



WHITE PAPER

In Support of Practices and Standards for Plugging Orphaned and Abandoned Hydrocarbon Wells: A Workshop, an activity of the National Academy of Sciences

Abstract

A compilation of practices white paper that discusses statutory and regulatory standards, methods, and design of plugging plans and requirements for well-plugging activities.

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The authors are solely responsible for the content of this paper, which does not necessarily represent the views of the National Academies of Sciences, Engineering, and Medicine. All authors are affiliated with the Ohio Department of Natural Resources, Division of Oil and Gas Resources Management.

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I. – II. Introduction and Purpose

This white paper has been commissioned by the National Academies of Sciences, Engineering, and Medicine (NAS) for the United States Department of the Interior (DOI). The authors have been tasked with producing a compilation of practices white paper that discusses statutory and regulatory standards, policies and procedures, methods, and design of plugging plans and requirements for well plugging activities. References to industry standards are included. This paper will discuss orphan well identification and characterization; well integrity evaluation; well remedial construction prior to or during plugging; plugging plan development; plugging inspection, oversight, and monitoring; well site risk assessment; well control and plugging prioritization; environmental focus for soils, surface and ground water, and gas emissions and associated well site equipment.

An orphaned well regulatory program may develop procurement procedures for plugging, remedial construction operations, site remediation, and site restoration. Some regulatory programs have authority to address every aspect of well abandonment. This may include site development, environmental remediation, well plugging, and site restoration. Other oil and gas regulatory programs may share responsibilities with sister agencies. Each agency may be responsible for one or more aspect of the overall project. For the purposes of this document, the DOI-IIJA definition of orphaned well will be utilized.

ORPHANED WELL. The term “orphaned well”--

(A) with respect to Federal land or Tribal land, means a well—(i)(I) that is not used for an authorized purpose, such as production, injection, or monitoring; and (II)(aa) for

which no operator can be located;(bb) the operator of which is unable— (AA) to plug the well; and (BB) to remediate and reclaim the well site; or

(cc) that is within the National Petroleum Reserve—Alaska; and

(B) with respect to State or private land—

(i) has the meaning given the term by the applicable State; or

(ii) if that State uses different terminology, has the meaning given another term used by the State to describe a well eligible for plugging, remediation, and reclamation by the State¹.

The DOI-IIJA definition allows for a state definition of orphaned or allows for an alternate term to define wells eligible for plugging, remediation, and reclamation by the state.

A number of states have defined some variation of the term orphaned well in statute or regulation. Some alternate terms such as ‘abandoned’ or ‘idle’ may be defined. States without formal definitions use informal definitions to characterize wells eligible for plugging with state funds².

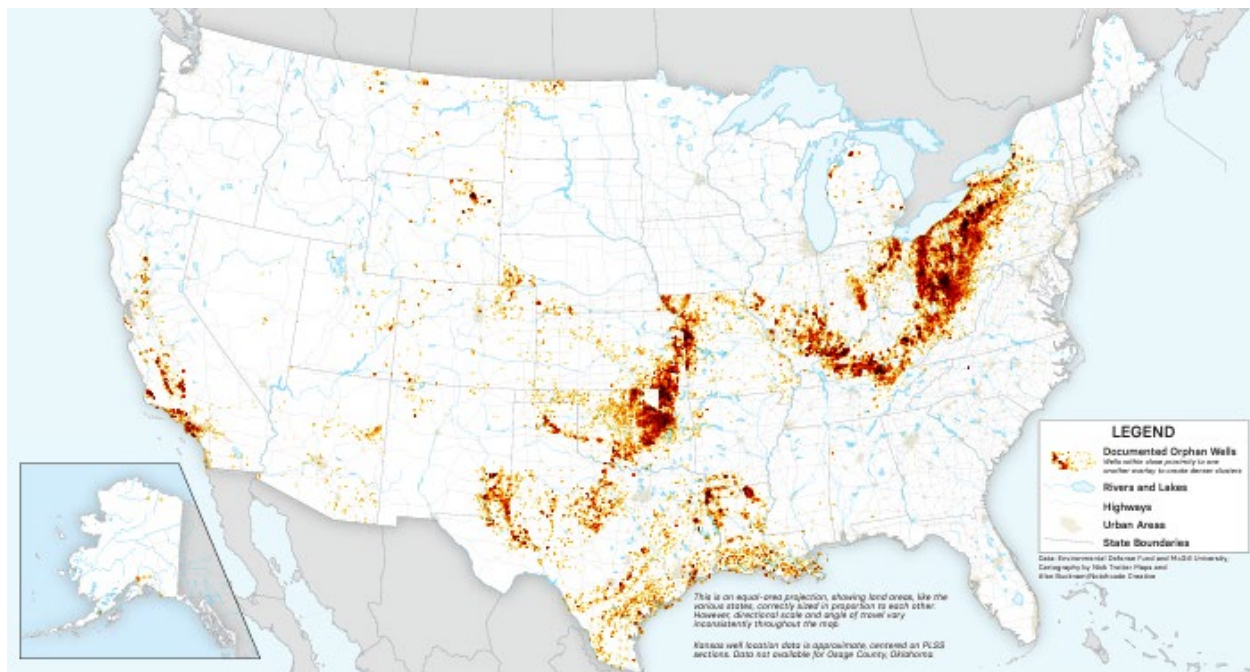
The goal of any orphaned well program is to address environmental risk and human health and safety concerns in the most appropriate way possible. Addressing orphaned wells and facilities (equipment and infrastructure) provides immediate safety and environmental benefits. Every orphaned well may present unique challenges. Variations in well construction, well integrity, maintenance, local geology, geographic setting, and a multitude of other factors may

¹ https://www.doi.gov/sites/default/files/definitions_0.pdf and <https://www.doi.gov/search/node?keys=definitions%20pdf>

² Appendix B Reference Documents: Interstate Oil & Gas Compact Commission (IOGCC): Idle and Orphan Oil and Gas Wells: State Provincial Regulatory Strategies (2021); State and Provincial Summaries; pages 45-76.

present challenges on an individual well basis. Varying state, local, and in some cases, federal requirements must also be considered. For these reasons, and more, the purpose of this paper is not written to propose or prescribe a uniform standard or approach to plugging. Orphaned well programs must have the ability to plan and design for unique situations. They must also have the ability to address unforeseen issues during the plugging and remediation process.

Map of more than 120,000 documented orphan wells that are eligible for closure funding under the [Infrastructure Investment and Jobs Act of 2021](#)³.



³ Map courtesy of Environmental Defense Fund; <https://www.edf.org/orphanwellmap>

III. General Discussion

A Brief History of Oil and Gas Development in North America

Early salt brine and crude oil wells in North America include the Thorla-McKee well ⁴ drilled in Ohio in 1814, a well drilled in Burkesville, Kentucky in 1828 and wells at Burning Springs, West Virginia⁵ in 1836. The natural gas industry started in 1821 near Fredonia, New York when an explorationist dug a well 27 feet deep into gas-bearing black shale. William Hart piped the natural gas to a local inn where it was burned for illumination.



Burning Springs, WV

Colonel Edwin Drake drilled his famous discovery well⁶ in Titusville, Pennsylvania in 1859. From 1861 into the early 1890's explorationists drilled shallow wells in the Appalachian Basin to recover crude oil. In 1884 the giant Lima-Indiana Oil Field was discovered in northwestern Ohio. Over 70,000 wells were drilled approximately 1600 feet deep, between 1888 and 1937. In Oklahoma,



Col. Drake's Well

⁴ <https://remarkableohio.org/marker/1-61-thorla-mckee-well/>

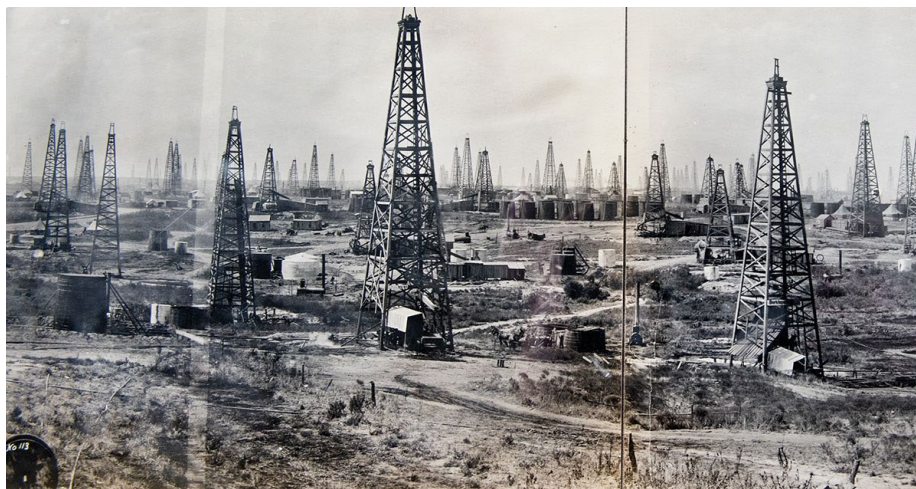
⁵ <https://ideastream.pbslearningmedia.org/resource/4a2e73af-d1ee-40ef-8e8f-87176a965c69/burning-springs/>

⁶ <https://www.drakewell.org/>

oil was first discovered by accident while drilling for salt near Salina. In 1916, natural gas was discovered leading to the development of the Hugoton Gas Field, the largest gas field in North America.

The first major discovery in Texas occurred in 1894 at Corsicana, southeast of Dallas. However, it was the discovery of oil at the Spindletop salt dome in 1901 that jumpstarted the Texas oil industry. Initial production from the Lucas No. 1 well was approximately 100,000 barrels per day. Within two years of the discovery well, over 1,200 oil wells were drilled over the 200-acre Spindletop salt dome, flooding the market and collapsing the price of oil to \$0.03 per barrel. This price collapse resulted in a dramatic reduction in drilling and production activities in the Appalachian Basin.

The East Texas Oil Field⁷ was discovered in 1930. Like other early oil booms, excessive drilling and overproduction resulted from the lack of well spacing or conservation regulations.



East Texas Oil Field

Without well spacing or conservation controls, competing companies constructed drilling derricks in the shadows of their competitor's derricks. Owners produced wells wide open,

⁷ <https://texashighways.com/travel/the-east-texas-oil-field-changed-kilgore-forever/>

leading to premature dissipation of reservoir pressure, lost production, and premature well abandonment.

Significantly, the crude oil and natural gas extraction industry began long before adoption of standard industry practices or state and federal regulations specifying well bonding, drilling, spacing, construction, plugging or abandonment practices. As a result, many pre regulation wells were abandoned without plugging materials or using methods and materials that would not be considered adequate by today's public health and safety standards. Many of the original pre regulation companies are no longer in business, and consequently, their abandoned wells are included in state or federal orphaned well inventories.

IV. Statutory and Regulatory Standards

A majority of states and provinces with documented inventories of orphaned and abandoned wells have specific authority that establishes an orphan well program or authorizes orphan plugging activities⁸. This authorization may define orphaned wells, facilities and funding sources. To the extent possible, orphaned plugging programs adhere to the same statutes, regulations, standards, and procedures as are followed by responsible operators. Funding sources are identified in the Idle and Orphan Oil and Gas Wells: State and Provincial Regulatory Strategies (2021) Table 10, Pg. 35 IOGCC

Figure 1. summarizes states and provinces with statutes or regulations that establish or are specific to an orphaned well program. Complete state and provincial responses to this question may be reviewed in Table 2. Responses may include citations of statutes, regulations, and comments.

Figure 1. State/Province Questionnaire⁹: Section 2: Orphan/Abandoned Well Regulatory Authority¹⁰ <i>State/Province full response can be seen in Table 2. State/Province Questionnaire: Section 2: Orphan/Abandoned Well Regulatory Authority</i>	
State or Province	Statutes and/or regulations <u>specific</u> to orphan/abandoned well program
Alabama	Yes
Alaska	Questionnaire not submitted. Statutes and/or regulations available at https://www.commerce.alaska.gov/web/aogcc/StatutesandRegulations.aspx
Arizona	No Known Orphan Wells ¹¹
Arkansas	Yes
California	Yes
Colorado	Yes

⁸ Appendix D: State/Province Survey Questions

⁹ Appendix D Survey Questions

¹⁰ Appendix C State and Provincial Orphan Well Definitions

¹¹ Appendix B Reference Documents: Interstate Oil & Gas Compact Commission (IOGCC): Idle and Orphan Oil and Gas Wells: State Provincial Regulatory Strategies 2021; page 28

Figure 1. State/Province Questionnaire⁹: Section 2: Orphan/Abandoned Well Regulatory Authority¹⁰

State/Province full response can be seen in Table 2. State/Province Questionnaire: Section 2: Orphan/Abandoned Well Regulatory Authority

State or Province	Statutes and/or regulations <u>specific</u> to orphan/abandoned well program
Idaho	No Known Orphan Wells ¹¹
Illinois	Questionnaire not submitted. Statutes and/or regulations available at https://dnr.illinois.gov/oilandgas/programsandregulations.html
Indiana	Questionnaire not submitted. Statutes and/or regulations available at https://www.in.gov/dnr/oil-and-gas/statutes-and-regulations/
Kansas	Questionnaire not submitted. Statutes and/or regulations available at https://www.kcc.ks.gov/oil-gas/rules-and-regulations
Kentucky	Yes
Louisiana	Yes
Maryland	No Known Orphan Wells ¹¹
Michigan	Yes
Mississippi	Yes
Missouri	Yes
Montana	Yes
Nebraska	No
Nevada	Questionnaire not submitted. Statutes and/or regulations available at https://minerals.nv.gov/Programs/OG/OG/
New Mexico	Questionnaire not submitted. Statutes and/or regulations available at https://www.emnrd.nm.gov/ocd/occ-info/og-rules-and-forms/
New York	Yes
North Dakota	Questionnaire not submitted. Statutes and/or regulations available at https://www.dmr.nd.gov/dmr/oilgas/rules
Ohio	Yes
Oklahoma	Yes
Pennsylvania	Yes
South Dakota	Questionnaire not submitted. Statutes and/or regulations available at https://danr.sd.gov/Environment/MineralsMining/OilGas/LawsRules.aspx
Tennessee	Yes
Texas	Questionnaire not submitted. Statutes and/or regulations available at https://www.rrc.state.tx.us/oil-and-gas/
Utah	Yes
Virginia	Yes
West Virginia	Yes
Wyoming	Yes
Alberta	Questionnaire not submitted. Statutes and/or regulations available at https://www.alberta.ca/oil-acts-and-regulations

Figure 1. State/Province Questionnaire⁹: Section 2: Orphan/Abandoned Well Regulatory Authority¹⁰ <i>State/Province full response can be seen in Table 2. State/Province Questionnaire: Section 2: Orphan/Abandoned Well Regulatory Authority</i>	
State or Province	Statutes and/or regulations <u>specific</u> to orphan/abandoned well program
British Columbia	Yes
Saskatchewan	Questionnaire not submitted. Statutes and/or regulations available at https://www.saskatchewan.ca/business/agriculture-natural-resources-and-industry/oil-and-gas/oil-and-gas-legislation-regulations-and-ministers-orders

Authorization in statute and regulation extends beyond those specifically citing an orphaned well. Many statutes and regulations are applicable to all wells, and therefore do not specifically reference orphaned wells. When reviewing authority within a given program, it is important to carefully review all legal requirements. For example, approved plugging materials or alternate plugging materials may be defined but without specific reference to an orphaned well.

Any well, but more commonly orphaned wells, may have issues or problems that cannot reasonably be anticipated. When an unexpected problem is encountered, state or Canadian staff must address the issue. Having legal authority to approve or require an alternate or modified plan is necessary for regulators. Statutes and regulations may authorize exceptions for demonstrated cause. A common example is plug material placement. Regulations may specify zones or intervals of plug placement. A bottom hole plug may be required at total depth, across a producing formation(s) or zone, or directly above a producing formation(s) or zone. A number of factors may arise making such plug placement impossible. If the primary requirement cannot be achieved, alternate plans must be reviewed and authorized.

Regulatory programs may include provisional language that allows for advances in technology. Performance standards may be included in statutes or regulation to allow regulators to evaluate new technologies against established standards. An example may be seen in the advancements in plugging materials. As wells are drilled in new geologic settings, the geophysical and geochemical properties of target zones may require new or modified materials. New or modified materials may not be specifically approved for use, but the initial use of such materials may be allowed if it is demonstrated that they meet or exceed certain performance standards. In some cases, new or modified materials may then be used without the need to update legal authority.

V. Other Regulatory Authority

The development, production, decommissioning and restoration of oil and gas well sites may be regulated under federal, state and local laws, regulations and permits. Development on federally-owned land is managed primarily by the Department of Interior, Bureau of Land Management or the Department of Agriculture, U.S. Forest Service. Subject to the Clean Water Act, U.S.EPA regulates discharges of water or wastes including storm water run-off from oil and gas drilling and production sites. The National Environmental Policy Act (NEPA) requires that oil and gas exploration on federal lands be analyzed to prevent environmental impacts. In addition, each of the states where oil and gas is produced have one or more agencies that permit wells and regulate the design, construction, location, spacing, operation, and abandonment of wells. These states also enforce environmental standards.

In addition to U.S. EPA, there are a number of federal agencies that also have important roles in supporting safe and environmentally sound production of oil and gas resources. These include:

- The United States Army Corps of Engineers
- The Department of Agriculture, Forest Services; and
- The National Park Services.

The United States Army Corps of Engineers (U.S.A.C.E.), under the authority prescribed by Section 404 of the Clean Water Act, requires any person, firm, or agency that plans to work or navigate waters of the United States to have authorization from the Secretary of the Army. For example, if it is necessary to emplace fill material in a stream or wetland to construct a pad to allow a plugging rig to be installed, a federal permit may be required. The U.S.A.C.E. manages

both civil works and environmental programs to ensure protection and/or reclamation of disturbed sites within their jurisdiction.

A number of states have supplemental standards to address environmental issues that are unique to specific states or regions. For example, frost laws reduce road weight limits to reduce damage that might occur when heavy vehicles travel road beds that are unstable due to intermittent freezing and thawing that typically occurs during the Spring.

In some states, local authorities including counties, townships, and municipalities have authority to enact standards that address local concerns about orphaned well plugging activities. For example, some local authorities require notification prior to mobilization of rigs or heavy equipment necessary for plugging activities. Most local authorities require notice when there are discharges of natural gas, crude oil, or other regulated materials. State project managers may address these local concerns through contract stipulations or permit terms and conditions.

VI. Orphaned Well Identification and Characterization

Well Identification

Before a plugging plan (see section XI) can be developed a well must be properly identified and a thorough review of well construction must be completed. There are many factors that must be considered. Pertinent information may be obtained from a variety of sources. Some of these wells may date back to the early 1800s. For these wells it is unlikely that many, if any, records exist. These wells were drilled prior to spacing or survey requirements¹².



Historic Oilfield Scene near Tulsa Oklahoma

For this group of wells, one may attempt to locate historic information associated with land or parcel records. Such records may be found in a county courthouse or a historic society. Interviews with property owners may provide useful information. As wells and/or leases are obtained by companies, the previous owners' records may be passed to a new owner. If the ownership of a well or lease can be tracked, existing companies owning wells or leases may have useful historic records. Companies are usually interested in historic records if they are drilling in or near a historic field or pool. Old wells can potentially impact new well construction. Conversely, a new well may impact an old well. A call or visit to companies holding leases in the area of interest may prove useful.

¹² <https://ktul.com/news/local/orphan-oil-wells-litter-riverbed-of-the-arkansas>; Orphan oil wells litter riverbed of the Arkansas

For many decades, wells were drilled very close to one another under the law of capture¹³. The resources produced by a well were the property of the well owner regardless of property boundaries or leases. Well spacing and setbacks did not exist. Small parcels of land often contained multiple wells, which make well identification very difficult even if well records exist. Some early wells may only be spaced by a few feet. The very close placement of wells also complicates plug design.

Before a plugging project is developed, an orphaned well program may attempt to locate and identify all wells within a project area. Surveys or accurate GPS coordinates should be gathered. The coordinates may then be compared with historic location information, including old oil well field maps, courthouse records and plat maps, if they exist. Plugging of all the known wells in the project area lessens the potential for problems and may provide economic benefits. For this reason, wells with a lower risk or priority may be included in a project with higher priority wells.

Wells drilled after regulatory programs were established are more likely to have relevant documents to assist in well identification. Multiple agencies may have useful records. Well identification information may be available on various applications, permits, authorizations, and related documents for post-regulatory wells. Well coordinates, footages, well name and number, and for some wells, API numbers may be used to assist with well identification.

A visual inspection of the borehole and casing(s) at surface may also provide clues to a well's identification or era of construction. When records exist, they may be compared with visible well components.

¹³ Appendix A: Glossary of Terms and Definitions

Errors in well identification can lead to potentially dangerous situations. For this reason, it is imperative to properly identify a well before designing a plugging plan.



No detailed well records were available for this well. However, historical records of nearby wells indicated the well was likely drilled to Trenton Limestone in the 1890s. The Mitchell Colin R. #1 well is located five feet from an existing home.¹⁴

Well Characterization

A well may be characterized by its age, drilling method, construction, or purpose. If the age of a well can be determined, or estimated, it may be possible to identify the drilling method and period specific construction practices. The age, depth, target formation and drilling method may help to identify features and structures associated with the well, such as drilling or production pits and water wells drilled to supply water through the drilling process.

Regionally, the range of wells that may be encountered may be more than 150 years old to very recent in age. Early wells often times had conductor made out of wooden planks¹⁴ or hollow tree stumps and were usually open hole completions.

¹⁴ <https://ohiodnr.gov/discover-and-learn/safety-conservation/about-ODNR/oil-gas/orphan-wells> Ohio Department of Natural Resources, Division of Oil and Gas Resources Management; 2021 OWP Annual Report



24-inch diameter wooden casing approximately 4 feet below grade. Photo courtesy of Ohio Dept. of Natural Resources, Division of Oil & Gas Resources Management.

These wells were very shallow by today's standard. They rarely exceeded several hundred feet and in some fields were producing from shallow pools within fresh water aquifers. Modern wells have a wide range of depths and construction can vary widely based on regulations or local geology. Newer wells may have five or more strings of casing¹⁵. This may help to differentiate and identify a particular well when wells of various ages are closely spaced.

¹⁵ Appendix A Glossary of Terms and Definitions

VII. Orphaned Well Construction Evaluation

Discussion

Oil and gas well design, materials, and construction practices have changed dramatically over the past 150 years. The earliest wells were designed and constructed to facilitate drilling and maximize production. Historically, little thought was given to resource protection or containment and isolation of non-target formations. The law of capture ruled, waste waters were discharged to the environment, crude oil was stored in unlined earthen pits and later in wooden tanks, and natural gas was commonly vented to the atmosphere. Over time, construction materials improved and technologies advanced. As regulatory programs were created, waste water containment and disposal practices changed, crude oil storage and spill prevention practices improved, restrictions on the venting of natural gas were tightened, and well design and construction became more protective of the environment and natural resources.

The change in materials and construction practices over time, dramatically impact well evaluation and plugging design¹⁶. Wells drilled after regulatory programs were established are more likely to have relevant construction documents. Depending on the state or provincial regulatory structure, one or more agencies may have useful records. Where they exist, records containing useful information may include:

- Application for a permit or authority to drill
- Drilling and construction permit or authorizations
- Construction records or reports

¹⁶ Appendix B: Reference Documents; Drilling and Completion Committee (DACC); IRP 27: Wellbore Decommissioning An Industry Recommended Practice (IRP) for the Canadian Oil and Gas Industry; Volume 27-2022; Edition 1; Sanction Date: February 2022; Copyright held by Energy Safety Canada.

- Drilling logs and reports
- Cementing logs and reports
- Service company records
- Well construction inspection records
- Well modification permits, records, or reports
- Application for a plugging permit or authorization
- Plugging permit or authorization
- Plugging records, reports, and inspections
- Local/state/federal agency records
- Offset well data

Orphaned well construction evaluations begin with the identification of all casings that are or may have been present in a well.

Conductor Casing

The outermost casing, often times called a ‘conductor¹⁷’ casing, is generally installed through soils and unconsolidated materials. The conductor’s main purpose is to contain unconsolidated materials and to isolate surface and very shallow groundwater from the well bore. This string may be driven, augured, or drilled. If the borehole was drilled, the conductor string may be pressure cemented or grouted. Historically, drill cuttings were used to fill the annular space¹⁸. In some cases, the conductor may be removed prior to, or immediately after, cementing subsequent strings.

¹⁷ Appendix A: Glossary of Terms and Definitions

¹⁸ Appendix A: Glossary of Terms and Definitions

Mine String

In regions with underground mines, an intermediate string of casing, sometimes called a ‘mine string¹⁹’, may be installed to isolate a mine. The mine string may serve to protect an underground mine and miners, and it may be used to isolate a mine void to facilitate the placement and isolation of subsequent casings. Depending on the depth of the mine, a mine string may be set before or after a separate casing string that isolates protected waters. Prior to oil and gas regulations, mine strings were placed to prevent ground water from flooding a mine.

Surface Casing

Today, casing is installed to isolate and protect potable waters. Some regulatory programs define Underground Sources of Drinking Water (USDW)²⁰. Some regulatory programs define ‘potable water’²¹. Others may require the protection of waters that may be of ‘future use’. Regardless of definition, these waters are isolated and protected. Some regulatory programs refer to this protective casing string as ‘surface casing²²’. The surface casing is designed to isolate protected waters, and contain lost circulation zones and flow zones. The surface casing may serve as a base for well control equipment. Historically, surface casing wellbores were drilled with cable tool rigs²³ or derricks, but today are most commonly drilled with some variation of a rotary rig. Sometimes the bore hole diameter may provide clues to the age and identity of the well. Prior to regulation, drill cuttings may have been shoveled into the annular space. Casing sealants may provide additional clues to the age or identity of a well. This practice should be considered when developing a plugging plan.

¹⁹ Appendix A: Glossary of Terms and Definitions

²⁰ Appendix A: Glossary of Terms and Definitions

²¹ Appendix A: Glossary of Terms and Definitions

²² Appendix A: Glossary of Terms and Definitions

²³ Appendix A: Glossary of Terms and Definitions

Intermediate Casing

One or more ‘intermediate’ casing strings²⁴ may be installed after the surface casing string. Intermediate casing may be used to isolate and control flow zones (fluids or gases), lost circulation zones, or unstable zones or formations. Intermediate casing may be placed on hangers at some depth in the well. In this case, they are not visible at surface and without well construction records they may become an unknown factor in plugging design. Regulations vary in the states, but an intermediate string may be cemented to surface, ‘tacked’ or cemented at bottom only, or the string may be pulled (removed) from the wellbore at a later point in well construction. In deeper wells this string may support well control or other equipment. Older wells are more likely to have intermediate casing pulled at some point during construction.

Production Casing

The ‘production string²⁵’ is usually the last casing installed in a well. This casing may be installed across a producing formation or zone creating a cased production zone or the casing may be set above a producing formation or zone creating an ‘open hole’, or uncased, production zone. Multiple producing formations or zones may be produced through this string. An approved cement²⁶ is usually circulated to tack in the bottom of the string or by regulation the cement may be circulated to surface.

The orientation of a well may impact a plugging plan. Well geometry may increase the risk of a poor primary cement job²⁷. Historically, wells were drilled in a near vertical orientation. As drilling technology improved it became possible to drill directional wellbores.

²⁴ Appendix A: Glossary of Terms and Definitions

²⁵ Appendix A: Glossary of Terms and Definitions

²⁶ Appendix A: Glossary of Terms and Definitions

²⁷ Appendix B: Reference Documents; Drilling and Completion Committee (DACC); IRP 27: Wellbore Decommissioning An Industry Recommended Practice (IRP) for the Canadian Oil and Gas Industry; Volume 27-2022; Edition 1; Sanction Date: February 2022; Copyright held by Energy Safety Canada, 2022; Section 27.11.1.1, Well Design and Construction, Risk Escalation Factors, Well Geometry; pg. 60

These wells may have had an upper vertical section followed by a slow curve, ending with the lower portion of the well completed at some degree from vertical. More recently, larger rigs and more advanced technologies have allowed for wells to be drilled horizontally. These wells begin with an upper vertical section followed by a gentle arc beginning at the kickoff point and ending with a near horizontal completion. The well orientation along its length must be factored into a plugging plan. Casing diameters in horizontal wells are also significantly larger than most other wells.

Every effort should be made to identify all of the casing strings remaining in a well. The condition and depth of remaining casing strings may have a direct impact on the plugging plan. Casing mechanical integrity and annular space isolation may require evaluation. Wells that were previously plugged may have had certain casings, or portions of a casing string removed. This has the potential to complicate reentry into the wellbore. In the late 1930s and early 1940s it was a fairly common practice to remove all retrievable casings to aid in the ‘war effort’.

Even newer post-law well construction and mechanical integrity must be reviewed. The earliest regulated wells may not have been constructed in a manner that isolates and contains backside (annular) flow. Protected waters may have been poorly defined or mapped. Acidic waters or gases may not have been isolated which may have caused cross-formation migration or casing mechanical integrity issues. It is possible that best construction practices may not have been applied or may have failed. If there is any doubt that a well may not have proper backside isolation (annulus open at surface, or annular pressure or flow), may have mechanical integrity issues, or has missing or inadequate casing, evaluations must be made prior to or during plugging operations.

Another consideration to account for is that open wells may contain debris. For many decades it was a common practice to use iron balls to plug wells. Tree stumps and rocks were also commonly used to plug a well or serve as a base for drill cuttings. Worn out steel cables, chain, and other materials were sometimes disposed in wells. The debris must be removed from a well before plugging. Some of these materials present a great challenge. Some wells may have been abandoned with surface equipment, downhole pumps, tubing, rods, and packers left in place. If a pump and tubing could not be pulled from the well, the owner may have abandoned the well. Tubing sometimes parts, or separates, which makes removal difficult and attempts to retrieve it may cause additional damage. Other obstructions such as permanent packers, casing patches, paraffin, liners and previously isolated zones may affect re-entry into the well²⁸. When obstructions are encountered, every attempt must be made to identify and remove the material.

A downhole camera or impression block²⁹ may help with the identification of the obstruction. The use of spears or overshot drills may be necessary. Milling may be attempted, but is usually a last resort because the mill may sidetrack through the casing or the metal obstruction may spin in the casing making milling difficult or impossible. Crushed stone may be tamped into the metal obstruction in an attempt to wedge the object so it may be milled. Other methods of debris removal may be attempted. Rig selection is an important plugging consideration because debris removal attempts may not be possible with certain rig types. Specialized equipment availability is also a consideration.

²⁸ Appendix B: Reference Documents; Drilling and Completion Committee (DACC); IRP 27: Wellbore Decommissioning An Industry Recommended Practice (IRP) for the Canadian Oil and Gas Industry; Volume 27-2022; Edition 1; Sanction Date: February 2022; Copyright held by Energy Safety Canada, 2022; Section 27..9.2.5, SCVF/GM, Risk Escalation Factors, Wellbore Access Restrictions; pg. 38

²⁹ Appendix A: Glossary of Terms and Definitions

A basic well construction checklist may consider the following items:

- Conductor casing³⁰ string
 - Present
 - Adequately sealed at base and wellbore
 - Casing integrity
 - Accessible
- Surface casing³¹ string
 - Present
 - Installed to a proper protective depth
 - Adequately sealed at base and wellbore
 - Casing integrity
 - Accessible
- Mine string³² casing (if applicable)
 - Present
 - Installed to a proper depth
 - Installed through a mine void or support column
 - Adequately sealed at base and wellbore
 - Casing integrity
 - Accessible
- Intermediate casing³³ string(s)

³⁰ Appendix A: Glossary of Terms and Definitions

³¹ Appendix A: Glossary of Terms and Definitions

³² Appendix A: Glossary of Terms and Definitions

³³ Appendix A: Glossary of Terms and Definitions

- Present
- Installed to a proper depth
- Adequately sealed at base and wellbore
- Casing integrity
- Accessible
- Liners³⁴
 - Present
 - On hanger
 - Adequately sealed at base and wellbore, if applicable
 - Liner integrity
 - Accessible

Other factors that may affect a plugging plan include the type and number of devices that may have been used to drill or construct a well. Such devices may include, but are not limited to:

- Centralizers
- Cement baskets
- DV tools
- Shoes
- Hangers (casing or liner), and
- Landing joints.

³⁴ Appendix A: Glossary of Terms and Definitions

On-Site Inspection and Verification

Prior to the development of a plugging plan a well must be inspected. After a thorough records search and records review, an on-site visual inspection of the well should be completed and documented. Wells may appear as an open hole without evidence of any casing, open casing (with or without casing hangers), or casing with a wellhead and/or valve assembly. Some wells have been buried by subsequent activity and may only be identified by surface indicators of leaking natural gas, oil, or brine. Production equipment may include above ground separators, tanks, below ground tanks and vaults, buried electric lines, flowlines, sales lines, and meter stations. Local building or zoning inspectors may have a unique knowledge of the area or may be called when abandoned oilfield related equipment or evidence of such is discovered during site development.

The well should be visually inspected for discharges through open annuli, valves, wellhead, or other equipment. Wells should be approached with caution as toxic or explosive gases may be present. Proper air monitoring equipment and personal protective equipment should be utilized. Inspection may include the use of handheld gas detectors, forward looking infrared recorders (FLIR), or other devices. The use of intrinsically safe equipment should be evaluated. All observations should be documented with an appropriate quantitative or qualitative synopsis. If fugitive gas or fluid flow is observed or detected, it may be necessary to characterize the emission or flow. Characterization with certain handheld equipment may identify gas or fluid composition and relative volumes. With background data, gas and fluid analyses may help to identify potential sources. Visual inspection of surface equipment and casings should generally characterize observable equipment and casing condition.

Releases from an orphaned well may be quantified in several ways. It may be possible to contain and measure fluid discharges in the form of water, brine, or oil. Gases including natural gas, hydrogen sulfide³⁵, and other gases, are more challenging to quantify but their presence can usually be detected. Extra caution is critical when hydrogen sulfide is suspected or known to be present in the region, vicinity, or is associated with certain formations. Hydrogen sulfide or acidic water may not have been noted in the drilling records, but if present can corrode multiple casing and tubing strings over time, complicating remedial well construction. Emissions are discussed in greater detail in Section XI: Plugging Plan Development.

Active Testing

Some wells, especially older wells, may require testing if well construction records are not available, are inadequate, or there is reason to believe a problem may exist. It may be possible to pressure test casing, liner, or tubing. This may require well modification, which can be costly, but it may reveal problems that may be addressed in a plugging plan and contract. Wireline tools may be used to verify the depth of the well, obstructions, and casing deformation.

The static height of fluids in annular spaces may be indicative of inadequate backside isolation. An ‘Echometer’³⁶ may be used to measure depths to fluid levels by reflecting sound waves off the fluid which in turn is represented as a depth to fluid. Well modification may be necessary to complete this test.

³⁵ Appendix A: Glossary of Terms and Definitions

³⁶ Echometer Company; 5001 Ditto Ln, Wichita Falls, TX 76302; www.echometer.com;
https://echometer.com/Portals/0/Brochures/BrochureEchometerWA_2008_12_01.pdf

Well Logging

If well construction is unknown or there are indicators of well integrity problems, it may be necessary to utilize one or more electric or nuclear wireline logging tools to evaluate a well. In some instances it may be necessary to log the well to determine if remedial actions are necessary before or during the plugging operation. Well logging is an extremely technical scientific field. The following discussion is a simple summary of some of the more common logging tools used to help identify potential issues with a well. The tools are expensive to use and data can be subjective. Consultation with a qualified logging company is recommended.

If it is necessary to identify specific geologic formations or zones, a **gamma ray tool** may be used. Gamma ray tools detect gamma rays from naturally occurring sources³⁷. This information may then be used to identify formations and in turn, possible hydrocarbon shows. Once identified, hydrocarbon shows may require isolation to minimize annular pressures and cross formation migration. Interpretation of this information requires a good working knowledge of local geology.

Nuclear logging tools may be used to help identify formation density and hydrogen content. They may be useful in identifying and differentiating liquids and gases. This added level of information may help to identify where remedial construction efforts may be needed.

