Innovative Delivery Yields Innovative Technical Solutions

30-August-2018

2018 One Water Ohio

One Water

BLACK & VEATCH

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Outline

- The Problem
- The Approach
- The Solution

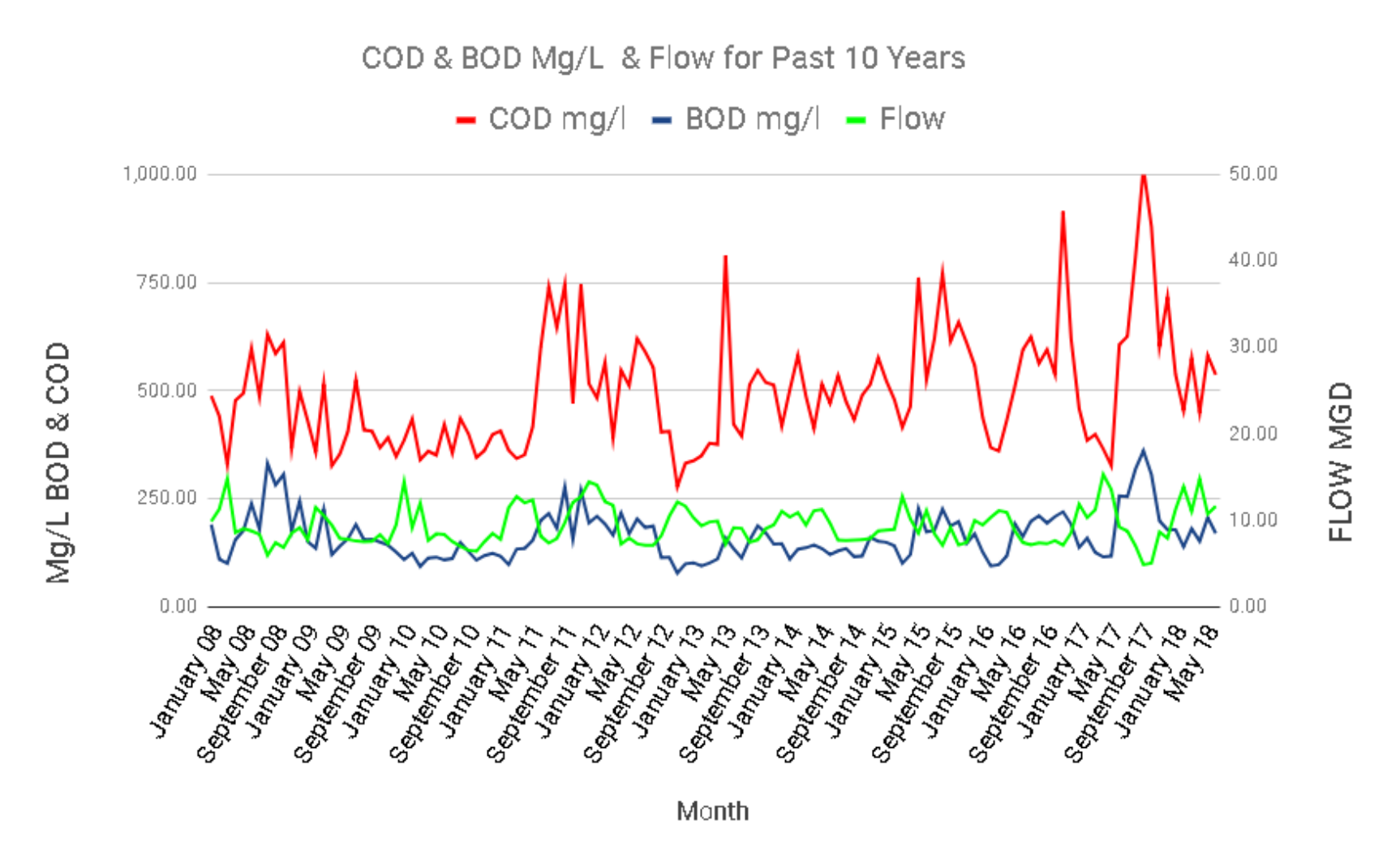
In 2015, After 35 years of Zimpo Operations we analysed the viability of our operations for the future

Areas of concern

- Increasing COD Loading in the Raw Sewage
- Increasing problems due to internal waste stream recirculation
- Maintenance issues with high pressure equipment
- The high cost of energy required for the current sludge process
- Future capabilities of the current aeration system
- Maintaining and improving our BNR systems

INCREASING COD LOADING IN RAW SEWAGE

The Cod loadings to the plant have steadily increased while the flows have remained stable



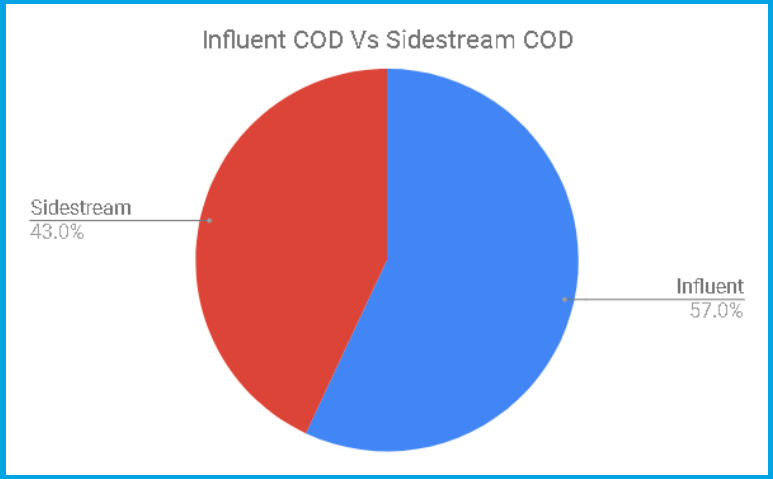
This was a strong indication that our efforts would need to be in the area of solids handling

