



## **RECOMMENDED PRACTICES: Pre-Drill Water Supply Surveys**

# RECOMMENDED PRACTICES: Pre-Drill Water Supply Surveys

## 1.1 Purpose

These recommended practices address relevant considerations and guidelines for Pre-drill Water Supply Surveys and they support the Marcellus Shale Coalition (MSC) guiding principles.

## 2.1 General

The objective of a pre-drill survey of water supplies and associated water sampling is to establish a baseline for conditions that exist prior to oil or gas drilling activities. Groundwater typically contains various natural constituents even with no human activity. Therefore, it is important for both the operator and the water supply owner to understand the concentrations of constituents in, and other characteristics associated with, water supplies located in the area of planned drilling activities. For example, there are areas throughout the United States where naturally occurring methane gas is present in aquifers frequently used as water supplies for private land owners. This has been well documented for decades in portions of the Appalachian basin. Refer to the MSC's Recommended Practice for Responding to Stray Gas Incidents for further information on this subject.

A pre-drill survey and associated water sampling should be conducted on all identified water supplies within a given area of the well pad surface location. The State Regulatory Agency (SRA) may have guidelines or regulations regarding the sampling distances. An oil and gas company may choose to sample beyond the area specified by the SRA, in accordance with the oil and gas company's internal sampling protocols. Sampling decisions may be based on hydrology, geology, aquifer characteristics or any number of other factors. Water supplies such as wells, springs, and ponds should be evaluated. Consideration should also be given to sampling water sources that are not currently in use, as they could be put into use in the future.

Sampling and laboratory analyses should be conducted prior to any earth disturbance for site construction or drilling related activities. Consider performing another round of sampling and analysis prior to additional drilling related activities if a significant time elapses between these activities.

## 3.1 Initial Survey

Water supplies within the selected area of the well pad surface location should be identified during initial water supply inventorying activities. The following tools may be utilized to identify water well, pond, and spring locations; regulatory databases; topographic and aerial maps; windshield surveys; and property tax rolls. Each water supply should be given a unique identifier.

The owner and/or user (e.g. resident) of the water supply should then be contacted to schedule the initial survey using, at minimum, any methods that may be prescribed by the SRA (e.g., certified mail, direct contact, etc.). Operators should inform the water supply owners and/or residents that any and all information/data collected will be provided to the owner/occupant and to the SRA (if required by state regulations) and, as such, the information could be disclosed as public information upon inquiry to the SRA.

With the assistance of the water supply owner or resident, locate the water supply(ies) and sampling location(s). Use GPS (preferably NAD83 datum) to determine and record the latitude and longitude of each water supply. For each water supply, conduct a survey or interview with the water supply owner or resident and document available basic water supply information (e.g., if the supply is a water well obtain the depth, year drilled, casing type, treatment, historic water quality issues). Prepare a plan view sketch to document the location of the water supply (and sampling point), residence, septic system, adjacent surface water bodies, mine influenced water seeps and any other pertinent features. Photograph all notable features, such as the wellhead, spring location, sample point, etc. Note the approximate relative distances between features on the sketch. For informational purposes, Appendix A contains an example site visit form to help illustrate information that should be collected during each sampling event.

## 4.1 Water Sampling

Water samples should be obtained by a properly trained and experienced independent third party. The sampling should be performed in accordance with any applicable state and federal regulations and requirements, and in accordance with all appropriate sample collection, preservation, handling, and chain-of-custody procedures. For more information, please refer to the MSC's Pre-Drill Water Supply Sampling Fact Sheet.

Sampling should be conducted as close to the water supply source as is practical, and when possible, prior to any treatment system or storage tank. Whenever the sample cannot be collected prior to the treatment system/storage tank, the sampler should note this as part of the sample collection documentation.

If the water supply owner or resident refuses to allow the operator access to conduct the water sampling, the operator should send an acknowledgement to the water supply owner or resident confirming that access was refused. The SRA may require a copy as well. The notice should include the following:

- The operator's intention to drill or alter an oil or gas well.
- The desire to conduct a predrilling or pre-alteration survey.
- The name of the person who requested and was refused access to conduct the survey and sampling, and the date of the request and refusal.
- The name and address of the well operator, and the address of the SRA if required, to which the water supply owner or resident may respond.

## 4.2 Sample Analyses

Water samples should be analyzed by an SRA certified laboratory using appropriate analytical methods (such as relevant EPA methods, ASTM methods, or methods listed in Standard Methods for the Examination of Water and Wastewater). For parameters that have a primary or secondary Maximum Contaminant Level (MCL) for public water systems, the laboratory should be instructed to provide a laboratory reporting limit no greater than the published MCL.

