EPA United States Environmental Protection Agency

Hydraulic Fracturing Study

State Partner Consultation

2:00 – 2:15	Greetings & Roll Call Ann Codrington, Office of Ground Water and Drinking Water
2:15 – 2:45	EPA Preliminary Plans for Study Audrey Levine, Office of Research and Development (ORD)
2:45 – 3:00	Stakeholder Process Jill Dean, Office of Ground Water and Drinking Water (OGWDW); Drinking Water Protection Division
3:00 – 4:00	Discussion

EPA
United States
Environmental Protection
Agency

Potential Relationships Between Hydraulic Fracturing and Drinking Water Resources

Outreach to State Partners on Study Design and Stakeholder Involvement

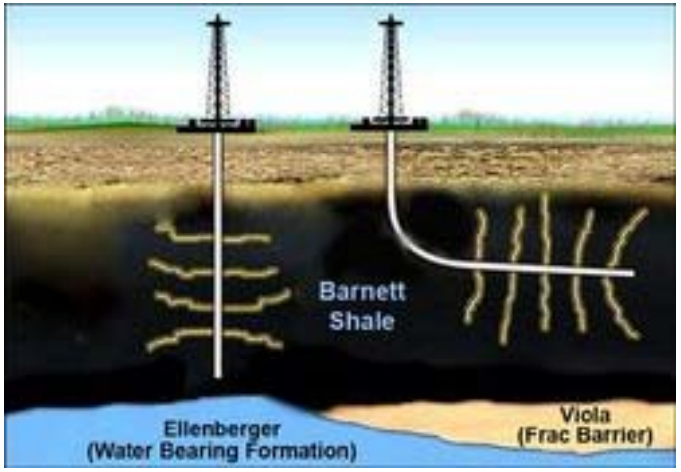


Office of Research and Development

State Partner Web-Cast
27 May 2010

Major topics to be discussed

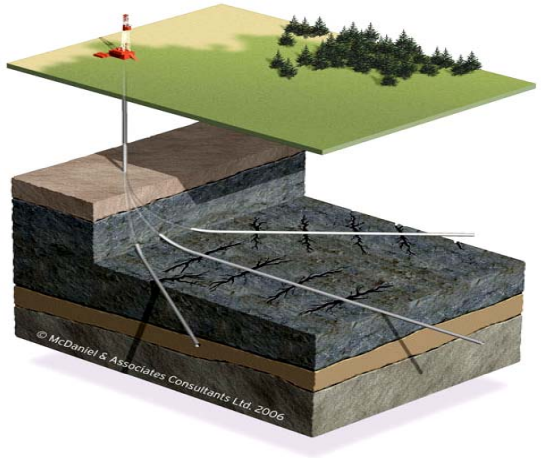
- Provide overview of context for study and approach for developing study design
- Describe potential components of study
- Identify types of data and information that stakeholders can provide
- Provide summary of April 2010 Science Advisory Board (SAB) Consultation
  - Scope of Study
  - Research Focus and Prioritization
  - Stakeholder Process
- Describe Stakeholder Process
- Solicit input/feedback from participants through discussion session



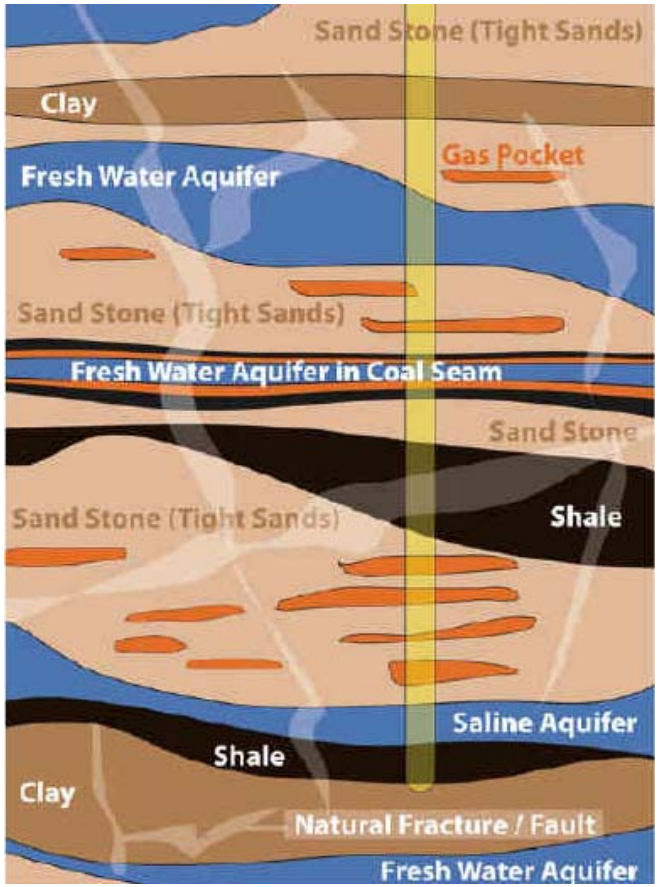
Directive to EPA from the FY10 Appropriation Conference Committee

"The conferees urge the Agency to carry out a study on the relationship between hydraulic fracturing and drinking water, using a credible approach that relies on the best available science, as well as independent sources of information. The conferees expect the study to be conducted through a transparent, peer-reviewed process that will ensure the validity and accuracy of the data. The Agency shall consult with other Federal agencies as well as appropriate State and interstate regulatory agencies in carrying out the study, which should be prepared in accordance with the Agency's quality assurance principles."

Why is hydraulic fracturing a concern now?



