# DATASET USER LICENSE/USE LIMITATIONS

## BACKGROUND

The Carnegie Museum of Natural History (CMNH), through its GIS Laboratory located at Powdermill Nature Reserve has developed the CMNH Pennsylvania Unconventional Natural Gas Wells Geodatabase (UNCGDB) (hereinafter referred to as WORK PRODUCT) that vertically integrates data from the Pennsylvania Department of Environmental Protection (PA DEP) database into a useful data compilation for scientific investigation. This WORK PRODUCT of CMNH offers a concise and pragmatic set of filtered and processed datasets in the public domain for unconventional wells in Pennsylvania. CMNH makes no warranty or guarantee with regard to the accuracy or completeness of the data. The WORK PRODUCT is being offered to universities and other scientific organizations without charge. As a condition of such non-royalty bearing license grant of its WORK PRODUCT to the dataset user (USER), USER accepts the following terms and conditions governing the employment of this WORK PRODUCT:

## INITIALIZATION

USER of the UNCGDB accepts the terms and conditions of this license upon receipt and acceptance of the dataset from CMNH. This license shall be effective until termination of the same by either party. In either case termination shall include the return of the UNCGDB data set to CMNH uncopied. USER acknowledges that the UNCGDB dataset is the WORK PRODUCT of CMNH and is owned by CMNH. USER agrees not to use, nor directly or indirectly permit the use of, the UNCGDB dataset in a manner inconsistent with the intended use of the dataset without the written consent of CMNH.

## LICENSE

CMNH grants to USER a non-exclusive, non-transferable, non-assignable license to use the UNCGDB dataset for scientific analysis and data manipulation consistent with this license. It is not the intent of CMNH to give USER any right, title, interest in its WORK PRODUCT other than the rights herein granted.

## WARRANTY s

CMNH makes no warranty of any variety with regard to the completeness of the data, the merchantability of the data, or the fitness of the UNCGDB dataset and data for a particular purpose of use. No representation is made as to the accuracy, currency, or completeness of the UNCGDB dataset or the data resources upon which it is based.

## CONSTRAINTS OF USE

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## UPDATES

CMNH may elect to provide updates to the UNCGDB dataset as additional data is generated by or through PA DEP. CMNH shall not have the obligation to generate or provide such updates. Neither the provision of such updates nor the election not to provide such updates shall have any associated liability attached to CMNH. The parties hereto shall make each other aware of any upgrades or modification to the UNCGDB on the annual anniversary of this license. All updates and modifications of the dataset shall be subject to the same terms and conditions found herein. USER shall make CMNH aware of any upgrades or modifications made by USER to the WORK PRODUCT on the annual anniversary of this license.

## COMPLETENESS

This license constitutes the complete and exclusive agreement between USER and CMNH relating to the WORK PRODUCT discussed herein. This license agreement supersedes all prior arrangements, correspondence, proposals, or agreements between the parties relating to the UNCGDB dataset. This agreement may be modified only by written amendment signed by both parties. If any provision of this Agreement is determined to be invalid or unenforceable the remaining provisions of this Agreement shall continue to be valid and enforceable. Neither this Agreement nor any of the rights granted hereunder may be assigned or transferred by USER without the express written approval from CMNH. Any attempted unauthorized assignment or transfer of the WORK PRODUCT or dataset is void. The exclusive remedy for breach of this License Agreement shall be the negation of the license and the return of all dataset information in whatever form to CMNH. USER shall thereafter be prohibited from any further use of the WORK PRODUCT and/or UNCGDB dataset.

## NO ENDORSEMENTS

The delivery of the WORK PRODUCT by CMNH to user under this License Agreement is not intended nor should it be construed as an endorsement of USER’s employment of the same without the express written agreement to the same by CMNH. USER shall nevertheless be obligated to credit CMNH for its development of its WORK PRODUCT in all publicity and acknowledgements which may be appropriate.

## ACCEPTANCE

This License Agreement shall be deemed to be accepted by the USER upon its acceptance of the delivery of CMNH’s WORK PRODUCT dataset. No other acceptance shall be necessary. Should USER not agree to the terms and conditions under which this License is granted USER shall inform CMNH of its non-acceptance and shall return the UNCGDB dataset to CMNH.

# ABOUT CARNEGIE MUSEUM of NATURAL HISTORY

Carnegie Museum of Natural History (CMNH) collects and cares for specimens and artifacts that document the history of life and human cultures. Through field studies and collections-based scientific research, we generate new knowledge and promote stewardship of the Earth and its natural resources. Through public exhibitions, programs, and educational partnerships, we share the results of our scientific research, in order to enhance scientific literacy by illuminating the processes of evolution and adaptation that have shaped the diversity of our world and its inhabitants.

Powdermill Nature Reserve (PNR), the environmental research center of CMNH, has been dedicated to its mission of research, education, and conservation for over 50 years. It is a place for scientists, students, and families who are interested in the natural world. Powdermill was established in 1956 to serve as a field station of Carnegie Museum of Natural History for long-term studies of natural populations—their life histories, behaviors, and ecological relationships.

## INTRODUCTION

To help support the research efforts throughout Pennsylvania regarding natural gas production from unconventional wells, the CMNH GIS Laboratory has developed the CMNH Pennsylvania Unconventional Natural Gas Wells Geodatabase (UNCGDB ) suitable for research and non-commercial use. The UNCGDB is designed to effectively unify the major natural gas datasets made available by the Pennsylvania Department of Environmental Protection (PA DEP) and show the life of each well from permit to production. Therefore CMNH distributes the geodatabase free of charge to those needing geodata for research regarding the Pennsylvania natural gas industry targeting Marcellus shale and other deep geologic layers as defined by the Act 13 legislation.

## TAGS

natural gas, natural gas wells, unconventional, unconventional natural gas wells, gas wells, wells, Marcellus shale, Utica shale, geology, conservation, Pennsylvania, PA, Department of Environmental Protection, DEP, Carnegie Museum of Natural History, Powdermill Nature Reserve, CMNH, PNR

## SUMMARY

The CMNH UNCGDB is a compilation of eight datasets available from the PA DEP that have been unified and summarized to show the location and life, from permit to production, of unconventional natural gas wells in Pennsylvania. The geodatabase is specifically designed to meet the needs for research analysis and other non-commercial uses. Neither CMNH nor PNR make any warranty or guarantee with regard to the accuracy or completeness of the data. The geodatabase is updated quarterly.

## DESCRIPTION

The PA DEP provides eight primary reports on natural gas well activity to the public: Permits Issued, SPUD Data, Production Reports, Waste Reports, Compliance Reports, Public Utility Commission (PUC) Act 13 Unconventional Wells Spud Report, PA DEP Oil & Gas Locations - Conventional Unconventional (hosted by PASDA), and Well Formations Report.

