conditions, adjacent land use, human use activities, results of field tests, and any other comments or observations the volunteer wants to record. These forms are submitted to the IOWATER Snapshot Event Coordinator for entry into the IOWATER database and a snapshot spreadsheet. Once entered, the data are reviewed for accuracy and completeness.

The IOWATER Chemical/Physical Assessment form is used when water monitoring is done as part of the Rapid Creek Watershed Project. A copy of this form can be found in Appendix 4. These forms, once completed, are reviewed by the JAICWC Project Coordinator who then enters the data into the IOWATER database. Once entered, the data are reviewed for accuracy and completeness.

Data reports from the University of Iowa Hygienic Laboratory will be downloaded by the IOWATER Snapshot Event Coordinator through the Electronic Laboratory Information System (ELIS), the lab's web interface. Data reports can be downloaded in a PDF or Microsoft® Excel format. Data reports include site name, date and time of sample

collected, name of the sample collector, comments associated with sampling in terms of holding time or sample temperature exceedances, concentration and quantitation limit, date analyzed, analyte method, analyst, and the initials of the person verifying the result. An electronic version of the lab data results will be retained during the length of the project by the Iowa DNR.

Data reports from the Iowa DNR Water Lab are downloaded by the IOWATER Snapshot Event Coordinator in a Microsoft® Excel format. Data reports include site name, date sample collected, DNR Lab number, comments associated with sampling in terms of holding time or sample temperature exceedances, date analyzed, dilution factor, and the result.

Following review and validation of the field data and lab results collected as part of the JAICWC snapshot events, the data are uploaded into the IOWATER database under the supervision of the IOWATER Snapshot Event Coordinator. The IOWATER database is a password-protected, internet-accessible database (www.IOWATER.net). The data are entered under the username "Johnson & Iowa Watershed Coalition." Once data are entered into the database, only the IOWATER Database Manager, IOWATER Field Coordinator, IOWATER Snapshot Event Coordinator, or the IOWATER Quality Assurance Officer can make changes to the data. This is only done if data are found to be erroneous by IOWATER staff. The date and reason for all changes to the database are recorded in fields associated with each data record. The lab results are also directly uploaded into STORET by the IOWATER Snapshot Event Coordinator with the assistance of staff at the Iowa DNR.

Following the review and validation of the field data collected as part of the Rapid Creek Watershed Project, the data are uploaded into the IOWATER database under the supervision of the JAICWC Project Coordinator. The lab results are uploaded into STORET with the assistance of the JAICWC Project Coordinator, the IOWATER Snapshot Event Coordinator, and the assistance of staff at the Iowa DNR.

Once the field and lab data for the JAICWC snapshot have been reviewed, watershed maps will be generated by the IOWATER Snapshot Event Coordinator to display the results for all parameters. Box plots will be generated to compare results from the snapshot to streams statewide that are sampled as part of Iowa's Ambient Water Monitoring Program. All maps and graphs will be reviewed by the IOWATER Program Coordinator, the IOWATER Quality Assurance Officer, and the JAICWC Project Coordinator. Finalized maps and graphs will be distributed through the IOWATER website or from the DNR's ftp site.

Box plots will also be generated to compare the Rapid Creek sites to the results from the snapshot and sampling data collected as part of Iowa's Ambient Water Monitoring Program.

All versions of the Johnson and Iowa Watershed Coalition Snapshot and Rapid Creek Watershed Quality Assurance Project Plan will be retained by the Iowa Department of Natural Resources. The most recent version of the QAPP will be available to project staff, volunteers and other interested parties in a PDF format online at www.IOWATER.net.

SECTION B – DATA GENERATION and ACQUISITION

B1. SAMPLING PROCESS DESIGN

Sampling for the JAICWC snapshot was designed to collect baseline data and provide a picture of water quality for streams throughout Johnson and Iowa counties at a particular point in time. To achieve this goal, all samples throughout the two counties will be collected within a period of four hours, which is the duration of the snapshot event. Sampling within a short time period, especially under high-flow conditions, should minimize any variability caused by climatic conditions. The JAICWC snapshot event will continue indefinitely based on the mutual interest of the JAICWC and the IOWATER Program. Information from other sampling and monitoring conducted within the watershed will be considered and used during this project.

The sampling design will allow for collection of data initially under low-flow conditions. Monitoring sites were selected by the JAICWC Project Coordinator in consultation with the Iowa DNR. Selected sites were visited to ensure accessibility and suitability for monitoring. In addition to considering sites with historic water quality data, sites were evaluated based on their distribution throughout the watershed and their proximity to major tributaries to the main branch of streams of interest, including Old Mans Creek, Clear Creek, and Muddy Creek. Nine sites throughout the Rapid Creek Watershed will be monitored more frequently as part of the Rapid Creek Watershed Project. All of the monitoring sites are identified using Universal Transverse Mercator (UTM) coordinates which were obtained in the field prior to the snapshot by JAICWC staff using Garmin® Etrex Vista C hand-held Global Positioning System (GPS) receivers (see Appendices 7 and 8). The UTM coordinates were then cross checked using the Iowa DNR Interactive Map. The snapshot sampling event will initially occur under low-flow conditions. Subsequent snapshots may occur under different flow conditions if mutually agreed to by the JAICWC and Iowa DNR.

Sampling for the Rapid Creek Watershed Project was designed to collect water quality data from sites in the watershed on a more frequent basis under varying flow conditions from March through October.

Data gathered during this project will be used by the JAICWC, Iowa DNR, and other concerned public and private organizations. Data will complement water quality information gathered by other organizations sampling throughout Johnson and Iowa counties and in the Rapid Creek Watershed.

B2. SAMPLING METHODS

Depending on the sampling site and stream flow conditions, samples will either be collected directly from the stream or in a container from a bridge. Prior to sample collection, each lab sample container is labeled in the field with a permanent waterproof marker. Lab sample container labels include site name, date and time of sample collections, and the collector's name.

Sampling will be conducted in a manner that minimizes the chances of contamination. Lab samples will be collected in sterile, unused sample containers provided by the University of Iowa Hygienic Laboratory or the Iowa DNR Water Lab. Table 6 lists the type of container in which each analyte is collected. Sample collection personnel will be instructed not to touch the insides of the sample containers or caps. Lab sample containers will be filled without pre-rinsing the container. Some lab sample containers contain a preservative (Table 6). When collecting samples in these containers, a small amount of air space will be left to ensure that the preservative is not lost or diluted.

Should the lab sample be taken directly from the stream, the sample will be collected in the middle of the channel or at its thalweg, deepest part of stream, while facing upstream. Samples will be collected directly into their respective lab sample container, immediately capped, and then stored on ice until delivered to the lab. Field parameters, including chloride, nitrate-N nitrite-N, dissolved oxygen, orthophosphate, pH, transparency, and water temperature, are then measured. Chloride is measured using a Hach® Chloride QuanTab® test strip by collecting a water sample from the stream using the small plastic beaker provided. Nitrate-N and Nitrite-N is measured using a Hach® Nitrate-N and Nitrite-N test strip and allowing one second of contact with the water being sampled. Dissolved oxygen present in the sample water is measured using a CHEMetrics® Oxygen Kit. A pH measurement is acquired using a Hach® pH test strip and allowing one second of contact with the water being sampled. A transparency measurement is made using a 60 cm clear polycarbonate transparency tube. Water temperature is measured using a thermometer set in a water sample collected using the large plastic beaker provided. All measurements will be recorded on the appropriate field forms (Appendices 3 and 4). See Appendix 1 for complete testing instructions using these field kits.

