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RECOVERY IMPLEMENTATION PROGRAM

Options for Initial Slurry Wall Storage Project

PRRIP Governance Committee Meeting
March 7, 2017

Overview

- **EDO is requesting GC guidance on the preferred approach to initial slurry wall project implementation**
- Recap borehole testing
- Pilot-scale or full-scale configurations
  - Options for each
  - Pros and cons
  - Estimated costs
- Important considerations
- WAC made recommendation at Feb 28, 2017 meeting

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Borehole Campaign

Approach

- Completed Aug-Oct 2016
  - Plum Creek, Elm Creek, Cottonwood Ranch, Lindstrom/Stall
  - More at Elm Creek in Feb 2017
- Results compiled by EDO, reviewed by Applegate

Results

- Low-perm layer
  - South of river: ~30-40 ft deep
  - North of river: ~20 ft deep

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Initial Slurry Wall Options

- Pilot-scale project
  - Approach 1: Non-functional
  - Approach 2: Functional
- Full-scale project
  - Approach 3a: Aquifer storage
  - Approach 3b: Gravel pit storage
- NOT mutually exclusive
- Representative examples
  - Certain sites used to estimate costs, potential scores
  - Ballpark estimates to be revised and refined as needed
  - Other locations can be considered

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Approach 1: Non-functional Pilot

- Example based on Elm Creek (Bartels)
  - 10-20 acres
  - 18-20 ft depth to low-permeability layer
  - About 3,000 lf slurry wall for 10-acre project
- No excavation
- No facilities to deliver or release water
- Dewatering and monitoring wells

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Approach 1: Non-functional Pilot