Thermal Hydrolysis

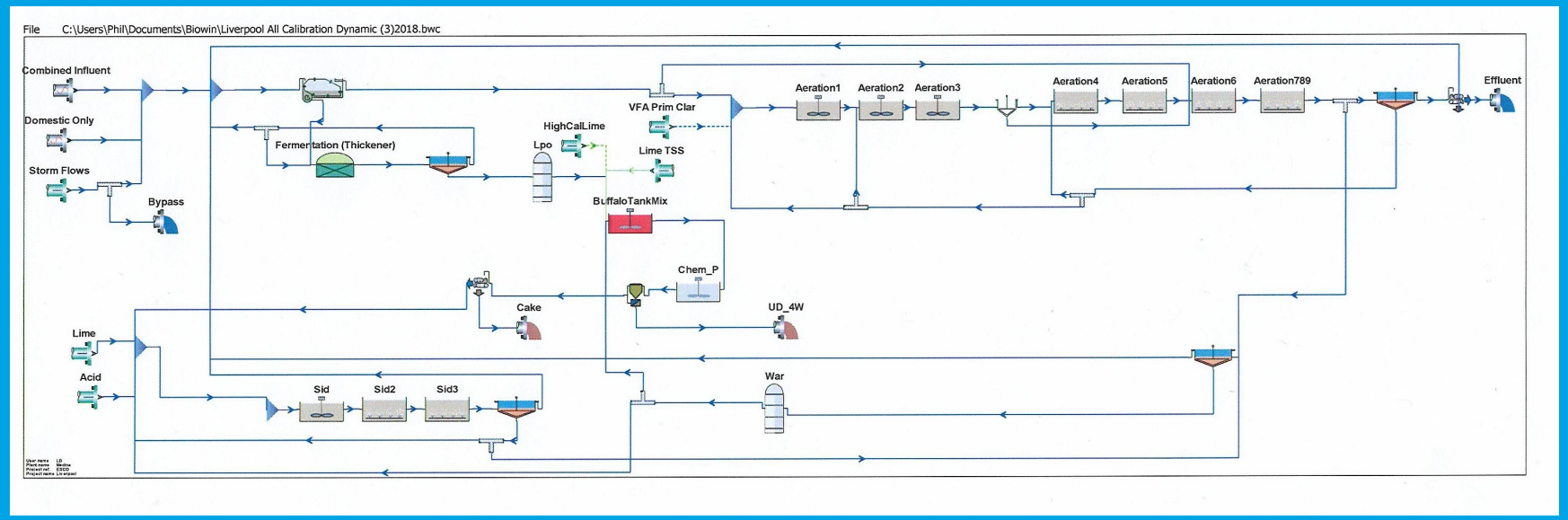
- Lysis – breaking stuff apart
- Thermal – with heat
- Hydro – with water (solubilization)

Our Zimpro Process is a Thermal Hydrolysis Unit

INTERNAL WASTE STEAM RECIRCULATION

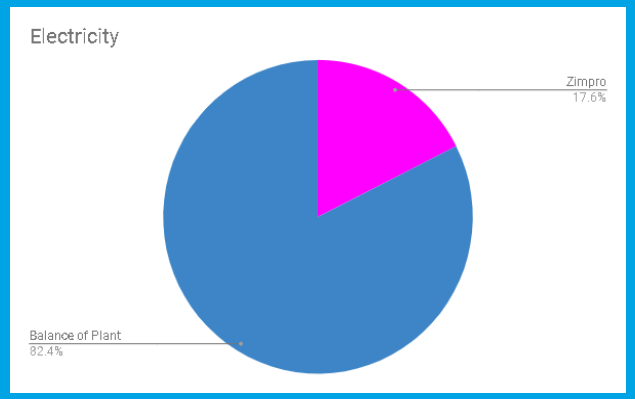


In 2015 we conducted an intensive two week sampling campaign at multiple locations throughout our plant and sewer system



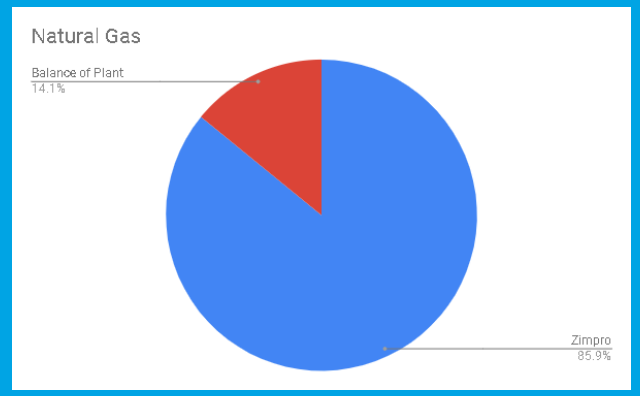
One of the most interesting findings was the significant percentage of recycle loading from our Zimpro process

HIGH COST OF ENERGY



Our Zimpro operations currently consumes 17 percent of our electrical power use

By shutting down Zimpro our average Electrical power use would drop to 1.01 MW. This power could be provided by one of our existing gas generators



Zimpro consumes 85 percent of our natural gas

This natural gas could be diverted to run one generator for 13 hours per day. While supplying hot water and Steam to a new process

Maintenance of high pressure equipment has been a constant issue.

