

WASTEWATER SURVEILLANCE AND RESEARCH

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Central Contra Costa Sanitary District

November 24, 2020

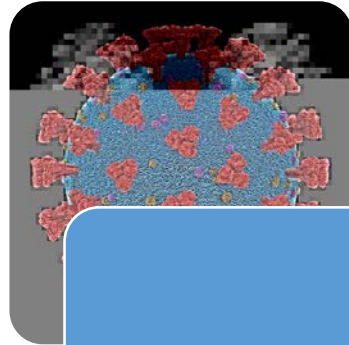


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AGENDA



Central San



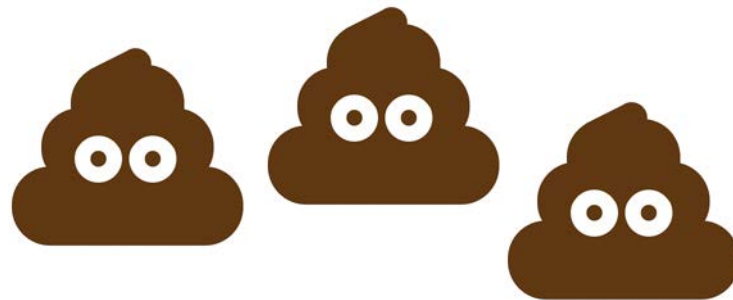
SARS-CoV-2



Wastewater
Surveillance

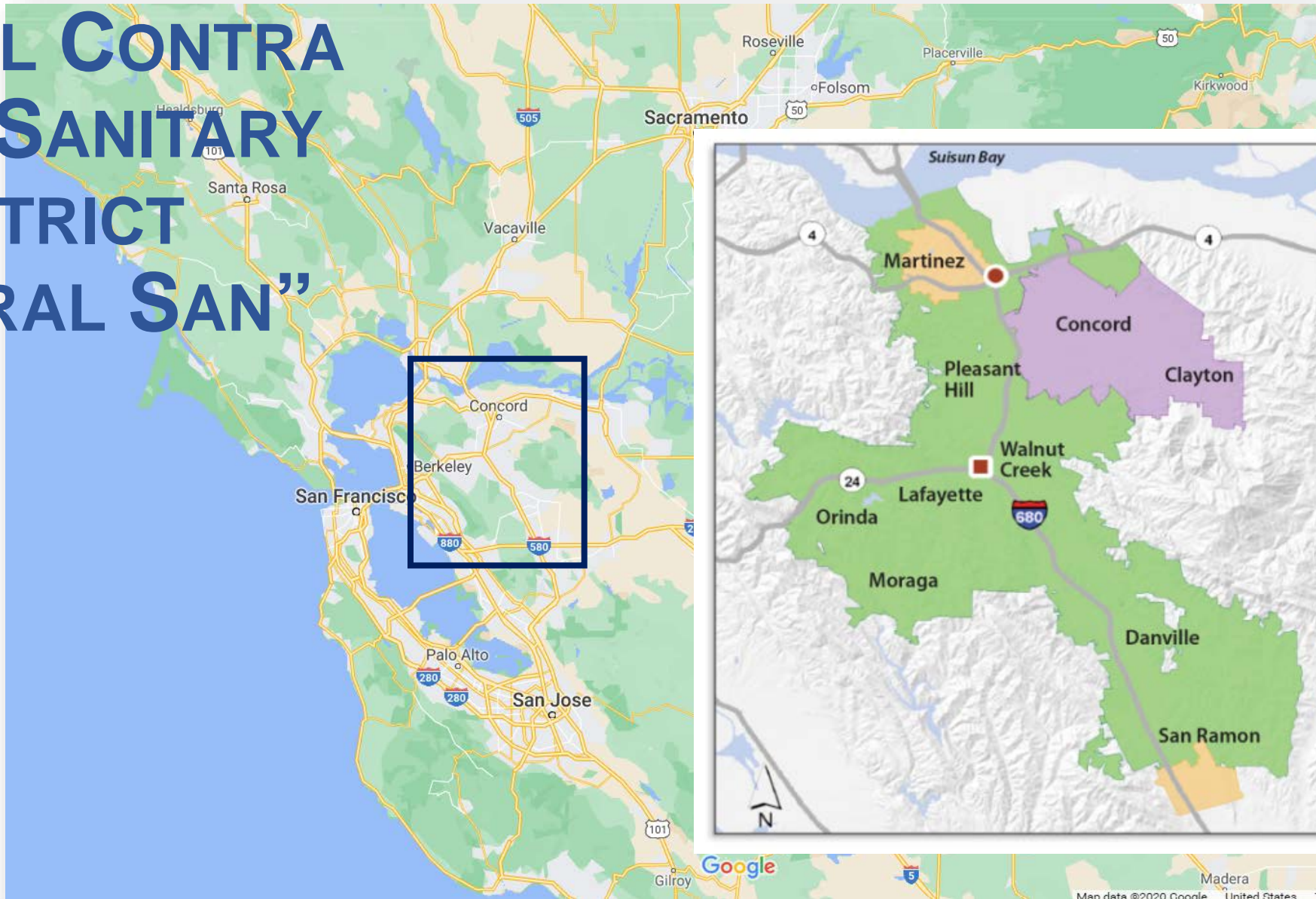


Research
Efforts



CENTRAL SAN

CENTRAL CONTRA COSTA SANITARY DISTRICT “CENTRAL SAN”



