

COVID-WEB: Monitoring Wastewater for SARS-CoV-2 in the Bay Area

Sasha Harris-Lovett Ph.D.
University of California, Berkeley

March 4, 2022
North Bay Watershed Association



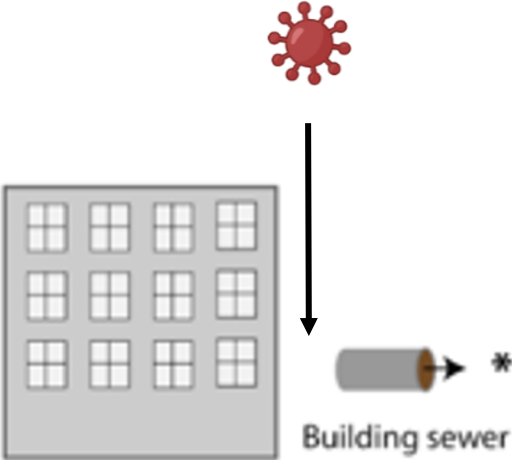
Covid-WEB
Wastewater Epidemiology for the Bay Area



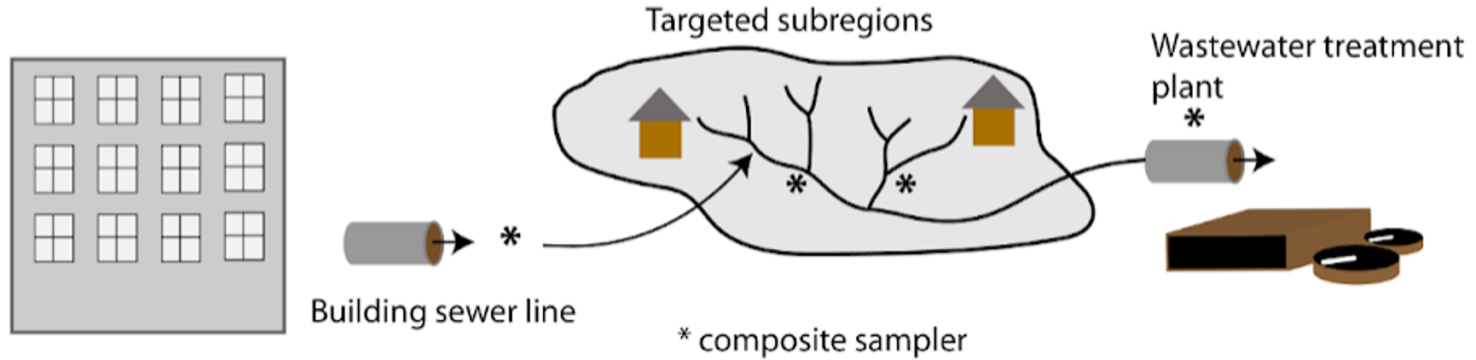
Outline

1. Overview of wastewater-based monitoring for public health
2. COVID-WEB (COVID Wastewater Epidemiology in the Bay Area)
3. Wastewater monitoring going forward

What is Wastewater-Based Epidemiology (WBE)?

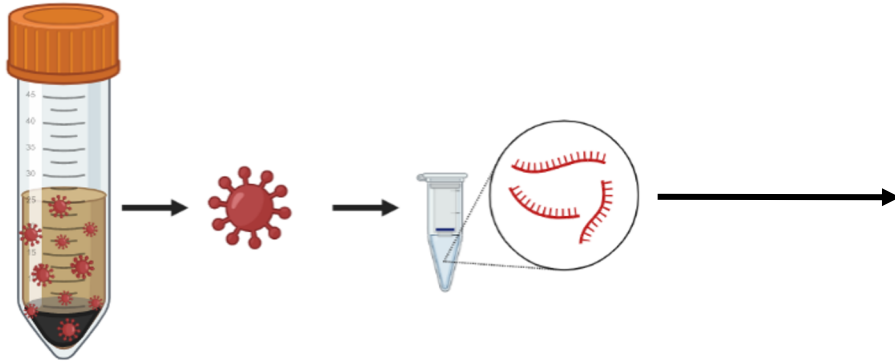


What is Wastewater-Based Epidemiology (WBE)?



Laboratory analysis: Virus concentration, extraction and quantification

Extract RNA/DNA from wastewater sample



Quantify SARS-CoV-2 via RT-qPCR or RT-d/ddPCR



Wastewater monitoring isn't new...

[nature.com](https://www.nature.com)

Sewage provides early warning for polio

2 minutes

-
- RESEARCH HIGHLIGHT
 - 29 March 2017

Viral levels in faeces could be used to detect 'silent' outbreaks.

Polio has been largely eliminated around the world, but it has made comebacks. In Israel, an outbreak in 2013 prompted authorities to launch a campaign to give people the live, oral vaccine. Poliovirus particles are shed in the faeces, and can spread even when infected people do not show symptoms, leading to 'silent'

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[ncbi.nlm.nih.gov](https://www.ncbi.nlm.nih.gov)

Estimating Community Drug Abuse by Wastewater Analysis

Ettore Zuccato, Chiara Chiabrando, Sara Castiglioni, Renzo Bagnati, and Roberto Fanelli

34-44 minutes

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Surveillance of influenza A and the pandemic influenza A (H1N1) 2009 in sewage and surface water in the Netherlands

Leo Heijnen et al. J Water Health. 2011 Sep.

Abstract

The role of the water cycle in spreading human pathogenic influenza viruses is poorly studied and is not considered to be significant. However, gastrointestinal symptoms developed in a large proportion of influenza A (H1N1) 2009 virus infected people during the pandemic in 2009 and fecal shedding was reported. This

...But COVID-19 proved the immediate public health value of wastewater monitoring



[A-Z Index](#)

Healthy Water ▾



[Advanced Search](#)

Waterborne Disease & Outbreak Surveillance Reporting

Waterborne Disease & Outbreak Surveillance



[Home](#) Waterborne Disease & Outbreak Surveillance

Waterborne Disease in the United States +

Detecting and Investigating Waterborne Diseases and Outbreaks +

Systems for Tracking Waterborne Disease and Outbreaks +

National Wastewater Surveillance System (NWSS)

