City of Ada
LS-ASR Project
(Enhanced Aquifer Recharge)

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GWPC
Project Technical Team

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Why Ada?

• The City of Ada and most of Pontotoc County are dependent on *Byrds Mill Spring*

• Available Technical Resources

• Public Awareness and Support for Water Resource Management

• Protect both quality/quantity

• Groundwork for Water Resource Credits
Approach

• Characterize Hydrogeology of Byrds Mill Spring Capture Zone (*near term goals*)
  – Protect Resource/Wellhead Protection
  – Ground water/surface water interaction studies

• Develop Best Practices for Enhanced Aquifer Recharge (*long term goals*)
  – Stabilize water resource for future needs
  – Increase available water resources
Resources

• Water Related Technical Resources
  – The Oka’ Institute, RSKERC, Chickasaw Nation, City of Ada

• Institutional Knowledge and Data from ASA Study

• Resource ($) Availability
  – Funding: Oka’, CN, Ada Water Development Fee
  – Infrastructure: City of Ada test site, monitoring
Relative Position of EAR Field Site to Bryds Mill Spring, ~12 miles South of Ada
Figure 4-5 represents an east-west cross-section of the surface topography from the dam/pond to one of the sinkholes. The responses from the transducers are presented in Figure 4-6. There is a berm between the pond and the sinkhole that acts as a barrier when the water level gets below the top of the berm and prevents any additional pond water from flowing into the sinkhole. These existing structures closely approximate the design concept of a dual pond design with a high-water dam and up-stream infiltration gallery (Figure 4-4).
Recharge Feature Ada LSASR Test Site

Figure 4-8. Sinkhole/Recharge Feature at Ada LSASR Test Site.
Figure 4-6 shows transducer readings indicating that the water levels in the sinkholes rose rapidly during the storm event. The water levels then dropped rapidly when the rain event subsided. The water in the sinkholes continued to drop rapidly until the water had completely disappeared into the subsurface. However, the water in the pond initially dropped rapidly until it was below the top of the berm and then continued to drop, but at a much slower rate. The yellow line that continually rises in this graph is the water level elevation recorded in the nearby Fittstown USGS well.
Objectives

• Develop monitoring capacity in the BMS capture zone and at the proposed Test Site.
  – Monitoring *well* installation, instrumentation
  – Recharge feature identification
  – Geophysics, mapping, infrastructure

• Baseline Characterization
  – Physical: potentiometric head, temperature, conductivity
  – Chemical: Cl\(^-\), Br\(^-\), TOC, DO, NO\(_2\)\(^-\), NO\(_3\)\(^-\), NH\(_4\)\(^+\), RP, SO\(_4\)\(^-\), pH
  – Biological: HPC, coliforms, *E. coli*
Objectives (2)

• Hydrogeologic Characterization
  – Pump test, Draw down
  – Seasonal effects

• Tracer Tests
  – Bromide, Hot/Cold water, *Fluorescent Magnetic Nano-Particles*
  – Geophysics, direct detection
  – Sinkholes, monitoring wells, BMS

• Performance Characterization
  – Impacts: Physical, Chemical, Biological
  – Surface Water impacts on Ground water Determination
  – Design Implications
Enhanced Aquifer Recharge is a rural approach to ASR.

Goal is to enhance base flow and spring flow in the targeted region.
Figure 2: Hypothetical hydrograph showing the relative contribution to stream flow from storm flow and base flow.
Base Flow Characteristics

• Conditions of Scarcity
  – High demand, lower availability

• Ecosystem Function
  – Minimal in stream flow conditions

• Falling Water Table
  – Well impacts: cost, availability
  – Related to available soil moisture

• Riparian Rights Issues
Enhanced Aquifer Recharge (EAR) Concept

Figure 3: Comparison of discharge curves in native and EAR implemented system.
Figure 4-1. Pond with incorporated infiltration features.

Leaky Pond Design

High Transmissivity Material in Constructed Bottom, Behind Retention Structure

- Low Water Dam
- Retained Storm Flow
- Water Table after rainfall event
- Aquifer Recharge
A Proposed Regulatory Framework

- Enhancing a Native Process
- Passive Design
- Similar to Pervious Pavement?
  - Lower Risk
  - Urban Storm Water vs Rural Storm Flow
- System Design/Best Practices
- Land Owner Tradable Credits
  - Similar to severable water rights
EAR, a landscape management approach to water resource creation.

Questions?