


JCW's
Sanitary Sewer Stream Crossing
Investigation
for
KWEA 2009 Annual Conference
Presented by,
Joe Barnes and Gary Beck

Background

- JCW owns and operates 2,100 miles of sewer which includes 54,400 manhole to manhole sewer segments.
- A significant portion of the system crosses streams within their service area.



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Background

- JCW was on a reactive basis to stream crossing repairs.
- JCW then began inspecting crossings themselves and could not keep up.
- JCW found that many repairs were not lasting and armoring stream crossings may not be the best solution.

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Background continued...


Manhole Armoring



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Background continued...

Stream Armoring

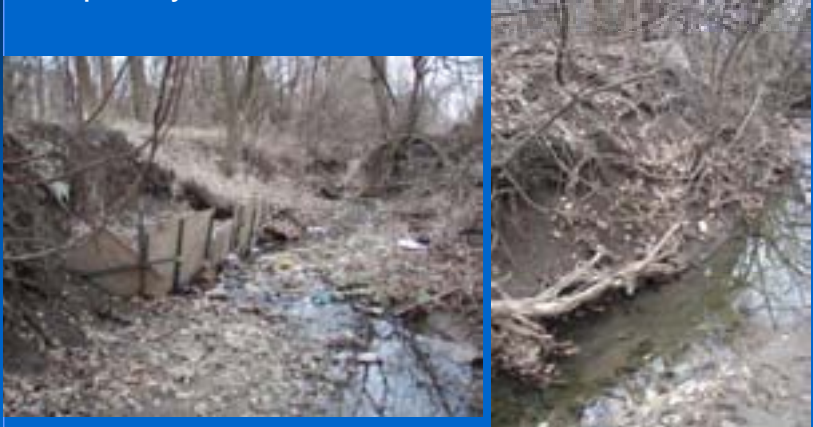


The first photograph shows a worker in a yellow safety vest standing on a dirt stream bank. The second photograph shows a stream with large, light-colored rocks placed in the water. The third photograph shows a stream with a waterfall over rocks.

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Background continued...

Temporary Stream Erosion Control



The first photograph shows a stream with a wooden structure made of logs and branches in the water. The second photograph shows a stream with a large log in the water.

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Background continued...

Even Parallel Sewers Are Not Safe!



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Background continued...

- GBA Architects and Engineers introduced the concept of working with the stream for sanitary sewer crossings. Projects have shown success.
- JCW recently developed an asset management program based on risk assessments. Stream crossings were high on the list of risky assets.
- JCW then retained GBA to inventory and Investigate all stream crossings as part of JCW's Risk Management Program.

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Goals of Project

1. Inventory and inspect sanitary sewer stream crossings and identify crossings at risk. The at risk crossings will be selected for further investigation and ultimately design and repair.
2. Develop system for periodic sanitary sewer stream crossing investigations.

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Goals of Presentation



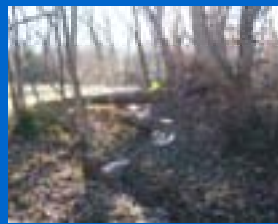
- ✓ Project Set-Up
- ✓ Investigation Results
- ✓ Conclusions



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Project Set-Up

- Stream Database
- Field Inspection Form
- Mapping
- Crew Training
- Geomorphologist
- GIS Specialist



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Project Set-Up Stream Database

- GIS Based
- AIMS Stream Shape Files
- National Hydrology Database
- Stream Data from Watershed Studies
- Database included 430 miles of stream within the JCW Service Area




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Project Set-Up

Identification of Potential Stream Crossings

- Sewer Database
- Database Overlaid on Stream Database
- Utilize 50 Foot Buffer on Streams
- 8,000 potential Stream Crossings



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Project Set-Up

Field Inspection Form

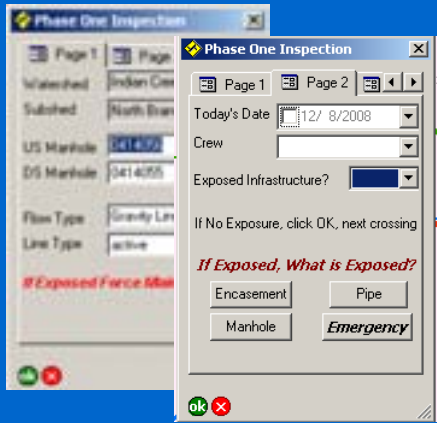
- GPS Hand Held's
- Expedite Data Collection



