

- Two wells with similar problems
- Initially identified as water quality issue
- Looked at potential causes
- Completed preliminary evaluation of available data
- Developed a plan



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Scenario 1

- Aging well drilled in 1970
- Acquired as part of a small system
- Limited Well construction information
- Problem: coliform bacteria



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Concerns

- Fix the problem
- Not changing the capacity of the well/Permitting
- Wellhead Protection Area (WHPA)



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Approach

- Viewed a video of the well
- Evaluated the original well log and regional geology
- Reviewed pumping/operation data



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Options

- Abandon well
- Reconstruct Well



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Develop a plan

Well reconstruction

- Set casing deeper to eliminate suspected shallow contamination
- Clear with DEP that we could reconstruct without losing grandfathered status – Not deepen or drill new water bearing zones



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How ???

- Consider current construction
- Consider needs and options for pump and appurtenances
- Can't line well; already 6-inch
- Only option – remove casing
- 20 feet of ten inch with ~ 43 feet of 6-inch
- Grouted

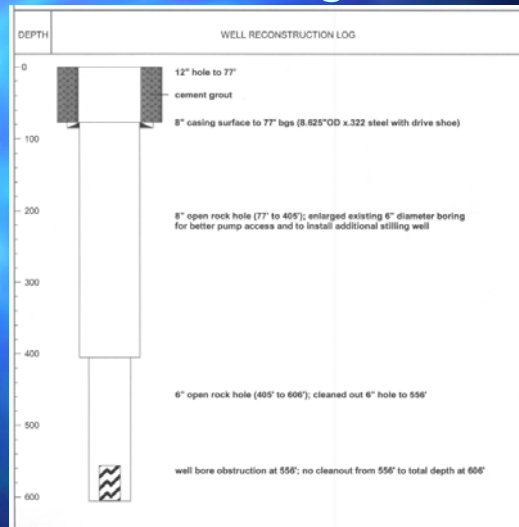


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Well Log



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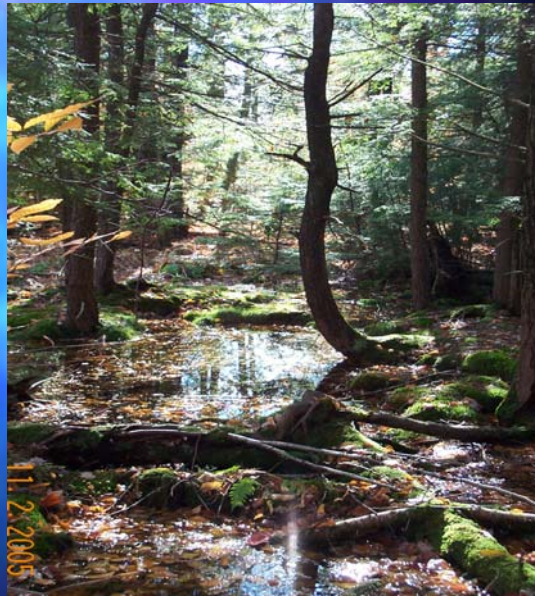
Conclusion

- Better constructed well to current standards
- Improved water quality (met drinking water standards and low risk MPA)
- No new infrastructure
- Saved a source , saved money



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Scenario 2 - Background

- Well was completed in 1998
- Constructed as 10 x 15 –inch well with Casing set at 60 feet bgs
- Macadam pad at Wellhead with constructed berm to divert Runoff
- In service approximately 15 years without problems



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Problem

- Water Quality testing identified problem
- Rains >1-1.25 inches resulted in increased turbidity and nitrate concentration.
- Took off line and self-reported to DEP



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Source of problem

- Stream
- Shallow surface water
- Abandoned monitoring well
- Transmission line bedding



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Mechanism

- Casing and or grout failure
- Fracture system connecting creek to well
- Flow from farm fields to shallow bedrock fractures
- Conduit- Monitoring well/transmission line bedding



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Data collection and review

- Existing data, new sampling
- Downhole logging
 - Video
 - Optical televiewer
 - Temperature
 - SP, Conductivity
 - Gamma, Caliper



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What did data tell us?

Existing data

- Direct and quick response to precipitation events (~1+ inches)
- Nitrates in particular were very high

Sampling and logging

- Stream and Well were physically and chemically different
- Problems with well integrity



