OHIO RIVER
Source Water Alliance
Prevent • Protect • Preserve

Source water Protection Annual Report
2018

May 2019

GREATER CINCINNATI WATER WORKS

Northern Kentucky Water District

Introduction

The Greater Cincinnati Water Works (GCWW) and the Northern Kentucky Water District (NKWD) both use the Ohio River as their primary source of drinking water. Together, GCWW and NKWD provide safe, sustainable, and great tasting drinking water to a total of 1.4 million people and businesses throughout Southwest Ohio and Northern Kentucky. The utilities have joined forces to collaboratively build and implement a protection program for the Ohio River to safeguard the health and wellbeing of their customers. This report summarizes the Source Water Protection activities for 2018.

Source water protection is the initial barrier of a multi-barrier protection strategy employed by both utilities to protect the drinking water quality and safeguard public health. In addition to these protection activities each utility operates treatment plants and monitors water quality throughout their systems and both utilities are in compliance with their respective state regulations.

The Ohio River is a robust water source steeped in history and serves as an economic catalyst for many communities and industrial areas. Much of the early industrial success and westward expansion of the Nation can be tied to this valuable and often much maligned waterway. Due in large part to the importance of the Ohio River as a navigable waterway for the transportation of goods and materials by barge, there has been a sufficient quantity of water to meet the varied needs since the construction of locks and dams on the river.

While there are several positive aspects to the Ohio River as a water source, the varied uses require constant vigilance to ensure the water quality stays within a range that the GCWW and NKWD treatment plants remain capable of removing any stray contaminants. The Source Water Protection Program is designed to maintain or improve that water quality and to identify and mitigate as many water quality risks as possible.

What is Source Water?[a]

Source water is the raw, untreated supply of water—typically surface water or groundwater— used for current or potential future use as a source for drinking water.

What is Source Water Protection?[a]

Source Water Protection is a proactive approach to safeguard, maintain, or improve the quality and/or quantity of drinking water sources and their contributing areas.

[a] *Definitions from the American Water Works Association, 2019*

Protection Program Goals

The overall mission of the Source Water Protection Program is to safeguard the drinking water supply for GCWW and NKWD customers and provide the first barrier of protection for each water utility. Seven goals were developed by the Planning Committee to help guide the development and implementation of the program. Those goals are listed below:

- Maintain or Improve the quality of the water in the Ohio River upstream of the GCWW/NKWD intakes.
- Minimize the potential for accidental industrial releases to the Ohio River or major tributaries upstream of the GCWW/NKWD intakes
- Ensure that GCWW and NKWD receive timely notification of upstream spills and releases and that the utilities' needs are met during spill response actions.
- Update and maintain an inventory of potential contaminant sources in the upstream watershed with particular emphasis on the Zone of Critical Concern.
- Improve communication between GCWW/NKWD and upstream industries including barge and railroad companies.
- Educate the public, upstream industries, and civic groups of the importance of protecting the Ohio River as a source of drinking water for the Greater Cincinnati and Northern Kentucky region.
- Maintain the partnership between GCWW and NKWD, with support from ORSANCO, to jointly implement an interstate source water protection program.

Ohio River Source Water Alliance

OHIO RIVER
Source Water Alliance
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The Ohio River Source Water Alliance (ORSWA) is a cooperative Source Water Protection Program that is dedicated to the preservation of the Ohio River as a source of drinking water for the citizens of the Greater Cincinnati and Northern Kentucky Area. GCWW and the NKWD, with support and encouragement from the Ohio River Valley Water Sanitation Commission (ORSANCO), started to jointly address source water protection on the Ohio River in 2006, with a resurgence of activity in 2013. The partnership grew through the 2013 to 2018 period as the group came together to prepare a joint source water protection plan and laid the groundwork to jointly implement that plan. The joint source water protection plan was endorsed and approved by both the Ohio Environmental Protection Agency and the Kentucky Department of Environmental Protection in 2018.

GREATER CINCINNATI WATER WORKS

Northern Kentucky Water District

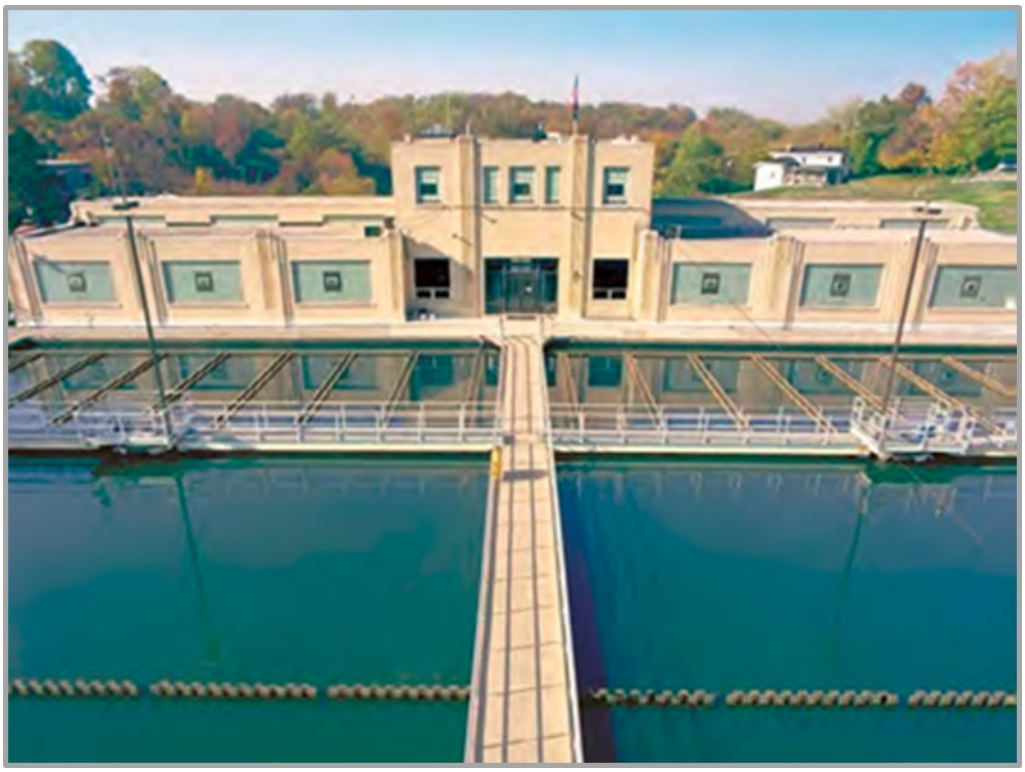
GCWW—Richard Miller Treatment Plant

The GCWW's Richard Miller Treatment Plant (RMTP) was constructed circa 1904 and brought into service in 1907. The original plant configuration included a brick intake structure in the Ohio River located near the Kentucky bank, a steam-driven pump station (Old River Station), two brick-lined off-channel reservoirs, coagulation and sedimentation basins, and rapid sand filters.

Over the ensuing 110 years there have been numerous upgrades to the plant including: chlorination, installation of a second submerged river intake and pump station (Ohio River Pump), expansion of the filter gallery, enhanced coagulation and sedimentation methods (inclined plate-pack settlers), post-filter granular activated carbon (with onsite regeneration) and, most recently, ultraviolet disinfection. The maximum treatment rate of RMTP is 240 million gallons per day (MGD) but currently averages approximately 100 MGD.

GCWW operates two reservoirs of partially treated water at the RMTP. These reservoirs have a combined storage of approximately 340 million gallons of water. Water from these two reservoirs can be used to maintain operations at the plant through periods when raw water pumping from the Ohio River must be suspended due to maintenance or in response to spills.

NKWD—Ft Thomas Treatment Plant

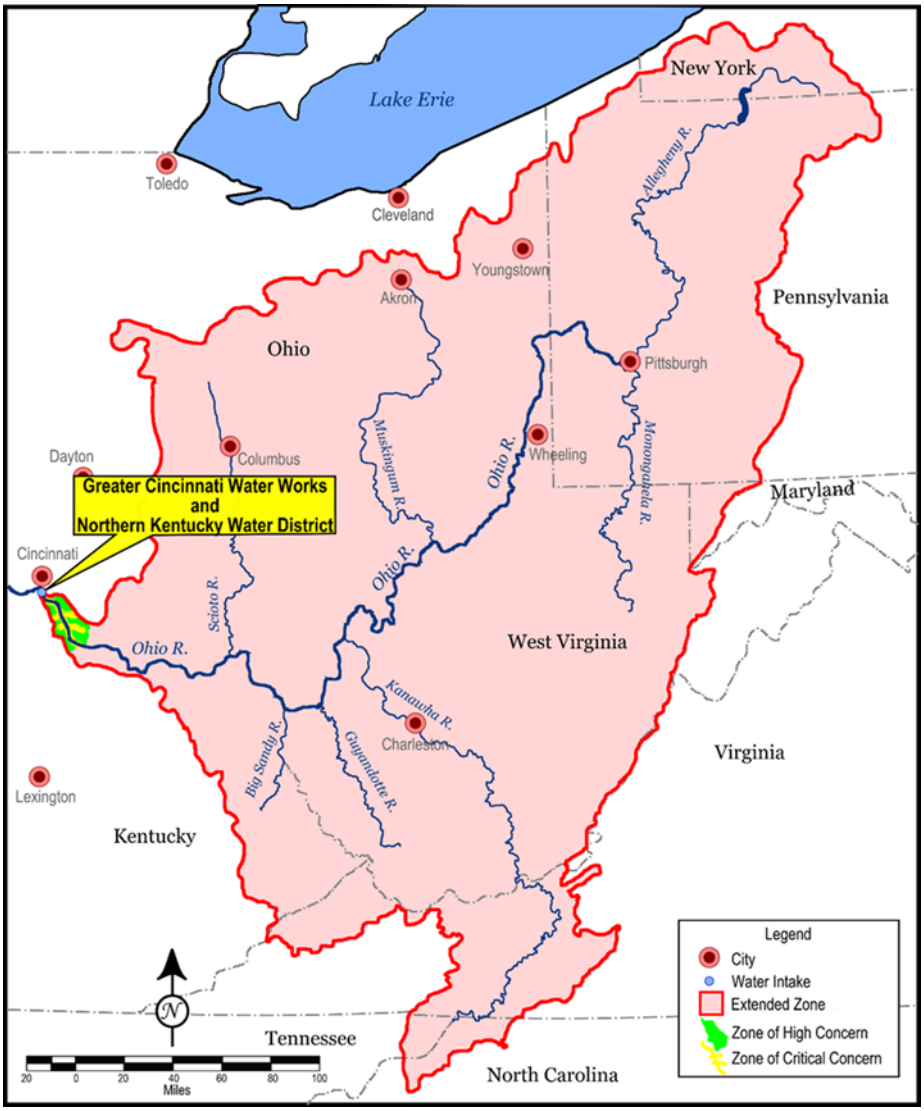


The Northern Kentucky Water District originally started out as the Covington Water Works in 1891 with the completion of an Ohio River pump station, a chemical building, and three reservoirs. The Ohio River water was pumped up to the chemical building where lime and alum were added as coagulants. The water then flowed by gravity into two of the reservoirs before flowing into the third reservoir where the water was drawn off by gravity to supply the water for the City of Covington. Chlorine was added as disinfection in 1927 as a result of a cholera epidemic.

In 1936, a 20 MGD conventional coagulation, flocculation, and sedimentation water treatment plant was constructed including a new chemical building, two settling basins and conventional treatment filter building. The new plant was built on the site of the third reservoir. Over the following years many upgrades were made to the treatment process, including a 40 MGD upgrade, post-filter granular activated carbon and ultra-violet disinfection. A new Ohio River pump station increased the pumping capacity to 44 MGD.

The two remaining reservoirs have a combined capacity of 72 million gallons of water. The reservoirs can be used to maintain operations at the plant in the event that the river intakes must be closed due to a spill on the Ohio River.

