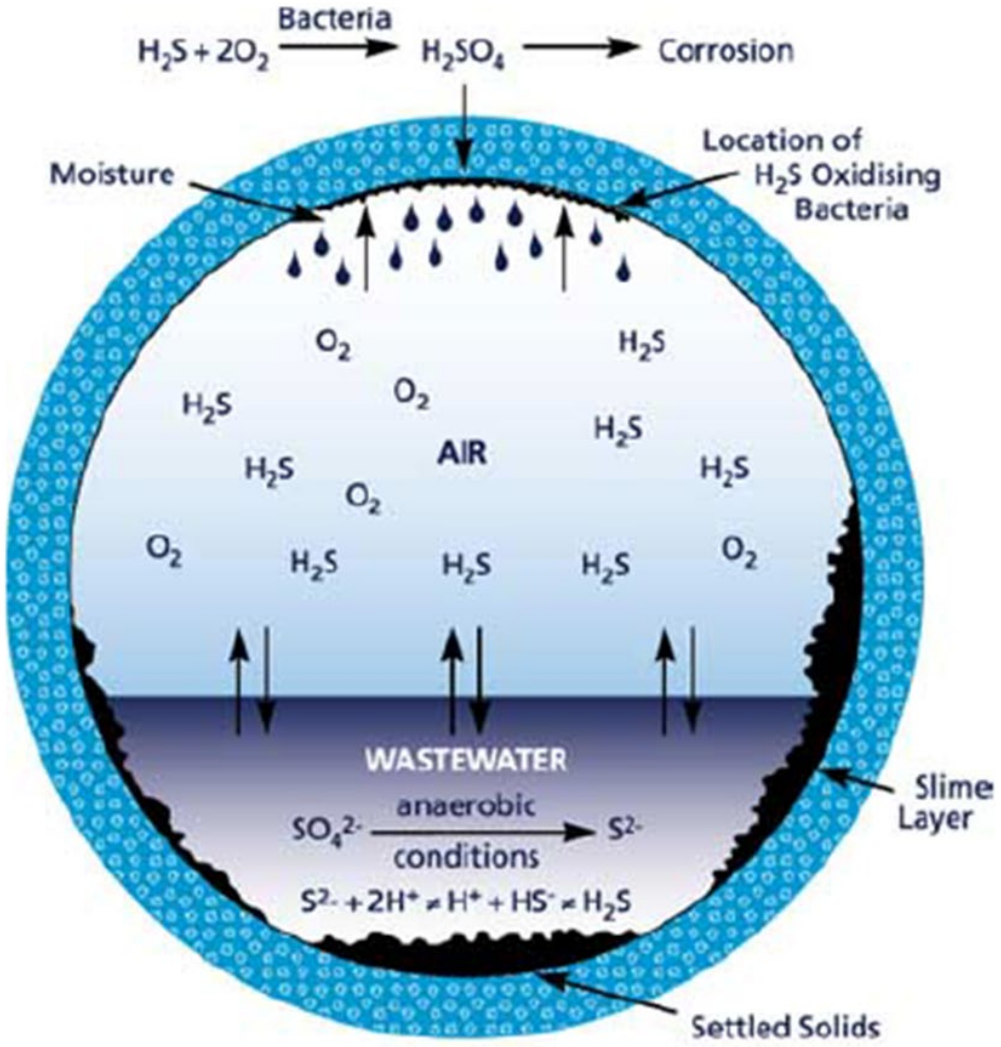
H_2S Odor Understanding the problem, options, and picking a strategy.

- Presenter
- Ed (Gun) Gunderson
- 28 years providing solutions to environmental issues.

