Public Employees for Environmental Responsibility
962 Wayne Avenue, Suite 610 • Silver Spring, MD 20910
Phone: (202) 265-PEER • Fax: (202) 265-4192
Email: info@peer.org • Web: http://www.peer.org

May 18, 2016

Director, Office of Science Quality and Integrity (OSQI)
U.S. Geological Survey
MS 911 National Center
Reston VA 20192

InfoQual@usgs.gov

RE: Information Correction Request

VIA U.S. MAIL & EMAIL

Dear Director:

Public Employees for Environmental Responsibility (PEER) hereby submits this Information Quality Complaint ("Complaint") pursuant to the Data Quality Act of 2000,[1] the Office of Management and Budget ("OMB") Guidelines for Ensuring and Maximizing the Quality, Utility, and Integrity of Information Disseminated by Federal Agencies ("OMB Guidelines"),[2] the U.S. Department of Interior Information Quality Guidelines[3] as well as the U.S. Geological Survey (USGS) Information Quality Guidelines.[4]

PEER hereby respectfully requests that the USGS rescind the publication of the study: "Median Nitrate Concentrations in Groundwater in the New Jersey Highlands Region Estimated Using Regression Models and Land-Surface Characteristics" Scientific Investigations Report

[1] Section 515 of the Fiscal Year 2001 Treasury and General Government Appropriations Act, Pub.L. 106-554.
[2] Office of Mgmt. & Budget Guidelines for Ensuring and Maximizing the Quality, Objectivity, Utility, and Integrity of Information Disseminated by Federal Agencies, 67 Fed. Reg. 8452 (Feb. 22, 2002).
[3] U.S. Department of the Interior; Information Quality Guidelines Pursuant To Section 515 Of The Treasury And General Government Appropriations Act For Fiscal Year 2001; https://www.doi.gov/sites/doi.opengov.ibmcloud.com/files/uploads/515Guides.pdf
[4] U.S. Geological Survey Information Quality Guidelines; http://www2.usgs.gov/info_qual/

2015–5075; Version 1.1, August 2015.[5] PEER makes this request because the identified study is based upon information that does not comply with USGS, DOI, or OMB Information Quality Guidelines.

This cited report is information disseminated by the USGS. The specific reason for this complaint is due to specified failures to meet information quality standards; those failures and supporting documentation are as follows:

I. CHALLENGED INFORMATION DOES NOT COMPLY WITH THE INFORMATION QUALITY GUIDELINES

A) Data Quality - Lack of Quality Assurance/Quality Control (QA/QC)

USGS has a data quality assurance and quality control policy which reads:

> "Protocols and methods must be employed to ensure that data are properly collected, handled, processed, used, and maintained at all stages of the scientific data lifecycle. This is commonly referred to as 'QA/QC' (Quality Assurance/Quality Control). QA focuses on building-in quality to prevent defects while QC focuses on testing for quality (e.g., detecting defects). QA makes sure you are doing the right things, the right way. QC makes sure the results of what you've done are what you expected."[6]

The data in the USGS study comes from two sources: a USGS National Water Information System (NWIS) [782 wells] and from the New Jersey (NJ) Private Well Testing Act (PWTA) [19,369 wells]. The study states:

> "Two independent sources of groundwater nitrate data were used for this study (table 4). The first dataset is a subset consisting of 782 wells in the Highlands Physiographic Province with data available from the USGS National Water Information System (NWIS) (http://waterdata.usgs.gov/nwis). The second dataset consists of 19,369 wells in the Highlands Physiographic Province with data available from the NJ Private Well Testing Act (PWTA; New Jersey Department of Environmental Protection, 2003)."[7]

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[5] Baker, R.J., Chepiga, M.M., and Cauller, S.J., 2015, Median nitrate concentrations in groundwater in the New Jersey Highlands Region estimated using regression models and land-surface characteristics (ver. 1.1, August 2015): U.S. Geological Survey Scientific Investigations Report 2015–5075, 27 p., http://dx.doi.org/10.3133/sir20155075.
[6] USGS Data Management: Manage Quality; http://www2.usgs.gov/datamanagement/qaqc.php
[7] Baker et al., *supra* note 5, at page 7.

