

Update on EPA's Prospective Case Studies

Technical Workshop: Case Studies to Assess Potential Impacts of Hydraulic Fracturing on Drinking Water Resources

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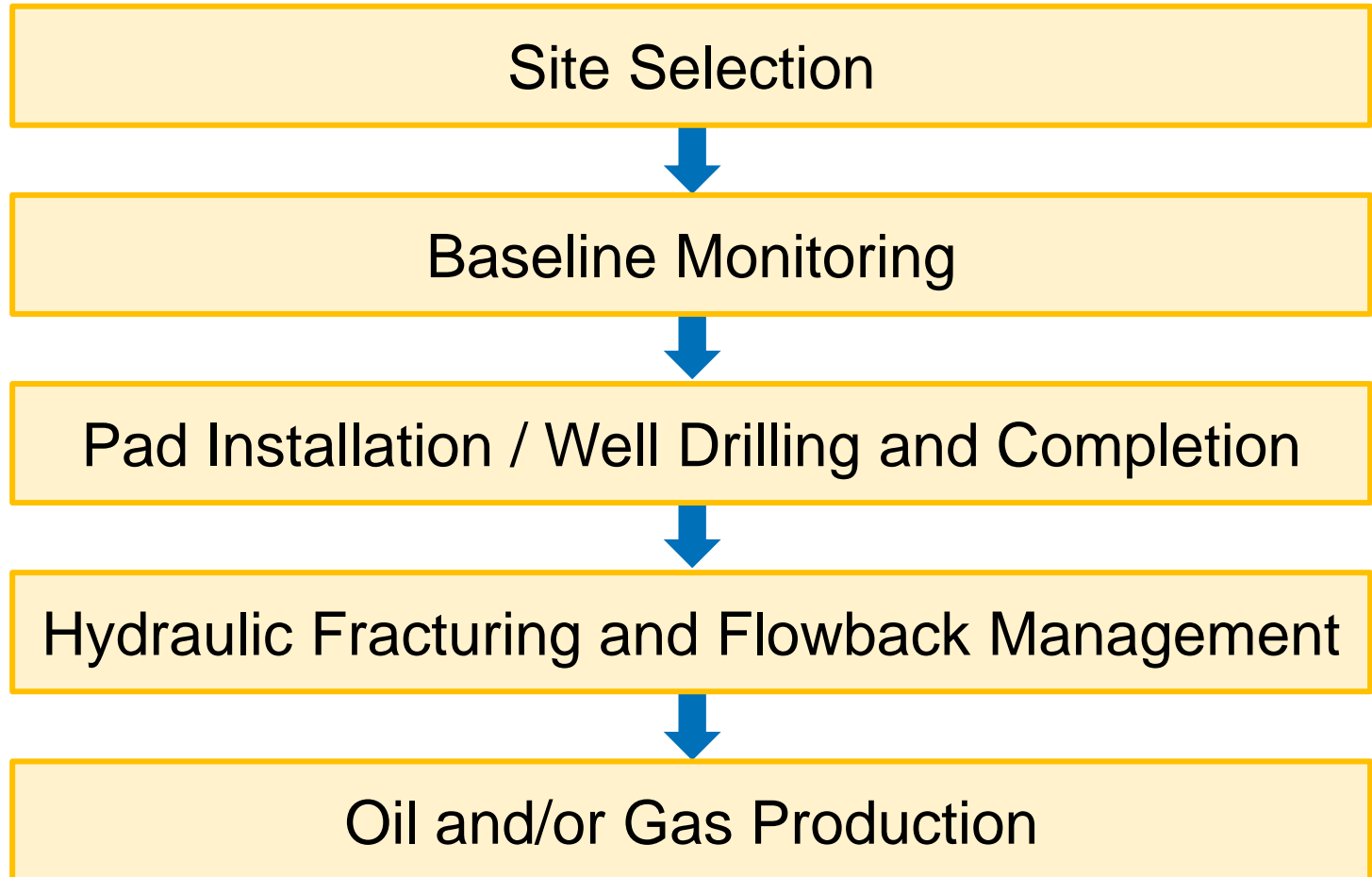


Prospective Case Study Goals

- Understand how site-specific hydraulic fracturing practices prevent impacts to drinking water resources
- Evaluate any changes in water quality over time

Study Approach

Follows development of production well



Site Selection

Example **environmental management practices** conducted by well operator

- Consider nearby water resources, slope, etc.

