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Oil and Gas Management

Chapter 78a Training
Area of Review

August 29, 2016

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Tom Wolf, Governor

Patrick McDonnell, Acting Secretary


Oil and Gas Management

Ch. 78a Training
MODULE 10

Area of Review (AOR) – 78a.52a and 78a.73(c)/(d)

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Disclaimer

This training webinar was recorded at a time when the Area or Review Technical Guidance Document and associated materials were still under internal review and development by DEP. As a result, several of the slides in the recording differ from those archived in the final pdf version of the presentation. Please refer to this pdf version of the presentation for the most recent guidance associated with the Area of Review regulation for unconventional operations.

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Overview

This regulation has been developed to mitigate risks associated with hydraulic fracturing communication incidents

Regulatory language provides a mechanism for surveying a defined area around a well that will be hydraulically fractured for the presence of offset wells, classifying identified offset wells using a risk-based approach, implementing monitoring or other mitigation strategies at those wells posing the highest communication risks, and resolving unanticipated communication incidents

Overview

A Note About Formatting:

- The presentation is sequenced to follow the sections in the AOR Technical Guidance Document (TGD)
- The presentation contains hyperlinks and an appendix which allow access to additional reference materials that will not be covered during this training
- Any italicized items are recommendations, whereas all other “guidelines” are based on regulatory requirements or DEP’s policy interpretations of activities that must be completed to maintain compliance with existing regulations and laws
- The example at the conclusion of the presentation is NOT based on an actual hydraulic fracturing communication incident, but some of the well locational information is derived from information submitted to DEP

Presentation Outline

- Applicability
- AOR Geometry
- Reference Material
- Landowner Coordination
- Adjacent Operator Coordination
- Well Monitoring
- AOR Report Submission
- Incident Resolution
- Assessing Frac Communication Risks
- AOR Example
- Questions/Discussion
- Appendix
  - Definitions
  - AOR Report Contents
  - Incident Report Contents
  - AOR Example Narrative

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Applicability Definitions

Hydraulic fracturing/hydraulically fractured

Applicability

The AOR regulations of Chapter 78a., found in §§ 78a.52a. and 78a.73, require the following:

- Identification of offset wells within the AOR using databases, historical maps, and landowner surveys
- Submission of a report to DEP containing the information required by § 78a.52a(c)
- Notifications to adjacent operators [§ 78a.73(c)] with active, inactive, abandoned, and plugged and abandoned wells in the AOR having certain penetration depths
- Monitoring during hydraulic fracturing at orphan, abandoned, and plugged wells within the AOR having certain penetration depths

Notifications and reporting must occur at least 30 days prior to commencing drilling at the well that will be hydraulically fractured

Applicability

Implementation Schedule Matrix: Well Permit Application Submitted But NOT Fraced (Pre-Reg)

Well Permit Application Submitted But Well NOT Fraced

Database Review: 78a.52a(b)(1)	NO
Historical Map Review: 78a.52a(b)(2)	NO
Landowner Survey: 78a.52a(b)(3)	NO
AOR Summary Report and Monitoring Plan: 78a.52a(c)	NO
Adjacent Operator Notification: 78a.73(c)	NO
Incident Notification: 78a.73(c)	YES

Promulgation Date

Applicability

Implementation Schedule Matrix: Well Already Permitted AND Fracing Commenced (Pre-Reg)

Well Already Permitted AND Fracing Commenced

Database Review: 78a.52a(b)(1)	NO
Historical Map Review: 78a.52a(b)(2)	NO
Landowner Survey: 78a.52a(b)(3)	NO
AOR Summary Report and Monitoring Plan: 78a.52a(c)	NO
Adjacent Operator Notification: 78a.73(c)	NO
Incident Notification: 78a.73(c)	NO*

*If Clean Streams Law or any other regulations/laws are violated, including general safety provisions; reporting must still occur under appropriate regulatory/statutory provisions.

Promulgation Date

Applicability

Implementation Schedule Matrix: Restimulated Well (Post-Reg)

Promulgation Date

Restimulated Well

Database Review: 78a.52a(b)(1)	YES
Historical Map Review: 78a.52a(b)(2)	YES
Landowner Survey: 78a.52a(b)(3)	YES
AOR Summary Report and Monitoring Plan: 78a.52a(c)	NO
Adjacent Operator Notification: 78a.73(c)	NO
Incident Notification: 78a.73(c)	YES

Applicability

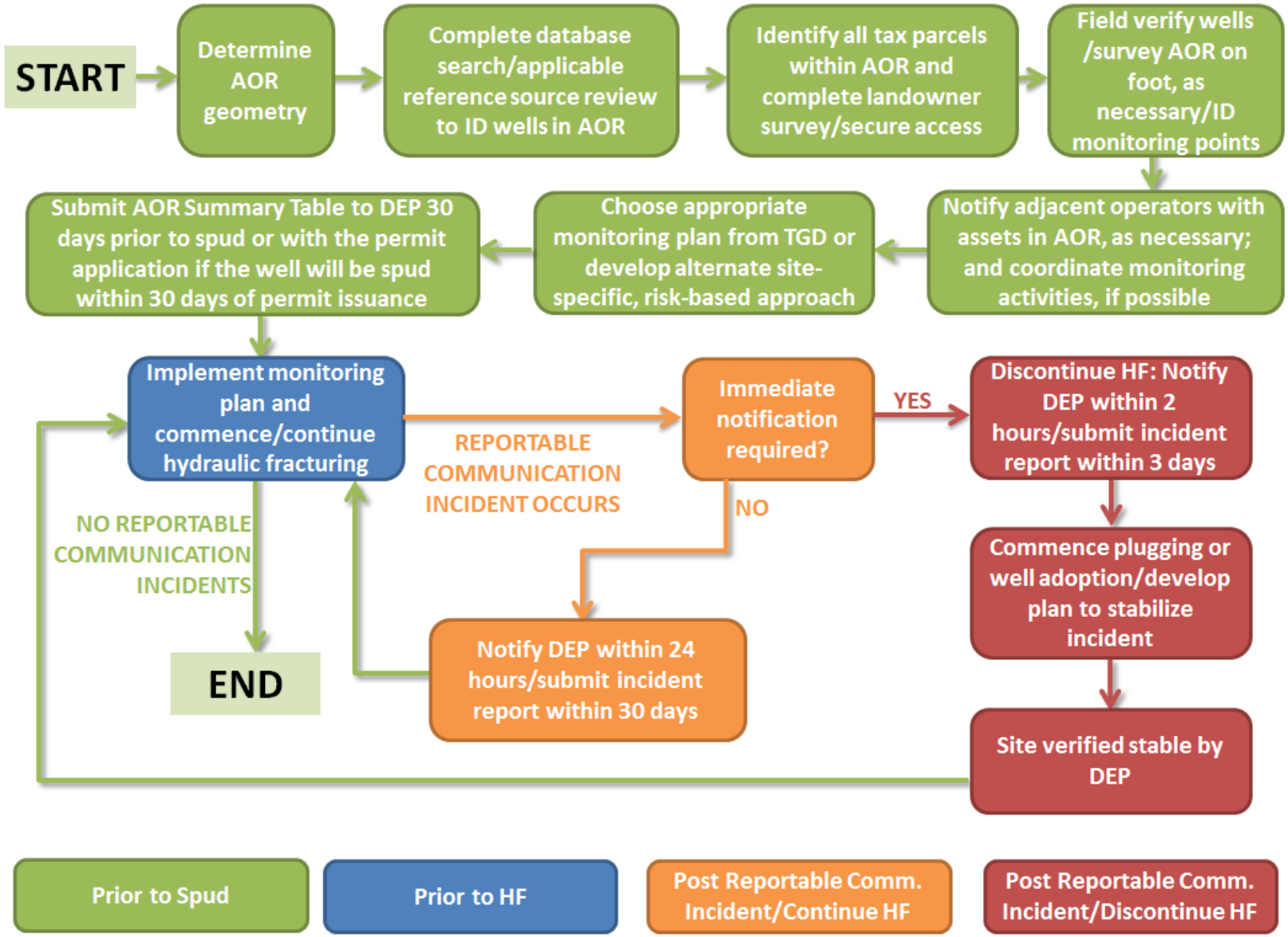
Implementation Schedule Matrix: Well Permit Application NOT Submitted (Post-Reg)

Promulgation Date

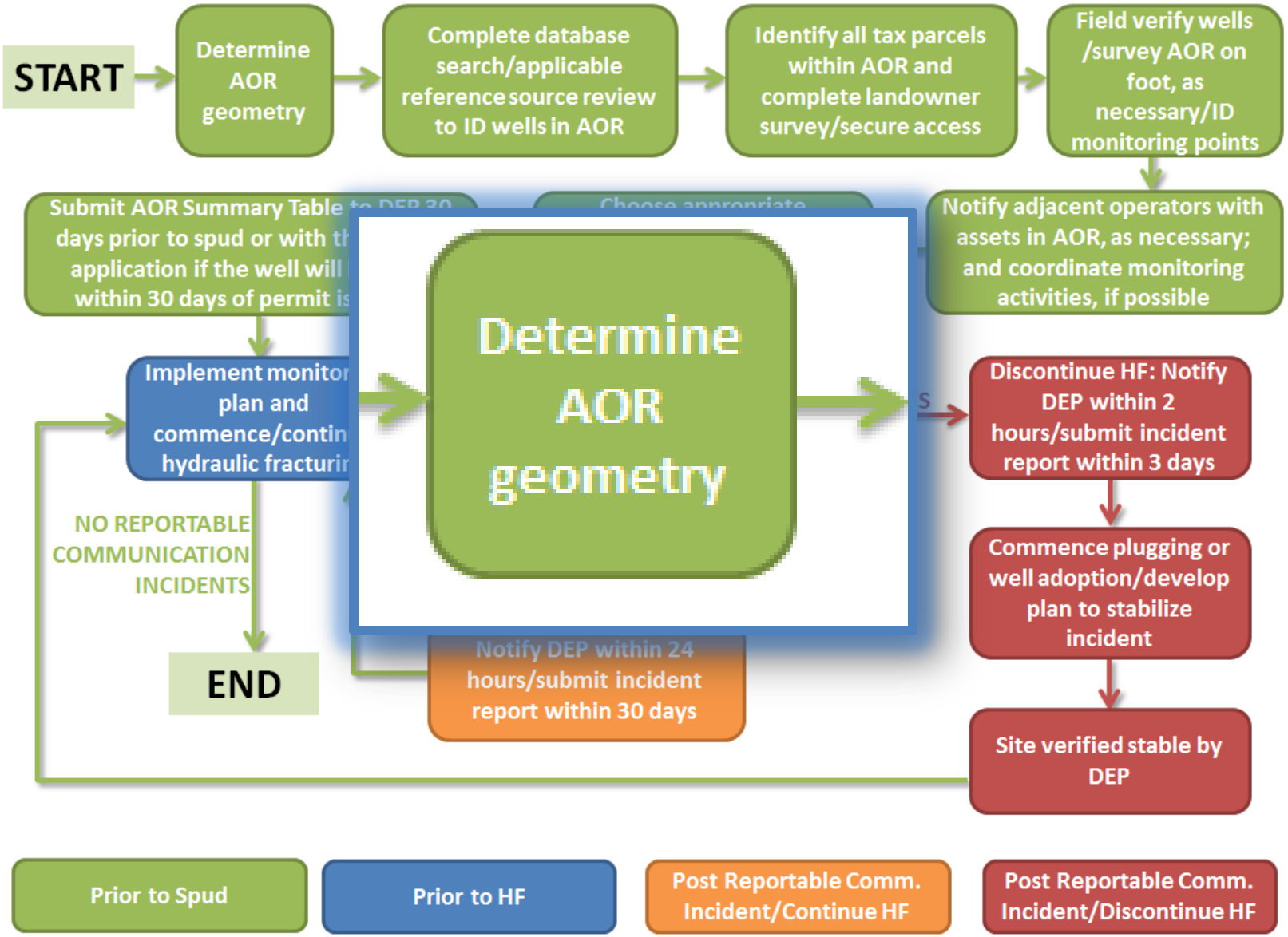
Well Permit Application NOT Submitted

Database Review: 78a.52a(b)(1)	YES
Historical Map Review: 78a.52a(b)(2)	YES
Landowner Survey: 78a.52a(b)(3)	YES
AOR Summary Report and Monitoring Plan: 78a.52a(c)	YES
Adjacent Operator Notification: 78a.73(c)	YES
Incident Notification: 78a.73(c)	YES

AOR Process Flow Diagram



AOR Geometry



AOR Geometry Definitions

Unconventional well

True vertical depth/True bottom hole depth

Zone of hydraulic fracturing influence

AOR Geometry Regulations

For 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. See § 78a.52a(a).

AOR Geometry Regulations

True vertical depths of offset abandoned, orphan, and plugged and abandoned wells determine whether or not visual monitoring during hydraulic fracturing activities must be completed:

- Vertical buffer distances, referencing perforation elevations for cased hole completions, are established at +/- 1,500 feet for all unconventional wells (§78a.73(c)).

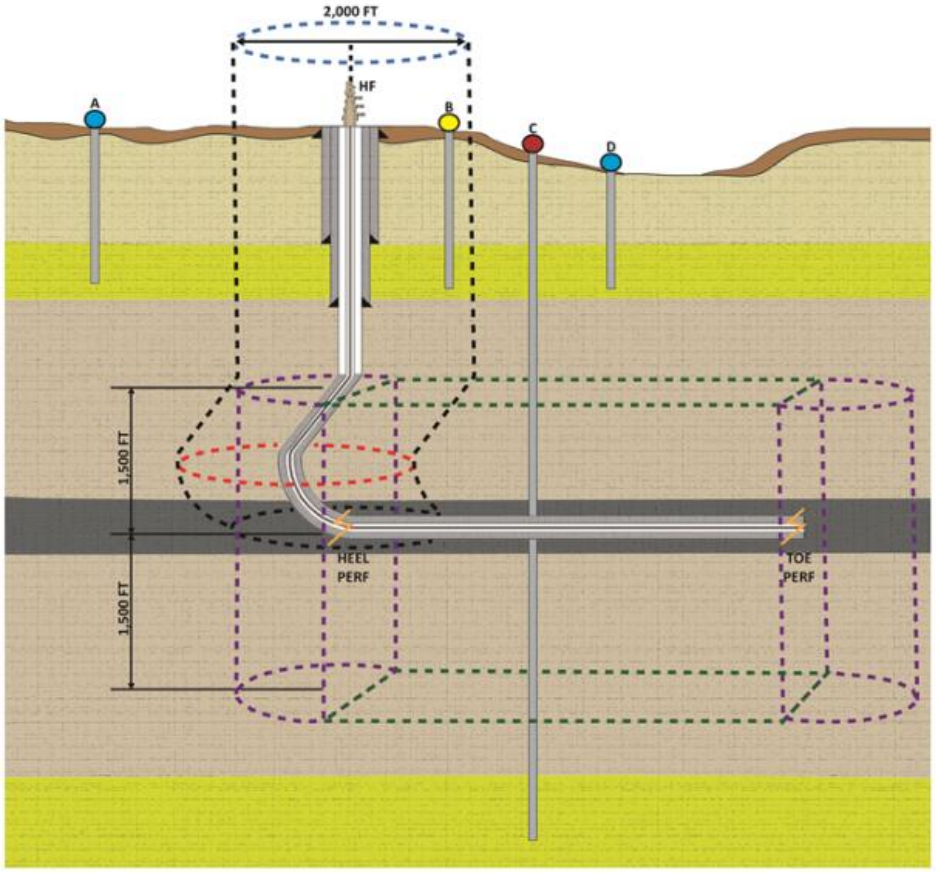
AOR Geometry

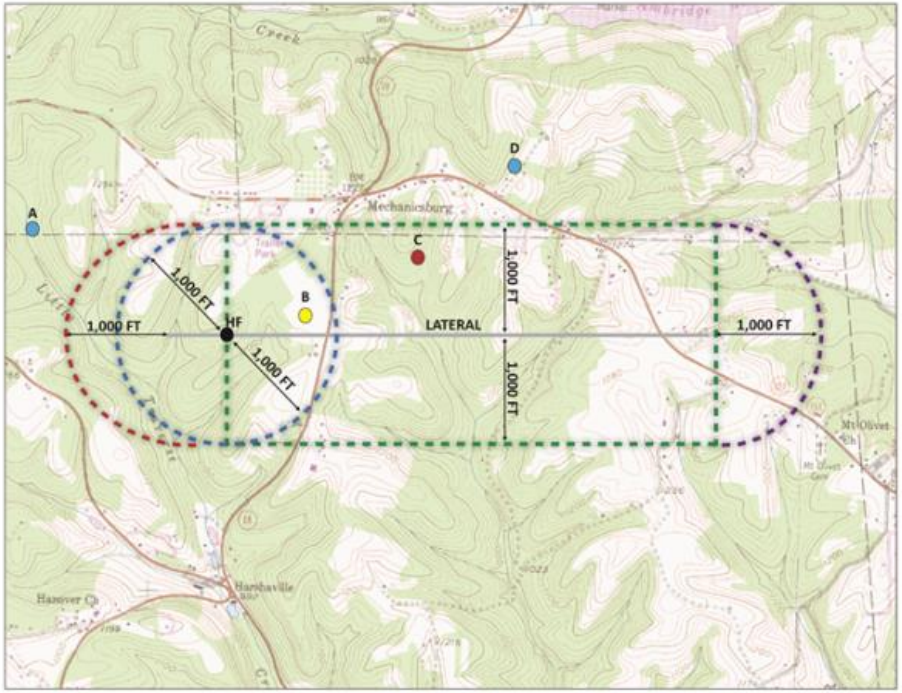
Well Type	Orientation	Anticipated Gas-to-Oil Ratio	AOR Distance (ft)	Wells Requiring Monitoring
Unconventional	Vertical	NA	1,000	all that penetrate within +/- 1,500 feet of uppermost and lowermost perforations
Unconventional	Horizontal	NA	1,000	all that penetrate within +/- 1,500 feet of uppermost and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

