2010 to 2030 Wastewater Facilities Plan Update

City of Eureka

BROWN AND CALDWELL

August 20, 2009

Topics for Discussion:

- Purpose
- Findings
- Recommendations
- Capital Improvements Summary

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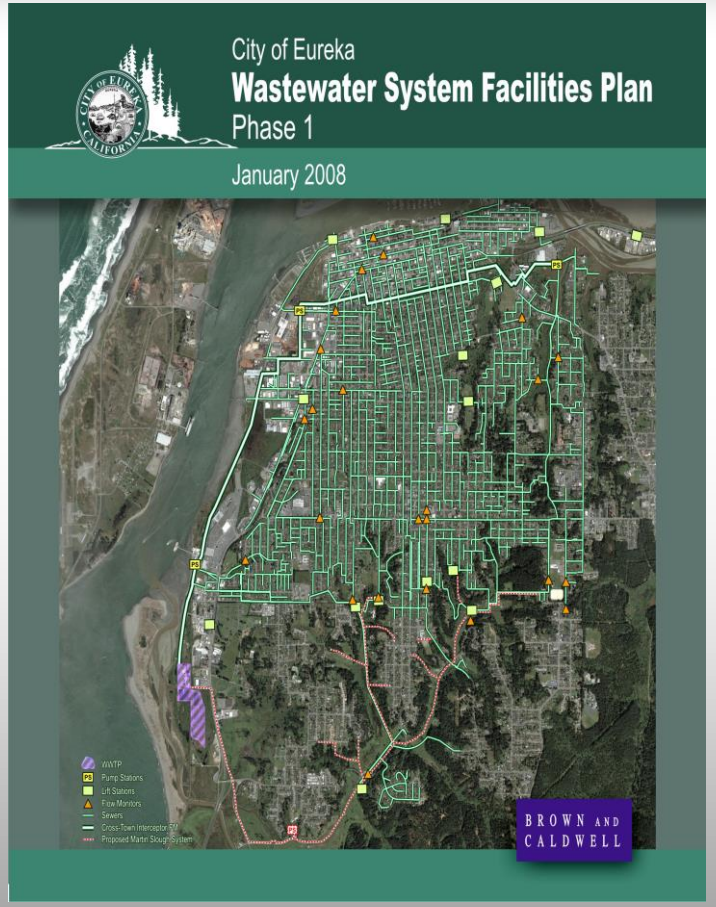
Wastewater Facilities Plan Update
Purpose

- Document the condition and capacity of the existing wastewater infrastructure
- Determine future facility requirements
- Develop recommendations for near-term and long-term improvements



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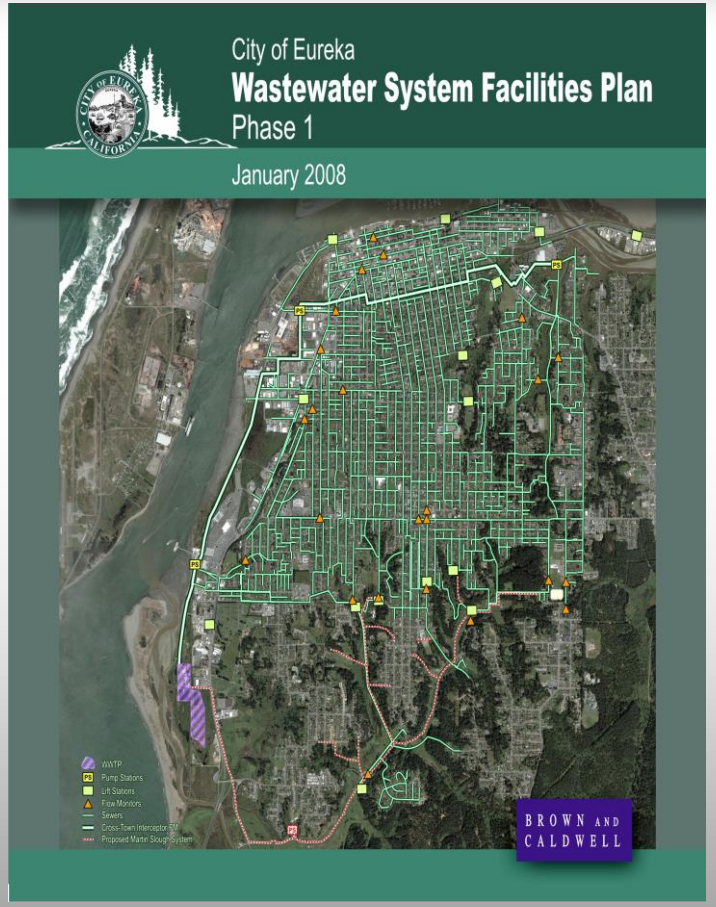
Wastewater Facilities Plan Update
Why Now?

- WWTP and Cross-Town Interceptor over 25 years old (1982)
- Collection System has capacity issues
- WWTP approaching capacity
- Regional Water Quality Control Board requires update



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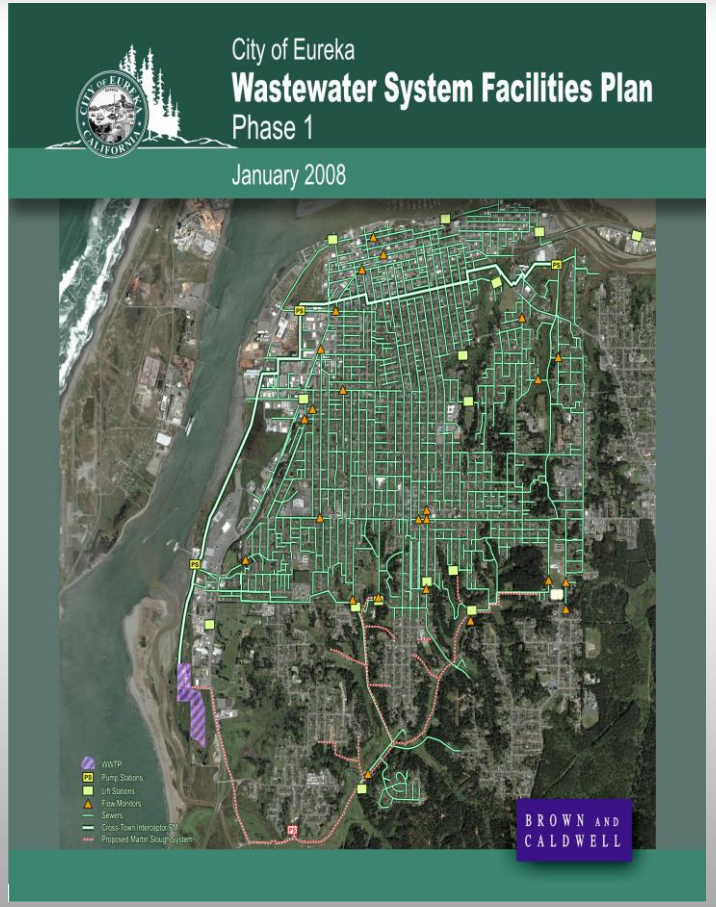
Wastewater Facilities Plan
Conducted in Phases

- Phase 1 – Collection System Emphasis (completed 2008)
- Phase 2A – WWTP Capacity Evaluation, Near-Term Needs, and NPDES Permit renewal (completed 2009)
- Phase 2B – Regulatory Issues and Effluent Discharge (current)
- Phase 2C – Long-Term WWTP Needs (future)



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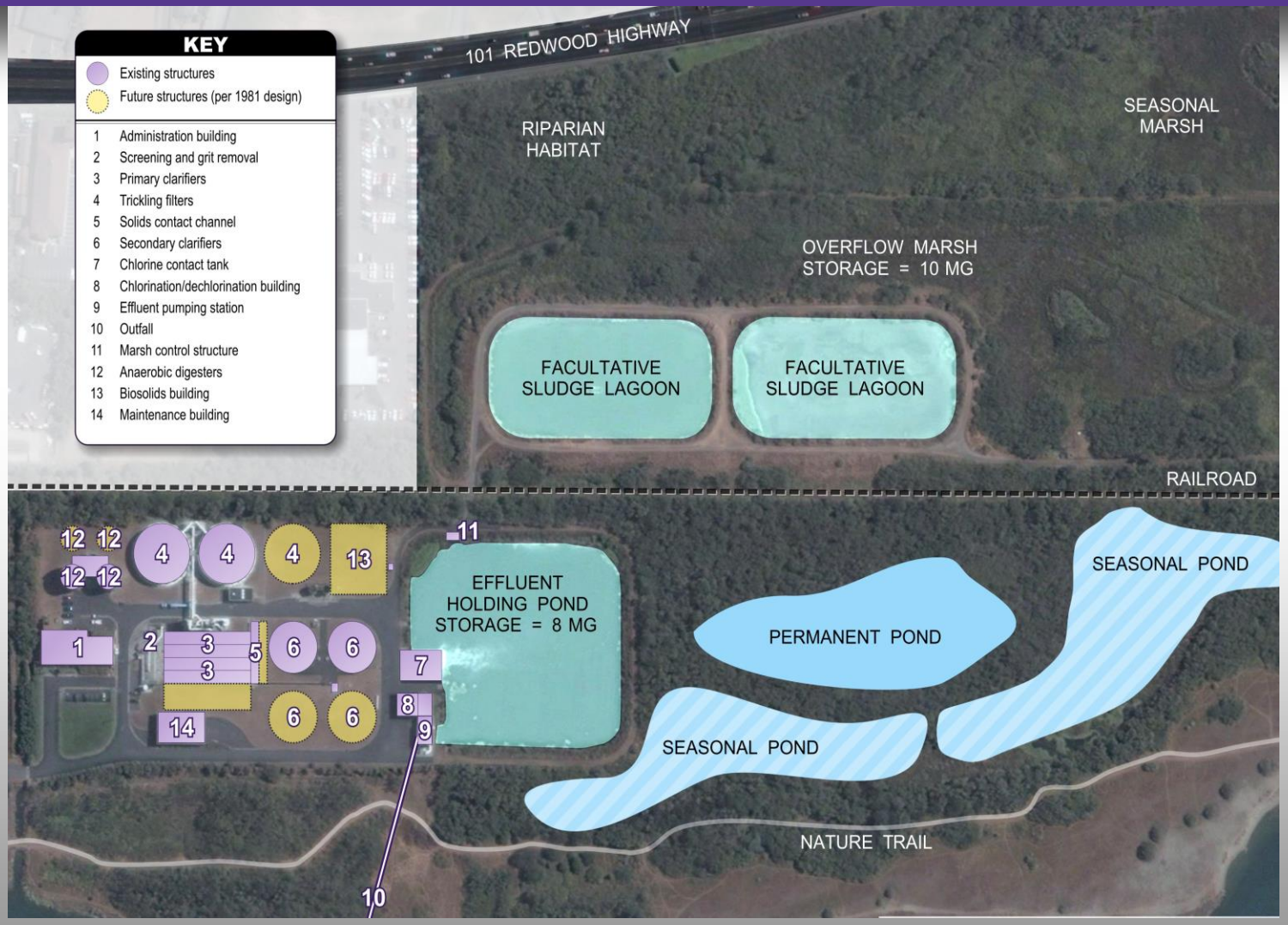
Wastewater Treatment Facility

Wastewater Treatment Facility
Effluent and Sludge Storage



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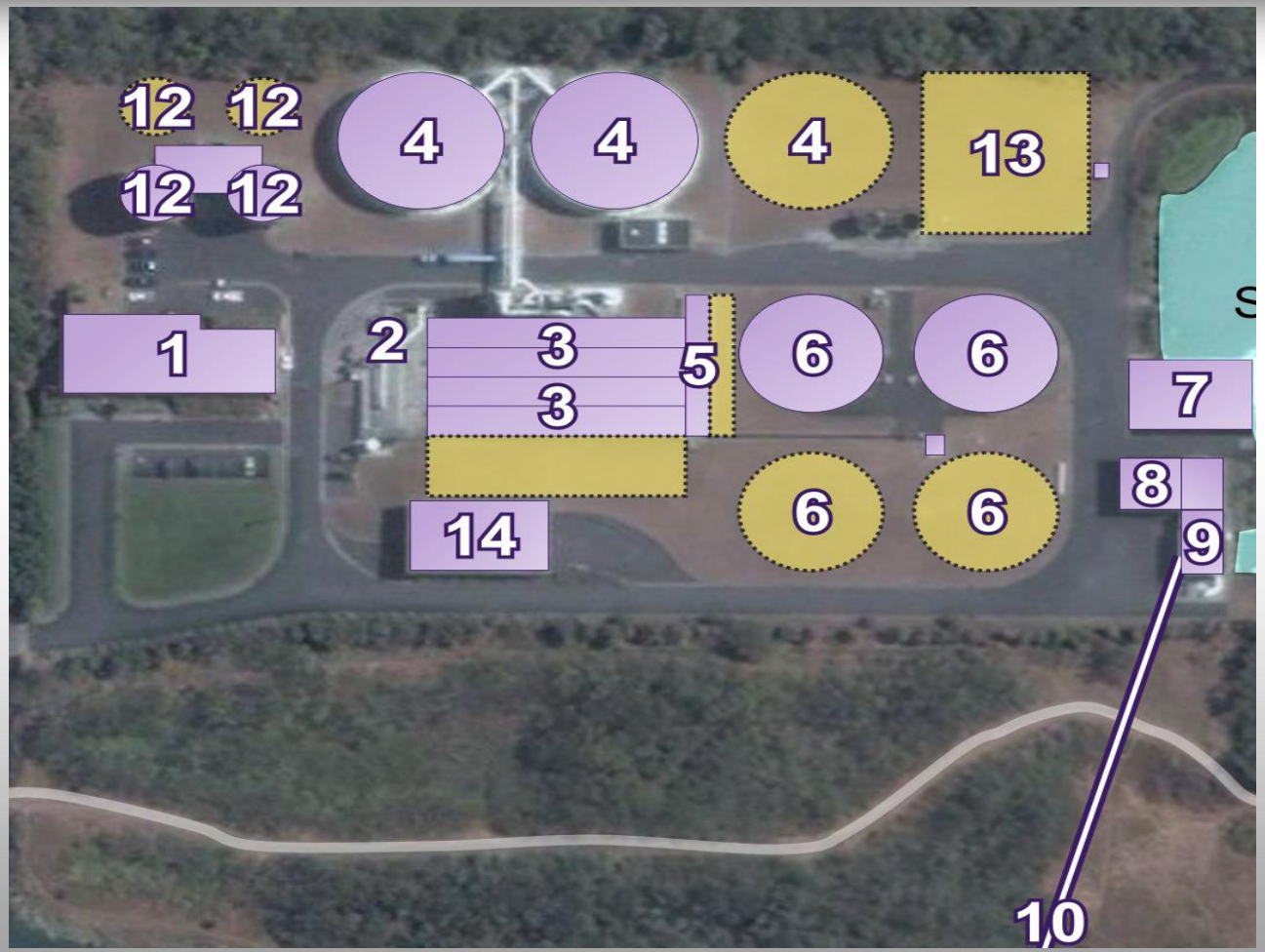
Wastewater Treatment Facility
Liquid and Solids Treatment