Resistivity logs may be run in open-hole sections of a well. They are primarily used to characterize fluids and formation properties. Lateral resistivity logs are used when the wellbore or portions of the wellbore are filled with saltwater (brine). Care must be taken to isolate the protected waters. Induction resistivity logs are used when fresh water is used to fill

³⁷ Spectral gamma ray tools may be used if radium and radon signatures are not necessary. The tool may allow mineral types and percentages to be identified in the borehole.

the wellbore. Resistivity logs may help to qualitatively identify formation waters. One caution in using resistivity logs is that crude oil may interfere with resistivity analysis.

Cement bond logs (CBL) may be one of the most useful tools used to develop or modify a plugging plan and may be run with single, double, or a radial array receiver. The receiver configuration affects radial coverage of the survey. Bond logs may help with the interpretation of the quality of a cement bond to the casing and/or formation, identification of cement tops, spacers³⁸, and the presence of channelization, or micro annuli in the cement.

Variable density logs may compliment a CBL especially for the interpretation of cement-to-formation bond. Even when used in tandem, log interpretation is very subjective and may be affected by many variables.

Temperature logs are used to identify temperatures anomalies in a well. Such anomalies may indicate fluid or gas flow through channelized cement, micro annuli, or compromised casing. Bottom hole temperature may affect cement circulation and set³⁹.

Borehole caliper logs are generally run in open well bores but may be run inside casing in an attempt to identify casing integrity issues. In simple terms, a caliper log indicates variations in borehole or casing diameter.

Casing collar locators are used to identify collars in a string of casing. The electric logging tool detects magnetic anomalies caused by the relatively high mass of the casing collar. Collar locators may be used to identify a precise depth to set a charge to ‘part’ or break a collar for casing recovery.

³⁸ Spacers are fluids with defined viscosity and/or weight that are circulated between plug stages. They provide hydrostatic weight to the plug column and with the proper weight and/or viscosity serve as a type of base for plugs placed on top of them.

³⁹ Appendix B: Reference Documents; Drilling and Completion Committee (DACC); IRP 27: Wellbore Decommissioning An Industry Recommended Practice (IRP) for the Canadian Oil and Gas Industry; Volume 27-2022; Edition 1; Sanction Date: February 2022; Copyright held by Energy Safety Canada, 2022; Section 27.10.4, Subsurface Parameters, Temperature; pg. 56

Noise or sonic logs are used to measure ‘noise’ caused by the turbulent flow of fluids or gases. They may help identify compromised casing, channelized cement, or open annuli with significant flow.

VIII. Orphaned Well Remedial Construction

Orphaned wells may require remedial construction to correct problems before or during plugging operations. It is important to identify construction deficiencies or integrity issues as early as possible. A thorough review of well construction records may allow orphan well plugging managers to prepare the best possible requests for bid or contracts and to receive the most accurate quotes from plugging contractors. This may help to minimize change orders and cost increases. When issues are identified early in the review process, it may be possible to address some issues prior to plugging. Others may need to be addressed as an integral component of the plugging plan. Remedial construction may address problems in a well of any age. Remedial corrective actions may include the identification and isolation of protected waters, casing repair, casing installation, and hydraulic isolation in annular spaces and in cased or uncased portions of the well. It may be necessary to install additional or replacement casing and/or downhole equipment (packers, bridge plugs, etc.). Surface equipment may include a new welded bell collar on an appropriate casing string in order to attach a new or replacement wellhead.



Conductor casing being set and wellhead installed for well control. Photos courtesy of Ohio Dept. of Natural Resources, Division of Oil & Gas Resources Management.

Wells requiring downhole evaluation or remedial construction should have an operational wellhead in place and secured. The wellhead and associated equipment help maintain control and safety. In order to reach the casing string, it may be necessary to excavate around the well and weld casing extensions to bring the working string above grade. Prior to initiating activity near the well, the condition and stability of the well and the immediate vicinity must be assessed.

Historic (Pre regulation) Well Construction

Conductor

The earliest conductor holes (1800's) were hand dug or drilled with a spring pole and bailer. Wooden boards or hollow tree trunks served as casing. Iron pipe may have been used but was usually removed as soon as possible. The wooden casing was 'sealed' by backfilling with unconsolidated materials. In the earliest wells, the conductor string's only function was to contain the unconsolidated material. The poorly sealed wellbore could pose a risk for surface contaminants to migrate toward groundwater or may create a preferential flow path for migrating fluids or gases.

Surface Casing

Surface casing is less common in pre regulation wells. Protected waters were not identified and casing installation was designed to minimize ground water flow into the wellbore to accommodate drilling or to protect underground mines. In some instances, a combination conductor and surface casing may have been installed. Contaminate migration pathways should be evaluated.

Intermediate Casing

Iron pipe may have been placed in a well as drilling knowledge advanced. Its primary purpose was to keep excess amounts of water out of the wellbore. These strings were usually removed after the well reached total depth (TD). But mining laws may have required a mine string. The mine string was installed above the mine roof and may have been sealed with clay. These strings may have been removed if a mine became inactive or was abandoned.

Production String/Tubing

Some historic wells may have a production string. The string may have been driven or landed and sealed with a homemade packer. Production strings may have been removed as the well was abandoned.

Tubing may have been used in lieu of a production string. Homemade packers were used to isolate production. Production tubing would be removed as the well was abandoned. Parting of the production string or tubing may have been a common problem as the tubing was not protected from hydrogen sulfide or corrosive waters.

Production may have been enhanced by the use of explosives, commonly dynamite or nitroglycerin. Early wells were open hole completions.

Remedial Construction/Integrity for Historic (Pre Regulation) Wells

Historic wells may have all casing and tubulars removed. Finding the wellbore at surface may prove challenging. Soil gas analysis using a grid pattern may help locate the wellbore if there are gas emissions, although local near surface geology can cause complications. Surface indicators such as dead vegetation or mud rings in the soil may indicate the presence of a wellbore. Excavation may be necessary to find the wellbore. If the wellbore cannot be located, remedial actions may not be possible.

If the wellbore is located, it may need to be drilled out or reamed and circulated before setting a conductor and/or surface casing. If casing is installed, casing depth and isolation should be in accordance with applicable regulations. See Chapter XI. Plugging Plan Development; Well Cleanout and Circulation for Well Cleanout information. If regulations allow, the conductor may be removed as the surface casing is circulated and cemented. If the well is to be circulated or if pressurized flow is anticipated, the plugging contractor should install a cellar to help manage fluid flow. It may be necessary to install a wellhead, diverter valve or BOP for potential well control issues. Because most pre regulatory wells were relatively shallow, intermediate and production casing may not be necessary if the well is dry, or if any fluid or gas flow is managed by circulating and conditioning the well.



2020 WOGCC Orphan Well Program Wasatch Forest 16-15 (Finishing Up)



Crude circulated to surface that was used in jet pump operations



Pumping the surface plug

If the well is cleaned out to total depth, the bottom plug may be placed by an approved method. See Chapter XI. Plugging Plan Development, for a discussion about plug placement methods. If regulations allow, the well may be plugged from bottom to top without spacers.

In some unique geologic settings, hydrocarbons may have been developed within or above the protected water intervals. Special well construction and plugging plans may need to be developed in these unique situations.

Early Regulated Wells (about mid 1900's)

For decades, the majority of wells were drilled with cable tool rigs or derricks. Fluid was removed from the wellbore by bailer. If too much water entered the wellbore, the impact of the bit became inefficient. After the conductor was set, drilling continued until unmanageable flows

of water were encountered. The isolation of protected waters was not a primary focus of early regulation. Casings set into protected waters may have been poorly sealed and may not have been set to proper protective depths. If surface casing is insufficient a new string may need to be installed. Surface casing installation may have to be completed after the bottom plug and any intermediate plugs are set and production and intermediate casings are removed. Care must be taken to avoid circulating crude oil or formation waters across the surface casing seat or any exposed portion of the protected water interval. Backside flow could result in aquifer contamination. If possible, the existing surface casing may be pulled or jacked out of the well. If necessary, a conductor may be set. The selection of a plugging rig must take into account string weights. Once the surface casing is pulled, the wellbore must be circulated and reamed, and if necessary, the wellbore deepened. If the surface casing cannot be pulled, a slim hole design may be considered⁴⁰. New surface casing must be installed to a protective depth and properly sealed. The new surface casing string will isolate the protected water interval and will provide access to the wellbore should re-plugging become necessary. Intermediate casings may have been installed to control water or lost circulation zones and may have been pulled after the well reached the production zone and production casing was landed.

Production strings were usually landed near the top of the production zone. Some wells may have been cemented in place by spotting cement at the casing seat with a bailer resulting in some amount of backside cementing. Packers were sometimes installed to control backside flow on the production string. Drilling would then advance into the production zone for an open hole completion. The production string annular space was usually left open resulting in possible gas

⁴⁰ Appendix B: Reference Documents: Drilling and Completion Committee (DACC); IRP 26: Wellbore Remediation; Section 26.2.7.2 Job Types, Casing Repair, Slim Hole Casing; pgs. 6-7; Copyright held by Energy Safety Canada, 2020.

or fluid flow across formations. Fluids or gases may flow from open annuli at surface. Some production strings were on hangers with an open annular space at the surface. Well logs may be reviewed to determine zonal isolation. A suite of logging tools may also be necessary to develop a zonal isolation plan. If the production string has mechanical integrity, the casing may be perforated, flow established and cemented to establish some backside isolation. The bottom plug may then be set.

With the advent of rotary drilling rigs, excess water management relied less on temporary intermediate casing and more on drilling mud circulation. Heavy drilling muds and lost circulation materials⁴¹ (LCM) were often effective in controlling fluid and gas shows. If an intermediate string is present, backside isolation should be verified. Any uncemented portion of the string that is not necessary for well plugging may be pulled unless remedial backside cementing is planned. Regulations began to require minimum surface casing depths to isolate protected waters but the surface casings were not always effectively cemented. If the surface casing is not adequately sealed and cannot be pulled, but has good mechanical integrity, the open wellbore below the casing seat may be conditioned (scraped or circulated). A plug may then be spotted or circulated to an appropriate protective depth. Again, care should be taken to avoid circulating crude oil or formation water into an annular space of the surface casing.

Intermediate casings were installed if required by regulation or if necessary to control water or strong shows of oil, gas, or brine. These strings were commonly pulled after the production string was set. Annular gas emissions were either vented at surface or contained with a packer or wellhead. In most cases, intermediate strings may be pulled. If an intermediate string

⁴¹ Appendix A: Glossary of Terms and Definitions

is not adequately sealed and cannot be pulled, zonal isolation should be determined by logging and/or reviews of drilling logs. It may be possible to achieve zonal isolation by perforating casing and squeezing cement. Section milling removes an interval of casing and may be considered if cement cannot be squeezed into the annular space. Milling must occur in caprock or other competent geologic formation. Other considerations include, casing integrity, multiple casing strings, and the location of top of cement⁴².

Production strings were either installed above the production zone or drilled into or through the production zone. Open hole completions were still common but hydraulic fracturing changed well completions. In either case, the production string was isolated to contain production. The production string may be removed during plugging. See Chapter XI. Plugging Plan Development for discussion on Plug Placement.

‘Recent Wells’ (Later half of 1900’s to current)

‘Recent wells’ are generally constructed with stricter regulations requiring the isolation of protected water, isolation and control of ‘shows’, strict well construction in or near underground mines, and better confinement of production zones. The regulations vary by state and province, and often vary regionally or locally.

Well construction is better defined by regulation and/or permit (NOTE: not all states use permit, e.g. authorization to drill). The regulation or permit may be prescriptive or performance based. Prescriptive authority requires certain minimum protective construction criteria. In some cases, companies may exceed the minimum protective criteria. Performance based authority may

⁴² Appendix B: Reference Documents; Drilling and Completion Committee (DACC); IRP 27: Wellbore Decommissioning An Industry Recommended Practice (IRP) for the Canadian Oil and Gas Industry; Volume 27-2022; Edition 1; Sanction Date: February 2022; Copyright held by Energy Safety Canada, 2022; Section 27.9.4, SCVF/GM, Remediation; pg. 50

establish certain minimum protective construction criteria without specifying method or procedure. Regulations may include both prescriptive and performance-based requirements.

Some variation of rotary drilling is now the most common drilling process; however, cable tool rigs are still used in some regions.

Conductors are commonly required, although, the removal of a conductor may be allowed in some states. The conductor string may serve to keep surface water from entering the wellbore and to contain unconsolidated materials. It is sometimes used to protect or isolate very shallow underground mines or very shallow hydrocarbon shows. Where installation methods allow, or as specified by regulation, this string may be cemented in place. Remediation of this string is generally not necessary.

Surface casing is installed as defined by regulatory and/or permit requirements. The protected water is isolated with cement or other approved material. Regulations may require bottom to top isolation or for very deep surface casings, may allow lower and upper isolation. Surface casing remains in the well during plugging. Once cemented remediation of the surface casing is not required, unless backside isolation is inadequate.

Intermediate casing, including mine strings, may be installed. When required, they may be cemented to isolate shows, producible formations, mineable formations or potential disposal zones. They may serve as a base for a wellhead and other safety equipment. If cemented, this string will remain in the well. Remedial cementing to correct backside isolation may be necessary if indicated by logging or construction records. Access to the intermediate string may be limited if the production string is left in the well.

Liners may be placed in deeper wells or wells with production string integrity issues. It is important to determine if a liner is present as a plugging plan is developed. Production strings are normally placed through the production zone with additional depth (rat hole) to run tools past the target zone. This string may be perforated and produced natural or it may be fractured to enhance production. The bottom of this string is normally cemented with cement circulated a minimum required distance off bottom.

Annular space zonal isolation may be required on one or more strings of casing. Logging may be necessary to identify top of cement and possible obstructions. With porous or flow zones identified, casing may be perforated⁴³. The annular space may be circulated in preparation of cementing. Circulation may condition the well for cementing and establishes a flow rate for pumping. Table 6. Placement Method by Job Type⁴⁴ illustrates placement methods by job type.

Placement Method by Job Type

	BGWP	SCVF/ GM	Porous Zone Isolation	Water Shutoff	Completion Zone Isolation	Casing Repair
Squeeze through a Retainer	X	X	X	X	X	X
Squeeze with a Packer				X		X
Bradenhead Squeeze	X		X		X	X
Bullhead Squeeze	X		X			X

NOTE: **BGWP** (Base of Groundwater Protection); **SCVF** (Surface Casing Vent Flow; **GM** (Gas Migration)

⁴³ Appendix B: Reference Documents; Drilling and Completion Committee (DACC); IRP 26: Wellbore Remediation; Section 26.4.1 Technique Selection for Remedial Cementing, Access; pgs. 15-18; Copyright held by Energy Safety Canada, 2020.

⁴⁴ Appendix B: Reference Documents

The pros and cons of each placement method are discussed in IPR 26, Section 26.4.5⁴⁵.

Remedial actions may also address casing deformation or restrictions that have reduced the inside diameter of the casing, preventing access to lower portions of the well. Internal restrictions may be the result of casing collapse or deformation or may be caused by paraffin or scale build up⁴⁶.

Casing with localized mechanical integrity issues may be remediated with the use of internal patches or packers. Patches may be permanently installed or retrievable. The inside diameter of the casing will be reduced which may limit access. The pros and cons of internal patches may be reviewed in IPR 26, Section 26.5.2⁴⁷.



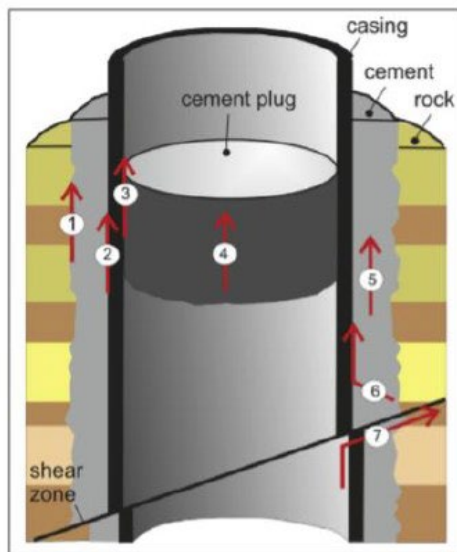
Cement Retainer.
Photo courtesy of
Alpha Oil Tools

⁴⁵ Appendix B: Reference Documents

⁴⁶ Appendix B: Reference Documents; Drilling and Completion Committee (DACC); IPR 26: Wellbore Remediation; Section 26.5.1 Technique for Mechanical Casing Repair, Wellbore Access; pgs. 23-24; Copyright held by Energy Safety Canada, 2020.

⁴⁷ Appendix B: Reference Documents

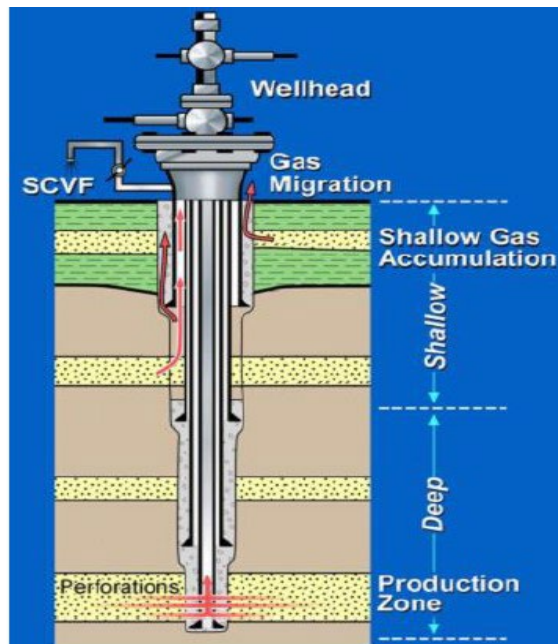
Potential Leak Paths in a Cemented Wellbore⁴⁸



The label numbers represent the following:

1. Between cement and surrounding rock formations
2. Between casing and surrounding cement
3. Between cement plug and casing or production tubing
4. Through cement plug
5. Through cement between casing and rock formation
6. Across the cement outside the casing and then between this cement and the casing
7. Along a sheared wellbore

Potential Leak Paths at Surface⁴⁹



⁴⁸ Appendix B: Reference Documents; Drilling and Completion Committee (DACC); IRP 27: Wellbore Decommissioning An Industry Recommended Practice (IRP) for the Canadian Oil and Gas Industry; Volume 27-2022; Edition 1; Sanction Date: February 2022; Copyright held by Energy Safety Canada, 2022; Figure 5; pg. 41

⁴⁹ Appendix B: Reference Documents; Drilling and Completion Committee (DACC); IRP 27: Wellbore Decommissioning An Industry Recommended Practice (IRP) for the Canadian Oil and Gas Industry; Volume 27-2022; Edition 1; Sanction Date: February 2022; Copyright held by Energy Safety Canada, 2022; Figure 6; pg. 42

IX. Environmental Review

It may be advisable to perform some degree of environmental review at each orphan well location. The level of review may be dictated by a variety of factors. Some factors are evident, such as an actively leaking or flowing well or obvious mechanical integrity issues at the well, pipeline, or production equipment. Dead or stressed vegetation may be an indicator of an active or historic fluid spill, gas permeating through the soil, or contaminants possibly leaching from buried tanks or closed earthen pits. Surface indicators of environmental impact warrant investigation. Any level of environmental review should be documented in the records, and documentation may include photos or videos. A variety of portable field-based test equipment is readily available and should be used as conditions indicate. All field sampling results should be documented. In some instances, it may be necessary to collect soil, surface water, or ground water samples for laboratory analysis. Proper sampling protocol should be followed and all samples should be accompanied by a proper chain of custody. For most test parameters, an accredited laboratory should complete the analyses. Not all test parameters have sampling or testing protocol and laboratories would not be certified for these parameters.

If there is evidence of off-site impact, such as oil sheens on surface waters or oil on high water marks, further investigation is likely warranted. Public or private water supplies that are proximal to these sites may require chemical testing or monitoring.

All known contamination should be characterized both chemically and spatially. Surface impacts can be measured with area calculated. It is also important to evaluate the potential depth of impact. Sites with extensive environmental impact may be evaluated with geophysical equipment such as electro-magnetic conducting survey instruments. Data from these surveys

may be subjective and may be affected by variations in local geology, metal, or electric services. Truck mounted rotary auger rigs or direct push rigs (split spoon) may be used to collect soil samples and to set temporary monitor wells if groundwater is encountered. These methods allow for direct field measurements and provide samples for laboratory analysis.

An evaluation of well integrity issues may indicate a source and pathway for potential contaminants which may be used to evaluate remediation options.

Data collected from well site environmental reviews may be considered in overall risk analysis and project prioritization. Some orphaned well programs are responsible for all phases of plugging, remediation, and restoration. Other programs may have authority for one phase of the overall project while sister agencies have authority for other portions of a project. It is very important for states and provinces with multiple jurisdictional responsibilities to share all information in real time and to coordinate activities as early as possible. This may lead to better overall project success and may help to control costs.

X. Risk Assessment and Prioritization

An orphaned well program may have a larger inventory of wells than can be plugged in a specified period of time, typically a fiscal year or contract term. With inventories exceeding plugging potential, states and provinces may have developed protocol to evaluate and prioritize well plugging and site restoration. Some 26 states and 3 Canadian provinces utilize some form of well prioritization for plugging⁵⁰. Protocol may be very basic or very detailed. Most systems have an urgent or emergency designation that when utilized cause immediate actions to mitigate threats to human health, safety, or the environment. All orphaned well programs take actions to ensure public safety and environmental protection by efficiently reducing the well inventory. Refer to Appendix B, Interstate Oil and Gas Compact Commission's Idle and Orphan Oil and Gas Wells: State and Provincial Regulatory Strategies Supplemental Information on State Prioritization Systems for Orphan Wells for a review of state prioritization systems.

There is a natural succession to an orphaned well program inventory. As wells are plugged and sites remediated and restored, other orphaned wells inevitably take their place. Program goals are to reduce and eventually eliminate the entire inventory of orphan wells. Until this is achieved, orphan well programs may consider periodic and regular evaluations of each well and site within the inventory. Changing conditions at an orphan well or site may complicate plugging, remediation, or restoration and in turn, increase costs.

⁵⁰ Appendix B Reference Documents: Interstate Oil & Gas Compact Commission (IOGCC): Idle and Orphan Oil and Gas Wells: State Provincial Regulatory Strategies (2021); page 37.



Orphan well plugged above an approximate 50 to 60 foot high wall along the Lake Erie shoreline, which is being undercut by the lake. Photos courtesy of Ohio Dept. of Natural Resources, Division of Oil & Gas Resources Management.

There are many factors that orphaned well program staff may consider as wells and sites are evaluated for risk and prioritized. The following outline includes a partial listing of risk and prioritization considerations.

- Emergency Situations: Imminent danger to the health or safety of the public—
 - Elevated fugitive gas levels (explosive or toxic)
 - Immediate or imminent impact from fluid releases to the environment
- Proximity to infrastructure, such as—



School gymnasium built over a plugged well, which began leaking. Photo courtesy of Ohio Dept. of Natural Resources, Division of Oil & Gas Resources Management.

- Schools
- Hospitals
- Airports



Orphan well in an urban location with very close proximity to neighboring property. Photo courtesy of Ohio Dept. of Natural Resources, Division of Oil & Gas Resources Management.

- Dwellings
- Public buildings or gathering places
- Bridges and roadways

- Railways
- Underground mines
- Dams
- Proximity to water supplies—
 - Public or private (surface or groundwater)
- Proximity to waterways, wetlands or critical habitat—
 - Impacts to flora or fauna
 - Invasive vegetation
 - Hazards to navigation
 - Flood prone areas
 - Storm water issues
- Well related issues—
 - Fugitive gases
 - Elevated fluid levels
 - Periodic fluid releases
 - Presence of elevated soil gases
 - Wellhead pressure
 - Annular space pressure
 - Open casing or casing hangers
 - Wellhead integrity (if present)
 - Casing integrity (observed or evaluated)
 - Time restricted access, such as

- Wildlife migration or breeding considerations
 - Frost laws
 - Wetlands
 - Crop issues
 - Planned development
- Remedial reconstruction requirements
- General well considerations—
 - Age (for integrity or reconstruction considerations)
 - Depth (for rig considerations)
 - Drilling method (for integrity and reconstruction considerations)
 - Casing present
 - Casing cementing/isolation
 - Well completion method (for bottom plug considerations)
 - Wellhead or well control devices present
 - Equipment remaining in the well
 - Debris or obstructions in the well
 - Leaking plugs or mechanical devices in the well
 - Connected pipelines or associated equipment
- On-site risks or hazards—
 - Proximity to pipelines or storage facilities
 - Public or private infrastructure (above ground or buried)
 - Open or buried pits or tanks
 - Contamination

- Site accessibility
- Terrain
- Urban and residential area considerations—
 - Current land use
 - Future site development/encroachment
 - Proximity to recreational areas

IRP 27, Section 27.8.1⁵¹ summarizes additional risk considerations for wells near urban areas or residences and includes a variety of other risk factors. Each topic may be expanded or additional items added as situations warrant.

The proximity of adjacent orphan wells may be reviewed for economics as contracts are developed. Proximity is also an important consideration since plugging within a field may cause formations to build pressure which may increase the potential to pressurize nearby wells. If formations begin to repressurize, old or poorly constructed wells may allow contaminants to migrate.

Location considerations may impact plugging plans. Very old well sites may no longer be accessible. Ingress/egress routes may need to be constructed. A worksite or pad may need to be constructed to safely accommodate the plugging rig and associated equipment. If wetlands or waterways are impacted, it may be necessary to coordinate with the Army Corps of Engineers. Permits or authorization to proceed may be required.

⁵¹ Appendix B: Reference Documents



Well located in stream. Photo courtesy of Pennsylvania Department of Environmental Protection.



Prior to plugging, the pad was constructed and a cellar ring was constructed for containment. The pad needed to be large enough for the rig and for the pipe trailer. Photo courtesy of Ohio Dept. of Natural Resources, Division of Oil & Gas Resources Management.

As development encroaches upon a well, certain safety and economic considerations may change.



Photo courtesy of Wyoming Oil & Gas Conservation Commission.

A great number of variables may be considered as a plugging plan is developed. For plugging purposes, the orphaned well and well site may need to be reviewed together. A tight location may necessitate the use of coiled tubing or may limit the size and type of rig. This in turn may alter the plugging plan.

Although the variables listed above are presented for consideration in the evaluation and prioritization of plugging, the list is only a starting point. It is meant to provide criteria to begin the evaluation. Each topic may be expanded or additional items added as situations warrant. Many federal, state, local, or site-specific factors may be reviewed. Some orphaned programs place 'high, medium, or low' valuation on evaluation and prioritization criteria. Others use

numeric scoring. Where appropriate, the matrix may be standardized to ensure consistent reviews and prioritization. Although some orphan programs may have thousands of documented wells in inventory (14 of 32 orphan programs⁵²), a future site review and reevaluation of each orphan well and site may be beneficial to verify that prioritization hasn't changed because changes to the well or well site over time may significantly impact prioritization, plugging plans, and costs.

The Interstate Oil and Gas Compact Commission (IOGCC) has a number of publications addressing idle and orphan oil and gas wells. One report, the *Idle and Orphan Oil and Gas Wells: State and Provincial Strategies* (2021)⁵³ contains a list of state and provincial summaries. The state and provincial summaries contain narratives by the states and provinces describing processes for prioritizing orphan wells for plugging⁵⁴. A follow-up report, *Idle and Orphan Oil and Gas Wells: State and Provincial Regulatory Strategies Supplemental Information on State Prioritization Systems for Orphan Wells* (2023)⁵⁵, incorporates information from state initial applications for grants through the Infrastructure Investment and Jobs Act (IIJA)⁵⁶. This law is administered by the U.S. Department of Interior.

Appendix E contains a few examples of risk assessment and evaluation worksheets or flow charts. IRP 27: *Wellbore Decommissioning*⁵⁷, contains multiple discussions of risks

⁵² Appendix B Reference Documents: Interstate Oil & Gas Compact Commission (IOGCC): *Idle and Orphan Oil and Gas Wells: State Provincial Regulatory Strategies* (2021).

⁵³ Appendix B Reference Documents: Interstate Oil & Gas Compact Commission (IOGCC): *Idle and Orphan Oil and Gas Wells: State Provincial Regulatory Strategies* (2021).

⁵⁴ Appendix B Reference Documents: Interstate Oil & Gas Compact Commission (IOGCC): *Idle and Orphan Oil and Gas Wells: State Provincial Regulatory Strategies* (2021); pages 45-81.

⁵⁵ Appendix B Reference Documents; Interstate Oil & Gas Compact Commission (IOGCC); *Idle and Orphan Oil and Gas Wells: State and Provincial Regulatory Strategies Supplemental Information on State Prioritization Systems for Orphan Wells* (2023).

⁵⁶ Infrastructure Investment and Jobs Act (IIJA); <https://www.congress.gov/117/plaws/publ58/PLAW-117publ58.pdf>

⁵⁷ Appendix B: Reference Documents

associated with remedial construction and decommissioning, including risk escalation factors and considerations.

XI. Plugging Plan Development

Overview

During the mid to late 19th and early 20th century, plugging operations were performed only on an as needed basis. Materials used at that time were based on availability, cost, and lastly, effectiveness. They included tree trunks, rocks/sand, drill cuttings, iron balls, and precast concrete plugs (still in use today). As time passed and wells were drilled deeper and used multiple casing strings, more advanced plugging methods became cost effective and readily available. Service companies (i.e. Halliburton, Dowell Well Service, Schlumberger (SLB) and others) became proficient at mixing, weighing, and pumping Portland cements downhole through casing or tubing workstrings and displacing cement to isolate and fill the annular space for production purposes but later for plugging. Plugging plans may be developed by orphaned well personnel that are experienced and familiar with historic and current construction and plugging practices. In some states, contractors or consultants may develop plugging plans for review or approval. Plugging plans take into account the well purpose, depth and construction. Mechanical integrity and well reconstruction are also considered. The plugging rig and associated equipment must be sized for the well depth, anticipated pressure, casing weights and possible location restrictions. UA plan may be developed for unanticipated flow and on-site storage. Contingency plans for unanticipated issues may be developed to expedite alternate plan review should it become necessary. A basic, although critical, consideration is the selection of an appropriate plugging material for the specified physical or chemical well conditions that may be encountered. Factors such as well depth, bottom hole temperatures, flow or lost circulation zones, fracture gradients, fluid and gas composition, and original or modified well construction

are a few of the parameters requiring review as plugging materials are considered. Regulatory program statutes or regulations may simply establish certain performance criteria as a basis for plug material selection and approval. Initial minimum compressive strength, usually in a 12 or 24 hour time, is an example of a basic selection parameter. Plugging material that meets or exceeds the established standards may qualify the material for use. Some regulatory programs maintain a list of approved plugging materials. Others may define approved materials in law. The use of alternate plugging materials may be necessary if there are material shortages or if specific well conditions are better addressed by such materials. Some programs have the legal authority to consider the use of alternate plugging materials while others may have narrowly drafted regulations that limit or prohibit their use.

During the plugging process, communication between adjacent or offset wells may occur. Lost circulation and thieved plugs may impact adjacent wells. As fugitive gas emissions are stopped by plugging, there is a potential to build formation pressure over time⁵⁸. This may lead to unanticipated flow in adjacent wells. The buildup of pressure may also cause oil, brine, or gases to migrate into shallow formations in poorly constructed wells or in properly constructed wells that now exhibit integrity issues. The rudimentary plugs in old wells may fail with increased formation pressure.

If records do not provide adequate information to identify a well and to properly develop a plugging plan, it may be necessary to develop a plan with circumstantial information. In addition to the reviews that were previously mentioned, knowledge gained by plugging wells of

⁵⁸ Appendix B: Reference Documents; Drilling and Completion Committee (DACC); IRP 27: Wellbore Decommissioning An Industry Recommended Practice (IRP) for the Canadian Oil and Gas Industry; Volume 27-2022; Edition 1; Sanction Date: February 2022; Copyright held by Energy Safety Canada, 2022; Section 27.3.4, Definitions and Regulation, Ability to Recharge; pgs. 3-4

a similar age, depth and location may prove invaluable in the development of a conditional plugging plan. Plans developed with limited information may contain multiple plugging scenarios to account for unknown conditions in the well.

Basic questions that may help with the well construction evaluation for the development of a plugging plan include:

- Is the well leaking?
 - Gases, composition
 - Fluids, composition
 - Location of leaks or flows
 - Evidence of leaking in the immediate area of the well
 - Quantitative or qualitative leak assessment
- Has equipment been left in the well?
 - Production tubing
 - Packers (tubing or formation)
 - Pumps and rods
 - Bridge plugs
 - Lost tools, including logging tools
 - Wellhead, valve assembly, etc.
- Has debris been placed in the well?

- Open wellbore for significant amount of time
- Has the well been disconnected?
 - Electric service
 - Production lines
 - Domestic service lines
 - Associated equipment
- Has the well been previously plugged?
 - Plug placement method(s)
 - Plug material(s) and volumes
 - Plug spacer materials and volumes
 - Bridge plugs, type, and number
 - Dates or era of plugging
 - Casings pulled
 - Casing evaluations, integrity, depth, isolation

Figure 2. summarizes states and provinces that maintain a list of approved plugging materials, define plugging materials in statute or regulation, and that have the statutory or regulatory authority to allow the use of alternate plugging materials.

Figure 2. State/Province Questionnaire⁵⁹: Section 3: Well Plugging Materials and Plug Placement Subsection 1: Well Plugging Materials and Alternate Plugging Materials

State/Province full response can be seen in Table 3: Section 3: Well Plugging Materials and Plug Placement Subsection 1: Well Plugging Materials and Alternate Plugging Materials

State or Province	List of approved plugging materials	Plugging materials defined by statute / rule	Alternate plugging materials allowed by statute / rule
Alabama	No	Yes	Yes
Alaska	Not Submitted	Not Submitted	Not Submitted
Arizona	No Known Orphan Wells ⁶⁰	No Known Orphan Wells ⁶⁰	No Known Orphan Wells ⁶⁰
Arkansas	Yes	Yes	Yes
California	No	Yes	Yes
Colorado	No	Yes	Yes
Idaho	No Known Orphan Wells ⁶⁰	No Known Orphan Well ⁶⁰	No Known Orphan Wells ⁶⁰
Illinois	Not Submitted	Not Submitted	Not Submitted
Indiana	Not Submitted	Not Submitted	Not Submitted
Kansas	Not Submitted	Not Submitted	Not Submitted
Kentucky	No	No	No
Louisiana	No	Yes	No
Maryland	No Known Orphan Wells ⁶⁰	No Known Orphan Wells ⁶⁰	No Known Orphan Wells ⁶⁰
Michigan	<u>Yes</u>	<u>Yes</u>	Yes
Mississippi	Yes	Yes	Yes
Missouri	No	No	Yes
Montana	No	No	Yes
Nebraska	No	No	Yes
Nevada	Not Submitted	Not Submitted	Not Submitted
New Mexico	Not Submitted	Not Submitted	Not Submitted
New York	No	No	No
North Dakota	Not Submitted	Not Submitted	Not Submitted
Ohio	Yes	Yes	Yes
Oklahoma	Yes	Yes	Yes
Pennsylvania	No	Yes	Yes
South Dakota	Not Submitted	Not Submitted	Not Submitted
Tennessee	Yes	Yes	Yes
Texas	Not Submitted	Not Submitted	Not Submitted
Utah	Yes	Yes	Yes
Virginia	No	Yes	Yes
West Virginia	No	Yes	Yes
Wyoming	No	No	Yes

⁵⁹ Appendix D: State/Province Survey Questions

⁶⁰ Appendix B Reference Documents: Interstate Oil & Gas Compact Commission (IOGCC): Idle and Orphan Oil and Gas Wells: State Provincial Regulatory Strategies 2021; page 28

Figure 2. State/Province Questionnaire⁵⁹: Section 3: Well Plugging Materials and Plug Placement Subsection 1: Well Plugging Materials and Alternate Plugging Materials

State/Province full response can be seen in Table 3: Section 3: Well Plugging Materials and Plug Placement Subsection 1: Well Plugging Materials and Alternate Plugging Materials

State or Province	List of approved plugging materials	Plugging materials defined by statute / rule	Alternate plugging materials allowed by statute / rule
Alberta	Not Submitted	Not Submitted	Not Submitted
British Columbia	Yes	No	Yes
Saskatchewan	Not Submitted	Not Submitted	Not Submitted

Plugging Materials

Various types or classes of Portland cement are the most common plugging material used by the oil and gas industry. Until recently, the more common cements were readily available but CO₂ emissions and raw material shortages have affected product availability. In some regions, API Class A and ASTM C150 Type 1 cements are either being phased out or are being produced in limited quantities. API Class G and H cements are most commonly used in the United States⁶¹. In Western Canada, API Class G cement is the default isolation medium for zonal isolation⁶². API Class L cements are also seeing an increase in approval and usage, especially in the Appalachian Basin⁶³. These same cements may be used for remedial construction of orphan and abandoned wells, as well as plugging operations. API Recommended Practice 65-3: Wellbore Plugging and Abandonment provides guidance for barrier design, materials, and placement. API Specification 10A: Cements and Materials for Well Cementing provides guidance for the mixing and testing of certain cements or cement blends. Oilfield cements are

⁶¹ [Drillingmanual.com/API-cement-classes-in-oil-and-gas/](https://www.drillingmanual.com/API-cement-classes-in-oil-and-gas/)

⁶² Appendix B: Reference Documents; Drilling and Completion Committee (DACC); IRP 27: Wellbore Decommissioning An Industry Recommended Practice (IRP) for the Canadian Oil and Gas Industry; Volume 27-2022; Edition 1; Sanction Date: February 2022; Copyright held by Energy Safety Canada, 2022; Section 27.5.4, Mechanical Plug Integrity Within a Permanent Isolation; pg. 16

⁶³ Success Using Low Emission API Class L Cement in cementing Marcellus Production Strings; <https://admin.onepetro.org/SPEERM/proceedings-abstract/23ERM/2-23ERM/D021S003R002/534147>

designed for a wide range of applications. A variety of additives may be blended to change cement characteristics for specific physical or chemical environments. The most common classes of oilfield cements are summarized below:

API Cement Classes

API (American Petroleum Institute) cement classes⁶⁴ and their applications.

