

## Appendix A

### **Specific Responses to Information Quality Request for Correction—ATSDR’s Chesapeake ATGAS 2H Well Site Health Consultation dated November 4, 2011**

Important context for this response is an understanding of what ATSDR health consultations are and the specific request that came from EPA in this case. As discussed on our web site (<http://www.atsdr.cdc.gov/hac/products.html>), “if a specific health question or issue arises about a potential environmental hazard, ATSDR conducts a public health consultation. A consultation differs from a public health assessment in that the consultation focuses on a specific question and provides a more rapid response. A consultation can address public health issues such as a chemical or radiological contamination, epidemiology, or provide technical advice on sampling and remediation plans. Public health consultations are not medical examinations, community health studies, or public health assessments.”

In the case of the Chesapeake ATGAS 2H Well Site health consultation, the U.S. EPA asked ATSDR to review their sampling data from a public health perspective and determine if the private well drinking water was safe for consumption and/or use. In conducting the health consultation, ATSDR focused on the maximum contaminant levels reported by EPA in drinking water samples, consistent with its standard protocol.

The purpose of the Chesapeake ATGAS 2H Well Site Health Consultation was to evaluate whether any public health exposures of concern exist in the seven private drinking water wells and to determine if any health concerns may exist for residents using water from these wells. ATSDR reviewed data available at the time and identified limitations of the data in the health consultation. ATSDR did not attempt to conclusively attribute the presence of chemicals detected in the private wells at this site to a definitive source. While ATSDR can recommend additional sampling to better characterize exposures or protective health actions, ATSDR recognizes the expertise and authority of EPA and state environmental agencies to determine both the preferred sampling protocols and the sources of contamination.

#### **From Chesapeake Energy Corporation, Paul Hagemeyer, January 20, 2012 letter**

- 1. The ATSDR patently ignored voluminous other sample results prepared by two environmental consultants, the PADEP, and the EPA.***

*Comment: The ATSDR relied on a single sampling event with seven samples to come to its conclusions and recommendations. During the course of the investigation being overseen by the PADEP, at least 29 sampling events were conducted at the seven residential locations by the independent consulting firms, Groundwater & Environmental Services, Inc. (GES) and Scientific Applications International Corporation (SAIC), generating a total of 211 sample analyses. The PADEP and the EPA conducted additional water quality sampling events,*

*generating three or four more sample analyses per well or approximately an additional 27 samples. Baseline water-quality samples were collected from these seven wells and analyzed prior to any drilling activity commencing, yielding a data set of seven samples collected in July through November 2010, five to nine months prior to the April, 2011 release. This does not include the approximately 3,576 other sample analyses, field observations, and biological assays that were developed during the eight month investigation which followed the release. All of this information, including the data validation and interpretation were summarized in three reports and were submitted to the PADEP.<sup>1</sup> These reports using the full complement of data, clearly demonstrate that the release did not impact the seven residential groundwater wells. All of this data was available to ATSDR during their evaluation for the Consultation through the PADEP or EPA.*

*The Consultation inaccurately states that it relied on “the currently available data” while ATSDR plainly failed to use the “best available information.” Best available information would include use of the additional GES and SAIC rounds of sampling and other sampling data collected by the EPA and the PADEP from those seven water wells. The broader data set reveals the scientific inadequacy of the Consultation’s reliance on one snapshot round of water-quality data and confirms that natural gas activities did not contaminate the wells. The Consultation selectively chose data that fit its conclusions: ATSDR, in most cases, based its opinion on data that yielded the highest values: ATSDR also relied on questionable “background” data in some circumstances while ignoring valid and available “background” sampling data in favor of generic regional background data in others. The Consultation failed to disclose or discuss instances where the published literature relied upon by ATSDR indicated natural or historical sources for various constituents present in the groundwater, but rather chose to imply that the detection of those constituents was in some way related to the ATGAS incident.*

<sup>1</sup> *The three reports are consecutively cited as 1) SAIC and GES, 2011. ATGAS Investigation Initial Site Characterization and Response, April 19, 2011 and May, 2011, Report, August 30, 2011; 2) SAIC, 2011. Haire Water Well Water-Quality Investigation, July 13, 2011; and 3) SAIC, GES and IEM, 2011, ATGAS Investigation Final Surface Water, Springs, and Water Well Site Characterization Report, December, 2011.*

*While relying on the meager seven samples, the Consultation and its widely reported press release asserted the following:*

- 1. The data do not “conclusively indicate but suggest that the groundwater near this site is impacted by natural gas activities”:*
- 2. methane, other hydrocarbons, and certain metals and other inorganic concentrations increased by up to ten-fold in one well; and*
- 3. there were “exceedances,” “exposure scenarios,” and “elevated levels” of “chemicals and “contaminants.”*

*The Consultation concluded with a number of sweeping recommendations for water treatment and additional evaluation and sampling of private water wells.*

*Unfortunately, based on the data, these conclusions are completely untrue and unfounded, and the resulting recommendations are completely without merit. In fact, the “elevated levels” discussed by ATSDR are representative of the normally existing water quality found in this area of Pennsylvania.*

**ATSDR Response:** ATSDR’s health consultations are targeted, site-specific responses to requests that may rely on a limited data set for specific exposure pathways. The ATSDR Chesapeake ATGAS 2H Well Site health consultation addressed a specific EPA request that ATSDR evaluate the environmental data collected from the seven private wells in April 2011 in order to determine whether harmful health effects would be expected from consuming and/or using the well water. ATSDR included other data sources in this review, as referenced in the health consultation document. These sources included Chesapeake's pre-drill baseline private well sampling data (pp. 6–7, Appendix D), PADEP's April 2011 sampling results (pp. 1–2), and the two industry reports published prior to the consultation's publication (the 7/13/11 Haire Water Well Water-Quality Investigation and the 8/30/11 ATGAS Investigation Initial Site Characterization and Response) (pp. 2–3, pp. 17–18). A third industry report, the 12/11 ATGAS Investigation Final Surface Water, Springs, and Water Well Site Characterization Report, was published after the ATSDR document was released. ATSDR used the appropriate, available data relevant for the scope of the request made to the agency for this public health review.

The purpose of the ATSDR health consultation was defined in the document summary as follows: “EPA requested that the Agency for Toxic Substances and Disease Registry (ATSDR) evaluate the environmental data collected from the seven private wells in order to determine whether harmful health effects would be expected from consuming and/or using the well water. ATSDR specifically evaluated environmental data collected from the seven private wells in drawing its conclusions.”

ATSDR appropriately cited the following data limitations (p. iv, p. 2) in this health consultation: “The environmental sampling information reviewed in this health consultation is limited to groundwater exposures from seven residential wells and primarily reflects a specific timeframe one week after the Chesapeake ATGAS 2H natural gas well hydraulic fracturing blowout. Other scenarios in the lifecycle of natural gas hydraulic well development and use would potentially involve different considerations for groundwater and air quality over both acute and chronic exposure durations.”

**ATSDR Action:** ATSDR reviewed all appropriate data available at that time, given the purpose of the health consultation. ATSDR identified data limitations in its health consultation. Retraction or modification of the health consultation is not warranted.

***2. The Consultation did not consider exposure pathways and utilizes misleading transposition of units.***

*Comment: The Consultation fails to evaluate exposure pathways to determine if it was even*

*physically possible for the incident to have caused particular impacts. The Consultation's claims regarding ten-fold increases in certain hydrocarbons were based on invalid data that reflected obvious cross-contamination or other sample collection or laboratory error. Its discussion of obviously naturally-occurring metals and anions as "contaminants" without providing adequate context about their natural occurrence in Bradford County is confusing at best, and at worst falsely implies that those constituents are artificially-introduced contaminants. The Consultation also often uses "parts per million" (milligrams per Liter) units to describe levels of constituents deemed safe, while reporting data in "parts per billion" (micrograms per Liter) units, making it appear to the lay reader that comparative levels of the constituents exceed safe levels when they do not.*

**ATSDR Response:** ATSDR's document considered exposure pathways relevant to a public health determination. ATSDR defines an exposure pathway as "The route a substance takes from its source (where it began) to its end point (where it ends), and how people can come into contact with (or get exposed to) it" (<http://www.atsdr.cdc.gov/glossary>). This is appropriate for ATSDR's public health approach for responding to health consultation requests, in which we are asked to evaluate possible risks to health, regardless of the source of the contamination. This comment about exposure pathways appears to be in reference to the identification of the source of the chemicals found in the groundwater. ATSDR did not attempt to attribute conclusively the presence of the chemicals detected in the private wells at this site to a definitive source. The health consultation does not attempt to determine if the incident at the ATGAS well site caused particular impacts. The purpose of the document was to evaluate whether any public health exposures of concern exist in the seven private drinking water wells and to highlight possible risks that could exist for these residents or could be of relevance for other private well users in similar circumstances. Because of ATSDR's responsibility to protect the health of the public, it is important to document possible risks to health, no matter the source or the cause.

