

# This presentation premiered at WaterSmart Innovations

[watersmartinnovations.com](http://watersmartinnovations.com)



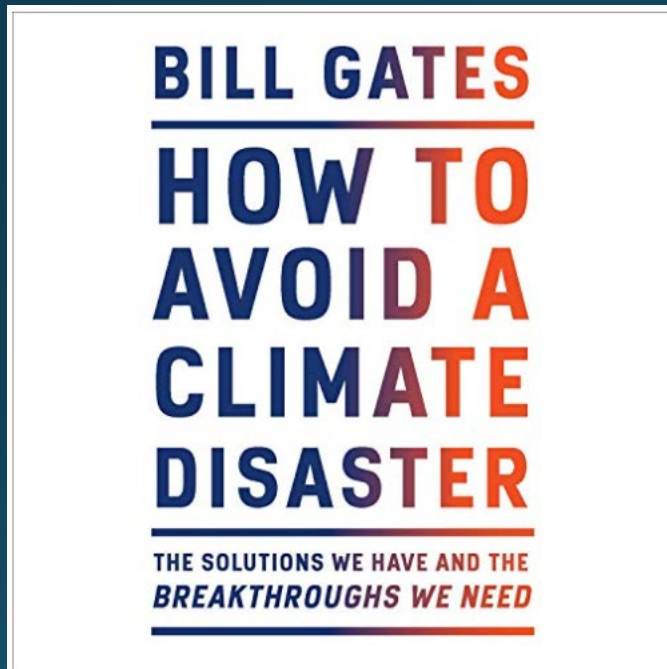
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# The Green Premium of Water Recycling

# What is a Green Premium?



- The cost delta between a zero carbon solution to a fossil-fuel dependent problem. (Gates 59)

# Variables that affect Green Premium Calculations

- Geographic Location
- Classification of water being recycled, ie. Rain, Grey or Blackwater
- Cost of Potable Water being offset with recycled water
- Manufacturer cost variances
- Service & Maintenance Cost variances
- Installation Labor Costs
- Collection and Conveyance Piping Material Costs
- Building Sizes and Collection Locations
- Recycled Water Quality & Testing Parameters dictated by the Regional Recycled Water Authority

# Narrowing it Down- Establishing the Limits of the Study

- 1. Classifications of Water to be Recycled:
  - Rainwater
  - Greywater
  - Blackwater
- 2. Ways in which the water is reused:
  - Toilet & Urinal Flushing
  - Irrigation
  - Cooling Tower Makeup Water- large buildings with excess supply only
- 3. How Clean must the water be? Says who?:
  - In 2016, the US Water Alliance, the San Francisco Public Utilities Commission and the Water Research Foundation had a baby. The baby's name is the **National Blue Ribbon Commission for Onsite Non-potable Water Systems**

# NBRC for Onsite Non-potable Reuse-Water Quality Standards

	Log Reduction Targets								
Water Use Scenario	Virus	Protozoa	Bacteria	Required Treatment Processes	Total Coliform	BOD <sub>5</sub>	TSS	Turbidity	pH
Blackwater									
Irrigation	8.0	7.0	6.0	Oxidation, Filtration, Disinfection	2.2 CFU/100 mL	25 mg/L	30 mg/L	.5 NTU	6-10
Indoor Use	8.5	7.0	6.0						
Graywater									
Irrigation	5.5	4.5	3.5	Oxidation, Filtration, Disinfection	2.2 CFU/100 mL	25 mg/L	30 mg/L	.5 NTU	6-10
Indoor Use	6.0	4.5	3.5						
Rainwater									
Irrigation	N/A	N/A	3.5	Disinfection	2.2 CFU/100 mL	N/A	N/A	10 NTU	6-10
Indoor Use	N/A	N/A	3.5						

# Calculating the Green Premium

$$\begin{array}{l} \text{Cost of Water} \\ \text{Recycling} \end{array} - \begin{array}{l} \text{Value of Water} \\ \text{being Recycled} \end{array} = \text{Green Premium}$$

# Costs of Water Recycling

- Engineering, Manufacturing & Delivery of the Water Recycling Equipment
- Equipment Room Construction
  - Plumbing & Electrical Installation
  - Water Holding Tanks sizes, materials of construction
- Dual Collection Piping (Greywater)
- Dual Distribution Piping (Potable Water & Non-Potable Water)
- Non-Potable Distribution Pumps
- Permit Fees

