Decentralized/Onsite Solutions for Non-Potable Water Reuse

Tristian Bounds, P.E.

Presentation Agenda

- Today's talking points:
  - Decentralized alternatives
  - Resources for Decentralized Non-Potable Guidelines
  - Case studies
  - Future possibilities

Pivotal Point for Water Infrastructure

Next generation water infrastructure exist now. Examples can be found in pioneering projects and communities around the nation and the world.

In many cases, these systems use less water and energy, recycle water at for purpose rates, capture nutrients for beneficial use, and perform at a cost below conventional treatment systems.

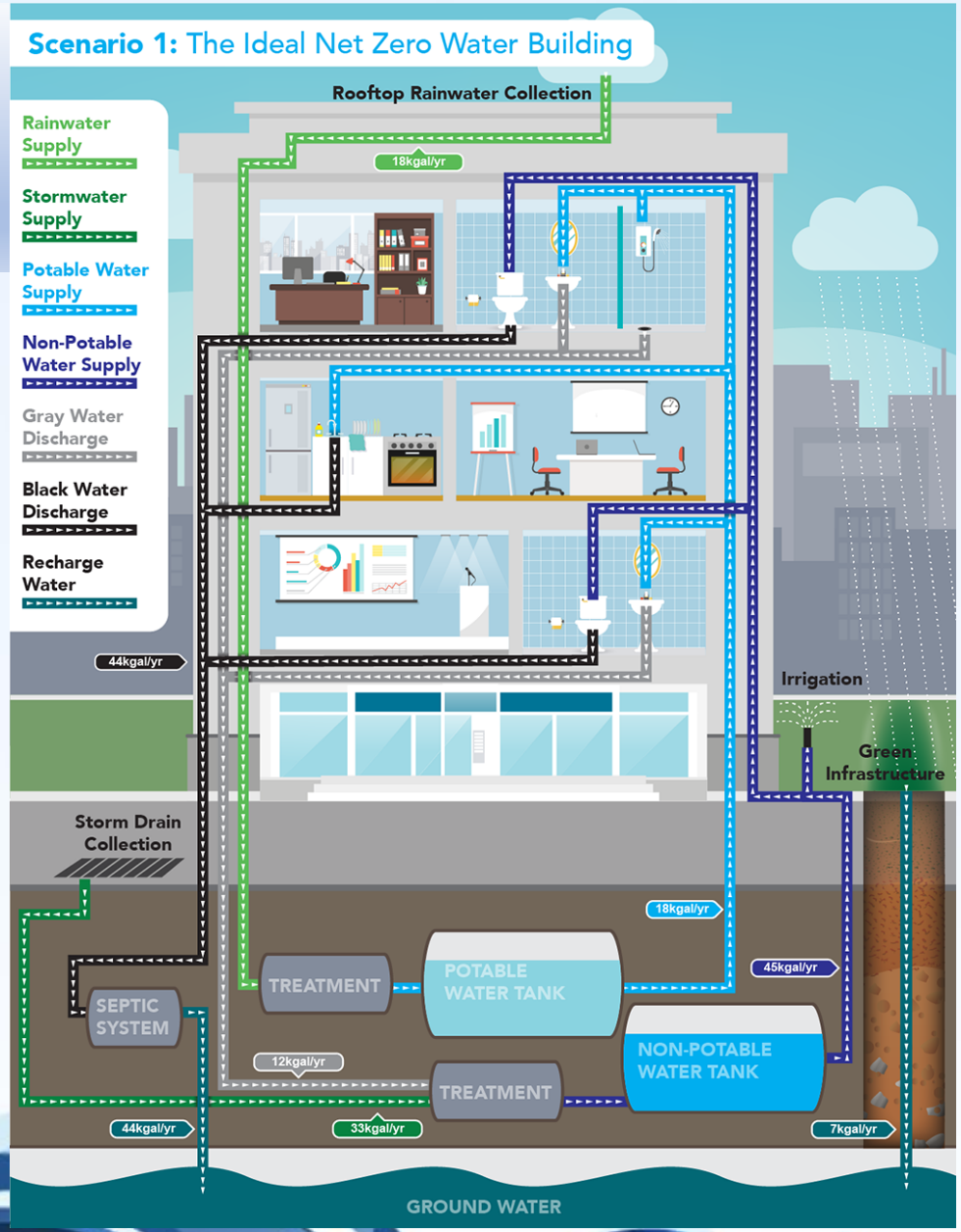
Urban Building Water Reuse

Ideal Urban Building Water:

- Rainwater Catchment – Potable Water Supply
- Stormwater Catchment – Non-Potable Supply
- Greywater Collection – Non-Potable Supply
- Blackwater Collection – Composting or Discharge

Alternative Urban Building Water:

- Rainwater Catchment – Non-Potable Water Supply
- Greywater Collection – Non-Potable Water Supply
- Stormwater Catchment – City Service
- Blackwater Collection – City Service
- Portable Water – City Service



Current State of Decentralized Reuse

Common applications:

- Landscape, golf course, and agricultural irrigation
- Cooling water for power generation
- Process water for industrial applications
- Aquifer recharge
- Toilet flushing

Benefits of Decentralized Water Reuse

- Scalable, modular, affordable, and adjustable systems
- 50-95% demand reduction on water and wastewater infrastructure and resources (Clerico 2009)
- Energy Conservation
- Lower capital and operational costs
- Quickly deployable alternatives without intensive construction
- For Purpose Water - Services delivered where and when its needed
- Strategic and adaptable planning
- No long pipelines, which directly reduces infiltration and exfiltration
- Mitigation of combined sewer overflow and sanitary sewer overflow
- Marketability & Collaboration fostered between stakeholders to moderate risks

Positive Directions!

- As of late 2016, all but three states had implemented regulations for non-potable water reuse.
- National Blue Ribbon Commission
- NSF/ANSI 350 and 350-1
- USGBC LEED, SITES, and ILFI with the Living Building Challenge