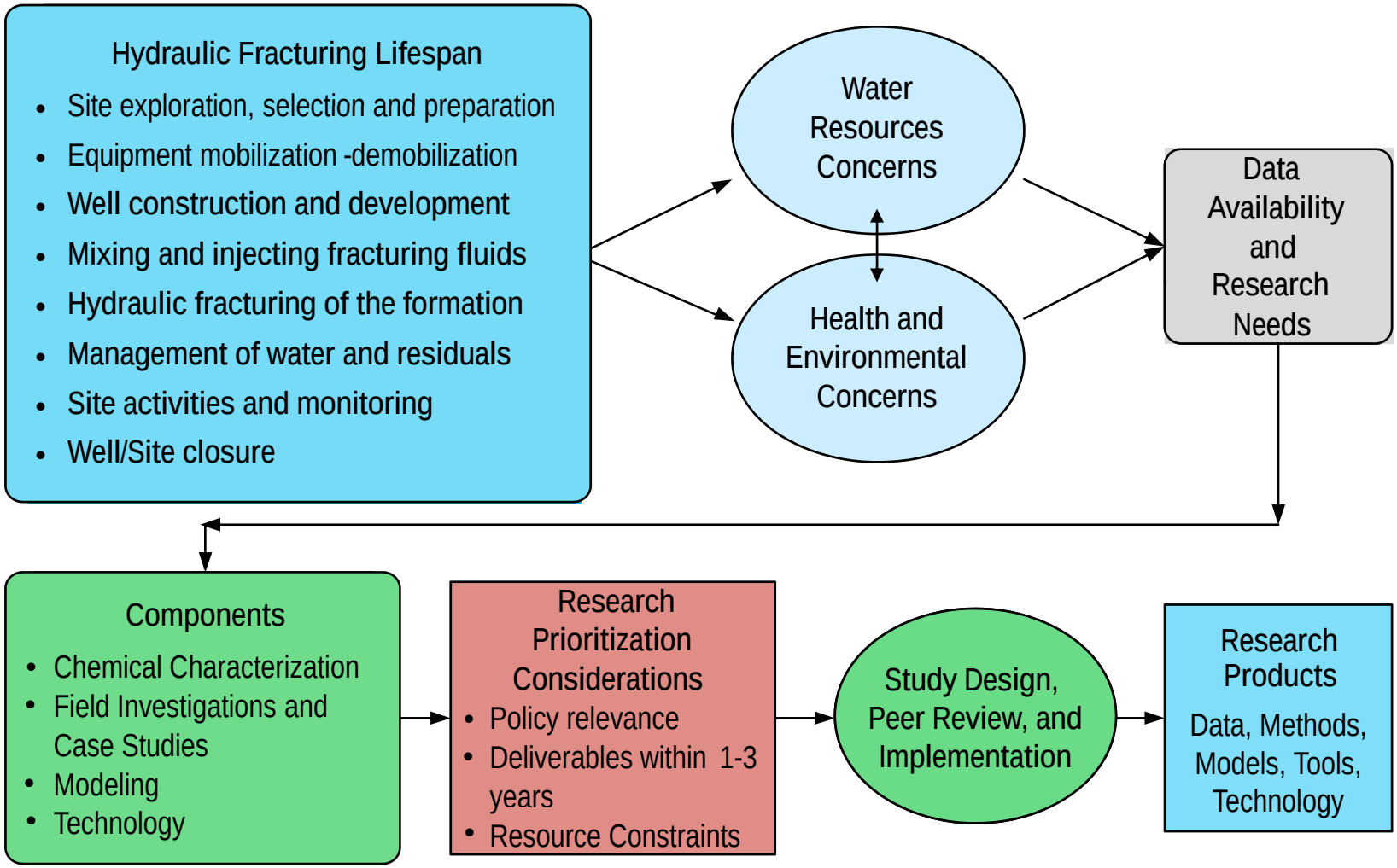
- Extraction of energy resources from shale is becoming more prevalent due to:
  - Advances in horizontal drilling technologies and new fluid formulations that improve economics
  - Access to different formations (shale, coalbeds, tight sands)
  - "Unconventional" gas is perceived to represent a significant future domestic "clean" energy source
- Concerns about potential endangerment of water supplies
  - New and different geographic and geologic settings
  - Adjacent formations may contain metals, radionuclides, salts, or other constituents that may be mobilized and impact water quality
  - Environmental contaminants associated with hydraulic fracturing chemicals, well drilling, water, wastes, and residuals may pose risks to public health, water resources, and the environment