EPA's post-event sampling results from April 2011, including for well RW-04, were validated by EPA's standard data validation procedures, including use of third-party contractor validation, accredited laboratory programs, and quality assurance/quality control procedures.

The term *contaminant* is an accepted term in public and private sources to describe any naturally occurring or man-made chemical that lessens the quality of drinking water (e.g., Oxford Dictionary definition, "to make (something) impure by exposure to or addition of a poisonous or polluting substance" or from EPA's online glossary and as cited in [sciencedictionary.org](http://sciencedictionary.org), "Any physical, chemical, biological, or radiological substance or matter that has an adverse effect on air, water, or soil").

ATSDR strives to use consistent and appropriate scientific units for the environmental data provided. For the primary sampling data summary table and throughout the full body of the report when discussing the private well sampling results, ATSDR consistently used the units of micrograms per liter ( $\mu\text{g}/\text{L}$ ) or parts per billion (ppb). Milligrams per liter ( $\text{mg}/\text{L}$ ) units were generally used when referencing source material

that used these units—for example, in Table 4, Comparison of Selected Purge Volumes, Specific Conductivity, Methane, Chloride, Sodium, and Strontium in RW04)—to be consistent with the industry consultant source report. ATSDR also did so on page 7 when referring to the Department of Interior guidelines for methane in drinking water wells. We recognize, however, that use of different units may indeed be challenging for the lay person. However, our primary audience for this consultation was EPA, and their scientists and engineers have experience and expertise in understanding these conversions.

**ATSDR Action:** ATSDR evaluated exposure pathways for human exposure, used validated sampling results, used correct scientific units, and appropriately used the term *contaminant* in its health consultation. Modification or retraction is not warranted.

**3. The ATSDR's very public announcements of the Consultation and its inaccurate conclusions caused unnecessary public alarm.**

*Comment: The results of ATSDR's Consultation and its conclusions were communicated to the local residents, the general public, the PADEP, and the EPA. After being informed of ATSDR's findings, many of the residents became alarmed. In reality, the quality of their water had not changed from pre-drill conditions. As reported in the Consultation, the level of arsenic in one of the wells exceeded the EPA Maximum Contaminant Level (MCL). Upon receiving this information, the EPA installed an arsenic water treatment system for this resident in July, 2011. However, based on comparison with pre-drill sampling, the level of arsenic in this well is unchanged – it is naturally occurring. Chesapeake collects pre-drill samples from residents within 1,000 to 4,000 feet of all of our locations. Out of 7,512 pre-drill samples collected since August, 2009 in Bradford County, PA, 320 residents have arsenic concentrations which exceed the arsenic MCL, and at least 2,978 (39.5%) of the residential well water samples do not meet one or more of the EPA primary or secondary drinking water-quality standards. If ATSDR intends to recommend installation of treatment systems for each of these residents, these baseline data have been provided to the PADEP.*

*Further, the natural occurrence of arsenic in groundwater from water wells in Bradford County is also discussed in a recent U.S. Geological Survey (USGS) report<sup>2</sup> which ATSDR did not disclose or discuss in the Consultation.*

<sup>2</sup>Low, DJ and DG Galeone, 2006. *Reconnaissance of Arsenic Concentrations in Ground Water From Bedrock and Unconsolidated Aquifers in Eight Northern-Tier Counties of Pennsylvania*, USGS Report 2006-1376.

**ATSDR Response:** ATSDR has a responsibility to communicate our public health findings to the communities in which we work. For this consultation, ATSDR followed a typical public release process to community, media, and other stakeholders; ATSDR uses this process for releasing public health documents at other sites. The process included intra- and inter-agency reviews and individual meetings and discussions with residents.

The health consultation refers to arsenic in pre-drill and April 2011 sampling events, stating on p. iv and p. 6 that post-blowout and pre-blowout sampling results for arsenic in RW02 were similar. ATSDR is familiar with the 2006 USGS Low et al. report referenced by Chesapeake. ATSDR discussed this report with the primary USGS author. USGS recommended the use of its 1998 publication as the most comprehensive reference describing background levels for a range of chemicals in groundwater in the site area.

**ATSDR Action:** The health consultation and related public release materials provided accurate information to the public. The health consultation specifically indicated that arsenic occurs naturally in Bradford County, PA groundwater. Modification or retraction is not warranted.

**Comments From Timothy A. Wilkins, Bracewell & Giuliani, LLP, Chesapeake Energy Corporation**

**1. ATSDR Statement: Currently Available Data**

*Objection: ATSDR stated that it “evaluated the currently available data against a range of possible exposure durations . . .” (Overview, page iii) (emphasis added). This is clearly false. ATSDR only utilized a very limited data set from an “initial groundwater sampling event for the seven private wells closest to the well site . . .” (page iii, paragraph 1). This confirms that ATSDR did not consider at least 29 additional data sets available for each of the wells and has therefore presented an outright falsehood by claiming that the “currently available data” was utilized in the Consultation. These 29-plus additional datasets, including pre-drill baseline data, were publicly available, having been provided to both the seven landowners and the PADEP well before ATSDR issued its Consultation and ATSDR’s occasional references to the Studies indicates the agency’s awareness of the existence of that data. By failing to use these data sets, ATSDR has failed to meet CDC/ATSDR Information Quality Act guidelines including requirements relating to accuracy, completeness, comprehensiveness, and use of the best available information.*

**ATSDR Response:** Please see Response 1 to Mr. Paul Hagemeyer regarding the review of the currently available data and the focused purpose of the health consultation document. ATSDR’s health consultation addressed a specific EPA request that ATSDR evaluate the environmental data collected from the seven private wells in April 2011 in order to determine whether harmful health effects would be expected from consuming and/or using the well water. ATSDR included other data sources in this review, as referenced in the health consultation document.

**ATSDR Action:** ATSDR reviewed all appropriate data available, given the purpose of the health consultation. ATSDR identified data limitations in its health consultation. Retraction or modification of the health consultation is not warranted.

**2. ATSDR Statement: Naturally-Occurring and Variable Constituents**

*Objection: Throughout the Consultation, ATSDR discusses detected levels of naturally-occurring, naturally-variable constituents without clearly and comprehensively explaining the natural occurrence and natural variability of those background constituents. As one example, ATSDR does not provide text that puts Table 3 (Well by Well Summary) of the Consultation into context with the pre-existing conditions in the individual wells prior to the ATGAS well incident. It should be pointed out that there are two Table 3's in the Consultation, an apparent error in numbering of the tables in that Consultation. Table 3 on page 8 of the Consultation will be referred to herein as the Table 3 (Well by Well Summary) and Table 3 on page 15 will be described as the Table 3 (Manganese) herein. In one instance, ATSDR indicates that barium is a naturally-occurring element and is found in most soils at significant concentrations. Yet ATSDR failed to include similar information regarding arsenic, bromide, calcium, chloride, iron, lithium, magnesium, manganese, methane/ethane, potassium, sodium, and radionuclides and their occurrence naturally in relatively high and/or detectable concentrations in soils.*

**ATSDR Response:** The health consultation states on p. 2 that “Reported concentrations for many of the chemicals detected in the environmental samples include contributions from naturally occurring sources. Relatively higher concentrations of naturally occurring chemicals (chloride, strontium, lithium, manganese, etc.) can be found in deep formations compared to surface soils.” Further, by providing information on background median concentrations for arsenic, barium, calcium, chloride, iron, magnesium, manganese, potassium, and sodium in the Devonian Lock Haven (Delhi) formation in Bradford County in Table 1 on p. 4 and in the text on pages 6–7, the document indicates that these chemicals are naturally occurring.

**ATSDR Action:** The health consultation does mention that many contaminants are naturally occurring. ATSDR agrees that minor labeling errors should be corrected to correct table numbering. Modification of table numbers will be made. Retraction is not warranted.