* **Permits Issued** – Proposed natural gas well drilling sites submitted to and approved by the PA DEP
* **Spud Data** – List of new natural gas wells drilled; the SPUD date refers to the date reported to DEP by the Operator that the drilling began (or will begin) at a well site.
* **Production Reports** – Information on natural gas production submitted by well operators. Conventional wells are submitted yearly while unconventional wells are submitted every six months (January to June and July to December) through the end of 2014. Starting in 2015, production is reported monthly.
* **Waste Reports** – Waste information from operators generated by drilling the well. Conventional wells are submitted yearly while unconventional wells are submitted every six months (January to June and July to December) through the end of 2014. Starting in 2015, waste is reported monthly.
* **Compliance Reports** – Inspections of wells, including information on violations and fines
* **PUC Act 13 Unconventional Wells Spud Report** – List of wells that the PA DEP has identified that satisfy the requirements set by the Pennsylvania Act 13 Legislation
* **Oil & Gas Locations - Conventional Unconventional** – Shapefile of the Oil & Gas Wells in Pennsylvania that the PA DEP has locational information for broken into two formation types of conventional and unconventional wells.
* **Well Formations Report** – Displays geological formation information by listing the target, oldest and producing formations for all oil and gas wells

Each data source provides a well permit or API number for all wells, conventional and unconventional. By extracting well permits numbers from all eight data sources for any wells flagged by the PA DEP as an unconventional well, a master table of permit numbers is generated of unconventional wells. By analyzing each data source, summary data is compiled to determine which wells are in the permitting process, are drilled, or are producing natural gas. Additional information includes how much gas is being produced, the number of violations, and which wells may be identified inconsistently as an unconventional well, as well as other attributes.

The source data can be found at the following websites:

Permit, SPUD, Compliance, and Well Formation Reports:

<http://www.portal.state.pa.us/portal/server.pt/community/oil_and_gas_reports/20297>

Well Production and Waste:

<https://www.paoilandgasreporting.state.pa.us/publicreports/Modules/DataExports/DataExports.aspx>

Public Utility Commission (PUC) Act 13 Unconventional Wells Spud Report:

<http://www.portal.state.pa.us/portal/server.pt/community/act_13/20789>

PA DEP Oil & Gas Locations - Conventional Unconventional:

<http://www.pasda.psu.edu/>

## GEOGRAPHIC INFORMATION

Applies to all geographic data included in the geodatabase or as a shapefile

Name: GCS\_North\_American\_1983

Angular Unit: Degree (0.017453292519943299)

Prime Meridian: Greenwich (0.000000000000000000)

Datum: D\_North\_American\_1983

Spheroid: GRS\_1980

Semimajor Axis: 6378137.000000000000000000

Semiminor Axis: 6356752.314140356100000000

Inverse Flattening: 298.257222101000020000

## CREDITS

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## CITATION

Whitacre, J. V, and Slyder, J. B. YYYY. Carnegie Museum of Natural History Pennsylvania Unconventional Natural Gas Wells Geodatabase (v.YYYY-Q#) [computer file]. Pittsburgh, PA: Carnegie Museum of Natural History. Available download: URL: http://maps.carnegiemnh.org/index.php/projects/unconventional-wells/. Accessed: Date of Download.

## DATA DICTIONARY

The following definitions are expanded from the included Field Definitions table found below.

### Unconventional Wells Definition

According to the PA DEP, “An unconventional gas well is a well that is drilled into an Unconventional formation, which is defined as a geologic shale formation below the base of the Elk Sandstone or its geologic equivalent where natural gas generally cannot be produced except by horizontal or vertical well bores stimulated by hydraulic fracturing.” (OOGM 2013)

For the purpose of this dataset, an unconventional natural gas well is defined as any well classified as such in any of the eight PA DEP data sources used in the compilation of this dataset. Some records in the individual data sources may not be classified as unconventional. If this is the case, at least one other record in any of the eight data sources indicates the well as unconventional. This inclusive approach allows for questionable wells to be subject to further scrutiny and to allow for a greatest-number of wells scenario. It is recommended that every effort be made by users to investigate and/or disregard records that may skew one’s research or analysis.

### Well Permit Numbers

The PA DEP roughly follows the American Petroleum Institute (API) standard for uniquely identifying wells by the well permit number (OOGM 2013). The permit number is used to unify all the datasets. Starting in 2013, the PA DEP dropped the last two pair of digits in their data products. Below are two brief explanations of the API format:

“The American Petroleum Institute (API) Subcommittee on Well Data Retrieval Systems was formed in 1962 to develop a standard method for nationwide well identification for use in computerized well data systems. They created the API well number, a unique, permanent, numeric identifier assigned for identification of a well (i.e. hole in the ground) which is drilled for the purpose of finding or producing oil and/or gas or providing related services.”

-API number Technical Explanation & Examples, Reference Material

<http://www.ihs.com/products/oil-gas-information/training/reference-materials.aspx?tid=t5>

SS-CCC-WWWWW-DD-EE

-**SS**: the code number for the state; PA is 37; this is not included in the PA DEP permit number

-**CCC**: the code number for the county; this is included in the PA DEP permit number

-**WWWWW**: the unique well identifier within the indicated county; this is included in the PA DEP permit number

-**DD**: the directional sidetrack code; 00 is the original vertical drill, while the sequential numbers will indicate horizontal/directional sidetracks; this is not included in the PA DEP permit number

-**EE**: the event sequence to distinguish between separate operations in a single bore hole; this is not included in the PA DEP permit number

-Information adapted from Wikipedia

<http://en.wikipedia.org/wiki/API_well_number>

### Current Operator

The current operator is determined by the most recent record queried from the source datasets. Priority of data sources is given in the following order: Production, Compliance, Waste, PUC, SPUD, Permit. Production is the best indicator of the current operator because it is the final level of data reporting and will continue to be reported throughout the life of the well. If a well changes operators, it will show up in the most recent Production. If a well is non-producing, the Compliance reports are the next most recent followed by the Waste, PUC, SPUD, and Permit. The PUC and SPUD reports appear to be updated as operators change, so these datasets are also reliable. However, for the purpose of creating the datasets, the established order works best.

### Location

Location information (latitude/longitude) is searched in the source datasets with the following priority: Permits, SPUD, PUC, Waste, Production. Compliance data does not include location information. This order ensures that the earliest known location information is used, ideally as reported in the permitting process. Geographic coordinates are reported in North American Datum 1983 according to the PA DEP (OOGM 2013). The locational accuracy of the geographic coordinates is unknown, as this is not reported to the PA DEP by the operators. The data are not analyzed for duplicate well locations. If a well is not going to be drilled at the particular location, then it technically requires a new permit.

