

Gravity Belt Thickeners and The Big Picture

Presentation to Joint NEWEA/NYWEA Spring Meeting

Howard Matteson,
P.E., BCEE
CDM Smith Inc.
Sol Posada, P.E.
NYC DEP



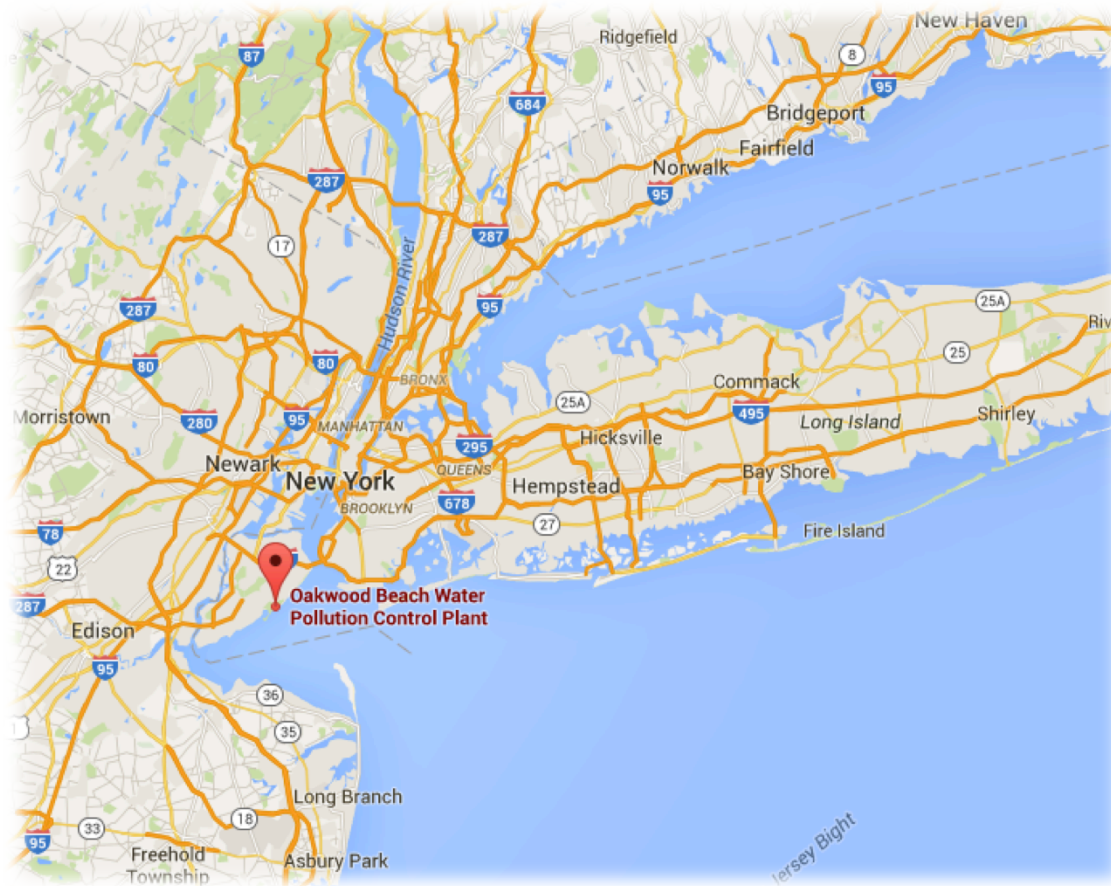
**CDM
Smith**

A Brief History of Wastewater Funding

- Federal Construction Grants program provided \$57 billion from 1972 until it was phased out following the passage of the 1987 amendments to Clean Water Act.
- All of the NYCDEP's 14 wastewater treatment plants were either upgraded to secondary treatment or built during this time period.
- Some of the facilities and equipment installed during this period has “reached the end of its useful life”.