CENTRAL SAN

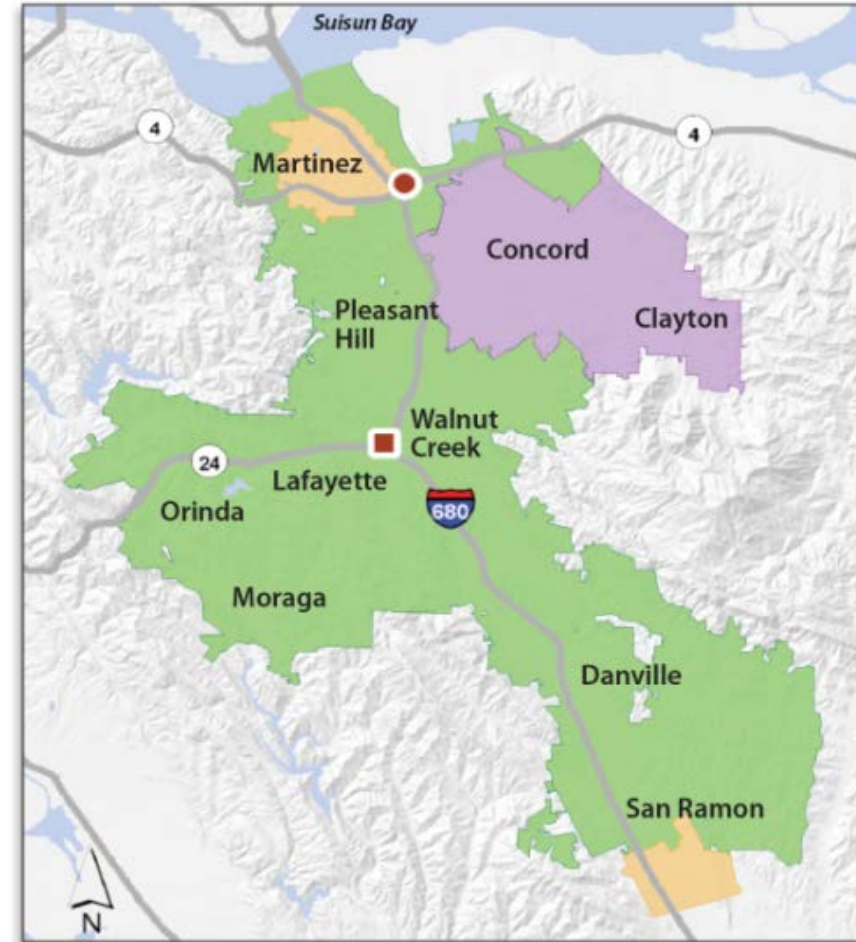
PROTECTING PUBLIC HEALTH AND THE ENVIRONMENT

Serve over 10 communities

500,000 residents

Treat 39 million gallons per day of wastewater

Operate 24 hours a day
7 days a week



FOLLOWING THE FLOW OF WASTEWATER



Lateral Sewers
of residences and
businesses



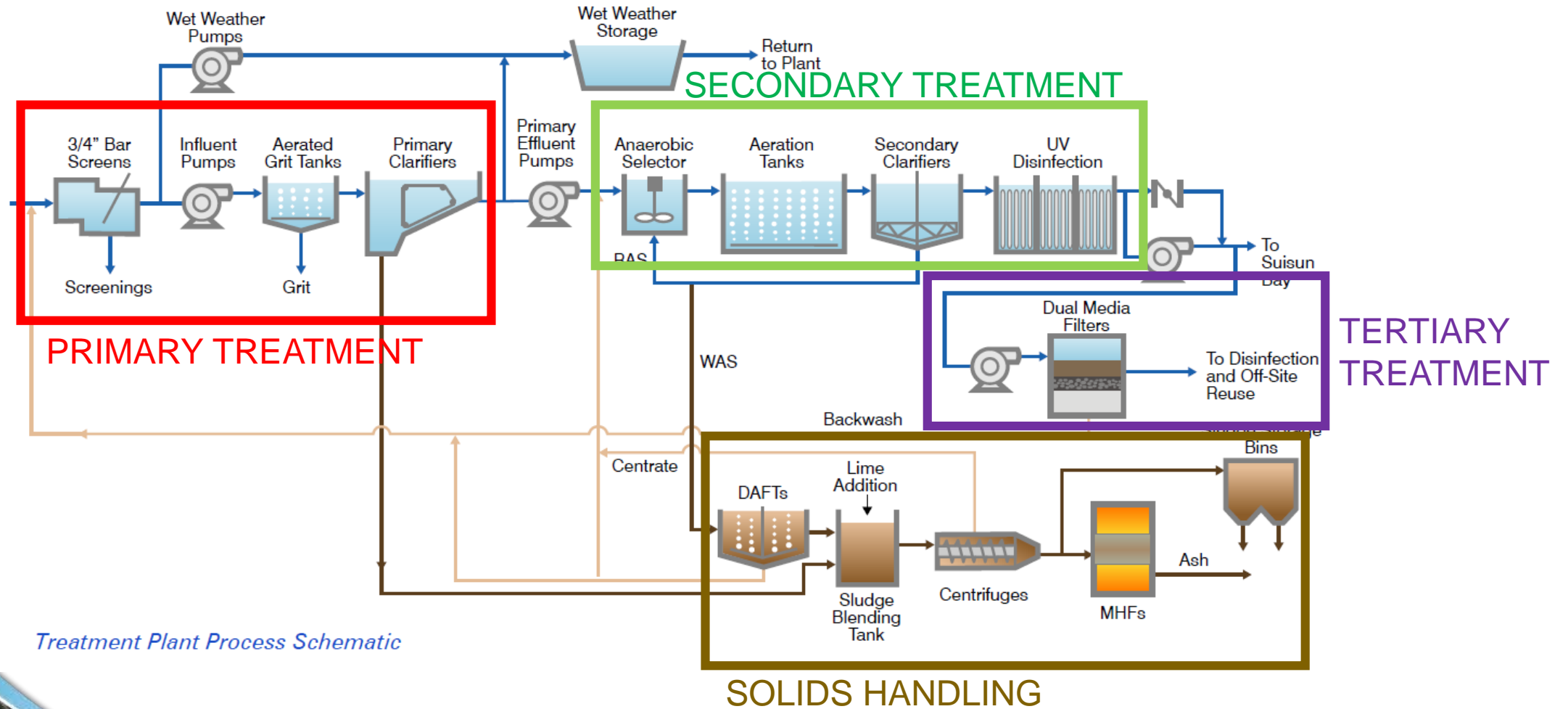
Collection System
pipes conveying
sewage underground



Treatment Plant
for treatment and
disinfection



WASTEWATER TREATMENT OVERVIEW



Treatment Plant Process Schematic



PLANNING AND APPLIED RESEARCH GROUP

Evaluate cost-effective and innovative technologies to improve treatment plant processes

New Technologies

Pilot Testing

Research Projects

**Optimize and
Improve**



CENTRAL SAN DEVELOPED COVID-19 RESEARCH TASK FORCE

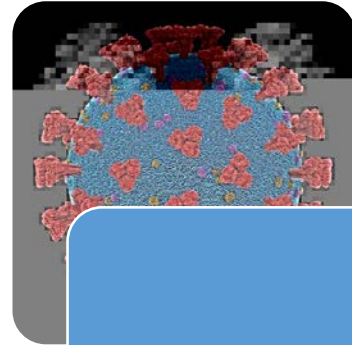
- Look into the latest understanding of the fate, transport, and control of SARS-CoV-2 in wastewater
 - Latest research efforts from industry leaders
- Identify and collaborate on wastewater research
 - Case study with Stanford University
 - Wastewater Surveillance