### **3. ATSDR Statement: Confusing Use of Units**

*Objection: Throughout the Consultation, ATSDR has reported data results in parts per billion (ppb) and micrograms per Liter ( $\mu\text{g}/\text{L}$ ) units but occasionally points to standards listed in parts per million (ppm) and milligrams per Liter ( $\text{mg}/\text{L}$ ) units. This misleading transposition of units occurs specifically during the Consultation's discussion of chloride and methane. This practice is misleading to the reader, especially the lay reader, suggesting that the results are unusually elevated. For example, in the chloride discussion on page 6 ATSDR uses both  $\text{mg}/\text{L}$  and  $\mu\text{g}/\text{L}$ . The lower numerical  $\text{mg}/\text{L}$  values are used to discuss background and standards and the much higher-appearing  $\mu\text{g}/\text{L}$  numerical values are used for concentrations present in the wells of interest. This same sort of cross reporting of units is also noted in the discussion on methane on page 7 of the Consultation. This is misleading as it could lead a lay reader to think the chloride or methane concentrations were considerably elevated rather than within the range of background values. Notably, EPA uses in its publicly available published drinking-water quality standards, Maximum Contaminant Levels (MCLs) and Secondary Maximum Contaminant Levels (SMCLs), the units of  $\text{mg}/\text{L}$  or ppm.*

**ATSDR Response:** Please see Response 2 to Mr. Paul Hagemeyer regarding the use of sampling units in the report. For the primary sampling data summary table and throughout the full body of the report when discussing the private well sampling results, ATSDR consistently used the units of micrograms per liter ( $\mu\text{g}/\text{L}$ ) or parts per billion (ppb). Milligrams per liter ( $\text{mg}/\text{L}$ ) units were used when the report referenced source material that used these units.

**ATSDR Action:** ATSDR used correct scientific units in its health consultation. Modification or retraction is not warranted.

**4. ATSDR Statement: Use of the Term “Chemicals” or “Contaminants” for Naturally-Occurring Constituents**

*Objection: Throughout the Consultation, ATSDR variously describes naturally-occurring substances in groundwater such as arsenic, iron, lithium, potassium, sodium and chloride as “Contaminants of Concern” or “Chemicals.” ATSDR then calculated public health implications for these naturally-occurring substances and presented them in a Consultation that purports to be investigating the short-term release of materials from the ATGAS well pad. ATSDR also has been inconsistent in the use of the words “chemical” and “contaminants.”*

**ATSDR Response:** Please see Response 2 to Mr. Paul Hagemeyer regarding the use of the term *contaminant*. The terms *contaminants* and *chemicals* are commonly used interchangeably in the environmental, regulatory, and public health arenas.

**ATSDR Action:** ATSDR appropriately used the terms *contaminant* and *chemicals* in its health consultation. Modification or retraction is not warranted.

**5. ATSDR Statement: Selectively Failed to Consider Available Pre-Drill/Baseline Data**

*Objection: ATSDR did not consider baseline data that was readily available for RW01, RW05 and RW07, three of the seven wells evaluated by ATSDR.*

**ATSDR Response:** ATSDR requested pre-drill data from EPA for all seven wells. EPA shared with ATSDR the information the EPA received from the state at the time of ATSDR’s request. This did not include pre-drill data for RW01, RW05, and RW07.

**ATSDR Action:** Modification or retraction is not warranted.

**6. ATSDR Statement: Inappropriately Utilized USGS Median Values as “Background” Instead of Ranges**

*Objection: ATSDR utilized background concentrations for a number of metals and inorganics from a single 1998 United States Geological Survey (“USGS”) and Pennsylvania Geological Survey (“PGS”) report (Report 68) and further used single values purported to be median values for the Devonian Lock Haven formation in Bradford County. Further, a background number was provided for arsenic, barium, calcium, chloride, iron, magnesium,*

*manganese, potassium, and sodium which is identified as background for the Devonian Lock Haven. Some of the values provide in Table 1 of the Consultation cannot be verified in the 1998 USGS report. More importantly, it is inappropriate to use a single value rather than a range as “background.” ATSDR used single median values for arsenic, calcium, magnesium, potassium, and sodium. A median background value in this context means that 50 percent of the background values were below this level while 50 percent were higher than this level. Clearly, a range of background values exists and selective use of a single median value that reduces that naturally-occurring variable range to a single concentration level is not reflective of “normal” background conditions, and is misleading to any reader of the Consultation, especially a lay reader. ATSDR fails to describe what background actually means, and proper science would have dictated that a discussion of all probable background ranges for these constituents be provided, as was done for some constituents in that 1998 USGS study. ATSDR selectively utilized and misrepresented data that was available in that 1998 USGS publication.*

**ATSDR Response:** The background levels of contaminants cited in the health consultation are appropriately referenced. ATSDR determined that a median was the best single value to include in the summary information on background groundwater quality in the report. The median value represents a well-recognized measure of central tendency for the distribution of environmental sampling results. The full USGS reference provides the detailed data, including the ranges of results.

**ATSDR Action:** Modification or retraction is not warranted.

**7. ATSDR Statement: Failed to Consider Well Depth and Penetration of Natural Saline Zones**

*Objection: The ATSDR relied heavily on the 1998 Water Resource Report 68 prepared by the USGS and PGS. ATSDR fails to adequately discuss that report’s recognition that numerous water wells within Bradford County penetrate zones of naturally-occurring saline groundwater and that a significant part of that report is dedicated to discussing the presence and natural occurrence of saline groundwater at shallow depths in the Lock Haven and Catskill Formations.*

**ATSDR Response:** The purpose of the health consultation was not to document all the information from the USGS report on background groundwater quality in the region, nor is it to draw conclusions about the sources of the chemicals in the samples provided to ATSDR. Health consultations are targeted, site-specific public health responses to requests that focus on the review of a limited data set for specific exposure pathways. The document focused on the seven private wells closest to the well pad, and it provided summary information on background groundwater characteristics from the USGS report for context. The health consultation acknowledges (p. 18) that well RW04 penetrates a zone of naturally occurring saline groundwater.

**ATSDR Action:** Modification or retraction is not warranted.

**8. ATSDR Statement: Use of “Pre-Blowout” to Describe Pre-Drilling Baseline**

**Condition**

*Objection: In numerous locations throughout the Consultation, ATSDR uses the word “pre-blowout” to describe pre-drill or baseline samples. This phrasing is inflammatory and inaccurate.*

**ATSDR Response:** The health consultation uses the term *pre-blowout* to identify samples collected before a blowout incident. The term is accurate.

**ATSDR Action:** Modification or retraction is not warranted.

**9. ATSDR Statement: Selectively Attributing Variation in Concentrations**

*Objection: The Consultation suggests in several places – most notably in Conclusion 1 – that upward variation in certain constituents between pre-drill and post-incident samples may entail causation. In addition to relying on the fallacy of post hoc ergo propter hoc – “after this, therefore because of this” – ATSDR has been selective and inconsistent in its analysis of causation. In many of these “before and after” samples, levels of the monitored constituents actually declined, yet ATSDR obviously does not attribute the cause of the declines in these constituents to oil and gas activities. It is clear that these declines as well as the detected increases – especially with the benefit of the full array of sampling data – demonstrate the natural variability of naturally-occurring constituents and differences in sampling execution; they do not prove causation by oil and gas activities.*

**ATSDR Response:** The health consultation did not determine the cause of changes in water quality in drinking water well RW04. The first conclusion of the health consultation states, “The available environmental data and information for RW04 do not conclusively indicate but suggest that the groundwater near this site is impacted by natural gas activities.” ATSDR based its conclusion on changes in drinking water quality in RW04 across the pre-drilling and post-blowout sampling. These changes are suggestive because they occurred following initiation of additional natural gas extraction-related activities. Final determinations regarding sources of contamination are beyond the scope of the health consultation requested by EPA, and are left to the appropriate federal, state, and local authorities

ATSDR carefully considered when the pre-drilling and post-blowout sampling results in a particular private well showed no appreciable change from natural background variability. For three of the four wells for which ATSDR was provided pre-drill sampling information, ATSDR did not find a pattern of noteworthy changes (see pp. 6–7 and Appendix D). Further, ATSDR stated in the health consultation document on p. iv and p. 6 that the arsenic concentrations that were noted to be of health concern in RW02 were similar in both the pre-drill and post-blowout sampling information.

**ATSDR Action:** The health consultation accurately describes the conclusions of the agency in reviewing available data for seven drinking water wells. Modification or retraction is not warranted.