Should the lab sample be taken from a bridge, the sample will be collected on the upstream side of the bridge over the middle of the channel or where the flow is greatest. A water sampling device consisting of a collection container composed of a non-contaminating material, such as high density polyethylene (HDPE) plastic, fastened to a length of nylon rope will be rinsed a minimum of three times at the site before the samples are collected. Rinsing consists of lowering the container into the stream, allowing it to fill with water, and lifting the container back to the bridge where the contents are then poured out. Once rinsing is complete, the container is again lowered and filled with sample water, which is then poured directly into the lab sample bottles. Bottles are immediately capped and then stored on ice until delivered to the lab. The remaining water in the collection container is discarded, then the container is lowered into the stream and refilled as often as needed to complete the field tests. Chloride is measured using a Hach® Chloride QuanTab® test strip by transferring 60 ml of water from the collection container to the small beaker, then immersing the lower half of the strip in the sample water. Nitrate-N and

nitrite-N are measured using a Hach® Nitrate-N and Nitrite-N test strip and allowing one second of contact with the water being sampled. Dissolved oxygen present in the sample water is measured using a CHEMetrics® Oxygen Kit. A pH measurement is acquired using Hach® pH test strips and allowing one second of contact with the water being sampled. A transparency measurement is made using a 60 cm clear polycarbonate transparency tube. Water is transferred from the collection container to fill the tube so the measurement may be taken from the bridge. Water temperature is measured using a thermometer set in water transferred from the collection container to the large plastic beaker provided. All measurements will be recorded on the appropriate field forms (Appendices 3 and 4). See Appendix 1 for complete testing instructions using these field kits.

Grab Samples

Grab samples can be taken at selected sites in the container and volume appropriate for each particular analysis. In-stream samples will be collected at mid-depth level at or near the thalweg to ensure a well mixed sample of water. The method used for any particular sample depends on several factors including flow rate, stream depth and width, and accessibility. Regardless of the collection method, the grab sample is stored and transported in a clean, labeled container.

The variations of the grab sampling method utilized by IOWATER are described below.

Wading and Hand Collection

If the stream is safe to wade, the collector will ford to its center or the area where the greatest rate of flow exists. The sample collector should face upstream, taking care to ensure that any stream bottom debris disturbed by wading does not contaminate the sample. The lab sample bottle is then tipped at a 45° angle, allowing it to fill. If water levels or velocity cause concerns for safety, DO NOT WADE. Alternatively, if a suitable sampling area is accessible from the bank, water samples may be collected without entering the stream.

Bridge and Rope Collection

A grab sample may be collected from a bridge using a water sampling device consisting of a collection container composed of a non-contaminating material, such as HDPE plastic, fastened to a length of nylon rope. The water sampling device and rope should be kept off the ground to minimize contamination. The water sample collection container should be rinsed a minimum of three times at the site before samples are collected. Rinsing consists of lowering the collection container into the stream thalweg from the bridge deck, letting it fill with water, lifting the container back to the bridge, and then pouring out the contents. Once rinsing is complete, water is poured from the collection container directly into the lab sample bottles, which are immediately capped and then stored on ice until delivered to the lab.

Field Equipment

The following equipment is or can be used when collecting grab samples. Equipment use may vary slightly due to site differences.

- Site Map and Directions
- JAICWC Snapshot Field Form or IOWATER Chemical/Physical Assessment Field Form
- Field Form Instructions
- Brown Paper Bags
    - Pencils/Pens
    - Permanent Markers
    - Clipboard
    - Hand Sanitizer
    - First Aid Kit
    - Orange Safety Vests
    - Zip-Lock Bags (to group bottles by site)
    - Sterile, Labeled Sample Bottles
        1. *E. coli UHL* (100ml plastic; sodium thiosulfate as preservative) or *(DNR) E. coli (15 ml plastic)*
        2. Nutrients – Ammonia, Nitrate+Nitrite Nitrogen (250ml plastic; sulfuric acid as preservative)
- IOWATER Bag, containing –
    - Rope/Sampling Device
    - Small Plastic Beaker
    - Large Plastic Beaker
    - Waste Bottle
    - CHEMetrics® Dissolved Oxygen Kit
    - CHEMetrics® Orthophosphate Kit
    - Hach® Chloride QuanTab® Test Strips
    - Hach® Nitrate and Nitrite Test Strips
    - Hach® pH Test Strips
    - Enviro-Safe® Thermometer
    - Transparency Tube
- Small Cooler w/ Ice Packs (3)

Relevant Paperwork and Other Equipment (specifically for snapshot events)

The following paperwork and equipment is generally kept at each central meeting location for use by IOWATER staff.

- Sign-In Sheet for Volunteers (includes cell phone numbers and site assignments)
- Group Sign-Up Sheet
- Liability Waiver
- Sample Check-In Sheet
- UHL Chain of Custody Forms
- Iowa DNR Chain of Custody Forms
- Large Coolers
- Ice and/or Ice Packs
- Extra Sample Bottles
- Extra Sampling Equipment

B3. SAMPLE HANDLING and CUSTODY

Once JAICWC samples and paperwork have been returned to the central meeting location(s), the IOWATER Snapshot Event Coordinator, or the Coordinator's designee, will be responsible for the water quality samples and the chain of custody. If the samples were collected as part of the Rapid Creek Watershed Project, the JAICWC Project Coordinator, or the Coordinator's designee, will be responsible for the water quality samples and chain of custody. Each sample container is to be labeled in the field with a permanent waterproof marker. Sample container labels include site name, date and time the sample was collected, and the name of the collector. For samples collected as part of the JAICWC snapshot events, a chain of custody form, provided by the Iowa DNR Water Lab (for samples being analyzed by the IDNR Water Lab – Appendix 5), and/or a chain of custody form provided by UHL (for samples being analyzed by UHL – Appendix 6) are completed by the IOWATER Snapshot Event Coordinator. Information included on the chain of custody forms includes the site name, date and time the sample was collected, collector's name and relevant contact information, sample matrix, and the analytes requested. The snapshot coordinator will be responsible for packing the samples on ice and ensuring their viability until they can be delivered to the lab. For samples collected as part of the Rapid Creek Watershed Project, the appropriate chain of custody form is completed and delivered to the lab with appropriately preserved samples.

Information on field conditions, such as weather and adjacent land use, deviations from written procedures, operating condition of the equipment, and other unusual occurrences will be documented on the field sheets. It is important to be able to trace the path of a sample from collection in the field through laboratory analysis should any problems occur. Therefore, adequate field documentation is an indispensable quality assurance element of any successful monitoring program.

Laboratory Sample Handling

Both the University of Iowa Hygienic Laboratory and the Iowa DNR Water Lab are accredited labs in the State of Iowa and the handling and analysis procedures used by both labs are accepted by the U.S. EPA. UHL/Iowa DNR Water Lab supplies the sample containers appropriate for the samples collected during this snapshot and currently analyzes all grab samples collected from the Rapid Creek Watershed. The certifications and accreditations held by UHL include American Industrial Hygiene Association, the Clinical Laboratory Improvement Amendments, the Information Collection Rule-Environmental Protection Agency, Safe Drinking Water Act-Environmental Protection Agency and the National Environmental Laboratory Accreditation Program. The Iowa DNR Water Lab is EPA certified for surface water analysis through the state of Iowa's Laboratory Certification Program.

Field Information Sheets

Field data sheets are the primary and most effective method for documenting field activities and conditions. These sheets serve as an initial record of any field measurements and weather conditions at the time sampling occurred. A copy of the Field Form used for the JAICWC snapshot events can be found in Appendix 3, while a copy of the IOWATER

Chemical/Physical Assessment Field Form used for the Rapid Creek Watershed Project can be found in Appendix 4. A copy of the Iowa DNR Water Lab chain of custody form will be completed and submitted with any samples delivered to the lab (Appendix 5). A copy of the University of Hygienic Laboratory chain of custody form that will be completed and submitted with any samples shipped or delivered to the lab can be found in Appendix 6.

Table 6 lists the methods associated with the analysis of each analyte. All methods are published in Standard Methods of Examination of Water and Wastewater (2005).