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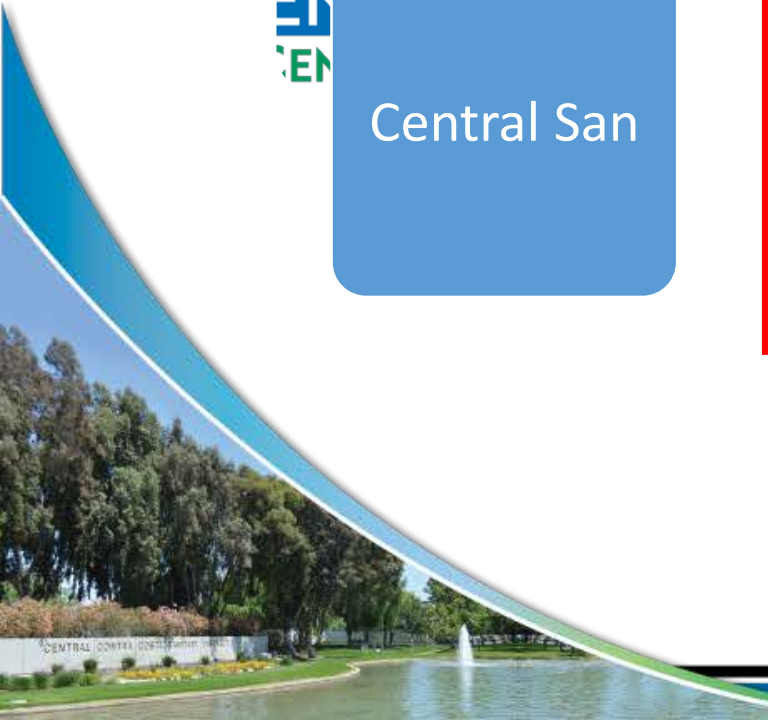
SARS-CoV-2



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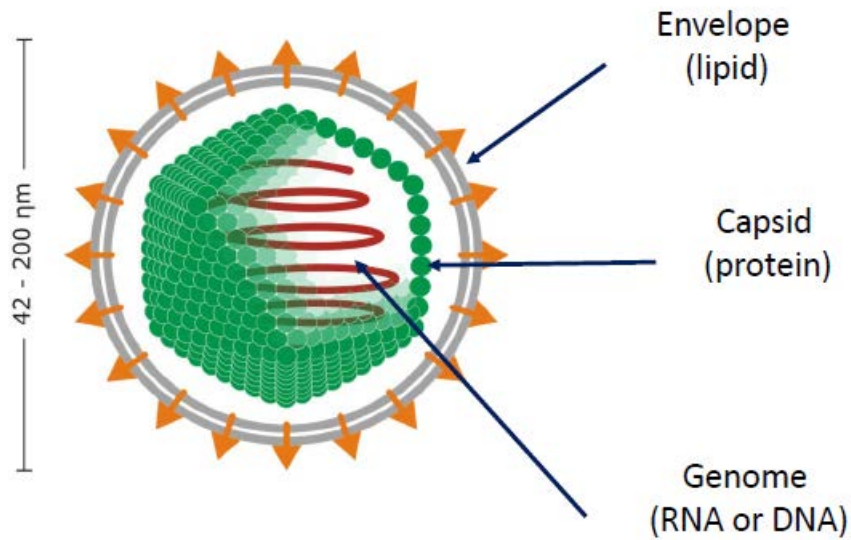


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WHAT IS SARS-CoV-2?



- Severe Acute Respiratory Syndrome Coronavirus-2 is the virus that causes COVID-19
- SARS-CoV-2 is an enveloped, single-strand RNA virus
- Other enveloped viruses include Ebola, Hepatitis B, SARS
- Shed virus in stool, nasal and lung secretions

Image Source: A. Kirby/CDC



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CAN SARS-CoV-2 BE ANALYZED IN WASTEWATER?

- CDC identified two specific RNA gene fragments; marker for the virus
- Analysis Method: Polymerase Chain Reaction (PCR)
 - Genome copies per liter of water
 - Quantifying the amount of RNA in the water
- Detection of RNA does not mean virus is infectious
 - Separate culture test is required
 - Virus culture requires an intact virus particle