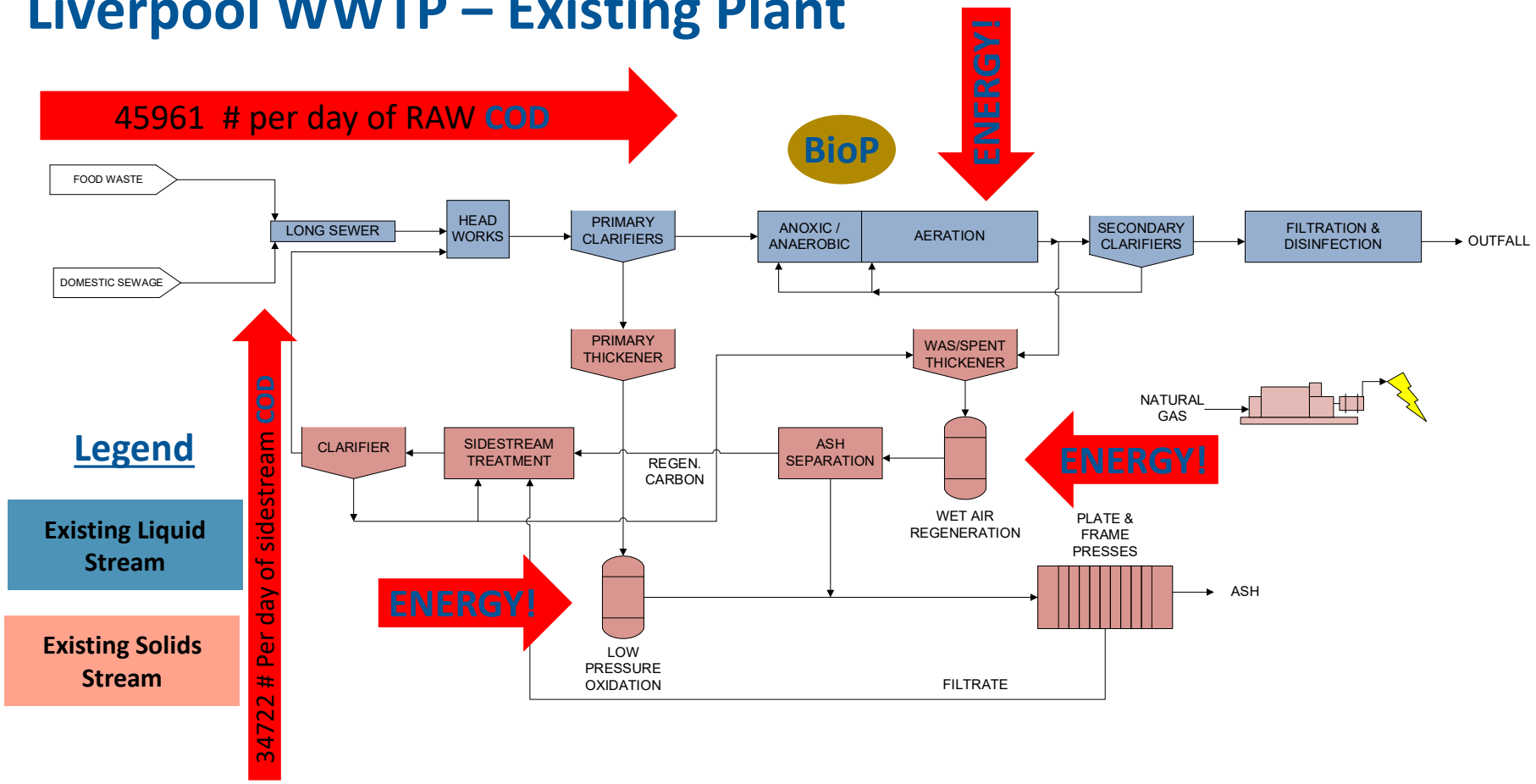
Some of our equipment is no longer functional.

FUTURE CAPABILITYS OF THE CURRENT AERATION SYSTEM

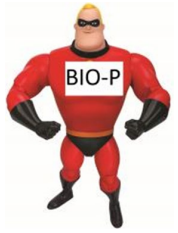
With the loadings increasing we considered adding more aeration tanks

Our projections however, showed that even adding three more aeration tanks would not provide enough capacity by 2038

Liverpool WWTP – Existing Plant



High energy requirements for Zimpro and aeration
However…….VFA is available for BioP



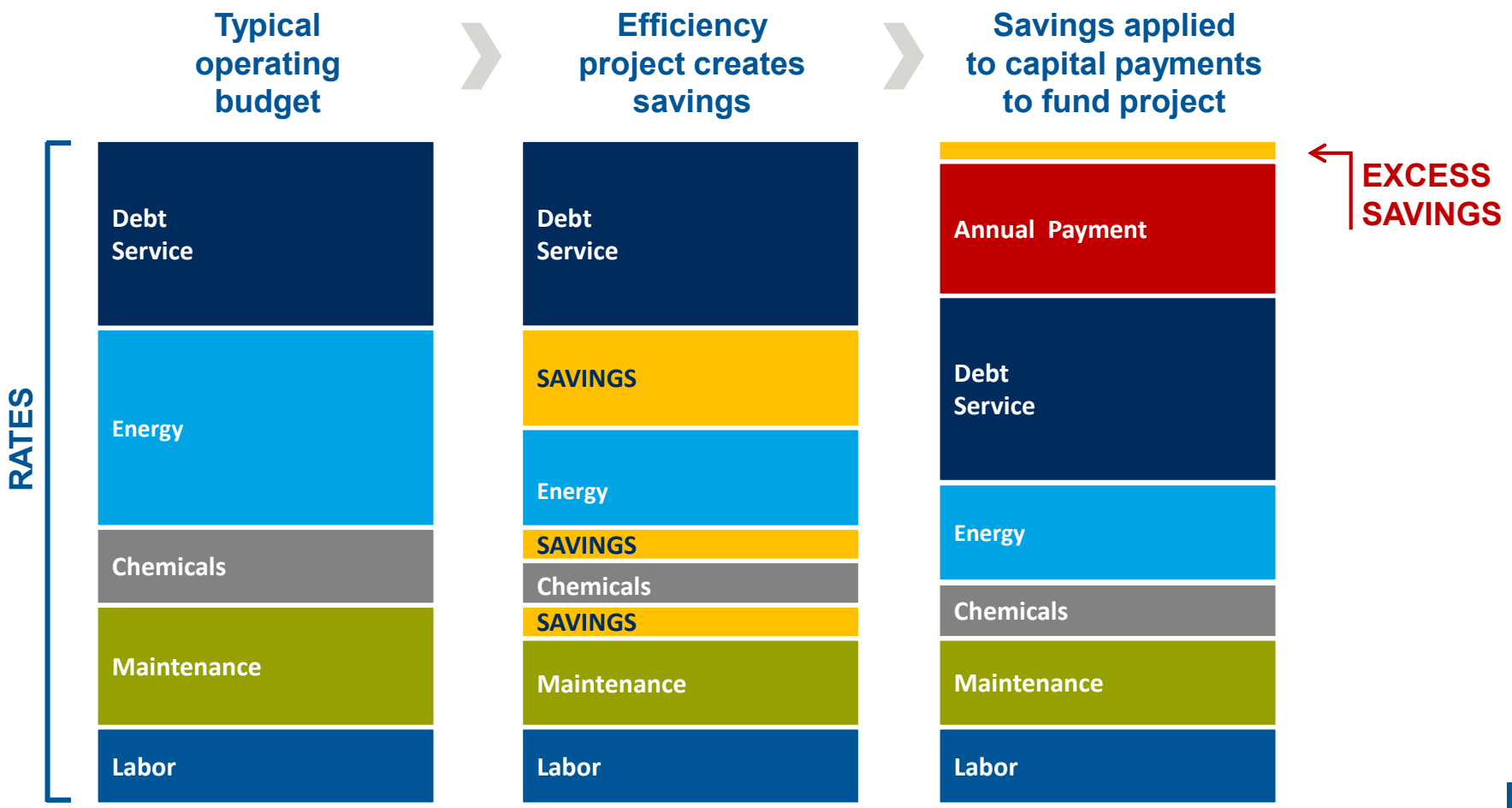
Our concern would be what would happen to our Bio P process if the VFA supply was reduced if the Zimpro process was shut down