Field Notes

Field notes will document important information during sampling events and are entered onto Field Forms with indelible ink. The Field Forms completed as part of the JAICWC snapshots become part of the project data and will be kept with other information related to JAICWC snapshot events. The Field Forms collected as part of the Rapid Creek Watershed Project will be kept by the Johnson County Soil & Water Conservation District.

Sample Labeling

All sample containers must have labels attached and filled out in their entirety. Sample containers without labels or labels that are missing information are not to be accepted by the University of Iowa Hygienic Laboratory nor the Iowa DNR Water Lab. The sample label should include the site name, location, date, time, initials of the sampler, and any other information required by the agencies involved or the laboratory.

B4. ANALYTICAL METHODS

The University of Iowa Hygienic Laboratory will have a document on file stating methods used to analyze samples. UHL follows strict Quality Assurance and Quality Control (QA/QC) guidelines to maintain a high degree of precision and accuracy. The Quality Assurance Program Plan of the University Hygienic Laboratory (UHL, 1997) includes protocols for sample custody, holding and extraction times, and detection limits. Confirmation studies are performed routinely. Table 5 lists the methods associated with each analyte. All the methods are published in Standard Methods for the Examination of Water and Wastewater (2005).

For analytes in which the holding time is exceeded, results will still be reported and the holding time exceedance will be indicated. All results will be reported within one month of the lab receiving the sample.

The Iowa DNR Water Lab will have a document on file stating methods used to analyze samples. Table 6 lists the methods associated with analytes measured by the lab as part of this monitoring. For analytes in which the holding time is exceeded, results will still be reported and the holding time exceedance will be indicated. All results will be reported within one week of the lab receiving the sample.

B5. QUALITY CONTROL

All water samples collected during the JAICWC snapshots and the Rapid Creek Watershed Project shall be collected in accordance with methods outlined by the UHL Standard Operating Procedures (UHL, 2002). Quality control for the sampling and monitoring methods of the JAICWC snapshot events will be the responsibility of the IOWATER Snapshot Event Coordinator, while monitoring done as part of the Rapid Creek Watershed Study will be the responsibility of the Rapid Creek Watershed Project Coordinator. The JAICWC Snapshot participants will be trained by the IOWATER Snapshot Event Coordinator and/or the Coordinator's designees in the measurement of field parameters, collection of water samples, and completion of paperwork. Any problems encountered during the snapshot event will be addressed by the IOWATER Snapshot Event Coordinator and/or the Coordinator's designees in consultation with the DNR QA officer.

Any volunteers assisting with the Rapid Creek Watershed Study will be trained by the JAICWC Project Coordinator. Any problems encountered during this sampling will be addressed by the JAICWC Project Coordinator.

The University of Iowa Hygienic Laboratory follows strict Quality Assurance and Quality Control (QA/QC) guidelines to maintain a high degree of precision and accuracy. The Quality Assurance Project Plan of the University Hygienic Laboratory (UHL, 1997) includes protocols for sample custody, holding and extraction times, and detection limits. Other procedures include: daily calibration of instruments, interference checks, verification standards, assessment of extraction and sampling efficiencies. Confirmation studies are performed on a regular basis. Generally, at least one duplicate and one spike sample are prepared and analyzed for each set of ten to fifteen samples. A minimum of one reagent blank is prepared and analyzed for each complete set of samples.

The Iowa DNR Water Lab follows strict Quality Assurance and Quality Control (QA/QC) guidelines to maintain a high degree of precision and accuracy. The laboratory standard operating procedures manual, methods manual, and field standard operating procedures documents (DNR, 2008a, 2008b, 2008c) includes protocols for sample custody, holding and extraction times, and detection limits. Confirmation studies are performed on a regular basis. Generally, at least one duplicate and one spike sample are prepared and analyzed for any set of greater than fifteen samples. A minimum of one reagent blank is prepared and analyzed for each complete set of samples.

B6. INSTRUMENT/EQUIPMENT TESTING, INSPECTION, and MAINTENANCE

Prior to the JAICWC snapshot event, IOWATER volunteers are provided with a standardized set of equipment at each central meeting location. A list of necessary equipment is provided in the Sampling Methods section. The IOWATER Snapshot Event Coordinator monitors the expiration dates of this equipment throughout the snapshot sampling season. The IOWATER Snapshot Event Coordinator also inspects and maintains the sampling equipment to ensure it is in proper working order. Maintenance includes, but is not limited to, the rinsing of sample collection devices, transparency tubes, and sample collection cups; ensuring that kits are complete; and confirming there are adequate test strips and ampoules for the sites to be sampled.

For the Rapid Creek Watershed Study monitoring, the JAICWC Project Coordinator inspects and maintains the sampling equipment.

B7. INSTRUMENT/EQUIPMENT CALIBRATION and FREQUENCY

IOWATER volunteers assisting with the JAICWC snapshot are provided with a standardized set of equipment at their respective central meeting location within the snapshot area. A list of this equipment is provided in the Sampling Methods portion of this document. This equipment does not require calibration.

The JAICWC Project Coordinator provides a standardized set of equipment for monitoring associated with the Rapid Creek Watershed Project. Resupplies are provided by the IOWATER Program.

B8. INSPECTION/ACCEPTANCE of SUPPLIES and CONSUMABLES

All supplies and equipment used for water monitoring during the JAICWC Snapshot and Rapid Creek Watershed Project are purchased under the supervision of the IOWATER Field Coordinator or the IOWATER Quality Assurance Officer. The specifications for the equipment provided to IOWATER snapshot volunteers are listed in Table 9.

Table 9. IOWATER Equipment Specifications.

Parameter	Equipment Used	Specifications
Chloride	Hach® Chloride QuanTab® Test Strips	Hach® Brand, silver nitrate titrant, Range: 30-600 mg/L
Nitrate-N	Hach® Nitrate-N + Nitrite-N Test Strip	Hach® Brand, Range: 0-50 mg/L
Nitrite-N	Hach® Nitrate-N + Nitrite –N Test Strip	Hach® Brand, Range 0-3 mg/L
Dissolved Oxygen	CHEMetrics® Dissolved Oxygen Test Kit	CHEMetrics® Brand, indigo carmine method, Range: 1-12 mg/L
Orthophosphate	CHEMetrics® Orthophosphate Test Kit	Chemetric® brand test kit, Stannous Chloride Method, Range: 0-1 & 1-10 mg/L
pH	Hach® pH Test Strip	Hach® Brand, Range: 4-9
Air and Water Temperature	Enviro-Safe Thermometer	Range: 25-125 °F, armored
Transparency	Transparency Tube	60 cm transparency tube with rubber stopper and drain tube with clamp at bottom

cm – centimeters
F – Fahrenheit
mg/L – milligrams per liter

UHL and the Iowa DNR Water Lab provide the necessary lab sample containers for the snapshot. The IOWATER Snapshot Event Coordinator will be responsible for inspecting sample containers before distribution to volunteer monitors during each sampling event. Only new sample containers will be used. Sample containers are inspected for cracks, ill-fitting lids, and other obvious defects before use and are discarded if defects are present.

B9. DATA ACQUISITION REQUIREMENTS (NON-DIRECT MEASUREMENTS)

Stream data collected throughout Iowa by the DNR as part of Iowa's Ambient Water Monitoring Program will be used for comparative purposes. Data collected for the Rapid Creek Watershed Project will be done in accordance with the IOWATER Quality Assurance Project Plan (2005).

B10. DATA MANAGEMENT

Water samples collected and delivered to UHL for analysis will be logged into the UHL mainframe system (ELIS). Once analyses are completed, results are entered into ELIS by the analyst and subsequently released by another analyst. UHL will report the data from the Rapid Creek Watershed snapshot monitoring sites to the Iowa DNR within one month in an electronic format.

