



Partnership for the Delaware Estuary, Inc.

April 7, 2011

Paula Schmidt
Commission Secretary
Delaware River Basin Commission
P.O. Box 7360
25 State Police Drive
West Trenton, NJ 08628-0360

Dear Ms. Schmidt,

The Partnership for the Delaware Estuary (Partnership) welcomes the opportunity to provide comments regarding Article 7 of the Delaware River Basin Commission's Water Quality Regulations as proposed to protect the water resources of the Delaware River Basin during the construction and operation of natural gas development projects. We appreciate DRBC's attention to this matter, and the important role played by DRBC in the regulation of natural gas development in light of the unique value of the basin's water resources to our region, and the nation.

As the National Estuary Program responsible for implementing the Comprehensive Conservation Management Plan (CCMP) for the 6,827 square mile Delaware Estuary study area, the Partnership has an obligation to work with its partners on a wide variety of tasks to sustain the Estuary's complex ecosystems, including management strategies that strike the proper balance among the needs of our diverse stakeholders. We help fulfill this mandate in part through assessment of the science underlying the decisions that are made affecting the Estuary, relying on the expertise of our Science and Technical Advisory Committee (STAC) for guidance. Because of our focus on science and the broad base of input the Partnership receives from its partners, we generally refrain from advocating for or against specific legislative or regulatory proposals. The comments presented here borrow heavily from some recent work by the Partnership's STAC.

The Partnership focuses its efforts on the Delaware Estuary study area – the tidal portion of the Delaware River and Bay in the lower half of the basin—but recognizes the importance of the upper basin, especially for maintaining clean fresh water flows critical to Estuary's health and productivity. Natural gas found in the Marcellus Shale formation underlies about 36 percent of the Delaware River Basin, primarily in the upper basin. However, the process of producing natural gas from this Marcellus Shale has the potential to impact the quantity and quality of water in the Estuary and efforts to implement elements of the CCMP for the Delaware Estuary, including:

Partnership for the Delaware Estuary: A National Estuary Program

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- **Efforts to manage freshwater flows to the Estuary.** The CCMP devotes an entire chapter to Water Use Management (Actions W1-W12), aimed at ensuring clean and adequate flow of water for the variety of uses needed in the Estuary. The Delaware River provides about 60% of the freshwater surface runoff to the Estuary, which is instrumental for sustaining critical habitats like freshwater tidal wetlands, as well as drinking water for people. Drilling in the basin requires withdrawal of millions of gallons of water per well for hydraulic fracturing, 75% of which is not recovered and returned to the surface afterward. It is unclear whether and how the combined effects of water withdrawals from multiple wells within tributary watersheds will lead to local or basin-wide cumulative effects on base flow in aquifers, streams, and/or the main stem Delaware River – especially in combination with other changes in the watershed that will make maintaining salt balance in the upper estuary increasingly challenging. We urge DRBC to take into careful consideration these factors, and the flow needs of the Delaware Estuary, in its implementation of regulations for natural gas development in the Basin.
- **Efforts to reduce toxics in the Estuary.** The CCMP also devotes an entire chapter to managing Toxics (Actions T1-T6). Great strides have been made in reducing major sources of toxic pollution to the Estuary, but a combination of non-point-source runoff and legacy pollutants continue to negatively impact the ecosystem and human health. The 25% of hydraulic fracturing water recovered at well sites can include a variety of chemicals added to aid in the fracturing process, as well a variety of metals such as Ba, Sr and Mg that may be present in sufficient concentrations to have toxic effects, and radioactivity levels above background. Between on-site leakage and spills, leakage and spills during transport and disposal, and wastewater discharge, there are numerous opportunities for these substances to make their way into surface and/or ground waters, potentially accumulating in the Delaware Estuary over time, especially if large amounts of wastewater are treated in the Estuary. We urge DRBC to take into careful consideration prevention of and mitigation for spills, proper treatment and release of wastewater, and cumulative effects of pollutants in the Estuary (over space and time) in its regulation of natural gas development in the basin.
- **Efforts to improve water quality through improved land management.** The CCMP also devotes an entire chapter to Land Management (Actions L1-L18), in recognition of the impact of land management practices in the watershed on the health of the Estuary. In a recent climate change adaptation study completed by the Partnership, the protection of forests in headwaters areas was identified as a top priority for maintaining drinking water and ecosystem integrity into the future. With each well pad requiring at least 5 acres of clearing, as well as clearing for roads and pipelines, extensive natural gas drilling

is expected to significantly decrease forest cover in critical forested areas of the basin. We urge the DRBC to take into careful consideration prevention of and mitigation for deforestation and its cumulative effects on drinking water and ecosystem integrity in its regulation of natural gas development in the basin.