KEY

Existing structures
Future structures (per 1981 design)

1	Administration building
2	Screening and grit removal
3	Primary clarifiers
4	Trickling filters
5	Solids contact channel
6	Secondary clarifiers
7	Chlorine contact tank
8	Chlorination/dechlorination building
9	Effluent pumping station
10	Outfall
11	Marsh control structure
12	Anaerobic digesters
13	Biosolids building
14	Maintenance building



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Wastewater Treatment Facility

Effluent Disposal Pipe in Humboldt Bay (4,000 ft)

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Wastewater Treatment Facility Planning
Initial Focus was on Near Term Needs

- Flow and Load Projections
- In-depth WWTP Solids and Liquid Stream Capacity Analysis
- Ebb Tide Discharge System Modeling
- Effluent Dilution Modeling
- NPDES Permit Renewal

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Wastewater Treatment Facility Planning
Remaining Work to Address Long Term Needs

- Workplan for Effluent Discharge Study
  - Fate and Transport of WWTP Effluent
  - Potential Effects of Effluent on Beneficial Uses
- Bay Model and Discharge Window Update
- Feasibility Analysis for Treating Peak Flows
- Long Term Treatment Requirements

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Wastewater Treatment Facility Near Term Projects

Wastewater Treatment Facility
Near Term Projects

- Interim Biosolids Dewatering Facility
- Solids Thickening Facility
- Standby Generator
- Outfall Pipe Stabilization

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Interim Biosolids Dewatering Facility
Purpose of Project

Dewatering of digested biosolids will facilitate efficient disposal and bring City into compliance with the NPDES permit

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Interim Biosolids Dewatering Facility
Need for Project

- Existing sludge lagoons are full to capacity with dilute biosolids
- Re-establishment of Sludge Lagoon volume and function provides additional treatment and digester redundancy mandated by Permit
- Dilute biosolids are expensive to transport
- Limited options for land application of dilute biosolids
- Expands the seasonal timeframe that biosolids can be hauled off-site

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Interim Biosolids Dewatering Facility
Permanent Building with Geo-Membrane Bags

- The interim dewatering facility (recently constructed) consists of a permanent building and the use of large geo-membrane bags to concentrate digested biosolids.
- Permanent dewatering equipment is planned for future.

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Solids Thickening Facility
Purpose of Project

A solids thickening facility will provide the digester redundancy required to maintain compliance with the NPDES Permit

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Solids Thickening Facility
Need for Project

- Thickening sludge prior to digestion allows the City to postpone construction of a third digester
- Thicker sludge will increase digester gas production and enhance the cogeneration of heat and electricity

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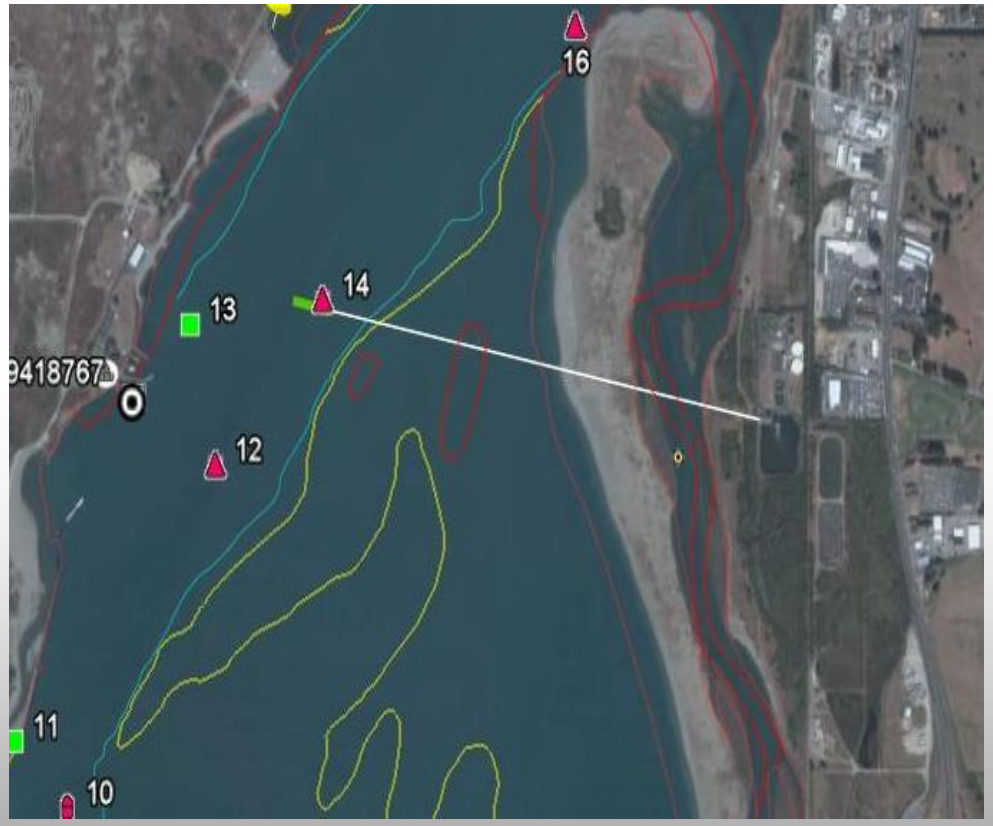
Outfall Stabilization

- Purpose: to reestablish the structural integrity of the effluent outfall pipe
- Need: erosion of sand spit has exposed sections of the effluent pipe



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Standby Generator
Purpose of Project

A standby generator is needed to meet Permit requirements for emergency power during a power outage

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Standby Generator
Need for Project

- Existing standby power generation equipment old with insufficient capacity
- Permit requires that essential WWTP equipment be in service under all conditions

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Wastewater Treatment Facility
Summary of Major Near-Term Capital Projects

Project Component	City ($)	HCSD ($)	Total ($)
Biosolids Dewatering Facility	$1.36M	$0.64M	$2M
Solids Thickening Facility	$1.8M	$0.8M	$2.6M
Outfall Stabilization	$0.7M	$0.3M	$1M
Standby Generator	$0.27M	$0.13M	$0.4M
Total	**$4.13M**	**$1.87M**	**$6M**

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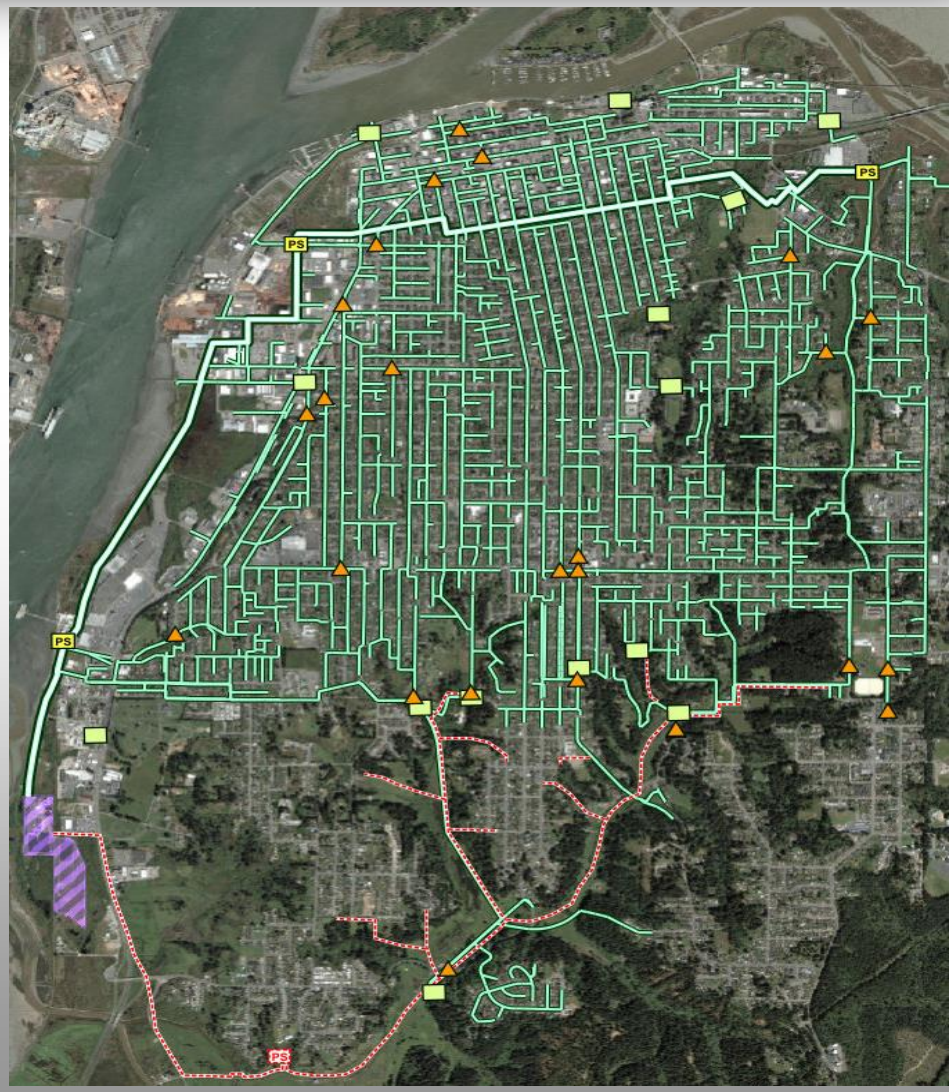
Martin Slough Project

Martin Slough Interceptor: Reduces Operating Costs, Provides Environmental and Safety Benefits

- Benefit to cost ratio of approx. 2.0
- Saves Energy
- Reduces Maintenance
- Improves Worker Safety
- Reduces Odor
- Decreases SSO's
- Protects Bay and Fisheries
- Reduces Potential for Fines



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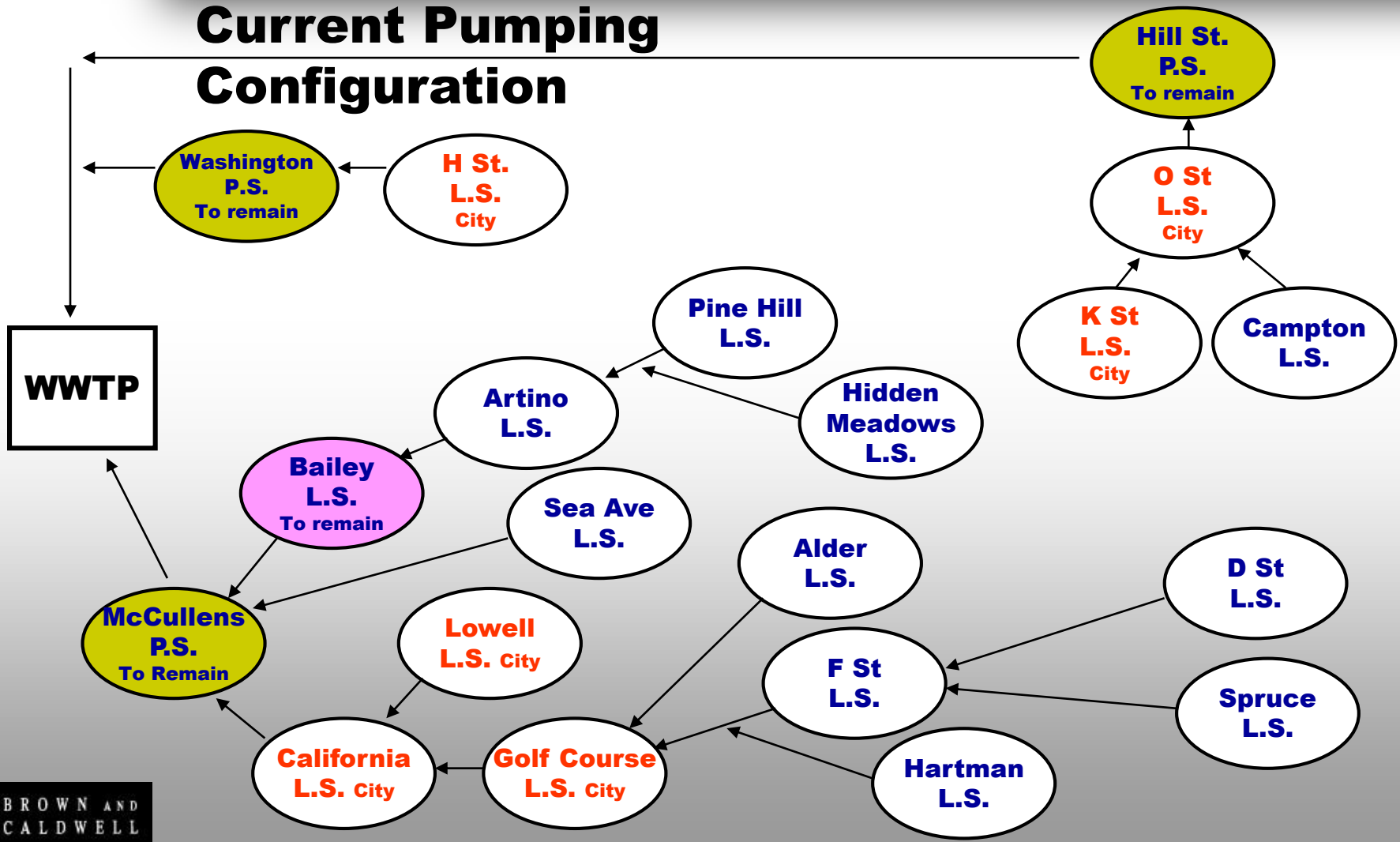
Martin Slough Project Eliminates Re-pumping and Saves Energy Costs



