

The State of Water Resource Recovery



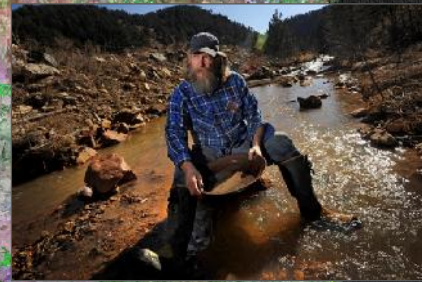
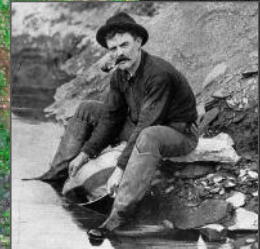
Wastewater Industry Insights

Structuring a National Test Bed Network to Support Water Innovation

Jim McQuarrie, Chief Innovation Officer

Flite Facility outfalls

A State of Resource Recovery



Agenda – Industry Insights

- ◆ What We're Doing
- ◆ What We Envision
- ◆ What We Need to Work out

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What We're Doing

Elite influent channels

4

Metro Wastewater Reclamation District Robert W. Hite Treatment Facility

Combined Heat and Power (CHP)
Average ~4.5 MW/day
38% of plant electricity consumption

You are here

Effluent (Water)
Average ~130 mgd
No District water rights
85% of S. Platte 6 months/year
Denver Water can reuse up to 120 cfs

Biosolids (Nitrogen)
82 dry tons/day (2015)
1.64 tons/day plant available nitrogen
75% applied on private property
25% applied on METROGRO Farm

METROGRO

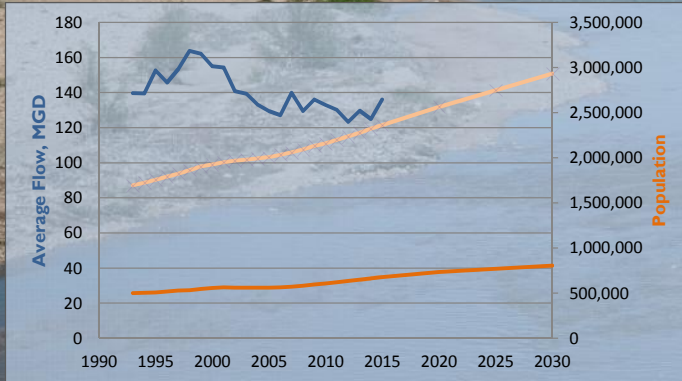
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Water in the South Platte Basin

Colorado Springs
Denver
Boulder
Greeley
Fort Collins
Craig
Mentrose
Gunnison

Mt. Democrat; Blue Lakes; Middle Fork of South Platte River in Hoosier Valley, south of Fairplay, and joining South Fork west of Strontia Springs Reservoir; South Platte River downstream of Hite Facility; improvements in the river further downstream

Wastewater Flow and Population in the Denver Metro Area

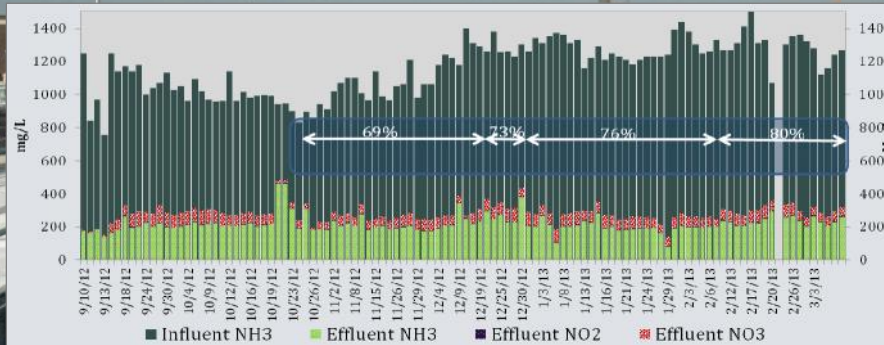


- Population Growth
- Water Conservation
- Wastewater Strength
- One Water/Fit for Use
- Denver Water's Efforts



