

# Sewer Authority Mid-Coastside Board Meeting

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NOVEMBER 8, 2021

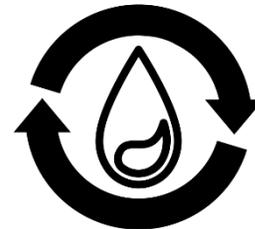


# Sewer Authority Mid-Coastside

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## MISSION STATEMENT

Sewer Authority Mid-Coastside (SAM) collects, transports, and treats wastewater for the Coastside communities in order to cost-effectively protect public health and the environment, while maximizing conversion of wastewater and wastewater byproducts into usable resources.

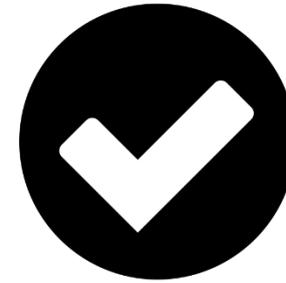


# This presentation will

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- NOT target breweries, distilleries, or wineries, or any other industry in this service area
- NOT target any individual district



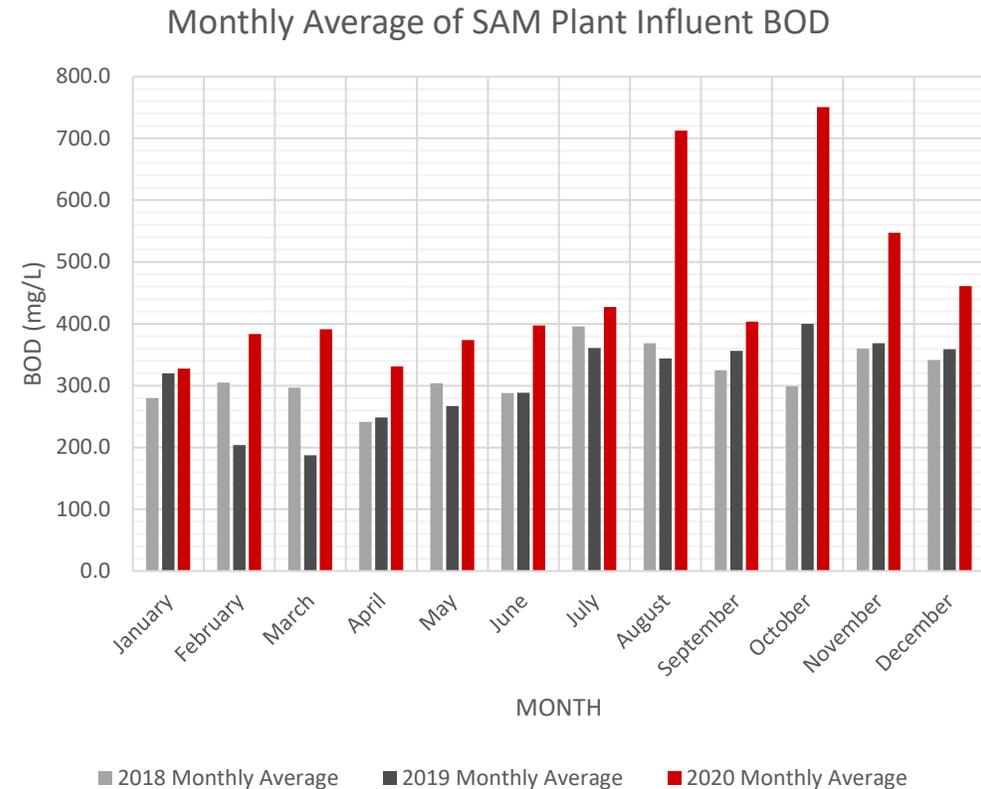
- Give facts to the Board and the public
- Refute inaccurate statements that were made at GCSD's last Board meeting