Class A	≅ASTM Type 1; 6000' (1830m); general
Class B	≅ASTM Type 2; 6000' (1830m); moderate to high; sulfate resistance
Class C	≅ASTM Type 3; 6000' (1830m); varying sulfate resistance; early strength
Class D	6000' (1830m) to 10,000' (3020m); moderate high temperature and pressure; moderate to high sulfate resistance
Class E	10,000' (3050m) → 14,000' (4270m); high temperature and high pressure; moderate to high sulfate resistance
Class F	10,000' (3050m) → 16,000' (4880m); extreme high temperature and high pressure; moderate to high sulfate resistance
Class G & H	0 – 8000' (2440m)

Class L composite well cement is obtained by intergrinding Portland cement clinker with one or more forms of CaSO₄ with fly ash or other pozzolanic material⁶⁵. It produces a low-density cement slurry that may be useful where low fracture gradients are problematic. API Class

⁶⁴ Excerpts from: <https://www.drillingmanual.com/api-cement-classes-in-oil-and-gas/>

⁶⁵ API Specification 10A, pg. 42

A and ASTM C150 Type 1 cements are being replaced by API Class L and ASTM C595 Type 1L cements.

Where wells have been circulated to control flow, the use of cements with quick thickening times (quick static gel strength) may be considered⁶⁶. These ‘thixotropic’ cements typically have low viscosity but gel quickly after they are displaced. Thixotropic cements are used when a quick gel time is required in order to minimize the potential for channelized cement. Another relatively common plug material for shallow wells (less than 1000 feet) is nine sack grout. Under the right conditions nine sack grout may be placed directly in an open wellbore from a ready-mix truck. If the wellbore is dry, the grout is simply placed into the well at a slow rate to avoid air bridging. If the wellbore contains fluid that cannot be bailed dry, a tremmie pipe (vent line) is lowered into the well to allow fluids to rise to the surface without significantly affecting the grout mixture.

A variety of mechanical devices may be placed in a well to serve as a base for the plugging material or to help control flow (pressurized flow or vacuum) so a static condition exists for plug placement. Bridge plugs, formation packers and precast conical concrete plugs are commonly used as a plug base or to control flow. These mechanical bases are not typically recommended as a permanent stand-alone plug⁶⁷. Mechanical plugs set inside casing must be placed where there is competent backside cement across a caprock or other competent geologic formation.

⁶⁶ Drillingmanual.com

⁶⁷ API RP 65-3: Wellbore Plugging and Abandonment, P.15

Mechanical plug types, characteristics and pros and cons are summarized in the following table⁶⁸.

Plug Type Characteristics, Pros and Cons

Plug Type	Characteristics/Pros/Cons
Permanent	- Typically combines simple design with minimal potential for leaks, based on a construction without O-rings. - Can be made from cast iron, steel, brass or composite materials. - Once set, typically via a setting tool, the bidirectional slips resist movement up or down. - Do not have a releasing functionality but are generally designed to be easy to mill out. - Most cannot be run through casing restrictions such as profiles, crossovers and casing damage. They have a limited casing weight range in which they can be set and require a running clearance close to nominal drift of the casing in which they are designed to be set. - In applications where the target setting depth is past a restriction, there are classes of high expansion permanent bridge plugs available that can be run through a restriction and set in larger tubulars below. However, the maximum expansion range is typically limited to one standard pipe size larger and these plugs are generally not rated for differential pressure unless they are topped with cement. - Element material choices are typically limited in terms of "off the shelf" availability (standard service element material and premium service element material). Check with supplier for elastomer compatibility and options for custom order.
Retrievable	- Can be released and retrieved, often in a single run, using a retrieving tool. - Are generally set on wireline and can be retrieved on slickline with light spanging or jarring. - Typically made from a low alloy steel but speciality plugs can be made out of more exotic corrosion resistant alloys (CRAs). - Cons include the number of potential leak paths, a potential to not release when commanded to do so and difficult milling operations to remove them when they do not release. - Designed for a narrow range of casing weights so typically have a tight running clearance which prevents their use below restrictions. - The retrieval mechanism would almost certainly be compromised if it were to be used as a platform for cement unless a layer of sand is placed on top of the plug after the pressure test and before placing the cement. - The use of retrievable plugs is currently considered non-routine in all jurisdictions.

⁶⁸ Appendix B: Reference Documents; Drilling and Completion Committee (DACC); IRP 27: Wellbore Decommissioning An Industry Recommended Practice (IRP) for the Canadian Oil and Gas Industry; Volume 27-2022; Edition 1; Sanction Date: February 2022; Copyright held by Energy Safety Canada, 2022; Table 5; pgs. 14-15

Plug Type Characteristics, Pros and Cons

Plug Type	Characteristics/Pros/Cons
Inflatable	• Set hydraulically and expand outwards until contacting the casing. Many designs are available. • Used in applications that require a high ratio expansion plug to be deployed through tubing, through a packer or through casing damage and be set in larger casing below. • They do not have high differential pressure or axial load ratings once set because they rely on a system of ribs vs. slips to prevent upward and downward motion and their structure has to be able to expand at high ratios. • Often not considered unless dictated by wellbore geometry. • Currently considered non-routine in all jurisdictions.
Swellable	• Relies on the fluid that it is run in or the produced fluid of the well in order to set. • The expansion is a gradual process, generally taking days to weeks to reach full set. • Due to this slow expansion, they are normally applied as an annular seal. • Currently considered non-routine in all jurisdictions.
Retainer	• A retainer that has not yet been stung into and activated with pipe is generally acceptable as a bridge plug. • Many retainers can also be modified with the addition of a bullnose to convert a retainer into a bridge plug. • Currently acceptable as routine if un-activated.
Permanent Packer + Plug in Packer Bore	• When a packer is present in a well at a suitable depth to serve as part of an inside casing plug for a zonal isolation, it is common to set a smaller permanent bridge plug inside the packer bore. This turns the packer into a bridge plug across casing. • May be acceptable as routine in some jurisdictions (Alberta, British Columbia). • Using a retrievable packer is currently considered non-routine in all jurisdictions.
Packer + Tailpipe Plug	• Currently considered non-routine in all jurisdictions.



Cast Iron Bridge Plug.
Photo courtesy of
Alpha Oil Tools

Mechanical plug selection considerations are summarized in IRP 27 Table 6⁶⁹.

Considerations for Choosing a Mechanical Plug

Consideration	Notes
Casing restrictions	- Restrictions may exclude plugs designed for nominal ID and require the use of high-expansion plugs or inflatable plugs. - High-expansion or inflatable plugs will either have a reduced pressure rating or no pressure rating unless topped with isolating medium.
Suspected leaking or damaged casing	- Leaks or damage to casing may interfere with the ability to test the plug from surface if the leak or damage is above the intended setting point of the plug. - It may be possible to position the mechanical plug and isolation medium above the leak point or damaged casing. This would be a non-routine scenario and may require a risk assessment of formations behind pipe and TOC/hydraulic isolation.
Re-entry requirements	The relative ease with which the plug can be milled or drilled out impacts the ability to re-enter a previously decommissioned zone.
Acid gas	- Acid gases, particularly H₂S, can lead to rapid onset catastrophic failure of materials so it is critical that plug metallurgy is fit for purpose when acid gases are present. - Controlled hardness (<22 HRC) 4130/4140 or L-80 material that is NACE MR0175/ISO 19165 compliant can be a cost-effective material for acid gas environments. - Chrome or high nickel CRAs can also be selected for CO₂ or H₂S environments (respectively) to better suit the expected environment and will have a longer effective design life.
Hydrogen embrittlement	- Hydrogen embrittlement can cause cracking and failure of materials. - Passivating scales such as iron sulphide are impermeable to hydrogen and tend to trap hydrogen inside the material, increasing the likelihood of a failure.
Bottom hole temperature	- Plug needs to be rated for the expected temperature environment. - This includes thermal.

⁶⁹ Appendix B: Reference Documents; Drilling and Completion Committee (DACC); IRP 27: Wellbore Decommissioning An Industry Recommended Practice (IRP) for the Canadian Oil and Gas Industry; Volume 27-2022; Edition 1; Sanction Date: February 2022; Copyright held by Energy Safety Canada, 2022; Table 6; pg. 16

Drilling muds, displacement fluids and spacers may help to control flow but are not generally considered to be a permanent plug material.

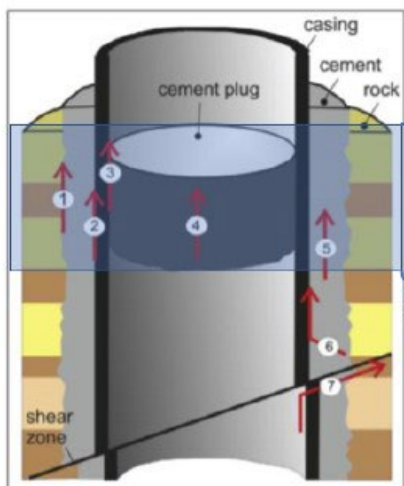
Natural geologic formations may form permanent barriers to fluid or gas flow over time. Certain shales and mudstones may hydrate and swell or collapse forming an effective barrier in an annular space. Halite formations have a plastic behavior that causes the halite to creep or flow, filling and blocking the annular space⁷⁰. These natural barriers may effectively stop annular flow but may also hinder remedial well construction by blocking a sealant flow path in certain sections of a well.

Plug Placement

Plug placement is frequently witnessed by a regulatory inspector. This activity may be required by regulation or by the agency policy as a priority. The plugs that are commonly placed in a well include a bottom plug, one or more intermediate plugs (which may include a mine plug), and a top or surface plug. Plug placement is usually defined by statute or regulation, plugging plans, or applications that are reviewed and approved. The approximate top and bottom of the plug may be defined by requiring a plug base with fill up some specified minimum distance above the base. Alternately, a specific volume of plugging material and spacer or displacement fluid may be required. Plugs that are set inside casing should be set where annular space isolation has been established in caprock or other competent formation.

⁷⁰ API RP 65-3: Wellbore Plugging and Abandonment, P.14

Rock-to-Rock Permanent Isolation



Rock-to-Rock Permanent Isolation

1. Placed within a regional caprock of adequate strength to withstand maximum pressures from zones below (includes recharge potential).
2. Good cement bond behind casing.
3. Adequate residual casing integrity.
4. Isolating medium of sufficient length and compressive strength.

Placement Methods

There are a few placement methods commonly in use today. Methods are dictated by the physical condition of the well, stability of the area, pressures, flowing liquids or gas (natural gas, hydrogen sulfide, CO₂), or equipment and material availability. Plugs may be placed by the balanced plug method, through a workstring until the plug is balanced inside the workstring and the annulus. Plugs may also be spotted (emplaced) using tubing, coiled tubing or casing workstrings. The workstring must be measured and tallied to determine the plug depth. In this process, the plug is placed while the workstring is slowly pulled. It is not necessary to hydrostatically balance the plug using this method⁷¹. Regionally, the use of dump bailers may be used to spot plug and spacers. The dump bailer is usually run into the well on a wireline. Cement is mixed and run into the well in small batches. Contact with wellbore fluids may contaminate the cement and interfere with set and compressive strength⁷². In shallow wells,

⁷¹ Wellbore Plugging and Abandonment API Recommended Practice 65-3, First Edition, June 2021.

⁷² Appendix B: Reference Documents; Drilling and Completion Committee (DACC); IRP 27: Wellbore Decommissioning An Industry Recommended Practice (IRP) for the Canadian Oil and Gas Industry; Volume 27-2022; Edition 1; Sanction Date: February 2022; Copyright held by Energy Safety Canada, 2022; Table 7; pg. 20

certain plugs may be gravity fed. Care must be taken to avoid air locks. If an adequate flow rate can be established through the production interval, and the production string is adequately cemented to at least the calculated top of plug height, the bottom plug may be placed through the production string. This process is often referred to as ‘bullheading’⁷³. If there are indicators or concerns that a plug has slipped, tubing or a wireline tool may be run in the wellbore to verify plug placement



Colorado orphan well plugging in Adams County. Photo courtesy of Colorado Public Radio News

Bottom Plug

The following discussion considers plugging a well that is constructed or reconstructed with cemented production casing (assuming production tubing has been removed) and properly cemented surface casing installed to isolate protected water sources. All necessary well casing integrity tests have been completed.

The purpose of the bottom plug is to isolate the production zone and contain fluids and gases at or near their point of origin. The base of this plug may be placed across the producing zone, immediately above the zone or both. In some wells the bottom hole plug may contain and isolate multiple producing zones. Challenges may exist with bottom hole plugs. Some wells,

⁷³ Appendix A: Glossary of Terms and Definitions

especially older wells, have uncased ‘open hole’⁷⁴ production zones. The production zone may be enhanced by hydraulic fracturing or in older wells, by the use of explosives. Production zones that are enhanced by hydraulic fracturing or explosives may be difficult to kill (stop fluid or gas flow) and lost circulation or thieved plugs may be problematic. Lost circulation material may be circulated in an effort to control flow or lost circulation. If the well cannot be made static, a bridge plug may be placed near the bottom of the production string, at an adequately cemented interval in the caprock or other competent strata.

Bridge plug and cement. Photo courtesy of Wyoming Oil & Gas Conservation Commission



The bridge plug serves as a means to temporarily control flow and acts as a base for the bottom hole plug. The bottom plug would then be spotted on the bridge plug with a tubing workstring. Additional cement may be required to compensate for volumes not placed across the producing interval, if required.

Assuming there are no known integrity issues with the production casing string, it is a common practice to bullhead the bottom plug through the production casing. The process usually starts by pumping clear fluid into the production zone to establish a flow rate. If an adequate flow rate is established the bottom plug would be pumped, followed by a wiper plug and a calculated volume of displacement fluid.

⁷⁴ Appendix A: Glossary of Terms and Definitions

The plug may be placed across the production interval with a specified fill up above the top perforation or uppermost portion of the production interval in an open hole completion. The top of the plug (height) is usually defined by statute, regulation, permit, or approval. As the bottom hole plug is bullheaded, internal casing pressure should increase. If the entire plug is displaced without a pressure increase, remedial actions should be considered in order to isolate the producing interval. Casing integrity issues could be indicated by annular flow or annular pressurization.

Figure 3. State/Province Questionnaire: Section 3: Well Plugging Materials and Plug Placement Subsection 2

State/Province full response can be seen in Table 3.2 State/Province Questionnaire: Section 3: Well Plugging Materials and Plug Placement Subsection 2

State or Province	Plug placement and volume defined by statute / rule	Packers, bridge plugs, tapered cement plugs, or other materials allowed as base for plugs	Plug spacers and materials defined by statute / rule	Plug placement methods defined by statute / rule
Alabama	Yes	Yes	Yes	No
Alaska	Not Submitted	Not Submitted	Not Submitted	Not Submitted
Arizona	No Known Orphan Wells ⁷⁵	No Known Orphan Wells ⁷⁵	No Known Orphan Wells ⁷⁵	No Known Orphan Wells ⁷⁵
Arkansas	Yes	Yes	Yes	Yes
California	Yes	Yes	Yes	Yes
Colorado	Yes	Yes	Yes	Yes
Idaho	No Known Orphan Wells ⁷⁵	No Known Orphan Wells ⁷⁵	No Known Orphan Wells ⁷⁵	No Known Orphan Wells ⁷⁵
Illinois	Not Submitted	Not Submitted	Not Submitted	Not Submitted
Indiana	Not Submitted	Not Submitted	Not Submitted	Not Submitted
Kansas	Not Submitted	Not Submitted	Not Submitted	Not Submitted
Kentucky	Yes	Yes	No	Yes
Louisiana	Yes	Yes	Yes	Yes
Maryland	No Known Orphan Wells ⁷⁵	No Known Orphan Wells ⁷⁵	No Known Orphan Wells ⁷⁵	No Known Orphan Wells ⁷⁵
Michigan	Yes	Yes	No	Yes
Mississippi	Yes	Yes	Yes	Yes

⁷⁵ Appendix B Reference Documents: Interstate Oil & Gas Compact Commission (IOGCC): Idle and Orphan Oil and Gas Wells: State Provincial Regulatory Strategies 2021; page 28

Figure 3. State/Province Questionnaire: Section 3: Well Plugging Materials and Plug Placement Subsection 2

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State or Province	Plug placement and volume defined by statute / rule	Packers, bridge plugs, tapered cement plugs, or other materials allowed as base for plugs	Plug spacers and materials defined by statute / rule	Plug placement methods defined by statute / rule
Missouri	Yes	Yes	No	No
Montana	No	Yes	No	No
Nebraska	Yes	Yes	No	No
Nevada	Not Submitted	Not Submitted	Not Submitted	Not Submitted
New Mexico	Not Submitted	Not Submitted	Not Submitted	Not Submitted
New York	Yes	Yes	No	Yes
North Dakota	Not Submitted	Not Submitted	Not Submitted	Not Submitted
Ohio	Yes	Yes	No	Yes
Oklahoma	Yes	Yes	Yes	Yes
Pennsylvania	Yes	Yes	Yes	No
South Dakota	Not Submitted	Not Submitted	Not Submitted	Not Submitted
Tennessee	Yes	Yes	No	Yes
Texas	Not Submitted	Not Submitted	Not Submitted	Not Submitted
Utah	Yes	Yes	Yes	No
Virginia	Yes	Yes	No	Yes
West Virginia	Yes	Yes	Yes	Yes
Wyoming	Yes	Yes	Yes	Yes
Alberta	Not Submitted	Not Submitted	Not Submitted	Not Submitted
British Columbia	No	Yes	No	No
Saskatchewan	Not Submitted	Not Submitted	Not Submitted	Not Submitted

Horizontal Well Bottom Plug

Horizontal well design has changed since its inception. Some horizontal wells were constructed with horizontal production strings that were circulated and cemented. Although some horizontal wells may still be constructed this way, it is now more common to isolate horizontal stages with packers. Early attempts to plug the stages of the horizontal production zone often had mixed results. In a horizontal well it is now more common to place a bottom hole plug near the kickoff point. Portions of the plug may be placed below the kickoff point and extend above that

point. As in a vertical well, this bottom hole plug must be placed where backside isolation can be verified. A bridge plug may be utilized as a plug base. The bottom plug is usually spotted with a liner or tubing.

Intermediate Plug(s)

Intermediate plugs are additional barriers to contain producing zone hydrocarbons but they often have secondary roles to isolate shallower production or injection zones and to isolate flow or lost circulation zones and isolate underground mines. Once the bottom plug has been set and the primary production zone is effectively isolated, plugging up-hole can begin. If the production string is to be pulled, the production casing may be ripped or shot at a free point above the bottom plug. A cement bond log will help to locate the depth to free pipe that will facilitate determining a separation point.

Once the bottom plug is placed, the well should be monitored for indicators of possible problems. Intermediate and surface plugs should be monitored. After the bottom plug is set and all indications are that the well is static, the next step will be to rip (mechanical tool) or cut (explosive or chemical means) the production casing. Ripping involves using a steel knife located on the bottom of a set of jars that are raised and lowered inside the casing and strike the inside of the casing at the collar connection. The depth of the tool inside of the casing is measured with a depthometer while the tool is being lowered into the well. Ripping is most effective when the casing string is under tension. A skilled rig operator can detect when the ripping tool knife is on a collar and when the casing has been successfully parted. Explosive charges used for cutting the casing or tubing string are provided by a logging contractor and consist of directed charges (collar busters) or primer cord. The logging contractor can use a collar locator wireline tool to identify the target collar. Explosive charges are directed toward the

collar connection. Explosive charges may be an alternative to ripping when the ripper does not set on a collar. Chemical cutters are usually provided by a logging contractor and are lowered into the well to the prescribed depth and the chemical reaction is initiated from the surface. The advantage to a chemical cutter is that the pipe can be parted anywhere between collars. Again, with the casing pulled under tension, a successful chemical cut will transmit to the surface. Using the separation depth and the length of each casing joint, calculate the number of joints of casing to recovery to properly place the next plug. Experience and formation knowledge will determine where there will be formation integrity to support the plug.

When the plug depth is reached, break circulation before mixing cement. This plug will then be placed by circulating cement. Calculations will include the amount of cement needed for the plug interval and the amount of water needed to displace the plug. The same step will be applied to any other open-hole plugs.

At any time during the plugging process, if the casing cannot be pulled, the option is to perforate the pipe with directed charges and then squeeze cement through the perforations. As with other plugs, it is necessary to establish circulation through the casing and returns up the annulus before introducing cement into the borehole. If done properly, this method will place cement on both the backside and the inside of the casing. Once placed however, the casing string in question cannot be pulled until a new free pipe depth is determined.

If no intermediate casing string is in place, the first intermediate plug may be set on the production string and extended a specified distance into the open wellbore. Subsequent intermediate plugs are set in the wellbore to isolate any potentially productive interval, mineable material, or flow zones. These open hole plugs can be set with the production casing, assuming it

has sufficient mechanical integrity, as it is being removed from the well. If the production casing is to remain in the well, and there is no intermediate string, annular space isolation of any potentially productive intervals, mineable intervals, or flow zones must be verified. Zones requiring isolation may be perforated and squeezed. Plugs would then be spotted to complete plugging of the zones.

If a well has a cemented intermediate string, the first intermediate plug should be set in open hole below the casing seat and into the bottom of the intermediate string. A cement bond log may be used to identify cemented intervals. If one or more intermediate strings are to be removed, it would be necessary to rip or shoot the casing. If the intermediate string has mechanical integrity it may be used to pump and circulate plugs. If an intermediate string has been cemented in stages or cemented to surface, the production string or tubing could be used to circulate or spot plugs. The intermediate plug(s) must be located within the casing and be backed by adequate annular cement. The number of intermediate plugs will vary and the size of intermediate plugs must be in compliance with regulatory requirements.

Mine Plug

Underground mine plugs are specialized intermediate plugs. Intermediate casings are sometimes set just above the roof of a mine or they may be set through the mine void to a prescribed depth below the mine floor. In older wells, casing may have been landed in a seat. If the casing penetrated the mine, the string may have been fitted with a cement shoe and one or more cement baskets. In this case, cement, drill cuttings, or clay may have been used to seal the annular space above the mine. Alternately, cement may have been pumped through the mine string casing and cement shoe, and circulated into the floor of the mine. This ‘tacks in’ the mine string and helps to isolate deeper shows of fluid or gas from reaching the mine void. Above the

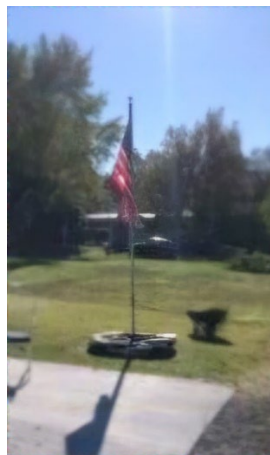
mine, cement or other materials may be gravity fed or pumped through tubing in the annular space, or pumped and circulated through a cementing diverter (DV) tool. If cement baskets were used, they serve as a base for the cement so it does not thief into the mine void. Casings penetrating a mine void may be exposed to acidic, oxygenated waters that may ultimately cause the casing to fail. When designing a plugging plan for a well that has penetrated a mine void, it is important to plug the well below the mine floor and above the mine roof. The lower plug prevents mine water from flooding out lower production or injection zones and helps to prevent the flow of gases, oil, or brine into the mine void. The upper plug also helps to isolate mine water from protected water sources. Mine strings drilled through a mine pillar may be cemented through the entire mine interval.

Surface Plug

Surface plugs are the uppermost plugs in a well. In newer wells the surface casings are set to a specified depth below the protected water and cement is circulated to surface or, in very deep surface casings, cement is circulated in stages. This permanently seals the casing in place. The surface plug is set at or below the base of the surface string by a required distance. In shallow casings the plug may be circulated to surface (or to cutoff depth). Deep surface casings may stage a bottom and top plug with a spacer that is compatible with the protected water interval.

The last plug(s) are placed inside of the casing installed and cemented during drilling to protect the potable water zones. This casing would not be recoverable and the cement plug should be circulated to surface. This plug should stay up. If it falls it would need to be topped off and monitored before any cap or monument is placed on the well.

In certain situations, it may be prudent to install a vault and vent system to enable monitoring of the plugged well and to direct potential fugitive gas away from structures should they occur. The vault may be placed over all casing strings present at surface. A sealed lid is placed over the vault and a vent line is installed through the lid to a selected venting location. A sampling port may be installed in the vent line to allow for gas monitoring. The vault and vent system may be considered when orphan wells are in urban settings, near residences or near critical structures. This system may prevent or minimize gas migration into a structure and provides a monitoring opportunity for higher risk wells.



Vault and vent system installation and completion. Photos courtesy of Ohio Dept. of Natural Resources, Division of Oil & Gas Resources Management.

Mechanical Devices and Spacers

It may be useful or in some cases necessary to use mechanical devices during plugging or well reconstruction for purposes of plugging. All plugs should be set in a static or ‘dead’ well if at all possible. Where a static condition does not exist or cannot be achieved by circulating the well, the use of mechanical bridge plugs or formation packers may be considered. Mechanical or inflatable packers may be placed inside competent casing with adequate annular isolation. These devices may serve as a base for plugs inside casings with properly cemented annuli. Where open hole conditions exist and a static condition cannot be achieved, formation packers may provide an adequate base for open hole plug intervals. Formation packers must be set in a competent geologic formation. Tapered precast concrete plugs may be placed on casing that has been shot or cut above a cemented interval. Regionally, stone and brush are sometimes placed in wells and tamped to form a makeshift bridge plug.

API Recommended Practice 65-3, Wellbore Plugging and Abandonment, First Edition, 2021, is a good reference document for a variety of plugging considerations.

Well Integrity Evaluation

Emissions

Hand held detection equipment (e.g. FLIR Detectors) are very effective for locating gas leaks without close exposure to the source. They are also effective in locating pipeline or flowline leaks. If desired, gas samples may be collected and submitted to a laboratory for analysis.

If gas emissions are present and the gas source has been identified and potentially quantified, a safety and remediation plan may be developed. This plan must take into account the

gas source (within casing or annular space), the lower explosive limit (LEL) and relative toxicity. In order to safely manage the release it may be necessary to install a properly functioning wellhead with a blow-out preventer. Intrinsically safe blowers or fans to disburse gas away from the working area may be necessary. Discharge or diverter lines may also be necessary to control gas accumulation. In known H₂S areas, a safety company with monitoring equipment may be contracted. Flaring of the fugitive gas may be considered with a properly constructed flair pit, if regulations and location considerations allow. Personal protective equipment (PPE) and a properly communicated safety plan should be considered. Depending on the well location, the anticipated gas volumes, and the relative toxicity, it may be necessary to communicate with local officials and the general public within a defined radius.

If gas is not detected at explosive or toxic concentrations and is being emitted through open casing or tubing, the gas may be originating from the known production zone(s). It may be possible to safely discharge gas to surface before plugging. If the gas is being emitted from the annulus of the casing, it may be necessary to modify the plugging plan and the plugging contractor may be required to pump kill fluids to contain the gas to its point of origin. If gas flow cannot be contained, the use of a formation packer or bridge plug may be considered. The plugging plan must ensure that all annular flow is addressed. Once the gas flow has been abated the bottomhole plug may be set.

If gas is detected in any annular space between the strings of casing, the gas pressure and source should be determined. The presence of backside or annular gas may indicate casing integrity issues, cement integrity issues, a leaking shoe or seat, open annular spaces, or in older wells, poor quality sealants such as drill cuttings or clay. It is important to isolate stray gas at depth, preferably at the point of origin. This will prevent gas cutting of shallower plugs set in the

well. A suite of cased hole or open hole logging tools (noise logs, temperature logs and cement bond logs) may be helpful in determining the gas source. (See Section VII).

Rig Considerations

Service Rig style, design, site conditions, and availability will vary greatly from region to region and well to well and should be selected as well specific considerations dictate. The rig may be single pole, double pole, or derrick.



Example of a derrick. This is a drilling rig capable of pulling heavy casing. Photo courtesy of Ohio Dept. of Natural Resources, Division of Oil & Gas Resources Management.



Example of a single pole swab rig. Photo courtesy of Ohio Dept. of Natural Resources, Division of Oil & Gas Resources Management.



Example of a double pole service rig. Photo courtesy of Ohio Dept. of Natural Resources, Division of Oil & Gas Resources Management.



Example of a double pole service rig. Photo courtesy of Ohio Dept. of Natural Resources, Division of Oil & Gas Resources Management.

The well specific conditions include the depth of the well, the casing size and weight (if known) and the footprint of the rig and associated equipment. The rig must be capable of handling the

anticipated hanging string weight, with enough crown height to pull, break and lay down casing and tubing being recovered. The rig should be capable of pulling stretch on any cemented casing string prior to shooting or ripping and be capable of managing any unanticipated conditions during plugging operations. Rig lighting may be considered if evening operations are anticipated.

Equipment Considerations

In addition to the rig itself, the site should be capable of staging cementing equipment, lined circulating pits or tanks, water and/or mud storage systems and trucks to remove recovered tubing and casing for offsite salvage or reuse. Wireline logging trucks may be helpful when designing the plugging plan. A well as it exists today may be open to atmosphere or covered with a reducer and a bull plug. In order to safely plug and abandon the well, it may need to be equipped with an operating wellhead, which can accept a blow-out-preventer properly sized for the casing involved. If no casing is present it may be necessary to set and cement a protective casing string to attach safety equipment.

Well Control

With a working wellhead in place, it may be necessary to attach pressure rated ball valves to each of the ports on the wellhead (typically two). Tubing with the same diameter should be threaded to each ball valve, secured with chains and directed toward a containment tank or a lined earthen pit. Slips and packing rubbers can be secured in the wellhead and flow may be directed to containment and managed with the ball valves. It would be possible, depending on surface conditions to allow the well to blow down or load itself. If necessary, it may be possible to pump kill fluid through the tubing/ball valves to load the hole and kill the well.

Site Considerations

The orphaned well location should be reviewed as the plugging plan is developed. Wells located in urban areas or near critical infrastructure pose different challenges than rural or remote locations. It may be necessary to construct ingress/egress roads. Buried and overhead utilities and infrastructure should be evaluated and protected. A stable location is necessary for safe operations. The rig and associated equipment should be selected for the anticipated plugging activity but must be appropriately sized for the location. The proposed surface activities will dictate service rig positioning, support equipment (trucks, trailers, water trucks, etc.), circulating tanks or pits, cementing pump and bulk trucks and equipment staging. Emergency access to the location should be factored. Traffic controls and heavy equipment routes may be reviewed. Seasonal access limitations or restrictions should be considered.

Well Cleanout and Circulation

Prior to mixing and placing any plugging material it may be necessary to pump fluid through the casing or tubing string to establish circulation, clean and condition the wellbore or to establish a flow rate. If annular circulation cannot be established it may indicate that the casing string was cemented or there is an obstruction in the annulus. If flow cannot be established, it may indicate the wellbore is obstructed, the formation has been cemented or formation permeability is limiting flow. Circulating and conditioning the well for an extended period of time may be necessary to control fluid loss or to establish a static condition. Cement bond logs may be useful when evaluating conditions behind pipe. If it becomes necessary to drill out any obstruction in the borehole, additional equipment will be required. This activity would require a rotating device (power swivel or power tongs) and a circulating system (mud pump or air compressor) with any modifications to the well head as necessary to manage surface discharge.

Remedial Well Construction at Surface

Before initiation of any activity near the well, the condition and stability of the site and well should be evaluated. In order to safely initiate and complete plugging operations, it may be necessary to install surface equipment. Surface equipment may include a new welded bell collar on the surface or intermediate casing string in order to attach a new or replacement wellhead, blowout preventer, diverter assembly or other equipment. In order to reach the casing string, it may be necessary to excavate around the well bore. Casing extensions may need to be welded in place to a proper working height. It is recommended that a cellar ring be installed around the well in order to contain and manage any fluids generated by the remedial activity or by the well itself.

Once the wellhead is in place and secure, work can begin on evaluating casing and/or tubing strings which may still be in the well.

Spacer and Displacement Materials

Spacer fluids should be compatible with the formations that will be covered and are commonly produced brine, gel, or fresh water. These fluids may be used to displace cement plugs and may provide hydraulic head to help maintain a static condition until the plug sets or forms a matrix. Regulations may define the composition, density and/or viscosity of spacer or displacement fluids. Although not common, solid materials such as sand or drill cuttings may be used as spacer material.

Placement Methods

Refer to Plug Material/Placement discussion in Chapter XI. Plugging Plan Development.

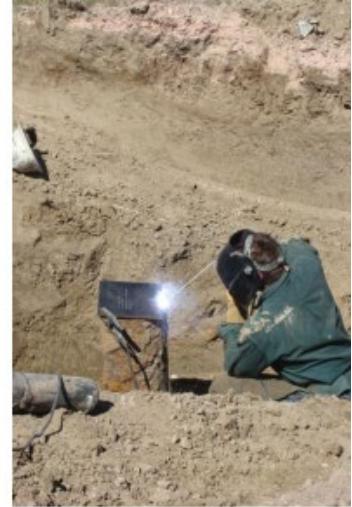
Plugging Inspection/Oversight/Monitoring

Orphaned wells receive regulatory inspections from the time they are discovered and through plugging and final restoration. Multiple agencies may be responsible for specific oversight. Orphaned well staff assist with initial site reviews and data collection. Records are gathered and reviewed and plugging plans are developed. Inspectors may witness environmental remediation, equipment removal and site preparation. Equipment mobilization and setup may be observed. Meetings may be held with property owners or local government officials. Well cleanout, mechanical integrity testing and reconstruction may be documented. As plugging proceeds, inspectors may be present for all or certain critical operations. Agencies may require certain inspection by regulation or they may prioritize inspections. The inspectors may document activities for contract compliance. It is not uncommon for unexpected issues or problems to arise at orphaned well plugging operations. Alternate plans may be proposed and evaluated. Inspectors may play an integral role in the review and approval process. Some regulatory programs require well casings to remain open after plugging so the well may be inspected for surface indicators of plug failure. Inspectors may also witness the installation of monuments or markers. Grading and final restoration may be inspected.

Witnessed inspection priorities may include; well integrity testing, remedial construction, cleanout and circulation, and plug placement and verification. Orphaned well staff may also test cement mixtures and mix water.

Well casing cut off

Plate welded on



Photos courtesy of Wyoming Oil
& Gas Conservation Commission.



XII. Procurement Considerations

It is a common practice for regulatory programs to hire private contractors to address a wide variety of issues at orphaned well sites. Some of the oil and gas regulatory programs may be responsible for the majority of plugging, remediation, and restoration work. In some states or Canadian provinces, multiple agencies may have individual responsibilities. Local and federal requirements may need to be evaluated.