South Platte River downstream of Hite Facility

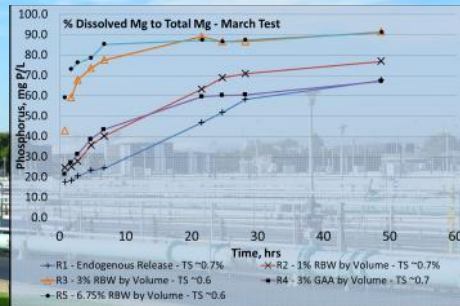
Sidestream – Shortcut Nitrogen Removal



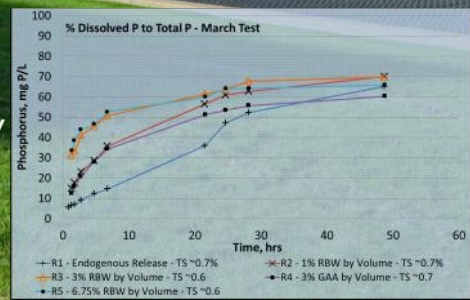
- 15% to 20% of influent nitrogen load
- 75% nitrogen elimination with Anammox
- Half the aeration energy requirement

South Secondary aeration basins

Sidestream – Phosphorus Recovery

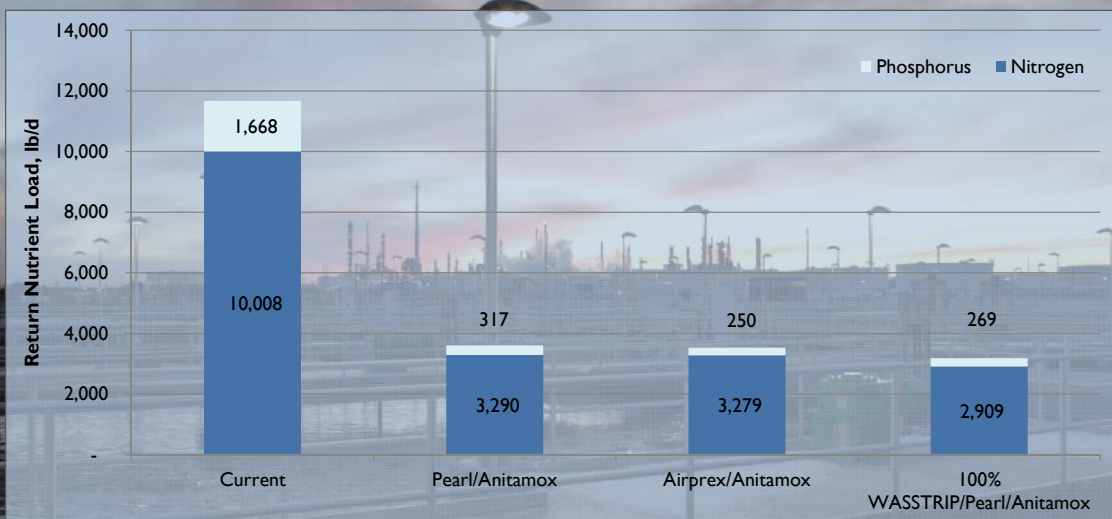


- ◆ 220-mgd Bio-P facility
- ◆ 15% to 40% of influent P could be recovered
- ◆ Understanding total value of phosphorus recovery
 - struvite in solids processes • impacts on dewatering •
 - chemical costs • water quality • revenue
- ◆ Understanding the role of cations (K^+ , Mg^{2+})



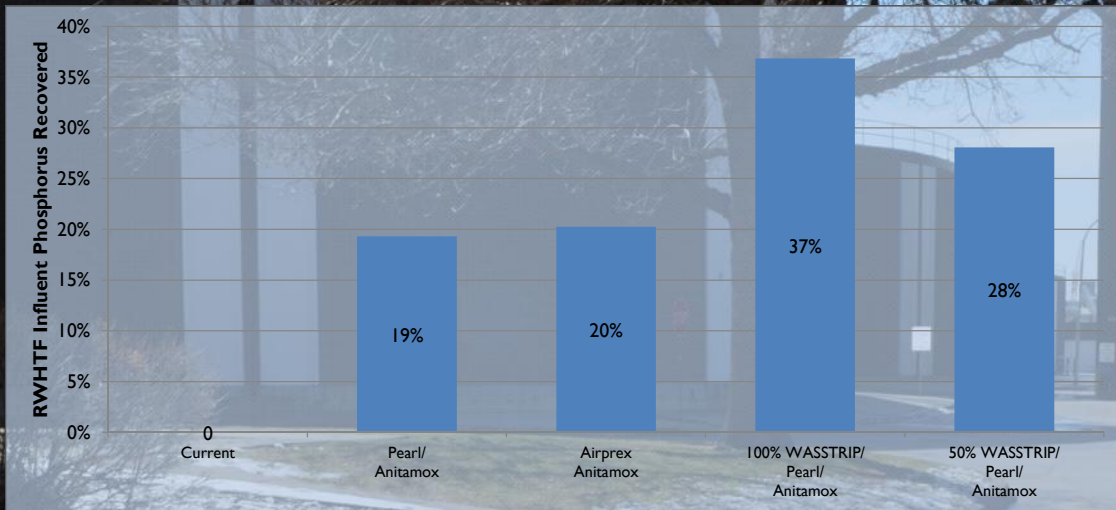
North Secondary aeration basins, AirPrex pilot system