AOR Geometry

UNCONVENTIONAL WELL 1

Red = Map and monitor/notify
Yellow = Map
Blue = No requirements

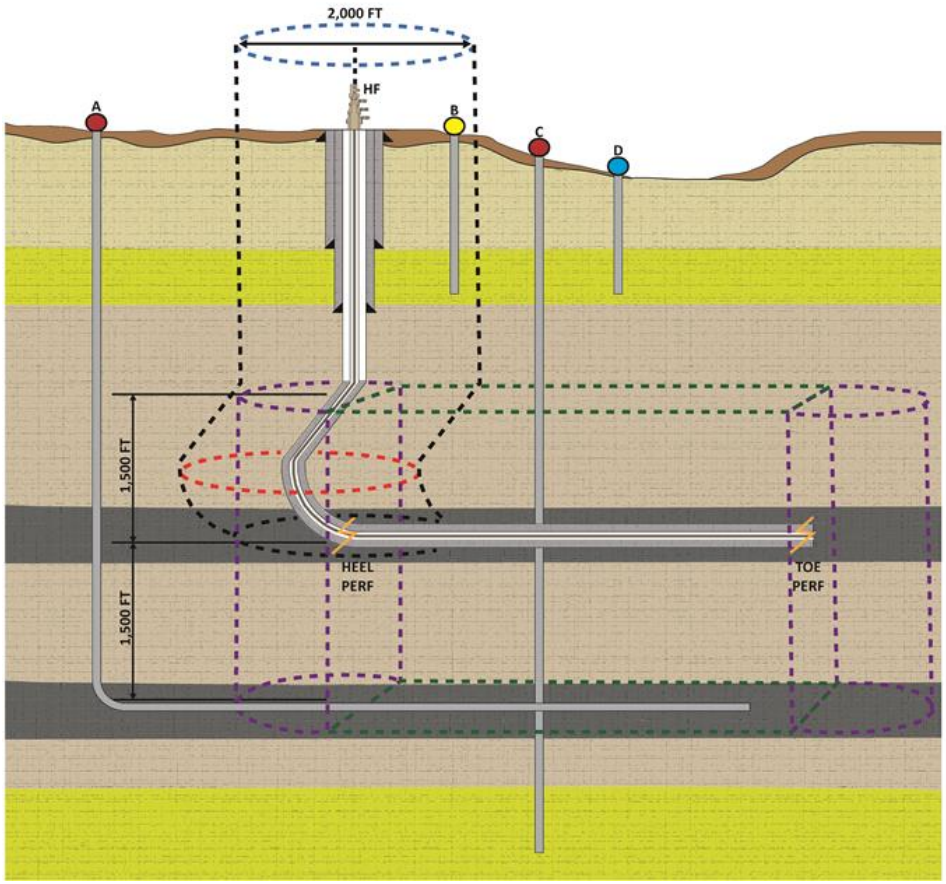


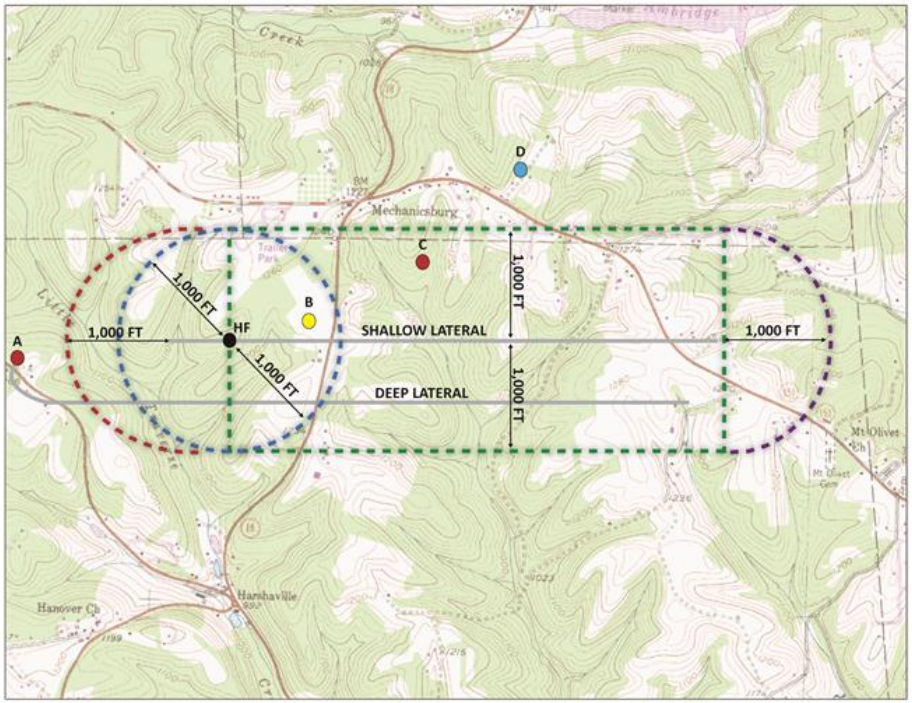


AOR Geometry

UNCONVENTIONAL GAS 2

Red = Map and monitor/notify
Yellow = Map
Blue = No requirements

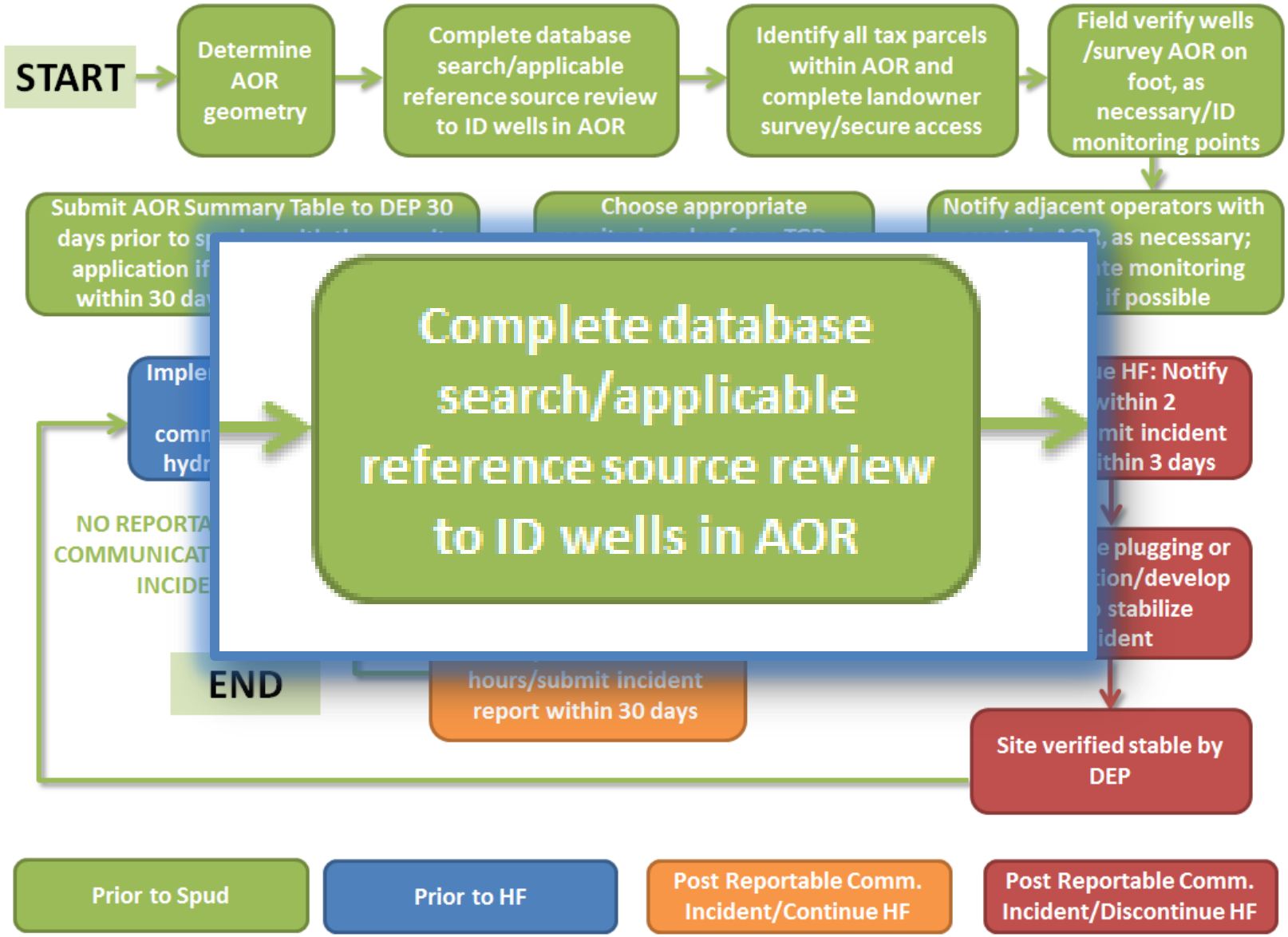




AOR Geometry Summary

- The AOR regulation is a “geometry problem”
- Knowing what type of well will be hydraulically fractured (vertical or horizontal unconventional well) allows an operator to define the AOR geometry
- Wells outside the AOR have no associated requirements, unless they are communicated with
- All wells within the AOR must be mapped and the subset of those wells penetrating the zone of hydraulic fracturing influence and successfully located in the field must be monitored if they are classified as abandoned, orphan, or plugged & abandoned

Reference Material



Reference Material Definitions

Offset well

Abandoned well

Inactive well

Orphan well

Active well

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Reference Material Regulations

Section 78a.52a(b) provides that operators must identify offset wells in the AOR by:

- Conducting a review of DEP's well databases and other available well databases
- Conducting a review of historical sources of information, such as applicable farmline maps, where accessible

Reference Material

- *Once the AOR has been defined, the operator should consult the list of reference materials in Table 1 and the associated Map Indices in Appendix B of the TGD*
- ***Professional discretion*** *should be applied to determine which reference materials should be consulted to identify offset wells within the AOR*, keeping in mind that the DEP Oil and Gas Map tool (or associated databases) and the EDWIN Viewer (once released) must always be consulted for any portions of the AOR not surveyed on foot (these sources are shaded in red in TGD)
- Prior to the release of the EDWIN Viewer, EDWIN (formerly PA IRIS) records or DCNR's Open File Report OFOG 15-01.2 (Map 10) well-depth information must be consulted

Reference Material

- Ground Surveys of AOR
  - Reference materials compiling locations for historical wells may have significant levels of uncertainty associated with the reported locations for such wells or may have limited resolution – locational accuracy for historical wells is a particularly acute problem in areas of significant historic development
  - Surveying the AOR on foot, provided all portions of the defined area are physically examined for the presence of wells, is an acceptable means for locating offset wells and forgoes the need to review reference materials; it is acceptable to survey portions of the AOR on foot and evaluate other portions using reference materials
  - In situations where a historical well is reported that requires monitoring based on its presumed depth, but cannot be identified in the field, there is no expectation for the operator to monitor the reported site of the well during hydraulic fracturing

Reference Material

- Updates to Oil and Gas Map Viewer will include the links to most of the reference materials, making it a one-stop directory
- TGD has links to almost all digital reference material sources and an index of other useful reports and maps in the appendix

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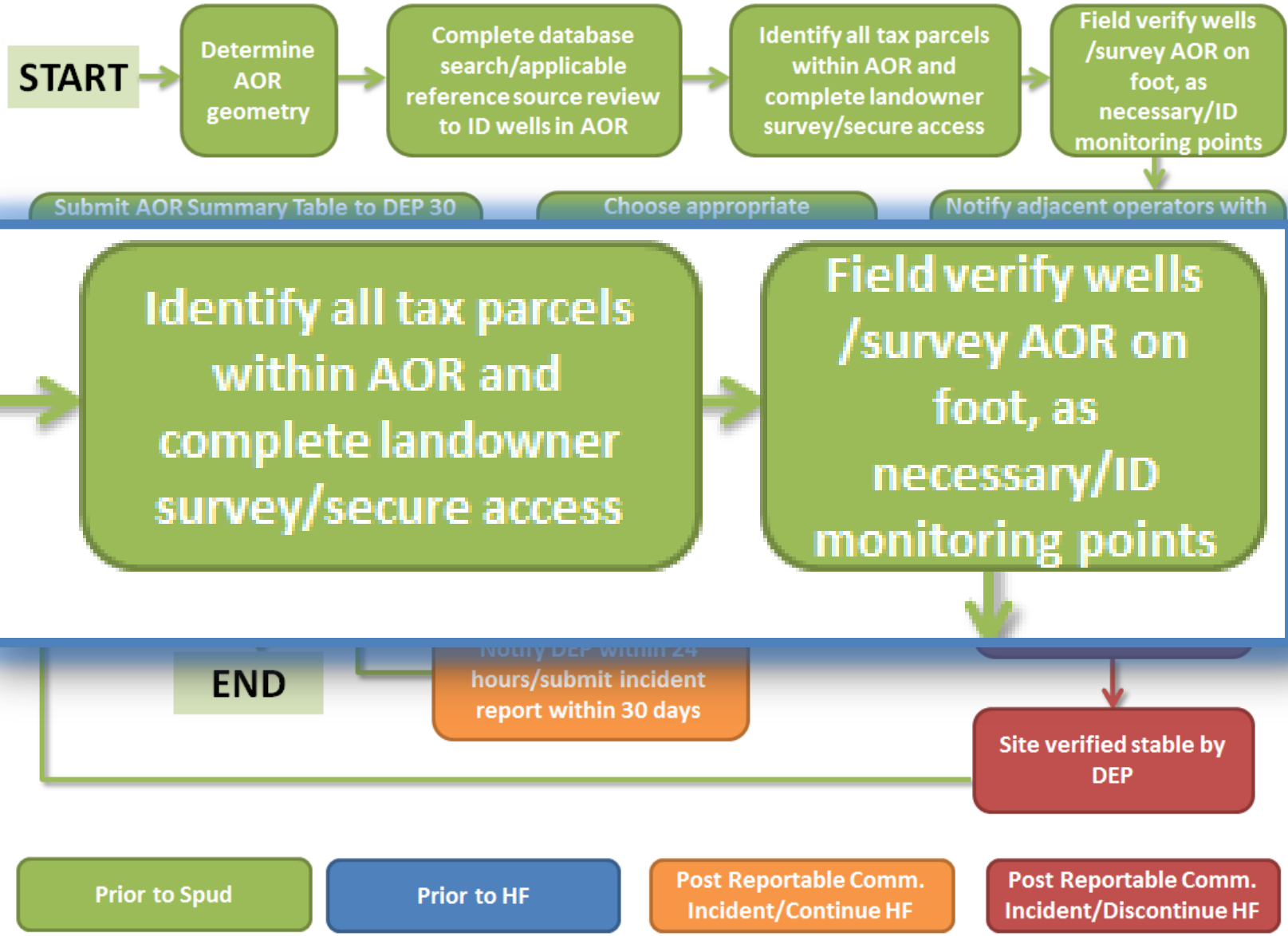
Reference Material Summary

