

Master of Public Health
Applied Practice Experience

***COMMUNICATING WASTEWATER SURVEILLANCE
INFORMATION IN MONTANA***

by

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MPH Candidate

submitted in partial fulfillment of the requirements for the degree

MASTER OF PUBLIC HEALTH

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Chapter 1 - Portfolio Products

I completed my Applied Practice Experience (APE) with the Communicable Disease Epidemiology Section (CDEpi) in Helena, Montana, at the Montana Department of Public Health and Human Services from September 4th through October 20th, 2023. The CDEpi section provides support to the local and tribal health jurisdictions in Montana during their public health efforts to investigate communicable disease cases and outbreaks. The section's mission is "to create, maintain, support, and strengthen routine surveillance and detection systems and epidemiological investigation processes, as well as to expand these systems and processes in response to incidents of public health significance" (Montana Department, n.d.).

My responsibilities included attending triweekly CDEpi and adjacent section calls, weekly Public Health and Safety Division meetings, monthly National Wastewater Surveillance System (NWSS) Health Department Community of Practice calls, and monthly Regional NWSS led by Colorado's Centers of Excellence site. The NWSS team is a part of the Centers for Disease Control and Prevention (CDC). It was also my responsibility to gather the wastewater surveillance data from two laboratories in Montana and report to NWSS through the Data Collation and Integration for Public Health Event Response (DCIPHER) portal. Additionally, I onboarded new sites for wastewater surveillance testing with a variety of stakeholders. I also attended the Water Environment Federation's Wastewater Surveillance Disease Summit virtually on October 1, 2023.

During my APE, I produced multiple products to further progress Montana's wastewater program and communicate wastewater surveillance information to the public. I designed the Montana Wastewater Surveillance web page (see Appendix A), created eleven social media posts (see Appendix B), analyzed SARS-CoV-2 trends in wastewater to trends of reported cases for two sites (see Appendix C), and created a flow chart of the wastewater surveillance program process and the stakeholders involved (see Appendix D).

Table 1.1 Summary of Portfolio Products

Portfolio Product		Description
1	Montana Wastewater Surveillance Web Page	This is a public web page on the Montana Department of Public Health and Human Services main website. The web page includes information about what wastewater surveillance is, how it works, its importance in public health action, our MT data, a contact/comment section, and frequently asked questions. (see Appendix A)

2	Wastewater Surveillance Social Media Posts	Eleven social media posts were created to communicate to the public about the change in wastewater surveillance trends. (see Appendix B). Four posts with the Montana Public Health in the 406 Communicable Disease Epidemiology logo are to be used as references for the local or tribal health jurisdictions. The logo free posts for COVID-19 and for any other disease can be edited and used by any jurisdiction (county or tribe) participating in wastewater surveillance to inform their community members about increased levels of disease in their town or community through social media. (see Appendix B).
3	Analyses of Trends of SARS-CoV-2 in Wastewater to Case, Hospitalization, and Death Trends in Two Sites in Montana	SARS-CoV-2 concentration trends in the wastewater for Helena and East Helena from August 18, 2020, through August 18, 2023, were compared to reported cases. (see Appendix C)
4	Progress Mapping - Flow Chart of Wastewater Surveillance Process	The flow chart was created to describe the wastewater surveillance process and highlights the stakeholders involved. (see Appendix D)

Table 1.2 Portfolio Products and Competency Addressed

Portfolio Product		Number and Competency Addressed	
1	Montana Wastewater Surveillance Web Page	8, 18, 19	• Apply awareness of cultural values and practices to the design or implementation of public health policies or programs. • Select communication strategies for different audiences and sectors. • Communicate audience-appropriate public health content, both in writing and through oral presentation.
2	Wastewater Surveillance Social Media Posts	8, 18, 19	• Apply awareness of cultural values and practices to the design or implementation of public health policies or programs. • Select communication strategies for different audiences and sectors. • Communicate audience-appropriate public health content, both in writing and through oral presentation.
3	Analysis of Trends of SARS-CoV-2 in Wastewater to Case, Hospitalization, and Death Trends in Two Sites in Montana	3	• Analyze quantitative and qualitative data using biostatistics, informatics, computer-based programming and software, as appropriate.
4	Progress Mapping - Flow Chart of Wastewater Surveillance Process	21, 22	• Integrate perspectives from other sectors and/or professionals to promote and advance population health. • Apply systems thinking tools to a public health issue. • Process Mapping - using graphics to understand the process for solving public health problems.

