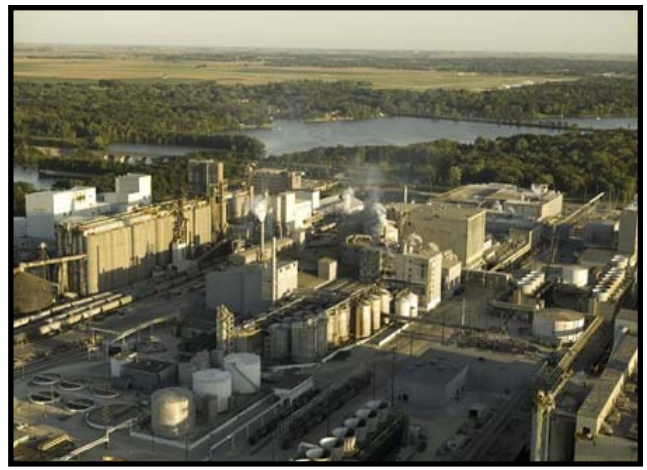
Permitting the Illinois Basin – Decatur Site



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October 8, 2008 • DOE Partnership Review Meeting • Pittsburgh, Pennsylvania

Engaging State and Federal EPA

- Building knowledge of UIC program and process
- Early engagement with State and Federal EPA and other government agencies
- Regional regulatory conference hosted by U.S. EPA Region 5 at Angola, Indiana (March 2007)
- Regular meetings throughout FutureGen and Phase III planning stages

Regulatory Context

- Illinois IEPA has primacy:
  - UIC Class I, III, IV, V
- Illinois Department of Natural Resources – Mines and Minerals Oil and Gas Division
  - UIC Class II
- Most recent new permit for a Class I non-hazardous well was issued in 1970s
- Common goal: Projects not slowed down by permitting process

Permitting Efforts

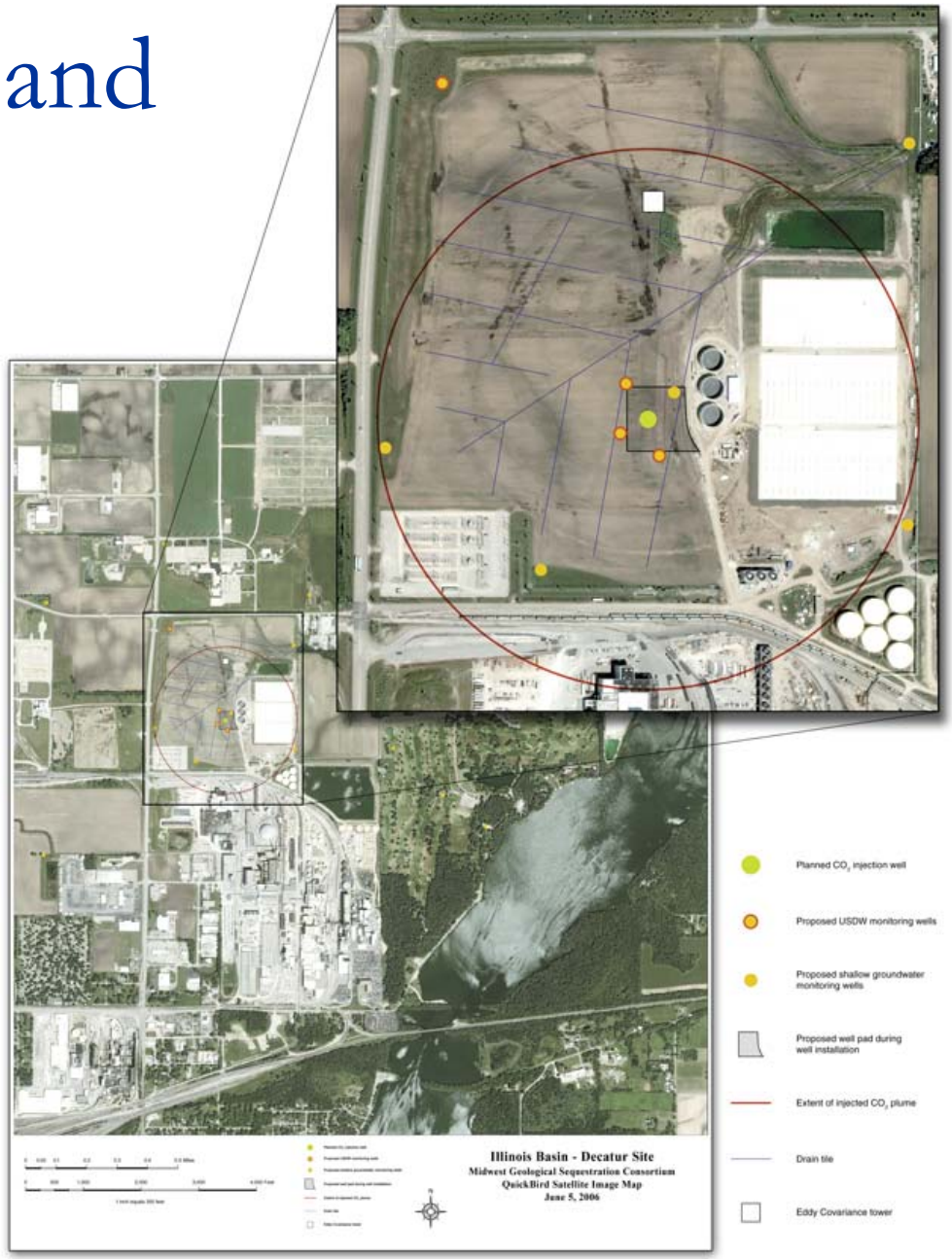
- NEPA – submitted
- Groundwater wells – Health Department compliance
- Environmental Assessment (EA) – completed by DOE contractor
- UIC permit – permit to drill well and inject CO_2
- Drilling permit – IDNR for observation well (pending)

