Excerpt from Guidance for Monitoring Effects of Gas Pipeline Development on Surface Water and Groundwater Supplies

Section 6: Guide for Services

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Downstream Strategies

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Our projects fit within one or more of our program areas—water, land, and energy—and most projects also utilize one or more of our tools, which include geographic information systems, monitoring and remediation, and stakeholder involvement and participation. Our primary service area includes West Virginia and Appalachia. DS has considerable background in environmental science and policy, environmental site assessments, geographic information systems, permitting, field monitoring, community and stakeholder facilitation, watershed planning, and other areas.

DS is experienced at conducting both water sampling and biological sampling. We frequently perform sampling of the air, soil, and water in support a wide range of environmental projects including underground storage tank corrective actions, contaminated site characterization, stream monitoring, drinking water monitoring, delineation of microbial impacts, and microbial remediation.

6. GUIDE FOR SERVICES

This list is not intended to be comprehensive, but includes a variety of options for contractors in the vicinity of the MVP and ACP routes who can provide water sampling, laboratory analysis of water quality, wetland delineation, and biological surveys.

Consultants. The following service providers offer a range of services including sample collection, wetland delineations, biological assessments, and data analysis and interpretation.

All Star Ecology, Fairmont, WV
allstarecology.com

Services: Stream and wetland delineation, macroinvertebrate assays, endangered species surveys, water quality monitoring, vegetation surveys.

Address:1582 Meadowdale Road, Fairmont, WV 26554
Phone: 304-816-3490

Downstream Strategies, Morgantown and Alderson, WV
Downstreamstrategies.com

Services: Sample collection, data analysis and interpretation, report preparation.

Morgantown office
Address: 295 High St., Suite 3, Morgantown, WV 26505
Phone: 304-292-2450

Alderson office
Address: 100 Railroad Ave., Alderson, WV 24910
Phone: 304-445-7200

Environmental Services and Consulting (ES&C), Christiansburg, VA
http://www.es-and-c.com

Services: Stream assessments, wetland delineation, drinking water analysis, water quality sampling, and laboratory analysis of total coliform bacteria and total heterotrophic bacterial counts only.

Address: New River Valley Office, 516 Roanoke St., Christiansburg, VA 24073
Phone: 540-552-0144
Email: nrv@es-and-c.com

Environmental Standards, Charlottesville, VA
http://www.envstd.com/

Services: Water sampling and results analysis.

Address: 1412 Sachem Place, Suite 100, Charlottesville, VA 22901
Phone: 434.293.4039

Green Rivers, Thomas, WV
Greenrivers.net

Services: Stream and wetland delineations, water supply inventories, biological inventories (endangered species and benthic macroinvertebrates), aquatic surveys, water sampling

Address: PO Box 106, Thomas, WV 26292
Phone: 304.704.4283

REIC, Beckley and Morgantown, WV and Roanoke and Staunton, VA
http://www.reiclabs.com/

Services: Laboratory analysis of samples, sample collection, wetland delineation, and macroinvertebrate surveys.

Address:
REI Consultants, Inc. (Corporate Headquarters), 225 Industrial Park Road, Beaver, WV 25813
Phone: 800-999-0105 or 304-255-2500
Email: info@reiclabs.com or fill out an online form here: http://www.reiclabs.com/contact.html

TNT Environmental, Chantilly, VA
https://tntenvironmentalinc.com/

Services: Wetland delineations and endangered species surveys.

Address: 13996 Parkeast Circle, Suite 101, Chantilly, Virginia 20151
Email: Info@TNTenvironmentalinc.com
Phone: 703-466-5123

Watershed Strategies, Bent Mountain, VA
http://www.watershed-strategies.com/#

Services: Wetland delineation.

Address: 10468 Fortune Ridge Rd., Bent Mountain, VA 24059
or
P.O. Box 21302, Roanoke, VA 24018
Phone: 540-420-4322
Email: dtrible@watershed-strategies.com

Wetland Studies and Solutions, Roanoke, VA
Wetlandstudies.com

Services: Wetland delineation, endangered species surveys, benthic macroinvertebrate surveys, vegetation assessments, and biological water quality assessments.

Address: Southwestern Virginia Office, 1402 Grandin Road SW, Suite 211, Roanoke, Virginia 24015
Phone: 703.679.5718 or 540.795.6180 (cell)
E-mail: Nathan Staley nstaley@wetlandstudies.com

GUIDE FOR SERVICES continued

Analytical laboratories. The following laboratories perform analysis of samples collected by contractors or citizens.

