

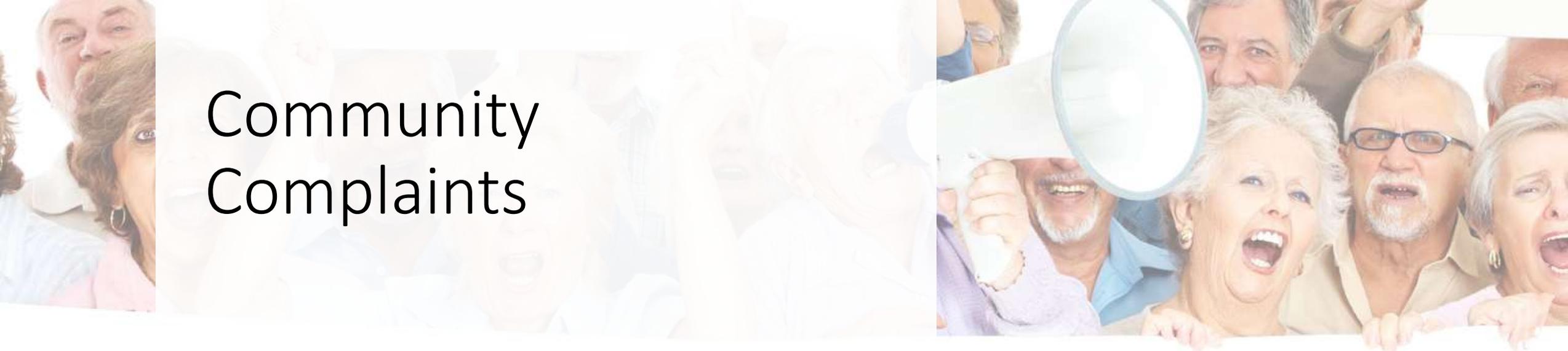


# Manganese Removal in the Poconos – A Success Story

Hemlock Farms Community Association

# History

- Hemlock Farms Well No. 4 was sited in 1999 by PA Geologist, Richard Wright, (PG 0001) using fracture trace analysis
- Following development, the well produced 600 GPM and was artesian. Appurtenances were constructed to allow the well casing to flow.
- At the time of well development and permitting, the concentration of iron and manganese was below 1.0 mg/l, so sequestering was utilized to minimize aesthetic impacts.
- Ratio of manganese to iron was greater than 4:1.



# Community Complaints

- It wasn't too long before the impacts of the manganese became apparent despite sequestering application.
- The manganese stained appliances and clothing
- In 2012 the Community voted to proceed with manganese treatment for Well No. 4
- A study concluded oxidation/filtration would be a viable option for manganese removal.

# Treatment Process

- The basis for the design was AdEdge Technologies oxidation filtration process using AD26, manganese dioxide filter media.
- Because the well pump existed and delivered system pressure of 135 PSI, the manganese treatment system was designed for 150 PSI operating pressure
- The process is a 4-tank system operating in parallel with a stainless steel piping harness and butterfly valves for service, backwash, and rinse (filter to waste).
- Filter loading rate is 6 GPM/SF. BW Rate is 20 GPM/SF.
- Initially, chlorine for oxidation was dosed at the well to achieve both oxidation and disinfection of the well at roughly 2 mg/l.

# Design, Construction and Cost

- Entech Engineering, Inc. was responsible for design and permitting of the plant.
- Pennvest funded a portion of the total project cost of \$1.4M.
- Construction cost was \$1.2 M and there was \$0 on change orders.
- Pioneer Construction was the general contractor.





# Process Pictures





# Stainless Steel Piping Leaks

- Within a year after start-up, leaks appeared at welds in some of the stainless steel piping.
- Review of the piping and literature revealed the cause could be faulty welds, chlorine or microbial induced corrosion.
- Chlorine dose was minimized for oxidation of manganese and then boosted for disinfection to minimize impacts on piping.



# Piping Resolution

- AdEdge Technologies replaced the portions of the faulty piping.
- A cost sharing approach was implemented by AdEdge and Hemlock Farms to replace the balance of the stainless steel piping.



# Residuals Management

- Backwash wastewater is collected in tanks; supernatant is recycled back through the process.
- Manganese sludge is transferred to a yard tank for pumping and hauling to a POTW. Sludge disposal for a year of treatment was less than \$2000.
- Solids separation is excellent. The manganese drops like a rock.