We do not take issue with the quality of the USGS NWIS data. However, the NJ Private Well Testing Act data has not undergone the required independent credible QA/QC process. Thus, the data relied on by USGS for the cited study is of poor quality and violates Information Quality Guidelines.

Further, the NJ Department of Environmental Protection (DEP) explicitly found that the PWTA data had significant limitations. For example, in the NJ DEP Private Well Testing Act Report (2008), the NJ DEP stated under "Limitations of the data":

> "Several factors may affect the measurement and quality of the data collected as part of the PWTA and utilized in this report. These factors include sample collection and transport, laboratory analysis, accuracy of related well location information, and data entry and reporting. Any of these factors, if handled improperly, could result in an unwarranted test failure or approval. **Since no state agency has the ability to verify that all real estate transactions (sales and leases) subject to testing under the PWTA have been reported to NJDEP, the absence of results, along with errors or mistakes in the reported data, could have a significant impact on the evaluation and interpretation of the data presented.** The following identifies some key issues concerning PWTA data:
>
> 1. Sample Collection and Transport - Samples collected or transported improperly often yield contaminated or questionable test results. For example, the NJDEP currently suspects that collection of lead samples from unflushed water tanks or spigots may be the primary reason why many elevated lead results are being reported.
>
> 2. Analysis and Data Reporting - **The PWTA Program testing data are submitted electronically and are automatically entered into the database without any quality control or quality assurance reviews**. It is assumed that the certified laboratory properly met all required protocols and the data are accurate. The PWTA Program relies on the reporting laboratory to catch and correct any data entry errors.
>
> 3. Collection of well location information - Without accurate well location information, the analytical results cannot be properly correlated to the well, thereby-hindering evaluations of the data. The new database that went on-line in the spring of 2007 included additional quality control checks to improve location data.

When reviewing PWTA results, it is important to remember that the tests were conducted on an untreated or raw water sample collected prior to any water treatment system. Many houses or wells may already have treatment systems in place to remove or lessen the degree of contamination and the PWTA test results do not measure if the treatment is working. Further post-treatment samples collected at a kitchen tap are recommended to evaluate the effectiveness of a treatment system.

PWTA test results are not confirmed through the collection and analysis of a second, or confirmatory sample. Questionable or unexpected results are neither confirmed nor verified by NJDEP, and have been included in the data analysis and summaries.

Although PWTA testing is more extensive than previous state regulatory requirements, the list of parameters is limited. The requirement to test for some parameters, such as arsenic and mercury, is based on regional occurrence where these parameters are known to be present in groundwater. Other types of compounds may be present in water if the well is near specific sources of contamination. Caution must be used not to conclude that these contaminants are not present in the drinking water. Assumptions about water quality may only be made for the tested parameters."[8] (Emphasis added)

These vast differences between the NJ PWTA data and the USGS NWIS data are directly relevant to data quality, reliability, and relevance:

- The NJ PWTA data lack the vital hydrogeological information attributes of the USGS NWIS data, including well depth and aquifer identification.

- The NJ PWTA data lack the QA/QC procedures of the USGS NWIS data.

- The NJ PWTA data are locationally biased towards shallow well depths and proximity to septic systems and other pollution sources that manifest and magnify anthropogenic loadings of nitrate.

[8] New Jersey Private Well Testing Act Program; http://www.nj.gov/dep/watersupply/pwta/pdf/pwta_report_final.pdf

- The NJ PWTA data magnify any inherent limitations of the USGS NWIS data and contaminate the combined data set.

Furthermore, these deficiencies are incurable in this report since the NJ PWTA data account for 96% of the data statistically analyzed in the USGS study. Given that the NJ PWTA data comprises the overwhelming majority of the challenged study's dataset, these flaws, biases, and limitations severely undermine the quality, reliability and relevance of the total dataset used for the study as well as the methodological credibility of the study objective (the characterization of representative ambient groundwater nitrate concentrations).

The report's reliance on such data conflicts with both the agency's Information Quality and data QA/QC requirements.