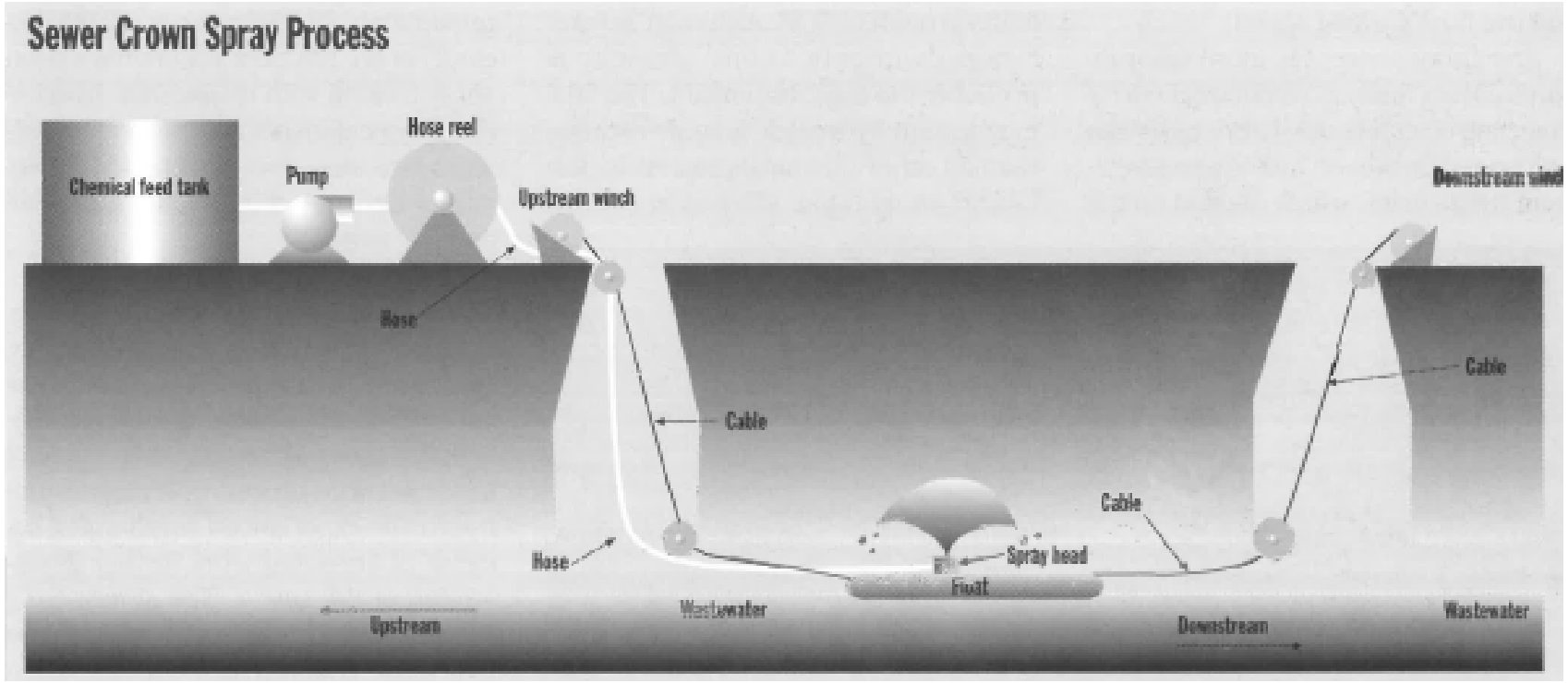
How did We and Ed Gun get here?

- Clean Water Act of 1972,77,87
- LACSD's Collection System started collapsing due to the the H2S degradation.
- Over 400 miles of unlined concrete pipe 18" to 12' Dia.
- LACSD Sprays Caustic
- Hill Brothers brought them magnesium hydroxide
- Crown Spray Early 90's Staff noticed the mag eliminating odor.
- Ed Gun 1996 – 1st task, sell this idea against Ferrous and Bioxide.

What's happening inside the collection system?



