



*The next generation of water filtration
purification & biological treatment*

**BioMag: New Technology
for Cost Effective
ENR Upgrades**

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Outline

- **Intro to CWT**
- **Secondary clarification: the weak link**
- **BioMag: ballasted biological treatment**
 - How does it work?
 - Applications
 - ENR Technology
- **Winebrenner BioMag trial in Cascade, MD**
- **ENR without the denit filters**
- **Significant potential cost savings in Maryland**



The Challenges of Biological Treatment

- **Secondary clarification is the bottleneck of activated sludge treatment**
 - Filamentous bulking
 - Storm flow issues (I&I)
 - Pin floc



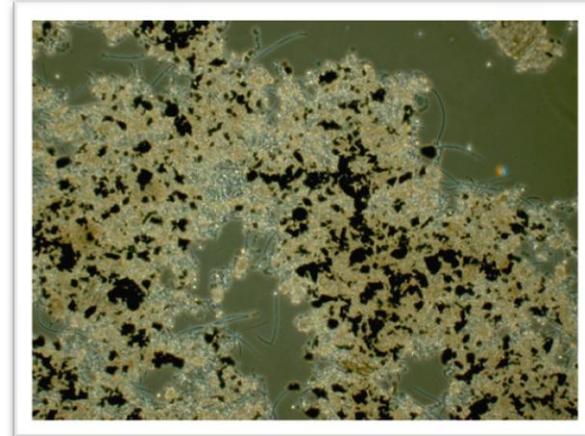
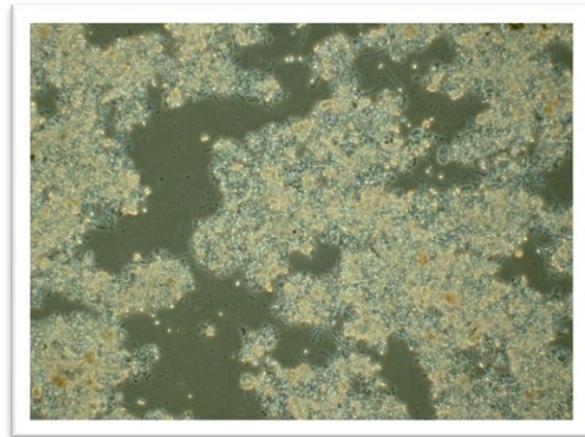
- **Limits MLSS concentration**
- **Limits nutrient removal capacity**
- **Compromises effluent quality**
- **Requires expensive solutions to correct**



Magnetite: the Enabler

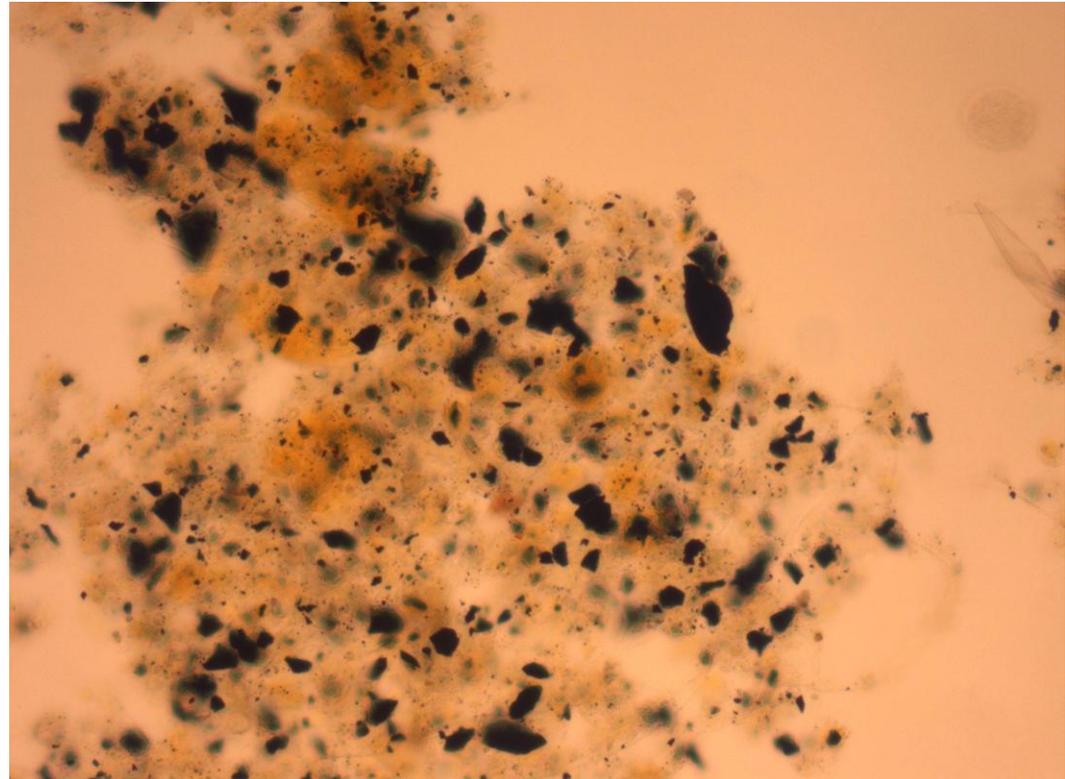
- **Magnetite is Fe_3O_4**
 - Doesn't rust or degrade
 - Completely inert