**10. ATSDR Statement: Failure to Perform Exposure Pathway Analysis**

*Objection: The ATSDR did not conduct an exposure pathway analysis. Specifically, ATSDR did not prove that transport through an environmental medium occurred or was even possible under the circumstances. Instead, ATSDR made an assumption that transport had occurred even though such an assumption was not supported by any scientific investigation by or information available to ATSDR.*

**ATSDR Response:** Please see Response 2 to Mr. Paul Hagemeyer regarding the exposure pathway analysis. ATSDR's document appropriately considered exposure pathways relevant to the scope of this health consultation. ATSDR did not attempt to attribute conclusively the presence of the chemicals detected in the private wells at this site to a definitive source. ATSDR's primary goal is to protect the public from environmental hazards and toxic exposures, regardless of the source of these exposures.

**ATSDR Action:** Modification or retraction is not warranted.

**11. ATSDR Statement: Failure to Note Duplicate Samples, Selective Inclusion of Results from Duplicates**

*Objection: ATSDR appears to have selectively chosen analytical results from between divergent split sample results for RW04 and, possibly, other wells.*

**ATSDR Response:** The health consultation was written based on established ATSDR guidelines, which can be found at the following link: <http://www.atsdr.cdc.gov/hac/PHAManual/toc.html>. According to these guidelines, to be protective of public health for screening purposes, ATSDR can evaluate environmental data by using maximum observed sampling concentration values. Utilization of maximum sampling values is appropriate when there is uncertainty in the variability in the environmental sampling data set. ATSDR documented this rationale in the "Data Limitations" section of the health consultation: "To account for some of these limitations, ATSDR assumed ingestion with the maximum detected chemical concentration(s) and included all detected contaminants in the evaluation regardless of source or possible background contributions."

**ATSDR Action:** The health consultation used sampling results in accordance with established ATSDR guidelines. Modification or retraction is not warranted.

**12. ATSDR Statement: Inappropriate Use of Dietary Standards for Environmental Media**

*Objection: Extrapolated Upper Tolerable Intake Levels for sodium, chloride, calcium and magnesium using values developed for dietary intakes is unsupported.*

**ATSDR Response:** Upper Tolerable Intake Levels were established by the Dietary Reference Intakes from the Institute of Medicine (IOM) and appropriately referenced in the health consultation. Standard methods were used to estimate the volume of ingested drinking water.

**ATSDR Action:** Modification or retraction is not warranted.

**13. ATSDR Statement: Failure to Provide Split Sample Data Utilized by ATSDR**

*Objection: ATSDR indicates on page 1 of the Consultation that data were compared to PADEP split sample results; however, these data are not included in the Consultation document with the exception of a single gross alpha result for RW03.*

**ATSDR Response:** The health consultation states on p. ii, “A comparison of the EPA and PADEP split samples showed consistency in the analytical results with the exception of the radionuclide results for one well.” ATSDR evaluated the PADEP data to examine the consistency of the EPA and PADEP sampling information. The one sample that was inconsistent is described in the health consultation document.

**ATSDR Action:** Modification or retraction is not warranted.

**14. ATSDR Statement: Failure to Attach or Otherwise Provide Sampling Protocol Information and Laboratory Quality Assurance Documents**

*Objection: The ATSDR considered environmental data from EPA, including field sample results, field blank, sample duplicates and intra-laboratory check sample (page 2). These types of data, generally supplied in these types of reports, have not been provided by ATSDR.*

**ATSDR Response:** The health consultation provided references to source documents that provide this information.

**ATSDR Action:** Modification or retraction is not warranted.

**15. ATSDR Statement: Inaccurate Incident Description**

*Objection: The incident description provided on page 1 in background section of the Consultation is inaccurate.*

*Basis for Our Objection:*

*PADEP and EPA had been provided with accurate timelines for the events which occurred following the well control event. ATSDR attempted to summarize these events, resulting in inaccurate and misleading information. The incident occurred late on April 19, 2011 and notification was made within a few hours; uncontrolled release occurred for approximately 4 hours rather than 10 hours; the well was temporarily plugged on April 21, 2011 and permanently controlled on April 25, 2011. The quantity of material released has been provided to both the PADEP and EPA; this information was disclosed shortly after the incident and a more detailed timeline was included in the both the Notice of Violation (NOV) response to EPA and the Initial Site Characterization report provided to PADEP on August 30, 2011. The Consultation’s incident description omits much of the relevant information and implies that Chesapeake has been unresponsive with information to the regulatory agencies involved in the incident. Accordingly, the*

*Consultation fails Information Quality Act tests for accuracy, objectivity, and completeness, as well as making the Consultation less useful to the public.*

**ATSDR Response:** The health consultation accurately conveys the information provided by EPA to ATSDR. Based on the information received from the EPA, the health consultation states that the incident occurred on April 19, 2011 and was reported to PADEP on April 20, 2011, as documented in EPA's POLREPs for the site, as well as in Chesapeake's Notice of Violation (NOV) response. During the first 10 hours after the incident, Chesapeake was still working to plug the well, as documented in Chesapeake's NOV report that the third and fourth well plugging attempts occurred at approximately 12:30 pm on April 20, 2011 (approximately 13 hours after the start of the incident.) Chesapeake's reported quantity of material directly released from the well during the uncontrolled event was estimated, but estimates did not include the total volume of materials mixed with rain and surface water flow surrounding the site. Final control of the well was achieved on April 25, 2011.

**ATSDR Action:** Modification or retraction is not warranted.

**16. ATSDR Statement: Arsenic**

*Objection: On Page iv, in Conclusion 3 the Consultation states that "[t]wo possible exposure scenarios were identified of health concern related to the maximum level of arsenic detected in [RW02 resulting in] an unacceptable cancer risk"; similar statements are found on Page 19, Conclusion 3 and in Recommendation 3 on Page 20 describing "elevated levels of arsenic."*

*ATSDR's presentation of the arsenic data from RW02 in Conclusion 3 (page iv and page 19) is inflammatory and misleading to the public. The data clearly indicate that the post incident arsenic levels were consistent with pre-drilling levels. ATSDR failed to provide accurate and complete information by failing to indicate that these levels were naturally occurring and relatively common in groundwater wells not only in Bradford County, but also in many other areas of the US. Finally, ATSDR described the naturally-occurring arsenic in RW02 as "elevated" (Recommendation 2) and higher than background (page 4), both of which statements are misleading and factually incorrect. In light of these inaccurate and misleading statements, the Consultation is also less useful to the public.*

**ATSDR Response:** The health consultation stated twice that the arsenic concentrations of health concern in RW02 were similar in both the pre-drill and the post-blowout sampling information (i.e., on p. iv and p. 6). The arsenic concentration in this well was elevated above a health-based level of concern.

**ATSDR Action:** The health consultation provides accurate information regarding arsenic concentrations in drinking water wells and is useful to the affected residents. Modification or retraction is not warranted.

**17. ATSDR Statement: Failed to Consider Impact of Higher Solids on Arsenic Levels Detected in RW03**

*Objection: ATSDR states on page 6 of the Consultation that in the post-incident sample the arsenic concentration was 9.4 µg/L for RW03 and in the “pre-blowout” sample arsenic was not found above the detection limit. ATSDR does not make any attempt to state or define what the detection limit was in analyzing the pre-drill sample or to put both results into proper context. ATSDR also failed to take into account the very high levels of total suspended solids and the effects of entrained sediment in groundwater samples on detected concentrations of total metals i.e. arsenic, manganese, aluminum, and iron in RW03 (pages 6 and 7 of the Consultation).*

**ATSDR Response:** ATSDR accurately provided a summary of the arsenic data for well RW03, including the EPA post-drilling result and the Chesapeake pre-drill result for arsenic (p. 6). ATSDR did not receive any indication of the detection limit for pre-drill data and therefore ATSDR reported the result as it was provided to ATSDR: “ND.” ATSDR considers the total concentration of the contaminant in drinking water (which includes contributions from total suspended solids), rather than the dissolved concentration. The total concentration reflects actual exposure.

**ATSDR Action:** The health consultation accurately provided reported arsenic concentrations for RW03. Modification or retraction is not warranted.

**18. ATSDR Statement: Inappropriate Use of Arsenic CREG Which is Far Below the Detection Limit**

*Objection: It is inappropriate to use a cancer risk evaluation guide (CREG) for arsenic of 0.02 µg/L (page 9 of the Consultation) which is two orders of magnitude below the standard analytical detection limit of 2 µg/L.*

**ATSDR Response:** The ATSDR arsenic CREG is independent of the analytical detection limit. CREGs are non-regulatory, conservative health screening values derived from EPA’s cancer slope factors. CREGs are analogous to EPA’s non-regulatory Maximum Contaminant Limit Goals (MCLGs), which are the level of a contaminant in drinking water below which there is no known or expected risk to health. EPA’s enforceable Maximum Contaminant Levels (MCLs) are set as close to MCLGs as feasible, taking factors such as the best available treatment technology, achievable detection limits, and cost into consideration. For example, the MCLG for arsenic is 0 µg/L (0 mg/L), while the MCL for arsenic is 10 µg/L (0.10 mg/L).