- Numerous reference materials are available for the purposes of identifying offset wells within the AOR, but only **DEP databases and the EDWIN viewer are required**
- Operator development maps are also useful sources of information
- PASDA, Penn Pilot, topographic maps, and geologic survey reports are other reference materials that might be worth consulting
- Surveying all or portions of the AOR on foot is always an option and precludes the need to review available references for such areas
- There is no expectation to monitor offset wells within the AOR that can’t be located in the field

Landowner Coordination



Landowner Coordination Definitions

Landowner

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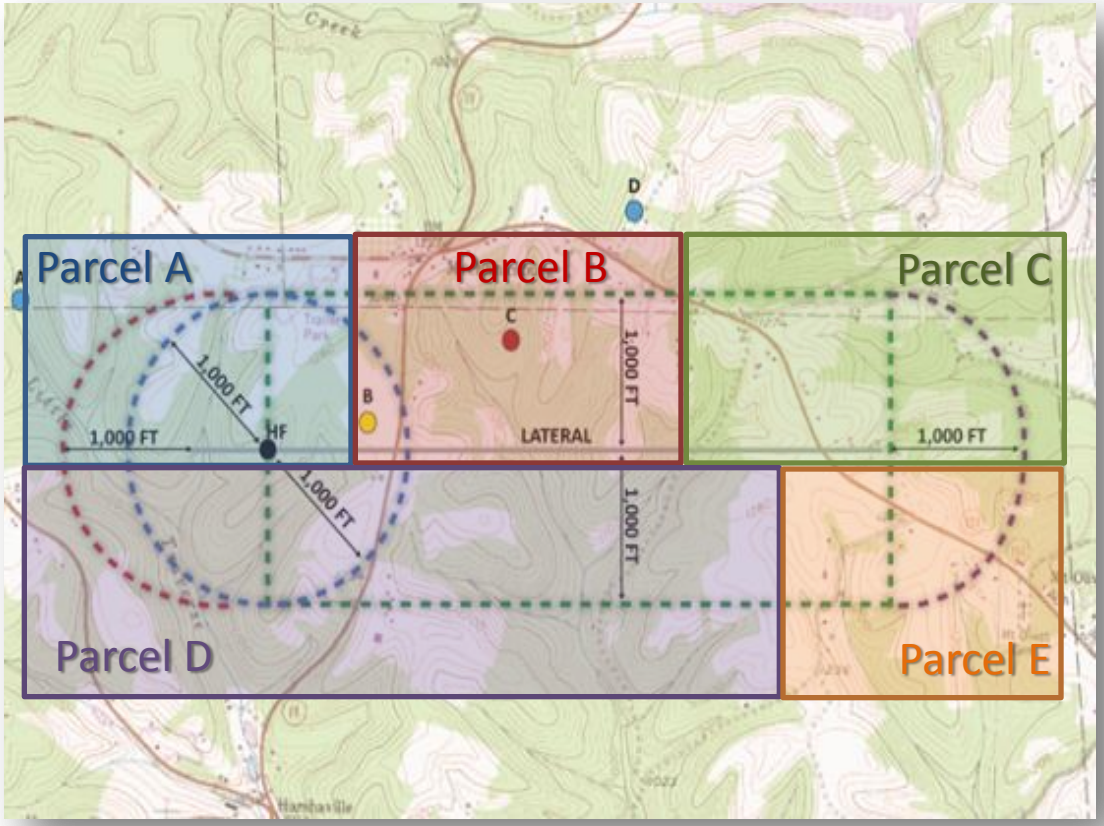
Landowner Coordination Regulations

As part of regulations established in § 78a.52a(b)(3), the operator is required to provide evidence to DEP that a due-diligence effort was made to identify potential offset wells of concern through submittal of questionnaires to landowners by certified mail delivery. DEP provided forms must be used.

Landowner Coordination

UNCONVENTIONAL WELL



- The landowner, as defined at the county recorder of deed's office, for all parcels intersecting the AOR must be surveyed
- In this case, Parcels A, B, C, D, and E must all be included in the landowner survey
- *It is recommended that a well site map be included along with the landowner survey form*

Landowner Coordination

- Two options are available for completing landowner surveys
  - Standard DEP paper forms: parcel-by-parcel checks for the presence of wells (10 business days provided for compilation of information)
  - Development plan option: allows operators to work ahead to clear larger percentages of development acreage (30 business days provided for compilation of information)
- *Completed and returned forms **do not** need to be submitted to DEP, but it is recommended operators retain this information for 5 years*
- Standard DEP forms must be used to assemble information under the development plan option

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Landowner Coordination

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COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OFFICE OF OIL AND GAS MANAGEMENT

AREA OF REVIEW LANDOWNER SURVEY
(Unconventional Operations Only)

GENERAL INFORMATION

Unconventional operators who are planning to drill a new well are required to submit a questionnaire to landowners in an effort to identify all nearby offset wells pursuant to 25 Pa. Code Section 78a.52a (relating to area of review). As part of this process, the operator must send this questionnaire form to surrounding landowners within 1,000 feet of the proposed new well, which is shown approximately on the attached map.

This questionnaire is designed to solicit information that you may have regarding the location of existing well(s) within 1,000 feet of the proposed well. Although legacy wells may sometimes be apparent in the form of derricks or pump jacks, other evidence may be more prevalent and could include partially buried steel pipes, areas of subsidence, and small-diameter piping at the surface associated with historical gathering systems. While the landowner is not required to complete this form, this information could be useful to the operator and DEP with regard to future drilling plans.

OPERATOR AND WELL INFORMATION

Operator Name			OGO No.
Operator Address			
City		State	Zip Code
Operator Contact		Operator Telephone No.	Email
County of Proposed Well Site		Municipality of Proposed Well Site	

PROPERTY INFORMATION

Surface Landowner Name			Surface Property Tax ID No.		
Property Address			Home Address (if different than Property Address)		
City	State	Zip Code	City	State	Zip Code
Telephone No. (Home)	Telephone No. (Cell)	Telephone No. (Other)	Best Time of Day to Contact		

FORM QUESTIONS

1. Are you aware of any active, inactive, abandoned, orphan or plugged oil/gas wells that are within 1,000 feet of the proposed new well (see attached map)? ☐ Yes ☐ No

   If no, please proceed to question 4 to complete the questionnaire.

2. **a.** If yes to question 1, are you able and willing to show an operator representative physical evidence of the well(s) on your property? ☐ Yes ☐ No

   b. If possible, please attach photograph(s) of the well(s) to this form submittal.

   c. Please list the number of wells on the property: _____ No. of wells

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3. **a.** If there is no physical evidence of oil/gas wells on your property, do you have other information (e.g., historic maps, well records, other documentation, etc.) regarding oil/gas wells within 1,000 feet of the proposed new well that you are willing to share with the operator? ☐ Yes ☐ No

   b. If yes, it would be helpful if you could attach a copy of such documentation to this form.

4. Provided advanced notice is given, will you allow the operator access to your property to inspect wells identified on your property by you or that the operator identified from other sources? ☐ Yes ☐ No

ADDITIONAL INFORMATION

If there is any additional information about wells on your property you wish to share, or if there is someone else you think might have additional information, please include that information below your signature or as a separate attachment.

Please note that unless you respond "yes" to questions 2a or 3a, and question 4, the operator will likely not contact you for additional information.

FORM CERTIFICATION AND SIGNATURE

Form Certification: I hereby acknowledge that I have supplied true and correct information to the best of my knowledge. There is no penalty if the surface landowner does not complete this questionnaire.

Signature:_____ Date: _____

Printed Name: _____

Please return this completed form to the operator designated above within ten (10) business days of receipt.

DRAFT

Landowner Coordination

- Development Plan Option

Operator Name:	
DEP ID/OGO No:	
Contact:	
Contact Telephone No.:	

Farm Name	Well No.	Serial No.	US Well No. (API No.)	County	Municipality

	Property Address			
Surface Landowner	Street Name and Number	City	Zip Code	Surface Property Tax ID No.

Landowner Coordination

- Development Plan Option

Telephone Number			
Home/Business	Cell	Other	Contact Time

Well Information: only indicate number of wells for which physical evidence was provided and access permitted					
Active	Inactive	Abandoned	Plugged	Orphan	AOR Summary Table Reference

Survey Completion Date	Survey Period	DEP Authorizing Contact	Operator Comments

Landowner Coordination

- Land management agencies/commissions are the "landowner" for many parcels spanning the oil and gas producing regions of the state
- The development plan option is likely the optimal choice for coordination with these entities in most cases
- The TGD contains contact information for the following land management agencies/commissions:
  - PA Fish & Boat Commission
  - Forest Service/Allegheny National Forest
  - DCNR Bureau of Forestry
  - DCNR Bureau of State Parks
  - PA Game Commission

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Landowner Coordination

- Information compiled through landowner surveys may be retained and used for up to **3 years** from the time a parcel was surveyed
- **Upon DEP approval**, information collected as part of the development plan option may be retained and used for up to **5 years** from the time a parcel was surveyed
- Information collected as part of landowner surveys is transferrable to other operators, provided original documentation is supplied to the new lease operator
- It is critical to document landowner coordination efforts using the U.S. Postal Service certified mailing system or other traceable methods defined in the regulation

Landowner Coordination

- There is no expectation that an operator field verify information provided by a landowner if any of the following scenarios apply:
  - The landowner does not complete the questionnaire within a reasonable timeframe or at all
  - 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
  - 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

Landowner Coordination

- There is no expectation that an operator field verify information provided by a landowner if any of the following scenarios apply:
  - The landowner will not grant access to the operator
  - 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

Landowner Coordination Summary

- Landowners of all parcels intersecting the AOR must be contacted
- Information compiled through landowner surveys may be referenced for a minimum of 3 years (standard DEP forms) and a maximum of 5 years (development plan option with DEP approval), and is transferrable to other operators
- *Completed forms do not need to be submitted to DEP, but it is recommended they be retained by the operator for 5 years*
- The TGD defines scenarios when landowner survey information is **not actionable**

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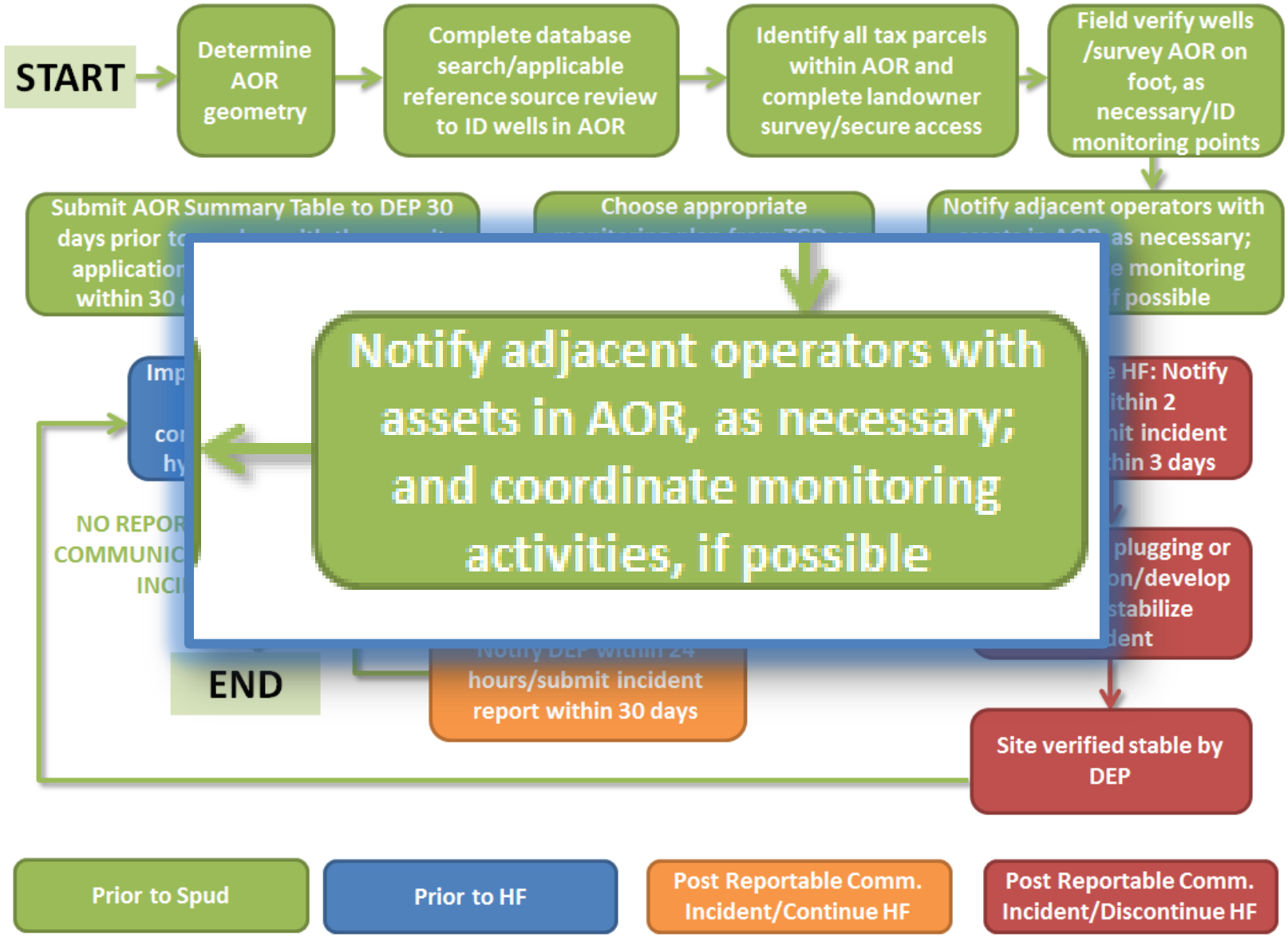
Adjacent Operator Coordination



Adjacent Operator Coordination Definitions

Owner (of a well)

Responsible Party/Operator

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Adjacent Operator Coordination Regulations

The AOR regulations in § 78a.73(c) require operators completing hydraulic fracturing activities to notify adjacent operators with offset wells that penetrate the zone of hydraulic fracturing influence.