- **Two critical properties:**
 - It's dense;
specific gravity: 5.2
 - Magnetically controllable

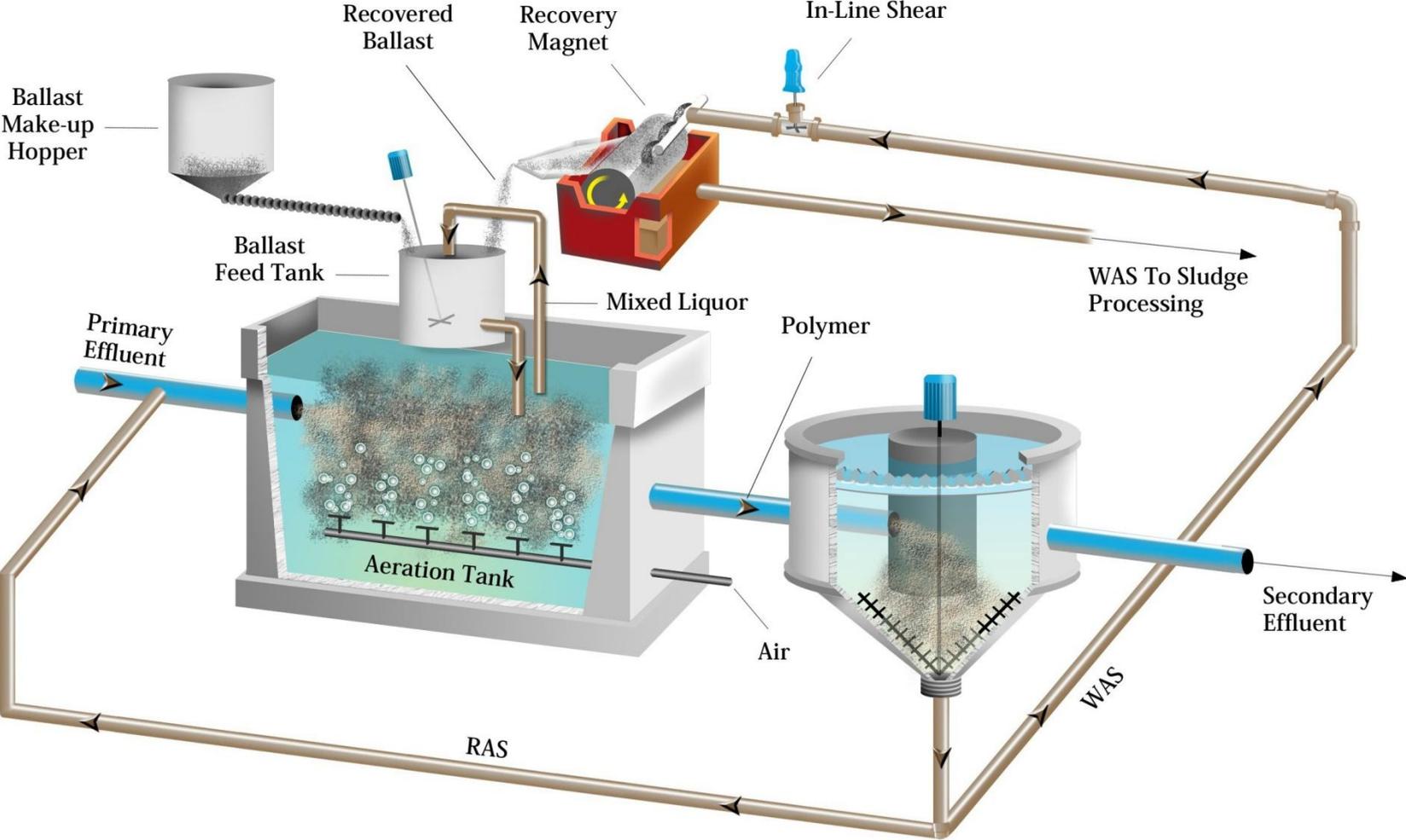


The Benefits of Ballasted Biological Floc

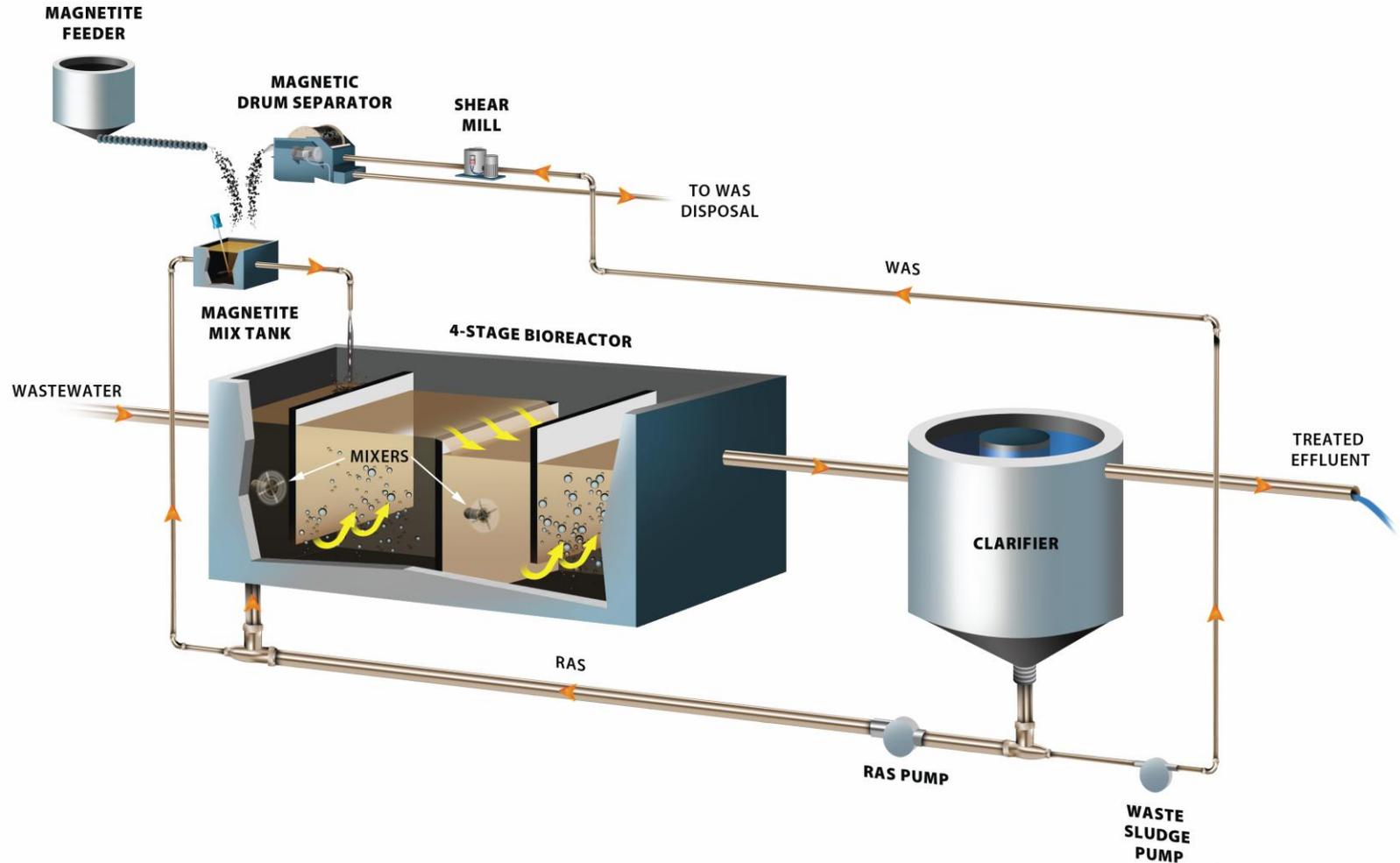
- **Ballasted floc ensures rapid, reliable settling**
- **Facilitates increased MLSS concentrations**
- **Maintains control over sludge blankets (I&I)**
- **Frees up tankage for nutrient removal (e.g. anoxic zones)**
- **Provides clean effluent – low TSS**
- **Facilitates low effluent TN!**



