# Short-term Water Efficiency Technologies: Considerations for Urban Areas

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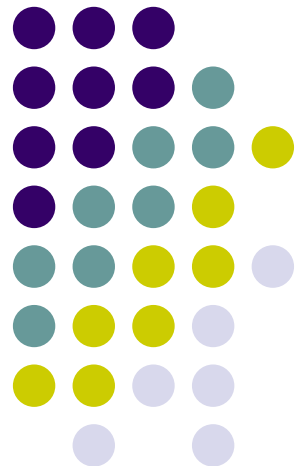


# Context:
# An accident waiting to happen

- McGill University/Fed'n of Cdn Municipalities (1996):
  - 1/3 of cities < 100,000 have deteriorating **sewage** infrastructure; 1/4 have declining conditions in **water distribution and water supply** infrastructure
  - In larger cities, sewage infrastructure is generally improving, but water supply/distribution infrastructure is deteriorating in 40% of cities >400,000
  - Overall: "need repairs" or "not acceptable" conditions exist in:
    - 58% of sewage infrastructure
    - 59% of water distribution systems, and
    - 43% of water supply systems
    - The biggest problem may lie with the smallest cities, who fund their own projects from a smaller tax base.

# Ageing infrastructure

- Average age of Canadian sewage infrastructure is >40 years; for water distribution and water supply systems it is now >50 years.
- In older development, average age is 70-100 years
  - Toledo, OH infrastructure dates from 1870; most elements are > 40 years old
  - Hamilton, ON: >1/4 of infrastructure is more than 75 years old; only 1/4 is younger than 25 years
  - Sewers and water mains are replaced regularly, but only at about half the necessary rate; cleaning and maintenance occurs mainly on an emergency basis
- ***Repair, replacement costs huge and growing***

# Climate change will..

- Exacerbate peaks (more frequent large, high intensity storm events)
  - Increased risk of infrastructure damage, overflow
  - Significantly higher water security risk
- Reduce base flows (warmer temperatures, more evaporation)
  - Less assimilative capacity, more treatment required
  - May require larger-capacity infrastructure or higher-level treatment
  - More risk to aquatic ecosystems
  - Less water available for municipal supply

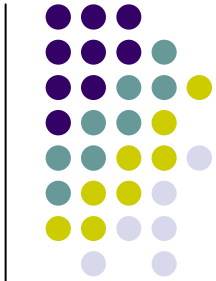
# Conventional design assumptions inadequate under climate change scenarios?

- Most municipal infrastructure design is based on outdated assumptions
- In 2004, the Industrial Pollution Action Team investigated causes of industrial spills to the St. Clair River in Ontario.
- They found that some recent spills were caused by overflows from stormwater containment facilities.
- They observe:
  - *Although most stormwater facilities in the area are designed to accommodate the 25-year storm, and some even the 100-year storm – certainly acceptable capacity in the past – this may not be sufficient to handle the size and number of extreme events expected in the future under climate change scenarios.*

# Efficiency technologies?

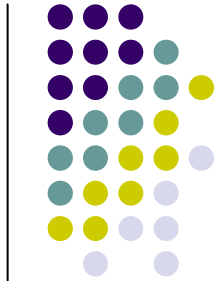
- Our sewage and water capacity is largely fixed, but our population is changing in location and density
- More of the same probably isn't going to work
  - Need new assumptions about capacity, siting
  - (Need to change the way we train engineers…)
  - Can't afford to fix, upgrade or replace what we already have
- ***Water conservation technologies will not be enough, even if we reduce our per-capita water consumption***
  - Population growth, changing population distribution

# What's the problem we are trying to fix? - tough choices



- Security of drinking water quantity and quality?
- Security of costly infrastructure? Property?
- Protection of aquatic ecosystems?
- Restoration of natural hydrology?
- Protect groundwater?
- Some things we can't change/avoid, e.g., population growth, location
- Others we can:
  - Location, form of urban development
  - Centralized vs. decentralized technologies
  - Retention of high flows vs. reinfiltration of moderate flows
  - Separation vs. combination of wastewater flows

# Technologies must include urban form



- Tough choices - again
  - “Estate” lots protect natural hydrology, but use more energy and space, create more air pollution
  - Compact growth concentrates impacts on a smaller (sacrificial?) area
- Will likely need a combination of traditional measures (e.g., storm ponds) for high flows, and lot-level measures for lower flows
- *Requires changes to current planning, financing practice*