

Public Information Meeting

Wastewater Master Plan

October 23, 2007



Department of Public Works

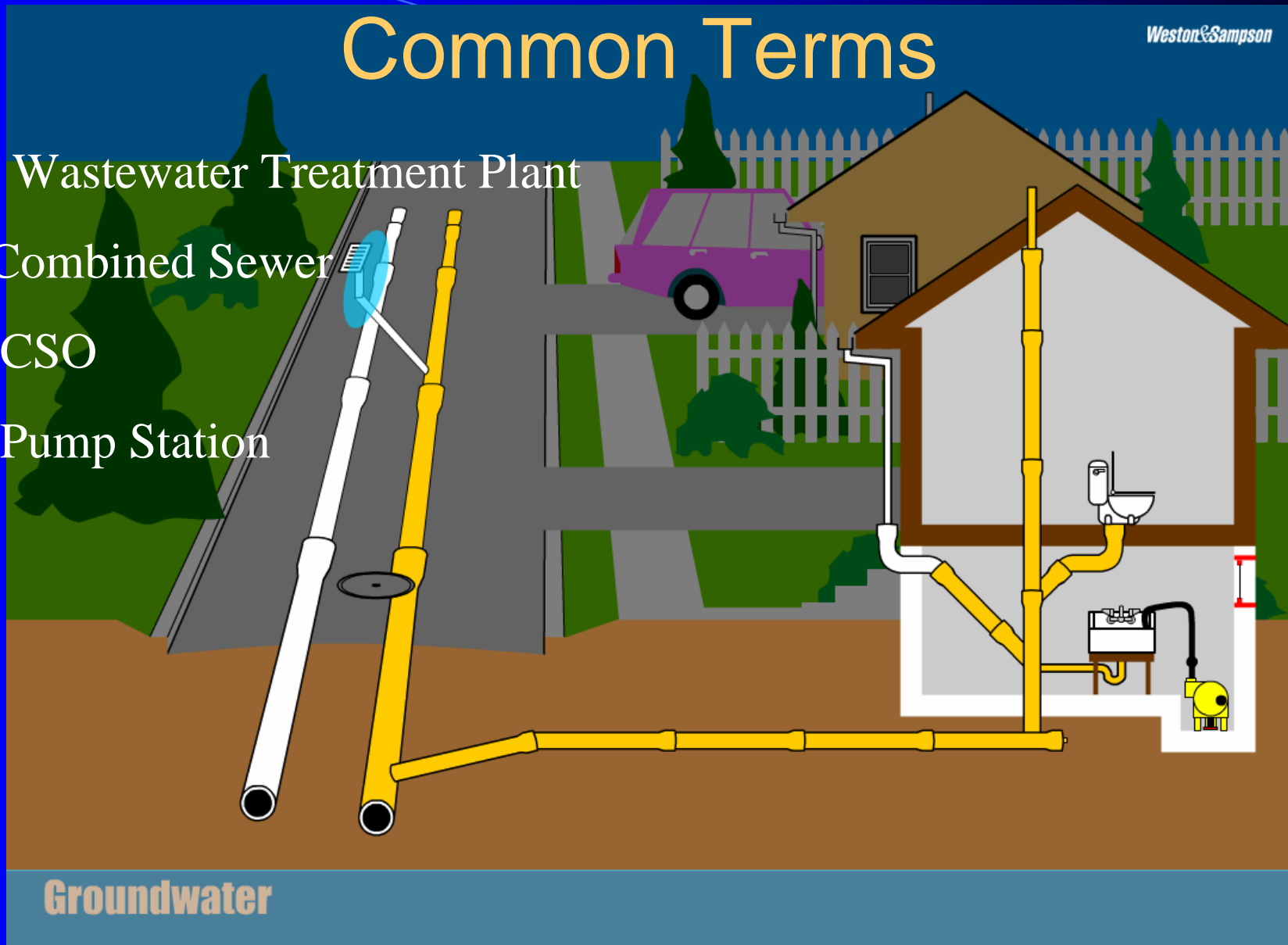
Presentation Outline

- Introduction and History
 - Break for Questions
- Wastewater 101
 - Break for Questions
- Regulatory Framework
- Wastewater Master Plan
 - Break for Questions

Common Terms

Weston&Sampson

- Wastewater Treatment Plant
- Combined Sewer
- CSO
- Pump Station



Groundwater

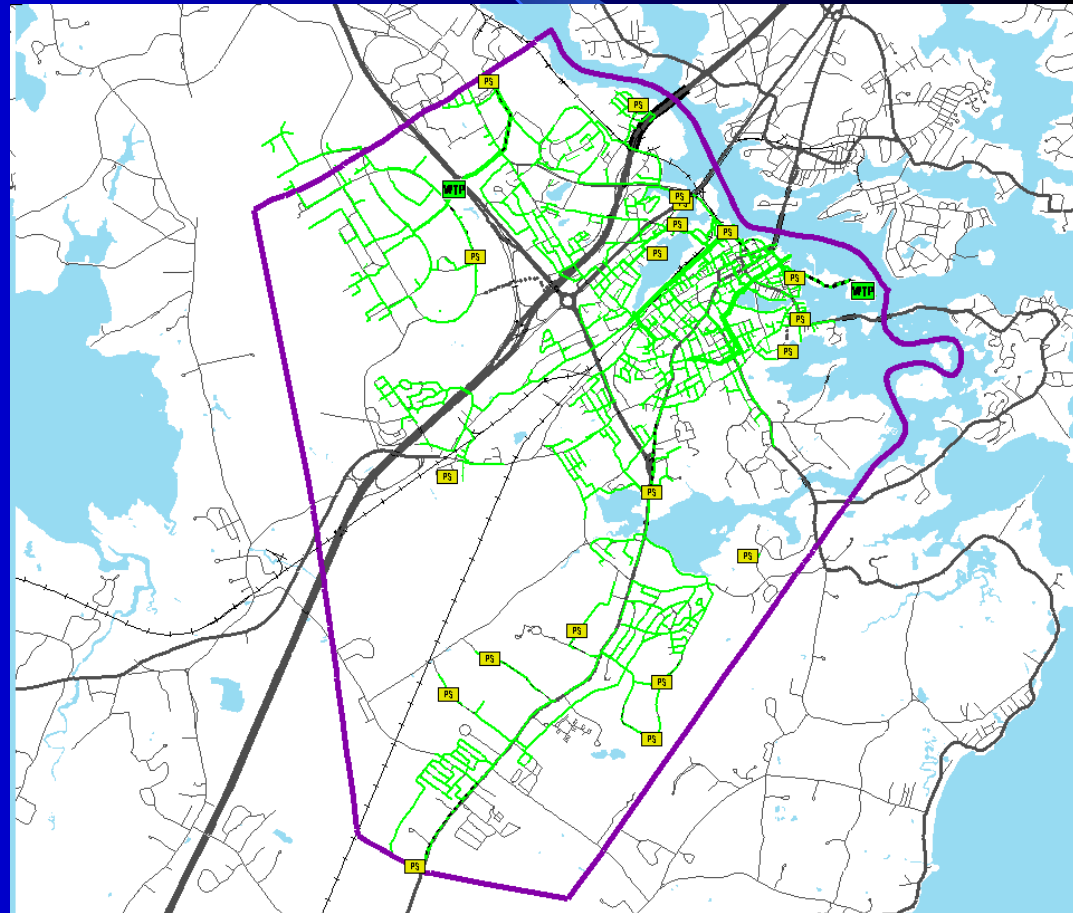
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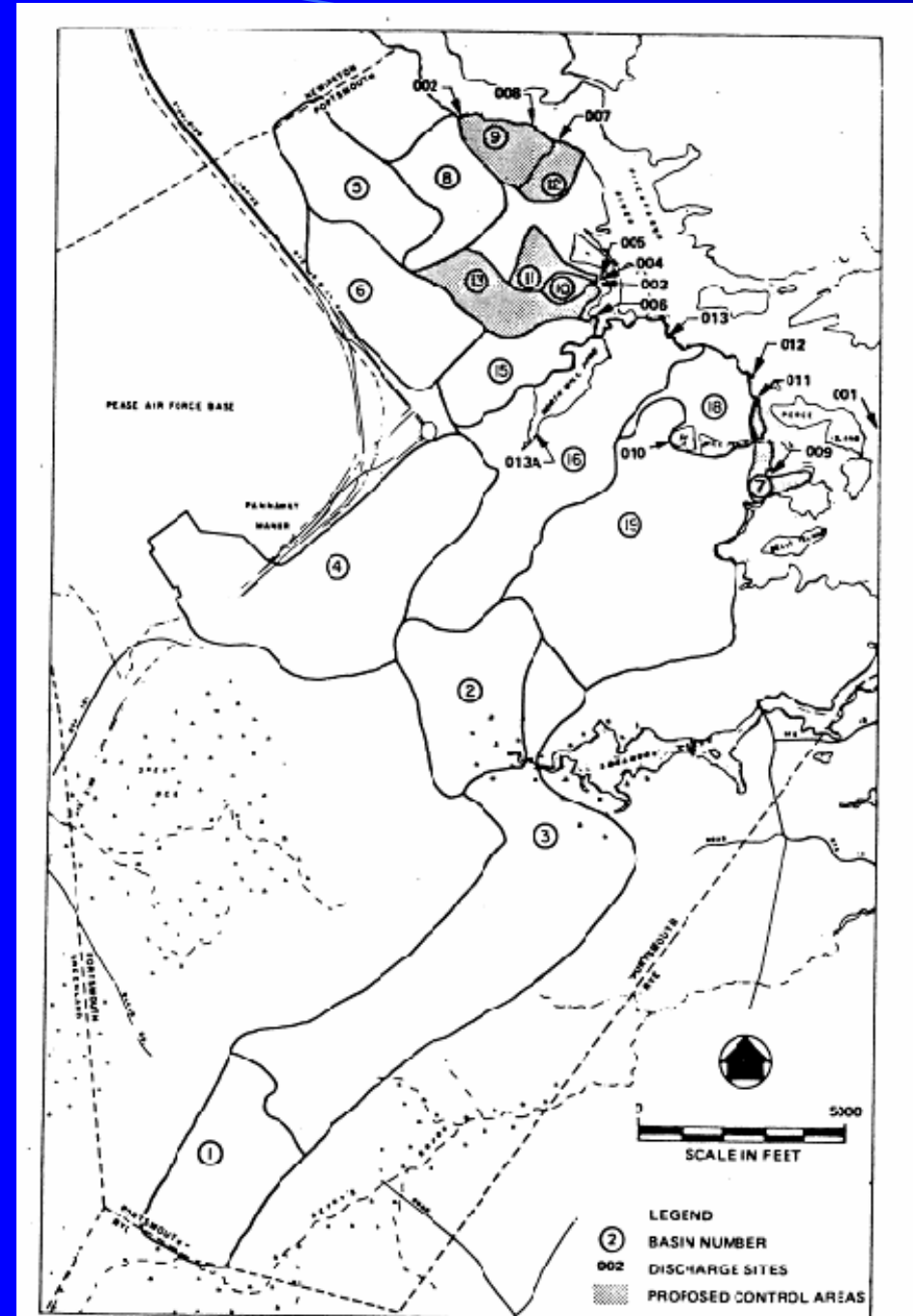
The Portsmouth Wastewater System