Adjacent Operator Coordination

- DEP's Well Inventory Report serves as the resource for identifying the most up-to-date contact information for operators in the state and can be accessed from the agency's reporting page
- Wells that have been plugged within the preceding 12 months are the responsibility of the operator who completed plugging in the context of the AOR regulation
- For active and inactive wells, notification responsibilities extend to other business units within the same company, e.g., drilling, completions, or operations; when the offset well is operated by the company completing hydraulic fracturing

Adjacent Operator Coordination

- *The hydraulic fracturing operations team should be briefed regarding appropriate response (implementing operational decisions and coordinating with DEP) when notified by an adjacent operator that a communication incident has occurred*
- *It is recommended that operators retain documentation regarding attempts to contact adjacent operators for 5 years*

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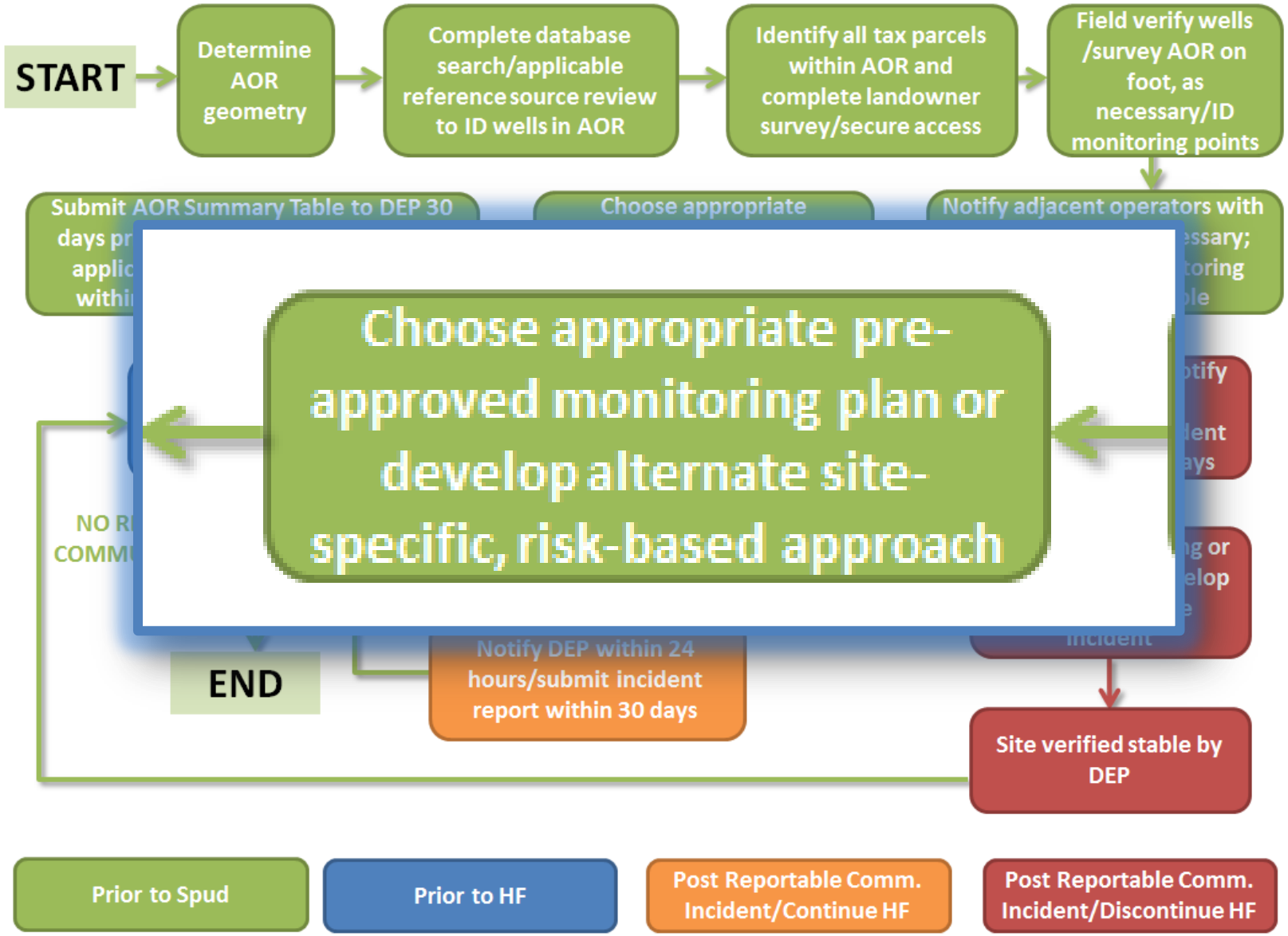
Well Monitoring



Well Monitoring Definitions

Closest approach

Visual monitoring

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Well Monitoring Regulations

Monitoring requirements associated with the AOR regulations of Chapter 78a are found in §78a.73(c).

Well Monitoring

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

- **FOR HISTORICAL WELLS THAT DON'T PENETRATE THE ZONE OF HYDRAULIC FRACTURING INFLUENCE, THERE ARE NO REQUIREMENTS TO FIELD LOCATE AND CONDUCT MONITORING**

- **FOR HISTORICAL WELLS THAT ARE PRESUMED TO PENETRATE THE ZONE OF HYDRAULIC FRACTURING INFLUENCE THAT CANNOT BE LOCATED IN THE FIELD, THERE ARE NO MONITORING REQUIREMENTS IN PLACE**

Well Monitoring

Description	Suggested Monitoring Level	Monitoring/Risk Mitigation Options
Wells within AOR which do not penetrate the zone of hydraulic fracturing influence	NONE	NONE
Wells inside AOR which penetrate the zone of hydraulic fracturing influence		
Active wells being drilled (adjacent operator or operatory hydraulically fracturing well)	LOW	NOTIFICATION ONLY
Active wells in production/inactive wells (adjacent operator or operator hydraulically fracturing well)		
Zone of hydraulic fracturing influence/pressure isolation is verified	LOW	NOTIFICATION ONLY
Lack of zone of hydraulic fracturing influence/pressure isolation	HIGH	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

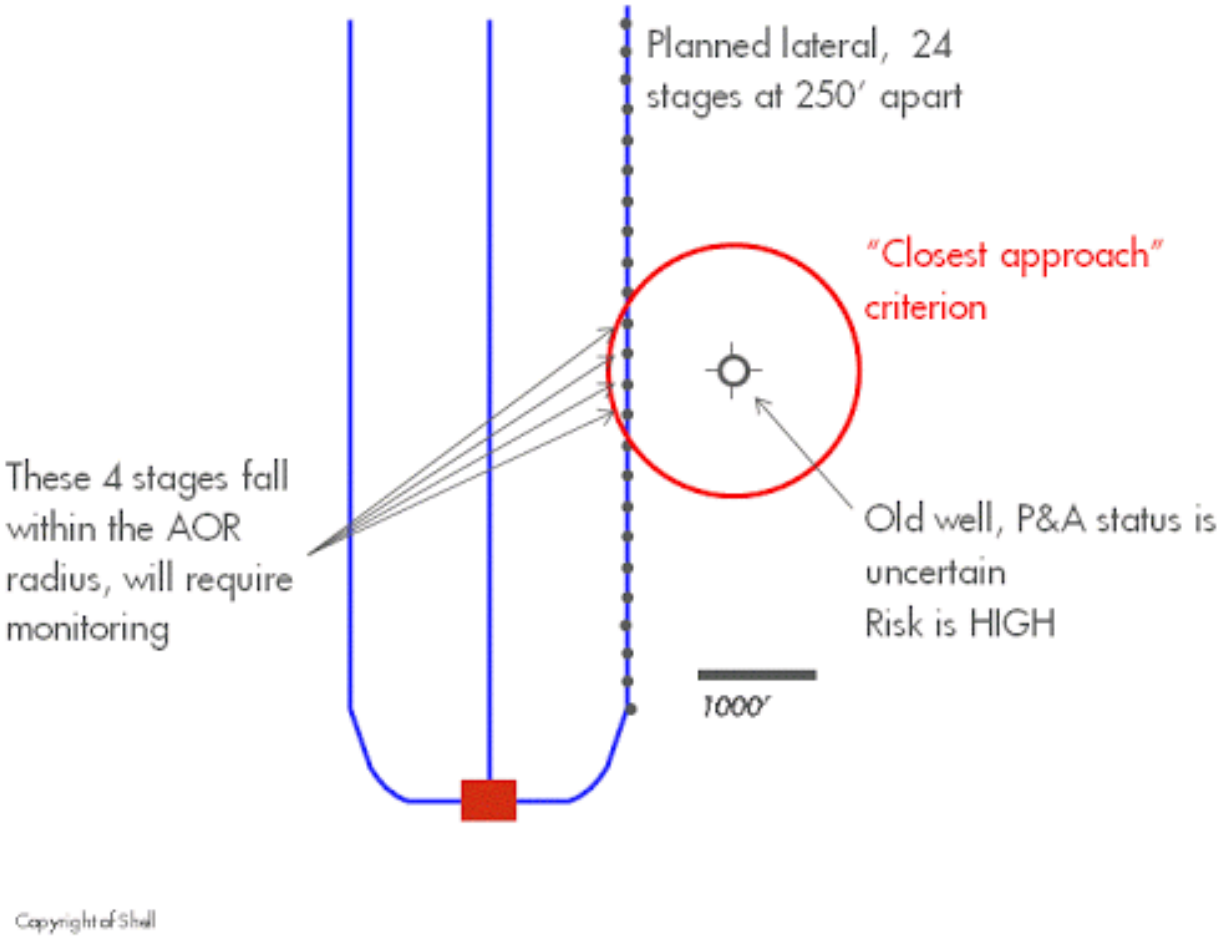
Well Monitoring

Monitoring Activities at Offset Wells

- Only abandoned, orphan, and plugged & abandoned wells are required to be part of an operator's monitoring plan
- There is no expectation for an operator to monitor the reported site of a historical well if it cannot be located in the field
- HIGH, MEDIUM, and LOW monitoring levels have been established based on the perceived risk an offset well presents
  - HIGH: Continuous monitoring or containment required
  - MEDIUM: Pre- and post-hydraulic fracturing inspection required
  - LOW: Post-hydraulic fracturing inspection required

Well Monitoring

"Closest Approach" Concept



Schematic developed by Bruce Mitchell, Shell Appalachia

Well Monitoring

Containment at Offset Wells

- Equipping an offset well in the AOR to prevent fluids from being released to the environment is a suitable option for achieving continuous monitoring
- Offset wells in AOR that have no viable responsible party or are not operated by the company completing hydraulic fracturing activities should not be retrofitted with any equipment until consulting the appropriate DEP district oil and gas personnel, i.e., **don't touch wells that don't belong to you without permission, as liability matters are at stake**

Well Monitoring

Monitoring Treatment Pressures and Volumes

- Sudden losses of pressure or volume changes that are clearly, statistically beyond the normal variability that a job has may indicate a communication incident has occurred; however, these particular guidelines (“normal variability”) cannot be quantified as a standard rule, as each completion job is unique
- Action in these cases is left to the discretion and experience of the operator

Well Monitoring

Standard Monitoring Plans

- DEP has developed a standard monitoring plan for unconventional operations
- It is based on information assessed as part of the AOR Workgroup process and does not represent the only option for completing monitoring activities
- *It is recommended that the operator contact the appropriate DEP oil and gas district staff with any questions related to monitoring alternatives that deviate from the standard monitoring plan prior to submission of the monitoring plan*

Well Monitoring

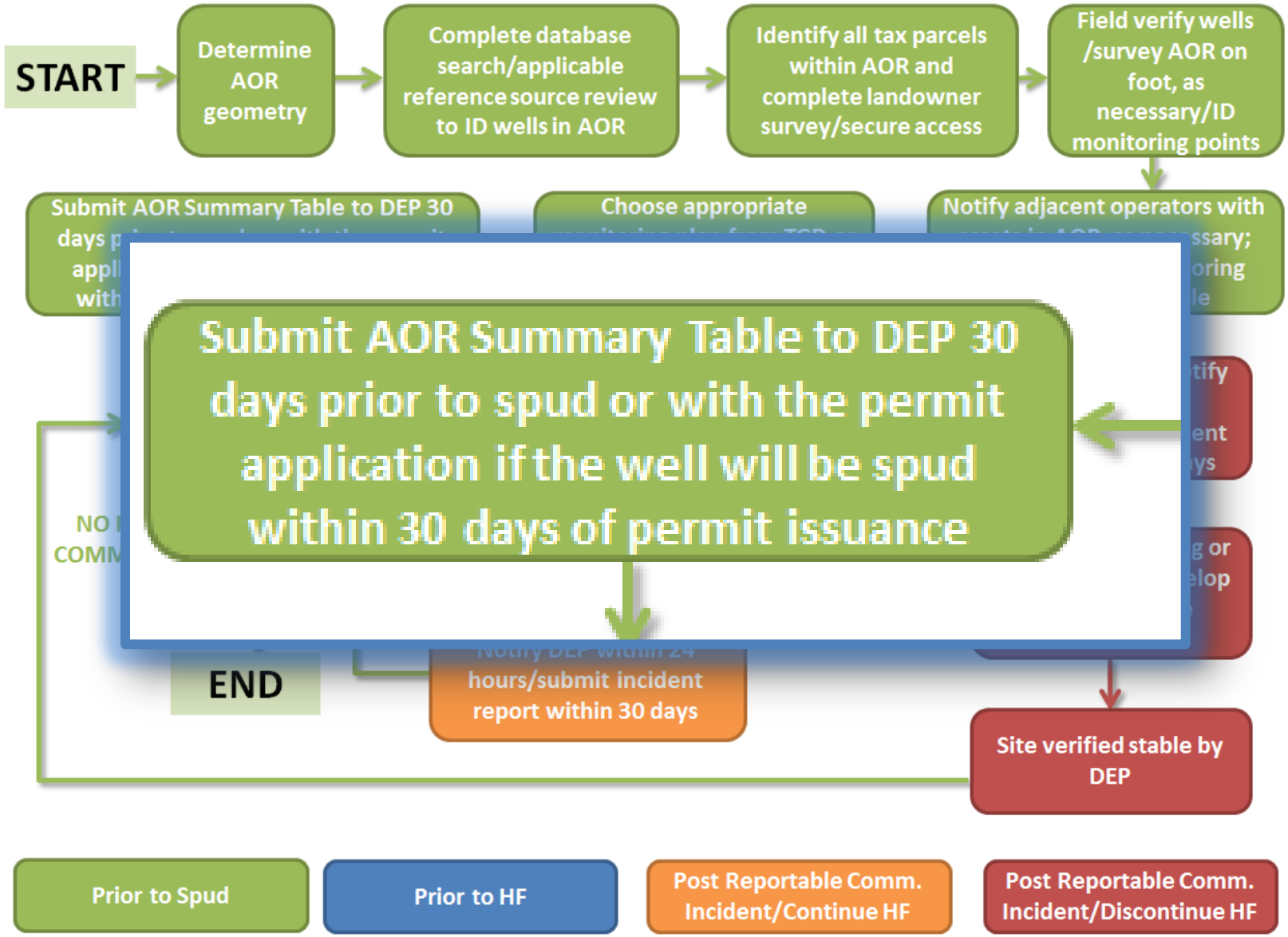
Standard Monitoring Plan

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

Well Monitoring Summary

- HIGH, MEDIUM, and LOW monitoring levels have been established based on the presumed risk each offset abandoned, orphan, and plugged & abandoned well represents
- Containment may be used as a visual monitoring option, but DEP coordination is essential in cases where the operator conducting hydraulic fracturing is not the operator of the well where containment is being considered
- DEP has developed a standard monitoring plan for unconventional wells, but site-specific options may be developed by the operator

AOR Report Submission



AOR Report Submission Definitions

GPS (global positioning system) coordinates

Bottom hole location

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AOR Report Submission Regulations

An AOR report and monitoring plan is required per Chapter 78a, § 78a.52a.(c).