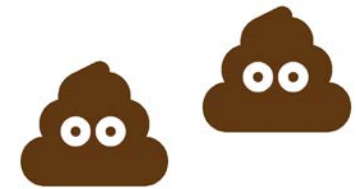
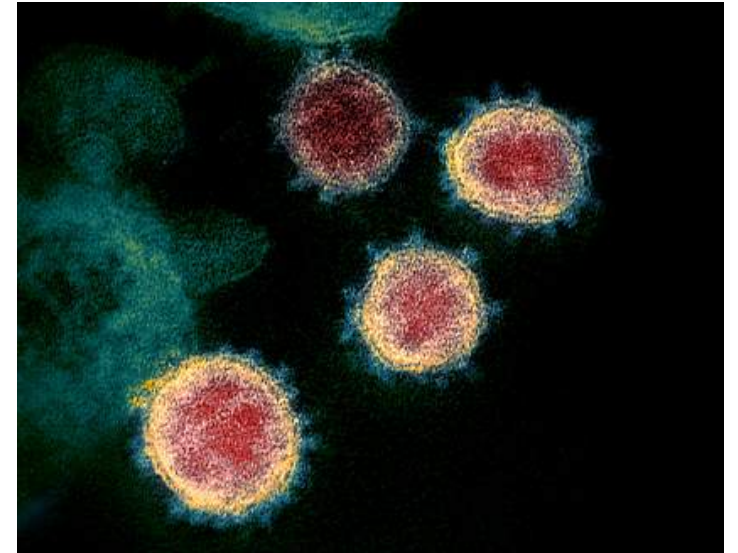
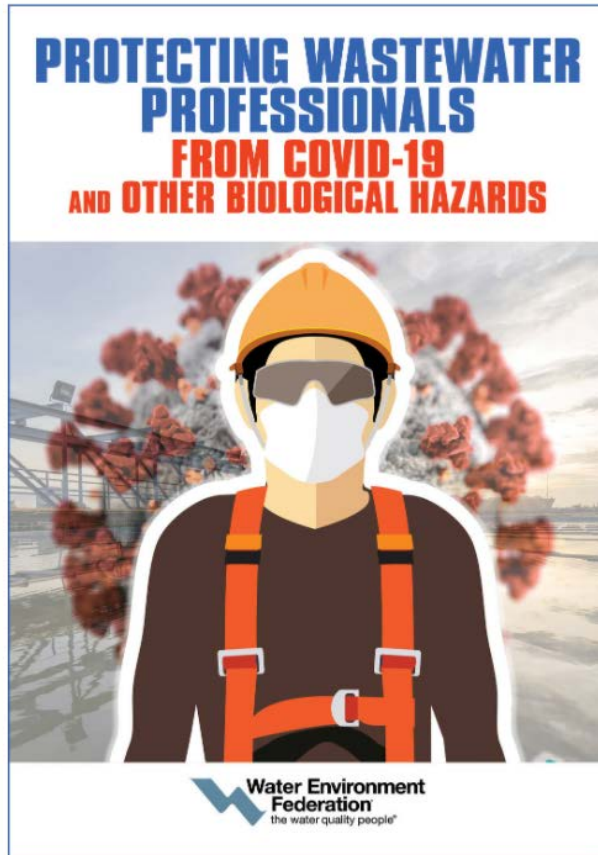


Image Source: NIAID-RML



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CAN YOU GET COVID-19 FROM WASTEWATER?



- No reports to date have shown viable or infectious forms of the virus in wastewater
 - Requires living host cells to reproduce

Image Source: Water Environment Federation

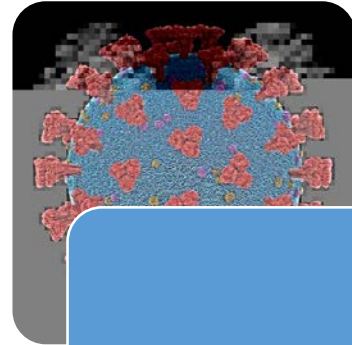


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SARS-CoV-2



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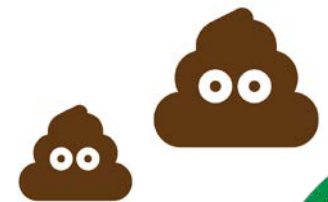
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WHAT IS WASTEWATER SURVEILLANCE?



Studying sewage for public health information is known as Wastewater-based epidemiology (WBE). (Image courtesy of the City of Tempe)

- Monitor for virus or disease pathogen that could move widespread through a community
 - Also known as Wastewater Based Epidemiology, “poop sleuth”
 - Excreted from humans and concentration quantified in a laboratory
 - Polio, Hepatitis A
 - Illegal drug use: methamphetamines, opioids



WASTEWATER SURVEILLANCE IN THE HEADLINES

[Science & Environment](#)

Coronavirus: Sewage testing for Covid-19 begins in England

By Victoria Gill
Science correspondent, BBC News

3 August 2020

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Coronavirus pandemic



What does coronavirus found in world's sewers tell?

CGTN

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It's time to begin a national wastewater testing program for Covid-19

By ANNA MEHROTRA, DAVID A. LARSEN, and ASHISH K. JHA / JULY 9, 2020

Reprints



UNIVERSITY OF ARIZONA/CHRIS RICHARDS

Poop tests stop COVID-19 outbreak at University of Arizona

ENVIRONMENT JULY 8, 2020 / 10:41 AM / A MONTH AGO

Italy to monitor sewage in hunt for possible new COVID-19 wave

HEALTH

There were no reports of coronavirus in Yosemite. Then they tested the park's sewage

Kurtis Alexander | July 17, 2020 | Updated: July 21, 2020 9:08 p.m.



Yosemite Valley on Thursday, June 11, 2020. Sewage testing has revealed the presence of the novel coronavirus.

tonicle

Like a lot of the rural West, Yosemite National Park stood as a safe haven from the coronavirus. No park employees or residents tested positive. No visitors reported being sick. The fresh air and open space seemed immune.