Background - Project Location

NYCDEP - Oakwood Beach WWTP - Staten Island, NY
Sludge Thickening Improvements

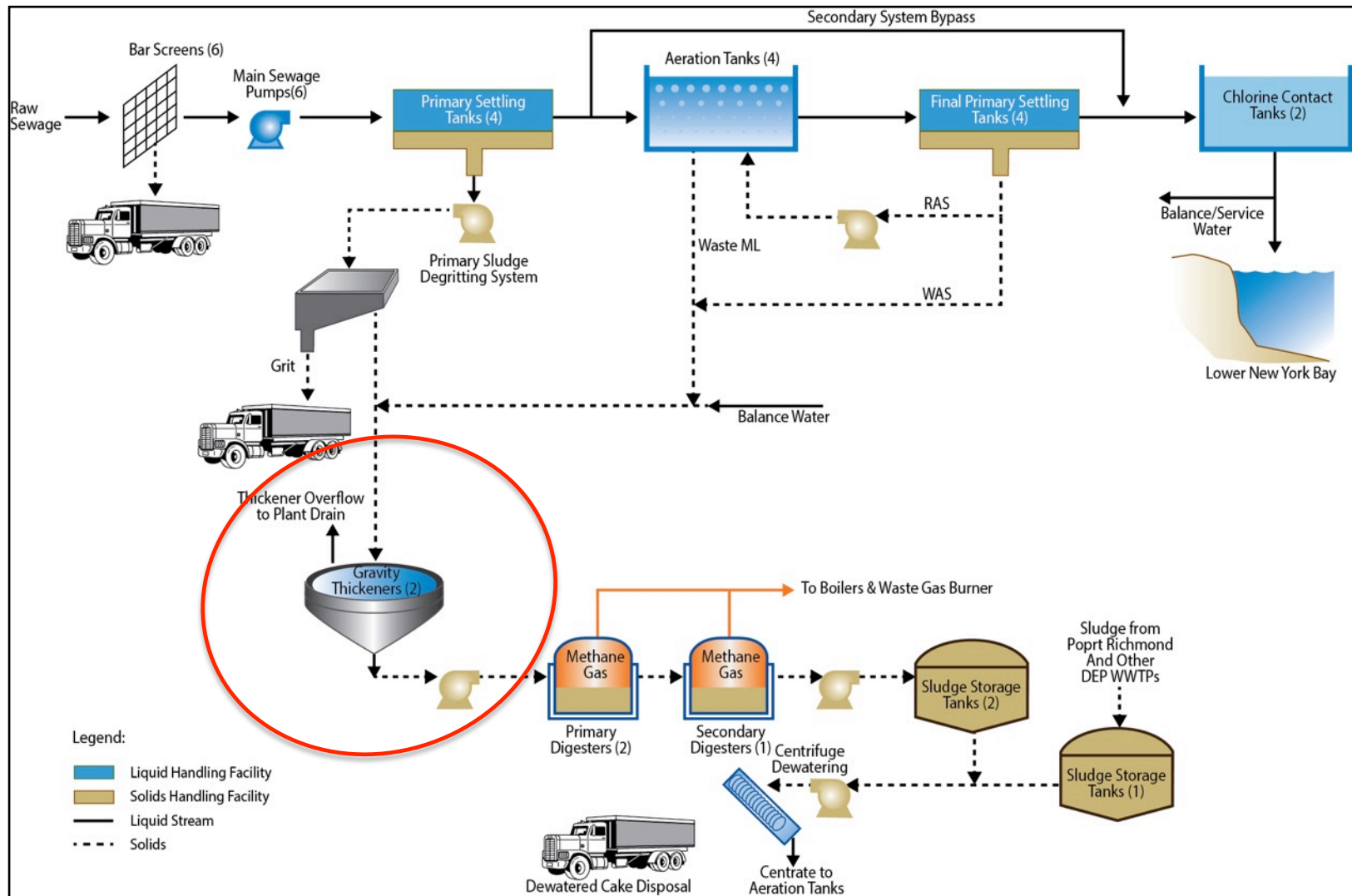


Background - Project Description

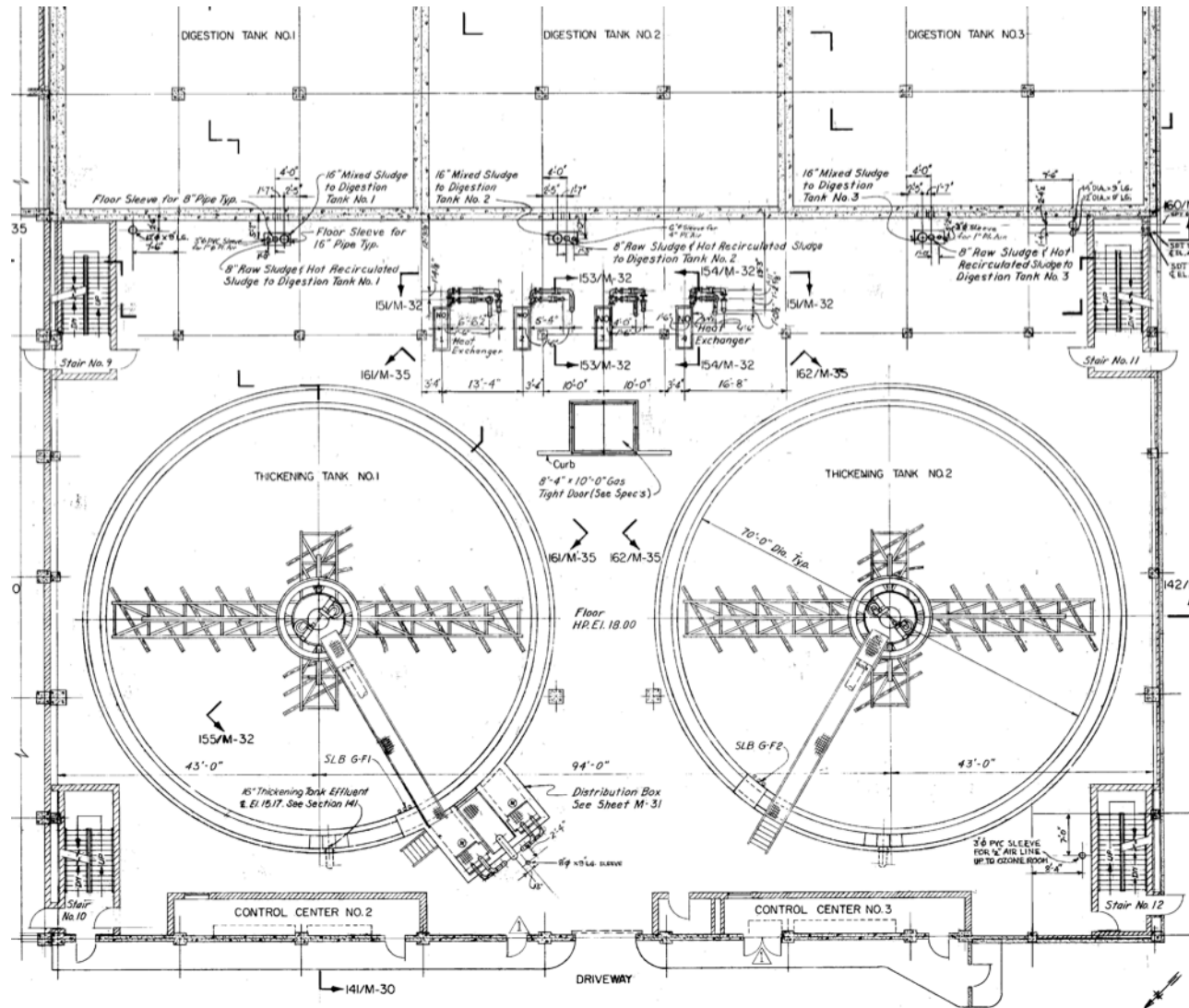
Project generally includes:

- Rehabilitation and/or replacement of sludge thickening and digestion equipment at the Oakwood Beach WWTP that are due for replacement, have corroded, or require excessive maintenance.

Background – Plant Schematic



Background – Existing Main Floor



Big Picture vs. Replacement In-Kind

- Current sludge treatment is combined primary and secondary sludge and two (2) circular gravity thickening tanks
- Simple replacement in-kind does not consider opportunities that that may exist to employ more current technologies, improve performance, minimize maintenance, and address additional issues of concern such as Sustainability.
- Need to look at the Big Picture!