### Horizontal Wells

For the purpose of this dataset, a horizontal well is defined as a well with at least one record classifying it as a horizontal well. A horizontal well is one that starts off drilled vertically but eventually curves to become horizontal (or near horizontal) in order to parallel a particular geologic formation. This would include any intentionally deviated wells.

### Record Discrepancies and Errors across PA DEP Datasets

Because not every data source includes records for every unique well, discrepancies are inherent. It is recommended that every effort be made by users to investigate and/or disregard records that may skew one’s research or analysis.

Wells are analyzed for errors based on the following criteria:

* *Permit Error* – Identifies wells that have a SPUD record and/or a production record indicating production greater than 0 Mcf but are missing permit information. To query for wells without permits, use the PERMIT\_COUNT field. This error is concerned with drilling and production and the lack of a permit. Production and SPUD records indicate with more confidence that a particular well exists and is operating. If no permit records exist, then data is incomplete for that particular well.
* *SPUD Error* – Identifies wells that show natural gas production but do not have a SPUD record. Wells producing gas should have a record of when drilling commenced. If no SPUD records exist, then data is incomplete for that particular well.
* *Unconventional Status Error* – Identifies wells that are inconsistently classified as unconventional wells across all datasets. Well records that are inconsistently classified as unconventional wells cannot be verified. Any analysis including these wells should have strong cause to include such wells. Although, such wells should not be ignored, as the wells can be reported to the PA DEP for clarification.
* *Location Error* – Identifies wells without geographic coordinates in any data source. Without geographic coordinates, a well is not able to be mapped or used in spatial analyses. Compliance reports do not include geographic coordinates. Records with location errors will not be present in GIS feature classes.

### Well Status (updated in version 2014-Q1)

Well Status is the state of the well as of the UNCGDB date (Act 13 of 2012 2013). The Well Status is determined by using the Well Status value of Spud report, PUC report, or the PA DEP Oil & Gas Locations - Conventional Unconventional shapefile. If a well does not have a record in these datasets, then the Production report Well Status is used as long as the production is greater than zero.

### PA DEP Well Status Definitions: (Act 13 of 2012 2013)

* *Active* – Drilling of the well has commenced. The well may, or may not, be producing.
* *Regulatory Inactive Status* – The PA DEP has granted inactive status for the well. (Any well that has not been used to produce, extract or inject any gas, petroleum or other liquid within the preceding 12 months, or any well for which the equipment necessary for production, extraction or injection has been removed, or any well, considered dry, not equipped for production within 60 days after drilling, redrilling or deepening, is, by definition, an abandoned well and shall be plugged upon abandonment pursuant to the Oil & Gas Act. However, the definition of an abandoned well shall not include any well granted inactive status.)
* *Plugged OG Well* – The well has been lawfully plugged. The well may, or may not, have produced prior to plugging.
* *Operator Reported Not Drilled* – The operator has reported that either the permit has expired and the well has not been drilled, or that they no longer intend to drill the well and wish to cancel the permit, although the permit is still valid.
* *Proposed But Never Materialized* – 1) A permit application was submitted, but the permit was never issued. 2) The well was entered into the database in error. 3) A permit had been issued, however Department staff have determined that the well was never drilled.
* *Unknown* – A well that does not have the required records to determine the Well Status. In general, such wells do not have Permit, Spud, or PUC records, but do have Production records without any gas production or Waste records with no other records.

### Well Stage (new in version 2014-Q1)

The Well Stage field represents the life stage the well is in as of the UNCGDB date. The Well Stage is determined by assessing whether a well has produced gas, has been drilled, is permitted, or if the permit has expired. This field is designed to help users understand the life history of wells.

### UNCGDB Well Stage Definitions:

* *Producing* – The well has a record in the Production report with natural gas production greater than zero Mcf.
* *Drilled* – The well has a SPUD or PUC record, but no Production report record with natural gas production greater than zero Mcf.
* *Permitted* – The well has a Permit record, but no SPUD record, PUC record, or Production report record with natural gas production greater than zero Mcf.
* *Permit Expired* – The well has a Permit record, but no SPUD record, PUC record, or Production report record with natural gas production greater than zero Mcf AND the last permit date is more than a year old (366 days).
* *Unknown* – A well that does not have the required records to determine the Well Stage. In general, such wells do not have Permit, Spud, or PUC records, but do have Production records without any gas production or Waste records with no other records.

