DEPARTMENT OF ENVIRONMENTAL PROTECTION
Office of Oil and Gas Management

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TITLE:	Guidelines for Implementing Area of Review (AOR) Regulatory Requirement for Unconventional Wells
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AUTHORITY:	2012 Oil and Gas Act (58 Pa. C.S. § 3201 *et seq.*), Clean Streams Law (35 P.S. § 691.1 *et seq.*), 25 Pa. Code §§ 78a.52a and 78a.73
POLICY:	*Unconventional well operators* conducting *hydraulic fracturing* activities should follow this policy to minimize the likelihood of *communication incidents* and to ensure protection of public health, public safety and the environment.
PURPOSE:	The purpose of this guidance is to inform those engaged in *hydraulic fracturing* activities how to comply with the requirements of The Clean Streams Law, the 2012 Oil and Gas Act, 25 Pa. Code Chapter 78a, and other applicable laws. This policy is developed to facilitate appropriate risk mitigation for *unconventional well operators* and includes a risk-based classification scheme for *offset well* locations and commensurate levels of monitoring; sections addressing *communication incident* management, reporting, and resolution; and operational alternatives and technical considerations for different anticipated scenarios. This policy also provides an outline of the Department of Environment Protection's (Department or DEP) well adoption permitting process.
APPLICABILITY:	This Policy applies to *operators* conducting *hydraulic fracturing* activities at *unconventional wells* in the Commonwealth of Pennsylvania.
DISCLAIMER:	The policies and procedures outlined in this guidance document are intended to supplement existing requirements. Nothing in the policies or procedures will affect regulatory requirements. The policies and procedures herein are not an adjudication or a regulation. There is no intent on the part of the Department to give these rules that weight or deference. This document establishes the framework, within which DEP will exercise its administrative discretion in the future. DEP reserves the discretion to deviate from this policy statement if circumstances warrant.
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I. INTRODUCTION

Hydraulic fracturing is a technical procedure utilized by the oil and gas industry to break down rock and extend and prop open fractures in hydrocarbon reservoirs in order to increase oil and gas recovery. It involves the application of surface and hydrostatic pressures that combine to generate bottom hole pressures in excess of rock strength and, thus, fracture the rock. Subsequent to this, emplacement of materials known as proppants occurs to prevent fracture closure after treatment pressure is reduced. Due to the character of the oil and gas reservoirs in Pennsylvania, *hydraulic fracturing* is necessary at most wells to produce commercial quantities of hydrocarbons.

When oil- or gas-bearing reservoirs are vertically isolated from shallower, freshwater aquifers serving as sources of drinking water by adequate intervening rock layers, *hydraulic fracturing* can be utilized with negligible risk to waters of the Commonwealth. However, when other wells penetrate the *zone of hydraulic fracturing influence*, they increase risk by serving as potential conduits to the surface and shallow subsurface. Properly plugged or equipped operating wells notably lessen this risk.

The Area of Review (AOR) regulations of Chapter 78a, found in sections 78a.52a and 78a.73, provide the assessment, reporting, monitoring and incident resolution requirements established to appropriately address risks associated with *hydraulic fracturing* communications. This document provides further clarification related to those sections of the regulations. Wherever possible, materials are sequenced chronologically from an operational perspective.

II. DEFINITIONS

This section of the document provides the Department of Environmental Protection's (DEP) interpretations of terms used in sections 78a.52a and 78a.73 and utilized throughout the document. Many of these terms have context-specific meanings and the definitions are, therefore, provided for clarity related to specific regulatory requirements. This section also includes definitions from the 2012 Oil and Gas Act and 25 Pa. Code Chapter 78a for reference. Note that the terms defined in this section are italicized throughout the document.

Abandoned well – As defined in 2012 Oil and Gas Act (58 Pa.C.S. § 3201 *et seq.*).

Active well – For the purposes of this policy, a well:

(1) That is designed to be capable of flowing or producing hydrocarbons into a metered gathering system, for commercial purposes; or one which is designed to provide natural gas for the purposes of supplying a domestic or commercial property. Both uses defined may apply at a single well.
(2) That has been assigned a permit or registration number by the state of Pennsylvania and has not been designated a status of *Inactive*, *Orphan*, *Abandoned*, or Plugged and Abandoned.
(3) That for the purposes of notification of adjacent *operators*, is being drilled or stimulated if it is determined that it penetrates or is likely to penetrate the zone of influence of the *hydraulic fracturing* activity.
(4) That penetrates below the typically recognized freshwater zone, including gas storage wells, injection wells used for secondary recovery and disposal wells.

(5) That meet criteria (1), (2) or (3) and has not been permitted or registered by the state of Pennsylvania.

Bottom hole location – GPS coordinates of the deepest penetration of the well (decimal degrees) for a vertical well, i.e., *GPS coordinates* of surface hole location; and depth below the last measured *GPS coordinate* pair equivalent surface location for an intentionally deviated or horizontal well. All coordinate data must reference the NAD 83 geodetic reference system.

Closest approach – The point or points along the length of a lateral (horizontal) well bore that potentially fall within the AOR radius (1,000 feet) of an *offset well*.

Communication incident – A transfer of measurable pressure or fluid flow from a well undergoing *hydraulic fracturing* to an *offset well* that is reportable in accordance with this policy. In certain cases, the referenced transfer of pressure or fluid may be evidenced at the well undergoing *hydraulic fracturing*.

GPS (global positioning system) coordinates – A satellite-based positioning system that provides detailed coordinate data, i.e., latitude and longitude. It is composed of user, control, and satellite segments, and allows precise position location quickly and with high accuracy (adapted from Bolstad, 2008). GPS utilizes a worldwide common grid that is easily converted to any local grid, is passive in all-weather operations, gives continuous real-time information, and is capable of supporting an unlimited number of users and areas (adapted from U.S. Air Force, 2016). The accuracy of coordinates provided by any GPS must be compliant with DEP's "Oil and Gas Locational Guidance" (Document Number: 550-2100-009) (+/- 10m) for wells that require *visual monitoring* at the *offset well* location as part of the AOR regulation. It is acceptable to collect locational information using standard surveying techniques. For wells in the area of review depicted on the submitted plat, *GPS coordinates* may be derived from a separate source such as on-file permits or available databases and do not need to be field-verified or compliant with DEP's "Oil and Gas Locational Guidance". All coordinate data must reference the NAD 83 geodetic reference system.

Hydraulic fracturing/hydraulically fractured – Injecting fracturing fluids into the target formation at a force exceeding the parting pressure of the rock, thus inducing fractures through which oil or gas can flow to the well bore (adapted from API Guidance Document HF3, 2011).

Inactive well – A well granted Inactive Status by DEP pursuant to the 2012 Oil and Gas Act (58 Pa.C.S. § 3214).

Landowner – For the purposes of this policy, any owner that has a right or interest in a surface estate. In certain cases, this owner may also have rights or interests in the mineral estate or oil and gas rights.

Offset well – Any *Active, Inactive, Orphan, Abandoned* or Plugged and Abandoned well surrounding a well that is undergoing *hydraulic fracturing*.

Orphan well – As defined in 2012 Oil and Gas Act (58 Pa.C.S. § 3201 *et seq.*).

Owner (of a well) – An *owner* per Pennsylvania's Oil and Gas Act, 2012 (58 Pa.C.S. § 3203) is defined to be person who owns, manages, leases, controls or possesses an oil or gas well. *Owner*

does not include owners or possessors of surface real estate property on which an *abandoned well* is located who did not participate or incur costs in the drilling/extraction operation of the *abandoned well* and has no right of control over the drilling/extraction operation of the *abandoned well*. An *owner* is not necessarily the same individual as the *Responsible Party/Operator* (see definition that follows), but is understood to be the person who has legal access to the well, and legal rights to any economic benefit, i.e. production, from the well.

Responsible Party/Operator – The person designated as the well *operator* or *operator* on the permit application or well registration per Pennsylvania's Oil and Gas Act (58 Pa.C.S. § 3203), i.e., the permit holder. Where a permit or registration was not issued, the term shall mean any person who locates, drills, operates, alters or plugs any well or reconditions any well with the purpose of production therefrom. In cases where a well is used in connection with the underground storage of gas, the term also means a "storage *operator*." Simply "locating" a well without the purpose of producing it does not assign *responsible party* status to an *operator* developing an area. The *responsible party* for the condition and maintenance of a well is assumed to be equivalent to the *operator*, but could also be the *owner* in the case where the two are not the same.

True vertical depth/True bottom hole depth – For the purposes of the AOR regulations, these terms should be considered to be equivalent. *True bottom hole depth* is defined to be the best available estimate of the depth in feet below the surface hole location for the deepest penetration point of the well. This shall be either as reported in available records, or represent a best technical estimate provided by the *operator* in consideration of development history in the state in the area of activity. For an intentionally deviated well, this is the depth below the x-y equivalent surface location of the deepest penetration point.

Unconventional formation – As defined in Oil and Gas Act of 2012 (58 Pa.C.S. § 3201 *et seq.*).

Unconventional well – A bore hole drilled or being drilled for the purpose of or to be used for the production of natural gas from an *unconventional formation* (as defined in the Oil and Gas Act of 2012 (58 Pa.C.S. § 3201 *et seq.*).

Visual monitoring – Verification at the location on the ground that is the identified site of a well bore requiring monitoring or some other feature that would require such monitoring. Eye contact or instrumentation are both suitable mechanisms for completing *visual monitoring* and "visual" inspections may be completed at a time interval that is respective of how well the site requiring monitoring is secured and the risk the monitored site poses.

Well control incident/loss of well control – A scenario where the treatment pressure, producing pressure, and/or annular pressure of the well being treated or any *offset well* deviates from anticipated pressures in a manner that indicates mechanical integrity has been compromised and continued operations pose a risk to personnel safety, equipment integrity, or the environment (adapted from API RP 100-1, 9.4.5, 2015). This definition also includes any situations where a *communication incident* requires mobilization of specialized equipment to enter an *offset well* under pressure in order to circulate out a kick.

Zone of hydraulic fracturing influence – A vertical buffer distance referencing upward or downward offsets from notch or perforation elevations in order to define what *offset wells* falling in the AOR have the highest potential to be communicated with during *hydraulic fracturing*

activities. The *zone of hydraulic fracturing influence* is defined as a function of perforation elevation and is set at +/- 1,500 feet for all *unconventional wells*.

III. AOR GEOMETRY

Sections 78a.52a. and 78a.73 require an *operator* of *unconventional* wells to identify wells within a specific area, execute monitoring at a subset of those wells having certain penetration depths, and submit a report and accompanying plat to DEP containing the information required by section 78a.52a(c) prior to drilling the well. These areas and penetration depths are a function of the well attributes that is the subject of the area of review, i.e., the well that will be stimulated using *hydraulic fracturing*.

For horizontal and vertical *unconventional wells*, survey distances reference the plan view projection of the well bore path and are set at 1,000 feet in all directions surrounding it. The well bore path in plan view for vertical wells is the surface hole location. *See* § 78a.52a(a).

True vertical depths of *offset wells* determine notification responsibilities and whether or not wells located within the AOR must be visually monitored during *hydraulic fracturing* activities. Vertical buffer distances, referencing perforation elevations for cased hole completions are established at +/- 1,500 feet for all *unconventional wells*. *See* § 78a.73(c).

Schematics depicting AOR geometries are included in Appendix A.

A. AOR Geometry Selection Table

Select the characteristics that describe the well that is the subject of the AOR:

Table 1. AOR Geometry Table.

Well Type	Orientation	AOR Distance (ft)	Wells Requiring Monitoring
Unconventional	Vertical	1,000	all that penetrate within +/- 1,500 feet of uppermost and lowermost perforations
Unconventional	Horizontal	1,000	all that penetrate within +/- 1,500 feet of uppermost and lowermost perforations

IV. REFERENCE MATERIAL REVIEW

Section 78a.52a(b)(1)–(2) provides that *operators* must identify *offset wells* by (1) conducting a review of DEP's well databases and other available well databases and (2) conduct a review of historical sources of information, such as applicable farmline maps, where accessible. Numerous sources of information are available for determining the locations of *offset wells* falling within the AOR.

DEP has identified several well databases and historical sources of information to ensure compliance with the identification requirements in section 78a.52a(b)(1)-(2). In addition to a desktop review of databases and historical sources, a thorough field survey may, in many cases, be a superior way to identify offset wells. Additionally, as *operators* field locate *offset wells* included the AOR report deliverables package, DEP will review and verify this information, as

resources allow; make necessary corrections; and add previously unidentified wells to its own databases.

Table 2 lists required sources to be used for completing the AOR survey as well as other potentially useful sources. With the exception of the required sources, discretion may be applied by the *operator* to arrive at a final conclusion regarding which reference sources may be most useful for assessing their site. Required sources are shaded in red.

Table 3 provides additional pay-for-service sources that may be useful when completing the AOR survey. Note that accessing these additional reference materials is not a regulatory requirement and that the compilation is provided for informational purposes only.

A. Reference Material Requirements Checklist

- Review list of reference materials in Table 1 and the associated Map Indices in Appendix B. Apply professional discretion to determine which reference materials should be used to locate *offset wells* at your site, keeping in mind that the DEP Oil and Gas Map (or associated databases) and DCNR Open File Report OFOG 15 01.2 (Map 10) must always be consulted for any portions of the AOR not surveyed on foot – these sources are shaded in red.
- Construct a table of well locations by status and list the reference material source used to identify each well.
- Determine which wells will require monitoring, i.e., which wells penetrate the *zone of hydraulic fracturing influence*?
- Indicate which wells in the AOR will require notification of adjacent *operators*.

Table 2. List of Publicly Available Reference Materials

Note that not all sources provide statewide coverage and professional judgment should be applied to determine which sources are appropriate for the site being assessed. A thorough field survey is recommended in certain cases.