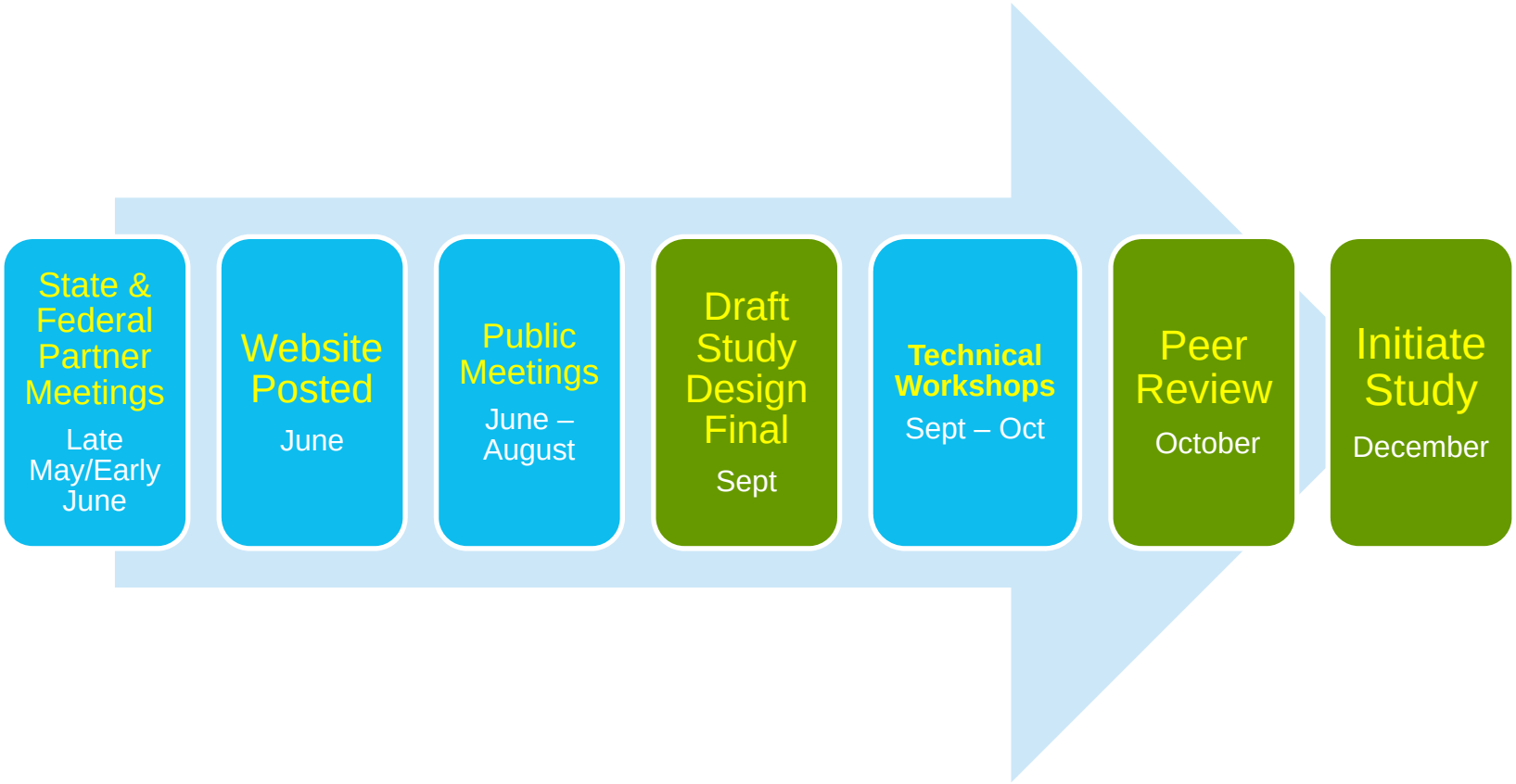
Role of Water in the context of the Hydraulic Fracturing Lifespan

- Water associated with hydraulic fracturing is derived from local underground or surface sources, and it is either managed on-site or transported off-site for treatment and/or discharge
- The water "footprint" of hydraulic fracturing depends on the formation, depth, and type of drilling (e.g. vertical, horizontal, directional)
- Examples of water associated with the hydraulic fracturing lifespan include:
  - *Underground and surface sources of drinking water*
  - *Make-up water for mixing hydraulic fracturing fluids and proppants*
  - *Flow-back water, produced water, wastewater, and storm water*
- Contaminants associated with flowback fluids and produced water may include:
  - *Hydraulic fracturing fluids, sand, propping agents, chemical degradation and transformation products, and microbial growth that may be triggered through water use*
  - *Materials in the subsurface that are mobilized by the injected fluids and brought to the surface during energy resource extraction*
  - *Constituents such as metals, radionuclides, and organics that may precipitate or volatilize through water and wastewater management*

Approach for Developing EPA Study Plan



2010 Timeline



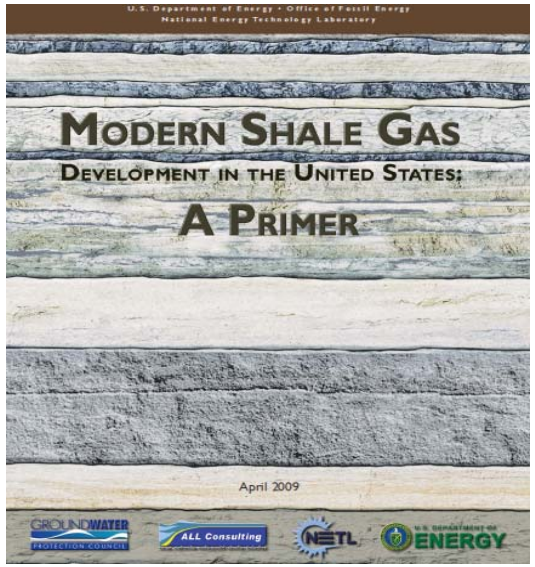
Initial study results are expected to be published by late 2012.