## STATEMENT at 39:57

*“I think you will notice this, when I list on my subject line, I called it ‘process issues’ not ‘BOD issues’ because as I said to you all before, I **don’t think they have a real BOD problem**, something of a long term source problem, coming from any of the districts, you know, much less ours.”*

- Inaccurate statement:
  - The average influent BOD was **consistently higher in 2020** compared to historical BOD data in 2018 and 2019
  - 2020 average is **49%** higher than that of 2019 and **47%** higher than 2018

Annual Average of SAM Influent BODs		
2018	316.4	mg/L
2019	311.8	mg/L
<b>2020</b>	<b>464.7</b>	<b>mg/L</b>



## STATEMENT at 42:46

*“... if you look at the (October) 22, 23 and 24, their (effluent) BOD is 31, 71, 40, even with these high influent BODs, so there is not a direct correlation a lot of time”*

*“These treatment plants are big biological masses, so they can absorb this stuff...”*

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- The effluent BOD is **not** residual of the influent BOD that doesn't get properly treated through the Plant
- There may be a correlation between influent and effluent BOD during **extremely** high BOD loading events, such as the 2021 plant upsets which resulted in poor settling sludge that was washed out of the secondary clarifier into the plant effluent
- During these events, poor settling sludge is washed out of the secondary clarifiers and into the effluent, which causes high effluent BOD

## STATEMENT at 45:21

*“They (SAM) set off a string of point source testing in Princeton, Half Moon Bay, and Montara that costs 500,000 dollars plus, for a **bad eight days**”*

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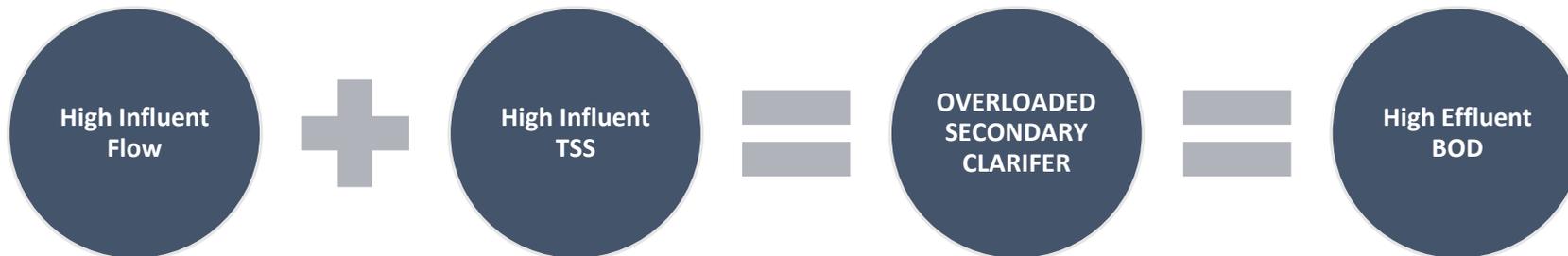
- Inaccurate Statement:
  - SAM started noticing higher influent BOD concentration in as early as August 2020 and started monitoring influent BOD more closely
  - The influent BOD stayed high in November 2020, December 2020, and January 2021
  - SAM Staff had to use chemically enhanced primary treatment (CEPT) and chemically enhanced secondary treatment (CEST) to address high BOD in the plant influent, and that’s why we did not have any high effluent BODs

## STATEMENT at 49:15

*“We have one stray (effluent BOD) reading of 200 on the 27<sup>th</sup> (of January)... **that is just a bad test.** You generally don’t go from 8 to 200 to 19 in three days.”*

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- Inaccurate Statement - effluent BOD can fluctuate due to other factors:
  - The flow on 27<sup>th</sup> was nearly **twice** the prior day
  - Total suspended solids (TSS) loading was also high on the 27<sup>th</sup>
  - Both high flow and TSS loading is consistent with **overloaded secondary clarifier** that was unable to settle the solids
  - SAM staff brought the additional clarifier online to address this issue, and the effluent BOD and TSS came down on the 28<sup>th</sup>