Where We Get Our Water



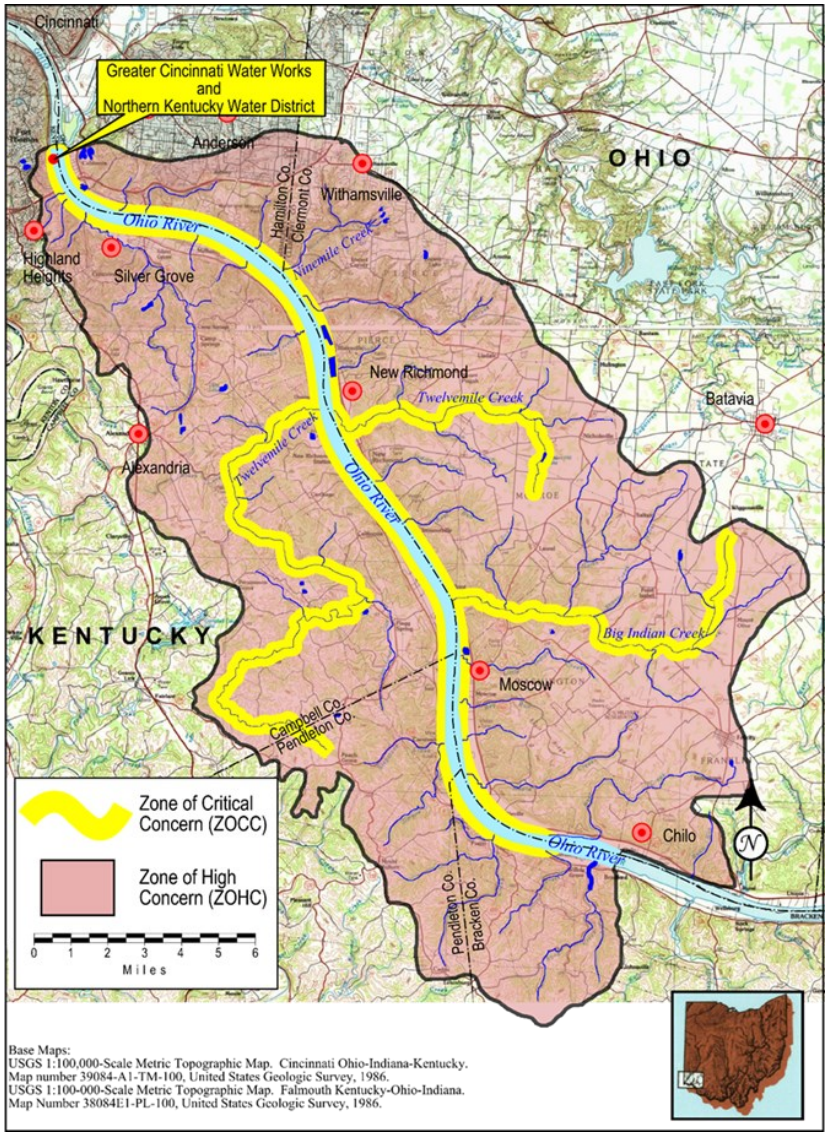
The Ohio River is formed by the confluence of the Allegheny and Monongahela Rivers in Pittsburgh, Ohio, approximately 460 miles upstream of the GCWW and NKWD Intakes. The upstream watershed is approximately 71,000 square miles and touches portions of eight states including over half of Ohio and most of West Virginia.

The upstream watershed includes portions 173 counties and is home to approximately 13.5 million people (total county population, 2010) and includes the cities of Pittsburgh, PA, Wheeling and Charleston WV, and Columbus, Ohio.

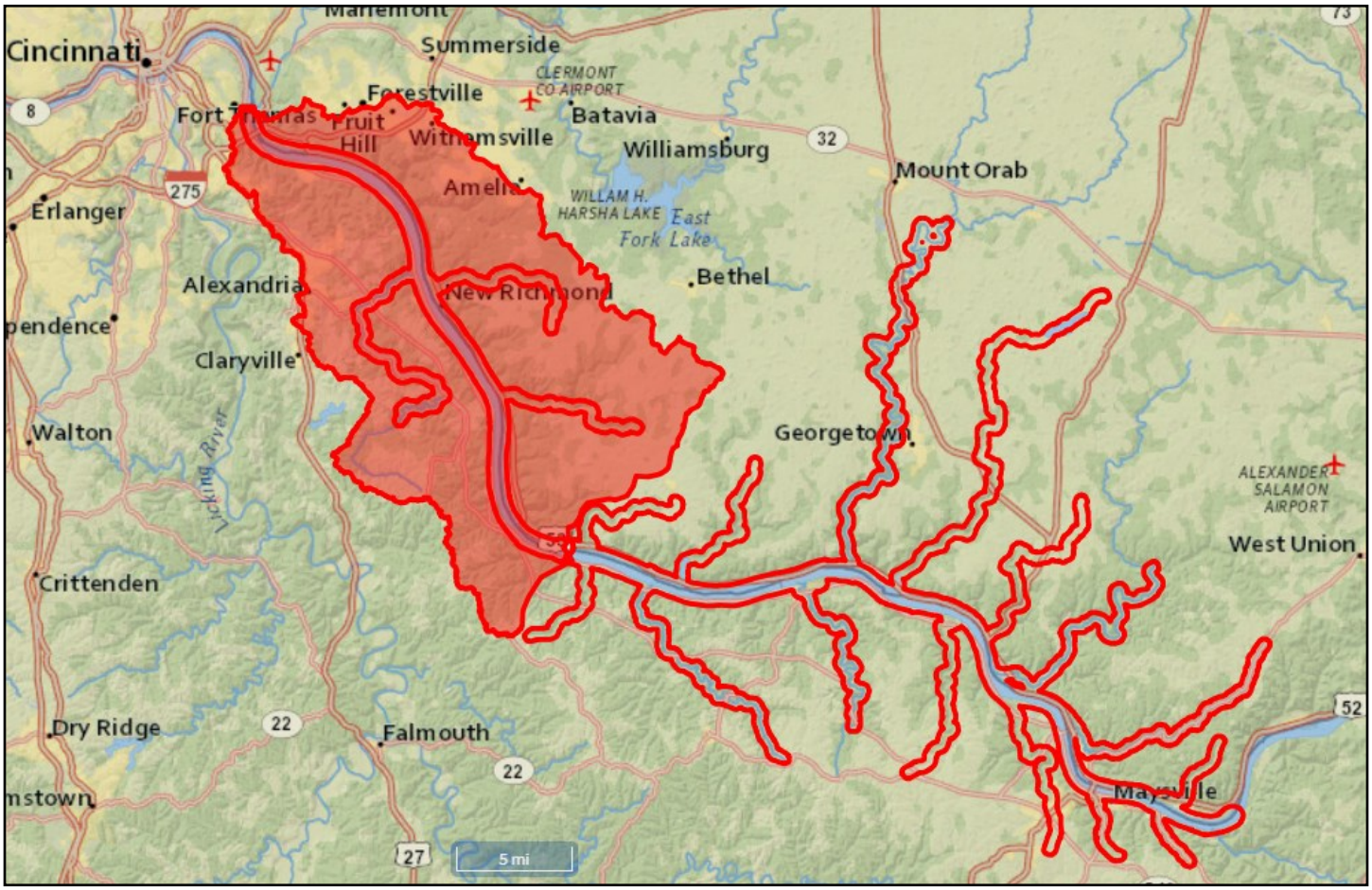
Protection Zones

Three management zones were originally defined as part of the Source water Protection Program to facilitate the prioritization of potential contaminant sources and to help guide the development and implementation of risk mitigation programs. These zones are:

- The Zone of Critical Concern (ZOCC). A corridor 0.25-miles wide on each bank of the river extending 25 miles upstream from the intake and include major tributaries.
- The Zone of High Concern (ZOHC). A zone from 0.25 miles downstream of the intake to 25 miles upstream and extending outward to the limits of the watershed
- The Extended Upstream Watershed (Zone 3). The entire extent of the upstream watershed



New for 2018:
The Extended Zone of Critical Concern



During 2018, ORSWA, in conjunction with the US EPA, extended the innermost protection areas to include an additional 25 miles (approximately) of the river from Meldahl Dam to the Maysville, Kentucky, drinking water intake. This was done to facilitate the creation of a more robust understanding of potential threats to the source water quality near the intakes.

The map above illustrates the original ZOCC and ZOHC (shaded) as well as the new management zone (unshaded red outline). ORSWA, as part of an ongoing project sponsored by US EPA, will examine potential sources of contamination in the new reach. The goal of the US EPA project is to create a river-wide inventory of potential sources of contamination so water utilities on the river can develop risk-mitigation strategies based on a current and complete threat assessment.

2018 By The Numbers

Potential Contaminant Source Inventory

- 62 High Priority Sites in the ZOCC and ZOHC
- 1140 facilities in the Potential Contaminant Source Inventory
- 2 High Priority Site Visits and Inventory Updates

Monitoring

- 3,807 Raw Water Analyses
- 365 Days of continual operation of the Organics Detection System (ODS)
- 3 Watershed Reconnaissance Events
- 2 Rules and Regulations commented on

Spills

- 165 Spills reported upstream
- Spills that required implementation of the contingency plan
- 0 Cessation of raw water pumping due to spills

2018 Highlights and Milestones

Program Endorsement

2018 represents the second full year the source water protection program has been officially implemented as a joint, regional protection program. One of the most significant milestones achieved by the program was the official endorsement or acceptance of the Source Water Protection Plan by both the Ohio Environmental Protection Agency and the Kentucky Department of Environmental Protection. A copy of the Ohio EPA Endorsement Letter is included as Appendix A.

Ohio Environmental Protection Agency

John R. Kasich, Governor
Mary Taylor, Lt. Governor
Craig W. Butler, Director

May 15, 2018

Mr. Richard Stuck
Greater Cincinnati Water Works
Source Water Protection Mgr.
4747 Spring Grove Ave
Cincinnati, Ohio
45232

Re: City of Cincinnati
Plan
Approval
Source Water Assessment and Protection (SWAP)
Hamilton County
OWS ID: OH3102612

Subject: Source Water Protection Plan Endorsement

Dear Mr. Stuck:

I am very pleased to inform you that the Ohio Environmental Protection Agency **endorses** the city of Cincinnati's drinking water source protection plan as meeting the requirements of Ohio's Source Water Protection Program. This endorsement is based on the review of the December 2017 report, *Source Water Protection Plan: A Plan to Protect the Drinking Water Resources on the Ohio River in the Greater Cincinnati and Northern Kentucky Region* prepared by Greater Cincinnati Water Works and the Northern Kentucky Water District.

Please see the attachment to this letter, which includes a formal statement of endorsement.

Ohio EPA commends the city of Cincinnati for recognizing the importance of protecting its valuable ground water resources. We look forward to presenting you with a framed certificate of recognition for your efforts signed by the Director of Ohio EPA. We hope you will be proud to display it.

If you have any questions concerning this review, please feel free to contact either Allison Reed at Ohio EPA's Southwest District Office (937-285-6449) or Craig Smith at the Central Office (614-644-2752). Additional information on Ohio's Source Water Assessment and Protection Program can be found at http://www.epa.ohio.gov/ddagw/swap.aspx.

