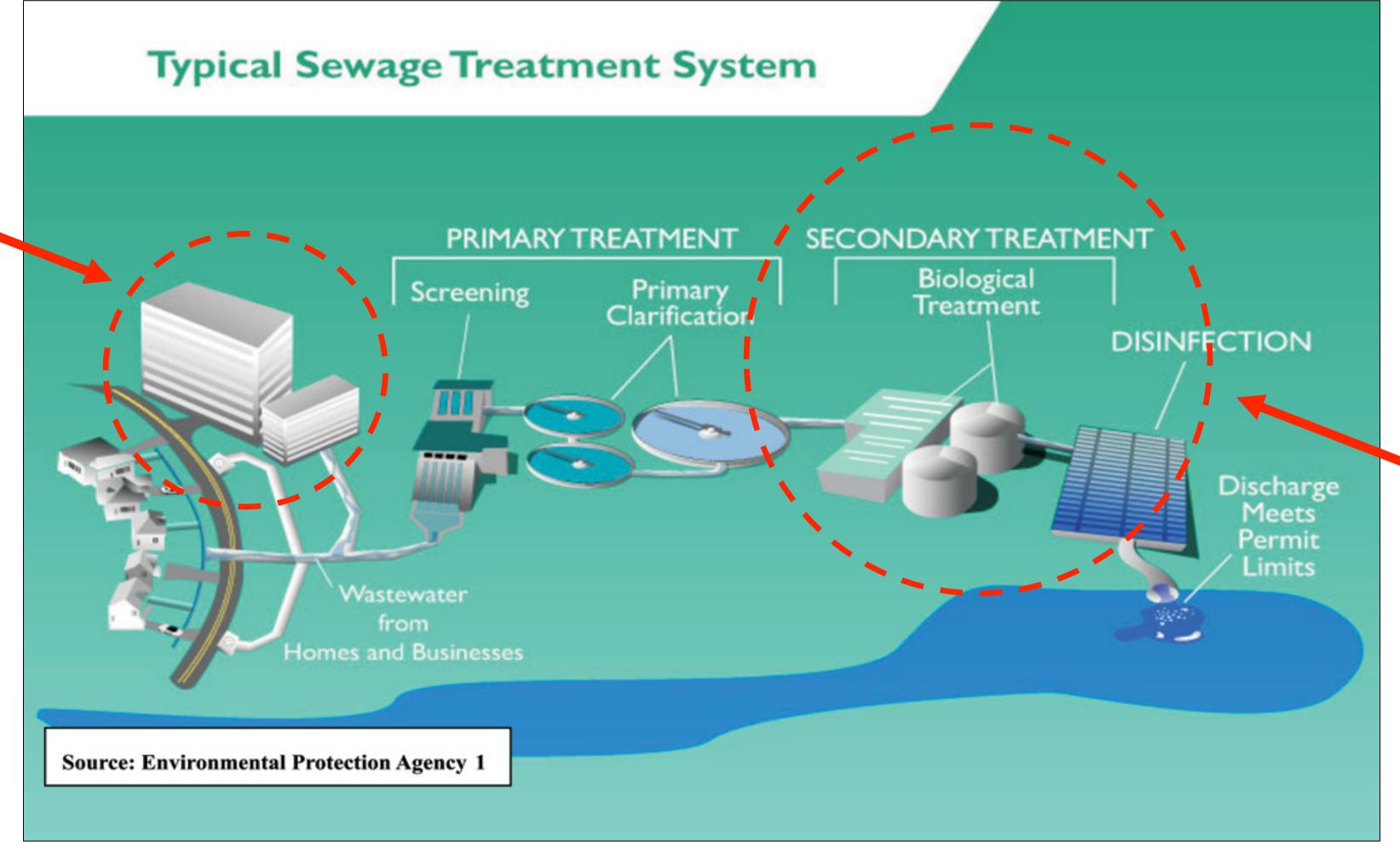


# (CMI Critical Materials Institute

An Energy Innovation Hub

## Rare Earth Effects on Biological Wastewater Treatment (WWT) Systems

Industries often release pretreated wastes to municipal wastewater treatment plants



Impairment of treatment function could cause failure to meet discharge criteria

- Local, State and Federal regulations drive the type and extent of required wastewater pretreatment.
- EPA has not yet established pretreatment guidelines for rare earth elements (REEs).

## **Objective:**

Evaluate the impact of potential REE wastewaters on the growth and function of WWT microbes.

### Results to date:

Exposed synthetic Eu and Y containing wastes (mimicking fluorescent lamp phosphor recycling) as well as complexant tributyl phosphate (TBP) to model nitrifying organisms:

Nitrosomonas europaea:  $NH_3 + 1.5O_2 \rightarrow NO_2 + H^+ + H_2O$ Nitrobacter winogradskyi:  $NO_2^- + 0.5O_2 \rightarrow NO_3^-$ 

- Found that >10 ppm Y and Eu inhibits growth and activity of N. europaea; TBP increases inhibition.
- N. winogradskyi even more sensitive to these REE and TBP.
- The REEs appear to exert toxic effects even when most of the metals are insoluble.

#### **Current and future work:**

- Conducting exposure studies with activated sludge consortia from Idaho Falls WWT Plant.
- Assessing effects on anaerobic treatment.

