Resource Recovery at DC Water

US DOE Bioeconomy 2017 – Domestic Resources for a Vibrant Future

July 11th, 2017

District of Columbia Water and Sewer Authority

NUTRIENTS and CARBON RECYCLING

FARMING

Provides carbon and nutrients valued at $300.00 per acre.

SILVICULTURE

Increases yield and improves understory.

RECLAMATION

Restoring mines to their natural state and providing wildlife habitats.

URBAN RESTORATION

Grow trees and reduce runoff.

BLUE PLAINS ADVANCED WASTEWATER TREATMENT PLANT: A RESOURCE RECOVERY FACILITY

dc water is life

water • nutrients • carbon • energy

BLUE PLAINS SERVICE AREA

DC Water receives and treats wastewater collected from the District of Columbia sewer system and from the Maryland and Virginia suburbs. On an average day, more than 330 million gallons of raw sewage flow into the Blue Plains Advanced Wastewater Treatment Plant from area jurisdictions.

dcwater.com/biosolids

GREEN ENERGY BIORENEWABLES

THERMAL HYDROLYSIS PROCESS (THP) AND DIGESTION FACILITY

DC Water will be the first in North America to use thermal hydrolysis for wastewater treatment. When completed, this facility will be the largest plant of its kind in the world.

GREEN BENEFITS:

- Produce combined heat and power, generating 13 MW of electricity
- Save DC Water $10 million annually cutting grid demand by a third (DC Water is the largest consumer of electricity in the District)
- Reduce carbon emissions by approximately 50,000 metric tons of CO_2e per year.
- Reduce trucking by 1.7 million miles per year.
- Save $10 million in biosolids trucking costs
- Produce Class A biosolids to grow trees, sequester carbon and reduce runoff.

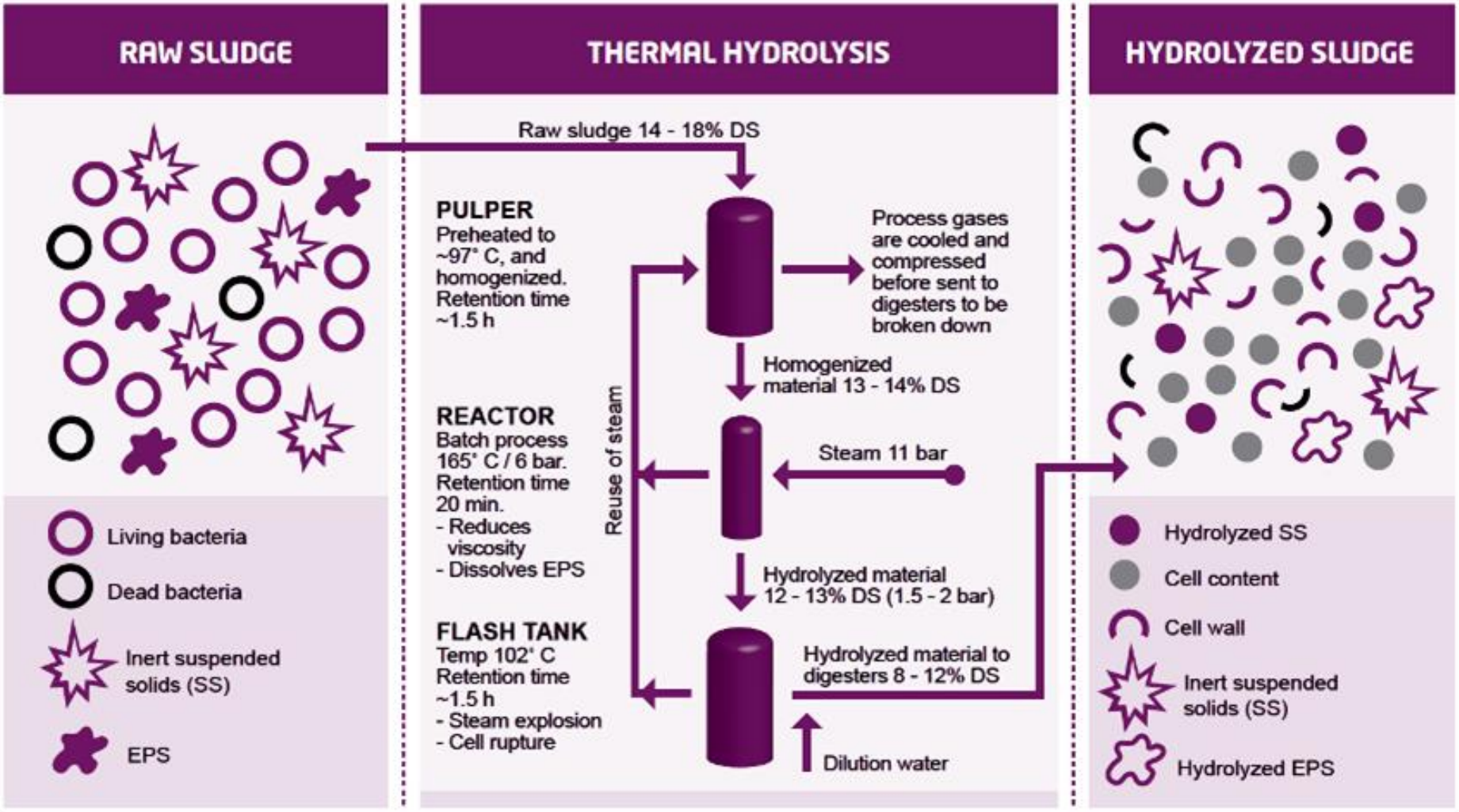
Anaerobic Digestion / Thermal Hydrolysis

