A Service of The City of Cincinnati

GREATER CINCINNATI WATER WORKS

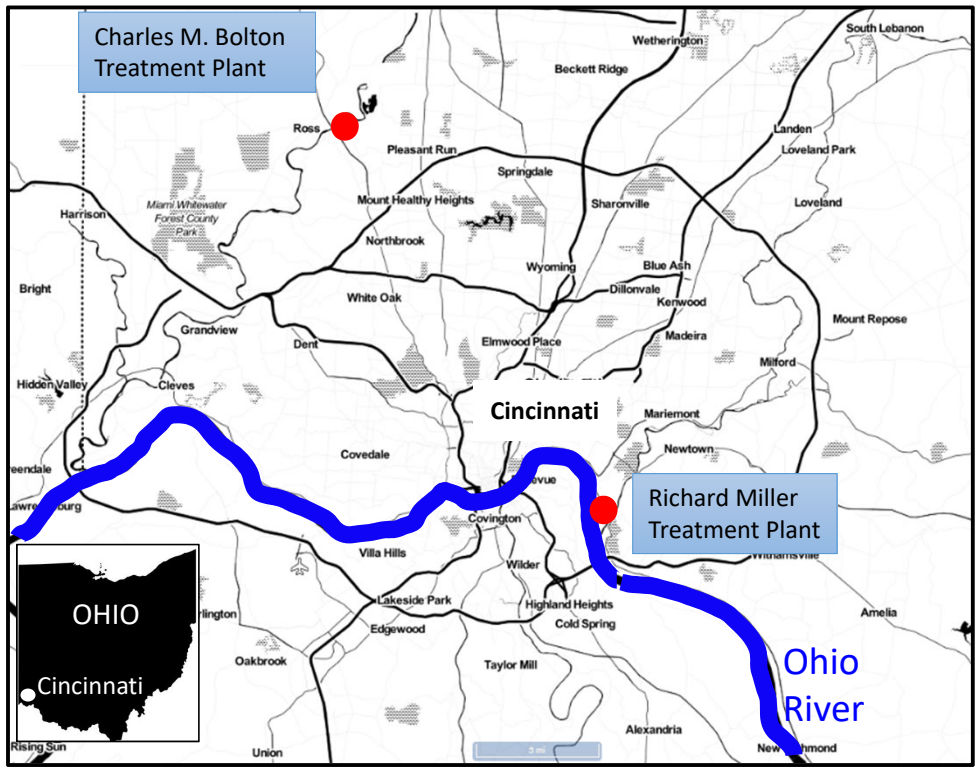
Using Data and Regulatory Programs from Outside the Safe Drinking Water Act to Protect Source Water

Richard Stuck, P.G.
Source Water Protection Manager
Greater Cincinnati Water Works

December 20, 2023

Greater Cincinnati Water Works

A Service of The City of Cincinnati
GREATER CINCINNATI WATER WORKS



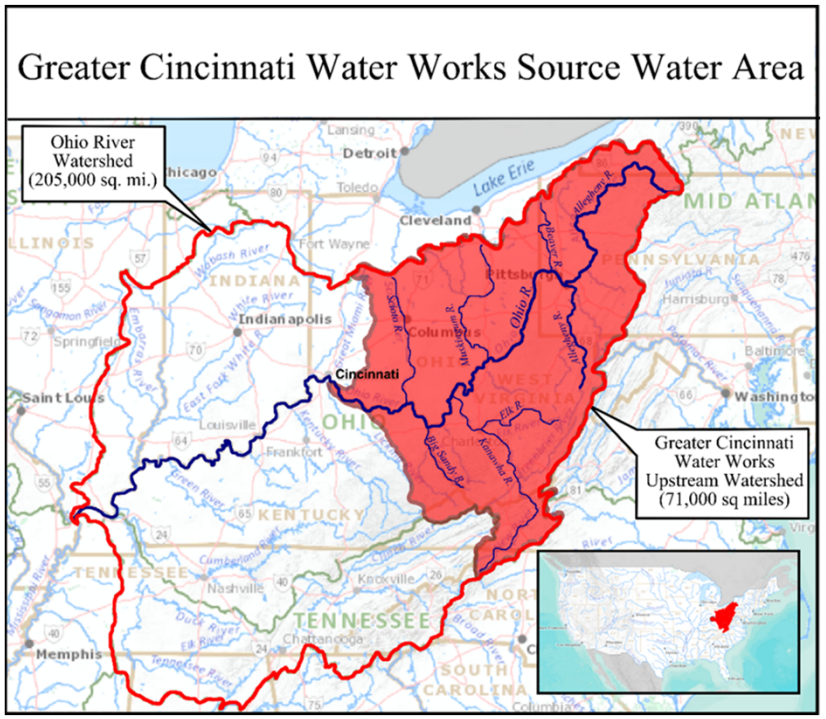
Treatment Plant Locations

GCWW Facts:

- Serve water to 1.1 million people every day
- 2 Water Treatment Plants
- Richard Miller Treatment Plant on the Ohio River can treat up to 240 million gallons each day

GCWW's Upstream Watershed

- Total Upstream Area = *71,000 mi²*
- Most of Ohio and WV
  Large parts of Eastern KY and Western PA
  Small parts of NY, MD, VA, TN and NC
- Includes the Monongahela, Allegheny, Scioto, Muskingum, Kanawha, and Big Sandy Rivers as Tributaries
- Major Cities: Pittsburgh, Columbus, Charleston
- Despite it's reputation, the Ohio River is a robust, although challenging, source of drinking water!



