COMMENTS

FROM

THE ENVIRONMENTAL LAW SOCIETY OF
THE UNIVERSITY OF CALIFORNIA, BERKELEY, SCHOOL OF LAW

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TO

THE DELAWARE RIVER BASIN COMMISSION

REGARDING

DRAFT NATURAL GAS DEVELOPMENT REGULATIONS

April 12, 2011

From: The Environmental Law Society of the University of California, Berkeley, School of Law
Re: Delaware River Basin Commission, Draft Natural Gas Development Regulations
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I. Introduction

The Environmental Law Society of the University of California, Berkeley, School of Law (Berkeley ELS)[1] respectfully submits these comments on the Delaware River Basin Commission's proposed rulemaking regarding natural gas development. While we appreciate the Commission's efforts to protect this sensitive watershed from contamination—such as by designating certain areas as Special Protection Waters—the proposed rules are inadequate. The Delaware River watershed provides critical ecological, recreational, and municipal services. Perhaps most importantly, it provides unfiltered, high quality drinking water to more than 15 million people, obviating the need for expensive water treatment facilities.[2]

Considering the industry-promoted uncertainty surrounding the environmental impacts of hydraulic fracturing (hydrofracking), the Commission should avoid the unnecessary and irretrievable "rush-to-drill" that has occurred in Pennsylvania and elsewhere.[3] Credible sources of information regarding hydrofracking's true impacts are sorely lacking, largely because the technique has so far been poorly regulated at the state level and almost entirely exempted from federal oversight.[4] The lack of sufficient baseline and ongoing data collection has left most of those affected by contamination without solid evidentiary support. However, the *New York Times* recently obtained documents from the Environmental Protection Agency (EPA), state regulatory agencies, and drilling companies that show strong emerging evidence of significant health and environmental risks related to hydrofracking.[5]

Because the long-term quality of the Delaware River Basin's air and water is at stake, the Commission should suspend the current rulemaking process and bar natural gas exploration and drilling within the basin until the extent of hydrofracking's potential human and environmental

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[1] The comments contained herein are solely those of Berkeley ELS and not those of affiliated institutions. Such affiliated institutions include, but are not limited to, the University of California, Berkeley, School of Law and the Regents of the University of California. The following members of Berkeley ELS contributed to these comments: Alexander J. Bandza (B.A., Economics with Honors in Environmental Science, Technology, and Policy), Stephanie A. Brauer, Jared B. Fish (B.A., Environmental Sciences and Policy), Nell Green Nylen (Ph.D., Geological and Environmental Sciences), Mary Tharin, and Meredith Wilensky (B.A., Environmental Studies).

[2] *See Integrated Water Management = Greater Water Resources!*, HEALTHY WATERS FOR EPA'S MID-ATLANTIC REGION, U.S. ENVTL. PROT. AGENCY (Feb. 17, 2011), http://blog.epa.gov/healthywaters/2011/02/themes/backyard/integrated-water-management-greater-water-resources/.

[3] *See, e.g.*, Isaiah Thompson, *Drill, Baby, Drill!*, PHILA. CITY PAPER, Feb. 17, 2010, *available at* http://archives.citypaper.net/articles/2010/02/18/drill-baby-drill.

[4] *See Lax Rules for the Natural Gas Industry*, N.Y. TIMES, Mar. 3, 2011, *available at* http://www.nytimes.com/interactive/2011/03/03/us/20110303-natural-gas-timeline.html ("The natural gas industry has exemptions or exclusions from key parts of at least 7 of the 15 major federal environmental laws designated to protect air and water from radioactive and hazardous chemicals.").

[5] Ian Urbina, *Regulation Lax as Wells' Tainted Water Hits Rivers*, N.Y. TIMES, Feb. 26, 2011, *available at* http://www.nytimes.com/2011/02/27/us/27gas.html; *see also Documents: Natural Gas's Toxic Waste*, N.Y. TIMES, Feb. 26, 2011, *available at* http://www.nytimes.com/interactive/2011/02/27/us/natural-gas-documents-1.html.

health impacts is better known. The EPA's Hydraulic Fracturing Study and the New York Department of Environmental Conservation's Supplemental Generic Environmental Impact Statement are still in process, and the Commission itself should engage in an exhaustive assessment of the cumulative impacts of natural gas drilling (including the impacts of water withdrawal, well development, waste disposal, greenhouse gas[6] and other air emissions[7] across 1000's of wells and over the full life cycle of well development and inactivity) before recommencing rulemaking. Considering the vast scale of drilling expected in the watershed—topping 10,000 wells[8]—regulations must address the magnitude of potential cumulative impacts and not simply the direct impacts of individual projects. The Commission should only allow hydrofracking in the basin after thorough evaluation of all available and reasonably developable information. Full knowledge of the direct, indirect, and cumulative[9] effects of the process is required to inform development of the stringent safeguards needed to protect this vitally important watershed and the population it serves. The draft regulations so far proposed do not meet this standard.

If the Commission insists on proceeding with the rulemaking process now, then any regulations must prioritize the public's vital stake in a clean and ecologically vibrant watershed. Unfortunately, the current draft regulations inappropriately streamline the permitting process, allowing approval by rule and public notice and comment provisions that fail to provide for meaningful public participation in the permitting process. Oversight and enforcement mechanisms also fall dangerously short, concentrating too much authority with the Executive Director, vesting too much authority in individual states, and failing to provide scientific criteria for, for example, permitting variances to well siting and setback requirements. Many of the proposed regulations' substantive standards are not scientifically defensible and are unlikely to provide adequate protections for public health and the environment. They also leave numerous

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[6] *See* ROBERT W. HOWARTH, ASSESSMENT OF THE GREENHOUSE FOOTPRINT OF NATURAL GAS FROM SHALE FORMATIONS OBTAINED BY HIGH-VOLUME, SLICK-WATER HYDRAULIC FRACTURING (2011), *available at* http://www.eeb.cornell.edu/howarth/GHG%20update%20for%20web%20--%20Jan%202011%20(2).pdf (demonstrating that natural gas has cumulative climate impacts that appear to be on par with, or possibly even more severe than, fossil fuels with "dirtier" reputations, like coal).