Project Elements

Project specifically include includes:

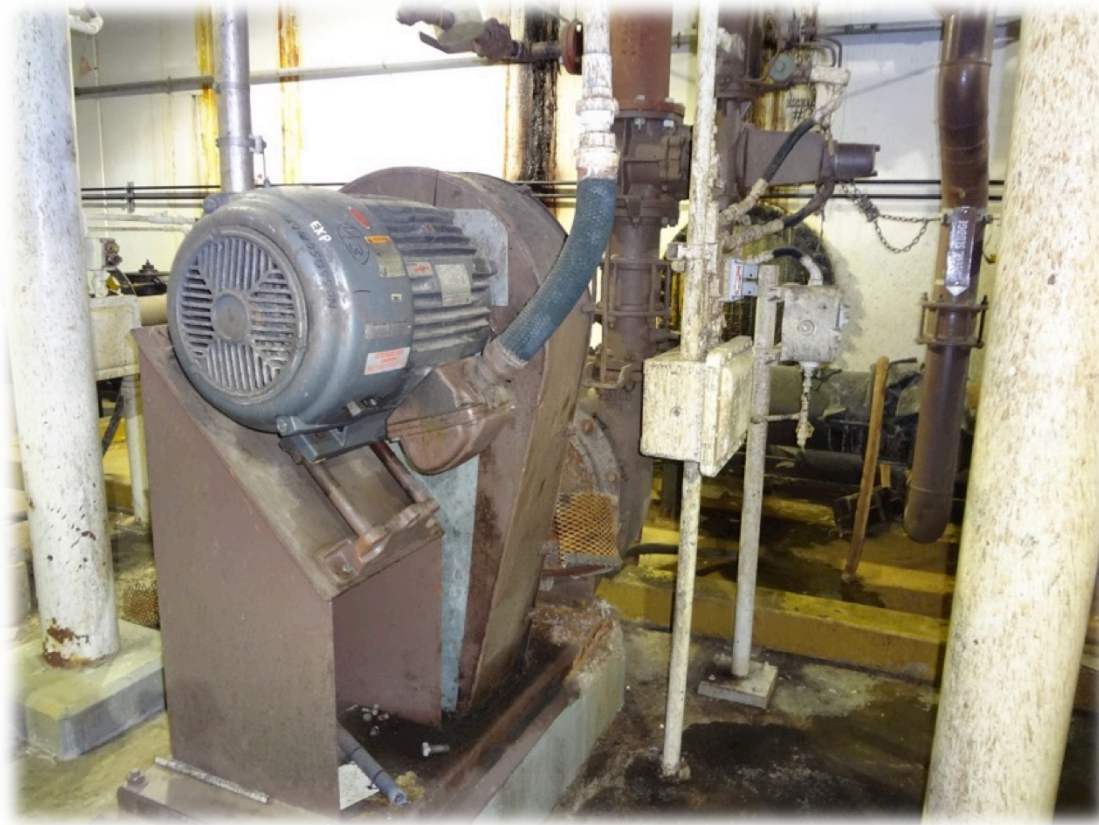
- Replacement of Equipment (in-kind)
 - 6 digester recirculation pumps
 - 6 digester mixing pumps
 - 2 series coupled sludge transfer pumps; and
 - 4 balance water pumps

Project Elements

Project also include includes:

- Structural repairs to existing gravity thickener tanks
- Improvements to Gravity Thickener Distribution Box