That's until local health officials started looking for the coronavirus in the

WASTEWATER SURVEILLANCE IS EXPANDING GLOBALLY

COVIDPoops19 Summary of Global SARS-CoV-2 Wastewater Monitoring Efforts by UC Merced



Dashboards

 **22**

Last update: a minute ago

Universities

 **143**

Last update: a minute ago

Countries

 **43**

Last update: a minute ago

Sites

 **345**

Last update: a minute ago

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-
Esri | Esri

BEFORE WE JUMP IN...

Strengths

Captures even asymptomatic and mild cases

Wastewater concentration trends align with clinical trends

Trends in wastewater can lead trends in reported cases by days

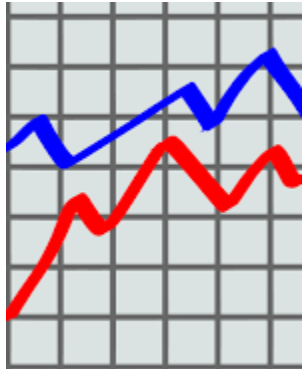
Statistics can be used by health officials along with testing
(Increase messaging, mobilize additional testing)

Limitations

Collection and analysis must be near real time

Not ready for predicting number of cases - virus concentration shed in stool is unknown

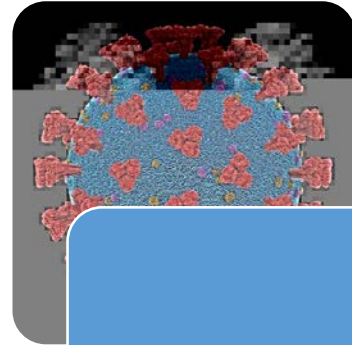
Does not replace testing people



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CURRENT UNIVERSITY RESEARCH

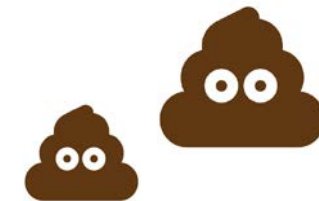
Stanford University

- Collected 1,700 samples from over 50 WWTPs
- Wastewater trends are aligning with confirmed clinical cases
- Virus observed more in solids than in liquid (100-1000x)



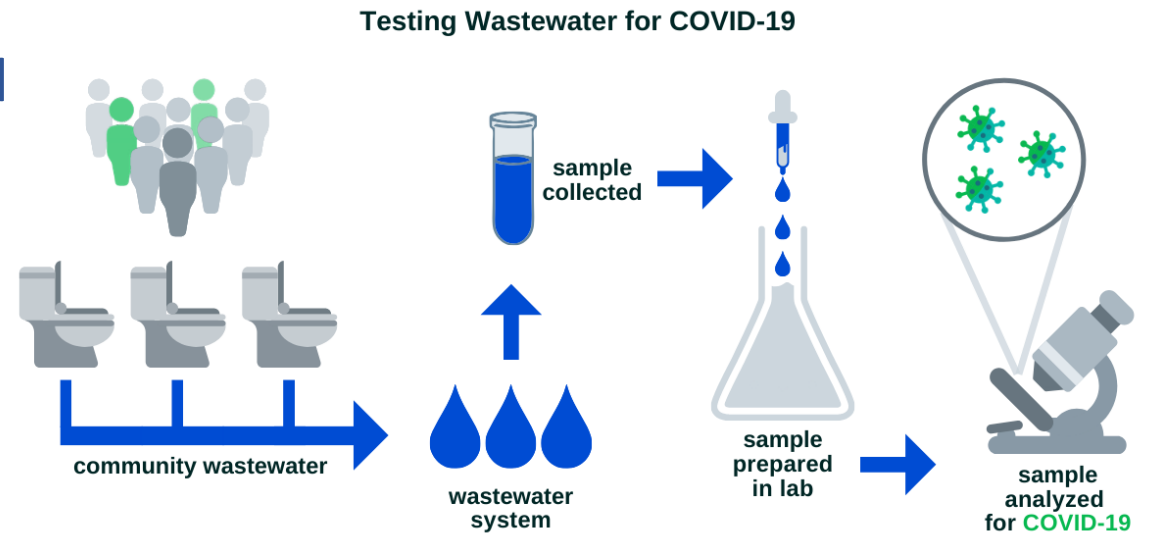
University of Arizona

- Determination of infectivity of SARS-CoV-2 in wastewater
Biological Safety Level BSL-3 laboratory
- Disinfectant assessments
- Dormitory and community wastewater surveillance