[7] *See, e.g.*, John Burnett, *Health Issues Follow Natural Gas Drilling in Texas*, NAT'L PUB. RADIO (Nov. 3, 2009), *available at* http://www.npr.org/templates/story/story.php?storyId=120043996 (describing the harmful effects of air emissions, including carcinogens and neurotoxins like benzene, from continually operating compressors and other natural gas development-related equipment); *see also* Lowell Brown & Britney Tabor, *Parents Voice Health Concerns, Gas Drilling Near Argyle Schools Making Kids Ill, Residents Tell Board*, DENTON RECORD-CHRONICLE, Oct. 24, 2010, *available at* http://www.dentonrc.com/sharedcontent/dws/drc/localnews/stories/DRC_Argyle_Drilling_1024.1bd9f97c2.html.

[8] Sandy Bauers & Tom Avril, *Delaware River Basin Commission Posts Proposed Marcellus Shale Rules*, PHILA. INQUIRER, Dec. 10, 2010, *available at* http://articles.philly.com/2010-12-10/news/25292691_1_drilling-moratorium-natural-gas-marcellus-shale.

[9] *See, e.g.*, Ian Urbina, *Pressure Limits Efforts to Police Drilling for Gas*, N.Y. TIMES, Mar. 3, 2011, *available at* http://www.nytimes.com/2011/03/04/us/04gas.html ("The air pollution from a sprawling steel plant with different buildings is added together when regulators decide whether certain strict rules will apply. At a natural gas site, the toxic fumes from various parts of it—a compressor station and a storage tank, for example—are counted separately rather than cumulatively, so many overall gas well operations are subject to looser caps on their emissions.").

voids that are inadequately filled by state law. For instance, the proposed regulations fail to manage hydrofracking fluids from cradle to grave, potentially imperiling public water supplies with dangerous chemical additives and naturally-occurring toxic and/or radioactive materials.[10] Some specific suggestions for improving the proposed regulations follow.

II. Public Notice and Comment Provisions Are Inadequate

The Commission's proposed rules fail to afford the public adequate notice and procedures for challenging natural gas well permitting decisions.

A. Notice Provisions

The proposed regulations must provide more detailed guidance for what is required in the "description of the project" (Section 7.3(i)(1)) provided in notice to nearby property owners. For example, the description for an application for well pad approval should include whether the sponsor has conducted baseline water sampling and the locations of those tests, with information on how the results may be retrieved. It should also include information about the size of the well pad, the number of wells, the roads that will be impacted by increased truck traffic, and the distance from underground aquifers and above ground water sources. The regulations should also include a requirement that project sponsors respond to complaints or inquiries addressed to them within a reasonable time-frame—perhaps within 48 hours of receipt—and that all complaints be relayed to the Commission and appropriate state agencies.

Furthermore, the notice provisions (Sections 7.3(i)(1) and 7.5(h)(1)(vi)(C)) should be modified to more accurately reflect the nature and distribution of the risks associated with natural gas drilling in general, and hydraulic fracturing and horizontal wells in particular. Requiring a project sponsor to notify property owners within 2,000 feet of a proposed well pad is inadequate considering potentially rapid rates of surface and groundwater movement,[11] which could quickly convey contaminants to property owners much further downstream or down-gradient in the event of an accident.[12] Plumes of contaminants in groundwater do not spread uniformly. They follow paths toward lower hydraulic head through zones of maximum porosity/permeability, and the progress of individual contaminants is heavily influenced by chemical conditions along the way. Groundwater flow is therefore heterogeneous and sometimes quite rapid. This can be seen in

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[10] *See* Urbina, *supra* note 5.

[11] Groundwater moves quickly through sandy or gravelly aquifers (10 to 1,000 ft/day), slowly through low-permeability clays (0.0001 ft/day or less), and at intermediate rates through fractured rock (on the order of 1 to 10 ft/day). *See* THOMAS HARTER, BASIC CONCEPTS OF GROUNDWATER HYDROLOGY 4 (2003), *available at* http://groundwater.ucdavis.edu/Publications/Harter_FWQFS_8083.pdf.

[12] *See, e.g.*, *NPL Site Narrative for Fort Dix (Landfill Site)*, U.S. ENVTL. PROT. AGENCY, http://www.epa.gov/superfund/sites/npl/nar160.htm (last updated Mar. 24, 2011) (noting streamwater contamination and concern for domestic water wells within 3 miles of the landfill).

glacial till deposits and shallow aquifers of the Pine Barrens of New Jersey, where groundwater and surface flow are not clearly distinguishable.[13] Due to geologic heterogeneity, properties at a distance can sometimes be rapidly affected by a contaminant leak (e.g., a blown casing or a release of flowback water), while those much closer can be insulated from its effects.

While near-surface casing failures and surface contamination by flowback water[14] are important and commonly cited sources of risk from natural gas development, there is also significant potential for well-related contamination at depth migrating upward to drinking water aquifers or the surface through preexisting or hydrofracking-induced fracture systems.[15] Horizontal drilling compounds this risk, because its geographic footprint, when combined with multi-stage hydrofracturing, is potentially extensive. Horizontal wells can extend more than 10,000 feet laterally in any direction from a vertical well bore.[16] In addition, multiple horizontal wells can be drilled from the same well pad, and hydrofracking can open up fractures that extend thousands of feet outward from the well bore—increasing the likelihood of eventual vertical communication via preexisting fracture systems. Assuming a 10,000 foot horizontal drilling radius, the proposed notice provisions would alert owners of only about 4 percent of the land within the potential reach of a proposed well pad.

In essence, due to the potentially significant long-term and geographically-widespread risks of natural gas drilling in general and of hydrofracking specifically, notification should include individual property owners and municipalities that may be affected, not only in a period of days or months, but those potentially impacted in decades by the cumulative effects of basin-wide drilling and the potential for long-distance vertical and horizontal transport.

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[13] *See* M. ALISA MAST & JOHN T. TURK, ENVIRONMENTAL CHARACTERISTICS AND WATER QUALITY OF HYDROLOGICAL BENCHMARK NETWORK STATIONS IN THE EASTERN UNITED STATES, 1963–95 (1999), *available at* http://pubs.usgs.gov/circ/circ1173/circ1173a/chapter08.htm ("Streamflow [in the Pine Barrens] is dominated by ground-water discharge . . . [and surface water] losses to the regional ground-water system" account for approximately 10% of average annual precipitation in the area. "[T]he ground-water table is generally 60 cm below the ground surface.").

[14] *See, e.g.*, Eartha Jane Melzer, *Fracking Accident May Lead to Review of Drilling Rules*, MICH. MESSENGER, Feb. 11, 2011, *available at* http://michiganmessenger.com/46503/fracking-accident-may-lead-to-review-of-drilling-rules; Abrahm Lustgarten, *Buried Secrets: Is Natural Gas Drilling Endangering U.S. Water Supplies?*, PROPUBLICA (Nov. 13, 2008, 2 PM, corrected Nov. 19, 2008), http://www.propublica.org/article/buried-secrets-is-natural-gas-drilling-endangering-us-water-supplies-1113.