Chapter 2 - Competencies

Table 2.1 Summary of MPH Foundational Competencies

Number and Competency		Description
3	<i>Evidence-based Approaches to Public Health</i>	Analyze quantitative and qualitative data using biostatistics, informatics, computer-based programming and software, as appropriate
8	<i>Planning and Management to Promote Health</i>	Apply awareness of cultural values and practices to the design or implementation of public health policies or programs
18	<i>Communication</i>	Select communication strategies for different audiences and sectors
19	<i>Communication</i>	Communicate audience-appropriate public health content, both in writing and through oral presentation
21	<i>Interprofessional and/or Intersectional Practice</i>	Integrate perspectives from other sectors and/or professionals to promote and advance population health
22	<i>Systems Thinking</i>	Apply systems thinking tools to a public health issue - Process Mapping - using graphics to understand the process for solving public health problems

Competency 3 Evidence-based Approaches to Public Health

Researchers across multiple jurisdictions have analyzed their wastewater trends compared to case, hospitalization, and death trends to determine if wastewater surveillance trends forecast clinical cases, hospitalizations, and deaths (National, 2023). To determine if Montana's wastewater surveillance program also demonstrates a forecast for COVID-19 cases in the community, a comparison of trends was performed (see Appendix C). This comparison was between trends of COVID-19 concentrations in the wastewater to the trends of reported COVID-19 cases in Helena and East Helena, Montana, from August 18, 2020, through August 18, 2023. Wastewater data of COVID-19 are based on concentrations of viral copies of SARS-CoV-2 per liter of wastewater analyzed as reported by the Carroll College laboratory. The COVID-19 reported cases were extracted from the Montana Infectious Disease Information System (MIDIS). The analysis showed that based on the collection date of the wastewater samples and the investigation state date of reported cases, both trends increased during the same week thus the wastewater data in Helena and East Helena did not forecast reported cases. This information highlighted multiple different areas needed for improvement in Montana's wastewater surveillance program to better capture changes in trends of COVID-19 cases in the community as well as to inform public health action. These findings were presented to the CDEpi and adjacent sections at their October 16th, 2023, meeting.

Competency 8 Planning and Management to Promote Health

There are multiple ways that this ILE/APE project applied this competency. Many Montanans value both physical privacy and privacy with their health data. The wastewater samples, both past and present samples, are from a community rather than from an individual, thus their individual privacy is protected while still providing important community-based information to public health (Centers, 2023). When sites were onboarded for testing, it was imperative to include the tribal nations. Montana is home to twelve tribal nations and seven reservations (Division, 2015). Tribal nations are a large part of Montana's history and culture and need to be represented in the wastewater surveillance program. Additionally, social media posts were selected to distribute weekly wastewater data directly to affected communities. A 2019 survey was conducted by the Greater Montana Foundation to understand Montanans usage and interaction with news and media. These researchers found that 76% of surveyed Montanans reported using social media daily (Greater, 2019). Facebook was also reported as the most used (40%) social media platform for news and other information followed by Instagram (10%) (Greater, 2019). Thus, the eleven created social media posts during the APE/ILE project provided a way for community members to receive pertinent COVID-19 data from their wastewater where they were already viewing other information (see Appendix B). As for the website, since privacy is important to Montanans, that value was mentioned by and reassured based on information provided by the website (see Appendix A).

Competency 18 & 19 Communications

The audiences to communicate wastewater surveillance data include, but are not limited to, wastewater treatment plant operators, health departments (state, local, tribal, and territorial), community members, laboratorians, computer scientists, news and social media correspondents, and government officials (National, 2023). A multidisciplinary approach is required for wastewater surveillance to be implemented efficiently. Direct and frequent communication is needed from all parties, especially health departments and the wastewater treatment plant operators (National, 2023). Therefore, a quarterly report and virtual meetings for wastewater treatment plant operators, laboratorians, and local and tribal health jurisdictions hosted by the state health department was identified through this ILE/APE project as an important communication strategy for these audiences. Future quarterly reports and virtual meetings will be created and implemented separately from this ILE/APE project. These quarterly reports and meetings will allow for these disciplines to engage with each other to delve into in-depth communication about trends, lessons learned, and best practices.