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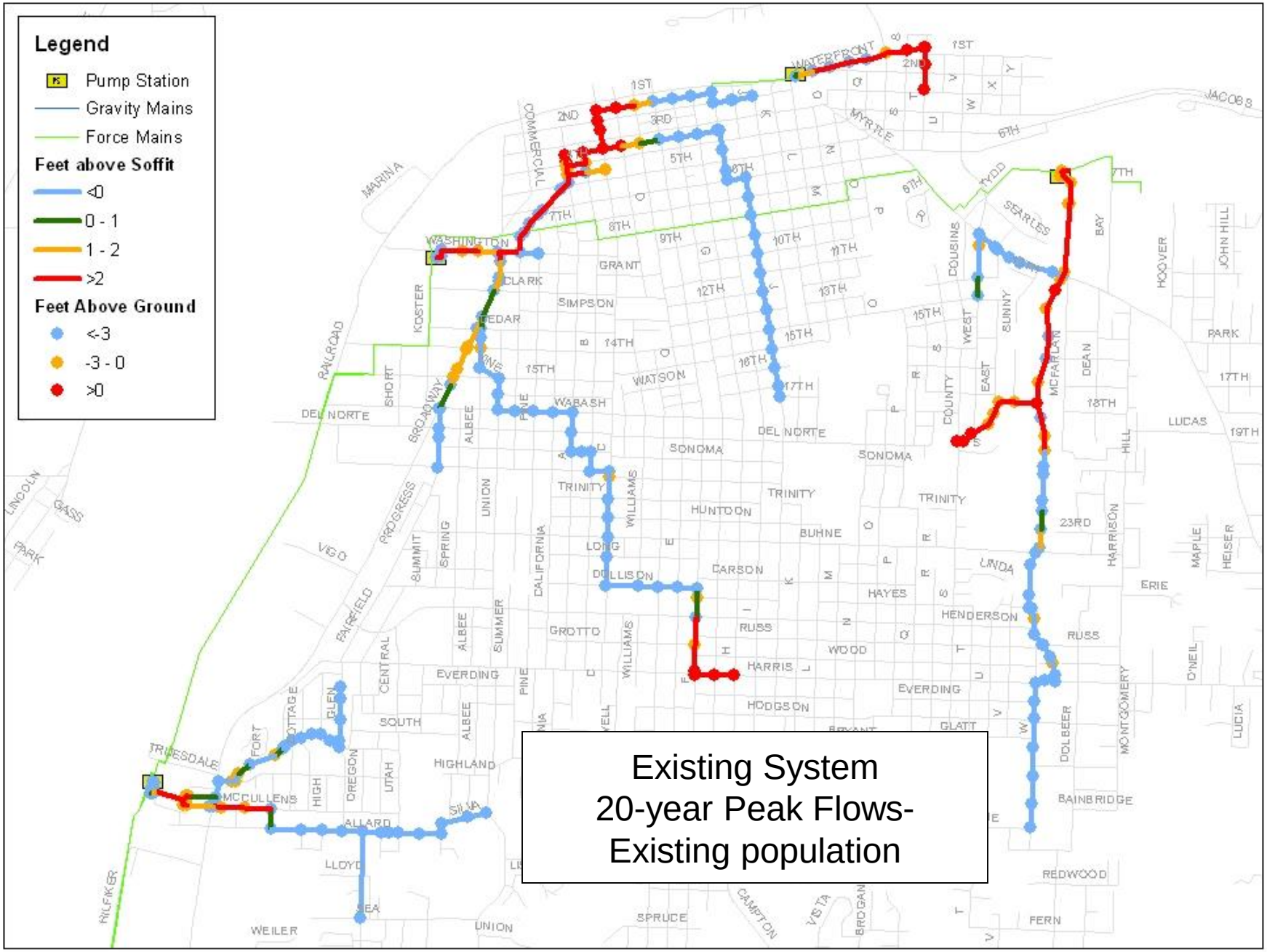
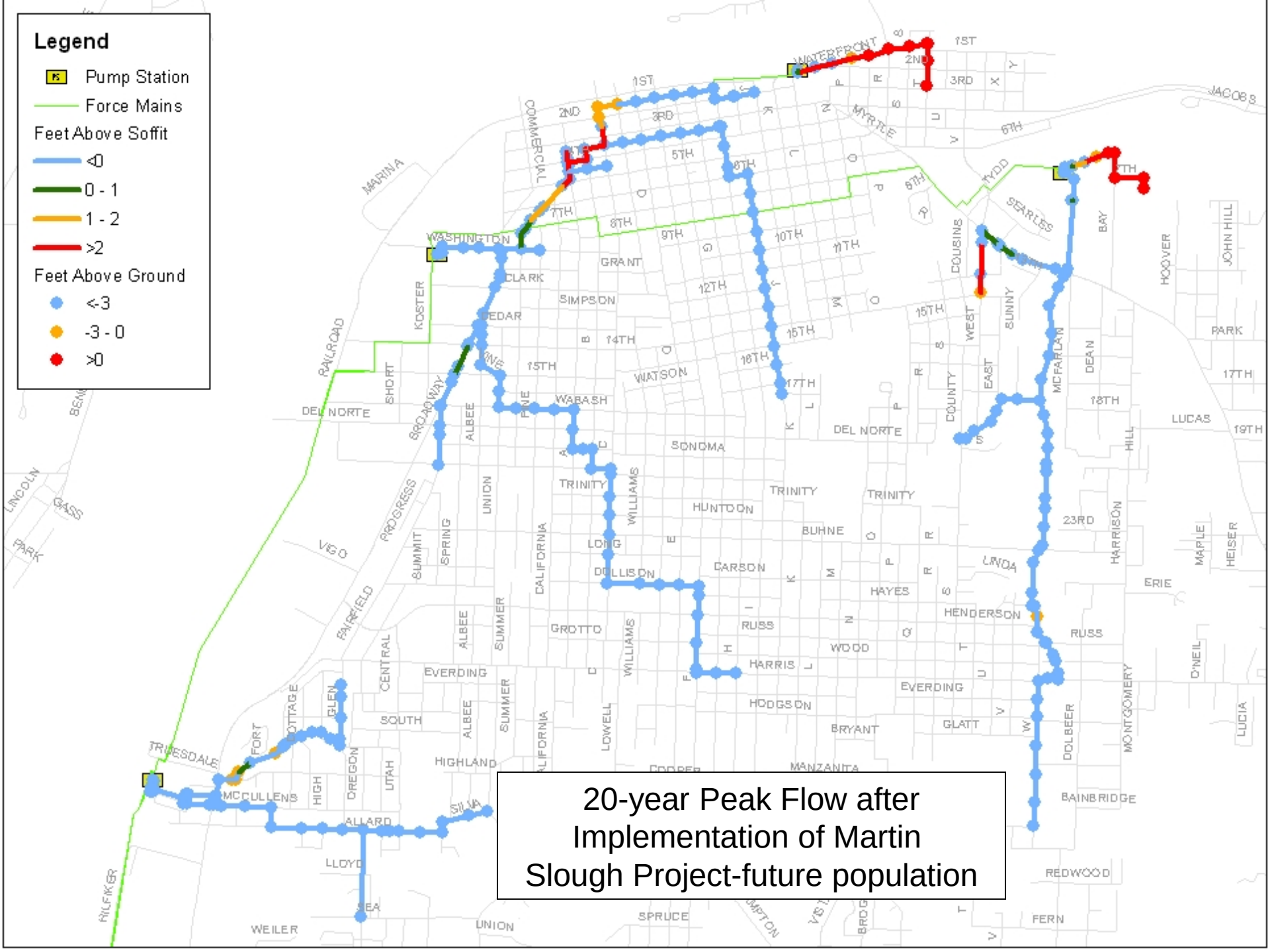

Legend
Pump Station
Gravity Mains
Force Mains
Feet above Soffit
<0
0 - 1
1 - 2
>2
Feet Above Ground
<-3
-3 - 0
>0
Existing System
20-year Peak Flows-
Existing population


Legend
Pump Station
Force Mains
Feet Above Soffit
<0
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Feet Above Ground
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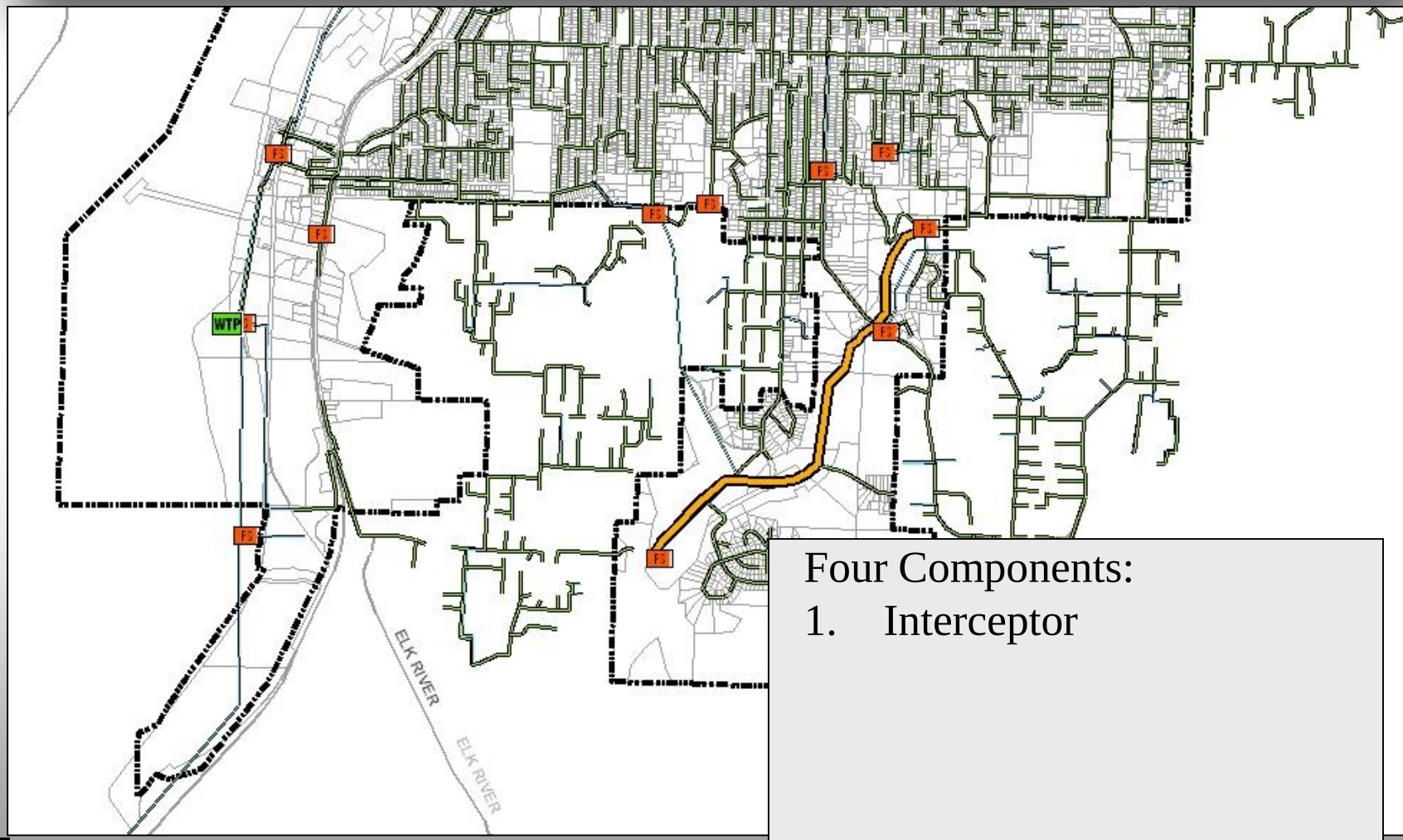
20-year Peak Flow after Implementation of Martin Slough Project-future population

Martin Slough Interceptor



Four Components:

1. Interceptor

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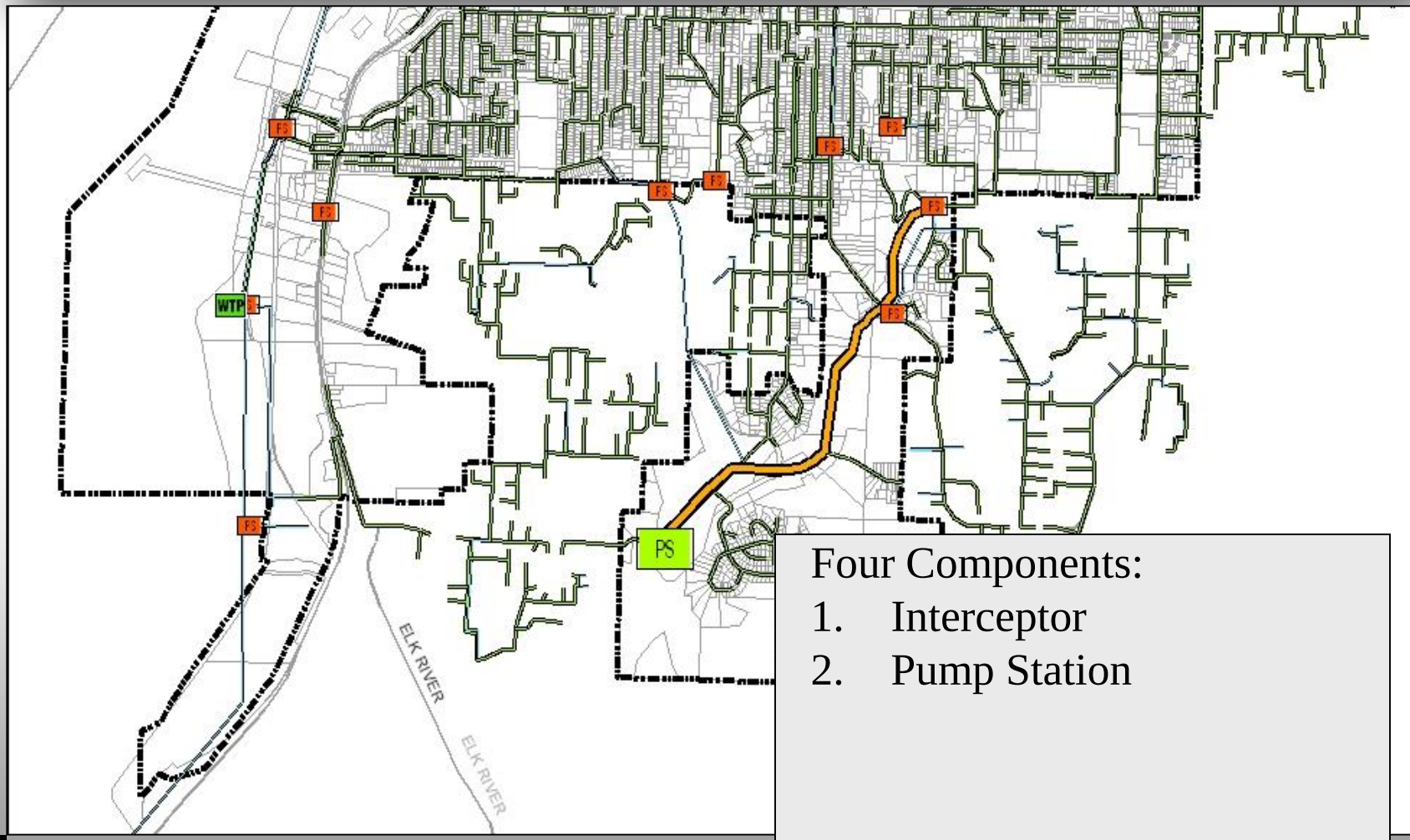
Martin Slough Pump Station



Four Components:

1. Interceptor
2. Pump Station

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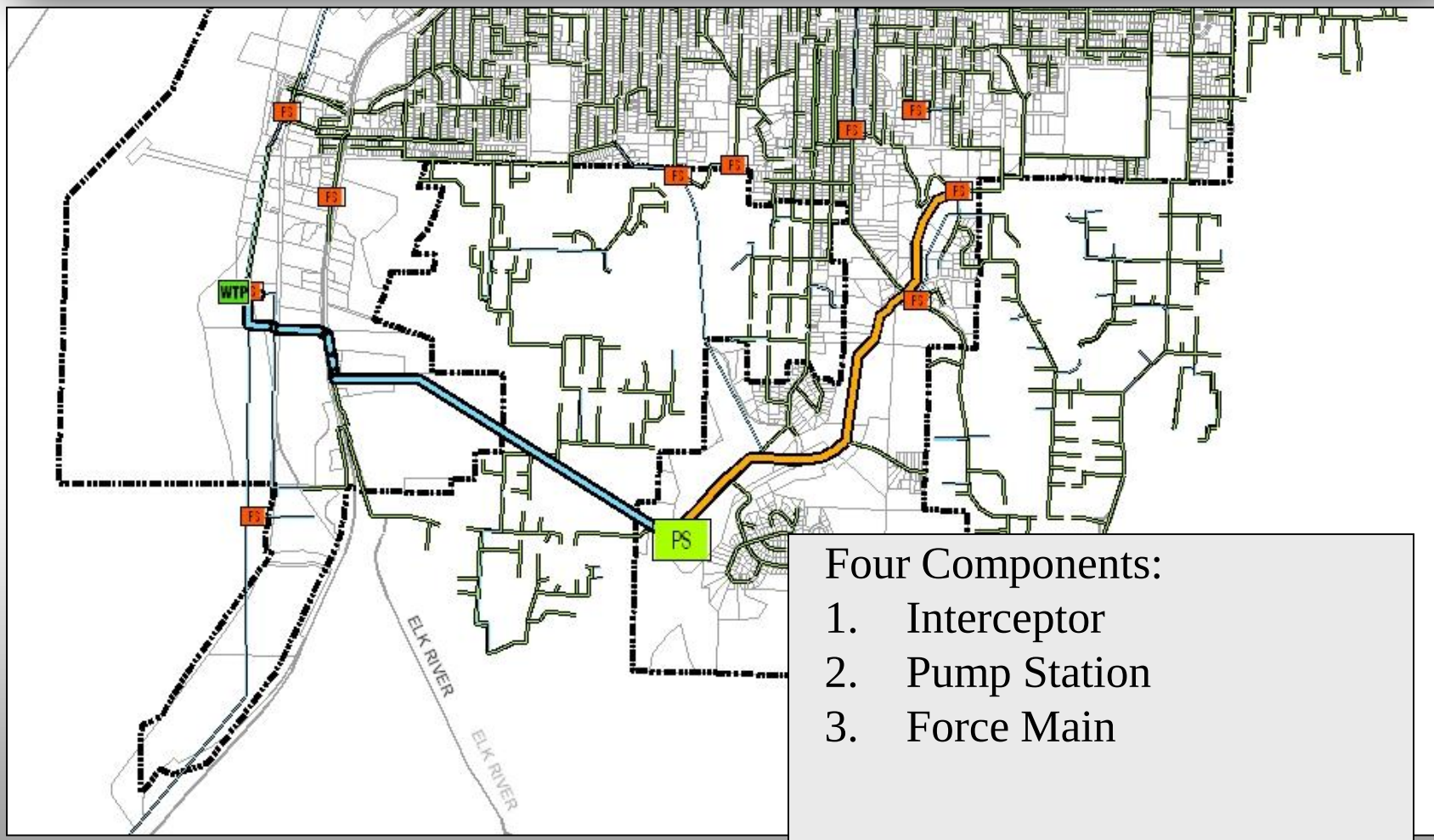
Martin Slough Force Main



Four Components:

1. Interceptor
2. Pump Station
3. Force Main

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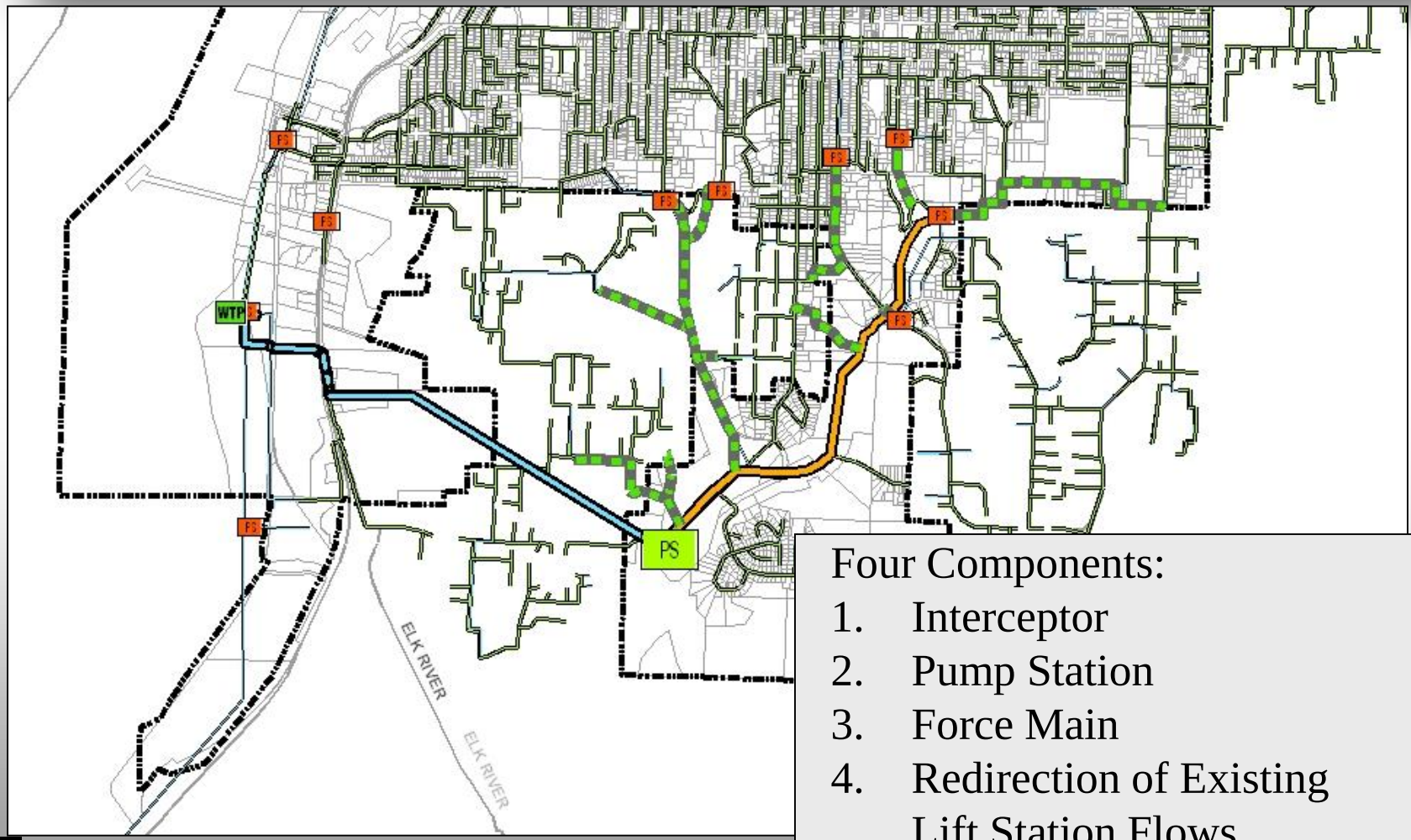
Martin Slough Collector Sewers (Flow Redirection)



Four Components:

1. Interceptor
2. Pump Station
3. Force Main
4. Redirection of Existing Lift Station Flows

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Martin Slough Interceptor
Breakdown of Costs

Project Component	City ($)	HCSD ($)	Total ($)
Interceptor (a)	$1M	$1.8M	$2.8M
Pump Station	$1.6M	$2.9M	$4.5M
Forcemain	$2.7M	$4.8M	$7.5M
Re-direct Flows	$700K	$TBD	$700K
Total (b)	**$6M**	**$9.5M**	**$15.5M**

(a) Estimated cost of the Interceptor is $7.2M. Grant funding from EPA and Proposition 50 will provide $4.4M ($2.8M + $4.4M = $7.2M).

(b) Total estimated cost of the project is $19.9 M. Grant funding from EPA and Proposition 50 will provide $4.4M ($15.5M + $4.4M = $19.9M).

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Collection System

Collection system management objectives: maintain condition and capacity

- Sewers are necessary and valuable assets; need to be managed as such = inspection and cleaning, prioritized rehab and replacement
- Sewers deteriorate over time which leads to *inflow* of surface water and *infiltration* of groundwater (I/I) which accelerates deterioration
- I/I also leads to capacity problems (backups and overflows) and impacts wastewater plant performance
- Overflows lead to regulatory agency intervention, 3rd party suits, health and water quality concerns

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Eureka's sewer system is a very valuable asset

Component	Quantity	Unit cost	Replacement cost total
Public mains	566,187 feet	$150	$85 million
Private service laterals	12,316 (85% single family residential)	$5,000	$62 million
Total			**$147 million**