dc water is life

Thermal Hydrolysis Reactors

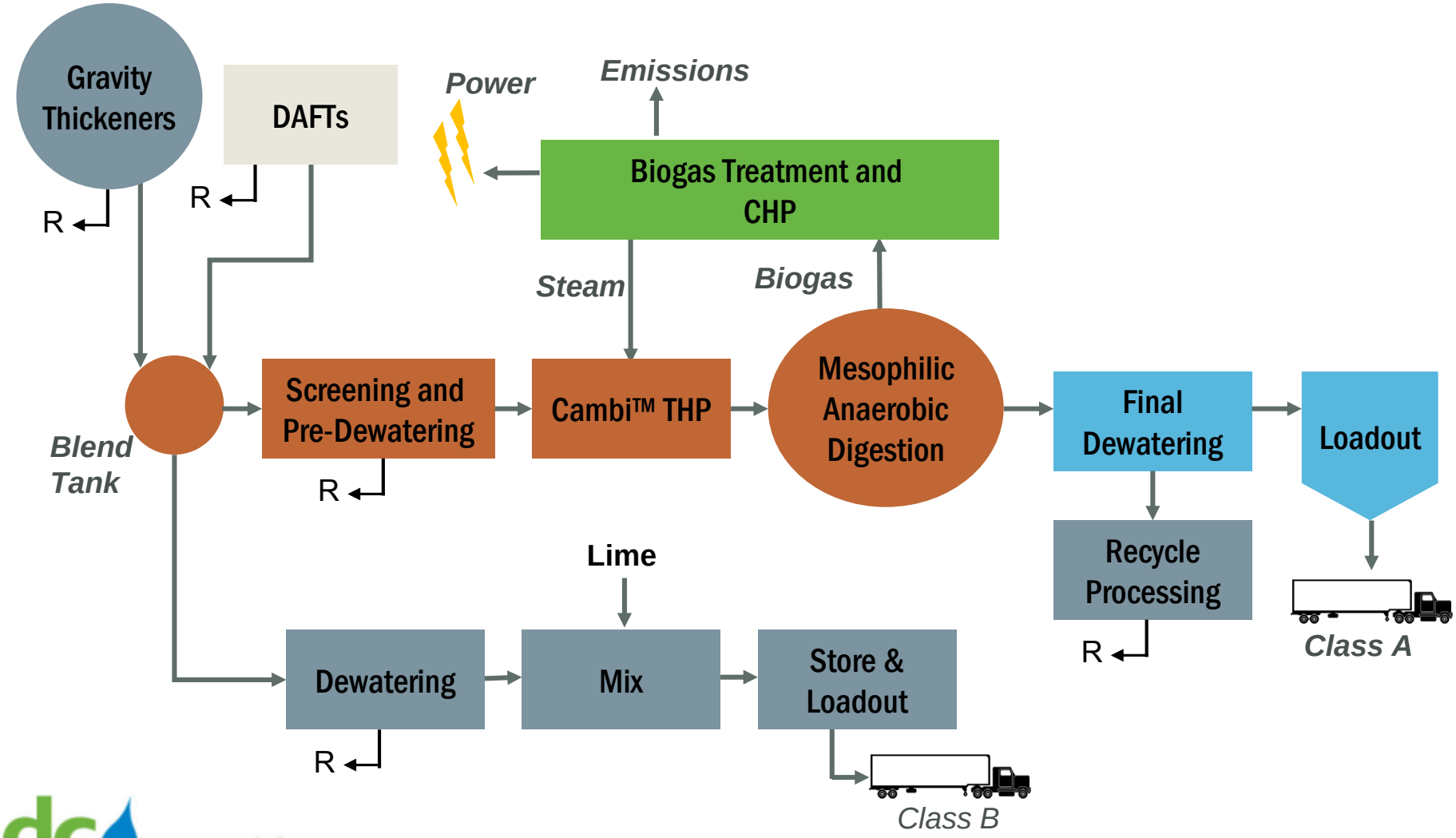
dc water is life

Thermal Hydrolysis Process



dc water is life

Process Schematic



dc water is life

Bloom Soil Amendment Product

BLOOM GOOD SOIL, BETTER EARTH.

