



MARBEK

Resource Consultants Ltd.

TECHNOLOGICAL INNOVATION IN WATER AND WASTEWATER INFRASTRUCTURE

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Overview

Objective: To identify important technological innovations

Presentation: In context of 5 challenges

- Challenge 1 and Technologies
- Our Current System
- Challenges 2 to 5 and Technologies

Challenges

1. Ensuring efficient, effective, affordable service
2. Managing water demand and developing sustainable levels of service
3. Meeting the challenges of potential human health impacts
4. Meeting the challenges of environmental impacts
5. Holistic, watershed approaches

Challenge 1

Efficient, effective, affordable services:

Aging infrastructure and investment needs

- Resources available – regulatory requirements, additional responsibilities, expertise and attrition
- Revenue capture and user-pay

Technologies in areas of:

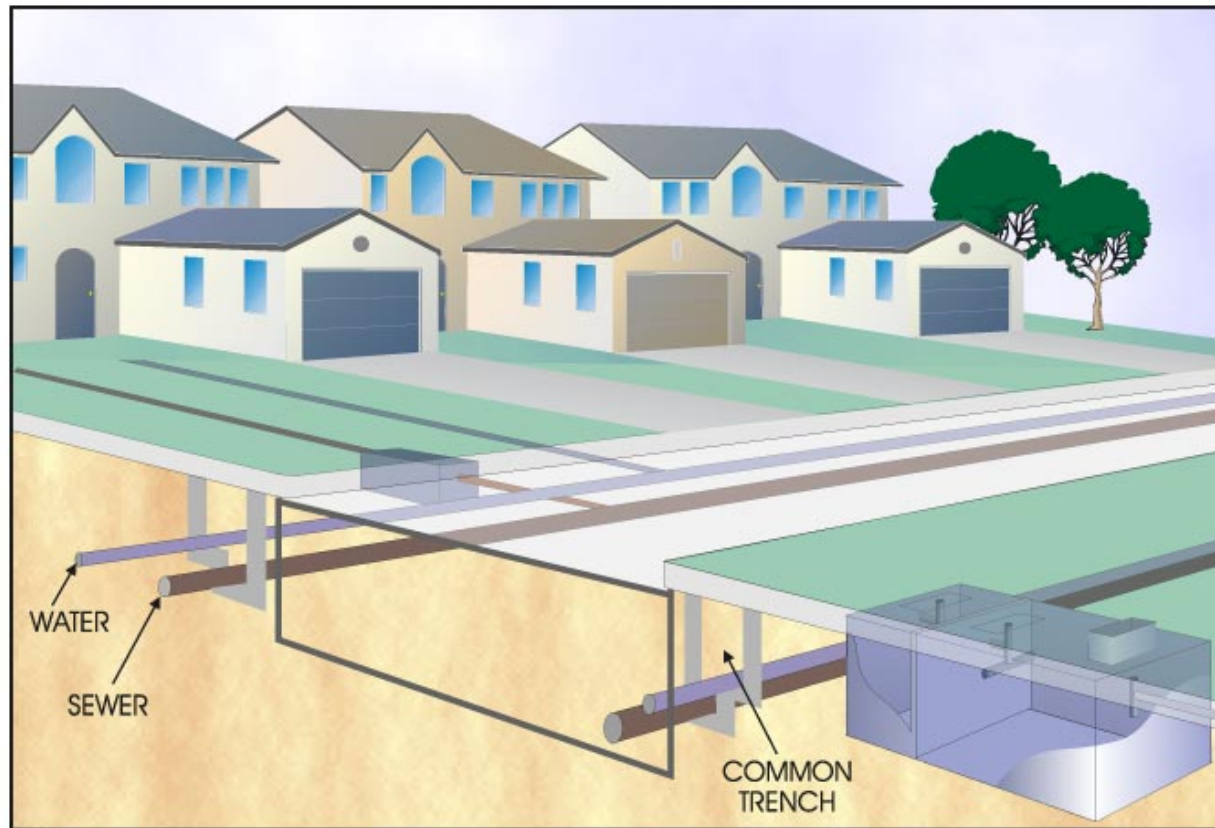
Design, maintenance and operations, replacement and rehabilitation, recover cost of service