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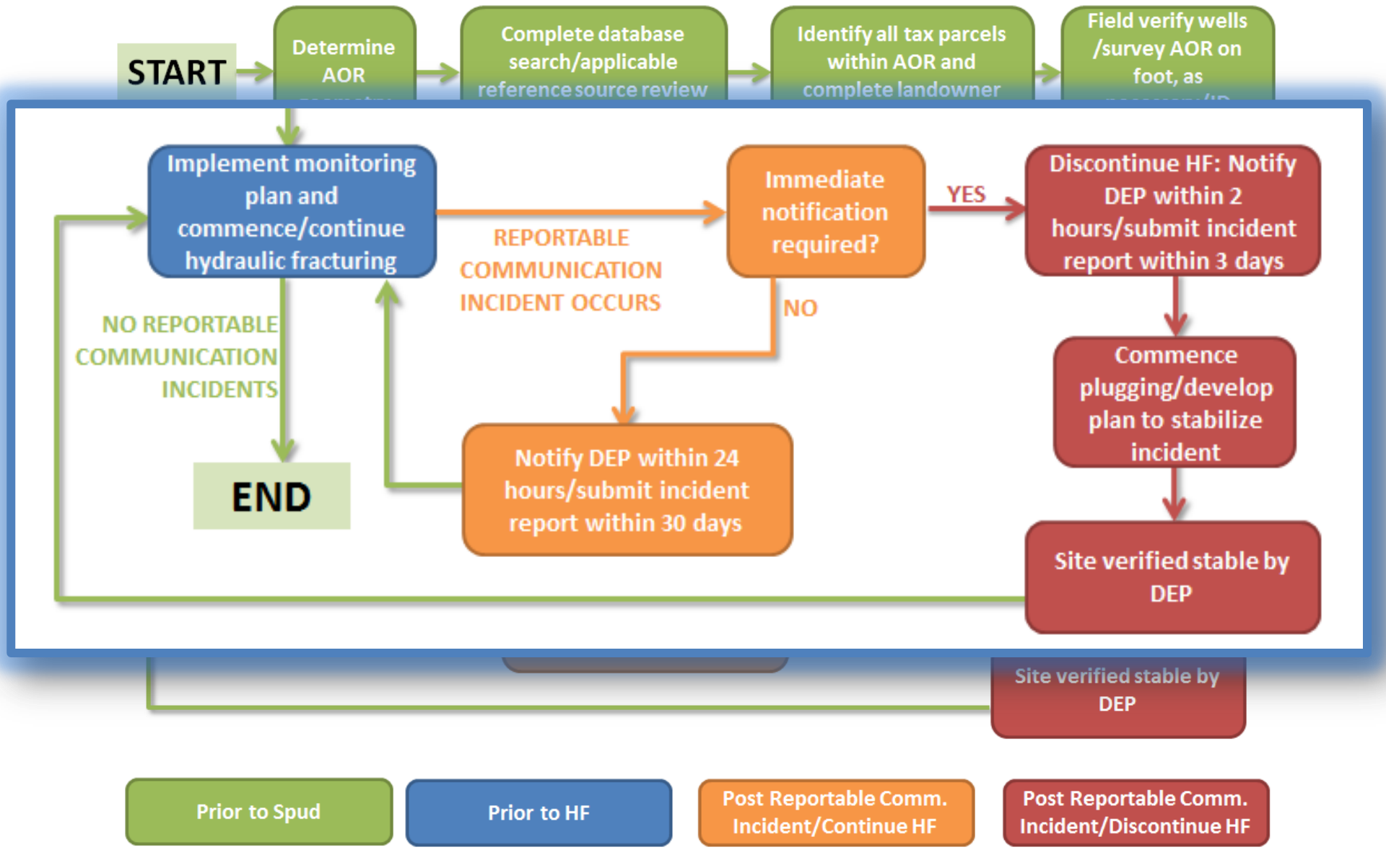
AOR Report Submission

- A standard tabular report must be submitted electronically to DEP at least 30 days prior to anticipated spud for all wells, or along with the permit application if the well will be spud within 30 days of permit issuance
- A site plat must accompany the standard tabular report – it must consist of an electronically rendered map, drawing, or print that is accurately scaled and depicts all wells listed in the AOR summary table along with other features deemed relevant by the operator

AOR Report Submission

- An accompanying site-specific report may be necessary, in certain cases, and possible components include:
  - 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
  - Any historical well drilling analysis completed to estimate well true vertical depths
  - Any geologic evaluation used to modify the AOR geometry beyond the dimensions prescribed in the regulations
  - Coordination/monitoring agreements between adjacent operators
  - Documentation of identified well ownership and access issues
  - Bibliography of reference materials used to compile information for wells falling within the AOR

Incident Resolution



Incident Resolution Definitions

Communication incident

Well control incident/loss of well control

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Incident Resolution Regulations

The AOR regulations address incident resolution in the sections detailing well adoption, plugging of altered wells, and DEP authorization prior to recommencement of hydraulic fracturing activities: §§ 78a.73(c) and 78a.73(d).

Incident Resolution

- The TGD defines 3 types of hydraulic fracturing communication incidents:
  - Those requiring 2-hour notification and follow-up with a standard electronic incident report within 3 days: hydraulic fracturing must stop immediately and may not continue without DEP authorization
  - Those requiring 24-hour notification and follow-up with a standard electronic incident report within 30 days: hydraulic fracturing may continue
  - Non-reportable communication incidents

Incident Resolution

- Incidents requiring 2-hour notification and follow-up with a standard electronic incident report within 3 days:
  - 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.

Incident Resolution

- Incidents requiring 2-hour notification and follow-up with a standard electronic incident report within 3 days:
  - Any communication incident with an abandoned, orphan or plugged well
  - 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

Incident Resolution

- Incidents requiring 2-hour notification and follow-up with a standard electronic incident report within 3 days:
  - Any communication incident that results in a well control incident/loss of well control as defined in the TGD
  - Any communication incident that results in site safety risks due to equipment malfunction or other events within the AOR

Incident Resolution

- Incidents requiring 2-hour notification and follow-up with a standard electronic incident report within 3 days:
  - NOTE THAT ESTABLISHED NOTIFICATION STANDARDS AND TIMELINES MUST BE FOLLOWED FOR ANY COMMUNICATION INCIDENTS THAT VIOLATE SECTION 91.33 OR THE PROVISIONS OF § 78a.66

Incident Resolution

- Incidents requiring 24-hour notification and follow-up with a standard electronic incident report within 30 days:
  - 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.

Incident Resolution

- Incidents requiring 24-hour notification and follow-up with a standard electronic incident report within 30 days:
  - Any communication incident that the operator completing the stimulation has become aware of that results in production pressure deviations at an offset active or inactive well that are significantly more than expected
    - Surface measured pressure >80% and <100% of hydrostatic for wells producing gas inside surface string
    - Pressure increases within 10% of containment rating for lowest rated well barrier element

Incident Resolution

- Incidents requiring 24-hour notification and follow-up with a standard electronic incident report within 30 days:
  - When an adjacent operator makes the operator conducting hydraulic fracturing aware of a communication incident below the thresholds for completing a 30-day standard incident report at an offset well they are responsible for, 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 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.

Incident Resolution

- Non-reportable Incidents:
  - Any communication incidents executed by design/engineered by the operator – there is no expectation that these incidents either interfere with completing hydraulic fracturing activities or be reported to DEP, provided none of the threshold criteria for reportable incidents are observed
  - Any communication incidents below the other established reporting thresholds

Incident Resolution

- Notification and Follow-up Incident Report
  - Notifications must be made electronically through GreenPort and responsible OGI will receive an email that the incident has occurred
  - *If and only if an emergency develops, the operator should contact DEP ER staff by phone immediately*
  - A standard incident report template has been developed

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Incident Resolution

- In cases where wells with no viable responsible party are communicated with during hydraulic fracturing, two options are available:
  - The operator may plug the altered well in accordance with DEP regulations
  - The operator may adopt the well and place it into production

Incident Resolution

- Well Adoption Permit
  - Similar to the well registration form/abandoned well identification form
  - **A workover summary is required for wells involved in hydraulic fracturing communication incident**

Incident Resolution

8000-PM-OOGM####

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COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OFFICE OF OIL AND GAS MANAGEMENT

DEP USE ONLY	
OGO No.	Site Id No.
APS	Geol
Auth ID	Date Appr

PERMIT APPLICATION TO ADOPT AN OIL OR GAS WELL

Applicant information: Please type or print.

Name of Applicant			
Street No. and Name or P.O. Box No.			OGO No.
City	State	Zip Code	Project No. (If previously assigned by DEP)
Telephone No.			Fax No.

Applicant Notification: Pursuant to the notification requirements of Section 3211(b.2) of 58 Pa.C.S. Sections 3201-3274 ("2012 Oil and Gas Act"), the applicant is hereby notified of both statutory and regulatory obligations to properly plug any adopted well upon abandonment.

Well information: Please group wells by county and use a separate form to list wells in each different county.

API No./ Other ID	County	Municipality	Well (Farm) Name	Well No.	Serial No.	Date Drilled	Well Type	Total Depth	Quad	Section	Was Well Involved in Hydraulic Fracturing Communication Incident?	Latitude	Longitude
												DEG MIN SEC	DEG MIN SEC
												DEG MIN SEC	DEG MIN SEC
												DEG MIN SEC	DEG MIN SEC
												DEG MIN SEC	DEG MIN SEC
												DEG MIN SEC	DEG MIN SEC
												DEG MIN SEC	DEG MIN SEC

Attachments Checklist (please check all that apply)

1. ☐ Well locations plotted on a U.S.G.S 7.5 minute topographic map
2. ☐ Driller's log, if available
3. ☐ Any additional well information available
4. ☐ Workover summary, if required

Applicant Signature

Subject to the penalties of Title 18-PA C.S. §4904 relating to unsworn falsification to authorities, I certify that I have the authority to submit this request to operate the above-listed abandoned wells. Further, I certify that the information provided on this form and attachments is true and correct to the best of my knowledge and information.

Signature _____ Date _____

Type or Print Name and Title _____

Incident Resolution Summary

- Three types of hydraulic fracturing communication incidents are defined in the TGD, but only two require reporting and only one requires that the operator cease hydraulic fracturing operations until further notice
- Electronic notifications for reportable incidents must be filed within either 2 hours or 24 hours, depending on the nature of the incident; Section 91.33 and spill regulations apply and reporting under those conventions must always be followed when applicable
- Standard, follow-up electronic incident reports are required for reportable communication incidents within either 3 days or 30 days, depending on nature of incident
- Altered wells must be either plugged (Good Samaritan application recommended) or adopted and placed into production (well adoption permit required)

Assessing Frac Communication Risks

How many wells penetrate the Zone of Hydraulic Fracturing Influence and where are they located?

DCNR's Open File Report OFOG 15-01.2 (Map 10)

- 135,546 total wells
- 122,266 conventional wells with depths
- 15,326 penetrate within 1,500 feet of top of Marcellus shale

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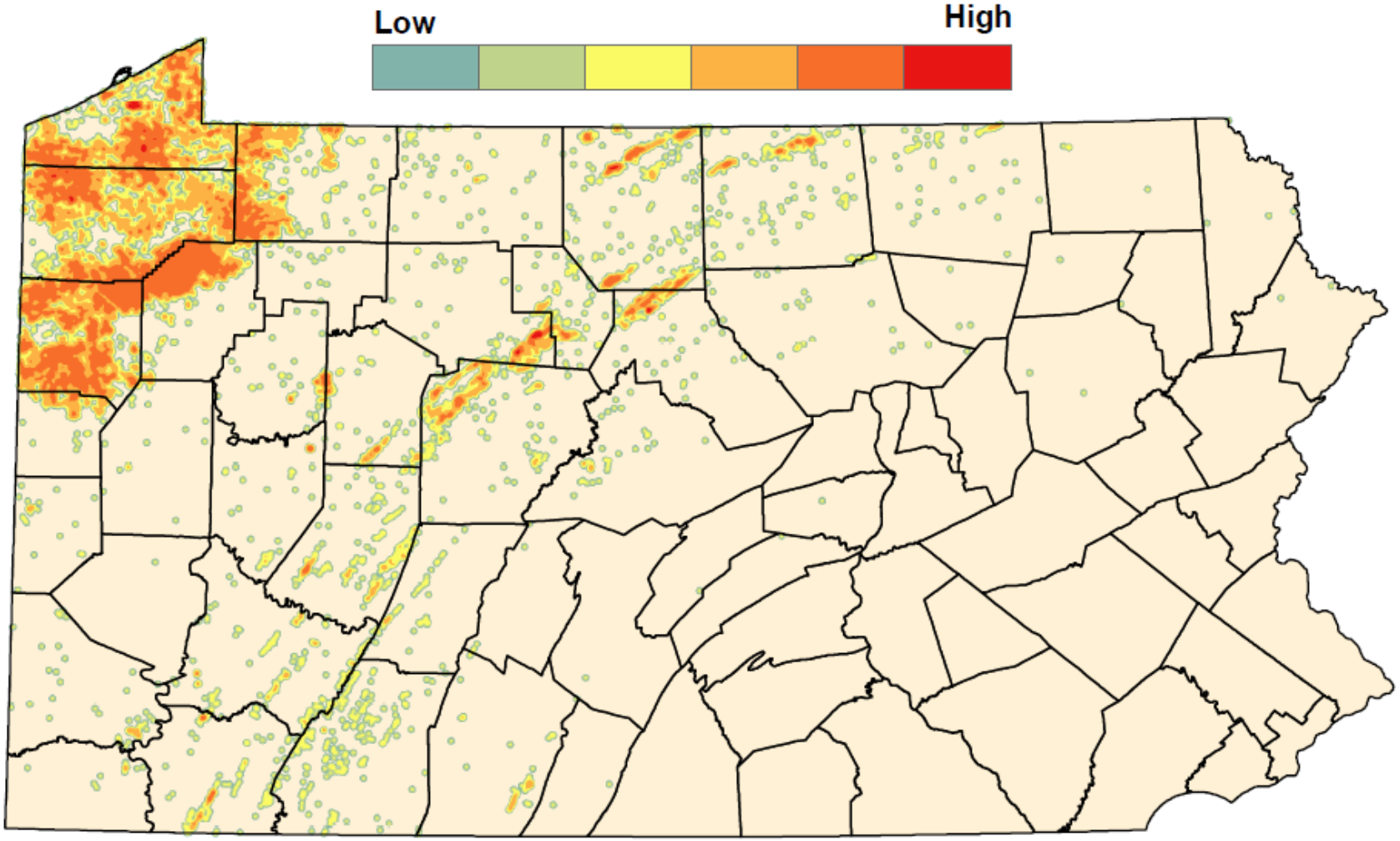
Assessing Frac Communication Risks

Density Map of Wells Penetrating Marcellus Shale



Assessing Frac Communication Risks

Map 10 Data

- Percentage breakdown of wells that penetrate within 1,500 feet of top of Marcellus distributed among municipalities
  - 0: 2,030
  - >0 to 10%: 174
  - >10 to 25%: 34
  - >25 to 50%: 33
  - >50 to 75%: 26
  - >75 to 95%: 49
  - >95%: 196