A new public health tool to understand COVID-19's spread in a community

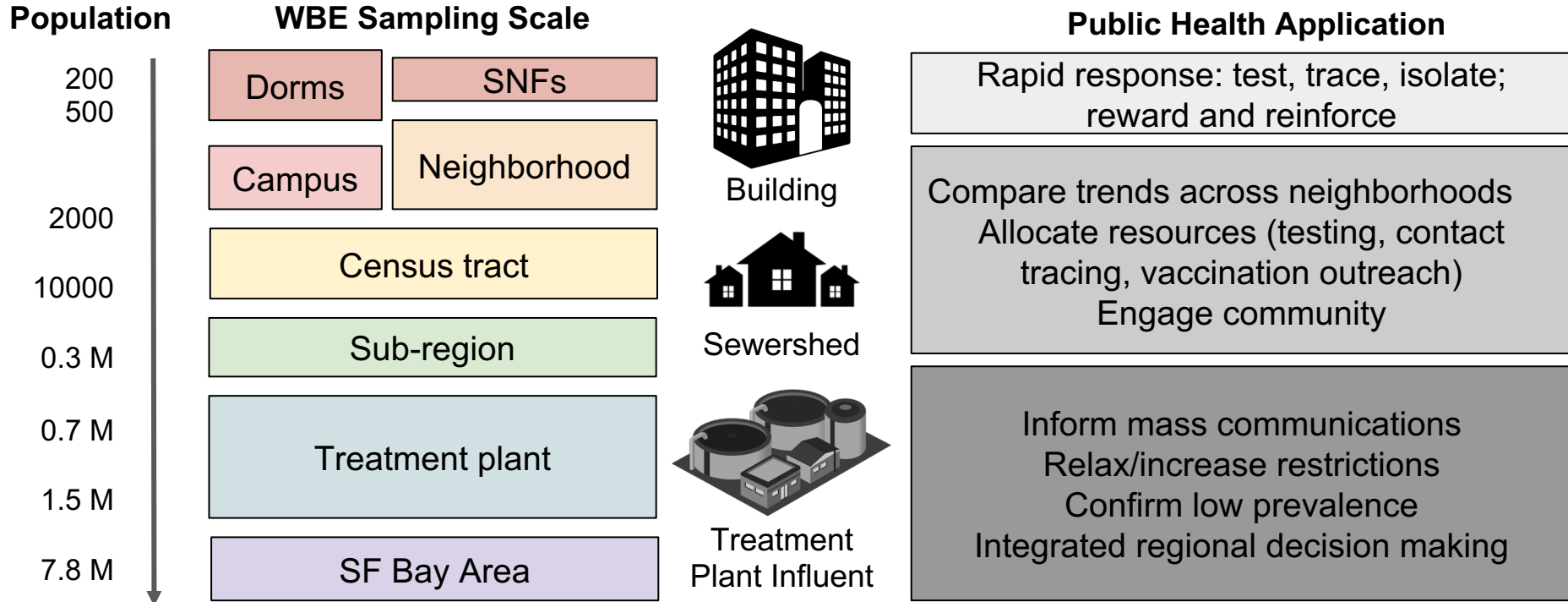
In response to the COVID-19 pandemic, CDC launched the National Wastewater Surveillance System (NWSS) in September 2020. CDC developed NWSS to coordinate and build the nation's capacity to track the presence of SARS-CoV-2, the virus that causes COVID-19, in wastewater samples collected across the country.

On This Page

[How wastewater surveillance works](#)

[Value of wastewater surveillance](#)

How can wastewater help us manage the pandemic?



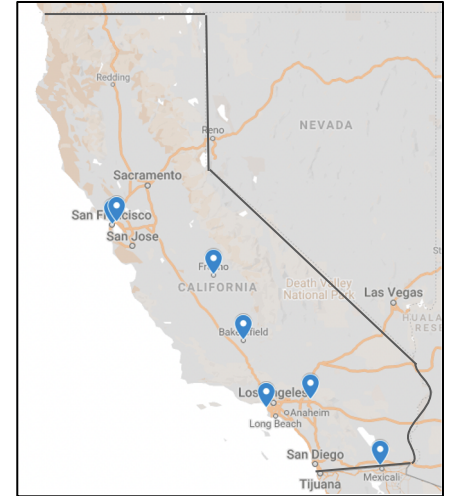
COVID-WEB team

- **Co-leadership:** Dr. Rose Kantor, Prof. Kara Nelson, Dr. Sasha Harris-Lovett
- **Current lab staff:** Joaquin Bradley Silva, Christina Lang, Monica Gurung, Story Sandy, Arisa Chuklin, Mia Vega
- **Past lab staff:** Matthew Metzger, Melissa Thornton, Justin Paluba
- **Ph.D. students:** Hannah Greenwald, Lauren Kennedy, Adrian Hinkle, Alma Bartholow, Oscar Whitney, Vinson Fan, Alex Crits-Christoph and others
- **Undergraduate research apprentices (> 20)**

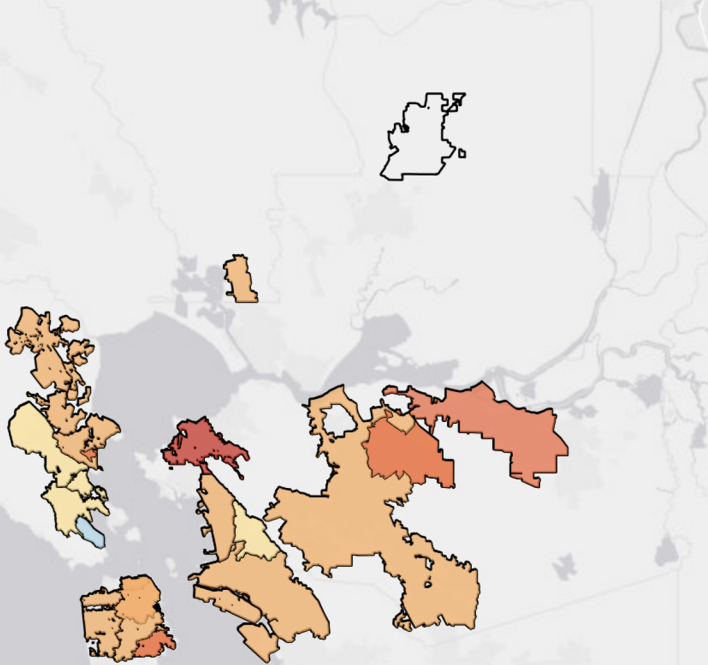


Wastewater-based epidemiology at UC Berkeley: Partnerships

- 47 Sampling sites (sampled 1-4x per week)
- 24 Wastewater agencies and facilities
- 11 County & city public health agencies and state
- Locations:
 - Prisons, residences for the elderly, university student housing
 - Neighborhoods
 - Wastewater treatment facility influents
- >5000 samples processed to date