Coupling Sidestream Technologies



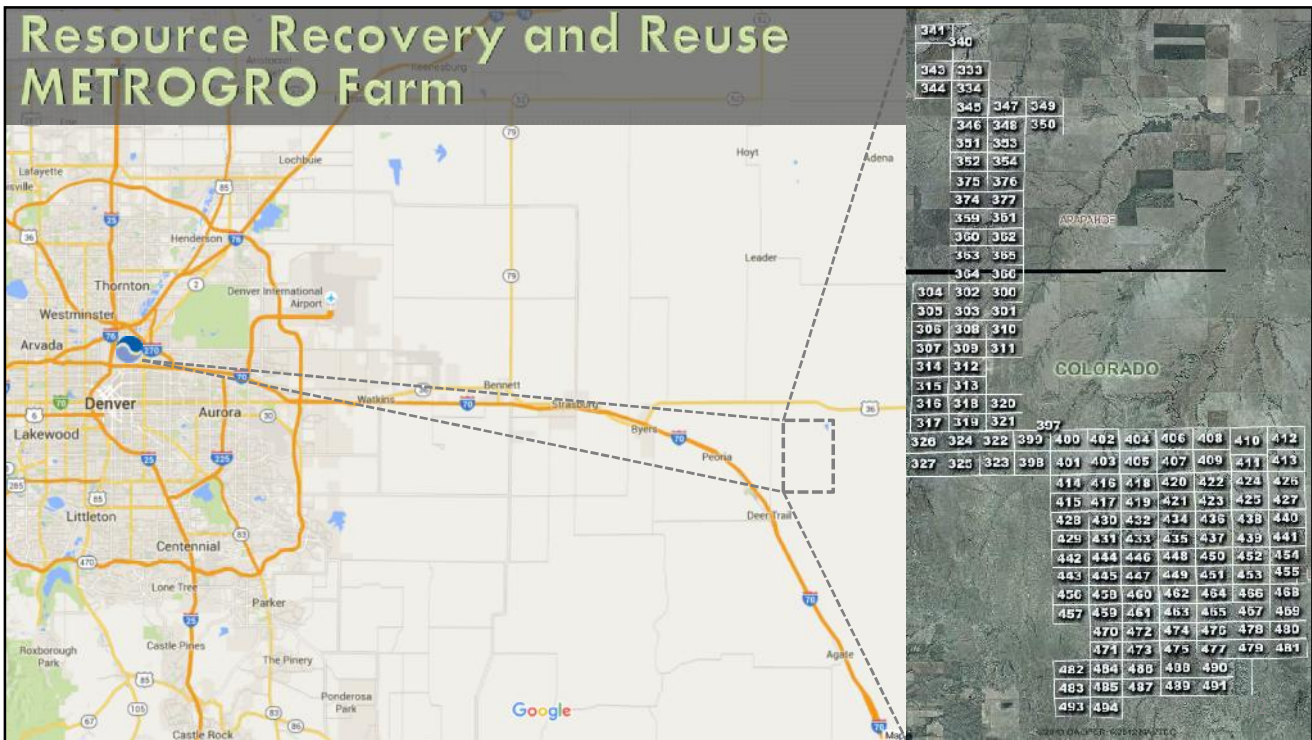
South Secondary aeration basins

Coupling Sidestream Technologies



Digesters

Resource Recovery and Reuse METROGRO Farm



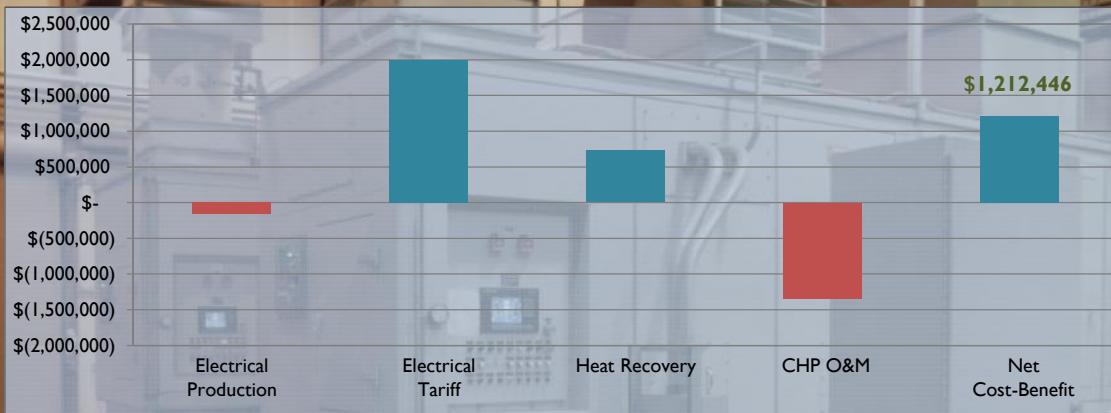
Resource Recovery and Reuse METROGRO Farm

- ◆ Dedicated beneficial reuse site since 1993
- ◆ 20 truckloads per day
- ◆ 120-mile round trip
- ◆ 52,000 acres
- ◆ Corn and wheat
- ◆ Nitrogen, micronutrients, soil conditioner
- ◆ Managed by the District



METROGRO Farm wheat and equipment

Recovering Energy at the Hite Facility