Agreements may be performance based, prescriptive, or some combination of both. Public contracts are usually awarded through a competitive bidding process and contract bids and awards should be part of the public record. Agencies should evaluate contractor qualifications and verify availability within project timeframes. Procurement procedures should be detailed and accessible. Reviews and the selection process must be defined and witnessed.

Items that warrant contract consideration may include:

- Project Description
- Scope of Work
- Permit and Inspection Requirements
- Effective Date and Term
- Contractors Responsibility
- Standards
- Substitutions
- Quantities of Work
- Omissions/Interpretation and Changes in Scope of Work
- Pay Estimates/Schedules/Retainage

- Access and Preservation of Site
- Damage Caused by Contractor
- Safety
- Maintenance of Traffic
- Protection of Existing Utilities
- Erosion and Sediment Control
- Spill Prevention and Remediation
- Well Obstruction Assessment
- Removal of Obstruction
- Sequence of Work
- Plugging Plan
- Well Control
- Well Preparation and Plugging
- Fluid Disposal
- Contaminated Material Disposal
- Salvage Material Disposal



- Site Restoration

Photo courtesy of Wyoming Oil
& Gas Conservation Commission

Reference: Hocking #6 Project⁷⁶

If necessary, a right of entry document may be used to secure permission for the contractor, subcontractors, and vendors to access the property. The real property owner should be made aware of the scope of work and anticipated timeframes. Agency staff should be present during critical phases of the project.

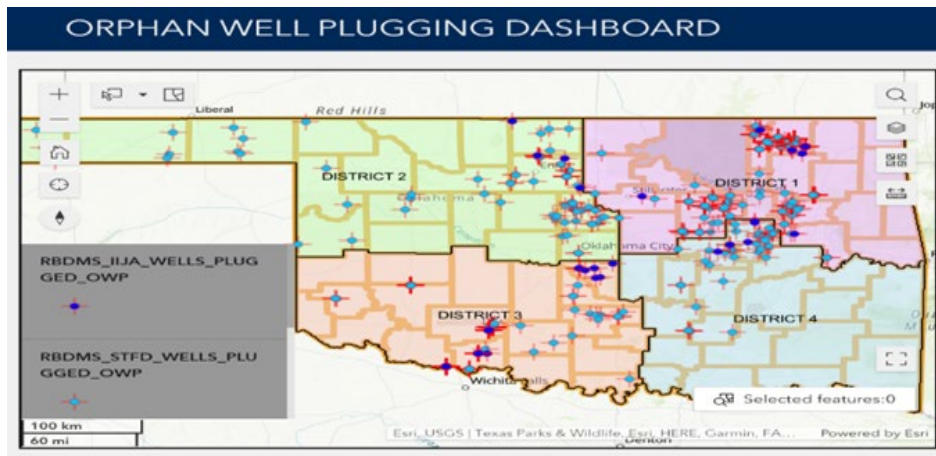
Appendix F contains sample field order change order, right of entry standard operating procedure, and orphan well referral standard operating procedure.

⁷⁶ https://dam.assets.ohio.gov/image/upload/ohiodnr.gov/documents/oil-gas/contractor/Hocking6_ScopeofWork-Offer.pdf

XIII. Public or Community Participation and Notifications

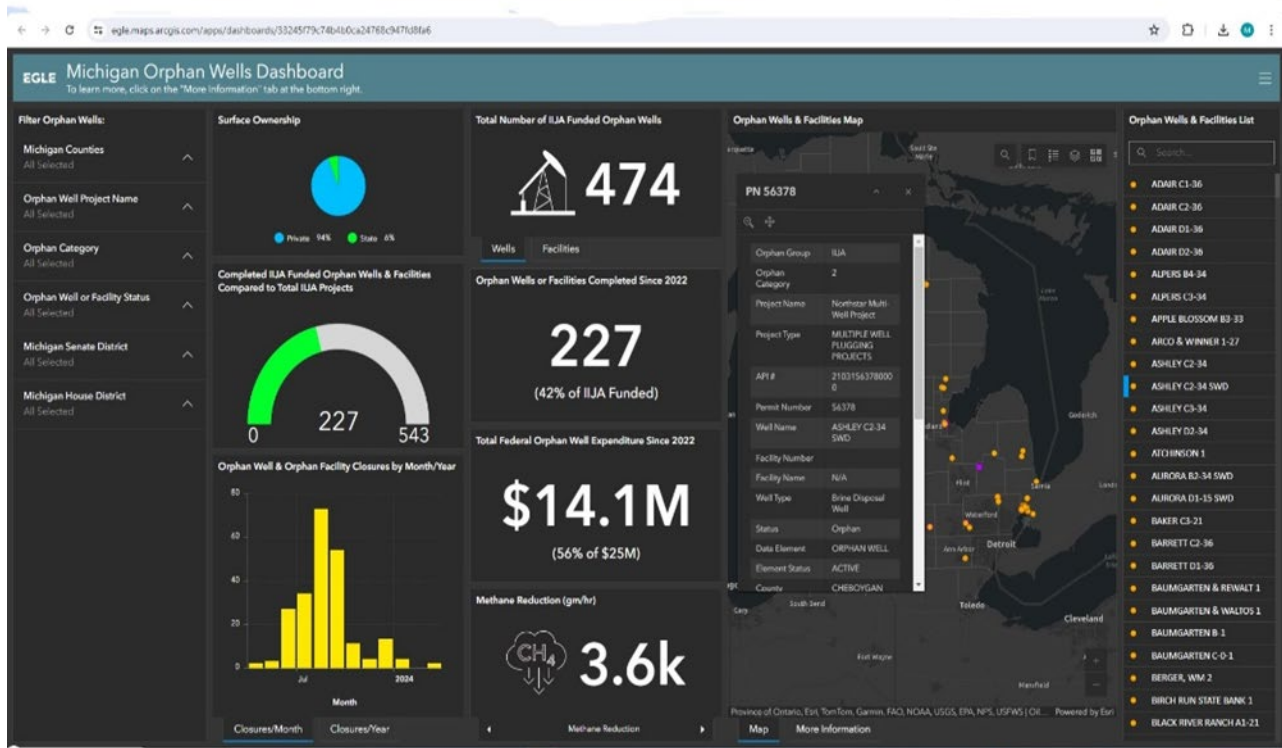
The plugging of orphaned wells, site remediation, and restoration improves overall public health and safety and benefits the environment.

Public participation and community involvement may help to improve the understanding of program functions. A majority of pre regulation orphaned wells are discovered and reported by the public. Some wells are discovered during public infrastructure projects or private projects such as new home construction. Many people are aware of orphaned wells but are not sure what they are or who to contact. Community outreach programs, through local governments and trade groups, such as farm associations, can help people identify and report orphaned wells. It is in everyone's best interest to locate and address as many orphan wells as possible. Outreach can be achieved through a variety of mechanisms. Agency websites⁷⁷ can provide useful



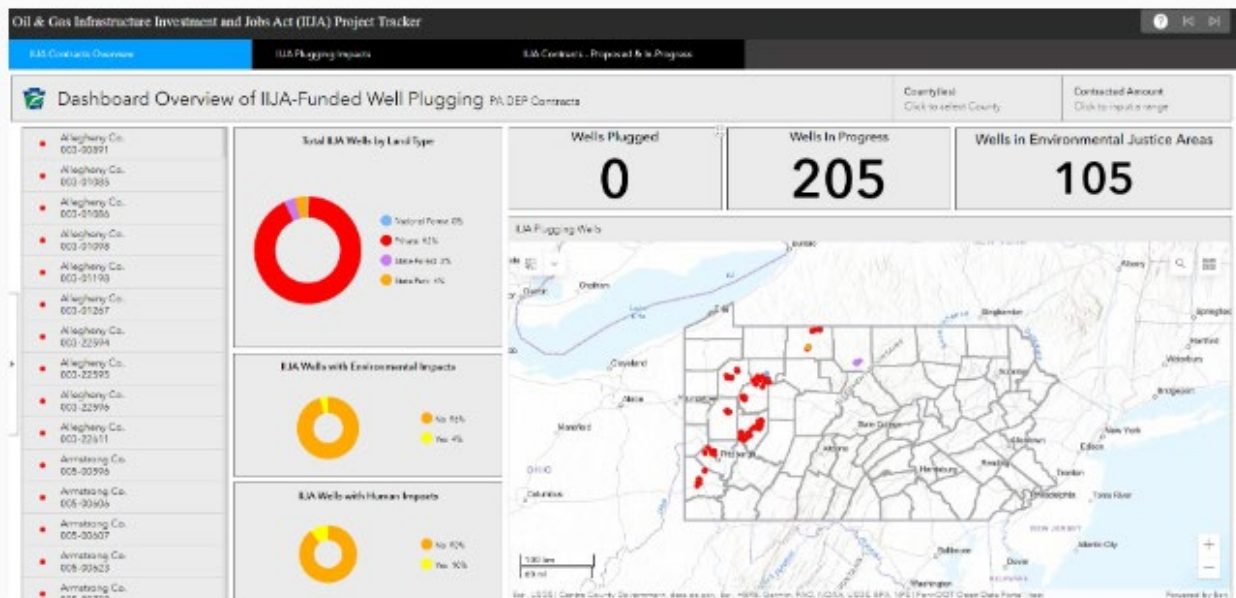
Oklahoma Orphan Well Plugging Dashboard

⁷⁷ Oklahoma Orphan Well Program; <https://oklahoma.gov/occ/divisions/oil-gas.html>



Michigan Orphan Well Dashboard

This dashboard was created to provide information to interested stakeholders through an interactive and summarized format about the work being done by the Michigan Department of Environment, Great Lakes, and Energy (EGLE) Orphan Well Program including total numbers of IJA funded and completed projects.



Pennsylvania Orphan Well Dashboard

This application allows users to explore Pennsylvania wells being considered for plugging with IJA funding.

information⁷⁸ for the identification and reporting of suspected wells, where online contact information should be easily accessed. Short online videos may be used to illustrate wells or the indicators that a well may be nearby or pamphlets may be widely distributed. In person informational meetings with local government agencies or organizations, such as Fire Chief's Association, may be very beneficial. The goal is to educate and inform as many people as possible so the wells are identified and reported.

A summary of the orphaned well process from start to finish may help to alleviate anxiety or fears. Process descriptions may include well evaluations and prioritization, contract processes, timelines, and a description of what may be expected onsite. Access to well inventory lists, prioritization lists, bid announcements, executed contracts, and expenditures may be considered.

A summary of onsite activity may include descriptions of equipment, hours of operation, traffic patterns, and possible noise, dust, and odor issues. Safety monitoring summaries may minimize calls to first responders. People near an active project site may have concerns and will likely call local officials. Detailed project reviews and updates with fire departments, police, emergency management agencies, and others, will allow those officials to have informed discussions with callers. It may also better prepare those responders should they be needed.

Project signage may prove quite useful. Signage may include anticipated project dates and hours of operation. It may include contact information for those with questions or concerns. A brief explanation of the public health, safety and environmental benefits may be included.

⁷⁸ Michigan Orphan Well Dashboard; <https://egle.maps.arcgis.com/apps/dashboards/33245f79c74b4b0ca24768c947fd8fa6>
Pennsylvania Orphan Well Dashboard; <https://padep-1.maps.arcgis.com/apps/instant/portfolio/index.html?appid=064e373125c34182b2e132dd50d7c619>



Photo courtesy of Ohio Dept. of Natural Resources, Division of Oil & Gas Resources Management.

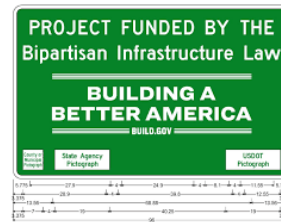


Photo courtesy of the White House.



Photo courtesy of Pennsylvania Department of Environmental Protection.

Project notification to adjacent or nearby property owners may be considered. Projects on public properties may require open public meetings as the project is designed and executed. Projects near schools, hospitals, or critical infrastructure may require special considerations. Some localities may require public meetings for certain activity on private properties. Local permits or authorizations may be necessary and may require public notice.

Property owners, whether public or private, being directly affected by a project should be informed and included throughout the entire process as they may have questions and concerns.

It may be possible to address certain landowner concerns or requests in the plugging or restoration contract. Property remediation and restoration may be a priority. As orphaned wells are discovered and catalogued, it is important to share the location information in an easily accessible mapping format. Education and coordination with building departments and contractors' associations may allow location information to be reviewed before construction

projects begin. When possible, building projects may be located to allow for future access to the wells should it ever become necessary. Well locations are not marked when calls are made to 811 “Call Before You Dig” but some states or trade associations have location services for oilfield pipelines and associated equipment.

Figure 4. summarizes state and provincial statutes, regulations, policies, or procedures that authorize or require public participation in any phase of the orphan and abandoned well process. Full responses, including comments, may be reviewed in Table 1. State/Province Questionnaire: Section 1. Public Participation/Notification.

Figure 4. State/Province Questionnaire: Section 1: Public Participation/Notification <i>State/Province full response can be seen in Table 1: State/Province Questionnaire: Section 1: Public Participation/Notification</i>	
State or Province	Statute(s), Rule(s), Policy(s), or Procedure(s) authorizing /requiring public participation in any phase of the orphan/abandoned well process.
Alabama	Yes
Alaska	Not Submitted
Arizona	No Known Orphan Wells ⁷⁹
Arkansas	Yes
California	Yes
Colorado	Yes
Idaho	No Known Orphan Wells ⁷⁹
Illinois	Not Submitted
Indiana	Not Submitted
Kansas	Not Submitted
Kentucky	No
Louisiana	Yes
Maryland	No Known Orphan Wells ⁷⁹
Michigan	Yes
Mississippi	No
Missouri	No
Montana	Yes
Nebraska	No
Nevada	Not Submitted

⁷⁹ Appendix B Reference Documents: Interstate Oil & Gas Compact Commission (IOGCC): Idle and Orphan Oil and Gas Wells: State Provincial Regulatory Strategies 2021; page 28

Figure 4. State/Province Questionnaire: Section 1: Public Participation/Notification

State/Province full response can be seen in Table 1: State/Province Questionnaire: Section 1: Public Participation/Notification

State or Province	Statute(s), Rule(s), Policy(s), or Procedure(s) authorizing /requiring public participation in any phase of the orphan/abandoned well process.
New Mexico	Not Submitted
New York	Yes
North Dakota	Not Submitted
Ohio	Yes
Oklahoma	No
Pennsylvania	No
South Dakota	Not Submitted
Tennessee	No
Texas	Not Submitted
Utah	Yes
Virginia	Yes
West Virginia	Yes
Wyoming	Yes
Alberta	Not Submitted
British Columbia	No
Saskatchewan	Not Submitted

XIV. Inspection, Monitoring and Reporting

Inspections occur in all phases of orphan well plugging operations from initial discovery of the well and site evaluation to plugging priority assessment to scheduling work activity to actual plugging activity to post plugging evaluation and needs assessment.

Inspections

Many initial inspections concerning orphaned wells are generated by written or verbal inquiries to regulatory agencies from the general public, property owners, developers, local building or zoning inspectors. Regulatory agencies may have access to out-of-print maps and records that could direct the agency inspector to a possible well location and a likely API permit number if one exists.

Wells, production equipment and pipelines may be discovered by hikers, hunters, and emergency responders. Property owners frequently find wells on property that they own or intend to purchase. They may be familiar with the history of the area as it relates to oil and gas development. Property owners are concerned about potential environmental impact from old wells and how they may negatively impact future plans for their property. Wells may be present as an open hole without evidence of any casing, open casing, or casing with a wellhead and/or valve. Some wells have been buried by subsequent activity and may only be identified by leaking natural gas, oil or brine. Production equipment can include aboveground separators, tanks, below ground tanks and vaults, buried electric lines, flowlines, sales lines and meter stations. Local building or zoning inspectors may have a unique knowledge of the area or may be called when abandoned oilfield related equipment or evidence of such is discovered during site development.

During the plugging operation, inspection and witness are synonymous. It is important to witness and to document the activity as it occurs in order prepare an accurate plugging report that is placed in the well file. Inspection records may include;

- Current well condition (i.e. document presence of natural gas, hydrogen sulfide or flowing oil, brine) and actions taken to control the situation.
- Meetings with the rig operator and crew to develop a safety plan and discuss casing and/or tubing recovery.
- Review the planned plug intervals for depth and thickness with the rig operator and cement contractor.
- Review cement calculations with the cement contractor to ensure there is adequate cement and water on site for plugs and spacers and to circulate the well if a plug fails Cement volumes may be a concern if the plug intervals are thick and numerous.
- Review potential lost circulation zones and, if necessary, verify that lost circulation materials are available.
- Document each plug including
 - Placement method
 - Static condition
 - Packers or bridge plugs
 - Cement (volume, weight, depth, estimated top and bottom)
 - Plug verification (e.g. tag)
 - Indicators of plug integrity
- Document mix water source (and quality)

- Document spacers and displacement fluids (type, volumes)
- Casing recovered
 - Rip or cut depth
- Perforation depth
- Squeeze volumes
- Circulation details
- Inspect and monitor top plug for indications of plug failure. This may include monitoring of gases emanating through the cement. Air or gases may become entrained in cement with circulation. Gases should dissipate after a few days.
- Document well identification
- Inspect grading and final restoration



Cutting the well head off



Cut and Cap – Plate welded on

Pictures courtesy of P. Amole, 2020, WOGCC

Monitoring

After a well has been plugged, the wellbore may be monitored for indicators of plug failure. Monitoring may be necessary for several days. Offset wells may also be monitored periodically for signs of repressurization.

Reporting

All inspections should be documented. Any documentation will be useful when working on subsequent wells discovered in the same field. Prior to abandonment and burial, if not already captured, it is recommended to record the GPS coordinates (or a site survey) and photograph documentation of the identification plate or monument for the well, if required, and any other pertinent information (tank battery, pipelines and electric lines).

Figure 5. summarizes state/province requirements for witnessing, documentation, and monitoring.

Figure 5. State/Province Questionnaire: Section 3: Well Plugging Materials and Plug Placement Subsection 3: Witnessing, Documentation, and Monitoring <i>State/Province full response can be seen in Table 3.3: State/Province Questionnaire: Section 3: Well Plugging Materials and Plug Placement Subsection 3: Witnessing, Documentation, and Monitoring</i>				
State or Province	Witnessing of plugs by regulatory official required	Documentation of plugging activity	Monitoring or inspection at plugging completion	How is location of orphan / abandoned well documented?
Alabama	Yes	Yes	Yes	GPS
Alaska	Not Submitted	Not Submitted	Not Submitted	Not Submitted
Arizona	No Known Orphan Wells ⁸⁰	No Known Orphan Wells ⁸⁰	No Known Orphan Wells ⁸⁰	No Known Orphan Wells ⁸⁰
Arkansas	Yes	Yes	Yes	GPS

⁸⁰ Appendix B Reference Documents: Interstate Oil & Gas Compact Commission (IOGCC): Idle and Orphan Oil and Gas Wells: State Provincial Regulatory Strategies 2021; page 28

Figure 5. State/Province Questionnaire: Section 3: Well Plugging Materials and Plug Placement Subsection 3: Witnessing, Documentation, and Monitoring

State/Province full response can be seen in Table 3.3: State/Province Questionnaire: Section 3: Well Plugging Materials and Plug Placement Subsection 3: Witnessing, Documentation, and Monitoring

State or Province	Witnessing of plugs by regulatory official required	Documentation of plugging activity	Monitoring or inspection at plugging completion	How is location of orphan / abandoned well documented?
California	Yes	Yes	Yes	GPS
Colorado	No	Yes	Yes	GPS
Idaho	No Known Orphan Wells ⁸⁰	No Known Orphan Wells ⁸⁰	No Known Orphan Wells ⁸⁰	No Known Orphan Wells ⁸⁰
Illinois	Not Submitted	Not Submitted	Not Submitted	Not Submitted
Indiana	Not Submitted	Not Submitted	Not Submitted	Not Submitted
Kansas	Not Submitted	Not Submitted	Not Submitted	Not Submitted
Kentucky	No	Yes	Yes	GPS
Louisiana	No	Yes	No	GPS
Maryland	No Known Orphan Wells ⁸⁰	No Known Orphan Wells ⁸⁰	No Known Orphan Wells ⁸⁰	No Known Orphan Wells ⁸⁰
Michigan	No	Yes	No	GPS
Mississippi	Yes	Yes	Yes	GPS
Missouri	No	Yes	No	GPS
Montana	No	Yes	Yes	Field inspection, database records
Nebraska	No	Yes	No	Database
Nevada	Not Submitted	Not Submitted	Not Submitted	Not Submitted
New Mexico	Not Submitted	Not Submitted	Not Submitted	Not Submitted
New York	No	Yes	No	GPS
North Dakota	Not Submitted	Not Submitted	Not Submitted	Not Submitted
Ohio	Yes	Yes	Yes	GPS
Oklahoma	No	Yes	Yes	GPS
Pennsylvania	No	Yes	No	GPS
South Dakota	Not Submitted	Not Submitted	Not Submitted	Not Submitted
Tennessee	Yes	Yes	Yes	GPS
Texas	Not Submitted	Not Submitted	Not Submitted	Not Submitted
Utah	Yes	Yes	Yes	Permanent monument; subsurface markers
Virginia	Yes	Yes	Yes	GPS
West Virginia	No	Yes	No	GPS
Wyoming	No	Yes	Yes	

Figure 5. State/Province Questionnaire: Section 3: Well Plugging Materials and Plug Placement Subsection 3: Witnessing, Documentation, and Monitoring

State/Province full response can be seen in Table 3.3: State/Province Questionnaire: Section 3: Well Plugging Materials and Plug Placement Subsection 3: Witnessing, Documentation, and Monitoring

State or Province	Witnessing of plugs by regulatory official required	Documentation of plugging activity	Monitoring or inspection at plugging completion	How is location of orphan / abandoned well documented?
Alberta	Not Submitted	Not Submitted	Not Submitted	Not Submitted
British Columbia	No	Yes	No	Mapped on website
Saskatchewan	Not Submitted	Not Submitted	Not Submitted	Not Submitted

XV. Industry Standards

State and provincial authorities have established regulatory standards for plugging orphaned wells that may include statutes, rules, permit terms and conditions, and contract terms. In addition, multi-state government agencies such as the Interstate Oil and Gas Compact Commission⁸¹ (IOGCC) and the Ground Water Protection Counsel⁸² (GWPC) assist states through information sharing and regulatory development coordination amongst states. There have also been collaborative efforts between oil and gas production companies and environmental advocacy groups that have recommended standards for incorporation in state regulations. Appendix B: Reference Documents, lists documents prepared by these multi-state organizations that promote proper plugging of oil and gas wells. The IOGCC conducts surveys and drafts periodic reports to assist states in identifying useful regulatory tools and strategies. IOGCC, Environmental Defense Fund (EDF) and the Society of Petroleum Engineers (SPE) have collaborated to develop webinar series for a number of issues⁸³.

Examples include:

Idle and Orphan Oil and Gas Well: State and Provincial Strategies (2021)

Supplemental Information on State Prioritization Systems for Orphan Wells (2023)

Industry trade associations such as the American Petroleum Institute (API) build teams of learned professionals to develop ‘Recommended Practices’, ‘Specifications for Manufacturing’,

⁸¹ <https://oklahoma.gov/iogcc/publications.html>

⁸² <https://www.gwpc.org/research/>

⁸³ Appendix B: Reference Documents; and <https://streaming.spe.org/?s=iogcc+edf>

‘Certification Programs’, and ‘Publications’ with over 1000 documents for the oil and gas industry.

A few of the API documents that may be reviewed for orphan and abandoned well operations include:

- Reconstruction
 - API SPEC 5CT: Casing and Tubing
 - API RP 65-2: Isolating Potential Flow Zones During Well Construction
- Plugging
 - API SPEC 11D1: Packer and Bridge Plugs
 - API RP 65-3: Well Plugging and Abandonment
 - API RP 10B: Recommended Practice for Testing Well Cements
 - API Spec 10A: Specification for Cements and Materials for Well Cementing, Twenty Fifth Edition, Includes Addendum 1 (2019) and Addendum 2 (2022)
- Safety
 - API STD 64: Diverter Equipment Systems
 - API TR 10TR1: Cement Sheath Evaluation
 - API RP 54: Occupational Safety and Health for Oil and Gas Well Drilling and Servicing Operations
- Remediation
 - API PUBL 1628: A Guide to The Assessment and Remediation of Underground Petroleum Release
 - API PUBL 1629: Guide for Assessing and Remediating Petroleum Hydrocarbons in Soils

- Environmental
 - API RP 51R: Environmental Protection for Onshore Oil and Gas Production Operations and Leases

The National Petroleum Council (NPC) has also published a report pertaining to recommended well-plugging practices, methods, materials and regulations entitled “Plugging and Abandonment of Oil and Gas Wells” (Paper #2-25, 2011)

In addition, there have been collaborative efforts between producers and national environmental advocacy organizations. For example, the Model Regulatory Framework (MRF) for Hydraulically Fractured Hydrocarbon Production Wells (2019) was a collaborative effort between Southwestern Energy and the Environmental Defense Fund that sought to identify practices to provide a tool for states to develop and measure the development of an effective regulatory framework.

XVI. New and Emerging Technologies

There are very few truly new technologies. The technologies that exist today may be a variation or improvement to an older technology. The application of a technology may change over time. Advancements in computers and electronics have moved certain technologies from analog to digital. Data interpretations improve as baseline data sets grow.

Some orphan and abandoned programs may have the finances to utilize new technologies. Unfortunately, many orphan and abandoned programs operate with very limited equipment and personnel budgets. For these programs ‘new’ technology may be new equipment that has existed but has been out of reach. Budget restrictions may also limit the orphan and abandoned programs from entering into service agreements with contractors capable of deploying new technologies.

Sometimes a new technology is one that has existed but was previously unknown. Examples of ‘new’ technologies may include:

- Plugging Materials
 - New blended cements (the manufacture process may reduce CO₂ emissions)
 - New cement additives that alter the chemical or physical properties of plugging materials
 - Bismuth and other alloy based plugging materials
 - Polymer based plugging materials
- Reconnaissance
 - LIDAR (light detection and ranging) systems- Fixed wing/drone
 - FLIR (forward looking infrared) systems ground based or aerial gas leak detection

- Magnetometers (drone based)
- LIDAR 3D (Laser) surveying equipment
- AI (artificial learning) systems

Figure 6. summarizes states and provinces that allow by statute or rule, new or emerging technologies or the use of new materials.

Figure 6. State/Province Questionnaire: Section 3: Well Plugging Materials and Plug Placement Subsection 4: New or Emerging Technologies	
<i>State/Province full response can be seen in Table 3.4: State/Province Questionnaire: Section 3: Well Plugging Materials and Plug Placement Subsection4: New or Emerging Technologies</i>	
State or Province	New or emerging technologies or use of new material allowed by statute/rule
Alabama	Yes
Alaska	Not Submitted
Arizona	No Known Orphan Wells ⁸⁴
Arkansas	Yes
California	Yes
Colorado	Yes
Idaho	No Known Orphan Wells ⁸⁴
Illinois	Not Submitted
Indiana	Not Submitted
Kansas	Not Submitted
Kentucky	Yes
Louisiana	No
Maryland	No Known Orphan Wells ⁸⁴
Michigan	Yes
Mississippi	Yes
Missouri	Yes
Montana	No
Nebraska	Yes
Nevada	Not Submitted
New Mexico	Not Submitted
New York	No
North Dakota	Not Submitted
Ohio	Yes
Oklahoma	Yes
Pennsylvania	Yes
South Dakota	Not Submitted

⁸⁴ Appendix B Reference Documents: Interstate Oil & Gas Compact Commission (IOGCC): Idle and Orphan Oil and Gas Wells: State Provincial Regulatory Strategies 2021; page 28

Figure 6. State/Province Questionnaire: Section 3: Well Plugging Materials and Plug Placement Subsection 4: New or Emerging Technologies

State/Province full response can be seen in Table 3.4: State/Province Questionnaire: Section 3: Well Plugging Materials and Plug Placement Subsection4: New or Emerging Technologies

State or Province	New or emerging technologies or use of new material allowed by statute/rule
Tennessee	No
Texas	Not Submitted
Utah	Yes
Virginia	Yes
West Virginia	Yes
Wyoming	Yes
Alberta	Not Submitted
British Columbia	Yes
Saskatchewan	Not Submitted

APPENDICES

- Appendix A: Glossary of Terms and Definitions
- Appendix B: Reference Documents
- Appendix C: State and Provincial Orphan Well Definitions
- Appendix D: Survey Questions
- Appendix E: Select Sample State Prioritization Systems for Orphan Wells
- Appendix F: Sample Orphan Well Contract Consideration Procedures

APPENDIX A

Appendix A: Glossary of Terms and Definitions

ANNULUS (ANNULAR SPACE) – The space surrounding pipe suspended in the well bore. The outer wall of the annulus may be the wall of the bore hole or it may be larger pipe. (Bul 10C, SSWID, WLOP)⁸⁵

API - Abbreviation for American Petroleum Institute. Founded in 1920, this national oil industry trade association maintains a headquarters office in Washington, D.C., and a Production Department office in Dallas, Texas. Standards for many items of drilling and producing equipment are produced by industry committees of the Production Department, including specifications for wire rope and solid wire line. (WLOP)⁸⁶

API CEMENT CLASSES - A classification system for well cements defined in API Spec 10.⁸⁷ (Bul 10C)

ASTM - American Society for Testing and Materials⁸⁸

ASTEM CEMENT TYPES - See Cement, ASTM Types (Bul 10C)⁸⁹ API BULL, 10C Bulletin on Well Cement Nomenclature

BAIL - To recover bottom-hole fluids, samples, or drill cuttings by lowering a cylindrical vessel, called a “bailer,” to the bottom of a well, filling it, and retrieving it. Also, a link of steel attached to pipe elevators for living. (WLOP)⁹⁰

BENTONITE - A highly plastic, highly colloidal clay, largely consisting of the mineral montmorillonite, a hydrated aluminum silicate. (Bul 10C)⁹¹

⁸⁵ <https://oklahoma.gov/content/dam/ok/en/occ/documents/og/api-glossary.pdf>

⁸⁶ <https://oklahoma.gov/content/dam/ok/en/occ/documents/og/api-glossary.pdf>

⁸⁷ <https://oklahoma.gov/content/dam/ok/en/occ/documents/og/api-glossary.pdf>

⁸⁸ <https://oklahoma.gov/content/dam/ok/en/occ/documents/og/api-glossary.pdf>

⁸⁹ <https://oklahoma.gov/content/dam/ok/en/occ/documents/og/api-glossary.pdf>

⁹⁰ <https://oklahoma.gov/content/dam/ok/en/occ/documents/og/api-glossary.pdf>

⁹¹ <https://oklahoma.gov/content/dam/ok/en/occ/documents/og/api-glossary.pdf>

BLOWOUT PREVENTER (BOP) - The equipment installed at the wellhead for the purpose of controlling pressures in the annular space between the casing and drill pipe (or tubing) during drilling, completion and certain workover operations. (ITOGP)⁹²

BOTTOM-HOLE - The lowest or deepest part of a borehole. (Bul D20, ITOGP, WLOP)⁹³

BRINE - Water saturated with or containing a high concentration of common salt (sodium chloride); hence, any strong saline solution containing such other salts as calcium chloride, zinc chloride, calcium nitrate, etc. (Bul D11)⁹⁴

BULLHEAD SQUEEZE – The process by which hydraulic pressure is applied to a well to force fluid such as cement outside the wellbore. Annular flow (returns) is prevented by a packer set in the casing above the perforation and/or in open hole. (RP 57)⁹⁵

CABLE-TOOL DRILLING – A method of drilling a well by allowing a weighted bit at the bottom of a cable to fall against the formation being penetrated. See Rotary Drilling. (Bul 10C)⁹⁶

CALIPER LOG – A record of the diameter of the wellbore or the internal diameter of tubular goods. The log indicates undue enlargement of the wellbore due to caving, washout, or other causes. (WLOP)⁹⁷

CASING – Pipe installed in the wellbore and usually cemented in place to retain the borehole dimension and seal off hydrocarbon and water-bearing formations. (RP54)⁹⁸

CASING STRING – The pipe run in a well, for example: surface string, intermediate string, production string, etc. (ITOGP)⁹⁹

⁹² <https://oklahoma.gov/content/dam/ok/en/occ/documents/og/api-glossary.pdf>

⁹³ <https://oklahoma.gov/content/dam/ok/en/occ/documents/og/api-glossary.pdf>

⁹⁴ <https://oklahoma.gov/content/dam/ok/en/occ/documents/og/api-glossary.pdf>

⁹⁵ <https://oklahoma.gov/content/dam/ok/en/occ/documents/og/api-glossary.pdf>

⁹⁶ <https://oklahoma.gov/content/dam/ok/en/occ/documents/og/api-glossary.pdf>

⁹⁷ <https://oklahoma.gov/content/dam/ok/en/occ/documents/og/api-glossary.pdf>

⁹⁸ <https://oklahoma.gov/content/dam/ok/en/occ/documents/og/api-glossary.pdf>

⁹⁹ <https://oklahoma.gov/content/dam/ok/en/occ/documents/og/api-glossary.pdf>

CELLAR – Excavation around the wellhead to provide space for items of equipment at the top of the wellbore. It also serves as a pit to collect drainage of water and other liquids. (RP 54)¹⁰⁰

CEMENT – API Classes – Cement (Classes A through J) meeting the applicable requirements of API Spec 10. ASTM Types – Cement (Types I through V) meeting the applicable requirements of Standard Specifications for Portland Cement ASTM C150. Common, Regular or Ordinary – A cement intended for use under conditions not requiring moderate to high sulfate resistance. Corresponds to API Class A or Class C which are similar to ASTM Type I or Type III cements, respectively. Construction – See Common, Regular or Ordinary. Gel Cement – A cement or cement slurry that has been modified by the addition of bentonite. Gypsum Cement – Composed primarily of the hemihydrate form of calcium sulfate, $\text{CaSO}_4 - 1/2\text{H}_2\text{O}$ (Plaster of Paris) High Alumina – See Calcium Aluminate Cement. High Early – (a) – API Class C cement; (b) ASTM Type III cement. High Temperature – A cement designed to overcome strength retrogression within the temperature limits designated by the supplier. Hydraulic Cement – A cement that sets and hardens by chemical interaction with water and that is capable of doing so under water. Modified Cement – A cement whose properties, chemical or physical, have been altered by additives. This term has been used to refer to specific formulations of gel cement containing certain concentrations of dispersing agent. Neat – A cement paste or slurry containing no additives. Well – Cement or mixture of cement with other materials that is intended for use in oil, gas, geothermal or water wells. Ordinary – See Common, Ordinary or Regular Cement. Portland – Hydraulic cement produced by pulverizing clinkers consisting essentially of hydraulic calcium silicates and usually containing one or more of the forms of calcium sulfate as an interground addition. Portland-Blast Furnace Slag – An intimate and uniform blend of Portland cement (or clinker) and fine granulated blast furnace slag in which the amount of slag is within specified limits. Portland-Pozzolan – A hydraulic cement consisting of an intimate and uniform blend of Portland cement or portland blast furnace slag cement and fine pozzolan produced by intergrinding portland cement clinker and pozzolan, by blending portland cement or portland blast furnace slag cement and finely divided pozzolan, or a combination of intergrinding and blending, in which the amount of the pozzolan constituent is within specified limits. Regular – See Common Ordinary or Regular Cement. Retarded Cement – A cement in which the thickening time is extended by adding a chemical retarder. Slag Cement – See Granulated Blast Furnace Slag. Slow-Set Cement – A cement in which the thickening time is extended by (1) eliminating the rapid hydrating components in its composition or (2) by adding a chemical retarder. API Classes D, E, and F are slow-set cements. Sulfate-Resistant Cement – Cements which meet applicable requirements of API Spec 10. Weighted Cement – A cement slurry containing additives to increase its normal density. (Bul 10C) CEMENT – A mixture of calcium aluminates and silicates made by combining lime and clay while heating. Slaked cement contains about 62.5 percent calcium hydroxide, which is the major source of trouble when cement contaminates drilling fluids. (Bul D11)¹⁰¹

CEMENT BOND LOG – A well log of the vibrations of an ultrasonic acoustical signal as it passes through a four phase system of fluid, pipe, cement and formation. If the pipe is not