dc water is life

Program Benefits

Resource Recovery

Reduce biosolids quantities by more than 50%

Improve product quality (Class A and more)

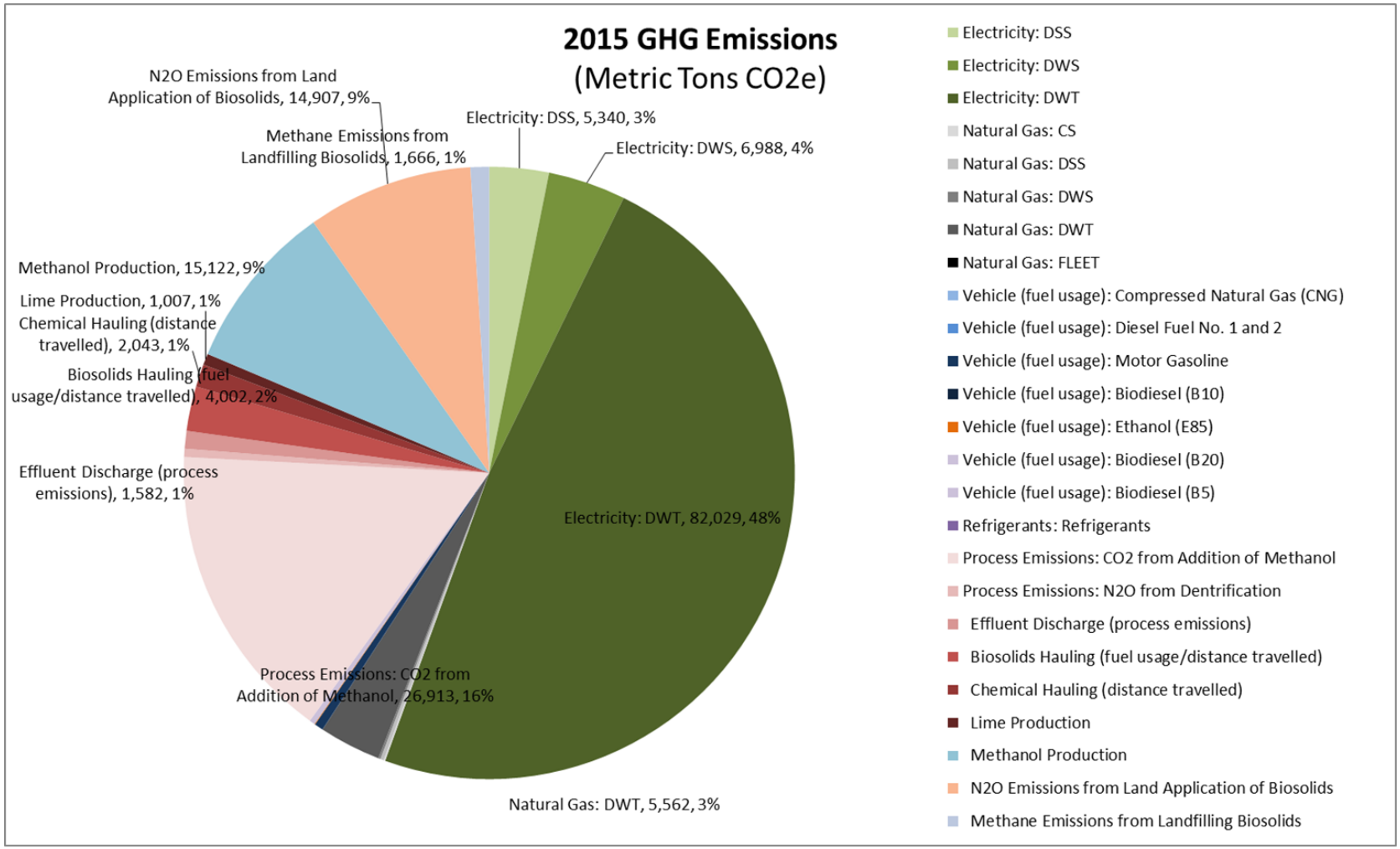
Generate 10 MW of clean, renewable power

