



Exploring the Environmental Effects of Shale Gas Development in the Chesapeake Bay Watershed

Scientific and Technical Advisory Committee

April 11-12, 2012

Workshop Agenda

Location: The Penn Stater Conference Center & Hotel - Meeting Room 104
215 Innovation Boulevard - State College, PA 16803

April 11

Webinar Website:

<https://chesapeakeereseach.webex.com/chesapeakeereseach/j.php?ED=185054822&UID=1068198532&PW=NYWFiMmY3YTnh&RT=MiMxMQ%3D%3D>

Password: Marcellus

Toll-Free Number: 1-877-668-4493

Access Code: 730-959-595

8:30 am Breakfast (Provided)

9:00 am Overview of Workshop Objectives - Kurt Gottschalk (USDA Forest Service)

- Introductions
- Review of Workshop Objectives
- Overview of Agenda

9:10 am Overview of FS/PSU Meeting - Susan Stout (USDA Forest Service)

9:20 am Overview of Marcellus Shale - Daniel Soeder (Department of Energy-NETL)

Soeder will provide an overview of shale gas development in the Appalachian Basin. The Eastern Gas Shale Project (EGSP) was implemented to develop new, domestic sources of oil and natural gas in response to the OPEC oil embargo of 1973-74. The goals of the EGSP were to assess the resource base and develop technology to overcome the challenges of recovering natural gas from shale. The combination of horizontal drilling and staged hydraulic fracturing developed by Mitchell Energy in the 1990s came directly out of DOE studies performed a decade earlier. Application of these technologies to the Barnett Shale in Texas led to the successful production of shale gas, followed by development of the Haynesville, Fayetteville and Marcellus shales in ensuing years.

9:50 am Past Experience in Arkansas/Texas - Sally Entrekin (University of Central Arkansas)

The rate of gas well installation in the Fayetteville shale is 774 wells/year since 2005 spanning an area of 23,000 km², although gas well development is concentrated within 8,000 km². Rapid and concentrated activity and wells placed close to streams increases potential for negative effects on surface waters. UCA quantified turbidity and suspended sediment during eight storms in 10 stream catchments with a gradient of gas well densities. Entrekin will discuss patterns of gas well development and the potential abiotic and biotic effects on streams.

10:20 am Unconventional Development of Natural Gas from Shale Formations: Impacts on Water - Tony Ingraffea (Cornell University)

Unconventional development of natural gas from shale formations requires spatially intense industrialization which creates risks to USDW and surface waters. Ingraffea will describe these risk sources, and actual performance to date of unconventional natural gas development in Pennsylvania.

10:50 am Break

11:00 am Impacts of Natural Gas Drilling on Water Quality and Water Quantity - Jim Richenderfer (Susquehanna River Basin Commission)

Richenderfer will provide an up-to-date summary compiled by the Susquehanna River Basin Commission of the actual amounts of water withdrawn from the basin and consumptively used by the natural gas industry since the Marcellus play began. Additionally, Richenderfer will give a description of the water quality monitoring activities currently conducted by the Commission within the active natural gas development portion of the basin.

11:30 am Shale Gas Development Impacts on Forests in the Chesapeake Watershed - Nels Johnson (The Nature Conservancy)

Rapid expansion of Marcellus shale natural gas development will cause extensive impacts on forest areas across the Chesapeake Bay watershed. Projections by the Nature Conservancy indicate more than 25,000 wells could be drilled in the Susquehanna basin during the next 20 years leading to extensive forest clearing, fragmentation of large forest patches, and habitat degradation for sensitive species. Incorporating habitat data and “high bar” Best Management Practices in gas development planning and operations can help to avoid, minimize or mitigate impacts to forest and aquatic habitats.

12:00 pm Department of Energy (DOE) Research Program - Daniel Soeder (DOE-NETL)

Horizontal drilling and staged hydraulic fracturing generate significant amounts of solid and liquid waste, and require relatively large work areas and infrastructure, impacting habitat/ ecosystems, landscapes, air, and water. In 2011, the U.S. Department of Energy oil & gas research program was directed to investigate the risks associated with deep offshore/frontier production and shale gas development/hydraulic fracturing. Integrated Risk Assessment Models are being constructed using field data measuring the direct effects of shale gas development on watersheds, drinking water, aquifers, and mobilization of stray gas. Lab analyses of the chemistry of flow back fluids and leachate from shale drill cuttings are also underway. Soeder will update participants on the current status of the DOE risk assessment study and plans for the future.

12:30 pm Lunch (Provided)

1:15 pm Wastewater Treatment Technologies - David Yoxtheimer (Pennsylvania State University)

This presentation will provide an overview of wastewater management practices associated with Marcellus natural gas production including the technologies being utilized to treat and recycle fluids as well as disposal practices. Recent trends in wastewater management will also be discussed.

1:45 pm Break-Out Groups Discussions

The workshop will be broken up into two separate discussion groups. One group will focus mainly on the water quality and water quantity impacts that unconventional natural gas drilling has/or will have. The second group will focus on the land-based impact of unconventional natural gas drilling.

- **Land Based Impact Facilitator - Kurt Gottschalk (USDA-Forest Service) - Room 203**

How does the shale gas development infrastructure affect land cover/use and indirectly water quality and quantity via cumulative impacts? How effective are BMPs at reducing those impacts? What is the potential effect on Chesapeake Bay TMDL pollutant reduction efforts? What are the high priority research needs for quantifying shale gas development impacts on land cover/use for Chesapeake Bay water quality?

- **Water Quality and Quantity Impacts Facilitators - Kelly Maloney (USGS) and Charlie Abdalla (PSU) - Room 204**

How effective are BMPs at reducing water quality and quantity impacts? What is the potential effect on Chesapeake Bay TMDL pollutant reduction efforts? What are the high priority research needs for quantifying shale gas development impacts on Chesapeake Bay water quality?

3:00 pm Break (Provided)

3:15 pm Continuation of Break-Out Group Discussions

Workgroup discussions will continue following the break. Each group should begin to synthesize their ongoing group discussions, for a presentation Thursday morning.

5:00 pm Adjourn

April 12

Webinar Website:

<https://chesapeakeresearch.webex.com/chesapeakeresearch/j.php?ED=185056037&UID=1068201687&PW=NNGQyN2YzODdm&RT=MiMxMQ%3D%3D>

Password: Marcellus

Toll-Free Number: 1-877-668-4493

Access Code: 730-509-516

9:00 am Breakfast (Provided)

9:30 am Group One Discussion - Water Quality and Water Quantity Impacts

Abdalla and Maloney will begin the discussion with an overview of the highlights/discussions from the previous day. All participants/presenters are encouraged to stay for this discussion to provide a sufficient amount of feedback. Questions and discussions within the group will continue throughout the hour.

10:30 am Group Two Discussion - Land-Based Impacts

Gottschalk will begin the discussion with an overview of the highlights/discussions from the previous day. All participants/presenters are encouraged to stay for this discussion to provide a sufficient amount of feedback. Questions and discussions within the group will continue throughout the hour.

11:30 am Break

11:45 pm Discussion of Future STAC Report

Workshop discussions will be documented in a workshop report to be submitted to the Chesapeake Bay Program and interested parties. This report will summarize the state-of-the-science regarding environmental impacts of shale gas development and will identify and prioritize specific research gaps. The expectation is that the workshop report will be completed within 90 days of the workshop.

12:15 pm Lunch (Provided)

1:00 pm Adjourn