Data on the JAICWC snapshot sampling will be entered into a Microsoft® Excel spreadsheet by the IOWATER Snapshot Event Coordinator. Data quality assurance checks on Field Forms include scanning for apparent errors, measurement errors, and omissions. Response to such errors is a follow-up with the individual(s) who sampled the site, followed by consultation with the JAICWC Project Coordinator to determine if the error or omission can be resolved. If so, the change to the data will be noted on the Field Form and in the Excel spreadsheet. If the error or omission can not be resolved, the data will not be entered into the Excel spreadsheet and the reason for the exclusion will be noted on the Field Form. Copies of both the Field Form and the Excel spreadsheet will be archived with the Iowa DNR. Values below the detection limit will be stored in STORET as "< detection limit." For data analysis, the non-detectable values will be assigned a value equal to one-half the detection limit in accordance with standard procedures of the Water Monitoring Program. Due to the variability in detection limit for the chloride QuanTab® test strips, a value of 10 will be assigned.

Data collected for the Rapid Creek Watershed will be entered into a Microsoft® Excel spreadsheet by the JAICWC Project Coordinator.

All of the field test kit and lab data will be uploaded into STORET. Data from the JAICWC snapshot will be uploaded into STORET in the IASNAPST organizational ID and with a project code of JOHNIACO. Table 10 matches the field test kit and lab analytes with the official standardized EPA STORET characteristic names for the parameters. When retrieving data from STORET, the EPA STORET characteristic name must be used in order to acquire the relevant data. As a final quality check, the data in STORET will be compared to the Field Forms and the electronic data from UHL to ensure all values are the same.

Table 10. Comparison of UHL and EPA STORET Names.

UHL/Field Analyte Name	EPA STORET Characteristic Name
Ammonia Nitrogen as N	Nitrogen, Ammonia as N
Chloride, Field	Chloride
E. coli	*Escherichia coli*
Nitrate-N	Nitrogen, nitrate (NO_3) as N
Nitrite-N	Nitrogen, nitrite (NO_2) as N
Nitrite+Nitrate Nitrogen as N	Nitrogen, nitrite (NO_2) as N + nitrate (NO_3)
Dissolved Oxygen	Dissolved Oxygen (DO)
pH	pH
Phosphate	Phosphate
Total Phosphate as P	Phosphorus as P
Temperature, Water	Temperature, Water
Transparency	Transparency, tube with disk

SECTION C – ASSESSMENT and OVERSIGHT

C1. ASSESSMENT and RESPONSE ACTIONS

The IOWATER Snapshot Event Coordinator will be responsible for all field activities, water sampling, and reporting to the JAICWC. Data will be sent from UHL to the Iowa DNR for entry into STORET. This data will be available for review and follow-up for the duration of the project.

The Iowa DNR Quality Assurance Officer will accompany sample collection personnel periodically during the monitoring period to ensure proper sampling protocols are being followed. If any deviances are discovered, the Iowa DNR Quality Assurance Officer will instruct sample collection personnel in the proper method.

The University of Iowa Hygienic Laboratory participates in numerous inter-agency and inter-laboratory proficiency testing and performance evaluation programs, including: U.S. EPA, Water Supply Series, Water Pollution Series, Office of Enforcement and Compliance Assurances series for the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), and Solid Waste Series; the U.S. Geological Survey Standard Reference Sample Program; and American Industrial Hygiene Association programs. In addition, UHL has participated in the U.S. EPA Contract Laboratory Program, one of the most rigorous quality assured analytical programs for environmental laboratories.

C2. REPORTS TO MANAGEMENT

In no less than one month before the Spring Snapshot sampling, a report produced by the IOWATER Snapshot Coordinator and the JAICWC Project Coordinator will be made available to the persons listed on the Approval Signature page and each person listed in Table 1. The report will be comprised of graphs, tables and maps and supporting text that summarize the data collected during the previous year(s) of Snapshot sampling events. The report will also compare collected data with other data collected as part of the Johnson and Iowa County Snapshot, as well as compared to data collected as part of the DNR's Ambient Water Monitoring program. The IOWATER Snapshot Coordinator will also work with the

JAICWC Project Coordinator for generation of customized reports for local interested groups. Reports for the Rapid Creek Watershed snapshot will also be distributed online through the IOWATER website (www.IOWATER.net).

A Fact Sheet will be generated, summarizing the data and observations collected in the Rapid Creek Watershed. This Fact Sheet will be presented to the Johnson County Soil and Water Conservation Board of Supervisors.

SECTION D – DATA VALIDATION and USABILITY

D1. DATA REVIEW, VERIFICATION and VALIDATION

Data collected as part of the JAICWC snapshots are reviewed by IOWATER and Iowa DNR staff to determine if the data meet the Quality Assurance Project Plan objectives. Decisions to reject or qualify data are made by the IOWATER Coordinator, the IOWATER Snapshot Event Coordinator, and the IOWATER Quality Assurance Officer. The Microsoft Excel spreadsheet, as well as the STORET and IOWATER databases, will be checked for completeness and accuracy against the raw field data forms and UHL ELIS data and Iowa DNR Water Lab data by the IOWATER Snapshot Event Coordinator. This may be done by randomly spot checking approximately 10% of the data. If 99% accuracy and 95% completeness are achieved in the spreadsheet and the databases, the IOWATER Quality Assurance Officer will then validate the data for use in analysis. All lab data are reviewed by the laboratory according to procedures outlined in UHL (1997) prior to it being released.

Data collected as part of the Rapid Creek Watershed Project are reviewed by the JAICWC Project Coordinator. Decisions to reject or qualify data are made by the JAICWC Project Coordinator, who also verifies the IOWATER and STORET databases for accuracy and completeness.

D2. VERIFICATION AND VALIDATION METHODS

Data, graphs, and maps collected and generated as part of the Johnson and Iowa County Watershed Coalition snapshot and the Rapid Creek Watershed Project will be reviewed and accepted or qualified by the JAICWC Project Coordinator and the Iowa DNR Quality Assurance Officer.

D3. RECONCILIATION and USER REQUIREMENTS

Data that do not meet the quality objectives outlined in the Data Quality Objectives for Measurement Data section of this document will be discarded. If failure to meet the quality objectives is due to equipment, such as outdated or damaged equipment, the equipment will be updated or replaced. If failure to meet the quality objectives is a result of volunteer error, said volunteer will be notified and the IOWATER Snapshot Event Coordinator will incorporate this into the brief refresher course done prior to each snapshot event.

REFERENCES

Iowa Department of Natural Resources, 2008a, Water Quality Monitoring of Iowa's State-Owned Beaches, Standard Operating Procedures, 18 p.

Iowa Department of Natural Resources, 2008b, Laboratory Quality Assurance/Quality Control Standard Operating Procedures, Water Monitoring and Assessment Laboratory, 24 p.

Iowa Department of Natural Resources, 2008c, Ambient Fecal Indicator Bacteria Methods, Water Monitoring and Assessment Laboratory, 19 p.

Quality Assurance Project Plan for IOWATER, 2005. Iowa Department of Natural Resources. Document QA/WM/01-01.

Standard Methods for the Examination of Water and Wastewater, 21st Edition, 2005. American Public Health Association (APHA), American Water Works Association (AWWA) & Water Environment Federation (WEF), 1368 p.

United States Environmental Protection Agency, 2002. Guidance for Quality Assurance Project Plans (EPA QA/G-5). EPA/240/R-02/009, 111 p.

United States Environmental Protection Agency, 2001. EPA Requirements for Quality Assurance Project Plans (EPA QA/R-5). EPA/240/B-01/003, 40 p.

University of Iowa Hygienic Laboratory, 1997. Quality Assurance Project Plan of the University Hygienic Laboratory. The University of Iowa Hygienic Laboratory, Iowa City, Iowa.