To accomplish effective communication with all audiences in Montana, a public facing web page on Montana's Department of Public Health and Human Services website was designed, published, and updated frequently to provide timely information (see Appendix A). For weekly communications with the community members, social media posts were created during this ILE/APE project with the intent for the local and tribal health jurisdictions to post this information on their social media pages (e.g., Facebook) with weekly updates on the COVID-19 wastewater surveillance trends (see Appendix B). Both the website and social media posts were ADA (Accessibility and Disability Act) compliant and used common language to be easily understood by the general public.

Competency 21 Interprofessional and/or Intersectional Practice

Many different methods used in Montana's wastewater surveillance program were integrated from other disciplines. Wastewater sample collection methods for this surveillance program were used from already established collection techniques from the wastewater treatment plants. The testing method, polymerase chain reaction (PCR), that was used was an established laboratory method for the detection of biomarkers from other sample collection sources. The method to compare disease trends in wastewater using excel and pivot tables was applied from epidemiologic methods used to compare other disease trends. Additionally, trends can be communicated using already established social media platforms.

During the onboarding of new sites to participate in the wastewater surveillance program, a variety of stakeholders were involved in the process. This multidisciplinary approach was depicted in the progress mapping flow chart (see Appendix D). Initially, I worked with the CDEpi section lead epidemiologist (my preceptor) and the section supervisor, the fiscal staff, and grant manager to understand the scope of the funds awarded by federal partners under the Epidemiology and Laboratory Capacity for Prevention and Control of Emerging Infectious Diseases (ELC) grant. I then connected interested local or tribal health jurisdictions and their utility partner to a participating testing laboratory. After drafting and distributing the Task Orders (similar to contracts) to the appropriate jurisdiction, I kept the lines of communication open through email and phone calls to ensure that questions or concerns were addressed promptly. Throughout this process I was able to successfully onboard four testing sites under the currently awarded grant funds (Helena, East Helena, Livingston, and Rocky Boy) and began onboarding additional sites. Once sites were ready to report laboratory results, I worked with the jurisdiction, laboratory, federal partners, and other epidemiologists within our division to ensure effective and prompt data reporting of the wastewater data.

Competence 22 Systems Thinking - Progress Mapping

As a public health practice, wastewater surveillance is multidisciplinary in nature. These different disciplines and stakeholders include, but are not limited to, federal partners, epidemiologists, fiscal staff, grant management staff, wastewater treatment plant operators, local and tribal health jurisdictions, laboratorians, courier and shipping staff, computer scientists, community members, news and social media correspondents, and local government officials and tribal councils (National, 2023). Process mapping, through the creation of a flow chart, will help the epidemiologists in CDEpi to understand and effectively communicate the sequence of actions and responses in wastewater surveillance (see Appendix D). CDEpi can use this tool to determine stakeholders that may need to be contacted to participate in their quarterly wastewater meetings and receive the quarterly reports. This flow chart will also help identify where bottlenecks and inefficient steps are present between onboarding a new wastewater surveillance site through reporting the data.

Table 2.2 MPH Foundational Competencies Course Mapping

22 Public Health Foundational Competencies Course Mapping	MPH 701	MPH 720	MPH 754	MPH 802	MPH 818
Evidence-based Approaches to Public Health					
1. Apply epidemiological methods to the breadth of settings and situations in public health practice	x		x		
2. Select quantitative and qualitative data collection methods appropriate for a given public health context	x	x	x		
3. Analyze quantitative and qualitative data using biostatistics, informatics, computer-based programming and software, as appropriate	x	x	x		
4. Interpret results of data analysis for public health research, policy or practice	x		x		
Public Health and Health Care Systems					
5. Compare the organization, structure and function of health care, public health and regulatory systems across national and international settings		x			
6. Discuss the means by which structural bias, social inequities and racism undermine health and create challenges to achieving health equity at organizational, community and societal levels					x
Planning and Management to Promote Health					
7. Assess population needs, assets and capacities that affect communities' health		x		x	
8. Apply awareness of cultural values and practices to the design or implementation of public health policies or programs					x
9. Design a population-based policy, program, project or intervention			x		