Potential Elements of the Study

- Collection of background data and information including public data collection
- Characterization of chemical constituents
- Field investigations, case studies, and modeling
- Modeling
- Explore technological solutions

Data and Information

- Hydraulic fracturing data and information needs
  - Baseline data about site characteristics and surrounding area prior to drilling
  - Validated and consistent data on chemicals, additives, and their concentrations
  - Water quality data associated with flowback and produced waters
  - Data on metals, radionuclides, and other constituents that are mobilized from the subsurface, wastewater, or residuals
  - Regional and geographic variations
- Identify and evaluate sources of published data
  - Published reports (e.g. EPA, DOE, USGS, GWPC, Industry, State Associations, Environmental Groups, Universities, etc.)
  - Peer-reviewed literature
- Develop process for collecting, compiling, and reporting data from stakeholders
  - Categories of data and information
  - Quality assurance criteria
  - Mapping, statistical analyses



Public Data Collection on HF and drinking water

- Types of data and information that are relevant to study:
  - Water quality and monitoring data (wells, surface water, wastewater)
  - Well installation, monitoring, and integrity data
  - Information on well failures
  - Information on water use and management practices
  - Data and information on chemicals use
- How the information may be used:
  - Qualitative evaluation of status of information
  - Identify research and information gaps
  - Inform study design and screen sites for case studies
  - Prioritize research
- Data and information collection challenges:
  - Credible sources, well-documented methodologies, quality assurance
  - Consistency across sources (format, reporting limits, sampling approaches, etc)
  - Potential reporting bias
- Federal Register Notice during summer 2010 to request data

Potential Research to Characterize Chemical Constituents

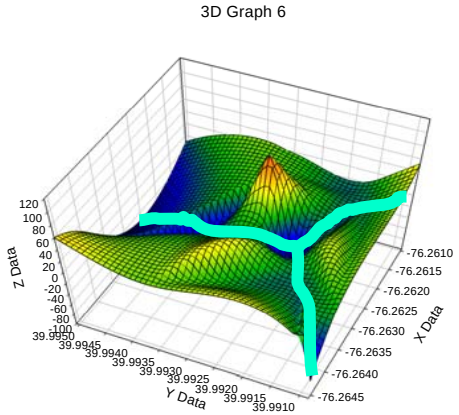
- Develop analytical methods that can overcome potential matrix effects
- Analyze degradation properties of fracturing fluids
- Chemically characterize pre-injection, flowback, and produced water
- Identify indicator/surrogate parameters that can be used to indicate exposure
- Determine the potential for metals, radionuclides, organic contaminants or gases to be mobilized from geologic formations and treatment residuals
- Evaluate key biogeochemical processes that might impact the quality of drinking water supplies

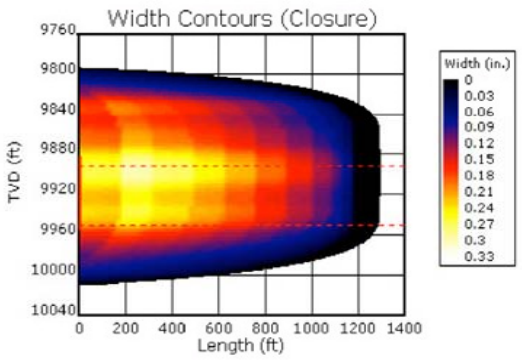
Potential Field Investigations

- Case studies
  - Criteria for site selection
  - Background information and data
  - Model of exposure pathways
  - Field investigations and sample collection
  - Data analysis and interpretation
  - Modeling
  - Risk assessment
- Sampling program for field investigations
  - Well Sampling and Analysis
    - New nested monitoring wells
    - Existing drinking water wells
    - Abandoned wells (gases)
  - Pre-injection, flowback fluids, produced water, wastewater discharges, surface water supplies
  - Process residuals
  - Other exposure pathways

Potential Computational Modeling Activities

- Fate and transport studies of HF fluids
- Predict the likelihood of drinking water impacts based upon the available geologic, geochemical, and geophysical data
- Determine the zone of influence of HF fluids and area of review in the subsurface
- Develop watershed based models to evaluate impacts of water withdrawals and wastewater discharges on water quality and availability





Explore Technological Solutions

- Water resource protection and best management practices
- Monitoring strategies (short-term and long-term)
- Sustainable and reliable strategies for water management
  - Water use optimization (quality and quantity)
  - Treatment technologies for flowback fluids ,produced waters, residuals, and other waste materials generated through HF
- Alternative chemicals/technologies that reduce environmental and health risks
  - Hydraulic fracturing chemicals
  - Biocides
  - Water treatment and reuse
- Integrated data and information management including mapping to overlay HF activities with the locations of gas resources, drinking water resources, and other relevant site information

Science Advisory Board Consultation

- Public meeting held in Washington DC April 7-8 2010
- SAB provided with scoping materials and charge questions
- Charge questions
  1. Scope:
     - *What recommendations does the SAB Environmental Engineering Committee (EEC) have regarding the scope of the study?*
  2. Research questions and prioritization:
     - *What recommendations does the SAB EEC have regarding the research questions identified?*
     - *What process does the SAB EEC suggest for prioritizing research needs given the Congressional request and a desire by the Agency to complete initial research products by the end of calendar year 2012?*
  3. Stakeholders:
     - *What advice does the SAB EEC offer for designing a stakeholder process that provides for balanced input in developing a sound scientific approach for the overall research strategy?*
- Stakeholder representation: Other Federal agencies, States and State agencies, local governments, non-governmental organizations and associations, public interest groups, industries, industrial organizations and associations, and private citizens
- Stakeholder Comments: 64 written comments, 15 oral statements
- For more information: http://www.epa.gov/sab

Summary of Science Advisory Board Draft Response to Charge Questions (5-20-2010)

1. Scope:
   - *Short-term research should be directed to study sources and pathways of potential impacts of hydraulic fracturing on water resources (quality and quantity), including surface waters, underground sources of drinking water, and potential sources of drinking water*
   - *Use a lifecycle framework to identify the most important research questions and characterize fundamental physical and chemical processes below and above ground*
   - *Focus on human health and environmental concerns specific to HF*
2. Research questions and prioritization:
   - *Careful compilation and review of all available data and knowledge available in peer-reviewed literature, in industry, in professional and non-governmental organizations, and government agencies*
   - *Use a case-study approach to facilitate exchange of information between resource development companies and citizen groups*
   - *Prioritize research toward the reactions and transport of hydraulic fracturing fluids in complex subsurface environments including characteristics of the injected fluids, reactions occurring in the injected zone, and pathways for exposure*