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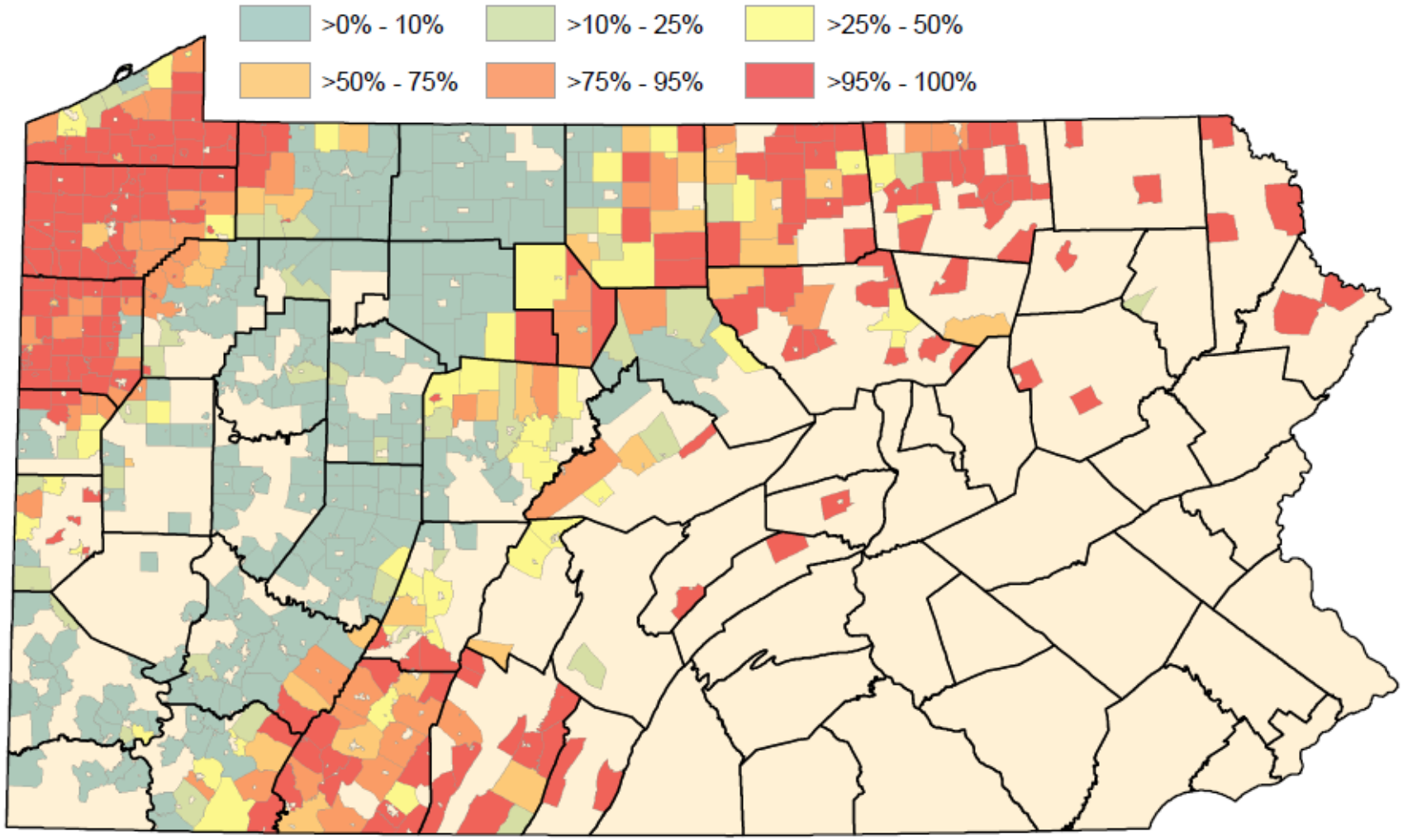
Assessing Frac Communication Risks

Probability of Discovered Legacy Wells Penetrating Marcellus



Assessing Frac Communication Risks

Map 10 Data: Comparison of SW to NE PA

- Consider hydraulic fracturing communication risks in Westmoreland and Tioga counties
- These risk maps can be used to help inform operator decision making as they plan safe resource development

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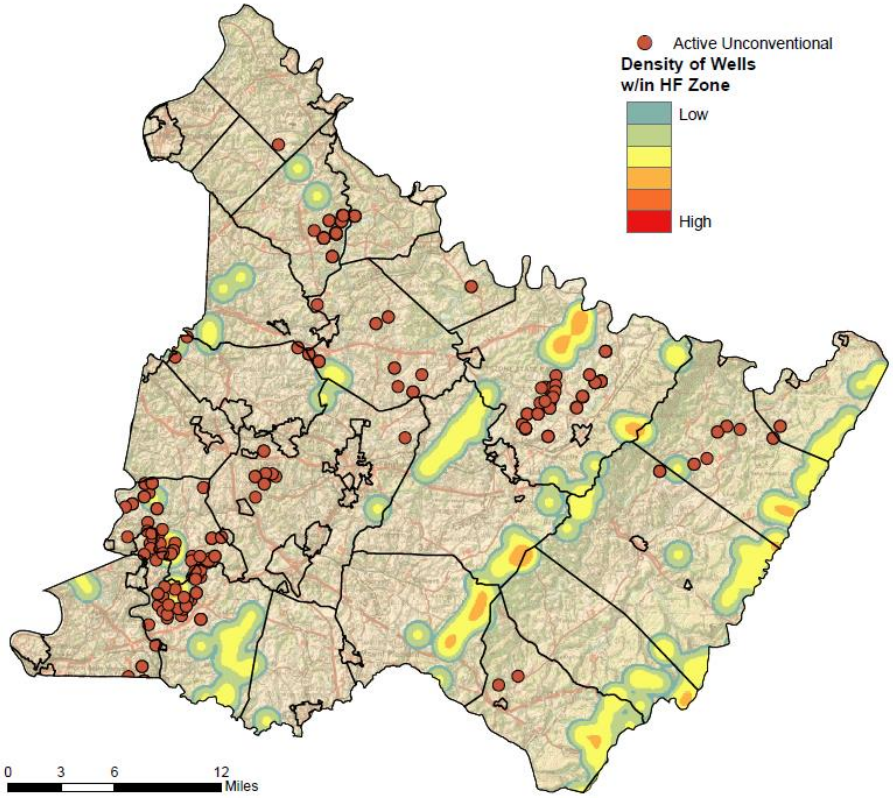
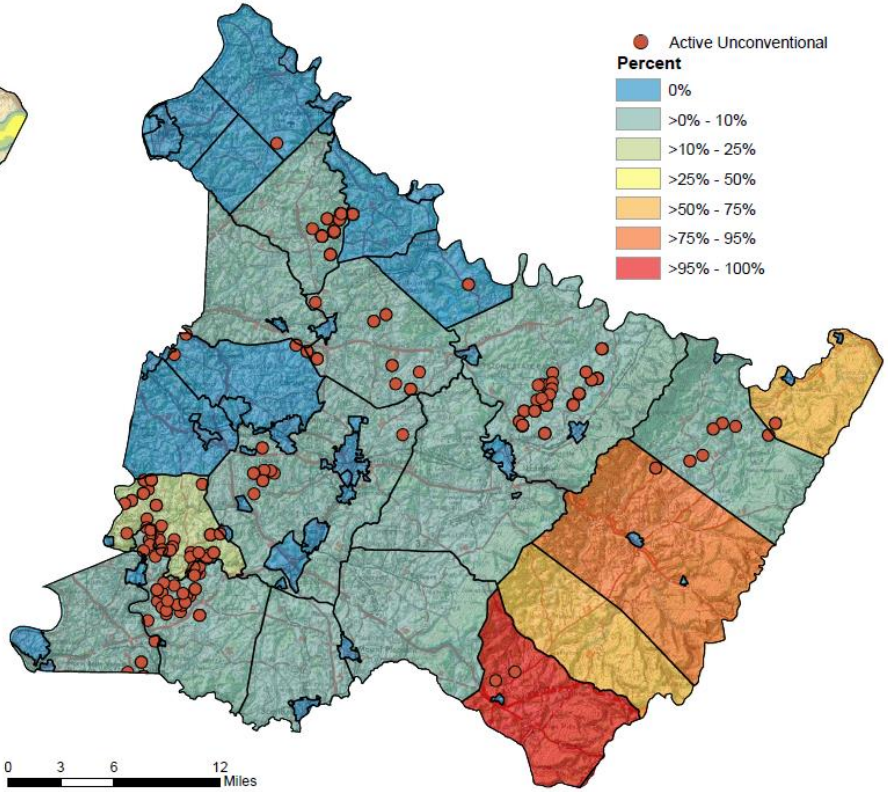
Assessing Frac Communication Risks

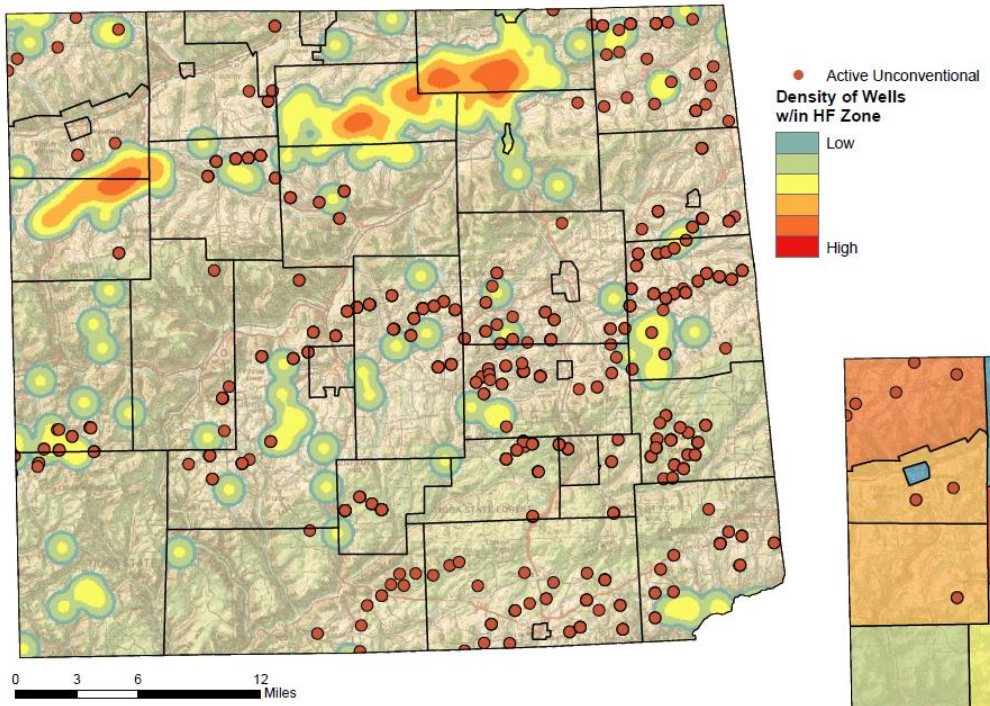
Map 10 Data: Westmoreland County

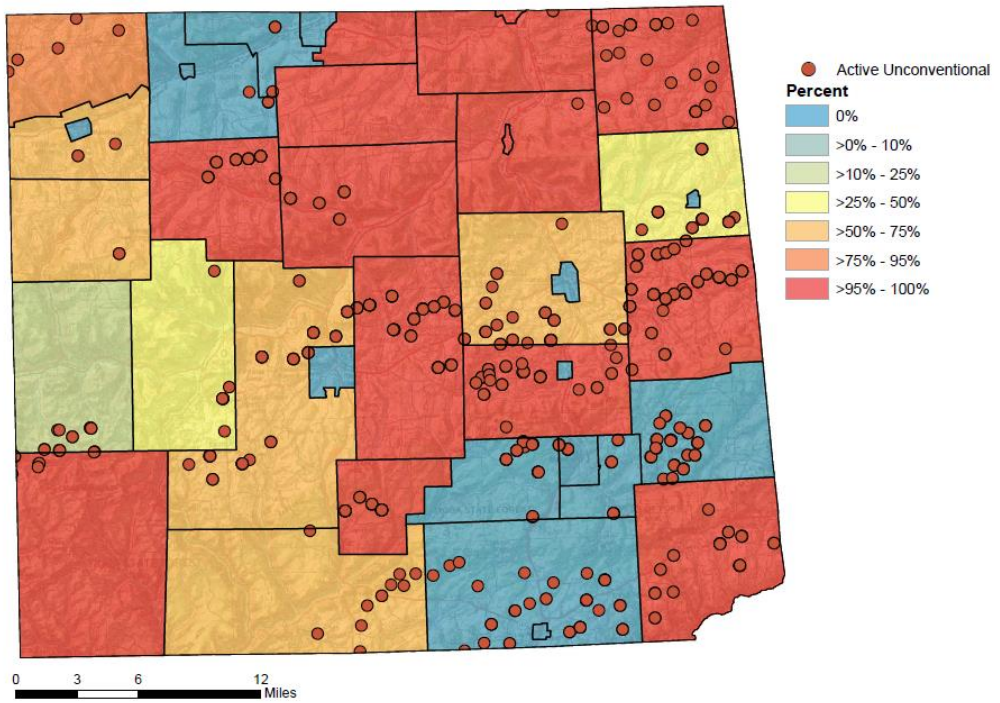




Assessing Frac Communication Risks

Map 10 Data: Tioga County





AOR Example

Background

An operator is planning to spud an unconventional Marcellus shale well in southwestern Pennsylvania. The well has already been permitted by DEP and has been assigned the following ID: **A**. The AOR in plan view intersects 64 parcels, but not all of these tracts have a unique landowner as revealed by a deed search at the county courthouse.

AOR Example

Database Search, Landowner Survey, and Historical Map Search

- The operator references its own records, as they are the only leaseholder in the area for the Marcellus shale and have directional survey data on file for offset wells. Additionally, they review DEP databases and EDWIN Viewer.
- The operator prepares letters to each unique landowner and sends DEP's landowner survey form along with a site map to each identified landowner using certified mail.
- The operator references its own archive of historical maps for the area.

AOR Example

Landowner Survey Results

- Landowner Survey 1:

OPERATOR AND WELL INFORMATION				
Operator Name Beattie E&P Company			OGO No. 44444	
Operator Address 123 Fake Stree				
City Canonsburg		State PA	Zip Code 15317	
Operator Contact Stew Beattie		Operator Telephone No. 888-555-15317	Email Stewisgreat@BEP.com	
County of Proposed Well Site Washington		Municipality of Proposed Well Site Canton Twp.		

PROPERTY INFORMATION					
Surface Landowner Name Rick Swank			Surface Property Tax ID No. 333-021-00-01		
Property Address 354 Germania Lane			Home Address (if different than Property Address)		
City Wolfdale	State PA	Zip Code 15301	City	State	Zip Code
Telephone No. (Home) 888-555-3535	Telephone No. (Cell) 888-555-6622		Telephone No. (Other)		Best Time of Day to Contact after 5 PM

AOR Example

Landowner Survey Results

- Landowner Survey 1:

FORM QUESTIONS

1. Are you aware of any active, inactive, abandoned, orphan or plugged oil/gas wells that are within 1,000 feet of the proposed new well (see attached map)? _____ Yes _____ No

   If no, please proceed to question 4 to complete the questionnaire.

2. **a.** If yes to question 1 above, are you able and willing to show an operator representative physical evidence of the well(s) on your property?_____ Yes _____ No

   b. If possible, please attach photograph(s) of the well(s) to this form submittal.

   c. Please list the number of wells on the property:_____**1**_____ No. of wells

3. **a.** If there is no physical evidence of oil/gas wells on your property, do you have other information (e.g., historic maps, well records, other documentation, etc.) regarding oil/gas wells within 1,000 feet of the proposed new well that you are willing to share with the operator? _____ Yes_____No

   b. If yes, it would be helpful if you could attach a copy of such documentation to this form.

4. Provided advanced notice is given, will you allow the operator access to your property to inspect wells identified on your property by you or that the operator identified from other sources? _____ Yes _____ No

AOR Example

Landowner Survey Results

- Landowner Survey 1:

ADDITIONAL INFORMATION

If there is any additional information about wells on your property you wish to share, or if there is someone else you think might have additional information, please include that information below your signature or as a separate attachment.

Please note that unless you respond "yes" to questions 2a or 3a, and question 4, the operator will likely not contact you for additional information.

FORM CERTIFICATION AND SIGNATURE

Form Certification: I hereby acknowledge that I have supplied true and correct information to the best of my knowledge. There is no penalty if the surface landowner does not complete this questionnaire.

Signature: Rick Swank Date: **6/15/2015**

Printed Name: **Rick Swank**

Please return this completed form to the operator designated above within ten (10) business days of receipt.

