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EPA-WERF Cooperative Agreement: Innovation and Research for Water Infrastructure for the 21st Century

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for

EPA Research Forum: Advancing Public Health Through Water Infrastructure Sustainability

Office of Research and Development
National Risk Management Research Lab
Water Supply & Water Resources Division,
Urban Watershed Management Branch, Edison, NJ

April 10 & 11, 2012

General Objective & Structure

- **To produce, evaluate, & summarize performance, cost, & value data & information about**
  - innovative technologies that will assist the user community to
  - reduce the cost and improve the effectiveness of design, O&M, rehabilitation, & replacement of
  - aging & failing wastewater/ stormwater/drinking water conveyance & treatment infrastructure.

- **Four tracks**
  - Condition Assessment
  - Rehabilitation
  - Advanced Concepts (includes GI & Energy efficiency)
  - Treatment
    - *All aspects of wastewater treatment*
    - *Emerging contaminants for potable water.*

Condition Assessment and Rehabilitation for Water and Wastewater Pipes (WATERiD) (INFR9SG09)

Background: Utilities both have, & desire, information about condition assessment and rehabilitation of their water and wastewater conveyance systems.

Objective: To facilitate transfer of performance & cost information on CA, pipe location, & rehab technologies for water and wastewater pipes via an online national database

Status: WATERiD is operational.
Product : www.waterid.org
PI: Virginia Tech/Dr. Sinha

End of Asset Life Reinvestment Decision Tool

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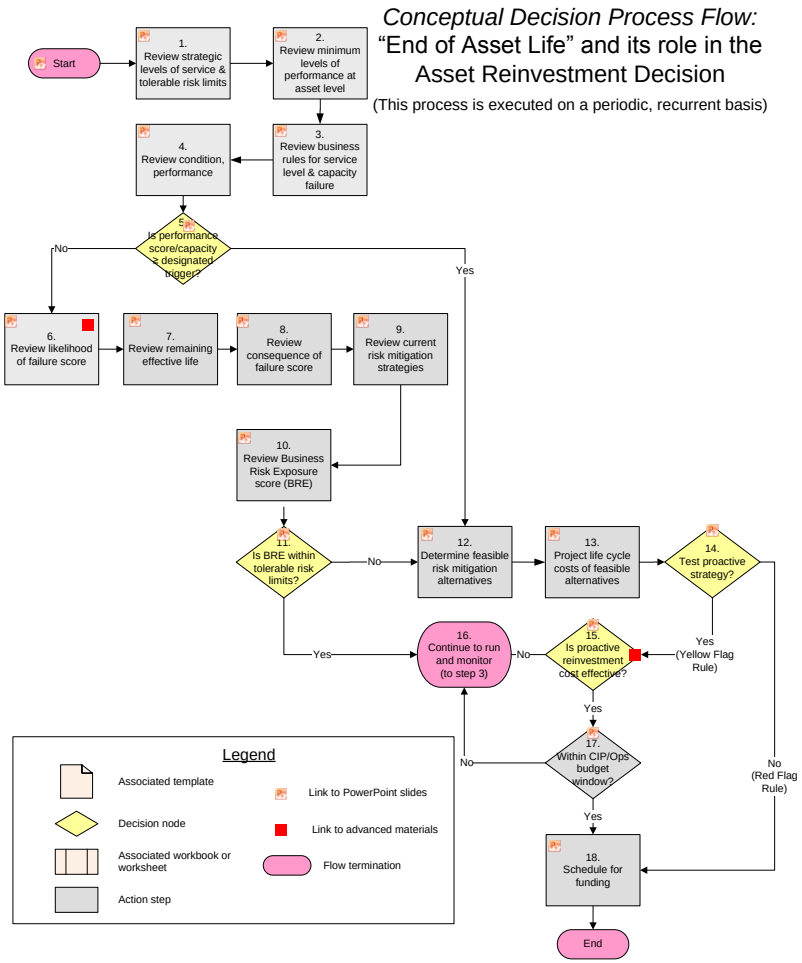


Conceptual Decision Process Flow:
"End of Asset Life" and its role in the Asset Reinvestment Decision

(This process is executed on a periodic, recurrent basis)

Background: A substantial and increasing portion of U.S. water and wastewater conveyance infrastructure requires assessment and renewal now and in coming decades. Utilities need guidance on assessing and managing risk while minimizing life-cycle costs.

Objective: The core management objective in this decision is to develop a budget investment strategy that represents the best integration of maintenance, operations, and capital investment (where this integration delivers sustained performance at an acceptable level of service, at the lowest total cost of ownership, and at a level of risk the community is willing to tolerate). Two case studies using utility data will document and validate the tool's effectiveness.

Status: Draft tool completed with embedded, narrated guidance, case study on buried assets complete, arranging for pilot utility for above ground assets.