### Unconventional Wells Summary Fields:

| Field Name | Source,  Calculated, or  Analysis | Definition Derived from: | Permit | SPUD | PUC | Waste | Compli­ance | Produc­tion | Oil & Gas Locations | For­mations |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| PERMIT\_NO | Source | The Permit Number issued for the well to the Oil and Gas Operator by the PA DEP. See above for more detail. | X | X | X | X | X | X | X | X |
| PRIMARY\_REPORT | Source | The data source in which a well entered the geodatabase system as a Unconventional well; the primary source of general well data. | X | X | X | X | X | X | X | X |
| CURRENT\_OPERATOR | Source | Organizational name of the current well operator. Several operators may report during the life of the well. See above for more information. | X | X | X | X | X | X | X | X |
| FARM\_NAME | Source | Name given to a well by the well operator, usually the landowner at the time of permitting, which does not change. The Site/Farm Name and Well Number normally uniquely identify the well for the operator. AKA Farm Name. | X | X | X | X |  | X | X | X |
| COUNTY | Source | County of well location. | X | X | X | X | X | X | X | X |
| MUNICIPALITY | Source | Municipality of well location. | X | X | X | X | X | X | X | X |
| LATITUDE | Source | Latitude in decimal degrees NAD83 for the well location. | X | X | X | X |  | X | X | X |
| LONGITUDE | Source | Longitude in decimal degrees NAD83 for the well location. | X | X | X | X |  | X | X | X |
| PERMIT\_DATE\_FIRST | Source | Date of the first permit issued for the well. | X |  |  |  |  |  |  |  |
| PERMIT\_DATE\_LAST | Source | Date of the last permit issued for the well. | X |  |  |  |  |  |  |  |
| PERMIT\_COUNT | Calculated | Count of the total number of permit records for the well. | X |  |  |  |  |  |  |  |
| PERMIT\_UNC\_COUNT | Calculated | Count of well permit records reporting an Unconventional well. | X |  |  |  |  |  |  |  |
| PERMIT\_HRZ\_COUNT | Calculated | Count of well permit records reporting a horizontal well. | X |  |  |  |  |  |  |  |
| PERMIT\_WELL\_TYPE | Source | The type of well: gas, combined oil and gas, coalbed methane, multiple well bore, observation, storage, test, etc. | X |  |  |  |  |  |  |  |
| SPUD\_DATE | Source | Date of the first SPUD reported for a well. |  | X |  |  |  |  |  |  |
| SPUD\_COUNT | Calculated | Count of the total number of SPUD records for the well. |  | X |  |  |  |  |  |  |
| SPUD\_UNC\_COUNT | Calculated | Count of well SPUD records reporting an Unconventional well. |  | X |  |  |  |  |  |  |
| SPUD\_HRZ\_COUNT | Calculated | Count of well SPUD records reporting a horizontal well. |  | X |  |  |  |  |  |  |
| SPUD\_WELL\_TYPE | Source | The type of well: gas, combined oil and gas, coalbed methane, multiple well bore, observation, storage, test, etc. |  | X |  |  |  |  |  |  |
| SPUD\_STATUS | Source | Spud report Well Status on the date of download. See above for more detail. |  | X |  |  |  |  |  |  |
| PUC\_SPUD\_DATE | Source | Date of the PUC SPUD reported for a well. |  |  | X |  |  |  |  |  |
| PUC\_COUNT | Calculated | Count of the total number of PUC records for the well (should be 1 or 0). |  |  | X |  |  |  |  |  |
| PUC\_HRZ\_COUNT | Calculated | Count of well PUC records reporting a horizontal well (should be 1 or 0). |  |  | X |  |  |  |  |  |
| PUC\_STATUS | Source | PUC report Well Status on the date of download. See above for more detail. |  |  | X |  |  |  |  |  |
| PUC\_PLUGGED\_DATE | Source | The completed date of well plugging activities as reported on the Well Plugging Certificate. |  |  | X |  |  |  |  |  |
| WASTE\_PERIOD\_FIRST | Source | First period of waste reported for a well. |  |  |  | X |  |  |  |  |
| WASTE\_PERIOD\_LAST | Source | Last period of waste reported for a well. |  |  |  | X |  |  |  |  |
| WASTE\_COUNT | Calculated | Count of the total number of waste records for the well. |  |  |  | X |  |  |  |  |
| WASTE\_UNC\_ COUNT | Calculated | Count of well waste records reporting an Unconventional well. |  |  |  | X |  |  |  |  |
| WASTE\_HRZ\_ COUNT | Calculated | Count of well waste records reporting a horizontal well. |  |  |  | X |  |  |  |  |
| WASTE\_STATUS | Source | Waste report Well Status of the most recent production record of the well. See above for more detail. |  |  |  | X |  |  |  |  |
| INSPECT\_DATE\_FIRST | Source | Date of the first inspection reported for a well. |  |  |  |  | X |  |  |  |
| INSPECT\_DATE\_LAST | Source | Date of the last inspection reported for a well. |  |  |  |  | X |  |  |  |
| INSPECT\_COUNT | Calculated | Count of the total number of compliance records for the well. |  |  |  |  | X |  |  |  |
| VIOL\_DATE\_FIRST | Source | Date of the first violation reported for a well. |  |  |  |  | X |  |  |  |
| VIOL\_DATE\_LAST | Source | Date of the last violation reported for a well. |  |  |  |  | X |  |  |  |
| VIOL\_COUNT | Calculated | Count of the total number of compliance records with violations for the well. |  |  |  |  | X |  |  |  |
| COMPL\_UNC\_COUNT | Calculated | Count of well compliance records reporting an Unconventional well. |  |  |  |  | X |  |  |  |
| PROD\_PERIOD\_FIRST | Source | First period of production reported for a well. |  |  |  |  |  | X |  |  |
| PROD\_PERIOD\_LAST | Source | Last period of production reported for a well. |  |  |  |  |  | X |  |  |
| PROD\_COUNT | Calculated | Count of the total number of production records for the well. |  |  |  |  |  | X |  |  |
| PROD\_UNC\_COUNT | Calculated | Count of well production records reporting an Unconventional well. |  |  |  |  |  | X |  |  |
| PROD\_HRZ\_COUNT | Calculated | Count of well production records reporting a horizontal well. |  |  |  |  |  | X |  |  |
| PROD\_STATUS | Source | Production report Well Status of the most recent production record of the well. See above for more detail. |  |  |  |  |  | X |  |  |
| PROD\_GAS\_QUANT | Calculated | Total Mcf of natural gas production from 2000 to Present. Values include a six month overlap for some well for when Unconventional gas reporting laws were changed. See Known Issues for more information. |  |  |  |  |  | X |  |  |
| PROD\_GAS\_DAYS | Calculated | Total days of natural gas production from 2000 to Present. Values include a six month overlap for some well for when Unconventional gas reporting laws were changed. See Known Issues for more information. |  |  |  |  |  | X |  |  |
| OGLOC\_COUNT | Calculated | Count of the total number of Oil & Gas Locations - Conventional Unconventional shapefile features for the well. |  |  |  |  |  |  | X |  |
| OGLOC\_UNC\_COUNT | Calculated | Count of well Oil & Gas Locations - Conventional Unconventional shapefile records reporting an Unconventional well. |  |  |  |  |  |  | X |  |
| OGLOC\_HRZ\_COUNT | Calculated | Count of well Oil & Gas Locations - Conventional Unconventional shapefile records reporting a horizontal well. |  |  |  |  |  |  | X |  |
| OGLOC\_WELL\_STATUS | Source | Oil & Gas Locations - Conventional Unconventional shapefile Well Status on the date of download. See above for more detail. |  |  |  |  |  |  | X |  |
| OGLOC\_WELL\_PAD | Source | Oil & Gas Locations - Conventional Unconventional shapefile Well Pad name. |  |  |  |  |  |  | X |  |
| OGLOC\_SURFACE\_ELEVATION | Source | Oil & Gas Locations - Conventional Unconventional shapefile ground elevation at the well head location. |  |  |  |  |  |  | X |  |
| FORMATION | Source | Well Formation report producing, target, or oldest formation, whichever is found first respectively. |  |  |  |  |  |  |  | X |
| ERROR\_PERMIT\* | Analysis | Yes/No Field: Uses a formula to determine if the well indicates drilling or production without a permit record. See above for more information. | X | X |  | X |  | X |  |  |
| ERROR\_SPUD\* | Analysis | Yes/No Field: Uses a formula to determine if the well indicates production without a SPUD record. See above for more information. | X | X |  | X |  | X |  |  |
| ERROR\_UNC\_STATUS\* | Analysis | Yes/No Field: Indicates whether well is inconsistently identified as a Unconventional well. See above for more information. | X | X | X | X | X | X |  |  |
| ERROR\_LOCATION\* | Analysis | Yes/No Field: Indicates whether or not a well has geographic coordinates. | X | X | X | X | X | X |  |  |
| ERROR\_COUNT | Calculated | Indicates how many errors were found for a particular well. | X | X | X | X | X | X |  |  |
| UNCONVENTIONAL\_STATUS\* | Analysis | Indicates categorically how many well records of all records indicate unconventional: UNC WELL, UNC MAJORITY, UNC UNKNOWN, UNC MINORITY | X | X | X | X | X | X | X | X |
| HORIZONTAL\_STATUS\* | Analysis | Yes/No Field: Indicates whether the well is a horizontal well. Determined by the presence of at least one record indicating horizontal. | X | X | X | X |  | X | X | X |
| WELL\_STATUS\* | Analysis | Indicates whether a well is Permitted, Expired, Drilled, Producing, Regulatory Inactive, Shut-In, Plugged, Abandoned, or Unknown. See above for more information. | X | X | X |  |  | X | X | X |
| WELL\_STAGE\* | Analysis |  | X | X | X |  |  | X |  |  |

\* These values are analysis, not calculated data, indicating that a formula was used to determine values based on logical parameters. Other methods could be used to determine these values. See above for more information about the particular fields.