[15] *See, e.g.*, James L. Northrup, OTSEGO 2000, Potential Leaks from High Pressure Hydro-Fracking of Shale 1 (2010), *available at* http://63.134.196.109/documents/10nov11_edit_NorthrupEPAFinal9-12-10.pdf; Paul A. Rubin, Report for the Delaware River Basin Commission Consolidated Administrative Hearing on Grandfathered Exploration Wells to Delaware Riverkeeper Network and Damascus Citizens for Sustainability 3 (2010), *available at* http://www.damascuscitizens.org/Rubin-Report_R1.pdf.

[16] *See* Greg McFarland, *Going Long in the Oil Patch: Super Extended Lateral Completions*, OIL & GAS EVALUATION REPORT (Feb. 5, 2010), http://www.oilandgasevaluationreport.com/2010/02/articles/horizontal-drilling-technology/going-long-in-the-oil-patch-super-extended-lateral-completions/ ("Newfield reports a $1,000,000 savings when drilling a 10,000 foot lateral vs,[sic] two 5,000 foot laterals. . . . When considering SXL completions it is important to note that the cost of mechanical failures rises. . . . Fracing into a fault or a karst that is a conduit to water could endanger production from the entire well bore.").

B. Approval By Rule

Under the Commission's proposed regulations, the vast majority of natural gas development projects will be streamlined through an "Approval By Rule" (ABR) procedure (Section 7.3(c)) that fails to give concerned citizens adequate time or prescribe a sufficient process to register comments. Considering the extreme ecological sensitivity of the Delaware River watershed, it is inappropriate for the Commission to give project sponsors a special exemption from its typical project application review process. That process generally takes 6 to 9 months, which gives adequate time for public review and comment; however, the Commission now proposes streamlining that process to a mere 30 days.[17] Such a condensed timeline does not afford property owners, local community groups, or other natural gas entities sufficient time to comment on the flurry of new natural gas projects anticipated in the coming years.[18]

C. Appeals Process

The appeals process for challenging an ABR (Section 7.3(d)) is inadequate. A strong public appeals process is critical to the legitimacy of the Commission's mandate to safeguard public water supplies. It is particularly important considering the uncertainty of the science surrounding hydrofracking's potential impact on ground- and surface-water resources. Those whose water supplies may be impacted—including the more than 15 million citizens whose water comes from this sensitive watershed—must be given an adequate voice in natural gas project approval decisions.

The proposed rule refers to the appeals process outlined in Article 6 of the Commission's Rules of Practice and Procedure. Relying on this procedure fails to give an adequate voice to concerned and interested citizens. The requisite criteria for granting a hearing are poorly defined and not necessarily directly applicable to the ABR process for natural gas well permitting. These criteria include Commission determinations "that an adequate record . . . is not available," that "the contested case involves a determination by the Executive Director or staff" requiring further action by the Commission, or that "the Commission has found that an administrative hearing is necessary or desirable." The Commission is unlikely to find that further action is needed by the Commission, since the ABR process gives total authority to the Executive Director to approve or deny permits in the first place.

Moreover, and most importantly, the appeals rules should explicitly state that a "necessary or desirable" reason for holding a hearing should be broadly construed to *require* a hearing where the complainant expresses a reasonable concern regarding, for example, ground or

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[17] *See* DEL. RIVER BASIN COMM'N, DRBC DRAFT NATURAL GAS DEVELOPMENT REGULATIONS "AT-A-GLANCE" FACT SHEET 2 (2010), *available at* http://www.state.nj.us/drbc/naturalgas-draftregs-factsheet.pdf.

[18] *See* Bauers & Avril, *supra* note 8.

surface water impacts. The vagueness of the current language inherently favors permittees.

III. Oversight and Enforcement Mechanisms Are Inadequate

A. Oversight

The proposed regulations permit crucial determinations to be made by the Commission and Executive Director without consideration of any specific factors or issues—providing little security that the Delaware River Basin will not be adversely impacted.

The purpose of the proposed regulations is ostensibly "to protect the water resources of the Delaware River Basin during the construction and operation of natural gas development projects." Notwithstanding this honorable goal, throughout the draft regulations allow the Commission and Executive Director to make important determinations without any guiding factors or mandatory scientific determinations that might ensure consistency with the regulations' stated purpose. For example, Section 7.5(b)(9) permits the Executive Director to grant variances to siting restrictions and setbacks. The only limit to the Executive Director's authority is a prohibition against granting a variance in a floodway. There are no other restrictions on the Executive Director's ability to grant a variance. Considering the inherent flexibility of siting well pads for horizontal drilling, strict restrictions on well pad siting could provide significant environmental benefits with minimal net economic impact.[19] Therefore, the Executive Director's unfettered power to ignore siting restrictions and setbacks needlessly allows determinations counter to the proposed regulations' purpose.

Additionally, Section 7.5(h)(1)(iv)(A)(1) provides that wastewater may be disposed of at a wastewater treatment or disposal facility "within the basin only if the Commission has approved it to accept non-domestic wastewater and [] it has obtained applicable state permits and approvals." However, state laws governing non-domestic wastewater may be grossly inadequate. Final regulations should provide clear environmental quality requirements based on expert scientific opinion before any wastewater may be discharged into the basin.

We appreciate the Commission's requirement that a "qualified professional" conduct water quality sampling and testing (Section 7.5(h)(2)(i)(A)(4)). However, the regulations should not give the Executive Director complete discretion to (for example) exclude existing groundwater wells from monitoring (Section 7.5(h)(2)(i)(A)(1)), to specify "[s]ampling frequency, sample parameters, analytical methods and required detection limits for . . . groundwater and surface water monitoring" (Section 7.5(h)(2)(i)(A)(2)), or to "approve an alternate program based on monitoring wells" (Section 7.5(h)(2)(i)(A)(6)).

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[19] The additional costs associated with stricter siting requirements may be offset by reduced insurance and/or capital costs due to lower site-specific risks.

B. Enforcement Mechanisms

The proposed regulations lack sufficient enforcement mechanisms to ensure that hydraulic fracturing is done safely. One troubling feature is the extensive reliance on state regulations to fill in the many regulatory gaps left unaddressed by the Commission. Unfortunately, state laws often flatly exempt natural gas development activities or are too weak to provide adequate health and environmental protections. Additionally, the proposed regulations rely heavily on state programs and personnel—already overtaxed and unable to effectively administer existing state laws—for enforcement.[20] This is a recipe for ineffectiveness.