Source	Geographic Area of Applicability	Location	Comments	Instructions for Use
County/Local Historical Societies	Statewide	Establish local contacts through various mechanisms	These organizations often archive historical maps which may be inclusive of oil and gas well locations	Find contact information and call organization to determine if any sources are available for review.
DCNR BTGS Reports and Publications	Limited Geographic Extent	http://www.gis.dcnr.state.pa.us/geology/index.html Also see Map Index in Appendix B	Reports and other publications with maps depicting oil and gas well locations associated with different fields throughout the commonwealth	Navigate to PaGEODE website and search for reports by quadrangle. Compare to Appendix B to determine which reports cover oil and gas topics and download applicable reports for review or visit BTGS in Pittsburgh to review report.
DCNR BTGS Farmline Maps	Limited Geographic Extent	See Map Index in Appendix B	Farmline map collection willed to Bureau of Topographic and Geologic Survey by Equitable	Reference Appendix B to determine if maps are available that cover drilling site and consult BTGS to review maps.
DEP Oil and Gas Map[1]	Statewide	http://www.depgis.state.pa.us/PaOilAndGasMapping/	Web-based GIS for mapping wells throughout the state	Navigate to area of operation and select well by status to view locations. Note that this information can also be downloaded in tabular format from DEP's website: http://www.dep.pa.gov/Business/Energy/OilandGasPrograms/OilandGasMgmt/Oil-and-Gas-Reports/Pages

Source	Geographic Area of Applicability	Location	Comments	Instructions for Use
DEP Production Reporting	Statewide	https://www.paoilandgasreporting.state.pa.us/publicreports/Modules/Welcome/Agreement.aspx	Most useful in situations where adjacent *operator* cannot be successfully contacted using available DEP address, as sometimes other companies report production on behalf of the *operator* and may be able to provide updated contact information	Search for well using API #. Contact DEP (717.772.2199) to determine who reported production for the well in question.
DEP Spud Report[1]	Statewide	http://www.depreportingservices.state.pa.us/ReportServer/Pages/ReportViewer.aspx?/Oil_Gas/Spud_External_Data	For wells in process of being drilled that have not yet been input in eFACTS or EDWIN	Use option for querying by location, i.e., query by municipality to determine what wells may be in process of being drilled or what wells have been drilled but not entered into eFACTS.
PASDA Historic Wells and Mine Map Atlas	Limited Geographic Extent	http://www.pasda.psu.edu/	This currently includes wells that were digitized from analog source maps (WPA and K-sheet/H-sheet mine map series) by DEP and wells located in the footprint of historic coal mines (Mine Map Atlas); this is not a comprehensive compilation and is subject to updates	In the "Data Search" box in the upper right corner of the main website, search for "historic wells." Click on the title and then click preview data to see locations in map form or to download a scanned map. The mine Map Atlas link is on main PASDA Page.
Penn Pilot	Statewide	http://www.pennpilot.psu.edu/	Archive of historical aerial imagery	Input address or coordinates to download associated aerial images. Options include filtering on location and image era. Images from the 1930s to 1970s are available.
The National Map	Statewide	http://viewer.nationalmap.gov/viewer/	Archive of current USGS topographic maps	Input address or coordinates and select "Other Featured Data" to view available topographic maps.

Source	Geographic Area of Applicability	Location	Comments	Instructions for Use
USGS Historical Topographic Map Explorer	Statewide	http://historicalmaps.arcgis.com/usgs/	Archive of current and historic USGS topographic maps	Input address or coordinates to review available historical topographic maps for the site. Maps from late 1800s to 1980s are available.
Google Earth Pro	Statewide	https://www.google.com/earth/	Aerial imagery dating back 1990s	After downloading free software, input address or coordinates to review available historical aerial imagery for the site.
USGS Reports and Publications	Limited Geographic Extent	http://energy.usgs.gov/RegionalStudies/AppalachianBasin.aspx	Archive of open-file reports discussing development histories in various portions of Appalachian basin	Compare to Appendix B to determine which reports cover oil and gas topics and visit BTGS in Pittsburgh to review report.
Industry Historic Map Inventory	Limited Geographic Extent	Various	Any maps in the possession of the *operator* completing *hydraulic fracturing*	Review available maps.
DCNR Open File Report OFOG 15-01.2 (Map 10)	Statewide	http://www.dcnr.state.pa.us/topogeo/publications/digitaldata/index.htm#oil	GIS layer that provides comprehensive compilation of oil and gas well depths in Pennsylvania	Download Open File Report files from DCNR website and import shapefiles into GIS

[1]Indicates mandatory reference source (shaded red).

Table 3: List of Pay-for-Service Reference Materials

Note: May have additional information useful for completing the AOR survey.

Source	Location	Comments
Core Lab Consortia	http://corelab.com/	None
DrillingInfo	http://drillinginfo.com/	None
EDWIN (formerly PAIRIS/WIS)	https://edwin.onbaseonline.com/1500AppNet/Login.aspx	Database containing well records/completion reports for oil and gas wells drilled in Pennsylvania
ENERDEQ	https://www.ihs.com/products/oil-gas-tools-enerdeq-browser.html	An IHS service
IHS	https://www.ihs.com/products/us-well-data.html	None
ITG	www.ITG.com	Analysis of data
Natural Gas Intelligence	http://www.naturalgasintel.com.newsletters/2-shaledaily	Analysis of data
TGS Well Log Data	https://llp.tgsnopec.com/llp/index.aspx	None
Woodmac	http://www/woodmac.com	Analysis of data

V. LANDOWNER COORDINATION/SURFACE ACCESS

In addition to reviewing databases and historical sources to identify *offset wells* in section 78a.52a(1)–(2), section 78a.52a(b)(3) requires the *operator* to submit a questionnaire by certified mail on forms provided by DEP to *landowners* whose property is within the AOR. The intent of this questionnaire is to solicit information regarding the precise location of *offset wells* on their property. Section 78a.52a(c) requires the *operator* to provide proof of notification that the *operator* submitted questionnaires to those applicable landowners. This regulatory process defined is also critical for coordinating surface access to locate any wells in the field that the *operator* is responsible for monitoring.

All information gathered as part of *landowner* surveys conducted in accordance with section 78a.52a(b)(3) may be cataloged for reuse by the *operator* for up to three (3) years from the date surveying of the parcel was completed. With approval from DEP, information gathered using the development plan option described below may be referenced for an additional two (2) years for a total of five (5) years from the date of collection. Information collected is transferrable to other *operators* who may acquire a lease in situations when the original, documented survey results are provided to the new *operator*.

A. Use of DEP Landowner Survey Form

In accordance with section 78a.52a(b)(3), DEP developed a form for completing the required *landowner* surveys: 8000-PM-OOGM0148U. This form must be sent via certified mail, as defined in 25 Pa. Code § 78a.1, to all *landowners* occupying parcels within the established AOR. It is recommended that a reference map be included with the form to best assist the *landowner* in determining whether or not wells they are aware of fall within the AOR. The form must be mailed to the person identified in courthouse records of the county who is designated to receive tax notices for the surface tax parcel, although this person may appoint a local designee. If more than one tax parcel within the prescribed AOR radius is registered to the same individual, multiple tax parcels can be included on a single form. Multiple proposed *unconventional* drilling locations may also be referenced on a single form. This is most relevant in situations where a *landowner* owns are large parcel or when a single parcel contains a multi-well pad.

The instructions accompanying the form specify that a *landowner* or the landowner's designee should complete and return the form to the *operator* within ten (10) business days of receipt. It is not required that certified mail receipts or completed forms be sent to DEP along with the AOR deliverables package, but the process must be verified by the *operator* completing the AOR report form. It is recommended, but not required, that all certified mail receipts and completed questionnaires be retained by the *operator* for five (5) years following the completion of *hydraulic fracturing* activities as documentation that the regulatory requirements were satisfied. This may also facilitate the transfer of *landowner* survey information to other *operators*.

As part of the survey, *landowners* are asked to provide documentation of any wells they are aware of on their property. Documentation may be in the form of pictures (physical evidence) or records (historic maps, well records, etc.). *Landowners* are also asked if they would be willing to share documentation concerning any wells with *operators* and allow the *operator* access to their property to evaluate any identified wells, including

those known by the *landowner* and any wells the *operator* may have become aware of through analysis of available reference materials.

There is no expectation that *operators* access wells under any of the following scenarios:

(1) The *landowner* does not complete the questionnaire within a reasonable timeframe or at all.
(2) The *landowner* does not acknowledge that any physical evidence of a well's presence exists nor do they indicate that they have any official records documenting the presence of a well.
(3) The *landowner* claims they have physical evidence or official records documenting the presence of wells on their property but is unwilling to share such information with the *operator*.
(4) The *landowner* will not grant access to the *operator*.
(5) Research completed by the *operator* and documented along with the AOR report deliverables indicates that any wells that may be present on the *landowner's* property are not likely to penetrate within the *zone of hydraulic fracturing influence* and the *landowner* has not provided any information that would call into question the validity of this determination.

B. Use of Development Plan Form

Many *operators* have lease agreements with state agencies or coordinate with land management agencies when oil and gas rights are severed from surface rights. Private *landowners* may also own significant acreage in rural areas. It is more common in these situations for development to take place on large tracts of land. Additionally, *operators* may wish to evaluate many smaller tracts of land at one time to prepare for well pad development. An operator may fulfill the requirements in section 78a.52a(b)(3) by coordinating with *landowners* to identify *offset wells* as presented in this section of the document.

Use of the Development Plan form, which is designed to enable efficiency measures, may be appropriate in the following scenarios:

(1) An *operator* has a lease agreement with a state or federal agency or a working access agreement with the agency in cases where oil and gas rights are severed from surface rights, e.g., DCNR, USFS, PGC, etc.).
(2) An *operator* is dealing with one or several large *landowners*.
(3) An *operator* is looking to evaluate large tracts of land (possibly with numerous surface *landowners*) in preparation for significant exploration efforts and to complete due-diligence assessments prior to finalizing site construction, drilling, and *hydraulic fracturing*.

The Development Plan form and accompanying instructions (8000-PM-OOGM0147U) are accessible from DEP's website and may be utilized for coordinating with landowners and identifying *offset wells* under the development plan option. The form allows the *operator* to maintain an electronic tabular summary of parcels associated with multiple well locations. Because this process potentially covers much larger areas of development, it necessarily requires more lead time/earlier coordination with *landowners*

and it should not be used in situations where information must be gathered within ten (10) business days, although the forms associated with the 10-day process must be used to facilitate the collection of information needed under the development plan option per the regulatory requirements of section 78a.52a(b)(3). *Operators* choosing the development plan option should allow for up to 30 business days for receipt of responses and may request approval from DEP to extend the reference period up to a maximum of five (5) years for any single well location.

It is recommended, but not required, that information used to complete the *landowner* survey (questionnaires, certified mail receipts, etc.) be retained by the *operator* for five (5) years following the completion of *hydraulic fracturing* activities as documentation that the regulatory requirements of section 78a.52a(b)(3) were satisfied. This may also facilitate the transfer of survey information to other *operators*.

C. Land Management Agency/Commission Contacts

In situations where a government agency or commission serves as the *landowner*, *operators* should use the following contact information to best coordinate *landowner* surveying activities.

(1) PA Fish & Boat Commission
Property Services Chief/Real Estate Chief
450 Robinson Lane
Bellefonte, PA 16827
814-359-5221 or 814-359-5108
RA-fbpropertyservice@pa.gov

(2) Forest Service/Allegheny National Forest
Supervisor's Office
4 Farm Colony Drive
Warren, PA 16365
Attention: Colleen Kelly

(3) DCNR Bureau of Forestry
Minerals Division
P.O. Box 8552
Harrisburg, PA 17105-8552
Attention: Chief, Oil and Gas

(4) DCNR Bureau of State Parks
P.O. Box 8551
Harrisburg, PA 17150-8851
Attention: Chief, Park Operations and Maintenance Division

(5) PA Game Commission
BWHM - Environmental Planning and Habitat Protection Division
OGM Section
2001 Elmerton Avenue
Harrisburg, PA 17110-9797

D. Landowner Coordination Requirements Checklist

- Have all parcels in the AOR been identified and have addresses been determined for each *landowner*?
- Have *landowner* questionnaires been submitted to each property owner in the AOR?
- Were *landowner* questionnaires submitted via certified mail?
- Is it necessary to schedule site visits to inspect any alleged wells or wells identified by the *operator* through the database or historic source review?
    - The *landowner* has completed and returned the questionnaire within a reasonable time.
    - The *landowner* has acknowledged that physical evidence of a well's presence exists or indicated that they have official records documenting the presence of a well and is willing to share this information.
    - The *landowner* has agreed to grant access to the *operator*.
    - Research completed by the *operator* and documented along with the AOR report deliverables indicates that at least one well present on the *landowner's* property is likely to penetrate within the *zone of hydraulic fracturing influence* or the *landowner* has provided information that at least one well on their property is likely to penetrate the *zone of hydraulic fracturing influence*

E. Other Considerations

- Were site maps included with each *landowner* questionnaire?
- Have returned questionnaires, certified mailing receipts, and other forms of documentation been placed in a file that has a retention schedule of five (5) years following the completion of *hydraulic fracturing* activities?
- Has the *operator* determined that it will be important to document conditions at wells on a *landowner's* property prior to *hydraulic fracturing* activities even in a situation where communication risks are low, i.e., is there concern that a false claim regarding a *communication incident* may be filed?
- Is a plan in place for attempting to re-contact unresponsive *landowners* in areas where communication risks are elevated?

VI. ADJACENT OPERATOR COORDINATION

Section 78a.73(c) requires *operators* completing *hydraulic fracturing* activities to notify adjacent *operators* with *offset wells* that penetrate the *zone of hydraulic fracturing influence*. The intent of this section is to facilitate the necessary level of coordination between *operators* in order to mitigate risk and ensure the integrity, safety, and continued viability of assets.

A. Wells Within the AOR

After defining the AOR and prior to drilling, the *operator* shall contact all adjacent *operators* who are responsible for *active*, *inactive*, *abandoned*, and plugged and abandoned wells in situations when the intended zone of completion (proposed

perforation elevations) for the planned well is within +/-1,500 feet of any portion of any *offset well* bore path intersecting the AOR.

For recently plugged wells identified within the AOR that intercept the *zone of hydraulic fracturing influence*, i.e., those plugged within the preceding 12 months, the *operator* who plugged the well is considered the *responsible party* and during coordination this should be clearly established. Such wells include those where the final site restoration has not yet been completed/approved and/or the bond has not yet been released. The *operator* intending to complete *hydraulic fracturing* activities may request that DEP complete an inspection of the well prior to stimulation. Such inspections will be completed at the agency's discretion. Note that this assignment of responsibility for recently plugged *offset wells* is exclusive to the AOR regulation and shall not be interpreted to apply in other contexts, unless directed by DEP.

In accordance with section 78a.73(c), adjacent *operators* whose wells fall within the AOR shall be notified of intended operations at least 30 days in advance of the anticipated spud date, or at the time the well drilling permit is submitted if it is expected that the well will be spud within 30 days of permit issuance. Wells in the process of being drilled or stimulated are classified as *active* if the definition in this policy is satisfied and must be considered during the analysis. *Operators* are also expected to coordinate notification and monitoring activities within different business units of their own companies.