Sincerely,

Jeffrey Patzke
Manager, Ohio EPA
Division of Drinking and Ground Waters

ec: District Office File

Attachment

Central Office • 50 W. Town St. • Suite 700 • P.O. Box 1049 • Columbus, OH 43216-1049
www.epa.ohio.gov • (614) 644-3020 • (614) 644-3184 (fax)

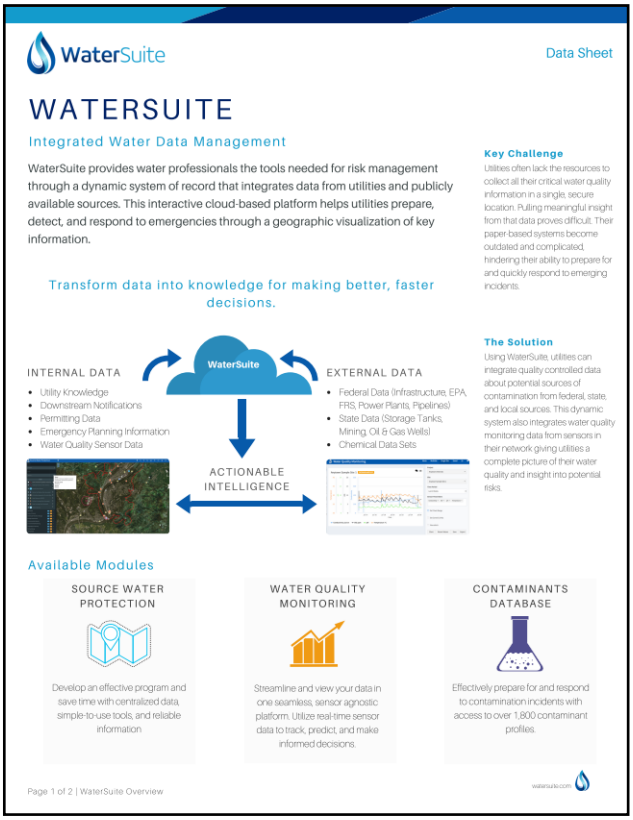
Ohio River Dye Test

In October 2018 GCWW, along with ORSANCO, NKWD, and students from the University of Cincinnati, conducted a two day tracer study on the Ohio River near the intakes. The study included the injection of red dye into the river and the subsequent tracking of the dye cloud as it migrated downstream past the intakes. The test was widely publicized via social media and garnered attention throughout the region. Details of the test are provided on Page 26. The test was conducted as part of a risk mitigation strategy designed to minimize the impact of potential traffic-related spills on the Combs-Hehl Bridge.

2018 Highlights and Milestones

WaterSuite™ Inventory Management System

In 2018 ORSWA, in conjunction with the US EPA, commenced a major update of the potential contaminant source inventory. The update was facilitated through the use of a commercially-available source water data management system called WaterSuite™. Through the use of WaterSuite™, multiple federal, state, and local database search results were integrated with local field-derived information to develop a comprehensive inventory of upstream water quality risks. The subscription-based data management system allows ORSWA to more effectively and efficiently manage the PCSI and facilitates development of future risk-mitigation strategies.


WaterSuite

Data Sheet

WATERSUITE

Integrated Water Data Management

WaterSuite provides water professionals the tools needed for risk management through a dynamic system of record that integrates data from utilities and publicly available sources. This interactive cloud-based platform helps utilities prepare, detect, and respond to emergencies through a geographic visualization of key information.

Key Challenge

Utilities often lack the resources to collect all their critical water quality information in a single, secure location. Pulling meaningful insight from that data proves difficult. Their paper-based systems become outdated and complicated, hindering their ability to prepare for and quickly respond to emerging incidents.

Transform data into knowledge for making better, faster decisions.

INTERNAL DATA

- Utility Knowledge
- Downstream Notifications
- Permitting Data
- Emergency Planning Information
- Water Quality Sensor Data

WaterSuite

ACTIONABLE INTELLIGENCE

EXTERNAL DATA

- Federal Data (Infrastructure, EPA, FRS, Power Plants, Pipelines)
- State Data (Storage Tanks, Mining, Oil & Gas Wells)
- Chemical Data Sets

The Solution

Using WaterSuite, utilities can integrate quality controlled data about potential sources of contamination from federal, state, and local sources. This dynamic system also integrates water quality monitoring data from sensors in their network giving utilities a complete picture of their water quality and insight into potential risks.

Available Modules

SOURCE WATER PROTECTION

Develop an effective program and save time with centralized data, simple-to-use tools, and reliable information

WATER QUALITY MONITORING

Streamline and view your data in one seamless, sensor agnostic platform. Utilize real-time sensor data to track, predict, and make informed decisions.

CONTAMINANTS DATABASE

Effectively prepare for and respond to contamination incidents with access to over 1,800 contaminant profiles.

Page 1 of 2 | WaterSuite Overview

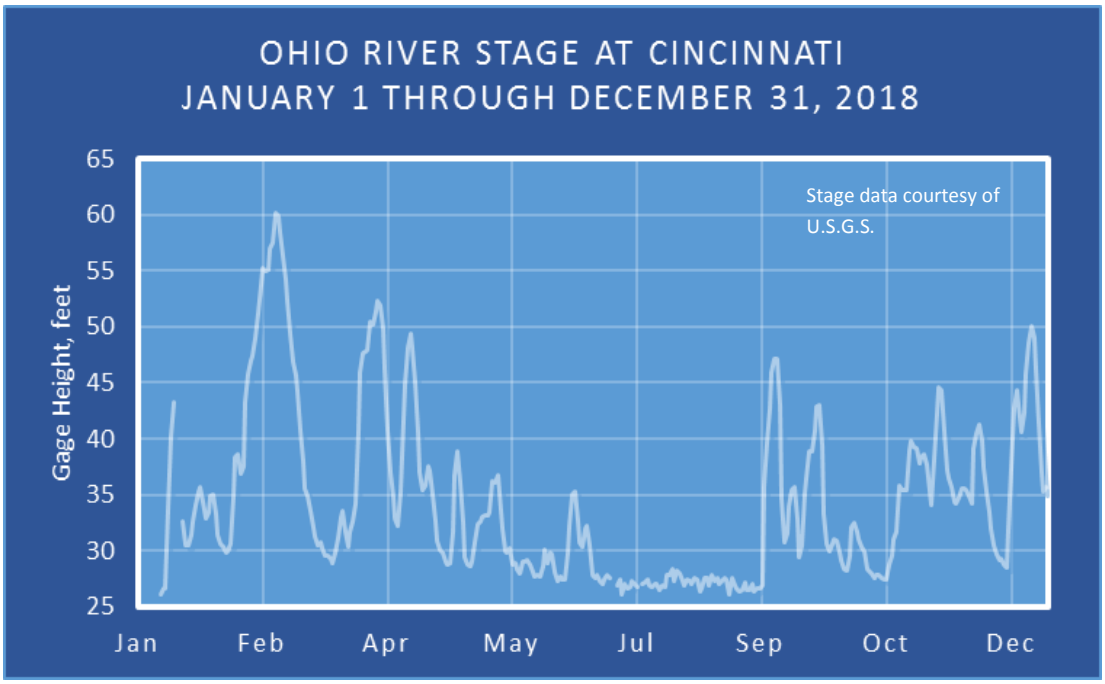
watersuite.com

Other Highlights and Milestones

- March 2018, Rich Stuck gave a presentation at the American Water Works Association Sustainable Water Management Conference in Seattle Washington titled: “Incorporating Spill Response into Source Water Protection: Lessons from a Large, Heavily-Used Inland Water Source”
- December 2018: Rich Stuck gave a presentation at the OKI Groundwater Committee meeting in Cincinnati titled “Safeguarding GCWW’s Water Supply Through Expanded Contingency Planning: Preliminary Results of a Recent Dye Tracer Study”.

River Conditions and Climate Summary

The Ohio River drainage basin upstream of the intakes is approximately 71,000 square miles. As a result, there is significant variability in in the weather and overall climate trends and there was sufficient rainfall through 2018 to maintain abundant flow past the GCWW and NKWD intakes to easily meet demand. Combined, the two utilities extract less than 1 percent of the water that flows past the intakes on a daily basis. A hydrograph of the Ohio River at the Cincinnati gage is presented below:



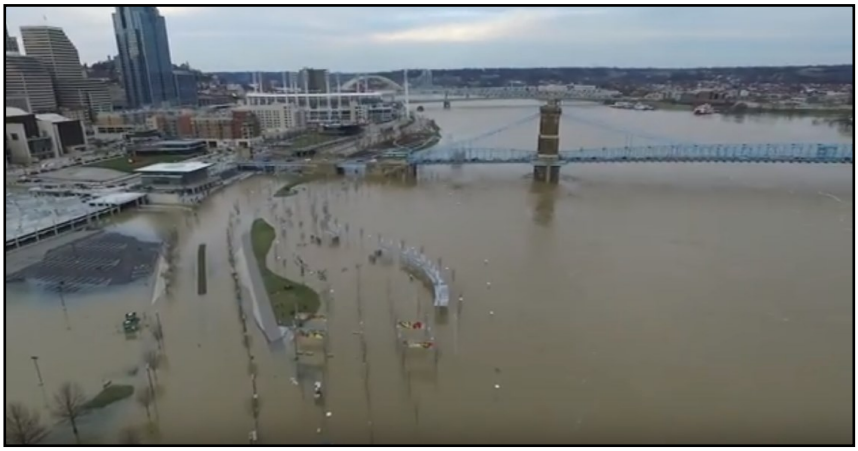
Cincinnati received 55.8 inches of rain in 2018 which is 13.6 inches above normal and is the second highest precipitation amount recorded by the National Weather Service for that location. Similarly, the major cities in the upstream area also received significantly more rain than average with the Charleston, WV area receiving the most at 21.8 inches above normal. Rainfall was slightly above average in early 2018, but was more-or-less average through the middle of August, after which precipitation greatly exceeded average amounts. A table of regional rainfall amounts is provided in the table below:

City	Rainfall Amount (inches)
Columbus, Ohio	54.8 (+15.6)
Pittsburgh, Pennsylvania	57.8 (+19.0)
Charleston, West Virginia	64.6 (21.8)
Cincinnati, Ohio	55.8 (+13.6)

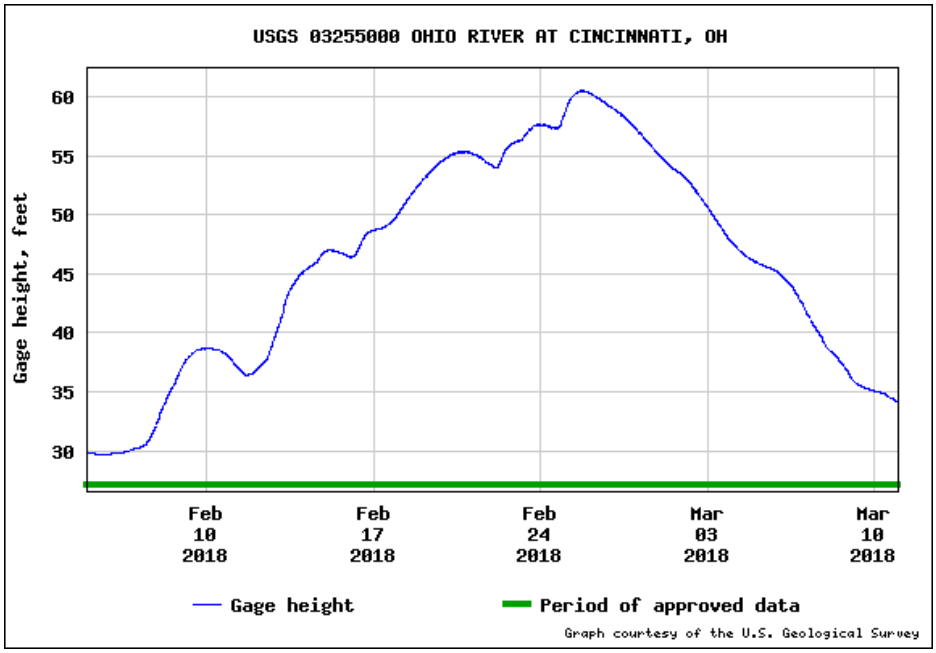
Data from national weather service, various web-based data archives

2018 Flooding

Significant rain fell across the Ohio Valley in February, 2018, resulting in widespread flooding. As shown in the photograph below water inundated much of the riverside portion of Cincinnati and brought with it significant disruptions and damage not only to Cincinnati but to many of the riverside towns upstream of the intakes (such as New Richmond, for example). Operations throughout utilities were affected, however from a source water perspective there were few issues other than a predictable rise in turbidity. There were incidents upriver due to the high water including barges torn from their moorings and floating downstream near Pittsburgh. Fortunately the runaway barges were secured before they caused any damage or ruptured.