Challenge 1: Design

Design to suit community size, capacity and needs

- Membrane bioreactors
- Small diameter sewer systems with private property clarifiers and central treatment facility
- Low pressure water mains with private property storage and pumping

Small Diameter Sewer System



SMALL BORE SEWER™ SYSTEM

Source: Clearford Industries Inc.

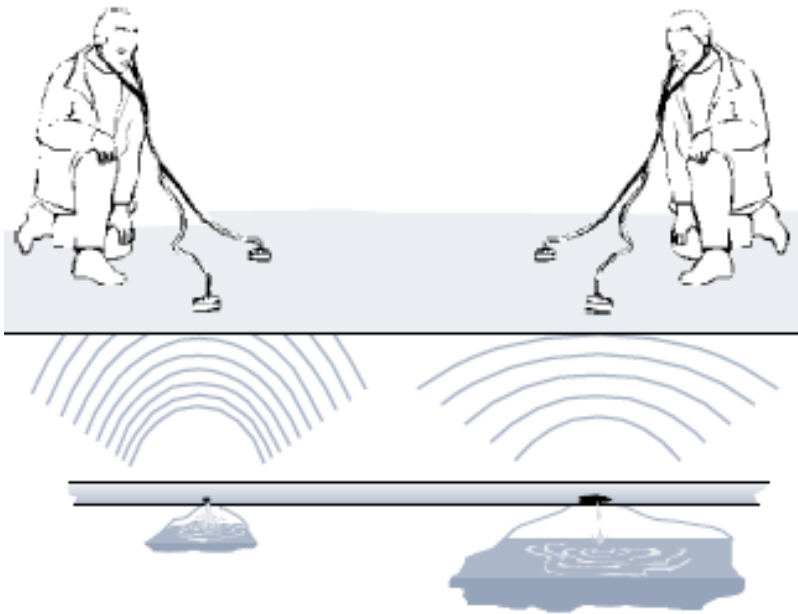
Challenge 1: Efficient O&M

Operations and maintenance to minimize costs, risks, catastrophic failures

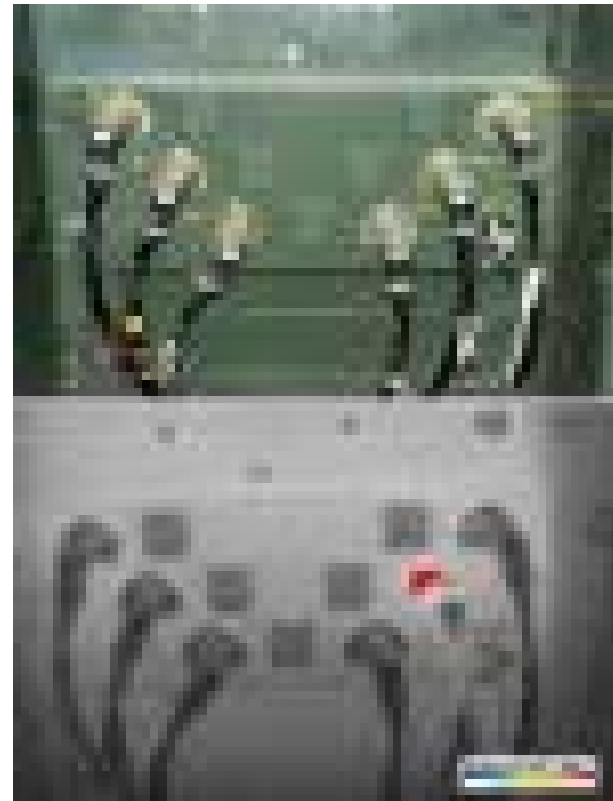
- Automated Asset Management systems
- Preventive Maintenance
- Predictive Maintenance
- Optimization of Operations