- Peirce Island Treatment Plant (4.8 MGD)
- Pease Treatment Plant (1.2 MGD)
- ~ 115 miles of Collection System Approximately 60% is Combined Stormwater and Sanitary Flow
- 20 pumping Stations
- 3 Permitted Active CSOs



Historic CSO Locations

- 14 Original overflows
- 3 Remaining
- Pumping stations replaced overflows



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History



Figure 1: Fort Washington elements early in the century

Peirce Island



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“The condition of the mill-ponds at the north and south ends of the City has become the subject of much public discussion and anxiety...

This is a source of great annoyance to the people of the city, and it causes great apprehension of danger to the public health. I am not prepared to decide what is the best remedy for this great evil, but I earnestly recommend the subject to your attention.”

· Mayor Moses H. Goodrich, 1875, September

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Regulatory History

- Clean Water Act passed in 1972.
 - Required Facilities Planning (201 Plan)
 - Required secondary treatment of sewage discharges
 - Set timetable for compliance
- Amendment in 1977 provided for a “301 (h)” waiver, allowing primary treatment for specific marine discharges.

City's Wastewater History

- Pre-1964 – Sewer collection system discharged directly to river at multiple points
- 1964 - Peirce Island Primary Treatment Plant
- 1972 - Clean Water Act passed
- 1977 – First 201 Facilities Plan prepared
- 1980 - Secondary plant designed
- 1982 - State prepares 301(h) waiver
 - State and City jointly submit to EPA.
- 1985 - Permit issued w/301(h) waiver

History (cont.)

- 1987 – Advanced primary WWTF designed
- 1990 EPA Consent Decree
- 1992 - Plant upgrades completed
 - Permit application submitted w/301(h)
- 2002 City prepares collection system CSO - LTCP
- 2005 EPA issues draft permit w/301(h)
- 2007 NPDES permit issued requiring Secondary Treatment.

Projects Completed Since 1997 (over \$20M)

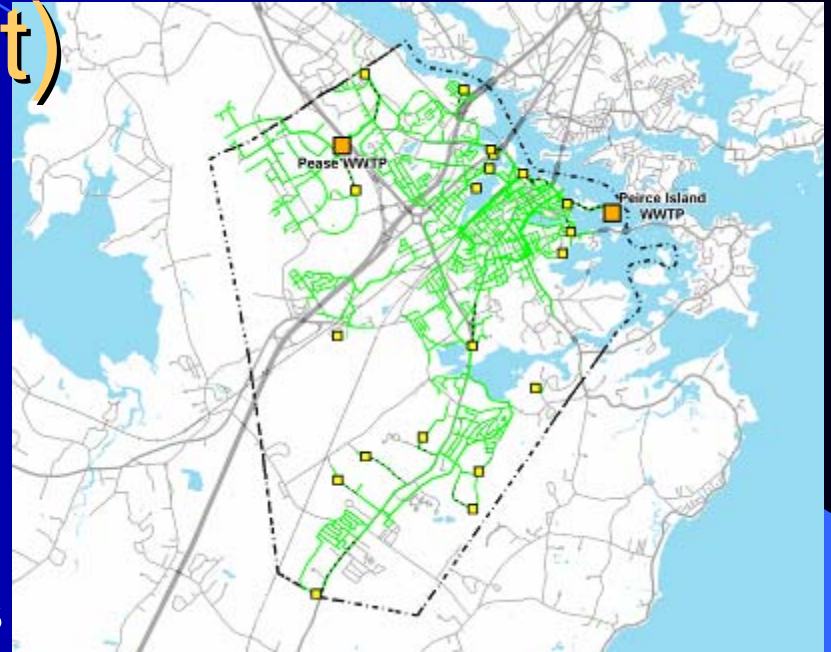
- Projects recommended from
 - 1999 - 201 Facilities Plan Update
 - 2002 CSO - Long Term Control Plan
 - Sewer System Evaluation and Survey
 - Targeted Sewer Separation Preliminary Design



Projects Completed Since 1997

(con't)

- Peirce Island Bridge Forcemain
- Essex Sheffield Separation
- Thaxter Fells Separation
- Pannaway Manor Separation
- Brickbox Cleaning
- Brackett Road Sewer Extension
- Peirce Island WWTP Improvements
- Mechanic Street Pumping Station Upgrade
- Route One Sewer Improvements
- Upper Court Street (LTCP)
- South Mill Pond Area - Contract 1 (LTCP)



Projects Completed Since 1997 (con't)

- **South Street Sewer Separation**
- **Pease Interceptor Upgrade**
- **Lafayette Road Pumping Station Upgrade**
- **SCADA System Upgrade**
- **Gosling Road Pumping Station Upgrade**
- **Dennett Street Sewer Separation**
- **Pleasant Point Sewer Extension**
- **Lower Court Street (LTCP)**
- **Deer Street Pumping Station (LTCP)**
- **Borthwick Avenue Sewer (LTCP)**

Pumps
nearly half
of City's
wastewater



Deer Street
Pumping Station
Upgrade



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Summary of History

- **City's Water Quality Program has evolved with environmental awareness.**
- **From 1700s with direct discharges to the River to the current collection and treatment system**
- **To date the City has eliminated 11 out of 14 combined sewer discharges.**
- **Upgrades to the collection system have had direct benefit to water quality and have helped minimize street and basement flooding.**

Break for Questions

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Wastewater 101



Wastewater Collection and Treatment

- Wastewater is collected in a network of underground sewer pipes.
- At low points, pump stations are needed to lift the sewer to a higher elevation.
- Wastewater is treated to reduce pollutants, then discharged to the receiving waters.