GCWW's Upstream Watershed is approximately 2.3 percent of the continental U.S.

What is Source Water Protection?

- **Source water** is a raw, untreated supply of water – typically surface water or groundwater – used for current or potential future drinking water.
- **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.
- **Stakeholders** include any group or individual interested in, affected by, or having an impact on source water protection activities. Stakeholders are diverse and vary based on local challenges faced in source water protection areas.

Definitions from AWWA Source Water Protection Committee and the G300 Standard Committee, 2018

Source Water Protection Process

A Service of The City of Cincinnati
GREATER CINCINNATI WATER WORKS

The water quality threats to a river system as complex as the Ohio River are complicated, change on a frequent basis, and require data from multiple sources to fully understand.

Environmental Statues That Can Help Utilities Mitigate Source Water Issues

- Safe Drinking Water Act (SDWA)
- Clean Water Act (CWA) – *Especially the NPDES Program!*
- Environmental Planning and Community Right-to-Know Act (EPCRA)
  - Tier II Data
  - Toxics Release Inventory
  - Etc.
- Toxic Substances Control Act (TSCA)
- National Environmental Policy Act (NEPA)
- Resource Conservation and Recovery Act (RCRA)

  Very Important for Groundwater Source Water
  - UST/LUSTs, Hazardous Waste Handling & Disposal, some Landfills, etc.
- Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)

  Another Very Important Statute for groundwater
- Federal Insecticide, Fungicide and Rodenticide Act (FIFRA)

(and others – Federal and State!)

A Case Study:
Using Multiple Regulatory Programs to Find and Reduce a Source of 1,4-Dioxane along the Ohio River

Unregulated Contaminant Monitoring Rule 3 (2013 to 2015)

A Service of The City of Cincinnati
GREATER CINCINNATI WATER WORKS

The 1996 Safe Drinking Water Act (SDWA) amendments require that once every five years EPA issues a list of no more than 30 unregulated contaminants to be monitored by public water systems (PWSs).

The UCMR determines the occurrence of these compounds and is used to determine whether they should ultimately be regulated in drinking water

UCMR -3 included:

One Synthetic Organic Compound (SOC) – **1,4-Dioxane**

1,4-dioxane was detected in 1,077 public water systems (>0.07 ug/L)

Note: UCMR 3 also included six per- and polyfluorinated alkyl substances (PFAS) – five of which will be regulated in drinking water either individually or as part of a group by the end of 2023 along with one other compound that was not part of UCMR3

A Service of The City of Cincinnati
GREATER CINCINNATI WATER WORKS

What is 1,4-Dioxane

- A colorless liquid that *mixes completely with water*.
- $C_4H_8O_2$
- Also know as Dioxane or 1,4-D
- Stabilizer for chlorinated solvents
- Byproduct of some manufacturing including plastics
- Byproduct in some consumer goods
- **US EPA – Probable Human Carcinogen**
- Persistent and highly mobile in water in the environment, one of a growing list of Chemicals of Emerging Concern (CECs) for Drinking Water
- **Not Easily Removed by Common Water Treatment Technologies**
- **US EPA Health Advisory – 0.35 ug/L ($1x10^{-6}$ cancer risk) – Not enforceable**

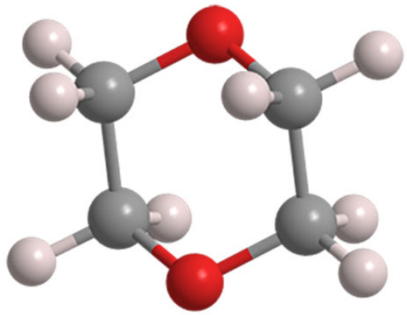


Image Credit: American Chemical Society

Regulatory Status of 1,4-Dioxane

- The US EPA has not established an MCL for 1,4-dioxane in SDWA
- Currently Being Evaluated under TSCA for Multiple Pathways
- US EPA Health Advisories:
  - Probable Human Carcinogen
  - 1x10-6 Cancer Risk: **0.35 ug/L**
  - 1x10-4 Cancer Risk: 35 ug/L
- New York – Enforceable MCL – 1 ug/L