## STATEMENT at 50:56

*“We’ve had this discussion of coarse air and fine air. People seem to like fine air better. I don’t (know). It’s oxygen transfer rate. So I don’t know it’s better or worse. I’ve worked with these engineers, they fall in love with technologies, and I don’t know if we have empirical data for it (chuckle)”*

- Inaccurate Statement:
  - Fine bubble diffusers are the **most common** type of diffusers and provide high oxygen transfer rates
  - There are empirical data that show **aeration is the largest energy use** in treatment plants and fine air bubble diffusers offer greater energy efficiency
  - Coarse bubble diffusers are less efficient and require more energy
  - More **efficient aeration** results in **lower operating costs** to the public ratepayers



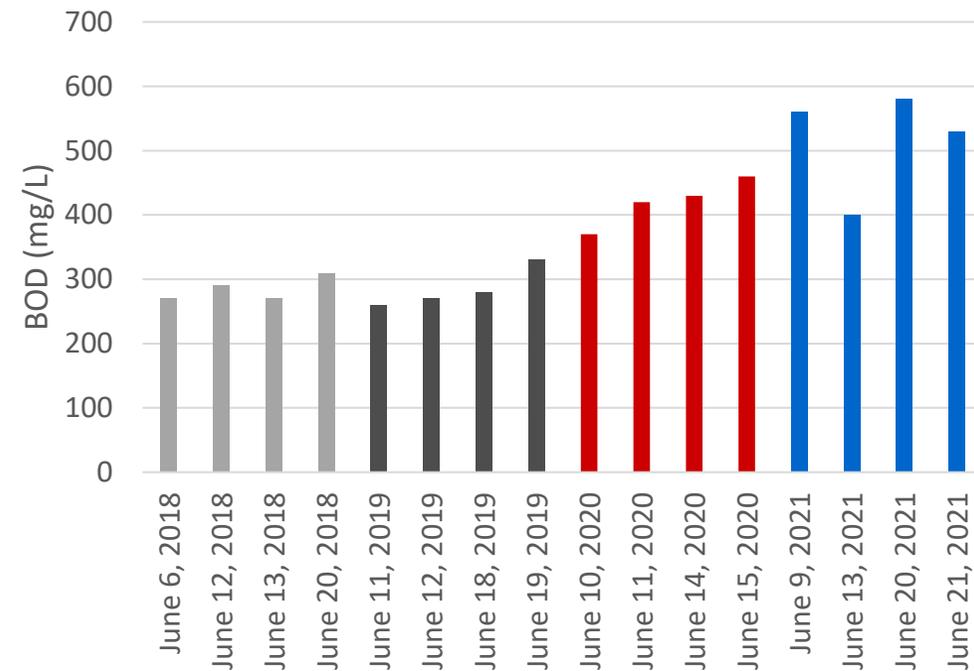
## STATEMENT at 52:48

*“To me, when I looked at June 1 and they went from using **Aeration Basin 1 and 2** to **Aeration Basin 3...** with brand new diffusers that no one has ever used, and all of a sudden, **your treatment goes to heck.** There’s correlation there. What I want to point out is, in this June month, they got some higher BOD numbers, but nothing out of the ordinary, and the problem in these months is filamentous bugs.”*

### ■ Inaccurate statement:

- SAM has always been using Aeration Basin 3 with fine bubble diffusers
- Aeration Basin 3 fine bubble diffusers were replaced in 2021 because the old ones are **15+ years over** their useful life
- Aeration Basin 1 and 2 were used for increasing capacity after the 2020 October plant upset, but they are not intended for long-term use due to high energy cost and poor conditions
- June 2021 had higher influent BOD compared to same period in 2018 – 2020, which is out of the ordinary