University Hygienic Laboratory, 2001. University Hygienic Laboratory Iowa City Central Services Standard Operating Procedures. The University of Iowa Hygienic Laboratory, Iowa City, Iowa.

University Hygienic Laboratory, 2002. Limnology Section Standard Operating Procedures Manual. The University of Iowa Hygienic Laboratory, Iowa City, Iowa.

University Hygienic Laboratory, 2003. University Hygienic Laboratory Des Moines Support Services Standard Operating Procedures. The University of Iowa Hygienic Laboratory, Iowa City, Iowa.

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Appendix 1. General Instructions for Field Parameters.

Water Temperature

1. Place the aquatic thermometer directly into the stream.
2. Hold thermometer under water in the main flow of the stream (not in a pool) for two minutes. Read immediately and record temperature on the Field Form.

pH

1. Dip the test strip in the water and remove immediately.
2. Hold strip level for 15 seconds.
3. Compare test pad to color chart on test strip bottle. Estimate pH and record results on the Field Form.
4. Dispose of test strip in waste container provided.

Dissolved Oxygen

1. For use with the CHEMetrics® Oxygen Kit.
2. Fill sample cup to 25 mL mark, mixing water with air as little as possible!
3. Place ampoule in sample cup, tilting so tip is wedged in corner of cup bottom.
4. Straighten ampoule. This will break off tip and ampoule will fill with water.
5. Mix water by inverting it slowly several times. Bubble will mix contents.
6. Two minutes from tip break-off, compare to color standards.
7. Estimate and record results on the Field Form.

*Ampoule may be disposed of in waste container provided. Avoid breaking ampoule open, as contents are mild skin and eye irritants. Liquid in the ampoule is light sensitive so avoid leaving the ampoule in direct sunlight.

Nitrate-N/Nitrite-N

1. Dip the test strip in the water for one second and remove.
2. Hold the strip level for 30 seconds.
3. Compare the inner test pad to the nitrite-nitrogen color chart on test strip bottle; estimate the amount of nitrites in mg/L. Record the nitrite-nitrogen concentration on the Field Form.
4. Wait 30 more seconds (total 60 seconds).
5. Compare the outer test pad to nitrate-nitrogen color chart on test strip bottle. Estimate the amount of nitrate-nitrogen in mg/L. Record on the Field Form. Dispose of test strip in waste container provided.

Phosphate

1. Fill sample cup to 25 mL mark. Add 2 drops of A-8500 Activator Solution
2. Place black cap on sample cup and shake to mix the contents.
3. Put on safety glasses
4. Place ampoule in sample cup, tilting so the tip is wedged in corner of cup bottom
5. Straighten ampoule. This will break off tip and ampoule will fill with water.
6. Mix water by inverting ampoule slowly several times. Bubble will mix contents.
7. **Two Minutes** from tip break-off, compare to color standards.
8. Based on the color of your sample, use the appropriate color comparator to determine the level of phosphate. The high-range comparator in the lid of the kit measures from 1 to 10 mg/L. Hold the high range comparator in a nearly horizontal

position while standing directly beneath a bright source of light. Place the CHEMetrics ampoule between the color standards moving it from left to right along the comparator until the best match is found. Record your result on the Field Form. The low-range circular comparator measures from 0 to 1 mg/L.

To use the circular comparator, place your ampoule, flat end down into the center tube. Direct the top of the comparator up toward a source of bright light while viewing from the bottom. Rotate the comparator until the color standard below the CHEMetrics ampoule shows the closest match. Record your result on the Field Form.

Dispose of ampoule and waste water in waste container. Avoid breaking ampoule open, as contents are mild skin and eye irritants.

Chloride

1. Fill sample cup to 60 mL mark.
2. Remove a titrator from bottle and replace cap immediately.
3. Insert the lower end of titrator into sample cup. Do not allow the yellow completion string located at the top of the titrator to become submerged in the water sample.
4. Allow water sample to completely saturate wick of titrator. Reaction is complete when yellow string turns dark. This will take 5-10 minutes.
5. Note where the tip of the white chloride peak falls on the numbered QuanTab® scale. This represents the QuanTab® unit value.
6. Refer to the table on the QuanTab® test strip bottle to convert the QuanTab® units into a chloride concentration and record results.
7. If the QuanTab® unit is below 1.0, report the chloride concentration as less than the detection limit (i.e. <30).
8. QuanTab® test strips may be disposed of in waste container provided.

Transparency

1. Collect a fresh water sample by placing the transparency tube horizontal in the water, just below water level. Avoid disturbing any bottom sediment.
2. Place the tube upright on a flat surface
3. Pour sample water into the transparency tube until it is full.
4. With your back to the sun, look directly into the tube and release water through the small hose, regulating the flow with the finger clamp, until you are able to just begin to distinguish the black and white pattern (secchi pattern) on bottom of the tube. When you can first distinguish the patter, close the clamp.
5. Read the number on the outside of the tube that is closest to the water line. Record your reading in centimeters (cm).

Appendix 2. Example Sampling Instructions.

Sampling Instructions
Johnson and Iowa County Snapshot Sampling

Sample Preparation, Collection, and Handling: One bottle needs to be filled at each site - one 15 milliliter plastic test tube for bacteria. It is important to keep the filled bottles chilled at all times. The bacteria bottle (test tube) should be filled a minimum of 10 milliliters but allow some head space or an air bubble at the top.

Your participation and attention to sampling instructions and logistics is vital to the success of this project.

1. **Make sure that you have the following BEFORE you proceed to the sample sites:**
    a. Bacteria bottles and cooler for your sites.
    b. Frozen ice packs in the cooler.
    c. Sample collection device and rope.
    d. Field forms (one per sample site), permanent marker, pen or pencil.
    e. A map of the collection site(s).
    f. IOWATER testing equipment – thermometer, pH test strips, Chemetrics dissolved oxygen kit, Nitrite-N/Nitrate-N test strips, Chemetrics phosphate kit, chloride test strips, water transparency tube.

At the site:

2. All bottles have been prelabeled with your site name. Pull out the appropriate bottle for the site (each site will need 1 bottle). Using the permanent marker, label the bottle with the sample time before collecting the sample. Use the same time for both bottle as you indicated on the field form. All bottles have been sterilized, so when collecting the sample, avoid touching the inside of the bottle or the lid.

SAMPLE COLLECTION - are you able to safely get in to the stream to collect the water samples? If YES, follow Plan A. If NO, follow Plan B.

Plan A - samples to be collected directly from the stream.

1. **Field form** - Pull out the appropriate field form for the site you are sampling. Complete the Field Form. Record your name and the name of others who helped collect the sample, the date and time the sample was collected, and your observations on water color, water odor, canopy cover, presence of animals in the stream, presence of tile lines, evidence of human use, and condition of stream banks along the stream at your site. Indicate that the samples were collected directly from the stream.

2. **Collection of Bacteria Sample** – The bacteria sample should be collected directly from the stream. Enter the stream below where sample will be collected. **The sample should be collected from the middle of the stream while facing upstream - *if possible, collect sample upstream of any bridges.*** Carefully remove the lid from the bottle. Tip the bottle at a 45° angle and fill. The bacteria bottle (test tube) should be filled a minimum of 10 milliliters but allow some head space or an air bubble at the top. Once the bottle is filled, place lid on bottle. **Place the bottle back into the Ziploc bag and into the cooler.**

3. **IOWATER Field Tests** - Complete the IOWATER tests for water temperature, dissolved oxygen, phosphate, pH, nitrate-N, nitrite-N, chloride, and water transparency. For directions on using the equipment, see the Instructions for IOWATER methods handout. Record results on the field form.

Plan B - samples to be collected from a bridge using the sampling device.

1. **Field form** - Pull out the appropriate field form for the site you are sampling. Complete the Field Form. Record your name and the name of others who helped collect the sample, the date and time the sample was collected, and your observations on water color, water odor, presence of animals in the stream, presence of tile lines, canopy cover, evidence of human use, and condition of stream banks along the stream at your site. Indicate that samples were collected from the bridge.

