Modeling and Uncertainty Analysis for Remedy Selection and Design to Address Groundwater Discharging to Surface Water

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agenda

- site background
- overall project objectives
- modeling approach and key details
- model results and use



site background



background – former MGP in Flint, MI



pre- dam lowering



post- dam lowering







overall project objectives



overall project objectives

- address direct contact exposure pathway for MGP-related impacts
- 2. meet MDEQ compliance criteria for groundwater venting to the river
- 3. restore riverbanks and infrastructure





modeling approach and key details



why a model?

- groundwater flow dependent on river conditions
- partially penetrating river
- dam with uncertain future operation
- diverse stakeholders
 - state agency
 - city
 - property owner
 - public



modeling approach

- starting point existing groundwater model
- update with new investigation data
- recalibrate
- predictive scenarios with uncertainty analysis



model use – throughout the project





site model



model calibration • the model was calibrated to a robust dataset, including:

- 2008, 2011, and 2013 steady-state heads and head differences
- building drain flux rates
- MW-37S pumping test drawdown and recovery
- high-frequency aquifer and river elevation data (STWT1)

- 2008 steady-state concentrations
- 2008-2013 transient concentrations
- additional regularization information

predictive scenarios





- high horizontal hydraulic conductivity
- low vertical hydraulic conductivity
- horizontal flow barrier package along riverbanks

 high horizontal hydraulic conductivity

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 high vertical hydraulic conductivity null space monte carlo

- step 1 generate 50 random parameter sets
- step 2 refine parameter sets based on parameter sensitivity
- step 3 run up to 2 calibration iterations to bring parameter sets closer to calibration
 - defined objective function threshold
 - all 50 parameter sets reached user-defined threshold

model results and use





feasibility study results



design results







design results







monitoring plan



questions?

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