



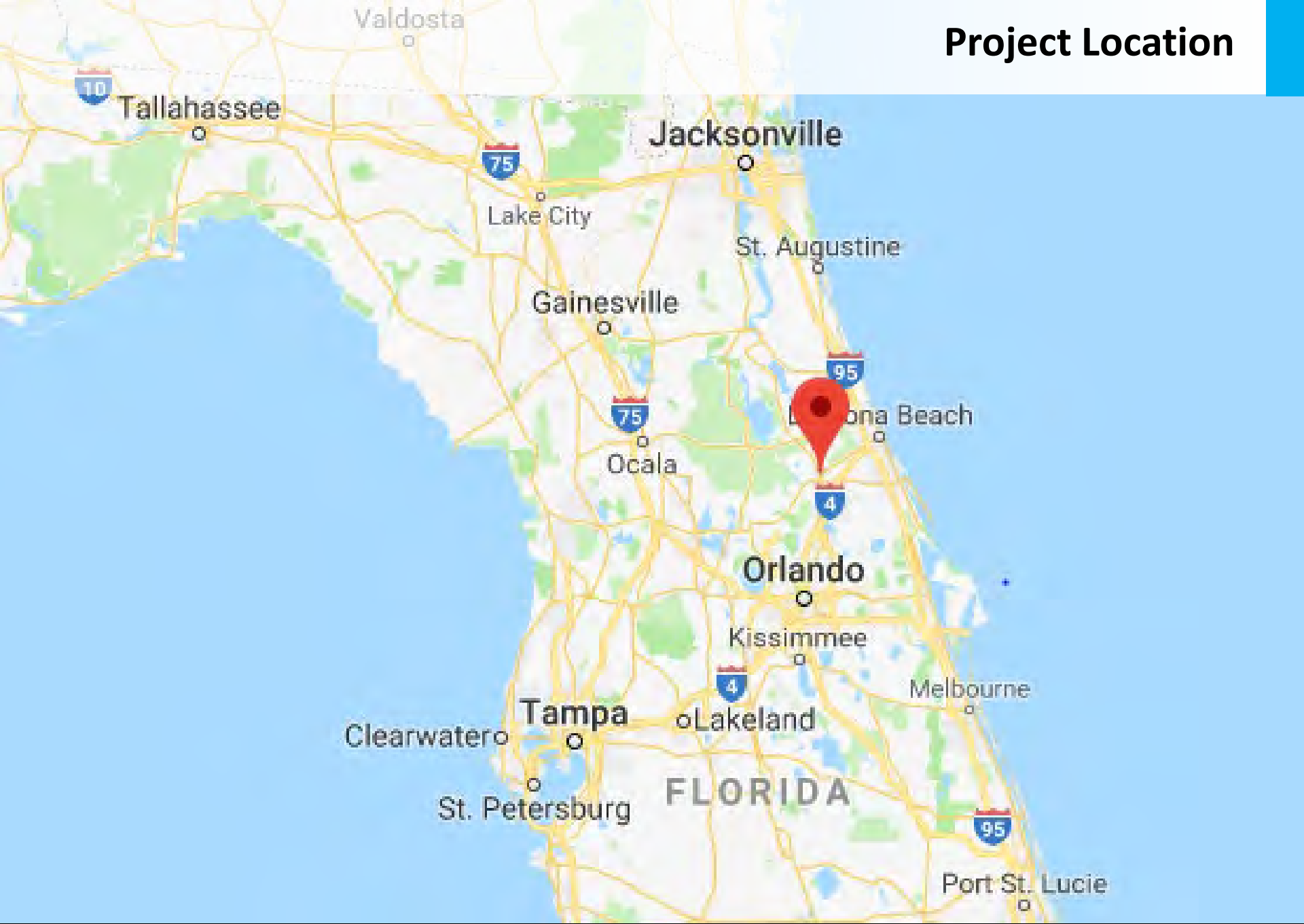
**Reducing TN to < 3 mg/L
with No Anoxic Basin
and No Chemicals**