**ATSDR Action:** Modification or retraction is not warranted.

**19. ATSDR Statement: Gross Alpha Radiation**

*Objection: In Conclusion 7 on Page v and Page 20 and Recommendation 3 on Page v and Page 20 of the Consultation, ATSDR indicates that bottled water is necessary for residents served by RW03 based on a single gross alpha activity level which exceeded the EPA MCL of 15 pCi/L. On Page 8, the Consultation suggested that the RW03 gross alpha result was “8 times higher than the PADEP result.” Such a recommendation based on a single, flawed*

*data point is scientifically unsupportable at best. Further, the Consultation's claims about the RW03 gross alpha result are flawed in several other ways as well.*

**ATSDR Response:** As a precautionary health protective measure, ATSDR supported EPA's recommendation to provide bottled water to the residents served by RW03 until more information became available.

**ATSDR Action:** Modification or retraction is not warranted.

**20. ATSDR Statement: Erroneous Sample Date for RW03 Sample**

*Objection: The sampling date listed in Table 1 for the sample date of RW03 as 4/27/2011.*

**ATSDR Response:** EPA conducted its April sampling at the site across two days, April 27 and April 28, 2011. Chesapeake is correct that RW03 was sampled on April 28, 2011 and not on April 27, 2011, as reported in the health consultation document.

**ATSDR Action:** ATSDR will correct the date in Table 1 and Appendix D. Retraction is not warranted.

**21. ATSDR Statement: Methane/Ethane in RW04**

*Objection: ATSDR asserts that the presence of dissolved methane together with dissolved ethane suggests groundwater is impacted by natural gas activities (Conclusion 1, page iii and page 16). In these discussions, ATSDR failed to indicate that duplicate sample results for methane and ethane in RW04 were considerably different (i.e., 6,200 µg/L versus 2,600 µg/L); and for ethane (i.e. 2.6 µg/L versus 1,000 µg/L) For scientists, when presented with a significant difference between split sample results, the standard practice is to resample. However, instead of re-sampling, ATSDR chose to cherry-pick sample values that allowed them to point to the most elevated possible result rather than the most accurate possible result. ATSDR also did not examine the inherent variability in the dissolved methane data for these wells. Clearly, ATSDR did not consider all publicly-available baseline data for Bradford County, but chose to engage in speculation after disregarding conflicting data also obtained from a single sampling event.*

**ATSDR Response:** According to established guidelines, to be protective of public health for screening purposes, ATSDR can evaluate environmental data by using maximum observed sampling concentration values. EPA's April 2011 duplicate sampling results for RW04 do show variability. Consistent with our agency health assessment guidance, ATSDR evaluated the maximum result from the EPA sampling results for public health implications in the health consultation document for screening purposes.

The environmental sampling at this site was jointly conducted by EPA, PADEP, and Chesapeake, and it included split sampling by all three organizations in addition to plans from the onset for repeated sampling at these wells. Therefore, there was no need for ATSDR to re-sample on the basis of EPA's duplicate sampling results for RW04. Chesapeake's April 2011 sampling result from RW04 for methane was 8,180 µg/L (8.18

mg/L), while EPA's April 2011 sampling results from RW04 for methane were 6,200 µg/L (6.2 mg/L) and 2,600 µg/L (2.6 mg/L).

**ATSDR Action:** ATSDR used sampling results consistent with its guidance for conducting health consultations, as described above in response to objection 11. Modification or retraction is not warranted.

**22. ATSDR Statement: Blank-Qualified Data Render RW04 Oil and Grease Results Wholly Illegitimate**

*Objection: ATSDR relied on "blank-qualified" data for Oil and Grease (HEM) to make unsupportable conclusions regarding the presence of hydrocarbons, especially in RW04.*

**ATSDR Response:** ATSDR agrees that the oil and grease (HEM) sampling results were blank qualified. ATSDR noted this fact in Appendices C and D of the health consultation document (pp. 27–30). ATSDR's conclusion regarding hydrocarbons in RW04 is primarily based on the presence of methane and ethane. The HEM results were noted parenthetically but are not the basis for the conclusion.

**ATSDR Action:** ATSDR will remove the parenthetical reference to HEM results in the Conclusions portions of the health consultation document. Retraction is not warranted.

**23. ATSDR Statement: Erroneous Conversion of Methane Concentrations**

*Objection: The conversion of methane concentration of 87 percent in air to a concentration in µg/L is incorrect (page 15).*

**ATSDR Response:** ATSDR agrees that this conversion concentration is incorrect. An accurate conversion for a methane concentration of 87 percent in air would be approximately 581,000 µg/L (581 mg/L).

**ATSDR Action:** ATSDR will correct the health consultation by correcting the conversion for methane in air. Retraction is not warranted.

**24. ATSDR Statement: Sodium**

*Objection: ATSDR stated that water from well from RW04 would exceed the recommended dietary guideline for sodium for general and sensitive populations. Further, ATSDR indicated that sodium was "elevated" in wells RW02, RW03, RW05, RW06, and RW07. The use of the term "elevated" to describe naturally-occurring levels of sodium in groundwater is misleading, inaccurate, and inappropriate (Conclusion 2, page iii and iv). ATSDR states that the chloride SMCL is 250 mg/L because "water with chloride concentrations greater than this level tastes salty to most people." ATSDR discusses the association of sodium chloride and effects on blood pressure, cardiovascular and renal disease. Additionally, on page 16 of the Consultation, in the discussion on sodium, ATSDR presents information such that it appears that the sodium in the groundwater in the wells under consideration is the result of human activities and anthropogenic sources.*

**ATSDR Response:** ATSDR's statements regarding elevated chemical concentrations refer to whether a chemical is above a level of public health concern, regardless of whether the source of the chemical is naturally occurring or man-made. The health consultation accurately reported that elevated sodium levels may be of health concern to sensitive subpopulations, including individuals on sodium-restricted diets. ATSDR provides context for the results detected in the private wells by including summary information on background groundwater quality in the document. For example, on p. 16 the health consultation states, "The median sodium concentration in the Bradford County Dlh formation is 28,000 µg/L (USGS 1998). Sodium levels in surface and ground waters can be affected by human activities. The extent to which any of these activities may affect the groundwater quality in the area of the Chesapeake ATGAS 2H Well Site is unknown."

**ATSDR Action:** ATSDR's statements regarding elevated chemical concentrations above a level of public health concern are accurate. Modification or retraction is not warranted.

#### **25. ATSDR Statement: Bromide**

*Objection: ATSDR presents a discussion of bromide as a contaminant of concern in Conclusion 4 (page iv and page 20) and did not indicate it is naturally occurring in groundwater (page 4).*

**ATSDR Response:** The health consultation noted on p. 11 that bromide is naturally occurring: "Bromide is commonly found in nature along with sodium chloride, owing to their similar physical and chemical properties, but in smaller quantities."

**ATSDR Action:** Modification or retraction is not warranted.

#### **26. ATSDR Statement: Lithium**

*Objection: In RW04 and RW06, lithium was detected at a level exceeding the EPA Regional Screening Level and the Pennsylvania Medium Specific Concentration as discussed in Conclusion 5. ATSDR failed to adequately explain that lithium is naturally occurring in groundwater. Additionally ATSDR indicated in Conclusion 6 and elsewhere that the estimated lithium exposures could be of concern to individuals currently undergoing lithium therapy and other prescription drugs. This appears to be inflammatory and misleading to the public.*

**ATSDR Response:** The health consultation stated that lithium is a naturally occurring substance and that there is insufficient toxicological information available to allow determination of the significance of these lithium exposures for individuals not undergoing lithium treatment.

The document states on p. 2, "Relatively higher concentrations of naturally occurring chemicals (chloride, strontium, lithium, manganese, etc.) can be found in deep formations compared to surface soils. Many of these naturally occurring chemicals are

readily mobilized in the environment by natural gas drilling and hydraulic fracturing activities.”

In addition, the document states on p. 14, “ATSDR concludes that exposure to lithium at the level detected in RW04 is not likely to cause adverse health effects to the general population. However, this maximum drinking water concentration would be of health concern for any individuals receiving lithium therapy, and there remains uncertainty regarding the potential for health effects of elevated but sub-therapeutic doses of lithium, particularly for sensitive subpopulations (e.g., children, pregnant women, people with significant cardiovascular disease, sodium depletion, and people on medications previously discussed).”