Resources Decentralized Non-Potable Guidelines

William J Worthen Foundation –

1. Onsite Non-Potable Water Reuse Practice Guide

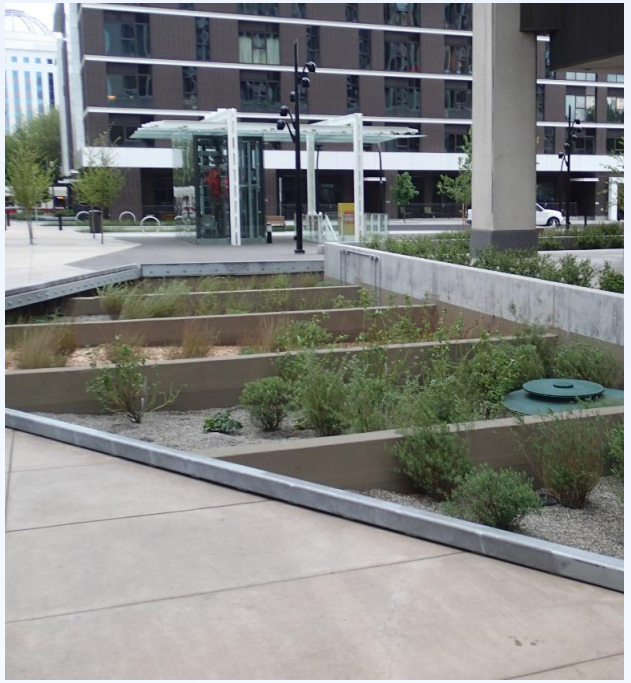
https://www.collaborativedesign.org/

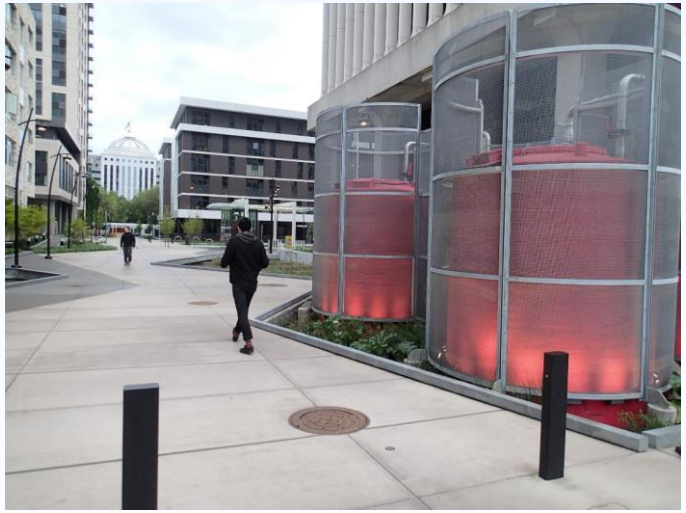
US Water Alliance –

1. Blueprint for Onsite Water Systems: A Step-by-Step Guide for Developing Local Programs to Manage Onsite Water Systems
2. A Guidebook for Developing and Implementing Regulations for Onsite Non-potable Water Systems
3. Model State Regulation for Onsite Non-potable Water Programs
4. Model Local Ordinance for Onsite Non-potable Water Programs
5. Model Program Rules for Onsite Non-potable Water Programs