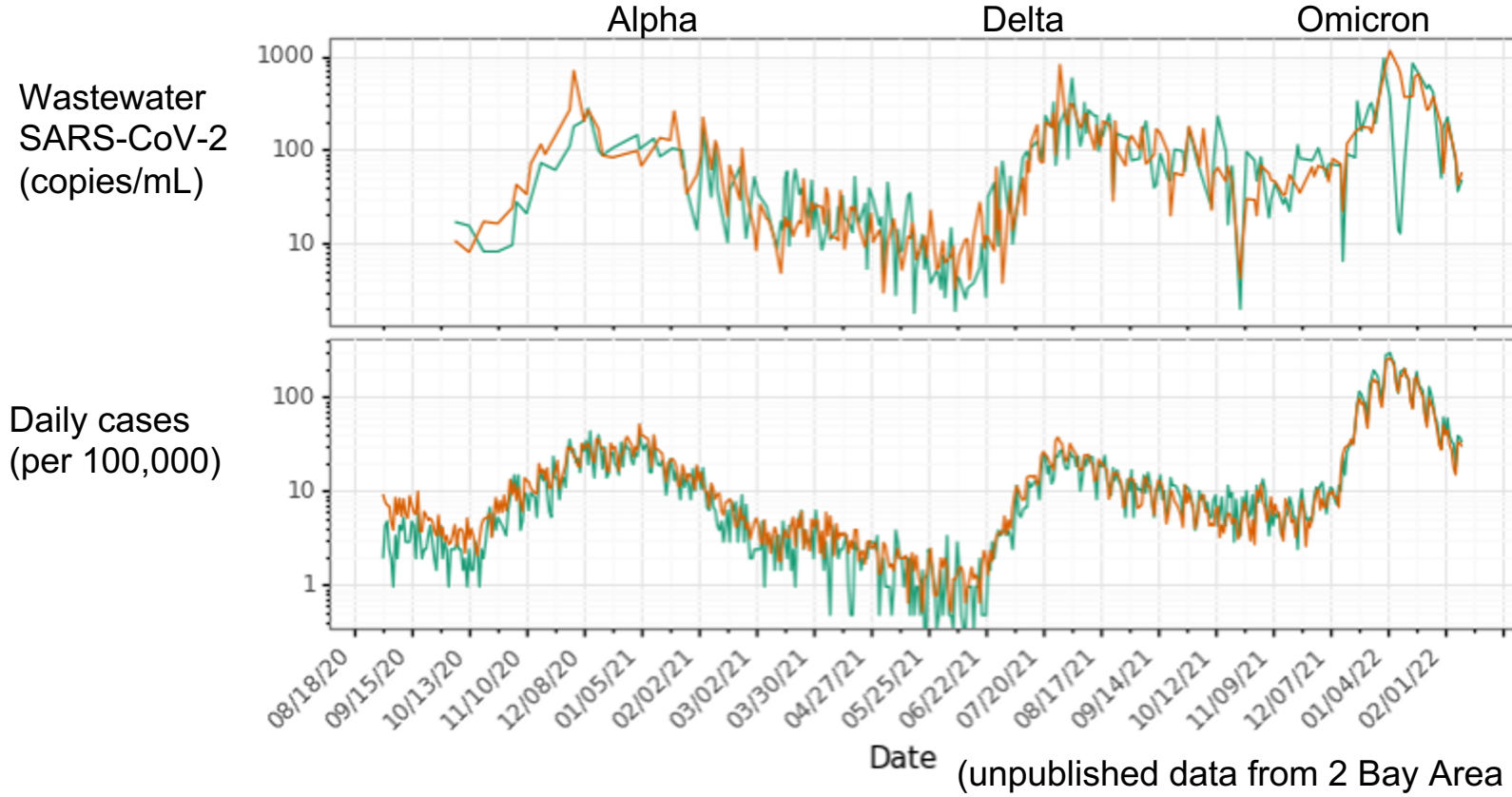
COVID-WEB Bay Area sampling locations



North Bay sites:

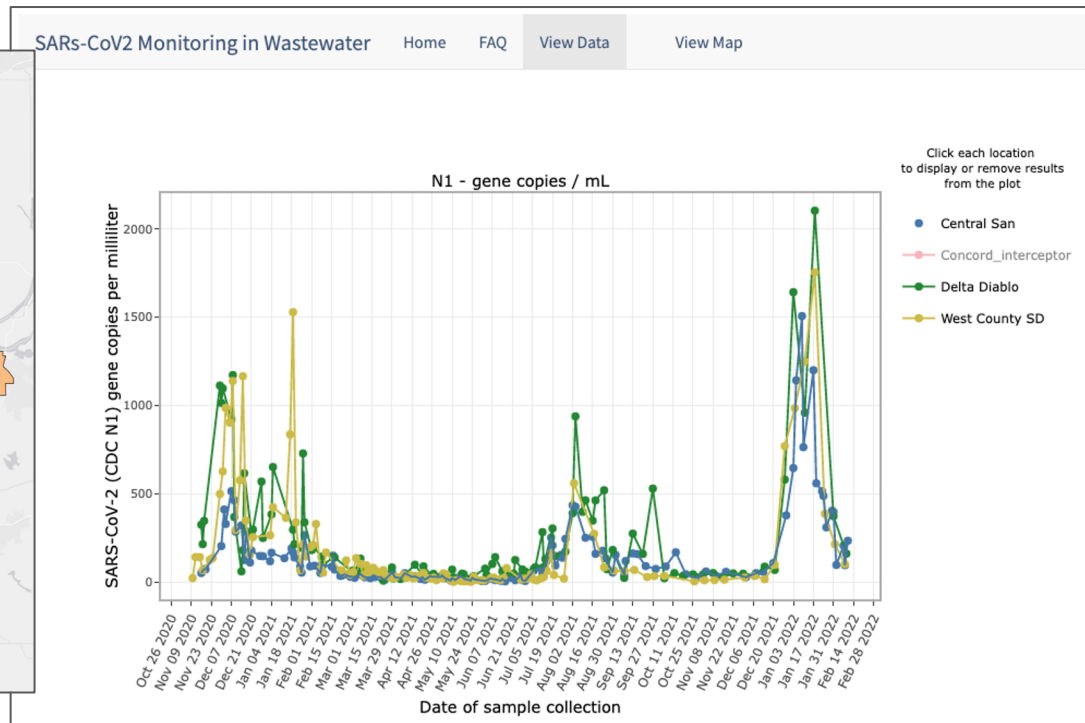
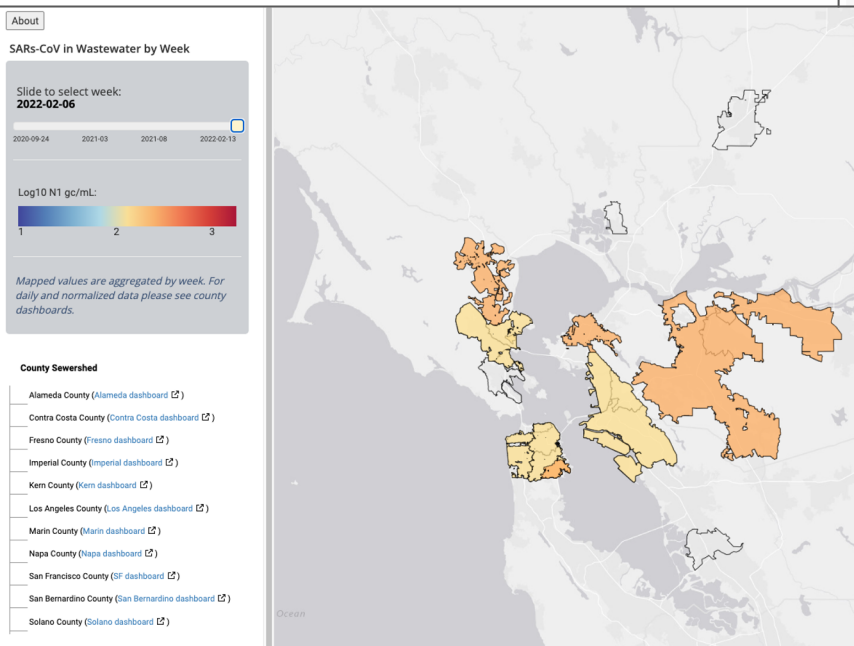
Las Gallinas Sanitary District, Novato Sanitary District, Central Marin Sanitation Agency, Sausalito-Marín City Sanitary District, Sanitary District No. 5, Sewerage Agency of Southern Marin, City of American Canyon, City of Yountville, Veteran's Home, California Medical Facility, San Quentin