While the Commission is charged with "preserv[ing] and utiliz[ing] the functions, powers and duties of existing offices and agencies of government to the extent not inconsistent with the compact," it must only "utilize and employ such offices and agencies for the purpose of this compact to the fullest extent it finds feasible and advantageous" (Section 7.1(i)). The Commission has a duty to ensure adequate protections for the entire Delaware River Basin watershed. This cannot be accomplished piecemeal in reliance on inadequate and under-protective state laws. The Commission should not rely on the lowest common denominator or uphold the status quo, but must instead respond to the public health and environmental needs of all its constituents.

For example, the proposed regulations depend on state agencies to administer natural gas and exploratory well construction (Section 7.1(i)). While choosing to use existing agency structure presents an obvious advantage (at least on paper) of efficiency, it is insufficient to ensure proper enforcement. The regulations should, at minimum, establish a backstop to ensure that sufficient time and resources are spent on enforcement even where a particular state is unable or unwilling to fulfill the role envisioned by the Commission. This will ensure that regulatory violations do not pass undetected due to lack of adequate state oversight.

Additionally, the proposed regulations lack sufficient enforcement mechanisms to deal with complaints filed about natural gas development projects. Section 7.3(m)(2) requires a project sponsor to investigate any complaints "unless excused by the Executive Director." The proposed regulations provide no criteria for when a claim may be excused. However, deviation (in this case, excusal) from the generally applicable process should be allowed only when consistent with the goals of the regulation, not on the Executive Director's whim.

Unfortunately, even in the case of a known (not merely alleged) violation, the proposed rules provide insufficient enforcement mechanisms. Section 7.3(n)(1)(i) gives too much

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[20] *See, e.g.*, Nicholas Kusnetz, *Many PA Gas Wells Go Unreported for Months*, PROPUBLICA (Feb. 3, 2011, 12:05 PM), http://www.propublica.org/article/many-pa-gas-wells-go-unreported-for-months.

discretionary authority to the Executive Director and the Commission Chair to choose whether or not to order that an offending "practice, operation, or activity [] cease or be corrected, mitigated and/or remediated" ("the Executive Director, with the approval of the Chair of the Commission, *may* order any such practice . . . to cease" (emphasis added)).

We urge the Commission to bolster this provision to protect water quality in several ways. First, the Executive Director should be *required* to make a violation or threat determination if he or she has reason to believe that a contamination event has occurred. The regulation should include mandatory language requiring the Executive Director to take such measures as are necessary to ensure that: 1) the activity causing the violation or threat is terminated immediately, and 2) that any damage is remediated or mitigated. The Executive Director should not have the discretion to determine whether or not to order these responses when contamination has occurred. Second, the regulation states that the Executive Director needs the permission of the Chair of the Commission to order a violation or threat to be stopped, corrected, remediated, or mitigated. However, it lacks a statement of the grounds upon which the Chair may choose not to approve such a response. At the very least, the regulation should require the Chair's decision to be consistent with the purpose of the regulation: to protect the Delaware River Basin's water resources. Further, the Chair should act as a backstop with the authority to require the Executive Director to take action to stop and correct regulatory violations or threats to the river basin, even if he or she fails to make the initial determination.

Additionally, to ensure better enforcement, mitigation requirements should be clarified. If a ground or surface water user is "substantially adversely affected, rendered dry or otherwise diminished" due to a project's water withdrawal, the proposed regulations require the project sponsor to replace the water or mitigate damage at its expense (Sections 7.3(m)(2) and 7.4 (e)(4)(ii)). The proposed regulation does not, however, define what "substantially adversely affected" means. Despite this ambiguity, mitigation requirements for injuries due to water withdrawals (Sections 7.3(m)(2) and 7.4 (e)(4)(ii)) seem to be automatically invoked (without requiring a determination by the Executive Director) and are spelled out more clearly than for other violations or activities that "pose[] a threat to the water resources of the basin" (Section 7.3(n)(1)(i)).

As discussed above, the wisdom of leaving the decision to require mitigation or not entirely up to the discretion of the Executive Director is questionable. Adverse impacts to water supplies should be reviewed under a strict liability standard, and should not be limited to the direct effects of water withdrawals. In other words, if a landowner's well water or nearby pond, lake, etc. is contaminated, dries up, or is otherwise adversely impacted, the project sponsor should be held legally responsible for correcting the problem. If equitable relief is not possible, then the regulation should require the project sponsor to pay pecuniary damages to the affected persons in an amount not less than an independent appraiser's assessment of reduced property value and any other appropriate compensation. This modification is necessary considering the

industry's past practices. Project sponsors routinely deny responsibility for "affecting" water resources (including where residents have complained of methane and other well-water contamination[21]). In this vein, requiring pre- and post-natural gas development test results as proof of causation for contamination could be an unreasonable burden on citizens adversely affected by natural gas operations. One possible solution is to accept the use of after-the-fact "tracers" (for example, certain fracking fluid constituents, methane and other natural gas constituents, deep formation water constituents, etc.) as proxies for contamination within a defined time period after natural gas production begins.

Finally, the proposed regulations include significant unclear language, preventing effective administration and enforcement. For example, Section 7.5(h)(1)(iii)(F) states that "The water conservation program must include the reuse and recycling of flowback and production waters to the greatest extent possible." The term "to the greatest extent possible" is not clear and makes the section difficult to enforce. Stronger and clearer language should be used, for example, requiring reuse and recycling of flowback and production waters where technologically feasible. Such language would provide a clearer legal test and more straightforward enforcement.

IV. Substantive Inadequacies of the Draft Regulations

A. Water Withdrawals

Section 7.4(e)(4)(ii) requires remedial measures when a project sponsor's water usage "significantly affects or interferes with any designated uses of ground or surface water, or if the project sponsor receives a complaint regarding th[e] project. . . ." While the rule appropriately requires the project sponsor to immediately notify the Executive Director and conduct an investigation (unless excused by the Executive Director—see discussion of enforcement inadequacies, above), the provision should be modified to adequately protect surface and underground water sources.