ALS Environmental, South Charleston, WV
Alsglobal.com

Services: Laboratory analysis of samples, will provide a client with bottleware for sample collection.

South Charleston Service Center
Address: 1740 Union Carbide Drive, South Charleston, WV 25303
Phone: 1 304 356 3168 or 1 304 989 2643
Email: rebecca.kiser@alsglobal.com

Pace Analytical, Richmond, VA, Eden, NC, Greensburg, PA and Hurricane, WV
Pacelabs.com

Services: Laboratory analysis. Will provide bottleware prior to sample collection. Some locations offer field support.

Richmond, VA Service Center
Address: 7130 Mechanicsville Turnpike, Richmond, VA 23111
Phone: 804.559.9004

Eden, NC: Environmental Lab
Address: 205 East Meadow RoadSuite A, Eden, NC 27288
Phone: 336.623.8921

Greensburg, PA: Environmental Lab
Address: 1638 Roseytown RdSuite 2, 3, 4, Greensburg, PA 15601
Phone: 724.850.5600

Hurricane, VA: Environmental Lab
Address: 5 Weatherridge Drive, Hurricane, WV 25526
Phone: 304.757.8954

REIC, Beckley and Morgantown, WV and Roanoke and Staunton, VA
http://www.reiclabs.com/

Services: Laboratory analysis of samples, sample collection, wetland delineation, and macroinvertebrate surveys.

Address: REI Consultants, Inc. (Corporate Headquarters), 225 Industrial Park Road, Beaver, WV 25813
Phone: 800-999-0105 or 304-255-2500
Email: info@reiclabs.com or fill out an online form here: http://www.reiclabs.com/contact.html

GUIDE FOR SERVICES continued

Well drillers. The following well drilling companies can be contacted for groundwater sustained yield testing.

Foster Well & Pump Company, Inc, Across western VA
http://fosterwellandpump.clickforward.com/drilling-installation/4063818

Services: Water well drilling and related services.

Phone: 434-326-1481
Email: sffosterwell@gmail.com

Virginia Well Drilling, Harrisonburg, VA
http://Vawelldrilling.com

Services: Residential well drilling and related services.

Address: 517 Captain Shands Rd. Weyers Cave, VA 24486
Phone: 540-434-1167 (Harrisonburg) or 540-280-6946 (Augusta County, Staunton, Waynesboro)

Hyre's Well & Pump Service, Rock Cave, WV
http://hyrewater.com/well-drilling/

Services: Water well drilling and related services.

Address: 12849 Route 20 South Road, Rock Cave, WV 26234
Phone: 304-924-6898 or 800-924-3360
Email: info@hyrewater.com or Jason@hyrewater.com

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WATER MONITORING PROCEDURES

1. PREPARATION

When planning to collect water samples, the parameters should be established first. Table 3 in the Guidance for Monitoring Effects of Gas Pipeline Development on Surface Water and Groundwater Supplies provides a recommended list for sampling parameters related to natural gas pipeline development. Budget, desired results, and consultation with the laboratory should guide the final parameter list for sampling.

The laboratory that is chosen for chemical analysis should be certified by the state for each of the parameters that will be tested and they should be aware of the proper testing methodology. A third-party consultant will be aware of the appropriate sampling preparation and procedures, and should make arrangements with the laboratory themselves. If you choose to collect water samples yourself, a consultant or a laboratory can assist you in proper procedures.

2. COLLECTION AND RECORDS

2.1 Documentation of monitoring

Water monitoring events should be thoroughly documented each time they are conducted. The frequency may vary depending on the situation of the landowner, but it should be consistent. For example, every week or every month. Monitoring on a monthly basis, for as long as practical, will provide a good baseline and show the inherent variability in the data. It is also enough information to observe trends, or changes, in the data.

Notes can be recorded in a dedicated notebook, or on a log form designed to collect monitoring information. Many examples can be found online, but the “Water Monitoring Log” included with this report may also be used. A form, such as the “Water Monitoring Log” has the advantage that it provides a template for information to include.

The date, time, name of the person collecting the sample, and the weather should always be included in documentation. Other information may include field measurements, including flow or water level, collected or any observations about the water source or conditions near the water source. Any outside activities, such as construction, should also be recorded.