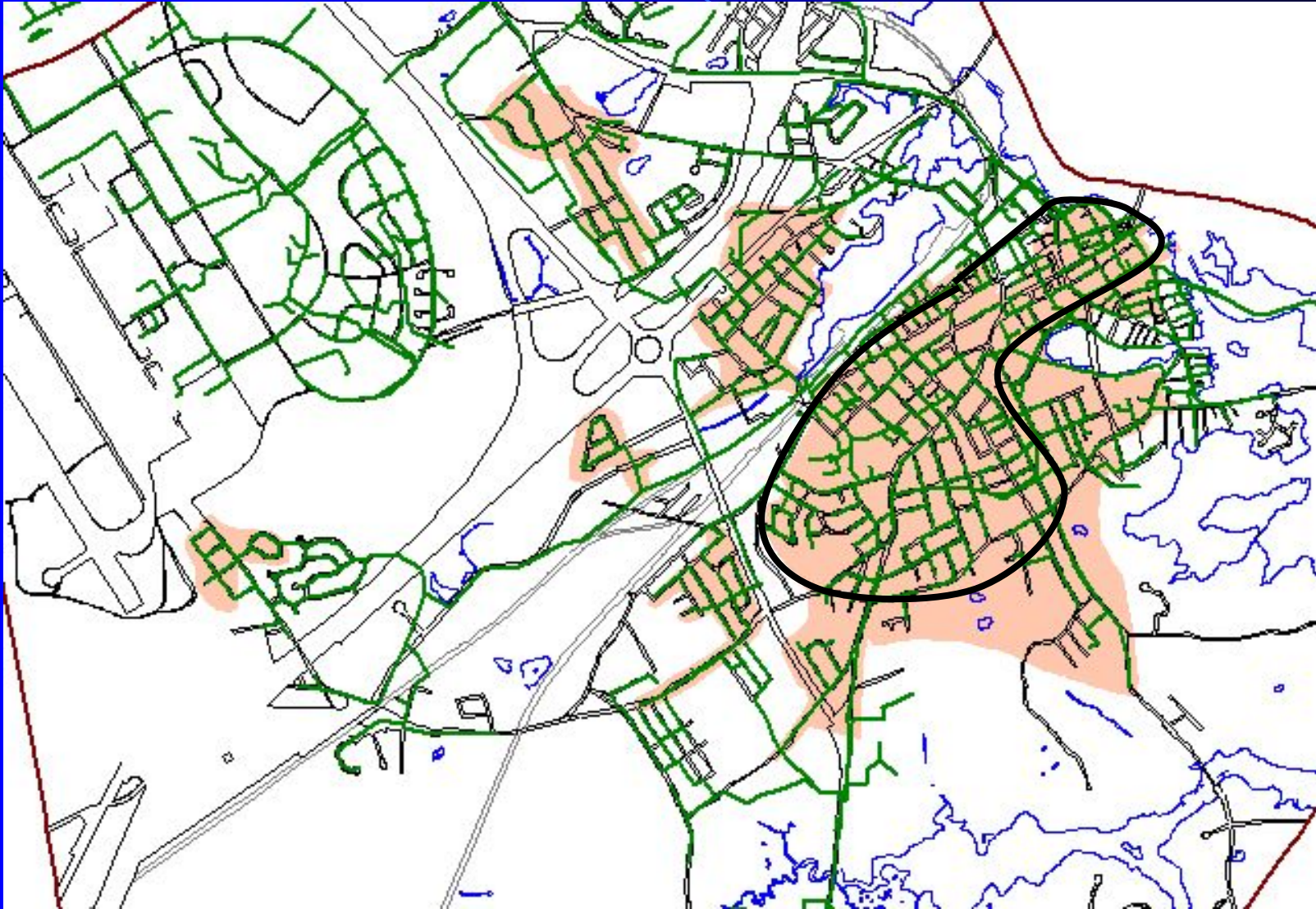


Combined Sewer Overflow

- What is a CSO?
 - A permitted discharge point in a combined sewer
- Why are they there?
 - Provides a relief to minimize flooding and backups