Over 30 Years of Crown Spray

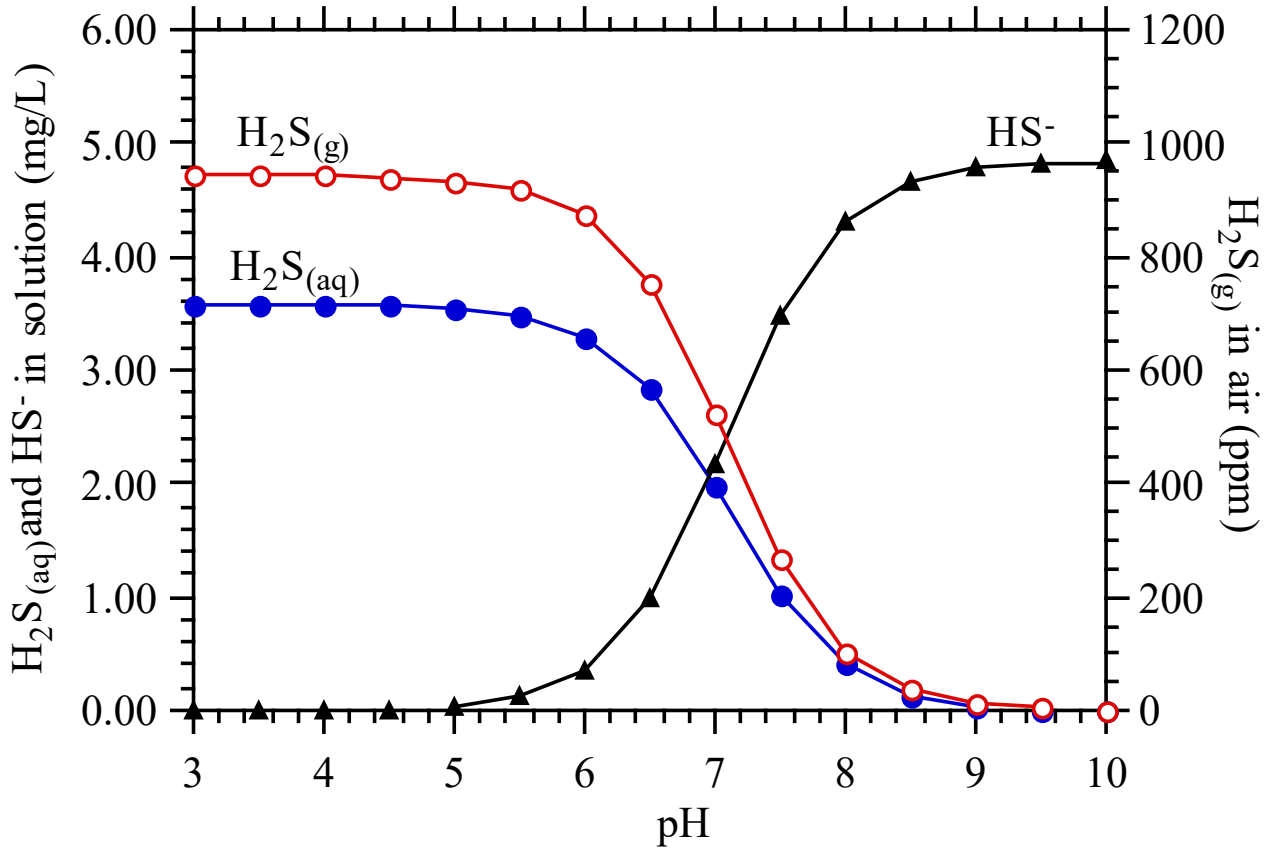


Magnesium Hydroxide – Milk of Magnesium

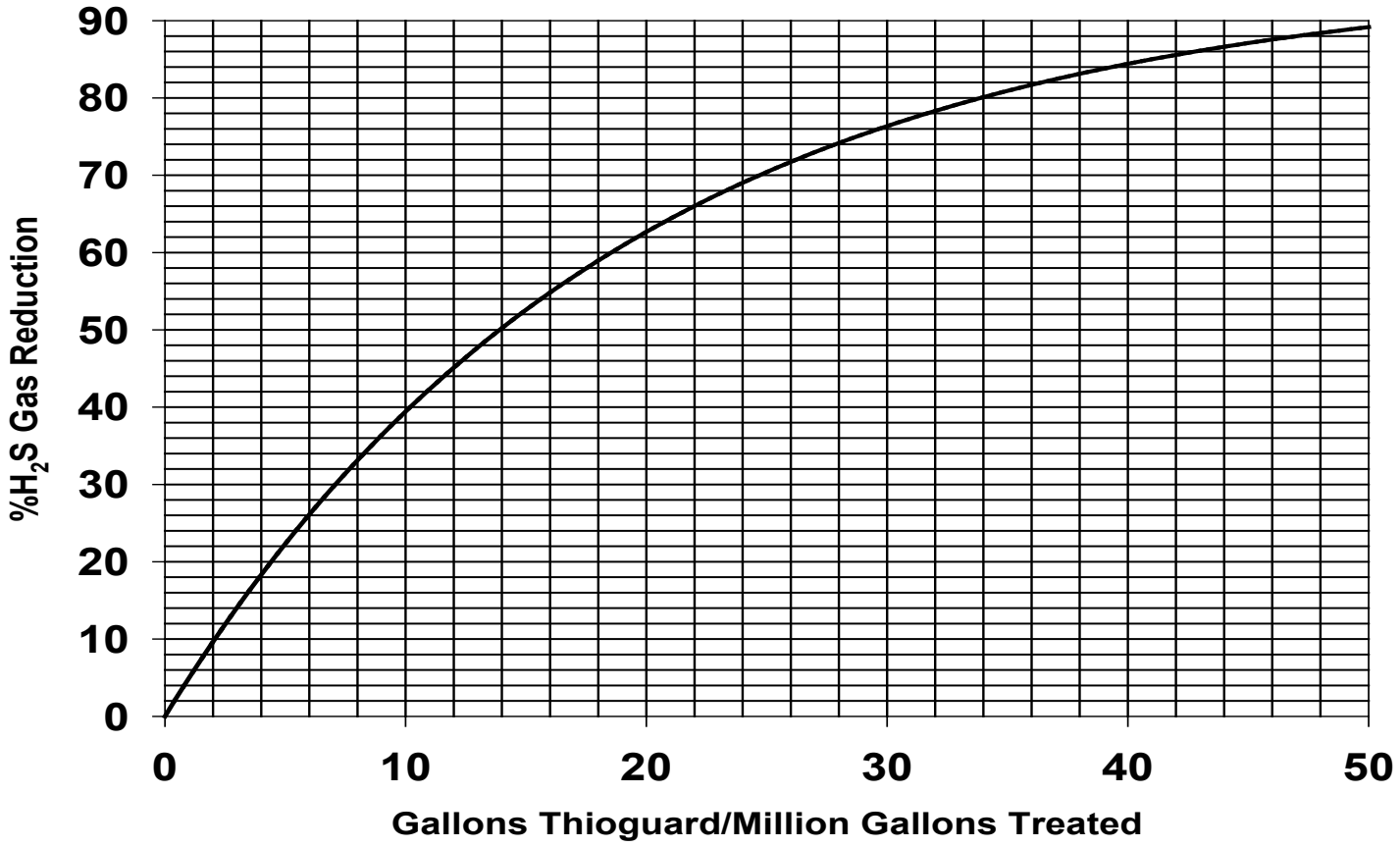
- Preventative and Curative

- Elevates pH
- Disassociates H_2S into HS^-
- Divalent Cation Mg^{++}
- Forms Magnesium poly sulfides
- Buffers at 9.2pH
- Averages a 90% to 95% reduction above 50 Gallons per million
- Retention time up to days