BioMag: Enhanced Biological Treatment



4-Stage Bardenpho Process Flow



BioMag Pilot Trailer



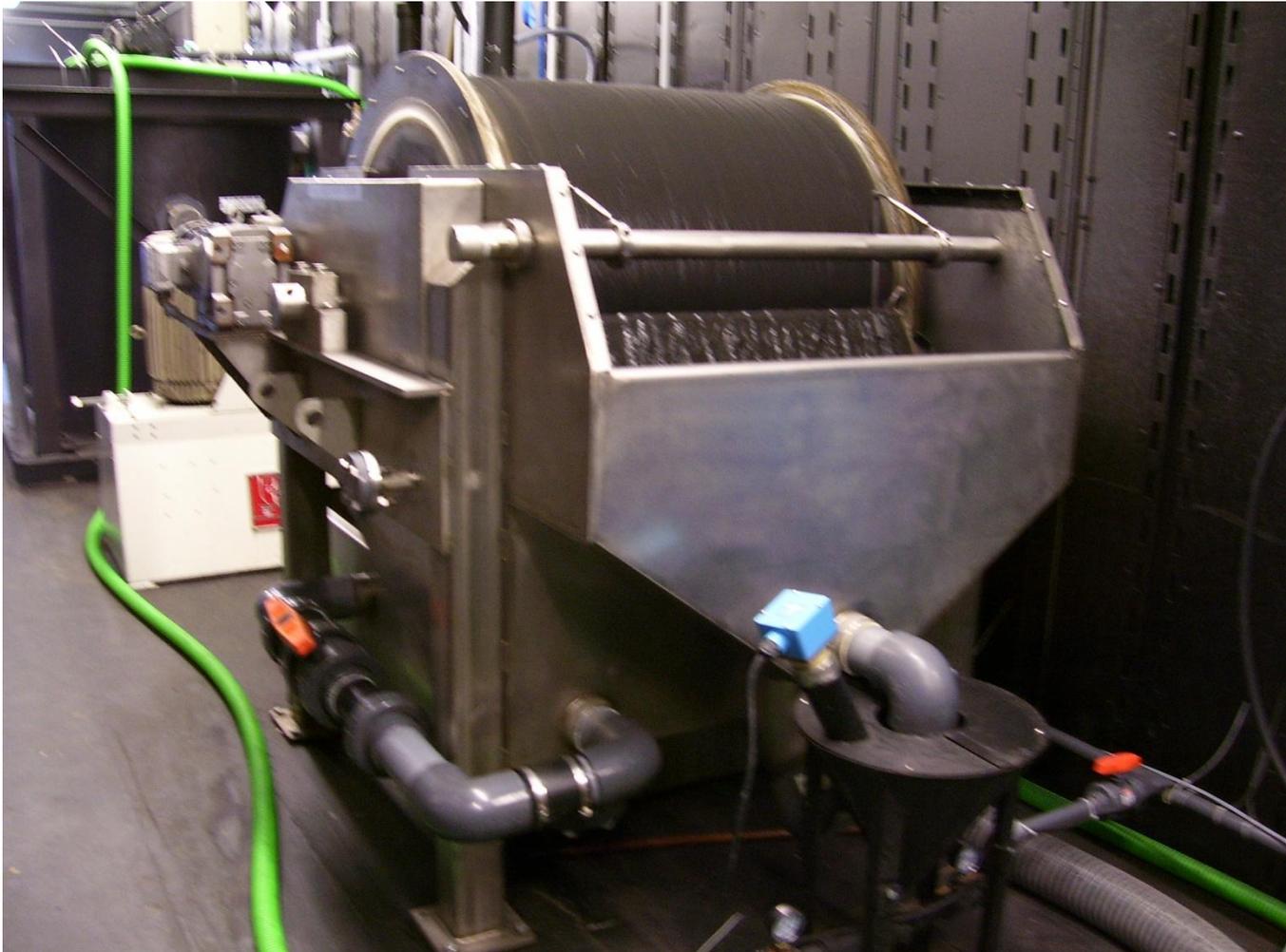
Magnetite Feeder



Shear Mill



Recovery Drum



Rapid Clarification Increases Capacity