- ◆ Since 2000
- ◆ Energy Service Agreement with Suez
- ◆ No gas cleaning
- ◆ Nominations and Grace Energy Allowance

Cogeneration turbines



Carbon Energy Capture Envisioning a Transition

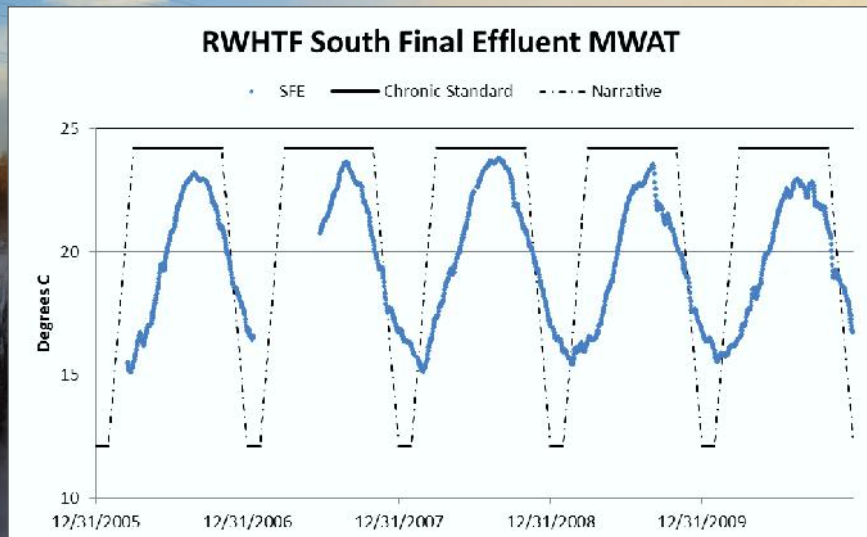


Energy
Positive
Resource
Recovery
Facility

- ◆ +/-38% self-produced power
- ◆ All of our process heating
- ◆ Traditionally a “by-product”
- ◆ The “sunk investment” effect
- ◆ Enhanced AD (e.g., THP)
- ◆ Biogas upgrading and CHP
- ◆ Smart co-digestion program
- ◆ Carbon redirection
- ◆ Shortcut nitrogen removal

