

# Water, Wastewater & Stormwater Systems



CAROLINA NORTH

*The* UNIVERSITY of NORTH CAROLINA *at* CHAPEL HILL

# Water Systems

- **POTENTIAL GOAL**
  - Reduce use of potable water
- **TECHNIQUE**
  - Collect rainwater for re-use
- **CASE STUDY**
  - Phillip Merrill Environmental Center; Annapolis, MD
- **DESCRIPTION:**
  - Cisterns are used to collect and store rainwater that is re-used in the building
- **POTENTIAL BARRIERS:**
  - Aesthetics of re-use water
  - Additional Operation & Maintenance



# Water Systems

- **POTENTIAL GOAL:**
  - Reduce use of potable water
- **TECHNIQUE**
  - Collect rainwater for re-use
- **CASE STUDY:**
  - Seattle City Hall; Seattle, WA
- **DESCRIPTION:**
  - A cistern located in the basement is used to collect rainwater to be re-used for toilet flushing and irrigation purposes
- **POTENTIAL BARRIERS:**
  - Aesthetics of re-use water
  - Additional Operation & Maintenance



# Water Systems

- **POTENTIAL GOAL:**
  - Implement water conservation
- **TECHNIQUE:**
  - Use reclaimed water
- **CASE STUDY:**
  - Irvine Ranch Water District; Irvine, CA
- **DESCRIPTION:**
  - Reclaimed water is 20% of the district's total water supply and provides irrigation for 80% of all commercial and community landscapes. In addition, reclaimed water is used for toilet flushing in several offices in the district.
- **POTENTIAL BARRIERS:**
  - Reclaimed water demand
  - Additional Operation & Maintenance



# Water Systems

- **POTENTIAL GOAL:**
  - Implement water conservation
- **TECHNIQUE:**
  - Use reclaimed water
- **CASE STUDY:**
  - University of Arizona; Tucson, AZ
- **DESCRIPTION:**
  - The campus uses reclaimed water for irrigation and for evaporative cooling of campus facilities.
- **POTENTIAL BARRIERS:**
  - Reclaimed water demand
  - Additional Operation & Maintenance



# Wastewater Systems

- **POTENTIAL GOAL:**
  - Treat wastewater on site
- **TECHNIQUE:**
  - Constructed Wetland
- **CASE STUDY:**
  - Sisters, Servants of the Immaculate Heart of Mary Motherhouse Renovation; Monroe, MI
- **DESCRIPTION:**
  - Greywater from the facility's sinks and showers are treated in wetlands and reused on site in the building's toilets
- **POTENTIAL BARRIERS:**
  - Land Intensive
  - Additional operation & maintenance



# Wastewater Systems

- **POTENTIAL GOAL:**
  - Treat wastewater on site
- **TECHNIQUE:**
  - Re-use sewage solids and compost
- **CASE STUDY:**
  - North Shore Country Club; Glenview, Il.
- **DESCRIPTION:**
  - A 50-50 mix of nutrient-rich biosolids from the Chicago Metropolitan Sanitary Sewer District and compost made from yard waste are used to upkeep the golf course grass.
- **POTENTIAL BARRIERS:**
  - Aesthetics/ Public Acceptance/ Odor Issues
  - Land Intensive
  - Additional Operation & Maintenance



# Wastewater Systems

- POTENTIAL GOAL:
  - Treat wastewater on site
- TECHNIQUE:
  - On-site package plant
- CASE STUDY:
  - Thomas Jefferson Visitor Center and Smith History Center; Charlottesville, VA
- DESCRIPTION:
  - An advanced wastewater treatment plant [BioMicrobics (FAST system)] coupled with a drip irrigation disposal system
- POTENTIAL BARRIERS:
  - Proprietary System
  - Requires Suitable Soils
  - Land Intensive
  - Additional Operation & Maintenance





# Wastewater Systems

- **POTENTIAL GOAL:**
  - Treat wastewater on site
- **TECHNIQUE:**
  - Membrane Bioreactor
- **CASE STUDY:**
  - Creemore Wastewater Treatment Plant; Ontario, Canada
- **DESCRIPTION:**
  - Conversion from individual septic tanks to a centralized municipal wastewater treatment plant using a Membrane Bioreactor
- **POTENTIAL BARRIERS:**
  - Additional Skilled Operation & Maintenance
  - High Maintenance