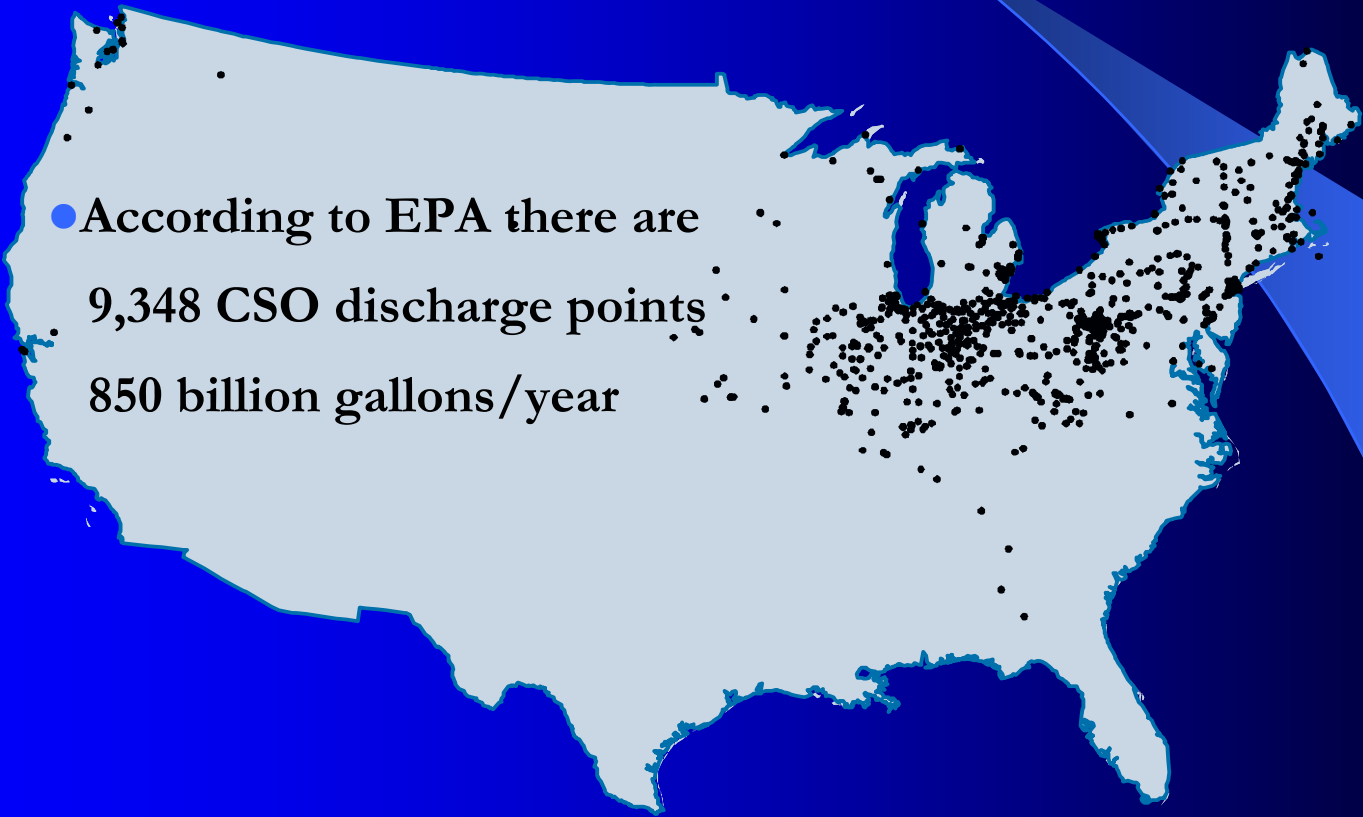
Combined Sewer Areas



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CSO Systems

- According to EPA there are
9,348 CSO discharge points
850 billion gallons/year



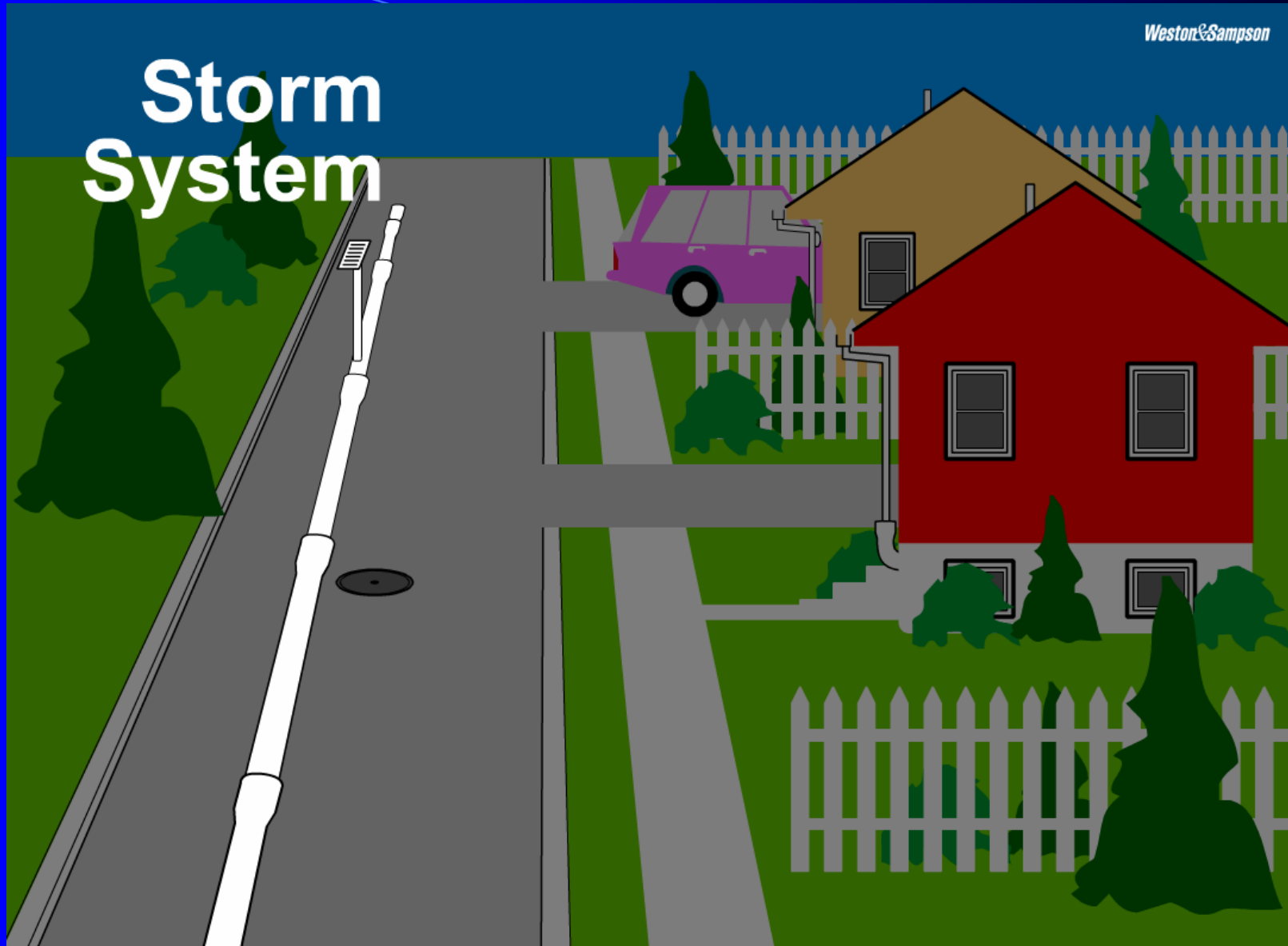
CSO Causes



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Storm System

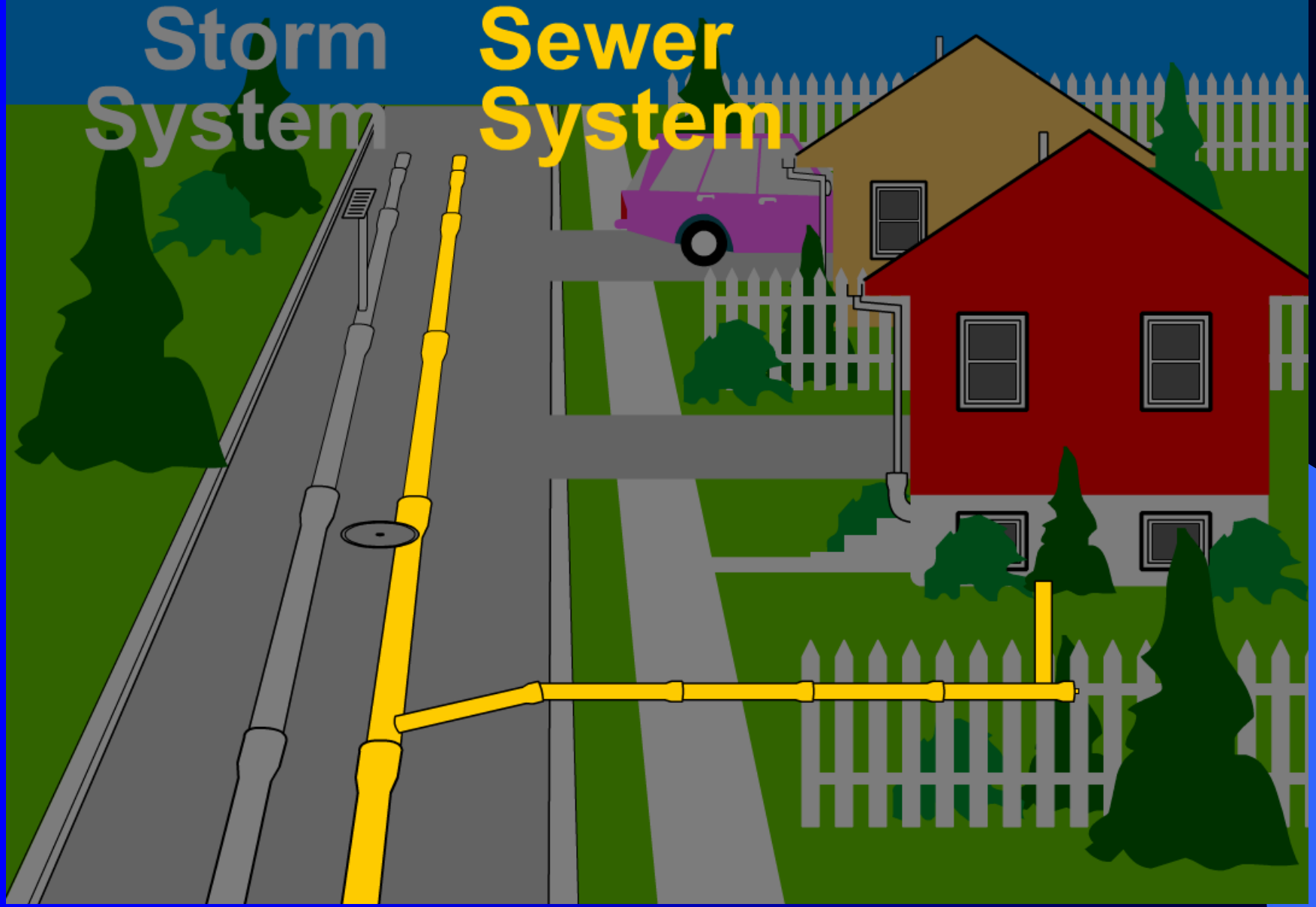
Weston&Sampson



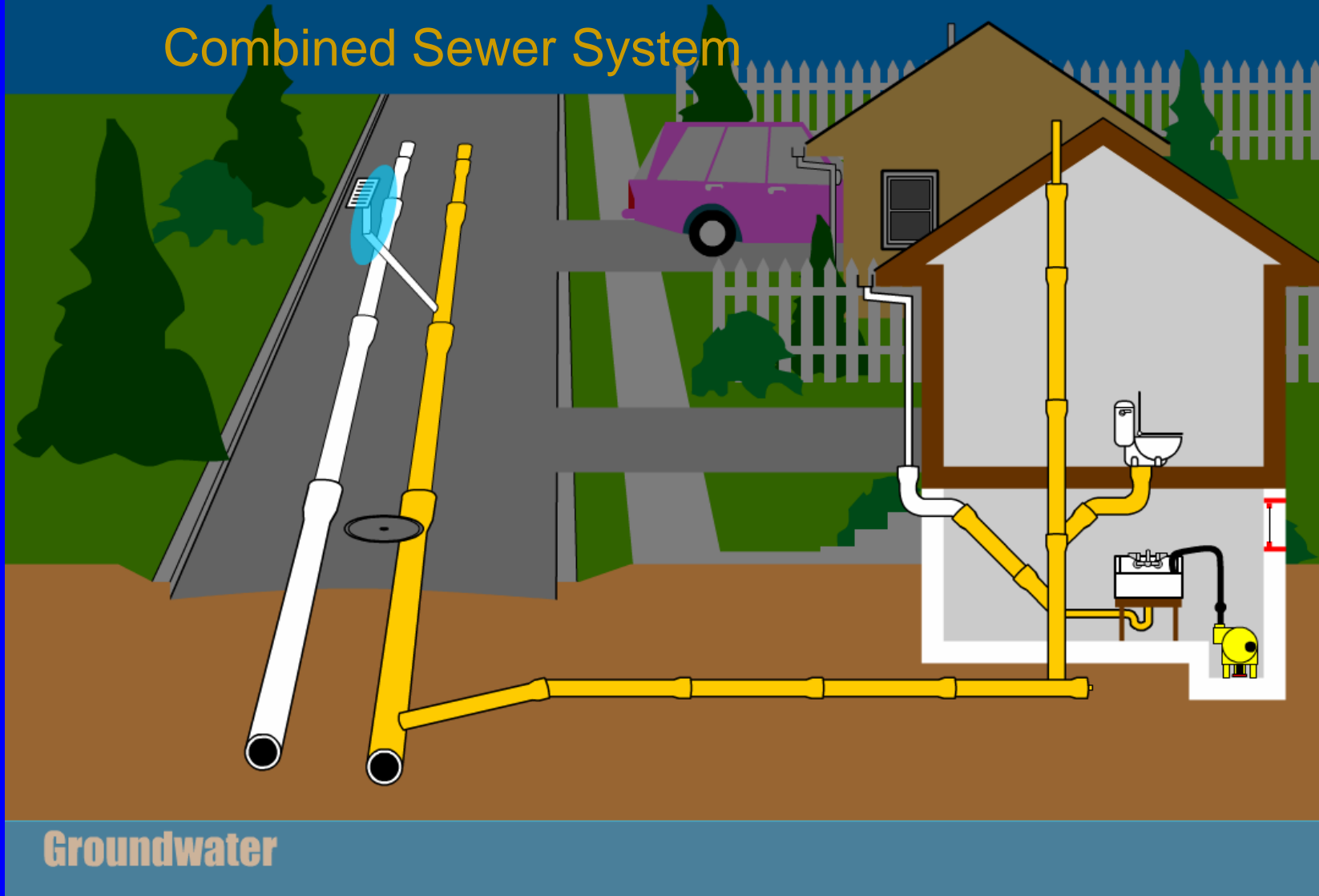
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Storm
System

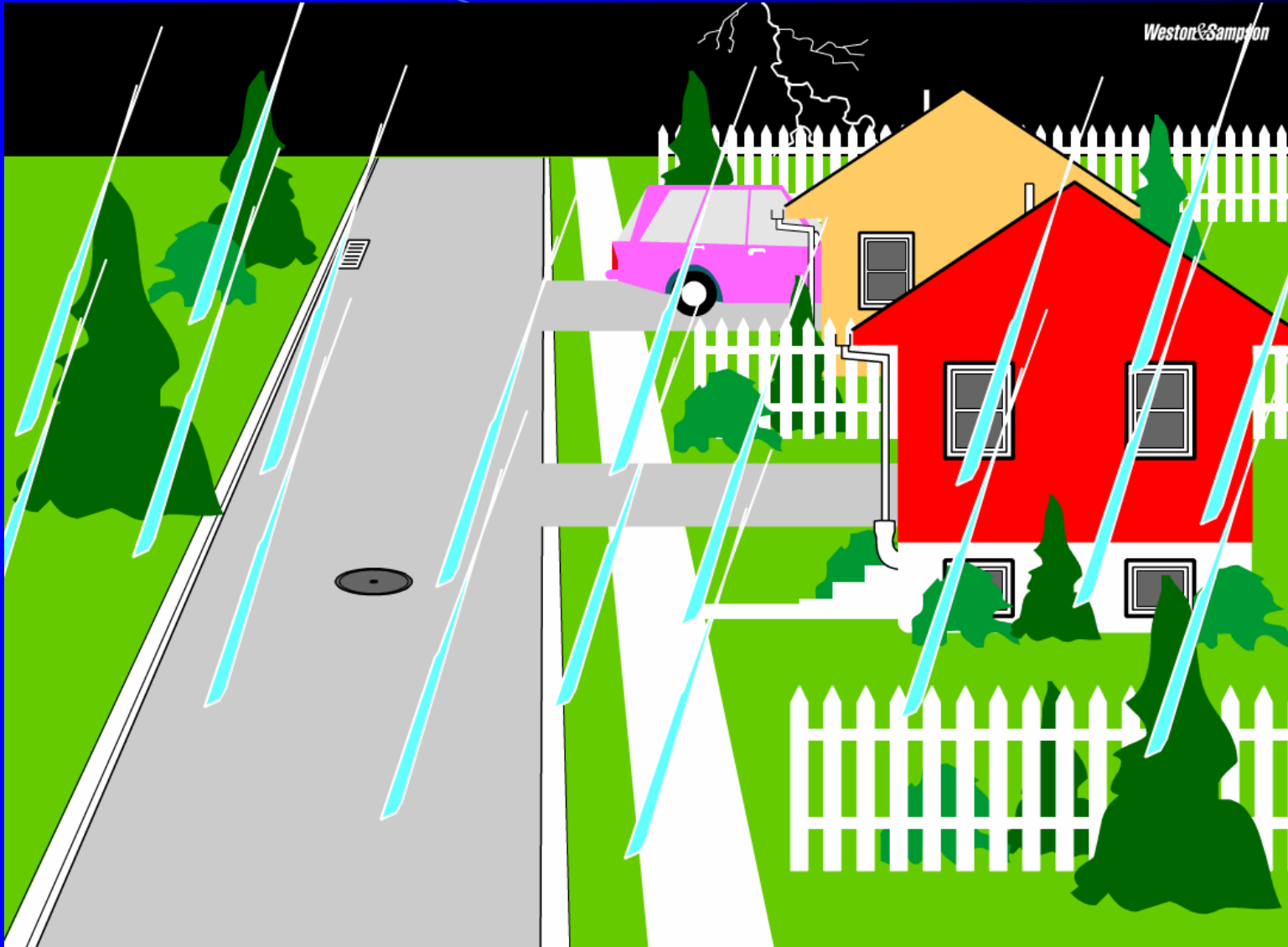
Sewer
System



Combined Sewer System



Groundwater



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Storm Drain to Sewer System
Roof Leader to Sewer System
Sump Pump to Sewer System



Storm Drain to Storm System
Roof Leader to **Outside**
Sump Pump to **Outside**



Groundwater

BALANCE RESTORED

Collection System Summary

- **Combined Sewer Overflows are a national issue**
- **Existing combined sewer system conveys wastewater to Mechanic Street pumping station**
- **Collection system projects will impact treatment plant alternatives**

Wastewater Treatment



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LEVELS OF WASTEWATER TREATMENT

Preliminary Treatment

Removes rags, sticks, floatables, rocks, grit and grease that may cause maintenance or operational problems at the treatment plant.

Primary Treatment

Removes settleable material from the wastewater.

Advanced Primary Treatment

Enhanced removal of settleable material from the wastewater using chemical addition or filtration.

Secondary Treatment

Removes dissolved organic material, suspended solids and some nutrients from wastewater.

Tertiary Treatment

Treatment beyond Secondary to remove nutrients additional dissolved organic material, and suspended solids.