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Project Set-Up Field Inspection Form - Crossing

- General Information
- Exposures
 - Encasement
 - Manhole
 - Pipe
 - Emergency

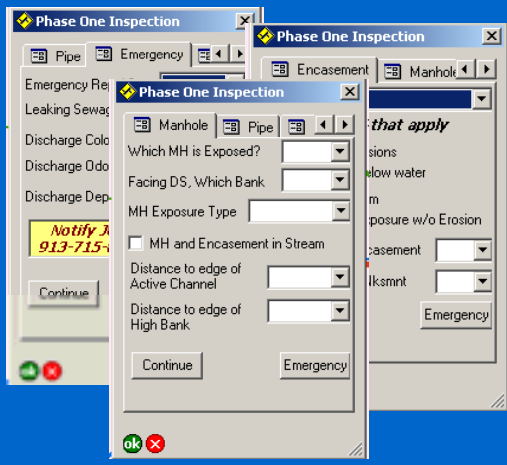


The screenshot shows a 'Phase One Inspection' dialog box with the following fields and options:

- Watershed: Jordan Cr.
- Subshed: North Star
- US Manhole: 041437
- DS Manhole: 041435
- Pipe Type: Gravity Lin
- Line Type: active
- Today's Date: 12/ 8/2008
- Crew: [empty]
- Exposed Infrastructure? [dropdown menu]
- If No Exposure, click OK, next crossing
- If Exposed, What is Exposed?**
 - Encasement
 - Pipe
 - Manhole
 - Emergency**

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Project Set-Up Field Inspection Form - Crossing



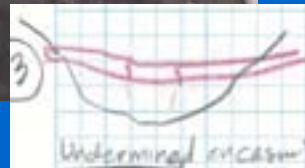
The screenshot shows a 'Phase One Inspection' dialog box with the following fields and options:

- Emergency Re: [dropdown menu]
- Leaking Sewag: [dropdown menu]
- Discharge Colo: [dropdown menu]
- Discharge Odo: [dropdown menu]
- Discharge Dep: [dropdown menu]
- Notify 913-715** (highlighted)
- Continue
- Which MH is Exposed?: [dropdown menu]
- Facing DS, Which Bank: [dropdown menu]
- MH Exposure Type: [dropdown menu]
- MH and Encasement in Stream
- Distance to edge of Active Channel: [dropdown menu]
- Distance to edge of High Bank: [dropdown menu]
- Continue
- Emergency
- that apply** (highlighted)
- sions
- slow water
- m
- posure w/o Erosion
- casement
- Iksmnt
- Emergency

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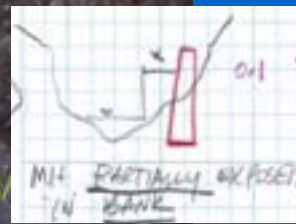
Project Set-Up Training

- Power Point
- Rating System
- Two Person Team
- Safety Procedures



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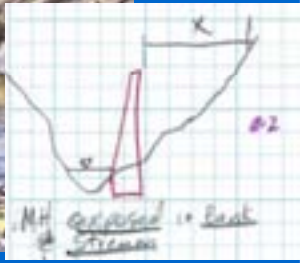