City of DeLand

**WRF Nutrient
Removal Upgrades**

April 16, 2019

Project Location



DeLand, Florida Wastewater Treatment Plant



- Built in 1978. Expanded in 2002.
- Rated dry weather 6.0 mgd
- Rated peak flow 12.0 mgd
- Screening
- Ovivo carrousel biological treatment
- Ovivo Secondary Clarifiers
- Aqua - Diamond Cloth Media Filters
- C1² disinfection
- Public access reuse distribution

BACKGROUND

- Mead & Hunt provided process upgrade planning beginning in 2015 by Mead & Hunt
- Total Maximum Daily Load (TMDL) Legislation Requires TN <3 mg/L for Wastewater Treatment Plant (WWTP) discharges near Blue Spring
- 50-percent grant
 - St Johns River Water Management District (SJRWMD)
 - Florida Department of Environmental Protection (FDEP)
- Total project cost \$ 1.64 million

New Process Equipment

- No new basin construction
- Replace aerators with Ovivo dual impeller aerators
- Add 'Oculus' control system
- Retrofit Variable Frequency Drives (VFD's) in existing motor control center (MCC)



BNR Layout



Operating Parameters



- Average Flow in 2018 3.2 MGD
- Peak flows in 2018 of 4.0 MGD
- MLSS of 2,500 mg/L
- Three Trains In Operation (1.0 mg each)
- No Supplemental Carbon



Control Strategy



- Control aerators 3E, 3W. Based on D.O. Ref
- 3E set to run 10 Hz > 3W
- D.O. Ref setpoint 0.25-0.30 mg/L