The maximum river stage in 2018 at Cincinnati was 60.53, which is the only time the river has been higher than 60 feet since 1997. The graph below presents the USGS hydrograph for the Cincinnati gage during the 2018 flood.



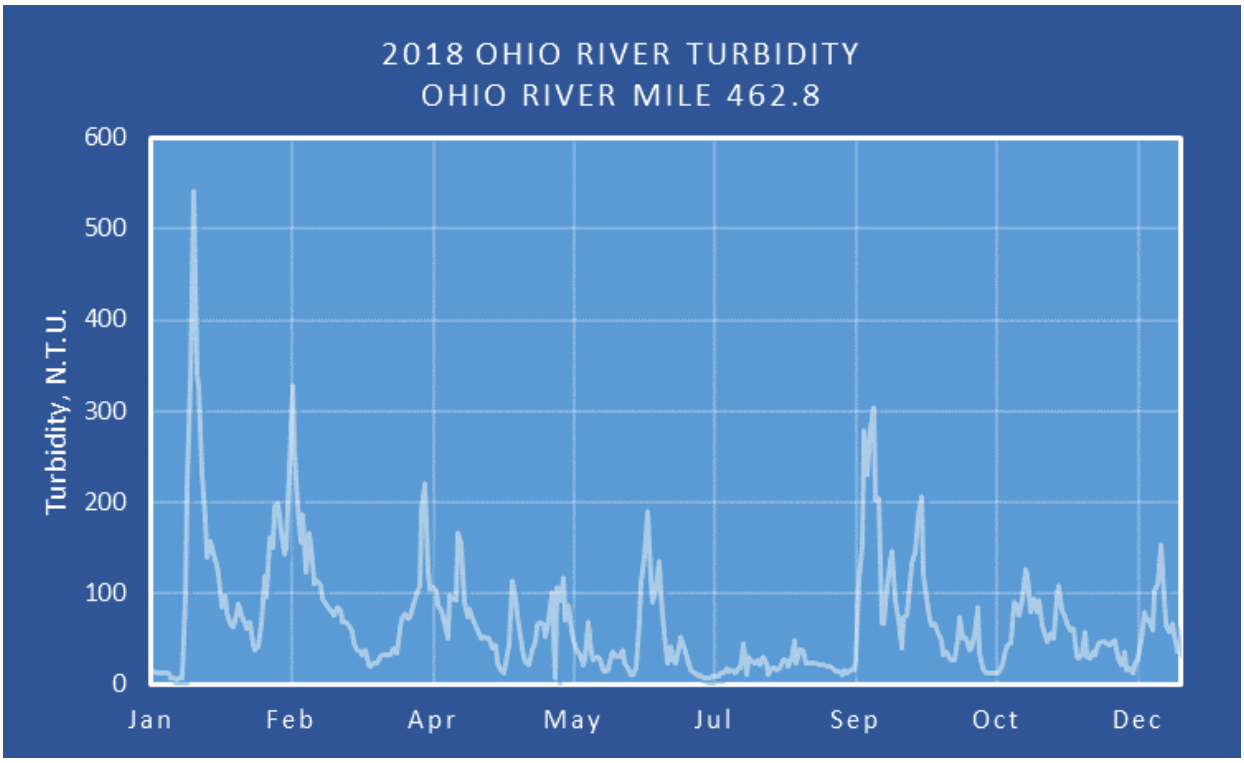
Water Quality Monitoring

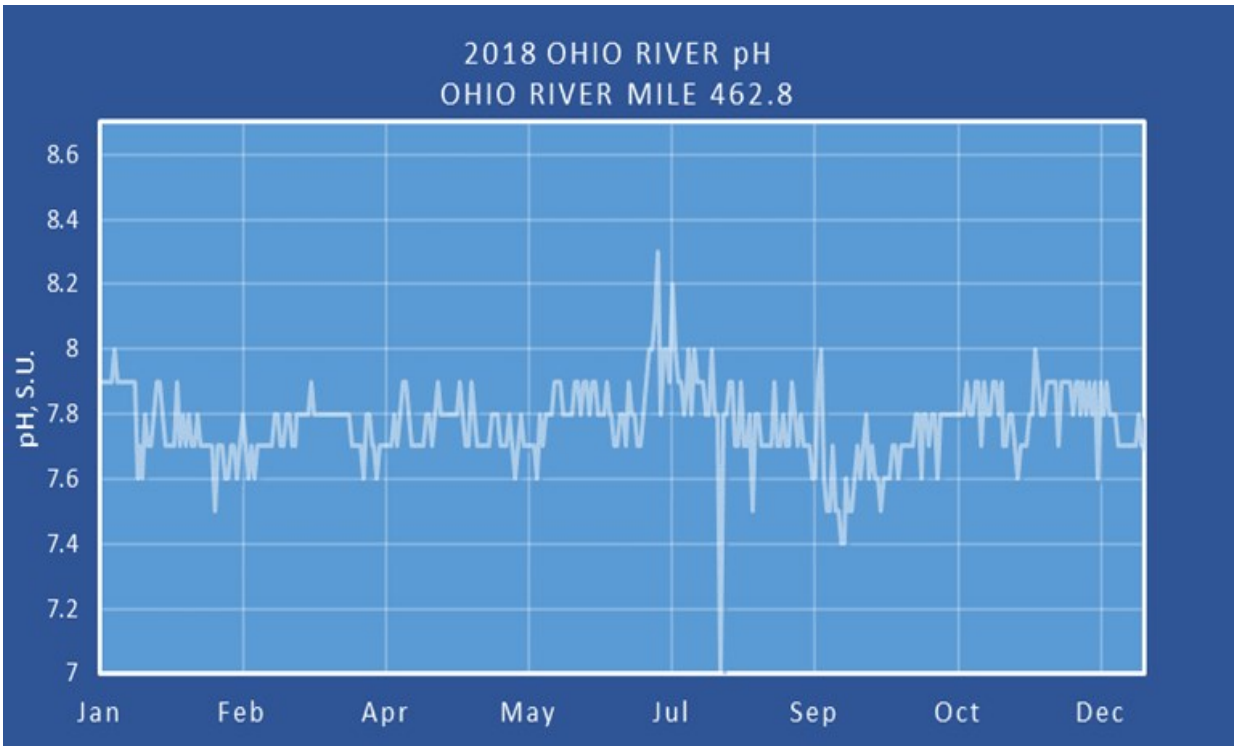
GCWW completed in excess of 3,807 analyses of the Ohio River in 2018 as part of the raw water monitoring program. That number does not include the daily analysis of river samples for volatile organic compounds (VOCs) as part of ORSANCO's river-wide Organics Detection System (ODS). Additionally, GCWW screens the water for VOCs every two hours on a more-or-less continuous basis as part of an early-warning monitoring program, which is also part of the ODS. Upstream monitoring in 2018 included quarterly sampling of the river and critical tributaries for cryptosporidium and giardia.

The Northern Kentucky Water District's Ohio River monitoring program includes VOCs and wet chemistry analyses (pH, turbidity, hardness, etc.), monthly bacteriological analysis, and bi-weekly chlorophyll and algae monitoring.

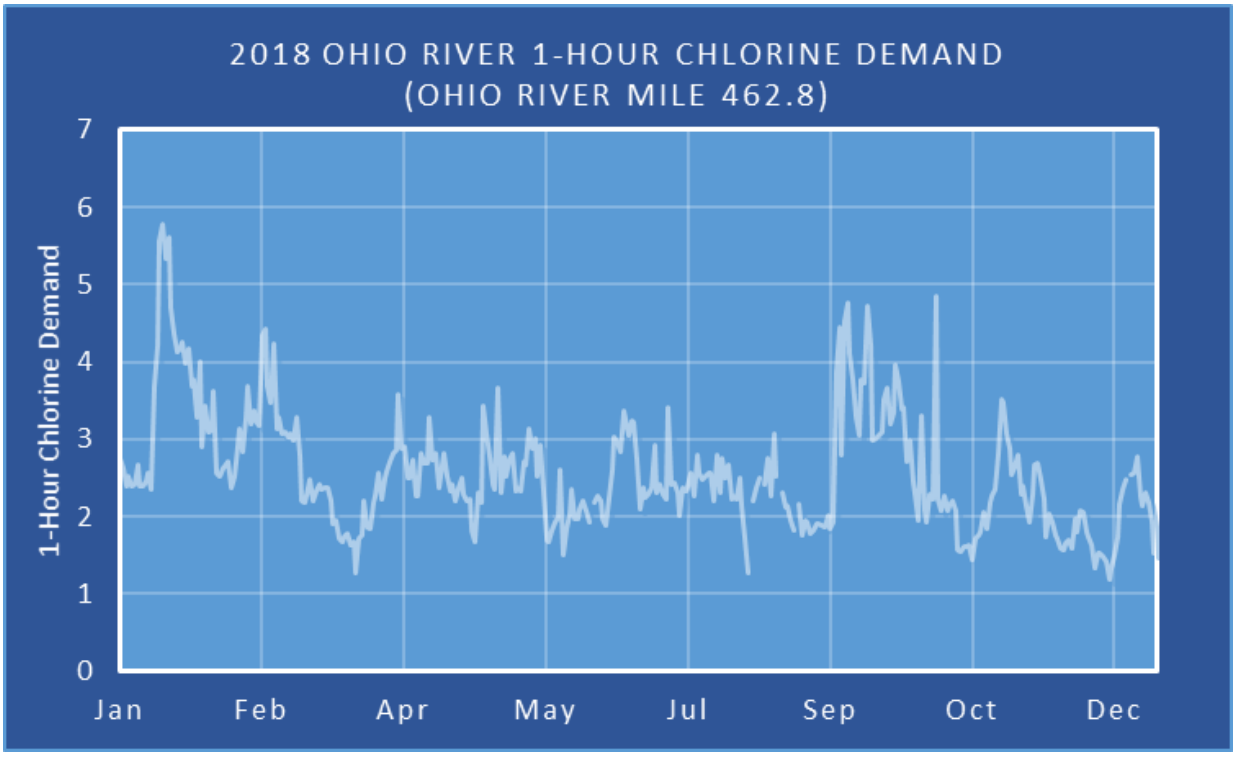
The graphs and tables on the following pages summarize the analytical results and trends for several key water quality parameters in 2018.