ENERGY SAVINGS PERFORMANCE CONTRACTS (ESPC)

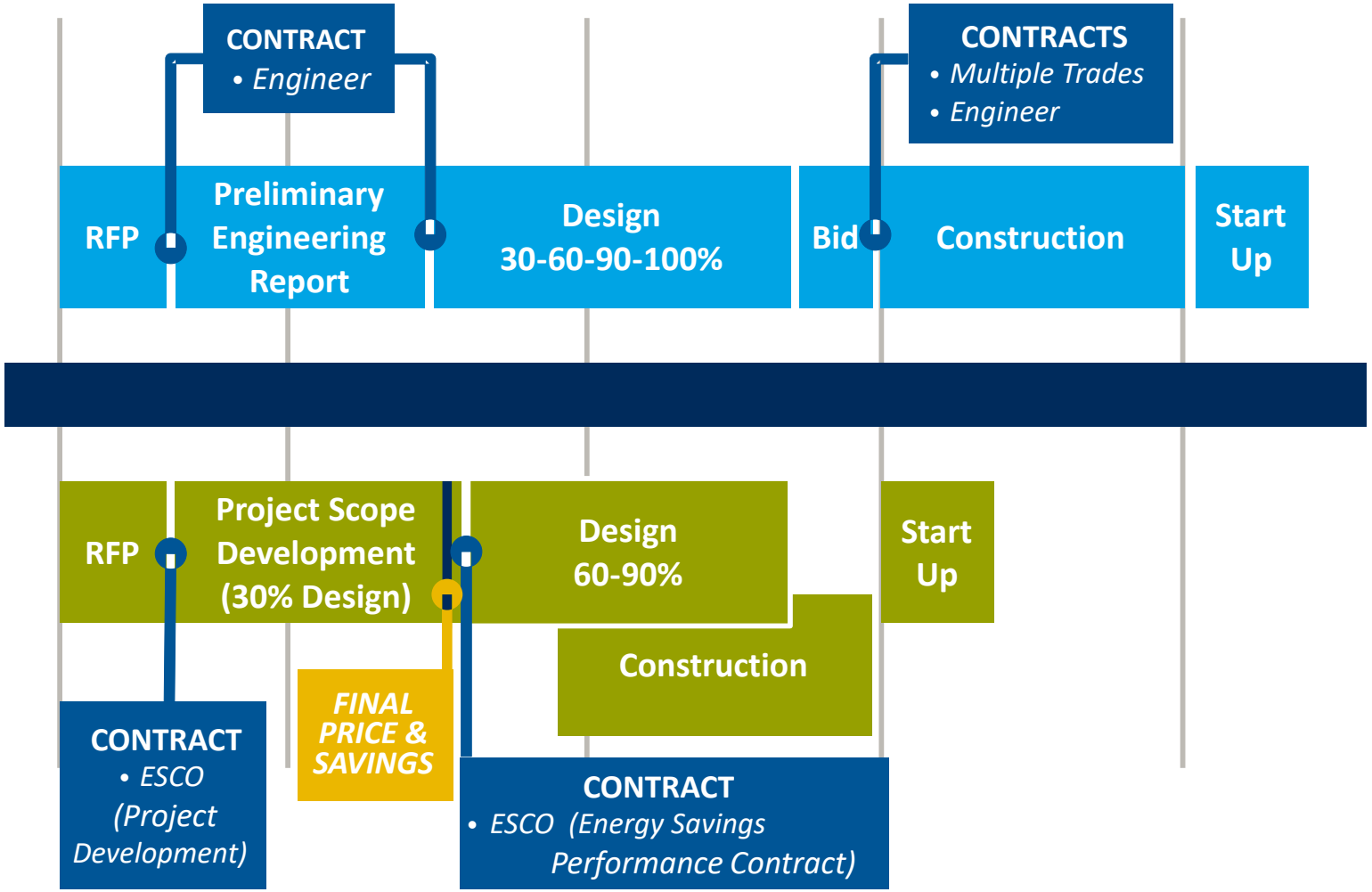
DELIVERY MODEL

1	REQUEST FOR QUALIFICATIONS	• Qualifications-based selection • Select team for entire project
2	INVESTMENT GRADE AUDIT	• Project Goals • Scope/Project Definition • Preliminary Design
3	PROPOSED ESPC AGREEMENT	• Guaranteed Lump Sum Price • Guaranteed Savings
4	PROJECT EXECUTION	• Final Design • Procurement • Construction
5	MEASUREMENT & VERIFICATION	• Verify Performance • ESCO Corrects or Reimburses Underperformance