### Wells Production Summary Fields:

| Field Name | Source,  Calculated, or  Analysis | Definition Derived from: | Permit | SPUD | Waste | Production | Compliance | PUC |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| GAS\_QUANT\_20XX(\_X) | Calculated | Total Mcf of natural gas production for **six-month reporting periods** 20XX(\_X). |  |  |  | X |  |  |
| GAS\_QUANT\_M-XX-X-XXXU | Calculated | General format for the monthly total gas produced field starting in 2015. After M-, the fields are year (2 digit), Month (1-2 digit), 3-digit text month abbreviation. For example January 2015 unconventional gas production would be GAS\_QUANT\_M-15-1-JANU. |  |  |  | x |  |  |
| ANN\_GAS\_QUANT\_Total | Calculated | Total Mcf of annual natural gas production from 2000 through present. |  |  |  | X |  |  |
| UNC\_GAS\_QUANT\_Total | Calculated | Total Mcf of Unconventional natural gas production from July 2009 to present. |  |  |  | X |  |  |
| GAS\_DAYS\_20XX(\_X) | Calculated | Total days of natural gas production for **six-month reporting periods** 20XX(\_X). |  |  |  | X |  |  |
| GAS\_DAYS\_M-XX-X-XXX | Calculated | General format for the Monthly gas production days field starting in 2015. After M-, the fields are year (2 digit), Month (1-2 digit), 3-digit text month abbreviation. For example January 2015 unconventional gas production would be GAS\_QUANT\_M-15-1-JANU |  |  |  |  |  |  |
| ANN\_GAS\_DAYS\_Total | Calculated | Total days of annual natural gas production from 2000 to present. |  |  |  | X |  |  |
| UNC\_GAS\_DAYS\_Total | Calculated | Total days of Unconventional natural gas production from July 2009 to present. |  |  |  | X |  |  |

## UPDATE and VERSION INFORMATION

The CMNH UNCGDB is designed to be updated with a new release every quarter. Below is the expected annual release schedule:

|  |  |  |  |
| --- | --- | --- | --- |
| Quarter | Data End Date | PA DEP DATA  Download Date\*\* | UNCGDB  Release Date\*\* |
| 1 | March 31 | April 7 | April 15 |
| 2 | June 30 | August 22 | August 31 |
| 3 | September 30 | October 7 | October 15 |
| 4 | December 31 | February 22 | February 28 |
| \*\*Date represents the week of the corresponding date. Actual download/release may occur earlier or later. | | | |

Due to differing release schedules of the PA DEP source data and to ensure that all records are included for each quarter, there is a delay from the end of the quarter of at least 5 business days before the data is downloaded and another 5 business days to allow for data processing. Data for all reports, except waste and production reports, are updated by the PA DEP on a rolling or daily basis. From July 2010 through December 2014, the PA DEP releases unconventional well production and waste reports every six months following the periods covering January through June and July through December (OOGM 2013). Starting in 2015, the DEP began requiring produces to report monthly production and waste figures within 45 days after the end of the month, and the DEP now releases these reports monthly.

As of publication of the 2015 Q2 Dataset on 04/08/2015, CMNH plans to maintain this roughly quarterly update schedule. Therefore, Q1 dataset will include production and waste through January and all other datasets through the end of March. Q3 will include production and waste through July and all other datasets through the end of September. Q2 and Q4 updates will include all records (including production and waste) through the end of June and the end of December, respectively.

Versions of the geodatabase are identified by indicating the year and quarter the data covers, following the scheme YYYY-Q# (Example: 2013-Q1). This is important for citation purposes (see Citation above). The geodatabase file name is named similarly with the dash (-) replaced by an underscore (Example: UnconventionalWellsPA\_2013\_Q1). Versions YYYY-Q2 and YYYY-Q4 will include the latest production reports and therefore take longer to release.

### List of Updates by Version

2017-Q2 (Released Aug 25 2017)

* Records (including production and waste) queried through June 30, 2017; Downloaded from PA DEP Aug 22, 2016.

2017-Q1 (Released April 24, 2017)

* Records queried through March 31, 2017, Downloaded from PA DEP Apr 10, 11, &14, 2017.
* Production and Waste through February 2017 downloaded and included.

2016-Q4 (Released Mar 1, 2017)

* Records (including production and waste) queried through December 31, 2016; Downloaded from PA DEP Feb 14 & 27, 2016.

2016-Q3 (Released Oct 13, 2016)

* Records queried through September 30, 2016, Downloaded from PA DEP Oct 11, 2016.
* Production and Waste through July 2016 downloaded and included.

2016-Q2 (Released Aug 24, 2016)

* Records (including production and waste) queried through June 30, 2016; Downloaded from PA DEP Aug 18, 19 & 22, 2016.

2016-Q1 (Released April 12, 2016)

* Records (including production and waste) queried through March 31, 2016; Downloaded from PA DEP April 8 & 11, 2016.
* Production and waste for January 2016 were downloaded and included.

2015-Q4 (Released February 23, 2016)

* Records (including production and waste) queried through December 31, 2015; Downloaded from PA DEP February 22, 2016.

2015-Q3 (Released October 13, 2015)

* Records queried through September 30, 2015; Downloaded from PA DEP October 7, 2015.
* Production and waste for July 2015 were downloaded and included.

2015-Q2 (Released Sep 1, 2015)

* Records (including production and waste) queried through June 30, 2015; Downloaded from PA DEP August 24, 2015.
* Monthly production field naming convention updated to differentiate these fields from ongoing 6-month reports production and waste figures. Unconventional gas production for Jan-June and July- December will remain Year-01 and Year-02, respectively, while monthly production and waste periods will follow the format M-15-1-JANU for January 2015, M-15-2-FEBU for February 2015 , and so on.