Photos or videos taken should be properly labeled and time stamped, if possible.

If water samples are being collected, the event should be documented in a written record and with photos and/or videos. Laboratory submittal information should also be recorded, such as the name of the laboratory and the date submitted to the laboratory. A third-party consultant collecting the samples should also keep records of the sampling event, but documentation by the landowner is also recommended.

2.2 Field measurements

A monitoring program is intended to determine whether conditions are changing from the baseline and if additional data collection steps are warranted. One good way to do this is to purchase a meter that can measure the temperature and conductivity (specific conductance) of your water source. Simple devices are also available for measuring turbidity. These meters can often be found for around $100 or less and are easy to use.

Temperature and conductivity

Conductivity can be determined with laboratory analysis or through field measurements using a hand-held electronic meter.

To determine the conductivity of the water, place the conductivity probes into the water where there is some current renewing the water in contact with the probes.

Read the temperature from the meter.

Observe the conductivity readings to make sure they are stable. Even after stabilizing, readings may drift up and down. If that is the case, select a value in the center of the range, but also record the top and bottom of the range.

Turbidity

Turbidity can also be determined with laboratory analysis or through field measurements. Field measurements can be collected with a Secchi tube (

Figure 1). Water is poured into the tube, and the depth at which a small black and white disk (the Secchi disk) cannot be seen correlates to the nephelometric turbidity units (NTUs), which is the measure of turbidity.

To measure turbidity (adapted from Trout Unlimited Water Monitoring Manual):

1. Collect a water sample and pour it into the tube until filled. If you are collecting a sample from a stream or spring, be careful to not stir up sediment from the bottom. The sample should be collected from a flowing portion of the water in a stream or spring.
2. Stand out of direct sunlight. Sunglasses should be removed.
3. Hold the Secchi tube vertically and look straight down into the tube.
4. Lower the Secchi disk into the tube using an attached string.

Lower the disk until the it disappears from view. Raise and lower the disk until you can confirm the point at which it disappears, and record the measurement on the side of the tube. This measurement will be correlated with a NTU number, which should also be recorded. Table 1 below shows the conversion from centimeters to NTUs.

Figure 1: Secchi tube

Table 1: Conversion of centimeters (cm) to nephelometric turbidity units (NTUs)

Depth to Turbidity Conversion					
cm	to	NTU	cm	to	NTU
6	=	240	39	=	16
7	=	200	41	=	15
9	=	150	43	=	14
12	=	100	46	=	13
18	=	50	48	=	12
19	=	45	51	=	11
20	=	40	53	=	10
23	=	35	57	=	9
26	=	30	62	=	8
29	=	25	67	=	7
33	=	21	76	=	6
35	=	19	85	=	5
36	=	18	97	=	4
38	=	17	118	=	3

Flow

Flow volume or flow rate of surface water or springs can be estimated by volume or by comparing to an established marker. Descriptions, such the flow is higher or lower than normal, can be recorded. A yard stick or other measuring device can be installed and the level of the water on the measuring device can be recorded at regular intervals.

For a spring, flow can also be measured using a bucket or other container of known volume and a stop watch. The procedure to measure flow in this manner is to record the seconds it takes to fill the bucket to a known volume. Flow can then be calculated by dividing the volume of water captured by the number of seconds. It is recommended that you make at least three measurements, averaging the calculated flows to arrive at a flow estimate.

For water wells, the static water level can also be recorded on a regular basis. This can be done by purchasing a water level meter, which is a sensor on a measuring tape that is unwound into a well. It beeps when the water is reached, and the depth to the water can then be recorded. However, water level meters generally cost several hundred dollars or more and require homeowners to introduce equipment inside the well casing, which can potentially cause damage or introduce contaminants. For these reasons and others, we recommend hiring a licensed well driller or consultant to monitor your water level.

Water levels in surface water bodies or groundwater can also be monitored using transducer data loggers, which are sensors that, once deployed, can automatically record water level or other measurements frequently and over long time periods. These systems, including the software to manage the data, are generally too expensive to be considered by individual landowners and will require training to program, properly deploy, and interpret the data.

Even recorded observations, such as the well going dry for some period of time, particularly if it never has, are important. Again, any information should be thoroughly documented with notes and photos or videos.