Product: Asset End of Life Reinvestment Decision Tool (INFR2R11)

PI: **GHD/Rose, Iyer**

Acoustic Signal Processing for Pipe Condition Assessment (INFR1SG09 (4360))

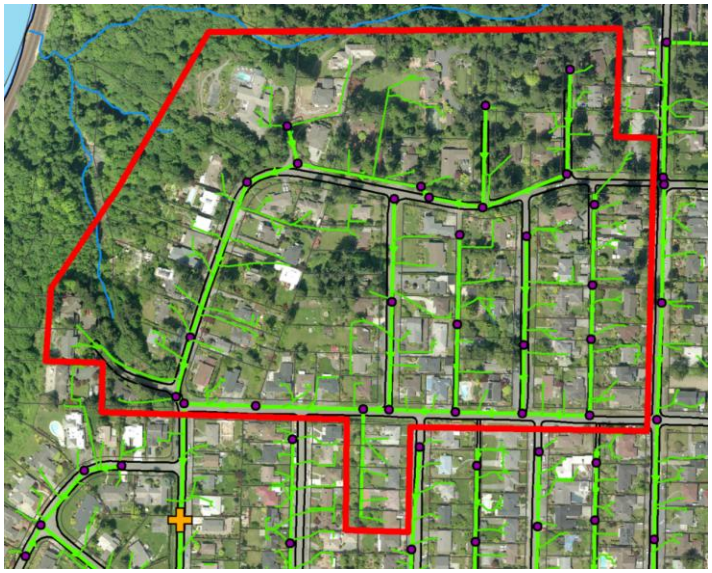
- **Background:** Do individual wire breaks in Pre-stressed Concrete Cylinder Pipe (PCCP) create an excitation in the pipe wall that varies in response to the remaining compression (i.e., condition) of the pipe core? If yes, then it should be feasible to conduct condition assessment of PCCP much more quickly and economically.

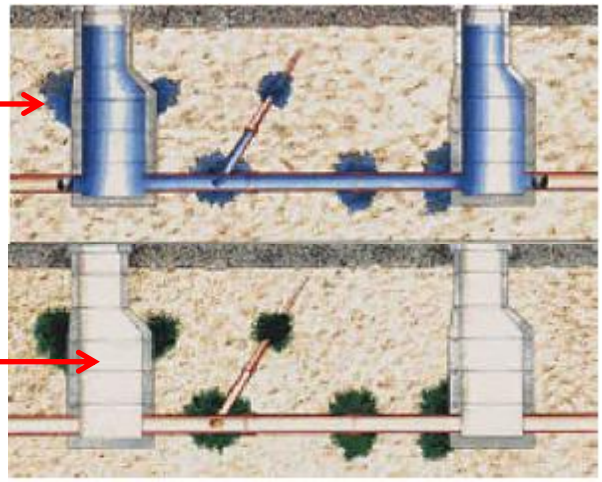
- **Objective:** To improve acoustic signal processing for pipe condition assessment in an experimental environment.

- **Status:** Burial, pressurization and subsequent intentional damage to the pre-stressing wires in three specimens of pre-stressed concrete cylinder pipe (PCCP) is completed. Report in preparation.

- **Product:** Draft final report (4/2013)
- **PI:** WaterRF/Pure Technologies/Paulson

Flood Grouting for Infiltration Reduction on Private Side Sewers





Background: Flood grouting is an innovative approach for simultaneously treating Mains, Manholes, & Side Sewers. Seattle Public Utility tested the method on a 31-acre residential sub-basin.

Objective: Document performance, cost, & benefits of Sanipor flood grouting trial to help decision-makers.

Status:

- Complete; Overall successful; B/C: 1.08; Good outlook
- Some side sewers inaccessible; steep slope issues

Report: Flood Grouting for Infiltration Reduction on Private Side Sewers

PI: Seattle Public Utilities/Burke

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Carbon Fiber Reinforced Polymer (CFRP) Renewal of Prestressed Concrete Cylinder Pipe INFR1SGO9 (4352)

Background: Internal CFRP renewal is used where external post-tensioning or replacement are not technically or economically feasible. A design standard is needed.

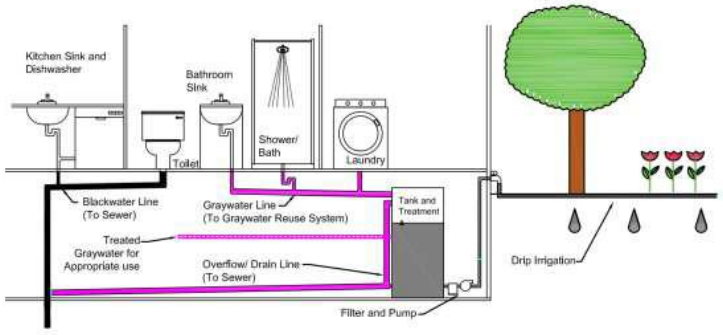
Objective: To perform technical work in support of establishing guidelines for renewal of PCCP using internally applied CFRP

Status: Completed lit review; hydrostatic & 3-edge bearing tests; FEA of 10 scenarios; reliability analysis; simplified design equations; 2 new failure modes identified that hindered test program.