¹⁰⁰ <https://oklahoma.gov/content/dam/ok/en/occ/documents/og/api-glossary.pdf>

¹⁰¹ <https://oklahoma.gov/content/dam/ok/en/occ/documents/og/api-glossary.pdf>

acoustically coupled tightly with a dampening material such as cement, very little energy of the acoustical signal is lost. If the cement is bonded or acoustically coupled tight to the pipe, the energy is extremely dampened and the signal nearly disappears, thereby indicating that the casing is well cemented. The log may consist of (1) a collar log, (2) a transit time curve recording the time of the first arrival of the acoustical signal, (3) an amplitude curve which represents the amplitude of a selected portion of the acoustical wave, and (4) a display of the acoustical wave as x-y signatures or a variable density version of the signatures. (Bul 10C)¹⁰²

CEMENT PLUG – A portion of cement placed at some point in the wellbore to effect a sealing action. (WLOP)¹⁰³

CEMENTING – The process of pumping a cementitious slurry into a well through steel pipe to critical points in the annulus or open hole. Cementing is performed to isolate different zones in the well, protect the pipe from corrosive fluids, support the pipe in the hole, or repair previous cement jobs. (Bul 10C)¹⁰⁴

CONDUCTOR PIPE – A relatively short string of large diameter pipe which is set to keep the top of the hole open and provide a means of returning the upflowing drilling fluid from the wellbore to the surface drilling fluid system until the first casing string is set in the well. Conductor pipe may also be used in well control. Conductor pipe is usually cemented. (RP 53, RP 54)¹⁰⁵

CUTTINGS – Small pieces of formation that are the result of the chipping and/or crushing action of the bit. See Samples. (Bul 10C, Bul D11)¹⁰⁶

DEAD WELL – A well which has ceased to produce oil or gas, either temporarily or permanently. (ITOGP)¹⁰⁷

DERRICK – A semipermanent structure of square or rectangular cross-section having members that are latticed or trussed on all four sides. This unit must be assembled in the vertical or operation position, as it includes no erection mechanism. It may or may not be guyed. (Spec 4F)¹⁰⁸

¹⁰² <https://oklahoma.gov/content/dam/ok/en/occ/documents/og/api-glossary.pdf>

¹⁰³ <https://oklahoma.gov/content/dam/ok/en/occ/documents/og/api-glossary.pdf>

¹⁰⁴ <https://oklahoma.gov/content/dam/ok/en/occ/documents/og/api-glossary.pdf>

¹⁰⁵ <https://oklahoma.gov/content/dam/ok/en/occ/documents/og/api-glossary.pdf>

¹⁰⁶ <https://oklahoma.gov/content/dam/ok/en/occ/documents/og/api-glossary.pdf>

¹⁰⁷ <https://oklahoma.gov/content/dam/ok/en/occ/documents/og/api-glossary.pdf>

¹⁰⁸ <https://oklahoma.gov/content/dam/ok/en/occ/documents/og/api-glossary.pdf>

ELECTRIC LOGGING – Electric logs are run on a wireline to obtain information concerning the porosity, permeability, fluid content of the formations drilled, and other information. The drilling-fluid characteristics may need to be altered to obtain good logs. (Bul D11)¹⁰⁹

FISHING – Operations on the rig for the purpose of retrieving from the wellbore sections of pipe, collars, junk, or other obstructive items which are in the hole. (Bul D11)¹¹⁰

FISHING TOOL – A tool designed to recover equipment (lost or left) from the well. (WLOP)¹¹¹

FORMATION PRESSURE – The pressure exerted by fluids in a formation, recorded in the hole at the level of the formation with the well shut in. Formation pressure may also be termed “reservoir pressure,” or “shut-in bottom-hole pressure.” (WLOP)¹¹²

HYDRAULIC FRACTURING – The act of pumping fluid(s) into a wellbore and into a specific formation to induce fractures. (RP 54)¹¹³

HYDROGEN SULFIDE – A flammable, toxic gas which is slightly heavier than air and sometimes found in fluids encountered in oil, gas, and service well drilling operations. Inhalation at certain concentrations can lead to injury or death. (RP 49)¹¹⁴

IMPRESSION BLOCK – A block with lead or another relatively soft material on the bottom. The block may be made up on drill pipe, tubing, or wireline at the surface, run into a well, and allowed to rest on a tool or other object that has been lost in the well. On retrieval to the surface, an idea of the size, shape and position of the “fish” is obtained from an examination of the impression left in the lead. This helps in selecting the appropriate fishing tools. (WLOP)¹¹⁵

¹⁰⁹ <https://oklahoma.gov/content/dam/ok/en/occ/documents/og/api-glossary.pdf>

¹¹⁰ <https://oklahoma.gov/content/dam/ok/en/occ/documents/og/api-glossary.pdf>

¹¹¹ <https://oklahoma.gov/content/dam/ok/en/occ/documents/og/api-glossary.pdf>

¹¹² <https://oklahoma.gov/content/dam/ok/en/occ/documents/og/api-glossary.pdf>

¹¹³ <https://oklahoma.gov/content/dam/ok/en/occ/documents/og/api-glossary.pdf>

¹¹⁴ <https://oklahoma.gov/content/dam/ok/en/occ/documents/og/api-glossary.pdf>

¹¹⁵ <https://oklahoma.gov/content/dam/ok/en/occ/documents/og/api-glossary.pdf>

INTERMEDIATE CASING STRING – The casing set in a well after the surface casing. Also called PROTECTION CASING. (ITOGP)¹¹⁶

INTRINSICALLY SAFE SYSTEM – An electrical system which is incapable of releasing sufficient electrical or thermal energy under normal or abnormal conditions to cause ignition of a specific hazardous atmospheric mixture in its most easily ignitable concentration. (RP 14F)¹¹⁷

KILL A WELL – To stop a well from producing so that surface connections may be removed for well servicing or workover. It is usually accomplished by circulating water or mud to load the hole and render it incapable of flowing. (ITOGP)¹¹⁸

KILL LINE – A line connected to the annulus below the blowout preventers for the purpose of pumping into the annulus while the preventers are closed. (Bul D11)¹¹⁹

KILL WEIGHT FLUID – A fluid whose density creates a hydrostatic pressure equal or greater than the pressure of the formation exposed to the wellbore. (RP 57)¹²⁰

LEL – Lower Explosive Limit.¹²¹

LINER – Any string of casing whose top is situated at any point below the surface. (Bul 10C)¹²²

LOST CIRCULATION MATERIAL (LCM) – A material added to cement slurries or drilling fluids which is designed to prevent the loss of cement or mud to the formation. See Bridging Material. (Bul 10C)¹²³

MAGNETOMETER – A device for measuring the strength of magnets or magnetic fields. Also known as a Gaussmeter. (RP 5A5)¹²⁴

¹¹⁶ <https://oklahoma.gov/content/dam/ok/en/occ/documents/og/api-glossary.pdf>

¹¹⁷ <https://oklahoma.gov/content/dam/ok/en/occ/documents/og/api-glossary.pdf>

¹¹⁸ <https://oklahoma.gov/content/dam/ok/en/occ/documents/og/api-glossary.pdf>

¹¹⁹ <https://oklahoma.gov/content/dam/ok/en/occ/documents/og/api-glossary.pdf>

¹²⁰ <https://oklahoma.gov/content/dam/ok/en/occ/documents/og/api-glossary.pdf>

¹²¹ <https://oklahoma.gov/content/dam/ok/en/occ/documents/og/api-glossary.pdf>

¹²² <https://oklahoma.gov/content/dam/ok/en/occ/documents/og/api-glossary.pdf>

¹²³ <https://oklahoma.gov/content/dam/ok/en/occ/documents/og/api-glossary.pdf>

¹²⁴ <https://oklahoma.gov/content/dam/ok/en/occ/documents/og/api-glossary.pdf>

MANIFOLD – An accessory system of valves and piping to a main piping system (or other conductors) that serves to divide a flow into several parts, to combine several flows into one, or to reroute a flow to any one of several possible destinations. (ITOGP)¹²⁵

MINE STRING - “Mine string” means a string of casing set and cemented to isolate a mine void, rubble zone, or a mined seam.

Source: Division of Mineral Resources Management – Oil and Gas, Ohio Administrative Code, Chapter 1501:9, January 2012. Regulations¹²⁶

OPEN HOLE – Uncased part of the wellbore. (RP 54)¹²⁷

PACKER – An expandable plug-like device for sealing off the annular space between the well’s tubing and the casing. (ITOGP)¹²⁸

PERFORATING – The act of making holes in pipe, cement, or formulation at desired depths (usually formed with an explosive device utilizing bullets or shaped charges). (RP 54)¹²⁹

PLUG AND ABANDON (P & A) – To place a cement plug or plugs in a dry hole or uneconomic producing well to abandon it. (WLOP)¹³⁰

PORTS – The openings in a centrifuge for entry or exit of materials. Usually applied in connection with a descriptive term, i.e., feed ports, overflow ports, etc. (Bul 13C)¹³¹

POTABLE WATER - A water supply that is acceptably pure for human consumption. Note: On an offshore rig, it is usually produced by water makers and used as supply water for mixing control fluid for a subsea control system.

¹²⁵ <https://oklahoma.gov/content/dam/ok/en/occ/documents/og/api-glossary.pdf>

¹²⁶ <https://iadclexicon.org/mine-string/#:~:text=%E2%80%9CMine%20string%E2%80%9D%20means%20a%20string,1501%3A9%2C%20January%202012.>

¹²⁷ <https://oklahoma.gov/content/dam/ok/en/occ/documents/og/api-glossary.pdf>

¹²⁸ <https://oklahoma.gov/content/dam/ok/en/occ/documents/og/api-glossary.pdf>

¹²⁹ <https://oklahoma.gov/content/dam/ok/en/occ/documents/og/api-glossary.pdf>

¹³⁰ <https://oklahoma.gov/content/dam/ok/en/occ/documents/og/api-glossary.pdf>

¹³¹ <https://oklahoma.gov/content/dam/ok/en/occ/documents/og/api-glossary.pdf>

Source: *API SPEC 16D, Specification for Control Systems for Drilling Well Control Equipment and Control Systems for Diverter Equipment, Upstream Segment, Second Edition, July 2004. Global Standards*¹³²

PRODUCTION CASING – Full length pipe string extending between the wellhead and elevation at or below pay formation inside of protective or surface casing and cemented in place to seal off productive zones and water-bearing formations. (RP 54)¹³³

RAT HOLE (1) – Hole that is drilled ahead of the main wellbore and which is of a smaller diameter than the bit used in the main borehole (refer to “Pilot Bit”). (Bul D20)¹³⁴

SHOE (CASING SHOE) - A short, heavy cylindrical section of steel, filled with cement, which is placed at the end (bottom) of the casing string. It prevents the casing from snagging on irregularities in the borehole as it is lowered. A passage through the center of the shoe allows drilling fluid to pass up into the casing while it is being lowered and allows cement to pass through and circulate behind the casing during cementing operations. Also called the guide shoe. When running casing in deeper wells, a float collar is run in addition to a guide shoe.

Source: *API BULLETIN E3, Environmental Guidance Document: Well Abandonment and Inactive Well Practices for U.S. Exploration and Production Operations, First Edition, January 1993 (Reaffirmed June 2000). Global Standards*¹³⁵

SIDE TRACKING – Usually drilling past an obstacle which has become permanently lodged in the hole. (Bul 10C)¹³⁶

SQUEEZE CEMENTING – The process of forcing cementing material under pressure into a specific portion of a well, such as fractures, openings, or permeable zones.

Hesitation-Squeeze Cementing – The process of forcing cementing material under pressure into the points to be squeezed with a final pressure equal to or greater than the formation breakdown pressure and with a final temperature equal to the bottom hole static temperature.

High Pressure Squeeze Cementing – The forcing of cement slurry into the desired position with a final pressure equal to or greater than the formation fracture pressure.

¹³² <https://iadclexicon.org/potable-water/>

¹³³ <https://oklahoma.gov/content/dam/ok/en/occ/documents/og/api-glossary.pdf>

¹³⁴ <https://oklahoma.gov/content/dam/ok/en/occ/documents/og/api-glossary.pdf>

¹³⁵ <https://iadclexicon.org/casing-shoe/>

¹³⁶ <https://oklahoma.gov/content/dam/ok/en/occ/documents/og/api-glossary.pdf>

Low Pressure Squeeze Cementing – The forcing of cement slurry into the desired position with a pressure less than the formation fracture pressure. (Bul 10C)¹³⁷

SURFACE CASING – Outside and first casing string installed in the wellbore, except for drive pipe or conductor pipe, to seal off surface sands and provide blowout protection and prevent loss of circulation while drilling deeper. (RP 54)¹³⁸

SWAGE NIPPLE – A pipe fitting having external threads of one size on one end and a different size on the other end. (WLOP)¹³⁹

SYSTEM, FLARE – A system for discharging gas through a control valve from a pressurized system to the atmosphere during normal operations. This discharge may be either continuous or intermittent, and may or may not be ignited. (RP 2G)¹⁴⁰

TD – Total depth. The maximum depth drilled. (WLOP)¹⁴¹

TEMPERATURE SURVEY – An operation to determine temperatures at various depths in the wellbore. This survey is used to determine the height of cement behind the casing when there is doubt as to the height, to find the location of water influx into the wellbore, and for other reasons. Wireline equipment may be used. (WLOP)¹⁴²

TUBING – Pipe installed in the wellbore inside all casing strings and extending from the wellhead to an elevation at or above the formation, and through which formation fluids normally are transported to the surface. (RP 54)¹⁴³

VACUUM – Pressure in a process component less than atmospheric pressure. (RP 14C)¹⁴⁴

WAITING ON CEMENT – The time necessary for the cement to set or harden in the well bore (abbr. W.O.C.). (Bul D20)¹⁴⁵

¹³⁷ <https://oklahoma.gov/content/dam/ok/en/occ/documents/og/api-glossary.pdf>

¹³⁸ <https://oklahoma.gov/content/dam/ok/en/occ/documents/og/api-glossary.pdf>

¹³⁹ <https://oklahoma.gov/content/dam/ok/en/occ/documents/og/api-glossary.pdf>

¹⁴⁰ <https://oklahoma.gov/content/dam/ok/en/occ/documents/og/api-glossary.pdf>

¹⁴¹ <https://oklahoma.gov/content/dam/ok/en/occ/documents/og/api-glossary.pdf>

¹⁴² <https://oklahoma.gov/content/dam/ok/en/occ/documents/og/api-glossary.pdf>

¹⁴³ <https://oklahoma.gov/content/dam/ok/en/occ/documents/og/api-glossary.pdf>

¹⁴⁴ <https://oklahoma.gov/content/dam/ok/en/occ/documents/og/api-glossary.pdf>

¹⁴⁵ <https://oklahoma.gov/content/dam/ok/en/occ/documents/og/api-glossary.pdf>

WEIGHTING MATERIAL – A material which when added to a cement slurry increases the density of the slurry. (Bul 10C)¹⁴⁶

WELL SERVICING RIG – Equipment and machinery assembled primarily for the purpose of any well work involving pulling or running tubulars or sucker rods, to include but not limited to, redrilling, completing, recompleting, workover, sucker rod or tubing pulling, and abandoning operations. (RP 54)¹⁴⁷

WELLHEAD – As assembly of valves and fittings used for control of the flow from a producing well or to an injection well. A wellhead usually includes a casing head, tubing head, master valve(s), wing valve or choke may be included. Offshore structures usually include several wellheads. (RP 2G)¹⁴⁸

WORK-OVER – To perform one or more of a variety of remedial operations on a producing well with the hope of restoring or increasing production. (Bul 10C)¹⁴⁹

UNDERGROUND SOURCES OF DRINKING WATER (USDW) - An underground source of drinking water (USDW) is an aquifer or a part of an aquifer that is currently used as a drinking water source. A USDW may also be ground water needed as a drinking water source in the future. A USDW is defined in the Code of Federal Regulations (40 CFR 144.3) as:

an aquifer or its portion: (a)(1) Which supplies any public water system; or (2) Which contains a sufficient quantity of ground water to supply a public water system; and (i) Currently supplies drinking water for human consumption; or (ii) Contains fewer than 10,000 mg/l total dissolved solids; and (b) Which is not an exempted aquifer.¹⁵⁰

ZONE – A term used to distinguish different rock strata (e.g., shale zone, sand zone, pay zone, etc.) (RP 57)¹⁵¹

¹⁴⁶ <https://oklahoma.gov/content/dam/ok/en/occ/documents/og/api-glossary.pdf>

¹⁴⁷ <https://oklahoma.gov/content/dam/ok/en/occ/documents/og/api-glossary.pdf>

¹⁴⁸ <https://oklahoma.gov/content/dam/ok/en/occ/documents/og/api-glossary.pdf>

¹⁴⁹ <https://oklahoma.gov/content/dam/ok/en/occ/documents/og/api-glossary.pdf>

¹⁵⁰ <https://www.epa.gov/uic/general-information-about-injection-wells#:~:text=An%20underground%20source%20of%20drinking%20water%20source%20in%20the%20future.>

¹⁵¹ <https://oklahoma.gov/content/dam/ok/en/occ/documents/og/api-glossary.pdf>

APPENDIX B

Appendix B: Reference Documents

Act S.1076, which may be cited as the “Revive Economic Growth and Reclaim Orphaned Wells Act of 2021” or the “Regrow Act of 2021. 117th Congress 1st Session in the Senate of the United States, April 12, 2021; <https://www.congress.gov/117/bills/s1076/BILLS-117s1076is.pdf>

ALBERTA ENERGY REGULATOR:

Directive 020 Well Abandonment; Alberta Energy Regulator; September 5, 2023
<https://static.aer.ca/prd/documents/directives/Directive020.pdf>

AMERICAN PETROLEUM INSTITUTE (API):

API Recommended Practice (RP) 65-3, *Wellbore Plugging and Abandonment, First Edition, 2021*

This document provides guidance for the design, placement and verification of cement plugs used in wells that will be temporarily or permanently closed, as well as for well remediation and verification of annular barriers, reinforcing groundwater protection and emissions retention.

API Specification 10-A, *Cements and Materials for Well Cementing, Twenty-fifth Edition, Includes Addendum 1 (2019) and Addendum 2 (2022)*

Specification 10-A outlines requirements and recommendations for well cements, as well as their chemical and physical requirements, and procedures for physical testing.

Glossary of Oilfield Production Terminology (GOT) (DEFINITIONS AND ABBREVIATIONS) FIRST EDITION, JANUARY 1, 1988 American Petroleum Institute 1220 L Street, Northwest Washington, DC 20005

DRILLING AND COMPLETION COMMITTEE (DACC)

IRP 26: Wellbore Remediation; An Industry Recommended Practice (IRP) for the Canadian Oil and Gas Industry; Volume 26 – 2020; Edition 1; Sanction Date: November 17, 2020; Copyright held by Energy Safety Canada, 2020; Energy Safety Canada; Unit 150 – 2 Smed Lane; Calgary, AB T2C 4T5; Phone: 800-667-5557 or 403-516-8000; Fax: 403-516-8166; www.energysafetycanada.com;

<https://www.energysafetycanada.com/Resource/DACC-IRP-Volumes/DACC-IRP-VOLUME-26-WELLBORE-REMEDIATION>

IRP 27: Wellbore Decommissioning; An Industry Recommended Practice (IRP) for the Canadian Oil and Gas Industry; Volume 27 – 2022; Edition 1; Sanction Date: February 2022; Copyright held by Energy Safety Canada, 2020; Energy Safety Canada; Unit 150 – 2 Smed Lane; Calgary, AB T2C 4T5; Phone: 800-667-5557 or 403-516-8000; Fax: 403-516-8166; www.energysafetycanada.com;

<https://www.energysafetycanada.com/Resource/DACC-IRP-Volumes/DACC-IRP-VOLUME-27-WELLBORE-DECOMMISSIONING>

GROUND WATER PROTECTION COUNCIL (GWPC):

Well Integrity Regulatory Elements for Consideration; Ground Water Protection Council (GWPC); January 2021; https://www.gwpc.org/wp-content/uploads/2021/03/Well_Integrity_Elements_Revised_1_19_2021_002.pdf

State Oil and Natural Gas Regulations Designed to Protect Water Resources; Ground Water Protection Council (GWPC); Fourth Edition 2023; <https://www.gwpc.org/wp-content/uploads/2023/05/State-Regulations-Report-2021-Published-May-2023-FINAL.pdf>

INTERSTATE OIL & GAS COMPACT COMMISSION (IOGCC):

Idle and Orphan Oil and Gas Wells: State and Provincial Regulatory Strategies 2021; IOGCC https://oklahoma.gov/content/dam/ok/en/iogcc/documents/news/iogcc_idle_and_orphan_wells_2021_final_web_0.pdf

IDLE AND ORPHAN OIL AND GAS WELLS: State and Provincial Regulatory Strategies Supplemental Information on State Prioritization Systems for Orphan Wells; IOGCC https://oklahoma.gov/content/dam/ok/en/iogcc/documents/publications/prioritization_report_7.10.23.pdf

Glossary of Oilfield Production Terminology (GOT) (DEFINITIONS AND ABBREVIATIONS) FIRST EDITION, JANUARY 1, 1988 American Petroleum Institute 1220 L Street, Northwest Washington, DC 20005 <https://oklahoma.gov/content/dam/ok/en/occ/documents/og/api-glossary.pdf>

NORSOK D-010:2021; Well Integrity in Drilling and Well Operations; Standard by NORSOK; 12/23/2021

This document defines the minimum functional and performance requirements for well barriers through the life cycle of a well.

SOCIETY OF PETROLEUM ENGINEERS (SPE) ENERGY STREAM:

Idle & Orphan Wells — Addressing Integrity Concerns with New P & A Technologies & Methods; This webinar is a collaboration between SPE, the Interstate Oil & Gas Compact Commission (IOGCC), and the Environmental Defense Fund (EDF)

<https://streaming.spe.org/course-idle-orphan-wells-addressing-integrity-concerns-with-new-p-a-technologies-methods>

APPENDIX C

Appendix C: State and Provincial Orphan Well Definitions¹⁵²

Blank fields indicate that no data was reported or available.

State or Province	Orphan / Abandoned Well Definition	Statutory or Regulatory Authority	Contact Information ¹⁵³
Alabama	Alabama does not statutorily define an orphan well per se but addresses abandoned wells.	Rule 400-1-4-.14 and 400-1-4-.17 Offshore wells: Rule 400-2-4-.11 and 400-2-4-.14 Coalbed methane: Rule 400-3-4-.14 and 400-3-4-.17	Agency regulating oil and gas exploration/production: State Oil and Gas Board, 420 Hackberry Lane, P.O. Box 869999, Tuscaloosa, AL 354866999. Phone: (205) 349-2852; Fax: (205) 349-2861.
Alaska	Alaska does not have a formal definition of “orphan well.” The AOGCC uses the informal definition for “orphan well” as a well that has not been properly plugged and abandoned and an operator responsible for the well cannot be determined/ found.	Regulation 20 AAC 25.110 and 20 AAC 25.115	Agency regulating oil and gas exploration/production: Alaska Oil & Gas Conservation Commission, 333 W. 7th Ave., Anchorage, AK 99501. Phone: (907) 279-1433. Fax: (907) 276-7542.
Arizona			Agency regulating oil and gas exploration/production: Oil and Gas Conservation Commission, 1110 W. Washington Street, Phoenix, Arizona 85007. Phone: (602) 771-4501. Fax: (602) 771-2299.
Arkansas	A well where the operator/permittee is unknown or cannot be located and the well is not covered by financial assurance of any type as defined by AOGC rules; or the operator/permittee has not paid the annual Abandoned and Orphaned Well Plugging Program fee on the well.	AOGC General Rules B-7, H-2 and H-3	Agency regulating oil and gas exploration/production: Arkansas Oil and Gas Commission, 301 Natural Resources Drive, Suite 102, Little Rock, AR 72205. Phone: (501) 683-5814.
California	California utilizes several terms to describe orphan wells. “Deserted” wells are wells for which a final plugging and abandonment order has been issued, but a determination of financial resources held by a current or prior operators has not yet been completed. “Orphan wells” are wells that have no responsible party, leaving the state to plug and abandon them. California statute differentiates between two types of orphan wells: idle-deserted wells and hazardous wells. An “idle- deserted well” is defined as a deserted well for which there is no operator responsible for its plugging and abandonment. A “hazardous well” is defined as an oil and gas	Public Resources Code sections 3206, 3206.1, 3206.3, 3206.5, 3237, 3250, 3251, 3251.5 and 3258. California Code of Regulations, title 14, sections 1760, 1772-1772.4, and 1772.6-1772.7	Agency regulating oil and gas exploration/production: California Department of Conservation, Division of Oil, Gas, and Geothermal Resources; 801 K Street, MS 18-05, Sacramento, CA 95814-3530. Phone: (916) 445-9686.

¹⁵² Data provided by Interstate Oil & Gas Compact Commission; Idle and Orphan Oil and Gas Wells: State and Provincial Regulatory Strategies 2021 publication; https://oklahoma.gov/content/dam/ok/en/iogcc/documents/news/iogcc_idle_and_orphan_wells_2021_final_web_0.pdf

¹⁵³ Data provided by Interstate Oil & Gas Compact Commission; <https://oklahoma.gov/iogcc/member-states/state-statutes.html>

State or Province	Orphan / Abandoned Well Definition	Statutory or Regulatory Authority	Contact Information ¹⁵³
	well determined by the Supervisor to be a potential danger to life, health, or natural resources and for which there is no operator determined by the Supervisor to be responsible for its plugging and abandonment.		
Colorado	Orphan well means a well for which no owner or operator can be found, or where the owner or operator is unwilling or unable to plug and abandon the well. Orphaned site means a site where a significant adverse environmental impact may be or has been caused by oil and gas operations for which no responsible party can be found, or where the responsible party is unwilling or unable to mitigate the impact.	Oil and Gas Conservation Act, C.R.S. Title 34-Article 60; 100-Series, 400-Series, 700-Series, and 1100-Series Rules Last update: January 15, 2021	Agency regulating oil and gas exploration/production: Oil and Gas Conservation Commission, 1120 Lincoln St., Suite 801, Denver, CO 80203. Phone: (303) 8942100. Statutory Authority: Oil and Gas Conservation Act, § 34-60-101 C.R.S. ("Act"). Rules: 2 CCR 404-1 ("Rule" or "Rules")
Idaho	"Orphan wells" are defined as idle wells for which the operator is unknown or insolvent.	IDAPA 20.07.02.220, IDAPA 20.07.02.320, IDAPA 20.07.02.501	Agency regulating oil and gas exploration/production: Idaho Department of Lands (IDL), Idaho Oil and Gas Conservation Commission. 300 N. 6th St., Suite 103, Boise, Idaho 83702
Illinois	A well has not produced and for which no fee has been paid or no bond coverage provided for two consecutive years; and no permittee or owner can be identified or located. Orphaned wells include wells for which an oil and gas well permit is not required if the well is a conduit for oil or saltwater intrusions into freshwater zones or onto the surface which may be caused by oil and gas operations.	Production Wells – 62 Ill. Adm. Code Section 240.1130 (Amended at 42 Ill. Reg. 5811, effective March 14, 2018) Class II UIC Wells – 62 Ill. Adm. Code Section 240.1132 (Amended at 42 Ill. Reg. 5811, effective March 14, 2018)	Official name of agency regulating oil/gas exploration & production: Department of Natural Resources, Office of Oil and Gas Resource Management, One Natural Resources Way, Springfield, IL 62702-1271. Phone (217) 782-7756.
Indiana	Indiana defines orphan wells as units that are not producing and for which no financially responsible party exists.	Citation: 312 IAC 29-33-4	Agency regulating oil and gas exploration/production: Division of Oil and Gas, 402 West Washington Street, Room W293, Indianapolis, IN 46204. Phone: (317) 232-4055.
Kansas	Kansas uses the term "abandoned well," defined as a well that is not claimed on an operator's license that is active with the commission and is unplugged, improperly plugged or no longer effectively plugged.	K.A.R. 82- 3-111	Agency regulating oil and gas exploration/production: Kansas Corporation Commission, Conservation Division, 266 N. Main St., Ste. 220, Wichita, KS 67202-1513. Phone: (316) 337-6200.
Kentucky	"Orphan well" means any oil or gas well which has been determined by the Energy and Environment Cabinet to be improperly abandoned or improperly closed, and that: (1) predates the permitting requirements enacted in 1960, or (2) has no known history of permitting or bonding; and (1) has no known responsible owner or operator or (2) all responsible owners or operators are determined to be financially insolvent.	KRS 353.560, KRS 353.562-564, KRS 353.588, KRS 353.590, 805 KAR 1:060	Agency regulating oil and gas exploration/production: Division of Oil and Gas, 300 Sower Blvd , Frankfort, KY . 40601. Phone: (502) 573-0147. Fax: 502-564-4245
Louisiana	"Orphan wells" are defined as idle wells for which the operator is unknown or insolvent. Orphaned oilfield site means an oilfield site	R.S. 43:XIX:101 and 137	Agency regulating oil and gas exploration/production: Office of Conservation. Main Phone

State or Province	Orphan / Abandoned Well Definition	Statutory or Regulatory Authority	Contact Information ¹⁵³
	which has no continued useful purpose for the exploration, production, or development of oil or gas and which has been declared to be an orphaned oilfield site by the Assistant Secretary.		(225) 342-5540 Fax (225) 342-3705 Physical Address 617 North Third Street LaSalle Building, 9th Floor Baton Rouge, Louisiana 70802 Mailing Address P.O. Box 94275 Baton Rouge, Louisiana 70804
Maryland			Agency regulating oil and gas exploration/production: Maryland Department of the Environment, Land Management Administration, Minerals, Oil and Gas Division, 1800 Washington Blvd., Baltimore, MD 21230.
Michigan	An abandoned or improperly closed well for which no owner or operator is known, or for which all owners or operators are insolvent.	Natural Resources and Environmental Protection Act, Act No. 451 of the Public Acts of 1994, as amended - Part 615, Supervisor of Wells and the Administrative Rules and Part 616 Orphan Well Fund	Agency regulating oil and gas exploration/production: Oil, Gas, and Minerals Division, Department of Environmental Quality, P.O. Box 30256, Lansing, Michigan 48909-7756. Phone: (517) 284-6823.
Mississippi	Mississippi defines "orphan well" as an oil or gas well, including Class II wells, which has not been properly plugged and for which a responsible party cannot be located or for which there is no other party which can be directed to plug the well.	Statewide rules 28 and 53	Agency regulating oil and gas exploration/production: State Oil and Gas Board. 500 Greymont Ave., Suite E, Jackson, MS 39202. Phone (601) 576-4900; Fax (601) 352-2201
Missouri			Agency regulating oil and gas exploration/production: State Oil and Gas Council administered through the Geological Survey Program, P. O. Box 250, Rolla, MO 65402. Phone: (573) 368-2143.
Montana	"Orphan wells" are defined as idle wells for which the operator is unknown or insolvent.	ARM 36.22.1303 Well Plugging Requirement Last Update: 1998 ARM 36.22.1240 Report of Well Status Change Last Update: 1993 ARM 36.22.1242 Reports by Producers Last Update: 1993	State agency: Board of Oil and Gas Conservation, P.O. Box 217, Helena, MT 59624. Phone (406) 449-2622. Technical Office: 2535 St. Johns Avenue, Billings, MT 59102, Phone (406) 656-0040. Northern Field Office: 218 Main Street, P.O. Box 690, Shelby, MT 59474, Phone (406) 434-2422.
Nebraska	"Orphan wells" are defined as idle wells for which the operator is unknown or insolvent.	Rules, Chapter 3-040	Agency regulating oil and gas exploration/production: Nebraska Oil and Gas Conservation Commission, P.O. Box 399, Sidney, NE 69162. Phone: (308) 254-6919.