3. RESULTS AND INTERPRETATION

3.1 Maintaining data

Paper copies and electronic versions of the sampling records should be maintained if possible. A three-ringed binder or folder would be appropriate for filing all the paperwork if multiple records will be kept. Laboratories can send data in both paper and digital copies as well for your records.

3.2 Results

The laboratory may offer some information or interpretation of the results; however, this information may be limited since they do not have information about your particular water source. One way to interpret the results is to compare them to state or federal water quality standards.

When testing drinking water—either a well, spring, or surface water—the best source is the USEPA Federal Drinking Water Standards. The drinking water standards establish maximum containment levels (MCLs), which are legal, health-based, enforceable limits for certain contaminants in drinking water. While the USEPA standards apply specifically to public drinking water supplies, they provide a point of comparison for water quality in the samples collected. The USEPA also issues Secondary Standards, which are not health-based and non-enforceable, but provide recommended thresholds for aesthetic qualities, such as taste, odor, and appearance. The most recent version of the drinking water standards can be found on the USEPA website.

https://www.epa.gov/ground-water-and-drinking-water/table-regulated-drinking-water-contaminants

When testing drinking water, West Virginia or Virginia surface water standards can be used for comparison. Surface water standards are established to protect waterways for public health and recreation, aquatic life, and for use in economic pursuits, such as agriculture or fisheries.

The current West Virginia standards can be found here:

http://www.dep.wv.gov/WWE/getinvolved/sos/Documents/WQS/Standards.pdf

The current Virginia standards can be found here:

http://law.lis.virginia.gov/admincode/title9/agency25/chapter260/section140/

4. TOOLS FOR WATER MONITORING

Below are a few recommended meters and a Secchi tube for monitoring water resources.

Conductivity meters

- LaMotte Company Salt/EC/TDS Pocket Tester, Code 1749
  http://www.lamotte.com/en/browse/1749.html

  Online prices range from $150 to $174 for the meter, a carrying case, and calibration solution.

- Oakton WD-35425-10 Waterproof Multiparameter PCSTestr35
  http://www.4oakton.com/proddetail.asp?parent=2&prod=352&seq=2&Totrec=13

  Online prices range from $141 to $165 for the meter and a carrying case.

Secchi tube

- Secchi-Tube (Code ST-60) or (ST-120)
  http://www.watermonitoringequip.com/pages/stream.html

  Online price is $57 for 120 cm tube.

- Secchi tube 120 cm
  http://www.forestry-suppliers.com/product_pages/Products.asp?mi=83631

  Online price is $59.

WATER MONITORING LOG Date: _____

Name of observer: _____

Site Name: _____

Site Type: **_____ Well _____ Spring _____ Surface water**

Event: **_____ Observation _____ Sampling**

Sampler(s): _____

_____

Begin Time: _____ End _____ Page___ of ___

Weather Observation

Air Temperature (°F): _____

Cloud cover: _____

Preciptation (None, Light, Heavy, etc.): _____ Date of last rain:_____

Approximate amount of rain (in.):_____

Other weather notes:_____

_____

Observations

Water clarity (clear, cloudy, etc.):_____

Water odor:_____

Water taste:_____

Has there been a change since last observation? ____Yes ____ No

If yes, describe and provide date of last observation:

_____

_____

_____

_____

_____

_____

Sample collection

Water sample collected? ____ Yes ____ No

Sample ID:_____

Laboratory for analysis:_____

Date submitted to the lab:_____

Chain of custody number:_____

Field Measuerments

Conductivity (µS): _____

Temperature (°C): _____

Turbidity (Secchi tube): centimeters _____ NTUs _____

Flow/Water Level

_____ Observed

Surface or spring flow

_____ Higher than normal _____ Lower than normal _____ About normal

Surface or spring clarity

Describe water clarity:_____

Other observations (flow, smell, taste, etc):_____

_____

_____

_____

Well yield

_____ Higher than normal _____ Lower than normal _____ About normal

Well water clarity

Describe water clarity:_____

Other observations (flow, pressure, smell, taste, etc):_____

_____

_____

_____

_____ Measured

Surface or spring flow

Measurement method: _____ Depth/stage _____ Bucket and stopwatch _____ Other

If other, describe:_____

Depth/stage: _____ Depth/stage measured by: _____

Bucket and stopwatch

	Time (seconds)	Volume (mL)
Trial 1		
Trial 2		
Trial 3		

Average flow (mL/sec): _____

Other technique notes: _____

_____

_____

_____

_____

_____