PROJECTS CAN BE IMPLEMENTED WITH NO RATE INCREASE

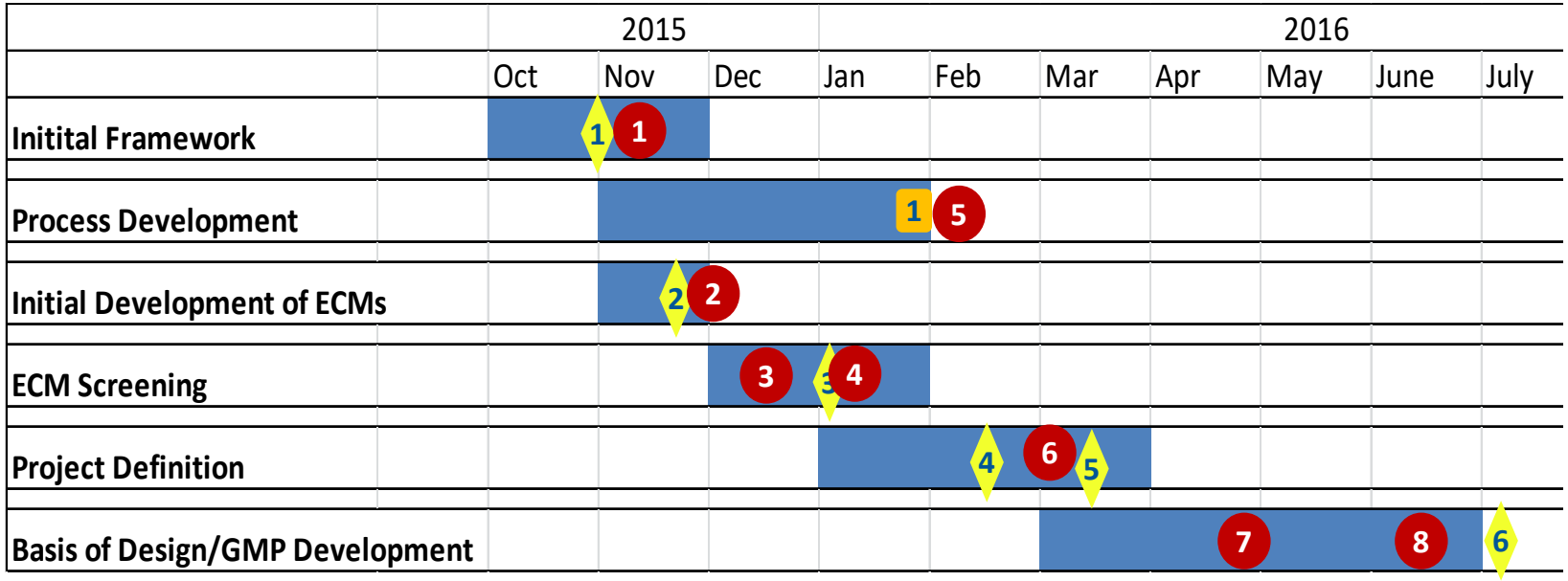


Design-Bid-Build



Performance Contract

DELIVERING THE LIVERPOOL PROJECT THROUGH ESPC



1 Project Kick-Off

2 ECM Walkthrough

3 ECM Screening / Digester Alternatives

4 Configuration Confirmation

5 Project Definition

6 GMP/ESPC

1 Process Finalization Work Session