SAB Response to Charge Question 3: *Stakeholders*

- Develop a balanced, collaborative advisory group of stakeholders representing a broad range of perspectives
- Engage stakeholders throughout the study
- Use best available social science for developing stakeholder engagement activities
- Engage with relevant states to inventory and conduct performance evaluations of the effectiveness of state regulatory, technological development and BMP activities

EPA United States Environmental Protection Agency

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United States Environmental Protection Agency

Hydraulic Fracturing Study: Stakeholder Process

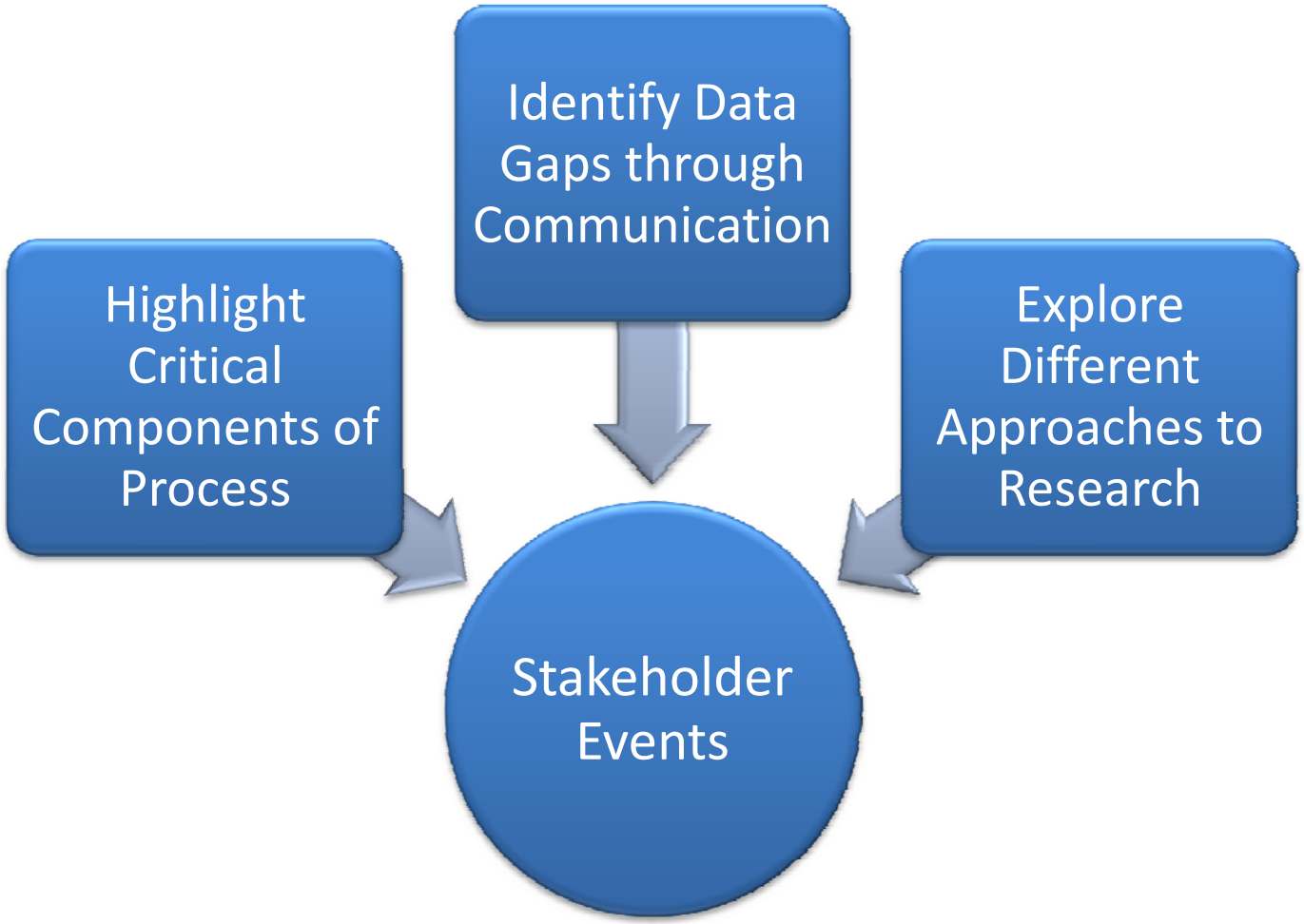
May 27, 2010
State Partner Consultation

Jill Dean, EPA Office of Water

OUTLINE

- Purpose of stakeholder events
- Types of stakeholder events
- Collaborative Groups
- Timeline
- Input

Purpose of Engaging the Public



Stakeholder Events

Facilitated Public Meetings

- Late June – August 2010
- Locations: Binghamton, NY; Morgantown, WV; Fort Worth, TX; Denver, CO; Washington, DC