DEP's Well Inventory Report serves as the resource identifying the most up-to-date contact information for *operators* in the state and can be accessed from the agency's reporting page. *Operators* intending to complete *hydraulic fracturing* activities should maintain documentation of attempts to contact adjacent *operators* for up to five (5) years following well completion.

B. Adjacent Operator Coordination Requirements Checklist

- Has notification been provided to *operators* with *offset wells*, including recently plugged wells (within the last 12 months), within the AOR at least 30 days prior to anticipated well spud?
- Has notification to different business units, e.g., drilling, completions, operations been provided within the company intending to conduct *hydraulic fracturing* activities?
- Has the *hydraulic fracturing* operations team been briefed about actions that must be taken when notified by an adjacent *operator* about a confirmed *communication incident*?

C. Other Considerations

- Are coordinated monitoring efforts with the adjacent *operator* needed in consideration of the communication risk at the location?
- Have communication protocols for implementation during *hydraulic fracturing* activities, including timely notification in the event of an unintended communication, been established with the adjacent *operator*?

- Has the subject of workover procedures been discussed with the adjacent *operator*, including scenarios where well work may be necessary to ensure mechanical integrity and/or environmental protection standards? Has it been determined who may assume financial responsibility for such work and the legal mechanisms for moving forward with adequate liability protection?
- Have risk mitigation strategies been fully evaluated in situations where an adjacent *operator* has not been cooperative? Such strategies may include revising/eliminating *hydraulic fracturing* stages or redirecting the targeted well bore path for horizontal *unconventional wells*, moving the well location an appropriate distance from the *offset well*, and/or completing visual observations from a distance.
- Have all correspondence or attempts to communicate with the adjacent *operator* been adequately documented and archived in a file with a retention schedule of five (5) years?

VII. WELL MONITORING

A. Hydraulic Fracturing Communication Risks and Monitoring Levels

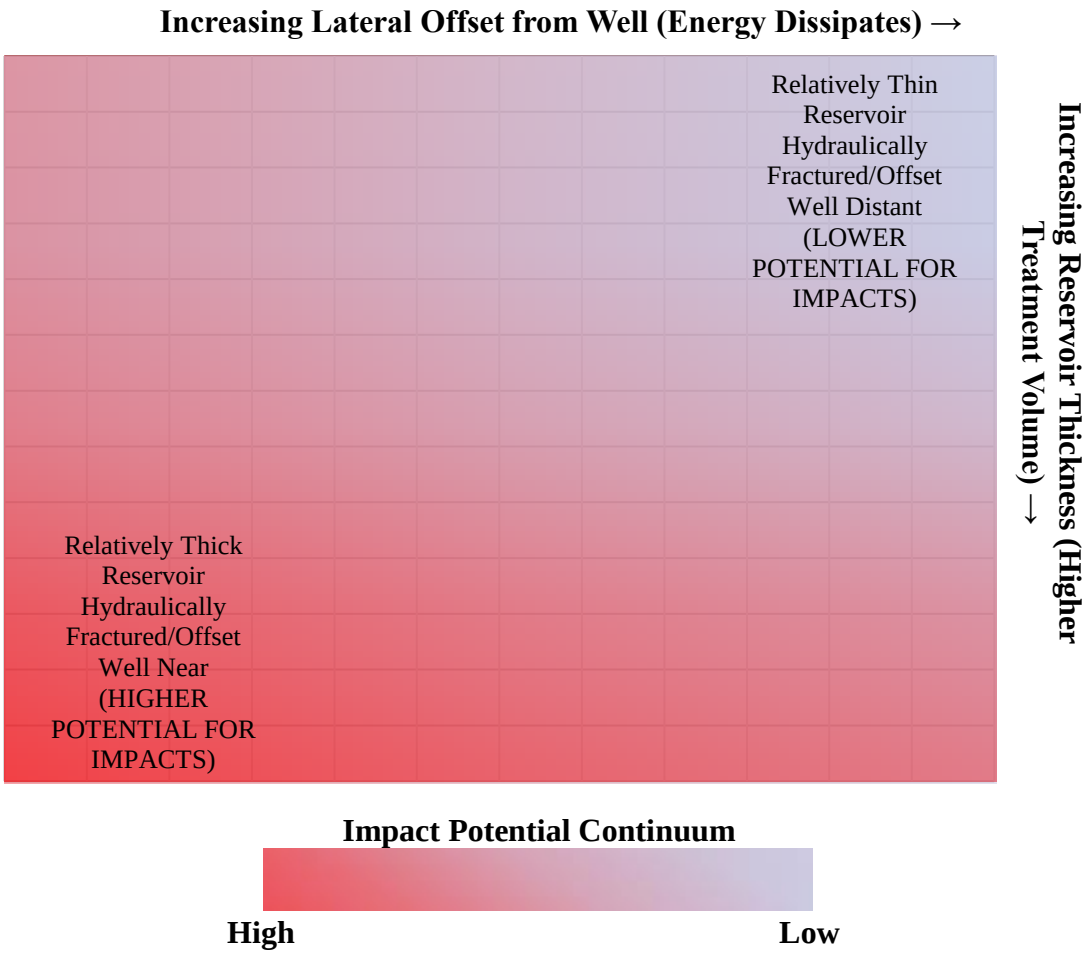
Section 78a.73(c) requires *operators* to visually monitor *offset wells* during stimulation activities that penetrate within 1,500 feet measured vertically from the stimulation perforations or have an unknown true vertical depth. Not all *offset wells* penetrating the *zone of hydraulic fracturing influence* pose the same level of risk. An assessment of historical data and *communication incidents* supports the concept that communication risks are a function of several different variables including *offset well* location, depth, construction details, age, and status. Several of these variables are interrelated, making it possible to further simplify the risk-characterization model. For this reason, there are several options available for the *operator* to meet the monitoring requirements in section 78a.73(c) based on the risk-classification criteria described below.

Key risk-classification criteria are:

(1) Character of the *hydraulic fracturing* activity.
(2) Character and location of wells in the AOR.

A generalized risk-classification scheme is presented in the figures that follow. Figure 1 categorizes the potential for impact as a function of reservoir thickness and offset distance between the stimulated wells and surrounding wells falling within the AOR. Figure 2 considers the character of the wells within the AOR.

Figure 1: Conceptual Model of Impact Potential



Conceptual model characterizing impact potential based on treatment volume (reservoir thickness) and offset distance for wells within the AOR.

Figure 2: Risk Characterization at Offset Wells

Description	General Risk Level
Wells within AOR which do not penetrate the *zone of hydraulic fracturing influence*	NEGLIGIBLE
Wells inside AOR which penetrate the zone *of hydraulic fracturing influence*	
Active wells being drilled	LOWER
Active wells in production/*inactive wells*	
Zone of hydraulic fracturing influence/pressure isolation is verified	LOWER
Lack of *zone of hydraulic fracturing influence*/pressure isolation	HIGHER
Plugged and/or *abandoned wells*	
Well plugged in accordance with current regulations and laws	LOWER
Well plugged prior to passage of Act 223 (1984 Oil and Gas Act)	MODERATE
Well plugged prior to permitting era (1956)	HIGHER
Well on DEP's orphan and abandoned list	HIGHER
Abandoned well for which plugging status is unknown	HIGHER

Characterization of risk associated with *offset wells* within the AOR that penetrate the *zone of hydraulic fracturing influence* and *offset wells* within the AOR which do not penetrate the *zone of hydraulic fracturing influence*. Note that site-specific well plugging methodologies may have significant influence on the portion of the classification scheme related to *abandoned wells*.

Suggested levels of monitoring are established in Figure 3. Scenarios requiring adjacent *operator* notification, as specified in section 78a.73(c), are also summarized for reference. Finally, general monitoring/risk mitigation options are described. It is important to note that no accurate historical records of *hydraulic fracturing communication incidents* have been kept. Because of this, the suggested monitoring levels are not quantitative and instead represent relative levels of perceived risk.

Figure 3: Suggested Monitoring Levels, Notification Responsibilities, and Monitoring/Risk Mitigation Options

Description	General Risk Level or Suggested Monitoring Level	Monitoring/Risk Mitigation Options
Wells within AOR which do not penetrate the *zone of hydraulic fracturing influence*	(NEGLIGIBLE)	NONE
Wells inside AOR which penetrate the *zone of hydraulic fracturing influence*		
Active wells being drilled	(LOW)	NOTIFICATION ONLY
Active wells in production/*inactive wells*		
Zone of hydraulic fracturing influence/pressure isolation is verified	(LOW)	NOTIFICATION ONLY
Lack of *zone of hydraulic fracturing influence*/pressure isolation	(HIGH)	NOTIFICATION ONLY
Active wells in production or being drilled/*inactive wells* (adjacent *operator*)	(LOW)	NOTIFICATION ONLY
Plugged and/or *abandoned wells*		
Abandoned well or well plugged within preceding 12 months (adjacent *operator*)	(LOW)	NOTIFICATION ONLY
Well plugged in accordance with current regulations and laws	LOW	CHECK POST-COMPLETION
Well plugged prior to passage of Act 223 (1984 Oil and Gas Act)	MEDIUM	CHECK PRE- AND POST-COMPLETION
Well plugged prior to well permitting era (1956)	HIGH	CONTINUOUS MONITORING OR ENSURE CONTAINMENT
Well on DEP's orphan and abandoned list	HIGH	CONTINUOUS MONITORING OR ENSURE CONTAINMENT
Abandoned well for which plugging status is unknown	HIGH	CONTINUOUS MONITORING OR ENSURE CONTAINMENT

Summary table of *offset well* characteristics, general risk level (in parentheses for wells requiring notification only) or suggested monitoring levels, notification responsibilities, and monitoring/risk mitigation alternatives. Note that time intervals over which continuous monitoring is required is dependent upon the character of the *hydraulic fracturing* operation and is further refined in Figure 4.

B. Standard Monitoring Plans

After locating all wells known to fall within the AOR, the *operator* must identify the subset of those wells that require monitoring in accordance with section 78a.73(c): intended zone of completion (proposed perforation elevations) for the planned well is within +/-1,500 feet of any portion of any *offset well* bore path intersecting the AOR.

Suggested options for both *visual monitoring* and ensuring containment are provided below. The operator may employ one or more of the listed techniques based on the operator's evaluation of the AOR. This list may not be comprehensive, i.e., there may be other techniques that satisfy the regulatory requirements related to monitoring. In all cases, it is essential that the *operator* coordinate with DEP prior to connecting any equipment to an *offset well* with no *responsible party*, as repercussions related to ownership responsibilities are at stake.

Monitoring/Containment techniques:

(1) Employ RTU/continuous monitoring/automatic shut-in devices at producing wells (monitoring/containment)
(2) Empty tanks at producing wells for optimum capacity (containment)
(3) With prior DEP authorization, equip *abandoned wells* with pressure gauges (monitoring)
(4) With prior DEP authorization, equip *abandoned wells* with tanks (containment)
(5) Plug or re-plug *abandoned wells* (containment)
(6) Install continuous gas meters/flow meters or employ hand-held gas meters at *abandoned wells* (monitoring)
(7) Appoint field personnel with radio contact to observe adjacent wells (monitoring)
(8) Install chart gauge(s) at producing wells for a permanent pressure record (monitoring)
(9) Use flagging tape and maintain clear observation pathways for *abandoned wells* that can be viewed from the rig operations area (monitoring)

Section 78a.52a requires the operator to submit a monitoring plan for wells that must be monitored under section 78a.73(c), including the methods the operator will use to monitor these wells. A standard monitoring plan is provided for *unconventional wells* in the table that follows (Figure 4). The plan does not cover incident response, as that subject is covered in Section X (Incident Reporting and Resolution). Monitoring protocols are based on relative, perceived risk levels. *Operators* also have the option of developing site-specific monitoring protocols that consider *communication incident* risks identified in this policy. Such an approach may rely on well-field geometries/preferred fracture propagation orientations and the character of the *hydraulic fracturing* activity e.g., treatment volumes and pressures used. In such situations, the site-specific assessment must be submitted as part of the AOR summary report. It is strongly recommended that the details of site-specific monitoring plans also be discussed with DEP prior to implementation. Under no circumstances may a monitoring plan be proposed that does not involve the *operator* confirming whether or not a *communication incident* has taken place through *visual monitoring*.

Figure 4: Standard Monitoring Plan for Unconventional Well

<table>
<tr><th rowspan="2">Well Type</th><th rowspan="2">Orientation</th><th rowspan="2">Depth (ft)</th><th colspan="3">Pre-Hydraulic Fracturing/During Hydraulic Fracturing Actions Based on Established Monitoring Level</th><th colspan="3">Post-Hydraulic Fracturing Actions Based on Established Monitoring Level</th></tr>
<tr><th>Low</th><th>Medium</th><th>High</th><th>Low</th><th>Medium</th><th>High</th></tr>
<tr><td rowspan="2">Unconventional</td><td rowspan="2">Any</td><td rowspan="2">Any</td><td rowspan="2">No pre-hydraulic fracturing requirements</td><td rowspan="2">Visually observe pre-hydraulic fracturing</td><td>Ensure containment</td><td colspan="3" rowspan="2">At conclusion of hydraulic fracturing, check all identified offset wells requiring monitoring within AOR</td></tr>
<tr><td>Visually observe offset well continuously during closest approach</td></tr>
</table>

Note: The plan does not cover incident response, as that subject is covered in Section X (Incident Reporting and Resolution).

C. Well Monitoring Requirements Checklist

- Have the construction characteristics, age, and status of the *offset wells* in the AOR been determined and used to assign the appropriate monitoring level (Figure 3)?
- For *offset wells* in the AOR requiring monitoring, has well integrity been assessed based on surface observations and a review of available records?
- Has a risk-based monitoring plan been developed for *offset wells* within the AOR?

D. Other Considerations

- Has the character of the *hydraulic fracturing* activity been defined in terms of anticipated treatment pressures, volumes, and pump durations and compared to the information in Appendix C?
- Has the expected type of fracture plane orientation, e.g., vertical or horizontal, been determined for the interval(s) being targeted for production?
- Does the risk change as a function of what activity is being completed at the well undergoing *hydraulic fracturing*, i.e., multi-zone or multi-stage completions?
- Have the standard monitoring protocols been considered (Figures 4 through 8)?
- Has a plan for securing high-risk *offset wells* in the AOR been executed to minimize the potential for environmental impacts?