22 Public Health Foundational Competencies Course Mapping	MPH 701	MPH 720	MPH 754	MPH 802	MPH 818
10. Explain basic principles and tools of budget and resource management		x	x		
11. Select methods to evaluate public health programs	x	x	x		
Policy in Public Health					
12. Discuss multiple dimensions of the policy-making process, including the roles of ethics and evidence		x	x	x	
13. Propose strategies to identify stakeholders and build coalitions and partnerships for influencing public health outcomes		x		x	
14. Advocate for political, social or economic policies and programs that will improve health in diverse populations		x			x
15. Evaluate policies for their impact on public health and health equity		x		x	
Leadership					
16. Apply principles of leadership, governance and management, which include creating a vision, empowering others, fostering collaboration and guiding decision making		x			x
17. Apply negotiation and mediation skills to address organizational or community challenges		x			
Communication					
18. Select communication strategies for different audiences and sectors	AAI 801				
19. Communicate audience-appropriate public health content, both in writing and through oral presentation	AAI 801				
20. Describe the importance of cultural competence in communicating public health content		x			x
Interprofessional Practice					
21. Perform effectively on interprofessional teams		x			x
Systems Thinking					
22. Apply systems thinking tools to a public health issue			x	x	

References

- Centers for Disease Control and Prevention. (2023, March 14). *National Wastewater Surveillance System*. Centers for Disease Control and Prevention. <https://www.cdc.gov/nwss/wastewater-surveillance.html>).
- Division of Indian Education Montana Office of Public Instruction. (2015). *Montana Indians Their History and Location*. Montana Office of Public Instruction. <https://opi.mt.gov/Portals/182/Page%20Files/Indian%20Education/Indian%20Education%20101/essentialunderstandings.pdf?ver=2018-09-21-121920-993>
- Greater Montana Foundation. (2019, June 27). *Montanans Following of the News*. Town Square. https://townsquare.media/site/119/files/2019/07/GMF-2019Survey_FactSheet_FINAL.pdf
- Montana Department of Health and Human Services (DPHHS). (n.d.). Communicable Disease Epidemiology Section. <https://dphhs.mt.gov/publichealth/cdepi/>
- National Academies of Sciences, Engineering, and Medicine. (2023). *Wastewater-based Disease Surveillance for Public Health Action*. Washington, DC: The National Academies Press. <https://doi.org/10.17226/26767>.