2015-Q1 (Released Apr 8, 2015)

* Records queried through March 31, 2015; Downloaded from PA DEP April 8, 2015.
* Production and waste for the first monthly reporting period, January 2015, were downloaded and included (see note in bold above).

2014-Q4 (Released Feb 23, 2015)

* Records queried through December 31, 2014; Downloaded from PA DEP February 20, 2015.

2014-Q3 (Released October 7, 2014)

* Records queried through September 30, 2014; Downloaded from PA DEP October 6, 2014.

2014-Q2 (Released August 26, 2014)

* Records queried through June 30, 2014; Downloaded from PA DEP August 22, 2014.

2014-Q1 (Released May 14, 2014)

* Records queried through March 31, 2014; downloaded from PA DEP April 14, 2014.
* Added two additional datasets: PA DEP Oil and Gas Locations – Conventional Unconventional shapefile from PASDA and Well Formations Report.
* Added new fields: OGLOC\_COUNT, OGLOC\_UNC\_COUNT, OGLOC\_HRZ\_COUNT, OGLOC\_WELL\_STATUS, OGLOC\_WELL\_PAD, OGLOC\_SURFACE\_ELEVATION, FORMATION, WELL\_STAGE.
* Changed the WELL\_STATUS definition to be in line with PA DEP definition.
* Added a new analysis, Well Stage, to indicate the life stage of a well. This field will help to better determine whether a well is permitted, drilled, or has produced natural gas.
* Fixed an error with the calculation for the ERROR\_UNC\_STATUS that did not accurately identify wells with the error.

2013-Q4 (Released February 28, 2014)

* Records queried through December 31, 2013; downloaded from PA DEP February 26, 2014.
* No updates.

2013-Q3 (Released October 15, 2013)

* Records queried through September 30, 2013; downloaded from PA DEP October 7, 2013.
* No updates.

2013-Q2 (Released August 30, 2013)

* Records queried through June 30, 2013; downloaded from PA DEP August 26, 2013.
* No updates.

2013-Q1 (Released June 30, 2013)

* Records queried through March 31, 2013; downloaded from PA DEP May 15, 2013.
* The Unconventional Wells Summary data compilation method changed significantly, allowing for faster processing. The order of fields changed, some field names were changed, new fields were added, while others were eliminated (see Unconventional Wells Summary Fields table). Below are the important changes. Not all are listed.
  + WELL\_STATUS – Definition changed to conform to the PA DEP definition. See Data Dictionary section of metadata document. The well status is also included from the Spud, PUC, Waste, and Production reports.
  + PERMIT\_WELL\_TYPE and SPUD\_ WELL\_TYPE – Fields added to indicate PA DEP well type classification.
  + PUC\_PLUGGED\_DATE – This field was added to show when wells were plugged.
  + VIOL\_DATE\_FIRST and \_LAST – Violations dates were added.
  + PUC\_ANALYSIS – This field was eliminated and the analysis is no longer completed.
  + PUC\_FORMATION\_NAME – this field was eliminated because the PA DEP no longer includes the field in the PUC report data. The PA DEP replaced this field with an additional report called “Oil and Gas Well Formations Report” (OOGM 2013). At this time, there is no plan to include the report or reestablish the field in a later release. If the data is desired, it is recommended to download that report, and use an attribute join to add the field.
  + All GAS\_QUANTITY and GAS\_DAYS fields – These fields were moved into a new table that summarizes natural gas production. It is designed to be easily joined to the Unconventional Wells Summary table.
* All tables are now available as Comma Separated Value (CSV) format instead of Microsoft Excel. This allows for more versatility and compatibility with other database software. CSV is a compatible format with Microsoft Excel.
* A quarterly release schedule was established. This also resulted in a redesigned versioning structure. See Update and Version Information of the metadata.
* The recommended data citation has changed.

2012.12 (Released February 8, 2012)

* Records queried through December 31, 2012; downloaded from PA DEP January 25, 2013 (All Sources).
* The 2012 annual and second period for unconventional wells Production and Waste reports are not included as these are not released until mid-February. The next version will contain these records.
* Minor elements of the data structure were updated to help conserve storage space and allow for greater flexibility for users with earlier versions of ArcGIS. The changes include fixes that allow the file geodatabase, map document, and layer file to be compatible with ArcGIS 9.3 and above.
* The known issue regarding the truncation of text values for the INSPECTION\_COMMENT field of the Compliance Report was resolved.

2012.06 (Released September 28, 2012)

* Records queried through June 30, 2012; downloaded from PA DEP August 16, 2012 (Permits, SPUD, Compliance, and PUC) and September 5, 2012 (Production and Waste).
* The geodatabase changed its name from “Carnegie Geodatabase of Pennsylvania Marcellus Shale Natural Gas Wells” to “Carnegie Museum of Natural History Pennsylvania Unconventional Natural Gas Wells Geodatabase”.
* Fields updated: SITE\_NAME changed to FARM\_NAME; Any field designated with “MS” was changed to “UNC” to reflect the geodatabase name change; LOCATION\_YN changed name to ERROR\_LOCATION; All GAS\_PROD fields changed to GAS\_QUANT;
* Fields removed: ERROR\_FLAG, ERROR\_NOTE
* New fields added: ERROR\_PERMIT, ERROR\_SPUD, ERROR\_MS\_STATUS, and ERROR\_COUNT. The field additions listed correct for any overlapping errors. For example, if a well has a permit or a spud error and is also inconsistently identified as an Unconventional well, each error will be reflected in the new fields. This eliminates weighting the errors and will show each error independently. The error count field can now be used to see which wells have more than one discrepancy. The definitions of errors and discrepancies were expanded and described more clearly as well.
* Metadata was updated to reflect the changes from above.

2012.04 (Released May 14, 2012)

* Records queried through April 30, 2012; downloaded from PA DEP May 14, 2012.
* Initial public release

2011.12 (no formal release)

* Records queried through December 31, 2011; downloaded from PA DEP on April 16, 2012.
* Added Waste Reports, Compliance Reports, and PUC Act 13 SPUD Report.

2011.10 (no formal release)

* Records queried through October 31, 2011; downloaded from PA DEP Fall of 2011.
* This dataset only includes Permit, SPUD, and Production records and used slightly different techniques in compiling the records due to a different data delivery system by the PA DEP. In January of 2012, the PA DEP released a new data query and download tool.

### KNOWN ISSUES

#### Production Report

In 2010, the PA DEP began compiling production and waste reports every six months for unconventional/Marcellus shale wells instead of annually. The law that issued the reporting schedule change also required that the PA DEP first include one full year of only unconventional/Marcellus shale well production, beginning in July 2009 through June 2010. This resulted in a half year overlap between annual and unconventional/Marcellus shale reporting schedules, which consequently disallowed the ability to aggregate production continuously through the reporting periods. This six month overlap of reporting cannot be calculated without using estimations. Therefore, it was the decision of CMNH to report the raw figures and not analyze or estimate production. The fields GAS\_PROD\_TOTAL and GAS\_DAYS\_TOTAL include the six month overlap and can therefore be considered inflated. The more appropriate method to display and analyze natural gas production amounts is to treat annual reports separately from the unconventional/Marcellus shale only reports.