Cut GHG emissions dramatically

Save millions of dollars annually

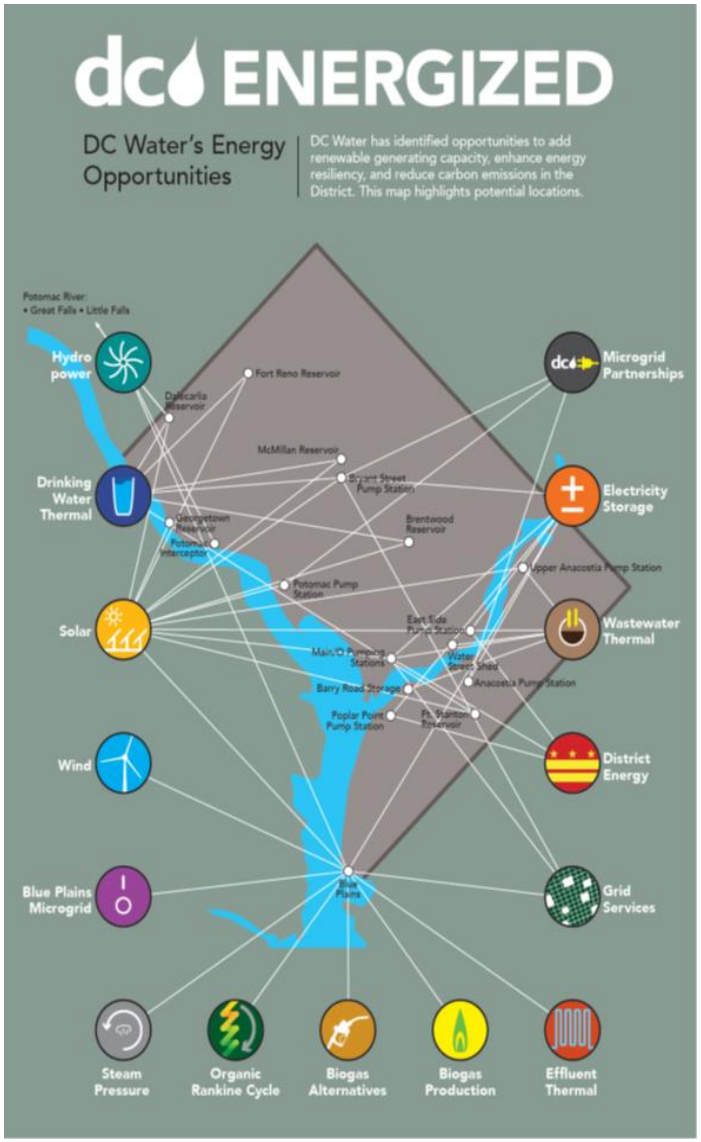
dc water is life

DC Water Carbon Footprint Model



dc water is life

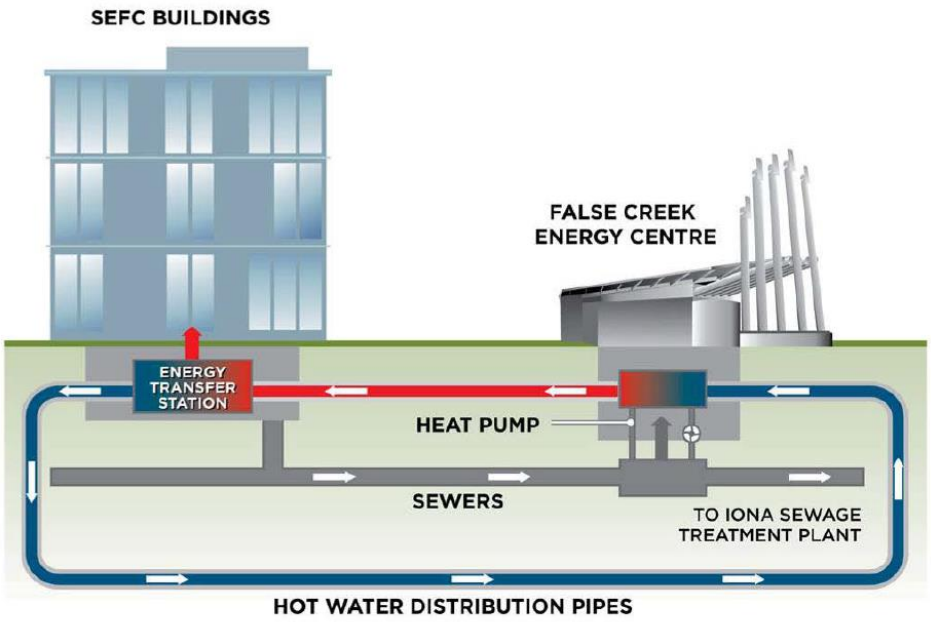
DC Water Energy Map



dc water is life

Sewer Heat Recovery

Gateway Theatre
Utility room supplies 50,000 ft^2 building in Vancouver, BC



Southeast False Creek
Providing 3 MW of heat energy to local neighborhood via hot water pipeline