Other States – Evolving Standards – Primarily for Groundwater

	MCL	Advisory	Notification	Cleanup	Guidance
No. of States	1	13	4	9	1
Upper Limit	1 ug/L	200 ug/L	6.4 ug/L	9.1	0.3
Lower Limit	NA	0.3 ug/L	0.4 ug/L	0.32 ug/L	

1,4-Dioxane in the News

Stories about 1,4-Dioxane Contamination of Drinking Water becoming more common – almost exclusively groundwater:

Long Island, New York
- 31 DW Utilities Affected. Industrial and DoD Sources
- GW Concentrations Exceed 5 ug/L

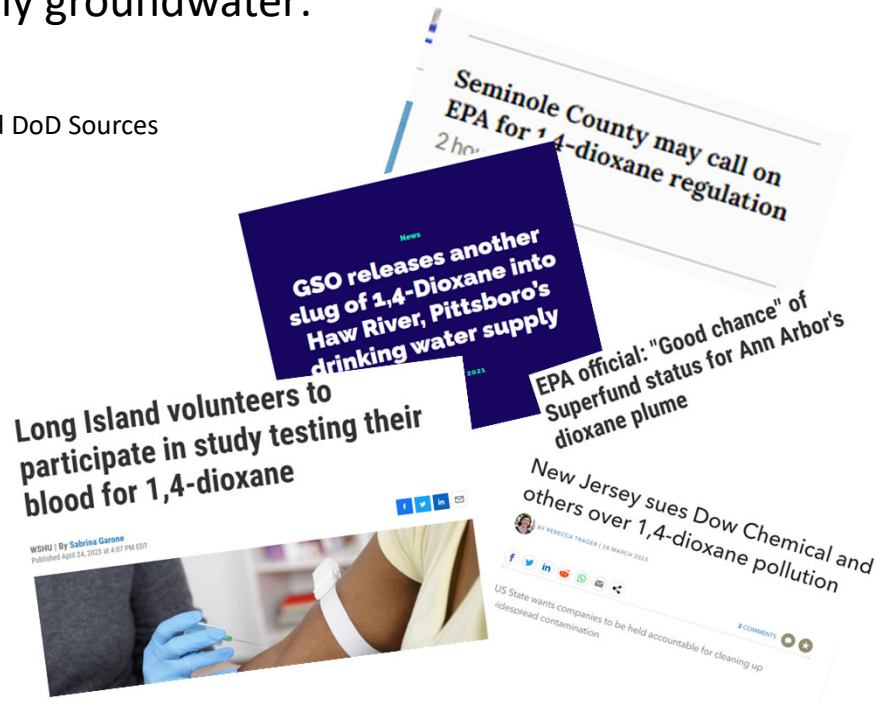
Ann Arbor, Michigan
- Gelman Sciences site
- GW Concentrations exceed 7.2 ug/L

Uniontown, Ohio
- Industrial Excess Landfill
- GW Concentrations Exceed 46 ug/L

Cape Fear, North Carolina
- *Surface Water Scenario*
- Multiple Utilities Affected

Seminole County, Florida
- General Dynamics
- 3 utilities affected

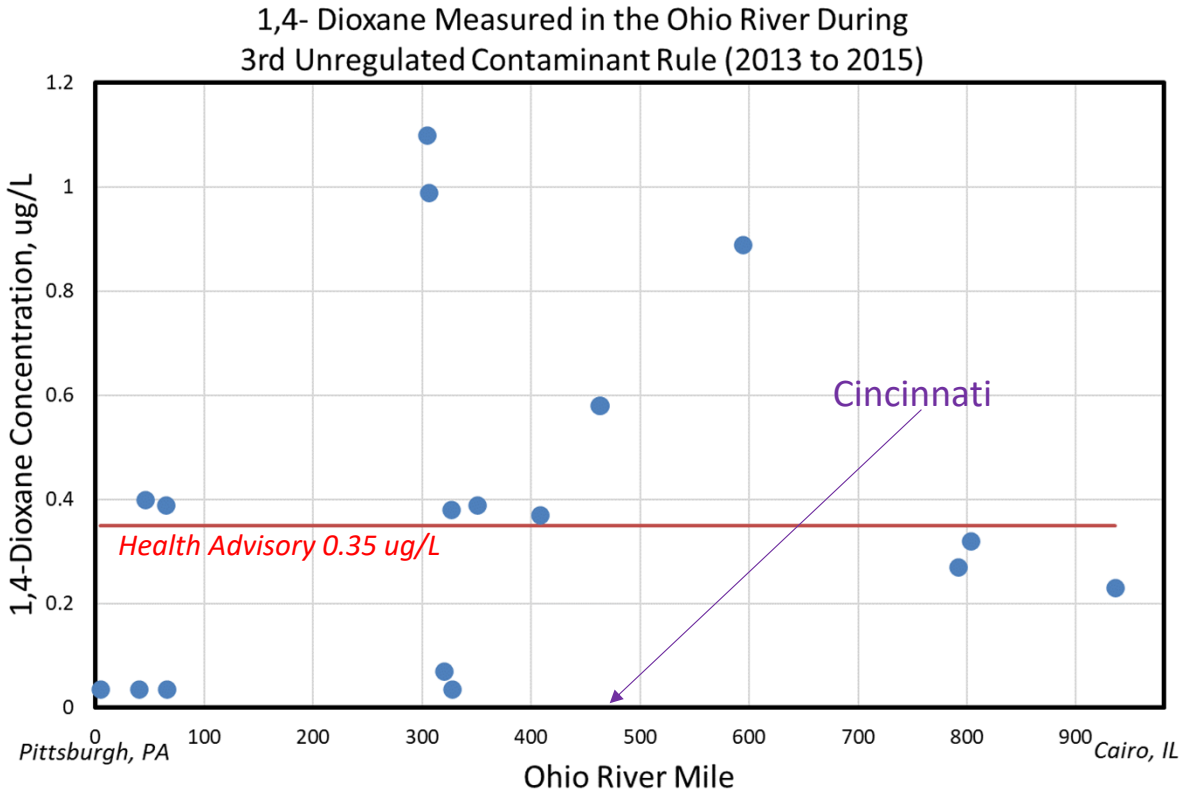
California (and others)
- prohibiting 1,4-D in Consumer Products and Cosmetics



