GLOBAL PERSPECTIVE.
LOCAL FOCUS.

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Englishman River Water Service

Phase 2 – Water Treatment Pilot Testing and Aquifer Storage and Recovery Feasibility Analysis




Progress Status Presentation

February 22, 2012

Components of Phase 2

- Water treatment process simulation / testing
  - Bench Scale Testing
  - Piloting
  - Water quality monitoring
- Aquifer Storage and Recovery (ASR)

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Treatment Process Simulation

Bench-Scale Testing

- Determines general treatability of raw water – feasibility of physical/chemical processes
- Evaluates the need for chemical enhancement (coagulation)
- Optimizes dosage to be used in pilot or at full scale

Piloting

- Reduced scale simulations of potential treatment options
- More accurately assesses treatment performance
- Determines operation & maintenance requirements
- Identifies treatment challenges

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Treatment Process Simulation

- Bench-scale testing concurrent with piloting
- Piloting done from November 2011 to February 2012
  - worst-case water conditions (winter)
  - frequent ‘flashy’ turbidity spikes
- Raw water drawn directly from Englishman River, near existing intake

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Treatment Process Options

- Phase 1 confirmed that particulate removal is required (a regulatory requirement)
- Turbidity spikes in winter: 50 to 200+ NTU
- Low turbidity in summer: < 1 NTU typically
- Colour: 20 to 60 TCU (limit is 15 TCU)

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Treatment Process Options

- Treatment options identified:
  - Direct Filtration
  - Conventional Treatment (Settling + Sand Filtration)
  - Other Pre-Treatment Technologies:
    - Dissolved Air Flotation (DAF)
    - Ballasted High Rate Settling
  - Membrane Filtration
- Evaluation criteria:
  - Economic
  - Source water quality and seasonal variation
  - Operator attention
  - Waste generation

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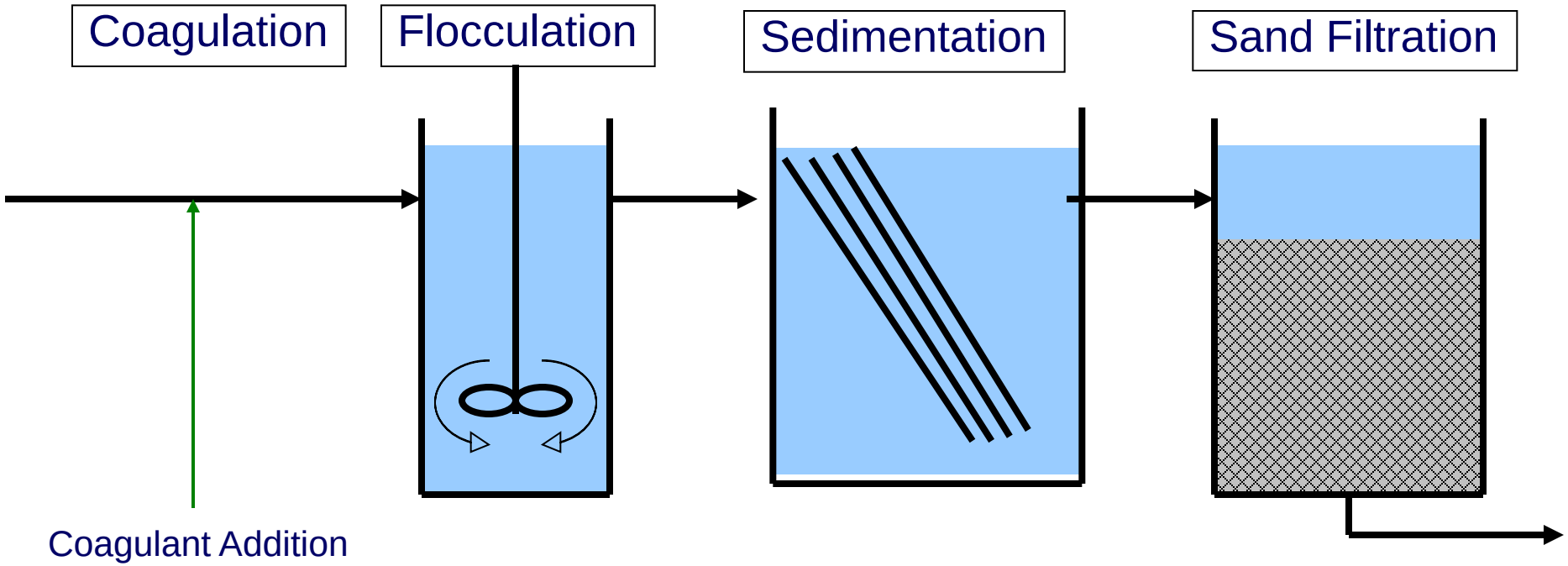
Conventional Treatment