**ATSDR Action:** Modification or retraction is not warranted.

### **27. ATSDR Statement: Strontium**

*Objection: ATSDR states on Page 3 that there is a notable increasing trend in strontium levels and warrant further consideration in future hydraulic fracturing-related groundwater sampling events.*

**ATSDR Response:** ATSDR agrees that referring to an increasing trend in strontium levels in the seven private wells is an error. Chesapeake is correct that strontium was not included as an analyte in the pre-drilling sampling. ATSDR will correct this statement in the health consultation document.

Nevertheless, ATSDR believes that further consideration of strontium in future hydraulic fracturing-related groundwater sampling results is warranted, given general industry and site-specific information related to this chemical. Specifically, post-blowout strontium levels did subsequently trend downward in RW04, with Chesapeake’s April 2011 results for RW04 at 9,090 µg/L (9.09 mg/L) and July 2011 results down to 625 µg/L (0.625 mg/L), as summarized on pp. 17–18 in the health consultation document. Further, other sources have previously demonstrated that divalent cations, including barium and strontium, may be elevated in produced formation water produced from oil and gas formations, raising the potential for impacts on nearby groundwater drinking water supplies.<sup>1,2</sup> However, we recognize that ATSDR is not a regulatory agency, and determination and implementation of future sampling recommendations and protocols would be carried out by the appropriate local, state and federal authorities.

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<sup>1</sup> Pees Coleman, N. (undated). Chesapeake Energy, Produced Formation Water Sample Results from Shale Plays, presentation. Available at: <http://www.epa.gov/hfstudy/producedformationwatersampleresultsfromshaleplays.pdf>.

<sup>2</sup> Hayes, T. (2009). Sampling and Analysis of Water Streams Associated with the Development of Marcellus Shale Gas, Final Report, Marcellus Shale Coalition, Gas Technology Institute (GTI). Available at: <http://eidmarcellus.org/wp-content/uploads/2012/11/MSCCommission-Report.pdf>.

**ATSDR Action:** ATSDR will correct the statement about an increasing trend in strontium levels in the health consultation document. The sentence will now read: “Although the detected levels of strontium did not exceed CVs and thus are not included in Table 1, site-specific and general industry-wide information for this chemical warrants further consideration in future hydraulic fracturing-related groundwater sampling events.” Retraction is not warranted.

## **28. ATSDR Statement: Barium**

*Objection: Inclusion of discussion regarding environmental sources of barium (page 10 of the Consultation) implies that the naturally-occurring barium in groundwater in Bradford County was somehow related to natural gas drilling activities. Comparison of the barium concentrations to a literature-based, single value concentration is inappropriate.*

### *Basis for Our Objection:*

*ATSDR presented the range of background barium values to be 560 – 98,000 µg/L from the Devonian Lock Haven formation; however, in the text the comparison was made only to the concentration from a single USGS well (Br205) rather than to that naturally occurring range. The 1998 USGS database shows this value is a single analysis from Br205 and the concentration is reported at 1,600 µg/L. The ATSDR text appears to indicate that there were multiple analyses for barium available in the USGS document for Br205 by use of the term “median,” this is not the case; only a single value is listed in the USGS database for Br205. This is misleading, in that it implies that the maximum concentration of barium from the wells under consideration was above background. All of the measured concentrations were well within the background range for barium from the cited literature and from baseline data collected in Bradford County. From over 7,500 baseline samples collected from water wells in Bradford County, 7,348 (97.4%) had detectable concentrations of barium ranging from <10 µg/L to 50,400 µg/L. Approximately 289 (3.8 %) of these baseline samples had barium detected over the MCL of 2,000 µg/L. On page 36 and Table 12 of the USGS 1998 report, the natural occurrence of barium greater than the MCL is described as occurring from the restricted-flow zone of the Lock Haven and Catskill Formations. All of the barium concentrations in the wells were well within this background concentration range. Further, for all the wells except RW04, the barium concentrations were generally consistent between the baseline sample result and the April 27 or 28, 2011 sample results. The barium concentration in RW04 reflects the naturally occurring water quality that occurs within the lower stratified portion of the well.*

*ATSDR provides in the Consultation a lengthy description of the health effects of exposure to barium. Selective presentation of data appears to be associated with ATSDR’s notion that the barium found in groundwater was related to mobilized barium due to the presence of released fluids from the ATGAS well pad.*

*Inclusion of a discussion of potential sources of barium in the environment implies that the concentrations measured in the seven wells had been impacted by anthropogenic activities which is clearly not the case at this site.*

**ATSDR Response:** ATSDR stated in the health consultation (p. 10) that barium is a naturally occurring element that is present in many drinking water samples, in addition to summarizing some of the anthropogenic sources of barium in the environment. ATSDR included the background levels of barium from groundwater in the region for comparative purposes only. The groundwater background information for barium was identified on pp. 4–5 as both a median concentration detected from a single nearby monitoring well from the 1998 USGS study and as a range of values reported from the same study in multiple monitoring wells. ATSDR compared the barium levels in the seven private drinking water wells to established health guidance values.

**ATSDR Action:** Modification or retraction is not warranted.

### **29. ATSDR Statement: Barite**

*Objection: ATSDR included a discussion of “Barite” on page 10 of the Consultation.*

*Basis for Our Objection:*

*There was no evidence that barite was used or released from the ATGAS well pad or that it has any association with oil and gas activities; discussion of barite in a report investigating a well control incident is inappropriate and inflammatory and has no scientific basis for inclusion.*

**ATSDR Response:** The health consultation includes general background information related to sources of barium, including barite. Many other forms of barium (e.g., barium carbonate, barium sulfate) are also included in this discussion for informational purposes only. Barite does have a well-established use in the oil and gas industry; USGS reports that the majority of the barite sold in the United States is used as a weighting agent in gas and oil well-drilling fluids (<http://minerals.usgs.gov/minerals/pubs/commodity/barite/080303.pdf>). As stated on p. 10 of the health consultation document: “Barium is a naturally occurring element and is found in most soils at concentrations ranging from about 15,000 to 3,500,000 µg/kg with mean values ranging between 265,000 and 835,000 µg/kg. Barium is present in a wide variety of food items including breads, peanut butter, cereals, pasta, fruits, vegetables, eggs, dairy products, and to a lesser extent meats, poultry, and fish, at levels from 10 µg/kg up to 3,000 µg/kg. Barite (a mineral composed primarily of barium sulfate with occasional traces of strontium and calcium) is used extensively in the oil industry as a constituent in drilling mud” (ATSDR 2007, WHO 2001).

**ATSDR Action:** Modification or retraction is not warranted.

### **30. ATSDR Statement: Erroneous Transcription of Iron Data for RW02**

*Objection: ATSDR states on page 7 that the iron concentration at RW02 is 500 µg/L and in Table 1 it is listed as 550 µg/L.*

**ATSDR Response:** The correct parenthetical entry on p. 7 of the health consultation should have been “RW02 at 550 µg/L,” not “RW02 at 500 µg/L.”

**ATSDR Action:** ATSDR will make the correction in the report to reflect RW02's concentration of 550 µg/L, not 500 µg/L. Retraction is not warranted.

### **31. ATSDR Statement: Health Effects of Iron**

*Objection: Although technically accurate, inclusion of discussions of rare health effects associated with iron on consumption of certain pharmaceuticals which might interact with an element, etc., are inflammatory and lead the reader to conclude there are significant potential health effects associated with the release of materials from the ATGAS well pad and this is not the case.*

**ATSDR Response:** The health consultation states on p. 13, "These intakes of iron are not likely to result in adverse health effects in healthy residents." Therefore, ATSDR disagrees that the readers are likely to conclude that there are significant potential health effects. And, as noted, the information is accurate.