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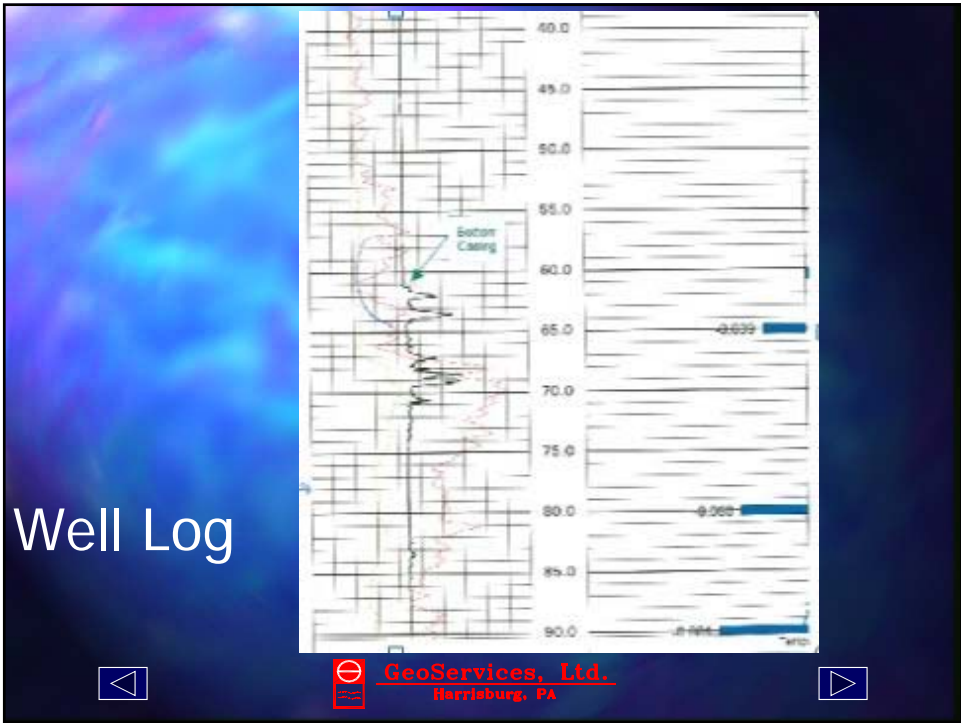


Casing Shoe



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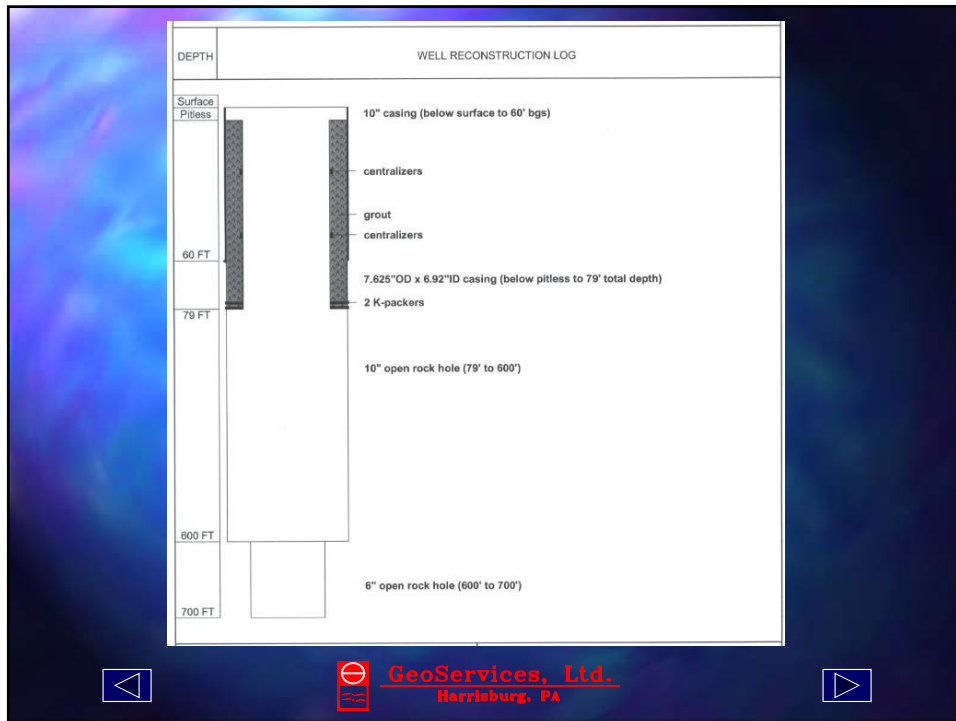




K-packer



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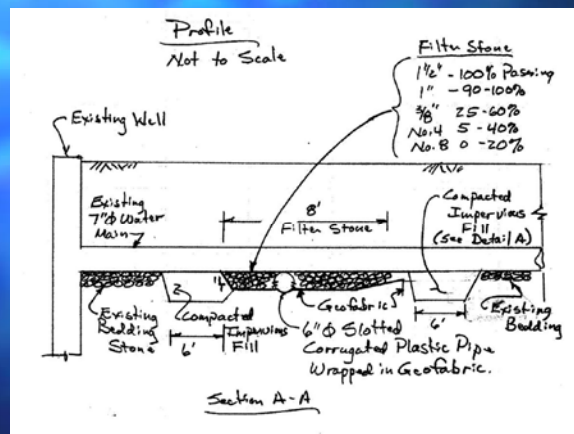
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Casing Liner



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Additional Mitigation



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Cut off Trench



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Results

- Turbidity dropped to approximately 0.3 NTU's, even following several storm events exceeding 3 inches
- Nitrate concentrations dropped to less than 10 mg/l (generally 5-8 mg/l)
- MPA Low Risk



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Additional testing

Because it was determined to be GUDI and off line for over a year:

- Swip Testing
- New Source Testing
- Passed Swip and met drinking water standards
- Brought back on line



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Conclusions

- Changes in Chemistry alerted to problem
- In both cases, was a result of compromised well construction
- Evaluated data and completed testing to develop approach /remedy



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- Maintained 'Status Quo' i.e., didn't try to get more water or water from different zones
- Saved the source at existing location
- Improved the construction
- Cost Savings compared to New Source
- Worked with DEP



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