1 Framework Memo

2 Initial ECM List

3 Proposed ECM List

4 Final ECM List

5 Proposed Configuration

6 Project Definition Memo

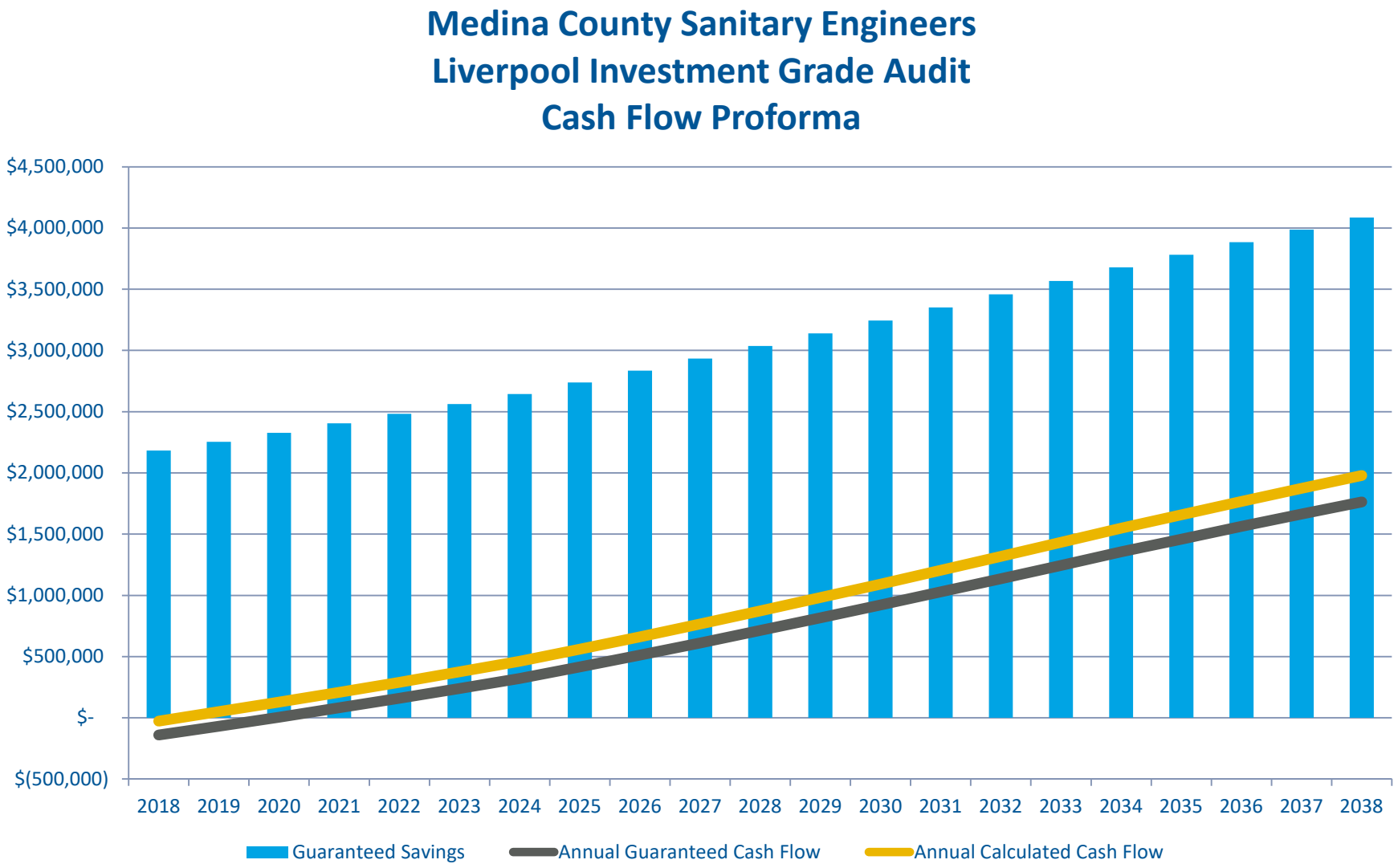
7 Basis of Design

8 ESPC/GMP Proposal

A COLLABORATIVE PROCESS

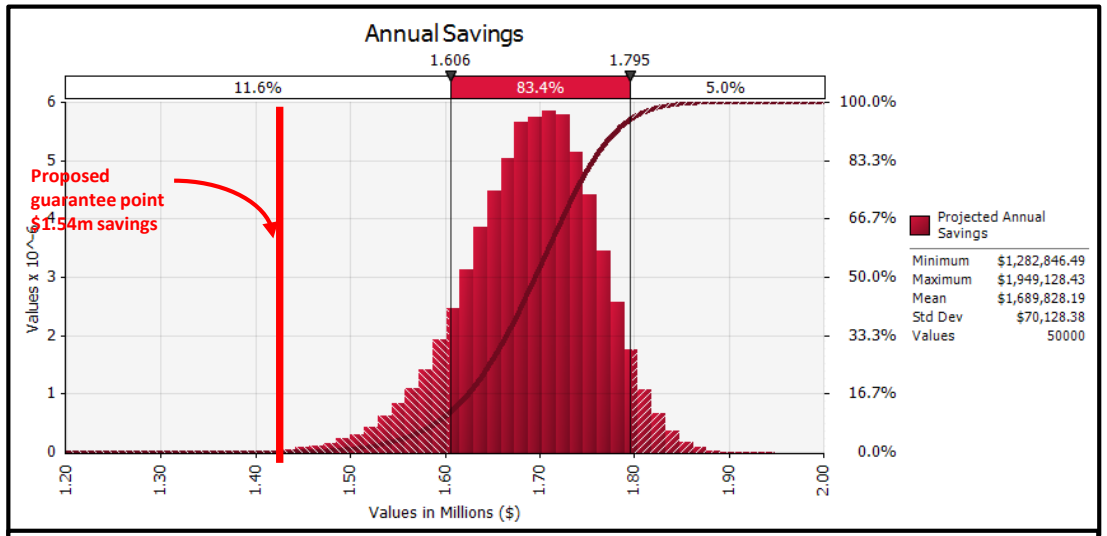
- ECM Walkthrough
- ECM Screening
- Project Definition
- Process/Configuration Finalization