Wastewater data aligns with clinical testing data



Visit our data dashboard!

data.covid-web.org



Finally coming out of Omicron surge!

Covid-WEB

Wastewater Epidemiology for the Bay Area



Our mission is to track the spread of COVID-19 in our region. Monitoring wastewater is an efficient method to track COVID-19 because infected individuals shed the SARS-CoV-2 virus in their feces. By testing a sample from a sewer, information is provided about infection levels for an entire community. Wastewater monitoring is complementary to clinical testing because it provides information even for people who are asymptomatic or don't access clinical testing.

[READ THE FAQ.](#)

Select Data for County:

Marin

Select Dates:

2020-10-06

2021-11-29

2022-02-27

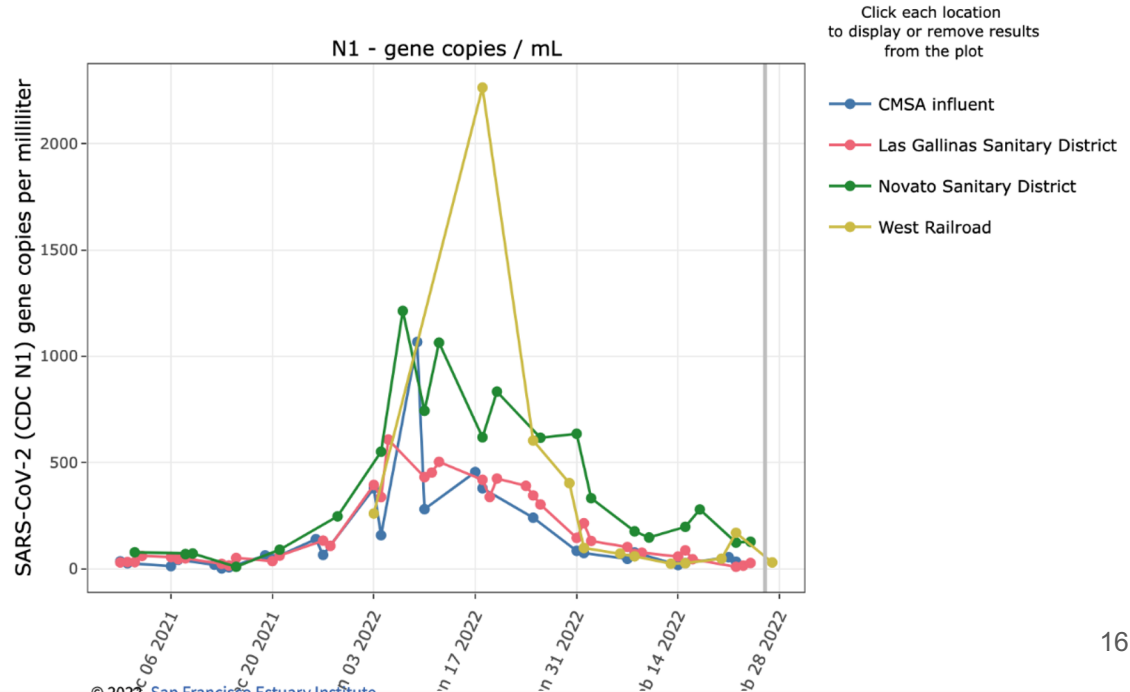
SARs-CoV2 Monitoring in Wastewater

Home

FAQ

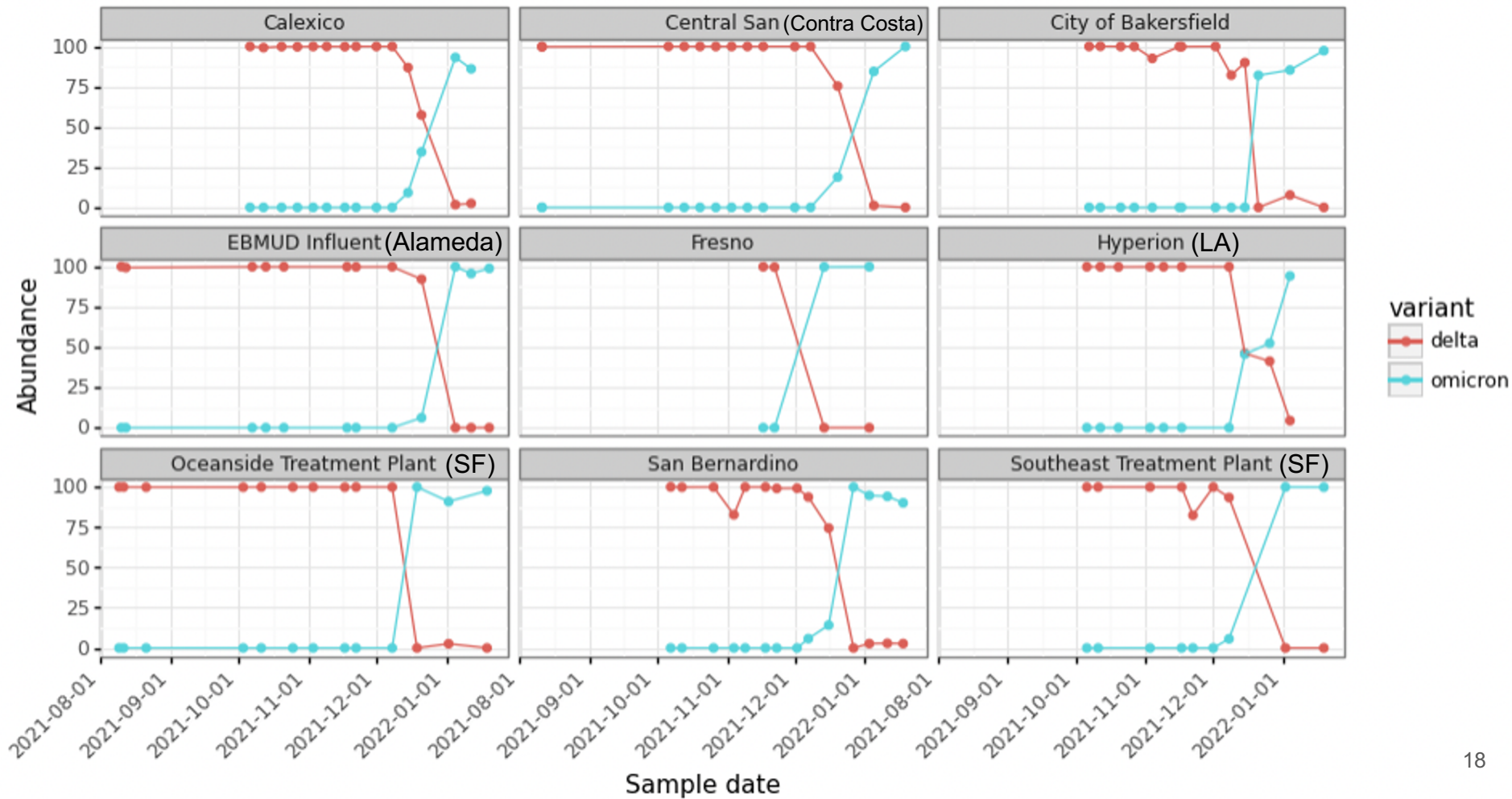
View Data

View Map



Other cool possibilities: Detecting variants of SARS-CoV-2 in wastewater

Targeted sequencing results: shift from Delta to Omicron

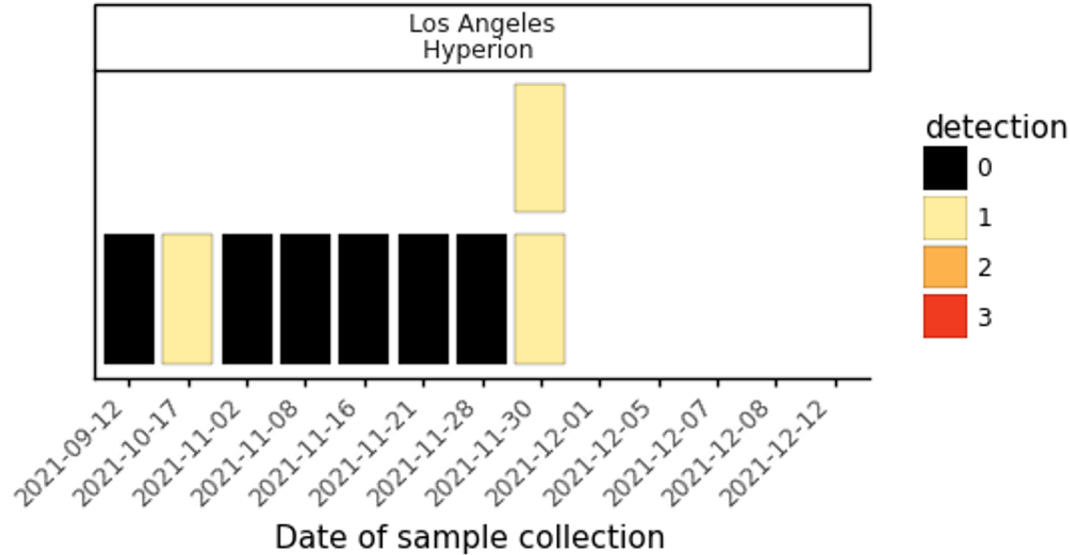


Detecting variants: PCR-based assays

- Specific, sensitive, quantitative
- Fast sample-to-results turnaround time
- Long lead time for development/optimization
- New reagents required

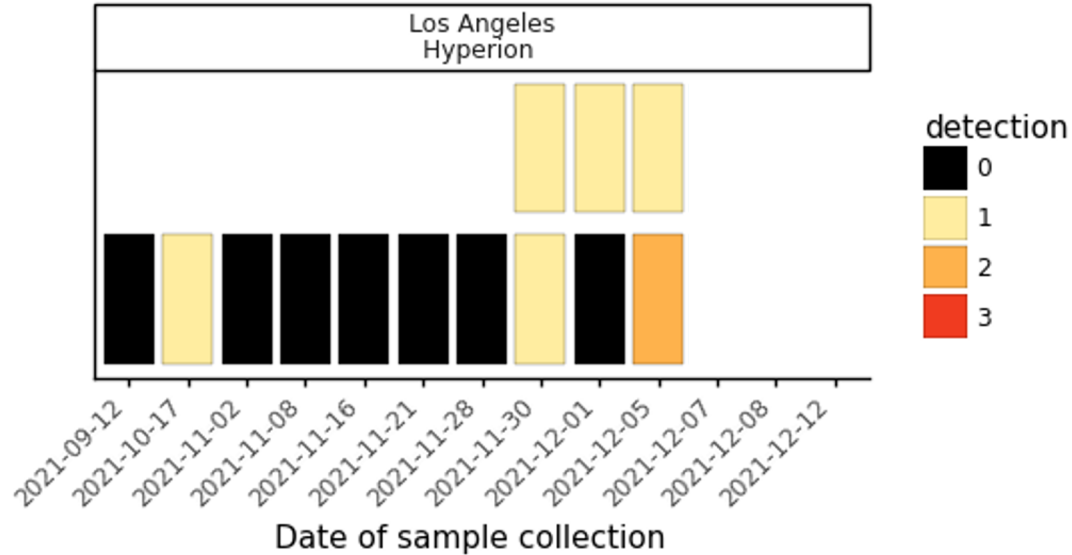
Detecting variants: PCR-based assays

Non-Delta RT-qPCR assay results (T19 wildtype)