## Operating Costs

- Service & Maintenance Contract
- Electricity Consumption
- Consumables & Chemicals
- Permit Renewal Fees
- Water Sample Analysis for Regulatory Compliance

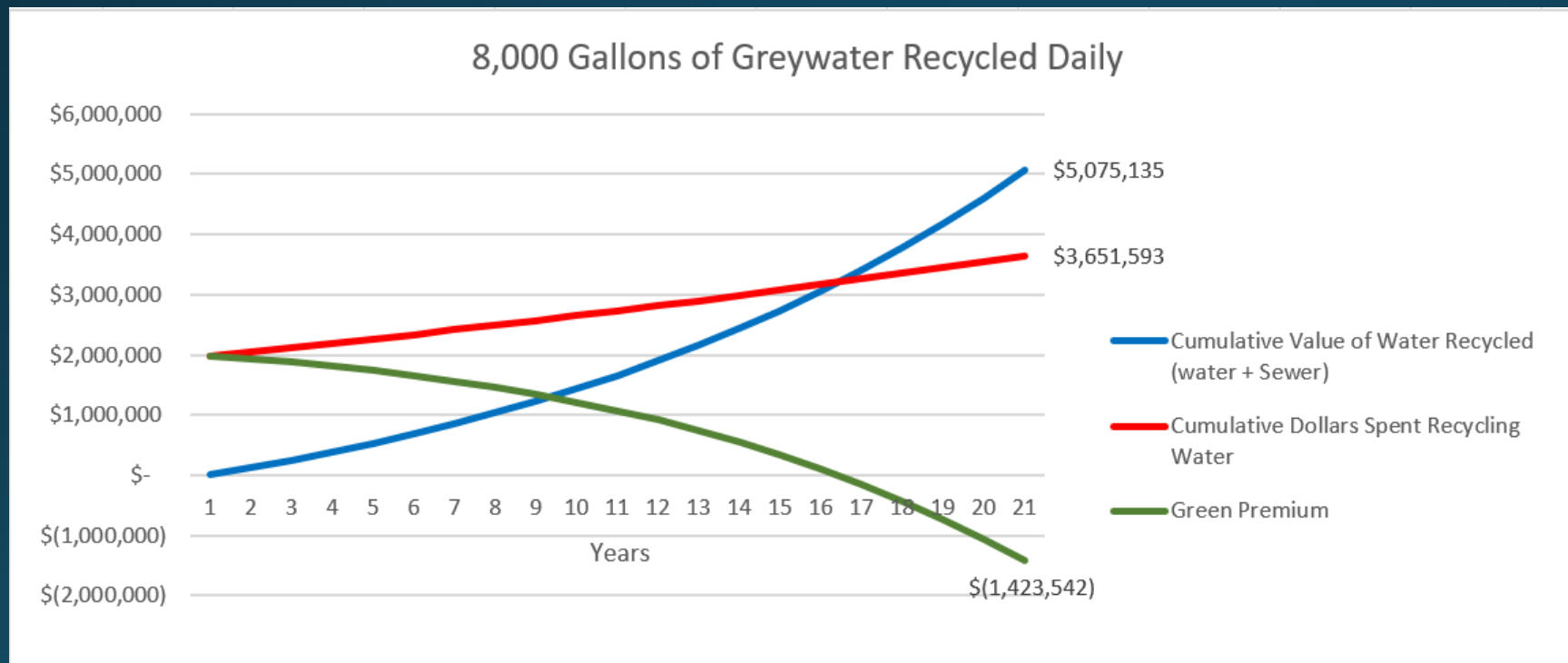


# Value of Water Being Recycled

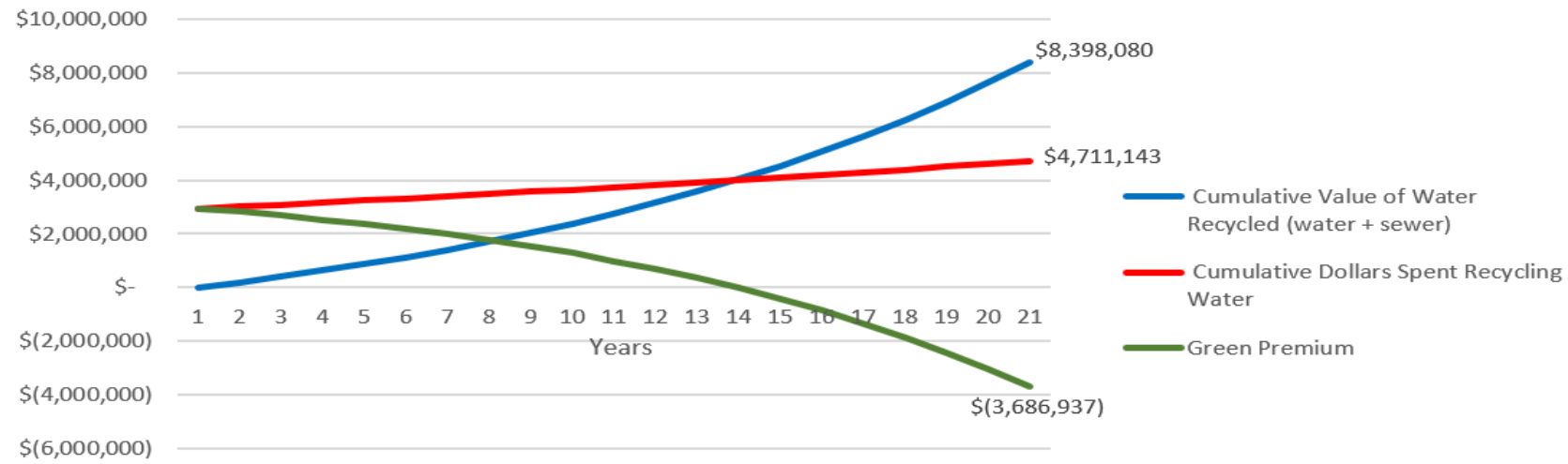
- The Cost of Potable Water by Volume
- The Cost of Wastewater Treatment by Volume