#### Waste Report

The 2007 Waste Report is missing a significant number of records. According the PA DEP, this data was lost due to a database system crash that resulted in the deletion of many records.

#### Compliance Report

In September 2014, an independent analysis of DEP paper and digital compliance reports noted “…inaccurate and incomplete information.” Findings in the analysis include missing or incorrectly coded violations in the online compliance report. Since the CMNH uses the online compliance report as its source data, our dataset will the record as it is entered into DEP’s digital tracking system. Therefore our dataset is unable to identify sites where paper and digital records do not match.

There is also an issue with the Compliance Report regarding fines. Fine numbers reported in the Compliance report likely represent the summation of fines for a collection of wells owned by the same operator. In other words, the Compliance Report does not indicate fines for a single well. Fines appear to be grouped by operator and include the total amount of fines for all well violations at a given time. Therefore, fines cannot be calculated on well by well basis.

### ARCHIVED INFORMATION FROM PREVIOUS VERSIONS

The information below is no longer valid for the current version of the UNCGDB, but is retained for reference for past versions of the UNCGDB.

#### Well Status (this changed in version 2014-Q1)

Well Status is the state of the well as of the UNCGDB date (Act 13 of 2012 2013). The well status is determined by using the Spud or PUC report Well Status value. If a well does not have a record in the Spud or PUC reports, then the Production report Well Status is used as long as the production is greater than zero. If there is no production, then the well is evaluated for whether the permit is valid or expired. All other wells do not have the required information to determine a well status, and are therefore regarded as unknown.

#### PA DEP definitions: (Act 13 of 2012 2013)

* *Active* – Drilling of the well has commenced. The well may, or may not, be producing.
* *Regulatory Inactive Status* – The PA DEP has granted inactive status for the well. (Any well that has not been used to produce, extract or inject any gas, petroleum or other liquid within the preceding 12 months, or any well for which the equipment necessary for production, extraction or injection has been removed, or any well, considered dry, not equipped for production within 60 days after drilling, redrilling or deepening, is, by definition, an abandoned well and shall be plugged upon abandonment pursuant to the Oil & Gas Act. However, the definition of an abandoned well shall not include any well granted inactive status.)
* *Plugged OG Well* – The well has been lawfully plugged. The well may, or may not, have produced prior to plugging.
* *Operator Reported Not Drilled* – The operator has reported that either the permit has expired and the well has not been drilled, or that, although the permit is still valid, they no longer intend to drill the well and wish to cancel the permit.
* *Proposed But Never Materialized* – 1) A permit application was submitted, but the permit was never issued. 2) The well was entered into the database in error. 3) A permit had been issued, however Department staff have determined that the well was never drilled.

#### UNCGDB Definitions:

* *Permitted* – A well that has not yet been drilled with a valid permit. A permit is valid from one year of the issue date.
* *Permit* *Expired*– A well that has not yet been drilled, but the permit has expired. The permit issue date is more than one year old and does not have a Spud record.
* *Unknown* – A well that does not have the required records to determine the well status. In general, such wells do not have Permit, Spud, or PUC records, but do have Production records without any gas production or Waste records with no other records.

#### Well Status (this changed in version 2013-Q1)

Well status is determined by a logical analysis using many fields. There are potentially other ways that well status could be determined. The following explains the logic used to determine the well status for this dataset. This method was influenced by Gehman et al. (2013). The explanation is in order of priority.

* *Producing* – Records are analyzed first to determine if a well is currently producing natural gas. This is determined by whether natural gas production values are greater than zero for the most recent annual or Unconventional production period. If a well did not produce natural gas in the most recent annual or Unconventional production period, it is analyzed to determine if it is Abandoned, Plugged, Regulatory Inactive, or Shut-In status.
* *Abandoned* – The production records are searched for any record that indicates "Abandoned well" in the COMMENT\_REASON field.
* *Plugged* – The production records are searched for any record that indicates "Plugged well" in the COMMENT\_REASON field.
* *Regulatory Inactive* – The production records are searched for any record that indicates "Regulatory Inactive Well" in the COMMENT\_REASON field.
* *Shut-In* – The production records are searched for any record that indicates "Well Temporarily Shut-In" in the COMMENT\_REASON field. If a well is not Abandoned, Plugged, Regulatory Inactive, or Shut-In, it is analyzed to determined Drilled status.
* *Drilled* – Records are analyzed to determine if a SPUD record, Waste record, Compliance record, or a PUC record exists. If this analysis does not return a drilled status, the production records are searched for any record that indicates “Well spud, drilling not completed,” “Drilling finished, well not yet completed,” “Sold this well,” or “Transferred this well” in the COMMENT\_REASON field. If a well is not Drilled, it is analyzed to determined Unknown status.
* *Unknown* – If a well does not include a Permit, SPUD, and Waste record and does not produce any natural gas during the life of the well, the well status cannot be determined. All other wells left can be analyzed for Expired or Permitted status.
* *Expired* – If a well has not been drilled within one year of its permit date, it is considered to be expired. A formula calculates the expiration based on whether a well has had activity beyond the Permit records from one year before the version date. Also, the production records are searched for any record that indicates "Never Spud Well, Permit Expired or Cancelled" in the COMMENT\_REASON field.
* *Permitted* – All wells that do not fit the above categories and have a permit are considered permitted. Also, the production records are searched for any record that indicates "Permit valid, well not spud" in the COMMENT\_REASON field.

#### PUC Analysis (this analysis is no longer included starting in version 2013-Q1)

The source data for PUC wells, in accordance with PA Act 13, has been questioned by many. Using a logical formula to analyze all records, wells can be determined if they should be reported to the PUC. Wells are identified as a PUC well if the well was included in the Act 13, SPUD, Waste, or Compliance tables; the well has produced gas; or was flagged in the production reports COMMENT\_REASEON field as “Abandoned well,” “Drilling finished, well not yet completed,” “Plugged well,” “Regulatory Inactive Well,” “Sold this well,” “Transferred this well,” "Well spud, drilling not completed," or “Well Temporarily shut-in.” The query of records that should be reported to the PUC can be compared to the PUC data source. It is expected that the analysis will return a greater number of wells. This method was influenced by Gehman et al. (2013).

