Asbestos Cement Pipe Study
Outline

• EBMUD’s Asbestos Pipe Inventory and Leak History
• Asbestos Pipe Corrosion Studies to date
• Identification of an AC Pipeline Replacement Plan
EBMUD: East Bay Municipal Utility District

- 4,200 miles of pipe
- 1.3 million people
- 90% of water supply from Sierra foothills
- Alameda and Contra Costa Counties
- 331 square miles of service area
Distribution Pipeline Inventory

- **Steel**: 26% (990 Miles)
- **Asbestos Cement**: 30% (1,100 Miles)
- **PVC**: 9% (360 Miles)
- **Cast Iron**: 35% (1,300 Miles)
- **HDPE**: < 1% (4.0 Miles)
AC Pipe Inventory

- 1,150 miles
- Avg. 47 years old
- Avg. 126 leaks/year (18% of total EBMUD leaks)
- Avg. 11 leaks/100 miles/year
- Highest frequency leaks = > 70 years old; 4” dia.
2009-2011 Collection & Testing

- 2009-2010: Collected 21 samples
- 2011: Collected 16 additional samples
- Size – various pipe lengths
- All on Failed Pipes
Current Sample Collection (2012-2013)

- Partnership with WRF
- Different Water Quality Zones
- 6’’ & 8’’ Diameters, Pre & Post 1970’s
- Sizes: 3-in diameter coupons and 3-ft long sections
- 70 samples collected (to date), primarily from “live” pipes w/o leak history
Lab Testing and Acoustical Surveys

- **JDH Corrosion: Laboratory Services**
  - Contracted to test up to 100 Samples
  - Battery of tests conducted includes stain, crush, tensile, flexural, density, pH, Scanning Electron Microscope (SEM), petrographic

- **Echologics: Pipeline Integrity Testing**
  - Acoustical Pipeline Condition Surveys
  - Evaluated approx. 2 miles of pipe at 22 sites

- Stain tests conducted to correlate with Echologics survey results.
2012-2013 – Samples w/ Echologics Surveys
Danville – AC Pipe Replacement
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Danville – AC Pipe Replacement
AC Pipe Corrosion Measurements

Outer Diameter (OD) Thickness

Inner Diameter (ID) Thickness
Stain Test and Elemental Composition
Crush strength tests conducted on the pipe samples indicated the all of the samples met the requirement of as-manufactured (new) pipe for Class 150 pipe.
Flexural Testing
Tensile Test
EAST of HILLS versus West of Hills
AC Pipe

Hills Review - Annual Leaks per 100 Miles - All Data
Echologics Acoustic Surveys

Measure the sound velocity

1. PC Based Correlator
2. Sensor

RF Transmitter

D

Noise Source

Measure the sound velocity
Stain Test results compared to Ecologics Surveys.

4 out of 6 pipe samples (non-break) have good correlation vs.

4 out of 9 for coupons

<table>
<thead>
<tr>
<th>Street Name</th>
<th>Location</th>
<th>Coupon or 3' Sample</th>
<th>Diameter</th>
<th>Year Installed</th>
<th>Echologics % Loss</th>
<th>Stain % Loss</th>
<th>Good Correlation Ech v Stain</th>
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<tbody>
<tr>
<td>Narcissus Court</td>
<td>Castro Valley</td>
<td>Coupon</td>
<td>6</td>
<td>1978</td>
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<td>0%</td>
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<tr>
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<td>1975</td>
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Pipe Replacement Plan

AC Pipe Sample Collection

AC Pipe Replacement Plan

Prediction Model

AC Pipe Replacement Prioritization
Model Input Data:

1. AC Pipe Database – Installation Age Attribute
2. Agency-Specific Corrosion Rates for AC Pipe
3. Pipeline Class Safety Factor Tolerances
AC Pipe Study Timeline & Next Steps

- **Ongoing thru 2013**
  - Collect and Test AC Samples
  - Investigate Replacement/Rehab Methods
  - Investigate Water Quality Optimization
- **2014**
  - Complete WRF/EBMUD AC Pipe Study
  - Pilot replacement/rehab method
Asbestos Cement Pipe Corrosion Study

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