State or Province	Orphan / Abandoned Well Definition	Statutory or Regulatory Authority	Contact Information ¹⁵³
			Web site http://www.nogcc.ne.gov .
Nevada	“Orphan wells” are defined as idle wells for which the operator is unknown or insolvent.	NAC 522.430	Agency regulating oil and gas exploration/production: Nevada Commission on Mineral Resources, Division of Minerals, 400 W. King St., Suite 106, Carson City, NV 89703-4212. Phone: (775) 684-7040, Fax: (775) 684-7052.
New Mexico	Orphan well: This term is not expressly defined under New Mexico regulations. However, if a well has been inactive for one year, enforcement action is taken. If the operator fails to bring the well back into compliance, the well is deemed to be orphaned and the OCD may plug the well. If no funding is available from the operator or well financial assurance, the OCD can use the reclamation fund to plug the well and restore the site.	19.15.5 & 19.15.25 NMAC	Agency regulating oil and gas exploration/production: New Mexico Energy, Minerals and Natural Resources Department, Oil Conservation Division, 1220 S. St. Francis Drive, Santa Fe, NM 87505. Phone: (505) 476-3440, Fax: (505) 4763462.
New York	Working definition (not in statute or regulation): unplugged, abandoned wells that have not been operated and maintained in accordance with prevailing statute and regulation, and for which no existing owner can be determined.	(1) Environmental Conservation Law, Article 23; (2) Title 6 of the New York Codes, Rules, and Regulations (6 NYCRR 550-559)	Agency regulating oil and gas exploration/production: Department of Environmental Conservation (DEC), Division of Mineral Resources. DMN, Bureau of Oil and Gas Regulation 625 Broadway Albany, NY 12233 Phone: 518-402-8056 oilgas@dec.ny.gov
North Dakota	The person or company drilling or operating the well or equipment cannot be found, has no assets with which to properly plug or replug the well or reclaim the site, or cannot be legally required to plug or replug the well or to reclaim the site, pipeline or associated facilities.	North Dakota Century Code § 38-08-04, North Dakota Administrative Code § 43-02-03-55	Agency regulating oil and gas exploration/production: North Dakota Industrial Commission, Dept. of Mineral Resources, Oil and Gas Division, 600 East Boulevard Ave., Dept. 405, Bismarck, ND 58505-0840. Phone: (701) 328-8020.
Ohio	Ohio uses the term “Idle and orphaned well:” a well for which a bond has been forfeited or an abandoned well for which no money is available to plug the well.	Ohio Revised Code 1509.071 (orphan well)	Agency regulating oil and gas exploration/production: Department of Natural Resources, Division of Oil & Gas Resources Management, 2045 Morse Road, Building F, Columbus, OH 43229-6693. Phone: (614) 2656922. Ohio’s laws are found in Ohio Revised Code (O.R.C.) 1509 and Ohio Administrative Code (O.A.C.) 1501:9.
Oklahoma	Oklahoma does not have a specific definition; however, the Commission considers a well an orphan when the company is out of business and the state is left with the responsibility of plugging.	Oklahoma Administrative Code (OAC) Title 165: Corporation Commission Chapter 10: Oil and Gas	Agency regulating oil and gas exploration and production: Oklahoma Corporation Commission (Commission), Oil and Gas Conservation Division, Jim Thorpe Office Building, 2101 North Lincoln

State or Province	Orphan / Abandoned Well Definition	Statutory or Regulatory Authority	Contact Information ¹⁵³
		Conservation 165:10-11-3	Boulevard, Oklahoma City, Oklahoma 73105. The mailing address is P.O. Box 52000, Oklahoma City, Oklahoma 73152-2000. Telephone: (405) 521-2302. Fax: (405) 521-3099. Web: www.occeweb.com. The Commission's Oil and Gas Conservation Rules are contained in OAC (Oklahoma Administrative Code) 165:10-1-1, et seq., and its Rules of Practice appear in OAC 165:5-1-1, et seq.
Pennsylvania	"Orphan well" is defined as (1) an abandoned well or (2) a well abandoned prior to April 18, 1985, that has not been affected or operated by the present owner or operator and from which the present owner, operator or lessee has received no economic benefit other than as a landowner or recipient of a royalty interest from the well. Abandoned well: A well (1) that has not been used to produce, extract or inject any gas, petroleum or other liquid within the preceding 12 months; (2) for which equipment necessary for production, extraction or injection has been removed; or (3) considered dry and not equipped for production within 60 days after drilling, redrilling or deepening. The term does not include wells granted inactive status.	58 Pa.C.S. §§ 3203, 3213, 3214, 3220 and 3271	Official name of agency regulating oil/gas exploration & production: Pennsylvania Department of Environmental Protection, Office of Oil and Gas Management, P. O. Box 8765, Harrisburg, PA 17105-8765. Phone (717) 772-2199. (NOTE: Oil and gas activities in Pennsylvania are regulated specifically under several statutes and regulations, including but not limited to the following: Title 58 of the Pennsylvania Consolidated Statutes, 58 Pa.C.S. §§ 2301-3504 (Act 13); the Coal and Gas Resource Coordination Act, Act of December 18, 1984, No. 214, 58 P.S. §§ 501-518 (RCA), as amended; the Oil and Gas Conservation Law, Act of July 25, 1961, P.L. 825, 58 P.S. §§ 401-407 (OGCL.) and the Unconventional Well Report Act, Act of Oct. 22, 2014, P.L. 2853, No. 173, 58 P.S. §§ 1001 – 1004. More generally, oil and gas activities are also regulated under the Clean Streams Law (35 P.S. § 691.1, et seq.), the Solid Waste Management Act (SWMA) (35 P.S. § 6018.101, et seq.), the Dam Safety and Encroachments Act (32 P.S. § 693.1, et seq.), the Land Recycling and Environmental Remediation Standards Act (35 P.S. § 6026.101, et seq.), and the Radiation Protection Act (35 P.S. §§ 7110.101, et seq.). Regulations promulgated under

State or Province	Orphan / Abandoned Well Definition	Statutory or Regulatory Authority	Contact Information ¹⁵³
			these statutes are found at 25 Pa.Code Chapters 78, 78a and 79.
South Dakota	South Dakota does not have a specific definition.	ARSD 74:12:03:03	Agency regulating oil and gas exploration/production: Department of Environment and Natural Resources, Minerals and Mining Program 2050 W. Main Ste #1, Rapid City, SD 57702. Phone: (605) 773-4201, Fax: (605) 3945317.
Tennessee			Agency regulating oil and gas exploration/production: TDEC- Division of Water Resources; Tennessee Oil and Gas Program, 711 RS Gass Blvd, Nashville, TN 37216.
Texas	“Orphan wells” are defined as idle wells for which the operator is unknown or insolvent.	Texas Natural Resources Code 89.023 and 89.024 16 Texas Administrative Code 16 TAC §§ 3.14 (b)(2) and 3.15(a)(6) Surface Equipment Removal Requirements and Inactive Wells SWR 3.15 Plugging- SWR 3.14	Agency regulating oil and gas exploration/production: Railroad Commission of Texas (RRC). Main Office: 1701 N. Congress Austin, Texas 78701 Mailing Address: P.O. Box 12967 Austin, Texas 78711-2967 Toll free: 877-228-5740 512-463-7158
Utah	Utah uses the term “abandoned” to describe a well for which there is no reclamation surety or the forfeited surety is insufficient for plugging and reclamation.	Utah Administrative Code R649-3-36	State agency: Department of Natural Resources, Division of Oil, Gas and Mining, 1594 W. North Temple, Suite 1210, P.O. Box 145801, Salt Lake City, UT 84114-5801. Phone (801) 538-5340. Fax (801) 359-3940. Web Page: www.ogm.utah.gov .
Virginia	The Code of Virginia defines an orphaned well as a well abandoned prior to July 1, 1950, or a well for which no records exist concerning drilling, plugging, or abandonment.	Virginia Gas and Oil Regulations 4VAC25-150-390. Shut-In Wells	Agency regulating oil and gas exploration/production: Department of Mines, Minerals and Energy, Division of Gas and Oil; P.O Drawer 159 Lebanon, VA 24266 Phone: (276) 415-9700
West Virginia	Abandoned wells: A well which is completed as a dry hole or which is not in use for a period of twelve consecutive months shall be presumed to have been abandoned and shall promptly be plugged by the operator, unless the operator furnishes satisfactory proof to the director that there is a bona fide future use for such well. “Orphan wells” are defined as idle wells for which the operator is unknown or insolvent.	W. Va. Code Section 22-6-19, 22-10 and 35CSR5	Agency regulating oil and gas exploration/production: West Virginia Oil and Gas Conservation Commission and Department of Environmental Protection, Office of Oil and Gas, both located at 601 57th Street, SE, Charleston, WV 25304. Phone: (304) 926-0450, Fax: (304) 926-0452.
Wyoming	“Orphan wells” are defined as idle wells for which the operator is unknown or insolvent.	Chapter 3, Sections 4, 16 and 22	Agency regulating oil and gas exploration/production: Wyoming Oil and Gas

State or Province	Orphan / Abandoned Well Definition	Statutory or Regulatory Authority	Contact Information ¹⁵³
			Conservation Commission , P.O. Box 2640, Casper, WY 82602. Phone: (307) 234-7147.
Alberta	A well, facility, or pipeline in the Licensee Liability Rating program is eligible to be declared an orphan when the licensee of that license becomes insolvent or defunct. Once it determines a party responsible for costs of a well, facility, or pipeline does not exist, cannot be located or does not have the financial means to contribute to those costs, the AER will designate the well, facility, or pipeline as an orphan for all aspects of this program: suspension, abandonment, remediation, and reclamation.	Directive 013: Suspension Requirements for Wells	Agency regulating oil and gas exploration/production: Alberta Energy Regulator, AER Suite 1000, 250 – 5th Street SW Calgary, Alberta T2P 0R4 Phone: 403-297-8311 or 1-855-297-8311 (toll-free)
British Columbia	The Commission may designate a well and associated operating area as an orphan site if the operator is insolvent or can't be identified or located.	Oil and Gas Activities Act: B.C. Drilling and Production Regulation: B.C. Dormancy and Shutdown Regulation: B.C. Environmental Protection and Management Regulation: B.C.	Agency regulating oil and gas exploration/production: Oil and Gas Commission (OGC or Commission). Members of the public (Toll Free): 1-877-500-BCER (2237) https://bc-cr.ca/
Saskatchewan	A well, facility, or associated flowline or site, if the responsible person does not exist, cannot be located, or does not have the financial capability to comply with requirements.	Oil and Gas Conservation Regulations, 2012 (OGCR)	Agency regulating oil and gas exploration/production: Ministry of Energy and Resources (ER), Energy Regulation Division (ERD), 1000, 2103 – 11th Avenue, Regina, Saskatchewan, Canada S4P 3Z8, Phone (306) 7872592, Fax (306) 787-2478

APPENDIX D

Appendix D: Survey Questions

Survey Questions

Project for the National Academy of Sciences Workshop on Orphan and Abandoned Well Plugging

Your response to the following questions would be appreciated in gathering information regarding the research paper project for the National Academy of Sciences Workshop on Orphan and Abandoned Well Plugging.

State/Province Organization:	
Respondent Name:	
Respondent Title:	
Respondent eMail:	
Respondent Phone:	
Mailing Address:	

Please return completed form and any copies of documentations to:

Name:	Rick Simmers
eMail:	rickjsimmers@gmail.com
CC:	lori.wrotenbery@iogcc.state.ok.us

Section 1: Public Participation Notification

Please cite any statute(s), rule(s), policy(s), or procedure(s) authorizing/requiring public participation in any phase of the orphan/abandoned well process.

--

Please provide copies or links to the referenced information.

--

Please add any information you feel may be useful to other states or provinces.

--

Section 2: Orphan/Abandoned Well Regulatory Authority

Please cite all statutes and/or regulations that specifically apply to your orphan/abandoned well program. i.e. "authorization; funding; contracts; etc.

--

Comments:

--

Section 3: Plugging Materials and Plug Placement

Subsection 1

Does your state/province maintain a list of approved plugging materials?

Yes	
No	

If yes, please provide a copy or link to the list of approved materials.

--

Comments:

--

Are approved plugging materials defined by statute/rule?

Yes	
No	

If yes, please provide a copy or link to the appropriate cite.

--

Comments:

--

Does your statute/rule allow for the use of alternate plugging materials?

Yes	
No	

If yes, please provide a copy or link to the appropriate cite.

--

Comments:

--

Subsection 2

Does your statute/rule define plug placement and volume?

Yes	
No	

If yes, please provide a copy or link to the appropriate cite.

--

Comments:

--

Does your statute/rule allow the use of packers, bridge plugs, tapered cement plugs, or other materials as a base for plugs?

Yes	
No	

If yes, please provide a copy or link to the appropriate cite.

--

Comments:

--

Does your statute/rule define plug spacers and the materials that may be used?

Yes	
No	

If yes, please provide a copy or link to the appropriate cite.

--

Comments:

--

Does your statute/rule define plug placement methods?

Yes	
No	

If yes, please provide a copy or link to the appropriate cite.

--

Comments:

--

Subsection 3

Does your statute/rule require witnessing of plugs by a regulatory official?

Yes	
No	

If yes, please provide a copy or link to the appropriate cite.

--

Comments:

--

Does your statute/rule require documentation of plugging activity?

Yes	
No	

If yes, please provide a copy or link to the appropriate cite.

--

Comments:

--

Does your statute/rule require monitoring or inspection at the completion of plugging?

Yes	
No	

If yes, please provide a copy or link to the appropriate cite.

--

Comments:

--

How does your state/province document the location of an orphan or abandoned well?

--

Subsection 4

Does your statute/rule allow for the use of new or emerging technologies or the use of new materials?

Yes	
No	

If yes, please provide a copy or link to the appropriate cite.

--

Comments:

--

Thank you for completing this survey. The information will be helpful in completing this paper and is appreciated.

APPENDIX E

Appendix E: Select Sample State Prioritization Systems for Orphan Wells

Orphaned Well Plugging Prioritizing System 2022

updated 5/22

INSPECTION DATE: _____

SN: _____

No.	Factors	Score	Well Sc
1a	Leaking well - natural gas - within 300' of a public building or residence	32	
1b	Leaking well - natural gas	14	
1c	Leaking well - water or oil > 1bbl/day	30	
1d	Leaking well - water or oil < 1bbl/day	10	
1e	Leaking Tanks - water or oil	10	
2a	Hazard to navigation -well submerged or at surface	28	
2b	Hazard to navigation - well in navigable waterway (boat hazard)	20	
2c	Well in any other body of water	12	
3	H2S possible or present	2	
4a	Well not leaking but under pressure	8	
4b	Well not leaking but pressure status unknown	6	
5	No wellhead or wellhead damaged	4	
6	No production casing/open hole	2	
7	Production site/pit contaminated	3	
8a	Within 300' of public water supply (aquifer, well, or surface water)	8	
8b	Within 300' of public building/facility used by public on a recurring basis, or a residence	7	
8c	Within 300' of surface water or wetland	7	
8d	Within 1200' of residential or urban development	3	
8e	Within 1200' of surface water or wetlands	3	
8f	On land actively managed for crops or forage (pasture)	1	
9	Potential Economic Development	6	
10	Public Concern	7	
11a	Date of orphaning/Age of disrepair (well orphaned more than 14 years before inspection date)	4	
11b	Date of orphaning/Age of disrepair (well orphaned between 14 and 9 years before inspection date)	3	
11c	Date of orphaning/Age of disrepair (well orphaned between 8 and 3 years before inspection date)	2	
	Post P&A Inspection	0	
	Orphan Site Closed	0	

Score: _____

Priority: _____

Priority Table	
Priority	Score
Priority 1 - Urgent	>30
Priority 2 - High	>19
Priority 3 - Moderate	>10
Priority 4 - Low	10 & Under

Instructions:

1. Assign the appropriate factors to a site.
2. For factors with more than one option in a Category. e.g., 4a and 4b, assign only one option.
3. Total all the assigned factors scores for the site.
4. Use the total score and the priority table to set the site priority.

By: _____

Date: _____

¹⁵⁴ Provided by Interstate Oil & Gas Compact Commission (IOGCC), Idle and Orphan Oil and Gas Wells: State and Provincial Regulatory Strategies, Supplemental Information on State Prioritization Systems for Orphan Wells; 2023

Ohio Prioritization System for Orphan Wells

Risk Evaluation Matrix DOGRM

Risk Class:	☐ 1 ☐ 2 ☐ 3 ☒ 4	Scorer:	Date:
API:	Well Name:	GPS:	

Step 1. Calculate the portion of the multiplier based on what is leaking from the wellhead

Natural Gas ☒ Not Leaking[0] ☐ Detect [3] ☐ Hazardous [5]		Gas Score (max = 5, min=0) 0
H2S ☒ Not Leaking[0] ☐ Detect [3] ☐ Hazardous [5]		
Area Impacted (ft²) 0	Multiplied by: 0.002296	Impact Score (max = 5, min=0) 0
Wellhead Discharge		Total Wellhead Leaking Score (max=10, min=1) 1

Step 2. Calculate the portion of the multiplier based on what is leaking from any equipment

☐ No Equipment [0]
 ☐ Yes, Empty and No Contamination [1]
 ☐ Yes, Product In [3]
 ☐ Yes, Contamination Outside [5]

Equipment Fluid

Area Impacted (ft²)

0

Multiplied by:

0.002296

Equipment Score (max = 5, min=0)

0

Equip Fluid Score (max = 5, min=0)

0

Total Equipment Leaking Score (max=10, min=0)

0

	Distance (ft)	Formula	Dwelling Score (max = 5, min=0)
Step 3. Nearest occupied building	500	5 - (Distance*0.01)	0

Step 4. Surrounding Landuse

☐ Barren/Other [1]
 ☐ Hay, Old Field [2]
 ☐ Wooded [3]
 ☐ Agricultural [4]
 ☐ Residential/Wetland [5]

Landuse Score (max = 5, min = 0)

0

Step 5. Accessibility	☒ None [0]	☐ Access more difficult in near future/Restricted Seasonally [3]	Accessibility Score (max = 9, min=0)
(Check all that apply)	☐ Road Needs Cut [1]	☐ Stream Crossing Needed/Discovered during active project [5]	
			0

Step 6. Landowner Complaint ☒ No [0] ☐ Yes [3] **Complaint Score** (max = 3, min=0) **0**

	Score			Score			
Dwelling	0			0	Total Equipment Leaking Score		
Landuse	0			0	Accessibility		
Public Health and Safety	0		Total Wellhead Leaking Score	0	Landowner Complaint		
Environmental	0		(min = 1)	0			Risk Score
	0	X	1	+	0	=	0

Risk Evaluation Matrix DOGRM

Risk Factors (GIS Model Outputs)

PUBLIC HEALTH AND SAFETY

					Score
H2S Townships	Out [0]	Neighboring [3]	In [5]		(max=5)
Environmental Justice Area (Justice 40)		Out [0]	In [5]		(max=5)
Drinking Water Protection	>500' from 5 yr [0]	<500' from 5 yr [1]	Within 5 yr, out of 1 yr [3]	In 1 yr [5]	(max=5)
Urban	Out [0]	In [5]			(max=5)
	Distance (ft)			Formula	
Private Water Wells		(Max distance = 500')	5 - (Distance*0.01)		(max=5)
Public Water Wells					(max=5)
Schools					(max=10)
Colleges		(Max distance = 2500')	10 - (Distance*0.004)		(max=10)
Hospitals					(max=10)
Roadways					(max=5)
Airport/Heliport		(Max distance = 500')	5 - (Distance*0.01)		(max=5)
Active Railways					(max=5)
Estimated Pop 1/2 mile		(Max Density = 840)	Density*0.00595		(max=5)
Public Health and Safety Total (max=80)					

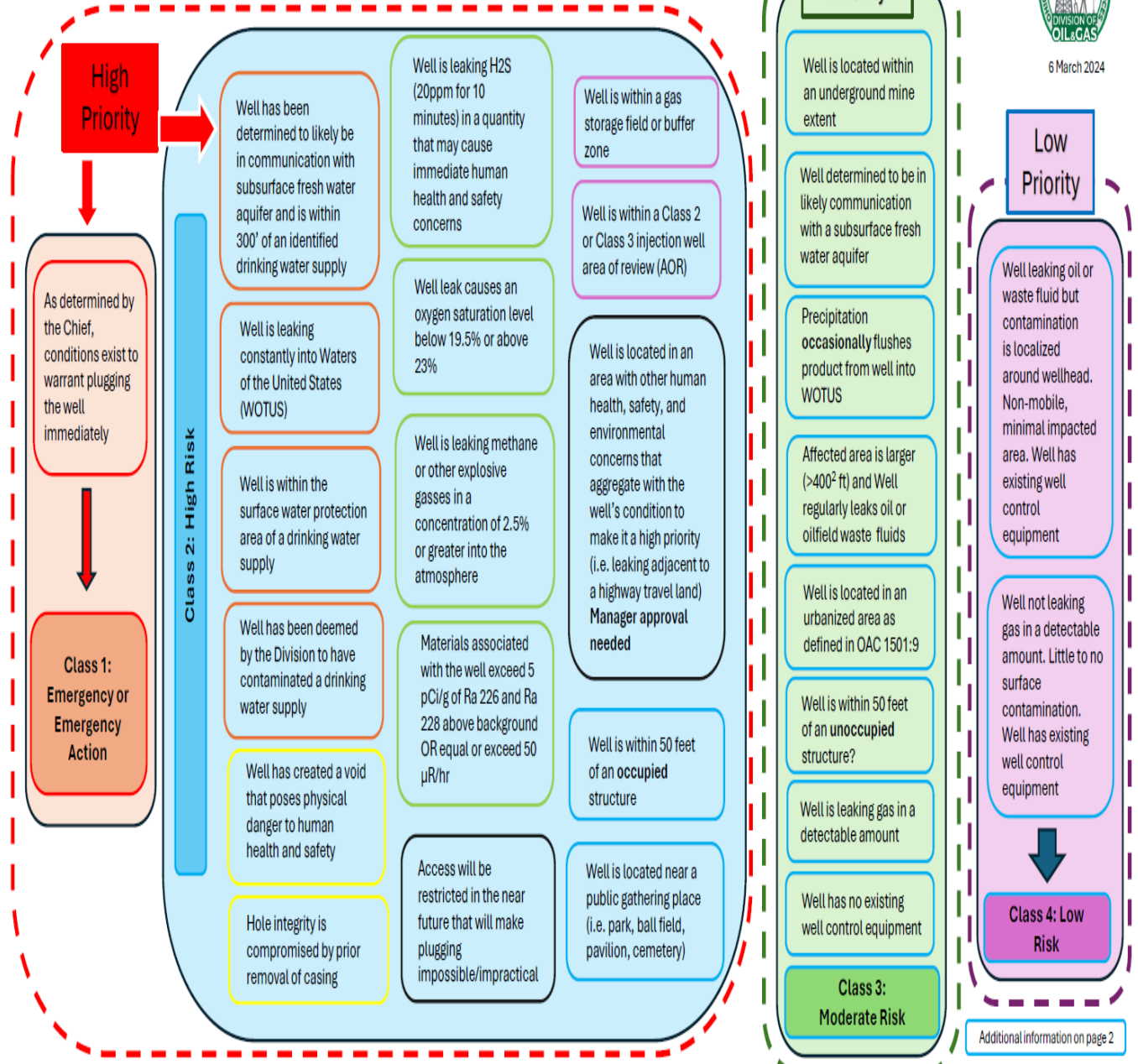
ENVIRONMENTAL

			Formula	
Streams/Rivers				(max=7)
Wetlands		(Max distance = 500')	7 - (Distance*0.014)	(max=7)
Bodies of Water				(max=7)
Scenic	>1000' [0]	<1000' [5]		(max=5)
Mussel	Class 9 [0]	<500' Category 1 or 3 [3]	<500' Category 2 or 4 [5]	(max=5)
100-Year Floodplain	X [0]	A, AE, AH, or AO [5]		(max=5)
LECMZ	Out [0]	In [5]		(max=5)
Environmental Total (max=41)				

CRITERIA TO ASSIGN RISK TO ORPHAN WELLS IN OHIO



6 March 2024



PADEP Abandoned Well Scoring Workbook

ABANDONED WELL INVESTIGATION

API #:		GPS Latitude:		Scoring Date:	
Farm Name:		GPS Longitude:		Well Type:	-
Well #:		County:	-	Well Classification:	-
DEP Inspector:		Municipality:			
Has a deed search been conducted?			-		
Is this investigation the result of a complaint or stray gas investigation?			-		
Additional information about complaint/stray gas incident					
Reported well depth (ft):					
Describe any casing and tubing observed or reported:					
Describe the condition of the well, including any oil, gas, brine discharge:					
Describe on site equipment (tanks, pipelines, meter houses, water well, etc):					
Other Comments:					
Last Known Operator:					
Current Surface Owner:					
Name:					
Address:					
City:					
State:					
Zip:					
Phone Number:					

¹⁵⁵ Provided by Interstate Oil & Gas Compact Commission (IOGCC), Idle and Orphan Oil and Gas Wells: State and Provincial Regulatory Strategies, Supplemental Information on State Prioritization Systems for Orphan Wells; 2023

PADEP Abandoned Well Scoring Workbook

ABANDONED WELL INVESTIGATION

Human Receptors		<i>Choose Up To 5</i>	
Gas in occupied structure with similar isotopic signature or believed to be associated with well*	50	-	
Oil/brine in occupied structure believed to be associated with well*	50	-	
Soil gas within 200 feet of structure believed to be associated with well	25	-	
Gas in water supply	25	-	
Oil/brine in water supply	15	-	
			0
Ecological Receptors		<i>Choose Up to 2</i>	
Liquids (oil/brine) to stream or wetland from well	25	-	
Oil/brine seep (discharge not from wellbore)	10	-	
			0
Well Site Hazards		<i>Choose Up to 4</i>	
Any ambient H ₂ S detection	25	-	
Any ambient LEL readings ≥ 10%	25	-	
Sustained ambient LEL <10%	10	-	
Unstable equipment, open pits, E&S issues/washouts	10	-	
Evidence of historical liquid spills not associated with well integrity breach	5	-	
			0
Well Integrity		<i>Choose Up to 4</i>	
Gas present outside surface casing/present in stream or liquid flow to surface	25	-	
Measurable annular flow of gas	15	-	
Wellhead pressure observed	10	-	
Severe corrosion (pitting) on well component that possibly contains pressure or fluids	10	-	
			0
Coal/Mining Status		<i>Choose Up To 1</i>	
Well within active underground mine (sealed or undergoing mining, i.e., longwall district) ¹	25	-	
Within abandoned mined area	25	-	
Permitted but not yet mined (intact coal/rock) ¹	10	-	
Workable coal present but not permitted	5	-	
			0
Setback/Surrounding Area		<i>Choose Up to 4</i>	
Well within 200 feet of occupied building or water supply well	10	-	
Well located in known gas migration area but not believed to be source	5	-	
Well within 100 feet of stream	5	-	
Well within 300 feet of any wetland >1 acre in size	5	-	
			0
Final Score			0
¹ Determine if situation justifies an emergency remediation or plugging contract			
¹ Notify the Coal Operator upon confirmation of well location.			

Texas Prioritization System for Orphan Wells¹⁵⁶

Table: Well Plugging Priority System

	FACTOR	Weight
1	Well Completion	
A	Unknown (no well records)	15
B	No surface casing or set above base of deepest usable quality water	10
C	Additional casing string not adequately cemented to isolate usable quality water	5
D	Injection or Disposal Well	10
E	Well penetrates salt/corrosive water bearing formation or abnormally pressured formation	5
F	Well in H ₂ S Field	5
G	Age: Well drilled ≥ 25 years ago	5
	Total: (40 points max)	
2	Wellbore Conditions	
A	Well is pressured up at the surface (tubing or prod casing)	10
B	Bradenhead pressure exists *	5
	Auto 2H if UQW*** not protected and fluid at BH is not UQW	
C	Measured fluid level	
D	Fluid level at or above the base of deepest usable quality water.	50
E	Fluid level less than 250' below base of deepest usable quality water (NA if 2D applies)	15
F	MIT Failure	5
G	H-15 (MIT) never performed or test > 5 years old (NA if F applies)	3
H	Inadequate wellhead control/integrity	5
	Total: (75 points max)	
3	Well location with respect to sensitive areas:	
A	H ₂ S well with public area ROE** Automatic Priority 2H	
B	In Marine Environment	10
C	Within 100' or river, lake, creek, or domestic use fresh water well (NA if B applies)	5
D	Between 100' and 1/4 mile of river, lake, creek, or domestic use fresh water well (NA if C applies)	3
E	Located within agricultural area.	2
F	Well located in known sensitive wildlife area.	3
G	Well located within city or town site limits.	10
	Total (20 points max)	
4	Unique environmental, Safety, or Economic Concern	
A	Adjacent to active water flood or disposal well at or above completion interval.	5
B	Logistics (poor roads, encroaching public, etc.)	5
C	Well contains junk.	5
D	P-5 Delinquent > 5 years	5
E	Other (attach explanation)	1-20
	Total: (20 points max)	
Total Weight		
Priority 1 = Leaking Well [based upon definition]		
Priority 2H = Higher Risk well [based on definition and/or total weight of 75+]		
Priority 2 = Total Weight of 50-75		
Priority 3 = Total Weight of 25-49		
Priority 4 = Total Weight < 25		

*BH pressure is sustained.

**2H if public areas could be impacted based on 16 Texas Administrative Code §3.36 [Statewide Rule 36] definition.

Undetected/continuous leak possible.

*** UQW = usable-quality water

¹⁵⁶ Provided by Interstate Oil & Gas Compact Commission (IOGCC), Idle and Orphan Oil and Gas Wells: State and Provincial Regulatory Strategies, Supplemental Information on State Prioritization Systems for Orphan Wells; 2023

APPENDIX F

Appendix F: Sample Orphan Well Contract Consideration Procedures

Examples:

Field Order Change Order Procedure

Orphan Well Referral Standard Operating Procedure

Orphan Well Right of Entry Standard Operating Procedure

Orphan Well Field Order Change Order Procedure

Project Administration:

The Division will give direction via Field Orders and authorization via Change Orders for all Orphan Well projects. The following policy will be utilized by Division staff to complete this work.

Field Orders

Besides the Project's Orphan Well Inspector utilizing the inspection report to document daily inspections of the work performed as well as the adequacy of the work performed, the Field Order provides documentation of defective work or materials, as well as specific notice, instruction, clarification, explanations, and/or interpretations of the contract documents. Field Orders are issued by the Orphan Well Inspector to ensure that the contractor performs the work in accordance with the terms and conditions of the contract documents, as well as, the intent of the contract documents. The Orphan Well Inspector shall only issue Field Orders after discussing with Orphan Well Manager and Orphan Well Engineer and obtaining their signature. **It shall be understood that any change in contract documents shall be documented. It is understood that certain instances may not seem like the effort of writing up the change is warranted, especially if we have a good contractor and the work will be completed prior to writing up the Field Order. With this understanding, it is also a realization that if we don't get into a habit of writing up all changes, a change is going to come along with a not-so-conscientious and easy to deal with contractor, and it is going to cause us stress, aggravation, and disruption. With this, all the time or effort we may have saved on all those previous minor changes is lost, because we weren't in the habit of writing Field Orders. In addition, what may initially seem like a minor change early in the construction process could lead to a major issue later.** Delivery of the Field Order and receipt is acknowledged with the contractor representative's signature. The contractor representative may not agree with the terms of the Field Order; however, the contractor representative's signature is required. The contractor representative's signature does not indicate an agreement; it only confirms that the Field Order was issued and received. The contractor may not delay the performance of the work required by the issuance of Field Orders and shall carry on the other work and maintain the overall progress of the construction schedule during all disputes or disagreements with the Division. No work shall be delayed or postponed pending resolution of any disputes or disagreements except as the contractor and the Division may jointly otherwise agree to in writing. The contractor bears sole responsibility for the quality of work and compliance with the contract documents regardless of the Division's level of inspection.

After drafting the Field Order, the Orphan Well Inspector shall forward to the Orphan Well Manager and Orphan Well Engineer for review and signature. The Orphan Well Engineer will send the final Field Order back to the inspector or signature and contractor representative signature. Once signed the inspector will send to the Orphan Well Engineer for any further distribution. If Field Order is connected with Change Order, see the Change Order section for the distribution process.

Contingency line items have been included in the original contract and can be enacted via a Field Order. Line item extensions can be completed via a Field Order to a quantity that does not cause the original contract amount to be exceeded. Documenting these changes in a timely manner are critical as this work is not approved until the paperwork has been processed. **At no time, will the Orphan Well Inspector, Orphan Well Manager or Orphan Well Engineer direct work. Decisions will not be made independently.**

Change Orders

A Change Order is a written order issued by the Orphan Well Inspector to the contractor covering changes to the Contract within or beyond the scope of the Contract and establishing the basis of payment and any necessary time adjustments for the work affected by the changes.

A proposal for modification may be requested of the contractor if:

- Substitutions are proposed by the contractor;
- Changes will modify the design or contract;
- Work involves negotiated work items or work outside of the project scope. *(Note these are just a few examples and shall not be considered all inclusive.)*

The proposal for modification serves as a starting point that the Orphan Well Inspector, Orphan Well Manager and Orphan Well Engineer can use in defining the scope of the contract modification, which initiates the negotiation process with the contractor. Once the work is sufficiently defined and the costs are adequately determined, the Field Order/Change Order shall be drafted and the final proposal attached to it. **At no time, will the Orphan Well Inspector, Orphan Well Manager or Orphan Well Engineer negotiate or authorize work independently.** This process requires the combined input from Orphan Well Inspector, Orphan Well Manager and Orphan Well Engineer. **It is the Orphan Well Engineer's responsibility to coordinate funding approval through the Contract Administrator to make certain that the appropriate source and amount of funding is available prior to issuance of the Change Order.** A Change Order may be utilized to extend the contract completion date if it can be shown that the critical path of construction has been altered by the work covered by the Change Order.

After the Orphan Well Inspector has conferred with the Orphan Well Manager and Orphan Well Engineer and obtained the necessary concurrences, the Orphan Well Inspector, in coordination with Orphan Well Engineer, will develop a Field Order and a Change Order, respectively. The Field Order will identify, with detailed explanation, the justification for the plan modification. In some cases, additional drawings or other attachments may be required to be attached to the Field Order/Change Order for detailed explanation. The Change Order only becomes effective upon the Chief's Signature of approval; therefore, the **Field Order will also stipulate that the contractor is "not" authorized to proceed with the modification outlined in the accompanying Change Order until signed by all parties required.** This Change Order will identify the added or deducted quantities and the associated costs. The Orphan Well Engineer circulate the Field Order and Change Order for signature from relevant signatory in the program. Next, the Orphan Well Engineer will forward the Change Order to the Contractor's Manager

that can make financial decisions for signature and return. Upon return of the Change Order, the Orphan Well Engineer will send the signed Change Order to the Contract Administrator and Chief for signature and return to the Orphan Well Program Administrator. After all signatures are acquired, the Orphan Well Program Administrator will file the documents and notice involved program staff.

If an additional purchase order is required for execution of a Change Order, the Contract Administrator will work with the Orphan Well Engineer to generate the Purchase Order Creation form and additional documentation needed to justify the additional purchase order.

Orphan Well Referral Standard Operating Procedure



Orphan Well Referral Standard Operating Procedure



The following is the standard operating procedure to be completed by Division staff when potentially referring a well to the Orphan Well Program. The Division field staff initially referring the well will complete the following documentation.

- 1) **Idle Well Report:** This form documents the physical well site at the time of inspection. It is imperative that the casing and tubing sizes given in this report are accurate and noted as ID or OD.
- 2) **Pictures:** Picture documentation of the well along with any equipment and access point. Pictures should be labeled with the Well Name, API, and direction.
- 3) **Risk Evaluation Matrix (REM):** This form identifies potential environmental, human health, and safety factors related to the well. This assessment is utilized by the Orphan Well Program to prioritize well plugging.

These forms are all located on the Mdrive at the following location.

<M:\Orphan Well Program Referrals\FORMS>

Complete files for a well referral will be placed on the M:Drive at the following location.

<M:\Orphan Well Program Referrals>

Please create a new folder for each well with the following naming convention and upload all associated files.

County_Township_34-000-0-0000_WellCardName_WellStatus_WellClassification

(If there is no name on the well card, assign it the current property owner name).

If scanned documents are provided, please separate each of the three document types into their own file rather than having one scanned document of all required files.

The Division field staff making a referral should complete these forms and request that their supervisor review the file. After review of the file, the field staff will post the required documents on the M:Drive

([M:\Orphan Well Program Referrals](#)) and will refer the well to Enforcement, Legal, or the Orphan Well Program to finalize a determination. Enforcement matters should be referred to the enforcement supervisor where the well is located. If a well is being referred to the Orphan Well Program or for Legal review, the Division field staff should email Rachel Verhoff at rachel.verhoff@dnr.ohio.gov and Josh Schiering at Joshua.Schiering@dnr.ohio.gov to notice them of a referral that is time sensitive. The email should provide the API and well name. Josh and Rachel will process each referral with the Orphan Well Program and/or the Legal team. Once a well is determined orphan ready, Josh or Rachel will move the well file from the Orphan Well Program Referrals folder to the Orphan Well Program folder, update the referral log, change the well status in RBDMS, and email notice of the well status change to the field staff who have expressed a notice of the change. Once a status has been changed to an Orphan Well the Orphan Well Program will consider the well for a plugging project.

Orphan Well Program Right of Entry Standard Operating Procedure

ORPHAN WELL PROGRAM (OWP) RIGHT OF ENTRY STANDARD OPERATING PROCEDURE

The following is the Division's Standard Operating Procedure for obtaining a Right of Entry (ROE) from Landowners for Orphan Well Plugging Projects.

OWP projects will involve landowners with a well located on their property and may also involve landowners without a well on their property. Often, the Division will need to utilize adjoining landowners' property to access a well. Division staff have the legal right to enter properties to perform R.C. Chapter 1509 duties, which include inspecting, accessing, and plugging wells. *See* R.C. 1509.03. Division contractors, as the authorized representatives of the Chief, also have the legal right to enter properties to plug wells. Division staff can legally enter property without notice to the landowner. Agents who are contracted by the Chief must first deliver written notice to the landowner. As a policy, the Division should always attempt to obtain a ROE from each landowner whose property is entered so landowners are informed about the OWP and what will occur during the plugging of the well. Please complete the following steps to obtain a ROE:

ROE Steps to Be Completed:

1. The field staff who initially referred the well to the OWP should make an attempt to obtain a signed ROE. Verbal communication is an important tool in obtaining ROEs from landowners. This gives the Division the opportunity to explain the program, the Division's role in plugging a well, the Landowner's role, and the different program options. Obtaining in-person ROE signatures or emailing a ROE form to landowners after verbal communication are the preferred methods of obtaining a signed form. The OWP Program Administrator can aid in locating contact information for landowners if there are problems locating this information. **Enough emphasis cannot be placed on the value that most landowners place on being able to verbally communicate with the Division or it's agent about the well/project.**
2. If multiple attempts to verbally communicate with a landowner to obtain a ROE have failed, then please mail the ROE form. A form letter and the program brochure will also accompany the ROE to explain the program.
3. If a landowner refuses to sign a ROE or multiple attempts have failed to connect with a landowner, the Division will consider the circumstances to determine if the Division will enter the property and plug the well without the signed ROE.

When the ROE is obtained, document any requests or concerns of the landowner. These will be considered by the OWP team during design. If a request or concern has potential to be a critical item to the completion of the project, make sure to alert the rest of the OWP team in writing. **Once design is underway, it is also critical that the OWP team (typically the OWP inspector or Division agent) present the details of the project SOW to the landowner prior to finalization of the SOW. Landowner requests can become exponentially more cumbersome and costly if realized late in the process due to the nature of the contracting portion of the project.**

Orphan Well Program Right of Entry Form

This form is the same for all landowners (with or without a well on their property).

M:\Orphan Well Program\Administrative\Forms\Right of Entry\OWP_Right of Entry.dotx

Orphan Well Program ROE Form Letter

This form shall be included when a ROE is mailed to help explain the program.

<M:\Orphan Well Program\Administrative\Forms\Right of Entry\OWP Right Of Entry Release Coverletter.docx>

Or

M:\Orphan Well Program\Administrative\Forms\Right of Entry\OWP_Right of Entry Adjacent Property Owner Coverletter.docx

When requesting a right of entry from an adjacent landowner provide the OWP Right of Entry form with the Well Information and Well History sections completed for the adjacent landowner. It is permissible for a Division staff or a Division agent to fill-in information on these forms as long as it is prior to the landowner's signature. No modifications should be made by Division staff or Division agent after the landowner has signed the form. If information is unknown on these forms, leaving the box blank is a reasonable response. Requesting right of entry from and adjoining landowner should be approved by Division staff prior to a Division agent making this request to confirm the need for the right of entry.