Illinois Basin – Decatur Site
Large-scale demonstration project (Phase III)

- Illinois Basin – Decatur deep saline reservoir sequestration demonstration project
- Inject 1 million metric tonnes over three years (1,000 metric tonnes/day)
- Drill new injection well into granite bedrock beneath Mt. Simon Sandstone (~8,000 feet)

Project Location and Details

- Corn processing plant
- CO_2 source is ethanol production facility
- Two injection zone monitoring wells
- Four regulatory shallow groundwater wells
- Area of review 2.5 miles



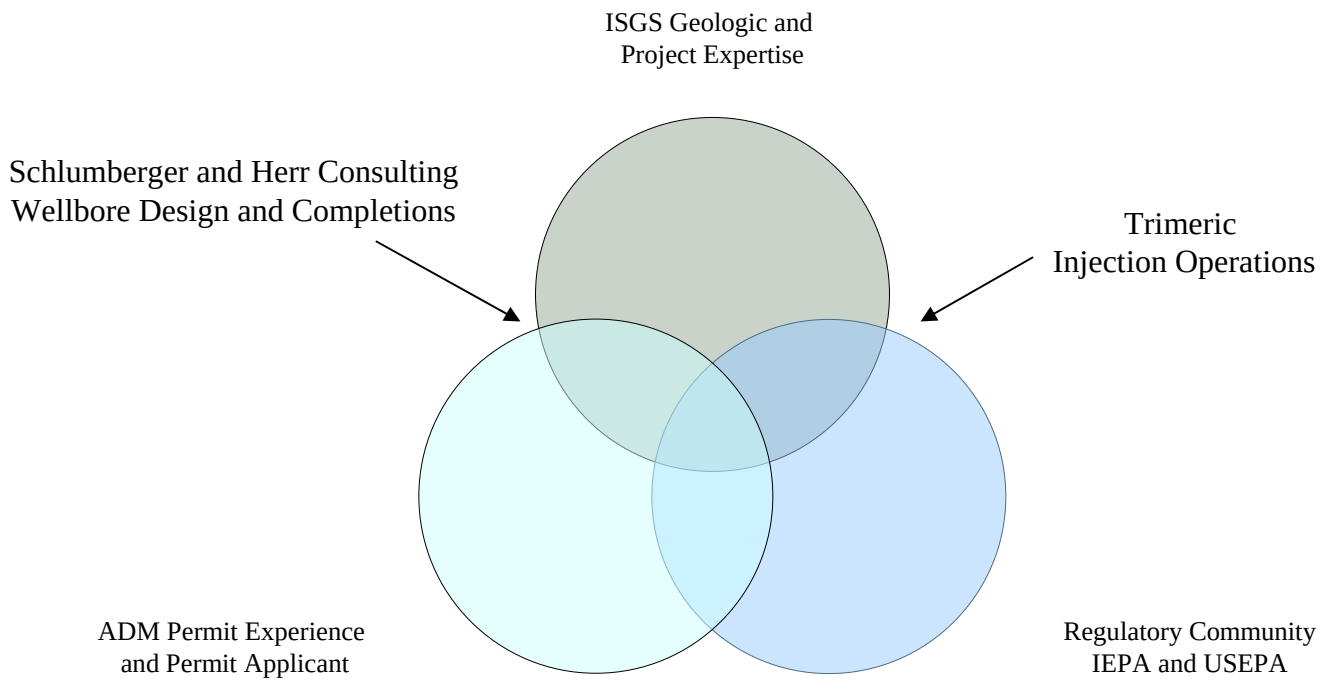
Stage One of the Permit Process
Feasibility Report

