LARGE-DIAMETER PIPELINE REHABILITATION

CHARLES NGO
TRUNK LINE DESIGN MANAGER
WATER ENGINEERING AND TECHNICAL SERVICES
AGENDA

- LADWP System Overview
- Asset Management
- Pipeline Rehabilitation
2015 WATER SYSTEM STATISTICS

- 2nd Largest Municipal Water Utility in U.S.
- Serving 3.9 Million People
- Average Usage is 131 Gallons Per Day
- 473 Square Miles of Service Area
- 6,734 Miles of Mainlines & 542 Miles of Trunk Lines
Overview:

- 24 in. diameter & greater
- 542 miles in total length
- In the next decade, 120 miles (22%) of TL’s will reach their useful life of 100 years
- Average replacement rate from last 10 years is 2.6 miles per year
- At this rate, the replacement cycle is almost 210 years
TRUNK LINE OVERVIEW

Inventory by Decade

- Length (Miles)

120 Miles
<table>
<thead>
<tr>
<th>Material</th>
<th>Avg Life (yr)</th>
<th>20-in to 39-in</th>
<th>40-in to 59-in</th>
<th>60-in to 79-in</th>
<th>80-in to 99-in</th>
<th>Ø&gt;100-in</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asbestos Concrete (AC)</td>
<td>60</td>
<td>0.00</td>
<td>-</td>
<td>0.01</td>
<td>-</td>
<td>-</td>
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<tr>
<td>Cast Iron (Cl)</td>
<td>100</td>
<td>65.26</td>
<td>1.19</td>
<td>0.19</td>
<td>0.02</td>
<td>-</td>
</tr>
<tr>
<td>Reinforced Concrete (CONC)</td>
<td>60</td>
<td>9.83</td>
<td>28.14</td>
<td>33.05</td>
<td>0.00</td>
<td>-</td>
</tr>
<tr>
<td>Corrugated Metal (CM)</td>
<td>60</td>
<td>0.11</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Ductile Iron (DI)</td>
<td>100</td>
<td>27.99</td>
<td>12.49</td>
<td>0.04</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>High Density Polyethylene (HDPE)</td>
<td>80</td>
<td>5.12</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Steel (STL)</td>
<td>120</td>
<td>190.56</td>
<td>82.40</td>
<td>71.68</td>
<td>10.34</td>
<td>2.03</td>
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<tr>
<td>Unknown Materials (UNKN)</td>
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<td>0.05</td>
<td>0.00</td>
<td>-</td>
<td>0.00</td>
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<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
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</table>

_Last Update: 7/1/2014, Source: GIS Pipe Data_
TRUNK LINE OVERVIEW

Inventory by Diameter & Material Types

- Cast Iron (CI)
- Reinforced Concrete (CONC)
- Ductile Iron (DI)
- High Density Polyethylene (HDPE)
- Steel (STL)

Length (Miles)

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<th>Cast Iron (CI)</th>
<th>Reinforced Concrete (CONC)</th>
<th>Ductile Iron (DI)</th>
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Likelihood of Failure (LOF) Factors

- Leaks
- Pipe Materials
- Service Life
- Soil Corrosivity
- Water Pressure
Consequences of Failure (COF) Factors

- Community Safety, Health, and Welfare
- Environmental and Traffic Impacts
- Repair Costs
- Lost Revenue
- Critical Customers
ASSET MANAGEMENT

TRUNK LINE
BUSINESS RISK EXPOSURE

Business Risk Exposure Score
Average is 2.6 miles per year. 210 year replacement cycle.
TRUNK LINE REPLACEMENT GOALS

AVERAGE IS 5.1 MILES PER YEAR
106 YEAR REPLACEMENT CYCLE

2X CURRENT REPLACEMENT CYCLE
1950
TL Cement Lining
Program started

1990
Mainlines Cement Lining
Program

June 2007
Program completed
West Valley

Repair cost to date for Roscoe TL = $3.5 M

Capital Project initiated to replace
1. Coldwater Canyon Trunk line
2. City Trunk Line North
3. Roscoe Trunk Line
Pipe Rehabilitation and/or Replacement:

1. 40 miles of D-graded pipe in next 10 years
2. Extended period of shutdown are difficult for in-city trunk lines
3. Cost of pipe rehabilitation over its service life vs. replacement pipe service life
4. Quality control of pipe installation & certification
5. Reliable service life for rehabilitated pipes
6. Leak detection inside host pipes
7. Seismic Resiliency System Consideration
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