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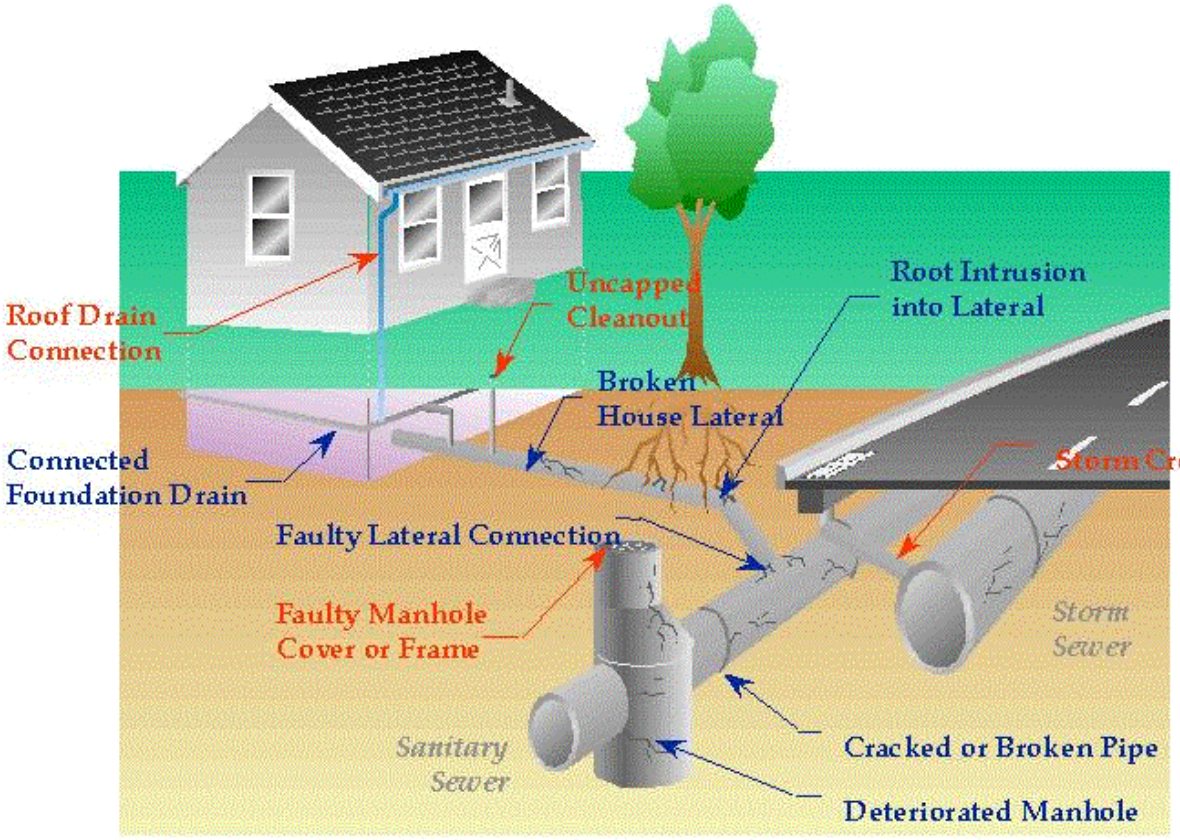
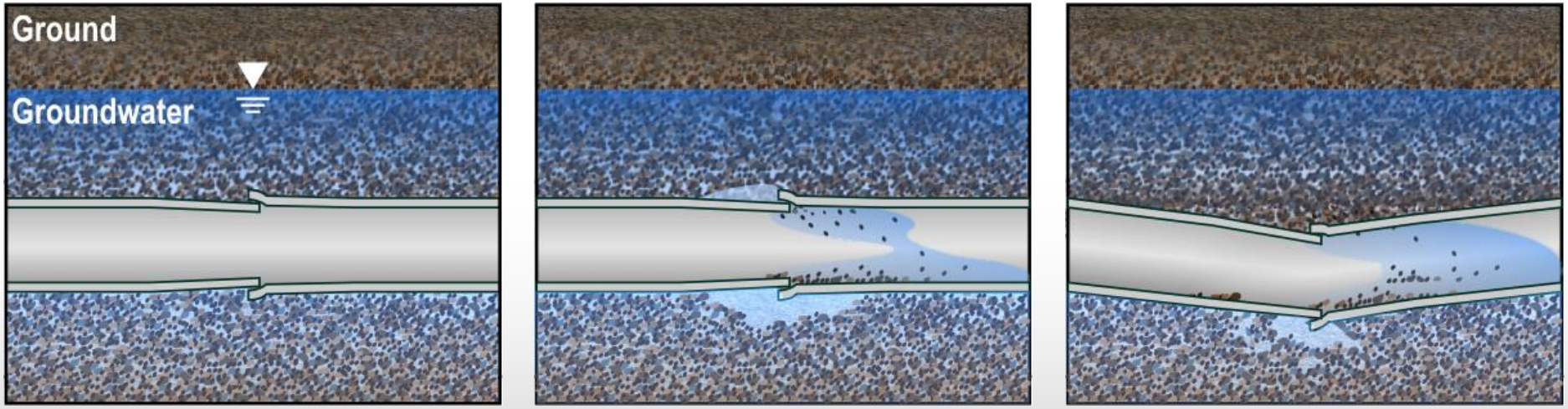
I/I sources


Roof Drain Connection
Uncapped Cleanout
Root Intrusion into Lateral
Broken House Lateral
Connected Foundation Drain
Storm Cross-Connection
Faulty Lateral Connection
Faulty Manhole Cover or Frame
Storm Sewer
Sanitary Sewer
Cracked or Broken Pipe
Deteriorated Manhole
Inflow Sources
Infiltration Sources

Erosion of bedding through leaky joints = sags, dropped joints



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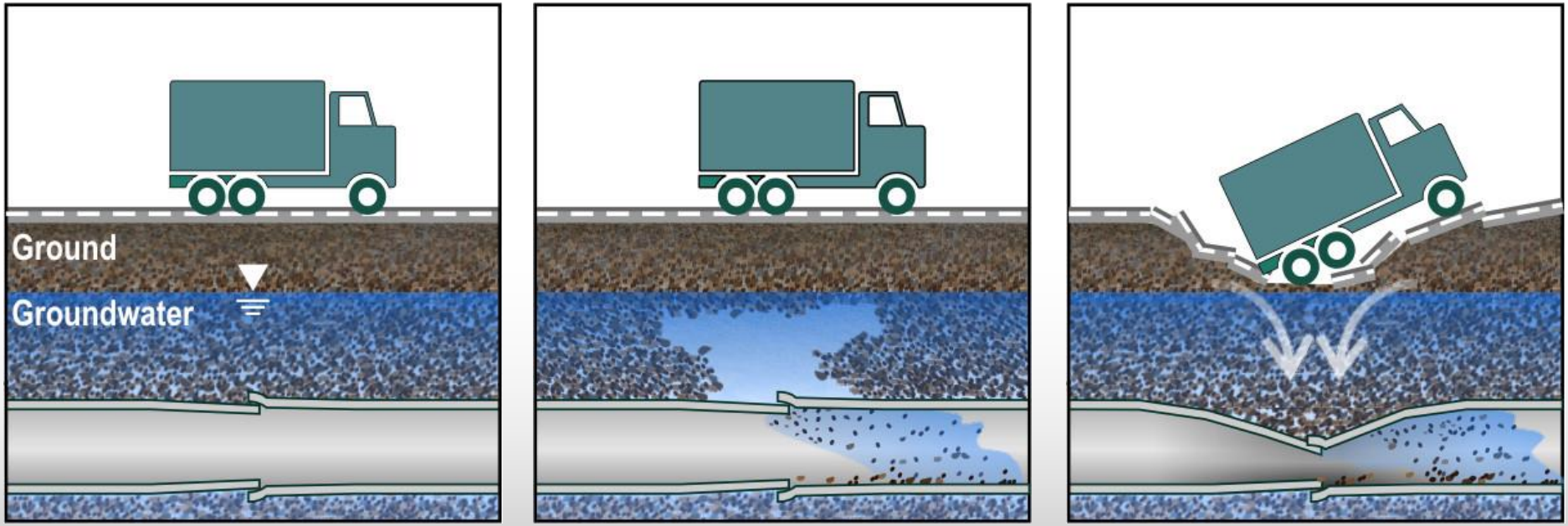
Erosion of backfill through leaky joints = voids, sinkholes



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Sinkholes are costly surprises

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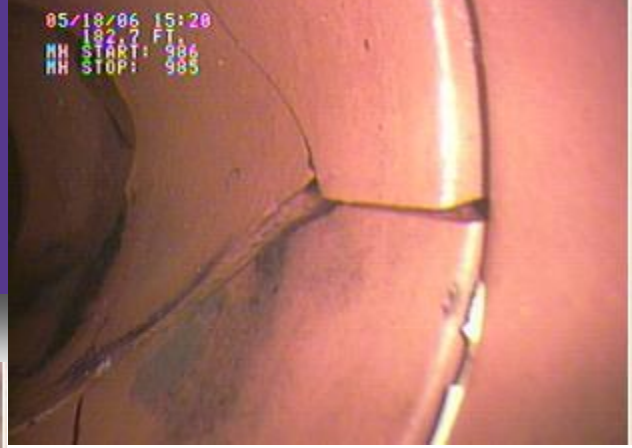
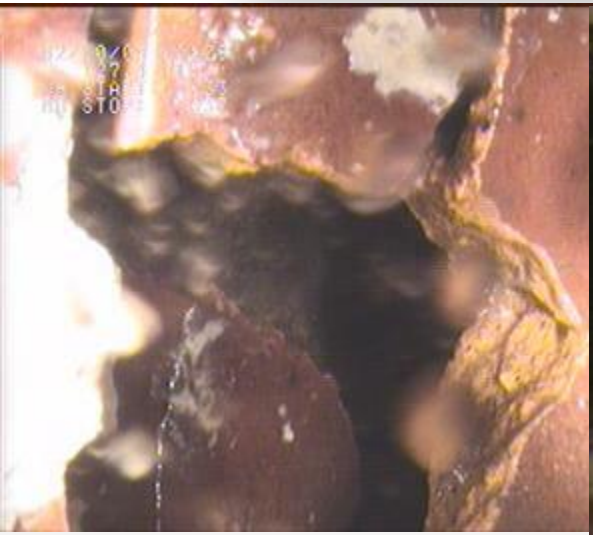
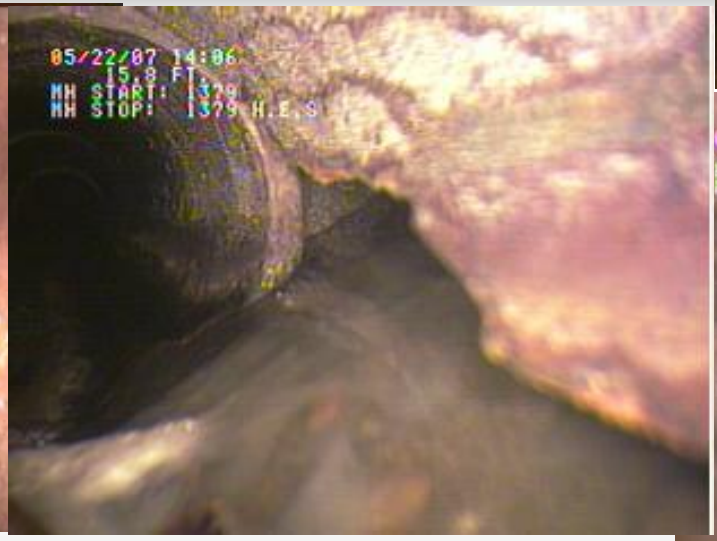
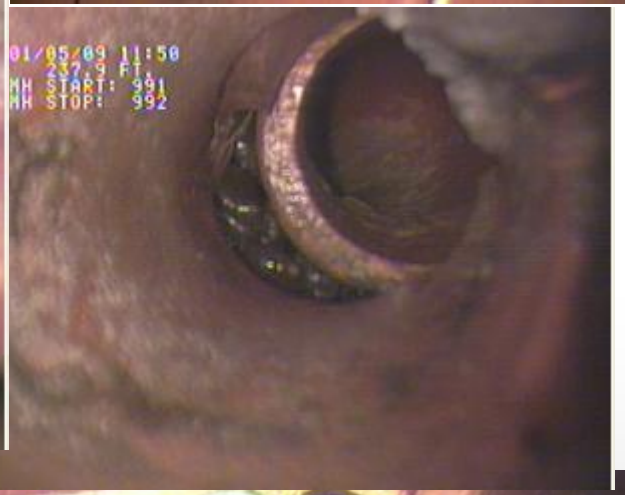
Structural defects in system

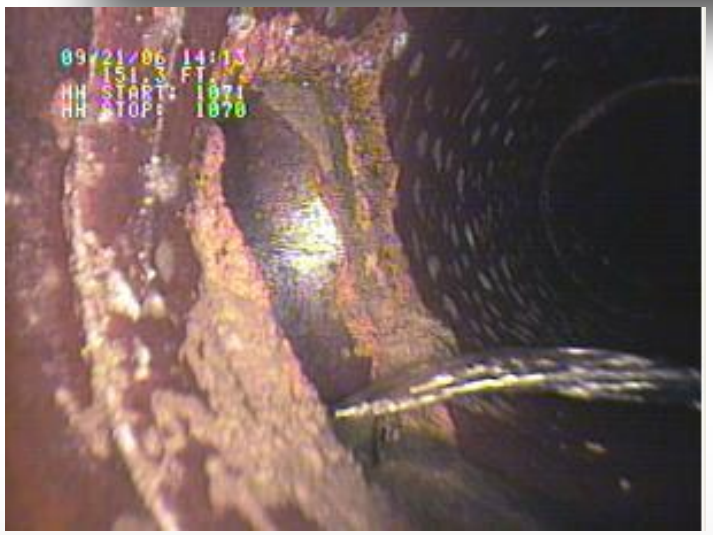








I/I defects



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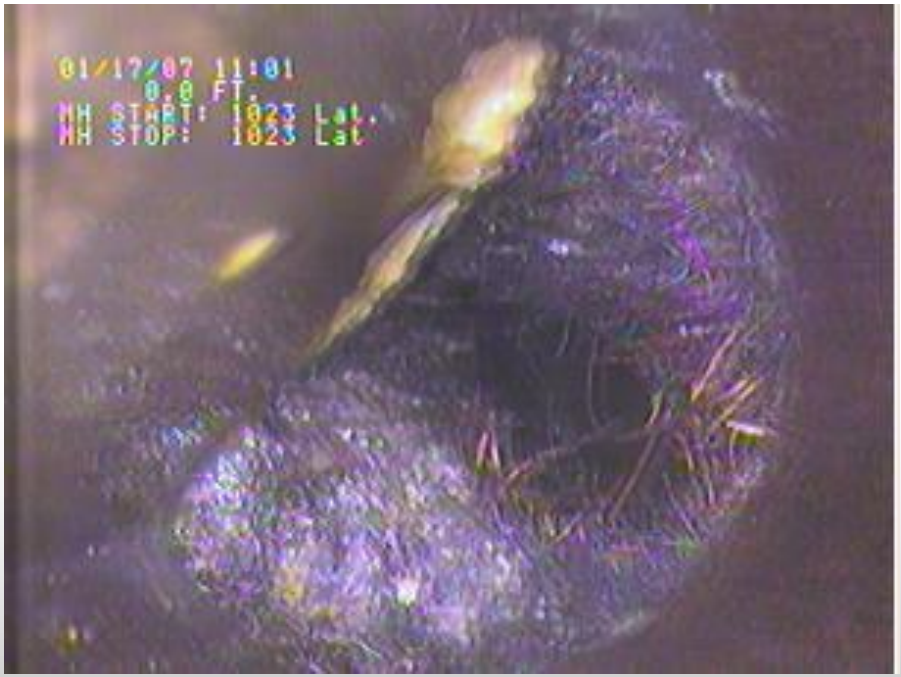
Roots can be ongoing problem