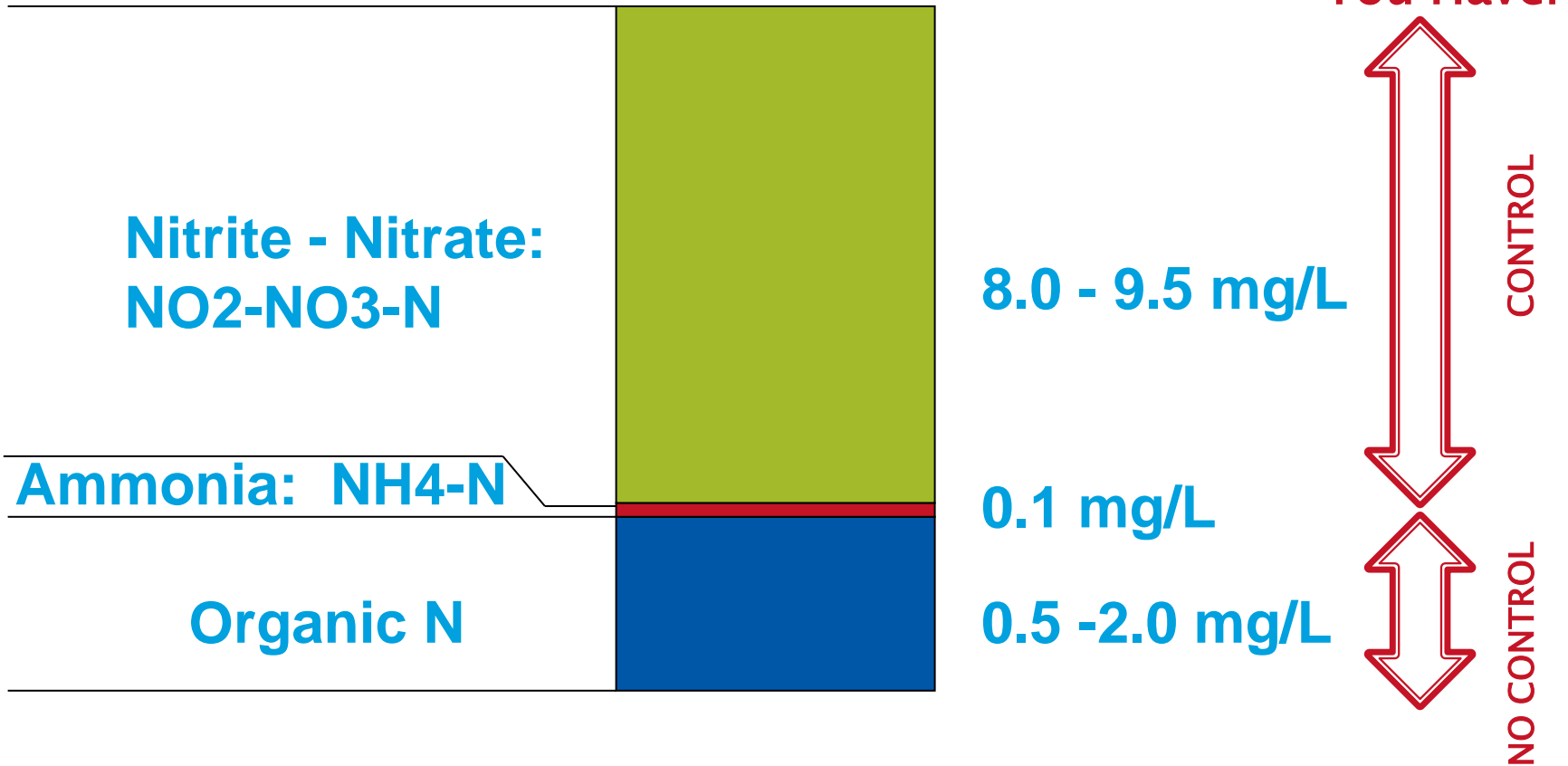
Control Strategy

- Create in-channel anoxic zones
- Promote sNdN (simultaneous nit/denit)
- Maintain channel velocity