Research Approach

EXAMPLE GOALS

- New development area
- Relatively shallow ground water of good quality
- Nearby surface water resources with access for monitoring
- Site topography provides good access for monitoring wells
- Cooperative landowners (access)

EXAMPLE IMPLEMENTATION TASKS

- Review historical oil and gas activities and distances
 - Evaluate potential water quality impacts from local pre-existing land uses
 - Determine distance and flow path to surface water resources
 - Identify existing nearby ground water wells
 - Gather pre-existing water quality information
 - Site visit to confirm
 - Sign access agreements
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Baseline Monitoring

Example **environmental management practices** conducted by well operator

- Conduct water quality monitoring

Research Approach

EXAMPLE GOALS

- Install monitoring network
- Conduct baseline monitoring
- Document baseline water quality

EXAMPLE IMPLEMENTATION TASKS

- Determine depth, direction and rate of ground water flow
 - Drill, log and install monitoring wells at multiple depths
 - Establish surface water monitoring locations
 - Conduct four quarterly water quality and flow monitoring events
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Pad Installation / Well Drilling and Completion

Example **environmental management practices** conducted by well operator

- Install liners, construct berms
- Install casing and cement, conduct mechanical integrity tests
- Construct secondary containment for tanks/impoundments

Research Approach

EXAMPLE GOALS

- Document well construction details
- Document well integrity
- Assess any impacts to water quality

EXAMPLE IMPLEMENTATION TASKS

- Observe pad construction
 - Observe drilling and completion of production well
 - Monitor ground and surface water for any impacts
 - Receive company-provided details on geology, casing materials and depths, cement details and evaluation tools, mechanical integrity test results, etc.
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Hydraulic Fracturing and Flowback Management

Example **environmental management practices** conducted by well operator

- Choice of hydraulic fracturing fluid components
- Fracture propagation assessment / microseismic monitoring
- Pressure monitoring
- Post-fracture mechanical integrity testing

Research Approach

EXAMPLE GOALS

- Document hydraulic fracturing and flowback process
- Document fracture propagation
- Document pressure monitoring
- Document post-fracture mechanical integrity testing
- Assess any impacts to water quality

EXAMPLE IMPLEMENTATION TASKS

- Observe hydraulic fracturing operations
- Monitor ground and surface water for any impacts
- Sample flowback
- Receive company-provided microseismic data; hydraulic fracturing reports on fluid volumes, pressure curves and chemical additives; mechanical integrity test results; etc.

Oil and/or Gas Production

Example **environmental management practices** conducted by well operator

- Monitor oil, gas and water production

Research Approach

EXAMPLE GOALS

- Document water management practices
- Evaluate any changes to water quality
- Evaluate for any delayed impacts to ground or surface water

EXAMPLE IMPLEMENTATION TASKS

- Confirm with operator produced water management volumes and disposal methods
 - Monitor produced water for four quarters
 - Conduct four quarterly water quality and flow monitoring events
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Collaboration is Key