www.uswateralliance.org/initiatives/commission/resources

Hassalo on 8th, Portland, Oregon, USA

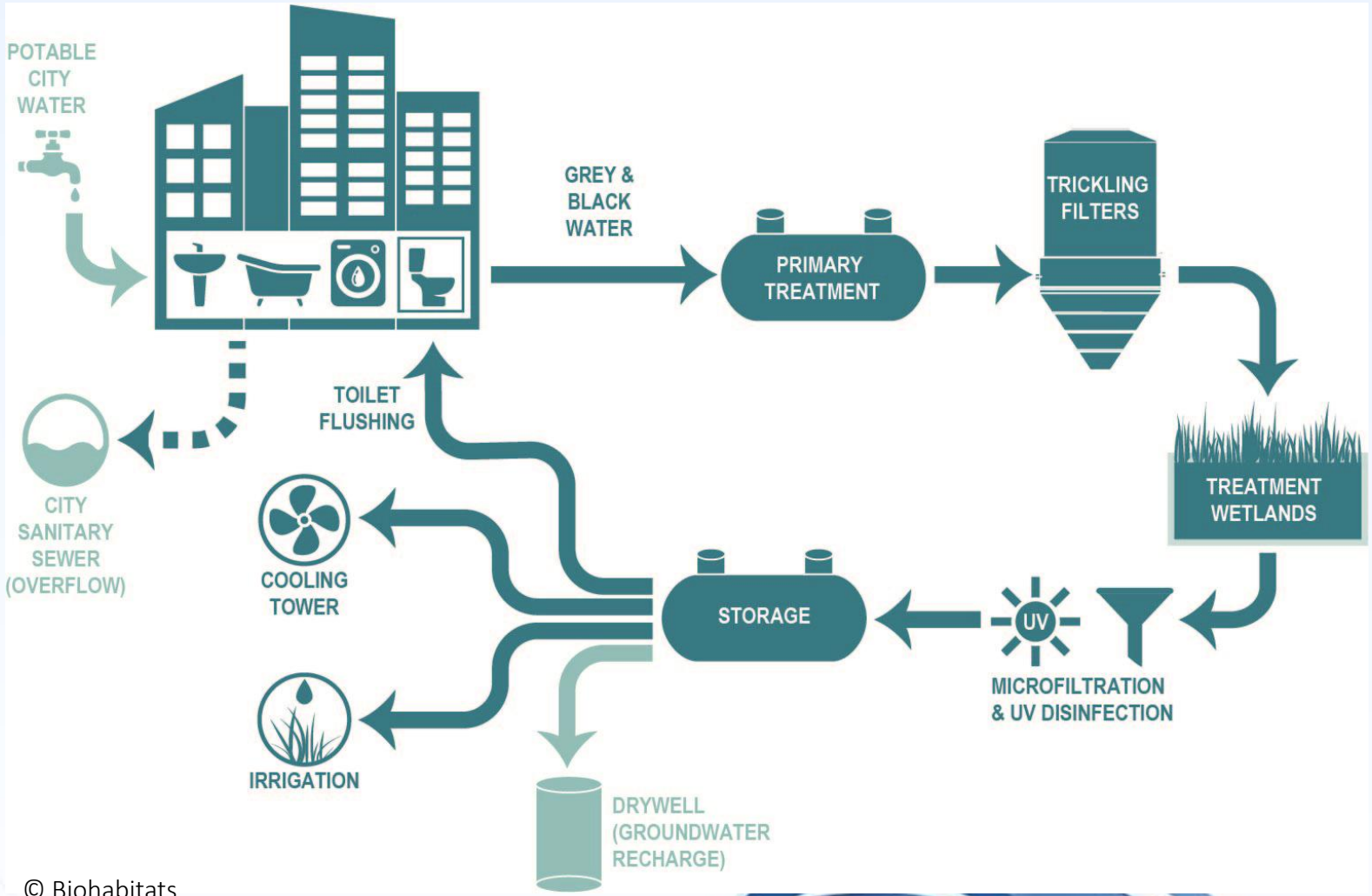


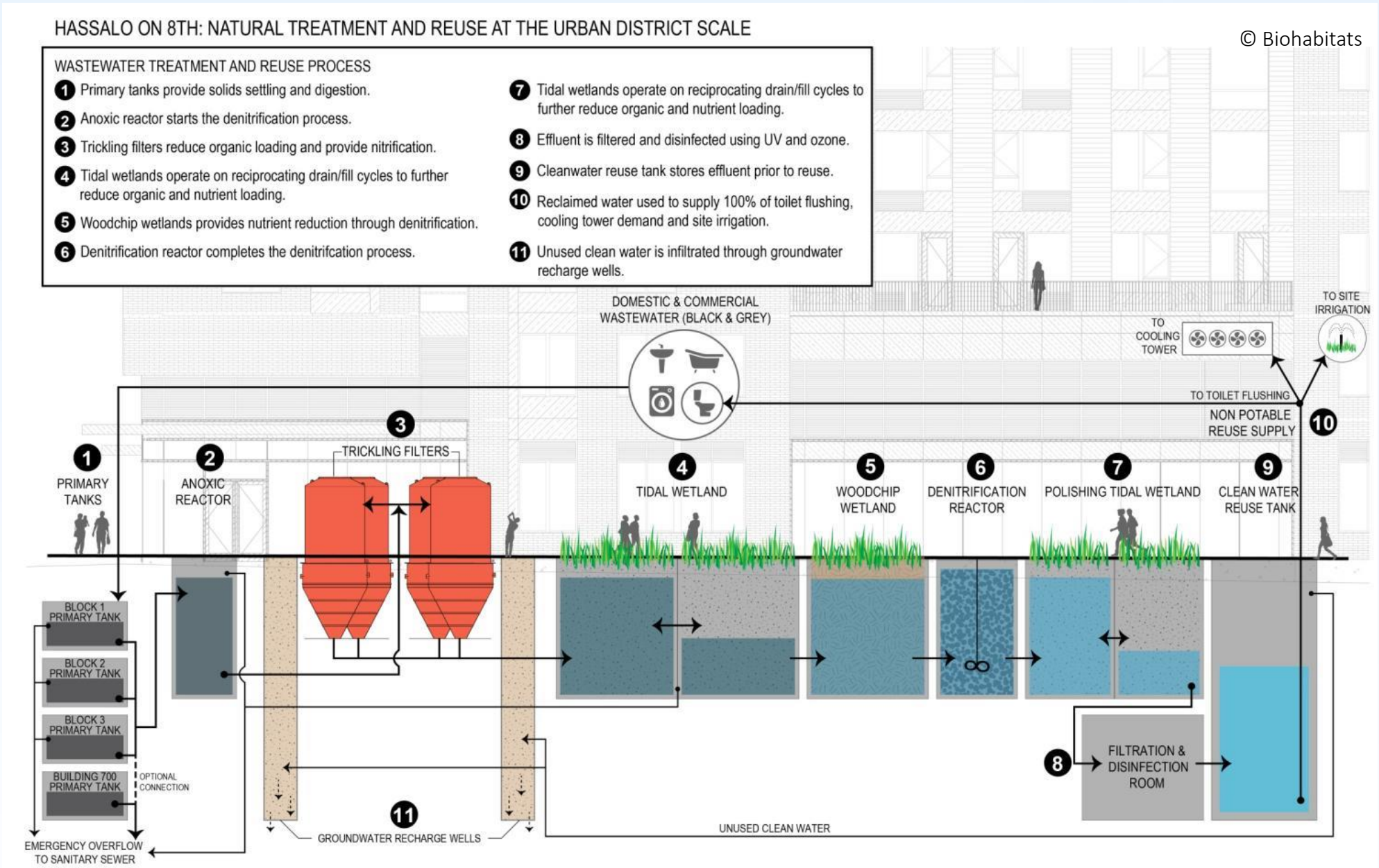


Hassalo on 8th – A BioHabitat Project

- A 4-block sustainable urban development in the Lloyd EcoDistrict
- First mixed-use developments by American Assets Trust
- LEED Platinum development

Hassalo on 8th





Hassalo on 8th

Guidelines for Class A+ recycled water for non-potable reuse for this application requires the following:

- TN < 10 mg/L
- Turbidity < 2 NTU (24-hour average) / < 10 NTU (24-hour max)
- E. coli < 2.2 cfu/100 mL (7 day average) / < 23 cfu/100 mL (max)

Hassalo on 8th – Stacked Benefit

- Pedestrian circulation
- Emergency access
- Landscape
- Iconic branding
- Wastewater treatment
- Educational
- Increases biodiversity

© Biohabitats

The Ecovillage at Currumbin, Queensland, Australia

Photo(s) courtesy of Landmatters Pty Ltd

The Ecovillage at Currumbin

- 272-acre site with 147 home lots, schools, shops, and offices
- Employs greywater reuse for toilet flushing, car washing, and irrigation
- Chosen by International Real Estate Federation as 2008's "World's Best Environmental Development"
- One of the most award-winning developments in Australia