Conventional Treatment

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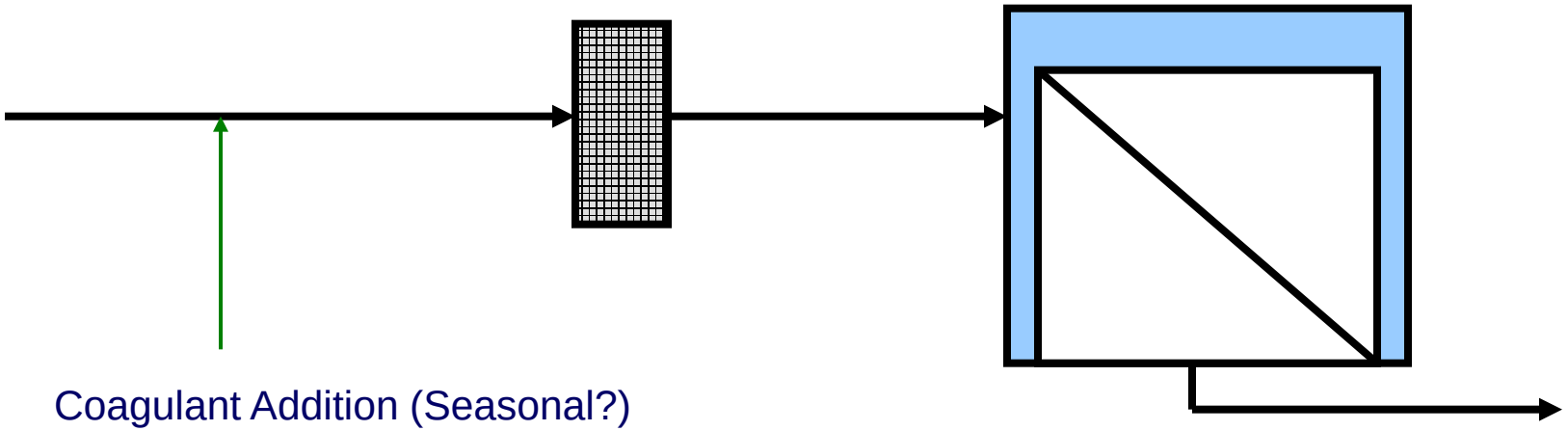
Membrane Filtration

Coagulation

Pre-Membrane Straining

Membrane Filtration



Coagulant Addition (Seasonal?)

Membrane Filtration

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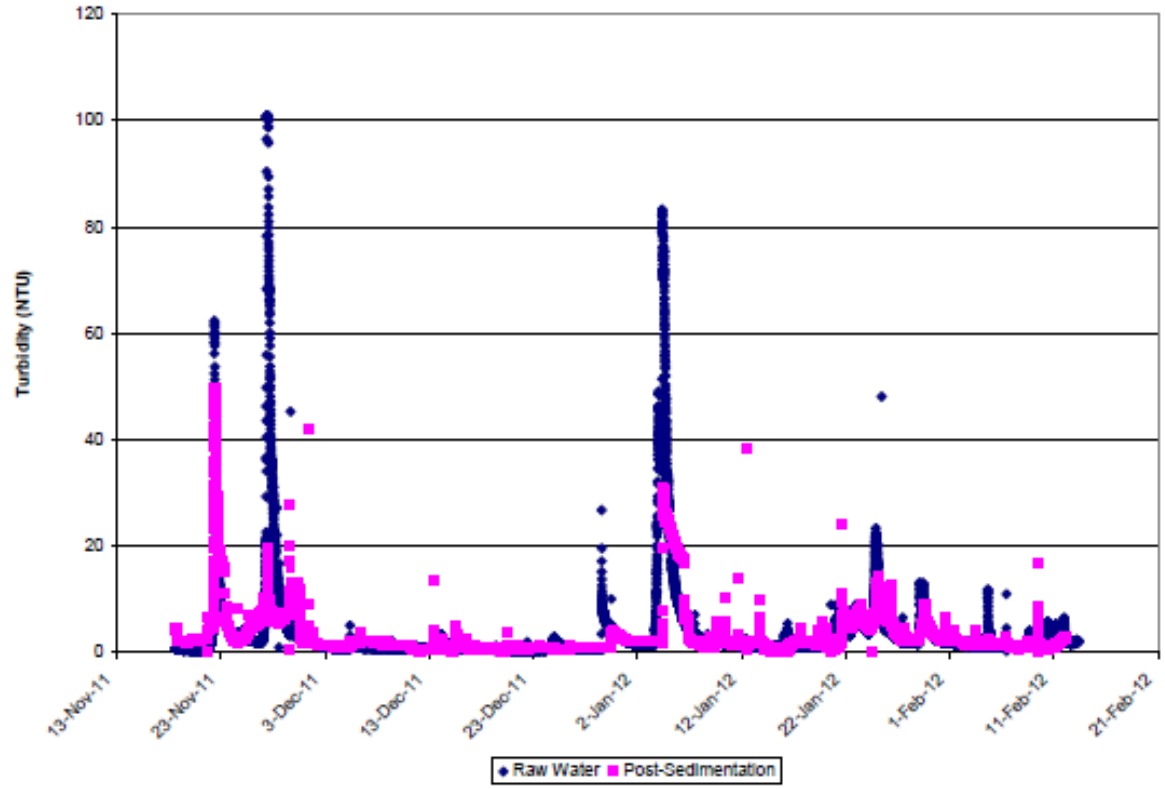
Results – Conventional Treatment (Settling Stage)