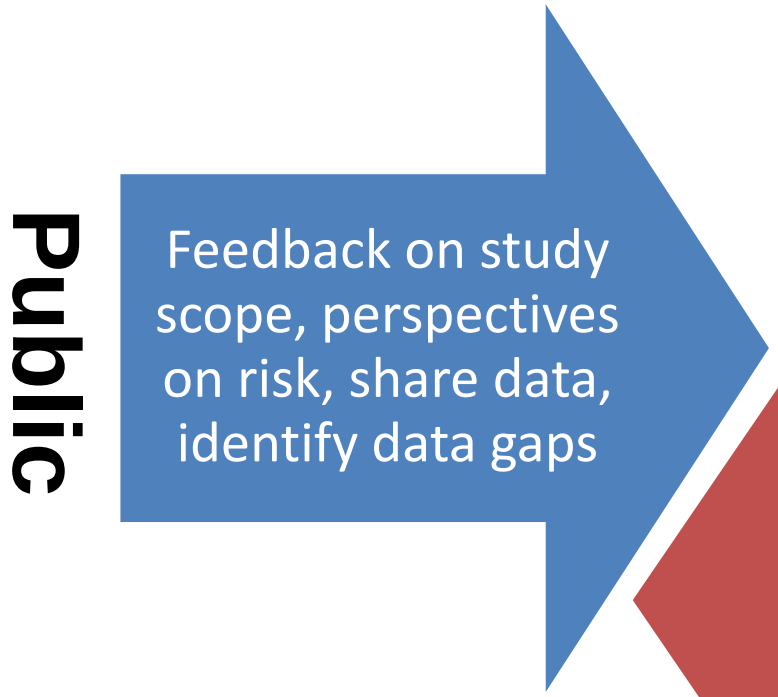
Sector-Specific Meetings

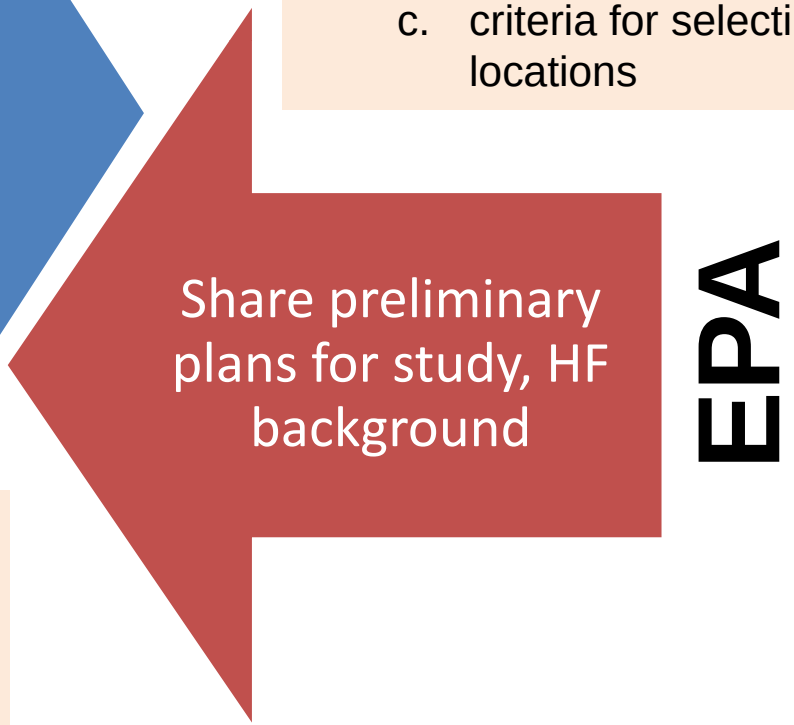
- June – July 2010
- Sectors: State & federal partners, industry, environmental groups, citizens, tribes