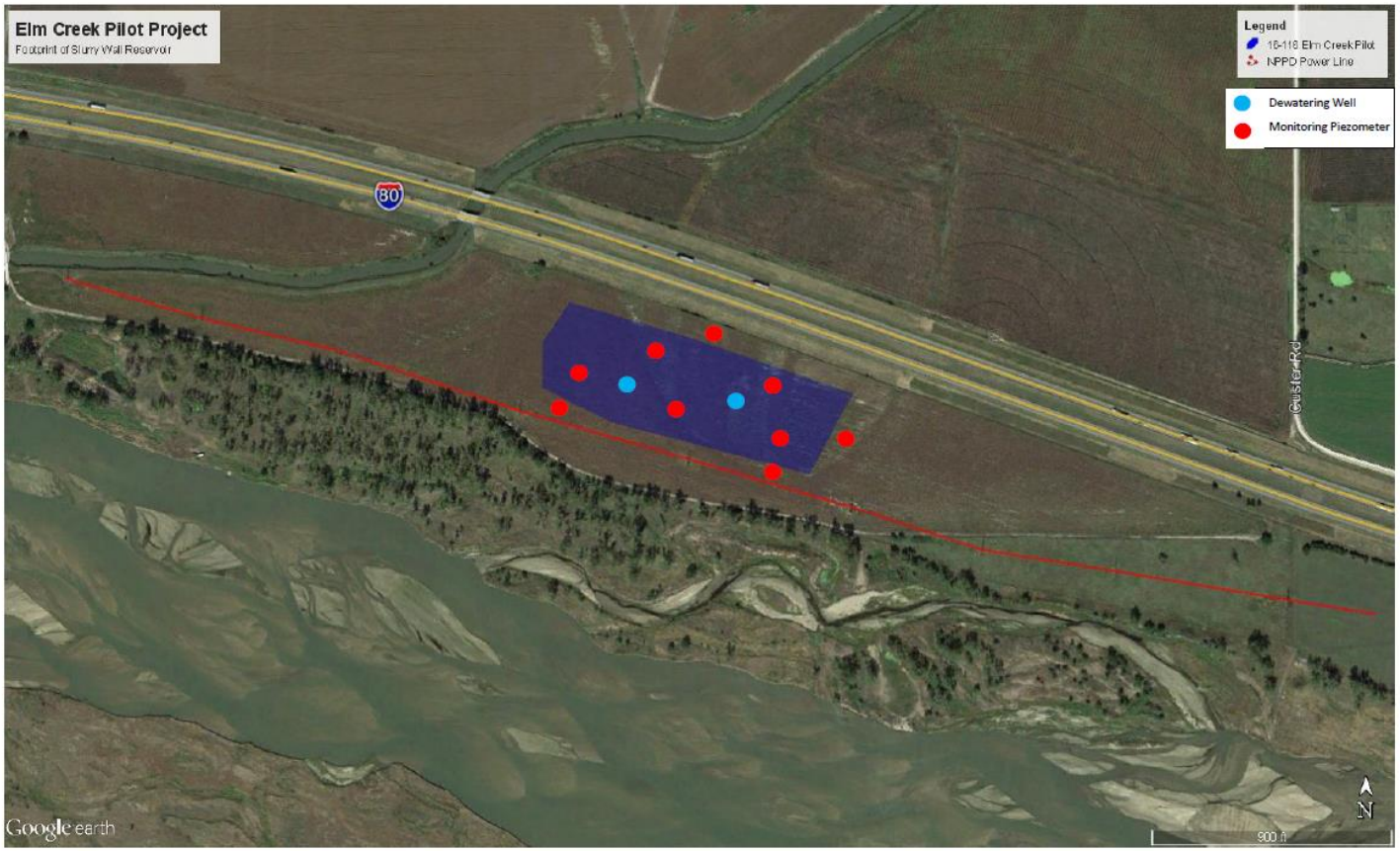

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Figure 1

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Approach 1: Non-functional Pilot

- Pros
  - Tests construction and function of slurry wall and low-permeability floor
  - Fastest and least expensive option
    - Implementation time about 1 year
    - Cost $700k (10-acre) to $1.2M (20-acre)
- Cons
  - No functional storage for PRRIP after pilot test
  - Shallower than sites on south side of river
  - Would not provide absolute certainty of continuity of low-permeability layer

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Approach 2: Functional Pilot

- Example based on Elm Creek (Bartels)
  - Same scale as non-functional pilot
  - Excavated to provide open surface gravel pit storage
  - Includes delivery and release infrastructure
  - Could function as small WAP project
    - Establish process for project development and permitting
    - Test operations as well as structure and function
    - Kearney Canal could be used to convey water
    - Potential score of 150 AFY to 400 AFY

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Approach 2: Functional Pilot