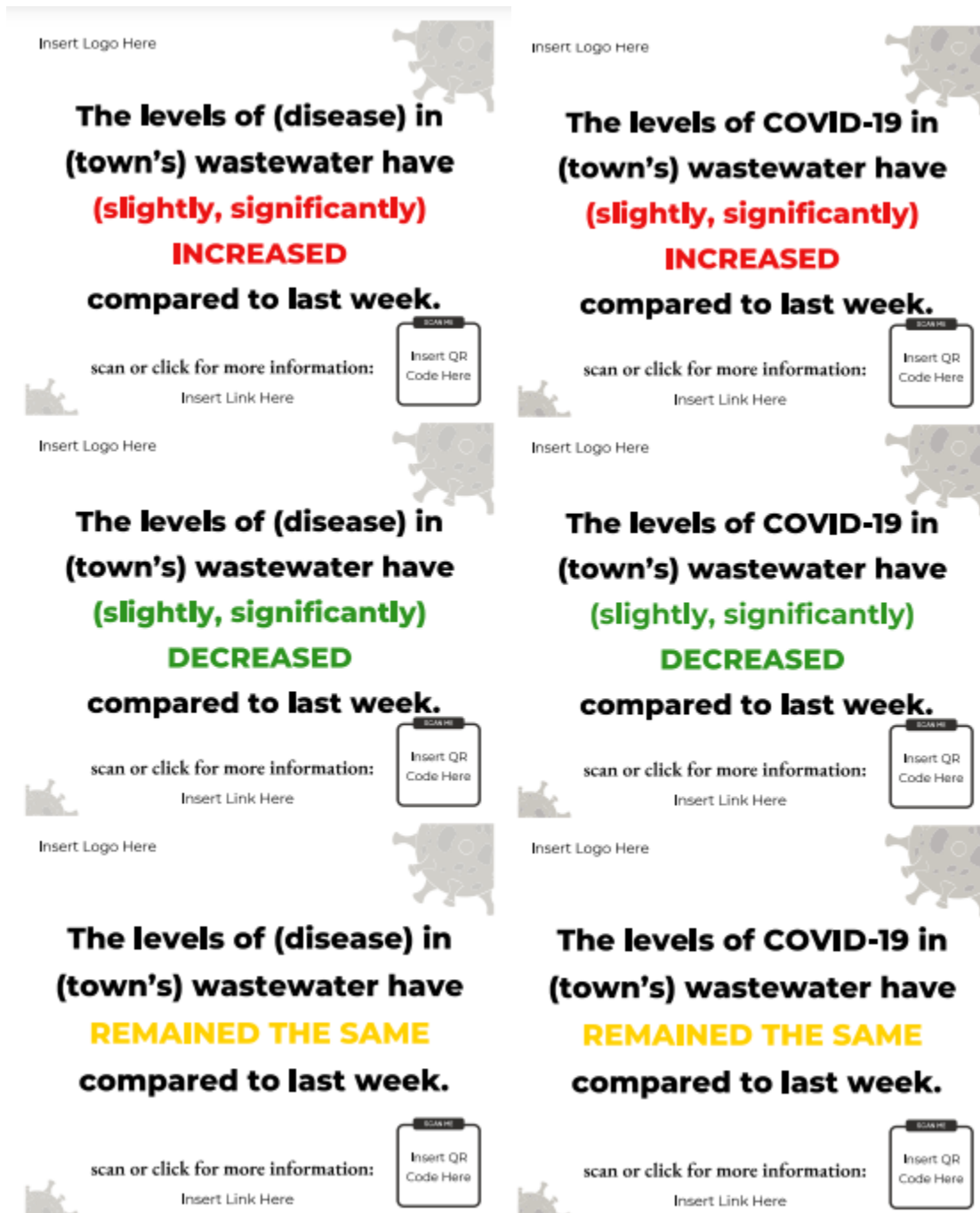
Appendix A - Montana Wastewater Surveillance Web Page

Website Link: <https://dphhs.mt.gov/publichealth/cdepi/diseases/WastewaterSurveillance>

Image of the Webpage



Appendix B - Wastewater Surveillance Social Media Posts





**The levels of COVID-19 in
Montana's wastewater have
SIGNIFICANTLY INCREASED
compared to last week.**

scan or click for more information:

<http://bit.ly/mtdpshsww>



**The levels of COVID-19 in
Montana's wastewater have
SLIGHTLY INCREASED
compared to last week.**

scan or click for more information:

<http://bit.ly/mtdpshsww>



**The levels of COVID-19 in
Montana's wastewater have
SIGNIFICANTLY DECREASED
compared to last week.**

scan or click for more information:

<http://bit.ly/mtdpshsww>



**The levels of COVID-19 in
Montana's wastewater have
REMAINED THE SAME
compared to last week.**

scan or click for more information:

<http://bit.ly/mtdpshsww>



Appendix C - Analysis of the Trends of SARS-CoV-2 in Wastewater to Case Data for Two Sites in Montana