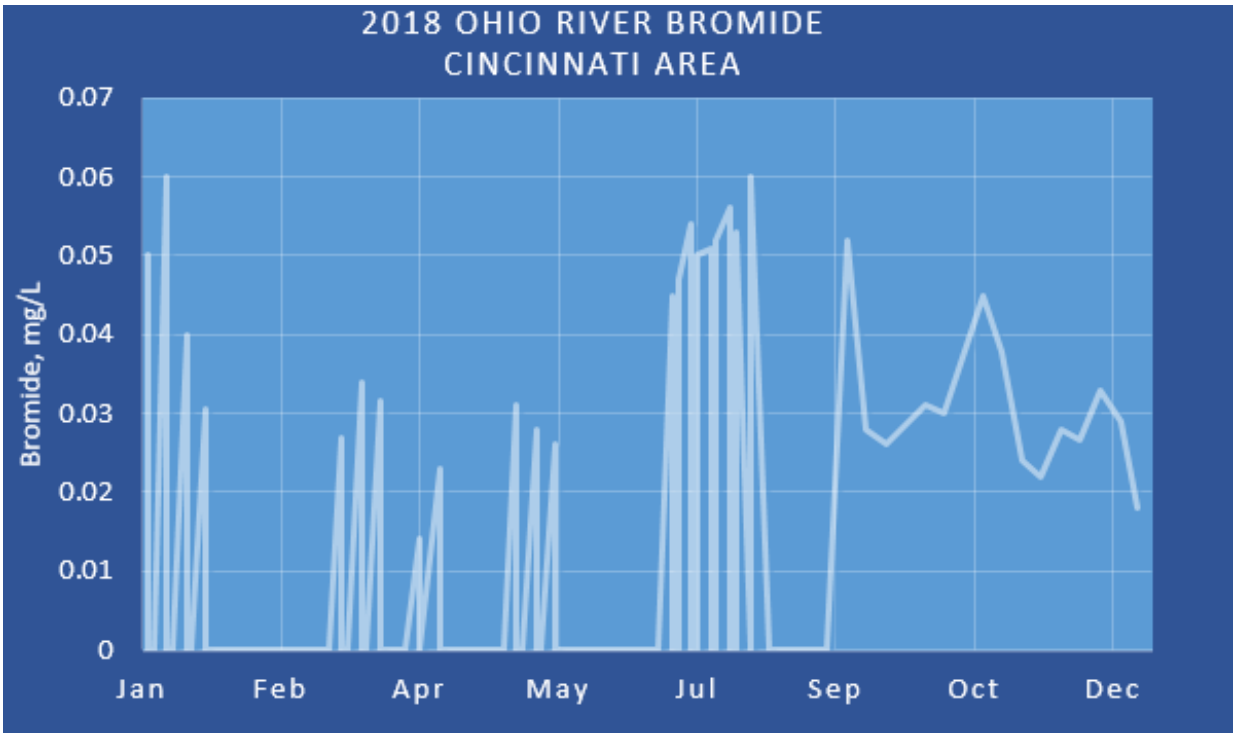
Raw Water Quality Monitoring Results



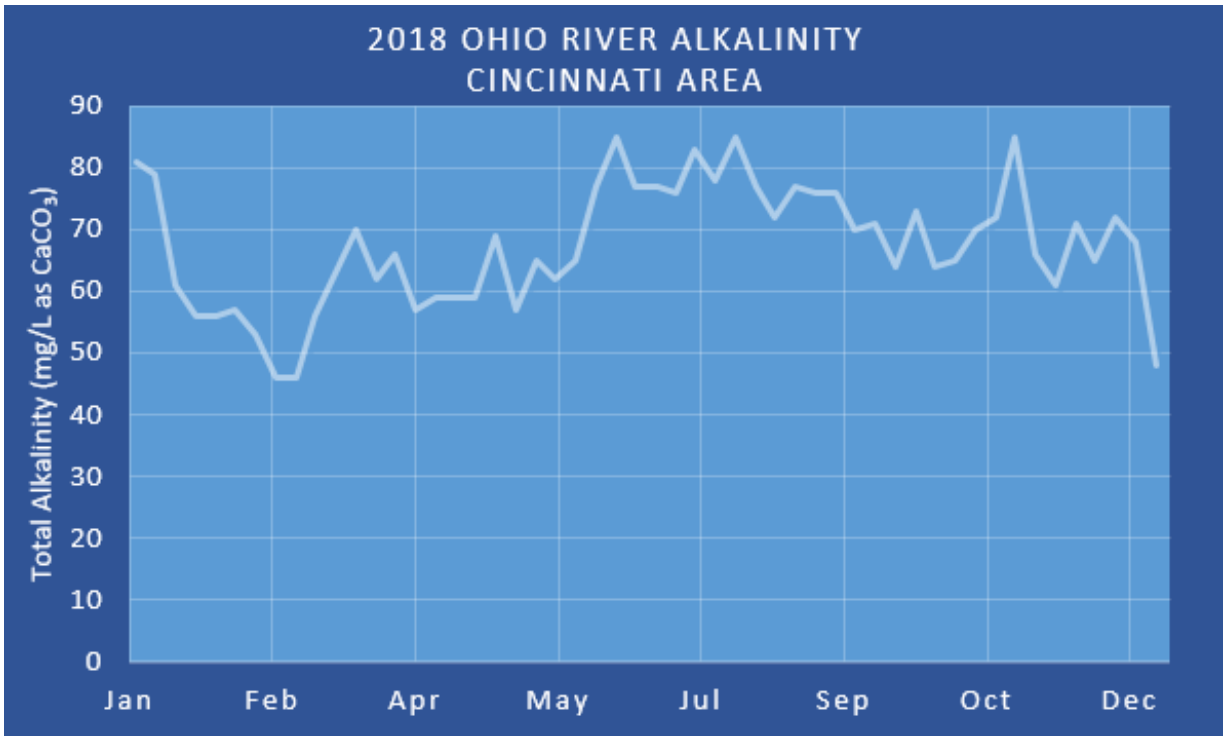


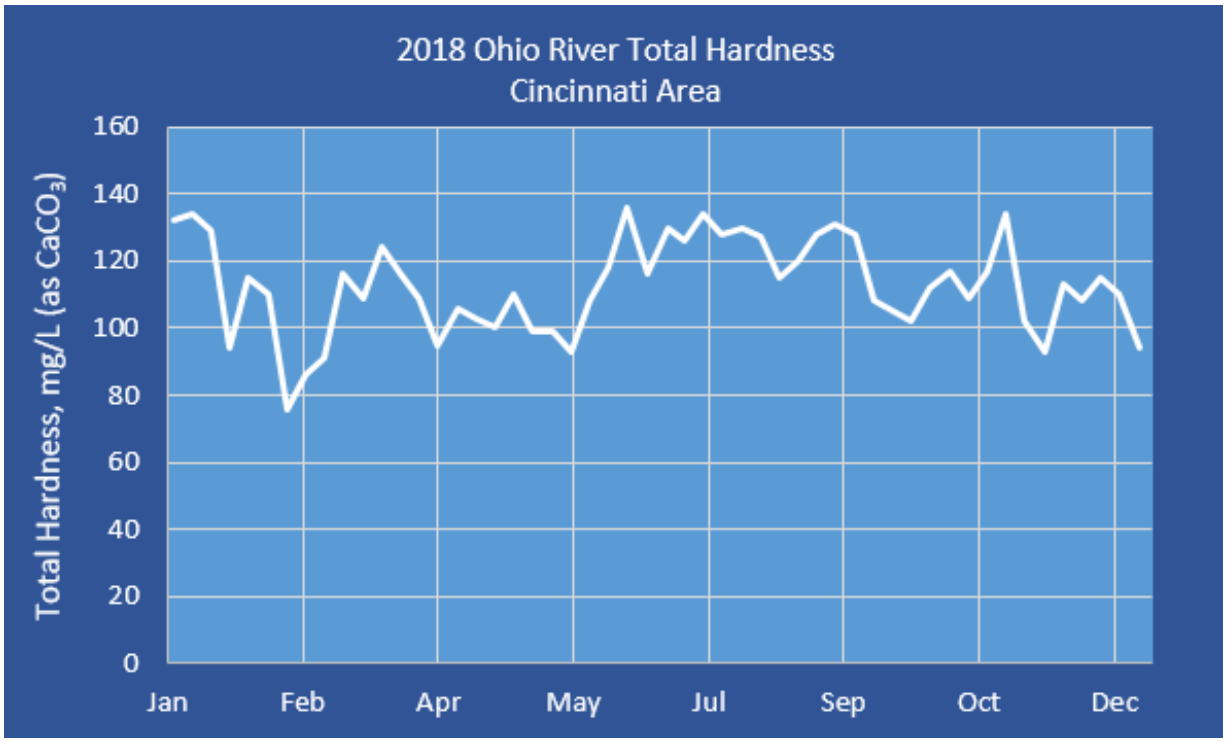
Raw Water Quality Monitoring Results



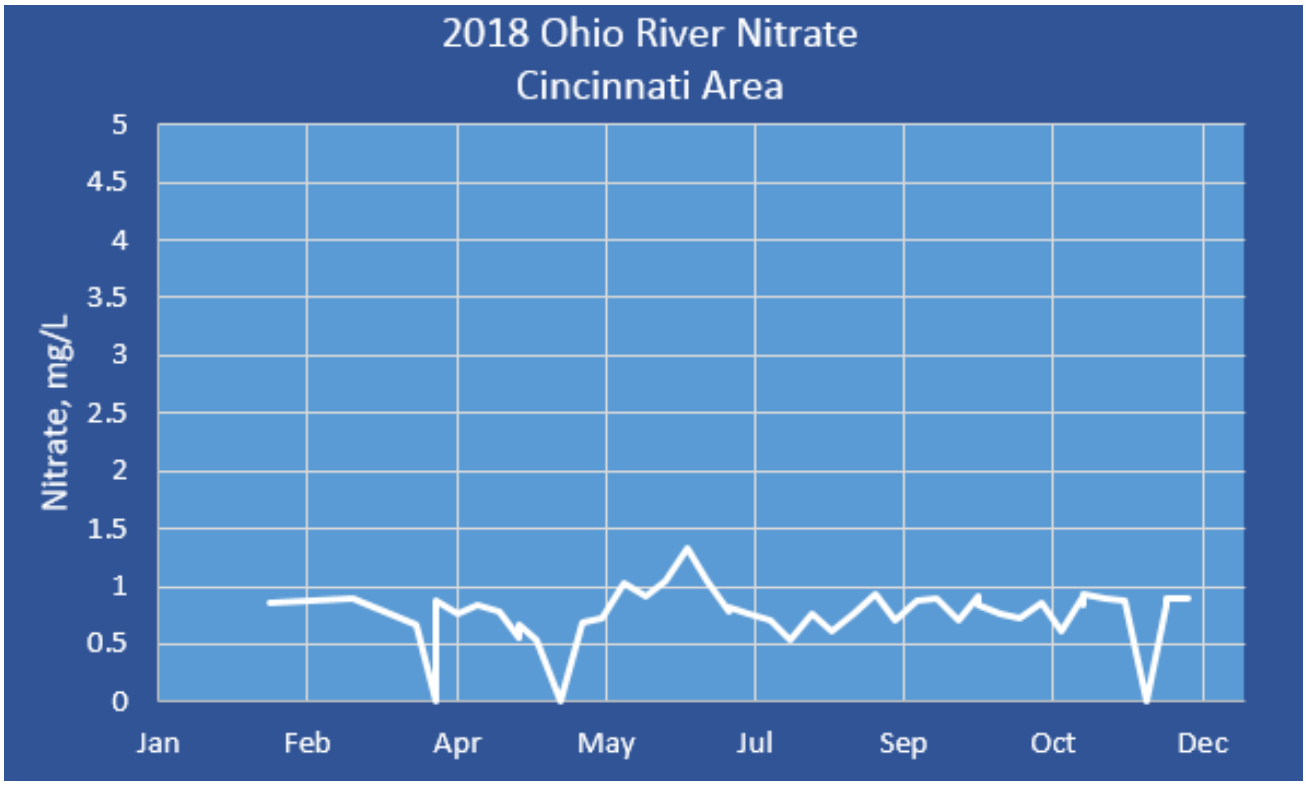


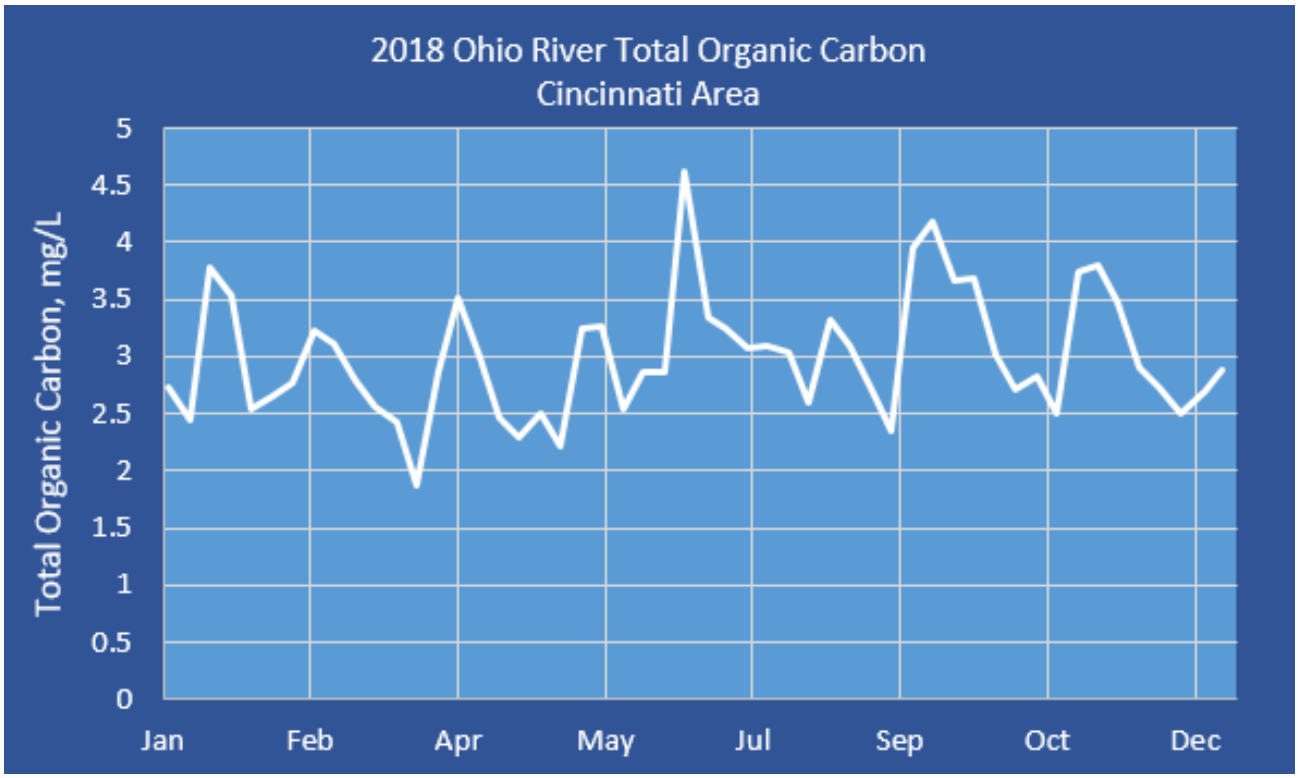
Raw Water Quality Monitoring Results





Raw Water Quality Monitoring Results





Water Quality Monitoring

Table 1. Summary of Greater Cincinnati Water Works Raw Water Quality Monitoring Results (all parameters measured monthly)

	Calcium Hardness mg/L	Chloride mg/L	Conductivity uS/cm	Dissolved Oxygen mg/L	Dissolved Organic Carbon, mg/L	Temperature Celsius
January	105	NS	257	12.37	2.65	2.2
February	98	BDL	661	10.7	2.37	6.5
March	87	BDL	274	9.38	2.33	15.9
April	91	BDL	335		0.5	10.8
May	78	BDL	257	8.4	1.8	NS
June	89	NS	310	7.6	2.54	24.1
July	91	19	358	7.3	3.26	25.6
August	95	NS	455	7.4	3	25.8
September	88	NS	395	6.6	2.49	26.4
October	93	12	250	8.65	3.2	20.7
November	105	19	303	9.79	3.32	12
December	106	17	254	9.6	2.53	7.6
Minimum	78.0	12.0	250.0	6.6	0.5	2.2
Maximum	106.0	19.0	661.0	12.4	3.3	26.4
Average	93.8	16.8	342.4	8.9	2.5	16.1

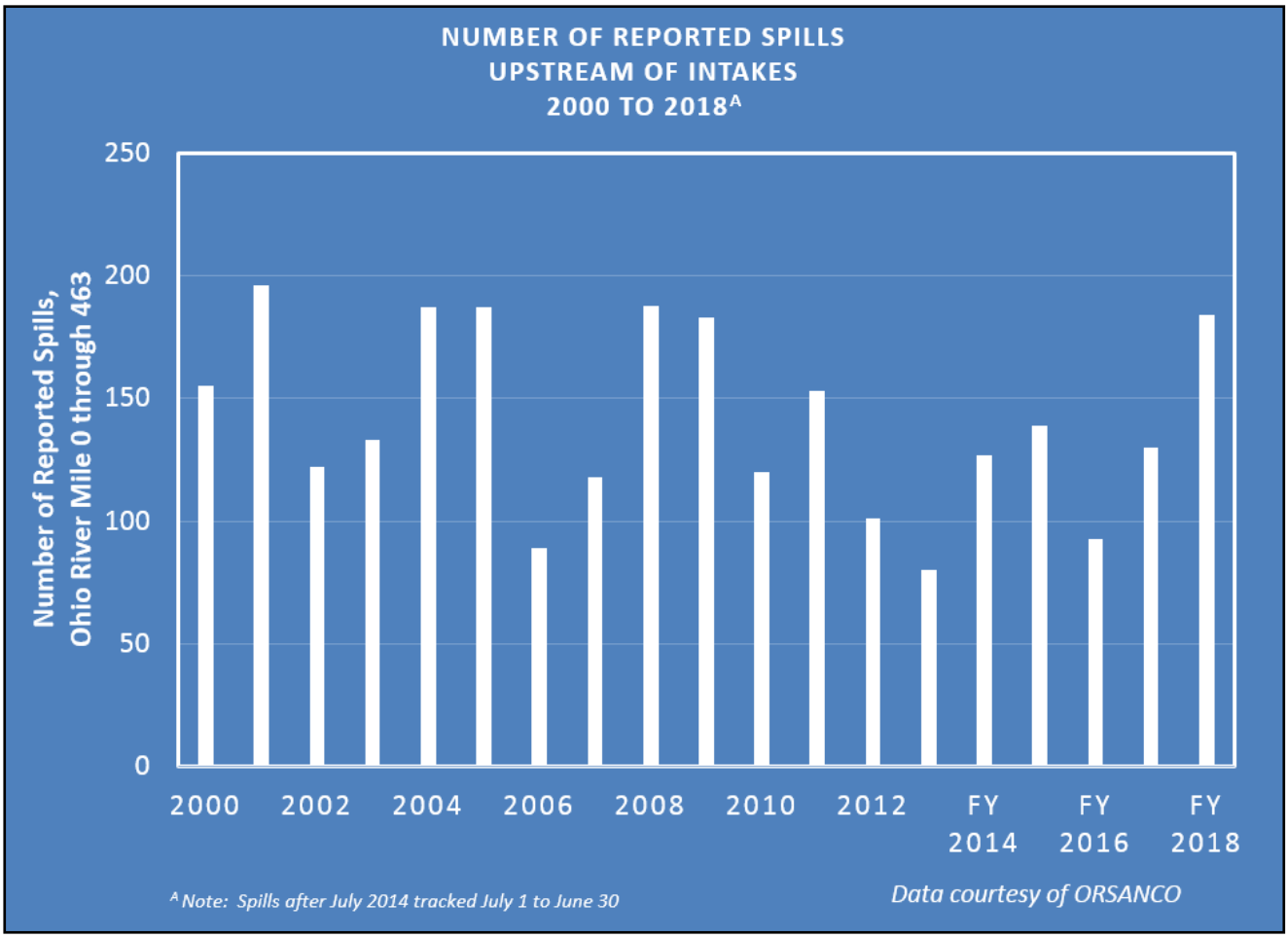
	Magnesium Hardness mg/L	ODOR t.o.n.	Phosphate mg/L	Sulfate mg/L	Total Dissolved Solids mg/L
January	27	NS	0.11	NS	BDL
February	12	BDL	0.18	45.8	210
March	29	BDL	0.22	47	196
April	18	BDL	0.12	BDL	218
May	22	BDL	0.09	46.5	158
June	19	BDL	0.08	NS	BDL
July	35	BDL	0.06	54	214
August	35	NS	0.07	NS	BDL
September	43	NS	0.26	NS	280
October	9	BDL	0.4	NS	186
November	29	NS	0.11	45	160
December	2	BDL	NS	43	BDL
Minimum	2.0	0.0	0.1	43.0	158.0
Maximum	43.0	0.0	0.4	54.0	280.0
Average	23.3	NA	0.2	46.9	202.8

2018 Spill Reports