2. **Collection of Bacteria Sample** – The bacteria sample should be collected using the sampling device provided. Avoid having the sampling device or rope touch the ground. Lower the sampling device down to the stream on the upstream side of the bridge. Partially fill the sampling device (you may need to bounce the sample device up and down a few times to allow water to enter). Retrieve the sampling device. Swish the water around the sampling device and empty. Repeat a total of **3** times. Fill the sampling device. Remove the lid from the bottle. Pour water from sampling device into the bottle. The bacteria bottle (test tube) should be filled a minimum of 10 milliliters but allow some head space or an air bubble at the top. Once the bottle is filled, place lid on bottle. **Place the bottle back into the Ziploc bag and into the cooler.**

3. **Collection of Sample for IOWATER Tests** - Fill the sampling device again. Pour water into the large beaker. Complete the IOWATER tests for water temperature, dissolved oxygen, phosphate, pH, nitrate-N, nitrite-N, chloride, and water transparency. For directions on using the equipment, see the Instructions for IOWATER methods handout. Record results on the field form.

Emergency Phone Numbers:

Dave Ratliff (cell) - 319-430-3586

Appendix 3. Johnson and Iowa County Watershed Coalition Snapshot Field Form.

FOR OFFICE USE ONLY
When data are checked and entered, initial here:

IOWATER
SNAPSHOT SAMPLING

Johnson/Iowa Counties Snapshot – May 10, 2008

Field Information (to be completed by the volunteer)

Site #: _____ Site Name: _____

Sampler Name(s) (print): _____

Date: 5/10/2008 Time: _____ AM PM

Weather (*circle all that apply*)

Sunny Partly Sunny Cloudy Rain/Snow Windy Calm

Visual Observations

1) WATER ODOR (*circle all that apply*)

None Sewage/Manure Rotten Eggs Petroleum Musky

2) WATER COLOR (*circle all that apply*)

Clear Brown Green Oily Sheen Reddish Blackish Milky Gray

3) Are there animals in the water upstream (i.e., cows, ducks, geese)? Yes / No
If yes, what type and how many? _____

4) Are there any tile lines or pipes of any sort that are visible along the river upstream? Yes / No
If yes, how many? _____ Are the tiles flowing? Yes / No

5) Stream Banks – using the categories below, check those that best describe the condition of the stream banks. (*check all that apply*)

Left Bank (*facing upstream*)
_____ Cut Bank – Eroding
_____ Cut Bank – Vegetated
_____ Sloping Bank
_____ Sand/Gravel Bar
_____ Rip/Rap
_____ Constructed Bank (i.e., drainage ditch)
_____ Other: _____

Right Bank (*facing upstream*)
_____ Cut Bank - Eroding
_____ Cut Bank – Vegetated
_____ Sloping Bank
_____ Sand/Gravel Bar
_____ Rip/Rap
_____ Constructed Bank (i.e., drainage ditch)
_____ Other: _____

Other comments

_____

_____

(over ⇒)

FOR OFFICE USE ONLY
When data are checked and entered, initial here:

Adjacent Land Use (*along stream reach – check all that apply*)

___ Row Crop	___ Wetland	___ Boating Accesses	___ Rural Residential Areas
___ Pasture	___ Prairie	___ Nature Trails	___ Conservation Lands
___ Urban	___ Park	___ Fence	___ Animal Feeding
___ Industrial	___ Playground	___ Steep Slopes	Operations/Lots
___ Timber	___ Campground	___ Stairs/Walkway	___ Other _____

Record all other land use practices that potentially could affect the stream

_____

Human Use Activities (*along stream reach – check all that apply*) **None observed**___

Please check activities you've participated in or witnessed at this site.

___ Swimming	___ Wind Surfing	___ Wading	___ Fishing
___ Tubing	___ Canoeing/Kayaking	___ Rafting	___ Kids Playing
___ Water Skiing	___ Boating	___ Hunting/Trapping	___ Other _____

Evidence of Human Use (*along stream reach – check all that apply*) **None observed**___

Please check evidence of human use you've witnessed at this site.

___ Streamside Roads	___ Livestock Watering	___ Camping Sites	___ Evidence of
___ Footprints or Paths	___ ATV/ORV Tracks	___ Fire Pit/Ring	Kid's Play
___ Dock/Platform	___ Rope Swings	___ Fishing Tackle	___ Other _____

Transparency (*record whole numbers only – no tenths*) _____ centimeters

Water Temperature ____ °Fahrenheit

pH (*check one*) **4**___ **5**___ **6**___ **7**___ **8**___ **9**___

Nitrite-N (*mg/l; check one*) **0**___ **0.15**___ **0.3**___ **1.0**___ **1.5**___ **3**___

Nitrate-N (*mg/l; check one*) **0**___ **1**___ **2**___ **5**___ **10**___ **20**___ **50**___

Dissolved Oxygen (*mg/l; check one*)
1___ **2**___ **3**___ **4**___ **5**___ **6**___ **8**___ **10**___ **12**___

Phosphate (*mg/l; check one*) **0**___ **0.1**___ **0.2**___ **0.3**___ **0.4**___ **0.6**___ **0.8**___
1___ **2**___ **3**___ **4**___ **5**___ **6**___ **7**___ **8**___ **10**___

Chloride
_____ **mg/l** – *Convert Quantab Units to mg/L using the chart provided on the bottle*

Where did you collect the water samples? (*check one*)

Directly from the Stream _____ From a bridge _____ Other (describe) _____

Please comment on safety of this site – is it in area of high traffic/was access a safety concern?

_____

Revised April 2008

Appendix 4. IOWATER Chemical/Physical Assessment Form.

IOWATER

Volunteer Water Quality Monitoring

Chemical / Physical Assessment

*** Recommended frequency -- monthly ***

Date _____ **Time** _____

IOWATER Monitor _____ **# of Adults** (*incl. you*) _____

Site Number _____ **# of under 18** _____

Other Volunteers Involved _____

Was the stream dry when it was monitored? Yes _____ **No** _____

Weather (*check all that apply*)
Sunny ____ Partly Sunny ____ Cloudy ____ Rain/Snow ____ Windy ____ Calm ____

Water Color (*check all that apply*)
Clear ___ Brown ___ Green ___ Oily ___ Reddish ___ Blackish ___ Milky ___ Gray ___

Water Odor (*check all that apply*)
None ___ Sewage/Manure ___ Rotten Eggs ___ Petroleum ___ Musky ___

Air Temperature _____ °Fahrenheit

Precipitation _____ inches over the last 24 hours

Transparency (*record whole numbers only – no tenths*)
_____ centimeters

pH
Expiration date on bottom of bottle _____
check one – **4** ____ **5** ____ **6** ____ **7** ____ **8** ____ **9** ____

Nitrite-N (*mg/l*)
Expiration date on bottom of bottle _____
check one – **0** ____ **0.15** ____ **0.3** ____ **1.0** ____ **1.5** ____ **3** ____

Nitrate-N (*mg/l*)
Expiration date on bottom of bottle _____
check one – **0** ___ **1** ___ **2** ___ **5** ___ **10** ___ **20** ___ **50** ___

Dissolved Oxygen (*mg/l*)
Expiration date on back of color comparator _____
check one – 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 8 ___ 10 ___ 12 ___

Phosphate (*mg/l*)
Expiration date on back of color comparator _____
Expiration date on round color comparator _____
Expiration date on activator solution _____
check one – 0 ___ 0.1 ___ 0.2 ___ 0.3 ___ 0.4 ___ 0.6 ___ 0.8 ___
1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 ___ 8 ___ 10 ___

Chloride
Expiration date on bottom of bottle _____
_____ mg/l – *Convert Quantab Units to mg/L using the chart provided on the bottle*

Water Temperature
_____ °Fahrenheit

Stream Width
___.___ meters

Maximum Stream Depth (*along your transect*)
___.___ meters

Stream Flow (*along your transect*)
_____ high _____ normal _____ low _____ not sure

Stream Depth (*in meters*)

1st Spot ___.___	5th Spot ___.___	9th Spot ___.___	13th Spot ___.___
2nd Spot ___.___	6th Spot ___.___	10th Spot ___.___	14th Spot ___.___
3rd Spot ___.___	7th Spot ___.___	11th Spot ___.___	15th Spot ___.___
4th Spot ___.___	8h Spot ___.___	12th Spot ___.___	

Stream Velocity (*in seconds*)

1st Spot _____	5th Spot _____	9th Spot _____	13th Spot _____
2nd Spot _____	6th Spot _____	10th Spot _____	14th Spot _____
3rd Spot _____	7th Spot _____	11th Spot _____	15th Spot _____
4th Spot _____	8th Spot _____	12th Spot _____	

Other Stream Assessment Observations and Notes

Appendix 5. Iowa DNR Water Lab Chain of Custody Form.