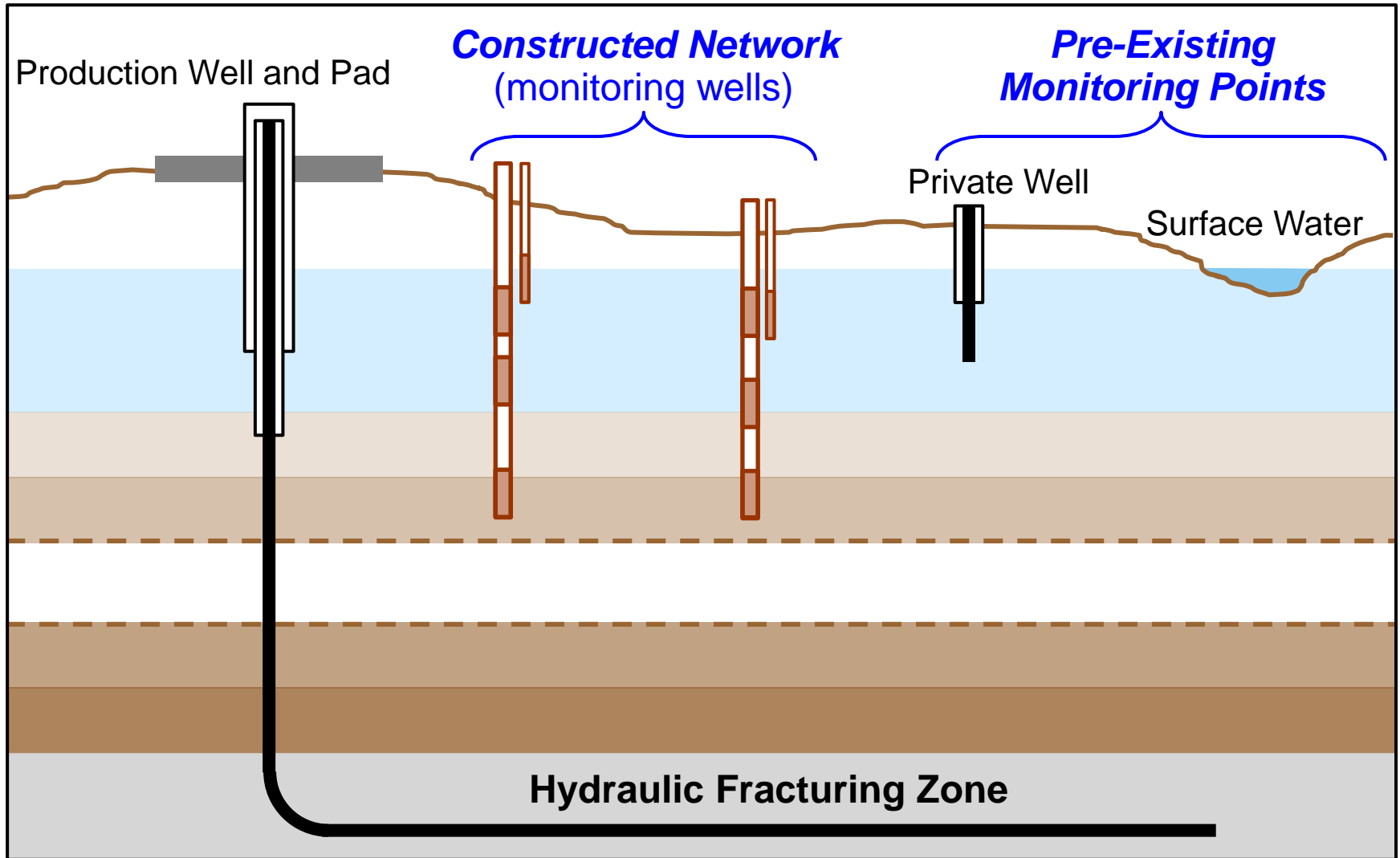
Partners: US EPA, US Department of Energy, US Geological Survey, host well owner/operator, state agencies, landowners and others