- Preparing the permit application
- Iterative addressing of technical concerns
- Resubmitting the permit application
- Review of draft permit
- Initiation of draft permit public comment period (30 days)
- Announcement of public hearing (45 days)
- Initiation of second public comment period (30 days)
- Initiation of appeal period (35 days)
- Issuance of permit
- Drilling

Stage Two of the Permit Process
Completion Report

- Compiling data for Completion Report
- Submission of Completion Report
- Addressing regulator concerns
- Issuance of final approval to begin injection

Permit Application Contributors



Areas of Expertise: The Permit Team

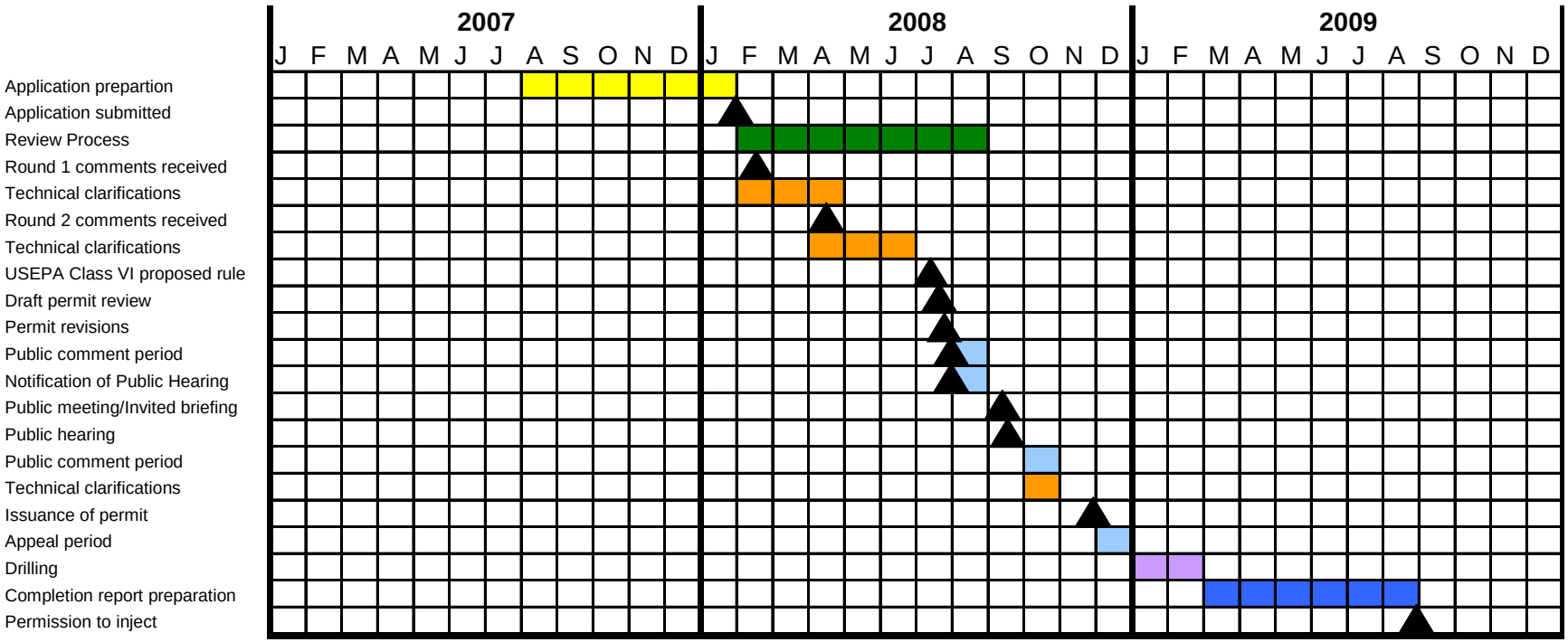
- Project lead (Rob Finley)
- Communications, planning, finalization (Sallie Greenberg)
- Plant coordinator and applicant representative (ADM, Dean Frommelt)
  - Environmental manager
  - Experience with plant permits
- Reservoir engineer, modeling (Scott Frailey)
- Hydrogeologist (Ed Mehnert)
- Basin geologist (Hannes Leetaru)
- Geochemists (William Roy, Ivan Krapac, Sallie Greenberg)
- Well design (Schlumberger, Herr Consulting, PE requirement)
- Operations design (Trimeric)
- GIS expert (Chris Korose)
- Graphics and layout support (Daniel Byers, ADM)
- Administrative support (ADM)
- Regulators (Kevin Lesko, Kelly Huser, Melinda Shaw, Bur Filson)