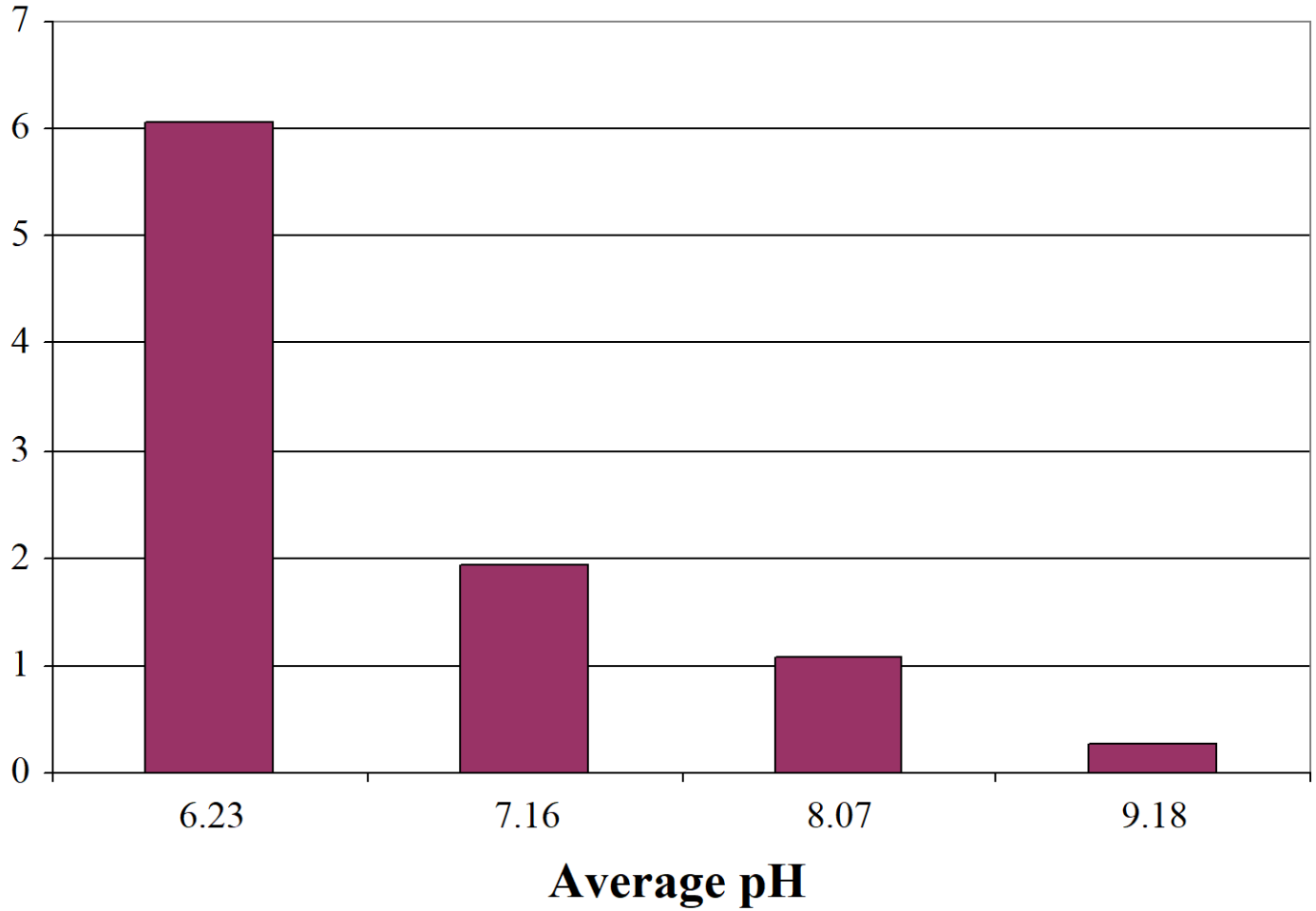
Effect of pH on the form of Sulfide



Dose Response pH shift



SRB Growth



Magnesium Hydroxide – Milk of Magnesium

Pros

- Non-Hazardous
- Widely used
- The higher the sulfide loading the more cost effective
- Treatment plant benefits

Cons

- Slurry that needs to be mixed
- Avoid low velocity and stagnate areas
- A maximum 90% to 95% reduction of background H_2S

Nitrates, Ammonium, Calcium, Sodium, etc

- Preventative and Curative

Preventative

- Alternative Oxygen Source
- Retention times of 2 to 4 hours

Curative

- Sulfide already formed
- 2 to 3 hours of contact time at a dose rate of 1 to 4 gallons per pound of H2S

Nitrates, Ammonium, Calcium, Sodium, etc.

Pros

- Non-hazardous
- Widely used

Cons

- Encourages biological action in the collection system
- Mating in wet wells.
- Not typically used as a curative

Nitrogen gas bubbling to the surface - DAF

Ferrous Chloride

- Curative

$$FeCl_2 + H_2S \rightarrow FeS + 2HCl$$

- Ferrous Chloride reacts directly with sulfide transitioning from dissolved solids to a suspended solid iron sulfide which will precipitate.

Ferrous Chloride

Pros

- Efficient and cost effective
- Long retention times 4 to 10 hours

Cons

- Low pH – Considered hazardous
- Take care feeding into infrastructure

Oxidizers – Bleach, Peroxide, Permanganate, Peracetic Acid, Oxygen ($EcoO_2$), etc.

Preventative or Curative

- Oxidizing sulfide back to sulfate
- An alternative oxygen source

Oxidizers – Bleach, Peroxide, Permanganate, Peracetic Acid, Oxygen, etc.