B) Data Reliability

1. Basic hydrogeological gaps violate Information Quality Guidelines

The NJ PWTA data cannot be reliably used for the objectives of the USGS study. They lack basic hydrogeological characteristic records that are vital to reliable data interpretation and analysis. The USGS study acknowledges these significant limitations in the NJ PWTA data, specifically comparing the data set to the more reliable data collected by USGS:

> "The PWTA data are extensive, but water samples are collected only from domestic supply wells. PWTA data do not contain the information available for NWIS wells, such as well depth and aquifer identification. The PWTA specified a list of 12 approved analytical methods for analysis of nitrate (table 5)." [9]

Acknowledging these limitations does not cure them, however. Well depth and aquifer identification are critical to any reliable characterization of actual groundwater quality. Moreover, the lack of these well-specific attributes conflicts with the standards of the USGS's own NWIS data system.

2. "Method Detection Limit" and non-detect values are not credible or reliable

[9] Baker et al., *supra* note 5, at page 9.

The NJ PWTA data are not credible or reliable because they are based on private laboratory detection practices that do not reflect sound analytical practices or control procedures. Specifically, 23% of the NJ PWTA data were classified as "non-detect" (ND). A ND classification was based on a range of analytical method detection limits (MDL's), which varied between private laboratories, including MDL's for nitrate as high as 10.0 mg/L:

> "Of the 19,670 PWTA and NWIS samples, 511 (3 percent) had concentrations greater than the State and Federal Maximum Contaminant Level (MCL) for nitrate of 10 mg/L as N. A total of 4,519 (23 percent) samples had concentrations less than the MDL, which ranged from 0.020 to 10.0 mg/L as N, and are categorized as non-detects. The MDL varied among samples because of differences among laboratories and analytical methods used."[10]

It is simply not reliable to classify data as "non-detect" based on analytical detection limits as high as 10 mg/L. This practice violates the USGS data collection and QA/QC requirements of the USGS Manual.[11]

Compare the accepted method detection limits (MDL's) for nitrate in groundwater as established by US EPA, which range between 0.05 mg/L and 2.0 mg/L:[12]

ANALYTICAL INFORMATION		
Method	**Detection Limit**	**Note**
US EPA 300.0, 300.1	0.4 mg/L	Nitrate-Nitrogen by Ion Chromatography
US EPA 353.2	0.05 mg/L	Nitrate-Nitrite by Automated Colorimetry
US EPA 9056	1 mg/L	Nitrate-Nitrite
US EPA 9210	2.0 mg/L	Nitrate
Known Limitations to Analytical Methods	Both US EPA Method 9056 and Method 9210 have interference and concentration restrictions	
Public Drinking Water Testing Requirements	Public water systems are required to test for nitrate and must report the results to the CDPH.	

The MDL's used by the NJ PWTA are orders of magnitude higher that these EPA methods.

The NJ DEP also sets a regulatory "Practical Quantitation Limit" (PQL) for nitrate. A PQL is defined at New Jersey Administrative Code (N.J.A.C.) 7:9C-1.4 as "the lowest

[10] *Ibid* at page 9.
[11] U.S. Geological Survey Manual, Chapter 502.2 - Fundamental Science Practices: Planning and Conducting Data Collection and Research; http://www2.usgs.gov/usgs-manual/500/502-2.html
[12] Groundwater Information Sheet: Nitrate. http://www.waterboards.ca.gov/gama/docs/coc_nitrate.pdf

concentration of a constituent that can be reliably achieved among laboratories within specified limits of precision and accuracy during routine laboratory operating conditions. 'Specified limits of precision and accuracy' are the criteria which have been included in applicable regulations including, but not limited to, those regulations listed at N.J.A.C. 7:9C-1.9 or those listed in the calibration specifications or quality control specifications of an analytical method."

The NJ DEP regulatory PQL for nitrate is set at 100 ppb (0.1 mg/L).[13] Yet, the MDL's in the NJ PWTA data, relied on by USGS, are orders of magnitude higher than NJ DEP's own PQL for nitrate. These wide discrepancies call into question the credibility of USGS relying upon this data.

C) Spatial Bias

The data collected and analysis conducted by USGS have a spatial bias that conflicts with the study objectives and undermines the accuracy, confidence, and reliability of those findings.