Illinois Basin – Decatur Site Timeline
UIC Class I Non-Hazardous

- August 2007 - permit application started
- January 31, 2008 – permit application submitted
- February 2008 – first round technical clarifications
- April 2008 – second round technical clarifications
- July 15, 2008 – USEPA Class VI proposed rule available
- July 17, 2008 – draft permit received for review
- August 1, 2008 – notice of public comment period and notice of public hearing
- September 11, 2008 – public information meeting and invited briefing
- September 16, 2008 – public hearing
- October 2008 – final technical clarifications
- October 17, 2008 – public comment period closes

Permitting Timeline

Illinois Basin - Decatur Site UIC Permit Timeline



Progress on UIC Permit

- Illinois Environmental Protection Agency
- Class I Non-Hazardous
- Draft permit out for public comment
- Feasibility report complete
- Drilling – pending permit
- Completion report – pending drilling, logging, and data analysis
- Permission to drill – pending successful completion report

Technical Clarifications

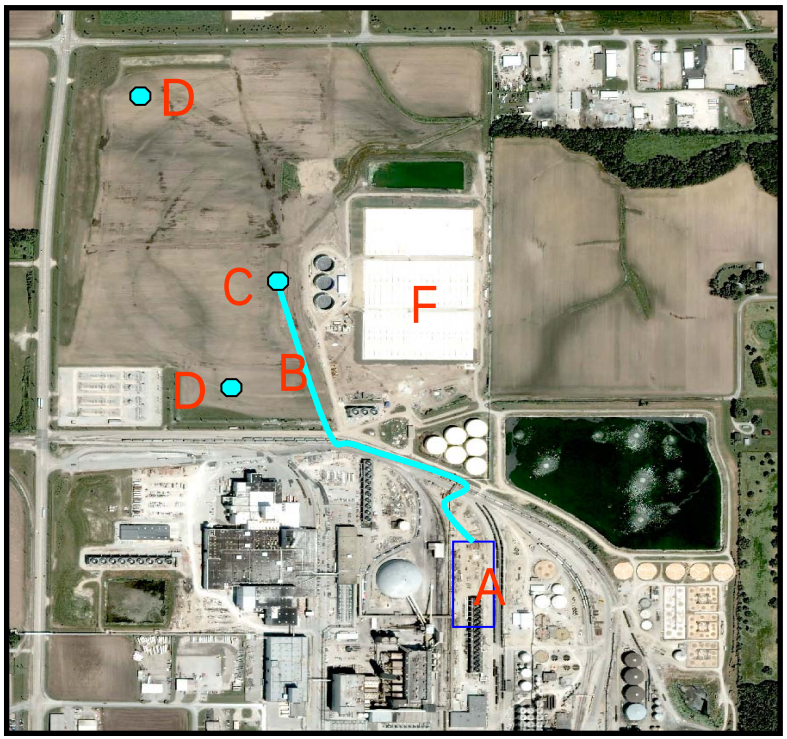
- Round 1
  - Details (abbreviations, larger figures)
  - Cementing plan and specifications
  - Modification of verification well to injection well
  - Packer placement
  - Groundwater sampling and monitoring parameters
- Round 2
  - More detailed groundwater sample analysis plan
  - Annulus pressure maintenance
  - Multiple perforations
  - MIT of monitoring wells

Balancing Research Goals and Regulatory Requirements

- MMV Program
  - Research monitoring wells
  - EPA required monitoring wells
  - Sampling
  - Frequency of reporting
- Well Design (minimum requirements for regulations and injection)
  - Cementing
  - Casing size and length
- Completion design
  - Perforated zones
  - Packer placement

Plume Monitoring Strategies

- Drill two verification wells (D) based on surface seismic and VSP data, generally one updip and one downdip, or placed based on VSP plume boundary imaging



- Open-hole logging and flexible (Westbay) fluid sampling strategy
- Pressure/temp. monitoring
- Cased-hole logging

Permit Requirements

- Permit for 1 million metric tones CO_2 injection
- Permit for project duration
- Reapplication if use as commercial well, under new regulatory conditions
- Well Construction
  - Casing – steel grades in application or better
  - Cement – CO_2 resistant cement
  - Surface, intermediate, and long-string cemented to surface
  - Operations – continuous recording of injection pressure, injection rate, temperature, annular space pressure
  - Closure – cement to surface
- CO2 Composition
  - As stated in permit application – 99.98%
  - Grab samples required annually

Permit Requirements (cont.)