Background – Existing Conditions



Digester Sludge Recirculation Pumps

Background – Existing Conditions



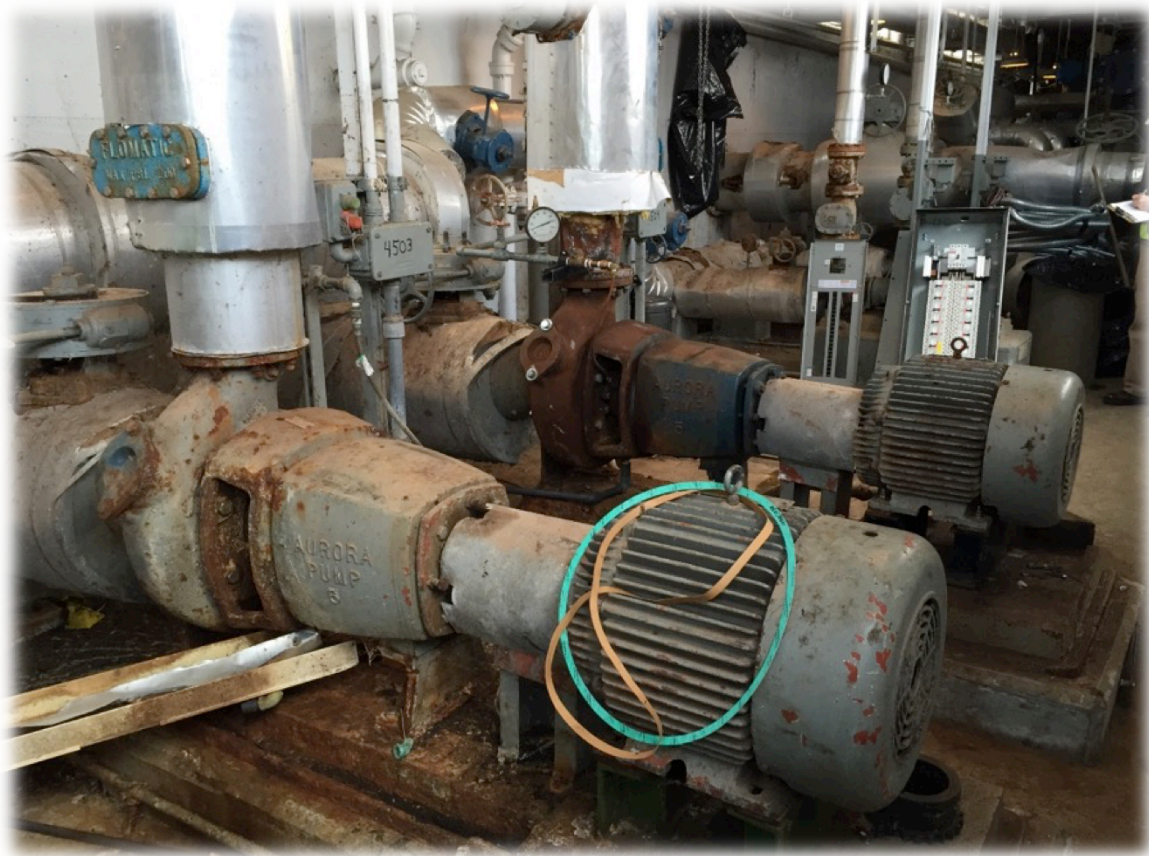
Digester Sludge Mixing Pumps

Background – Existing Conditions



Digester Sludge Transfer Pumps

Background – Existing Conditions



Balance Water Pumps

Project Elements

Project specifically include includes:

- Replacement with New Equipment
 - 4 triplex plunger gravity thickener thickened sludge pumps with progressing cavity pumps
 - 3 waste activated sludge pumps with progressing cavity pumps (converted to GBT feed pumps)
 - 4 Heat Exchangers

Background – Existing Conditions



Thickened Sludge Pumps
(Replace with Progressing Cavity)

Background – Existing Conditions



Waste Activated Sludge Pumps
(Replace with Progressing Cavity)