#### Version Info (the version scheme changed with version 2013-Q1)

Versions of the geodatabase are identified by indicating the year and month (YYYY.MM) through which records are compiled from the begin date. For example, data through April, 2011, would be version 2011.04 and data through the December, 2011, would be version 2011.12. This is important for citation purposes (see above). The geodatabase file name is named similarly, but with the dot (“.”) removed and the addition of the last day of the month. Versions released covering data queries through June (YYYY.06) and December (YYYY.12) will include the latest production reports and may take longer to release.

#### Compliance Reports Known Issues (this Issue was fixed in version 2012.12)

There is an issue with the Compliance Reports with the INSPECTION\_COMMENT. This field is a text field designed to allow greater than 1,000 characters. However, due to the way ArcGIS handles CSV files, only 255 characters can be read from the raw CSV file. Therefore, some comments in this field are truncated. To review the entire field, it is suggested to search for the specific well of interest using the PA DEP’s Compliance Report viewer website.

## REFERENCES

Gehman, J., Mastroianni, D., Grant, A., & Etzion, D. 2013. An Analysis of Unconventional Gas Well Reporting under Pennsylvania’s Act 13 of 2012. Environmental Practice 14:262–277.

Office of Oil and Gas Management. 2013. Oil and Gas Reports [Web page]. Pennsylvania Department of Environmental Protection. <http://www.portal.state.pa.us/portal/server.pt/community/oil_and_gas_reports/20297> Accessed: [6 August 2013].

Act 13 of 2012. 2013. Public Utility Commission (PUC) Act 13 Unconventional Wells Spud Report [Web page]. Pennsylvania Department of Environmental Protection. <http://www.depreportingservices.state.pa.us/ReportServer/Pages/ReportViewer.aspx?/PUC/PUC_Interactive_Web> Accessed: [6 August 2013].

## COMPUTER DATA FILES

Below is a list of the computer files found in the downloadable zip file:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| File Name | | | File Type | Description |
| folder icon | CSV | | File Folder | Folder containing CSV tables; Each file below has a corresponding XML document |
|  | file icon | PUC.csv | Table | Corresponds to geodatabase PUC table |
|  | file icon | Unc\_Compliance.csv | Table | Corresponds to geodatabase Unc\_Compliance table |
|  | file icon | Unc\_PADEP\_OilGasLocations.csv | Table | Corresponds to geodatabase Unc\_ PADEP\_OilGasLocations table |
|  | file icon | Unc\_PermitsIssued.csv | Table | Corresponds to geodatabase Unc\_ PermitIssued table |
|  | file icon | Unc\_Production.csv | Table | Corresponds to geodatabase Unc\_Production table |
|  | file icon | Unc\_SPUDData.csv | Table | Corresponds to geodatabase Unc\_SPUDData table |
|  | file icon | Unc\_Waste.csv | Table | Corresponds to geodatabase Unc\_Waste table |
|  | file icon | Unc\_WellFormations.csv | Table | Corresponds to geodatabase Unc\_WellFormations table |
|  | file icon | Unc\_WellsProductionSummary.csv | Table | Corresponds to geodatabase Unc\_WellsProductionSummary table |
|  | file icon | Unc\_WellsSummary.csv | Table | Corresponds to geodatabase Unc\_WellsSummary table, includes records without latitude/longitude not included in the feature class |
| container icon | UnconventionalWellsPA\_YYYY\_Q#.gdb | | File Geodatabase | ArcGIS File Geodatabase version 9.3 |
|  | feature class icon | Counties\_PA | Feature Class | Pennsylvania county dataset for reference |
|  | relationship icon | CountiesToUncWells | Relationship Class | Relationship from Counties\_PA feature class to Unconventional Wells feature class |
|  | feature class icon | MarcellusShaleFormation | Feature Class | The entire Marcellus formation for reference |
|  | feature class icon | MarcellusShaleFormation\_PA | Feature Class | The Marcellus formation within Pennsylvania for reference |
|  | table icon | PUC | Table | All Public Utility Commission (PUC) Act 13 Unconventional Wells Spud Report records |
|  | table icon | Unc\_Compliance | Table | Queried unconventional Oil and Gas Compliance Report records |
|  | table icon | Unc\_ PADEP\_OilGasLocations | Table | Queried unconventional Oil & Gas Locations shapefile records |
|  | table icon | Unc\_Permits\_Issued | Table | Queried unconventional Permits Issued Detail Report records |
|  | table icon | Unc\_Production | Table | Queried unconventional Production Report records |
|  | table icon | Unc\_SPUD\_Data | Table | Queried unconventional SPUD Data Report records |
|  | table icon | Unc\_Waste | Table | Queried unconventional Waste Report records |
|  | table icon | Unc\_WellFormations | Table | Queried unconventional Well Formations Report records |
|  | table icon | Unc\_WellsProductionSummary | Table | Calculated natural gas production for unconventional Production Report wells |
|  | table icon | Unc\_WellsSummary | Table | Summary table of all source data reports; includes records without latitude/longitude not included in the feature class |
|  | file icon | UnconventionalWells | Feature Class | Point feature class of Unconventional Wells, only includes records with valid latitude/longitude; same fields as Unc\_WellsSummary table |
|  | relationship icon | UncWellsToCompliance | Relationship Class | Relationship from UnconventionalWells feature class to Unc\_Compliance table |
|  | relationship icon | UncWellsToFormations | Relationship Class | Relationship from UnconventionalWells feature class to Unc\_WellFormations table |
|  | relationship icon | UncWellsToOGLocations | Relationship Class | Relationship from UnconventionalWells feature class to Unc\_PADEP\_OilGasLocations table |
|  | relationship icon | UncWellsToPermits | Relationship Class | Relationship from UnconventionalWells feature class to Unc\_Permits\_Issued table |
|  | relationship icon | UncWellsToProduction | Relationship Class | Relationship from UnconventionalWells feature class to Unc\_Production table |
|  | relationship icon | UncWellsToPUC | Relationship Class | Relationship from UnconventionalWells feature class to PUC table |
|  | relationship icon | UncWellsToSPUD | Relationship Class | Relationship from UnconventionalWells feature class to Unc\_SPUD table |
|  | relationship icon | UncWellsToWaste | Relationship Class | Relationship from UnconventionalWells feature class to Unc\_Waste table |
| layer file icon | Pennsylvania Unconventional Wells.lyr | | ArcGIS Layer File | Layer properties for symbolizing Unconventional Wells feature class based on Well Stage |
| pdf icon | UnconventionalWells\_Metadata.pdf | | PDF | Metadata Document (i.e. this document) |
| map icon | UnconventionalWellsPA\_YYYY\_Q#.mxd | | ArcGIS Map Document | ArcGIS Map document that allows for quick searches of wells using relationship classes |
| file icon | UnconventionalWellsPA\_YYYY\_Q#.shp | | Shapefile | Point features in shapefile format that correspond to the geodatabase Unconventional Wells feature class |