Project Set-Up Field Inspection Form - Crossing



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Project Set-Up

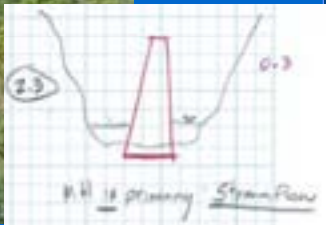

Field Inspection Form - Crossing



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Project Set-Up

Field Inspection Form - Crossing



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Project Set-Up

Stream

- Bends and Tangents
- Riffles and Pools
- **Bed Material**
- Bank Material



Silt



Bedrock



Project Set-Up

Stream

- Bends and Tangents
- Riffles and Pools
- Bed Material
- **Bank Material**



Soil



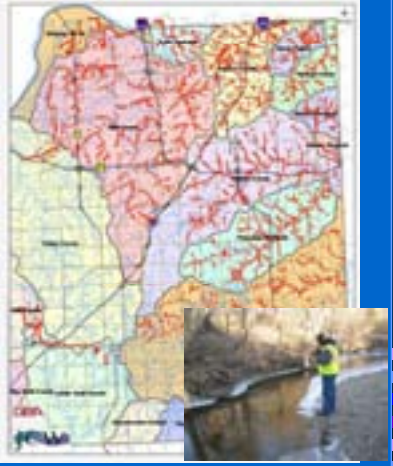
Structure



Project Set-Up

Mapping and Tracking

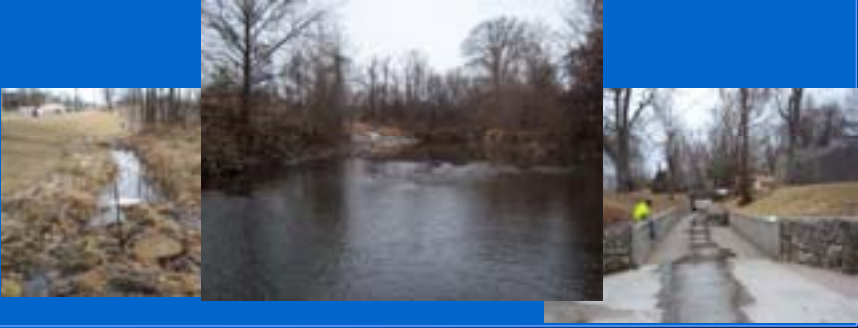
- Broke System into Sub-Watersheds
- Highlighted Potential Stream Crossings
- Download Data Collectors



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Investigation Results

- We found that stream channels come in many forms and manholes can be located in odd places.



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Investigation Results

- We found that other utilities can be affected by stream channels.



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Investigation Results Definitions

- We found that exposed sewers do not always cross a stream.



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Investigation Results

Definition of Exposure

- Exposed Sewer – Any part of a sewer asset that is within the belt-width of the stream channel where the action of stream flow has caused the normal cover material to erode away from the asset endangering the sewer asset. This can include manholes, main sewer pipes with or without encasement, force main pipes with or without encasement, and service laterals.

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Investigation Results

- Approximately Half were Actual Crossings in Stream Channels
- 577 were Exposed

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Investigation Results


10 Sites were Reported for Immediate Attention



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Investigation Results

10 Sites were Reported for Immediate Attention



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Investigation Results

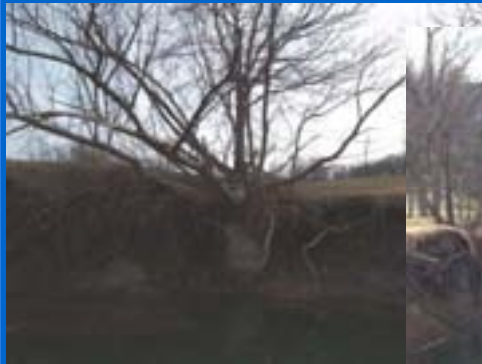
306 Manhole Were Exposed



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Investigation Results

306 Manholes were Exposed



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Investigation Results

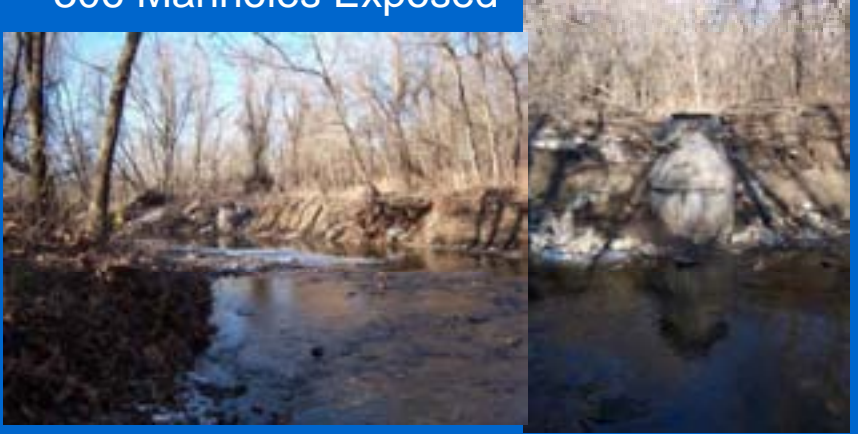
306 Manholes Exposed



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Investigation Results

306 Manholes Exposed



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Investigation Results

306 Manholes were Exposed



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Investigation Results

306 Manholes were Exposed



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Investigation Results

306 Manholes were Exposed



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Investigation Results


28 Pipe Exposures



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Investigation Results


28 Pipe Exposures



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Investigation Results


28 Pipe Exposures



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Investigation Results

28 Pipe Exposures




The image consists of two side-by-side photographs. The left photograph shows a close-up of a pipe exposure in a rocky streambed, with water flowing over the pipe. The right photograph shows a similar pipe exposure, but from a slightly different angle, showing more of the surrounding rocky terrain and the pipe's connection to the ground.