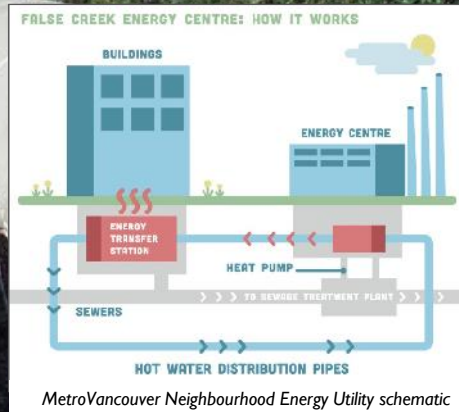
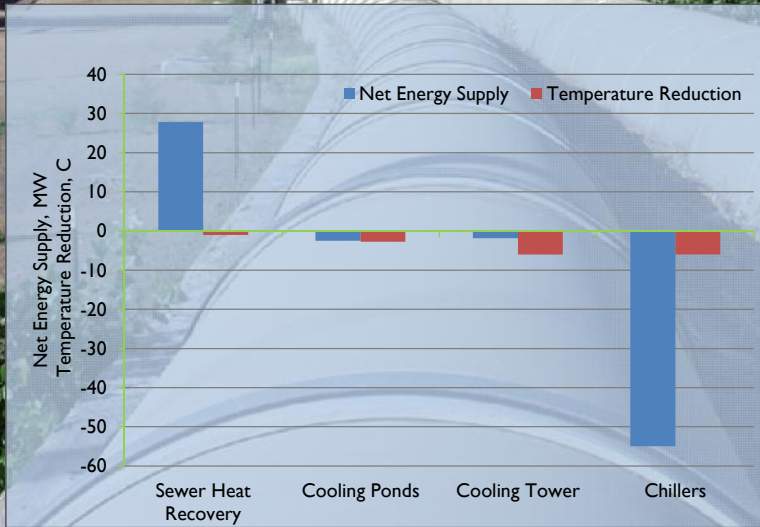
Aeration basin diffusers

Thermal Energy Recovery



Steam from Uitz outfalls in winter

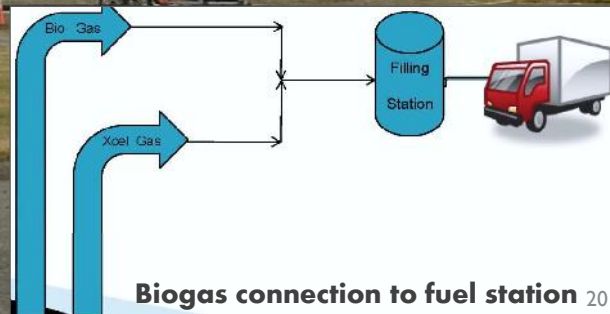
Thermal Energy Recovery Envisioning Partnerships/Sustainable Solutions



Delany Interceptor

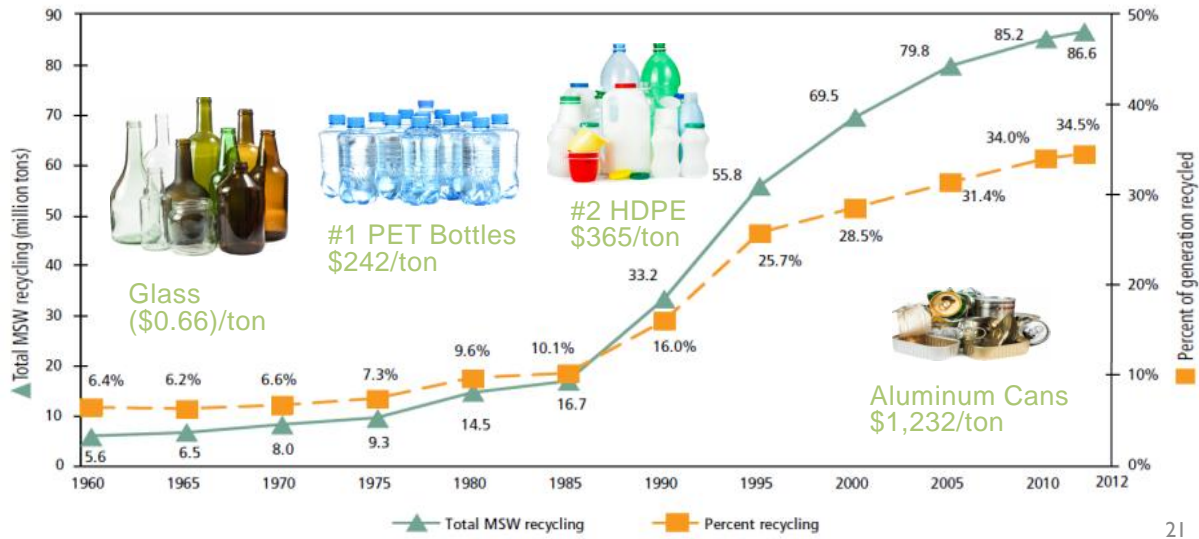
Renewable Natural Gas

Gas produced, scrubbed, and compressed at Grand Junction's Persigo WWTP
5.7-mile pipeline to City/County fueling facility



Increasing Recovery of Resources

Figure 2. MSW Recycling Rates, 1960 to 2012



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Elbe outfalls

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1. Strategic Direction



Northern Treatment Plant Visitors' Center exhibit, draft Strategic Framework

2. Inter-Utility Industry Collaboration