First, the provision should not be limited to protecting "designated uses of ground or surface water." The language could be interpreted to mean that if a water source is not actively being used for the purposes set forth in Section 7.5(a)(1)—"drinking water, aquatic life, recreation, and other designated uses"—then a complaint related to that water source is invalid. For example, if a project sponsor's activities significantly affect the quality or long-term viability

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[21] *See, e.g.*, Ian Urbina, *Gas Drilling Boom Sets off Pollution Alarms*," N.Y. TIMES, Feb. 27, 2011, at 11A (industry points to radioactivity in waste water as posing no threat); *Industry Expert Says New Natural Gas Regulations Off Base*, PR NEWSWIRE, Dec. 9, 2010, *available at* http://www.prnewswire.com/news-releases/industry-expert-says-new-natural-gas-regulations-off-base-111605179.html ("The industry has an impeccable safety record."); *Statement of Cabot Oil & Gas Corporation Refuting Reports of Contamination of Carter Road Water by Hydraulic Fracturing Fluid*, BUSINESS WIRE, Sep. 21, 2010, *available at* http://www.businesswire.com/news/home/20100921006614/en/Statement-Cabot-Oil-Gas-Corporation-Refuting-Reports.

of an aquifer not currently used for drinking water, irrigation, etc., complaints related to the activity should nonetheless be recognized under this section. A primary purpose of the Commission's oversight authority is to safeguard all water resources within its jurisdiction – not just those currently being "used." Therefore, the current ambiguity in the language must be resolved in favor of broader applicability. Preferable language would be: "If the monitoring required herein, or any other data or information demonstrates that the operation of this project significantly affects or interferes *with the quality or sustainability of ground or surface water resources* or with any designated uses of ground or surface water, or if the project sponsor receives a complaint regarding this project, the project sponsor must immediately notify the Executive Director of any complaints *and investigate such complaints*."

B. Monitoring

The water quality monitoring requirements (Section 7.5(h)(2)(i)) in the proposed regulations are inadequate. First, low-volume and non-hydraulically-fractured wells, which also pose a risk of blowout, fracking fluid contamination, and long-term vertical transport of deep hydrocarbons, radioactive elements, and brines, should not be exempted from monitoring. However, the proposed regulations currently require ground and surface water quality monitoring only for "Well Pads involving High Volume Hydraulically Fracture Wells." Second, the pre-alteration and post construction reporting requirements fail to set up a program of monitoring with sufficient scope, content, or frequency to determine the actual immediate or long-term impacts of a natural gas development project. Third, the details of "[s]ampling frequency, sample parameters, analytical methods and required detection limits" for monitoring (Section 7.5(h)(2)(i)(A)(2)) should not be left completely to the discretion of the Executive Director. Instead, the regulations should, at the very least, impose scientifically justifiable minimum standards and provide the Executive Director with guidance for when and how to increase their stringency.

The pre-alteration report requires "sampling and laboratory analysis of a representative number of groundwater wells within 1,000 ft of the well pad," to be extended to 2,000 ft of the well pad in the event "the project sponsor or the Executive Director concludes that an insufficient number of existing wells are identified within this distance to adequately characterize the groundwater" (Section 7.5(h)(2)(i)(A)(1)). However, the regulations fail to provide guidance for what constitutes a "representative sample." *Every well* within *at least* 2,000 feet (more, if conditions warrant) should be tested. Additionally, in the absence of any groundwater wells within 2,000 ft, or if "the project sponsor is unable to gain access to any existing groundwater wells within 2,000 ft of the project well pad," the installation of a single monitoring well within 1,000 feet of the well pad should not suffice. Given the heterogeneity of most groundwater flow, this single monitoring location could easily miss even significant contamination. Multiple, much closer monitoring locations (preferably some within tens to hundreds of feet of the drilling pad) may be needed to reveal contamination. Similarly, surface water monitoring requirements—for

monitoring of a single upstream and a single downstream site (Section 7.5(h)(2)(i)(A)(2))—are insufficient, especially where a site has obvious routes of communication (including groundwater connections) with multiple surface water bodies.

The requirement for annual monitoring after well construction (Section 7.5(h)(2)(i)(B)) is also grossly inadequate. Annual monitoring may miss significant contamination due to "seasonal fluctuations in water table conditions and groundwater use."[22] Therefore, the proposed regulations should mandate (at a minimum) monthly monitoring. For example, light non-aqueous phase liquids (LNAPL)—which include oil, BTEX (benzene, toluene, ethylbenzene, and xylenes), and other organic substances—are especially difficult to monitor because they are often immiscible (they float on top the water column, instead of being distributed within it), are attracted to sedimentary particles, and encompass considerable chemical complexity (individual compounds may be found at low concentrations that are nonetheless cumulatively significant).[23] To be effective, monitoring wells would need to be sampled for LNAPL monthly, including directly from the top of the water column, and analyses would need to target low-solubility hydrocarbons present at very low concentrations. However, significant LNAPL contamination could still be present even if water sampling comes up negative.[24] Many other contaminants presenting different monitoring challenges could potentially result from natural gas development activities. Effective regulations must adequately address the temporal, physical, and chemical complexity of these potential contaminants. Groundwater sampling must be more extensive and more frequent, and it should be supplemented with mandates for more extensive surface water sampling and for soil sampling.

C. Setbacks and Siting Restrictions

The setbacks and siting restrictions in the proposed regulations (Section 7.5(b(3)–(5)) provide inadequate protections for human and environmental health. For example, the 500-foot setbacks from water bodies, wetlands, and surface water supply intakes/reservoirs defined in the draft regulations are not scientifically based and are generally insufficient. Other setback requirements should not be left to the host state to determine. Instead, minimum basin-wide setbacks should be established, leaving states with the discretion to institute more protective standards. More stringent setbacks should be required when geological or hydrological

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[22] PATRICK H. LAY ET AL., LNAPL DETECTION FOR LOWERING LONG-TERM MONITORING COSTS - APPLICATION OF A LEAK DETECTION CABLING SENSOR 1, *available at* http://www.baskow.com/client/rttw2011/Final%20Abstracts/Thurs%20Aft%20La%20Joya%20Lay%20abs.pdf (noting that weekly to quarterly measurements are the norm, whereas semi-annual or annual measurements are too infrequent to capture seasonal fluctuations).

[23] *See* Fred Marinelli & Deanna S. Durnford, *LNAPL Thickness in Monitoring Wells Considering Hysteresis and Entrapment*, 34 GROUND WATER 405 (1996).

[24] *See id.* at 405 (noting that "[m]onitoring wells can contain no observable LNAPL, even though soil sampling indicates significant LNAPL in the adjacent formation above and/or below the water table" and "[t]here can be sudden appearances or disappearances of LNAPL in monitoring wells across a site").

conditions warrant.