Pros

- Fast acting for spot treatment

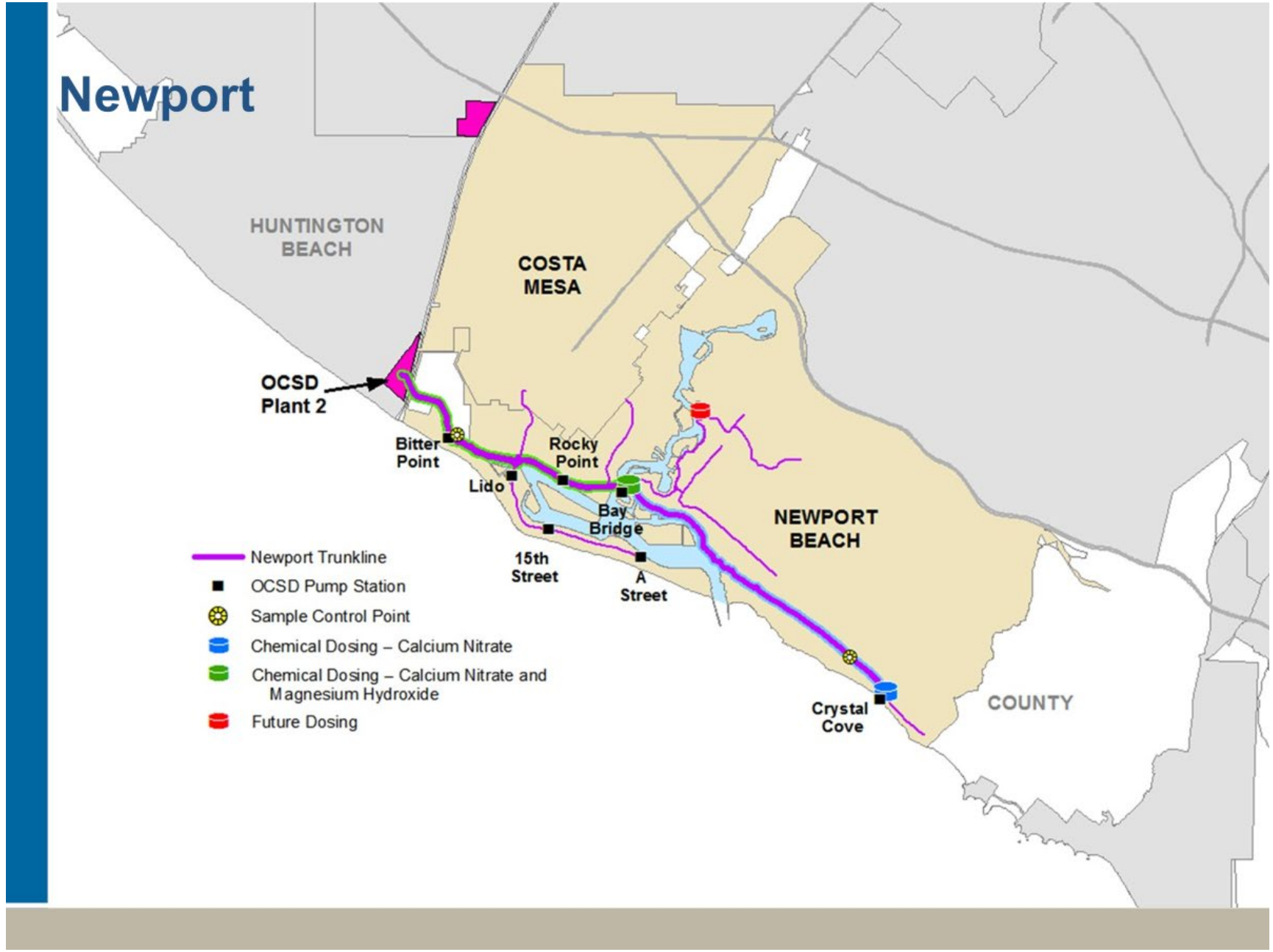
Con

- Hazardous
- Commodity pricing fluctuations (Costs)
- Short retention times mostly 1 hour Except peroxide seems to do a decent job with some control 30 to 90 minutes

Synergistic Combinations

- Nitrate and Magnesium Hydroxide
- Summer 400 Mag and 225 NO3
- Ferrous Chloride and Magnesium Hydroxide

Newport


HUNTINGTON BEACH
COSTA MESA
NEWPORT BEACH
COUNTY
OCSD Plant 2
Bitter Point
Rocky Point
Lido
Bay Bridge
15th Street
A Street
Crystal Cove
Newport Trunkline
OCSD Pump Station
Sample Control Point
Chemical Dosing – Calcium Nitrate
Chemical Dosing – Calcium Nitrate and Magnesium Hydroxide
Future Dosing

Collection System Challenges

- Diurnal Flow Variation WD-WE
- Rogue Industrial dischargers
- Lift Station configurations
- Pipe depressions
- Air flows
- Low Flow Velocity
- Temperature
- Sulfate levels
- TSS
- BOD
- COD
- Lack of district owned property

Partnering with private landowners.

Bacteria, Enzymes and Stimulants

- I have only ever seen these work in a grease trap or a pump twice a day wet well.

Killing Slime Layer – Caustic Shock or Clovis

Caustic Shock

- Widely used in large collection systems that can mitigate the sodium and high pH slug.
- Duration is 1 to 7 days mostly

Clovis

- Acid based reaction to kill the slime layer with a nitrous acid.
- Duration is 1 to 3 weeks depending

The End

Questions?