dc water is life

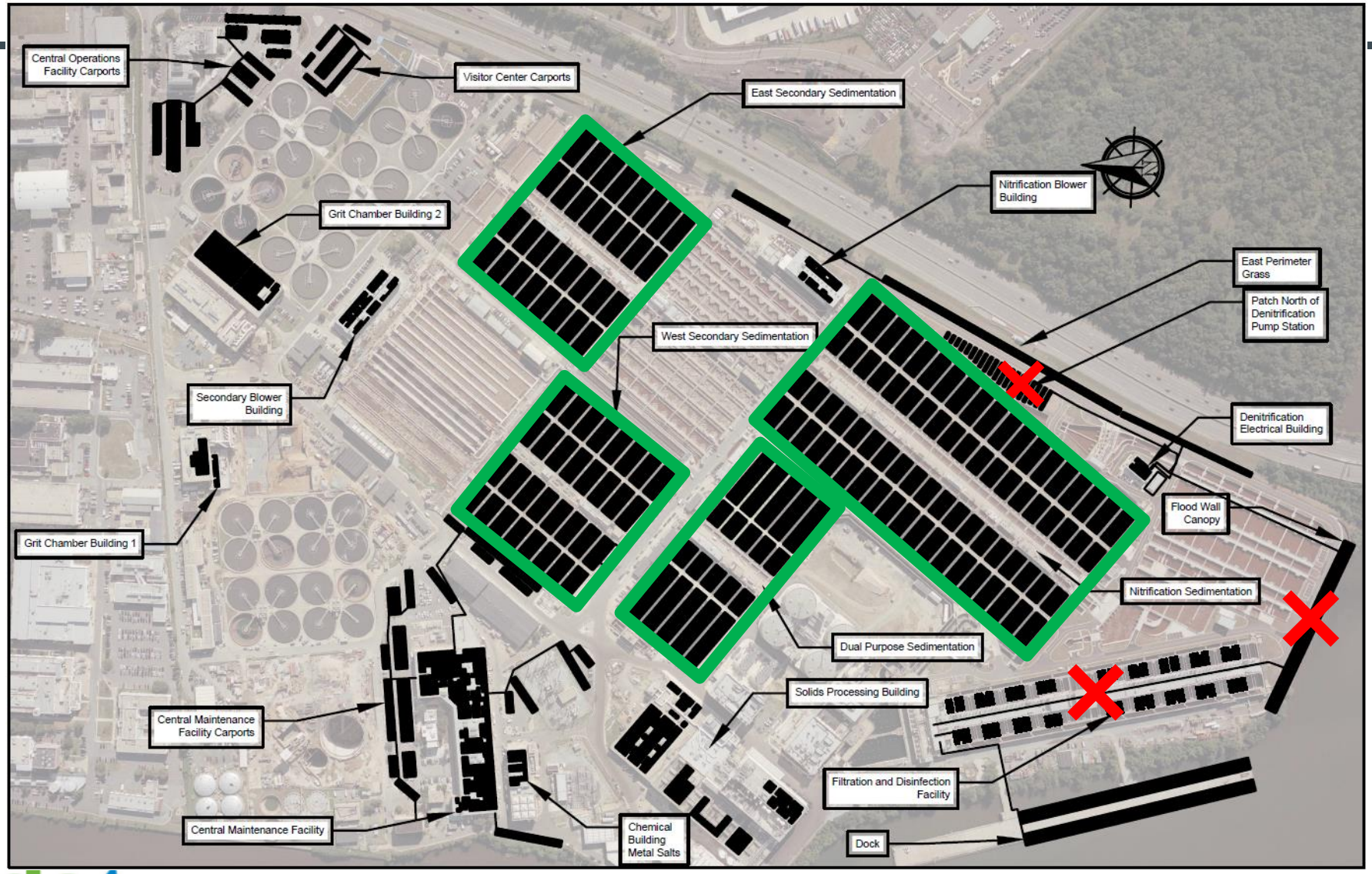
CITY OF VANCOUVER

Sewer Heat Recovery Potential

- Stable daily temperatures (2°F cycle)
- Significant seasonal cycle (58°F - 78°F)
- Significant variation site-to-site
- Weather has varying impact