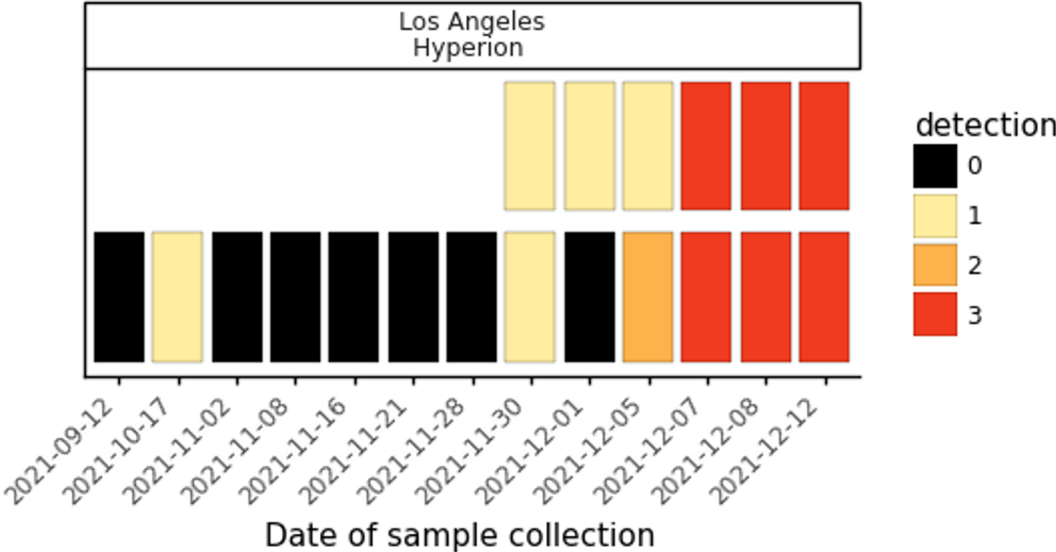
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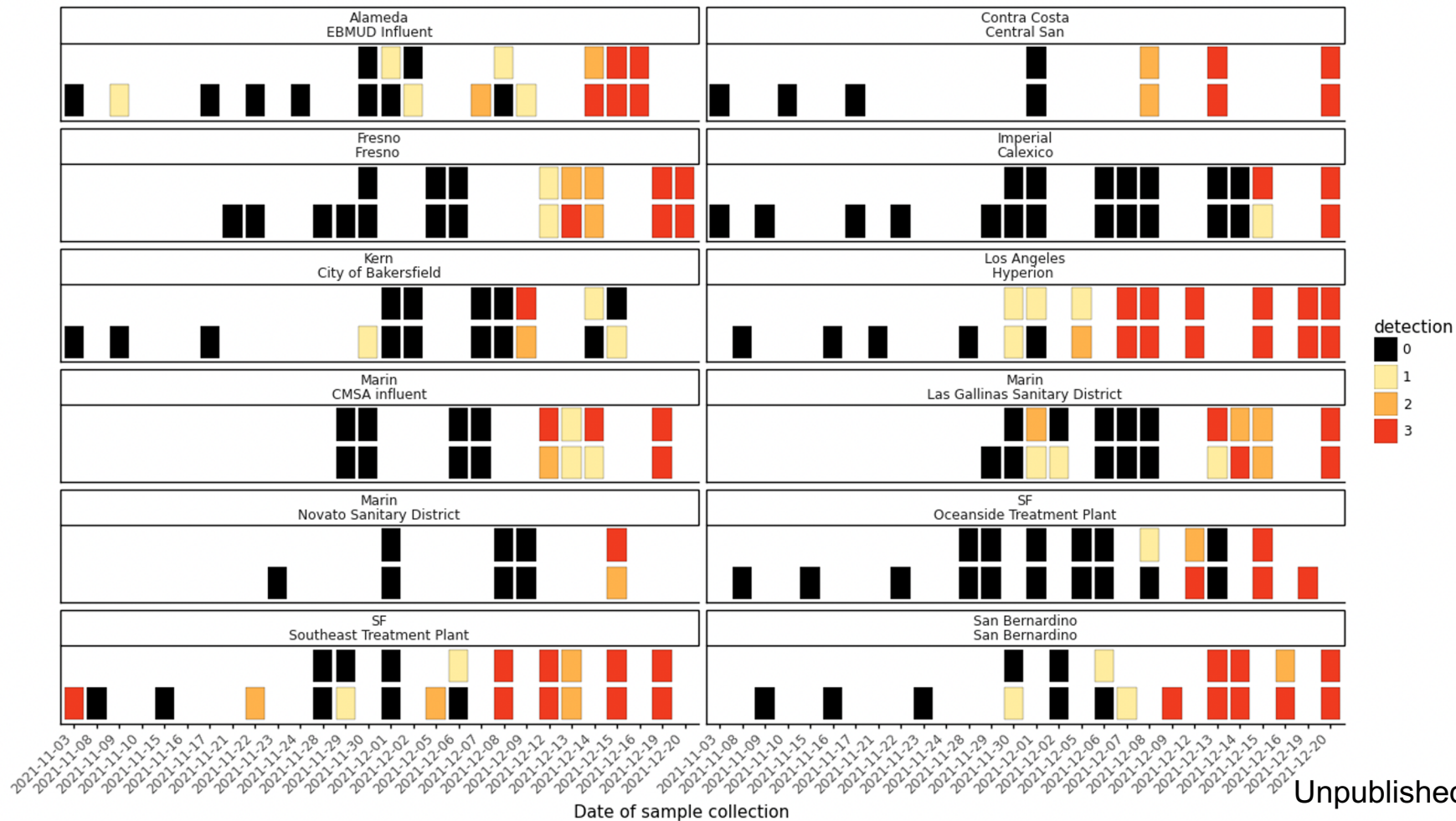
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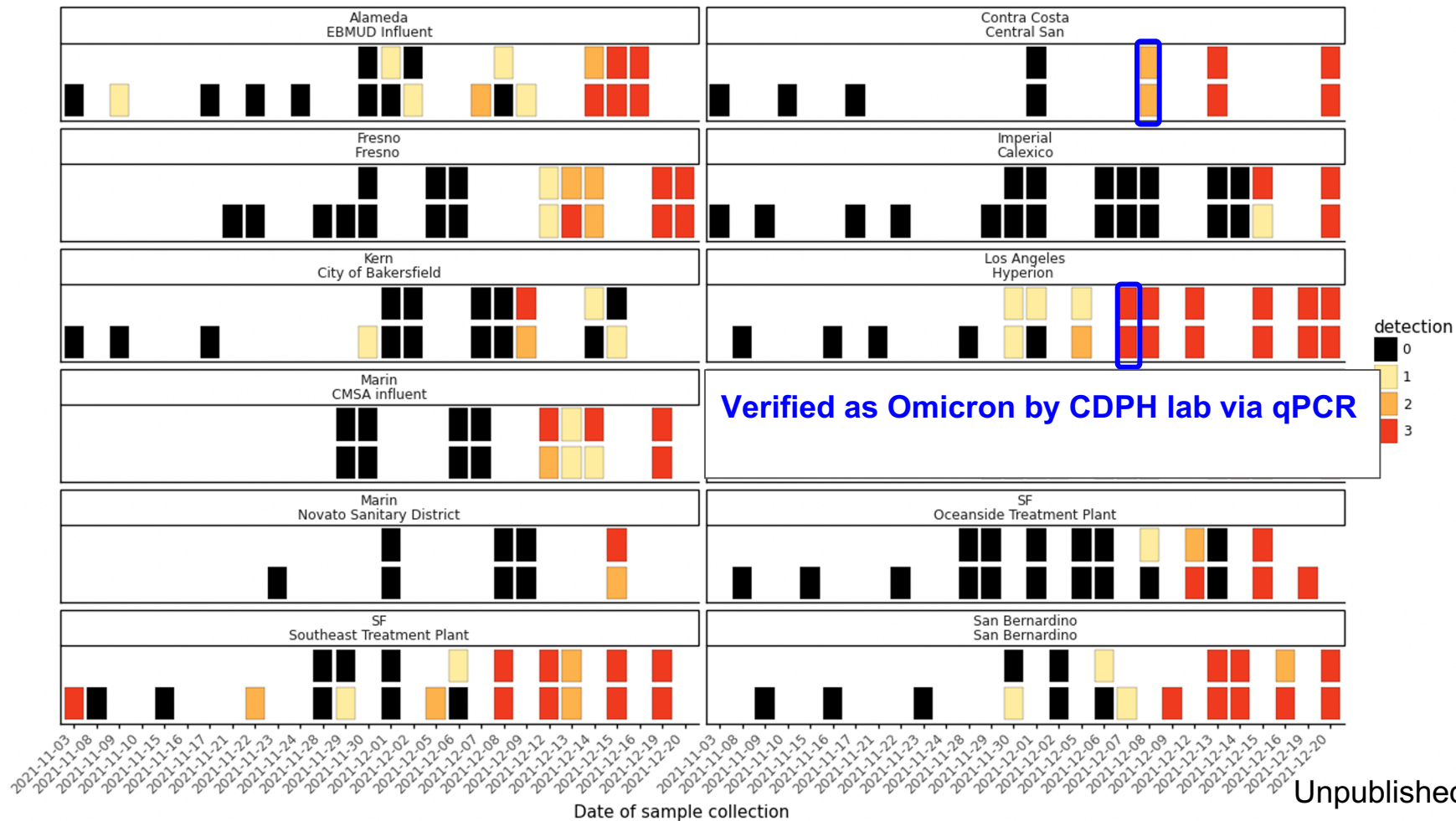