The USEPA primary and secondary MCLs have been established for treated drinking water at the delivery point of public water systems. Although MCLs are commonly used as a benchmark for private water supplies, it should be noted that the USEPA and the SRAs do not have authority to regulate private drinking water wells. The following parameters should be considered:

#### 4.3 Parameters

Alkalinity	Total Chromium
Oil & Grease	Total Arsenic
pH	Total Barium
Specific Conductance	Total Lead
Total Dissolved Solids	Total Selenium
Total Suspended Solids	Total Strontium
Chloride	Total Calcium
Sulfate	Total Iron
Total Hardness	Total Magnesium
MBAS (Methylene Blue Activated Substances; surfactants / foaming agents)	Total Manganese
Benzene, Toluene, Ethylbenzene, Xylenes (BTEX)	Total Potassium
Dissolved Methane*	Total Sodium
Dissolved Ethane	E. Coli
Dissolved Propane	Total Coliform
Nitrate as Nitrogen	Turbidity**

*This document provides general guidance on recommended practices for the subject(s) addressed. It is offered as a reference aid and is designed to assist industry professionals in improving their effectiveness. It is not intended to establish or impose binding requirements. Nothing herein constitutes, is intended to constitute, or shall be deemed to constitute the setting or determination of legal standards of care in the performance of the subject activities. The foregoing disclaimers apply to this document notwithstanding any expressions or terms in the text that may conflict or appear to conflict with the foregoing.*

\* Consider obtaining isotopic analysis if the pre-drill samples show levels of methane in a water supply that exceed background levels in the area.

\*\* If Turbidity exceeds 10 ntu, the operator should consider collecting samples for dissolved metals analysis.

Additional parameters may be appropriate based on location and specific conditions and may be added at the discretion of the operator. Appendix B provides the list of parameters along with their respective MCLs (for those parameters that have an MCL).

#### 4.4 Reporting

A report documenting the pre-drill survey and associated analytical results of the predrill sampling should be prepared. The report should be provided to the water supply owner and/or resident, and where required, to the SRA. The report should contain the following information:

- The location of the water supply and the name of the water supply owner
- The date of the survey, the name of the certified laboratory and the person who conducted the survey
- A description of where and how the sample was collected
- A description of the type and age, if known, of the water supply, and treatment, if any
- The name of the oil or gas well operator, name and number of well(s) to be drilled and permit number(s) if known
- The results of the laboratory analysis

Consider including references that the water supply owner and/or resident may use to interpret the analytical data such as publicly available guidance documents from regulatory agencies. For more information, please refer to the MSC's Tips on Understanding Your Water Test Results.



## APPENDIX A

### SITE VISIT FORM ONE FORM FOR EACH WATER SOURCE

**Part A: GENERAL INFORMATION**

Water Source ID:	O&G Well Name/No.:	Permit No.:	Well Operator:
Coordinates: (in NAD83, in decimal degrees) Lat _____ Long _____ Elevation _____ FT.			
Interviewed By:	Date Interviewed:		
Person Interviewed (circle one):	Owner	Resident	Other: _____
PROPERTY OWNER		RESIDENT OR OTHER	
Name:	Name:		
Address:	Address:		
Address:	Address:		
Phone No.:	Phone No.:		

**Part B: WATER QUALITY**

Reported Quality			Observed Quality			Treatment		Pump Type
	Yes	No	N/A	Yes	No	N/A	<input type="checkbox"/> None <input type="checkbox"/> UV Light	<input type="checkbox"/> None <input type="checkbox"/> Gas Piston <input type="checkbox"/> Submersible <input type="checkbox"/> Windmill <input type="checkbox"/> Jet <input type="checkbox"/> Other: _____ <input type="checkbox"/> Capacity _____ GPM
Staining	<input type="checkbox"/> Softening <input type="checkbox"/> pH Adjustment							
Odor	<input type="checkbox"/> Chlorination <input type="checkbox"/> Other: _____							
Cloudiness	<input type="checkbox"/> Iron Removal							
Sheen	<input type="checkbox"/> In-line Sediment Filter							
Effervescence	<input type="checkbox"/> Charcoal Filter							
Perceived Taste	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Functioning Properly							
If Yes, describe _____								