- **For each 1 MGD, ~1 MW of thermal energy**
- **200 MGD baseflow = 200 MW available**
- Possibly “sweetspots”

dc water is life

Solar Project for Blue Plains



Offsite Solar Potential

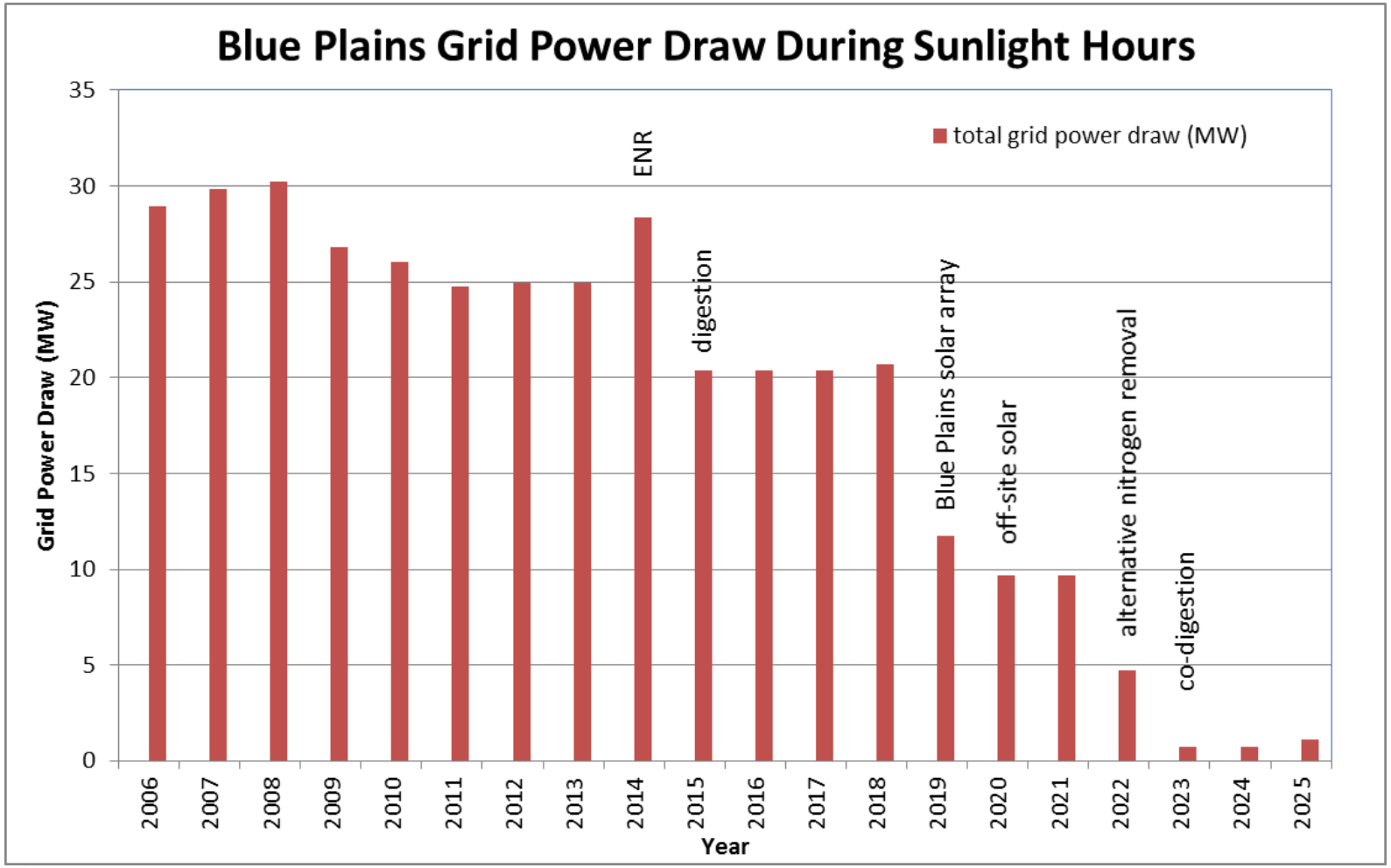
FORT STANTON : 2.0-2.5 ACRES (500kW)