In addition to being a robust source of drinking water, the Ohio River is a "working river" and an engine for commerce and industry throughout a very large geographic region. This leads to an unfortunate reality…..spills and discharges are very real possibilities.

Typically there are over 100 reported spills to the Ohio River upstream of GCWW and NKWD every year, meaning there is a spill reported approximately every 3 to 4 days. The overwhelming majority of these reported spills are very small and of relatively little consequence from a drinking water perspective and the GCWW and NKWD treatment plants are designed to deal with these everyday occurrences.

The chart presented below summarizes the number of spills reported on the Ohio River upstream from the GCWW intake since 2000 (The spills have been tracked from July 1 through June 30 of the following year since 2013). There were 184 spills upstream of the intakes reported from July 1, 2017 to June 30, 2018.



2018 Spill Reports (continued)

There were a total of 165 spills reported upstream of GCWW and NKWD in calendar year 2018. Based on the number of reported spills, petroleum products were the most commonly spilled materials.

A summary of the spills by type is presented below:

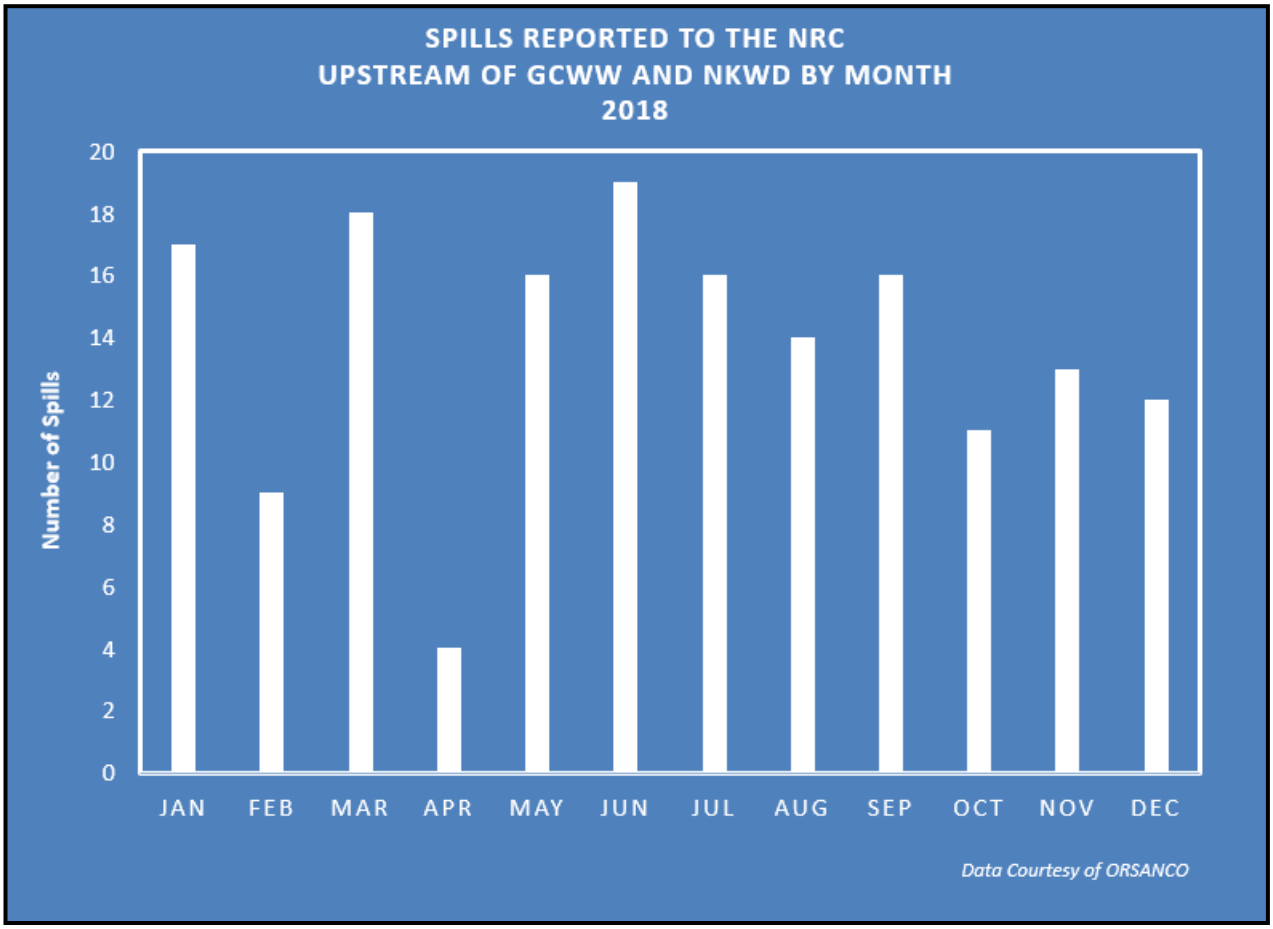
- Petroleum Products 118
- Transformers 18
- Other 11
- NPDES Exceedances* 5
- Sewage 3
- Bilge Slops 2
- Fire Fighting Discharge 2
- Process Water 2
- Natural Gas 2
- Foam 1
- Coal Ash 1

A summary of spills reported by river mile is presented below:

- Ohio River Mile 0 to 100 68
- Ohio River Mile 101 to 200 23
- Ohio River Mile 201 to 300 30
- Ohio River Mile 301 to 400 36
- Ohio River Mile 401 to Intakes 8

- The "NPDES Exceedance" category includes 3 instances of 1,4-dioxane being discharges over permitted concentrations.

