2010 to 2030 Wastewater Facilities Plan Update

City of Eureka

August 20, 2009
Topics for Discussion:

- Purpose
- Findings
- Recommendations
- Capital Improvements Summary
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
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
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)
Wastewater Treatment Facility
Wastewater Treatment Facility
Effluent and Sludge Storage

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
Wastewater Treatment Facility
Liquid and Solids Treatment

KEY
- Existing structures
- Future structures (per 1981 design)

1. Administration building
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13. Biosolids building
14. Maintenance building
Wastewater Treatment Facility
Effluent Disposal Pipe in Humboldt Bay (4,000 ft)
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
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
Wastewater Treatment Facility
Near Term Projects
Wastewater Treatment Facility
Near Term Projects

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

Purpose of Project

Dewatering of digested biosolids will facilitate efficient disposal and bring City into compliance with the NPDES permit.
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
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.
A solids thickening facility will provide the digester redundancy required to maintain compliance with the NPDES Permit.
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
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
A standby generator is needed to meet Permit requirements for emergency power during a power outage.
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
# Wastewater Treatment Facility
## Summary of Major Near-Term Capital Projects

<table>
<thead>
<tr>
<th>Project Component</th>
<th>City ($)</th>
<th>HCSD ($)</th>
<th>Total ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biosolids Dewatering Facility</td>
<td>$1.36M</td>
<td>$0.64M</td>
<td>$2M</td>
</tr>
<tr>
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<td>$1.8M</td>
<td>$0.8M</td>
<td>$2.6M</td>
</tr>
<tr>
<td>Outfall Stabilization</td>
<td>$0.7M</td>
<td>$0.3M</td>
<td>$1M</td>
</tr>
<tr>
<td>Standby Generator</td>
<td>$0.27M</td>
<td>$0.13M</td>
<td>$0.4M</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$4.13M</strong></td>
<td><strong>$1.87M</strong></td>
<td><strong>$6M</strong></td>
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</tbody>
</table>
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
Martin Slough Project Eliminates Re-pumping and Saves Energy Costs

Current Pumping Configuration

WWTP

Washington P.S. To remain

H St. L.S. City

Hill St. P.S. To remain

O St L.S. City

K St L.S. City

Campton L.S.

Pine Hill L.S.

Hidden Meadows L.S.

Artino L.S.

Sea Ave L.S.

Alder L.S.

Lowell L.S. City

F St L.S.

Hartman L.S.

D St L.S.

Spruce L.S.

McCullens P.S. To Remain

Bailey L.S. To remain

California L.S. City

Golf Course L.S. City

Lowell L.S. City

K St L.S. City

Hartman L.S.
Existing System
20-year Peak Flows
Existing population
20-year Peak Flow after Implementation of Martin Slough Project-future population
Martin Slough Interceptor

Four Components:
1. Interceptor
Martin Slough Pump Station

Four Components:
1. Interceptor
2. Pump Station
Martin Slough Force Main

Four Components:
1. Interceptor
2. Pump Station
3. Force Main
Martin Slough Collector Sewers (Flow Redirection)

Four Components:
1. Interceptor
2. Pump Station
3. Force Main
4. Redirection of Existing Lift Station Flows
### Martin Slough Interceptor Breakdown of Costs

<table>
<thead>
<tr>
<th>Project Component</th>
<th>City ($)</th>
<th>HCSD ($)</th>
<th>Total ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interceptor (a)</td>
<td>$1M</td>
<td>$1.8M</td>
<td>$2.8M</td>
</tr>
<tr>
<td>Pump Station</td>
<td>$1.6M</td>
<td>$2.9M</td>
<td>$4.5M</td>
</tr>
<tr>
<td>Forcemain</td>
<td>$2.7M</td>
<td>$4.8M</td>
<td>$7.5M</td>
</tr>
<tr>
<td>Re-direct Flows</td>
<td>$700K</td>
<td>$TBD</td>
<td>$700K</td>
</tr>
<tr>
<td><strong>Total (b)</strong></td>
<td><strong>$6M</strong></td>
<td><strong>$9.5M</strong></td>
<td><strong>$15.5M</strong></td>
</tr>
</tbody>
</table>

(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).
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
Eureka’s sewer system is a very valuable asset

<table>
<thead>
<tr>
<th>Component</th>
<th>Quantity</th>
<th>Unit cost</th>
<th>Replacement cost total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public mains</td>
<td>566,187 feet</td>
<td>$150</td>
<td>$85 million</td>
</tr>
<tr>
<td>Private service laterals</td>
<td>12,316 (85% single family residential)</td>
<td>$5,000</td>
<td>$62 million</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>$147 million</strong></td>
</tr>
</tbody>
</table>
I/I sources

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

- Infiltration Sources
  - Sanitary Sewer
  - Storm Sewer
  - Roof Drain Connection
Erosion of bedding through leaky joints = sags, dropped joints
Erosion of backfill through leaky joints = voids, sinkholes
Sinkholes are costly surprises
Structural defects in system
Roots can be ongoing problem
Debris or objects in sewer
## Eureka sewer system age