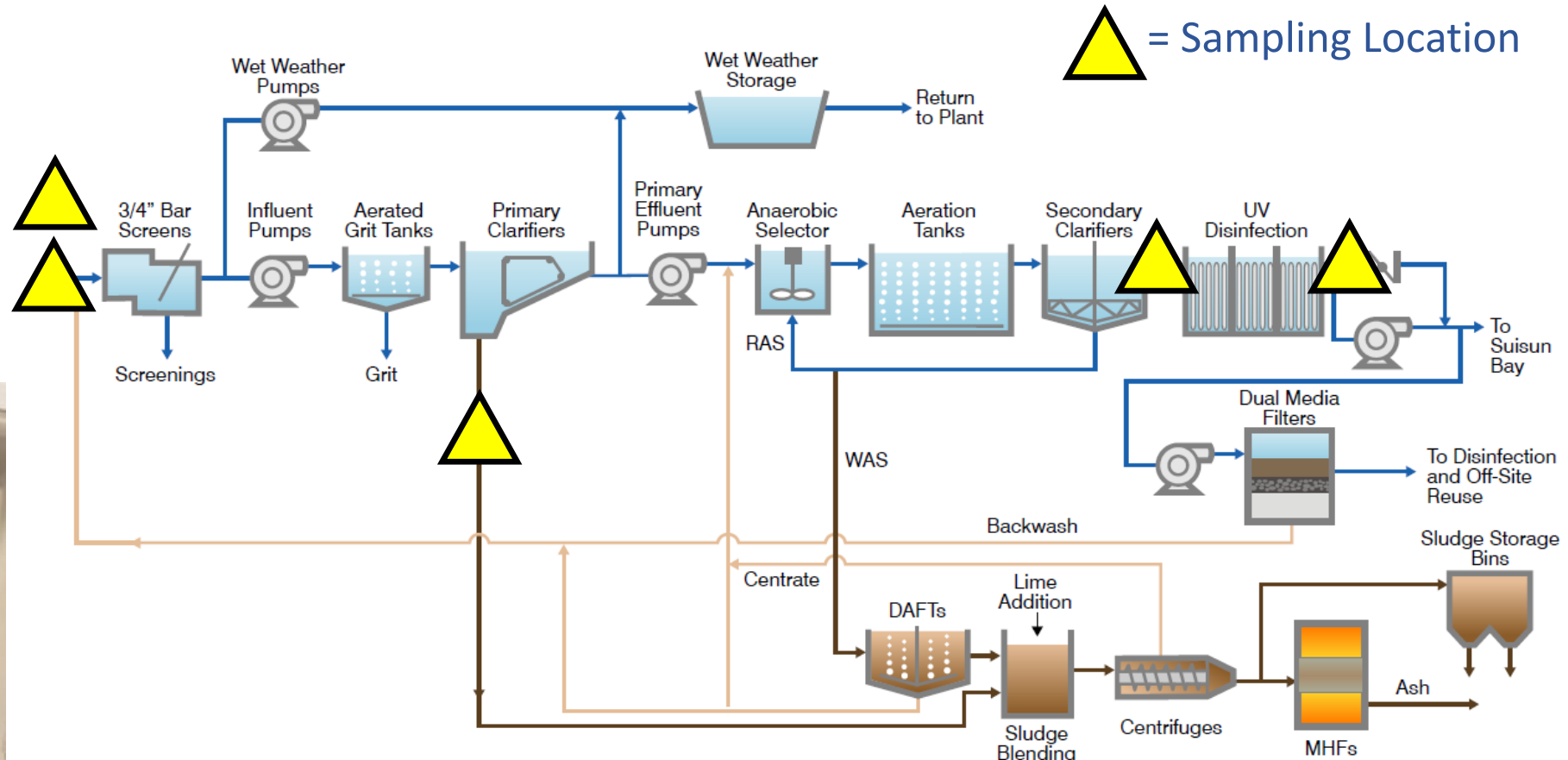
CURRENT NATIONAL RESEARCH

- The Water Research Foundation identified where further research is needed:
 - What is the fate of SARS-CoV-2 as it travels through the sewer system?
 - Are there impacts to results by storing samples at different temperatures?
 - What sample preparation methods will produce the most reliable results for analyzing the SARS-CoV-2 virus in water/wastewater?
- Goal to determine best practices for all laboratories to use



STANFORD CASE STUDY TO EVALUATE SARS-CoV-2 THROUGH TREATMENT PLANT

- Weekly Sampling June to Sept 2020
- Addnl Hourly Sample Study
- Results end of 2020