# Greywater Recycling

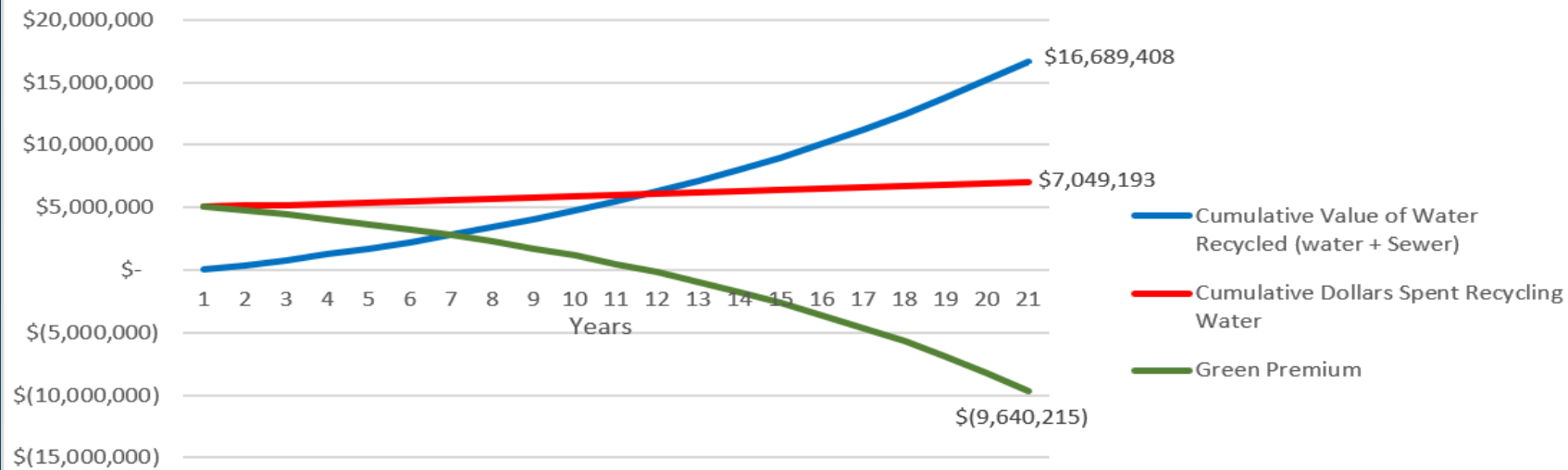
## Green Premium



### 13,200 Gallons of Greywater Recycled Daily

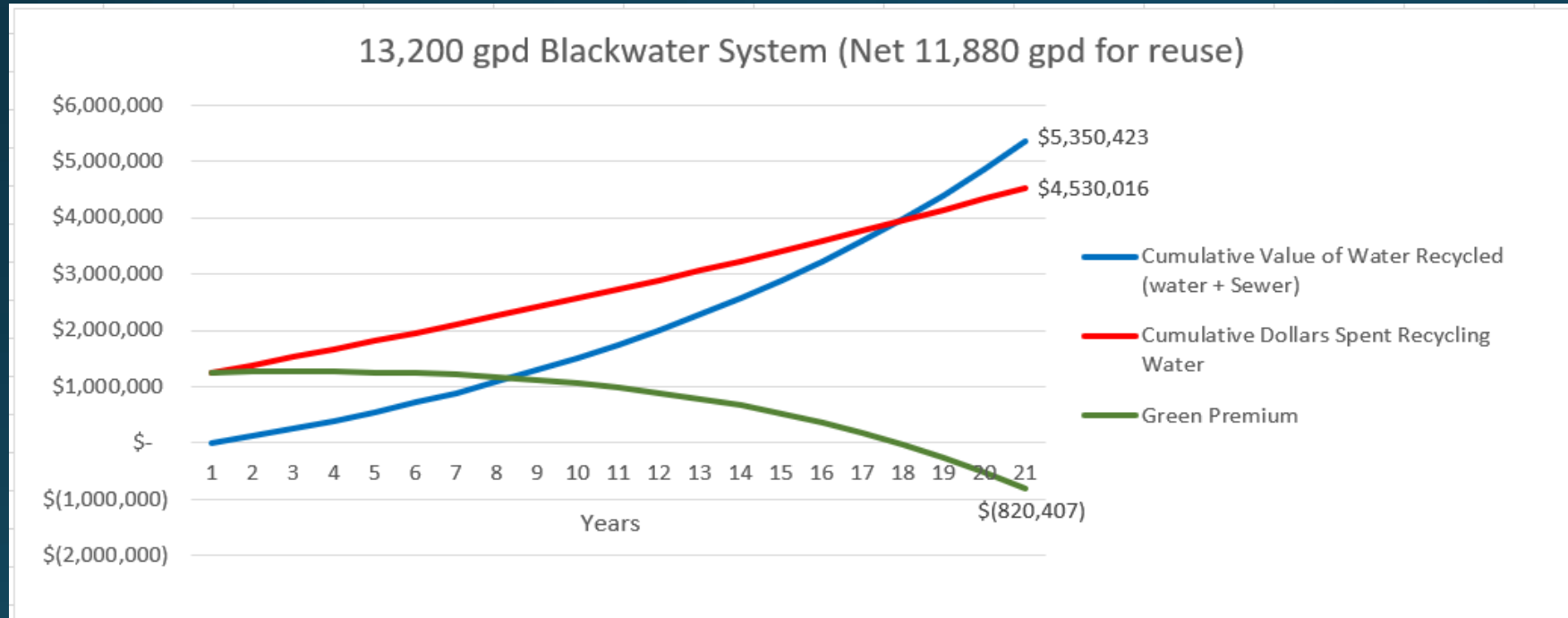