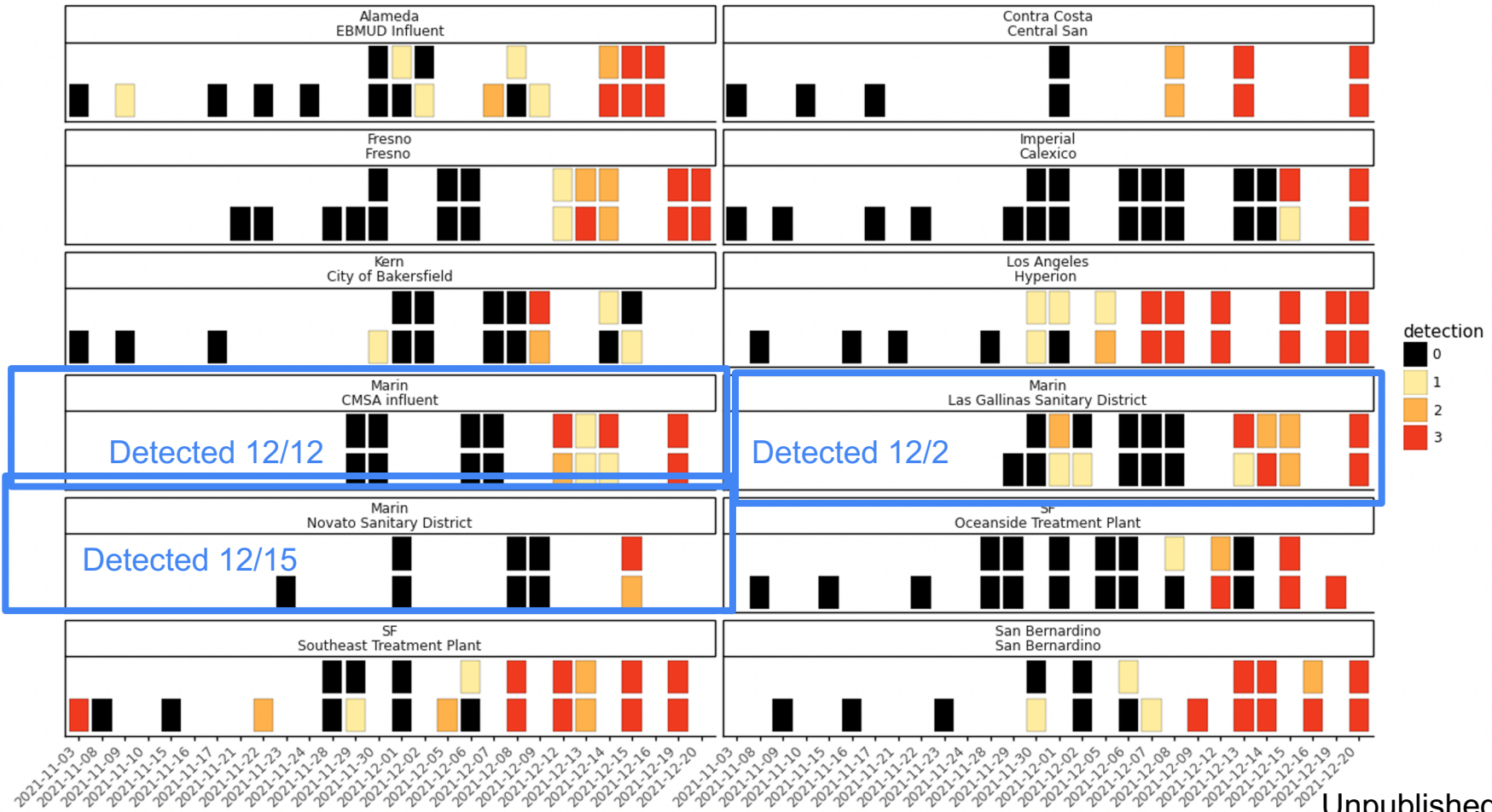
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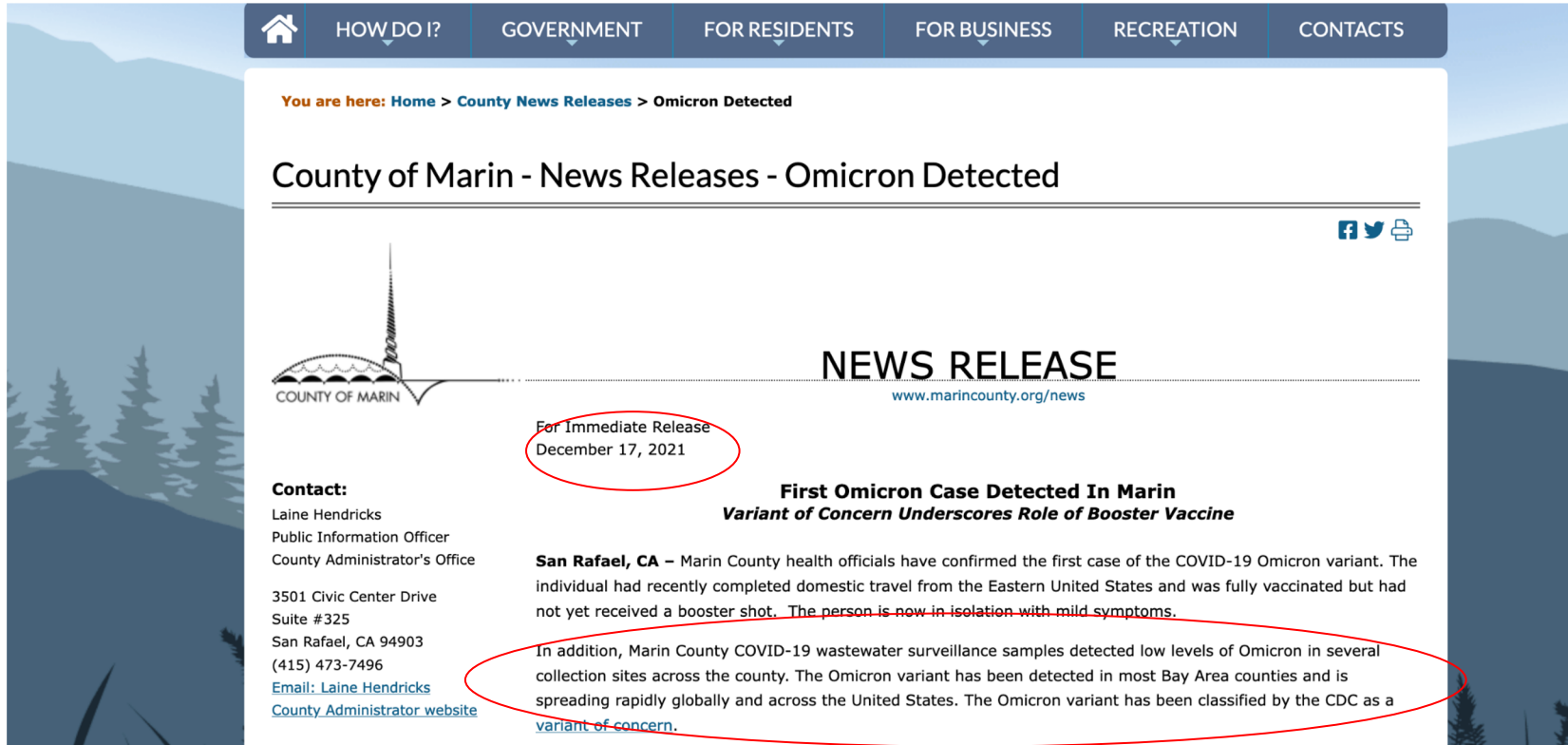








