FIELD TRIP MEMORANDUM

TO: MARGARET LANG AND EILEEN CASHMAN
FROM: KELSEY BURRELL
SUBJECT: ARCATA WASTEWATER TREATMENT PLANT
DATE: OCTOBER 7, 2016

Purpose

On the morning of September 30th our Introduction to Engineering lab visited the Arcata Wastewater Treatment Plant and spent about an hour touring the facilities. As detailed below, we gained specific information about the treatment train we had previously understood very generally.

Discussion

During our tour we followed the sequential treatments of influent wastewater. The BOD_5 and TSS of the raw sewage are each around 250 mg/L in the dry season, and 90 mg/L in the wet season. During the dry months when Arcata is impacted with the student population, the plant receives a peak of about 1.6 mgd. This volume spikes to about 8 mgd during the wet season due to leaky pipes around the city. The raw sewage is pumped into the grit chamber by two Archimedes screw pumps, each with a capacity of 2.5 mgd.

After a few minutes in the grit chamber, water is sent to the primary clarifier where it settles for a couple of hours. The sludge scraped from the bottom is transferred to an anaerobic digester, where it is mixed with mesophilic bacteria and heated using the methane produced by the digestion reactions. The mesophilic reactions are slower than the thermophilic variety and require more energy than cryophilic systems, but the advantage is a much more stable system with a wider variety of organisms. After sufficient anaerobic interactions, the sludge is allowed to air-dry and then sent to be composted. The water leaving the primary clarifier exhibits a 60% reduction of TSS and BOD_5.

The water spends a month in the oxidation ponds where much of the bacteria settles and dies due to radiation form the sun. It is then directed through the treatment wetlands. The vegetation there captures some nutrients, but primarily serves as a structural obstacle to hinder the flow of bacteria which cling to the suspended solids. As a result of water flow patterns over time, stagnant areas have developed within the marshes. Sludge builds up in these areas, which creates the necessity for increased detention time which yields a higher water level. This has caused most of the plants to uproot, which defeats the purpose of the treatment. The problem was addressed this past summer, when the sides of the pond were dredged and additional pipes were placed such that influent and effluent volumes span greater areas. Blue Frog machines were also placed in one pond. These serve to aerate and mix the water, creating radial currents which help digesting organisms come into contact with the bacterial sludge.

By the time the water has cycled through the chlorination chamber, the enhancement wetlands and the dechlorinating process, the TSS and BOD_5 are each $\leq$ 30 mg/L and reach the effluent point which drains into Humboldt Bay.

Conclusions

The wet season influent volume of raw sewage is more than the screw pumps can handle, and as a result untreated raw sludge gets washed out to the oxidation ponds. This may contribute to the sludge build-up in the failing treatment ponds. Since the wetland renovations are new this year, their level of success has yet to be determined. Additional action may include upgrading the facility to handle a higher influent volume. This could be achieved by adding another pump or an overflow tank to prevent leakage into the oxidation ponds.