VIII. AOR REPORT DELIVERABLES

Section 78a.52a(c) requires the *operator* to submit a report summarizing the AOR review, including (1) a plat, (2) proof of submitting questionnaires to landowners, (3) a monitoring plan, and (4) the true vertical depth of offset wells in the AOR, if known. The AOR report consists of standard components that will be useful for creating a database detailing *operator* activities associated with the regulation. The AOR report also consists of site-specific analyses and plans that are not easily transferable to a tracking system, but are nonetheless important for recognizing and addressing variability throughout the different oil and gas producing areas of the state. This section of the guidance provides a tabular summary of the standard AOR deliverables, as well as a discussion of considerations related to the composition of the accompanying site-specific report. Note that an electronic plat must also be filed in conjunction with each AOR report. The AOR report must be submitted electronically to DEP at least 30 days in advance of well spud, or in cases where a well will be spud within 30 days of permit issuance, along with the well permit package in accordance with section 78a.52a(d).

A. Standard AOR Report Electronic Summary Table

In accordance with section 78a.52a(d), each AOR report must be submitted electronically using the standard form available on DEP's website. Instructions have been developed for completion of the report (8000-FM-OOGM146U). Figure 5 is a tabular summary of the standard components that must accompany each submittal. Note that not all parameters listed apply for each report developed. Those that are not relevant should be left blank. Each tabular report shall cross-reference a plat using the designated well ID. The plat must consist of an electronically rendered map, drawing, or print that is accurately drawn to scale and depicts all wells listed in the AOR report along with other relevant features.

Additional information concerning the well that is the subject of the AOR must also be provided. This information shall be inclusive of anticipated surface and *bottom hole GPS coordinates* for the well that will be stimulated by way of *hydraulic fracturing* and the API number, or the farm name and number for a well that has not yet been permitted. Finally, *operators* must indicate if all *landowners* within the AOR have been notified and whether or not proof of notification is on file.

B. Site-specific AOR Report

In certain cases, the *operator* completing the AOR survey may develop a site-specific narrative report to accompany the electronic summary table. Information in the report may consist of the following:

(1) The specifics of the risk assessment completed to determine appropriate levels of monitoring at applicable wells and details related to the type of monitoring activities that will be implemented
(2) Any historical well drilling analysis completed to estimate well *true vertical depths*
(3) Any geologic evaluation used to modify the AOR geometry beyond the dimensions prescribed in the regulations
(4) Coordination/monitoring agreements between adjacent *operators*
(5) Documentation of identified well ownership and access issues
(6) Bibliography of reference materials used to compile information on wells falling within the AOR

Whenever a written accompanying report is deemed necessary, it shall be submitted to DEP electronically in pdf format. Written reports are recommended by DEP in cases where significant supplemental analyses were used to arrive at conclusions related to assigning risk and implementing monitoring activities, as they will be critical in determining what may have gone wrong when unanticipated *communication incidents* occur and also useful for resolving compliance matters in such cases.

C. AOR Report Deliverables Requirements Checklist

- Has the Standard AOR Summary Table Report been downloaded and completed for the well that is the subject of the AOR?
- Has an accompanying AOR well plat that references all wells in the AOR Report Electronic Summary Table been prepared and submitted along with the AOR Report Electronic Summary Table?
- Do submitted *GPS coordinates* for all field-verified wells within the AOR meet DEP accuracy requirements, i.e., +/-10 m?

D. Other Considerations

- Has the need for an accompanying narrative report been evaluated in consideration of information that is most likely to be included in such a report (see items (1)-(6) in subsection B above)?

Figure 5: AOR Summary Table Report Parameters

Field Heading	Description of Report Parameter
Operator ID/OG Number	DEP ID or OGO number for the *operator* planning to conduct hydraulic fracturing.
Landowner Notification Documentation	"Y" to certify that all *landowners* with parcels in the area of review were notified per the regulatory requirements, otherwise enter "N."
Were Any Wells Identified Within the AOR?	"Y" if offset wells were identified within the AOR, otherwise enter "N."
US Well No. (API No.)/Authorization ID for Well that is Subject of Area of Review	If the well has been permitted, provide the US Well No. (API No.) using the following format: CCC-XXXXX. CCC represents the three-digit county code and XXXXX represents the unique, 5-digit county ID. The sections of the US Well No. (API No.) must be separated by a dash (-). If the well has not been permitted, the GreenPort authorization ID should be provided along with the county and municipality in the appropriate fields.
Municipality	Municipality that well will be drilled in if no US Well No./API No. has been assigned.
County	County that well will be drilled in if no US Well No./API No. has been assigned.
Surface Hole Latitude for Well that is Subject of Area of Review (decimal degrees)	The anticipated surface location latitude and longitude, in decimal degrees, for the well that is the subject of the area of review. This must reference NAD 83 datum.
Surface Hole Longitude for Well that is Subject of Area of Review (decimal degrees)	
Bottom Hole Latitude for Well that is Subject of Area of Review (decimal degrees)	For horizontal wells, the anticipated *bottom hole* location latitude and longitude in decimal degrees for the well that is the subject of the area of review. This must reference NAD 83 datum.
Bottom Hole Longitude for Well that is Subject of Area of Review (decimal degrees)	

Note: Information for AOR Report pertaining to well that will be hydraulically fractured.

Figure 5 Continued

ld Heading	Description of Report Parameter
US Well No. (API No.)/Alternate Well ID	The US Well (API No.) assigned to the well using the following format: CCC-XXXXX. CCC represents the three-digit county code and XXXXX represents the unique, 5-digit county ID. The sections of the US Well No. (API No.) must be separated by a dash (-). If a US Well No. (API No.) has not been assigned, use the following numbering system: "U1", "U2", "U3", etc. The identifiers used in the report must be identical to those used on the site plat for cross-referencing purposes.
Reference Material/Source	The source that used to identify the *offset well* from the list of available options: "DEP Database", "Other Database", "Historical Source", "*Operator* Map", "*Landowner* Survey", "Aerial Image", or "Field Inspection."
Well Status	The status used to classify the *offset well* from the list of available options: "*Active*", "*Inactive*", "*Orphan*", "*Abandoned*", "Plugged & Abandoned", or "Undetermined." If the offset well has been field verified, the status should reflect what was observed during the inspection.
Adjacent *Operator* ID/ OGO Number	If the *offset well* included in the summary report is the responsibility of an adjacent *operator*, please provide the DEP ID or OGO number for that *operator*. Leave this space blank if neither notification nor monitoring at the offset well is required. Indicate "No RP" if well does not have an *operator* associated with it.
Adjacent *Operator* Notification	"Y" if the adjacent *operator* was notified or "N" if the delivery service failed. This space should be left blank if the well is the responsibility of the *operator* intending to conduct hydraulic fracturing activities at the well indicated in the first section of Figure 5 or if the well does not require notification in advance of well spud

ld Heading	Description of Report Parameter
Surface Location Latitude (decimal degrees)	The true latitude and longitude in decimal degrees of the surface location of the well. This should be North American Datum of 1983 (NAD 83) and must meet or exceed the current DEP policy regarding locational accuracy (+/- 10 m) for any wells surveyed in the field by the operator.
Surface Location Longitude (decimal degrees)	
Bottom Hole Latitude (decimal degrees)	The true latitude and longitude in decimal degrees of the bottom hole location of all intentionally deviated wells based on a review of available records. This should be North American Datum of 1983 (NAD 83).
Bottom Hole Longitude (decimal degrees)	
Survey Accuracy (+/- meters)	For any well coordinates referenced in DEP/Department of Conservation and Natural Resources (DCNR) databases, or anything digitized from a historical map or a map from a published report that has not been field verified, leave this column blank. If the offset well has been field verified and surveyed with a hand-held GPS or other surveying equipment, accuracy must be reported as a numerical value in meters in the space provided and meet the current DEP accuracy policy: +/- 10 meters or better.
Access	"Y" if *landowner* consent for access has been granted or "N" if *landowner* consent for access has not been granted.
Property Tax ID #	The tax parcel ID for the tract of land where the *offset well* is located.
TVD (feet)	The *true vertical depth* (TVD) in feet for the *offset well*. This shall either be as reported in available records, or represent a best technical estimate provided by the *operator* in consideration of development history in the state in the area of activity. For an intentionally deviated well, this is the depth below the latitude-longitude equivalent surface location of the deepest penetration point.
Information Source for TVD	Information regarding how the *offset well* TVD was determined from a list of available options: “DEP Well Record”, “Publication Well Depth”, “Private Source Well Record”, “Study of Regional Drilling History”, or “Other”. A separate written report may be necessary to explain measures undertaken by the *operator* to investigate drilling history in an area.
Well Integrity Assessment	For *offset wells* in the monitoring plan that are observed in the field, the *operator* must assess the well's ability to contain fluids based on a surface visual inspection. Please choose from the following codes for each *offset well* inspected in the field: "1" if the well appears to have integrity based on field observation and any well construction details gleaned from a file review; "2" if the well appears to have compromised integrity or may experience compromised integrity during *hydraulic fracturing* based on any well construction details gleaned from a file review; and "3" if the integrity status cannot be determined with reasonable confidence. For wells not observed in the field, this parameter should be left blank.
Monitored Site	If the *offset well* is included in monitoring plan, indicate "Y", otherwise indicate "N.”
Monitoring Level	Indicate the monitoring level from the list of available options: "High", "Medium", and "Low." Leave this field blank if the well does not require monitoring.
Monitoring Plan Notes	This field is optional and is designed to contain specific notes explaining monitoring or mitigation plans for each well. Entries are limited to 255 characters or less.
Engineered Communication	The engineered communications field is for use if an operator has planned a controlled communication event in association with well efficiency testing. If such an event is planned, indicate "Y,” otherwise indicate "N." This space should be left blank if the well does not require notification in advance of spud.
Text Comment	This field is optional and intended for use in cases when further clarification may be necessary. Entries are limited to 255 characters or less.

Standard report parameters for tabular component of AOR Report and accompanying Monitoring Plan

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IX. WELL ADOPTION

In section 78a.73(d), the AOR regulation has provisions for adopting *offset wells* that have been communicated with. Although a discussion of the details of the well adoption permit (Permit Application to Adopt an Oil or Gas Well) is beyond the scope of this document, several recommendations and general guidelines are provided for reference.

If an *operator* identifies an *abandoned* or *orphan well* within the AOR that they are interested in adopting, it is recommended that this activity be pursued prior to commencement of *hydraulic fracturing*, as it may be one way to effectively mitigate risk ahead of stimulation. Establishing well ownership and identifying whether or not there is some operating interest in an *abandoned well* is essential to manage liability in such situations. For wells already on DEP's *orphan* and *abandoned* list, due diligence has been completed in this regard and an interested party need only perform additional measures if they believe it is legally advisable to do so. For wells that are not listed on DEP's *orphan* and *abandoned* list, conducting due diligence related to well ownership and operating interests is a critical step.

In all cases, it is essential to establish an updated lease agreement addressing operating/royalty-disbursement conditions, and to secure ongoing access to rehabilitate and operate the well. DEP does not regulate the details of lease agreements and does not intend to evaluate any processes that were undertaken by the *operator* to bring the well back in to legal production aside from those aimed at assuring that necessary environmental protection standards are in place.

For any wells that were communicated with during *hydraulic fracturing* activities, a site-specific integrity assessment protocol or workover plan, potentially involving downhole analysis procedures, must be submitted to DEP along with the adoption permit.

A. Other Considerations

- Have the well adoption permit and accompanying instructions been reviewed?
- Have *abandoned* and *orphan wells* in the AOR been considered for adoption prior to *hydraulic fracturing* activities?
- For any wells on the adoption permit, have all potential *responsible parties* been considered and has a thorough assessment of potential operating interests been completed?
- Has a lease agreement been established that provides ongoing access and the ability to operate the well that is being considered for adoption?

X. INCIDENT REPORTING AND RESOLUTION

Section 78a.73(c)-(d) provides notification and incident response requirements for certain *communication incidents*. Accordingly, to clearly define a protocol for incident resolution, it is first essential to indicate what constitutes a reportable *communication incident*. Reportable *communication incidents* include, in accordance with section 78a.73(c): (1) any change in a well required to be monitored, (2) any treatment pressure or volume changes indicative or abnormal fracture propagation at the well being stimulated, or (3) confirmed well communication incidents associated with the well's stimulation activities. Inter-well communication intentionally executed by the *operator* and communication incidents below the reporting thresholds defined in this policy are not reportable *communication incidents* under section 78a.73(c). Please note,

operators are required to maintain a safe operating environment. *See* 58 Pa.C.S. § 3259(2); 25 Pa. Code § 78a.81. When a reportable *communication incident* occurs, the operator must notify DEP, cease stimulation activities and prevent any pollution to waters of the Commonwealth or discharges to the surface. This section of this document outlines the operator's obligations under different circumstances.

Please note that the notification and reporting requirements included in this regulation do not necessarily satisfy other regulatory obligations under sections 78.73/78a.73 pertaining to the over-pressuring of the surface casing seat, sections 78.86/78a.86 pertaining to defective casing and cement, sections 78.88/78a.88 pertaining the mechanical integrity of operating wells, or sections 78.89/78a.89 pertaining to the investigation of stray gas migration incidents; or any other statutory or regulatory investigative and reporting requirements. Further, all environmental releases of regulated substances must be reported and remediated in accordance with the Clean Streams Law, section 91.33, section 78a.66, and/or applicable law.

A. Incidents Requiring 2-Hour Notification and 3-Day Follow-up Incident Report

In cases where certain reportable incidents are identified, the *operator* must immediately cease *hydraulic fracturing* and notify DEP via the electronic reporting notification service on the DEP website. This notice must be filed within two (2) hours of when the *operator* first becomes aware of the incident. Note that established standards and timelines must be followed for any *communication incidents* that also violate section 91.33 or the provisions of section 78a.66. If, and only if, an emergency develops, the operator should contact DEP Emergency Response by telephone immediately (see Appendix D). *Hydraulic fracturing* may not commence again until DEP is satisfied that the situation is under control and measures have been developed to prevent any further anticipated risk. Part of this process includes submission of the standard electronic follow-up incident report available for download on DEP's website and described in Figure 6 and the accompanying instructions for the incident report (8000-PM-OOGM0145U).

Immediate activity cessation and notification is essential to begin the process of risk mitigation and reduce the potential for compounding environmental impacts as soon as possible. It is also critical for initiating conversations between the *operator* and DEP; and coordination with the public, as necessary. A *communication incident* report must be filed with the agency within three (3) days of when the *operator* first becomes aware of the incident.

Communication incidents that must be reported to DEP within two (2) hours and followed up with a standard incident report within three (3) days include:

(1) Any *communication incident* evidenced by downhole pressure or volume changes during *hydraulic fracturing* in the well being completed when the specific event observed indicates a loss of mechanical integrity, i.e., containment, and that could pose a specific risk to the environment (surface or subsurface fluid release), safety or is indicative of *loss of well control*. This would amount to a sudden loss of pressure or a volume change that is clearly, statistically beyond the normal variability that a job has.