**Part C: WATER SOURCE INFORMATION**

Does this source supply any other properties? _____ If yes, identify properties _____	
Is the water source(s) located on the property: Yes <input type="checkbox"/> No <input type="checkbox"/> If No, please explain: _____	
Number of people using this water source? _____ Gallons/day, if metered: _____	
Has water source ever gone dry? Yes <input type="checkbox"/> No <input type="checkbox"/>	
Pressure Tank Yes <input type="checkbox"/> No <input type="checkbox"/> Size of tank _____ gallons <input type="checkbox"/> Actual size <input type="checkbox"/> Estimated <input type="checkbox"/> Unknown	
Water Use <input type="checkbox"/> Domestic <input type="checkbox"/> Livestock <input type="checkbox"/> Irrigation <input type="checkbox"/> Other: _____	
Compass course from water source to dwelling _____ Estimated distance from water source to dwelling _____ FT.	
Are there any other water sources on the property? Yes <input type="checkbox"/> No <input type="checkbox"/> If yes, how many? _____	
Provide all water source ID(s) _____	
Are you aware of any abandoned water source (s)? _____ If yes, where _____, when _____	
<b>Water Source Type:</b> <input type="checkbox"/> Water Well	
Drilled Well: Yes <input type="checkbox"/> No <input type="checkbox"/> Dug Well: Yes <input type="checkbox"/> No <input type="checkbox"/> Artesian: Yes <input type="checkbox"/> No <input type="checkbox"/> Other: _____	
Reported total well depth: _____ FT. Well casing diameter: _____ IN. Missing/damaged pit-less adaptor Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown <input type="checkbox"/>	
Reported depth of water level: _____ FT. Reported pump depth _____ FT.	
Date Drilled _____ Drillers Name _____ Is the well in basement or crawlspace? _____	



## APPENDIX A

### SITE VISIT FORM ONE FORM FOR EACH WATER SOURCE

Driller log available Yes <input type="checkbox"/> No <input type="checkbox"/> Driller's name _____
Signature of owner authorizing release of well log(s) _____
Water Source Type: <input type="checkbox"/> Spring
Discharge Pipe Yes <input type="checkbox"/> No <input type="checkbox"/> Seep/Ground Surface Flow Yes <input type="checkbox"/> No <input type="checkbox"/> Spring House Yes <input type="checkbox"/> No <input type="checkbox"/> Underground Vault Yes <input type="checkbox"/> No <input type="checkbox"/>
Water Source Type: <input type="checkbox"/> Cistern
Size of Cistern _____ gallons <input type="checkbox"/> Actual size <input type="checkbox"/> Estimated <input type="checkbox"/> Unknown
Source of water: _____ (e.g. delivered, spring, well, gutter, etc.)
Water Source Type: <input type="checkbox"/> Surface Water
<input type="checkbox"/> Pond <input type="checkbox"/> Lake <input type="checkbox"/> Creek <input type="checkbox"/> River
Water Source Type: Public Water Yes <input type="checkbox"/> No <input type="checkbox"/>

#### PART D: DESCRIPTION OF WATER SOURCE (check all that apply)

<input type="checkbox"/> Loose, missing, or damaged cover (circle one if applicable)	<input type="checkbox"/> Evidence of erosion
<input type="checkbox"/> Evidence of insects, spiders, animals (circle one if applicable)	<input type="checkbox"/> Water source secured
<input type="checkbox"/> Any cracked or damaged well casing/spring vault (circle one if applicable)	<input type="checkbox"/> Source buried
<input type="checkbox"/> Water source open to surface water	<input type="checkbox"/> Location unknown
<input type="checkbox"/> Additional storage or holding tank/coyote system (circle one if applicable)	<input type="checkbox"/> Other: _____
<input type="checkbox"/> Cover flush with ground	

#### PART E: DESCRIPTION OF AREA SURROUNDING WATER SOURCE (check all that apply) Show locations on site sketch and provide approximate distance & compass course. Document housekeeping conditions. (Attach photos.)

<input type="checkbox"/> Ground sloping toward water source
<input type="checkbox"/> Water source downgradient of septic system
<input type="checkbox"/> Signs of failing septic, soggy ground, foul odor (circle all that apply)
<input type="checkbox"/> Close proximity to garden, agricultural field, orchard, greenhouse. (circle all that apply)
<input type="checkbox"/> Close proximity to junkyard, dumping area, landfill. (circle all that apply)
<input type="checkbox"/> Close proximity to fuel storage tanks, equipment storage or maintenance areas, garage. (circle all that apply)
<input type="checkbox"/> Located in field with livestock, barn, barnyard, other out building. (circle all that apply)
<input type="checkbox"/> Close proximity to salt storage area, salted roadway.
<input type="checkbox"/> Close proximity to pipeline.
<input type="checkbox"/> Other: _____

ADDITIONAL REMARKS & COMMENTS: (record details from any previous sampling events, including who for, when, and who collected samples)