Advanced Treatment

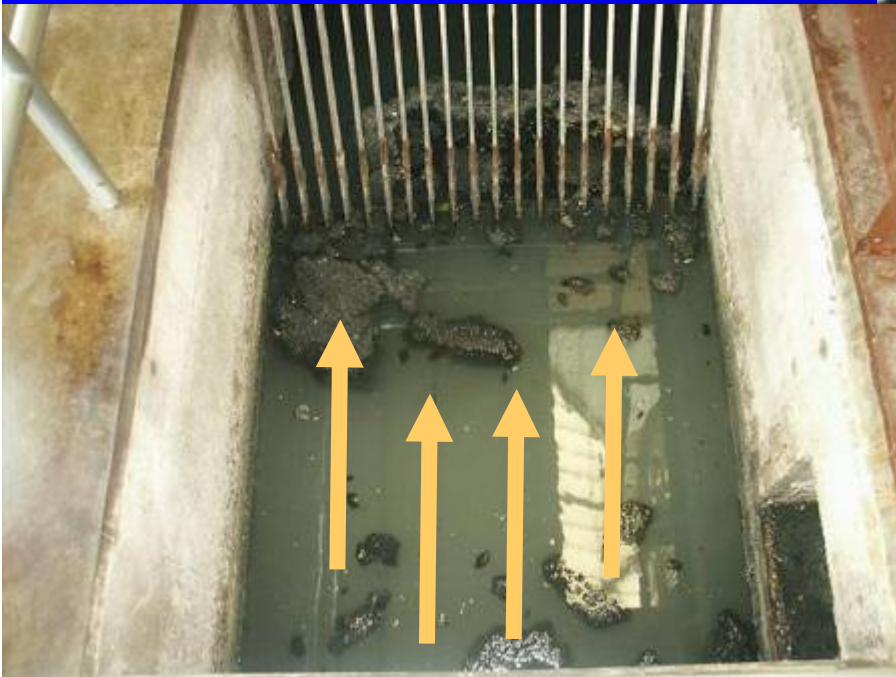
Removal of dissolved and suspended materials remaining after normal biological treatment when required for various water reuse applications.

Typical Primary Treatment Unit Processes



Headworks

- Screen out large solids and remove grit from influent



Typical Primary Treatment Unit Processes

Influent



Headworks



Primary Clarifiers

Effluent



Disinfection Chamber

Primary Clarifiers

- Remove settleable solids



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Typical Primary Treatment Unit Processes

Influent



Headworks



Primary Clarifiers

Effluent



Disinfection Chamber

Disinfection Chamber

- Chlorine added to kill bacteria
- Final step prior to discharge to river



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Approximate
Discharge Location
75 feet of depth



08/17/2005

Typical Secondary Treatment Unit Processes

Influent



Headworks



Primary Clarifiers



Aeration Tanks



Secondary Clarifiers

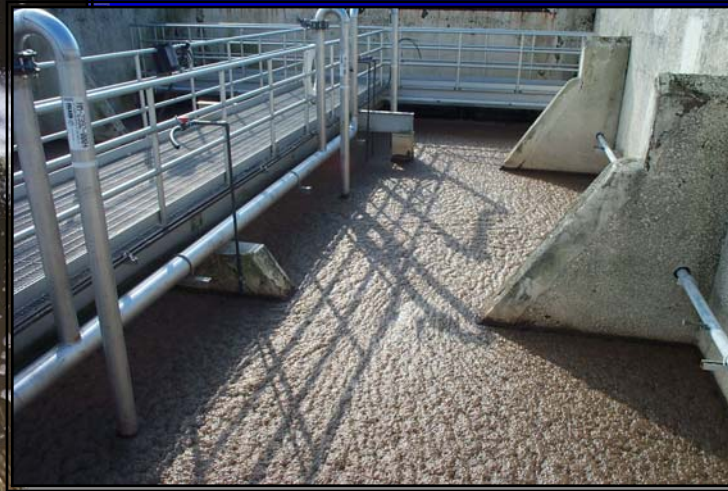


Disinfection Chamber

Effluent

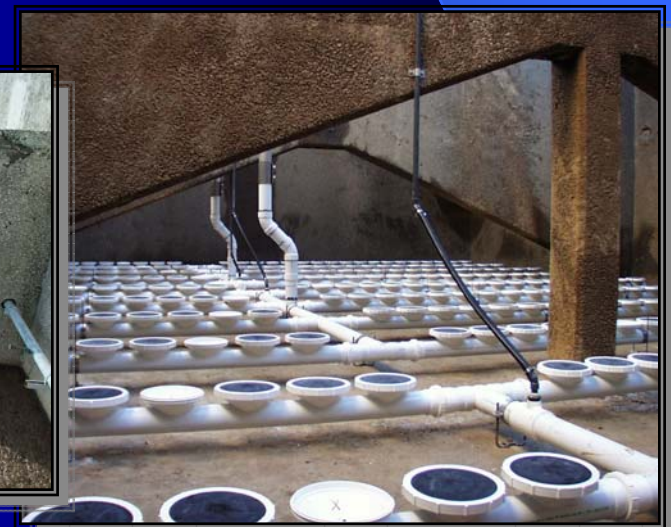
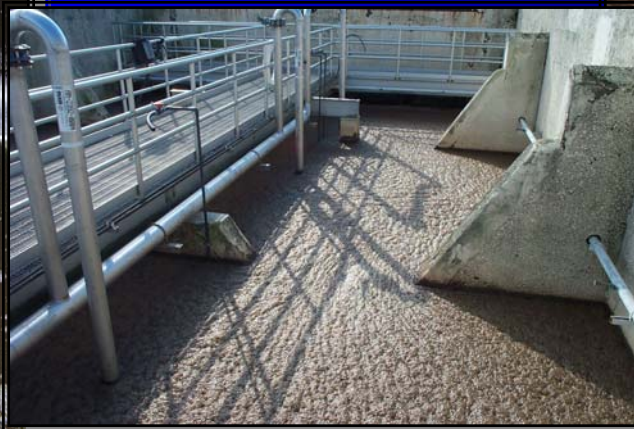
Aeration Tanks

- Compressed air is added in large volumes.
- Air is utilized by bacteria to break down organic waste (i.e. BOD).



Aeration Tanks

- Secondary treatment is a biological process that converts solids and dissolved material into micro-organisms that are easily separated in a secondary clarifier.



Secondary Clarifiers

- Separate solids (micro-organisms) from treated wastewater
- Clear water exits at the top
- Solids exits at the bottom



Typical Secondary Treatment Unit Processes

Influent



Headworks



Primary Clarifiers



Aeration Tanks



Secondary Clarifiers

Effluent



Disinfection Chamber

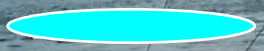
Disinfection Chamber

- Chlorine added to kill bacteria
- Final step prior to discharge to river



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Approximate
Discharge Location
75 feet of depth



08/17/2005

Conventional Secondary Treatment Summary

- Historically secondary treatment focused on solids reduction (TSS) and dissolved material reduction (BOD)
- With treatment technologies in place for these constituents, nutrients are now the focus of regulatory efforts