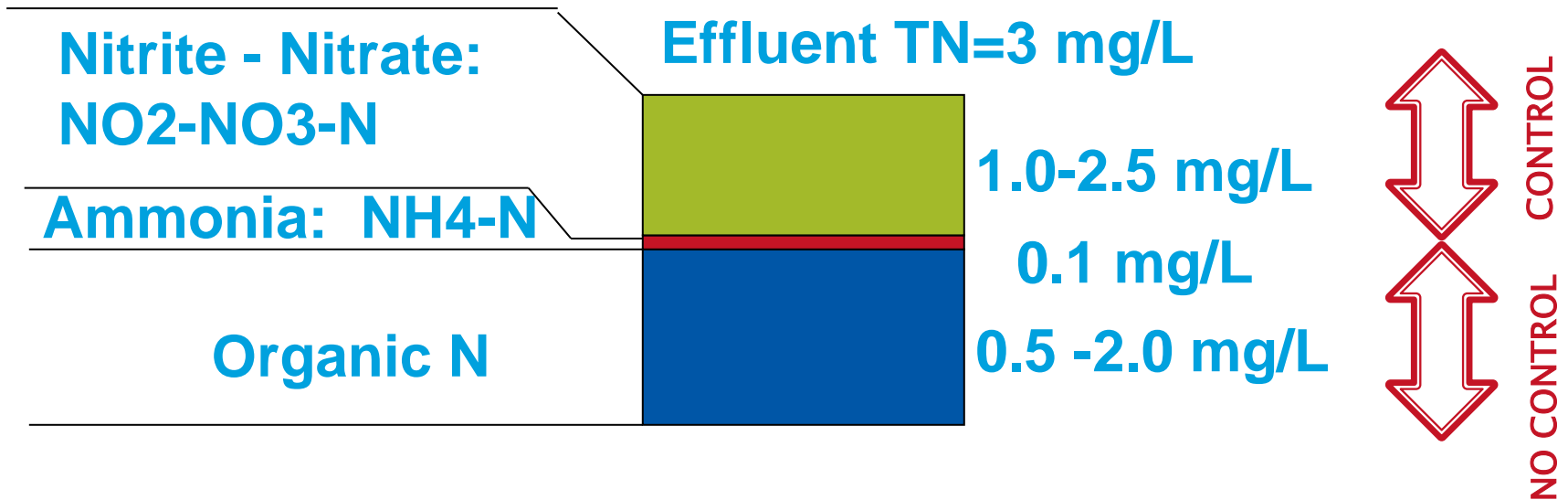
Removing Nitrogen To Reuse Standards

Effluent TN=10 mg/L



Removing Nitrogen To Reuse Standards