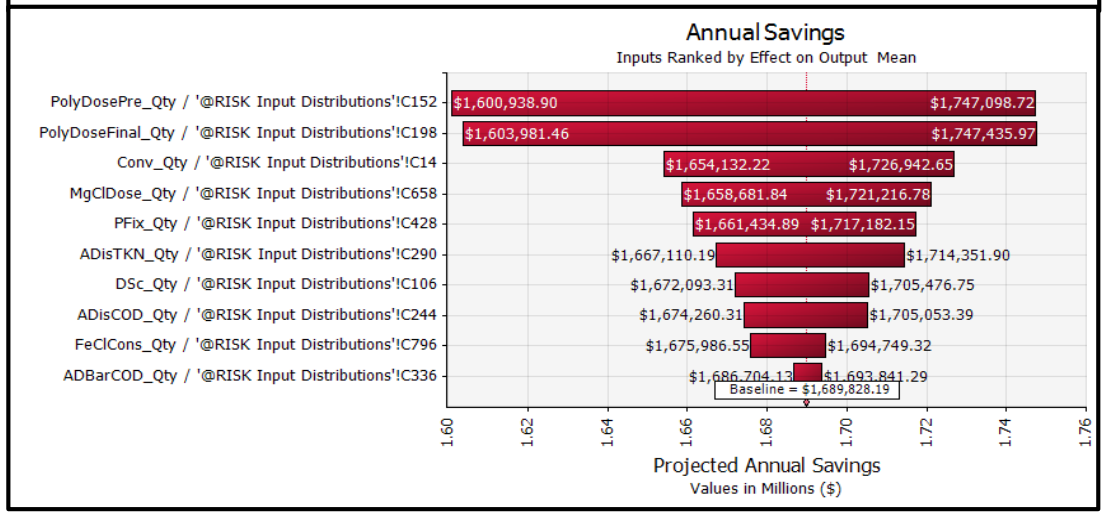
FINANCIAL PROFORMA



Managing Risk

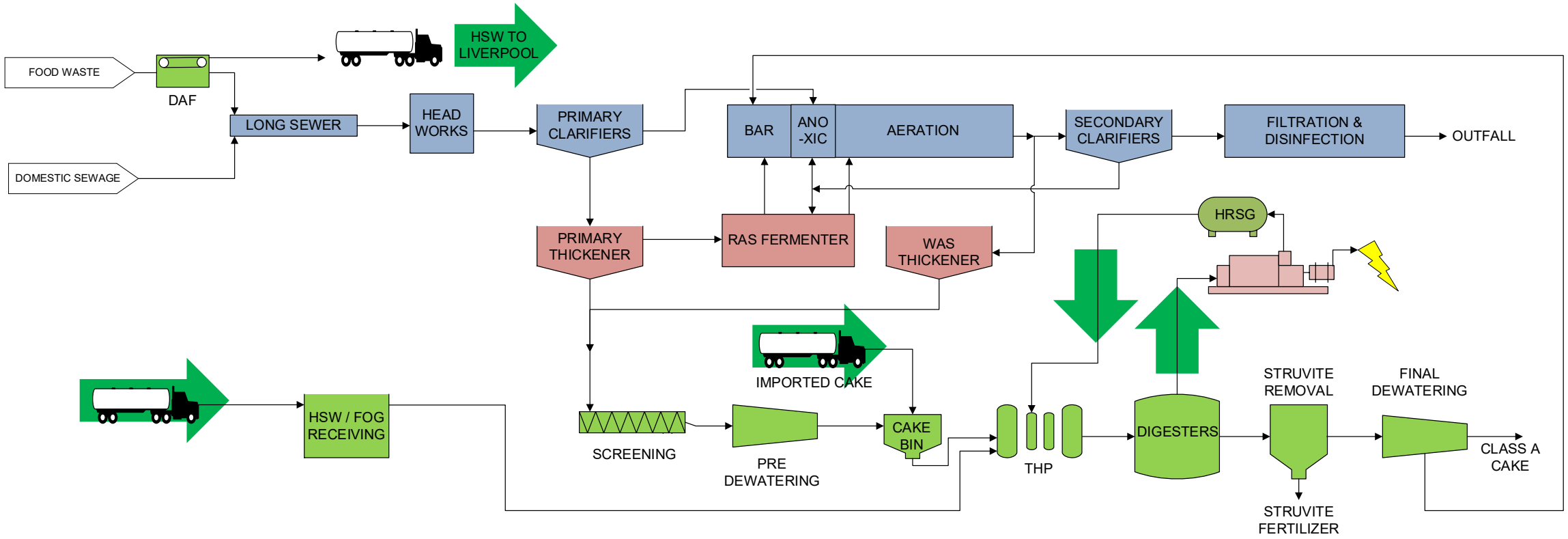
- B&V at risk for aggregated savings
- Looked closely at our risk using Monte-carlo type analysis (using @Risk software)
- Polymer was by far the biggest risk
- In the end the client removed savings guarantee to reduce project cost