- **Efforts to restore living resources and habitats in the Estuary.** The CCMP also devotes an entire chapter to sustaining Habitats and Living Resources (Actions H1-H10). Some of the most critical of these are reliant on the Estuary's unique salinity gradient. For example, both our nationally rare freshwater tidal wetlands and economically important shellfish beds are sensitive to salinity changes. In addition to the chemicals already noted above, the wastewater from hydraulic fracturing contains levels of salt (NaCl) as high as 6-10 times that of seawater, which could be harmful to living resources and habitats if discharged to streams. Aquatic organisms are diagnostic for ecosystem health, and could be impacted in a variety of ways from drilling operations. We urge DRBC to take into careful consideration prevention of and mitigation for impacts to aquatic living resources and habitats, including cumulative impacts, in its regulation of natural gas development in the basin.

We realize that the above concerns have likely been given some consideration in the development of proposed Article 7. However, scientists from our STAC have considered the potential environmental effects of Marcellus Gas drilling activity and the proposed regulations on the water resources and aquatic communities downstream, based on the information readily available to them. And, as a result, have raised a variety of questions about potential impacts to water quantity, water quality, aquatic life, and forest loss that are not fully addressed in Article 7. The STAC's work is summarized in a brief entitled "Natural Gas Drilling in the Delaware River Basin: Comments and Questions by the STAC" available on our website at http://www.delawareestuary.org/scienceandresearch/STAC/Briefs/PDE_STAC_Gas_Drilling_Comments_3-16-11.pdf, and questions from that brief are reiterated below. We urge DRBC to fully address these questions before regulations natural gas drilling regulations for the Delaware River Basin are adopted.

Many of the questions raised by the STAC scientists are related to the monitoring proposed/planned, and the need to ensure that it is sufficient to accurately detect and assess the impacts of any leaks, spills, or releases, whether they be at the drilling site, while transporting drilling wastewater or drilling muds, or from treatment plants. The STAC notes that the proposed monitoring framework includes surface and ground water monitoring that is limited to the immediate area where drilling will occur and focused on the first few years of drilling and production, rather than long-term, cumulative impacts at the tributary and basin level. And also that it includes aquatic life surveys in surface waters immediately downstream of drilling operations, with the endpoints being considered consisting of periphyton and macroinvertebrates, which are relatively standardized within existing state regulations.

However, the number and nature of these questions about monitoring suggests that proposed/planned monitoring may not be sufficient. These questions include:

- How will changes to the salt line and salinity in the Delaware Estuary be monitored and managed?
- How will spills or permit violations be monitored and detected? Will monitoring be sufficient to detect the wide array of contaminants potentially spilled or running off at well pad sites, such as barite used in drilling muds?
- At well sites and in tributary watersheds, how frequently will aquatic organisms be monitored, and by who? Will long-lived aquatic life be assessed? How will aquatic life be monitored at broader spatial scales, such as in the larger tributaries, mainstem Delaware River, and in the Delaware Estuary? Will aquatic life be monitored at (and downstream of) water withdrawal sites (if surface water) to discern any effects of changing flow? Will aquatic life be monitored seasonally?
- What assurance is there that the BACI (before-after-control-impact) monitoring approach will be intensive enough to capture isolated spill incidents in small streams (currently planned for annual sampling up to 5 years, after the initial drilling operations)? If wells are operating for decades, how will long-term monitoring be sustained? Will long-term bioaccumulation of metals, radioactivity and other toxic compounds be included in the BACI monitoring plan especially near wastewater treatment facilities?
- Is there a monitoring plan for facilities that will treat the wastewater and along travel routes between sources and treatment plant areas? How will wastewater plants analyze each shipment of wastewater for levels of radioactivity before being accepted for treatment and discharge into waters of the Delaware basin? Will aquatic life be monitored in the vicinity of wastewater treatment sites that receive wastewater from drilling operations?
- What entity will monitor and assess the collective changes in forest area and forest fragmentation across the Delaware River Basin? Are there any plans in place to monitor for biological effects of forest cover loss on instream water temperatures, pH, storm water increases, leaf litter and instream habitat complexity decreases, and stream flashiness?