Ohio River Drinking Water Utilities' 1,4-Dioxane Concentrations (UCMR3)

A Service of The City of Cincinnati
GREATER CINCINNATI WATER WORKS

1,4-Dioxane was detected in 15 of the 22 utilities using the Ohio River as their source water (68%).

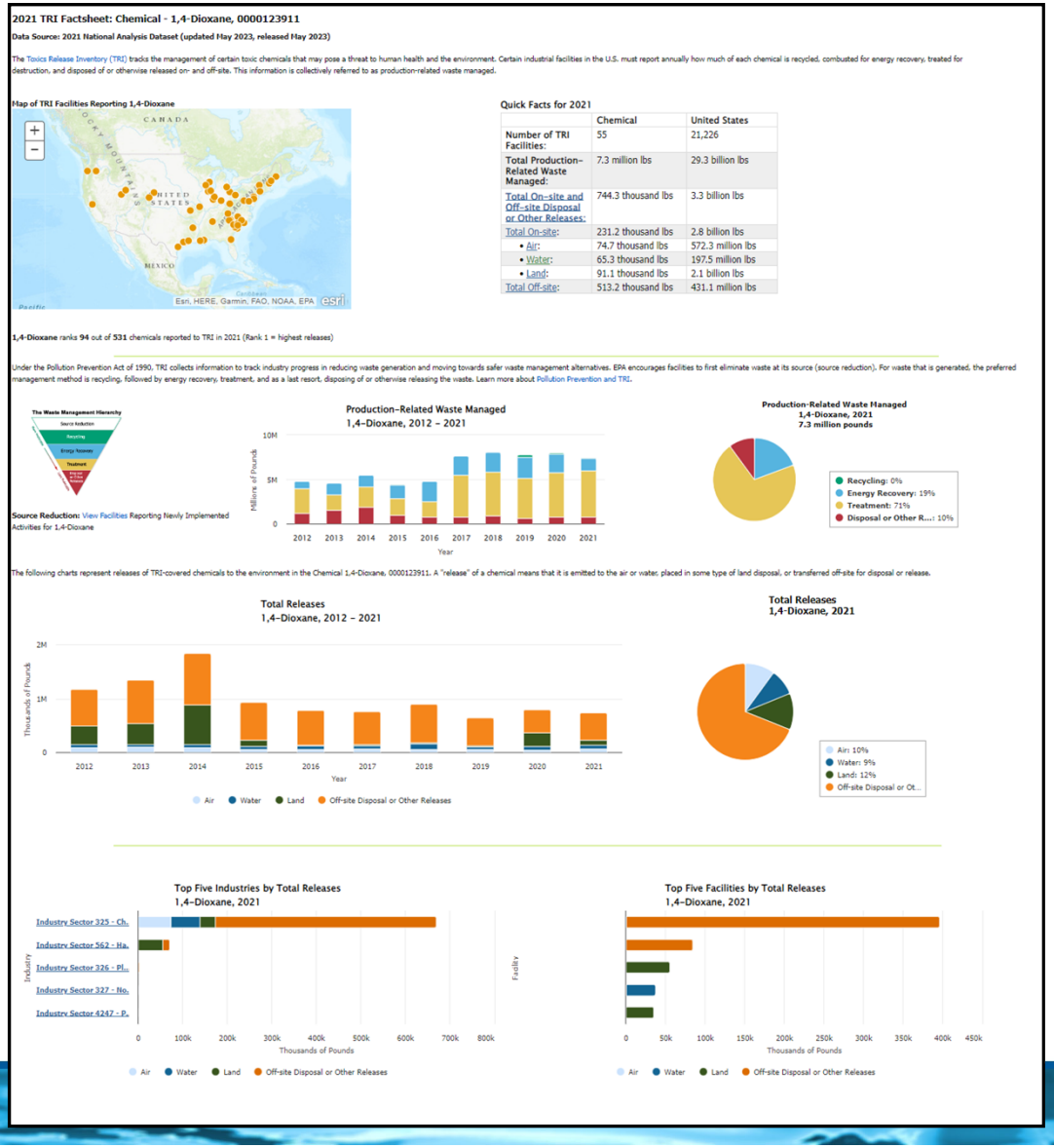


Toxics Release Inventory (TRI)