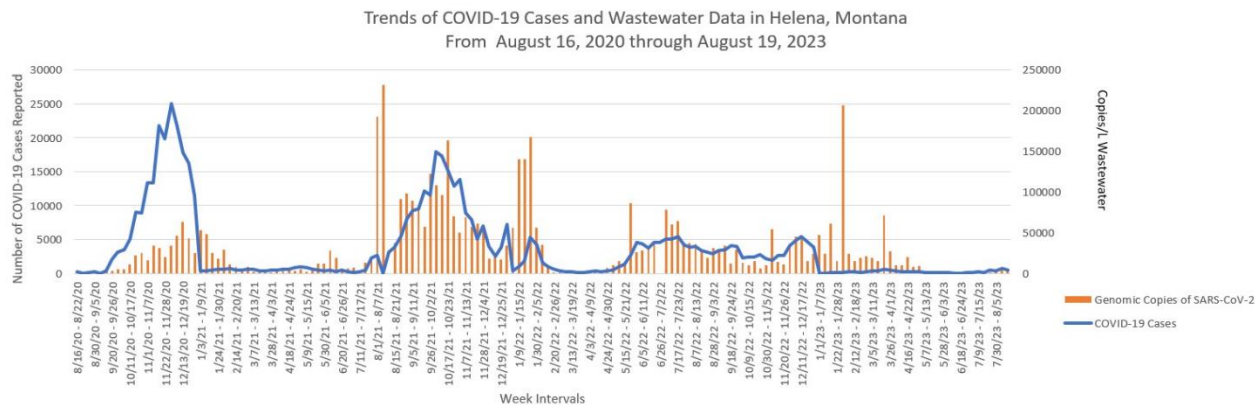


Figure A The trends of reported COVID-19 cases in Helena, Montana, and genomic copies of SARS-CoV-2 per liter of wastewater were graphed together for comparison from August 16, 2020, through August 19, 2023. The reported COVID-19 case data was collected from the Montana Infectious Disease Reporting System (MIDIS). The wastewater surveillance data was analyzed and reported to CDEpi from Carroll College. While the wastewater surveillance data demonstrated here does not forecast COVID-19 cases, it did demonstrate a continued presence of SARS-CoV-2 in the wastewater in January through March 2023 contrary to the minimal amounts of COVID-19 reported cases.

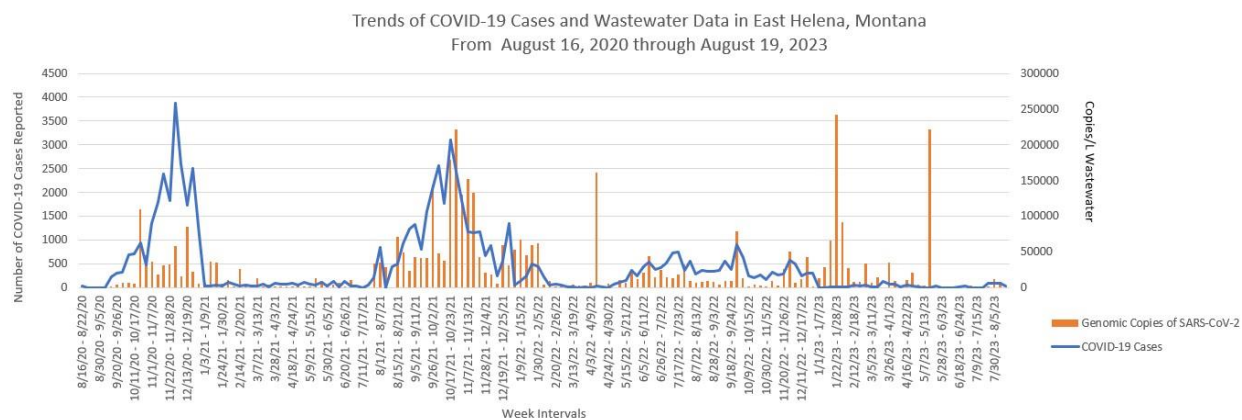


Figure B The trends of reported COVID-19 cases in East Helena, Montana, and genomic copies of SARS-CoV-2 per liter of wastewater were graphed together for comparison from August 16, 2020, through August 19, 2023. The reported COVID-19 case data was collected from the Montana Infectious Disease Reporting System (MIDIS). The wastewater surveillance data was analyzed and reported to CDEpi from Carroll College. While the wastewater surveillance data demonstrated here does not forecast COVID-19 cases, it did demonstrate a continued presence of SARS-CoV-2 in the wastewater in January through March 2023 contrary to the minimal amounts of COVID-19 reported cases.

Appendix D - Progress Mapping - Montana's Wastewater Surveillance Program Flow Chart

MONTANA'S WASTEWATER SURVEILLANCE PROGRAM FLOW CHART



Updated 10/16/2023