Magnets Are Used to Recover Magnetite

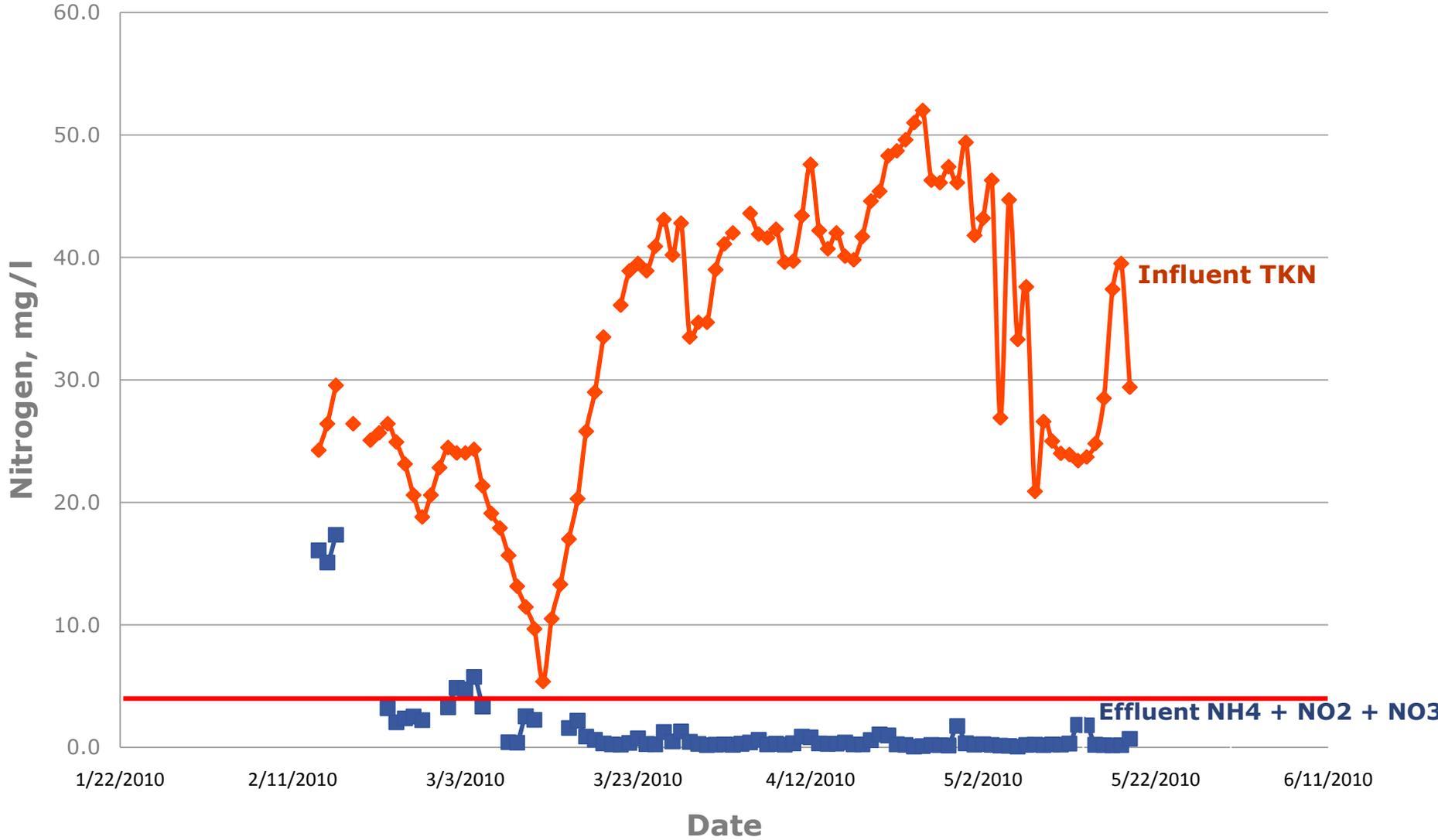
- Video clip



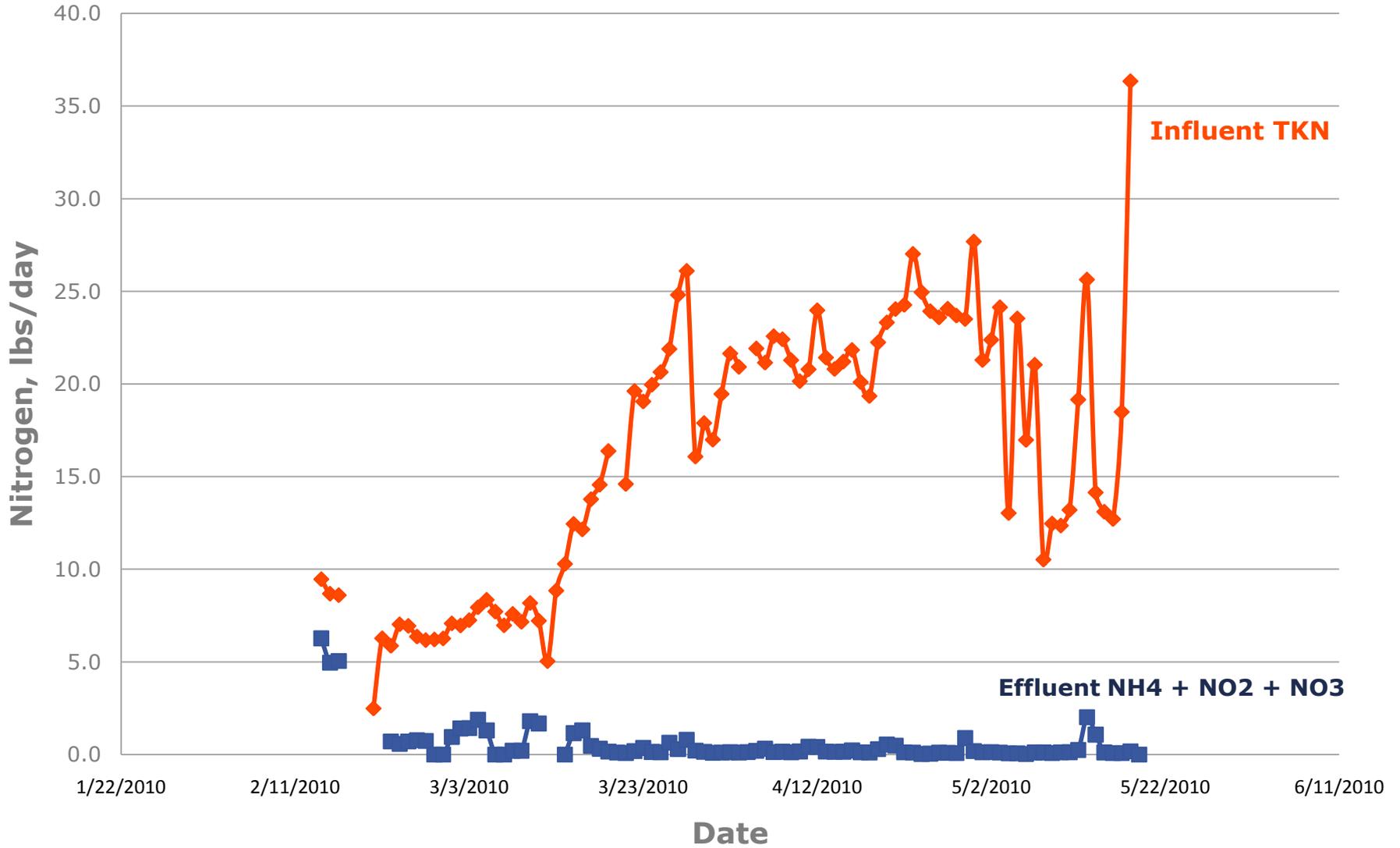
Winebrenner Plant Layout



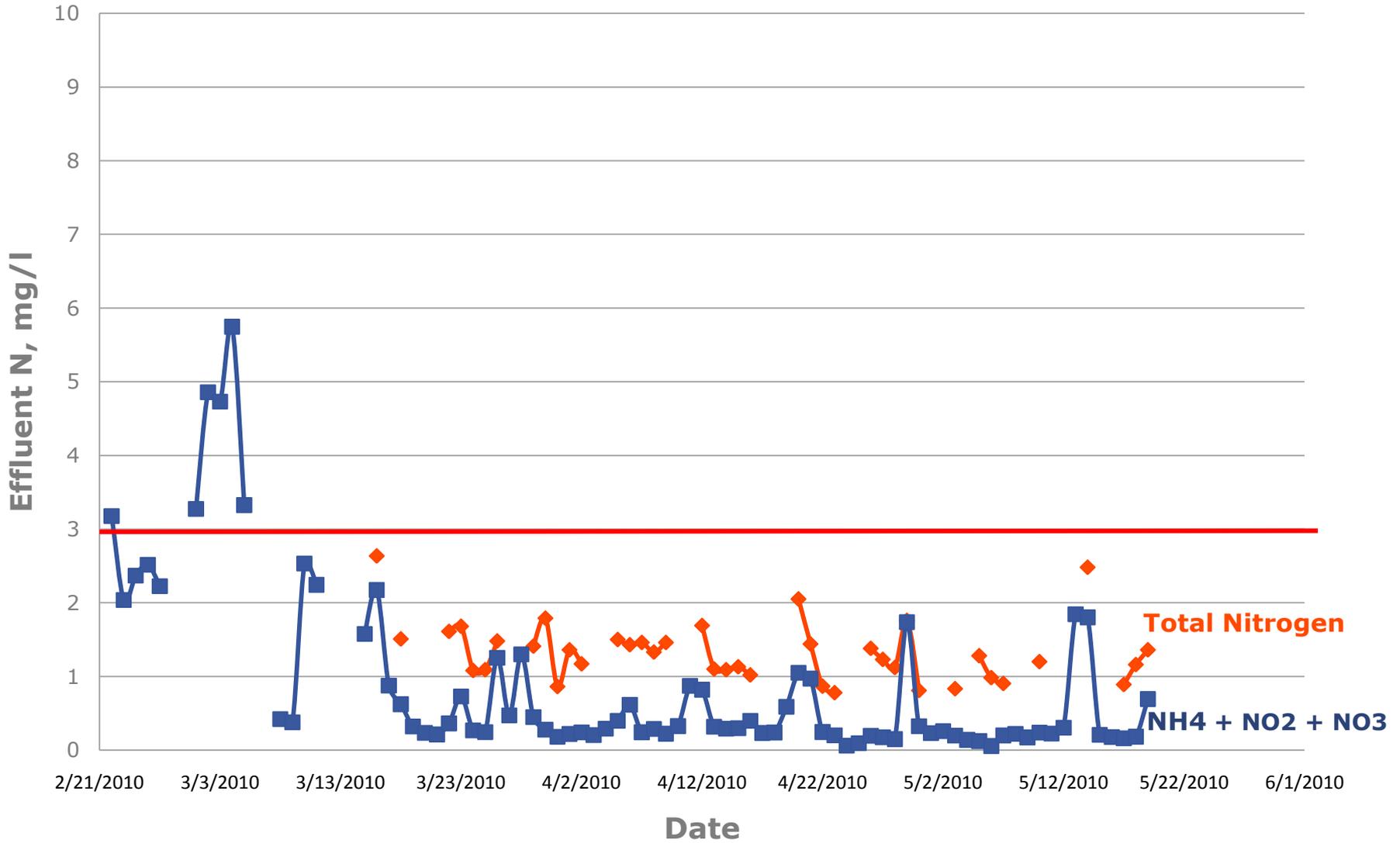
BioMag Influent and Effluent Nitrogen