NRC = National Response Center



Top 3 Incidents of 2018

In addition to the variety of relatively small and insignificant spills, there are periodically larger events or spills of chemicals that pose additional water treatment challenges to drinking water providers. These spills are highlighted below and a more comprehensive summary of spills that required the utilities to implement some aspect of the utility's contingency plans are listed on the following page.

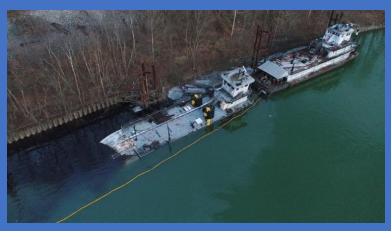


Photo: US Coast Guard

Tow Boat Sinking, Big Sandy River

In January, the National Response Center (NRC) was notified that the M/V Gate City sank while moored on the Big Sandy River and was discharging oil. The U.S. Coast Guard and West Virginia DEP responded, the area around the vessel was boomed and oil was removed from the ship, however, black oil and a sheen were noted across the Big Sandy River. Booms were deployed at three downstream intakes as a precaution

Natural Gas Well Pad Fire, Powhatan, Ohio

The XTO Energy Schnegg B natural gas well experienced a blowout on the morning of February 15, 2018. An unknown quantity of brine and produced water, estimated to be more than 5,000 gallons was initially discharged to Captina Creek. Nearby residents were evacuated for over two weeks. No oil was discharged but brine and fracking compounds were released.

Photo: Ohio State Highway Patrol

Photo: www.mg-chemicals.com

1,4-Dioxane Releases, APG Poly Tech, Apple Grove, WV

In November 2018, APG Reported the release of 253.7 pounds of 1,4-dioxane through a permitted outfall. This quantity exceeds the facilities discharge limits. It is likely this is an ongoing release and will continue until the on-site wastewater treatment plant is upgraded to remove 1,4-dioxane.

Summary of Notable Upstream Spills

Although there were overall more spills reported in 2018 compared to the previous 8 years, the severity of the spills seemed lower. There were a total of 8 notable spills in 2018 that required significant portions of the Contingency Plan to be activated. By comparison, there were 19 notable spills in 2017. The table below summarizes the spills that triggered contingency actions by GCWW or NKWD beyond calculating arrival times. Generally the additional activities included increased monitoring and coordination with upstream utilities. GCWW did not stop raw water pumping due to a spill in 2018.

Date	Spill Location	Mile to Intakes	Material	Quantity
1/10/18	Beaver County, PA	428	Fire Fighting Fluids	50 GPM, unknown Duration
1/10/18	Big Sandy River—Tow Boat Sinking	146	Oils	Unknown, <5,000 gal
2/11/18	Meldahl Dam	27	Hydraulic Oil	300 gals
2/15/18	Powhatan, Ohio	353	Brine and Frac Fluid	Unknown
6/19/18	Beaver, PA	439	Diesel Fuel and Motor Oil	7360
6/27/18	Friendly, WV	321	Landfill Storm Water Waste	33,000
7/1/18	Well's Bottom, WV	341	Hydrochloric Acid	2,600 gals
11/5/18 and 11/12/18	Apple Grove, WV	183	1,4-dioxane	175 lbs and 253.7 lbs

Regional Concerns

There are a number of regional and national issues that *could* have an impact on our source water quality. As part of the ongoing source water protection program, ORSWA monitored several of these issues in 2018 including the following:

Chemicals of Emerging Concern

There is an evolving awareness of the environmental distribution of sub-part per billion concentrations of a family of contaminants known collectively as chemicals of emerging concern (CECs). The CECs include compounds such as 1,4-dioxane as well as per- and polyfluoroalkyl substances (PFAS), including perfluorooctanesulfonic acid (PFOS) and perfluorooctanoic acid (PFOA). Regulation and other scientific information about these compounds is evolving at a rapid rate and will continued to be evaluated as part of the source water protection program.

W.C. Beckjord Power Generating Station

Located approximately 10 miles upstream of the intakes, the W.C. Beckjord Power Generating Station (Beckjord) stopped producing electricity in late 2014. The station was formerly owned and operated by Duke Energy, who announced plans to decommission and demolish the former coal-fired power plant. The property was transferred to Commercial Liability Partners in 2018. All chemicals have been removed from the site, however, 4 large coal ash ponds are located immediately adjacent to the Ohio river. The new owners have included notification to GCWW and NKWD as part of their spill response plan in the event there is a real to the river.

Hydraulic Fracturing and Unconventional Hydrocarbon Extraction

Continued development in the Marcellus and Utica shales has resulted in booming oil and gas businesses in the upstream portion of our watershed. ORSWA will, along with our many partners, continue to comment on emerging regulations to ensure drinking water safety is considered in all new regulations related to this industry and the handling of the frac-related waste.

Ethane Cracker Plants

The success of the hydrocarbon extraction from the Utica shale has resulted in the development of two very large ethane cracker plants and possibly very large underground hydrocarbon storage caverns in southeast Ohio and West Virginia along the Ohio River. Comments will be provided on discharge and operational permit applications related to these new industrial facilities to limit the risk to drinking water these new facilities may create.

New Pipelines

New pipelines throughout the region, especially those servicing the Marcellus and Utica shale regions of Ohio, Pennsylvania, and West Virginia are proposed or are currently being installed throughout the upstream area. ORSWA will evaluate each proposed pipeline project and provide comments as needed to safeguard the water supply.

Bromide

Brominated compounds, which may originate from a variety of sources including wastewater from unconventional gas and oil wells and from coal-burning power plants, can generate potentially harmful disinfection byproducts in finished drinking water. Bromide will continued to be monitored so that, if needed, appropriate management strategies can be developed.

Ohio River Tracer Study

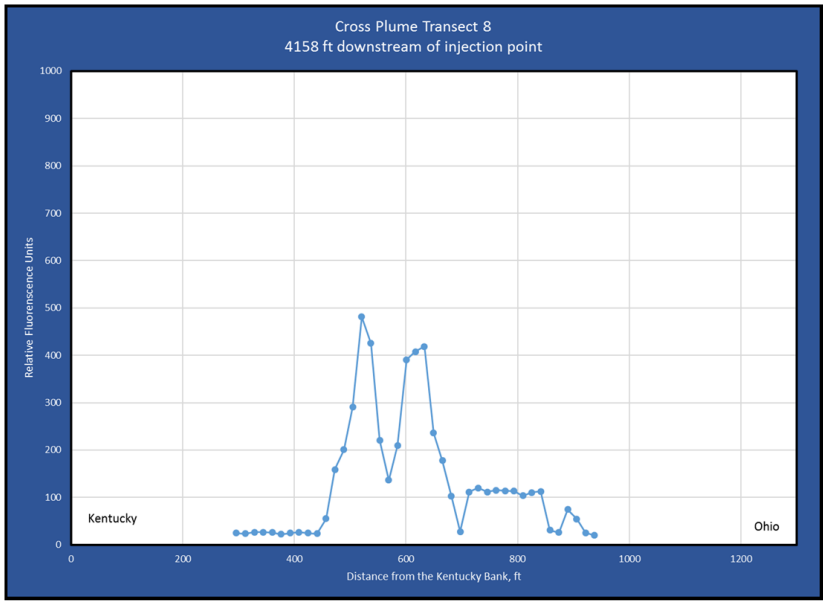
In October 2018, the ORSWA members, with assistance from engineering students from the University of Cincinnati, conducted a tracer study on the Ohio River between ORM 461.9 to 463.3 (e.g., from the Combs-Hehl Bridge to the NKWD Newport Intake). The study was conducted to investigate the amount and rate of lateral dispersion of a contaminant released at points on the Ohio side of the river (right descending bank) and was conducted as part of the ongoing evaluation of risk mitigation strategies for the Combs-Hehl Bridge. The results of the dye test were used to calibrate a numerical dispersion model.

The tracer test comprised two separate injections of Rhodamine WT dye directly into the Ohio River. The spreading of the dye was then determined by measuring the concentration of dye using boat-mounted fluorometers along lateral transects as the plume drifted downstream. Additionally, the dye concentrations were measured at the GCWW and NKWD intakes to determine whether the dye spread enough to be pulled into the intakes. Drone-derived video logging was conducted to visually monitor the dye spread in addition to the quantitative measurements.

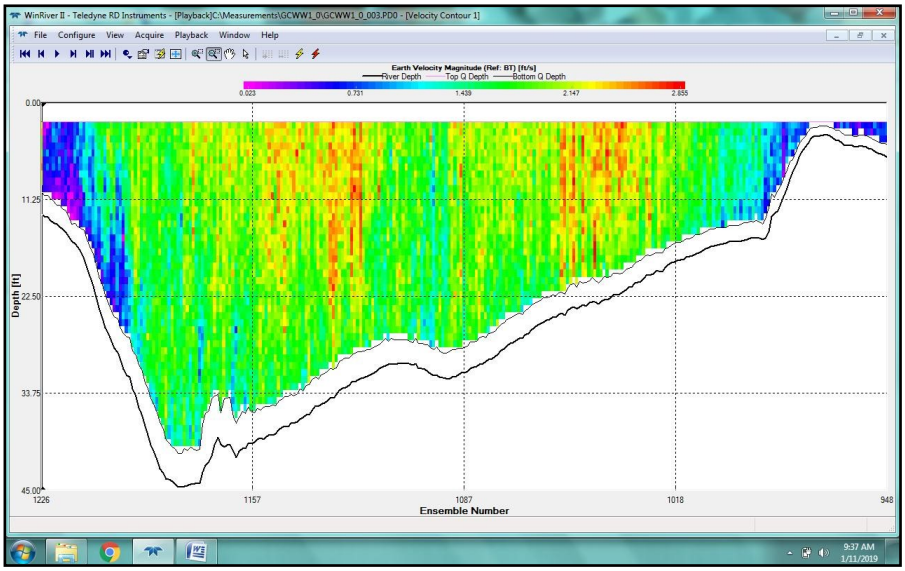
The tracer study was conducted on October 22 and October 23, 2018. The dye was injected into the river immediately downstream of the Combs-Hehl bridge on both days, although the injection point was altered each day. On October 22nd the dye was injected approximately 450 from the Ohio bank while the injection point on the 23rd was moved to approximately 700 ft from that same bank. Transect data was

Ohio River Tracer Study (continued)

not collected on the 22nd due to an equipment failure, however no dye was detected at any of the intake sampling locations. Transect data was successfully collected on the 23rd. No dye was detected in the GCWW intakes or the NKWD ORPS1 intake although there may have been a very low-level detection at the NKWD ORPS2 intake. The transect data indicated the leading edge of the plume separated into two lobes and spread to a maximum width of approximately 472 wide near the Newport intake. The graph to the right is the concentration of the dye along a lateral transect at the GCWW intake.