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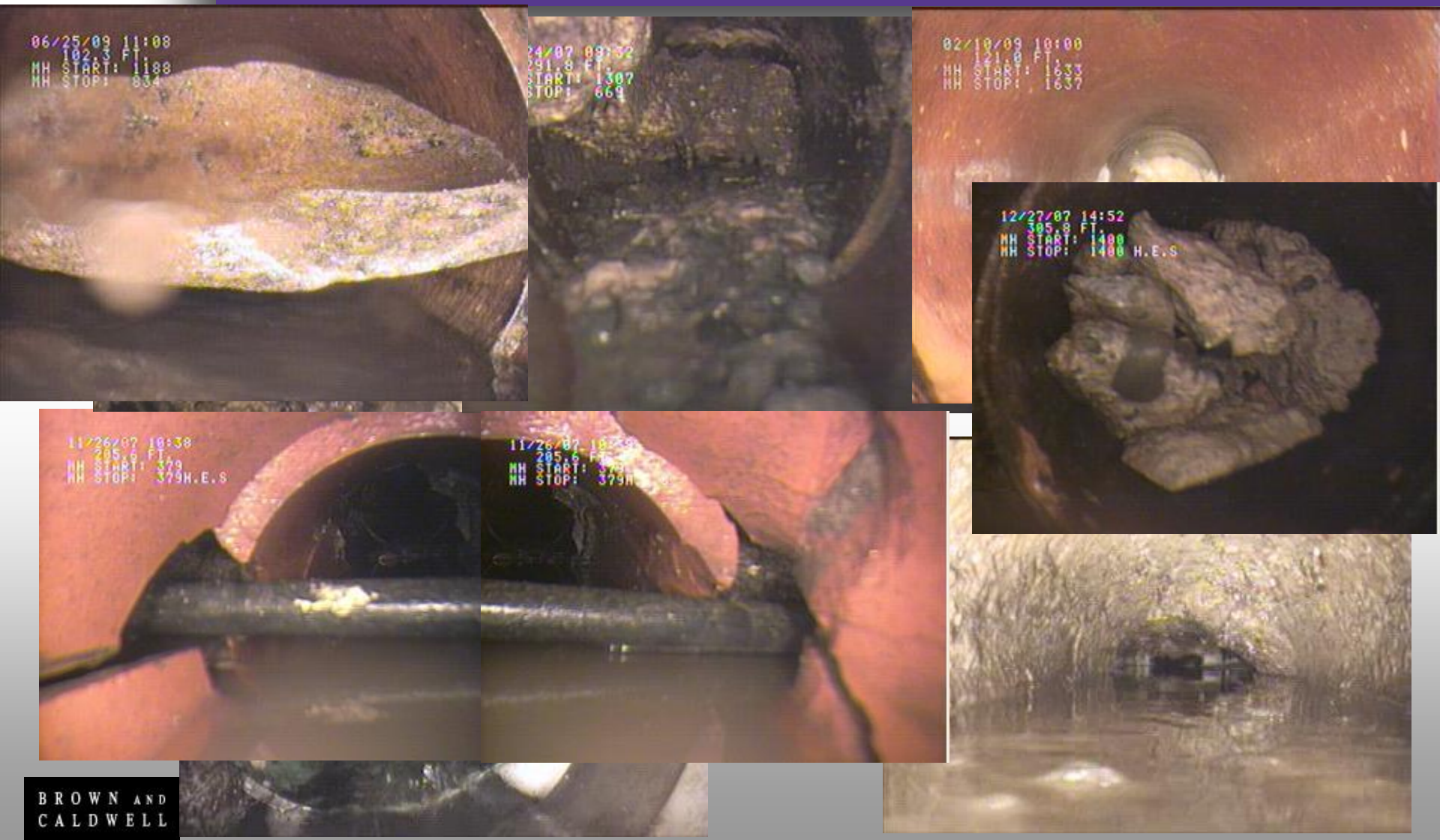
Debris or objects in sewer



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Eureka sewer system age

Pipe Age	Total Feet	% of System
Before 1920	193,585	35%
1921-1950	21,874	4%
1950-1970	175,739	32%
1970-1990	39,145	7%
1990-Present	48,861	9%
Unknown	74,376	13%

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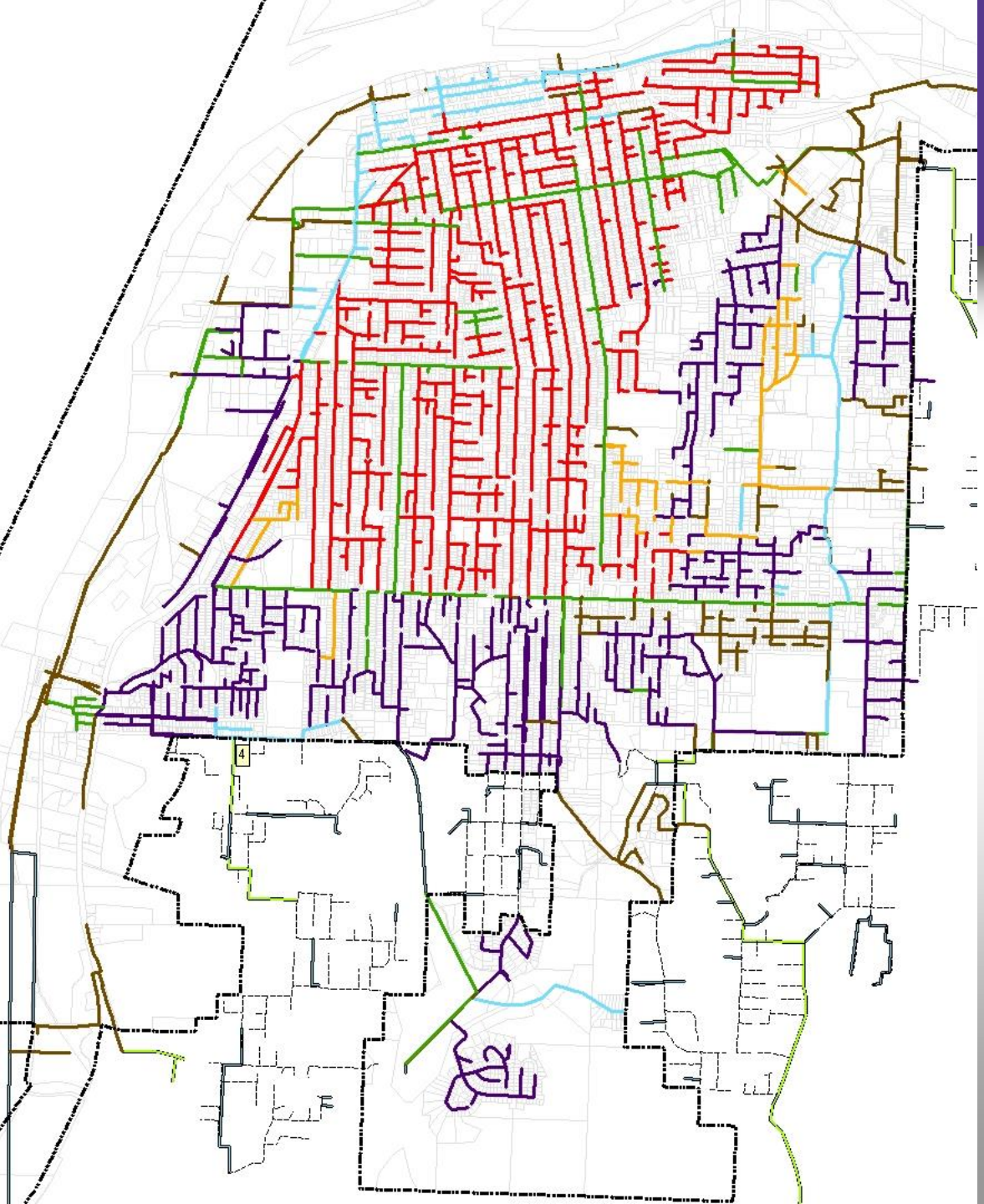
System age



- Before 1920
- 1921-1950
- 1950-1970
- 1970-1990
- 1990-Present
- Unknown

Materials of construction

Pipe Material	Total Feet	% of System
Vitrified Clay	452,014	80%
PVC	72,568	13%
Concrete or Asbestos Cement	17,544	3%
ABS/Polyethylene	12,948	2%
Cast Iron / Ductile Iron / Galvanized Iron	7,446	1%
Unknown	2,966	1%

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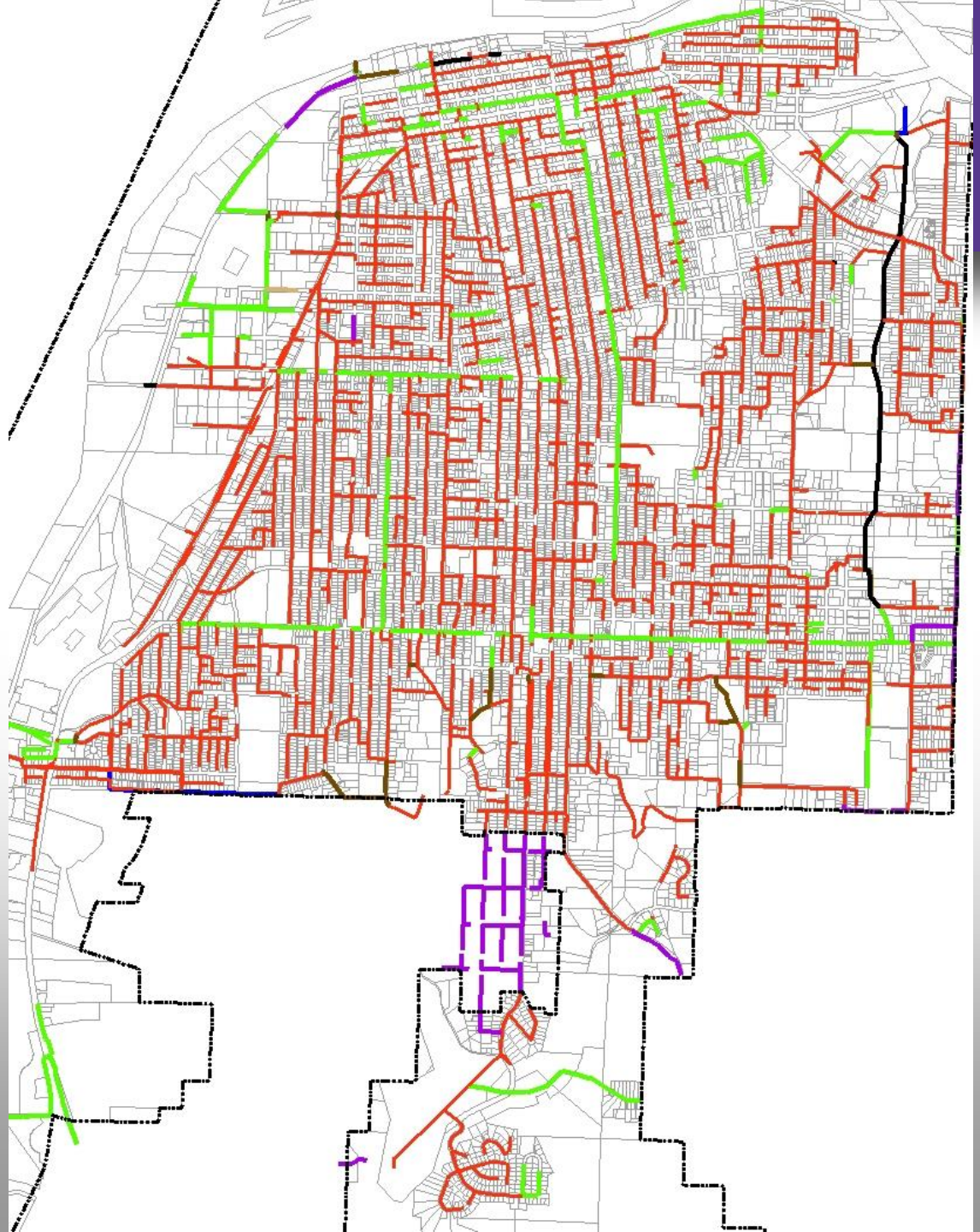
Materials of construction



- Unknown
- ABS/Polyethylene
- Concrete or Asbestos Cement
- PVC
- Cast Iron/Ductile Iron/Galvanized Iron
- Reinforced Plastic Mortar
- Stainless Steel
- Vitrified Clay

Sewer condition grade rating scale

- Level 5: Failed or will fail within 5 years
- Level 4: Failure likely in 5-10 years
- Level 3: May fail in 10-20 years
- Level 2: Unlikely to fail for at least 20 years
- Level 1: Unlikely to fail in foreseeable future

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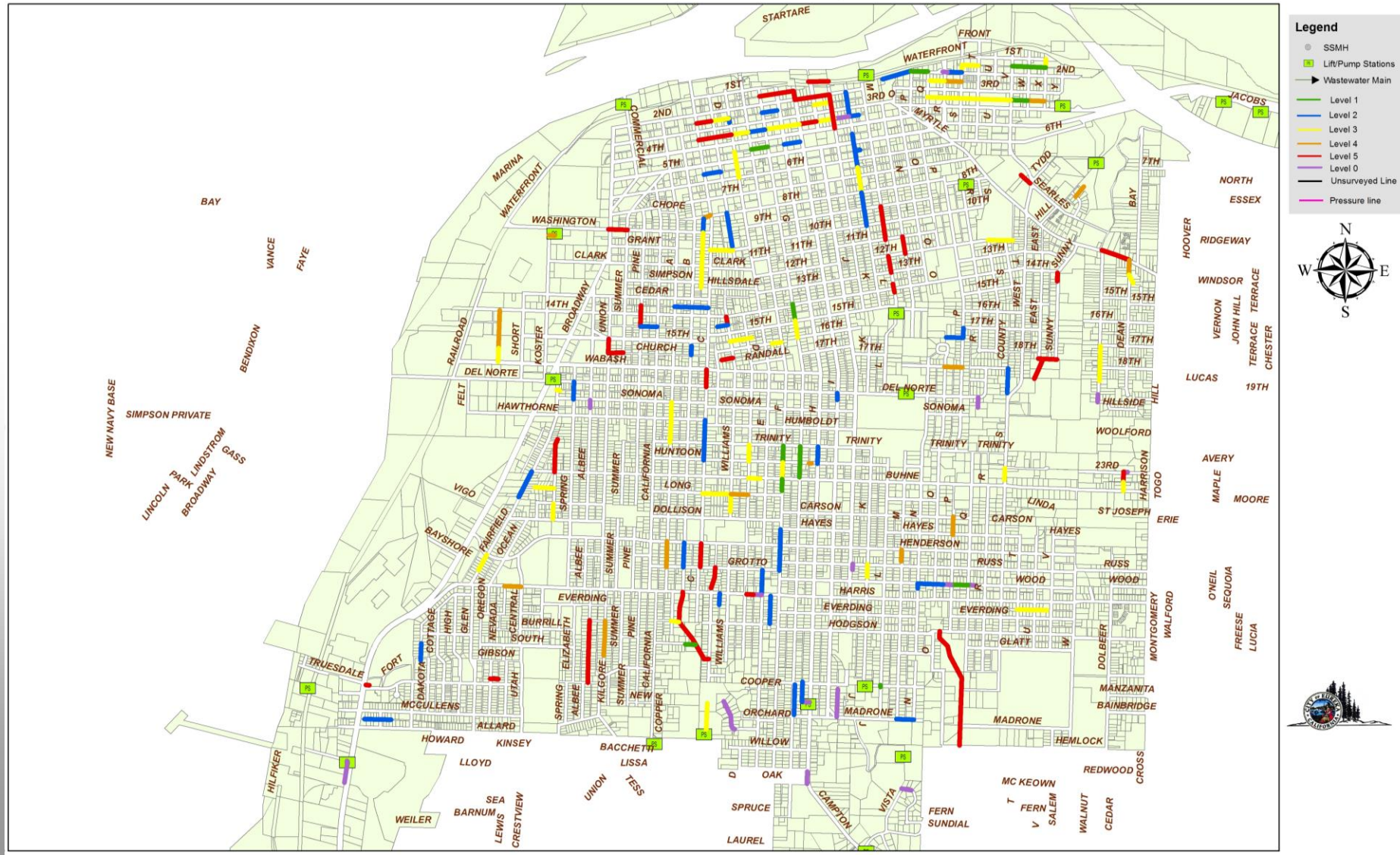
CCTV Inspections to Date