FORT RENO : 6.0-7.8 ACRES (1 MW+)

BRENTWOOD RESERVOIR: 2.0-2.75 ACRES (500kW+)

dc water is life

Potential Grid Power Draw Reductions



dc water is life

There is no such thing as waste, only wasted resources.

www.bloomsoil.com

Chris Peot PE, BCEE
cpeot@dcwater.com

Capacity to Produce Methane and CNG

Gas Production: 2,640,000 scf/day

- Value as residential gas
- $1.22/therm (residential)
- $12.1 M/yr

- Value as electricity
- $0.085/kw hr (at Blue Plains)
- $7.9 M/yr

- Value as CNG
- 20,842 GGE/day
- $2.56/GGE (retail)
- $19.5 M/yr

DC Water is modeling carbon balance for base year, current year, and future projects

Table 1. Summary of Annual Emission Estimates, Calendar Year: 2008		
Emission Source	Annual Emissions Estimate Metric Tons CO2e	Scope 1 and 2 Percent Contribution
Scope 2		
Electricity	146,920	88%
DSS	11,053	7%
DWS	9,163	5%
DWT	126,704	76%
Scope 1		
Natural Gas	2,967	2%
CS	197	0.1%
DSS	371	0.2%
DWS	441	0.3%
DWT	1,924	1%
FLEET	34	0.02%
Vehicle (fuel usage)	2,586	2%
Compressed Natural Gas (CNG)	0.064	0.00004%
Diesel Fuel No. 1 and 2	1041	0.6%
Motor Gasoline	1545	0.9%
Refrigerants	142	0.08%
Nitrification/Denitrification (process emissions)		
CO2 from Addition of Methanol	12,007	7%
N2O from Dentrification	443	0.3%
Effluent Discharge (process emissions)	2,009	1%
Total with Scope 1 and 2	**167,074**	
Scope 3		
Biosolids Hauling (fuel usage/distance travelled)	4,107	
Chemical Hauling (distance travelled)	1,450	
Lime Production	14,883	
Methanol Production	6,747	
N2O Emissions from Land Application of Biosolids	52,548	
Methane Emissions from Landfilling Biosolids	7	
Total with Scope 3	**246,815**	
Carbon Credits		
Carbon Sequestration Land Application	26,844	
Carbon Sequestration Land Application with Composting	13,576	
Carbon Sequestration Landfill	2	
Avoided N2O Emissions from Replacement of Inorganic Fertilizers	52,548	
Fertilizer Credits Direct Applied Biosolids (N and P)	9,006	
Fertilizer Credits Composted Biosolids (N and P)	1,692	
Total	**103,668**	
GRAND TOTAL	**143,147**	

dc water is life