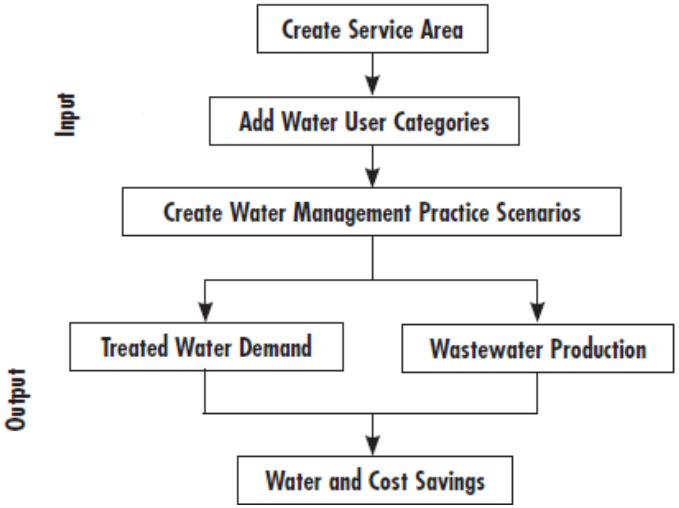
Products: (1) Draft report in review; (2) data for AWWA design standards; (3) WaterRF will study 2 new failure modes

PI: Simpson, Gumpertz, & Heger/Zhargamee

Advanced Concepts for Urban Water Management (multiple topics)



Blackwater/graywater plumbing



Depiction of the IUWM Integrated Water System

Several advanced concepts for urban water management were investigated through this project.

1. *Guidance Manual for Separation of Graywater from Blackwater for Graywater Reuse* (INFR4SG09a) (2012)
2. *Source Separation and Treatment of Anthropogenic Urine* (INFR4SG09b) (2012)
3. *Development of the Integrated Urban Water Model (includes software)* (INFR4SG09c) (2012)
4. *Review of Advanced Sewer System Designs and Technologies* (INFR4SG09d) (2012)

PI: Colorado State University/Sharvelle and Roesner

Transforming Our Cities: High Performance Green Infrastructure - Distributed Real-time Control (DRTC) Technologies for Green Infrastructure

Green roof with DRTC

Background: Dynamic control systems can potentially improve the effectiveness of various types of onsite stormwater systems.

Objective: To examine dynamic control systems in various types of onsite stormwater systems. Pilot projects will demonstrate and verify, in the field, dynamic models and cost analyses of high performance green infrastructure.

Status: Several stormwater BMPs on cisterns, pervious pavement, green roof, etc. have been instrumented and data collection is underway. Numerous additional BMP-owners have volunteered to participate.

Products: Report (2014)

PI: Geosyntec/Quigley

Full Plant Deammonification for Energy Positive Nitrogen Removal

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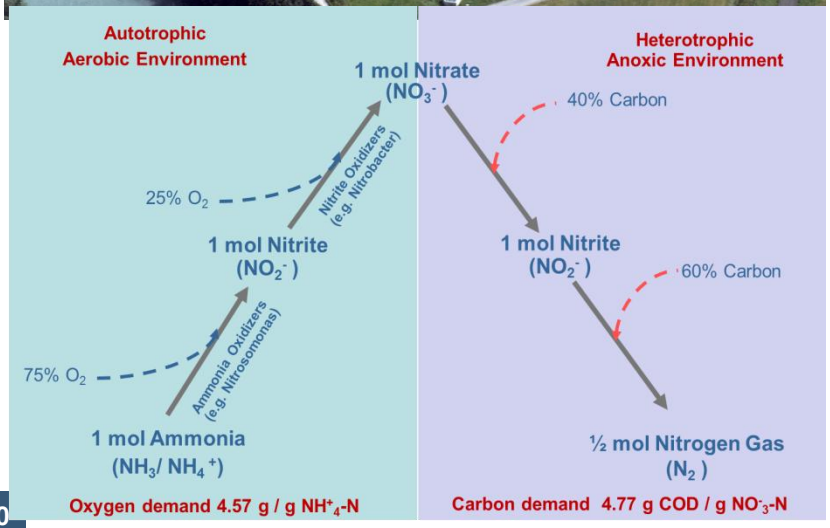

Background: Wastewater treatment processes have been developed that are claimed potentially energy positive or neutral. Successful application could save wastewater utilities $ millions in aeration and external carbon costs.

Objective: Project will attempt to demonstrate energy neutral or energy positive wastewater treatment and reduction of external carbon, such as methanol, for denitrification. Will also develop guidance for migrating to full-scale plant operations.

Status: Pilot studies in progress.

Product: Report (2/2014)

PI: O'Shaughnessy

Water/O'Shaughnessy

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- www.epa.gov/awi
- www.werf.org
- www.waterrf.org

- THANK YOU!

- QUESTIONS?

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