City's maintenance history

- Grease, roots, debris are most common problems
- 270 segments require annual (or more frequent) cleaning

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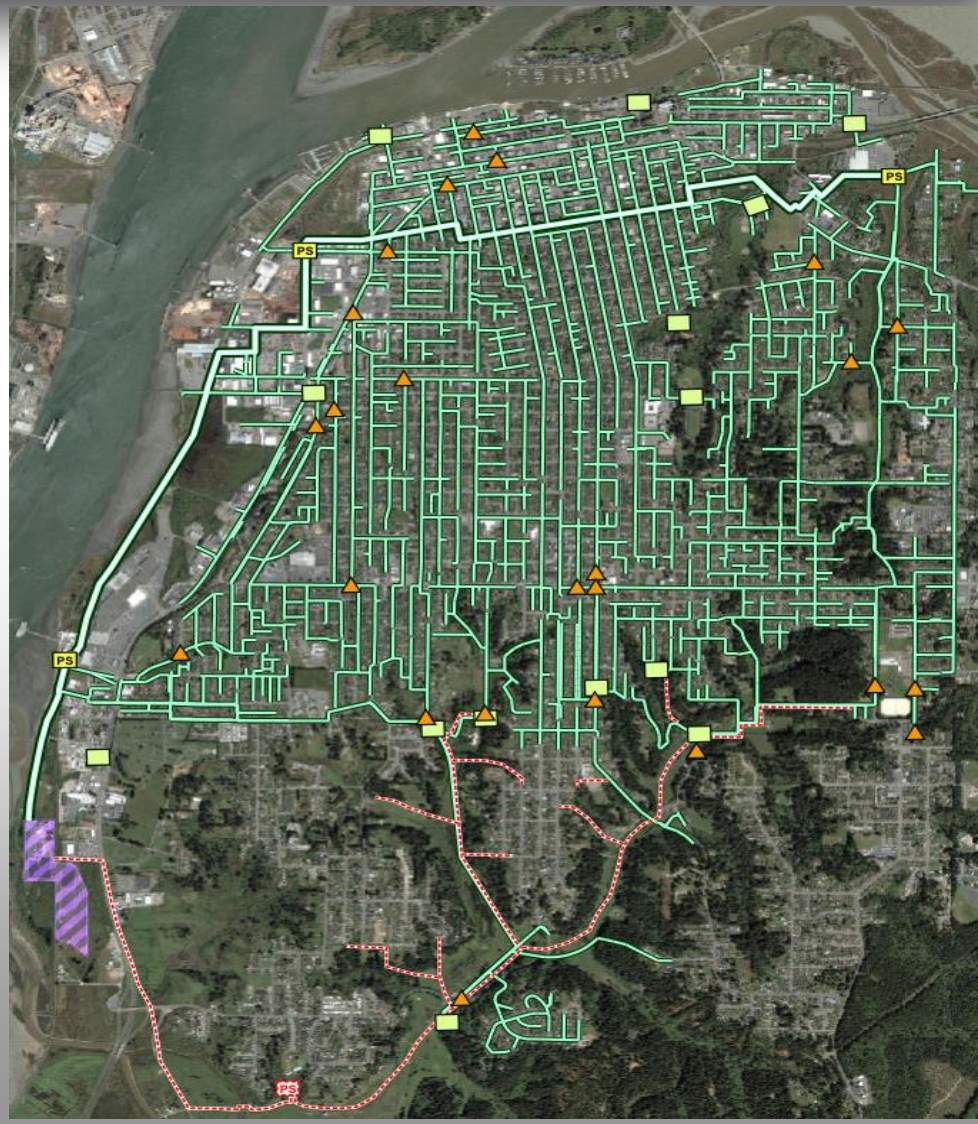
Collection system metering and modeling prioritizes I/I work and capacity needs

- Flow monitoring
- Hydrologic modeling
- Hydraulic modeling
- Lift stations and pump stations



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Flow Monitoring:
27 City meters + 7 HCSD meters

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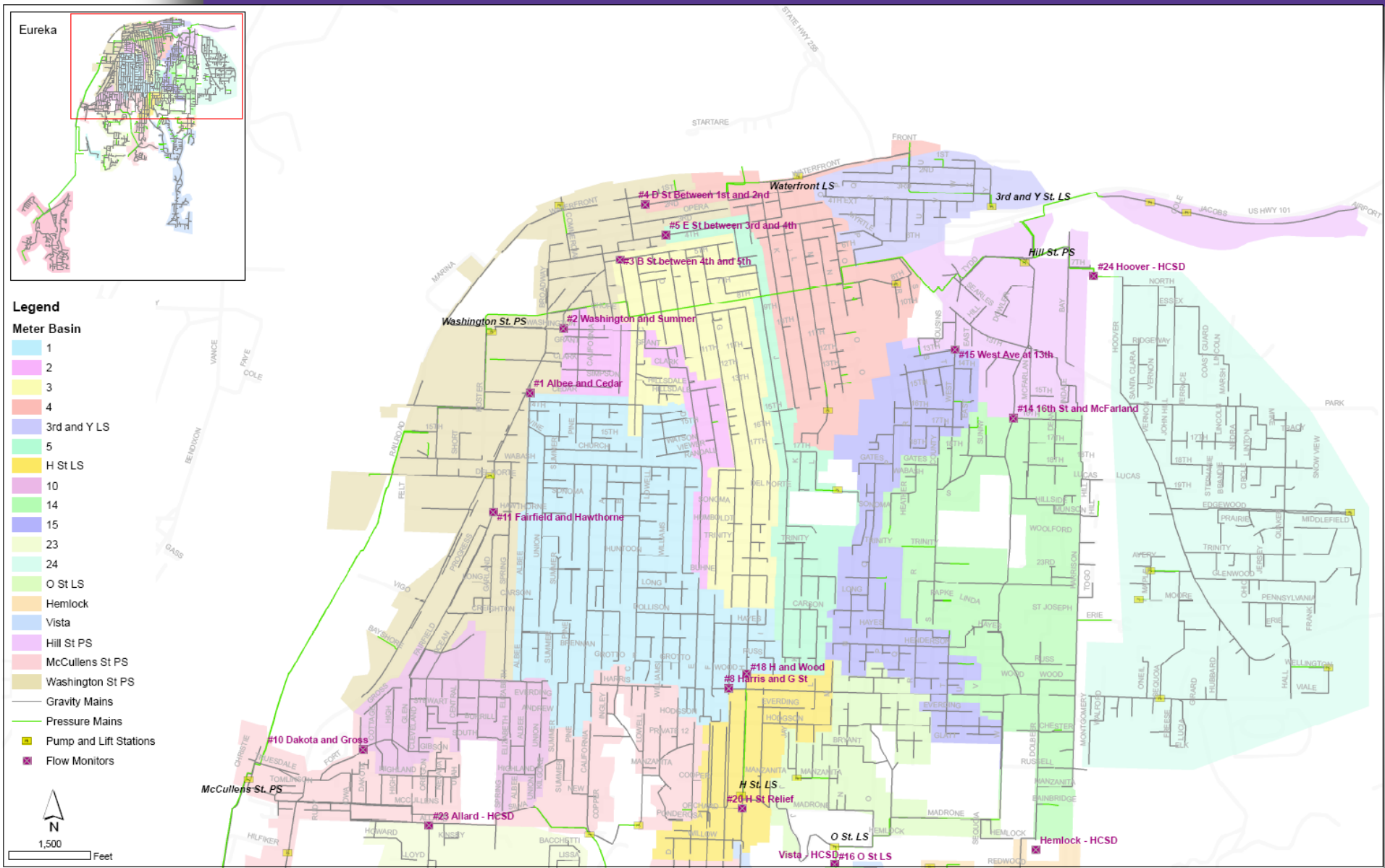
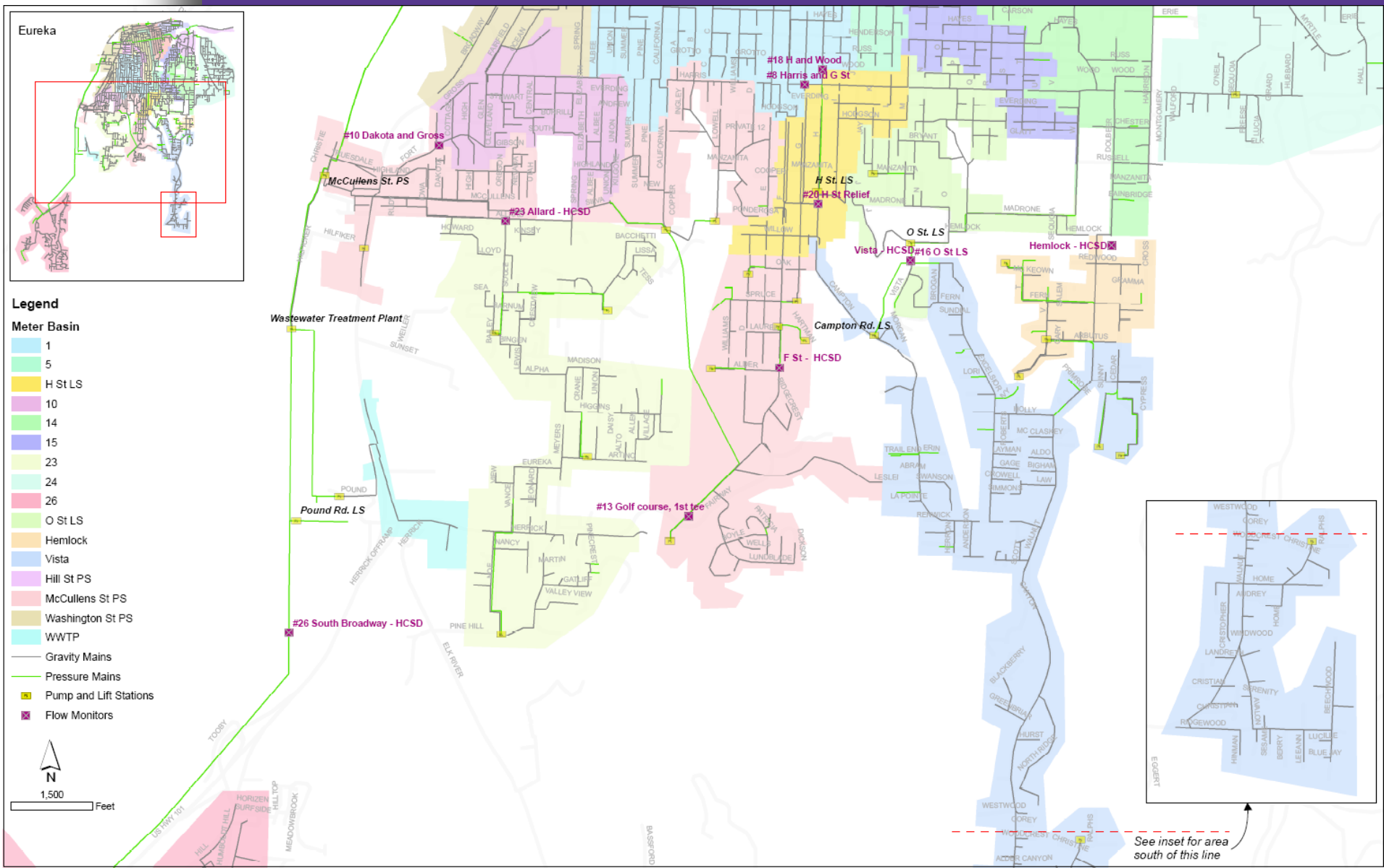
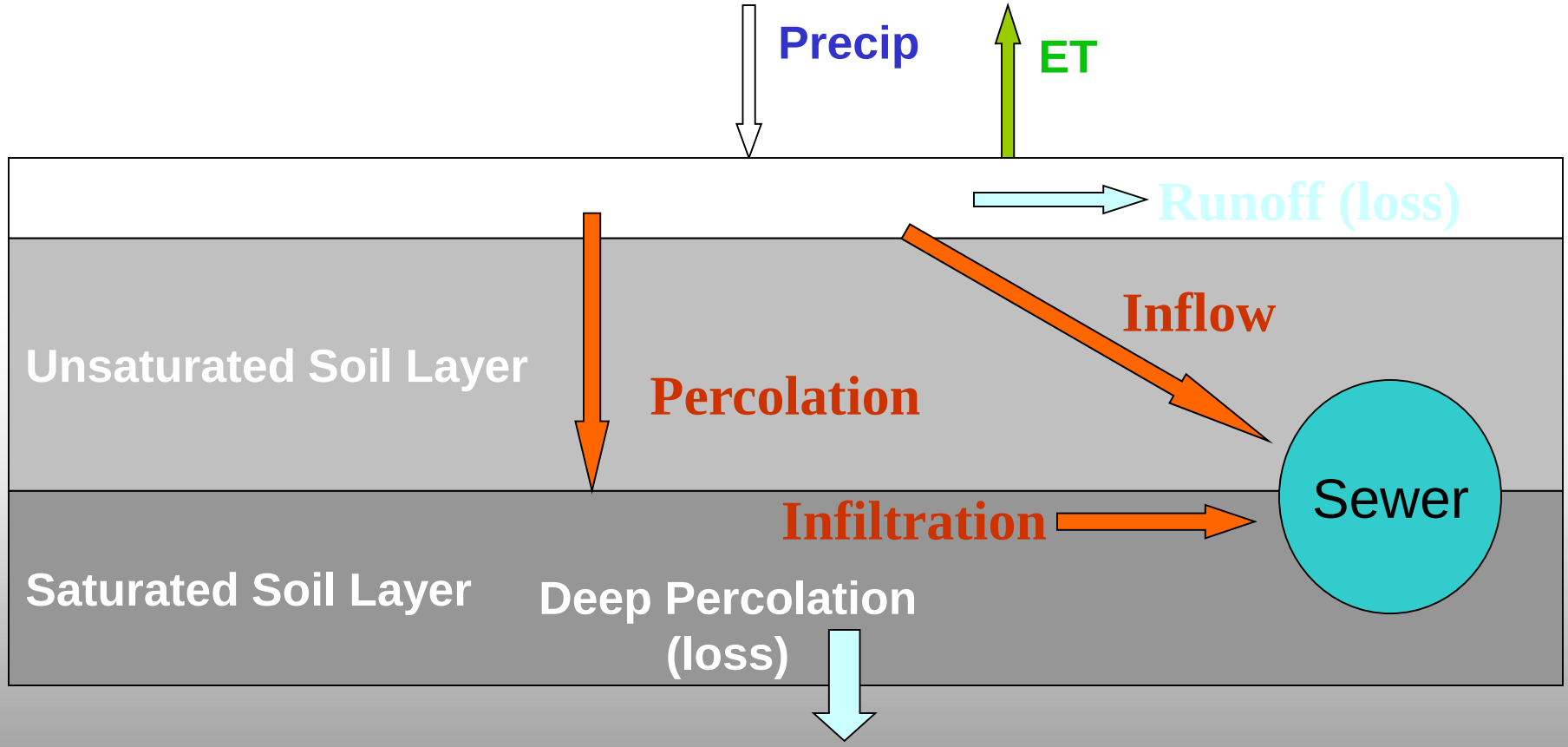
Flow metering subbasins