Month of June Influent BOD Comparison:  
2018 - 2021

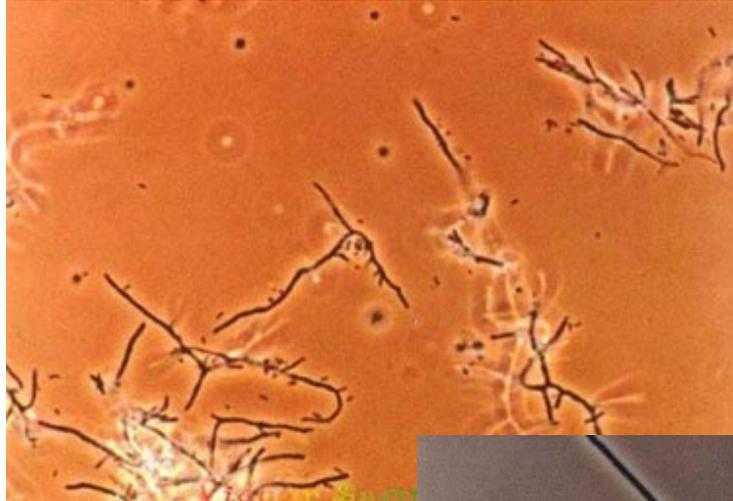


## STATEMENT at 54:04

*“If I go into July (2021) here, the influent BOD are really low, yet they are not making their numbers.. Brown and Caldwell said ‘hey you are chlorinating too much’. They actually mentioned in the report that might be part of the problem.”*

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- Inaccurate statement:
  - BC did identify that RAS chlorination in July **2020** was higher than recommended
  - **That was not the case in 2021**
  - Microbiological examination of the mixed liquor in July 2021 clearly indicated presence of Actinomycetes – *S. Natans*, which is **not** standard filamentous bacteria that GCSD board presentation referred to
  - Actinomycetes – *S. Natans* are more prevalent in discharges from several types of establishments which discharge simple starches, sugars, etc.



Photograph of *Nocardia*, the most prevalent filamentous bacteria in wastewater



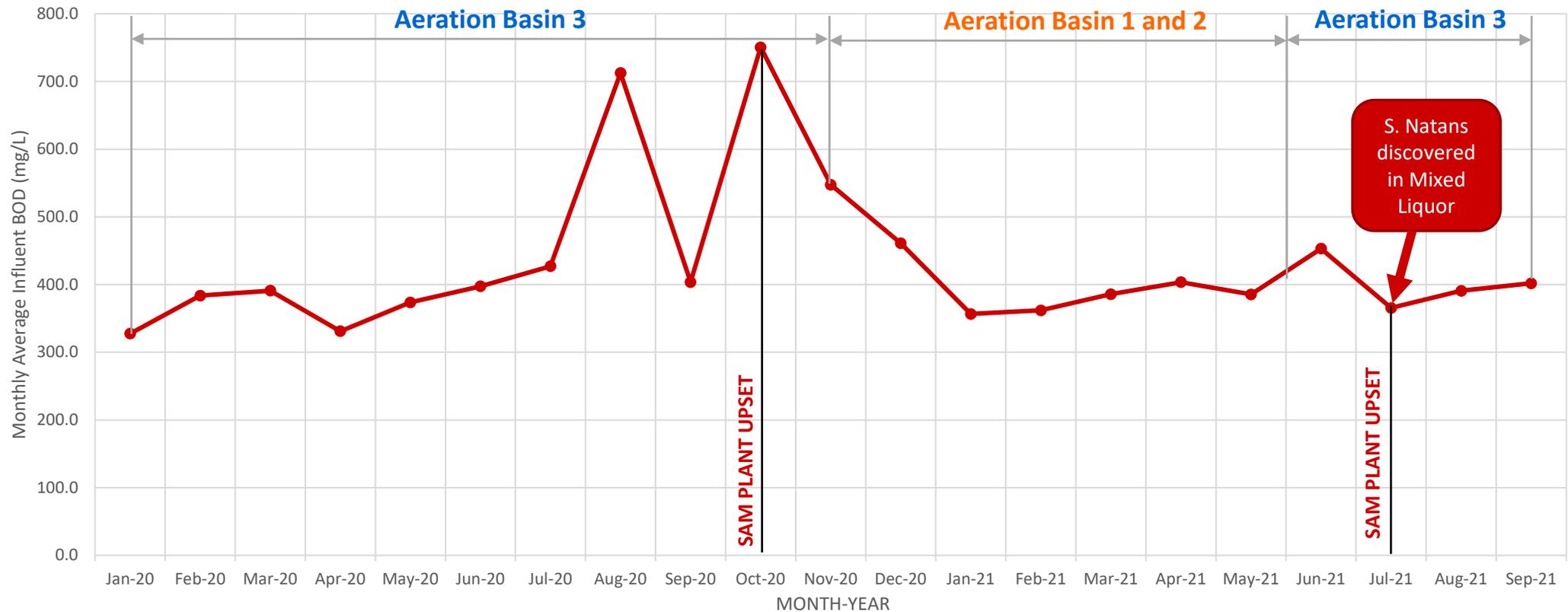
Photograph of *Sphaerotilus Natans*.