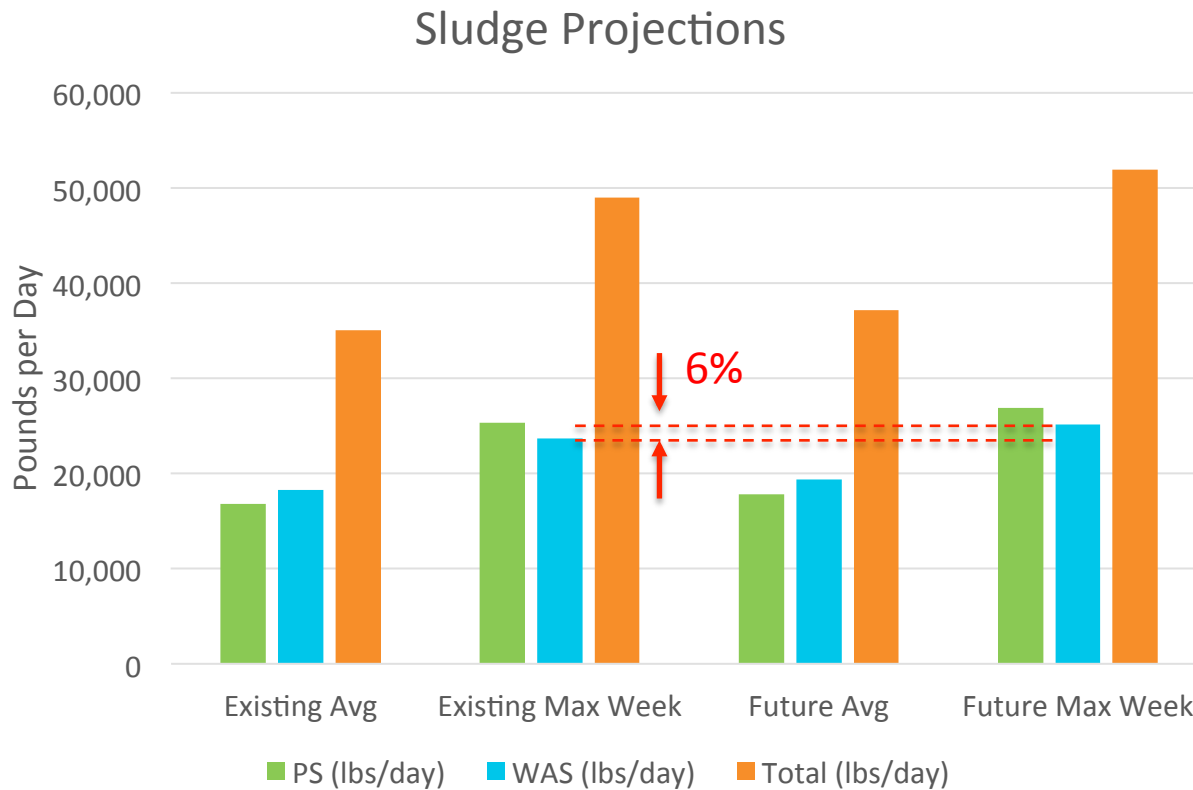
Background – Existing Conditions



Heat Exchangers

Review of Sludge Data

Project Team evaluated sludge projections:



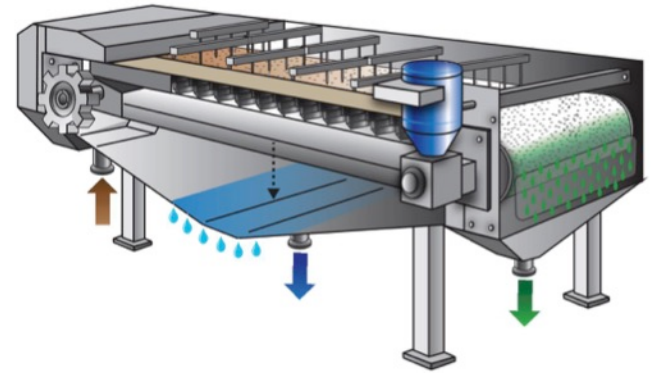
Sludge Thickening Opportunity

- Projected changes are small, which supports the replacement in-kind approach but....
- Opportunity for separate mechanical thickening of primary and secondary sludge, for process control, and energy reduction.
- Opportunities are consistent with and support **OneNYC** and **NYCDEP** goals of reducing greenhouse gas emissions and energy consumption as a result of project design and construction.

Sludge Thickening Opportunity

Added to project scope:

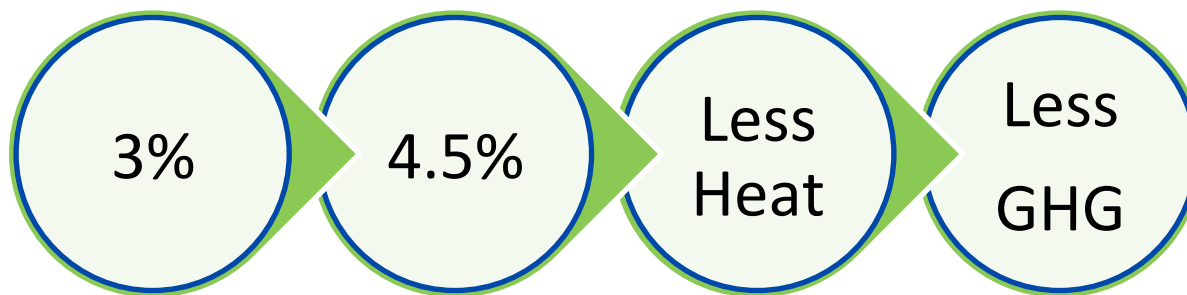
- Installation of New Equipment
 - Two (2) Gravity Belt Thickeners (GBTs) – DEP preferred
- Cost of new GBTs (\$700k) offsets costs for Temporary Dewatering during construction