## APPENDIX A

### SITE VISIT FORM ONE FORM FOR EACH WATER SOURCE

#### PART F: SAMPLING

Sampled By:	Date Sampled:	
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SAMPLED		SAMPLING POINT LOCATION		
<input type="checkbox"/> Before Treatment	<input type="checkbox"/> After Treatment	<input type="checkbox"/> Inside Faucet: _____	<input type="checkbox"/> Pressure Tank	<input type="checkbox"/> Overflow/Discharge Pipe
<input type="checkbox"/> No Treatment	<input type="checkbox"/> Not Sure	<input type="checkbox"/> Outside Faucet: _____	<input type="checkbox"/> Wellhead	<input type="checkbox"/> Other: _____
		<input type="checkbox"/> Seep	<input type="checkbox"/> Surface Water (sampled at coordinates in Part A)	
SAMPLING METHOD: <input type="checkbox"/> Existing well pump <input type="checkbox"/> Sampling pump <input type="checkbox"/> Low flow <input type="checkbox"/> Bailer <input type="checkbox"/> Other: _____				
Was the water source purged before sampling? Yes <input type="checkbox"/> No <input type="checkbox"/> If yes, volume (gal.) and/or time (min) purged: _____				
Is it possible to run water for 30 minutes? Yes <input type="checkbox"/> No <input type="checkbox"/> If no, please explain: _____				
Average water usage within last 24 hours _____				
Chain of custody attached? <input type="checkbox"/> Yes <input type="checkbox"/> No Name of Certified Laboratory: _____				
FIELD ANALYSES:				
Turbidity: _____ pH: _____ Conductivity: _____ Temperature: _____				
Combustible Gas Reading (Describe location and method): _____				

PART G: PLAN SKETCH and PHOTOGRAPHS (use additional pages as necessary) Show compass course and provide approximate distance.

#### Sampler/Interviewer

I hereby acknowledge that I have supplied the correct information to the best of my knowledge

Sign \_\_\_\_\_ Print \_\_\_\_\_ Date \_\_\_\_\_

Company: \_\_\_\_\_ Address: \_\_\_\_\_ Phone: \_\_\_\_\_

## Appendix B

### Summary of Aqueous Pre-Drill Constituents and Maximum Contaminant Levels

Constituent	MCL <sup>1,6</sup> (mg/L) <sup>2</sup>	Recommended Laboratory Reporting Units <sup>5,7</sup>
<b>Conventional Analyses</b>		
Alkalinity	--	mg/L
Oil & Grease	--	mg/L
pH	6.5-8.5 SU <sup>3</sup>	SU
Specific Conductance	--	uhmos/cm
Total Dissolved Solids	500 <sup>3</sup>	mg/L
Total Suspended Solids	--	mg/L
Chloride	250 <sup>3</sup>	mg/L
Sulfate	250 <sup>3</sup>	mg/L
Hardness	--	mg/L
Nitrate as Nitrogen	10	mg/L
MBAS / Surfactants / Foaming Agents	0.5 <sup>3</sup>	mg/L
Total Coliform	5.00%	<1
E. Coli		<1
Turbidity	--	NTU
<b>Hydrocarbons</b>		
Dissolved Methane	--	ug/L
Dissolved Ethane	--	ug/L
Dissolved Propane	--	ug/L
<b>Volatile Organic Compounds</b>		
Benzene	0.005	ug/L
Toluene	1	ug/L
Ethylbenzene	0.7	ug/L
Xylene	10	ug/L
<b>Total Metals</b>		
Arsenic	0.01	mg/L
Barium	2	mg/L
Calcium	--	mg/L
Chromium	0.1	mg/L
Lead	0.015 <sup>4</sup>	mg/L
Iron	0.3 <sup>3</sup>	mg/L
Magnesium	--	mg/L
Manganese	0.05 <sup>3</sup>	mg/L
Potassium	--	mg/L
Selenium	0.05	mg/L
Sodium	--	mg/L
Strontium	--	mg/L

**Notes:**

1 - MCL - Maximum Contaminant Level - The maximum permissible level of a contaminant in drinking water which is delivered to any user of a public water system.

2 - Units are in milligrams per liter (mg/L) unless otherwise noted. Milligrams per liter are equivalent to parts per million.

3 - Limit is a secondary drinking water standard. Secondary drinking water standards are non-enforceable guidelines regulating contaminants that may cause cosmetic or aesthetic effects in drinking water.

4 - Lead is regulated by a Treatment Technique that requires a system to control the corrosiveness of its water. This limit is an action level.

5 - The analytical laboratory should use the most current analytical methods.

6 - The US EPA regulates public water systems, it does not have the authority to regulate private drinking water wells.

7 - The laboratory reporting limits should be equal to or less than the MCLs.



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