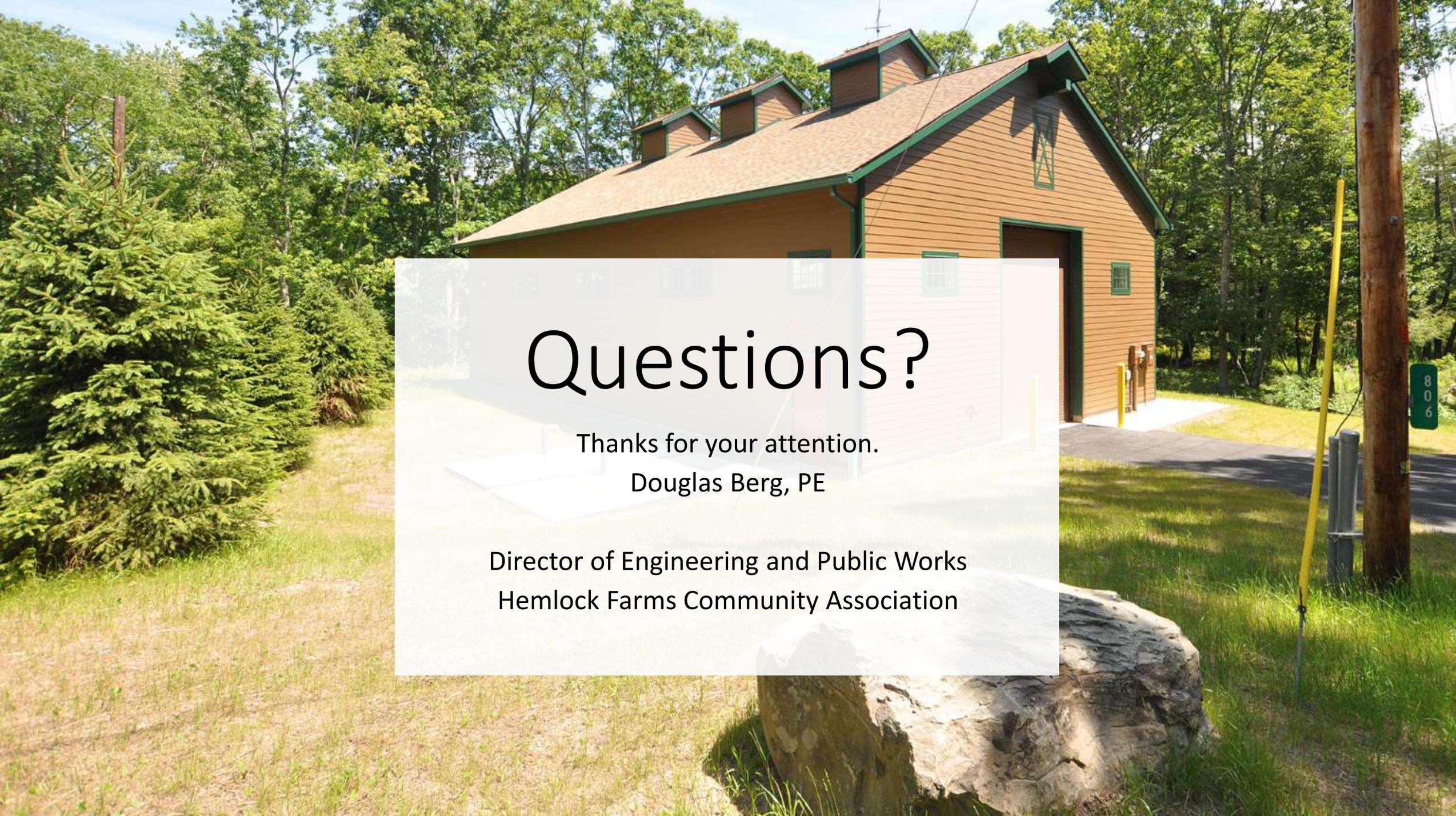


# Supernatant Recycle Pump and Cartridge Filters



# Lessons Learned

- With such a high operating pressure, it may have been better to design for a lower operating pressure and boost pressure after treatment.
- A decant pump system should have been designed for the yard sludge tank to make it easier to remove excess water from the sludge tank.
- If manganese concentration in a well is 0.2 mg/l or greater, strong consideration should be given to treatment or complaints will be likely.



# Questions?

Thanks for your attention.

Douglas Berg, PE

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Hemlock Farms Community Association