1. NJ PWTA data correlate with land use and anthropogenic loadings

The USGS study was designed to characterize nitrogen concentrations in the Highlands region. The USGS researchers were aware of the fact that this data would be used for regulatory purposes by the NJ DEP in establishing so called "septic density standards" for the legislatively designated Highlands Preservation Area in the NJ DEP Highlands regulations.[14]

The USGS researchers were also aware of, but failed to cite, the NJ DEP's methodology and analytical basis and background for the "septic density standards," which are explicitly based on natural background nitrate levels documented by NJ DEP in the Highlands region. The NJ DEP basis for the current ambient nitrate concentration standards are expressed as, "0.21 mg/L for forest land use and 0.76 mg/L for mixed land use."[15]

[13]Appendix Table 1 - Specific Ground Water Quality Criteria, http://www.nj.gov/dep/rules/rules/njac7_9c.pdf
[14] *See* Basis & Background of the Septic Density Standard of the Highlands Water Protection and Planning Act Rule at N.J.A.C. 7:38-3.4 (NJDEP); http://www.nj.gov/dep/highlands/docs/septicdensity.pdf
[15] *Ibid* at page 1.

Yet, in direct conflict with this DEP regulatory methodology, the USGS study developed a spatially biased approach, expressed as:

> "The estimated median nitrate concentration for the entire Highlands Region is about 1.25 mg/L as N, and estimated median concentrations range from about 1.05 to 1.78 mg/L as N among 11 smaller administratively defined areas within the Highlands Region that vary in percentages of urban land use, agricultural land use, and septic-system density."[16]

This approach creates a spatial bias which the USGS authors admit:

> "There is spatial bias in well locations because many sampled wells are located in urban areas; thus, a bias in median nitrate concentrations was expected. Over-representation of urban and possibly agricultural areas and under- representation of forested areas in the combined NWIS-PWTA database must, therefore, result in higher median nitrate concentrations for all water samples than the actual median concentration for groundwater underlying the entire Highlands Region or any Area, Zone, or Area: Zone combination."[17]

Thus, the groundwater samples relied on by USGS were spatially biased because they reflected land uses and anthropogenic nitrogen loads to groundwater. This admission of bias by the study's authors, however, does not correct the bias or allow those relying on the study to account or compensate for it.

2. Data sources located outside Highlands Preservation Area

The data were also collected from wells located outside the legislatively designated Highlands Preservation Area, yet arbitrarily assigned by USGS to certain "administratively defined areas" that have no scientific or even logical basis.

As USGS researchers were aware, the NJ DEP septic density standards regulations were based upon, and apply only in, the Highlands Preservation Area. Yet in deriving regional groundwater nitrate levels, the USGS study design specifications inappropriately conflicted with the geographic specifications for what constitutes the Highlands Preservation Area as specified

[16] Baker et al., *supra* note 5.
[17] *Ibid* at page 14.

in NJ law and regulation. This unexplained departure further undermines the reliability of the study's data and conclusions.

D) Statistical Bias - Selection of Median

The NJ DEP septic density standards are authorized by the Highlands Act in order to protect water quality:

> "…a septic system density standard established at a level **to prevent the degradation of water quality**, or to require the restoration of water quality, and to protect ecological uses from individual, secondary, and cumulative impacts, **in consideration of deep aquifer recharge available for dilution**…"[18] (Emphasis added)

Although the study was intended for use by NJ DEP in setting septic standards, NJ legislative policies and standards were not cited in the USGS Report. Moreover, the study's design and its statistical analysis of the data appear in conflict with these legislative policies and standards. Specifically:

- The NJ PWTA data were collected from shallow residential wells of unknown depth. This ignores the legislative mandate to consider "deep aquifer recharge."

- The NJ PWTA data were collected with a spatial basis that will "result in higher median nitrate concentrations for all water samples than the actual median concentration for groundwater underlying the entire Highlands Region or any Area, Zone, or Area: Zone combination."[19]

In addition, the USGS researchers were undoubtedly aware of the statutory basis and authority for the NJ DEP to establish septic density standards. The initial scientific methodology used by NJ DEP to establish the current septic density standard relied on USGS NWIS well data

[18] C.13:20-32 Rules, regulations, standards.; (e); P.L. 2004, c.120
[19] Baker et al., *supra* note 5, at page 14.

on nitrate concentrations in groundwater.[20] That methodology was designed to reflect the non-degradation standard established by the NJ Legislature in the Highlands Act.