<table>
<thead>
<tr>
<th>Pipe Age</th>
<th>Total Feet</th>
<th>% of System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before 1920</td>
<td>193,585</td>
<td>35%</td>
</tr>
<tr>
<td>1921-1950</td>
<td>21,874</td>
<td>4%</td>
</tr>
<tr>
<td>1950-1970</td>
<td>175,739</td>
<td>32%</td>
</tr>
<tr>
<td>1970-1990</td>
<td>39,145</td>
<td>7%</td>
</tr>
<tr>
<td>1990-Present</td>
<td>48,861</td>
<td>9%</td>
</tr>
<tr>
<td>Unknown</td>
<td>74,376</td>
<td>13%</td>
</tr>
</tbody>
</table>
# Materials of construction

<table>
<thead>
<tr>
<th>Pipe Material</th>
<th>Total Feet</th>
<th>% of System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vitrified Clay</td>
<td>452,014</td>
<td>80%</td>
</tr>
<tr>
<td>PVC</td>
<td>72,568</td>
<td>13%</td>
</tr>
<tr>
<td>Concrete or Asbestos Cement</td>
<td>17,544</td>
<td>3%</td>
</tr>
<tr>
<td>ABS/Polyethylene</td>
<td>12,948</td>
<td>2%</td>
</tr>
<tr>
<td>Cast Iron / Ductile Iron / Galvanized Iron</td>
<td>7,446</td>
<td>1%</td>
</tr>
<tr>
<td>Unknown</td>
<td>2,966</td>
<td>1%</td>
</tr>
</tbody>
</table>
Materials of construction
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
CCTV Inspections to Date
City’s maintenance history

- Grease, roots, debris are most common problems
- 270 segments require annual (or more frequent) cleaning
Collection system metering and modeling prioritizes I/I work and capacity needs

- Flow monitoring
- Hydrologic modeling
- Hydraulic modeling
- Lift stations and pump stations
Flow Monitoring:
27 City meters + 7 HCSD meters
Flow metering subbasins
Flow metering subbasins
Simulation model mimics the hydrologic process
City flow meter shows significant I/I response to rainfall
41% of the I/I comes from 22% of the overall system, all City basins

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

- Washington Street Pump Station
  - 20-Yr Peak Hour = 3.01 mgd
  - 20-Yr Leakage Rate = 7,201 gpad

- H Street Lift Station
  - 20-Yr Peak Hour = 1.65 mgd
  - 20-Yr Leakage Rate = 11,074 gpad

- 3rd and Y Lift Station
  - 20-Yr Peak Hour = 1.60 mgd
  - 20-Yr Leakage Rate = 13,333 gpad

- Hill Street Pump Station
  - 20-Yr Peak Hour = 1.48 mgd
  - 20-Yr Leakage Rate = 8,000 gpad

- O Street Lift Station
  - 20-Yr Peak Hour = 2.16 mgd
  - 20-Yr Leakage Rate = 11,082 gpad

- 16th and McFarrland
  - 20-Yr Peak Hour = 3.14 mgd
  - 20-Yr Leakage Rate = 8,920 gpad
Rehabilitation of top six basins will take many years

<table>
<thead>
<tr>
<th>Basin</th>
<th>Pipe Length (feet)</th>
<th>Mains Only ($)</th>
<th>Mains and Connections ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3rd &amp; Y LS</td>
<td>17,440</td>
<td>$2,616,000</td>
<td>$5,563,164</td>
</tr>
<tr>
<td>O Street LS</td>
<td>28,297</td>
<td>$4,244,550</td>
<td>$9,026,425</td>
</tr>
<tr>
<td>H Street LS</td>
<td>21,605</td>
<td>$3,240,750</td>
<td>$6,891,752</td>
</tr>
<tr>
<td>16th and McFarland</td>
<td>51,102</td>
<td>$7,665,300</td>
<td>$16,300,964</td>
</tr>
<tr>
<td>Hill Street PS</td>
<td>26,830</td>
<td>$4,024,500</td>
<td>$8,558,468</td>
</tr>
<tr>
<td>Washington Street PS</td>
<td>60,757</td>
<td>$9,113,550</td>
<td>$19,380,800</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>206,031</strong></td>
<td><strong>$31 million</strong></td>
<td><strong>$66 million</strong></td>
</tr>
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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
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
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
Major Capital Improvement Projects Summary (Through Fiscal Year 2014)

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<td>$0.4M</td>
</tr>
<tr>
<td>Outfall Stabilization</td>
<td>$0.7M</td>
<td>$0.3M</td>
<td>$1M</td>
</tr>
<tr>
<td>Martin Slough Interceptor (a)</td>
<td>$6M</td>
<td>$9.5M</td>
<td>$15.5M</td>
</tr>
<tr>
<td>I/I Reduction Program</td>
<td>$6M</td>
<td>0</td>
<td>$6M</td>
</tr>
<tr>
<td>Sewer Replacement Program (b)</td>
<td>$3.75M</td>
<td>0</td>
<td>$3.75M</td>
</tr>
<tr>
<td>Cross Town Interceptor Cathodic Protection</td>
<td>$136,000</td>
<td>$64,000</td>
<td>$0.2M</td>
</tr>
<tr>
<td><strong>Total (c)</strong></td>
<td><strong>$20M</strong></td>
<td><strong>$11.5M</strong></td>
<td><strong>$31.5</strong></td>
</tr>
</tbody>
</table>

(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)
Questions?