Steps for Access without ROE:

If a ROE cannot be obtained after reasonable efforts, the decision to enter a property without a ROE will be contemplated by the Chief on a case-by-case basis. The following is a guide for obtaining this determination:

1. Once field staff has determined a ROE cannot be obtained for a project, the field staff should make the OWP NRA manager and the OWP Program Administrator aware of the circumstances in writing, including a detailed summary of the attempts to obtain a signed ROE. The Program Administrator will track the situation and place the documentation in the project file.
2. The OWP NRA manager will review the documentation for potential elevation to the Chief. As a guide, if the landowner is unwilling to sign a ROE and has a well scored as a:
 - Class 4 well, the well will not be considered further for plugging until the well is given a

new score or a new landowner takes over the property.

- Class 3, the OWP NRA manager should consider all the circumstances to determine if the program should further consider the well for plugging at this time. If the OWP NRA manager determines the well should be plugged at this time the OWP NRA manager should complete the OWP Entry Due to Well Condition Authorization Form and present the form for signature by the Chief or his designee.
 - Class 1 or Class 2 well, the OWP NRA manager should complete the OWP Entry Due to Well Condition Authorization Form and present the form for signature by the Chief or his designee.
3. Once the OWP Entry Due to Well Condition Authorization Form is signed, the OWP NRA manager should present the form to the Division Legal Section for review to determine if a court order or injunction will be necessary. The Legal Section will advise on how to proceed and how to inform the landowner of the decision. Legal Section will consider to:
- Proceed with statutory authority; or
 - Seek a court order for access.
- If time permits before seeking a court order, the Legal Section will send a letter to the landowner explaining that the nature of the conditions of the wells require the Division to seek access by a court order.

If a landowner expresses desire to withdraw a previously signed ROE or attempts place accommodatable restrictions related to the entry and plugging of the well after signing a ROE, field staff should make the OWP NRA manager and the OWP Program Administrator aware of the circumstances in writing, including a detailed summary. The Program Administrator will track the situation and place the documentation in the project file. The NRA Manager will work through a similar set of steps as described above to resolve the issues. These situations will be dealt with on a case by case basis depending on the degree of work previously completed by the Division to plug the well.

Orphan Well Program Entry Due to Well Condition Authorization Form

This form shall be completed when a signed ROE is not obtained from a landowner.

<M:\Orphan Well Program\Administrative\Forms\Right of Entry\OWP Entry Due to Well Condition Authorization.docx>

Below are applicable laws related to this work.

ORC 1509.03 Administrative Rules

(C) The chief or the chief's authorized representative may at any time enter upon lands, public or private, for the purpose of administration or enforcement of this chapter, the rules adopted or orders made thereunder, or terms or conditions of permits or registration certificates issued thereunder and may examine and copy records pertaining to the drilling, conversion, or operation of a well for injection of fluids and logs required by division (C) of section [1509.223](#) of the Revised Code. No person shall prevent or hinder the chief or the chief's authorized representative in the performance of official duties. If entry is

prevented or hindered, the chief or the chief's authorized representative may apply for, and the court of common pleas may issue, an appropriate inspection warrant necessary to achieve the purposes of this chapter within the court's territorial jurisdiction.

ORC 1509.071 Forfeiting Bond

(B)

(1) All moneys collected because of forfeitures of bonds as provided in this section shall be deposited in the state treasury to the credit of the oil and gas well fund created in section [1509.02](#) of the Revised Code.

For purposes of promoting the competent management and conservation of the state's oil and natural gas resources and the proper and lawful plugging of historic oil and gas wells for which there is no known responsible owner, the chief annually shall spend not less than thirty per cent of the revenue credited to the oil and gas well fund during the previous fiscal year for both of the following purposes:

(a) In accordance with division (E) of this section, to plug idle and orphaned wells or to restore the land surface properly as required in section [1509.072](#) of the Revised Code;

(b) In accordance with division (F) of this section, to correct conditions that the chief reasonably has determined are causing imminent health or safety risks at an idle and orphaned well or a well for which the owner cannot be contacted in order to initiate a corrective action within a reasonable period of time as determined by the chief. (D)

(1) Upon determining that a well is an idle and orphaned well, the chief shall do all of the following:

(a) Make a reasonable attempt to determine from the records in the office of the county recorder of the county in which the well is located the identity of the current owner of the land on which the well is located, the identity of each person owning a right or interest in the oil or gas mineral interests, and the identities of the persons having a lien upon any of the equipment appurtenant to the well. For purposes of division (D)(1)(a) of this section, the chief is not required to review records in the office of the county recorder that are older than forty years from the date on which the chief made the determination that the well is an idle and orphaned well.

(b) Mail notice to each person identified in division (D) (1)(a) of this section;

(E) The chief may expend money from the oil and gas well fund for the purpose of division (B)(1)(a) of this section, and such expenditures shall be made in accordance with either of the following:

(1) ... Agents or employees of persons contracting with the chief for a restoration or plugging project may enter upon any land, public or private, on which the well is located for the purpose of performing the work. Prior to such entry, the chief shall give to the following persons written notice of the existence of a contract for a project to restore a location or plug a well, the names of the persons with whom the contract is made, and the date that the project will commence: the owner of the well, the owner of the

land upon which the well is located, and, if the well is located in the same township as or in a township adjacent to the excavations and workings of a mine...

FIGURES LIST

Figure 1. State/Province Questionnaire: Section 2: Orphan/Abandoned Well Regulatory Authority

Figure 2. State/Province Questionnaire: Section 3: Well Plugging Materials and Plug Placement; Subsection 1: Well Plugging Materials and Alternate Plugging Materials

Figure 3. State/Province Questionnaire: Section 3: Well Plugging Materials and Plug Placement; Subsection 2: Plug Placement, Volume, Materials, and Methods

Figure 4. State/Province Questionnaire: Section 1: Public Participation/Notification

Figure 5. State/Province Questionnaire: Section 3: Plugging Materials and Plug Placement; Subsection 3: Witnessing, Documentation, and Monitoring

Figure 6: State/Province Questionnaire: Section 3: Plugging Materials and Plug Placement; Subsection 4: New or Emerging Technologies

Figure 1. State/Province Questionnaire¹⁵⁷: Section 2: Orphan/Abandoned Well Regulatory Authority¹⁵⁸

State/Province full response can be seen in Table 2. State/Province Questionnaire: Section 2: Orphan/Abandoned Well Regulatory Authority

State or Province	Statutes and/or regulations <u>specific to</u> orphan/abandoned well program
Alabama	Yes
Alaska	Not Submitted
Arizona	No Known Orphan Wells ¹⁵⁹
Arkansas	Yes
California	Yes
Colorado	Yes
Idaho	No Known Orphan Wells ¹⁵⁹
Illinois	Not Submitted
Indiana	Not Submitted
Kansas	Not Submitted
Kentucky	Yes
Louisiana	Yes
Maryland	No Known Orphan Wells ¹⁵⁹
Michigan	Yes
Mississippi	Yes
Missouri	Yes
Montana	Yes
Nebraska	No
Nevada	Not Submitted
New Mexico	Not Submitted
New York	Yes
North Dakota	Not Submitted
Ohio	Yes
Oklahoma	Yes
Pennsylvania	Yes
South Dakota	Not Submitted
Tennessee	Yes
Texas	Not Submitted
Utah	Yes

¹⁵⁷ Appendix D Survey Questions

¹⁵⁸ Appendix C State and Provincial Orphan Well Definitions

¹⁵⁹ Appendix B Reference Documents: Interstate Oil & Gas Compact Commission (IOGCC): Idle and Orphan Oil and Gas Wells: State Provincial Regulatory Strategies 2021; page 28

State or Province	Statutes and/or regulations <u>specific</u> to orphan/abandoned well program
Virginia	Yes
West Virginia	Yes
Wyoming	Yes
Alberta	Not Submitted
British Columbia	Yes
Saskatchewan	Not Submitted

Figure 2. State/Province Questionnaire: Section 3: Well Plugging Materials and Plug Placement Subsection 1: Well Plugging Materials and Alternate Plugging Materials

State/Province full response can be seen in Table 3.1: State/Province Questionnaire: Section 3: Well Plugging Materials and Plug Placement Subsection 1: Well Plugging Materials and Alternate Plugging Materials

State or Province	List of approved plugging materials	Plugging materials defined by statute / rule	Alternate plugging materials allowed by statute / rule
Alabama	No	Yes	Yes
Alaska	Not Submitted	Not Submitted	Not Submitted
Arizona	No Known Orphan Wells ¹⁶⁰	No Known Orphan Wells ¹⁶⁰	No Known Orphan Wells ¹⁶⁰
Arkansas	Yes	Yes	Yes
California	No	Yes	Yes
Colorado	No	Yes	Yes
Idaho	No Known Orphan Wells ¹⁶⁰	No Known Orphan Wells ¹⁶⁰	No Known Orphan Wells ¹⁶⁰
Illinois	Not Submitted	Not Submitted	Not Submitted
Indiana	Not Submitted	Not Submitted	Not Submitted
Kansas	Not Submitted	Not Submitted	Not Submitted
Kentucky	No	No	No
Louisiana	No	Yes	No
Maryland	No Known Orphan Wells ¹⁶⁰	No Known Orphan Wells ¹⁶⁰	No Known Orphan Wells ¹⁶⁰
Michigan	Yes	Yes	Yes
Mississippi	Yes	Yes	Yes
Missouri	No	No	Yes
Montana	No	No	Yes
Nebraska	No	No	Yes
Nevada	Not Submitted	Not Submitted	Not Submitted
New Mexico	Not Submitted	Not Submitted	Not Submitted
New York	No	No	No
North Dakota	Not Submitted	Not Submitted	Not Submitted
Ohio	Yes	Yes	Yes
Oklahoma	Yes	Yes	Yes
Pennsylvania	No	Yes	Yes
South Dakota	Not Submitted	Not Submitted	Not Submitted
Tennessee	Yes	Yes	Yes
Texas	Not Submitted	Not Submitted	Not Submitted
Utah	Yes	Yes	Yes
Virginia	No	Yes	Yes
West Virginia	No	Yes	Yes
Wyoming	No	No	Yes
Alberta	Not Submitted	Not Submitted	Not Submitted
British Columbia	Yes	No	Yes
Saskatchewan	Not Submitted	Not Submitted	Not Submitted

¹⁶⁰ Appendix B Reference Documents: Interstate Oil & Gas Compact Commission (IOGCC): Idle and Orphan Oil and Gas Wells: State Provincial Regulatory Strategies 2021; page 28

Figure 3. State/Province Questionnaire: Section 3: Well Plugging Materials and Plug Placement Subsection 2

State/Province full response can be seen in Table 3.2: State/Province Questionnaire: Section 3: Well Plugging Materials and Plug Placement Subsection 2

State or Province	Plug placement and volume defined by statute / rule	Packers, bridge plugs, tapered cement plugs, or other materials allowed as base for plugs	Plug spacers and materials defined by statute / rule	Plug placement methods defined by statute / rule
Alabama	Yes	Yes	Yes	No
Alaska	Not Submitted	Not Submitted	Not Submitted	Not Submitted
Arizona	No Known Orphan Wells ¹⁶¹	No Known Orphan Wells ¹⁶¹	No Known Orphan Wells ¹⁶¹	No Known Orphan Wells ¹⁶¹
Arkansas	Yes	Yes	Yes	Yes
California	Yes	Yes	Yes	Yes
Colorado	Yes	Yes	Yes	Yes
Idaho	No Known Orphan Wells ¹⁶¹	No Known Orphan Wells ¹⁶¹	No Known Orphan Wells ¹⁶¹	No Known Orphan Wells ¹⁶¹
Illinois	Not Submitted	Not Submitted	Not Submitted	Not Submitted
Indiana	Not Submitted	Not Submitted	Not Submitted	Not Submitted
Kansas	Not Submitted	Not Submitted	Not Submitted	Not Submitted
Kentucky	Yes	Yes	No	Yes
Louisiana	Yes	Yes	Yes	Yes
Maryland	No Known Orphan Wells ¹⁶¹	No Known Orphan Wells ¹⁶¹	No Known Orphan Wells ¹⁶¹	No Known Orphan Wells ¹⁶¹
Michigan	Yes	Yes	No	Yes
Mississippi	Yes	Yes	Yes	Yes
Missouri	Yes	Yes	No	No
Montana	No	Yes	No	No
Nebraska	Yes	Yes	No	No
Nevada	Not Submitted	Not Submitted	Not Submitted	Not Submitted
New Mexico	Not Submitted	Not Submitted	Not Submitted	Not Submitted
New York	Yes	Yes	No	Yes
North Dakota	Not Submitted	Not Submitted	Not Submitted	Not Submitted
Ohio	Yes	Yes	No	Yes
Oklahoma	Yes	Yes	Yes	Yes
Pennsylvania	Yes	Yes	Yes	No
South Dakota	Not Submitted	Not Submitted	Not Submitted	Not Submitted
Tennessee	Yes	Yes	No	Yes
Texas	Not Submitted	Not Submitted	Not Submitted	Not Submitted
Utah	Yes	Yes	Yes	No
Virginia	Yes	Yes	No	Yes
West Virginia	Yes	Yes	Yes	Yes

¹⁶¹ Appendix B Reference Documents: Interstate Oil & Gas Compact Commission (IOGCC): Idle and Orphan Oil and Gas Wells: State Provincial Regulatory Strategies 2021; page 28

State or Province	Plug placement and volume defined by statute / rule	Packers, bridge plugs, tapered cement plugs, or other materials allowed as base for plugs	Plug spacers and materials defined by statute / rule	Plug placement methods defined by statute / rule
Wyoming	Yes	Yes	Yes	Yes
Alberta	Not Submitted	Not Submitted	Not Submitted	Not Submitted
British Columbia	No	Yes	No	No
Saskatchewan	Not Submitted	Not Submitted	Not Submitted	Not Submitted

Figure 4. State/Province Questionnaire: Section 1: Public Participation/Notification

State/Province full response can be seen in Table 1: State/Province Questionnaire: Section 1: Public/Notification

State or Province	Statute(s), Rule(s), Policy(s), or Procedure(s) authorizing /requiring public participation in any phase of the orphan/abandoned well process.
Alabama	Yes
Alaska	Not Submitted
Arizona	No Known Orphan Wells ¹⁶²
Arkansas	Yes
California	Yes
Colorado	Yes
Idaho	No Known Orphan Wells ¹⁶²
Illinois	Not Submitted
Indiana	Not Submitted
Kansas	Not Submitted
Kentucky	No
Louisiana	Yes
Maryland	No Known Orphan Wells ¹⁶²
Michigan	Yes
Mississippi	No
Missouri	No
Montana	Yes
Nebraska	No
Nevada	Not Submitted
New Mexico	Not Submitted
New York	Yes
North Dakota	Not Submitted
Ohio	Yes
Oklahoma	No
Pennsylvania	No
South Dakota	Not Submitted
Tennessee	No
Texas	Not Submitted
Utah	Yes
Virginia	Yes
West Virginia	Yes
Wyoming	Yes
Alberta	Not Submitted
British Columbia	No
Saskatchewan	Not Submitted

¹⁶² Appendix B Reference Documents: Interstate Oil & Gas Compact Commission (IOGCC): Idle and Orphan Oil and Gas Wells: State Provincial Regulatory Strategies 2021; page 28

Figure 5. State/Province Questionnaire: Section 3: Well Plugging Materials and Plug Placement Subsection 3: Witnessing, Documentation, and Monitoring

State/Province full response can be seen in Table 3.3: State/Province Questionnaire: Section 3: Well Plugging Materials and Plug Placement Subsection 3: Witnessing, Documentation, and Monitoring

State or Province	Witnessing of plugs by regulatory official required	Documentation of plugging activity	Monitoring or inspection at plugging completion	How is location of orphan / abandoned well documented?
Alabama	Yes	Yes	Yes	GPS
Alaska	Not Submitted	Not Submitted	Not Submitted	Not Submitted
Arizona	No Known Orphan Wells ¹⁶³	No Known Orphan Wells ¹⁶³	No Known Orphan Wells ¹⁶³	No Known Orphan Wells ¹⁶³
Arkansas	Yes	Yes	Yes	GPS
California	Yes	Yes	Yes	GPS
Colorado	No	Yes	Yes	GPS
Idaho	No Known Orphan Wells ¹⁶³	No Known Orphan Wells ¹⁶³	No Known Orphan Wells ¹⁶³	No Known Orphan Wells ¹⁶³
Illinois	Not Submitted	Not Submitted	Not Submitted	Not Submitted
Indiana	Not Submitted	Not Submitted	Not Submitted	Not Submitted
Kansas	Not Submitted	Not Submitted	Not Submitted	Not Submitted
Kentucky	No	Yes	Yes	GPS
Louisiana	No	Yes	No	GPS
Maryland	No Known Orphan Wells ¹⁶³	No Known Orphan Wells ¹⁶³	No Known Orphan Wells ¹⁶³	No Known Orphan Wells ¹⁶³
Michigan	No	Yes	No	GPS
Mississippi	Yes	Yes	Yes	GPS
Missouri	No	Yes	No	GPS
Montana	No	Yes	Yes	Field inspection, database records
Nebraska	No	Yes	No	Database
Nevada	Not Submitted	Not Submitted	Not Submitted	Not Submitted
New Mexico	Not Submitted	Not Submitted	Not Submitted	Not Submitted
New York	No	Yes	No	GPS
North Dakota	Not Submitted	Not Submitted	Not Submitted	Not Submitted
Ohio	Yes	Yes	Yes	GPS
Oklahoma	No	Yes	Yes	GPS
Pennsylvania	No	Yes	No	GPS
South Dakota	Not Submitted	Not Submitted	Not Submitted	Not Submitted
Tennessee	Yes	Yes	Yes	GPS

¹⁶³ Appendix B Reference Documents: Interstate Oil & Gas Compact Commission (IOGCC): Idle and Orphan Oil and Gas Wells: State Provincial Regulatory Strategies 2021; page 28

State or Province	Witnessing of plugs by regulatory official required	Documentation of plugging activity	Monitoring or inspection at plugging completion	How is location of orphan / abandoned well documented?
Texas	Not Submitted	Not Submitted	Not Submitted	Not Submitted
Utah	Yes	Yes	Yes	Permanent monument; subsurface markers
Virginia	Yes	Yes	Yes	GPS
West Virginia	No	Yes	No	GPS
Wyoming	No	Yes	Yes	
Alberta	Not Submitted	Not Submitted	Not Submitted	Not Submitted
British Columbia	No	Yes	No	Mapped on website
Saskatchewan	Not Submitted	Not Submitted	Not Submitted	Not Submitted

Figure 6. State/Province Questionnaire: Section 3: Well Plugging Materials and Plug Placement Subsection 4: New or Emerging Technologies

State/Province full response can be seen in Table 3.4 State/Province Questionnaire: Section 3: Well Plugging Materials and Plug Placement Subsection 4: New or Emerging Technologies

State or Province	New or emerging technologies or use of new material allowed by statute/rule
Alabama	Yes
Alaska	Not Submitted
Arizona	No Known Orphan Wells ¹⁶⁴
Arkansas	Yes
California	Yes
Colorado	Yes
Idaho	No Known Orphan Wells ¹⁶⁴
Illinois	Not Submitted
Indiana	Not Submitted
Kansas	Not Submitted
Kentucky	Yes
Louisiana	No
Maryland	No Known Orphan Wells ¹⁶⁴
Michigan	Yes
Mississippi	Yes
Missouri	Yes
Montana	No
Nebraska	Yes
Nevada	Not Submitted
New Mexico	Not Submitted
New York	No
North Dakota	Not Submitted
Ohio	Yes
Oklahoma	Yes
Pennsylvania	Yes
South Dakota	Not Submitted
Tennessee	No
Texas	Not Submitted
Utah	Yes
Virginia	Yes
West Virginia	Yes
Wyoming	Yes
Alberta	Not Submitted
British Columbia	Yes
Saskatchewan	Not Submitted

¹⁶⁴ Appendix B Reference Documents: Interstate Oil & Gas Compact Commission (IOGCC): Idle and Orphan Oil and Gas Wells: State Provincial Regulatory Strategies 2021; page 28

TABLES LIST

Table 1. State/Province Questionnaire: Public Participation/Notification

Table 2. State/Province Questionnaire: Orphan/Abandoned Well Regulatory Authority

**Table 3. State/Province Questionnaire: Plugging Materials and Plug Placement;
Subsection 1: Well Plugging Materials and Alternate Plugging Materials**

**Table 3. State/Province Questionnaire: Plugging Materials and Plug Placement;
Subsection 2: Plug Placement, Volume, Materials, and Methods**

**Table 3. State/Province Questionnaire: Plugging Materials and Plug Placement;
Subsection 3: Witnessing, Documentation, and Monitoring**

**Table 3: State/Province Questionnaire: Plugging Materials and Plug Placement;
Subsection 4: New or Emerging Technologies**

Table 7: Orphan Well Plugging and Expenditures (2018-2020)

Table 12: Plugging Funds

Table 13a: Updated Data on Documented Orphan Wells

Table 1. State/Province Questionnaire¹⁶⁵: Section 1: Public Participation/Notification

State or Province	Statute(s), Rule(s), Policy(s), or Procedure(s) authorizing /requiring public participation in any phase of the orphan/abandoned well process.	Comments	Additional information provided.
Alabama	Yes	Before a well is plugged by the AOGB, a public notice is required before a Board Hearing to show cause why a well should not be plugged and the surety bond collected. The Board has extensive regulation on Public Notice. Rule 400-7-1-.01 et et seq. of the <i>State Oil and Gas Board of Alabama Administrative Code</i> .	https://www.ogb.state.al.us/ogb/rules
Alaska	Not Submitted		
Arizona** ¹⁶⁶	No		
Arkansas	Yes	Arkansas statute A.C.A. 15-71-110 (e) empowers the Oil and Gas Commission administer an orphan and abandoned well plugging program. Arkansas statute A.C.A. 15-72-217 requires the Oil and Gas Commission to provide notice and public hearing to issue a Well Abandonment Order. Oil and Gas Commission Administrative Rule G-2 provides the Oil and Gas Commission Director with an administrative process to make an Orphan well determination under certain circumstances without a Commission Well Abandonment Order.	<u>RULE G-2: PLUGGING OF ORPHAN WELLS</u> a) Definitions: 1) “Orphan Well” means a well for which a Permit Holder cannot be located, there is no record the well is covered by a Commission required bond by the last known permit holder of record, and no fees have ever been paid on the well in accordance with Ark. Code Ann. § 15-71-110. 2) “Well Site Equipment” means the equipment, including but not limited to an associated tank battery, production and injection facility equipment, hydrocarbons from the well that are stored in tanks located on the lease, and hydrocarbons recovered during the plugging operation 3) “Well Site” means the area around and near the well, including any associated pits, crude oil or produced water storage tanks or other related production facility equipment, such as injection pumps, compressors or gas processing equipment.

¹⁶⁵ Appendix D State/Province Survey Questionnaire

¹⁶⁶ No** indicates respondents report no known orphan wells. See Appendix B – Reference Documents; Idle and Orphan Oil and Gas Wells: State and Provincial Regulatory Strategies 2021; Interstate Oil and Gas Compact Commission; Table 3. Documented and Undocumented Orphan Wells (2018 – 2020); page 28

State or Province	Statute(s), Rule(s), Policy(s), or Procedure(s) authorizing /requiring public participation in any phase of the orphan/abandoned well process.	Comments	Additional information provided.
			4) "Director" means the Oil and Gas Commission Director of Production and Conservation. b) If after review of the Commission records, the Director determines a well or well site to be orphaned, that well or well site may be administratively determined to be eligible for plugging, without the need for a hearing. Following designation as an orphaned well or well site, the Director may elect to properly plug, re-plug, or restore so as to remedy the situation, and authorize any person to enter upon the land properly plug, re-plug, or restore so as to remedy the situation. c) All work completed under this rule shall be paid with funds from the Abandoned and Orphan Well Plugging Fund. Additionally, the Director may dispose of all well site equipment and hydrocarbons, to offset the cost of the well plugging and well site restoration operations. Proceeds from any public sale, auction or private sale of all well site equipment or hydrocarbons shall be deposited into the Plugging Fund or used to offset plugging costs. (Source: new rule April 13, 2008) A.C.A. § 15-71-110 15-71-110. Powers and duties — Rules — Definitions. (e) The commission has the following specific powers and duties in administering the Abandoned and Orphaned Well Plugging Program and the Abandoned and Orphaned Well Plugging Fund: (1) To adopt rules necessary to implement the program, including rules regarding wells deemed abandoned in accordance with § 15-72-217; (2) To collect the fees assessed by the commission under this chapter and to make deposits into the fund; (3) To deposit the amount of any forfeited bond or other financial assurance into the fund; (4) To recover well-site plugging, repair, and restoration costs from well operators who fail to reimburse the fund for expenses attributable to

State or Province	Statute(s), Rule(s), Policy(s), or Procedure(s) authorizing /requiring public participation in any phase of the orphan/abandoned well process.	Comments	Additional information provided.
			those well operators and to deposit any amounts reimbursed or collected into the fund; (5) To accept, receive, and deposit into the fund any grants, gifts, or other funds that may be made available from public or private sources; (6) To make expenditures of amounts appropriated from the fund, as the commission may deem appropriate in its sole discretion, for the sole purposes of plugging, replugging, or repairing any well or restoring the site of any well, including, but not limited to: (A) Removal of well-site equipment or production facilities; and (B) Reimbursement to landowners through grants for plugging a well and restoring the site of a well, including, but not limited to, removal of well-site equipment located on the landowner's property for which the landowner has no legal obligation to plug the wells or remove the well-site equipment, if the well is determined by the commission to be abandoned or ordered by the commission to be plugged, replugged, repaired, or restored; (7) To enter into contracts and to administer a landowner grant program in accordance with applicable state law; and (8) To dispose of well-site equipment, including an associated tank battery and production facility equipment, and any amount of hydrocarbons from the well that is stored on the lease, in a commercially reasonable manner at generally recognized market value, by either or both of the following methods after the well has been determined to be abandoned by the commission: (A) A plugging contract may provide that the person plugging the well or remediating oil field waste pollution, or both, shall have clear title, subject to any prior perfected claim on all well-site equipment and hydrocarbons from the well that are stored on the lease or hydrocarbons recovered during the plugging operation, in exchange for a sum of money deducted as a credit from the contract price; or (B) (i) (a) The well-site equipment, including, but not limited to, an associated tank battery and production facility equipment, hydrocarbons from the well that are stored on the lease, and hydrocarbons recovered during the plugging operation may be sold at a public auction or a public or private sale.

State or Province	Statute(s), Rule(s), Policy(s), or Procedure(s) authorizing /requiring public participation in any phase of the orphan/abandoned well process.	Comments	Additional information provided.
			(b) The proceeds from any sale under subdivision (c)(8)(B)(i)(a) of this section shall be deposited into the fund. (ii) All well-site equipment and hydrocarbons acquired by a person by sale shall be acquired under clear title subject to any prior perfected claims. A.C.A. § 15-72-217 15-72-217. Plugging dry or abandoned well by lessee or operator. (a) All lessees or operators drilling or operating for crude oil or natural gas within the State of Arkansas shall immediately, in a practical and workmanlike manner under the supervision of the oil or gas inspector, as provided in this section, plug all dry holes or abandoned oil or gas wells in accordance with Oil and Gas Commission plugging rules. (b) (1) If after notice and a hearing the commission finds that a well drilled for the exploration, development, storage, or production of oil or gas, or as injection, salt water disposal, salt water source, brine injection or disposal has been abandoned, as defined by the commission, or is leaking salt water, oil, gas, or other deleterious substances into any fresh water formation or onto the surface of the land in the vicinity of the well, or creates an imminent danger to the health or safety of the public, the commission shall issue an order that the well be properly plugged, replugged, or repaired to remedy the situation. (2) (A) If the well operator fails to obey the order within the time set by the order, the commission may: (i) Authorize a person to enter upon the land on which the well is located and plug, replug, or repair the well, as may be reasonably required to remedy the condition; or (ii) (a) Transfer the well, the well-site equipment, or any hydrocarbons from the well that are stored on the well site.

State or Province	Statute(s), Rule(s), Policy(s), or Procedure(s) authorizing /requiring public participation in any phase of the orphan/abandoned well process.	Comments	Additional information provided.
			(b) "Well-site equipment" includes without limitation an associated tank battery and production facility equipment. (B) Any proceeds received from the transfer of a well, well-site equipment, or hydrocarbons from the well under subdivision (b)(2)(A) of this section shall be deposited in the Abandoned and Orphaned Well Plugging Fund. (3) (A) The costs and expenses incurred by the commission and paid with funds from the fund shall be a debt due by the well operator to the commission for reimbursement to the fund. (B) The well owner's failure to comply with the commission's order to plug, replug, or repair the well or to repay expenses incurred by the commission to plug, replug, or repair the well is a violation of this chapter and subject to enforcement action or a cessation of operations (c) This section does not: (1) Relieve any well operator otherwise legally responsible from any obligation to plug, replug, or repair a well; or (2) Limit the authority of the commission to require the proper plugging, replugging, or repair of a well. (d) (1) Any person who enters upon the land on which the well is located to plug, replug, or repair the well, or who supports or contributes to any such action in accordance with the order of the commission and under contract to the commission, shall not be liable for any damages resulting from operations reasonably necessary or proper to plug, replug, or repair the well, except for damages to growing crops and improvements. (2) The person shall not be held to have assumed responsibility for future remedial work on the well or be liable in damages or otherwise for conditions subsequently arising from or in connection with the well.
California	Yes	The California Environmental Quality Act (CEQA) CEQA requires that state and local agencies disclose and evaluate the significant environmental impacts of proposed projects and adopt all feasible mitigation measures to reduce or eliminate those impacts. The CEQA	https://oag.ca.gov/environment/ceqa California has had and will continue to have public forums where people of the state can give their input into the elements of the State Orphan Oil and Gas Well Abandonment program.

State or Province	Statute(s), Rule(s), Policy(s), or Procedure(s) authorizing /requiring public participation in any phase of the orphan/abandoned well process.	Comments	Additional information provided.
		process requires public participation in the orphan/abandoned well process.	
Colorado	Yes	From the 2022 IIJA Initial Grant Application (the quotation uses the Energy & Carbon Management Commission's former name, the Colorado Oil and Gas Conservation Commission, or COGCC): COGCC's [Orphaned Well Program] OWP Staff use several methods to notify and solicit recommendations from local officials and the public regarding the prioritization of well plugging and site remediation activities. First, the Local Government Officials are notified of upcoming OWP Projects in their jurisdiction by both correspondence and a Field Operations Notice. Second, the surface owners and adjacent surface owners (if additional access is needed to the property) are notified of upcoming OWP Projects occurring on their or neighboring properties. Additionally, OWP Staff provide notice to surrounding building occupants and owners of upcoming OWP Project activities. Finally, the COGCC complaint process also directs OWP matters requiring more immediate attention to the appropriate staff. However, in general, OWP Staff encourages members of the public at large to work through their local government representatives to bring matters to Staff attention. OWP projects are listed on COGCC's website at https://sites.google.com/state.co.us/cogcc-owp/project-list. Orphaned sites are depicted on COGCC's GIS for public viewing as Planned (no site work performed yet), In Progress (site work has commenced), or Completed (the site has passed final reclamation) at	https://sites.google.com/state.co.us/cogcc-owp/project-list https://ecmc.state.co.us/maps.html#/gisonline https://ecmc.state.co.us/documents/reg/Policies/Policy_Surface_Development.pdf

State or Province	Statute(s), Rule(s), Policy(s), or Procedure(s) authorizing/requiring public participation in any phase of the orphan/abandoned well process.	Comments	Additional information provided.
		https://ecmc.state.co.us/maps.html#/gisonline. On June 14, 2023, ECMC modified its Surface Development Policy to describe the process necessary for a surface owner to request that the Commission declare an oil and gas location an “Orphaned Site” or a well an “Orphaned Well” through a Commission hearing process.	
Idaho** ¹⁶⁷	No		
Illinois	Not Submitted		
Indiana	Not Submitted		
Kansas	Not Submitted		
Kentucky* ¹⁶⁸	No	There are no statutes that cover this however, orphan wells are and can be reported by private citizens via email and through direct contact with our inspectors. We use public concern as a prioritization criteria based on what we find once we follow up on these complaints or nominations.	Having an open communication with the public is a good way to identify leaking or problem wells that may have never been identified without it. Our Division of Oil and Gas has established a public process for citizens to report suspect orphan/abandoned wells by sending an email to orphanwells@ky.gov . Field inspectors follow up on every citizen email report to inspect the site and determine corrective actions needed.
Louisiana	Yes	Oilfield Site Restoration Commission meetings are subject to the Open Meetings Law (LA R.S. 42:12 – 42:280).	https://www.legis.la.gov/legis/laws_Toc.aspx?folder=75&level=Parent
Maryland** ¹⁶⁹	No		
Michigan	Yes	Procedures require generation of a notice of orphan well determination which is published on the department website and in an industry publication to alert potential interested parties that the Oil, Gas, and Minerals Division (OGMD) is listing a well regulated under Part 615 Supervisor of Wells, of the Natural Resources and Environmental Protection Act (NREPA), Public Act 451 of 1994, as amended (Part 615) to be	The OGMD Orphan Well Team also works closely with property owners to coordinate plugging and remediation activities.

¹⁶⁷ No** indicates respondents report no known orphan wells. See Appendix B – Reference Documents; Idle and Orphan Oil and Gas Wells: State and Provincial Regulatory Strategies 2021; Interstate Oil and Gas Compact Commission; Table 3. Documented and Undocumented Orphan Wells (2018 – 2020); page 28

¹⁶⁸ No* indicates respondents do not have statute(s), rule(s), policy(s) or procedure(s) authorizing/requiring public participation in any phase of the orphan/abandoned well process, **but** state public participation is encouraged.

¹⁶⁹ No** indicates respondents report no known orphan wells. See Appendix B – Reference Documents; Idle and Orphan Oil and Gas Wells: State and Provincial Regulatory Strategies 2021; Interstate Oil and Gas Compact Commission; Table 3. Documented and Undocumented Orphan Wells (2018 – 2020); page 28

State or Province	Statute(s), Rule(s), Policy(s), or Procedure(s) authorizing /requiring public participation in any phase of the orphan/abandoned well process.	Comments	Additional information provided.
		transferred to the official Orphan Well List as addressed by the statute Part 616, Orphan Wells, of the NREPA (Part 616). No other specific public notification is required in this process. The state may take action to plug or address the orphan well or site once listed and receives any comment from concerned interests. 324.61603 EXPENDITURES FROM FUND; CONSULTATION WITH OPERATOR. Sec. 61603. (1) The supervisor shall expend money from the fund, upon appropriation, only for the following purposes: (a) For plugging of abandoned or improperly closed oil or gas wells or response activity or site restoration at oil or gas wells for which no owner or operator is known, for which all owners or operators are insolvent, or at which the supervisor determines there exists an imminent threat to the public health and safety. (b) For the reasonable cost of the supervisor for internal administration in connection with the activities included in subdivision (a). (2) The supervisor shall consult with the operator of natural gas storage field prior to plugging any abandoned or improperly closed oil or gas wells within the boundary of the storage field operator's natural gas storage field. And 324.61604 LIST TO BE SUBMITTED TO LEGISLATURE; ANNUAL APPROPRIATION FROM FUND FOR LISTED PROJECTS. Sec. 61604. (1) By January 1 of each year, the supervisor shall prepare and submit to the legislature a list of the oil or gas wells that should be plugged and	

State or Province	Statute(s), Rule(s), Policy(s), or Procedure(s) authorizing /requiring public participation in any phase of the orphan/abandoned well process.	Comments	Additional information provided.
		those at which response activities or site restoration should be performed with money in the fund. The list shall be compiled in order of priority. The list shall be accompanied by estimates of total project costs for the proposed plugging, response activity, site restoration, internal administration, and potential emergency contingencies. Additionally, the supervisor shall include with the list a statement of the criteria used in listing and assigning the priority of these proposed actions.	
Mississippi	No		Active wells that are orphaned by the Board after notice and hearing have been adjudicated out of compliance and penalized under Statute 53-1-47.
Missouri	No		
Montana	Yes	Surface owner of well location gets notice under 82-10-401, MCA and has input on reclamation.	https://leg.mt.gov/bills/mca/title_0820/chapter_0100/part_0040/section_0010/0820-0100-0040-0010.html
Nebraska	No		
Nevada	Not Submitted		
New Mexico	Not Submitted		
New York	Yes	Environmental Conservation Law §23-0305 8 J – DEC must give notice to underground mines of any phase of oil and gas well work that may impact those mining operations. 6 CRR-NY 555.5 (b) – landowner written consent required to waive surface restoration requirements following well plugging	Laws of New York (state.ny.us) http://public.leginfo.state.ny.us/lawssrch.cgi?NVLWO : View Document - New York Codes, Rules and Regulations (westlaw.com) View Document - New York Codes, Rules and Regulations (westlaw.com)
North Dakota	Not Submitted		
Ohio	Yes	Pursuant to Ohio Revised Code (ORC) 1509.071, the Division issues a public notice prior to plugging of orphan wells which allows interested parties to notify the Division of their interest.	https://codes.ohio.gov/ohio-revised-code/section-1509.071 *Refer to division (D)(1)(d)
Oklahoma* ¹⁷⁰	No	Landowners are encouraged to notify the OCC of any abandoned wells on their property. Field Inspectors will go and inspect the site and research the database and court records to see if there is a	Field Inspectors are also doing site inspections daily looking for abandoned wells as time allows.