(2) Any *communication incident* with an *abandoned*, *orphan* or plugged well; as the ability for containment and pressure control at such wells is significantly limited. Immediate reporting applies even in the case where an *operator* has established temporary containment measures at the surface that appear to have been implemented with success. A plan for permanently plugging the affected well must be developed and executed by the *operator* as soon as practicable, unless the *operator* plans to adopt the well and place it into production. The plan may be implemented without filing a notice of intent to plug the well, provided DEP approval is received.

(3) Any *communication incident* with any other well that the *operator* completing the stimulation has been made aware of and that threatens or jeopardizes the integrity of the surface or near surface environment as a result of a breach/loss of containment, a release of pollution-causing substances to the environment, or some other occurrence that has the potential to impact the waters of the Commonwealth.

(4) Any *communication incident* that results in a *well control incident/loss of well control* as defined in this guidance.

(5) Any *communication incident* that results in site safety risks as a result of equipment malfunction or other events within the AOR.

B. Incidents Requiring 24-Hour Notification and 30-Day Follow-up Incident Report

A subset of *communication incidents* may occur that were either anticipated and coupled with measures introduced by the *operator* to maintain control of the situation, but were not intentionally implemented or engineered; or that do not otherwise result in any environmental, safety, or *well control incidents* by virtue of the *offset well's* construction and operating characteristics. The *operator* conducting *hydraulic fracturing* is not required to cease *hydraulic fracturing* if: (1) any releases to the environment are prevented, (2) safe site conditions are maintained at all times, (3) it is ensured that *offset well* construction components and all appurtenances are adequately rated to contain fluid pressure and volume, (4) DEP is notified within 24 hours of when the *operator* first became aware of the incident via the electronic reporting notification service on the DEP website, and (5) an incident report is filed with DEP within 30 days of when the *operator* first becomes aware of the incident.

Information associated with these *communication incidents* will help determine what risk-mitigation measures are appropriate in the future, e.g., size of tank that should be installed, allow DEP to complete follow-up work as needed with regard to any potential well integrity problem(s), and enable DEP and the industry to continue to evaluate the geometry of the AOR in a more comprehensive sense and update this guidance from a risk-mitigation standpoint, as needed.

Communication incidents that must be reported to DEP within 24 hours and followed up with a standard incident report within 30 days include:

(1) Any *communication incident* with any *active* or *inactive well* that the *operator* conducting the stimulation has become aware of that does not result in an environmental, safety, or *well control incident*, but does result in a breach/loss of containment that is not coupled to a release, e.g., release to a tank. A breach/loss

of containment includes the observation of any flowing fluids in sections of the well where they were previously not noted, provided these observations are not in association with the outer annular spaces of surface or coal casing. The reporting threshold is characterized by a significant increase in the volume of such fluids or annular pressures respective of baseline conditions, as judged by the *operator* completing *hydraulic fracturing* and/or responsible for the *offset well*.

(2) Any *communication incident* that results in significant production pressure deviations at any *active* or *inactive well* that the operator conducting the stimulation has become aware of. For wells that produce gas inside of surface or coal casing strings, reportable conditions include any surface-measured production pressures in excess of 80% but less than 100% of the hydrostatic pressure at the casing seat depth (assume 0.433 psi/ft gradient). For all wells, any pressure increases that are within 10% of the containment rating for the lowest rated barrier element subjected to production pressure must be reported. For example, if a well head valve is rated for 5,000 psi and production pressures increase to 4,500 psi as a result of a *communication incident*, this constitutes a reportable incident.

There is no expectation that adjacent *operators* notify an *operator* conducting *hydraulic fracturing* when *communication incidents* below the thresholds for completing a 30-day follow-up incident report described in this policy are noted at an *offset well* that is the responsibility of the adjacent *operator*. However, in cases when the adjacent *operator* does make the *operator* conducting *hydraulic fracturing* aware of a *communication incident* below these thresholds, the *operator* conducting *hydraulic fracturing* is not required to cease *hydraulic fracturing* if: (1) the adjacent *operator* documents in writing that none of the applicable thresholds for reporting in subsections A and B of this section have been exceeded, (2) DEP is notified within 24 hours of when the *operator* first became aware of the incident via the electronic reporting notification service on the DEP website, and (3) an incident report is filed with DEP within 30 days of when the *operator* first becomes aware of the incident. In this case, the follow-up incident report is the aforementioned written documentation provided by the adjacent *operator* in (1) above. Notification and follow-up reporting is required one time only if subsequent *communication incidents* occur at the *offset well* during later *hydraulic fracturing* stages provided the incidents remain below the thresholds requiring a 30-day follow-up incident report.

C. Incident Resolution

For reportable *communication incidents* under subsection A of this section, *hydraulic fracturing* may only recommence after DEP has provided authorization in accordance with § 78a.73(c). In instances where a *communication incident* alters a nearby *abandoned* or *orphan well* that is on DEP's list, or any previously plugged well for which no further regulatory obligations exist for another *operator/responsible party*, plugging/re-plugging or well adoption (Permit Application to Adopt an Oil or Gas Well) is required. Provided the *operator* is able to stabilize conditions at the affected well, plugging does not necessarily need to be completed prior to recommencement of *hydraulic fracturing*.

The *operator* may choose to file a Good Samaritan Law proposal for plugging the well or may proceed with the project outside of the liability protection afforded under that law. All Good Samaritan Law filings will be reviewed and judged on individual merit and the circumstances which led to the *communication incident*. Because the regulation requires plugging if the well is not going to be adopted, DEP may decide that the protections afforded under the Good Samaritan Law are not appropriate. Note that it is not necessary to first adopt the well in instances where plugging will be implemented.

When plugging is necessary to resolve an issue at a well that is not covered under the previous paragraph, i.e., a well for which some other *operator/responsible party* exists, environmental and safety issues must be mitigated as soon as possible, even if under an Order from DEP. After resolution of these matters, it is up to both *operators/responsible parties* involved to make the necessary arrangements for plugging of the well in accordance with all applicable laws and regulations. Some of these matters are discussed in more detail under Section V of the guidance addressing coordination between adjacent *operators*.

Plugging may not always be necessary to resolve *communication incidents*, and in certain cases there may be disputes between adjacent *operators* that must be resolved. Resolution of such matters is beyond the scope of this document or regulatory program. In all cases, the *operators/responsible parties* must demonstrate that all environmental and safety matters are mitigated with diligence and that the plan to move forward with *hydraulic fracturing* activities can be implemented in a manner that appropriately mitigates previously revealed or reasonably anticipated risks.

D. Other Considerations

- Prior to commencement of *hydraulic fracturing* activities, have the subsections of this section detailing incidents requiring suspension of *hydraulic fracturing* activity and 2-hour notification (subsection A above) and 24-hour notification (subsection B above) been reviewed and are they understood by operations staff?
- Has the necessary coordination with adjacent *operators* and *landowners* been implemented to ensure that environmental and safety risks can be addressed expeditiously in the event of an unanticipated *communication incident*?
- Are company personnel responsible for interfacing between operations staff and DEP familiar with the immediate notification and follow-up incident reporting deadlines and where appropriate forms and instructions for notification and follow-up incident reporting can be accessed?
- Have operations staff been in communication with DEP field inspection staff to discuss the timeline for commencement of the *hydraulic fracturing* activities and any aspects of the monitoring plan that may require close coordination with the agency?
- Has the Good Samaritan Law and project proposal template been reviewed and evaluated for future consideration?

Figure 6: Standard Follow-up Incident Report

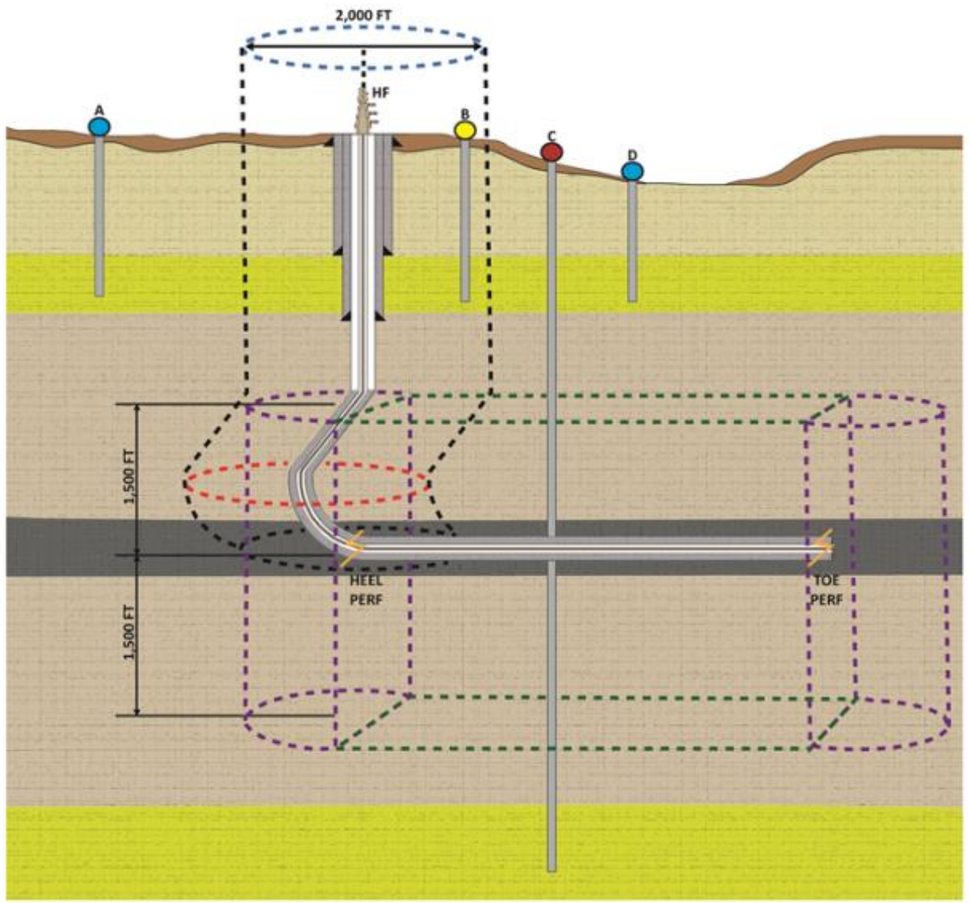
Field Heading	Description of Report Parameter
API No. (US Well No.) of *Hydraulically Fractured* Well	The US Well No. (API No.) assigned to the well that was undergoing *hydraulic fracturing* at the time of the *communication incident*. Use the following format: CCC-XXXXX. CCC represents the three-digit county code and XXXXX represents the unique, 5-digit county ID. The sections of the API No. must be separated by a dash (-).
API No. (US Well No.)/ID of Well Where *Communication Incident* Was Observed	If a US Well Number or API number has been assigned to the well where the *communication incident* was observed, enter it in the space provided using the format described above. If no API number has been assigned to the well, either enter the ID from the Area of Review Report Summary Table that was previously submitted or, if the well was not identified as part of the area of review survey and does not have an API number, use the following nomenclature: (C1, C2, C3, etc.).
Adjacent *Operator* ID/ OGO Number	If an adjacent *operator's* well was involved in the communication incident, this is the OGO No. for that *operator*. Leave blank if same as the *operator* who was conducting *hydraulic fracturing* activities. Indicate "No RP" if well does not have an *operator* associated with it.
Start Date	The date that the *communication incident* was first observed in MM/DD/YYYY format.
End Date	The date incident control was established at the well where *communication incident* was observed, i.e., environmental or safety concerns mitigated. Use MM/DD/YYYY format. Leave blank if incident has not yet been resolved when the report is submitted.
Environmental/Safety/Well Control Incident	"Y" if a surface release, water supply impact, other environmental impacts, or a *well control* or other safety incident has occurred, otherwise indicate "N."
Communication Type	The type of *hydraulic fracturing communication incident* from the list of available options: "Stimulation to Operating Well", "Stimulation to Well Being Drilled", Stimulation to *Abandoned/Orphan Well*", "Stimulation to *Inactive* Well", "Stimulation to Plugged Well", or "Other."
Adjacent Lateral Effects	"Y" if *communication incident* originated at horizontal well and intervening horizontal wells fall between the source of the communication and the well where the *communication incident* was observed, otherwise indicate "N."
Latitude of Stage Midpoint for Well Undergoing *Hydraulic Fracturing* (decimal degrees)	The midpoint latitude and longitude, in decimal degrees, of the stage being *hydraulically fractured* when the *communication incident* occurred. If a vertical well was being *hydraulically fractured*, provide the surface hole location. This must reference NAD 83 datum and, if a vertical well was being *hydraulically fractured*, the locational information provided must meet the DEP policy regarding locational accuracy (+/- 10 m).
Longitude of Stage Midpoint for Well Undergoing *Hydraulic Fracturing* (decimal degrees)	
Latitude of Receiving Well (decimal degrees)	The latitude and longitude, in decimal degrees, representing the surface hole location of the well where the *communication incident* was observed. This applies for vertical wells or when the vertical section of an intentionally deviated is the point of entry for pressure/fluids associated with the well undergoing *hydraulic fracturing*. This must reference NAD 83 datum and meet the DEP policy regarding locational accuracy (+/- 10 m).
Longitude of Receiving Well (decimal degrees)	