Iowa Department of Natural Resources Snapshot Sample Information/Chain of Custody Bench Sheet/Results	**Report To** Lynette Seigley
DNR	**Agency/Company** Iowa Department of Natural Resources
Version 1, Revised 4/10/2008	**Project Code** Snapshots

Snapshot Name:

Collection Site	Date Collected	Time	DNR Lab Number	Date Analyzed	Dilution Factor	*E. coli* Small	*E. coli* Large	*E. coli* MPN

Chain of Custody — Temp Upon Receipt:

Relinquished by:	Date:	Time:
Received by:	Date:	Time:
Analyzed by:	Date:	Time:

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Appendix 6. UHL Chain of Custody Form.

Hygienic Laboratory

The University of Iowa

CHAIN-OF-CUSTODY

Contact Name	Phone	Analysis Requested	Purchase Order #
Company	Fax		Project Name and/or Number
Address			Collector's Phone #
City	State / Zip		Print Collector's Name
			Collector's Signature

Sample ID/Description	Date	Time	Sample Matrix W	S	Other	Comments/UHL Sample Number
1.						
2.						
3.						
4.						
5.						
6.						
7.						
8.						

	Date	Time	Comments
Relinquished by			
Relinquished by			
Sample receiving custodian			Sample Receipt Comments

102 Oakdale Campus, #H101 OH
Iowa City, Iowa 52242-5002
319/335-4500 Fax: 319-335-4555

http://www.uhl.uiowa.edu

H.A. Wallace Building
900 E. Grand Ave., Des Moines, Iowa 50319-0034
515/281-5371 Fax: 515/243-1349

Yellow - UHL Copy
Blue - Client Copy

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Appendix 7. Sampling Site Information for sites monitored as part of the Rapid Creek Watershed Project. UTM coordinates are NAD83.

Site Name	IOWATER Site Number	County	Site Location	Reason for Site Selection	UTM X (meters)	UTM Y (meters)
SA1	952175	Johnson	Sanders Creek at Newport Rd.	Top most accessible test site on Sanders Creek	624180	4618637
RC1D	952172	Johnson	Rapid Creek at Strawbridge Rd	Top most accessible test site on the North Branch	630353	4622519
RC1C	952169	Johnson	Rapid Creek at 280th St.	At USGS Rain Gauge	630787	4620920
RC1BE	952168	Johnson	Rapid Creek at Rapid Creek Rd.	Bottom most accessible of East Branch	630895	4620075
RC1B	952167	Johnson	Rapid Creek at Wapsi Ave.	First site below the joining of the North and East Branches	629875	4620202
RC1A	952166	Johnson	Rapid Creek at Dingleberry Rd.	Below heavily grazed pasture area	628444	4619735
RC1S	952170	Johnson	South Branch at Rapid Creek Rd.	Bottom most accessible site on the South Branch	626664	4617434
RC1	952100	Johnson	Rapid Creek off Hwy 1	USGS Gauge station and JAICWC test site since September 2003	625833	4617582
RC2	952171	Johnson	Rapid Creek at Prairie du Chien Rd.	Bottom most accessible test site of Rapid Creek	623093	4617344

Appendix 8. Sampling site information for sites monitored as part of the Johnson and Iowa County Watershed Coalition Snapshot. UTM coordinates are NAD83.

Site Name	IOWATER Site Number	County	Site Location	UTM X (meters)	UTM Y (meters)
BC1	952061	Johnson	Buck Creek at W66	624727	4595866
CC00	948049	Iowa	Clear Creek at Hwy 149	582479	4617745
CC00A	948050	Iowa	Clear Creek south trib Q Ave	584196	4617975
CC00AS	948051	Iowa	Clear Creek south tile line on south trib	584188	4617970
CC00AW	948052	Iowa	Clear Creek west tile line on south trib	584188	4617975
CC00B	948053	Iowa	Clear Creek north trib Q Ave	584191	4618926
CC00BN	948056	Iowa	Clear Creek north tile line on north trib	584184	4618932
CC00BS	948054	Iowa	Clear Creek south tile line on north trib	584184	4618920
CC00BW	948055	Iowa	Clear Creek west tile line on north trib	584184	4618926
CC1	948025	Iowa	Clear Creek at R Avenue	585789	4618617
CC2	948026	Iowa	Clear Crek at T	589045	4618560
CC2A	948046	Iowa	Clear Creek at 200th St	590808	4618846
CC3	948027	Iowa	Clear Creek at 200th east of W21 V	592776	4618830
CC4	948028	Iowa	Clear Creek at W	593889	4617975
CC5	948029	Iowa	Clear Creek at Y	595456	4617679
CC05A	948057	Iowa	Unnamed Creek upstream of CC05	595071	4617212
CC6	948030	Iowa	Clear Creek at Johnson/Iowa Co. line	597038	4618254
CC7	952062	Johnson	Rhine Creek in Oxford	600572	4619650
CC7A	952063	Johnson	Rhine Creek at 295th St	601416	4619012
CC8	952064	Johnson	Clear Creek at Chambers Ave	601551	4618737
CC9	952065	Johnson	Clear Creek at Echo Ave	604788	4619243
CC10	952066	Johnson	Clear Creek at Half Moon Ave	608928	4617489
CC11	952067	Johnson	Clear Creek at Ireland Ave	610956	4617389
CC12	952068	Johnson	Clear Creek at Jasper Ave	612557	4617718
CC13	952069	Johnson	Clear Creek at Deer Creek Rd	615068	4616473
CC14	952070	Johnson	Clear Creek at Camp Cardinal Rd	616684	4614787
CC15	952071	Johnson	Clear Creek at Hwy 6 - 2nd St	618808	4614049