courtesy of Landmatters Pty Ltd

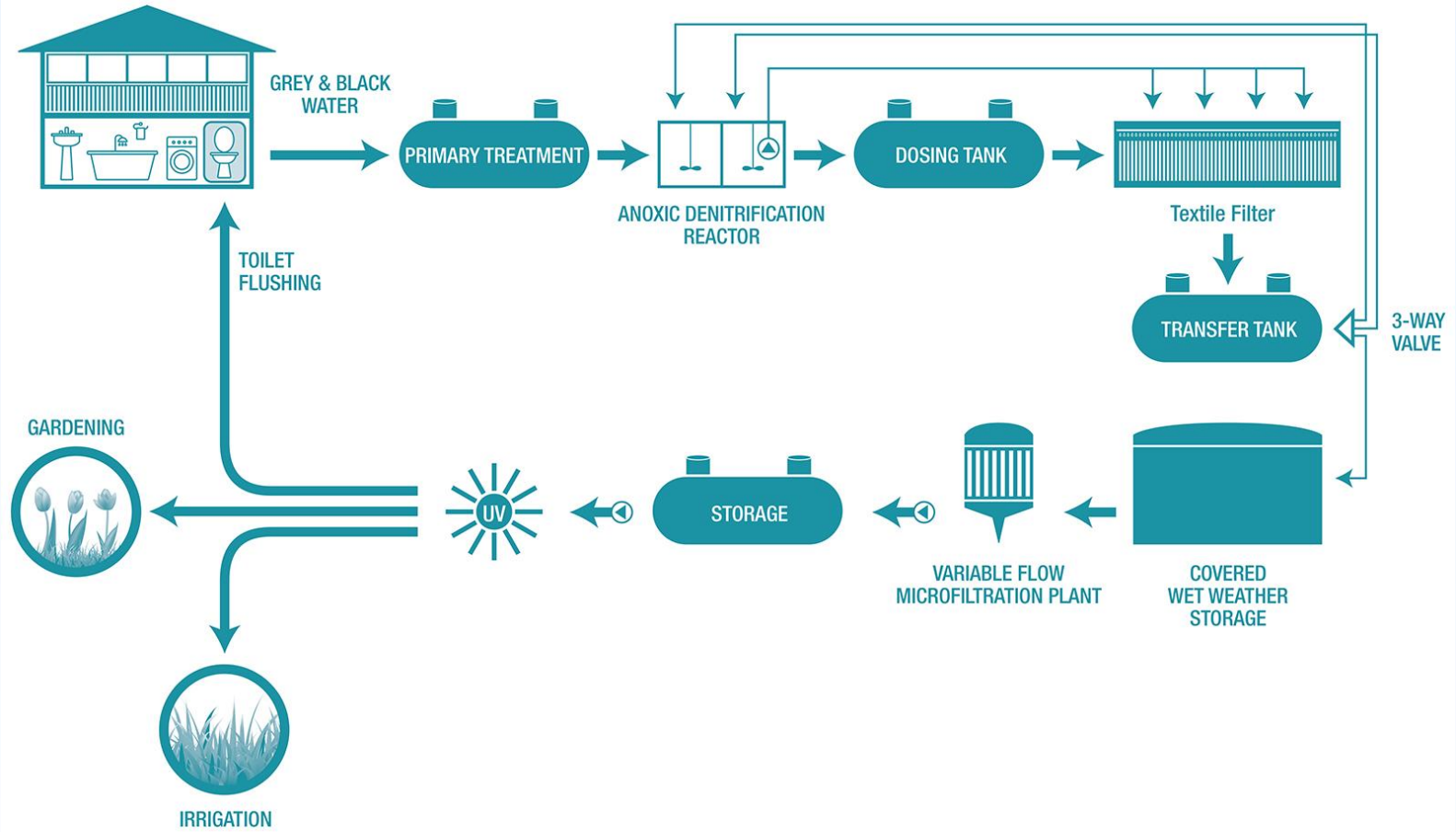
The Ecovillage at Currumbin

Sustainable features of the wastewater treatment facility include ...

- The use of polyethylene piping and watertight construction to eliminate infiltration and inflow (I&I)
- Anaerobic solids digestion to minimize solids handling needs
- Packed-bed filter construction in the secondary treatment unit for reduced energy usage
- Nutrient reuse through irrigation
- No unpleasant odor generation
- Low noise
- Low greenhouse gas production
- Pleasing aesthetics
- High-quality reuse water

courtesy of Landmatters Pty Ltd

The Ecovillage at Currumbin



The Ecovillage at Currumbin

Class A+

- BOD_5 < 10 mg/L
- Turbidity < 2 NTU
- E. coli < 10 CFU
- 5 log removal of viruses and protozoa

Multiple Disinfection Barriers

- Micro-filtration
- Ultraviolet light
- Chlorine (optional)

courtesy of Landmatters Pty Ltd

The Ecovillage at Currumbin

Effluent quality:

- BOD_5 = 3.37 mg/L
- TSS = 1.85 mg/L
- Turbidity < 2 NTU
- E. coli < 1 cfu/100 mL
- Viruses/pathogens > 9 log removal

courtesy of Landmatters Pty Ltd

Boy Scouts of America Summit (BSA) Bechtel Reserve

West Virginia, USA

Photos and graphics in this case study BSA

BSA Summit Bechtel Reserve Project Goals

- Create a model for sustainability and environmental stewardship.
- Create a site that would be a “net zero energy” and “net zero carbon footprint” environment
- Protect the New River by eliminating any direct discharge of treated wastewater