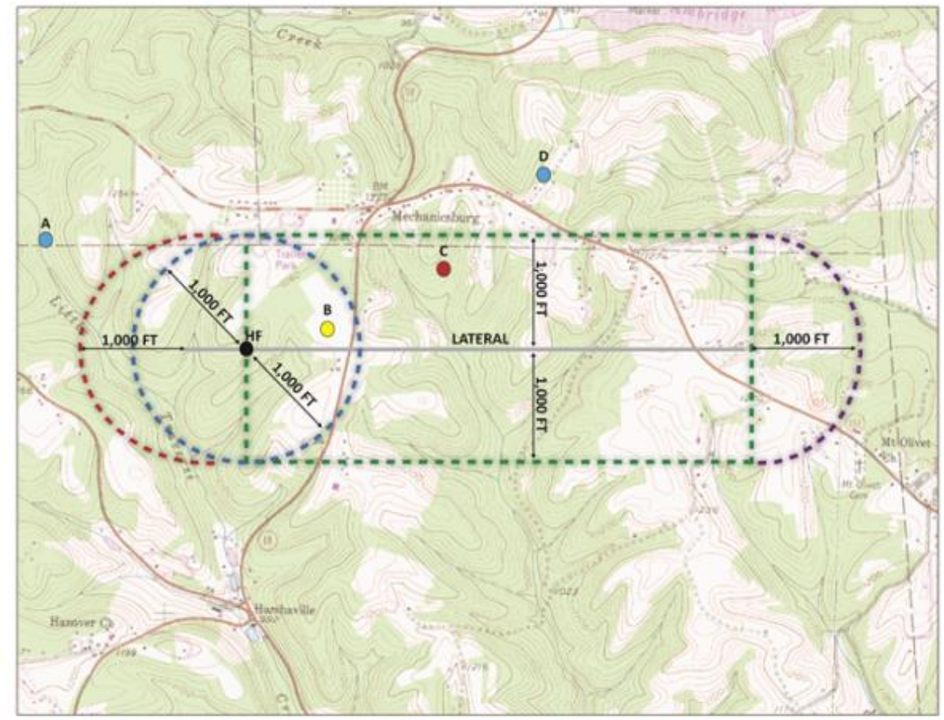
Field Heading	Description of Report Parameter
Bottom Hole/Bit Location Latitude of Receiving Well (decimal degrees)	The latitude and longitude, in decimal degrees, of the well where the *communication incident* was observed. If being drilled, indicate the bit location, otherwise indicate the *bottom hole location*. This field applies for intentionally deviated wells only when the point of entry for pressure/fluids associated with the well undergoing *hydraulic fracturing* occurred along the deviated portion of the production hole section. This must reference NAD 83 datum. This field should be left blank if the *communication incident* is associated with a vertical well or the vertical section of an intentionally deviated well.
Bottom Hole/Bit Location Longitude of Receiving Well (decimal degrees)	
Landing Point Latitude of Receiving Well (decimal degrees)	The landing point latitude and longitude, in decimal degrees, of the well where the *communication incident* was observed. This field applies for intentionally deviated wells only when the point of entry for pressure/fluids associated with the well undergoing *hydraulic fracturing* occurred along the deviated portion of the production hole section. This must reference NAD 83 datum. This field should be left blank if the *communication incident* is associated with a vertical well or the vertical section of an intentionally deviated well.
Landing Point Longitude of Receiving Well (decimal degrees)	
Kick Volume (bbls)	The volume of the kick circulated out, in barrels (bbls), at the well where the *communication incident* was observed. This field only applies to offset drilling scenarios when a reportable kick was detected in association with the *hydraulic fracturing communication incident*.
Stage Fluid Volume (bbls)	The volume of the stage, in bbls, that was being *hydraulically fractured* at the time of the *communication incident*.
Maximum Treatment Pressure (psi)	The maximum treatment pressure, in pounds per square inch (psi), of the stage that was being *hydraulically fractured* at the time of the *communication incident*.
Average Treatment Pressure (psi)	The average treatment pressure, in psi, of the stage that was being *hydraulically fractured* at the time of the *communication incident*.
Abnormal Treatment Volumes Noted	Indicate "Y" if the treatment volume of the stage being *hydraulically fractured* at the time of the *communication incident* was significantly higher compared to adjacent stages; otherwise indicate "N."
Abnormal Treatment Pressures Noted	Indicate "Y" if the treatment pressure of the stage being *hydraulically fractured* at the time of the *communication incident* was significantly higher compared to adjacent stages; otherwise indicate "N."
Faults Present or Geologic Anomalies Noted	Indicate "Y" if the presence of faults or other geologic anomalies was noted in the intervening area between the well that was being hydraulically fractured and the well that was communicated with, otherwise indicate "N."
Orientation of Fault/Geologic Anomaly in Horizontal Plane	If faults or geologic anomalies were noted, provide the azimuth of the dominant orientation of the fault/geologic anomaly in horizontal plane (0 to 360 degrees). If no faults or geologic anomalies were noted, this space should be left blank.
Brief Description	Additional details related to incident, as needed. Limit description to 255 characters or less.

Figure 6 is for *unconventional well hydraulic fracturing communication incident*.

APPENDIX A - AOR GEOMETRY

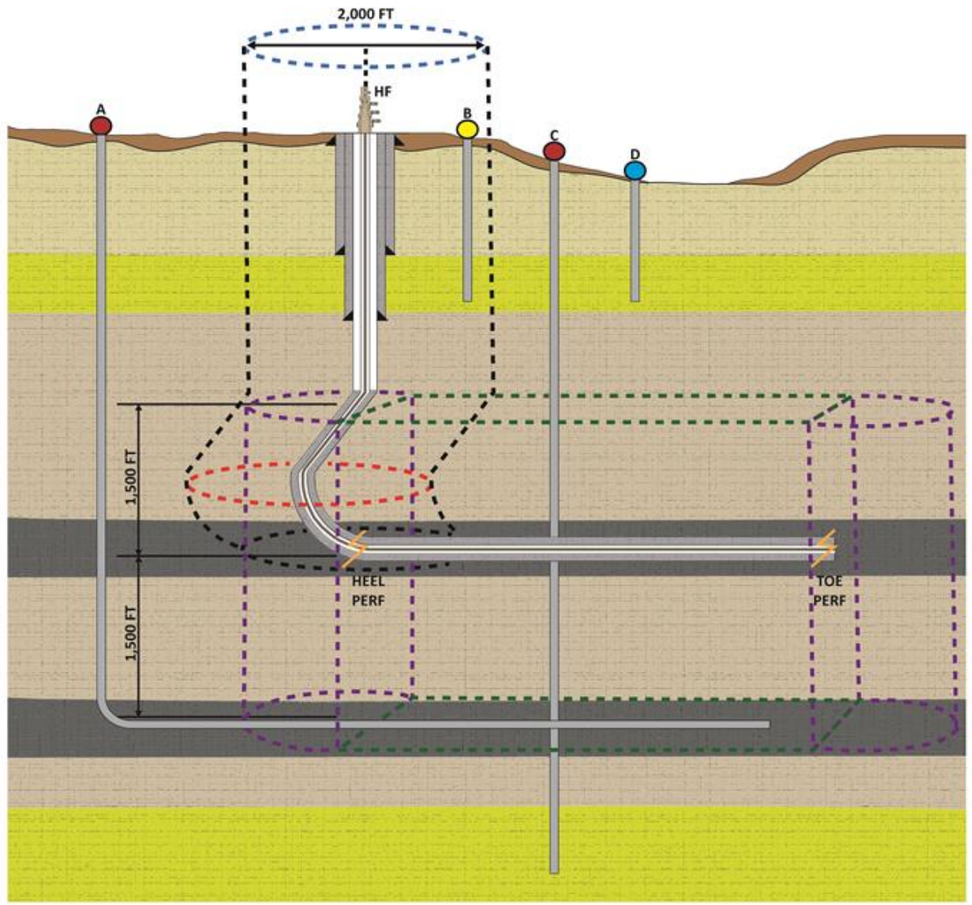
EXAMPLE 1 - UNCONVENTIONAL GAS WELL WITH NO NEARBY PROSPECTIVE SHALE GAS UNITS

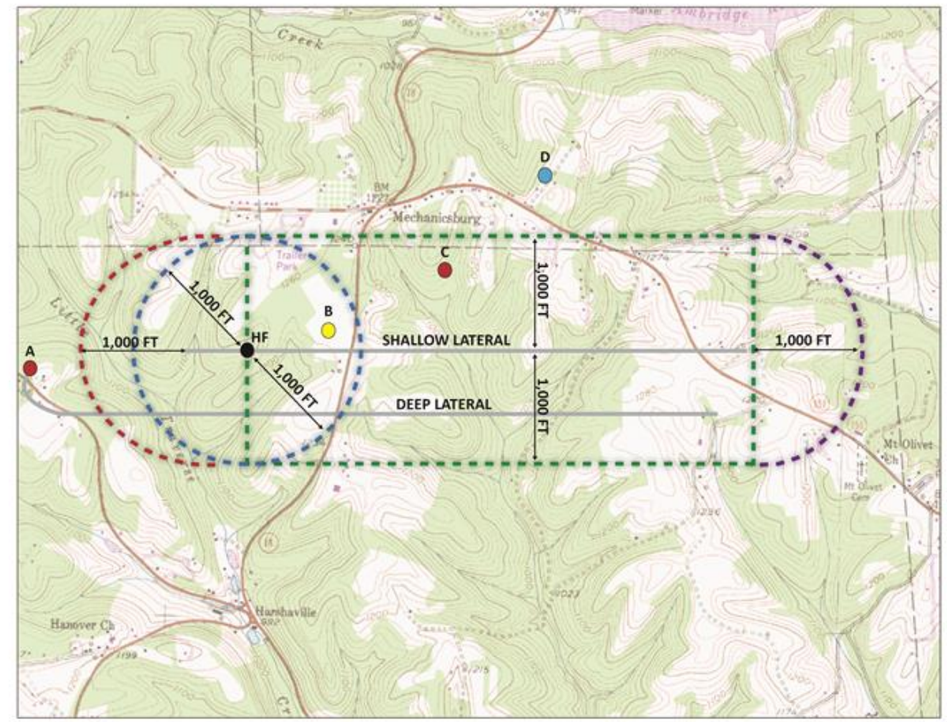




Notes: Yellow (identify); Red (identify and visually monitor); and Blue (no requirements); HF (well that is subject of area of review that will be *hydraulically fractured*)

EXAMPLE 2 - UNCONVENTIONAL GAS WELL WITH UNDERLYING PROSPECTIVE SHALE GAS UNIT



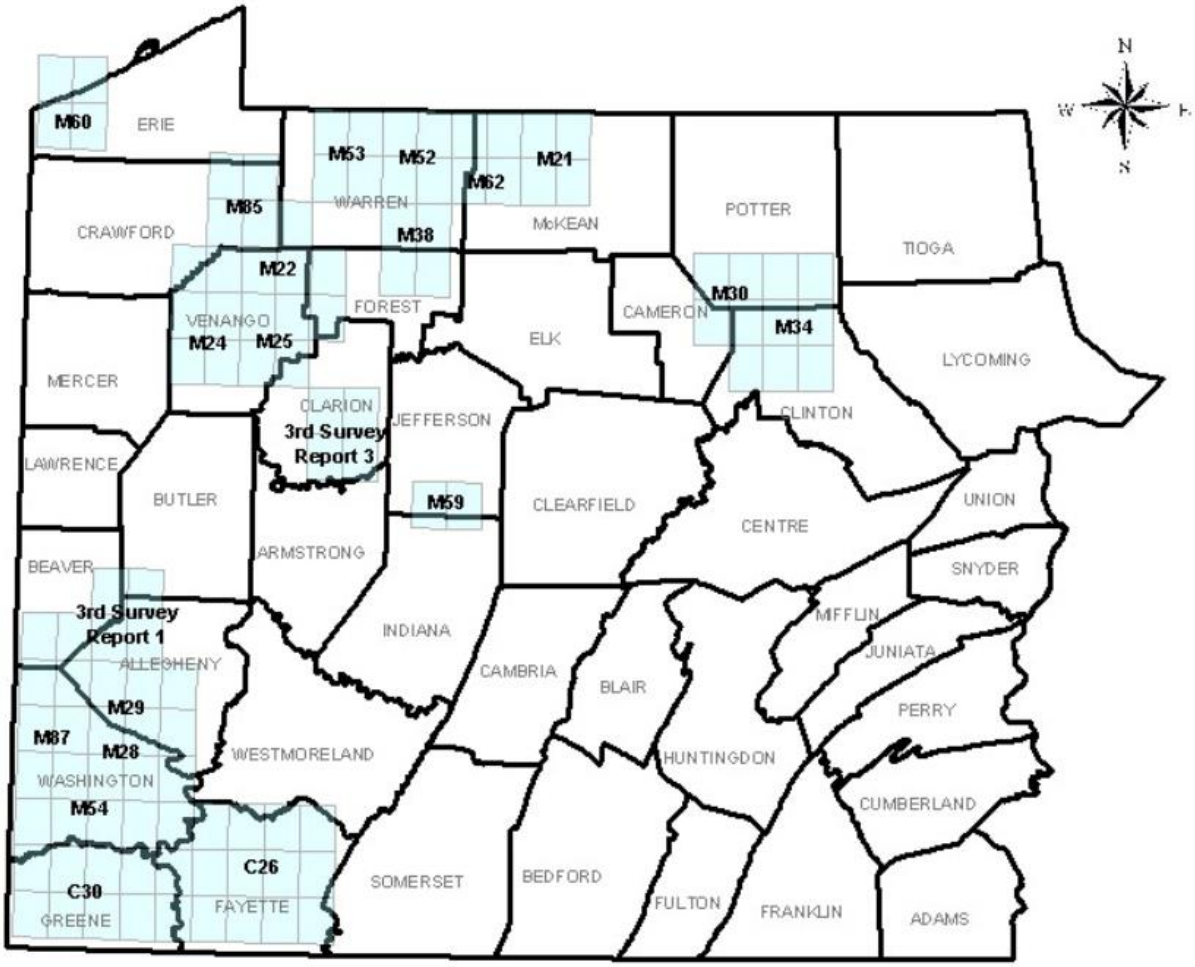


Notes: Yellow (identify); Red (identify and visually monitor); and Blue (no requirements); HF (well that is subject of area of review that will be *hydraulically fractured*)