Coagulation / Flocculation removes some of the turbidity before filtration – but not meeting operational target of 2 NTU.



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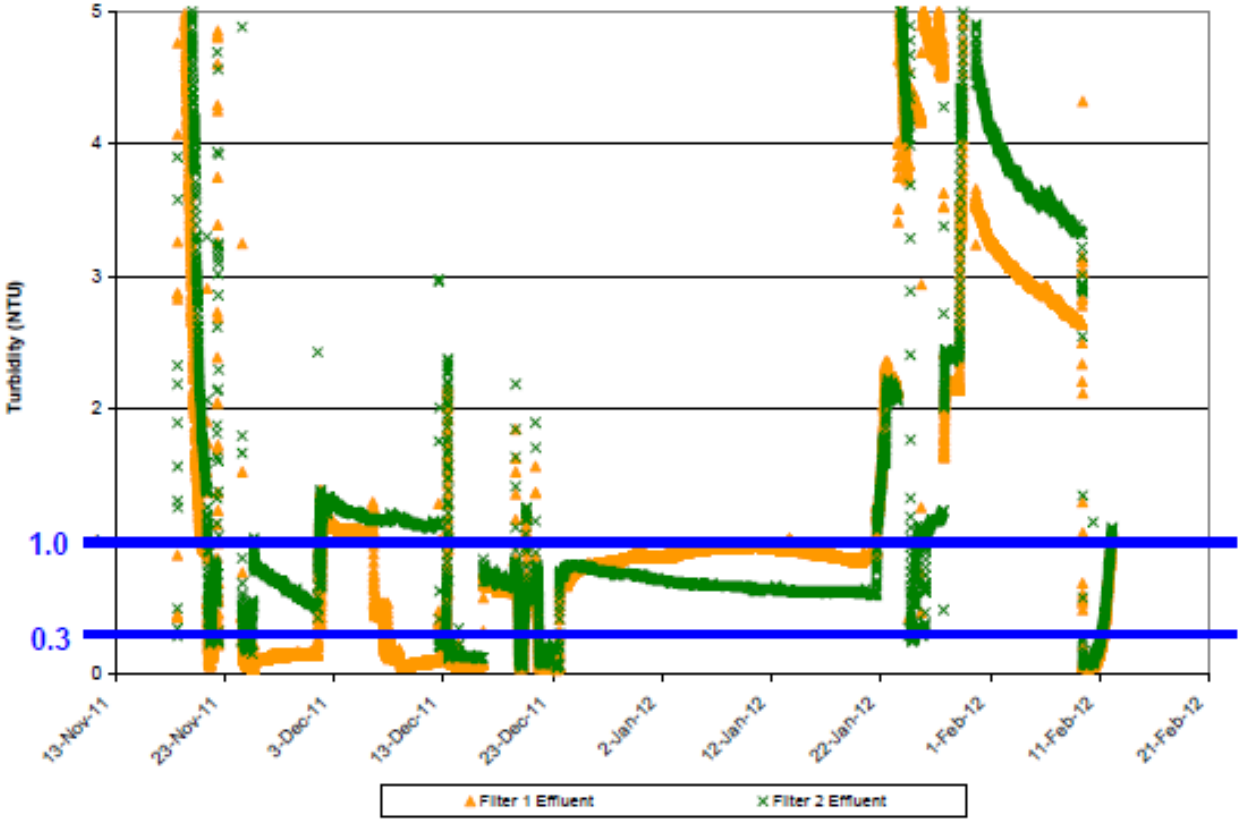
Results – Conventional Treatment (Sand Filtration Stage)

- Regulation: <0.3 NTU 95% of the time
- Achieved <0.3 NTU only 30% of the time approx.