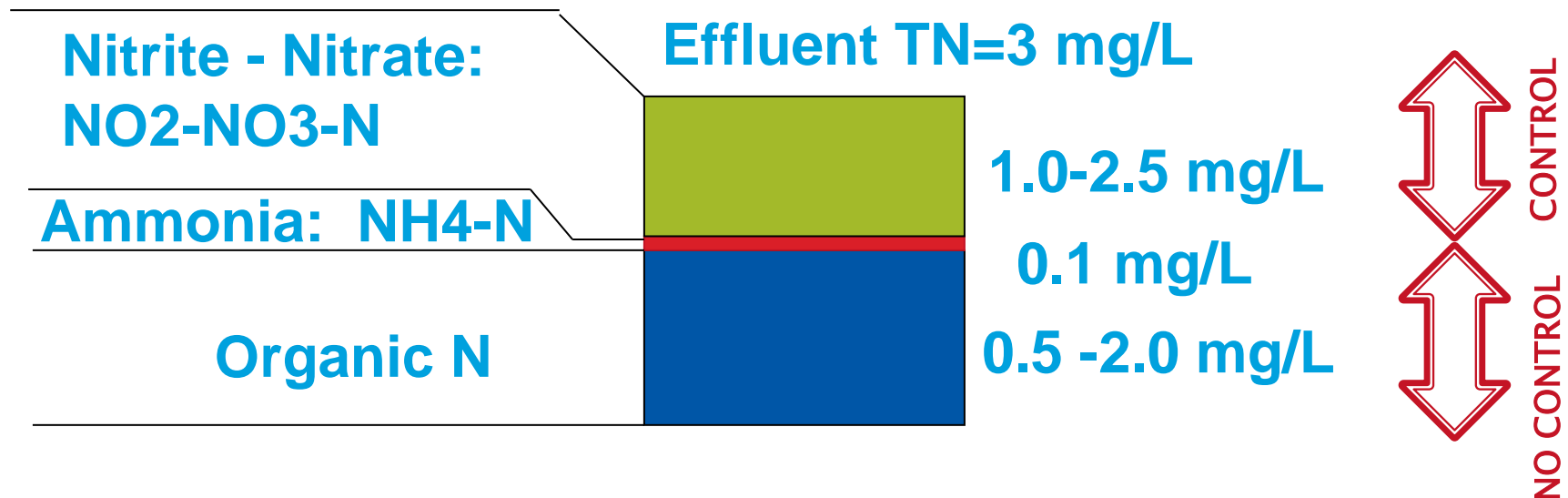
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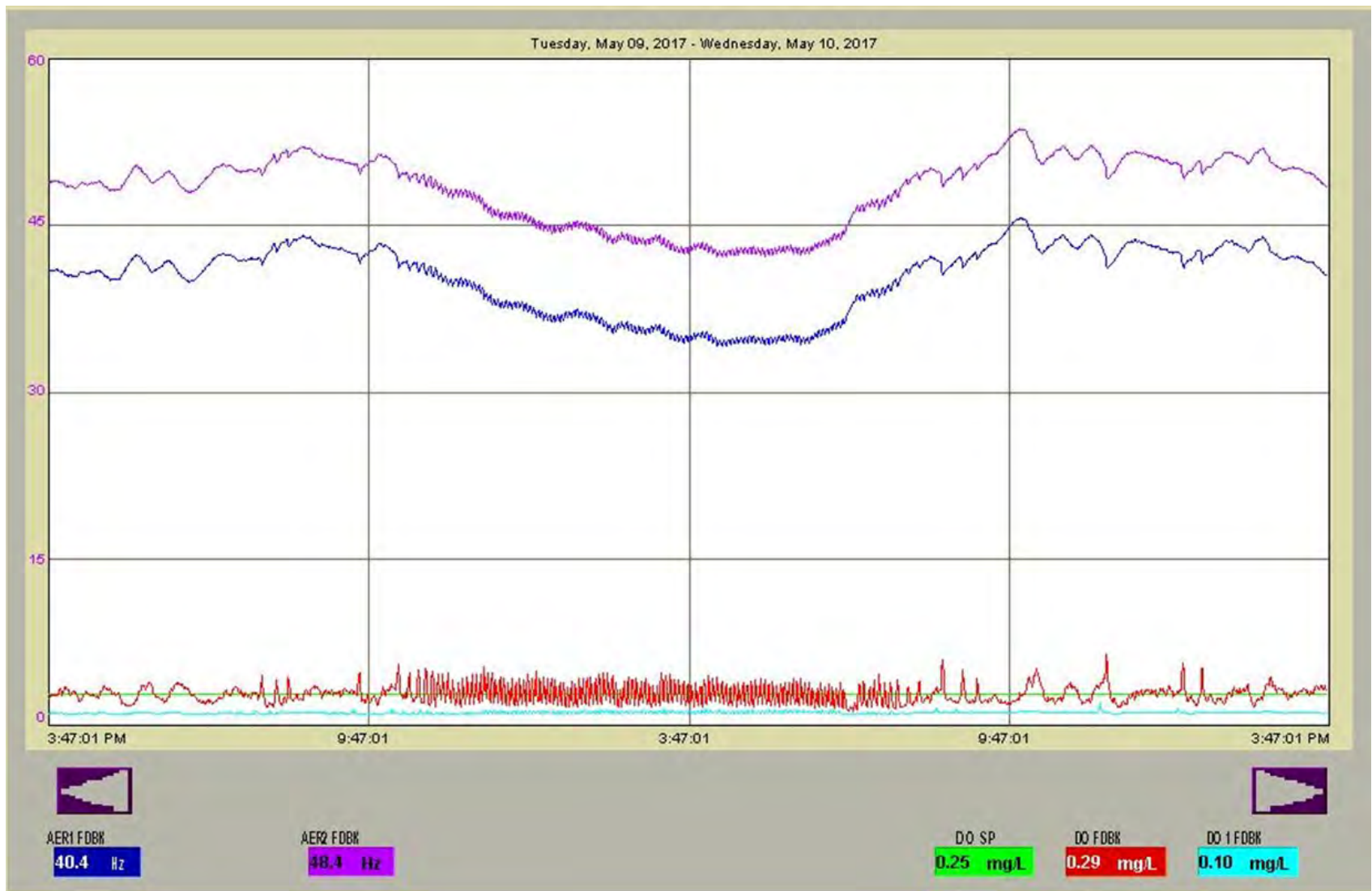
Removing Nitrogen To AWT/Springs