APPENDIX B - MAP INDICES OF GEOGRAPHIC AREAS COVERED BY VARIOUS STANDARD REFERENCE MATERIALS

Historical Oil and Gas Reports by Series

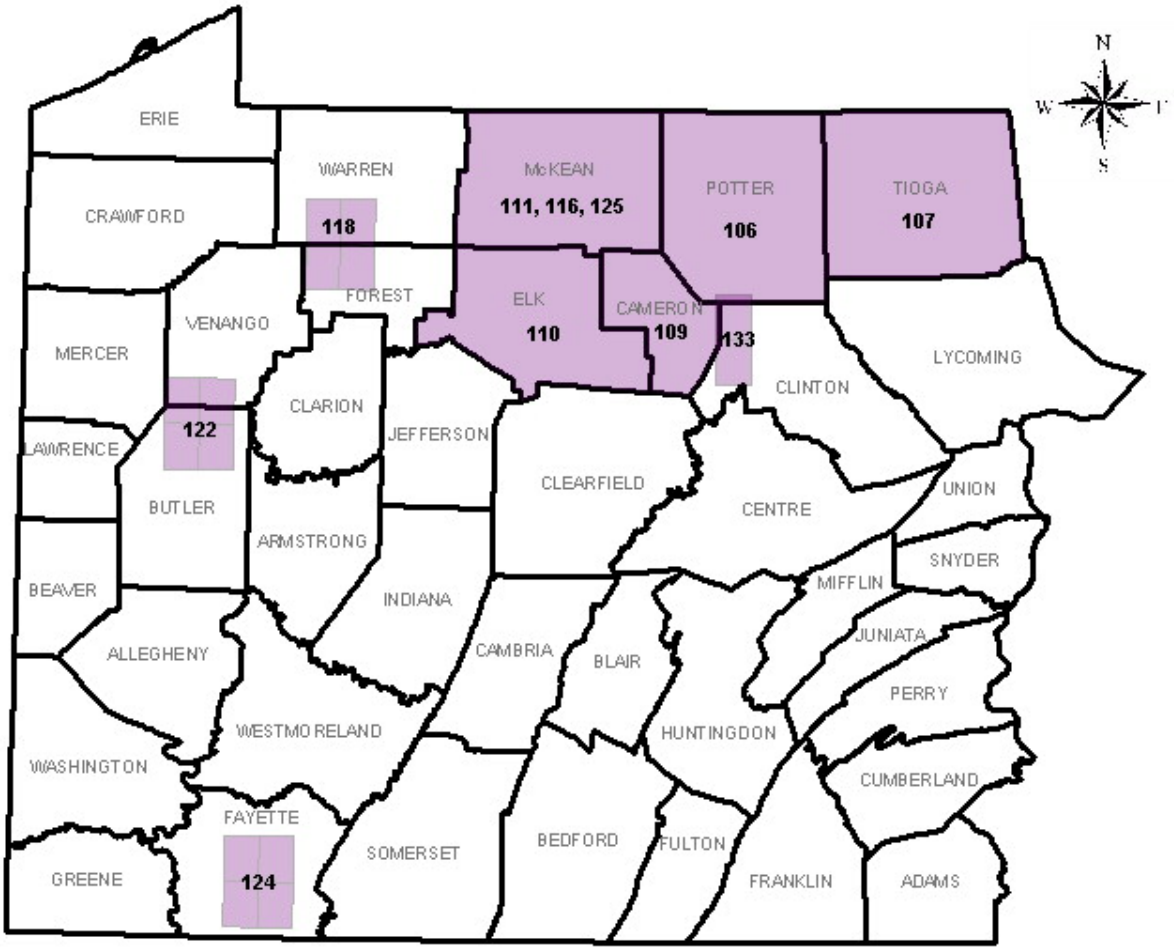
Coverage for Bureau of Topographic and Geologic Survey Reports



Source: DCNR, accessed December 2015

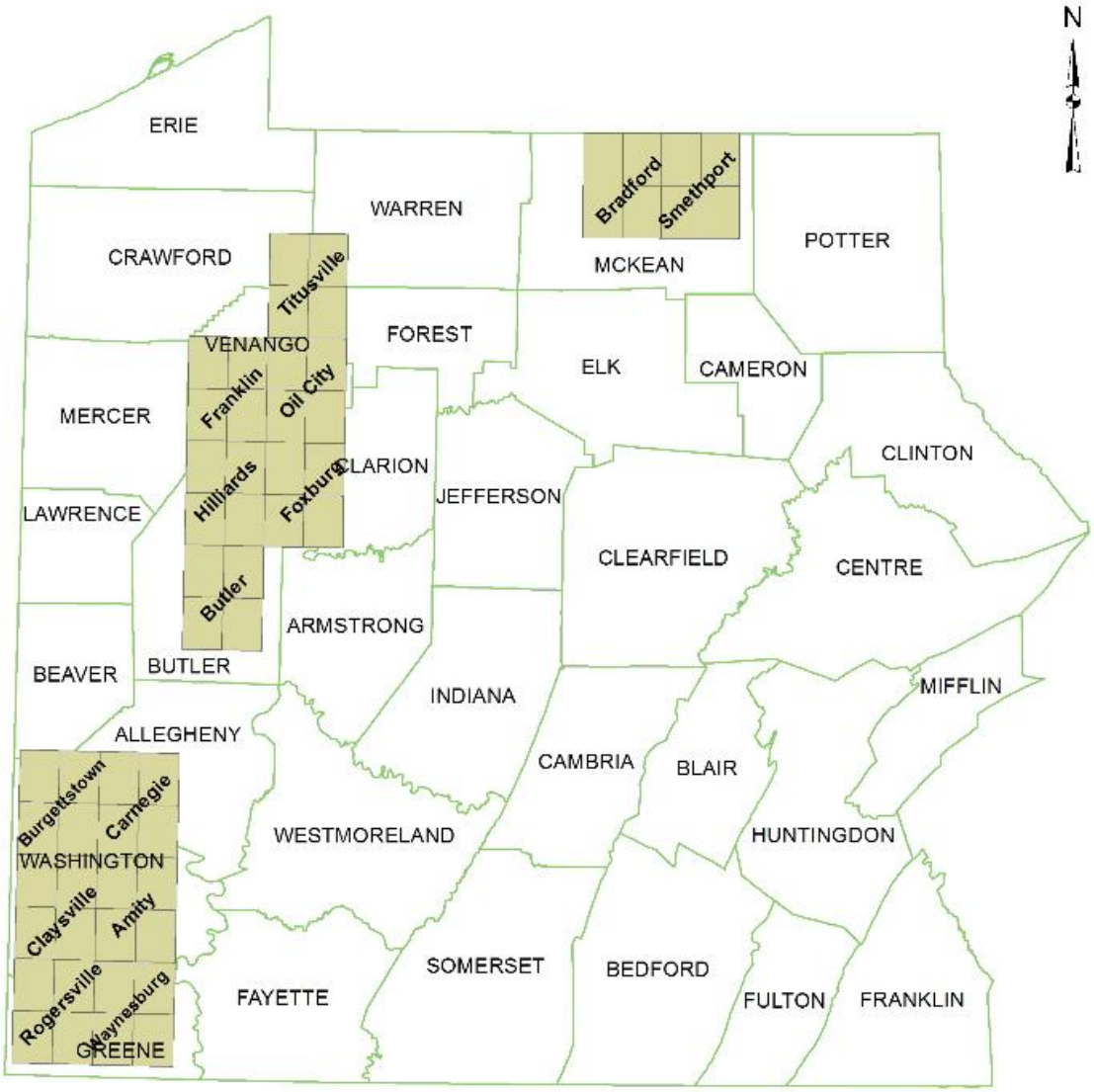
Notes: Publication M39 (Summarized Records of Deep Wells in Pennsylvania, 1950-1954) supplements Publication M30 and provides information for wells in Armstrong, Bedford, Bradford, Cameron, Centre, Clearfield, Clinton, Crawford, Elk, Erie, Fayette, Indiana, Juniata, Luzerne, Lycoming, McKean, Mercer, Northumberland, Potter, Somerset, Sullivan, Tioga, Union, Warren, Washington, Westmoreland, and Wyoming counties.

Coverage for Bureau of Topographic and Geologic Survey Progress Reports



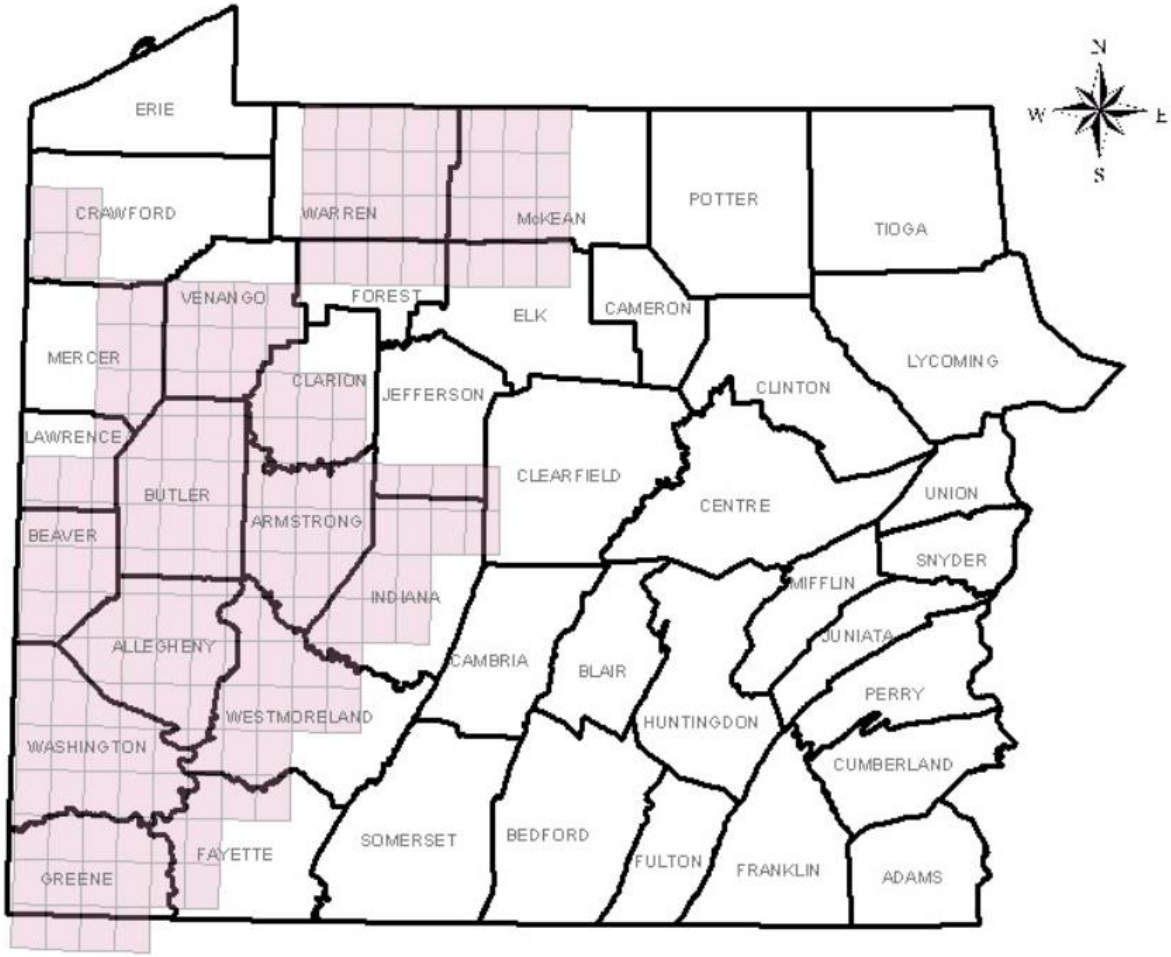
Source: DCNR, accessed December 2015

Coverage for Bureau of Topographic and Geologic Survey Special Bulletin Reports



Source: DCNR, accessed December 2015

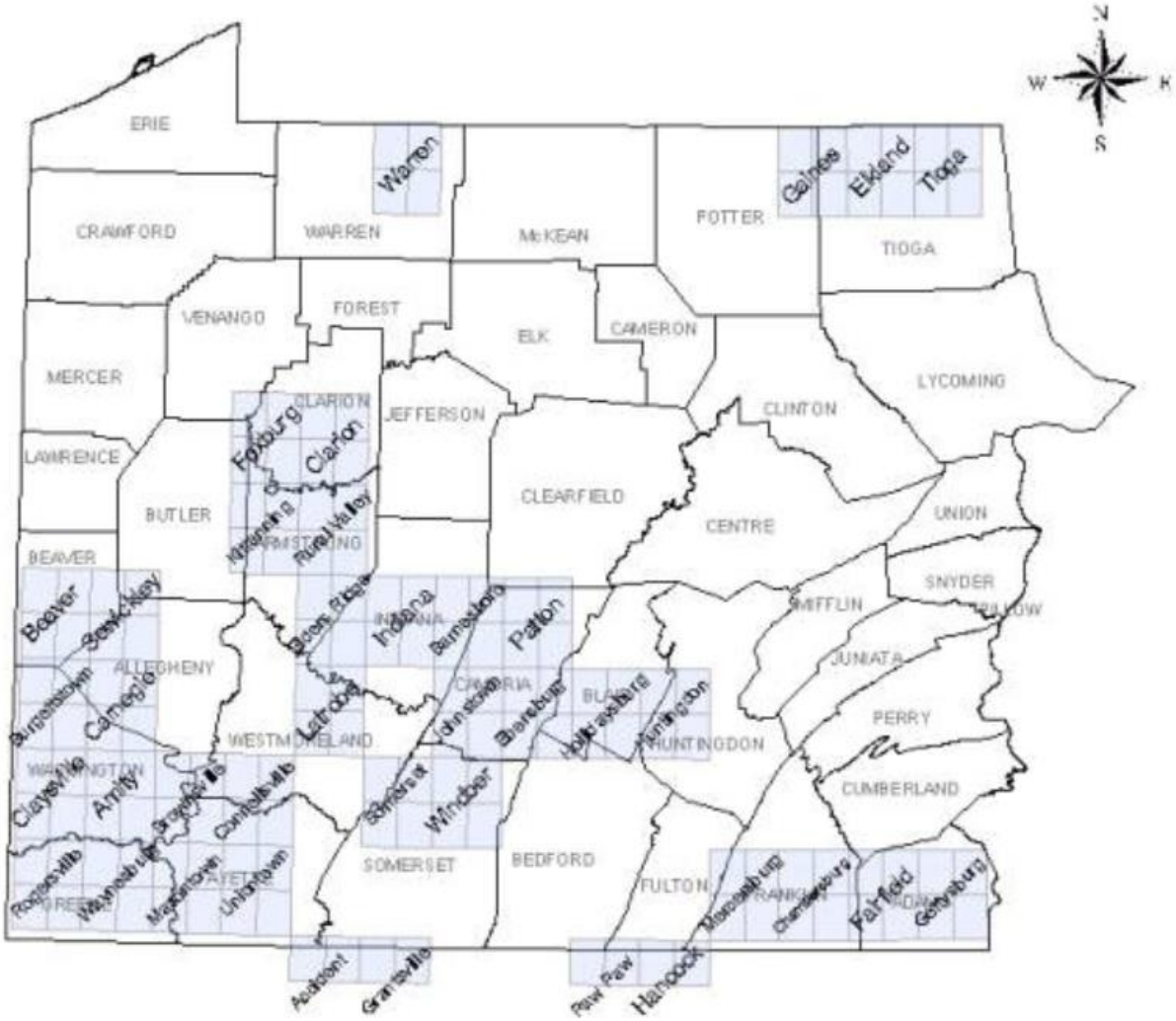
Coverage for Bureau of Topographic and Geologic Survey Farmline Maps



Source: DCNR, accessed December 2015

Disclaimer: The information presented on this map is provided "as is" without representation or warranty of any kind – as to suitability, reliability, applicability, merchantability, fitness, non-infringement, result, outcome, or any other matter. The Department of Conservation and Natural Resources does not represent or warrant that such information is or will be always up-to-date, complete, or accurate. Any representation or warranty that might be otherwise implied is expressly disclaimed.