The NJ DEP adopted a conservative approach to data and model design. The NJ DEP methodology Basis and Background document explains:

> "The Department believes the correct interpretation of the HWPPA [Highlands Water Protection and Planning Act] language is to use a conservative approach in estimating recharge available for dilution. Establishing such an approach required the Department to make two decisions: 1) determine the most appropriate and scientifically defensible methodology with which to estimate annual average recharge in the Highlands Region, and 2) determine the appropriate critical conditions under which to apply the model in order to be adequately protective."[21]

The context for method selection must be guided by the intent of the legislation, which is to protect and restore ground water and surface water quality (hence the NJ DEP's current methodological reliance on "pristine" groundwater nitrate concentrations from wells located in forested areas to establish background nitrate levels free from anthropogenic nitrate loadings). Despite this statement, the statistical metric selected by USGS was a median value. Selection of a median value - by definition - incorporates significant degradation in groundwater quality. This degradation of groundwater quality explicitly conflicts with the legislative standard "to prevent the degradation of water quality."[22]

These questionable statistical practices are at variance with NJ state law and regulation. This conflict undermines the perceived utility of the report, creates confusion, and renders the results less reliable.

E) Administrative classification of well data lacks scientific support and is inconsistent with law

[20] NJDEP, *supra* note 14, at page 17.
[21] *Ibid* at page 3.
[22] Rules, *supra* note 18.

The NJ Highlands region is defined and delineated in multiple ways, based upon multiple factors. The US Forest Service's "New York - New Jersey Highlands Regional Study: 2002 Update" defined the region "using topography and geology as key components."[23]

The New Jersey Legislature, in the 2004 Highlands Act, expanded the U.S. Forest Service definition of the region, based on natural resource and policy considerations. The Legislature bifurcated the region by creating a "Preservation Area," where NJ DEP regulations were mandatory, and a "Planning Area," where they were voluntary.[24] The Act also created the Highlands Council and authorized the Council to prepare a Regional Master Plan (RMP). The RMP adopted by the Council divides the Highlands Region into different land use categories, based on multiple planning objectives established in the Highlands Act.[25]

These various methods of defining and delineating the Highlands Region have huge regulatory significance, because they trigger different land use planning policies and surface and groundwater standards. Thus, the science and methods used to define and delineate the region must reflect both law and public policy.

The USGS analyzed and characterized the groundwater quality data according to land use, referencing administratively defined areas within the Highlands Region that vary in percentages of urban land use, agricultural land use, and septic-system density. The USGS study arbitrarily selected land use classifications established by the Highlands Council's Regional Master Plan. In so doing, USGS necessarily rejected the bifurcation of "Preservation Area" and "Planning Area" established by the Highlands Act and incorporated into NJ DEP regulations.

The USGS selection of the RMP land use classification scheme to present the well data contradicts the current Highlands Act and NJ DEP septic density regulatory standards (which were based on USGS data), as well as the NJ DEP's scientific basis and methodology for establishing the current septic density standards. As the USGS study is the exclusive basis for the NJ DEP proposed revisions to the current septic density standard, the USGS decision to collect, analyze and present well data based on RMP land use classifications lacks scientific support and conflicts with current NJ DEP scientific and regulatory methodology.

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[23] Phelps, M.G., and Hoppe, M.C., 2002, New York – New Jersey Highlands Regional Study: 2002 Update: U.S. Dept. of Agriculture, Forest Service, NA-TP-02-03; http://na.fs.fed.us/pubs/stewardship/ny_nj_highlands02_hr.pdf

[24] Highlands Water Protection and Planning Act (HWPPA), N.J.S.A. 13:20-1 et seq.

[25] Highlands Regional Master Plan; http://www.highlands.state.nj.us/njhighlands/master/rmp/final/highlands_rmp_112008.pdf

This data characterization lacks a scientific basis, conflicts with USGS data management policies and procedures, and contradicts the legislative standards and NJ DEP regulations that apply to septic density in the Highlands Preservation Area.