TRI Explorer
National Report/
Factsheet

Single Chemical Report
(1,4-Dioxane)

https://www.epa.gov/toxics-release-inventory-tri-program/tri-data-and-tools



2021 TRI Factsheet: Chemical - 1,4-Dioxane, 0000123911

Data Source: 2021 National Analysis Dataset (updated May 2023, released May 2023)

The Toxics Release Inventory (TRI) tracks the management of certain toxic chemicals that may pose a threat to human health and the environment. Certain industrial facilities in the U.S. must report annually how much of each chemical is recycled, combusted for energy recovery, treated for destruction, and disposed of or otherwise released on- and off-site. This information is collectively referred to as production-related waste managed.

Map of TRI Facilities Reporting 1,4-Dioxane

Quick Facts for 2021

	Chemical	United States
Number of TRI Facilities:	55	21,226
Total Production-Related Waste Managed:	7.3 million lbs	29.3 billion lbs
Total On-site and Off-site Disposal or Other Releases:	744.3 thousand lbs	3.3 billion lbs
Total On-site:	231.2 thousand lbs	2.8 billion lbs
• Air:	74.7 thousand lbs	572.3 million lbs
• Water:	65.3 thousand lbs	197.5 million lbs
• Land:	91.1 thousand lbs	2.1 billion lbs
Total Off-site:	513.2 thousand lbs	431.1 million lbs

1,4-Dioxane ranks **94** out of **531** chemicals reported to TRI in 2021 (Rank 1 = highest releases)

Under the Pollution Prevention Act of 1990, TRI collects information to track industry progress in reducing waste generation and moving towards safer waste management alternatives. EPA encourages facilities to first eliminate waste at its source (source reduction). For waste that is generated, the preferred management method is recycling, followed by energy recovery, treatment, and as a last resort, disposing of or otherwise releasing the waste. Learn more about Pollution Prevention and TRI.

Source Reduction: View Facilities Reporting Newly Implemented Activities for 1,4-Dioxane

Production-Related Waste Managed
1,4-Dioxane, 2012 – 2021

Production-Related Waste Managed
1,4-Dioxane, 2021
7.3 million pounds

The following charts represent releases of TRI-covered chemicals to the environment in the Chemical 1,4-Dioxane, 0000123911. A "release" of a chemical means that it is emitted to the air or water, placed in some type of land disposal, or transferred off-site for disposal or release.