### 26,400 Gallons of Greywater Recycled Daily

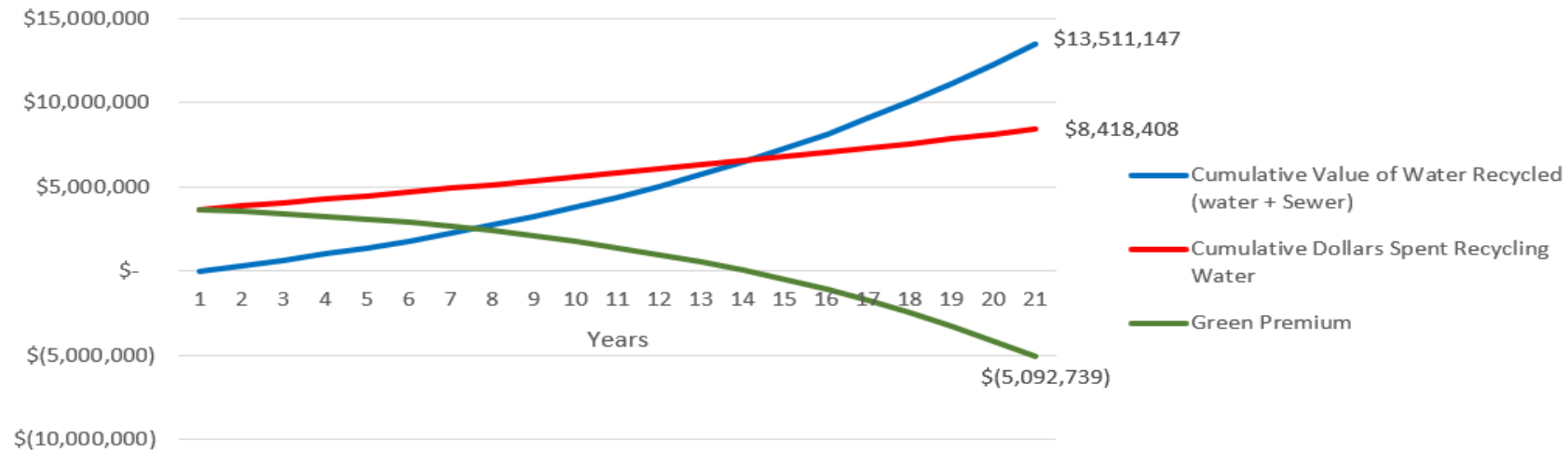


# Blackwater Recycling

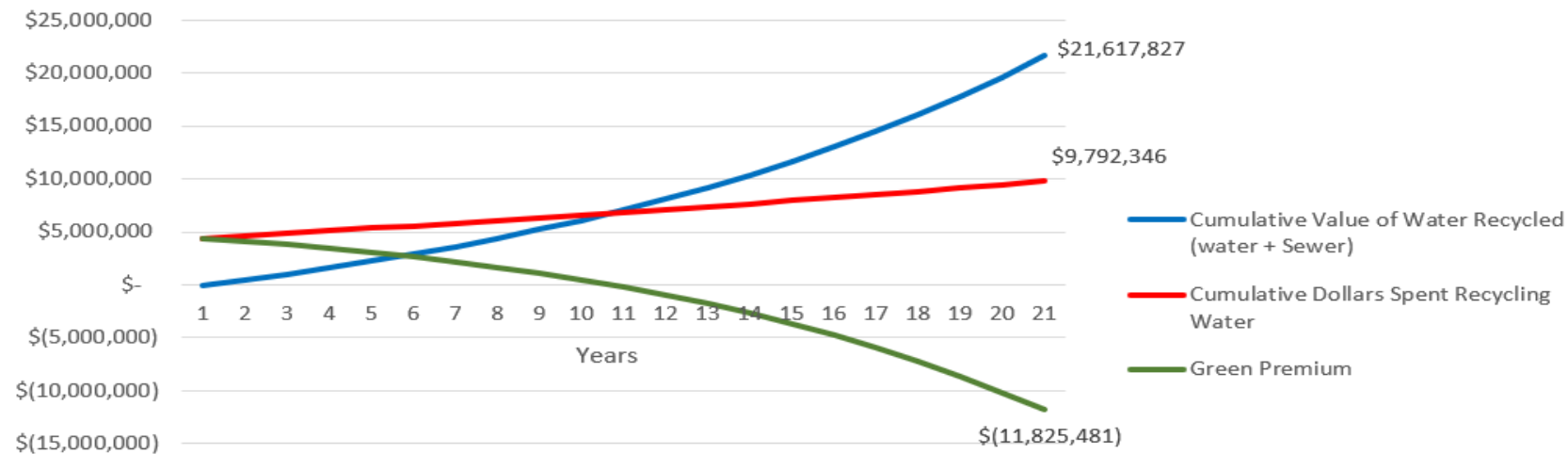
## Green Premium



40,000 gpd Blackwater System (Net 30,000 gpd reused)



64,000 gpd Blackwater System (Net 48,000 gpd reused)