# Wastewater Systems

- **POTENTIAL GOAL:**
  - Treat wastewater on site
- **TECHNIQUE:**
  - Biological Wastewater Treatment
- **CASE STUDY:**
  - Living Machine™ at Oberlin College Lewis Center; Oberlin, OH
- **DESCRIPTION:**
  - Biological wastewater treatment designed to replicate natural purification
  - Uses sunlight, greenhouse, organisms, plants to breakdown and digest organic pollutants
- **POTENTIAL BARRIERS:**
  - Proprietary System
  - Bio-remediation is an evolving technology



# Stormwater Systems

- **POTENTIAL GOAL:**
  - Replicate natural hydrology
- **TECHNIQUE:**
  - Control stormwater quality, rate and volume
- **CASE STUDY:**
  - Morgan View Student Housing Complex at Morgan State University; Baltimore, MD
- **DESCRIPTION:**
  - Grass channels, bioretention areas, sand filters and underground storage pipes are used to control stormwater runoff
- **POTENTIAL BARRIERS:**
  - Land Intensive
  - Maintenance required
  - Hydraulic gradient



# Stormwater Systems

- **POTENTIAL GOAL:**
  - Replicate natural hydrology
- **TECHNIQUE:**
  - Control stormwater quality, rate and volume
- **CASE STUDY:**
  - University of North Carolina at Chapel Hill Rams Head Center; Chapel Hill, NC
- **DESCRIPTION:**
  - A green roof and underground cistern are used for water reduction and re-use
- **POTENTIAL BARRIERS:**
  - Aesthetic of re-use water
  - Hydraulic gradient



# Stormwater Systems

- **POTENTIAL GOAL:**
  - Replicate natural hydrology
- **TECHNIQUE:**
  - Control stormwater quality, rate and volume
- **CASE STUDY:**
  - SW 12<sup>th</sup> Avenue Green Street ;  
Portland, OR
- **DESCRIPTION:**
  - Landscaped stormwater planters are used to capture street runoff
- **POTENTIAL BARRIERS:**
  - Infiltration capacity of soils
  - Hydraulic gradient
  - Public vs. Private maintenance



# Stormwater Systems

- **POTENTIAL GOAL:**
  - Replicate natural systems
- **TECHNIQUE:**
  - Control stormwater quality, rate and volume
- **CASE STUDY:**
  - Siskiyou Green Street; Portland, OR
- **DESCRIPTION:**
  - Landscaped curb extensions reduces the amount of stormwater that flows into the sewer system
- **POTENTIAL BARRIERS:**
  - Infiltration capacity of soils
  - Hydraulic gradient
  - Public vs. Private maintenance
  - Roadway capacity



# Stormwater Systems

- **POTENTIAL GOAL:**
  - Replicate natural hydrology
- **TECHNIQUE:**
  - Make stormwater improvements off-site
- **CASE STUDY:**
  - Baltimore City Schools Greening Program; Baltimore, MD
- **DESCRIPTION:**
  - Convert unnecessary asphalt pavements to lawn and plantings
- **POTENTIAL BARRIER:**
  - Intergovernmental coordination