- Avg Organic at Deland ~0.5 mg/L
- Full nitrification required
- Removal of NOX-N < 2.5 mg/L required

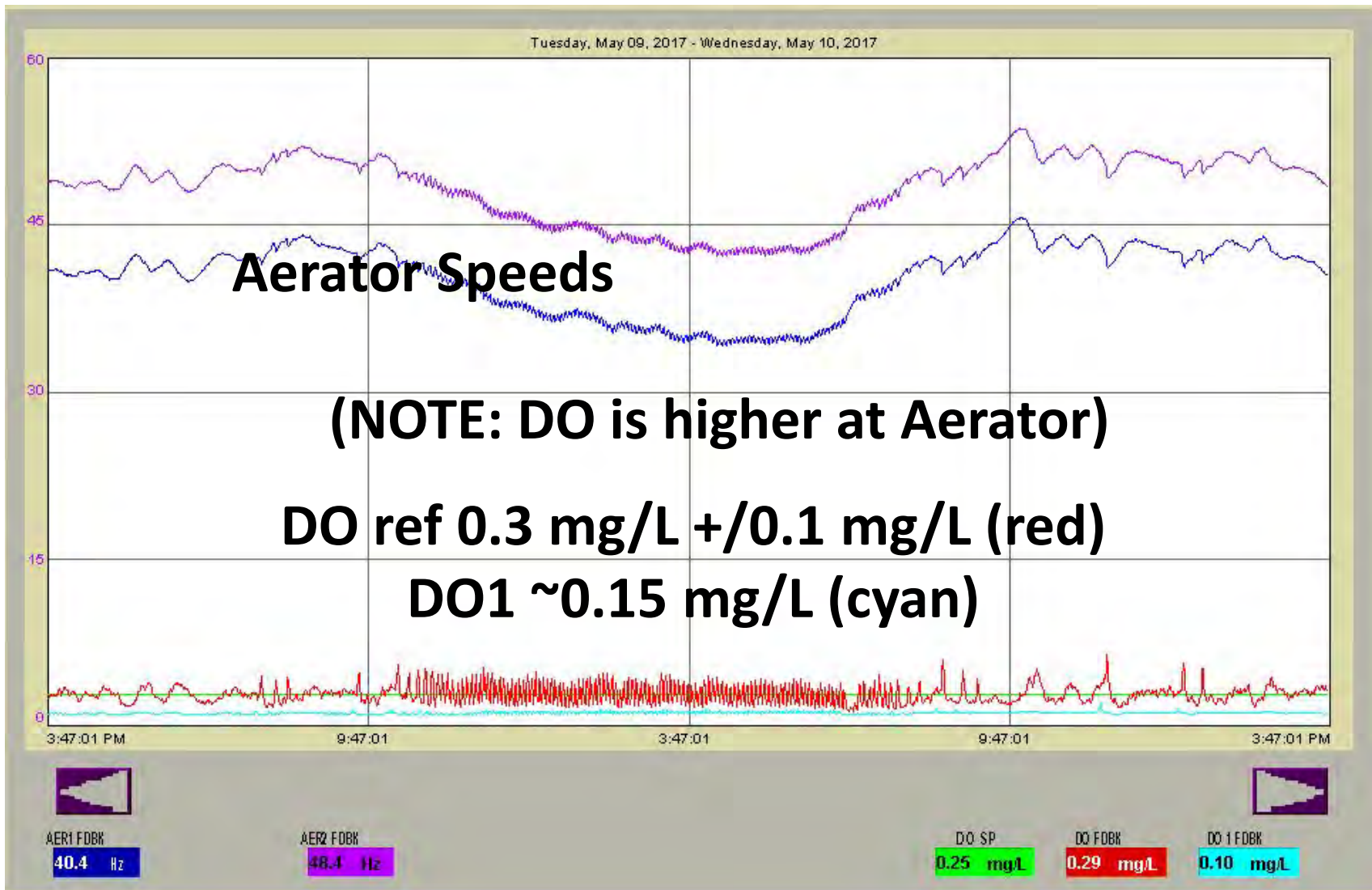