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Results – Conventional Treatment

What are the challenges?

- Conventional treatment requires relatively stable raw water quality conditions
  - sudden turbidity spikes difficult to adjust to
- Low alkalinity – alkalinity helps coagulation (particle agglomeration)
- Prolonged periods of low turbidity
  - Difficult to produce larger particles to settle

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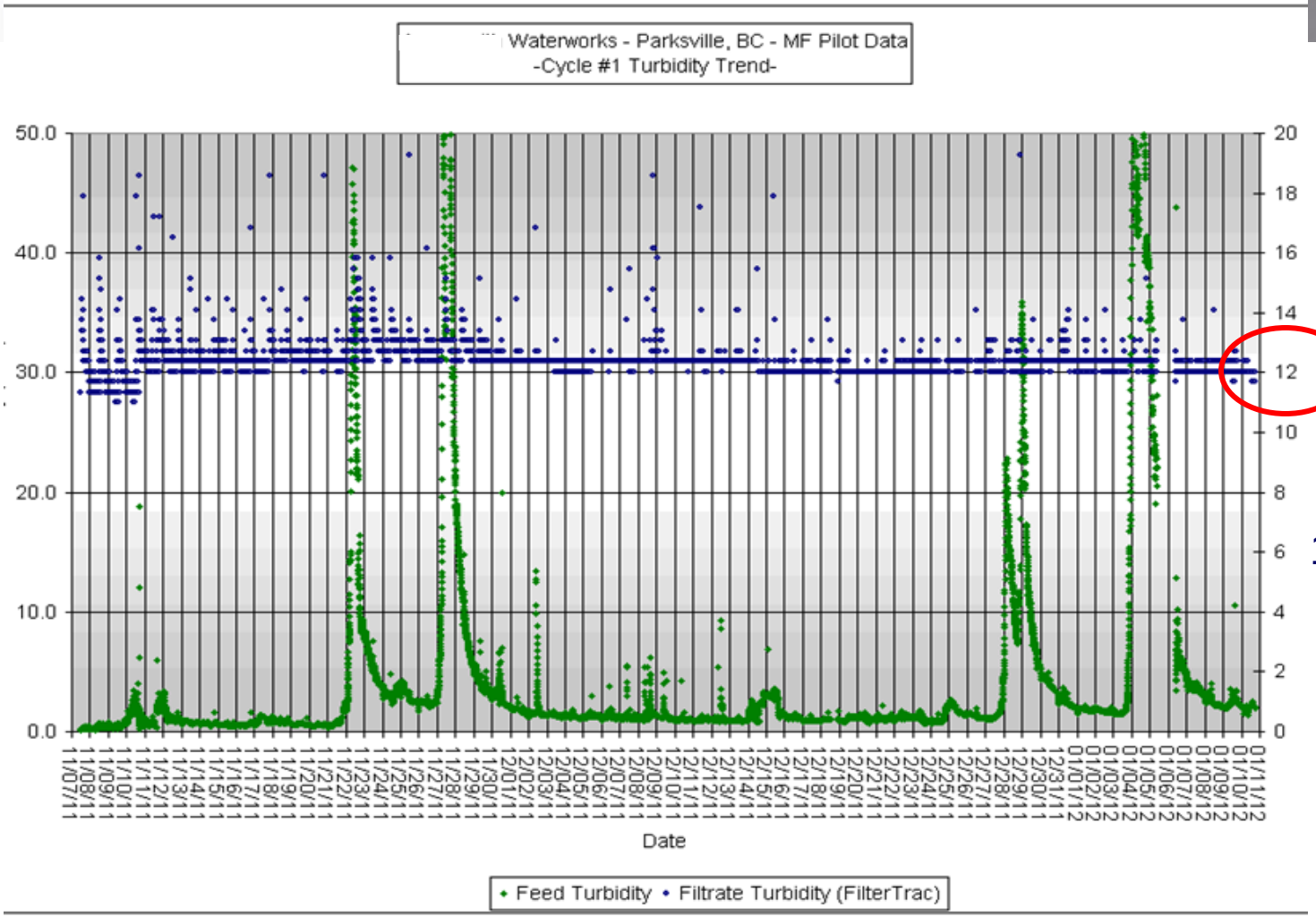
Results – Membrane Filtration