# Utility Corridors

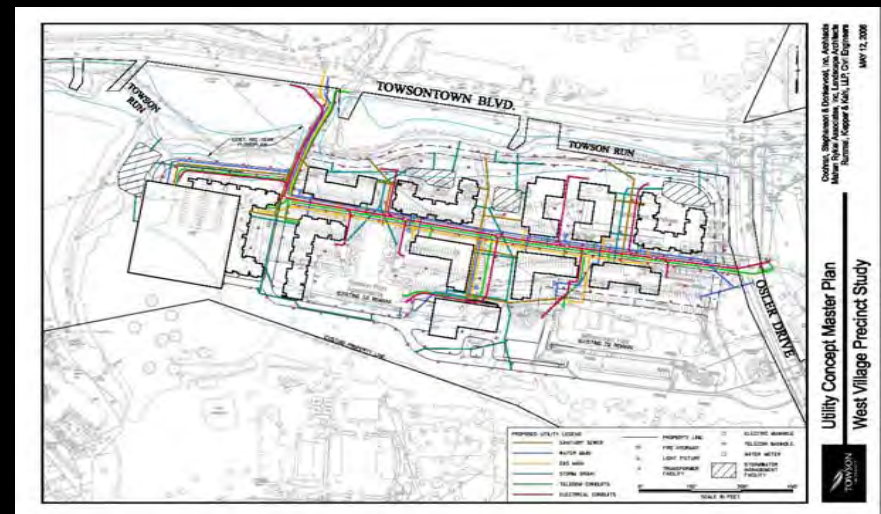
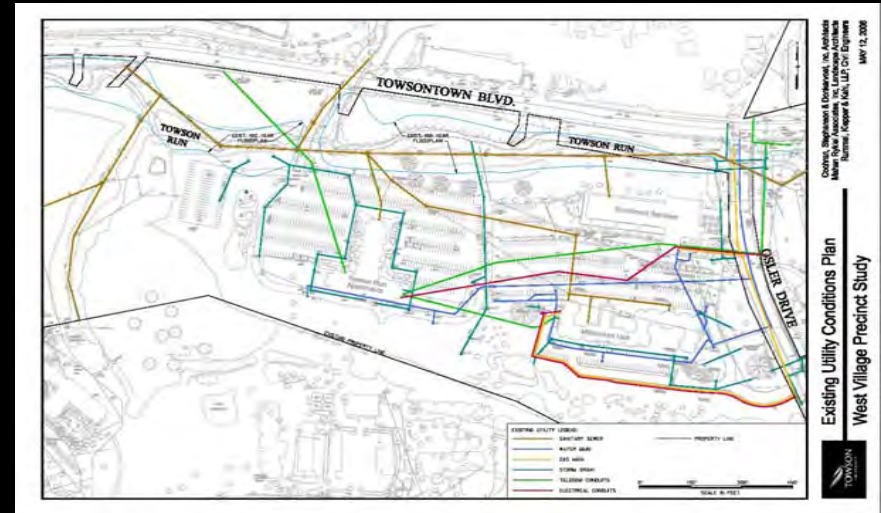
- **POTENTIAL GOAL:**
  - Limit land disturbance
- **TECHNIQUE:**
  - Establish Utility Corridors
- **CASE STUDY:**
  - University of Maryland Baltimore County; Baltimore, MD
- **DESCRIPTION:**
  - Master plan included alignment for a utility tunnel between buildings
- **POTENTIAL BARRIERS:**
  - Quantity and depth of excavation
  - Gravity systems not well-suited for tunnel





# Utility Corridors

- **POTENTIAL GOAL:**
  - Limit land disturbance
- **TECHNIQUE:**
  - Establish Utility Corridors
- **CASE STUDY:**
  - Towson University West Village; Baltimore, MD
- **DESCRIPTION:**
  - Master plan includes alignment for utility corridor
- **POTENTIAL BARRIERS:**
  - Quantity and depth of excavation
  - Gravity systems not well-suited for tunnel



# Water, Wastewater, Stormwater Systems

- **POTENTIAL GOAL:**
  - Flexibility, Adaptability in Innovative Systems
- **TECHNIQUE:**
  - Membrane bioreactor for wastewater
- **CASE STUDY:**
  - Town of Huntsville Wastewater Treatment Plant; Huntsville, TN
- **DESCRIPTION:**
  - Wastewater Treatment Plant was retrofitted with a membrane bioreactor package plant that doubled treatment capacity.
- **POTENTIAL BARRIER:**
  - Additional skilled Operation & Maintenance
  - High Maintenance



# Water, Wastewater, Stormwater Systems

- **POTENTIAL GOAL:**
  - Standardize de-centralized water, wastewater, stormwater systems
- **CASE STUDY:**
  - ?
- **DESCRIPTION:**
  - To the extent possible, standardize the various components for the multiple innovative treatment/distribution systems
- **POTENTIAL BARRIERS:**
  - Additional Operation & Maintenance
  - May limit implementation of innovative facilities



# Funding for Innovative Systems

- **POTENTIAL GOAL:**
  - Funding for Innovative Systems
- **CASE STUDY:**
  - Harvard University Green Campus Loan Fund; Cambridge, MA
- **DESCRIPTION:**
  - The Green Campus Loan Fund provides interest-free capital for high performance campus design, operations, maintenance and occupant behavior projects.
  - <http://www.greencampus.harvard.edu/gclf/>
- **POTENTIAL BARRIERS:**
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