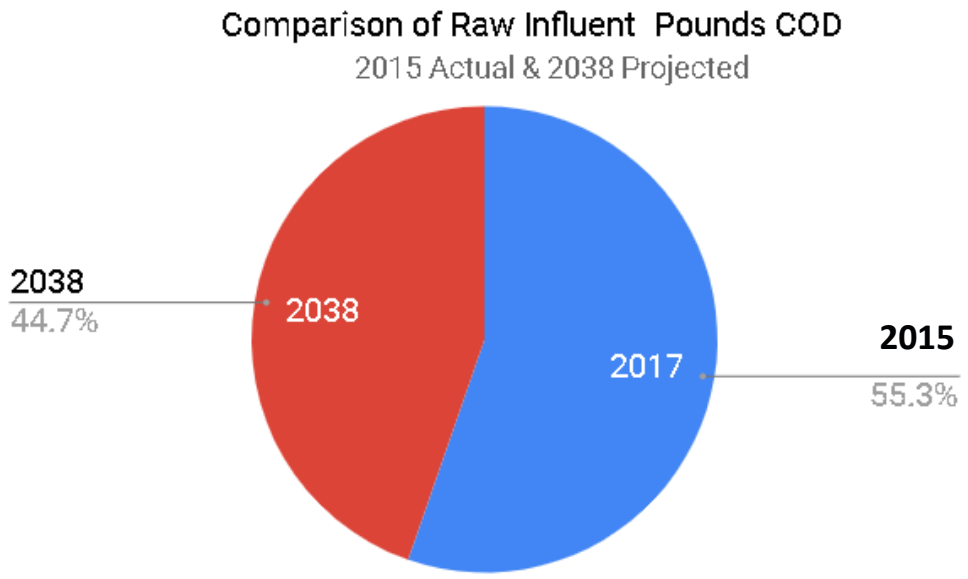


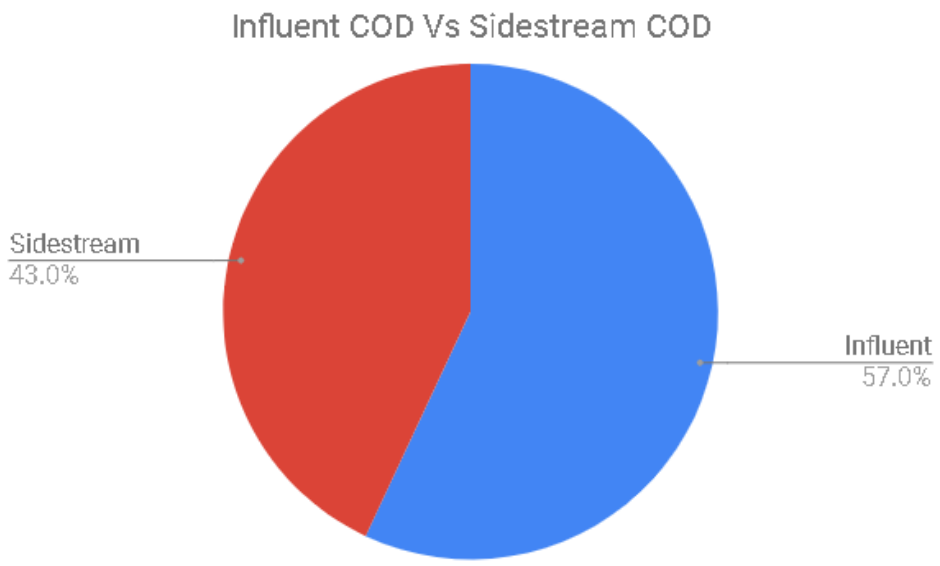
INNOVATIVE RESULTS

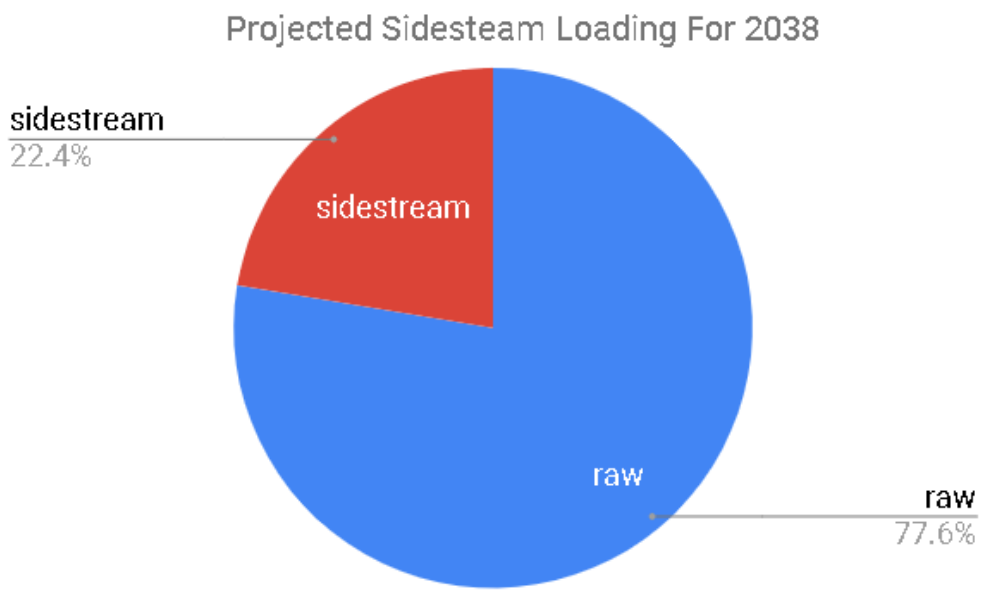
Liverpool WWTP – New Plant



COD / energy is redirected to anaerobic digestion.
Engine generators converted to CHP to run on biogas and produce steam
RAS fermenter to maintain stable bioP operation with less influent VFA
Struvite removal to prevent PO4-P recycle


Comparison of Raw Influent Pounds COD
2015 Actual & 2038 Projected
2038
44.7%
2038
2017
2015
55.3%


Influent COD Vs Sidestream COD
Sidestream
43.0%
Influent
57.0%


Projected Sidesteam Loading For 2038
sidestream
22.4%
sidestream
raw
raw
77.6%

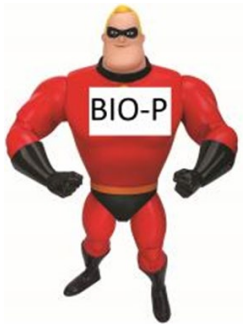
INNOVATIVE PROCESS

THP and Digesters

- 1,100 gph throughput (THP feed)
- 2 x 0.87MG digesters (1 primary, 1 secondary)

RAS Fermenter

- 0.7 MG
- 2 day SRT



Struvite Precipitation (Airprex)

- 41,000 gpd
- > 85% PO4-P removal

CODIGESTION/COGENERATION

DAF Plant (Marks Rd PS)

- Drum screen
- Single DAF unit
- 240 gpm

HRSG & Steam Accumulator

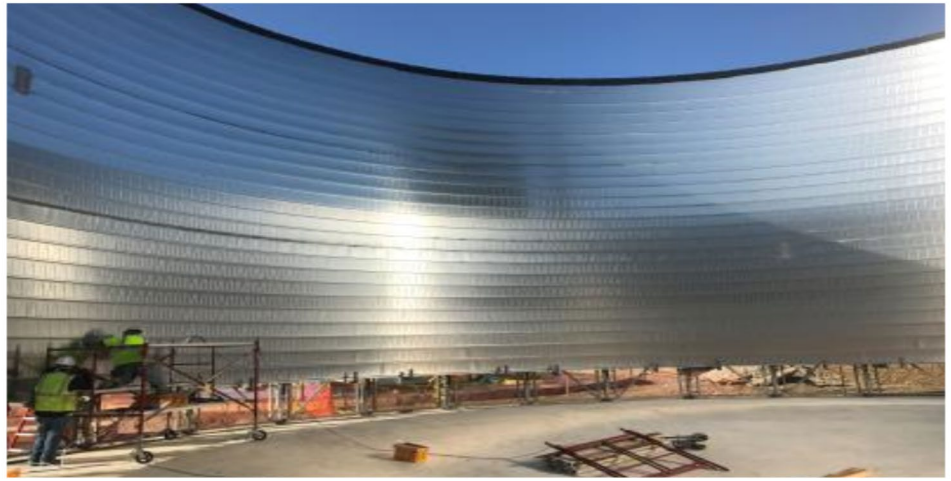
- 1,800 lb/hr steam at 175PSIg
- Existing steam generator as auxiliary boiler

HSW Tank

- 67,000 gallon high strength waste tank

Liverpool WWTP

- Lipp Digesters
- Rolled stainless steel construction



CURRENT STATUS

As of August 30, 2018

- Aeration Control ✓
- RAS Fermenter ✓
- Bioagmentation Reactor (BAR) ✓
- BNR ✓
- Cogen Engine Controls ✓
- Construction Complete and Mechanical Systems Commissioned – November 2018
- Digester Seeding – November 2018
- THP Start-up – December 2018
- Gas Cleaning and CHP – January 2019
- Airprex, Dewatering, Polymer – February 2019

QUESTIONS?

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