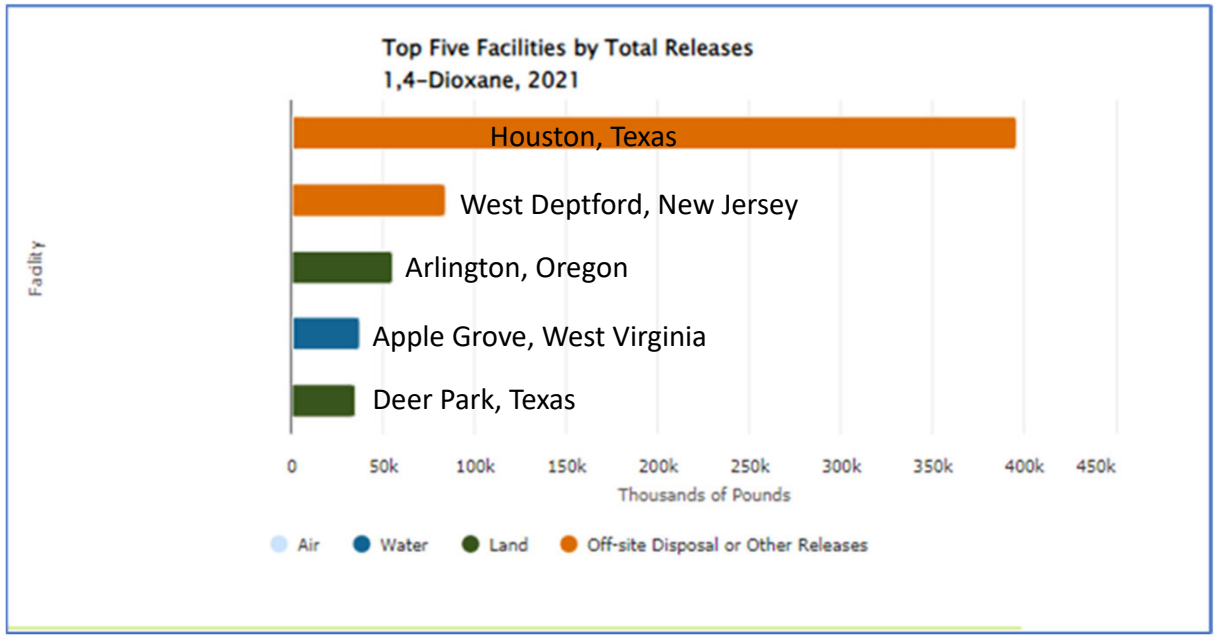
Total Releases
1,4-Dioxane, 2012 – 2021

Total Releases
1,4-Dioxane, 2021

Top Five Industries by Total Releases
1,4-Dioxane, 2021

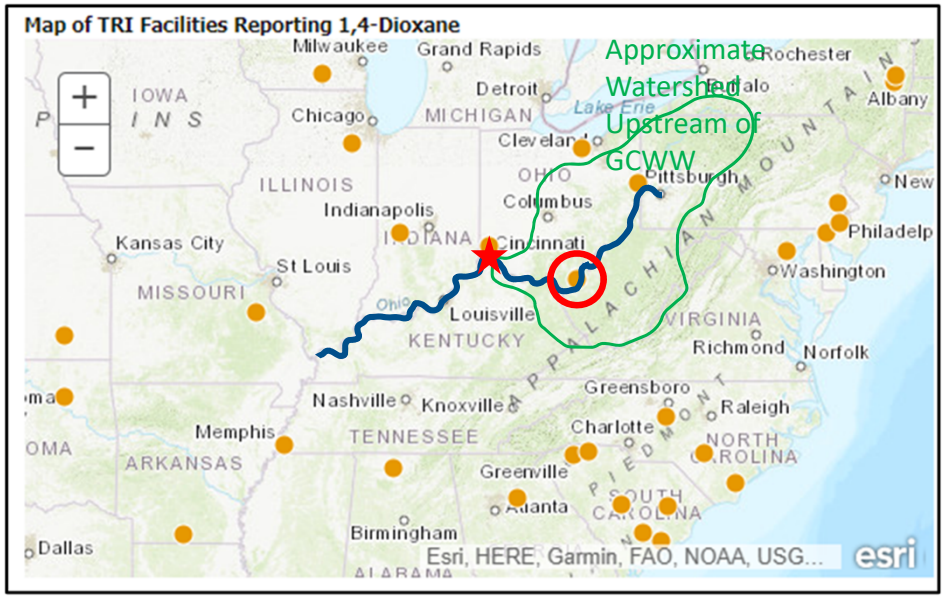
Top Five Facilities by Total Releases
1,4-Dioxane, 2021

Potential Sources of 1,4-Dioxane in the Environment



1,4-Dioxane – Reporting Facilities

GCWW used available data and permits to identify a significant point source of 1,4-dioxane in the Ohio River in Apple Grove, WV.



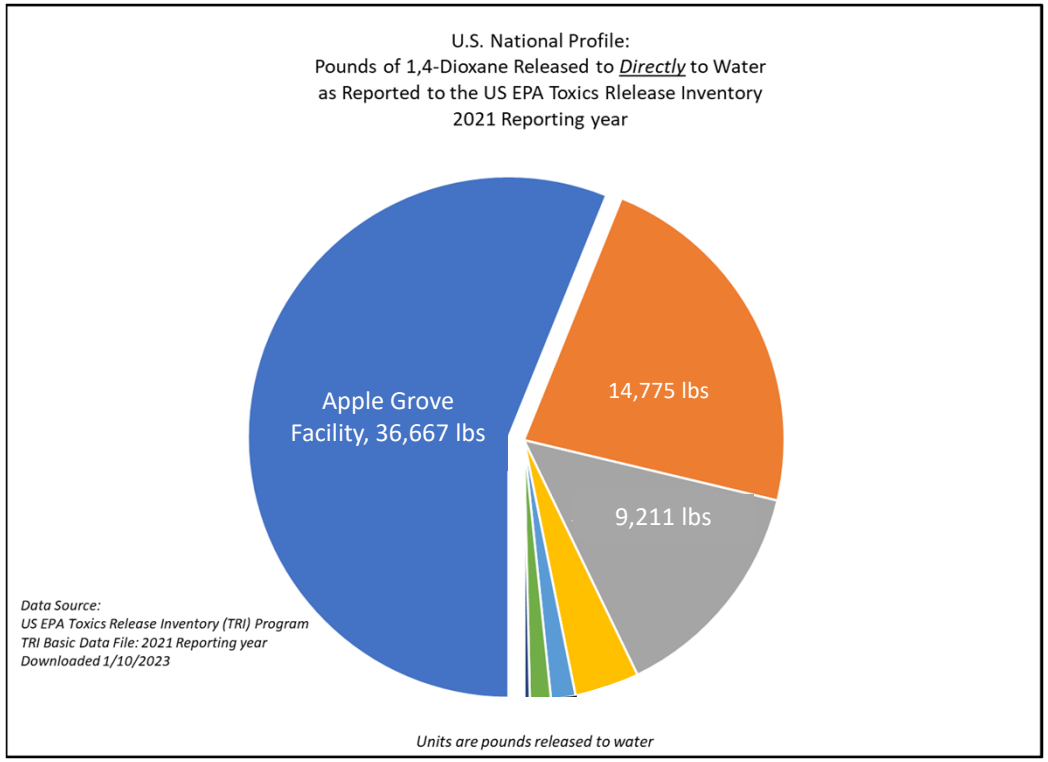
Distance to GCWW:

Apple Grove WV – ORM 281

GCWW – ORM 462

Total Distance = 181 river miles!

Nationwide Industrial Discharges of 1,4-Dioxane Directly to Water



In 2021 – 65,342 lbs of 1,4-dioxane was reported to be released *directly* to water nationally in the TRI.

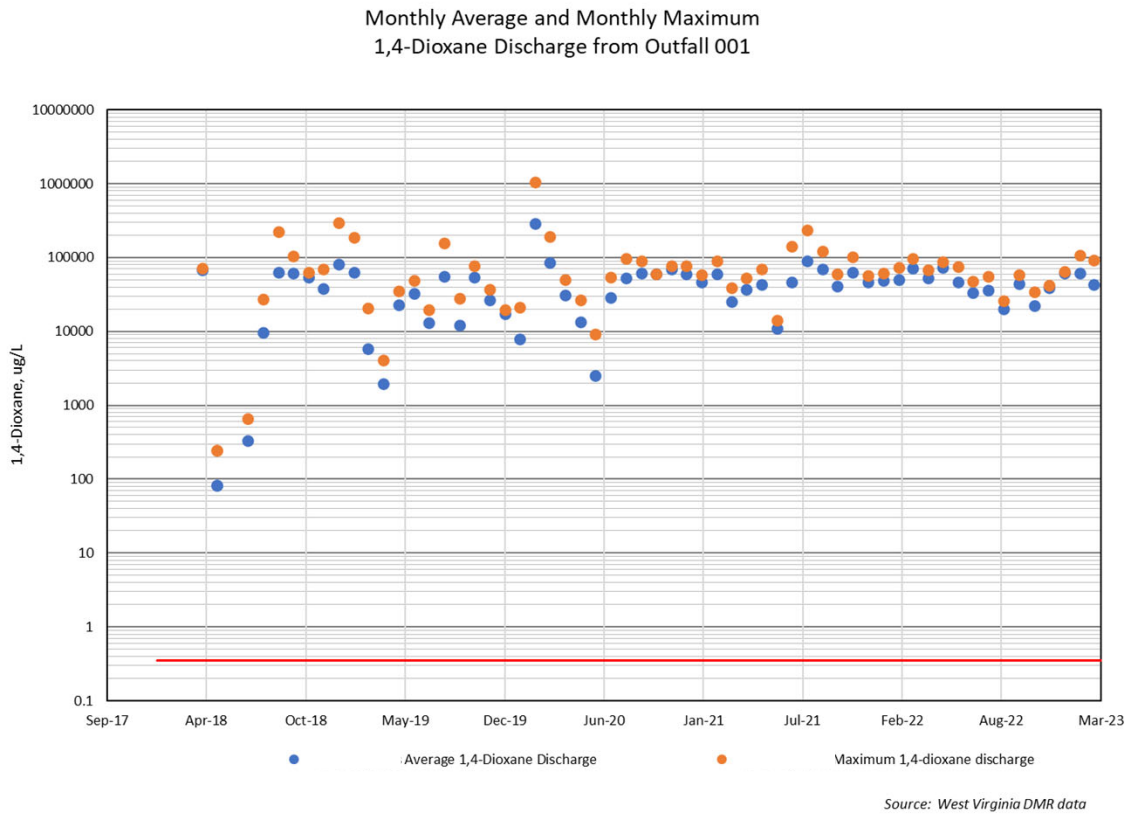
The Apple Grove Facility accounted for 56% of that total

Source: USEPA 2021 TRI Factsheet for 1,4-dioxane

(Note: these data do not include discharges to POTWs which then may discharge to surface waters).

A Service of The City of Cincinnati
GREATER CINCINNATI WATER WORKS

Facility Discharge Concentrations



Source: West Virginia DMR data

2016 - 2021 NPDES Permit and Appeal

A Service of The City of Cincinnati
GREATER CINCINNATI WATER WORKS

2016 NPDES Permit included 1,4-Dioxane effluent limits and a 5-year compliance schedule

Company successfully appealed the permit and received a stay (removal) of the effluent limits from the WV Environmental Quality Board (Board).