12 mNTU =
0.012 NTU

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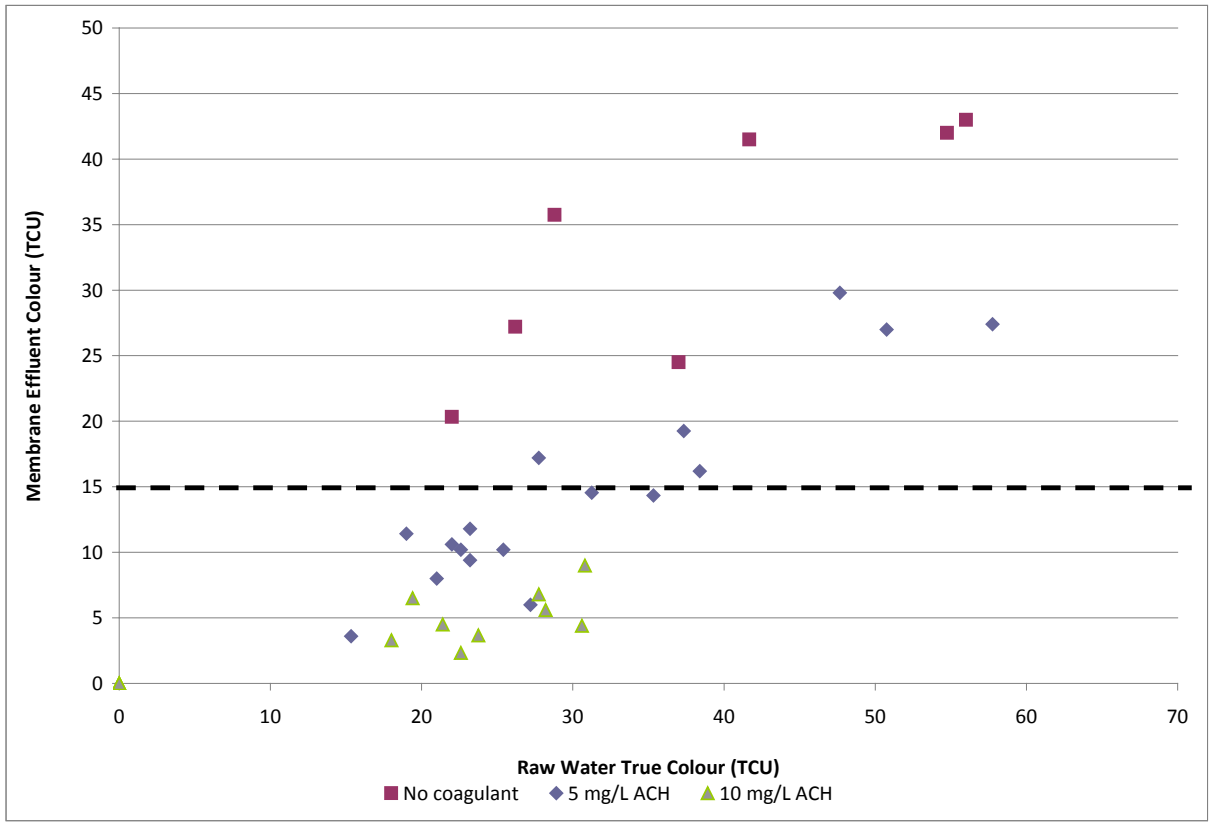
Results – Membrane Filtration

- Coagulant needed to remove colour



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Conclusions

- Conventional treatment could not reliably achieve treatment objectives
  - Sudden changes in water chemistry hard to adjust for
- Membrane filtration readily met treatment objectives
  - Turbidity consistently reduced to <0.1 NTU
  - Coagulant addition needed to remove colour (winter observation)

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Next Steps for Treatment Studies

- Full analysis of data from pilot program
- Perform bench-scale tests regularly throughout 2012
  - Confirm that treatment, tested in the winter, will perform similarly in different seasons
- Continue program of water quality monitoring
  - Develop detailed water quality profile for the river under different weather and seasonal conditions

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