Because hydrofracking methods can involve horizontal drilling over many thousands of feet, well pad site selection is a process with significant flexibility. Overly lenient regulations may encourage selection of sites dictated purely by convenience, short-term economic interests, or concerns over notification and/or litigation. Conversely, sites should be selected to minimize long-term environmental impacts including water withdrawals, surface and subsurface contamination risks (including the presence and continuity of preexisting fractures), air quality problems, and the direct and indirect impacts of gas drilling infrastructure. For example, the cumulative impacts of well pads that are remote from existing developments may include the creation of new roads and networks of gas and water pipeline infrastructure. These elements have direct environmental impacts but might also promote further incursions into previously undeveloped areas.

As previously described, surface or near surface contamination due to flowback water releases or casing failures can be rapidly transmitted through surface or groundwater over large distances, with potentially devastating effects for those far downstream or down-gradient. Even when hydraulic fracturing is not used, casing failures can occur for a variety of reasons, including poor construction, cement shrinkage, seismic disturbance, or differences in pressure along the borehole related to bedrock conditions.[25] Cementing in a well at the end of its useful life does not return the well bore and surrounding rock to its pre-drilled condition. On the contrary, the cement-filled bore remains a zone of weakness that will necessarily respond differently than surrounding rock to physical and chemical stressors. This fact all but ensures eventual failure. Certainly, the prevalence of eventual leakage is known to be high: "in North America, there are literally tens of thousands of abandoned, inactive, or active oil and gas wells, including gas storage wells, that currently leak gas to [the] surface."[26] Deep drilling in tight shale formations, like the Marcellus, increases the likelihood of casing failure.[27] Additionally "there is a slight risk of hitting permeable gas reservoirs at all levels . . . caus[ing] shallow gas . . . and underground blowouts").[28] Therefore, siting considerations should include the increased risks of casing failure related to the depth of the target formation, the potential for synergistic cumulative effects of well density on contaminant migration potential, the possibility that proposed frack jobs will contribute to casing failures in adjacent active or inactive wells, and the impacts of likely eventual well casing failures in the area.

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[25] *See* Rubin, *supra* note 15, at 7.

[26] MAURICE B. DUSSEAUL ET AL., WHY OIL WELLS LEAK: CEMENT BEHAVIOR AND LONG TERM CONSEQUENCES (2000), *available at* http://www.albertasurfacerights.com/articles/?id=458.

[27] David M. Kargbo et al., *Natural Gas Plays in the Marcellus Shale: Challenges and Potential Opportunities*, 44 ENVTL. SCI. & TECH. 5679, 5678 (2010) ("[C]ontrol of well bore trajectory and placement of casing become increasingly difficult with depth.").

[28] *See id.*

Finally, hydrofracking can result in the migration of gas, fracking fluids, and toxic formation waters from great depth into drinking water aquifers or to the surface, with potentially broad geographic implications. In their push to make the expense of high-volume hydraulic fracturing and horizontal drilling pay off, companies often forego 3-D seismic analysis that would enable identification of preexisting through-going faults or fractures that could communicate contaminants from the deep, intentionally fractured zone to higher levels.[29] Specifically, when scouting for shale gas in laterally continuous formations like the Marcellus shale, companies planning to use horizontal wells generally do only enough geological/geophysical analysis to determine the depth and thickness of the targeted shale formation.[30] According to an industry analyst:

> [G]as shale developments have become "real estate" plays with some engineering content. There has been a mindset shift among producers that gas shale developments are the equivalent of manufacturing operations, where the well drilling and completion process is repetitious following an initial successful well.[31]

Despite this mindset, natural fractures and faults can transmit fluids vertically, and hydrofracking enhances these connections, potentially allowing leakage of fracking fluids far outside the fracking zone, including all the way to the surface. Without detailed subsurface mapping of fracture systems, migration susceptibility will not be accurately factored into drilling decisions.

According to the EPA, field observations of coal bed methane hydrofracking indicate that "fluid may move beyond the idealized, hypothetical 'edge of fracture zone' . . . often tak[ing] a stair-step transport path through the natural fracture system."[32] While the higher ambient pressures at the greater depths generally tapped for shale gas might decrease this risk somewhat (e.g., by collapsing natural fractures), evidence suggests it remains a significant concern. Hydraulic fracturing is intended to force open (and keep open) existing natural fractures, as well as to create new ones, enhancing fluid flow. A multi-year Colorado study suggested that fracking fluids and methane may have migrated vertically "along natural open-fracture pathways

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[29] *See* Northrup, *supra* note 15.

[30] *See id.*

[31] Allen Brooks, *Gas Shales: Energy Market Solution or Problem?*, E&P MAGAZINE, Jan. 26, 2010, *available at* http://www.epmag.com/Magazine/2010/2/item52332.php?opattr=%22Gas_Shales%3A_Energy_Market_Solution_or_Problem%3F%22.

[32] U.S. ENVTL. PROTECTION AGENCY, EVALUATION OF IMPACTS TO UNDERGROUND SOURCES OF DRINKING WATER BY HYDRAULIC FRACTURING OF COALBED METHANE RESERVOIRS STUDY 4-12 (2004), *available at* http://www.epa.gov/ogwdw000/uic/pdfs/cbmstudy_attach_uic_ch04_hyd_frac_fluids.pdf.

or [new] pathways such as well-bores or hydraulically-opened fractures."[33] In that study area, the regional drinking water aquifer experienced a 25-fold increase in dissolved methane coincident with a large increase in the number of natural gas wells in the area over the same timeframe.[34] The study found that the locations "most affected [we]re near structural features where [] faults and fractures maximize the vertical mobility" of fluids.[35] These observations render untenable the idea that deep hydrofracking poses no risk to drinking water supplies on the assumption that its effects will be isolated by a thick sequence of intervening rock.[36]

Indeed, hydrofracking in the Marcellus shale explicitly seeks to take advantage of the natural vertical joints, or fractures, that characterize this formation.[37] Horizontally drilled wells are intended to intercept as many of these joints as possible in order to maximize gas production potential.[38] Hydraulic fracturing forces existing fractures open and creates new ones, greatly enhancing connectivity and overall fluid flow. Even without hydraulic fracturing or horizontal drilling, vertical wells that encounter "a reservoir of interconnected natural fractures" in the otherwise low permeability shale can experience blowouts or produce larger than expected quantities of gas.[39] Where natural joints are especially closely spaced, methane, saline water, radioactive elements, and LNAPLs like benzene regularly make their way to the surface with no human assistance at all.[40] In fact, these highly jointed zones are identified by analyzing soil gas composition (background levels of soil methane are "on the order of 4 ppm, but over open fractures . . . the soil gas content increases to 40-1000+ppm"[41]).