Technical Workshops

- September – October 2010
- Locations: To be determined

Facilitated Public Meetings





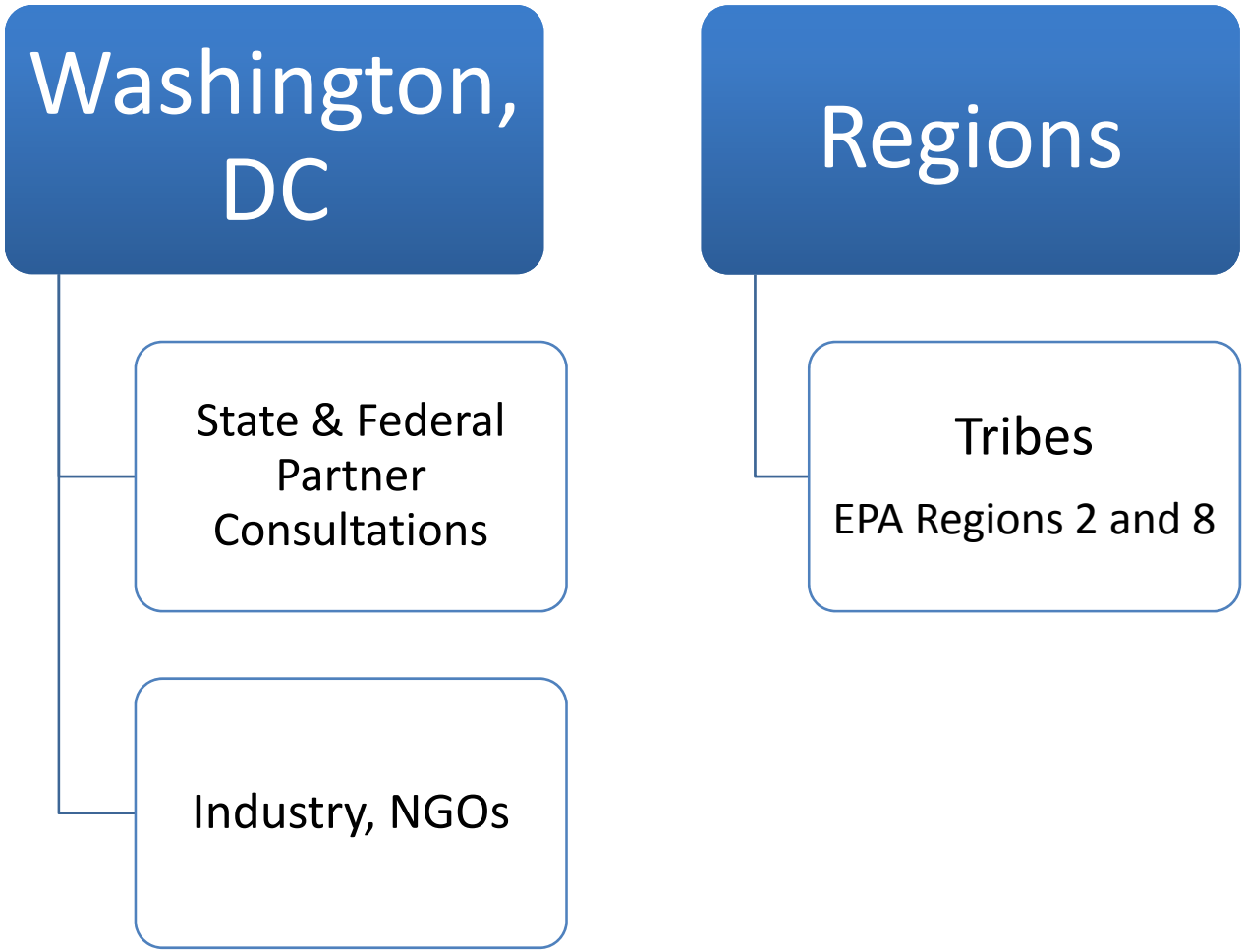
Possible Meeting Activities

1. Presentations by EPA on
   a. hydraulic fracturing background
   b. draft study plan and scope
   c. criteria for selecting case study locations

Format Options

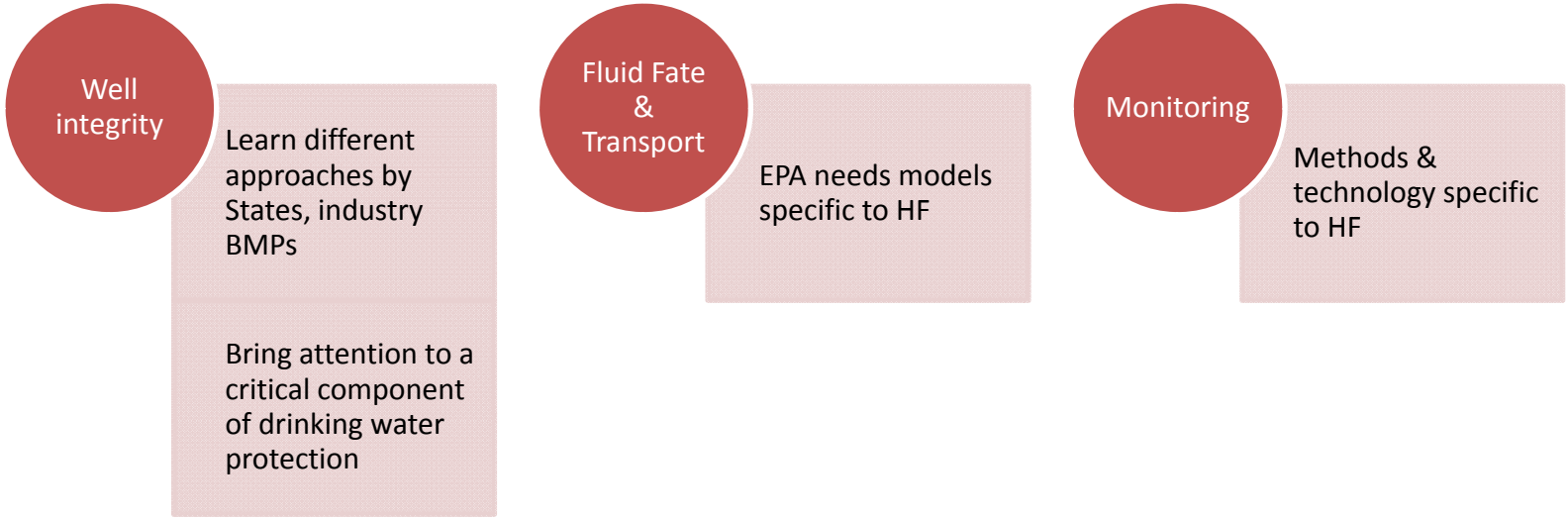
1. Full-day public meeting followed by ½ day citizen meeting
2. ½ day public meeting in afternoon, and ½ day citizen meeting in evening