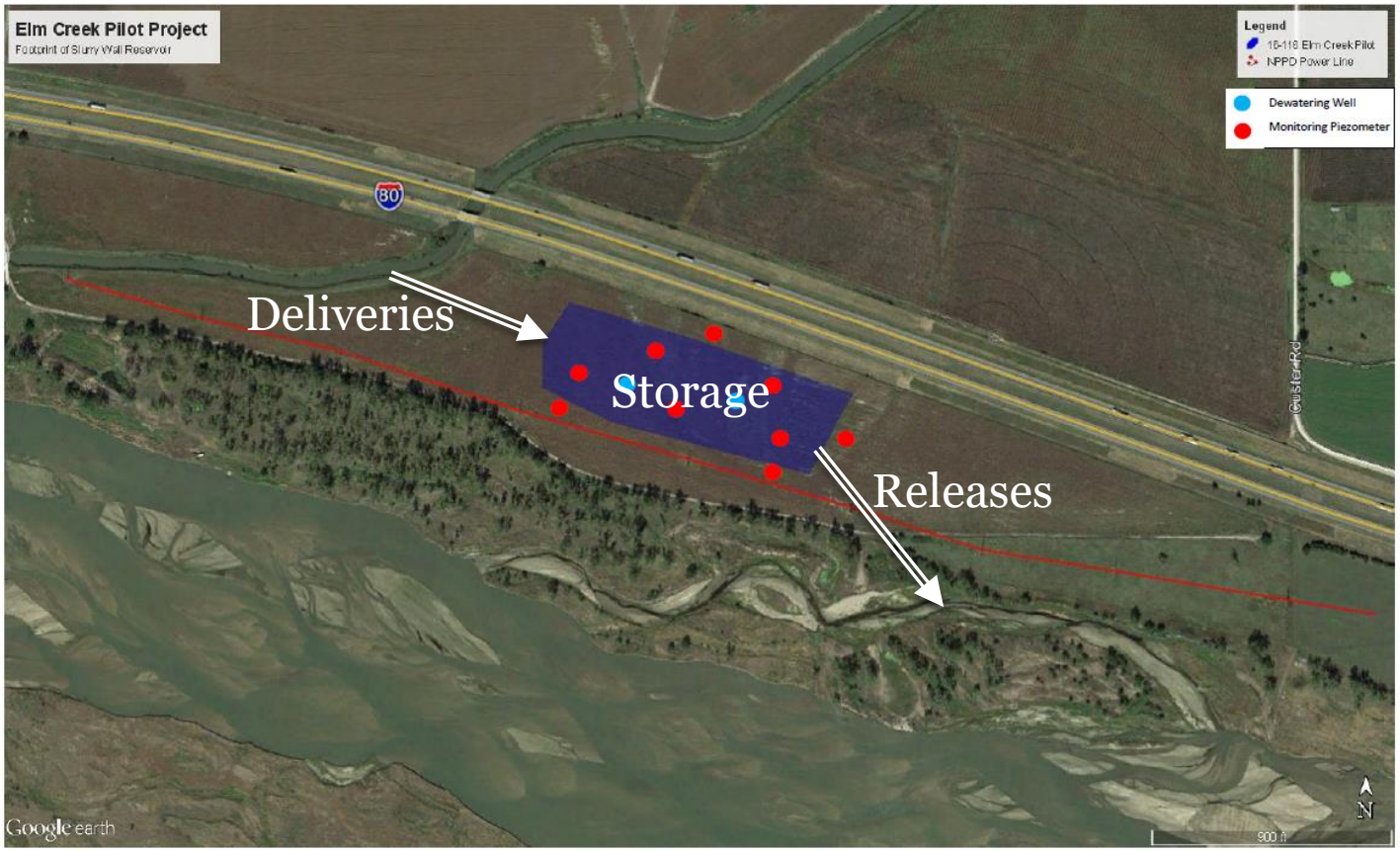

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Figure 1

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Approach 2: Functional Pilot

- Timeframe about 2 years
  - Extra time needed for more extensive design, permitting
  - Excavation of alluvial materials and shaping of sloped inner walls
- Cost
  - $1.6M (10-acre) to $3M (20-acre)
  - Site with deeper low-perm layer may cost more
- Overall more thorough concept evaluation

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Approach 3: Full-scale Project

- Full-scale slurry wall project
  - Skip pilot-scale testing
  - Fully-functional WAP project with anticipated larger score
  - Options
    - Slurry wall aquifer storage on PRRIP land
    - Slurry wall gravel pit at existing sandpit to be acquired

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Approach 3a: Full-scale Project

- Aquifer storage
  - Use existing PRRIP lands (e.g., Plum Creek complex)
  - No excavation of alluvial materials
  - Water storage in void space
  - Less yield that gravel pit for same land area
  - Implementation time about 2 years
  - Potential score
    - On the order of 800 AFY from 116-acre site
    - Highly dependent on inflow/outflow rates
  - Cost about $5M

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Approach 3b: Full-scale Project

- Gravel pit
  - Identify and acquire existing sand pit
    - Assume about 60 acre surface area
    - Fully-mined or nearly complete
    - Could take 6 months to 2 years to acquire
  - Project design and implementation another 2 years after site acquired
  - Score on the order of 2,000-3,000 AFY
  - Cost about $6M

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Important Considerations

- No known precedent for slurry wall storage in central Nebraska
- EDO anticipating significant yield (~15kaf) from slurry wall storage
- Pilot-scale project
  - Learning opportunity
  - Confirm that slurry wall storage can work in central Nebraska
  - Make better site selections and designs later
  - Use Program land (Elm Creek, Plum Creek, Lindstrom)
  - Start sooner
- Full-scale project
  - Delayed start to gravel pit project to acquire property
  - Can still lay groundwork during a pilot
  - EDO to develop screening of existing pits

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WAC Recommendation

- Approach 1 (Non-Functional Pilot) generally unfavorable
  - Lack of functionality
  - Little or no use beyond pilot test
  - No beneficial score
- Approach 3a (Full-Scale Aquifer storage) generally unfavorable
  - Potential patent issues
  - Low yields compared to gravel pits
  - Well pumping issues
  - Significant limitations on inflow/outflow rates

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WAC Recommendation

- Approved motion recommending:
  - Pursuit of a small-scale gravel pit pilot project on Program lands (Approach 2)
  - Simultaneous search for existing sand and gravel pit(s) suitable for acquisition and development of a full-scale slurry wall gravel pit project (Approach 3b)

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Snapshot of Options

- **Approach 1:** Non-functional pilot study
  - Tests construction & performance of slurry wall
  - Time to implement: 1 year
  - Cost: $700,000 to $1.2 million
  - Score: 0 AF

- **Approach 2:** Functional pilot study
  - Tests construction, performance & operation of slurry wall storage facility
  - Time to implement: 1.5 – 2 years
  - Costs: $1.5 to $3 million
  - Score: 150 to 400 AF

- **Approach 3a, 3b:** Full-scale project
  - Skip pilot project and proceed to full-scale
  - Time to implement: 2+ years
  - Cost: $5-$6 million
  - Score: 800 AF (aquifer); 2,000 to 3,000 AF (gravel pit)

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Questions?

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