- Design
- Observation
- Interpretation

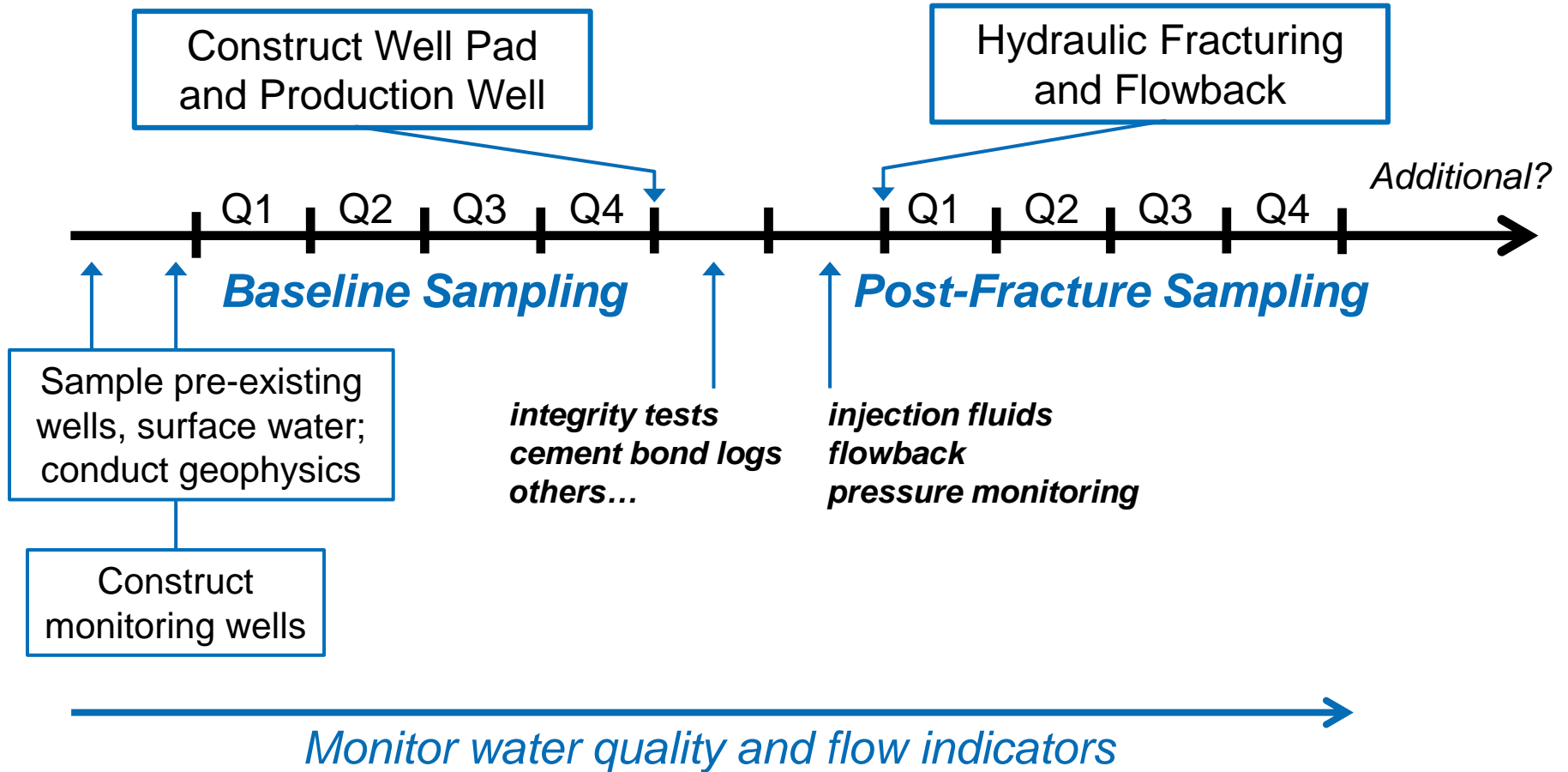
Water Quality Monitoring

- **Use pre-existing monitoring points**
 - Private, public, industrial, agricultural wells
 - Springs and surface water bodies within local drainage system
- **Install additional targeted monitoring wells**
 - Location, depth and number depend on local ground water depth, flow rate and direction
 - Target anticipated flow paths within aquifers

Conceptual Framework for Monitoring



Anticipated Timeline



Technical Challenges

- **Legacy or active fossil fuel extraction and other land use**
 - Existing historical/active fossil fuel extraction (oil, gas or coal), other commercial/private sources (USTs)
 - Prior industrial or commercial activity
 - Affects analyte choice and interpretation*
- **Site-specific aquifer properties**
 - Direction of ground water flow within study area
 - Rate of ground water flow
 - Affects monitoring well location and frequency/duration of sampling*

Implementation Challenges

- **Access**
 - Involves well owner/operator and landowner
- **Timing**
 - Well development
 - Corridor planning and development

Best approaches to manage research and commercial timelines?