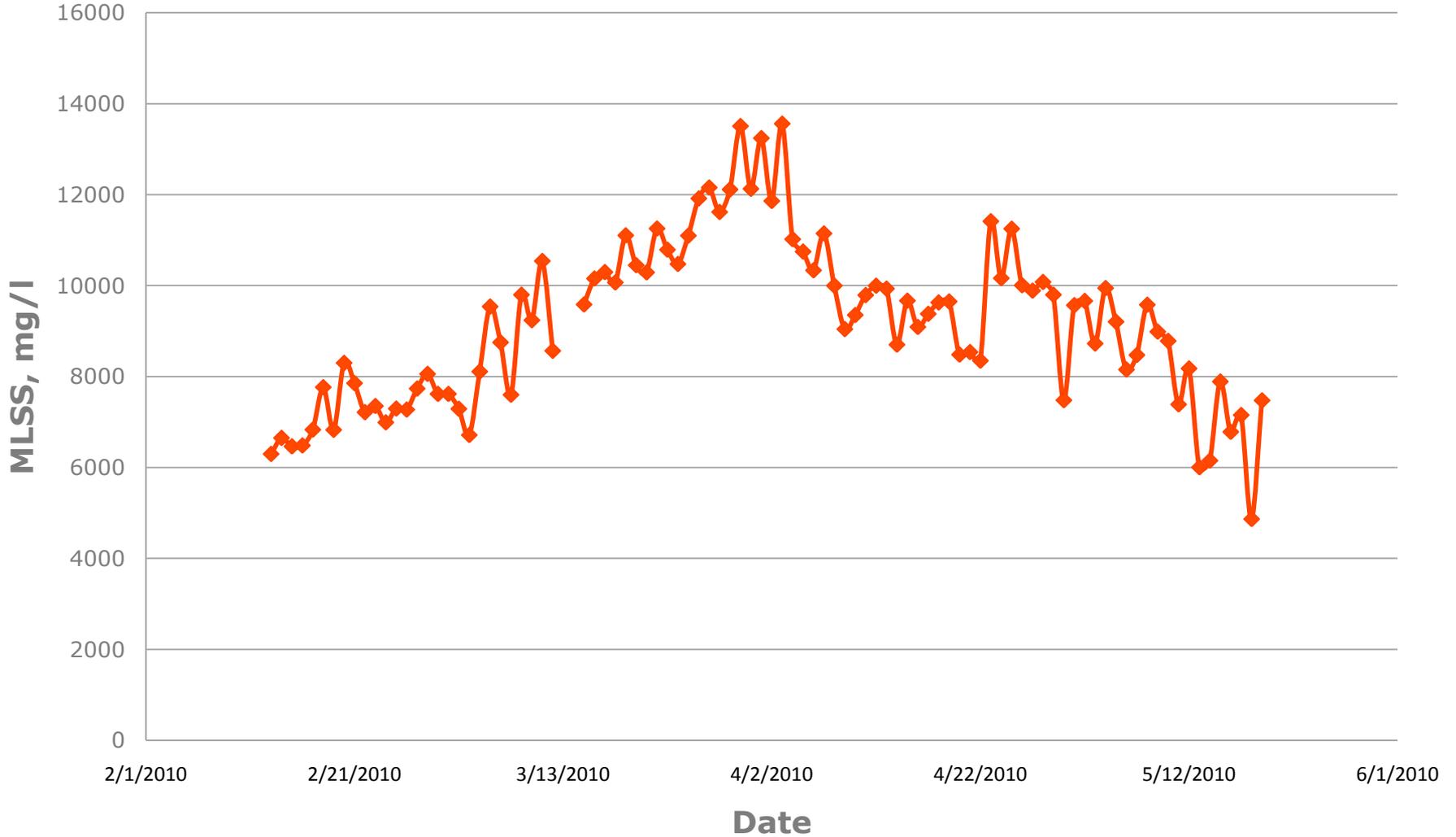
BioMag Influent and Effluent N, lbs/day



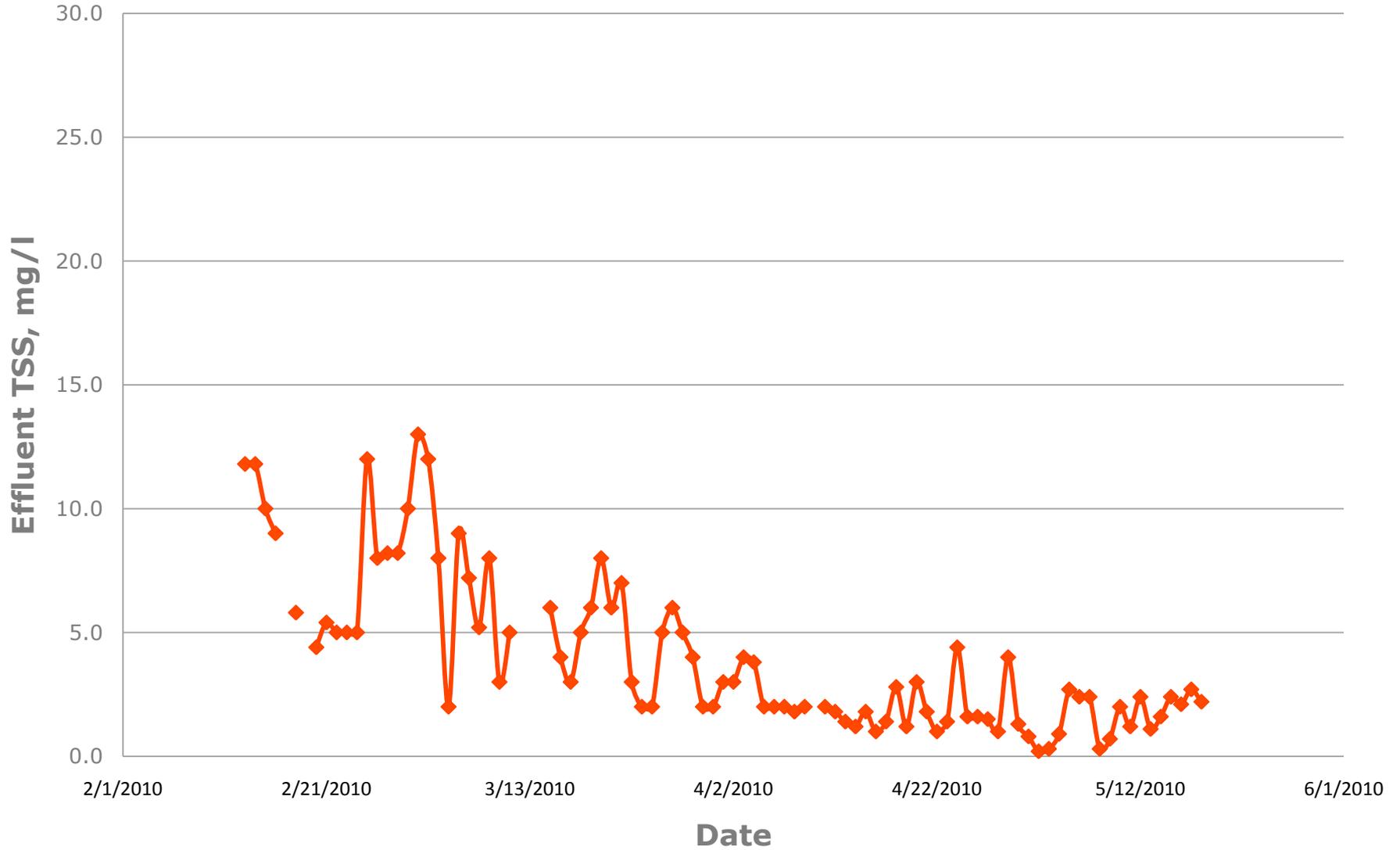
BioMag Effluent TN and NH4 + NO2 + NO3



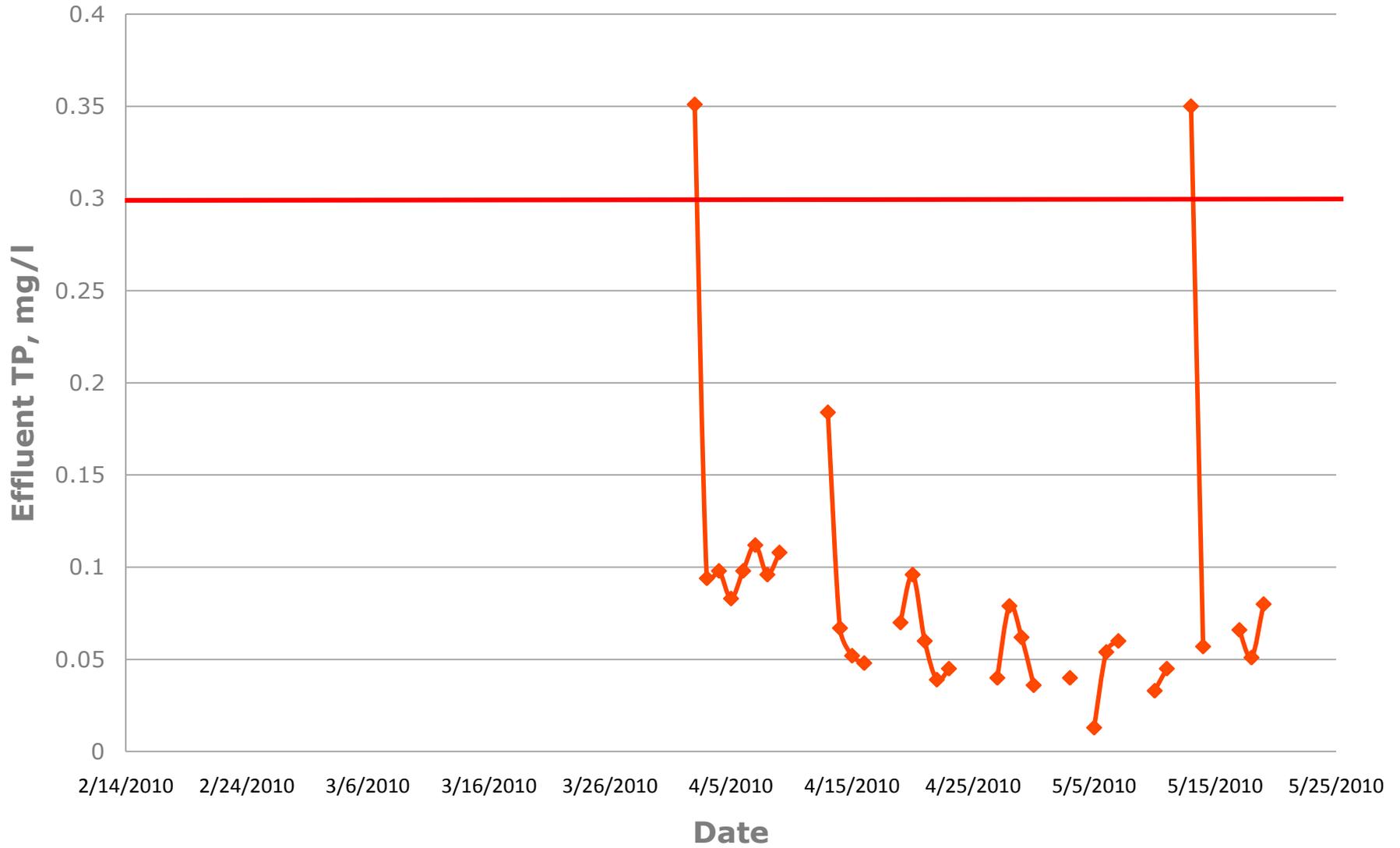
BioMag MLSS (not including magnetite)



BioMag Effluent TSS



BioMag Effluent Total P



BioMag Wet Weather Flow Performance



ENR Without the Filters

- **Excellent, reliable TN removal**
- **Same for TP**
- **Low effluent TSS (< 5 mg/l)**
- **High MLSS and low, stable sludge blanket**
- **Frees up tankage for anoxic zones**
- **Often eliminates need for new process tankage and/or IFAS**
- **Also eliminates need for filters**
- **Mitigates impacts of I&I**
- **Scales up very well**