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Investigation Results

28 Pipe Exposures



The image shows a single photograph of a pipe exposure in a rocky streambed. A person's hands are visible near the pipe, suggesting an inspection or measurement. The pipe is partially submerged in water, and the surrounding area is rocky and appears to be a natural streambed.

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Investigation Results

28 Pipe Exposures



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Investigation Results

Many Exposures had Scouring Problems




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Investigation Results
Many Exposures had Scouring Problems



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Investigation Results
Many Exposures had Scouring Problems




GBA

Investigation Results

Many Exposures had Scouring Problems



Nick Points



Investigation Results

21 Service Lateral Exposures were Found



Recommendations

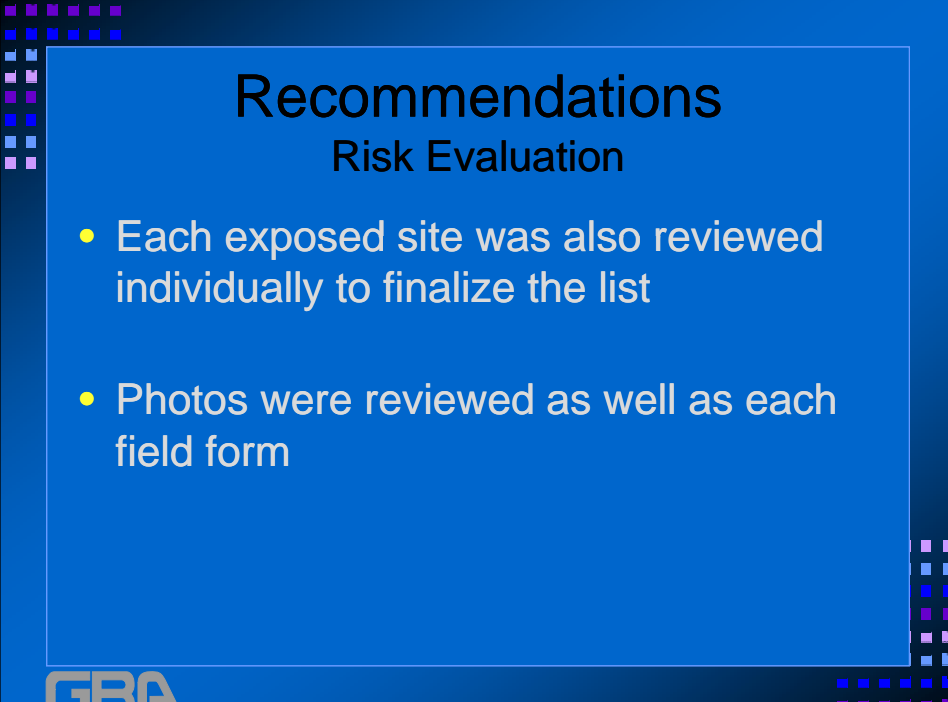
- One Goal was to inspect sanitary sewer stream crossings and identify crossings at risk.
- Phase 2 is to Group the Exposures for Repairs by JCW or by Contractor

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Recommendations Risk Evaluation

- A Scoring System was set up to help Prioritize Exposed Stream Crossings
 - Included Exposure Score
 - Included Stream Score
 - Included Weighting by Pipe Size
 - Scoring was used to Conduct a Priority Sort