Site Name	IOWATER Site Number	County	Site Location	UTM X (meters)	UTM Y (meters)
CC16	952072	Johnson	Deer Creek Half Moon	608971	4615386
CC17	952073	Johnson	Deer Creek at Kansas	613400	4615187
CC18	952074	Johnson	Buffalo Creek at NW Half Moon Road	609298	4619119
CC18A	952118	Johnson	Buffalo Creek at James	610915	4619875
CC18B	952119	Johnson	Buffalo Creek at Jasper	612536	4620812
CC18C	952120	Johnson	Buffalo Creek at 270th	613195	4621572
CCNB	948077	Iowa	North Branch Clear Creek	592272	4619213
CCNBA	948078	Iowa	North Branch Clear Creek	590887	4620451
CCNBNA	948079	Iowa	North Branch Clear Creek	589580	4622052
CCNBSA	948080	Iowa	North Branch Clear Creek	589043	4620979
Jordan Creek	952032	Johnson	Jordan Creek at Jordan Creek Rd	623183	4628564
MCA	952115	Johnson	Muddy Creek at West Cherry St	616064	4622855
MCB	952116	Johnson	Muddy Creek at Golf View Dr	616266	4621577
MC1	952075	Johnson	Muddy Creek at Front St.	616597	4620396
MC2	952076	Johnson	Muddy Creek at Kate Wickham Elem School	618718	4618029
MC3	952077	Johnson	Muddy Creek at 1st Avenue	619589	4617510
Mill Creek (Oakland)	952031	Johnson	Mill Creek at Oakland Cemetery	623650	4630210
Mill Creek (Randall)	952030	Johnson	Mill Creek at Randall Park	624293	4629786
Muddy Creek - Penn	952146	Johnson	Muddy Creek at Penn	616031	4623243
Muddy Creek - Spring	952145	Johnson	Muddy Creek Spring	615984	4623495
OMC1	948031	Iowa	Old Mans Creek at V48 G	567974	4615646
OMC2	948032	Iowa	Old Mans Creek at H V52	569686	4615380
OMC3	948033	Iowa	Clear Creek at HH	570490	4615308
OMC4	948034	Iowa	Old Mans Creek at 220th	571738	4615509
OMC5	948035	Iowa	Old Mans Creek at V60	572901	4615623
OMC6	948036	Iowa	Old Mans Creek at K	574512	4615459
OMC7	948037	Iowa	Old Mans Creek at L	576115	4615416
OMC8	948038	Iowa	Old Mans Creek at V66	577723	4614323
OMC9	948039	Iowa	Old Mans Creek at NN	580186	4613785

Site Name	IOWATER Site Number	County	Site Location	UTM X (meters)	UTM Y (meters)
OMC10	948040	Iowa	Old Mans Creek at 240th F46	583203	4612677
OMC11	948041	Iowa	Old Mans Creek at 265th	583903	4608381
OMC12	948042	Iowa	Old Mans Creek at R	585959	4606690
OMC13	948043	Iowa	Old Mans Creek at Q	588040	4606083
OMC14	948044	Iowa	Old Mans Creek at U W21	590876	4606156
OMC15	948045	Iowa	Old Mans Creek at W	593980	4606888
OMC16	952078	Johnson	Old Mans Creek at F52	597506	4606385
CC16A	952147	Johnson	Deer Creek at 340th St	606860	4615881
CC16ASA	952148	Johnson	Unnamed Creek at 340th St	606385	4615871
OMC17	952079	Johnson	Old Mans Creek at Blackhawk	599287	4606089
OMC18	952080	Johnson	Old Mans Creek at Calkins	600907	4606500
OMC19	952081	Johnson	Old Mans Creek at Orval / Yoder	604085	4606239
OMC20	952082	Johnson	Old Mans Creek at Cosgrove	605291	4605960
OMC21	952083	Johnson	Old Mans Creek at Hazelwood	607518	4606565
OMC22	952084	Johnson	Old Mans Creek at Kansas	613454	4607196
OMC23	952085	Johnson	Old Mans Creek at Sharon Center	615350	4607009
OMC24	952086	Johnson	Old Mans Creek at Maier	616886	4605738
OMC25	952087	Johnson	Old Mans Creek at Naples	618375	4605023
OMC26	952088	Johnson	Old Mans Creek at 500th County F62	620504	4602135
OMC27	952089	Johnson	Old Mans Creek at Observatory	621020	4601213
OMC28	952090	Johnson	Old Mans Creek at Oak Crest Hill Rd	621527	4600085
OMC29	952091	Johnson	Old Womans Creek at Black Diamond	612180	4608303
OMC30	952092	Johnson	North Branch Old Mans Creek at Eagle	602406	4612940
OMC31	952093	Johnson	Dirty Face Creek at Sharon Center Rd.	611439	4601953
OMC32	952094	Johnson	Dirty Face Creek at Naples	618417	4601633
OMC33	952095	Johnson	Picayune Creek at Sharon Center Rd	609918	4597948
OMC34	952096	Johnson	Picayune Creek at Naples	618421	4601267
OMC35	952097	Johnson	North Branch Old Mans at Black Diamond	607920	4607871
OMC36	952110	Johnson	Phebe Creek at Hwy 1	614393	4608537

Site Name	IOWATER Site Number	County	Site Location	UTM X (meters)	UTM Y (meters)
PC01	948060	Iowa	Price Creek at N Avenue, 1 mile north of 110th St.	579304	4634078
PC02	948059	Iowa	Price Creek at P Avenue	582535	4633858
PC03	948071	Iowa	Price Creek at PP Avenue	583392	4633916
PC04	948070	Iowa	Price Creek at 110th St., 0.5 miles west of R Avenue	585547	4633319
PC05	948058	Iowa	Price Creek at R Avenue	586131	4633174
PC06	948074	Iowa	Price Creek at S Avenue	587326	4633174
PC07	948067	Iowa	Price Creek at New Jerusalem Church on T Avenue	588982	4632952
PC08	948065	Iowa	Price Creek at U Avenue and 118th St.	590616	4632148
PC09	948063	Iowa	Price Creek above campground	593226	4629764
PC10	948075	Iowa	Price Creek and Hwy 151	593614	4628757
PC11	948061	Iowa	Price Creek at Amana	594655	4627860
PE1	952098	Johnson	Pechman Creek at W66	625009	4600932
PR1	952099	Johnson	Prairie Creek at 670th	628158	4589361
RC1	952100	Johnson	Rapid Creek off Hwy 1	625833	4617582
RLC01	952194	Johnson	Ralston Creek at Evans	623167	4613308
RLC01NA	952195	Johnson	Ralston Creek at Glendale	623627	4613288
RLC01SA	952196	Johnson	Ralston Creek at College	623569	4612966
RLC10	952197	Johnson	Ralston Creek at Dubuque St.	622159	4611907
RC1A	952166	Johnson	Rapid Creek at Dingleberry Rd.	628444	4619735
RC1B	952167	Johnson	Rapid Creek at Wapsi Ave.	629875	4620202
RC1BE	952168	Johnson	Rapid Creek at Rapid Creek Rd.	630895	4620075
RC1C	952169	Johnson	Rapid Creek at 280th St.	630787	4620920
RC1D	952172	Johnson	Rapid Creek at Strawbridge Rd	630353	4622519
RC1S	952170	Johnson	South Branch at Rapid Creek Rd.	626664	4617434
RC2	952171	Johnson	Rapid Creek at Prairie du Chien Rd.	623093	4617344
SA1	952175	Johnson	Sanders Creek at Newport Rd.	624180	4618637
SC1	952101	Johnson	Snyder Creek Napolean Road	624933	4606282
SC2	952102	Johnson	Snyder Creek Wetland	625288	4606402
SC3	952103	Johnson	Snyder Creek Taft & Hwy 6	627378	4606912

Site Name	IOWATER Site Number	County	Site Location	UTM X (meters)	UTM Y (meters)
SC4	952104	Johnson	Snyder Creek Hwy 6 & 420th	626683	4609542
SC5	952105	Johnson	Snyder Creek 420th & Taft	628528	4609097
SC6	952106	Johnson	Snyder Creek 400th & Amer. Leg	629588	4611382
WC01	952185	Johnson	Willow Creek	616955	4611976
WC02	952186	Johnson	Willow Creek	618351	4611924
WC03	952187	Johnson	Willow Creek	618980	4611731
WC04	952188	Johnson	Willow Creek	619284	4611176
WC05	952198	Johnson	Willow Creek	619577	4610950
WC06	952189	Johnson	Willow Creek	619577	4610950
WC06D	952190	Johnson	Willow Creek	621646	4609753
WC5WSA	952191	Johnson	Willow Creek	619166	4610976
WC5WSB	952192	Johnson	Willow Creek	619090	4610751
WC5WWB	952193	Johnson	Willow Creek	618727	4611109

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