II. CHALLENGED INFORMATION IS INFLUENTIAL AND MUST MEET HIGHER STANDARDS

The Department of Interior Information Quality Guidelines require that "influential information" must meet higher standards of quality, clarity and reliability**.** They define influential information as "scientific, financial, or statistical information" which "will have or does have a clear and substantial impact on important public policies or important private sector decisions."[26] The Guidelines further provide that that influential information "regarding analysis of risks to human health, safety, and the environment" must, among other requirements:

> "(a) Use the best available science and supporting studies…
> (b) Use data collected by standard and accepted methods or best available methods…
> (c) In a document made available to the public, specify…[e]ach significant uncertainty identified in the process of the risk assessment and studies that would assist in reducing the uncertainty."[27]

By any measure, the challenged USGS study falls within this definition of influential information. Moreover, as detailed above, it falls far short of meeting the quality, clarity and reliability requirements for such information.

In this case, the USGS researchers knew that their work would be used in a highly controversial area of public health currently debated in the halls of the NJ Legislature and litigated in state courts. In fact, the USGS study was the exclusive scientific basis for the NJ DEP's May 2, 2016 regulatory proposal to revise the current septic density standards. The NJ DEP proposal states:

> "When the Department promulgated the existing septic system density standards in 2005, the Department used Highlands Region-specific data in the USGS's NWIS (National Water Information System) database to establish the target ground water nitrate concentrations for the forested and nonforested areas of the preservation

[26] Information Quality Guidelines, *supra* note 3, at VII (9).
[27] *Ibid* at II (4)(a)-(c).

> area. In developing the target ground water nitrate concentrations for the LUC Zones for purposes of the proposed amended standards, the Department used additional nitrate data reported pursuant to the New Jersey Private Well Testing Act (PWTA), N.J.S.A. 58:12A-26 et seq., and a logistic-regression model developed by USGS to correlate the nitrate data with Highlands Region land use characteristics. See Median Nitrate Concentrations in Groundwater in the New Jersey Highlands Region Estimated Using Regression Models and Land-Surface Characteristics, by Baker et al."[28]

The pending DEP rule proposal on the precise topic of the USGS study underlines the influential stature of that study. Moreover, as this topic is also the subject of a pending lawsuit, the USGS report entangles the federal agency in a state legal dispute.

Finally, it is most significant that the series of data quality, data bias, and statistical methodologies criticized in this complaint are all biased in the same direction – militating for further degradation of waters in a preservation area. This pattern of deficiencies calls into question the independence and objectivity of USGS science.

III. PEER IS AFFECTED BY THE INFORMATION ERRORS

PEER is a non-profit organization chartered in the District of Columbia with the mission to hold government agencies accountable for enforcing environmental laws, maintaining scientific integrity, and upholding professional ethics in the workplace. PEER is an "affected person" in that PEER is a watchdog organization whose members are negatively affected by official scientific efforts which violate quality standards.

In addition, the New Jersey PEER chapter has been a long-time advocate for science based water resource protections in New Jersey and for safeguarding the Highlands Preservation Area.

IV. RECOMMENDATIONS FOR CORRECTION OF THE INFORMATION CHALLENGED BY THIS COMPLAINT

[28] Highlands Water Protection and Planning Act Rules Proposed Amendments http://www.nj.gov/dep/rules/proposals/20160502a.pdf

Accordingly, PEER respectfully requests the USGS take the following steps to comply with the Information Quality Act:

1. Retract the "Median Nitrate Concentrations in Groundwater in the New Jersey Highlands Region Estimated Using Regression Models and Land-Surface Characteristics" study.
2. Issue a public statement explaining the reasons for this retraction.
3. Send a letter to the NJ DEP Commissioner requesting that that agency refrain from relying on this retracted report for any regulatory or public health purpose.

Please let us know if you require any additional information in support of this complaint or if there is any aspect of it that requires clarification.

Respectfully submitted,

Jeff Ruch
Executive Director

Bill Wolfe
New Jersey Director

Primary Contact:
Jeff Ruch
Executive Director
Public Employees for Environmental Responsibility (PEER)
962 Wayne Avenue; Suite 610
Silver Spring, MD 20910
Tel: (202) 265-7337; Fax: (202) 265-4192
Email: info@peer.org