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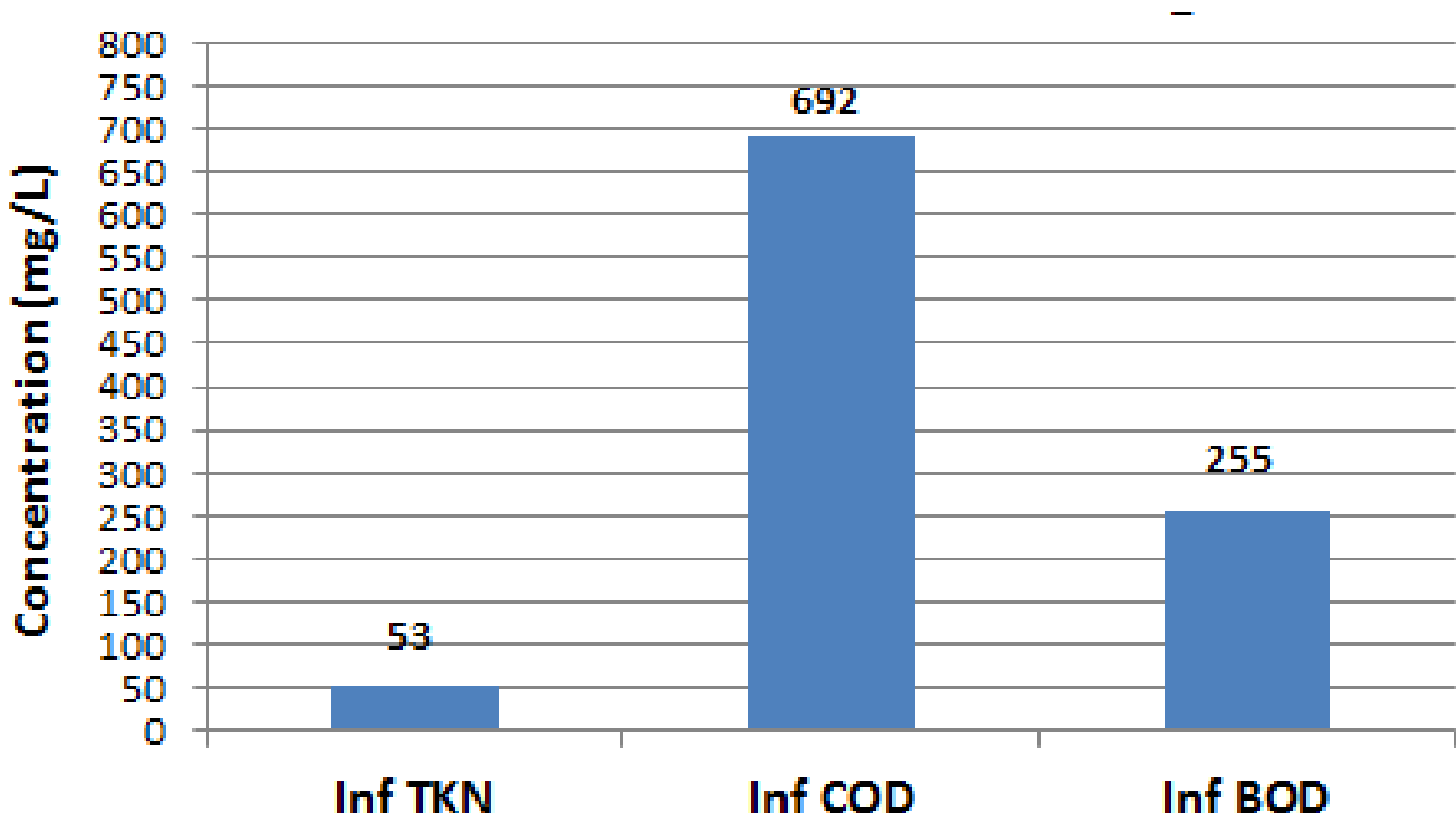
Deland, Florida WWTP 24 Hour Trend