- Monitoring
  - 4 regulatory shallow groundwater monitoring wells
  - Determine lowermost USDW
  - Injection pressure to be determined (submitted in completion report)
  - Injection rate 1,200 tons/day
  - Corrosion plan (completion report)
  - Injection zone – demonstrate no cross contamination
- Mechanical Integrity
  - MIT every 5 years
  - Annual annulus pressure test
  - Temperature survey every two years
  - Well annulus pressure – 400 psi minimum
  - Pressure differential – 100 psi differential between tubing and annulus during injection

Public Engagement

- Hosted Congressional Briefing
- Hosted Media Briefing
- Hosted Invited Briefing
- Hosted Public Information Meeting
- Working with Decatur Public Schools
- Public comment period closes October 17, 2008

The Public Hearing Experience

- Hearing opened
- Brief summary of permit by IEPA
- 12-15 members of the general public present
  - 1 local business owner concerned about groundwater
  - 1 NGO representative from Chicago regional office
  - Several curious parties
- One satisfied customer… “I came here with questions, you answered my questions. I am satisfied.”
- Opportunity to hear questions concerns
- Few surprises
- NGOs may employ delay tactics on projects
  - “We will be submitting several technical questions.”
- No comments received by IEPA to date
- Opportunity to help write technical responses to comments

Questions/Comments

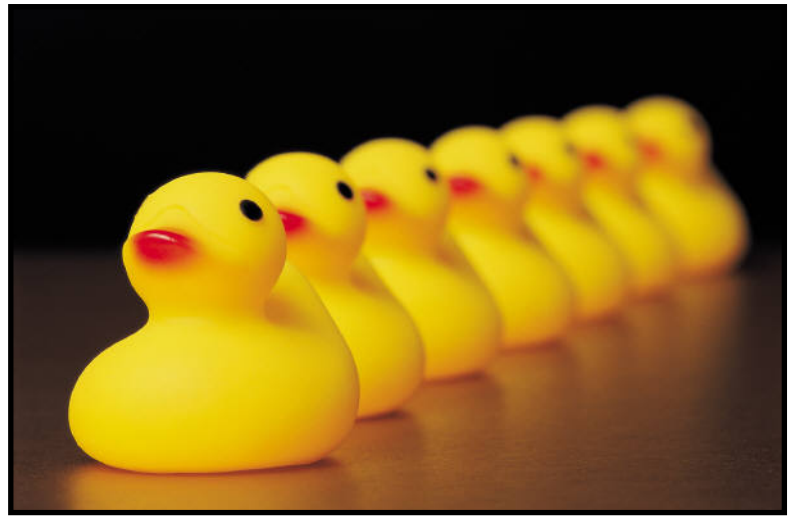
- Open for public comments/questions
  - What happens in the event of earthquakes?
  - How does this permit fit within new Class VI proposed rule?
  - How long is post-monitoring period for this well?
  - How long is permit issued for?
  - Who is liable if something goes wrong with the project?
  - Will the well materials be corrosion resistant?
  - Will the seismic data collected be available to the public?
  - Will Union rules be upheld?

Benefits of Internal Application Development

- Permitting process impacted and drove aspects of:
  - Partnership Development
  - Well design
  - MMV program design
  - Injection operations design
  - Communications program
    - Technical outreach
    - General outreach
    - Government outreach
- Familiarized staff with UIC program and regulatory process
- Prepared ISGS for role as provider of information for future permits

Lessons Learned

- Start early, start earlier
- Ask a lot of questions
- Understand the timetable
- Build a good team
- Establish good relations with regulators
- Hire a consultant if it makes sense for your organization
- Have an internal point person
- Plan for the unexpected



Future Opportunities

- What role do regional partnerships, geological surveys, and carbon service providers have in the permit process?

- Information providers
  - ISGS, IGS, KGS primary sources of geologic information
  - Existing permit application/permit as examples
- Support for IEPA with other permits
  - Provide figures, rock samples
  - Provide review, consultation
- Permit consultation for developing projects
  - Permit application and permit likely to set standards
  - Data reconnaissance
  - Data source

Questions ?