Wastewater provided early warning of Omicron in Marin




The screenshot shows the County of Marin website's news release page. At the top, there is a navigation bar with links for Home, How Do I?, Government, For Residents, For Business, Recreation, and Contacts. Below the navigation bar, a breadcrumb trail reads: "You are here: Home > County News Releases > Omicron Detected". The main heading is "County of Marin - News Releases - Omicron Detected". To the right of the heading are social media icons for Facebook, Twitter, and Print. Below the heading is the County of Marin logo, which includes a stylized bridge and the text "COUNTY OF MARIN". To the right of the logo is the text "NEWS RELEASE" and the URL "www.marincounty.org/news". The main content of the news release is titled "First Omicron Case Detected In Marin" with the subtitle "Variant of Concern Underscores Role of Booster Vaccine". The text of the news release states: "San Rafael, CA – Marin County health officials have confirmed the first case of the COVID-19 Omicron variant. The individual had recently completed domestic travel from the Eastern United States and was fully vaccinated but had not yet received a booster shot. ~~The person is now in isolation with mild symptoms.~~ In addition, Marin County COVID-19 wastewater surveillance samples detected low levels of Omicron in several collection sites across the county. The Omicron variant has been detected in most Bay Area counties and is spreading rapidly globally and across the United States. The Omicron variant has been classified by the CDC as a variant of concern." The text "For Immediate Release December 17, 2021" is circled in red. The paragraph starting with "In addition, Marin County COVID-19 wastewater surveillance samples detected low levels of Omicron..." is also circled in red. On the left side of the page, there is a "Contact:" section with the following information: Laine Hendricks, Public Information Officer, County Administrator's Office, 3501 Civic Center Drive, Suite #325, San Rafael, CA 94903, (415) 473-7496, Email: Laine.Hendricks@marincounty.org, and County Administrator website.

HOW DO I? GOVERNMENT FOR RESIDENTS FOR BUSINESS RECREATION CONTACTS

You are here: Home > County News Releases > Omicron Detected

County of Marin - News Releases - Omicron Detected

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COUNTY OF MARIN

NEWS RELEASE

www.marincounty.org/news

For Immediate Release
December 17, 2021

Contact:
Laine Hendricks
Public Information Officer
County Administrator's Office

3501 Civic Center Drive
Suite #325
San Rafael, CA 94903
(415) 473-7496
Email: Laine.Hendricks@marincounty.org
[County Administrator website](http://www.marincounty.org)

First Omicron Case Detected In Marin
Variant of Concern Underscores Role of Booster Vaccine

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Looking forward



- CA NWSS program launched at CDPH
- Governor Newsom included wastewater as part of the SMARTER plan
- CDPH launching wastewater lab, which will process California samples
- Continued research & collaborations:
 - Develop improved methods and monitor additional pathogens
 - Combine data streams to improve pandemic preparedness and health equity
- Our lab will close for routine monitoring at the end of May

Thank you!

- California Department of Public Health
- City of Berkeley Department of Public Health
- San Francisco Department of Public Health
- Contra Costa County Department of Public Health
- Marin County Department of Public Health
- Alameda County Department of Public Health
- Napa County Department of Public Health
- University of California Berkeley, COVID-19 response team
- Sanitary District No.5 of Marin County
- Central Marin Sanitation Agency
- East Bay Municipal Utility District
- San Francisco Public Utilities Commission
- Las Gallinas Sanitary District
- Sausalito-Marín City Sanitary District
- Sewerage Agency of Southern Marin
- Novato Sanitary District
- Central Contra Costa Sanitary District
- Delta Diablo Sanitary District
- West County Water District
- City of Yountville
- City of American Canyon
- Dublin-San Ramon Services District
- Union Sanitary District
- City of Vacaville
- University of California Berkeley, EH&S
- Recent partners in Fresno, Bakersfield, San Bernardino, Los Angeles, and Calexico

Extra slides

Sewage, Salt, Silica and SARS-CoV-2 (4S) method