GPS location is 40.230919, -80.322033

AOR Example

Landowner Survey Results

- Landowner Survey 2:

OPERATOR AND WELL INFORMATION				
Operator Name Beattie E&P Company			OGO No. 44444	
Operator Address 123 Fake Stree				
City Canonsburg		State PA	Zip Code 15317	
Operator Contact Stew Beattie		Operator Telephone No. 888-555-15317	Email Stewisgreat@BEP.com	
County of Proposed Well Site Washington		Municipality of Proposed Well Site Canton Twp.		

PROPERTY INFORMATION					
Surface Landowner Name Bruce Jankura			Surface Property Tax ID No. 333-021-00-02		
Property Address 22 Nittany Lion Drive			Home Address (if different than Property Address)		
City Wolfdale	State PA	Zip Code 15301	City	State	Zip Code
Telephone No. (Home) 888-555-3566	Telephone No. (Cell) 888-555-6613		Telephone No. (Other)		Best Time of Day to Contact b/w 12 and 1 PM

AOR Example

Landowner Survey Results

- Landowner Survey 2:

FORM QUESTIONS

1. Are you aware of any active, inactive, abandoned, orphan or plugged oil/gas wells that are within 1,000 feet of the proposed new well (see attached map)? _____ Yes _____ No

   If no, please proceed to question 4 to complete the questionnaire.

2. **a.** If yes to question 1 above, are you able and willing to show an operator representative physical evidence of the well(s) on your property?_____ Yes _____ No

   b. If possible, please attach photograph(s) of the well(s) to this form submittal.

   c. Please list the number of wells on the property:_____**1**_____ No. of wells

3. **a.** If there is no physical evidence of oil/gas wells on your property, do you have other information (e.g., historic maps, well records, other documentation, etc.) regarding oil/gas wells within 1,000 feet of the proposed new well that you are willing to share with the operator? _____ Yes _____No

   b. If yes, it would be helpful if you could attach a copy of such documentation to this form.

4. Provided advanced notice is given, will you allow the operator access to your property to inspect wells identified on your property by you or that the operator identified from other sources? _____ Yes _____ No

AOR Example

Landowner Survey Results

- Landowner Survey 2:

ADDITIONAL INFORMATION

If there is any additional information about wells on your property you wish to share, or if there is someone else you think might have additional information, please include that information below your signature or as a separate attachment.

Please note that unless you respond "yes" to questions 2a or 3a, and question 4, the operator will likely not contact you for additional information.

FORM CERTIFICATION AND SIGNATURE

Form Certification: I hereby acknowledge that I have supplied true and correct information to the best of my knowledge. There is no penalty if the surface landowner does not complete this questionnaire.

Signature: *Bruce Jankura* Date: **6/11/2015**

Printed Name: **Bruce Jankura**
Please return this completed form to the operator designated above within ten (10) business days of receipt.

I've attached a picture of the well location and I also have some records associated with the well I am willing to share.

AOR Example

Landowner Survey Results

- Picture Landowner Survey 2:

AOR Example

Field Verification/Notifications/No Further Action?

- Well Summary
  - U1 (Landowner Survey): landowner claims well is present but will not provide access; regional drilling trends suggest Upper Devonian completion
  - U2 (Historical Source): completed in Oriskany sand at TVD of 6,850 feet
  - U3 (Historical Source): completed in Middle Devonian section short of Marcellus shale and reported as a dry hole
  - U4 (Landowner Survey): landowner provides photograph of well and permits access; also claims to have records for the well
  - U5 (Historical Map): completed in Upper Devonian section at TVD of 2,250 feet
  - 1 (Other Database): well completed on same pad as drilled well
  - 2 (Other Database): well completed on adjacent pad
  - 3 (DEP Database): adjacent operator well completed in Oriskany sand at TVD of 6,874 feet
  - 4 (Other Database): well completed on adjacent pad

AOR Example

Field Verification/Notifications/No Further Action?

- Well Summary
  - U1 (Landowner Survey): landowner claims well is present but will not provide access; regional drilling trends suggest Upper Devonian completion: **NFA**
  - U2 (Historical Source): completed in Oriskany sand at TVD of 6,850 feet: **Plugging Status Unknown**
  - U3 (Historical Source): completed in Middle Devonian section short of Marcellus shale and reported as a dry hole: **Well Flowing Brine – Operator Plugs under Good Samaritan Provisions**
  - U4 (Landowner Survey): landowner provides photograph of well and permits access; also claims to have records for the well: **Well Record Provided by Landowner Indicates Upper Devonian Completion**
  - U5 (Historical Map): completed in Upper Devonian section at TVD of 2,250 feet: **NFA**

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AOR Example

Field Verification/Notifications/No Further Action?

- Well Summary
  - 1 (Other Database): well completed on same pad as drilled well: **Notification**
  - 2 (Other Database): well completed on adjacent pad: **Notification**
  - 3 (DEP Database): adjacent operator well completed in Oriskany sand at TVD of 6,874 feet: **Notification**
  - 4 (Other Database): well completed on adjacent pad: **Notification**

AOR Example

AOR Summary Table Report and Monitoring Plan

Were all landowners notified and do you have proof of notification?:	Y
Were any wells identified within the AOR?	Y
US Well No. (API No.) or Well Farm Name and Number for Well that is Subject of Area of Review:	A
Municipality of Well (only if US Well No. (API No.) has not been assigned)	
County of Well (only if US Well No. (API No.) has not been assigned)	
Surface Hole Latitude for Well that is Subject of Area of Review:	40.2295
Surface Hole Longitude for Well that is Subject of Area of Review:	-80.323277
Bottom Hole Latitude for Well that is Subject of Area of Review:	40.23963
Bottom Hole Longitude for Well that is Subject of Area of Review:	-80.340496

AOR Example

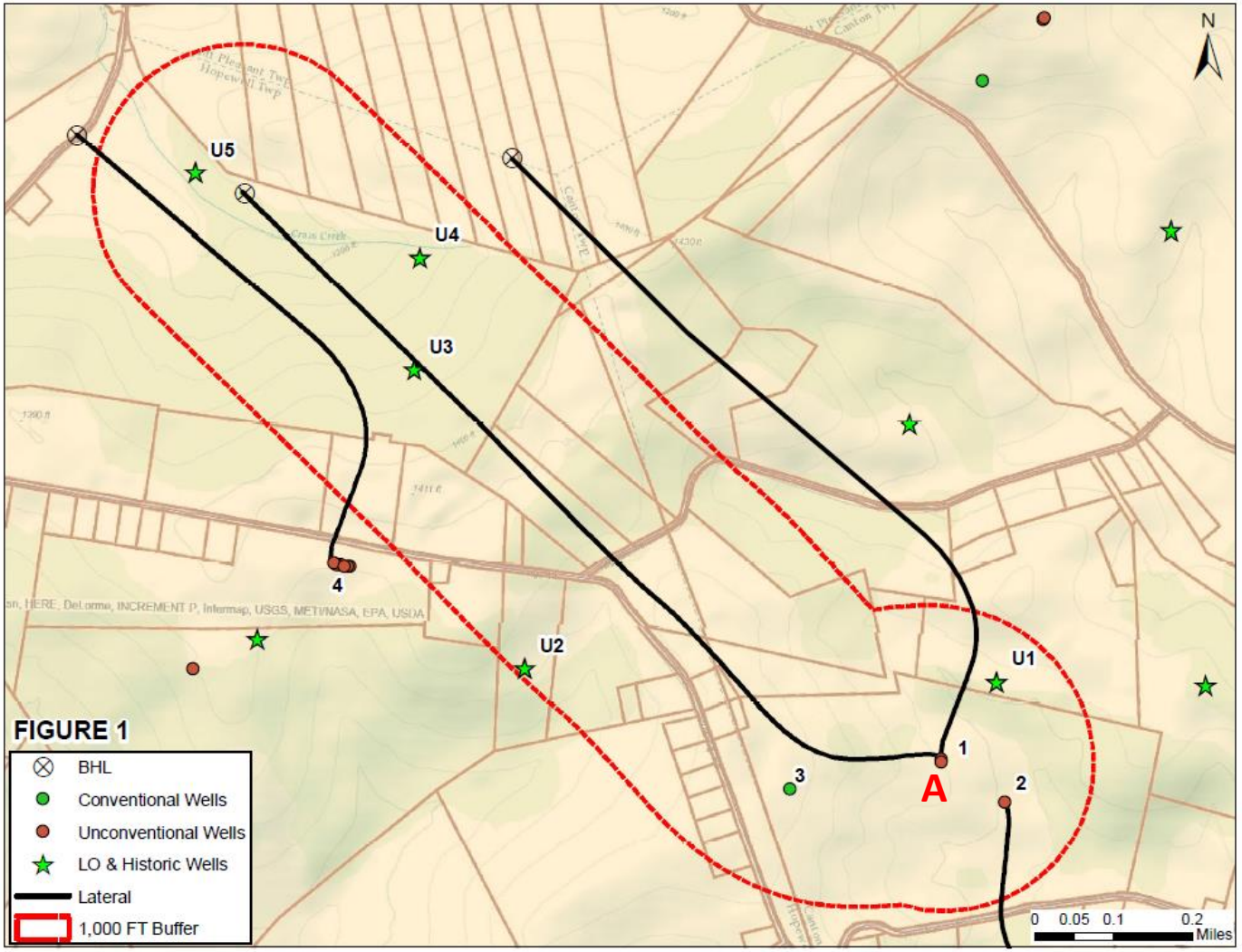
AOR Summary Table Report and Monitoring Plan

US Well No. (API No.)/Alternate Well ID	Reference Material/ Source	DEP Well Status	Adjacent Operator Information	Adjacent Operator Notification	Surface Hole Latitude (DD)	Surface Hole Longitude (DD)	Bottomhole Latitude (DD)	Bottomhole Longitude (DD)	Survey Accuracy (+/- m)
1	Other Database	Active	44444	Y	40.229447	-80.32328	40.240361	-80.32328	1
2	Other Database	Active	44444	Y	40.228745	-80.321721	40.220312	-80.321721	1
3	DEP Database	Active	55555	Y	40.228881	-80.326897			
4	Other Database	Active	44444	Y	40.232784	-80.338096	40.240612	-80.338096	1
U1	Landowner Survey	Undetermined	N		40.230919	-80.322033			
U2	Historical Source	Abandoned	N		40.230972	-80.333406			
U3	Historical Source	Plugged & Abandoned	N		40.236429	-80.336244			1
U4	Landowner Survey	Abandoned	N		40.238512	-80.336181			1
U5	Historical Source	Undetermined	N		40.23996	-80.341641			1

Access	Property Tax ID No.	Well Integrity Assessment	TVD	Information Source for TVD	Monitored Site	Monitoring Level	Monitoring Plan Notes	Controlled Communications	Text Comment
Y	111-017-00-01		6760	Private Source Well Record	N			Y	
Y	111-017-00-01		6760	Private Source Well Record	N			N	
Y	111-017-00-01		6874	DEP Well Record	N				Will coordinate activities with adjacent operator during stimulation
Y	222-019-00-01		6576	Private Source Well Record	N			N	
N	333-021-00-01		2300	Study of Regional Drilling History	N				Well existence not proven, but historical drilling trends suggest area of Upper Devonian development
Y	224-012-00-01	1	6850	Private Source Well Record	Y	High			
Y	113-015-00-02	1	5250	Other	Y	Low			Depth attained during cleanout
Y	113-015-00-02	1	2300	Private Source Well Record	N				
Y	113-015-00-02		2250	Private Source Well Record	N				