Treatment Plant Process Schematic





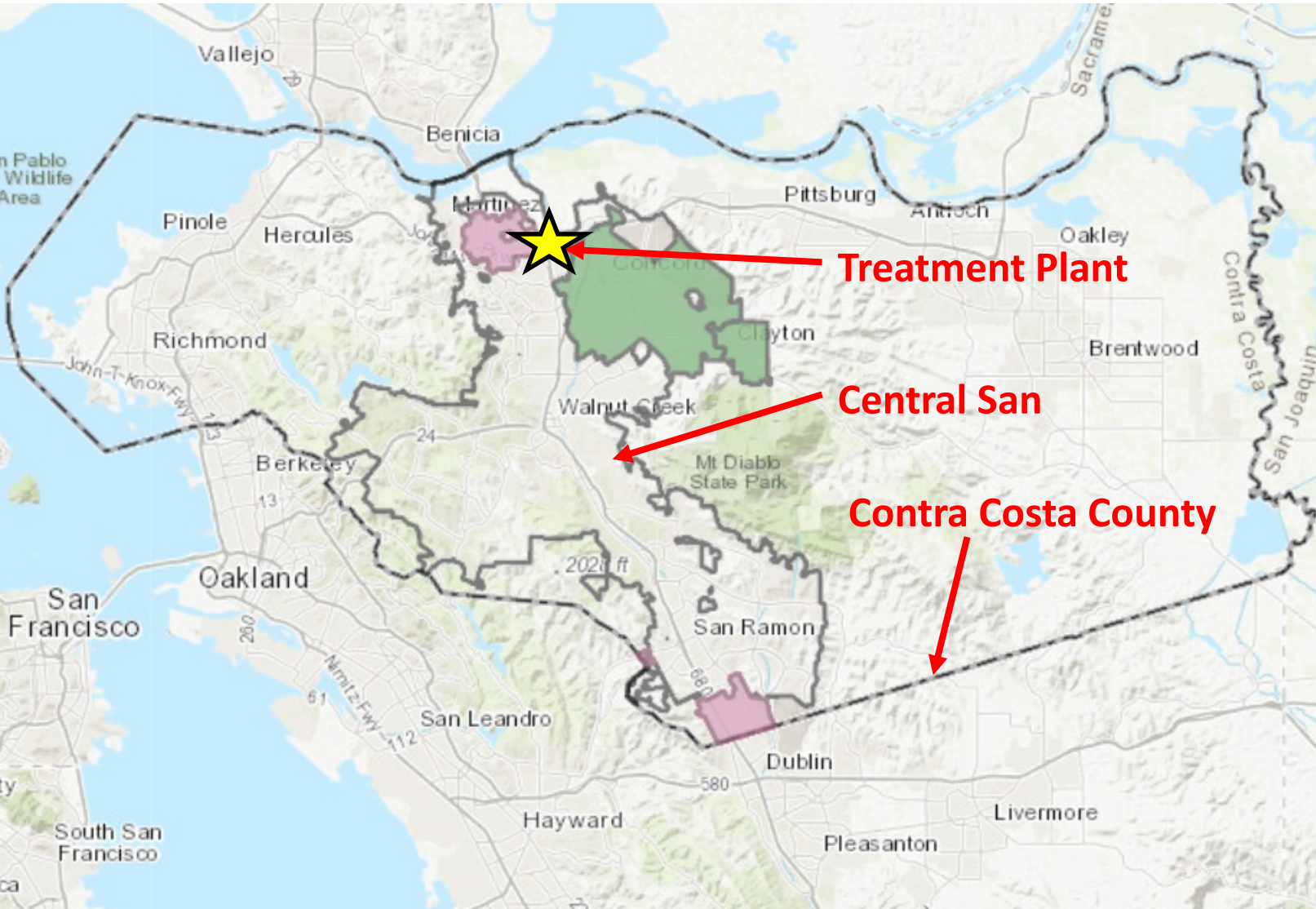
Setting up Composite Sampler



Collecting Primary Sludge Sample



WASTEWATER SURVEILLANCE IN CONTRA COSTA COUNTY



- Program starting up with us and neighboring wastewater agencies
- UC Berkeley pop-up laboratory performing analysis



WORKING WITH CONTRA COSTA HEALTH



- Sent frozen influent samples from Stanford study to for analysis
- Provide CC Health an opportunity to correlate clinical cases with wastewater data
- Collect influent samples 3x/week and weekly at an upstream location
- Start small, understand the data, then expand

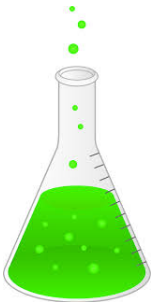


MANHOLE SAMPLING



TAKEAWAYS AND NEXT STEPS

- Wastewater surveillance has the possibility of being a powerful tool to monitor for disease outbreaks
 - Critical research is still underway:
 - Fate of SARS-CoV-2 as it travels through the sewer system and treatment process
 - Virus concentration in stool
 - Model to predict the number of COVID-19 cases
- Research Opportunities in the Wastewater Field



MORE INFORMATION

- California Water Environment Association (CWEA)
- Water Research Foundation (WRF)
- [UC Merced COVIDPoops19](#)



Questions?