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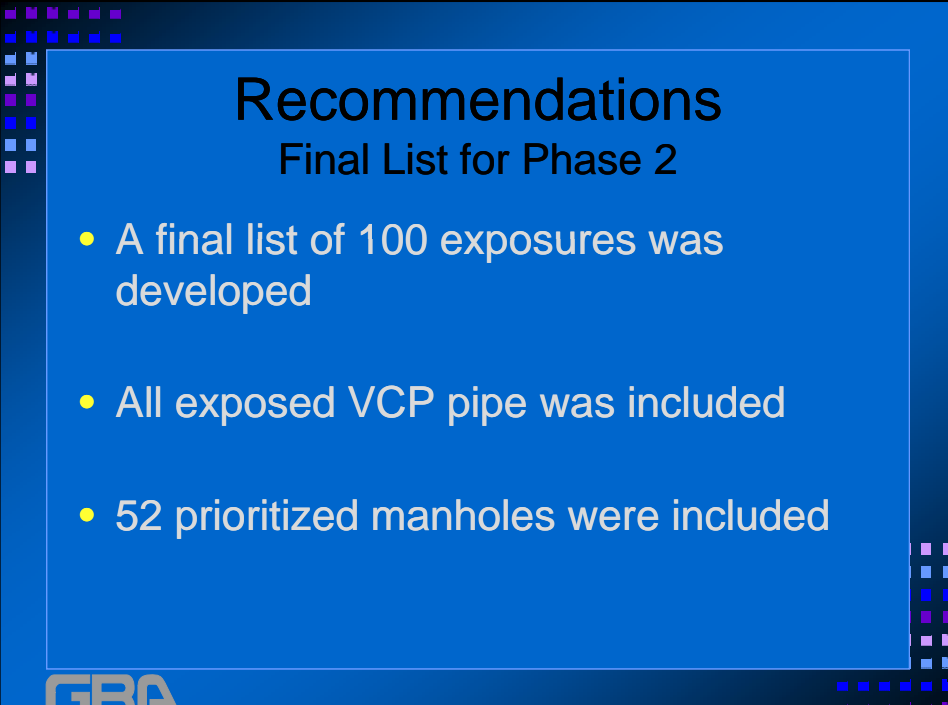


Recommendations

Risk Evaluation

- Each exposed site was also reviewed individually to finalize the list
- Photos were reviewed as well as each field form

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Recommendations

Final List for Phase 2

- A final list of 100 exposures was developed
- All exposed VCP pipe was included
- 52 prioritized manholes were included

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Future Investigations and Repairs

- A second goal was to develop system for periodic sanitary sewer stream crossing investigations.
- The field forms, PowerPoint training, and stream database is a good start.

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Future Investigations and Repairs

- Collect Additional Stream Information to Begin Pre-Design
- Group Problem Exposures into Projects
- Cost Sharing with SMAC Projects
- Set-Up Future Inspection Program

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Conclusions

- Sanitary stream crossings are a High Risk portion of a sanitary sewer system as evident from the findings
- Upfront planning is imperative
 - Stream Database Development
 - Potential Crossing List
 - Field Forms and Mapping
 - Training

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Conclusions Continued...

- Input from Geomorphologist needed
- Input from GIS Specialist needed
- JCW is left with knowledge of stream crossing conditions and a better plan to maintain their system
- Stream stability is the Long Term Solution for stream crossing repairs

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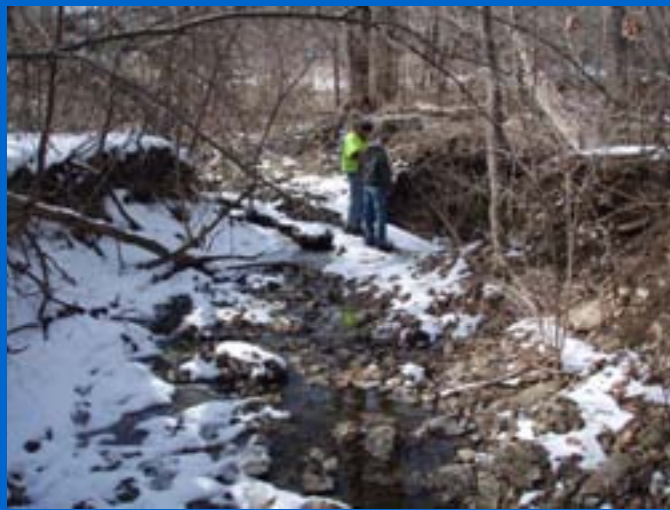
Conclusions Continued...

We Presented:

- ✓ Project Set-Up
- ✓ Investigation Results
- ✓ Conclusions

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Questions?



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