Sector-Specific Meetings



Technical Workshops

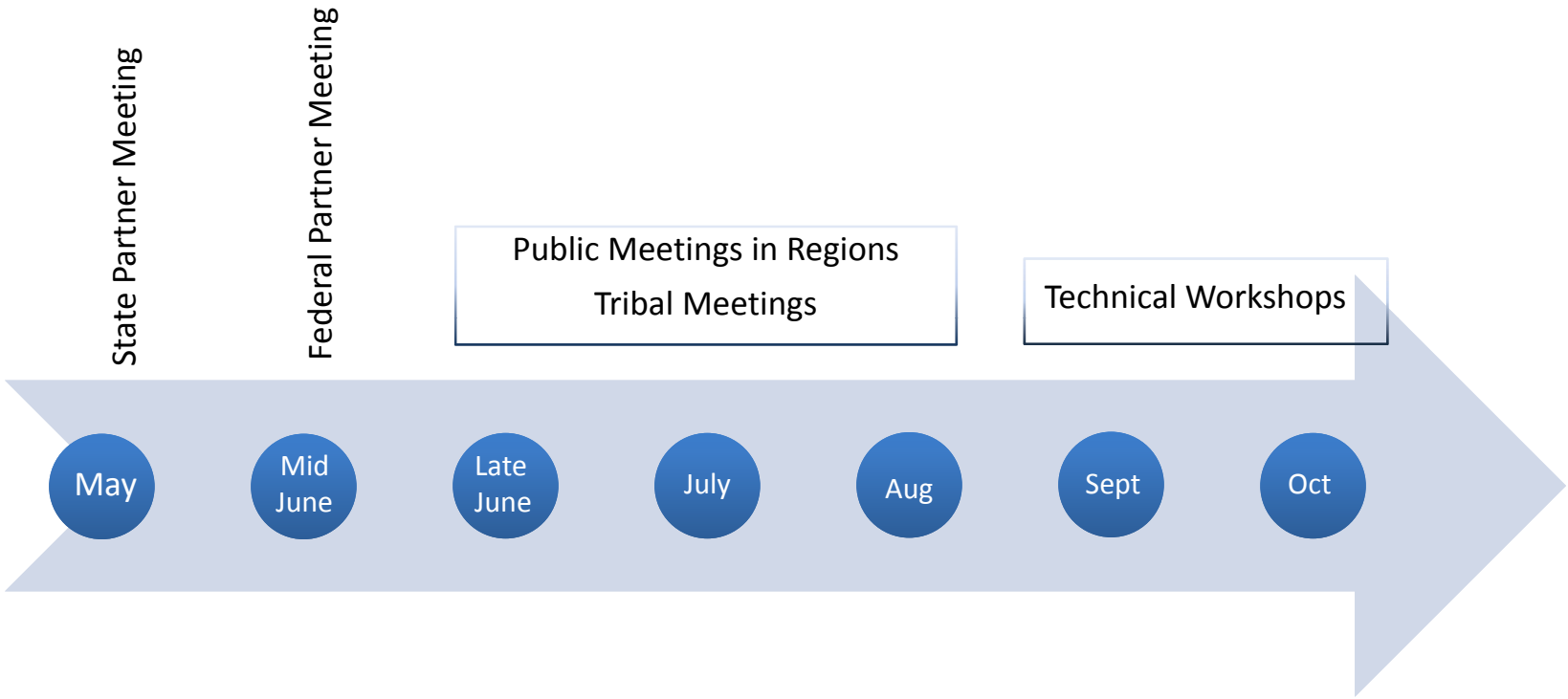
- Define the technical information EPA does not have to inform the study design, field investigations
- Who do we invite?
- Are these the right topics?



Opportunities for Collaboration

- Stakeholder collaborative group (suggested by SAB, but undecided by EPA)
  - Represent balanced perspectives from many sectors
  - Group would give feedback throughout study
  - Individual advice rather than consensus
  - Nominating process?
- Interagency collaborative group
  - Federal & State partners
  - Group would serve as a “sounding board” and provide constructive feedback throughout study
  - Members should be working staff, not managers

2010 Stakeholder Process Timeline



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Discussion Topics

- Components of study
  - What are the highest priority and most critical outputs/outcomes that this study should seek to accomplish?
  - Are there issues that are not included that should be considered in the study design?
- Availability of data and information
  - What types of data and information are available?
  - Do you have suggestions on streamlining the data collection process?
- Ongoing activities
  - Can you provide information on other studies that may be relevant to this effort?
  - Are there ways that this study could complement/leverage current activities?

Discussion Topics (2)

- Case study concept
  - Do you have any feedback/suggestions on the case study approach?
  - Do you have suggestions on criteria that should be considered in selecting sites for the case studies?
- Stakeholder process
  - How would you like to be involved as the study progresses from design to implementation?
  - Do you have suggestions for our proposed approach
- Other comments and suggestions?

For stakeholder questions, contact Jill Dean, dean.jill@epa.gov

For study-related questions, contact Jeanne Briskin, briskin.jeanne@epa.gov

Appendix

ASDWA Questions Submitted to EPA for Webinar

Association of State Drinking Water Administrators

State Hydraulic Fracturing Questions

1. Is there any way to assess the likelihood that a horizontal borehole will have communication with upper aquifers before and after fracing?

a. What information should be collected to evaluate the communication via natural fractures or fractures expanded by hydrofracing?
b. What parameters would EPA be most concerned about during the evaluation of the location for a potential gas well? What would they use or suggest as a parameter to evaluate to preclude locating a site specific drill pad?

2. Does EPA have any recommendations for setback distances from potable supply wells? Is there a database of contamination events that describes distances between the source and where the contamination shows up?

3. Why were early estimates indicating that 80% of the hydrofracing fluid would flow back but the experience so far has been the opposite -- 20% flowback?

4. If a problem develops, what are EPA's recommendations for finding the source and what activity should occur at the gas well pad? What is EPA's view on adding tracers? If a tracer is needed, what would it be?

Association of State Drinking Water Administrators

State Hydraulic Fracturing Questions

5. What is EPA's position on whether or not hydrofracing is resulting in seismic activity of concern?

6. What analytical parameters would EPA recommend for assessing local potable water wells and the potential impacts from hydrofracing?

7. States would like to hear a generic discussion of treatment of the flowback water and brines. What does the Agency see being the ultimate fate of these waters/materials?

8. Are the state primacy agencies responsible for ground water regulations, potential impacts, and ground water protection related to the Oil and Gas operations that will be discussed in the webinar? State regulations could potentially be affected the most by this study and the outcomes.

9. Is the study looking at a range of geologic scenarios? (i.e., fracture flow situations, shallow alluvial aquifers, confined aquifers, etc.) Please clarify the range of hydro-geologic environments involved in the study.

10. What is the proposed length of the study? What time commitments are expected from the steering committee members vs. general participants?