**ATSDR Action:** Modification or retraction is not warranted.

### **32. ATSDR Statement: Claim of Increasing Trend in Lithium Values**

*Objection: ATSDR states that GTI reported an "increasing trend" in lithium values and attributes potential responsibility for the lithium concentrations in RW04 to natural gas activity.*

*Basis for Our Objection:*

*The GTI report (Hayes, 2009) provides concentration data for both influent water and 5-day flowback water samples from wells in 19 locations within the Marcellus Formation. Lithium is known and expected to occur in produced formation water. Lithium is also known to occur naturally in groundwater as discussed earlier; therefore the presence of lithium is not unexpected in the groundwater. Lithium is now included in the Chesapeake baseline sampling program. Lithium results are available for 136 baseline water well samples collected from water wells in Bradford County, lithium was detected in 31 samples. The range of detected values was from 61.3 µg/L to 1,360 µg/L with an average detected value of 220 µg/L. The Consultation misleads the public by suggesting that there was an increasing trend of lithium values in groundwater in the seven water wells in the ATGAS pad area. The ATSDR only had a single value for each of the seven water wells they were considering, and no baseline lithium values are available from these seven water wells. No trend can exist when data from only one sampling is available for review.*

*The lithium concentrations encountered in RW04 are naturally present in the geologic formation and therefore are present in the groundwater. Attribution of lithium at RW04 to natural gas activity was not supported by the data presented in the ATSDR Consultation.*

**ATSDR Response:** The 2009 GTI report documents an increasing trend in metals concentrations (including lithium) in Marcellus Shale flowback waters over time at multiple locations in Pennsylvania and West Virginia. Rapid concentration increases in

metals (including barium, lithium, strontium, sodium) were seen in the flowback water from day 1 through day 90. For example, total lithium values in the influent ranged from non-detectable to approximately 14,000 µg/L (14 mg/L) (note: the 14,000 µg/L (14 mg/L) was qualified and appears to be an anomaly), the next highest concentration was 2,300 µg/L (2.3 mg/L). Lithium concentrations on day 1 flowback averaged 24,000 µg/L (24 mg/L), day 5 flowback lithium averaged 64,000 µg/L (64 mg/L), day 14 lithium averaged 78,000 µg/L (78 mg/L), and day 90 averaged 125,000 µg/L (125 mg/L).

The health consultation does not definitively attribute lithium concentrations in RW04 to natural gas activities and does not attribute a trend in the sampling data for lithium in the seven private wells near this site. The health consultation states (p. 14), "ATSDR believes that given the trend of increasing lithium concentrations as observed in an industry flow-back water study (GTI 2009) and the suggestive impacts on lithium concentrations in RW04, lithium sampling should be included in future environmental sampling events related to hydraulic fracturing." However, we recognize that ATSDR is not a regulatory agency, and it is up to the appropriate regulatory authorities to determine when and if such sampling is appropriate and will be required.

**ATSDR Action:** Modification or retraction is not warranted.

### **33. ATSDR Statement: Background Manganese Concentrations in Groundwater**

*Objection: ATSDR reported background groundwater concentration values for manganese in groundwater of 4 µg/L to 32 µg/L on page 14 of the Consultation citing the 2008 draft Toxicological Profile for Manganese (ATSDR, 2008).*

#### *Basis for Our Objection:*

*ATSDR had previously reported in Table 1 the site-specific background values for manganese in groundwater and also had baseline sampling results of manganese for the wells under consideration. It is misleading to the reader to suggest that the manganese concentrations for the seven wells in question are not within background values. Further, the background values noted as ranging from 4 to 32 µg/L were cited in the referenced document in the context of finished public drinking-water supplies (ATSDR, 2008, page 361). Within the same document, the preceding paragraph presents specific ranges of manganese in groundwater and reports the range of groundwater manganese concentrations to be between 20 and 90 µg/L (ATSDR, 2008, page 358). Baseline manganese data for water wells completed in Bradford County show that out of over 7,500 analyses, manganese was detected in 4,214 of the samples, or in 55.9% of the samples tested. Manganese was detected over the EPA SMCL of 50 µg/L in 2,978 of the samples or 39.5 % of the samples tested. Manganese ranged in this baseline database for Bradford County from <15 µg/L to 124,000 µg/L, mean of 210 µg/L and median of 23.8 µg/L. Manganese frequently occurs naturally in groundwater in Bradford County above the EPA SMCL, and that natural occurrence is well documented in the literature. The 1998 USGS report, on page 31, states that about 50% of the wells sampled in that study exceeded the EPA SMCL for both iron and manganese. The ATSDR references this 1998 USGS report but fails to point out this statement showing manganese is naturally*

*occurring in groundwater in the area and that manganese frequently occurs above the EPA SMCL. The manganese that occurs in groundwater from the seven wells is naturally occurring and well within background ranges for Bradford County, and none of these seven wells were impacted by the ATGAS incident. ATSDR's failure to discuss known indications that manganese is naturally and commonly present above the SMCL reflects a failure to use complete information, the best information, objectivity, and good scientific practices.*

**ATSDR Response:** ATSDR includes multiple statements in the health consultation referring to the fact that manganese is naturally occurring in the environment. The first sentence in the manganese subsection on p. 14 is "Manganese is a naturally occurring substance found in many types of rock and soil." Further, on p. 4, ATSDR includes both a median value for manganese in groundwater from the region and a value for which only 10% of the wells in the local formation exceeded this concentration. The statement on p. 14 that "The average levels of manganese in drinking water have been reported to range from approximately 4 µg/L to 32 µg/L" is properly cited from the ATSDR Toxicological Profile for manganese.

**ATSDR Action:** Modification or retraction is not warranted.

#### **34. ATSDR Statement: Manganese Health Effects**

*Objection: The Consultation provides incomplete and misleading summaries of toxicological information regarding the relationship between health effects and manganese in well water (page 15).*

**ATSDR Response:** ATSDR's Toxicological Profiles provide comprehensive summaries of toxicological information regarding health effects and chemical exposures. Health consultations reference these profile documents and may include relevant subsets of this information, as appropriate. It is beyond the scope of a health consultation document to provide complete toxicological information; however, a reference to the ATSDR Toxicological Profile is provided for additional information.

**ATSDR Action:** Modification or retraction is not warranted.

#### **35. ATSDR Statement: Chlorides**

*Objection: ATSDR states that the chloride SMCL is 250 mg/L because "water with chloride concentrations greater than this level tastes salty to most people."*

*Basis for Our Objection:*

*The supporting EPA documentation for the chloride SMCL as well as information on the taste threshold for chloride available from the WHO, indicates that the taste threshold for chloride is dependent upon the cation associated with the chloride and generally ranges between 200 and 300 mg/L (WHO, 2003).*

**ATSDR Response:** The health consultation (p. 6) states, "EPA has set a SMCL of 250,000 µg/L for chloride. This limit is an aesthetic not health-based level. It was

established because water with chloride concentrations greater than this level tastes salty to most people. The maximum detected level in a residential well at this site (1,900,000 µg/L) exceeds the EPA SMCL and would result in exceedances of the UL of 3.6 g/day for individuals consuming 2 liters or more of this water per day (IOM 2005).” This information is accurate.

**ATSDR Action:** Modification or retraction is not warranted.

**36. ATSDR Statement: Unfounded Recommendation for Additional Sampling Near ATGAS Well Pad**

*Objection: ATSDR has recommended additional sampling be conducted in the area adjacent to the ATGAS well pad.*

**ATSDR Response:** The health consultation provides recommendations to the EPA for further actions at the site. The health consultation recognizes limitations in the data provided to ATSDR by EPA. Additional sampling is recommended to fill data gaps and protect public health. Further sampling of the wells near the Chesapeake ATGAS 2H well pad has been conducted by EPA.

**ATSDR Action:** Modification or retraction is not warranted.

**37. ATSDR Statement: Unfounded Recommendation for Extensive Regional Sampling and Studies**

*Objection: Chesapeake objects to ATSDR’s use of data from a single sampling event involving seven water wells as constituting sufficient evidence to recommend that lengthy and expensive environmental studies and substantial drinking water well testing are warranted in all of the Marcellus Shale. Especially in light of substantial additional data that ATSDR failed to consider altogether, this premature conclusion reflects a lack of objectivity, evidence of bias, and an absence of sound scientific reasoning.*

**ATSDR Response:** ATSDR continues to support further assessment of water quality and a more standardized and consistent approach to baseline sampling to better understand natural groundwater conditions in the Marcellus Shale region (as well as in other parts of the country with similar activities) prior to drilling. The information reviewed in this health consultation provides a case example of the importance of this information. Baseline groundwater sampling is not required in Pennsylvania. A gas production company has the option of collecting baseline data if it wishes to do so. In the absence of consistent baseline sampling and reporting, the data quality and scope of baseline sampling parameters will be variable and may not include important public health parameters. In addition, the reporting, warehousing, validation, and management of these data are of concern.