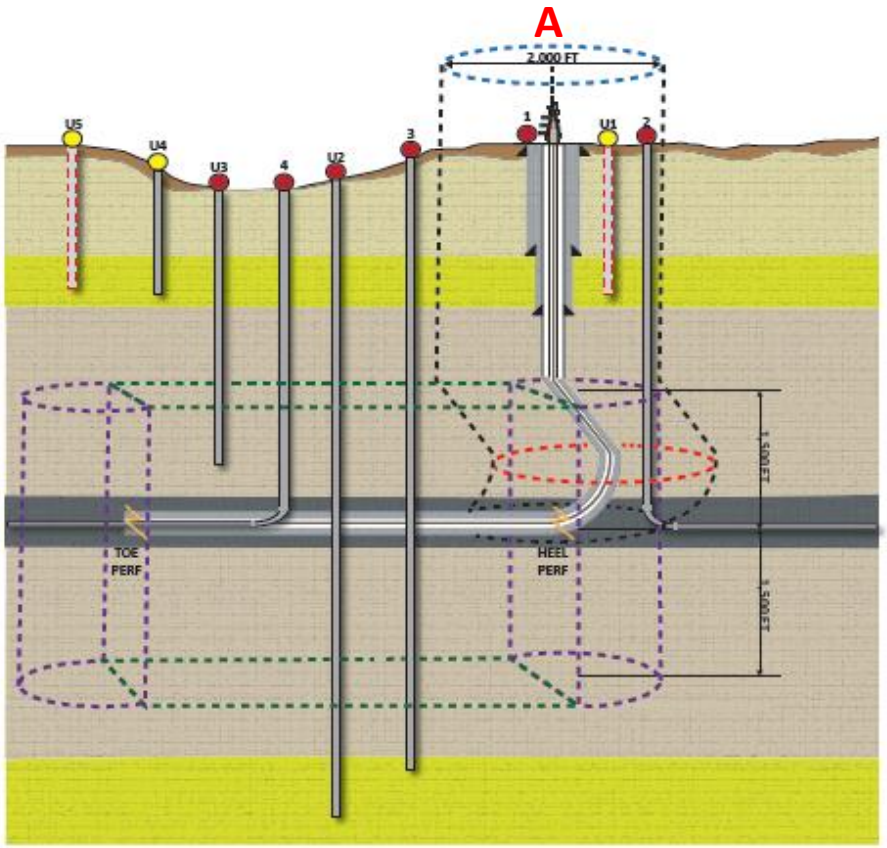
AOR Example

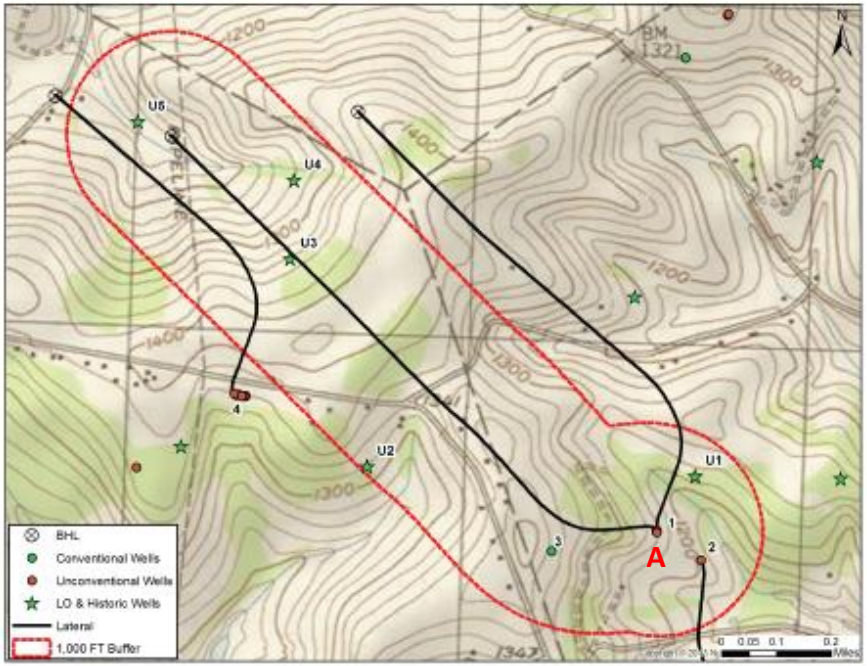
Figure 1: AOR Plat



AOR Example

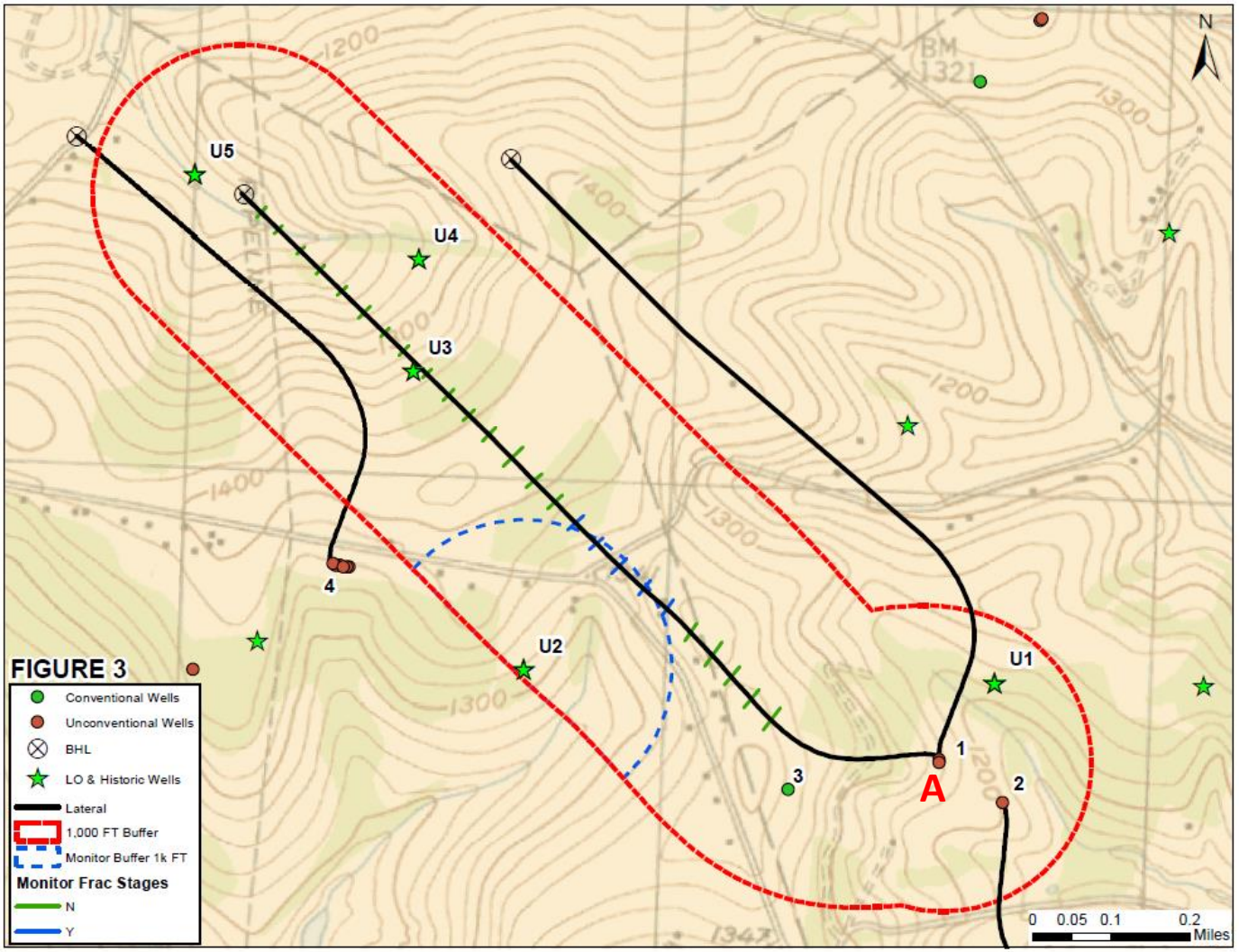
Figure 2: AOR Cross-Section





AOR Example

Figure 3: AOR Monitoring Plan



AOR Example

Incident Reporting

- As the operator is pumping frac stage 25, they receive a call from the operator of well 3 at 0835 on 8/24/2016 reporting that fluids have begun to flow at a moderate rate in the production annulus and have discharged to the area surrounding the well
- The completions team discontinues hydraulic fracturing at 0840 and notifies the company man
- The company man reports back to company headquarters and the company HSE team files an electronic notification with DEP at 0930 on 8/24/2016

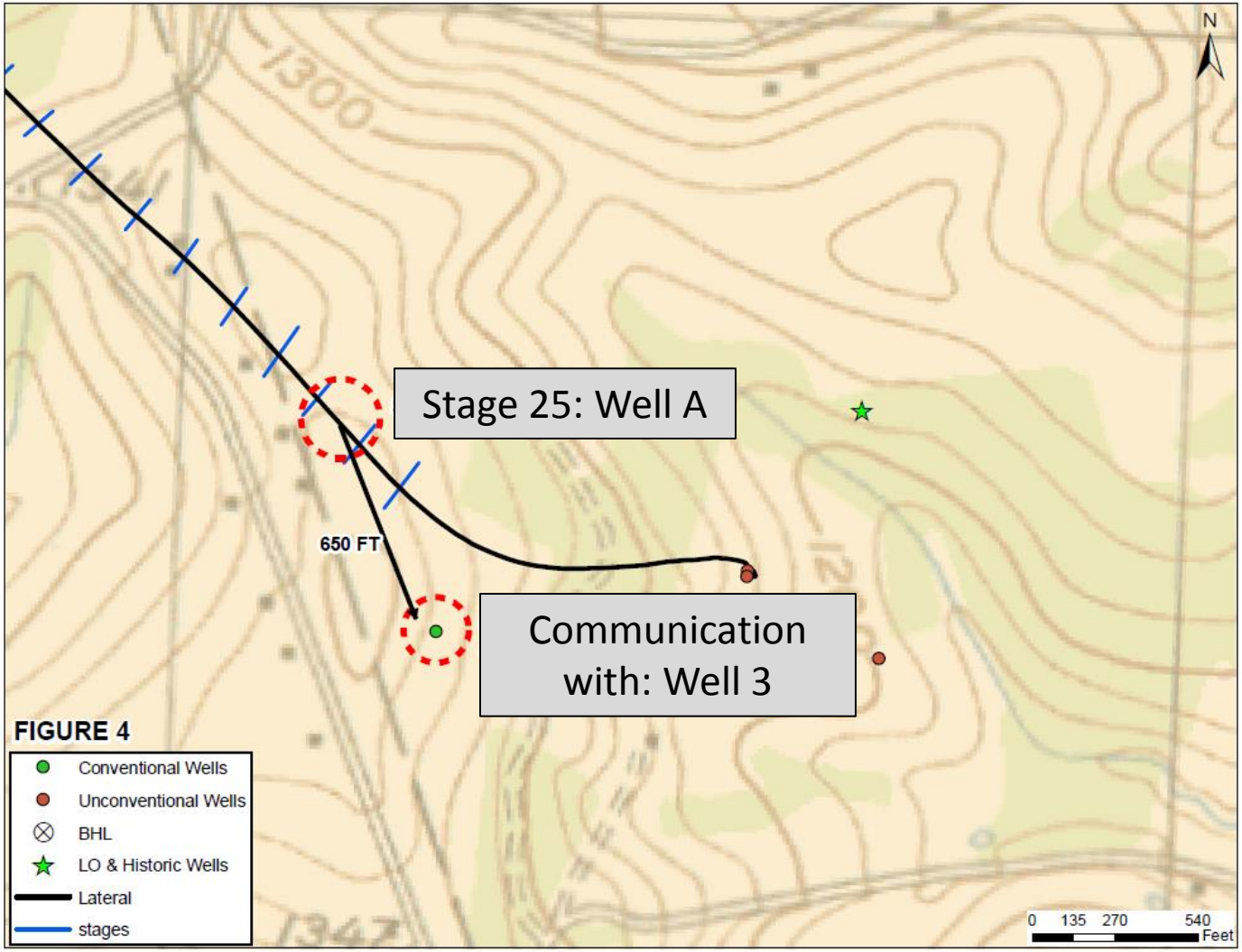
AOR Example

Incident Reporting

- Beattie E&P Company representatives meet with the adjacent operator and hire a private consulting firm to address the environmental release – well work and remedial efforts are underway and the completions team has temporarily demobilized from the site
- The company HSE team analyzes the reportable communications incident, downloads and completes the hydraulic fracturing communication incident report, and files it with DEP at 0800 on 8/26/2016

AOR Example

Figure 4: AOR Communication Analysis



AOR Example

Communication Incident Report

US Well No. (API No.) of Hydraulically Fractured Well	US Well No. (API No.)/ID of Well where Communication Incident was Observed	Adjacent Operator	Start Date	End Date	Environmental/ Safety Incident	Communication Type	Adjacent Lateral Effects
A	3	55555	8/24/2016		Y	Stimulation to Operating Well	N

Latitude of Stage Midpoint for Well Undergoing Hydraulic Fracturing (DD)	Longitude of Stage Midpoint for Well Undergoing Hydraulic Fracturing (DD)	Latitude of Receiving Well (DD)	Longitude of Receiving Well (DD)	Bottomhole/Bit Location Latitude of Receiving Well (DD)	Bottomhole/Bit Location Longitude of Receiving Well (DD)	Landing Point Latitude of Receiving Well (DD)	Landing Point Longitude of Receiving Well (DD)	Kick Volume (bbls)
40.230738	-80.328086	40.228881	-80.326897					

Frac Stage Fluid Volume (bbls)	Max Treatment Pressure (psi)	Average Treatment Pressure	Abnormal Treatment Volumes Noted	Abnormal Treatment Pressures Noted	Faults Present or Geologic Anomalies Noted	Orientation of Fault/Geologic Anomaly in Horizontal Plane	Brief Description
4,600	7,200	6,850	N	N	N		Adjacent operator reported annular flow of fluids and subsequent release to ground surface on 8/24/16 at 0835


Oil and Gas Management

Questions?

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APPENDIX

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Definitions

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).

Definitions

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.*).

Definitions

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.

Definitions

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*.

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Definitions

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

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

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

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

Definitions

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.

Definitions

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.

Definitions

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.

Definitions

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.

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Definitions

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*.

Definitions

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.

Definitions

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 Policy 550-2100-009. All coordinate data must reference the NAD 83 geodetic reference system.

Definitions

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.

Definitions

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*.

Definitions

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.

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, Armstrong, Beaver, Cambria, Fayette, Greene, Indiana, Somerset, Washington, Westmoreland
Northwest	814-332-6945 After Hours: 800-373-3398	Butler, Clarion, Crawford, Elk, Erie, Forest, Jefferson, Lawrence, McKean, Mercer, Venango, Warren
RCSOB	1-800-541-2050	Statewide and Interstate

AOR Report Contents

Information For The Well That Will Be Hydraulically Fractured:

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)	

AOR Report Contents

Offset Well Information:

Field 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 or if the well does not require notification in advance of well spud
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)	

AOR Report Contents

Field Heading	Description of Report Parameter
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.

AOR Report Contents

Field Heading	Description of Report Parameter
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.

Incident Resolution

Standard 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 OperatorID/ 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."

Incident Resolution

Standard Incident Report

Field Heading	Description of Report Parameter
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)	
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)	

Incident Resolution

Standard Incident Report

Field Heading	Description of Report Parameter
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.

AOR Example Narrative

Background

An operator is planning to spud an unconventional Marcellus shale well in southwestern Pennsylvania. The well has already been permitted by DEP and has been assigned the following ID: **A**. The AOR in plan view intersects 64 parcels, but not all of these tracts have a unique landowner as revealed by a deed search at the county courthouse.

AOR Example Narrative

AOR Procedure

- Database Search, Landowner Survey, and Historical Map Search
  - The operator plots the anticipated directional survey for the well and creates a 1,000 foot buffer around the well bore path to define the AOR in plan view.
  - The operator prepares letters to each unique landowner and sends DEP's landowner survey form along with a site map to each identified landowner using certified mail.
    - Approximately 15% (10) of the surveys are returned within 10 business days:
      - One of the landowners claims a well is present on their parcel and the individual marks the alleged location on a map, but they have not provided any documentation along with the survey and refuse to provide access to the operator (**Well U1 on Slide 99**)
      - One of the landowners identifies a previously unknown well site and provides suitable documentation including possession of a well record and submission of a photo of the well (**Well U4 on Slide 99** and **Slide 93**).
      - The other returned landowners do not report the presence of any wells on the associated parcels, but do permit the operator access to the parcels.

AOR Example Narrative

AOR Procedure

- Database Search, Landowner Survey, and Historical Map Search
  - The operator references its own records, as they are the only leaseholder in the area for the Marcellus shale and have directional survey data on file for offset wells. Additionally, they review DEP databases and EDWIN. Through this work, the operator identifies 3 additional unconventional wells that have been drilled and completed (**Wells 1, 2, and 4 on Slide 99**). The operator also identifies a conventional well (**Well 3 on Slide 99**). Wells 1, 2, and 4 have TVDs of 6,760 feet, 6,760 feet, and 6,576 feet; respectively. A well record for Well 3 is retrieved and indicates a TVD of 6,874 feet. The well record suggests that the Marcellus shale is isolated with cement in the production annulus based on the sacks of cement used and the diameter of the well bore.
  - The operator references its own archive of historical maps for the area and identifies 3 potential historical wells on a map series that was last updated in the early 1960s (**Well U2, U3, and U5 on Slide 99**). Nomenclature on the map indicates that well U2 was completed in the Oriskany sand at a TVD of 6,850 feet, U3 was a dry hole that was TD'd in the Middle Devonian section short of the Marcellus shale, and well U5 was completed in the Upper Devonian section at a TVD of 2,250 feet.

AOR Example Narrative

AOR Procedure

- Field Verification
  - The operator makes arrangements with landowners in the area to field verify the locations of wells U2, U3, and U4.
    - Based on casing design and the vintage of production equipment at the U4 location, it is apparent that the well record provided by the landowner is accurate and that the well was completed in the Upper Devonian section and will not require monitoring. GPS coordinates are collected so that DEP can be notified.
    - U3 is in poor condition and flowing brine. The operator completes a Good Samaritan application and plugs the well voluntarily. The well cleanout depth is 5,250 feet. GPS coordinates are collected.
    - U2 shows no signs of integrity problems but does not appear to have been plugged, as a wellhead is still in place and older production equipment is plumbed to the well. GPS coordinates are collected.

AOR Example Narrative

AOR Procedure

- AOR Report and Monitoring Plan Preparation
  - The operator prepares a site cross-section based on planned perforation depths for well A (**Slide 100**).
  - The operator prepares a monitoring plan map depicting the frac stages during which well U2 will be monitored (**Slide 101**).
  - The operator notifies the operator of well 3 of its plan to spud well A within the next 60 days. The operators agree to coordinate with each other during the completion of well A.
  - The operator notifies its well operations team responsible for production at the adjacent directional wells of its plans for spudding and completing well A.
  - The operator downloads and completes the AOR Summary Table (**Slides 97 and 98**).
  - The operator submits the AOR Summary Table **(Slides 97 and 98**)**, Well Plat** (**Slide 99**), and Monitoring Plan Map (**Slide 101**) to DEP 30 days prior to the anticipated spud date for well A.

AOR Example Narrative

AOR Procedure

- Communication Incident Reporting
  - As the operator is pumping frac stage 25, they receive a call from the operator of well 3 at 0835 on 8/24/2016 reporting that fluids have begun to flow at a moderate rate in the production annulus and have discharged to the area surrounding the well.
  - The completions team discontinues hydraulic fracturing at 0840 and notifies the company man.
  - The company man reports back to company headquarters and the company HSE team files an electronic notification with DEP at 0930 on 8/24/2016.
  - Beattie E&P Company representatives meet with the adjacent operator and hire a private consulting firm to address the environmental release – well work and remedial efforts are underway and the completions team has temporarily demobilized from the site.
  - The company HSE team analyzes the reportable communications incident (**Slide 104**), downloads and completes the hydraulic fracturing communication incident report (**Slide 105**), and files it with DEP at 0800 on 8/26/2016.