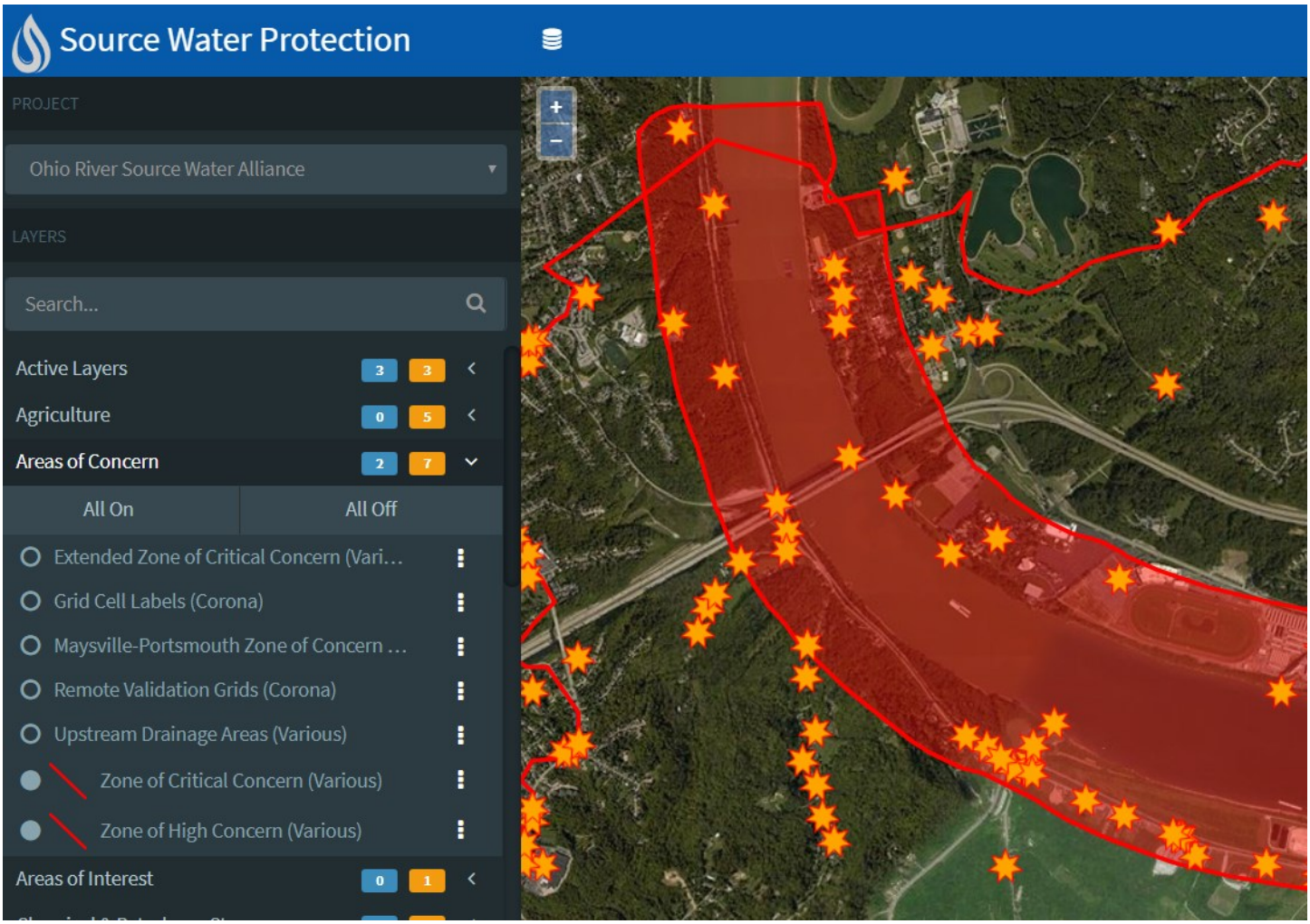


In addition to the tracer study, ORSANCO measured the discharge and bathymetry of the river at three transects through the study area using an acoustic Doppler current profiler (ADCP). Both the discharge and the bathymetry profiles were used by the UC students to subsequently build a grid model of the study reach and to model the flow characteristics. A graph of one of the velocity contour diagrams from the ADCP provided by ORSANCO is included below.



The UC students evaluated several potential flow models as part of their work in 2018 and recommended the use of a commercially-available model called Flow 3D^{tm}. The student team will create, run and calibrate the model during the first half od 2019 to investigate plume dynamics based on other injection points and under a variety of river flow conditions.

WaterSuite™ Deployment



GCWW and NKWD, with significant support from the US EPA, input the potential contaminant source inventory into a commercially-available GIS platform specifically designed for the management of source water protection called WaterSuite[tm]. In addition to the previously-generated PCSI data, WaterSuite polled and imported additional environmental and chemical storage data from a variety of Federal, State and local databases. Combined with the existing PCSI data, the combined data set provides a comprehensive threat assessment for the ORSWA Zones of Critical and High Concern. Additionally, database-derived PCSI information was imported for an additional reach beyond the ZOCC, extended that reach to approximately Maysville, Kentucky. WaterSuite will be used to analyzed PSCI data to identify the highest priority water quality threats and facilitate the creation of appropriate risk reduction strategies.

Projects and Outreach

Water Research Foundation Project 4748 "Risk Management Framework for Source Water Protection"

GCWW is part of a research team developing a risk-based approach to prioritize potential contaminant sources. Source water areas in and near heavily populated or industrialized area often generate a significant number of potential contaminant sources. It is often difficult for protection managers to transition from gathering and managing information about their watersheds and aquifer to using those data to develop and implement meaningful protection programs. If successful, this project will facilitate that transition and provide the framework necessary to quantify and communicate risks and develop appropriate protection strategies.

Onsite Reconnaissance: CHS, Inc. 5903 Mary Ingles Highway, Melbourne, Kentucky

Rich Stuck of GCWW and Mary Carol Wagner of NKWD met with the facility manager at CHS, Inc. in June 2018 to discuss CHS' operations and the ORSWA source water protection program. The facility imports solid potash, urea, monoammonium phosphate, and diammonium phosphate in bulk via rail cars or barges and then ships those same products via rail or truck. They do not process any quantities below the size of a typical tractor trailer size. The material is stored inside a large steel building pending distribution. CHS was provided the standard Voluntary Notification Program paperwork and emergency contact procedure.

Comments Provided on West Virginia NPDES Water Pollution Control Permit No. WV0001279 for the Chemours Washington Works Facility

GCWW commented extensively on the draft NPDES permit modifications for the Chemours site located adjacent to the Ohio River in Washington, West Virginia. The Chemours facility historically used and discharged perfluorooctanoic acid (PFOA) to the Ohio River and may discharge the replacement compound Gen-X (Hexafluoropropylene oxide dimer acid). The West Virginia DEP responded to the GCWW in July 2018 and while most of the comments were deemed unnecessary or beyond the scope of the NPDES program, the draft permit was modified based on two of the comments. The modifications included clarification in the permit for the use, disposal, and degradation of other per and polyfluorinated compounds and clarified that Chemours could not claim a storm water monitoring waiver for Gen-X

Staff and Stakeholders

The ORSWA Central Planning Committee Members are:

Mr. Rich Stuck – GCWW

Mr. Bruce Whitteberry – GCWW

Mr. Jeff Swertfeger – GCWW

Dr. Haishan Piao—GCWW

Ms. Amy Kramer – NKWD

Ms. Mary Carol Wagner – NKWD

Mr. Sam Dinkins – ORSANCO

Ms. Lila Ziolkowski - ORSANCO

More information about the Source Water Protection Programs of GCWW and NKWD are available at:

http://www.orswa.org

https://www.cincinnati-oh.gov/water/about-greater-cincinnati-water-works/water-sources-resource-protection/

http://www.nkywater.org/waterquality.html

More information about ORSANCO's Source Water Protection Program is available at:
http://www.orsanco.org/programs/source-water-protection/

General information about the Ohio River may be found at:
http://riverlearning.org/

Appendix A: Ohio EPA source Water Protection Plan Endorsement Letter

Ohio Environmental Protection Agency

John R. Kasich, Governor
Mary Taylor, Lt. Governor
Craig W. Butler, Director

May 15, 2018

Mr. Richard Stuck
Greater Cincinnati Water Works
Source Water Protection Mgr.
4747 Spring Grove Ave
Cincinnati, Ohio
45232

Re: City of Cincinnati
Plan
Approval
Source Water Assessment and Protection (SWAP)
Hamilton County
OWS ID: OH3102612

Subject: Source Water Protection Plan Endorsement

Dear Mr. Stuck:

I am very pleased to inform you that the Ohio Environmental Protection Agency **endorses** the city of Cincinnati's drinking water source protection plan as meeting the requirements of Ohio's Source Water Protection Program. This endorsement is based on the review of the December 2017 report, *Source Water Protection Plan: A Plan to Protect the Drinking Water Resources on the Ohio River in the Greater Cincinnati and Northern Kentucky Region* prepared by Greater Cincinnati Water Works and the Northern Kentucky Water District.

Please see the attachment to this letter, which includes a formal statement of endorsement.

Ohio EPA commends the city of Cincinnati for recognizing the importance of protecting its valuable ground water resources. We look forward to presenting you with a framed certificate of recognition for your efforts signed by the Director of Ohio EPA. We hope you will be proud to display it.

If you have any questions concerning this review, please feel free to contact either Allison Reed at Ohio EPA's Southwest District Office (937-285-6449) or Craig Smith at the Central Office (614-644-2752). Additional information on Ohio's Source Water Assessment and Protection Program can be found at http://www.epa.ohio.gov/ddagw/swap.aspx.

Sincerely,

Jeffrey A. Patzke

Jeffrey Patzke
Manager, Ohio EPA
Division of Drinking and Ground Waters

ec: District Office File

Attachment

Central Office • 50 W. Town St. • Suite 700 • P.O. Box 1049 • Columbus, OH 43216-1049
www.epa.ohio.gov • (614) 644-3020 • (614) 644-3184(fax)

Appendix A: Ohio EPA source Water Protection Plan Endorsement Letter (cont.)

ATTACHMENT A

Ohio EPA Review of the City of Cincinnati's Drinking Water Source Protection Plan

Endorsement Statement

Ohio EPA endorses Cincinnati's drinking water source protection plan as meeting the requirements of Ohio's Source Water Protection Program. The plan identifies priority contaminant sources within the delineated protection area (i.e., hazardous material transport, POTWs, non-point source runoff, railroads, petroleum and chemical storage) and proposes protective strategies for them that are appropriate for a protection area with a high susceptibility surface water source.

The protective strategies emphasize voluntary strategies such as the Combs-Hehl Bridge risk reduction program, notification programs for spill response, a nutrient reduction program and the Source Water Defender Recognition Program. Some education and outreach activities are already being implemented, and the formation of a public education committee is planned. Future education and outreach strategies include: creation of brochures and fact sheets, hosting a booth a environmentally related festivals, creating an industrial outreach program and creating a web site and social media presence. Additionally, Cincinnati coordinates with OSANCO on water quality monitoring and spill response planning. Cincinnati maintains advanced in-house laboratory capabilities and conducts regular raw water monitoring. Quarterly reconnaissance of the zone of critical concern is planned to asses land use and other activities.