In conclusion, minimum setbacks from water bodies, wetlands, water supply reservoirs, and water supply wells could easily be extended without impacting the ability of natural gas companies to access the Marcellus Shale at depth. We suggest *at least* a 2,000 foot setback as a minimum buffer for these sensitive systems. The Commission should not leave other setback

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[33] S.S. PAPADOPULOS & ASSOCIATES, INC., PHASE II HYDROGEOLOGIC CHARACTERIZATION OF THE MAMM CREEK FIELD AREA, GARFIELD COUNTY, COLORADO 23 (2008), *available at* http://s3.amazonaws.com/propublica/assets/methane/garfield_county_final2.pdf.

[34] *See* GEOFFREY THYNE, REVIEW OF PHASE II HYDROGEOLOGIC STUDY PREPARED FOR GARFIELD COUNTY 9 fig.6 (2008), *available at* http://s3.amazonaws.com/propublica/assets/methane/thyne_review.pdf.

[35] *See id.* at 21.

[36] *See* Abrahm Lustgarten, *Digging at Mystery of Methane in Wells: The Oil and Gas Industry Says Water Contamination Is Rare, But a Recent Garfield County Study Faults Drillers*, DENVER POST, Apr. 22, 2009, available at http://www.denverpost.com/news/ci_12195167.

[37] *See* Rubin, *supra* note 15, at 3.

[38] *See id.*

[39] *See id.* at 4.

[40] *See id.* at 5.

[41] Robert D. Jacobi, *Basement Faults and Seismicity in the Appalachian Basin of New York State*, 353 TECTONOPHYSICS 75, 77, 79 (2002).

standards to the states, but should institute scientifically supported minimums that states can choose to expand. Where local hydrologic and geologic conditions warrant, setbacks should be increased.

Finally, shale gas developments should not be treated as cookie-cutter "manufacturing operations" or "'real estate' plays with some engineering content."[42] The proposed regulations should require thorough subsurface mapping for each well pad site and each proposed horizontal well. If seismic data suggest existing faults or other possible routes of communication with an aquifer or the surface, the Commission should deny a drilling permit. Furthermore, permits should not be granted in Special Protection Waters areas. Finally, the regulations should make clear that setback and siting requirements hold regardless of what form of approval is requested (ABR or docket).

D. Treatment and Disposal Practices for Produced/Flowback Water

The proposed regulations fail to adequately regulate disposal of produced water. Requiring that produced/flowback wastewater be stored on-site in containment tanks rather than in surface impoundments (Section 7.5(h)(2)(ii)(F) and 7.5(h)(2)(iv)) is a substantial improvement over current state law in Pennsylvania. That said, the rules inadequately regulate final treatment and disposal of the produced water (Sections 7.5(h)(2)(ii)–(v), 7.6). This is a critical component to ensuring the ecological integrity of water sources in the Delaware River Basin watershed. Lax regulations at the state level, particularly in Pennsylvania, have already put water sources at significant risk of contamination due to poor oversight and enforcement. A recent *New York Times* study found that public sewage treatment plants are accepting produced water from hydrofracking operations but are ill-equipped to process such solutions.[43] Indeed, some plants accepted wastewater with radioactivity levels as high as 2,122 times the drinking-water standard.[44] Many of these plants were just upstream from drinking water intake stations.[45] According to the *New York Times*, none of the 65 drinking water intake plants in Pennsylvania had tested for radioactivity since 2008.[46] At least 12 sewage treatment plants in three states accepted industry wastewater and then discharged it into lakes, rivers, and streams after it was only partly treated.[47]

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[42] *See* Brooks, *supra* note 31.

[43] Urbina, *supra* note 5.

[44] *Id.*

[45] *Id.*

[46] *Id.*

[47] *Id.*

It is a fact that produced water contains hazardous naturally-occurring materials, such as radium, uranium, arsenic, and bromide, in addition to hydrofracking fluid additives.[48] While Section 7.6 would require a treatability study of resulting wastewater, the study's parameters are poorly defined and it fails to address many of the contaminants common to hydrofracking (including benzene and other VOCs). Specific standards for wastewater constituents requiring removal of toxic substances (encompassing those intentionally added to fracking fluids and those gained from subsurface interactions with groundwater and rock) are needed. Many contaminants are conservative (e.g., salts), not responsive to treatment (e.g., some organic hydrocarbons), or require specialized techniques to remove (e.g., heavy metals, including arsenic).[49] The treatment required must be effective, and oversight/enforcement is necessary. Untreatable hazardous wastes should be handled and disposed of under hazardous waste laws and not subject to exemption.

In addition, Pennsylvania's failure to adequately monitor the treatment of wastewater renders Section 7.6(b)'s delegation of authority to the state unreasonable.[50] Consistent with its jurisdictional authority, the Commission should be responsible for issuing permits for wastewater discharge and disposal and for defining the standards for such permitting.

To ensure that no untreated or inadequately treated wastewater is disposed of into waterways within the Commission's jurisdiction, the regulations must include the following provisions:

- A requirement that each project sponsor use only Commission-approved fracking fluid components and disclose all components (and their volumes) prior to carrying out a frack job.
- Elimination of the exception for Zones 4, 5 & 6 in Section 7.6(c) governing compliance with primary and secondary safe drinking water standards.
- A reporting requirement obligating a project sponsor to disclose the contents of any produced/flowback water to the Commission, the appropriate state agency, and the relevant wastewater treatment or disposal facilities.
- An independently verified determination of whether a waste treatment facility has

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[48] Don Hopey, *Bromide: A Concern in Drilling Wastewater*, PITTSBURGH POST-GAZETTE, Mar. 13, 2011, *available at* http://www.post-gazette.com/pg/11072/1131660-113.stm.

[49] *See* Urbina, *supra* note 5.

[50] *See* David B. Caruso, *EPA Asks Pa. to Boost Monitoring of Gas Well Waste*, THE PHILA. TRIBUNE, Mar. 8, 2011, *available at* http://www.phillytrib.com/tribune/phillynewsheadlines/17965-epa-asks-pa-to-boost-monitoring-of-gas-well-waste-.html ("[A]n EPA regional administrator, Shawn Garvin, said in a letter to Pennsylvania's Department of Environmental Protection on Monday that it was concerned about the potential for harm to human health and the aquatic environment.").

the capacity and technological expertise to process both the type and volume of chemical constituents present in produced/flowback water and the sheer volume of the water itself. This determination must be based on cumulative analysis of the aggregate shipments received by the plant and not on a project-by-project analysis.