Predictive Maintenance

Listening for Leaks



Source: National Drinking Water Clearinghouse



Source: ElectriSCAN

Challenge 1: Rehab & Replace

Cost-effective rehabilitation and replacement
– Trenchless Technologies



Source: Virginia Tech



Source: Insituform

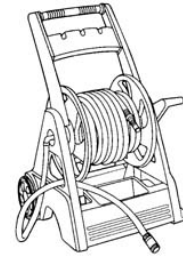
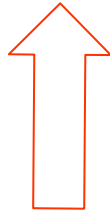
Challenge 1: Recover Costs

Technologies to assist in fair, equitable user pay:

- Water meters (both water and wastewater)
- Sampling equipment for high strength waste
- GIS for stormwater - impervious area of properties

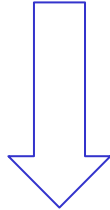
Our Current System

- Potable Water

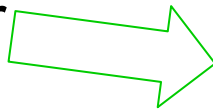


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- Wastewater



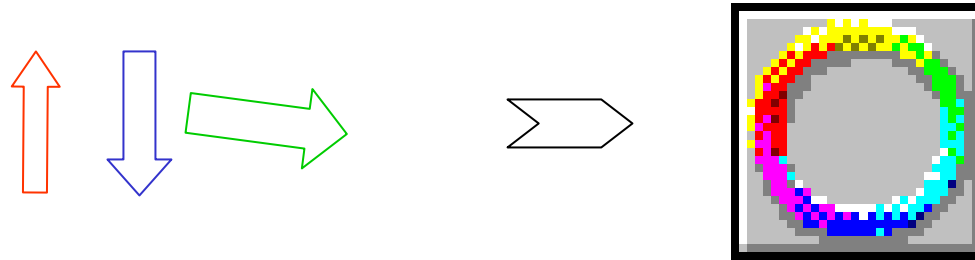
- Storm water



Our Current System



Introduce Water Cycle in Design



- Quality of water is rationalized for use and reuse: beyond efficiency to carrying capacity of watershed
- Waste discharge to watercourses not an automatic design feature
- Water cycle integrity as a goal of infrastructure design – e.g. post development flows = pre-development flows

Challenge 2

Meeting demand and sustainable levels of service:

- Growing urban populations and high consumption rates
- Consumer expectations
- Effects of climate change on availability

Technologies:

- Community design
- Water Efficiency
- Beyond Efficiency – Matching Quality to Use