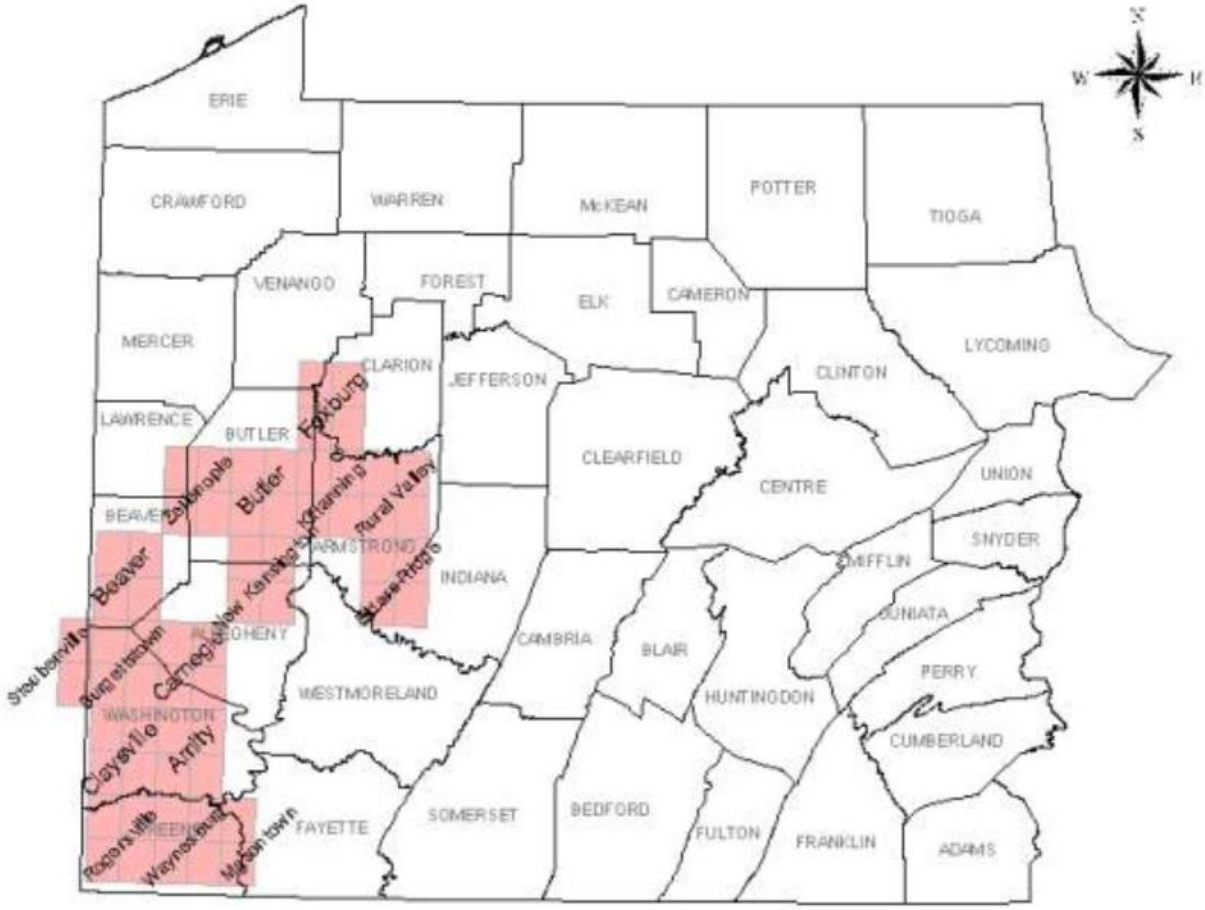
Coverage for United States Geological Survey Folio Reports



Source: DCNR, accessed December 2015

Report No.	Quadrangle
82	Masontown-Uniontown
92	Gaines
93	Elkland-Tioga
94	Brownsville-Connellsville
102	Indiana
110	Latrobe
115	Kittanning
121	Waynesburg
123	Elders Ridge
125	Rural Valley
133	Ebensburg
134	Beaver
144	Amity
146	Rogersville
160	Accident-Grantsville
170	Mercersburg-Chambersburg
172	Warren
174	Johnstown
176	Sewickley
177	Burgettstown-Carnegie
178	Foxburg-Clarion
179	Pawpaw-Hancock
180	Claysville
189	Barnsboro-Patton
224	Somerset-Windber
225	Fairfield-Gettysburg
227	Hollidaysburg-Huntingdon

Coverage for United States Geological Survey Bulletins



Source: DCNR, accessed December 2015

Tabular Summary of United States Geological Survey Bulletins

Publication No.	Quadrangle
256	Elders Ridge
279	Kittanning & Rural Valley
286	Beaver
300	Amity
304	Greene County (Rogersville, Waynesburg, Masontown)
318	Steubenville, Burgettstown & Claysville
454	Foxburg
456	Carnegie
829	New Kensington
873	Butler & Zelienople

APPENDIX C - SUPPORTING TECHNICAL INFORMATION

Treatment Pressure and Volume Monitoring

Treatment pressure and volume monitoring are discussed in the AOR regulations of Chapter 78a in section 78a.73(c). The following discussion considers the role of treatment pressure and/or volume monitoring as a direct surrogate for *offset well* monitoring in circumstances where either access cannot be secured or more efficient monitoring strategies may occur at the well that is the subject of the AOR.

Describing, to any reasonable approximation, the theoretical mechanism for *hydraulic fracturing*, is beyond the scope of the regulation and depends greatly on the local lateral and vertical stress fields, depths/pressures, and lithologies of the objective reservoir. Many competing models exist to describe fracture propagation and experts in the field are not aligned on a "standard" model. However, in general, the following statements can be made with some degree of certainty:

(1) It is important to distinguish between shallow-reservoir *hydraulic fracturing* models and deep-reservoir *hydraulic fracturing* models. In shallow reservoirs, horizontal "pancake" fractures propagate along bedding planes. In deeper reservoirs, tensile vertical fractures are generated when the overburden stress is no longer the least principal stress, i.e., the weight of overburden exceeds the "lift" generated by the hydraulic fracture pressure, causing the fracture to propagate vertically through the rock and laterally away from the well bore, rather than along a bedding plane. Transition from shallow-reservoir to deep-reservoir propagation types typically occurs at 1,000 to 3,000 feet below surface. Deep-reservoir models are generally assumed to be associated with the development of *unconventional* reservoirs at depths greater than 2,000 feet below surface.

(2) In the simplest deep-reservoir model, two vertical "wing" fractures (180 degrees apart) are generated from the perforation point that extend away from the well bore. Azimuth orientation of the vertical fracture depends on the azimuths of the minimum and maximum horizontal stresses in the rock. However, this assumes a homogeneous reservoir (uniform stresses and rock properties through the volume of rock being stimulated by the hydraulic fracture). Any deviation from this, e.g., natural fractures, layering of rock with very different geomechanical characteristics, etc., would lead to a much more complex three-dimensional set of fractures.

(3) In the deep-reservoir case, hydraulic fractures may extend out hundreds of feet beyond the well bore in height and lateral extent, but probably not much more than a thousand feet beyond in most circumstances. The only exception may be scenarios where a pre-existing zone of weakness occurs, such as a fault. This is supported by microseismic data, which is the industry's standard tool for monitoring the extent of fracture propagation in the subsurface.

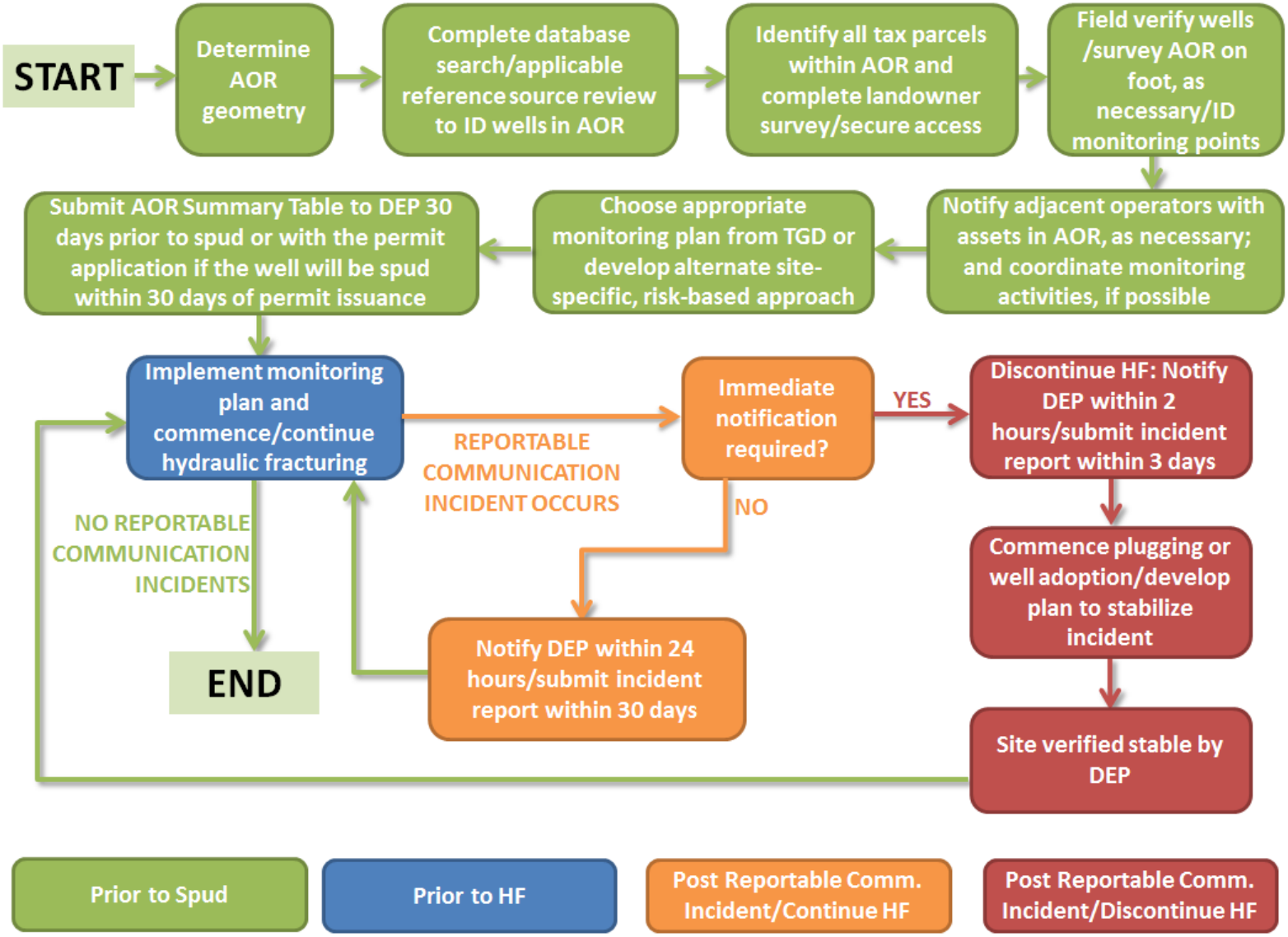
(4) Modern *hydraulic fracturing* is most often used in reservoirs with low porosity and permeability, e.g., porosity <10%, permeability < 1000 nD, referred to as a "tight" or *unconventional* reservoirs that cannot be otherwise developed with standard stimulation techniques. Typical examples include gas-bearing shales and siltstones.

During a *hydraulic fracturing* operation, variations in pressure and volume are common. A measurable treatment pressure or volume change that indicates a communication event with another well bore would be so small, relatively speaking, that it would not be possible to distinguish it from the normal variability in any event for high-volume, *hydraulic fracturing* treatments. Therefore, it is not appropriate to recommend a specific requirement for pressure or volume monitoring during an *unconventional* completion job.

Pressure and fluid communication with an adjacent producing well bore is relatively common, and indeed is often by design in the industry. The communication effects are usually detected in the adjacent well bore; however, not in pressure or volume changes in the well being completed. Communication effects can include pressure "spikes" and subsequent drops, changes in production rate, and the detection of chemical tracers, when used. The industry deliberately designs tests, e.g., downspacing trials, to see when inter-well communication starts to occur to optimally develop the hydrocarbon resource in an area. In such trials, adjacent producing wells are designed to handle moderate fluctuations in pressure and volume. These industry-standard trials and variations are not the target of the AOR regulation and are not considered reportable incidents.

Any reporting of downhole pressure or volume changes during an *unconventional* completion job either in the well being completed or in adjacent, producing wells should be done only when a specific event occurs that could indicate a loss of mechanical integrity, i.e., containment, and that could pose a specific risk to the environment (surface or subsurface fluid release) or safety (*loss of well control*). This would amount to a sudden loss of pressure or a volume change that is clearly, statistically beyond the normal variability that a job has. However, these particular guidelines ("normal variability") cannot be quantified as a standard rule, as each completion job is unique. Therefore, action in these cases is left to the discretion and experience of the *operator*.

APPENDIX D - DEP EMERGENCY RESPONSE CONTACT INFORMATION

DEP Emergency Contact Numbers		
Region	**Emergency Phone**	**Counties Supervised**
Southeast	484-250-5900	Bucks, Chester, Delaware, Montgomery, Philadelphia
Northeast	570-826-2511	Carbon, Lackawanna, Lehigh, Luzerne, Monroe, Northampton, Pike, Schuylkill, Susquehanna, Wayne, Wyoming
South-central	866-825-0208	Adams, Bedford, Berks, Blair, Cumberland, Dauphin, Franklin, Fulton, Huntingdon, Juniata, Lancaster, Lebanon, Mifflin, Perry, York
North-central	570-327-3636	Bradford, Cameron, Centre, Clearfield, Clinton, Columbia, Lycoming, Montour, Northumberland, Potter, Snyder, Sullivan, Tioga, Union
Southwest	412-442-4000	Allegheny, Beaver, Cambria, Fayette, Greene, Somerset, Washington, Westmoreland
Northwest	814-332-6945 After Hours: 800-373-3398	Armstrong, Butler, Clarion, Crawford, Elk, Erie, Forest, Indiana, Jefferson, Lawrence, McKean, Mercer, Venango, Warren
RCSOB	1-800-541-2050	Statewide and Interstate

APPENDIX E - AOR PROCESS FLOW DIAGRAM