**ATSDR Action:** Modification or retraction is not warranted.

**38. ATSDR Statement: Unfounded Recommendation for Extensive Residential Testing Based on Single Sampling Event**

*Objection: Chesapeake is disturbed that ATSDR would use data from a single sampling event for seven water wells to conclude that residents should conduct substantial drinking water well testing each year.*

**ATSDR Response:** Please see responses to Objections 36 and 37. Pennsylvania is one of just two states nationwide that lack statewide standards for construction of private water wells. ATSDR and CDC make this general recommendation to all private well users in Pennsylvania and nationwide, when appropriate, as a prudent public health measure. There are many factors that may affect groundwater quality. Private well users need to test their wells to ensure there are not unacceptable levels of contaminants in their drinking water, regardless of the source of the contaminants. Additionally, Chesapeake notes that baseline water sampling is being conducted by natural gas production companies. Unfortunately, the baseline sampling conducted by natural gas drilling companies is variable and often limited in scope and temporal coverage, and that sampling may not include all the information necessary to determine whether a well provides safe drinking water prior to and over the course of natural gas activities near the private drinking water source.

**ATSDR Action:** Modification or retraction is not warranted.

### **39. ATSDR Statement: Inaccurate Statement About Duration of Environmental Sampling**

*Objection: ATSDR indicated in the data limitations section that environmental sampling data were limited to a 7- to 8-day period after the well control incident.*

**ATSDR Response:** The health consultation accurately characterizes the environmental sampling data used and the limitations inherent in these data. ATSDR's health consultation states, "The majority of the environmental sampling data *reviewed in this document* [italics added] are limited temporally to a 7 to 8 day period after the blow-out began. Chemical concentrations in groundwater samples collected on a single day may not accurately represent year-round conditions or past, present and future exposure levels."

**ATSDR Action:** Modification or retraction is not warranted.

### **40. ATSDR Statement: Ready Mobilization of "Naturally-Occurring Chemicals"**

*Objection: ATSDR states "naturally occurring chemicals are readily mobilized in the environment by natural gas drilling and hydraulic fracturing activities." (Page 2). Further, ATSDR states that relatively higher concentrations of naturally-occurring chemicals can be found in deep formations compared to surface soils. This statement is false. The use of the word "chemical" to characterize naturally-occurring elements in soils is also inappropriate.*

**ATSDR Response:** The health consultation statement that "naturally occurring chemicals are readily mobilized in the environment by natural gas drilling and hydraulic fracturing activities" is supported by multiple references. Please see the U.S.

Environmental Protection Agency's (2011) Plan to Study the Potential Impacts of Hydraulic Fracturing on Drinking Water Resources and associated references, ([http://www.epa.gov/hfstudy/HF Study Plan 110211 FINAL 508.pdf](http://www.epa.gov/hfstudy/HF_Study_Plan_110211_FINAL_508.pdf)), as well as Hayes, T. (2009) Sampling and Analysis of Water Streams Associated With The Development of Marcellus Shale Gas, Final Report, Marcellus Shale Coalition, Gas Technology Institute (GTI) and B. Heaton and J. Lambley 1995, "TENORM in the Oil, Gas and Mineral Mining Industry," *Applied Radiation and Isotopes*, Vol. 46(6-7): pp. 577-581.

The health consultation statement that "relatively higher concentrations of naturally-occurring chemicals can be found in deep formations compared to surface soils" summarizes a generally accepted concept in geology. References include Pennsylvania Department of Conservation and Natural Resources, Geology of Pennsylvania's Groundwater (<http://www.dcnr.state.pa.us/topogeo/education/es3.pdf>); and the New York Department of Environmental Protection Final Impact Assessment of Natural Gas Production in the New York City Water Supply Watershed ([http://www.nyc.gov/html/dep/pdf/natural\\_gas\\_drilling/12\\_23\\_2009\\_final\\_assessment\\_report.pdf](http://www.nyc.gov/html/dep/pdf/natural_gas_drilling/12_23_2009_final_assessment_report.pdf)).

The use of the word *chemical* in general terms for naturally occurring or manmade substances is common practice, as typified in the references cited earlier in this response.

**ATSDR Action:** Modification or retraction is not warranted.

**41. ATSDR Statement: Recommendation for Surface Water and Fish Samples, Sharing of Data with Health Professionals**

*Objection: ATSDR indicates as a part of the Public Health Action Plan that additional groundwater sampling results will be reviewed as well as data from surface water and fish samples. Further ATSDR has indicated that results of the Consultation will be shared with community members and health professionals.*

**ATSDR Response:** ATSDR agrees that the additional rounds of groundwater sampling that were conducted at this site in July and September 2011 have fulfilled recommendation #4 in the health consultation document for further sampling of the residential wells near this site. As stated in the Public Health Action Plan (p. 20), ATSDR documented that follow-up environmental sampling was being conducted at the site.

ATSDR was requested by the EPA to evaluate potential public health impacts/exposures of consuming/using water from specific private wells following the Chesapeake ATGAS 2H wellhead failure. Due to independent communications between PADEP and the Pennsylvania Department of Health (PADOH), PADOH expressed an interest in reviewing information relevant to the surface water/fish consumption exposure pathway at this site. ATSDR documented this interest in the public health action plan.

ATSDR communicated the availability of this information in the December 2011 SAIC report to PADOH.

**ATSDR Action:** Modification or retraction is not warranted.

**42. ATSDR Statement: Recommendation that Post-Treatment Sampling Results Be Provided to Public Health Authorities**

*Objection: In Recommendation 1, ATSDR has recommended that post-treatment system results from RW04 be shared with public health authorities.*

*Basis for Our Objection:*

*Private water well quality is not regulated by ATSDR and as such it is the well owner's decision whether or not to share the results of any post-treatment system sampling with ATSDR. The treatment system was installed and other actions were undertaken at RW04 as a voluntary action on behalf of Chesapeake unrelated to the well control incident. The treatment system has been sampled on three occasions. These data have been shared with the PADEP and are included in the final site surface water and water well characterization report which was submitted to the PADEP on December 22, 2011 (SAIC, GES and IEM, 2011). Also, ATSDR in Recommendation 1 incongruously recommended that post-treatment results for Chesapeake installed treatment system at RW04 should be shared with public health authorities but did not include a similar recommendation for sharing post treatment results from the EPA-installed treatment system at RW02.*

**ATSDR Response:** ATSDR is a non-regulatory agency that provides conclusions and recommendations regarding public health in response to a specific request. Recommendation 1 is a non-regulatory public health recommendation. It is correct that private well water quality is not regulated and that it is the decision of the well owner to share any personal testing results. During individual discussions with residents from this site, the well owners chose to share their post-treatment results with ATSDR. ATSDR did not need to make a similar recommendation for sharing post-treatment results from RW02, because that treatment system was installed by EPA and EPA provides sampling results to ATSDR when we conduct an evaluation at EPA's request.

**ATSDR Action:** Modification or retraction is not warranted.

**Appendix B. Revisions that will be made to the ATSDR Chesapeake ATGAS 2H Well Site Health Consultation (“Request comment number” is from the Chesapeake ATGAS Energy Corporation Information Quality Request for Correction).**

<b>Request Comment Number</b>	<b>Error</b>	<b>Correction</b>
2	Mislabeling of Table 3.	ATSDR will remove the duplicate Table 3 header and re-label the tables.
20	Incorrect sampling date for RW03 (April 27, 2011).	ATSDR will correct the sampling date for RW03 (April 28, 2011).
22	ATSDR relied on “blank-qualified” data for Oil and Grease (HEM) to make unsupportable conclusions regarding the presence of hydrocarbons, especially in RW04.	ATSDR will remove the parenthetical reference to HEM results in the Conclusions portions of the health consultation document.
23	The conversion of methane concentration of 87 percent in air to a concentration in $\mu\text{g/L}$ is incorrect (page 15).	The appropriate conversion should be approximately 581,000 $\mu\text{g/L}$ . ATSDR will make this correction in the health consultation.
27	ATSDR states on Page 3 that there is a notable increasing trend in strontium levels and warrant further consideration in future hydraulic fracturing-related groundwater sampling events.	ATSDR will correct the statement about an increasing trend in strontium levels in the health consultation document. The sentence will now read: “Although the detected levels of strontium did not exceed CVs and thus are not included in Table 1, site-specific and general industry-wide information for this chemical warrants further consideration in future hydraulic fracturing-related groundwater sampling events.”
30	ATSDR states on page 7 that the iron concentration at RW02 is 500 $\mu\text{g/L}$ and in Table 1 it is listed as 550 $\mu\text{g/L}$ .	ATSDR will correct the entry on page 7 to change the RW02 value to 550 $\mu\text{g/L}$ .