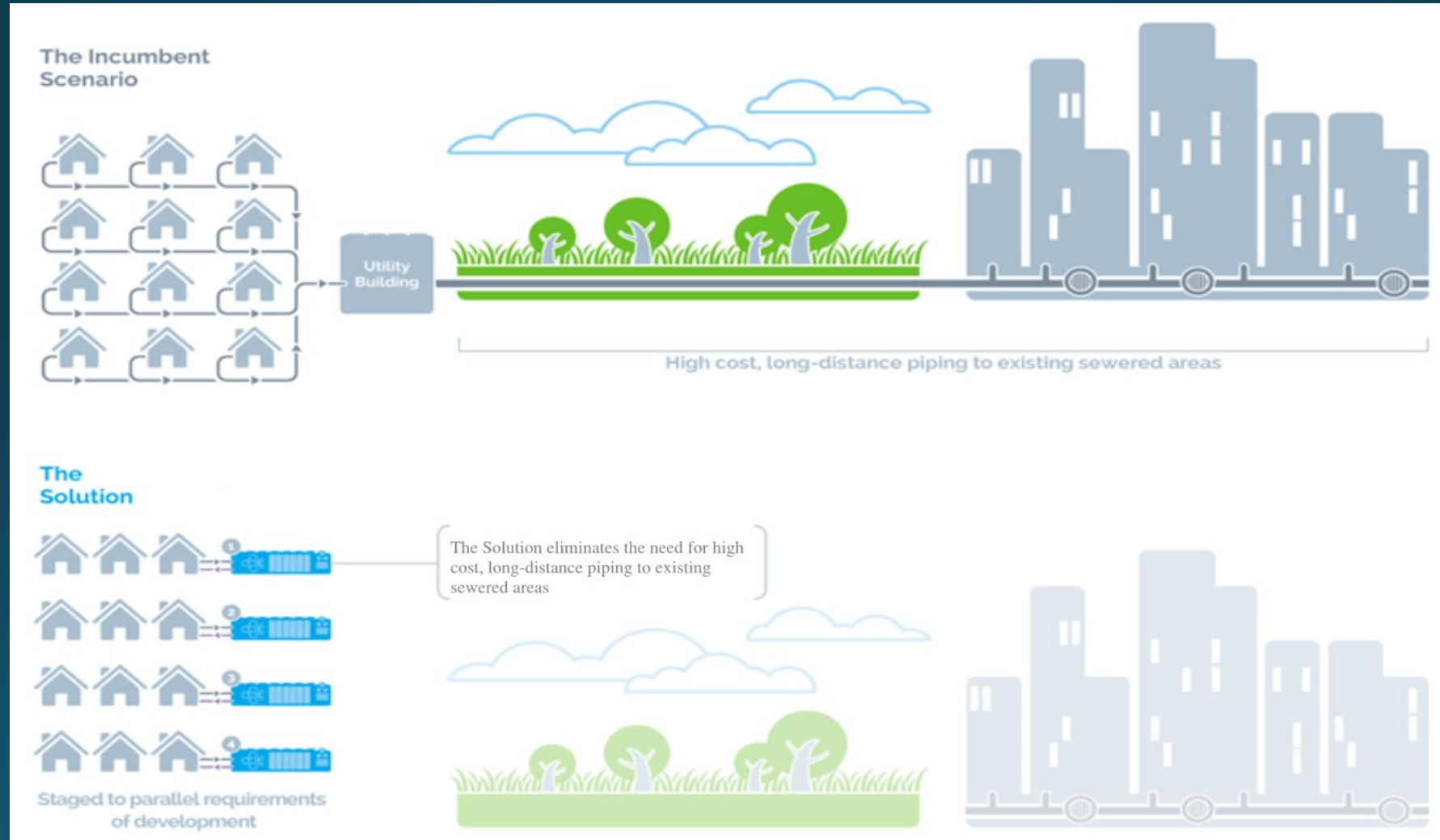
# Greywater & Blackwater Recycling Takeaways

1. The greater the volume of greywater and/or blackwater being recycled, the sooner the **Green Premium** switches from positive to negative.
2. Many factors can impact the **Green Premium**. Not a one-size-fits-all equation.
  1. Tank Sizes & Cost of Construction
  2. Cost of Water Sample Analysis for Regulatory Compliance
  3. Cost of Consumables & Chemicals
  4. Is separated potable and non-potable water distribution piping already required?

# Trends Affecting Decision-Making

- Drought
- Is there a Return on the Investment?
- Who will maintain the system while its operating?
- New Construction or Retrofit?
- Can the **Green Premium** calculation be improved by charging the tenants for the recycled water?
- Grant Funding Available?
- Mandate- yes or no?
- Location of Building or Development in relation to existing sewer system

# Water Recycling Solutions for Remote Developments





# How much water can be saved by recycling?

Rainwater	Low End	High End
Commercial	Building Type & Geographical Region Dependent	
Residential		

Greywater	Low End	High End
Commercial	17%	25%
Residential	20%	50%

Blackwater	Low End	High End
Commercial	60%	80%
Residential	18%	60%

# New Technologies to reduce the Green Premium

- 1. District Scale Water Recycling Systems
- 2. Integrate multiple water sources into 1 recycling system
- 3. Integrate the ability to remotely operate, and remotely monitor a recycled water system.
- 4. Additional Surrogate Parameters or Critical Control Points for monitoring water quality in real time.
- 5. Mandates for water recycling take optional costs out of the Green Premium calculation.

Thank You!

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