Other questions raised by scientists from the STAC are related to the process for holding drilling companies accountable for impacts to water resources, and the need to ensure that this process clearly addresses both mitigation (for intended impacts) and violations (for unintended

ones), and that it includes responsibility for the full range of impacts over space and time (from immediate impacts on-site, to cumulative impacts in the region, and including impacts to aquatic resources). The STAC notes that proposed permit rules require drilling companies to report water volumes needed, and that permit review will consider the combined effects of more than 5 wells by a single company within a tributary watershed. However, the number and nature of these questions about holding drilling companies accountable for impacts suggests concern that the process proposed/planned so far may not be sufficient. These questions include:

- What actions will be taken if a spill or violation occurs? If TDS sensors detect an anomaly, is there a rapid mobilization plan and infrastructure/capacity to quickly respond with more intensive monitoring, and if so by who?
- Will drilling companies be required to mitigate for any incidences of aquatic community disturbance from potential low flow impairment? How will drilling companies be required to mitigate for water quality mediated disturbances/impairments to either aquatic communities or human communities?
- For spills or other water quality impacts at drilling sites, and collectively across larger areas, what is the damage assessment and mitigation plan? If cumulative water quality impacts are detected downstream for more than one well or more than one company, how will the responsible party(s) be determined?
- Will drilling companies be given some incentive to establish re-forestation projects in areas of the basin as mitigation for loss of forest cover due to well pad, pipeline, and road development? Is there a mitigation plan to offset or restore the collective ecosystem service losses associated with landscape changes to these upland habitats, such as carbon sequestration and maintenance of source water quantity and quality?

Scientists from the STAC had several questions related to the withdrawals needed for from the hydraulic fracturing process, and the need to ensure that these withdrawals are managed to protect to the basin's many water users, as well as stream ecology. These questions include:

- What will be the cumulative water withdrawals needed to sustain the expected development of the Marcellus Shale drilling in the Delaware River Basin? How could we expect these withdrawals to change in the future? Will withdrawals vary seasonally, and can they be managed seasonally to protect critical base flow during summer?
- Are there other sources of water that drillers can use without impacting drinking water supplies in the basin, such as treated wastewater effluent, brackish or salty water from the lower estuary, or water supplies brought in from other basins?

And, they raised a number of questions related to the wastes from the hydraulic fracturing process, and the need to ensure that these wastes are treated appropriately to prevent pollution to the basin's waters. These questions include:

- Can the STAC be provided with a full list of the compounds used in hydraulic fracturing formulas? Where will drilling wastewater generated in the Delaware River Basin be treated? Will the Delaware River Basin receive drilling wastewater from other states? Which of the toxic chemical compounds will be detoxified by treatment, and which will not? (Wastewater treatment typically does not remove radioactivity, for example.)
- Will drilling wastewater treatment vary seasonally, and can it be managed seasonally to rely less on summer dilution and protect critical life histories as appropriate in the vicinity of treatment sites? If dilution is used to achieve nontoxic endpoints following wastewater treatment, what will be the combined annual (seasonal preferred) increase in total chemical loads and total dissolved solutes per wastewater treatment facilities? Per tributary? Per the whole basin? What level of radioactivity in wastewater will be considered acceptable?
- Could total dissolved solutes in the flowback fluid, which can be 6 to 10 times saltier than seawater, collectively contribute to specific conductance in rivers and salinity in the Estuary? If so, how will this be offset to maintain salinity regime in the Estuary?

Finally, the STAC scientists raised the question: do regulatory agencies currently have the capacity and funding to perform the necessary monitoring, modeling, and industry oversight needed for water quality maintenance? Given the extensive natural gas exploration and development that is anticipated and the difficult economic times and budgetary challenges currently facing government agencies, this is an especially critical question.

Safeguarding the resources of the Delaware Estuary – one of 28 estuaries recognized by Congress for their importance to the country – will require attention to these critical questions and concerns. We urge the DRBC and consent decree parties to address these before finalizing regulations, and to seek the input and expertise of our STAC if we can be of any assistance in this regard. Thank you once again for the opportunity to comment.

Sincerely,



Jennifer Adkins
Executive Director