- A requirement for treatment facilities to monitor and confirm adherance to strict maximum release limits of all hazardous materials.

- Authority granted to the Executive Director to order cessation of any gas drilling-related wastewater shipments to wastewater treatment plants that are out of compliance with these regulations, as well as applicable provisions of the Clean Water Act.[51]

E. Definitions of Certain Terms and Requirements Are Inadequate

1. "Measurable change" (Section 7.1(f))

Section 7.1(f) provides that the Special Protection Waters (SPW) regulations "require among other things that a project cause no *measurable change* to existing water quality from point or nonpoint sources at control points identified in the SPW regulations . . ." (emphasis added). This requirement is only meaningful if a "measurable change" is specifically defined, and if specific procedures are defined for routine water quality testing. Moreover, due to the sensitivity of these areas, drilling should not be permitted in the vicinity of SPWs at all.

2. "Significant impact on hydrologic resources" (Section 7.3(k)(17)(ii))

Section 7.3(k)(17)(ii) provides that "[s]uccessful restoration of well sites and access roads may only be considered complete after observations over two growing seasons indicate no *significant impact on hydrologic resources* . . ." (emphasis added). Again, the regulations must include objective criteria for defining a "significant impact on hydrologic resources." The rules should include factors for determining what constitutes a "significant" impact.

3. Criteria for ABR (Section 7.5(e))

Section 7.5(e) provides that "ABRs may only be issued in accordance with this section for a well pad . . . [associated with a project which] has been identified and is in conformance with an approved NGDP [(Natural Gas Development Plan)]; *or* meets all" of the criteria provided in 7.5(e)(2)-(7). (emphasis added). The requirement should instead state that the project must be in conformance with an approved NGDP *and* must meet the list of criteria

[51] 33 U.S.C. §§ 1311, 1312, 1316, 1317 (2006).

provided in the section. Otherwise, the requirement fails to effect the environmental impact protections the regulations purport to achieve.

4. "Facilitate analysis" and "identify measures" (Section 7.5(c)(1))

The statement that NGDPs are "intended to . . . facilitate analysis of potential water resource impacts and identify measures to minimize these impacts" is so vague as to render the provision meaningless. We suggest replacing "facilitate analysis of" with "analyze" so NGDPs accomplish their intended purpose—to actually analyze potential water resource impacts. Further, this section should explicitly state that the measures identified to minimize water resource impacts *must* be implemented for the plan to be approved.

V. What Is Missing from the Draft Regulations?

A. Restrictions on Fracking Fluid Composition

The draft regulations are silent about what chemicals may be used in fracking fluids. Instead they institute only basic post-hoc disclosure requirements (Section 7.5(h)(2)(ii)(D)). Although chemical additives often comprise less than 1% of fracking fluid, high-volume hydraulic fracturing employs millions of gallons of water and, therefore, thousands of gallons of chemicals. Fracking fluid components should be disclosed in full *before* use, and the use of hazardous chemicals, including but not limited to diesel fuel and other petroleum derivatives, in hydraulic fracturing fluids should be prohibited. Only non-toxic, non-hazardous components should be allowed as inputs in the hydrofracking process.

In addition to the requirement for project sponsors to collect and analyze representative samples of flowback and production water (Section 7.5(h)(2)(ii)(F)), oversight should include unannounced on-site sampling of fracking fluids and flowback/production water. Ideally, qualified *independent* professionals, and not project sponsors, would be required to carry out the standard representative sampling and analysis. The proposed language seems to be of two minds on this issue ("[p]roject sponsors must collect samples . . . and analyze" them, vs. "[a]ll sampling must be performed by a qualified professional" and analyzed "by a state certified laboratory"), so clarification in the final rule is needed.

B. Well Casing Construction Specifications

The proposed regulations should specify a uniform, high standard for well casings and cement jobs, including material quality requirements and construction specifications for different portions of vertical and horizontal well bores. Standards for these barriers—critical to preventing subsurface blowouts into aquifers and to the long-term integrity of capped wells—should not be left to the differential policies of individual states or companies. Unfortunately, even strict adherence to such standards cannot ensure that active well casings and inactive

cemented wells will remain intact and leak-free (see discussion of "Setbacks and Siting Restrictions" (Section IV(c)).

C. Standardized Basin-wide Setbacks

As mentioned previously, there is no compelling reason to leave individual states to determine, for example, setbacks from public or domestic water supply wells. The Commission has a distinct interest in providing uniform guidance (resulting in uniform minimum protection) across the basin. The setbacks currently in place in Pennsylvania, for example, have repeatedly proven to be insufficient to protect public water supplies.[52]

D. Hazardous Hydraulic Fracturing Wastes

Unfortunately, even if fracking fluid additives are restricted to food-grade, non-toxic substances, the increased connectivity produced by hydrofracking risks contaminating shallow, potable water with saline, toxic, radioactive, and/or hydrocarbon-containing waters originating at depth.[53] Additionally, produced/flowback water picks up these naturally-occurring contaminants through interaction with deep formation waters and with the shale itself. Recycled flowback water becomes increasingly toxic with reuse, and will eventually need to be treated and/or disposed of. It is imperative that hydraulic fracturing wastes that effectually meet the definition of "hazardous" wastes be subjected to the equivalent of all hazardous waste generation, transportation, and disposal laws under the Resource Conservation and Recovery Act[54] and state laws. Exemptions serve no legitimate purpose and place the health of the Delaware River Basin, and the people who depend on it, at risk.

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In summary, we urge the Commission to suspend the current rulemaking process at least until the EPA completes its Hydraulic Fracturing Study and the Commission undertakes a thorough assessment of the cumulative impacts of natural gas development. Without this crucial context, the Commission risks institutionalizing grossly inadequate protections for this important region. If the Commission insists on going forward with its rulemaking process now, we hope it will adopt significant revisions to the current draft regulations, including those detailed above, to ensure the continued ecological vitality of this sensitive and treasured region. Because drinking water quality for more than 15 million Americans is at stake, the Commission cannot afford to get this wrong. The risk-benefit calculation clearly aligns with adoption of the precautionary principle.

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[52] *See, e.g.*, Marianne Lavelle, *A Dream Dashed by the Rush on Gas*, NAT'L GEOGRAPHIC NEWS, Oct. 17, 2010, *available at* http://news.nationalgeographic.com/news/2010/10/101022-energy-marcellus-shale-gas-environment/.

[53] Rubin, *supra* note 15, at 14.

[54] 42 U.S.C. § 6901 *et seq.* (2006).