Matching Quality to Use



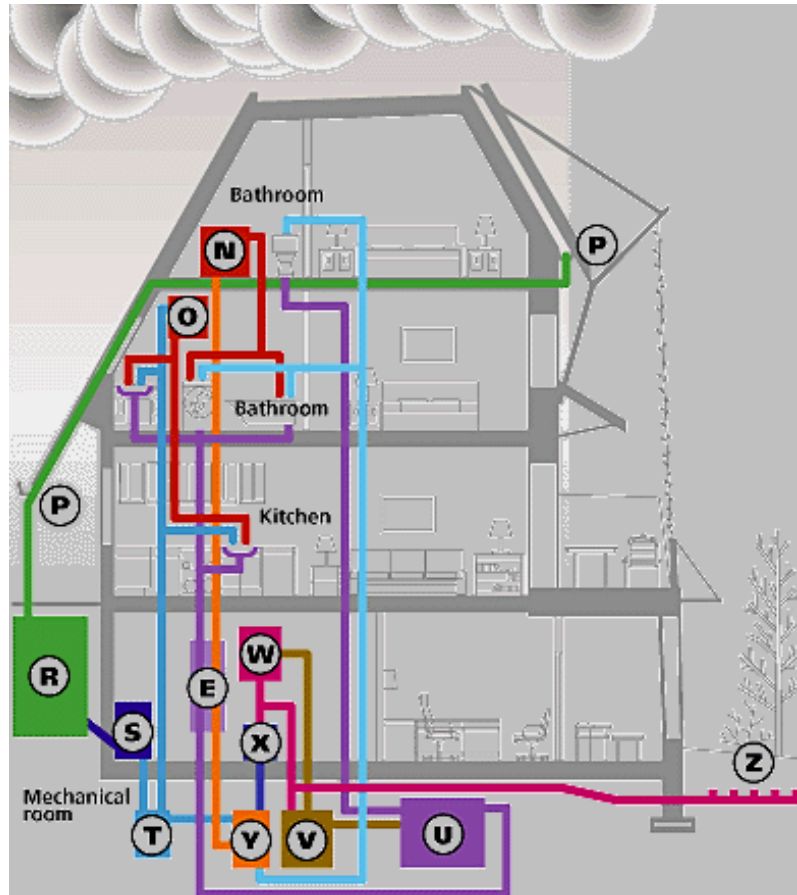
Sink (grey water)
cascading to toilet

Source: Renewable Energy Works



Rainbarrels or
cisterns for outdoor
water use

Matching Quality to Use



Toronto Healthy House

All grey water and black water is treated and recycled for toilet flushing

Source: CMHC

Challenge 3

Meet Challenges of Human Health Impacts:

Conventional contaminants

- New contaminants (disinfection by-products)
- Emerging Contaminants – endocrine disrupting substances and pharmaceutical and personal care products

Technologies: water purification; wastewater treatment, alternative system configuration

Alternate System Configuration



Waterless Toilet

Source: Envirolet



CK Choi Building
(UBC): disconnected
from the sanitary system.

Source: GVRD

Challenge 4

Meet Challenges of Environmental Impacts:

- Human health and environmental health share many issues (e.g. endocrine disruptors)
- Mitigate stormwater impacts by keeping water where it falls: Infiltration, ditches, green roofs, cisterns
- Mitigate climate change by using resources provided: biogas, heat recovery
- Climate change will have implications for design and management

Stormwater Infiltration



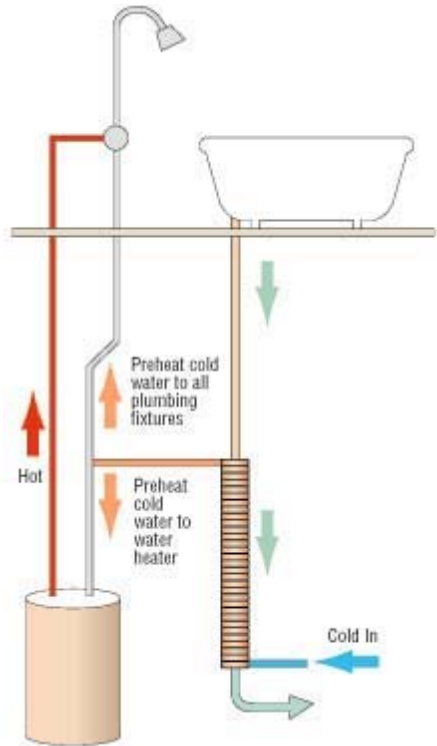
Source: City of Ottawa

Swale with Ditch Inlets



Source: D Henry

Climate Change Mitigation



Heat Exchanger

Source: Renewable Energy Works



Co-generation Facility

Source: City of San Diego

Challenge 5

Holistic Watershed Management Approach:

- Social and governance process
- Not technology driven
- Municipal use only one part of the picture
- Technologies can assist:
 - Geographic Information Systems
 - Public engagement (e.g. MetroQuest modelling software)
 - Field investigation technologies for watershed characterization/capacity
 - Environmental effects monitoring for informed decision-making

Conclusion

- Significant challenges for both business-as-usual and for new approaches
- Technologies can assist in meeting the challenges
- Innovation is a relative term for the sector
- To implement the technologies: resources, capacity, standards, stakeholder buy-in