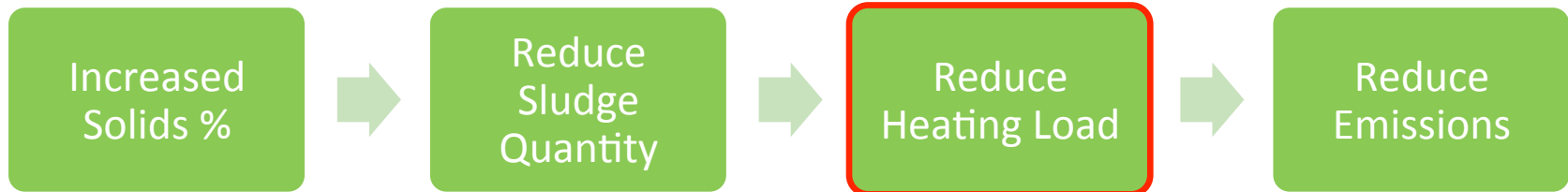
Sludge Thickening and Sustainability

How does sludge thickening affect greenhouse gas emissions and energy consumptions?

- Existing thickened solids concentration = 3.0%
- Future thickened solids concentration = 4.5%
- Reduction in water content \Rightarrow reduction in heating requirements during digestion \Rightarrow less GHG emissions

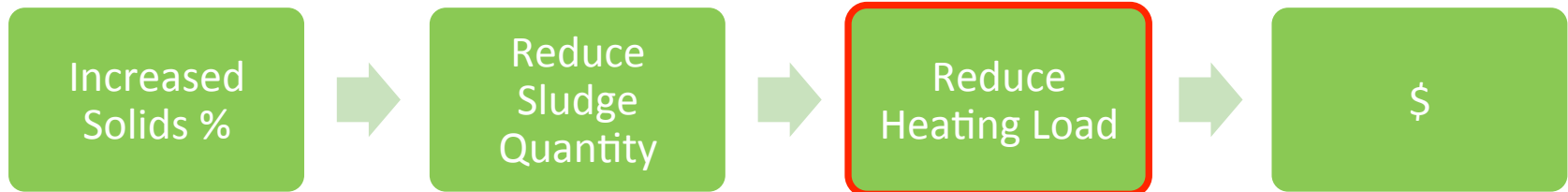


Greenhouse Gas Emissions



- 1. Increase solids %:** 3% to 4.5%
- 2. Reduce sludge flowrate:** 97 gpm to 65 gpm
- 3. Reduce heating load:** 1.8 MMBTU/hr to 1.2 MMBTU/hr
- 4. Reduce Emissions:** 870 tons/yr CO₂e to 590 tons/yr CO₂e (carbon dioxide equivalent)

Savings



- 1. Increase solids %:** 3% to 4.5%
- 2. Reduce sludge flowrate:** 97 gpm to 65 gpm
- 3. Reduce heating load:** 1.8 MMBTU/hr to 1.2 MMBTU/hr
- 4. Savings:** Operation 24/7 = 0.6 MMBTU/hr x 24 hrs/day x 365 days/year
@ \$5/MMBTU = \$26,000/yr (2014)
@ \$2.5/MMBTU = \$13,000/yr (2016)

A number of Project Planning Goals were Achieved

By looking at The Big Picture, the Project Team was able to include project elements that plan for:

- Use of current sludge thickening technology;
- Integrating a process improvement (separate primary and secondary sludge for thickening);
- Operational savings;
- Reduced energy consumption = 0.6 MMBTU/hr, 33% reduction;
- Reduced greenhouse gas emission = 280 tons/CO₂e per year, 33% reduction; and



THANK YOU!