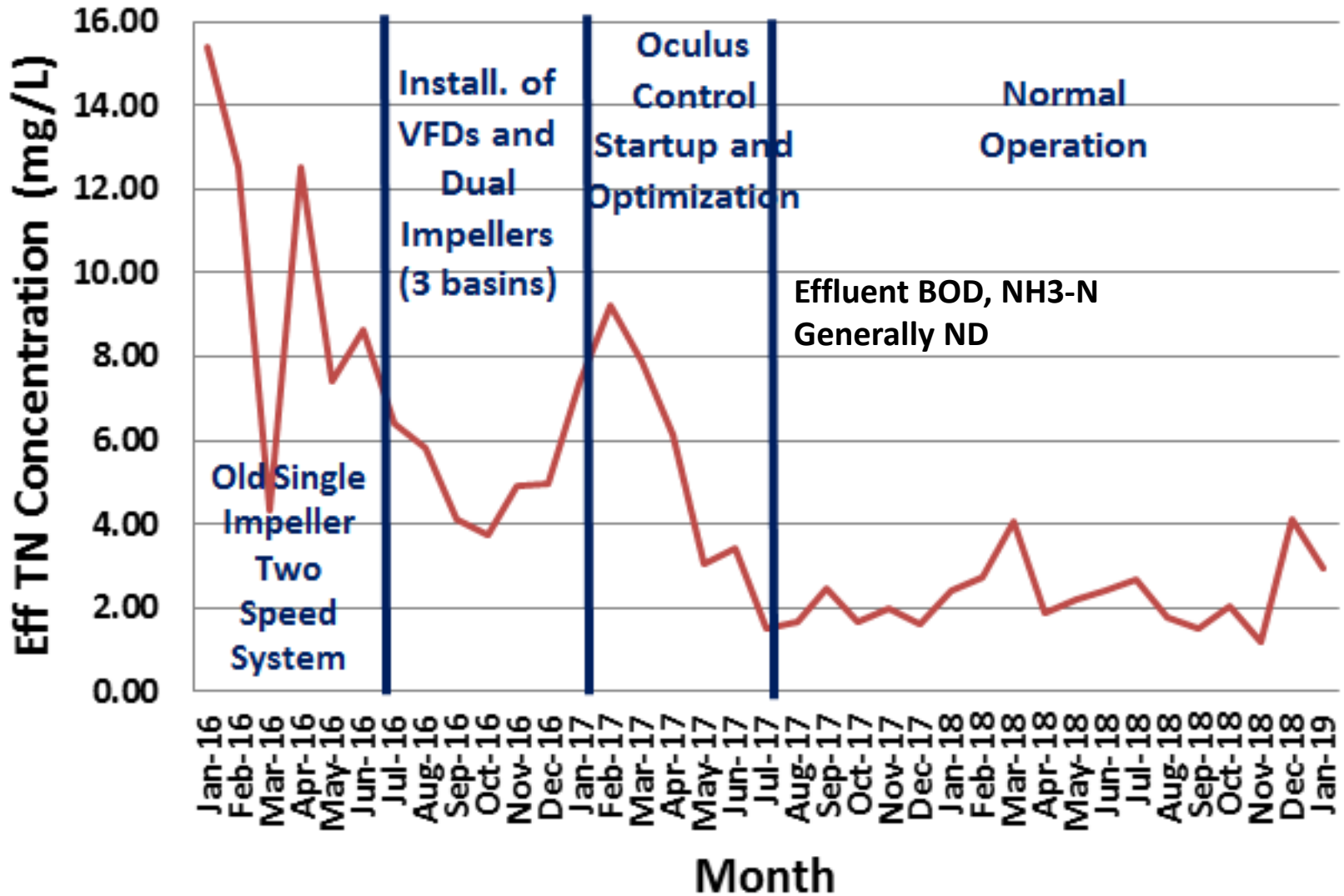
DeLand, Florida WWTP 24 Hour Trend



DeLand, Florida Influent 2018 Average



Effluent TN at DeLand, Florida



Summary and Conclusions

- Given sufficient HRT, SN/DN can be achieved with proper equipment and controls
- Dual impellor mixers promote floc shear, increasing SN/DN efficiency
- Very low DO, 0.25-0.30 mg/L, are required at DO ref site
- DO higher near aerators, VFD's are a necessity
- DO setpoints +/- 0.05 mg/L made a significant difference
- Tandem control is more effective than lead lag control

Questions?

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