Source: <https://www.maine.gov/dep/water/wwtreatment/ten.pdf>

**STATEMENT at 55:01**

*“We had eight bad days, or two bad weeks at SAM in late October or early November. Then we had an eight months run of perfectly fine treatment. Then they switch basins, and the treatment went off.”*

- The new diffusers in Aeration Basin 3 do **NOT** have any correlation with plant upset



## Interactive Spreadsheet at 57:08

Location	Flow	BOD	BOD x flow
<b>SAM Plant baseline at 400 BOD</b>			
SAM Plant (w/o Princeton)	1,250,000	380	475,000,000
Princeton	100,000	655	65,500,000
	1,350,000		540,500,000
		<b>Calculated BOD at SAM Plant</b>	<b>400</b>
		Delta from baseline of Plant at 400 BOD	0
<b>Brewery's at hypothetical</b>			
	5,000	<b>BOD, with flow based on their water use</b>	
Location	Flow	BOD	BOD x flow
SAM Plant	1,347,500	400	539,000,000
Brewery's	13,500	5,000	12,500,000
	1,350,000		551,500,000
		<b>Calculated BOD at SAM Plant</b>	<b>409</b>
		Delta from baseline of Plant at 400 BOD	9

- Dilution is NOT the solution to pollution
- SAM influent BOD cannot be calculated and must be determined using lab analysis
- Industry standard is to use BOD loading rate to assess the impact of BOD on substrate conversion rate in wastewater treatment processes
  - BOD: mg/L
  - Flow: gallons/ day
  - BOD Loading Rate: lbs/day

$$BOD \times flow = \frac{mg}{L} \times \frac{gallon}{day} \neq \frac{lbs}{day}$$

The weight of water needs to be accounted for in the calculation

## The Correct Formula to Calculate BOD Loading Rate

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$$1 \text{ mg/L} = 1 \text{ ppm}$$

$$\text{BOD Loading Rate} \left( \frac{\text{lb.}}{\text{day}} \right) = \text{BOD Concentration (ppm)} \times \text{flow rate} \left( \frac{\text{million gallons}}{\text{day}} \right) \times$$
$$\text{density of water } 62.4 \frac{\text{lbs.}}{\text{ft}^3} \times \frac{1 \text{ ft}^3}{7.48 \text{ gallons}}$$

Therefore, correct formula for BOD loading rate (lbs./day) = BOD Concentration (mg/L) x Flow Rate (MGD) x 8.34 (lbs./gallon)

## BOD Loading Rate: SAM Plant and Princeton Pump Station

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Using the same assumptions presented:

- SAM WWTP: Flow rate = 1.25 million gallons/day, average BOD = 380 mg/L
- Princeton Pump Station: Flow rate = 0.1 million gallons/day, average BOD = 655 mg/L

$$\text{BOD loading rate at SAM WWTP} = 380 \frac{\text{mg}}{\text{L}} \times 1.25 \frac{\text{Million Gallons}}{\text{day}} \times 8.34 \frac{\text{lbs}}{\text{gallon}} = 3,961.5 \frac{\text{lbs}}{\text{day}}$$

$$\text{BOD loading rate out of Princeton} = 655 \frac{\text{mg}}{\text{L}} \times 0.1 \frac{\text{Million Gallons}}{\text{day}} \times 8.34 \frac{\text{lbs}}{\text{gallon}} = 546.3 \frac{\text{lbs}}{\text{day}}$$

All BOD out of Princeton must go to SAM WWTP

$$\text{Princeton Flow Contribution} = \frac{0.1 \text{ MGD}}{1.25 \text{ MGD}} = \mathbf{8\%}$$

$$\text{Princeton BOD Contribution} = \frac{546.3 \text{ lbs/day}}{3961.5 \text{ lbs/day}} = \mathbf{13.8\%}$$

Most important is WHAT is in the wastewater: spikes of cleaning products, yeast, or sugar could cause problems

## STATEMENT at 58:07

*“Breweries just don’t put out enough, no matter what their BOD, to move the needle in a substantial way at the treatment plant. I’ve heard of talk of ‘magical slugs’ of BOD and people emptying giant vats into the system from the breweries. Talking to the brewers, I’ve only talked to them briefly, that doesn’t happen.”*

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Using the assumptions presented:

**Typical BOD in Beer: 75,000 – 180,000 mg/L  
Wort has even higher BOD**

- SAM Plant: flow rate = 1.347 MGD, BOD = 400 mg/L
- One Brewery: hypothetical flow rate = 2,500 gallons/day = 0.0025 MGD, BOD = 10,000 mg/L
- SAM WWTP Loading Rate = 4,493.5 lbs/day
- One Brewery’s Loading Rate = 208.5 lbs/day = **5%** of WWTP Influent BOD loading rate
- If two or more breweries discharge at the same time, the loading could be 10% or more in a short amount of time
- If breweries discharges happen during low-flow, BOD spikes could be even higher
- “Magical slugs” are real and can be detrimental to the WWTP treatment process

A hypothetical scenario following the example in GCSD Board presentation:

- One brewery has process upset and had to dump finished beer into the sewer in one day
- SAM Plant: flow rate = 1.347 MGD, BOD = 400 mg/L
- Assuming lower end of typical BOD concentration in beer: 75,000 mg/L

Brewery Discharge (Gallons/day)	Brewery BOD Loading Rate (lbs./day)	SAM Influent BOD Loading Rate (lbs./day)	% of Brewery BOD in SAM's Influent BOD
500	313	4,494	7%
1,000	626	4,494	14%
2,000	1,251	4,494	28%



## STATEMENT at 59:48

*"I don't see a correlation, except for the fact that they had a bad two weeks in October and November. And they switched to Aeration Basins 1 and 2 to Aeration Basin 3 with a new diffuser system... I might have just gone back to 1 and 2 (chuckle). I'm a simple guy. If 3 is not working, let me just go back to 1 and 2 and regroup."*

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### ON AERATION BASIN 1, 2, AND 3:

- Basin 1 and 2 **cannot** be used for day-to-day operation because:
  - Oxygen dosage cannot be controlled for Basin 1 and 2
  - Coarse bubble diffusers are inferior in efficiency and cost a lot of energy to operate
  - Both basins have missing and/or broken diffusers
- Basin 3 cannot be operated with 1 and 2 without major modifications due to the present hydraulic configurations