Nutrient Impacts

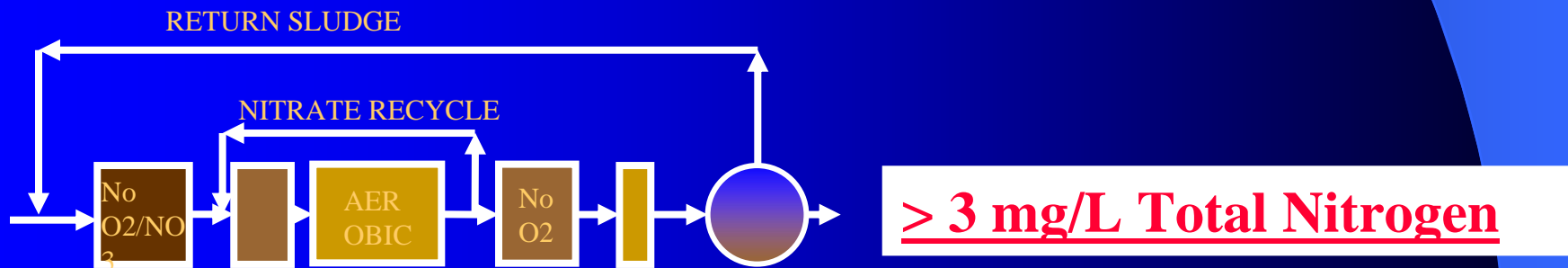
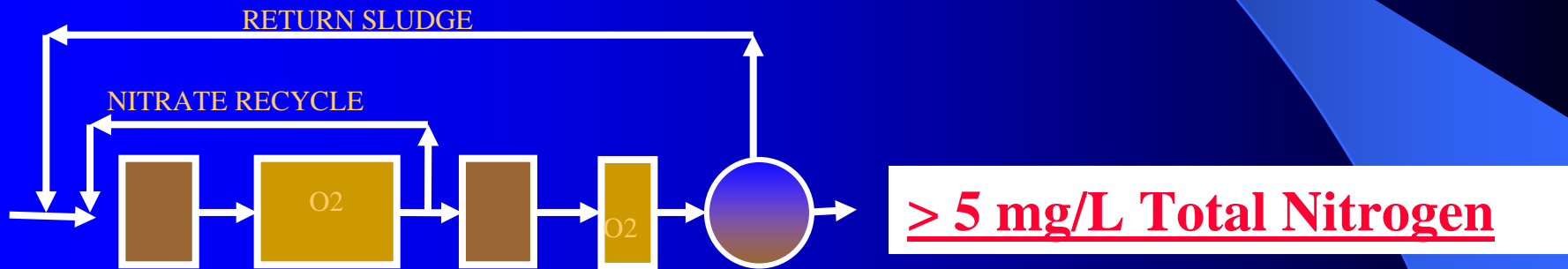
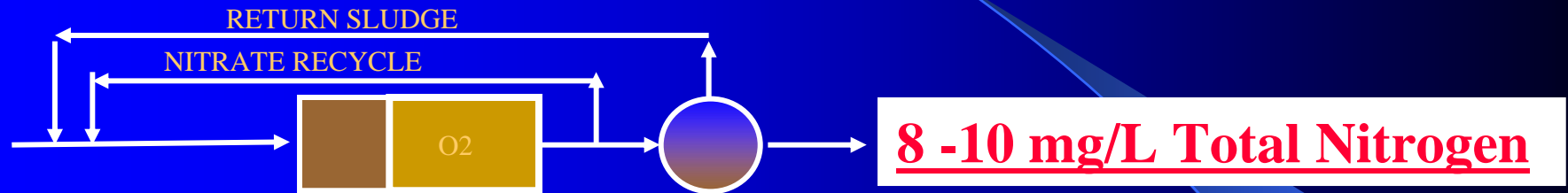
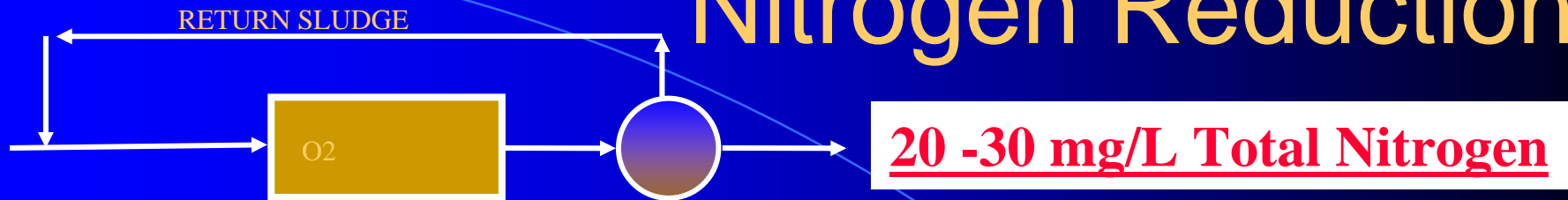
- Phosphorus and Nitrogen
- Phosphorus is the limiting nutrient in freshwater systems.
- Nitrogen is the limiting nutrient in tidal systems.
- Excess nutrients can lead to Eutrophication
 - Algae blooms deplete oxygen, which can stress marine life.



Secondary Treatment with Nutrient Reduction

- Nutrient (i.e. Nitrogen) reduction requires additional treatment steps.
- Treatment complexity and cost increases with more stringent nutrient limits

Nitrogen Reduction



Wastewater Treatment Summary

- Uses natural processes in an engineered facility
- Treatment levels vary with the assimilative capacity of the receiving water
- Complexity, cost and land requirements increase with level of treatment required

Break for Questions

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Permitting and Regulatory Framework



National Pollutant Discharge Elimination System Permits

- EPA issues five year permits with State concurrence
- The Permit regulates what is allowed out of a wastewater treatment plant into the river
- Permit Limits are based on
 - Technical Standards
 - State Issued Water Quality Standards

Collection System Regulatory Issues

- 1990 Consent Decree still active
- 1998 – EPA required collection system CSO LTCP Update
- Collection system capacity management, operation, and maintenance.
- Wet weather discharges and flooding

Peirce Island Regulatory Status

- Current Peirce Island permit issued in April 2007
- Requires secondary treatment standards be met.
- Existing WWTF at Peirce Island cannot meet secondary treatment requirements
 - A WWTF upgrade or a new WWTF will be required to meet permit limits
 - City initiates Wastewater Master Planning process May of 2007 to address compliance requirements

Peirce Island Regulatory Status (con't)

- EPA issued Administrative Order August 2007 establishing:
 - Interim WWTF permit limits
 - Compliance schedule for ongoing CSO LTCP abatement projects
 - Compliance schedule for Wastewater Master Plan

Piscataqua River Impairments

- Mercury
- PCBs
- Dioxin
- Enterococci Bacteria

- None of these have been attributed to the Peirce Island discharge
- Nutrients are not on this list

08/17/2005

* As listed on the State 303 (d) List

Permitting Summary

- Current Peirce Island NPDES permit is a standard secondary permit
- Permit does not have nutrient limits
- Nutrient levels in the river are being studied. Data available to date are inconclusive as to the extent of impact
- The City will work with the regulators and scientific community to assess the need for nutrient removal at a future WWTF
- As part of this planning effort the City is including nutrient removal in design alternatives

Wastewater Master Plan Components



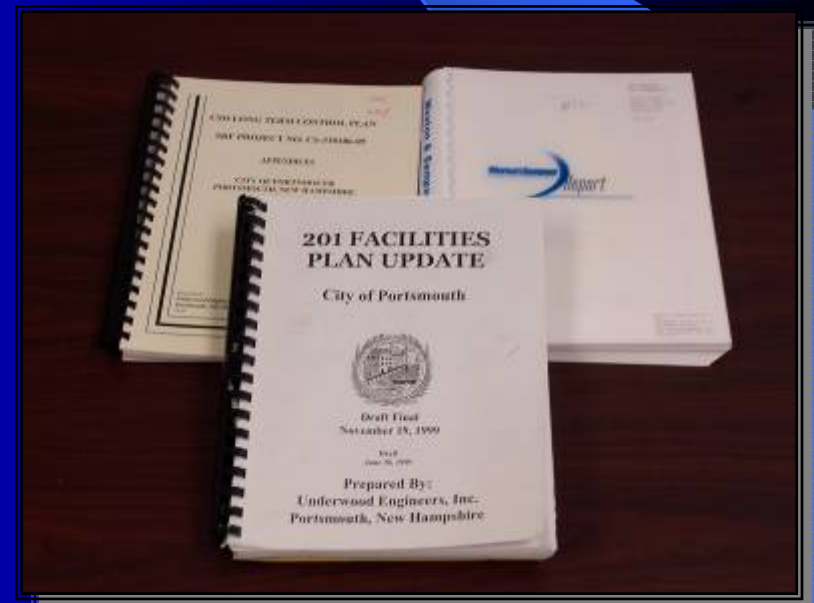
Collection System
CSO LTCP

Wastewater Treatment Facilities



Master Planning Goal

- Master Planning effort will ensure the selected treatment plant and collection system CSO LTCP alternatives are:
 - Sustainable
 - Cost effective
 - Environmentally sound
 - Fulfills Regulatory requirements
 - Fulfills funding requirements