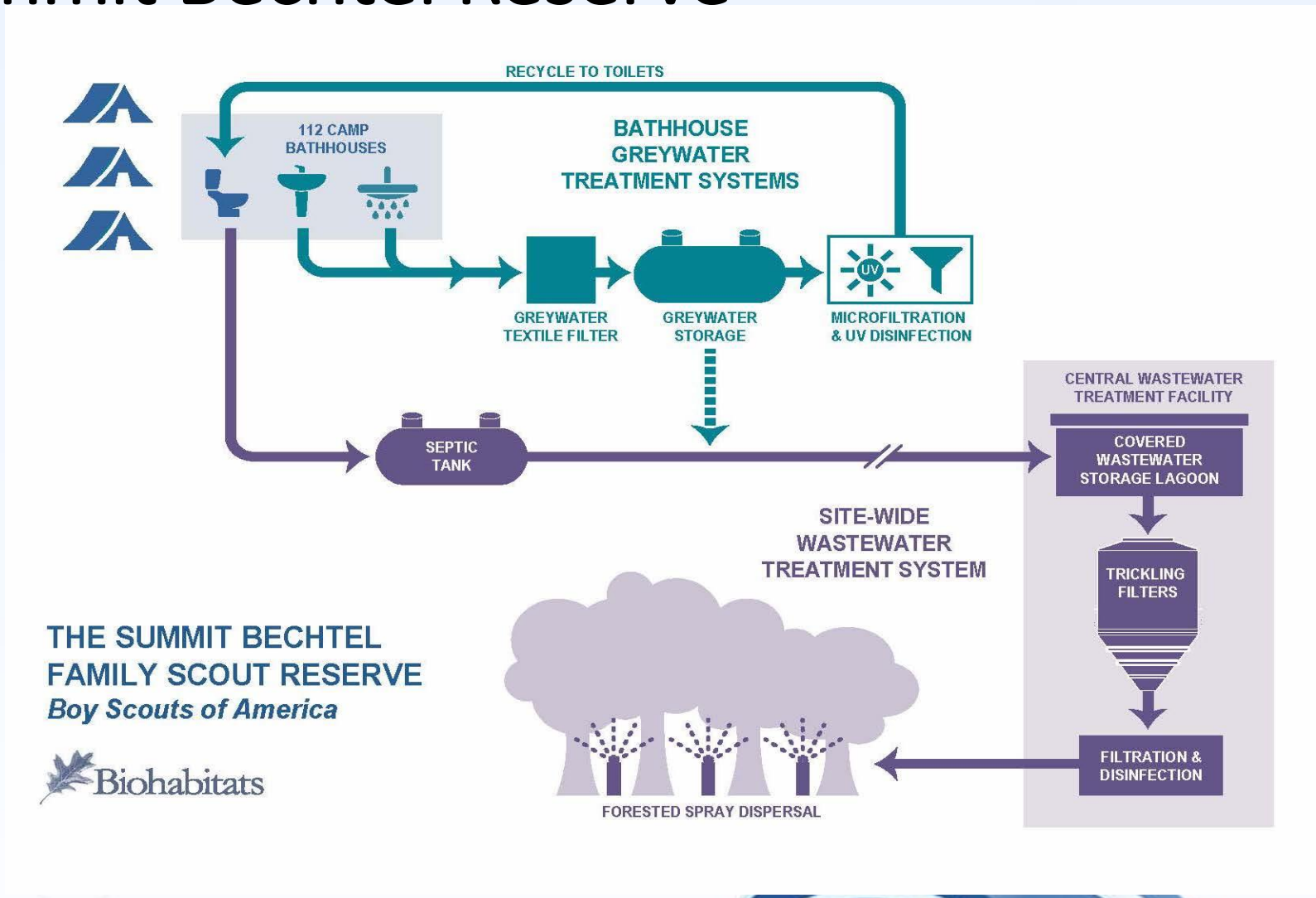
BSA Summit Bechtel Reserve

- 336 shower facilities
- Reuse of greywater for toilet flushing
- Rainwater makeup
- Potable water makeup

BSA National Jamboree 2013 and 2017

The greywater system at the Summit Bechtel Reserve is designed to treat and reuse over 200,000 gallons (757 m^3) per day, which saves over two million gallons (7,571 m^3) of water during a Jamboree.

BSA Summit Bechtel Reserve



BSA Summit Bechtel Reserve

The Future of Water

In the near future, we need more emphasis on …

- Integrating non-potable water reuse (and, possibly, potable reuse)
- Regularly using combined food and organic wastes for nutrient recycling
- Reducing overall treatment system footprint through improved technology
- Using heat energy from water to power collection, distribution, and treatment facilities
- Providing more education about responsible water usage

Conclusions

- Allied partners need to make a concerted effort to learn from projects on the cutting edge, change perceptions among professionals and the public, and work collaboratively across disciplines to change the way we govern innovation.
- To maintain healthy, resilient, and safe communities into the future, we need to effectively integrate decentralized systems into existing centralized systems.

Decentralized Solutions for Non-Potable Water Reuse

Thank You!

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