### ON PLANT CAPACITY

- Aeration Basin 3 accounts for **40%** of the overall volume and was designed to process about 3,400 lb. BOD per day
- Plant average loading in 2018-2019 is about 3,700 lb. BOD per day, which exceeds what Basin 3 can handle
- The plant has been operating **under the design capacity**, and with **little buffer room** for unexpected conditions
- The solution to reclaim design capacity is to retrofit Aeration Basin 4, which is consistent with Brown and Caldwell's recommendation

## STATEMENT at 1:00:46

*"I run another two different, larger ones (wastewater treatment plants) in Ramona Water District in the past. They are all basically extended aeration plants, which is what the SAM plant is. And there is not a lot of moving parts on this stuff. You get that biomass going, you gotta work pretty hard to knock it out, really."*

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### ■ Inaccurate Statement:

- SAM is **NOT** an extended aeration plant; SAM is a high-rate activated sludge plant



#### Extended Aeration Plant

- Low Rate
- Solids Retention Time: 20 – 30 days
- Does have great resiliency in the system



#### Activated Sludge Plant (SAM)

- High Rate
- Solids Retention Time: 2 days
- Much **more susceptible** to shock loads



## STATEMENT at 1:05:00

*“I’ve got the RFP that SAM sent out when they hired Brown and Caldwell, you know, again, I’ve mentioned this to you all before. They asked two questions in the RFP, and one of them is capacity to deal with potential variations in high influent loading. So they are leading the witness, if you will.”*

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- The RFP was discussed with Member Agency Managers as well as with the SAM Board
- Comments which were made were incorporated before the RFP was sent out
- RFP language was **accepted by all**
- RFP was solicited competitively, and proposals were evaluated by all the member agencies
- Brown and Caldwell was awarded the contract for the process study

## STATEMENT at 1:05:18

*“They are saying to Brown and Caldwell, hey don’t come in and just figure out what’s wrong. We are kind of telling you what the issue is and now go study this.”*

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- Incorrect statement
  - SAM did not have premeditated interest in the outcome
  - SAM’s sole intent was to obtain multiple possible options to present to the Board
  - Brown and Caldwell is a reputed national engineering consulting firm
  - Their evaluation was performed using standard industry procedures and assumptions
  - Providing opinions for the sole purpose of reinforcing their client’s predisposition would not serve Brown and Caldwell’s best interests in the long term
  - The Brown and Caldwell report is authored by licensed professional engineers, and peer reviewed also by licensed professional engineer

**STATEMENT at 1:18:57**

*“Who’s paying them (Brown and Caldwell)? (Chuckle) Not me. So, they put this report together based on what SAM told them to do. They’ve got their hypothesis. Whatever they say is gonna back into it.”*

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- As stated in the previous slide, Brown and Caldwell’s analysis was based on industry standard procedures and assumptions
- SAM and Brown and Caldwell do not have any “hypothesis”
- SAM has been conducting business with consultants since 1996 and our credibility depends not on them agreeing with us but determining what is best for SAM which, as per the Mission Statement, is what is best for the community

# In Summary

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- SAM's Plant is more susceptible to shock loading due to its nature
- Proper assumptions and calculations showed that small amount of flow carrying high concentration of BOD can create a spike or shock in SAM's influent BOD loading rate
- Influent conditions can change throughout the time, and influent BOD has been consistently higher starting 2020
- While on the other hand, SAM has been operating under the design capacity because SAM has no choice but to use Aeration Basin 3 until Aeration Basin 4 is ready
- As recommended by Brown and Caldwell, the most optimum solution to increasing BOD loading capacity and better absorb loading spikes is to retro fit Aeration Basin 4

# CONCLUSIONS

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## WHAT SAM IS DOING

- Safeguarding public health and coastal environment
- Operating the treatment plant to SAM's best capability
- Planning and implementing infrastructure renewal and upgrade to cope with a changing world
- Guide all decisions using data and sound engineering judgement
- Educating public about wastewater treatment processes

## WHAT SAM IS NOT DOING

- Targeting any districts
- Targeting any breweries, wineries, distilleries, or any other business