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Wastewater Master Plan

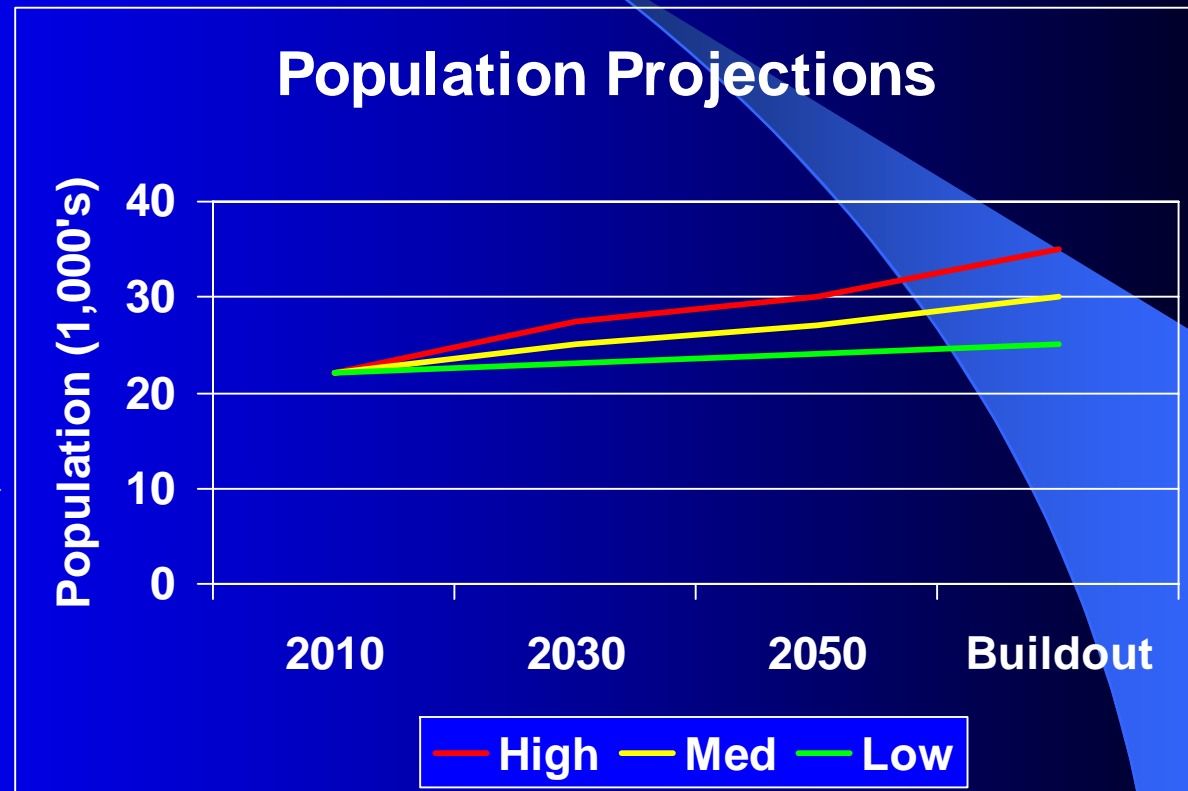
- Basis of design
- Alternatives evaluation
- Preliminary design level of detail for the recommended alternative
- Funding options and user rate impacts
- Public Participation

Basis of Design

- Development is not driving force for this study
- Basis of design will determine:
 - Current and projected flows and loads
 - Extents of regional involvement
 - Regulatory requirements
- Basis of design will be used to size and select appropriate technologies for the new treatment plant and collection system CSO LTCP upgrades.

Flow Projections

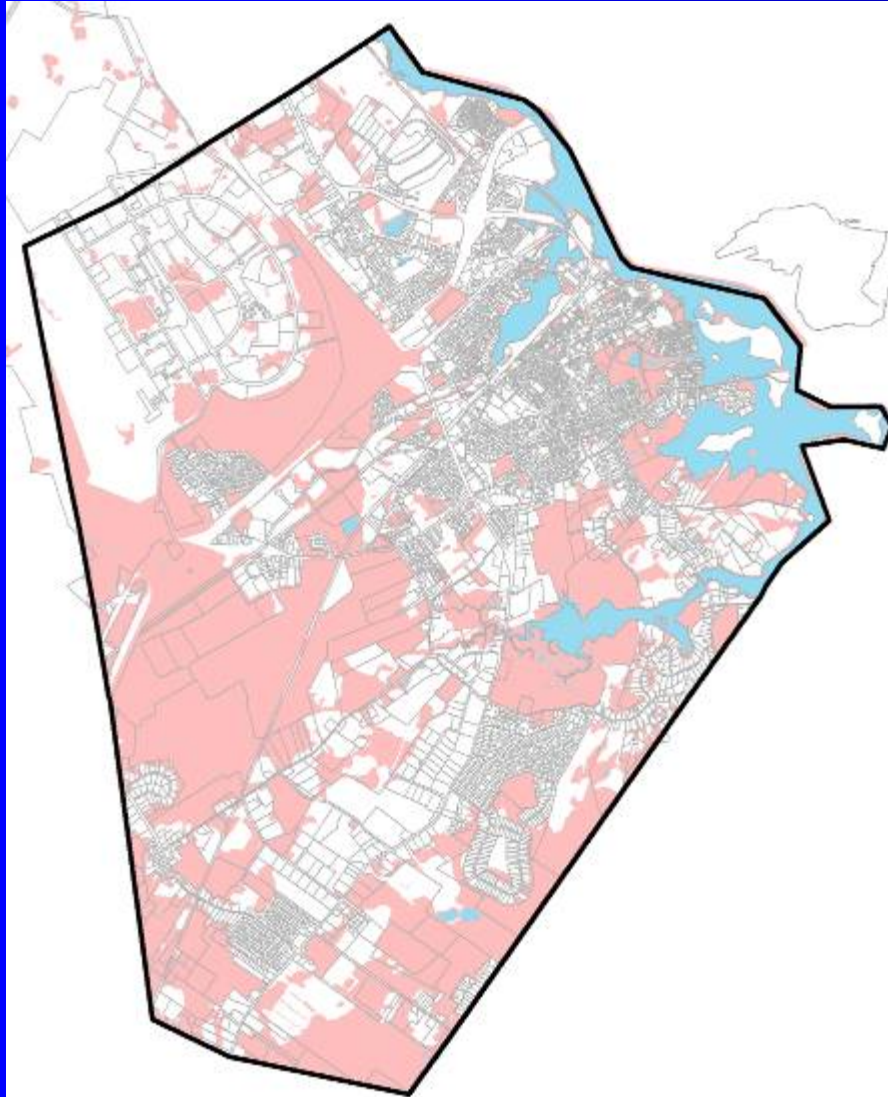
- Current Zoning
- Water use records
- Monitoring data
- Flow/person
- Flow/House
- Flow/Business



Alternatives Assessment

- Alternatives assessment will include:
 - Collection system CSO mitigation strategies
 - Treatment plant upgrade options
 - Type of treatment processes
 - Plant location

Potential Wastewater Treatment Facility Locations



- Lot size
- Ownership
- Protected land
- Proximity to residential areas
- Proximity to river

Potential Plant Alternatives

- Treatment Plant Upgrade Alternatives
 - Expand the Peirce Island plant
 - Expand the Pease plant
 - Construct a new plant at a new location
 - Combination of redirecting flow and plant expansion/upgrade
- Each alternative impacts the collection system CSO LTCP

Funding

- The Wastewater Master Plan will also evaluate funding alternatives. It will identify:
 - Costs for selected solution
 - Potential grant and loan sources
 - Update water/sewer user rate model
 - Cost impacts to various user groups

Grant and Loan Opportunities



New Hampshire Department of Environmental Services

DES Grants and Loans

Funding Programs Serving New Hampshire Communities

Each year, the State of New Hampshire provides substantial grant and loan opportunities to municipalities and others, to support environmental infrastructure improvements and other environmental and public health projects.

This page provides descriptions of the grant and loan programs administered by the Department of Environmental Services (DES). Over the years, this funding has created substantial environmental and public health benefits across the state of New Hampshire.

For further information on any of the grant and loan programs summarized here, please contact the person (s) listed.

Program Descriptions...

▶ [Grants](#)

▶ [Loans](#)

[Current RFP/Grant Opportunities](#)

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Potential Capital Costs

- Secondary Treatment Capital Cost \$35M - \$50M
- The CSO – LTCP capital cost \$30M - \$40M
- Additional Operation and Maintenance \$1M to \$2M per year
- Cost Impact to rate payer will vary depending upon the selected alternative and its implementation schedule

Public Participation

- Public Participation will be ongoing throughout the Wastewater Master Plan.
- Periodic updates to City Council
- Web Site
<http://www.cityofportsmouth.com/>

Next Steps

- Completion of Wastewater Master Plan 3 years
- Funding authorization
- Implementation schedule will be establish as part of the Wastewater Master Plan with concurrence of EPA and DES

Questions/Discussion



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