The permit and appeal overlapped a bankruptcy in 2017 and new ownership 2018

Appeal resulted in 5 years of no enforceable 1,4-dioxane discharge limits

2021 – 2026 NPDES Permit

A Service of The City of Cincinnati
GREATER CINCINNATI WATER WORKS

- WV DEP issued a Draft NPDES permit for comment in February 2021.
- The draft permit included a 24-month schedule of compliance to meet 1,4-dioxane limits that would be protective of drinking water.
- GCWW, Louisville Water (LWC), West Virginia American Water (WVAW), West Virginia Rivers, and the company provided comments to WV DEP on the draft permit.
- The comments from the water utilities supported WVDEPs effluent limits and requested a shorter compliance schedule (among some other minor issues).
- The Company appealed the permit shortly after it was finalized in 2021 including a motion to vacate the effluent limits

2021 NPDES Permit Appeal

GCWW, WVAW, and LWC successfully recognized as “Intervenors” by the WV Environmental Quality Board – This gave the utilities standing in the appeal.	The Board allowed various parties work toward a settlement and delayed hearings etc.	There were many administrative and legal steps completed by the attorneys for all the parties .
GCWW and the other utilities provided comments and guidance throughout this phase.	Attorney’s provided exceptional insights to the Clean Water Act process and what was possible under that statute.	Slow progress was made over roughly 18 months. A looming Board Hearing Date and finally resulted in an Agreed Order.

So, What Was the End Result

- Consent Order
- Settlement Agreement
- Effluent limits went into effect on June 30, 2023
- Revised Compliance Schedule for Installation of a Treatment System
- Stipulated penalties (including a lump sum for previous violations)
- Withdrawal of all outstanding appeals, including the request to vacate the limits in the 2021 permit
- By 2024 – there will be a 99% reduction of this discharge of 1,4-Dioxane

Final Words

Without the utility involvement, the Company may have won their appeal as they did in the earlier permit cycle, resulting in at least 5 additional years of no effluent limits for 1,4-dioxane.

The permit and order will reduce the 1,4-dioxane loading to the Ohio River from this facility from over 100 lbs per day to less than 1 lb per day.

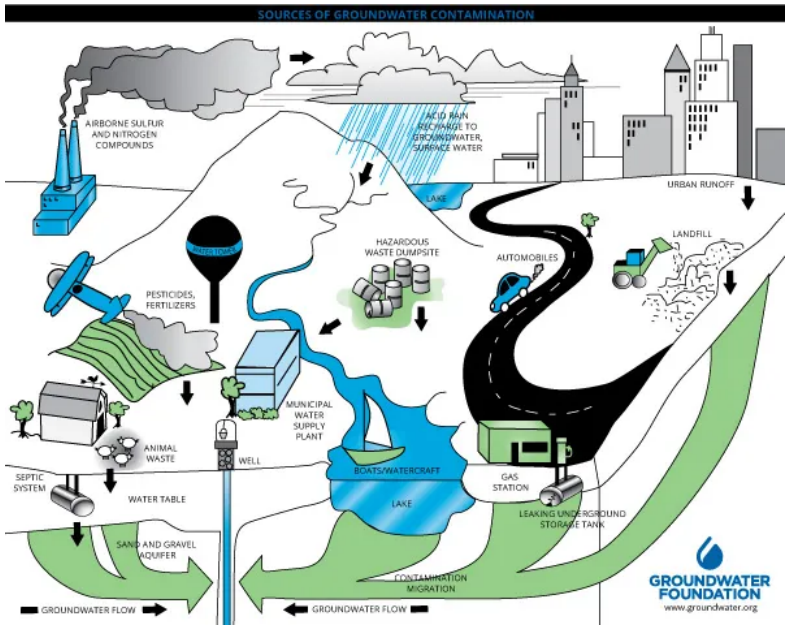
Successfully shifted the burden of treatment to the polluter and away from the drinking water ratepayers to substantially reduce exposure to a probable human carcinogen through drinking water.

The use of TRI and other data allowed drinking water utilities to affect a positive outcome hundreds of miles away and in a different state!

Bringing this Back to Groundwater

Possible Regulatory Programs That Can Help:

- CWA
- CAA
- RCRA
- CERCLA
- EPCRA
- SDWA
- FIFRA
- Ag. Programs
- US ACE
- State/County Health Departments



Available Data That Can Help:

- EPCRA Tier II Data
- TRI Annual Reports
- ECHO Database
- State LUST Lists
- "Envirofacts" Website
- USGS – NAWQA
- LEPCs/SERCs
- Other State, Local, Conservation Agencies
- NRCS/Ohio Farm Bureau

and Many More

Richard Stuck, P.G.
Source Water Protection Manager
Greater Cincinnati Water Works
513-624-5659
richard.stuck@gcww.cincinnati-oh.gov

Greater Cincinnati Source Water Protection page:
https://www.cincinnati-oh.gov/water/water-quality-and-treatment/water-sources-resource-protection/

Ohio River Source Water Alliance page:
https://orswa.org/