Flow metering subbasins



Simulation model mimics the hydrologic process



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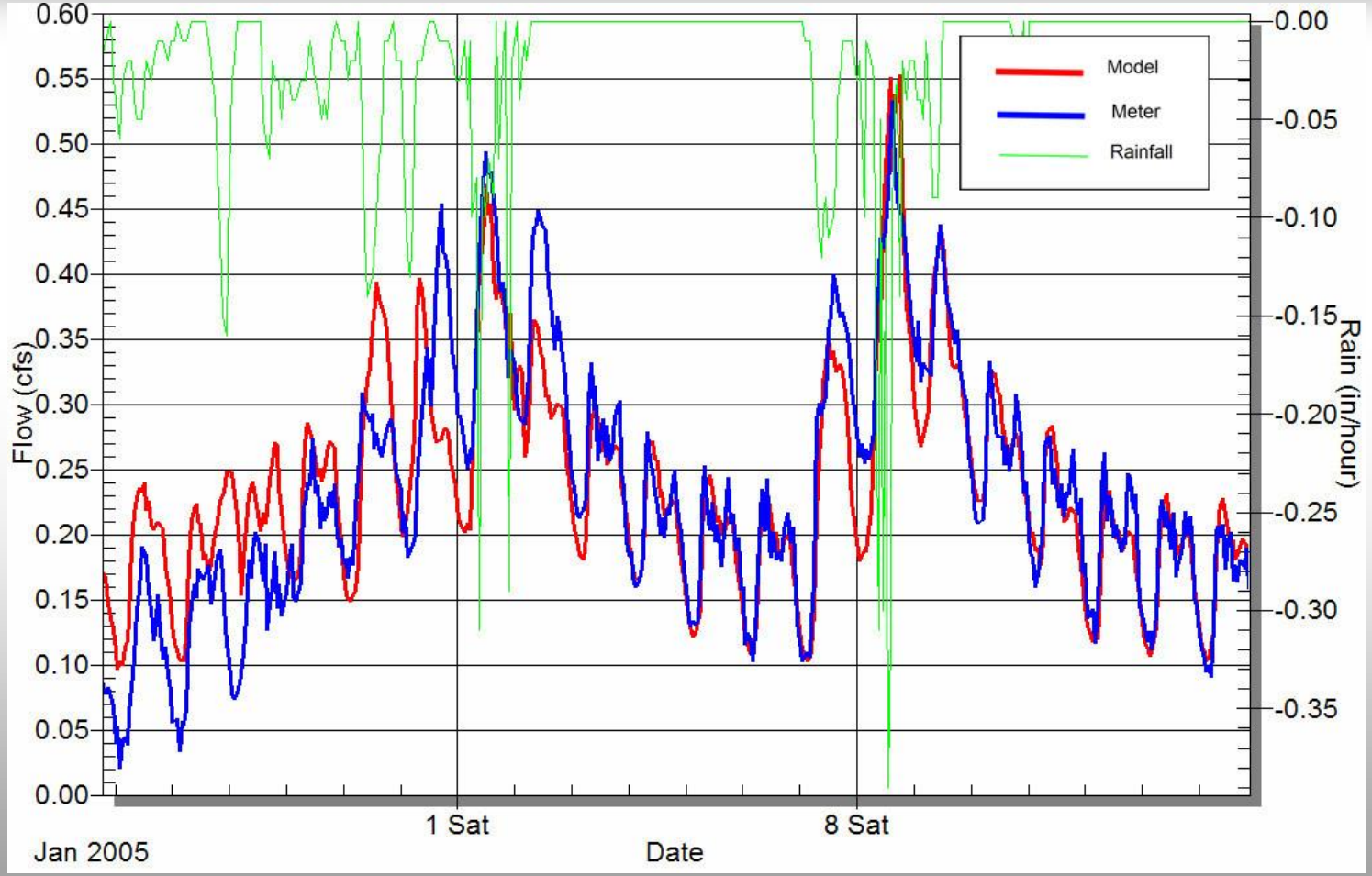
City flow meter shows significant I/I response to rainfall



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41% of the I/I comes from 22% of the overall system, all City basins

Basin	Area (acres)	Pipe Length (feet)	20-year peak hour I/I (mgd)
3rd & Y LS	120	17,440	1.6
O Street LS	195	28,297	2.2
H Street LS	149	21,605	1.7
16th and McFarland	352	51,102	3.1
Hill Street PS	185	26,830	1.5
Washington Street PS	418	60,757	3.0
Total	**1,419**	**206,031**	**13.0**
Eureka and HCSD System Totals	6,434	934,084	31.8
Priority Basins (% of Total System)	**22%**	**22%**	**41%**

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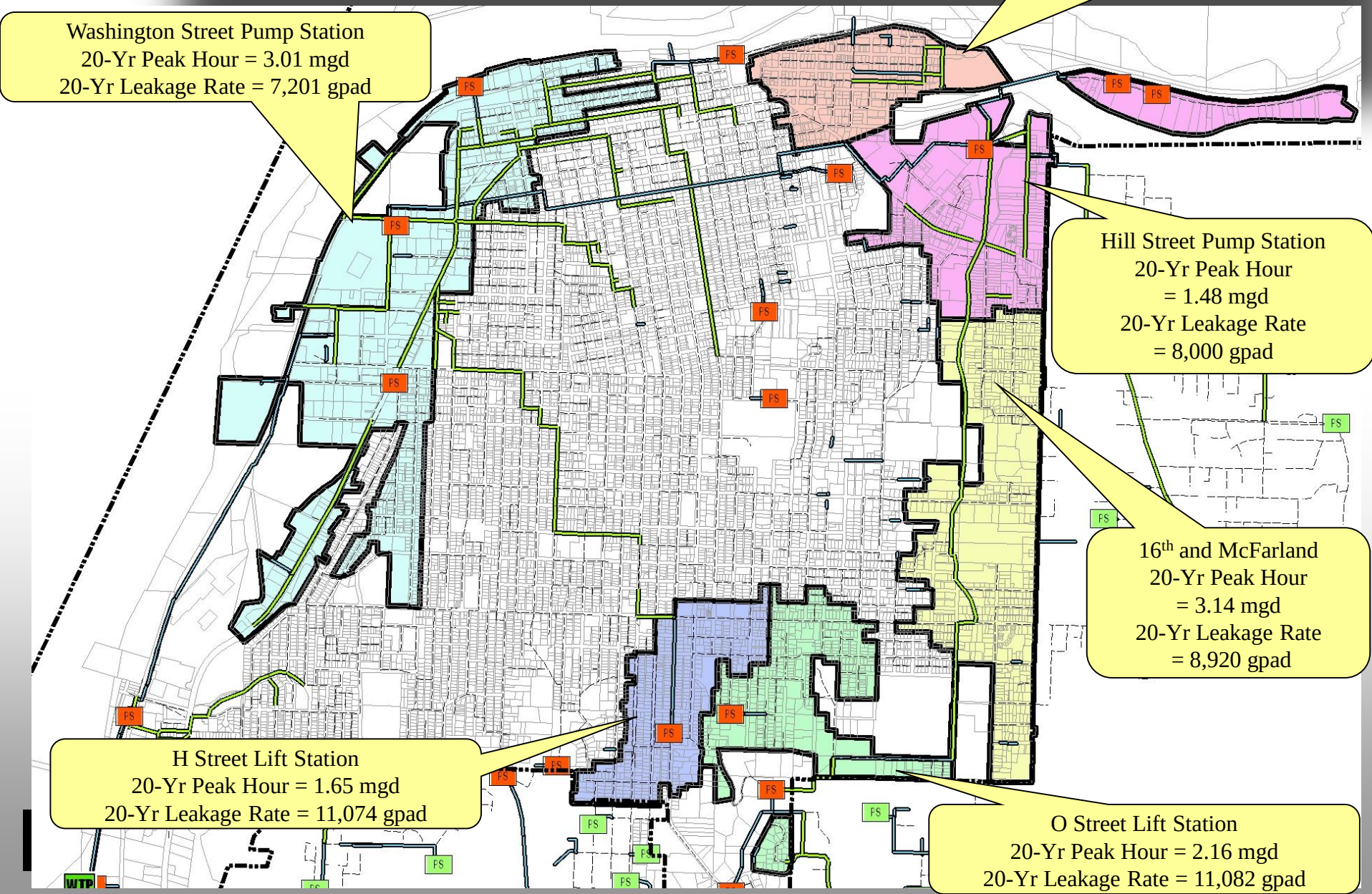
6 priority basins



Rehabilitation of top six basins will take many years

Basin	Pipe Length (feet)	Mains Only ($)	Mains and Connections ($)
3rd & Y LS	17,440	$ 2,616,000	$ 5,563,164
O Street LS	28,297	$ 4,244,550	$ 9,026,425
H Street LS	21,605	$ 3,240,750	$ 6,891,752
16th and McFarland	51,102	$ 7,665,300	$16,300,964
Hill Street PS	26,830	$ 4,024,500	$ 8,558,468
Washington Street PS	60,757	$ 9,113,550	$19,380,800
Total	**206,031**	**$31 million**	**$66 million**

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Recommendations

Minimize cost of ownership over long-term

- Spend the right amount at the right time in the right place
- Deferring needed maintenance shortens asset life and increases life-cycle cost
- Deferring rehab or replacement results in more expensive emergency projects

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Collection system management

- Complete TV inspection of entire system in 2 to 3 years
- Fix pipes in immediate danger of structural failure
- Correlate TV inspection results with modeling to prioritize rehabilitation effort
- Identify and separate inflow sources in Priority Basins
- Develop private service lateral rehab policy
- Update collection system CIP with specific projects
- Start rehab work

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Private service laterals contribute at least 50% of I/I and must be part of rehab program for success

- Built to lower standard, received less maintenance
- Policy issues
  - Who pays?
  - Addressed at time of sale of building?
  - Cost sharing, financing
  - Upper lateral, lower lateral or both?
  - Part of public contract?
  - Technologies
  - Street patching vs. overlay

BROWN AND CALDWELL

Major Capital Improvement Projects Summary (Through Fiscal Year 2014)

Project Component	City ($)	HCSD ($)	Total ($)
Biosolids Dewatering Facility	$1.36M	$0.64M	$2M
Solids Thickening Facility	$1.8M	$0.8M	$2.6M
Standby Generator	$0.27M	$0.13M	$0.4M
Outfall Stabilization	$0.7M	$0.3M	$1M
Martin Slough Interceptor (a)	$6M	$9.5M	$15.5M
I/I Reduction Program	$6M	0	$6M
Sewer Replacement Program (b)	$3.75M	0	$3.75M
Cross Town Interceptor Cathodic Protection	$136,000	$64,000	$0.2M
Total (c)	**$20M**	**$11.5M**	**$31.5**

(a) **The Martin Slough Project total cost is estimated at $19.9M. Grant funding from EPA and Proposition 50 will provide $4.4M**

(b) **The City has allocated $750K per year for it's Sewer Replacement Program.**

(c) **Total CIP estimate is $35.9M including allocated grant funding from EPA and Proposition 50 ($31.5M + $4.4M = $35.9M)**

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Questions?