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State or Province	Statute(s), Rule(s), Policy(s), or Procedure(s) authorizing /requiring public participation in any phase of the orphan/abandoned well process.	Comments	Additional information provided.
		responsible party and if not place the well on the orphan well list. Oklahoma Corporation Commission Web Page. https://oklahoma.gov/occ.html	
Pennsylvania	No	Pennsylvania does not have rules or regulations authorizing or requiring <i>general</i> public participation in any phase of the orphan/abandoned wells plugging process. However, in areas underlain by workable coal seams, section 3220 of the Oil and Gas Act does require the operator plugging the well to notify the department and the coal operator, lessee or owner and submit a plat, on a form to be furnished by the department, showing the location of the well and fixing the date and time plugging will commence, which shall be not less than three working days, nor more than 30 days, after the notice is received, to permit representatives of the persons notified to be present at the plugging. Notice and the right to be present may be waived by the department and the coal operator, lessee or owner, but waiver by the coal operator, lessee or owner shall be in writing and a copy shall be attached to the notice of abandonment filed with the department under this section. Section 513 of the Coal and Gas Coordination Act also contains plugging requirements for wells that penetrate workable coal seams.	As noted, Pennsylvania does not have rules or regulations authorizing or requiring <i>general</i> public participation in any phase of the orphan/abandoned wells plugging process. There is additional process involving coal operators and owners when well plugging is occurring in areas of workable coal seams.
South Dakota	Not Submitted		
Tennessee	No	There is no public participation in any phase of the orphan/abandoned well process in Tennessee.	
Texas	Not Submitted		
Utah	Yes	The forfeiting of bond and orphaning of wells follows rule R649-3-1.16 which requires public notice and a public hearing for claiming and orphaning the wells. 16. The following guidelines will govern the forfeiture of bonds.	https://adminrules.utah.gov/public/rule/R649-3/Current%20Rules?searchText=R649 https://adminrules.utah.gov/public/rule/R649-10/Current%20Rules?searchText=R649 https://le.utah.gov/xcode/Title40/Chapter6/40-6-S10.html?v=C40-6-S10_1800010118000101

State or Province	Statute(s), Rule(s), Policy(s), or Procedure(s) authorizing /requiring public participation in any phase of the orphan/abandoned well process.	Comments	Additional information provided.
		16.1. The division shall take action to forfeit the bond if any of the following occur: 16.1.1. The operator refuses or is unable to conduct plugging and site restoration. 16.1.2. Noncompliance as to the conditions of a permit issued by the division. 16.1.3. The operator defaults on the conditions under which the bond was accepted. 16.2. In the event forfeiture of the bond is necessary, the matter will be considered by the board. 16.3. For matters of bond forfeiture, the division shall send written notification to the parties identified in Subsection (15.3), in addition to the notice requirements of the board procedural rules. 16.4. After proper notice and hearing, the board may order the division to do any of the following: 16.4.1. Proceed to collect the forfeited amount as provided by applicable laws for the collection of defaulted bonds or other debts. 16.4.2. Use funds collected from bond forfeiture to complete the plugging and restoration of the well to which bond coverage applies. 16.4.3. Enter into a written agreement with the operator or another party to perform plugging and restoration operations in accordance with a compliance schedule established by the division as long as such party has the ability to perform the necessary work. 16.4.4. Allow a surety to complete the plugging and restoration, if the surety can demonstrate an ability to complete the plugging and restoration. 16.4.5. Any other action the board deems reasonable and appropriate. 16.5. In the event the amount forfeited is insufficient to pay for the full cost of the plugging and restoration, the division may complete or authorize completion of plugging and restoration and may recover from the operator any costs	https://le.utah.gov/xcode/Title63G/Chapter4/63G-4.html?v=C63G-4_1800010118000101 Utah Procurement Code 63G-6a-112 Required Public Notice, opens in a new tab

State or Province	Statute(s), Rule(s), Policy(s), or Procedure(s) authorizing /requiring public participation in any phase of the orphan/abandoned well process.	Comments	Additional information provided.
		of plugging and restoration in excess of the amount forfeited. 16.6. In the event the amount of bond forfeited was more than the amount necessary to complete plugging and restoration, the unused funds shall be returned by the division to the party from whom they were collected. 16.7. In the event the bond is forfeited and there exists any unplugged well or wells previously covered under the forfeited bond, then the operator must establish new bond coverage in accordance with these rules. 16.8. If the operator requires new bond coverage under the provisions of Subsection (16.7), then the division will notify the operator and specify a reasonable period, not to exceed 90 days, to establish new bond coverage. Right of Way and Right of Agreement documents are sent out to parties who may be affected by the proposed work. Once a project has been finalized it works with the Division of Purchasing to put the project out to bid. The State of Utah has partnered with JAGGAER, opens in a new tab (formerly SciQuest), an online e-procurement service, to distribute and receive bids, proposals and other solicitations posted by the State of Utah. This contract was implemented as the result of a competitive solicitation process and serves in part to satisfy Utah Procurement Code 63G-6a-112 Required Public Notice, opens in a new tab requirements.	
Virginia	Yes	Any abandoned well or site that is of public concern is promptly evaluated by Gas & Oil Program staff and prioritized accordingly. In the event that an abandoned well is scheduled to be plugged, the Gas	https://law.lis.virginia.gov/admincode/title4/agency25/chapter150/section480/

State or Province	Statute(s), Rule(s), Policy(s), or Procedure(s) authorizing /requiring public participation in any phase of the orphan/abandoned well process.	Comments	Additional information provided.
		& Oil Program staff will contact the surface owner to obtain written permission (Form DGO-GO-24) and notice the public in the local newspaper. Right of entry provisions for orphaned wells are addressed in 4 VAC 25-150-480.	
West Virginia	Yes	W. Va. Code § 22-10-7 Provision for allowing interested parties to plug abandoned wells. W. Va. CSR 35-4-10 Comment period provision regarding well transfers. These are done when the State plugs abandoned / orphaned wells. The public may file complaints or otherwise report abandoned / orphaned wells. This may result in well plugging depending on the risk posed by the well.	
Wyoming	Yes	Wyoming Statutes (W.S. § 30-5-104) requires the WOGCC hold a hearing to declare a well abandoned and to authorize the agency staff to plug the well. Wyoming Public Meeting Act (W.S. § 16-4-403) requires meetings of an agency's governing body to be open to the public. The WOGCC policy has also been to notify and work with the surface owners at the well location and along the route from a public road to the well for access and scheduling of any work or travel on their property. No other requirements for public participation exist.	Access to Wyoming Statutes can be found at the Wyoming Legislature's website at https://wyoleg.gov/ Wyoming also has an open/public process for bidding on projects related to orphan wells. These follow state procurement requirements that are managed by another state agency.
Alberta	Not Submitted		
British Columbia ¹⁷¹	No	There are no legal triggers for consultation and notification regarding restoration of orphan sites; however, notifications of planned and completed work are delivered to land owners, local government and First Nations. Feedback is gathered and incorporated through engagement. Where wells are dormant (inactive for 5+ years), permit holders must	Orphan Sites BC Energy Regulator (BCER) (bc-cr.ca) Dormancy and Shutdown Regulation (gov.bc.ca) – refer to sections 13 and 14 Engagement work on Orphan sites is consistent with expectations of Industry proponents, as outlined under Section 13 of the Dormancy & Shutdown Regulation

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State or Province	Statute(s), Rule(s), Policy(s), or Procedure(s) authorizing /requiring public participation in any phase of the orphan/abandoned well process.	Comments	Additional information provided.
		prepare an annual work plan. Permit holders must give written notice of the annual work plan, and 30 days prior to conducting work at a dormant site, to any interested persons with respect to that site.	
Saskatchewan	Not Submitted		

Table 2. State/Province Questionnaire¹⁷²: Section 2: Orphan/Abandoned Well Regulatory Authority

State or Province	Statutes and/or regulations specific to orphan/abandoned well program	Referenced information provided.	Comments
Alabama	Yes	Section 9-17-6(5) of the Code of Alabama 91975) allows the Board to require a surety bond. The AOGB process for handling orphan/abandoned wells is as follows: Wells that have been inactive for 6 months shall be plugged pursuant to Rule 400-1-4-.14 (Plugging and Abandonment of Wells) unless classified as temporarily abandoned or shut-in pursuant to rule 400-1-4-.17 (Request to Classify Wells as Temporarily Abandoned or Shut-In) and has been determined to have future utility. Wells will be classified Abandoned pursuant to Rule 400-1-4-.18 (Abandoned Wells) if for whatever reason the well has not been granted TA/SA status and has no future utility and has not been plugged. The Supervisor may order Abandoned wells to be plugged by the operator, or the Board after notice and hearing may issue an order. If an Operator is not responsive, the Board after notice and hearing will order the Surety Bond to be collected, and the proceeds used to plug the well. The AOGB will then procure a contract to plug the well with a qualified plugging company through the State procurement process. If proceeds of the surety bond are not sufficient to plug the well, and the well is not an immediate threat to the environment or to public health and safety, the well will be placed on our orphaned well list to	

¹⁷² Appendix D State/Province Survey Questionnaire

State or Province	Statutes and/or regulations specific to orphan/abandoned well program	Referenced information provided.	Comments
		be plugged as funds become available.	
Alaska	Not Submitted		Questionnaire not submitted. Statutes and/or regulations available at https://www.commerce.alaska.gov/web/aogcc/StatutesandRegulations.aspx
Arizona	No ¹⁷³		
Arkansas	Yes	See Table 1. Public Participation / Notification response. With respect to funding: A.C.A. § 15-71-115 15-71-115. Abandoned and Orphaned Well Plugging Fund. (a) There is created on the books of the Treasurer of State, the Auditor of State, and the Chief Fiscal Officer of the State a special revenue fund to be known as the “Abandoned and Orphaned Well Plugging Fund”. (b) (1) The fund shall receive funds from: (A) Fees assessed by the Oil and Gas Commission; (B) Forfeited bonds; (C) Proceeds from the sale of hydrocarbons and production equipment located at the site of abandoned and orphaned wells; (D) Grants and gifts from private and public sources; and (E) Any other revenue as may be authorized by law. (2) All moneys collected under the fund shall be deposited into the State Treasury to the credit of the fund as special revenues. (c) (1) The fund shall be used by the commission to: (A) Make expenditures through contracts to plug abandoned and orphaned wells and to remediate associated production facilities;	

¹⁷³ Respondent reports no known orphan wells. See Appendix B – Reference Documents; Idle and Orphan Oil and Gas Wells: State and Provincial Regulatory Strategies 2021; Interstate Oil and Gas Compact Commission; Table 3. Documented and Undocumented Orphan Wells (2018 – 2020); page 28

State or Province	Statutes and/or regulations specific to orphan/abandoned well program	Referenced information provided.	Comments
		(B) Award grants to landowners to plug abandoned and orphaned wells and to remediate associated production facilities; and (C) Make expenditures for emergency repairs to wells or production facilities endangering the public health and safety. (2) Expenditures from the fund may be authorized by the commission through contracts or grants for the payment of plugging costs or the cost of performing corrective work as follows: (A) If after the commission gives the well operator notice and hearing and finds that an abandoned well must be plugged, that a leaking well must be plugged, replugged, or repaired, or that a well site must be restored and the well operator fails to perform the required plugging, replugging, repair, or restoration work within the time frame prescribed in the commission order, the commission may authorize fund expenditures to plug, replug, or repair the well or wells and to restore the well site in accordance with commission rules; and (B) If the abandoned well or well site operator cannot be identified or located for purposes of notice and hearing, the commission may administratively determine the well or well site to be orphaned, as defined by commission rules, and may authorize expenditures from the fund to plug the orphaned well and restore the orphaned well site. (d) The fund may be used by the commission to provide security in the event an oil or gas well	

State or Province	Statutes and/or regulations specific to orphan/abandoned well program	Referenced information provided.	Comments
		operator fails to perform plugging responsibilities under the provisions of § 15-72-217 or fails to correct well conditions that create an imminent danger to the health or safety of the public or threaten significant environmental harm or damage to property.	
California	Yes	For orphan/abandoned well regulatory authorization, the statutes are California Public Resources Code sections 3110, 3206, 3224, 3226, 3236.5, 3237, 3240, 3241, 3250, 3251, 3251.5, 3252, 3255, 3256, 3257, 3258, 3260, 3261, 3423, and, California Code of Regulation, Title 14 Sections 1723 et seq., 1775, 1776. For contracting, the statutes are California Public Contract Code, Government Code, including section 4525 et seq. and California Code of Regulations, Title 14, Section 1690 et seq. For lien authority, the rules are stated in the California Government Code section 7150 et seq.	
Colorado	Yes	From C.R.S. 34-60-106, Additional powers of commission - rules - definitions - repeal. (13) The commission shall require every operator to provide assurance that it is financially capable of fulfilling every obligation imposed by this article 60 as specified in rules adopted on or after April 16, 2019. The rule-making must consider: Increasing financial assurance for inactive wells and for wells transferred to a new owner; requiring a financial assurance account, which must remain tied to the well in the event of a transfer of ownership, to be fully funded in the initial years of operation for each new well to cover future costs to plug, reclaim, and remediate the well; and creating a pooled fund to address orphaned wells for which no owner, operator, or responsible party is capable of covering the costs of plugging, reclamation, and remediation...	On July 1, 2018, the annual program budget appropriation increased from \$445,000 to more than \$5,000,000. At the same time, the legislature also authorized the program's first full-time employees

State or Province	Statutes and/or regulations specific to orphan/abandoned well program	Referenced information provided.	Comments
		Relevant excerpts from C.R.S. 34-60-133, Orphaned wells mitigation enterprise - creation - powers and duties - enterprise board created - mitigation fees - cash fund created - rules - definitions. (1) Enterprise created. (a) The orphaned wells mitigation enterprise is created in the department for the purpose of: (I) Imposing and collecting mitigation fees; (II) Funding the plugging, reclaiming, and remediating of orphaned wells in the state; (III) Ensuring that the costs associated with plugging, reclaiming, and remediating orphaned wells are borne by operators in the form of mitigation fees; and (IV) Determining the amount of mitigation fees. (b) The enterprise board, in consultation with the commission, shall administer the enterprise in accordance with this section. ... (4) Enterprise board - duties. In addition to administering the enterprise, at least annually, the enterprise board shall: (a) Consider whether the amounts of the mitigation fees should be increased or reduced, based on current circumstances and reasonably anticipated future expenditures from the fund; (b) If the enterprise board determines that an increase or reduction of the mitigation fee amounts is warranted, adjust the mitigation fee amounts; except that the enterprise board shall not set the fee amounts in an amount that results in a violation of subsection (6)(b) of this section; and (c) Advise the commission of the outcome of the enterprise board's deliberations pursuant to this subsection (4). (5) Mitigation fees. (a) On or before August 1, 2022; on or before April 30, 2023; and on or before April 30 each year	

State or Province	Statutes and/or regulations specific to orphan/abandoned well program	Referenced information provided.	Comments
		thereafter, each operator shall pay a mitigation fee to the enterprise for each well of an operator that has been spud but is not yet plugged and abandoned, in accordance with rules of the commission. Mitigation fees due by August 1, 2022, shall be paid in the following amounts: (I) For operators with production that is equal to or less than a threshold to be determined by rules of the commission, one hundred twenty-five dollars for each well; and (II) For operators with production that exceeds a threshold to be determined by rules of the commission, two hundred twenty-five dollars for each well. (b) Mitigation fees paid after August 1, 2022, shall be paid in the amounts described in subsection (5)(a) of this section, as such amounts may be adjusted by the enterprise board pursuant to subsection (4) of this section. ... (6) Cash fund. (a) The orphaned wells mitigation enterprise cash fund is created in the state treasury. The fund consists of: (I) Money received as mitigation fees; (II) Any money received from the issuance of revenue bonds, as described in subsection (1)(c)(II) of this section; (III) Any gifts, grants, or donations received pursuant to subsection (2)(e) of this section; and (IV) Any other money that the general assembly may appropriate or transfer to the fund. (b) The total amount of money credited to the fund as mitigation fees may not exceed one hundred million dollars in the first five fiscal years of the enterprise, beginning with the 2022-23 state fiscal year. (c) The state treasurer shall credit all interest and income derived from the deposit	

State or Province	Statutes and/or regulations specific to orphan/abandoned well program	Referenced information provided.	Comments
		and investment of money in the fund to the fund. Any unexpended and unencumbered money remaining in the fund at the end of a fiscal year remains in the fund and shall not be credited or transferred to the general fund. (d) Money credited to the fund is continuously appropriated to the fund for use by the enterprise and shall be expended to: (I) Provide plugging, reclaiming, and remediating services at the request of the director of the commission; (II) Pay the enterprise's reasonable and necessary operating expenses; and (III) Otherwise exercise the enterprise's powers and perform its duties as authorized by this section. Orphan Wells Mitigation Enterprise https://ecmc.state.co.us/owe.html#/owe Prior to formation of the Orphan Well Mitigation Enterprise, and through June 30, 2024, legislative budget appropriations to the cash fund described below allowed for OWP expenditures funded by oil and gas operators through financial assurance, a levy on oil and gas production, and penalty revenue paid by oil and gas operators. The State budget appropriation does not and has not received revenue from personal or corporate state income tax (i.e., General Fund). Relevant excerpts from C.R.S. 34-60-124. Energy and carbon management cash fund - definitions - repeal. (4) The fund may be expended: (a) By the commission, or by the director at the commission's direction, prior to, during, or after the conduct of any operations subject to the authority of the commission to:	

State or Province	Statutes and/or regulations specific to orphan/abandoned well program	Referenced information provided.	Comments
		(I) Investigate, prevent, monitor, or mitigate conditions that threaten to cause, or that actually cause, a significant adverse environmental impact on any air, water, soil, or biological resource; ... (6) For the purposes provided for in subsection (4) of this section, the commission is authorized to: (a) Enter onto any lands or waters, public or private; and, except in emergency situations, the commission shall provide reasonable notice prior to such entry in order to allow a surface owner, local government designee, operator, or responsible party to be present and to obtain duplicate samples and copies of analytical reports; ... (7) If the commission determines that mitigation of a significant adverse environmental impact on any air, water, soil, or biological resource is necessary as a result of the conduct of oil and gas operations, the commission shall issue an order requiring the responsible party to perform such mitigation. If the responsible party cannot be identified or refuses to comply with such order, the commission shall authorize the necessary expenditures from the fund. In 2022, the U.S. Department of Interior (DOI) awarded a Federal Infrastructure Investment & Jobs Act Initial Grant to ECMC: \$25 Million for the period from October 1, 2022 through September 30, 2024. After the Initial Grant expires, the Act authorizes Formula Grants and Performance Grants. DOI has more information available at https://www.doi.gov/orphanedwells.	

State or Province	Statutes and/or regulations specific to orphan/abandoned well program	Referenced information provided.	Comments
		Infrastructure Investment and Jobs Act Federal Grant https://sites.google.com/state.co.us/cogcc-owp/federal-grant?authuser=0 In 2023, ECMC entered into an agreement with the Bureau of Land Management to perform work on federally-orphan wells.	
Idaho	No ¹⁷⁴		
Illinois	Not Submitted		Questionnaire not submitted. Statutes and/or regulations available at https://dnr.illinois.gov/oilandgas/programsandregulations.html
Indiana	Not Submitted		Questionnaire not submitted. Statutes and/or regulations available at https://www.in.gov/dnr/oil-and-gas/statutes-and-regulations/
Kansas	Not Submitted		Questionnaire not submitted. Statutes and/or regulations available at https://www.kcc.ks.gov/oil-gas/rules-and-regulations
Kentucky	Yes	KRS 353.562, 353.563, 353.564, (Definitions in 353.510 (12, 47, & 48)), and KRS 353.590 (27) statute.aspx (ky.gov)	In Kentucky our KASTOW laws (KRS 353.562-564) are specifically in place to deal with orphan oil and gas wells and associated infrastructure.
Louisiana	Yes	Louisiana Oilfield Site Restoration Law (LA R.S. 30:80 – 30:97) Louisiana Public Bid Law (LA R.S. 38:2211 et seq)	
Maryland	No ¹⁷⁵		
Michigan	Yes	http://www.legislature.mi.gov/(S(jc0haesbwfsgjtymba5fiz))/mileg.aspx?page=getObject&objectName=mcl-324-61601 PART 616, ORPHAN WELL FUND, 1994 PA 451, AS AMENDED 324.61601 DEFINITIONS. Sec. 61601. As used in this part: (a) “Abandoned oil or gas well” means an oil or gas well that has not been plugged promptly after having been drilled as a dry hole or has not been used for its intended	The OGMD also conducts plugging work in accordance with Part 615 Supervisor of Wells, of the Natural Resources and Environmental Protection Act (NREPA), Public Act 451 of 1994, as amended (Part 615) which contains plugging and restoration standards.

¹⁷⁴ Respondent reports no known orphan wells. See Appendix B – Reference Documents; Idle and Orphan Oil and Gas Wells: State and Provincial Regulatory Strategies 2021; Interstate Oil and Gas Compact Commission; Table 3. Documented and Undocumented Orphan Wells (2018 – 2020); page 28

¹⁷⁵ Respondent reports no known orphan wells. See Appendix B – Reference Documents; Idle and Orphan Oil and Gas Wells: State and Provincial Regulatory Strategies 2021; Interstate Oil and Gas Compact Commission; Table 3. Documented and Undocumented Orphan Wells (2018 – 2020); page 28

State or Province	Statutes and/or regulations specific to orphan/abandoned well program	Referenced information provided.	Comments
		purpose during 12 consecutive months, unless the supervisor has authorized it to remain idle. (b) "Fund" means the orphan well fund created in section 61602. (c) "Oil or gas well" means a well drilled pursuant to part 615, or its predecessor acts, or a well drilled prior to the effective dates of part 615 or its predecessor acts as determined by the supervisor, for oil or gas exploration or development or storage, or associated production or disposal activities. (d) "Operator" means the person authorized by contract or agreement by the owner to drill, operate, maintain, or plug a well. Operator does not include the operator of a natural gas storage field within the boundary of the natural gas storage field unless the natural gas storage field operator has either drilled, plugged, or replugged the well in question or has utilized the well for the injection or withdrawal of natural gas into or from the natural gas storage field. (e) "Owner" means the person who has the right to drill a well into a pool, to produce from a pool, and to receive and distribute the value of the production from the pool for himself or herself either individually or in combination with others. (f) "Response activity" has the same meaning as in part 201. (g) "Site restoration" means the filling and leveling of all cellars, pits, and excavations; the removal or elimination of all debris; the elimination of conditions that may create a fire or pollution hazard; the minimization of erosion; and the restoration of the well site as nearly as practicable to the original land contour or to a condition approved by the supervisor after consulting with the surface owner of the land and with the operator of a natural gas storage field if the well site is within the boundary of a natural gas storage field.	

State or Province	Statutes and/or regulations specific to orphan/abandoned well program	Referenced information provided.	Comments
		(h) "Supervisor" means the supervisor of wells as provided by part 615 or his or her designee. History: Add. 1995, Act 57, Imd. Eff. May 24, 1995. 324.61602 ORPHAN WELL FUND; CREATION; DISPOSITION OF ASSETS. Sec. 61602. (1) The orphan well fund is created within the state treasury. (2) The state treasurer may receive money or other assets from any source for deposit into the fund. The state treasurer shall direct the investment of the fund. The state treasurer shall credit to the fund interest and earnings from fund investments. (3) Money in the fund at the close of the fiscal year shall remain in the fund and shall not lapse to the general fund. History: Add. 1995, Act 57, Imd. Eff. May 24, 1995. 324.61603 EXPENDITURES FROM FUND; CONSULTATION WITH OPERATOR. Sec. 61603. (1) The supervisor shall expend money from the fund, upon appropriation, only for the following purposes: (a) For plugging of abandoned or improperly closed oil or gas wells or response activity or site restoration at oil or gas wells for which no owner or operator is known, for which all owners or operators are insolvent, or at which the supervisor determines there exists an imminent threat to the public health and safety. (b) For the reasonable cost of the supervisor for internal administration in connection with the activities included in subdivision (a). (2) The supervisor shall consult with the operator of natural gas storage field prior to plugging any abandoned or improperly closed oil or gas wells within the boundary of the storage field operator's natural gas storage field. History: Add. 1995, Act 57, Imd. Eff. May 24, 1995. 97	

State or Province	Statutes and/or regulations specific to orphan/abandoned well program	Referenced information provided.	Comments
		324.61604 LIST TO BE SUBMITTED TO LEGISLATURE; ANNUAL APPROPRIATION FROM FUND FOR LISTED PROJECTS. Sec. 61604. (1) By January 1 of each year, the supervisor shall prepare and submit to the legislature a list of the oil or gas wells that should be plugged and those at which response activities or site restoration should be performed with money in the fund. The list shall be compiled in order of priority. The list shall be accompanied by estimates of total project costs for the proposed plugging, response activity, site restoration, internal administration, and potential emergency contingencies. Additionally, the supervisor shall include with the list a statement of the criteria used in listing and assigning the priority of these proposed actions. (2) The legislature shall annually appropriate money from the fund for projects on the list prepared under subsection (1) and for sites where there exists an imminent threat to public health and safety. Except for sites where there exists an imminent threat to public health and safety, projects shall be funded in the order of their priority on the list. History: Add. 1995, Act 57, Imd. Eff. May 24, 1995. 324.61605 ACTION BY ATTORNEY GENERAL AGAINST WELL OWNER OR OPERATOR; RECOVERY OF MONEY EXPENDED. Sec. 61605. Following the expenditure of money from the fund pursuant to section 61603(1)(a), the attorney general may bring an action against a person who was the owner or operator of the well at the time that the condition arose requiring expenditure of money from the fund, to recover from that owner or operator the amount of money expended from the fund for which the owner or operator is liable. Money recovered under this	

State or Province	Statutes and/or regulations specific to orphan/abandoned well program	Referenced information provided.	Comments
		section shall be deposited into the fund. History: Add. 1995, Act 57, Imd. Eff. May 24, 1995. 324.61606 SALE OF EQUIPMENT. Sec. 61606. The supervisor may sell the well pipe and any other equipment related to an abandoned or improperly closed well as to which there is an expenditure of money from the fund. The proceeds of sale shall be credited to the fund. History: Add. 1995, Act 57, Imd. Eff. May 24, 1995. 324.61607 REPORT TO LEGISLATURE OF EXPENDITURES. Sec. 61607. By December 31 of each year, the supervisor shall prepare and submit to the legislature a report that details expenditures from the fund for the preceding fiscal year. History: Add. 1995, Act 57, Imd. Eff. May 24, 1995.	
Mississippi	Yes	Statutes 53-1-47, 53-1-77	
Missouri	Yes	RSMo 259. 10 CSR 50	
Montana	Yes	82-11-161, MCA - Oil And Gas Production Damage Mitigation Account -- Statutory Appropriation	https://leg.mt.gov/bills/mca/title_0820/chapter_0110/part_0010/section_0610/0820-0110-0010-0610.html
Nebraska	No		
Nevada	Not Submitted		Questionnaire not submitted. Statutes and/or regulations available at https://minerals.nv.gov/Programs/OG/OG/
New Mexico	Not Submitted		Questionnaire not submitted. Statutes and/or regulations available at https://www.emnrd.nm.gov/ocd/occ-info/og-rules-and-forms/
New York	Yes	Environmental Conservation Law §23-0305 8 (e) 6 CRR-NY §555.5 Plugging methods, procedures and reports	
North Dakota	Not Submitted		Questionnaire not submitted. Statutes and/or regulations available at https://www.dmr.nd.gov/dmr/oilgas/rules
Ohio	Yes	ORC 1509.071 establishes and defines Ohio's Orphan Well Program. Pursuant to ORC 1509.071, the Chief of the Division is required to spend at least 30 percent of the previous year's revenue deposited into the Oil & Gas Well Fund created under ORC 1509.02 for the purpose of	The Oil & Gas Well Fund is authorized in ORC 1509.02. This fund includes all oil & gas generated revenue such as severance tax, fines, and permit fees.

State or Province	Statutes and/or regulations specific to orphan/abandoned well program	Referenced information provided.	Comments
		plugging orphan wells, restoring disturbed land surface, and remediating conditions the Chief has determined are causing imminent health and safety or environmental risks. OAC 1501:9-11 Plugging of Wells https://codes.ohio.gov/ohio-administrative-code/chapter-1501:9-11	
Oklahoma	Yes	165:5-7-39 Staff applications for state funds to conduct remedial action (a) Scope. This Section establishes the procedure for applications by Commission staff requesting the issuance of orders authorizing the use of state funds to plug, replug, or repair wells, and repair, remediate or close commercial pit facilities	We are limited on how many wells this money will plug each year.
Pennsylvania	Yes	Section 3220 of the Oil and Gas Act establishes the authority for PA DEP to plug abandoned, orphan and unregistered/unpermitted active wells. Those terms are defined in section 3203 of the Oil and Gas Act. The Department can “sell equipment, casing and pipe at the site which may have been used in production of the well in order to recover the costs of plugging.” If the amount obtained for casing and pipe salvaged at the site is inadequate to pay for plugging, the owner or operator of the abandoned or unregistered well shall be liable for the additional costs. Section 3271 of the Oil and Gas Act creates permit application surcharges of \$150 per oil well and \$250 per gas well. Fifty dollars of these surcharges are paid into the Abandoned Well Plugging Fund and expended by the department to plug abandoned wells threatening the health and safety of persons or property or pollution of waters of this Commonwealth. The balance is paid into the Orphan Well Plugging Fund and expended by the department to plug orphan wells.	An “abandoned” well is a well that has not been used to produce, extract or inject any gas, petroleum or other liquid within the preceding 12 months; for which equipment necessary for production, extraction or injection has been removed; or considered dry and not equipped for production within 60 days after drilling, redrilling or deepening. An “orphan” well is a well abandoned prior to April 18, 1985, that has not been affected or operated by the present owner or operator and from which the present owner, operator or lessee has received no economic benefit other than as a landowner or recipient of a royalty interest from the well. All “orphan” wells in Pennsylvania are therefore “abandoned” wells. Please note that the Department’s authority to plug abandoned wells is NOT dependent on the lack of a responsible party to conduct the well plugging or an attempt by the Department to require a responsible party to plug the well (through, for example, issuing an administrative order requiring plugging). The Department is authorized to directly plug the abandoned well and then seek cost recovery from the responsible party.

State or Province	Statutes and/or regulations specific to orphan/abandoned well program	Referenced information provided.	Comments
South Dakota	Not Submitted		Questionnaire not submitted. Statutes and/or regulations available at https://danr.sd.gov/Environment/MineralsMining/OilGas/LawsRules.aspx
Tennessee	Yes	0400-52-01-.01 AMOUNT OF PLUGGING BOND 0400-52-01-.02 BLANKET PLUGGING BOND 0400-52-01-.03 RECLAMATION BOND 0400-52-01-.06 FORFEITURE 0400-52-02-.02 DRILLING PERMIT 0400-52-12-.01 VIOLATIONS, PENALTIES, NOTICE, HEARING	Our orphan/abandoned wells go through a bond forfeiture process. Plugging and reclamation bonds are required from the well operator prior to a permit to drill being issued. If the well operator is noncompliant with the oil and gas program's statute and/or regulations, the program pursues enforcement, up to and including bond forfeiture. The state then secures the funding that the operator has posted on the well and site. The monies go into a fund that is utilized for contracts to plug and reclaim the well(s) sites according to regulation.
Texas	Not Submitted		Questionnaire not submitted. Statutes and/or regulations available at https://www.rrc.state.tx.us/oil-and-gas/
Utah	Yes	Statute that establishes funding and creation of Orphan well plugging program is 40-6-14.5. https://le.utah.gov/xcode/Title40/Chapter6/40-6-S14.5.html?v=C40-6-S14.5_2021050520210505 Contracts are run through State Purchasing and are governed by their code on procurement. https://le.utah.gov/xcode/Title63G/Chapter6A/63G-6a.html?v=C63G-6a_1800010118000101	
Virginia	Yes	An Orphaned well is defined in Section 45.2-1600 of the Virginia Gas and Oil Act as any well abandoned prior to July 1, 1950. An exclusive plugging fund for orphaned wells has been established by Section 45.2-1642 of the Act. Abandonment of a well refers to a well that was drilled after July 1, 1950, has been abandoned, its bond attached by the state, and requires plugging. Plugging and reclamation of such a well is funded by bond forfeiture and, if necessary, supplemented by the Gas and Oil Plugging and Restoration Fund established under Section 45.2-1634 of the Act. All wells drilled after 1950 are bonded.	

State or Province	Statutes and/or regulations specific to orphan/abandoned well program	Referenced information provided.	Comments
West Virginia	Yes	W. Va. Code §§ 22-6-29, 22-6-29a, 22-10-6, 22-10-7 W. Va. CSR 35-6	
Wyoming	Yes	Wyoming Statute §30-5-104(a) grants the WOGCC jurisdiction and authority over all persons and property, public and private, necessary to effectuate the purposes and intent of the act. The act is the Conservation Act which is the enabling act for the WOGCC and includes authority for bonding and use of the conservation tax for plugging wells if bonding is not adequate. W.S. §30-5-104(d)(i)(D) grants authority to the WOGCC to require the furnishing of surety bond or other guaranty securing the performance of the duty to plug wells. W.S. §30-5-104(d)(vii) grants authority to use finds collected under W.S. §30-5-116(b) to plug wells and seismic holes and reclaim the surrounding area affected by them if the WOGCC is unable to enforce its regulations and laws requiring the owner, seismic contractor, or hole plugger to plug and reclaim and if these parties do not have an adequate surety bond or other guaranty to cover the cost of the plugging and reclamation. If oilfield equipment is abandoned in the area of the well or hole which is plugged or reclaimed under this statute the WOGCC may, after notice and hearing provided in W.S. §30-5-105 and 30-5-106 and a finding that the equipment is abandoned, dispose of the equipment by public sale or by transferring it to the contractor who performs the plugging and reclamation. The transfer or proceeds of the sale shall be used to defray the cost of plugging or reclamation. W.S. §30-5-116 assesses a charge on the fair cash market value of all oil and gas produced, sold or transported from the premises in Wyoming, which is not to exceed eight-tenths of one mill on the	WOGCC rules and regulations are located on the Wyoming Secretary of State website at https://rules.wyo.gov/ and searching by Oil and Gas Conservation Commission. A pdf copy of the WOGCC Rules and Regulations are attached to the email response to this document.

State or Province	Statutes and/or regulations specific to orphan/abandoned well program	Referenced information provided.	Comments
		dollar. The amount of the charge is fixed by the WOGCC through a rulemaking process. The monies collected are used exclusively to pay the costs and expenses incurred in connection with the administration and enforcement of W.S. §30-5-101 through 30-5-119, known as the Conservation Act, including the activities mentioned above. Chapter 1, Section 2 and Chapter 5, Section 17 of the WOGCC rules and regulations provides additional definitions and requirements related to declaring oilfield equipment abandoned and the process for removal of abandoned oilfield equipment, related to W.S. §30-5-104(d)(vii). Chapter 2, Section 3 of the WOGCC rules and regulations grants access to the Supervisor and his Authorized Agents to all wells at all reasonable times for the purpose of plugging and abandonment and to well sites for the purpose of reclamation if the Supervisor determines that the wells and/or well sites should be added to his plugging schedule. Chapter 3, Section 16 (f) states that the Commission may, in its sole discretion, approve the Supervisor to use conservation funds collected in accordance with W.S. §30-5-116(b) to plug wells and seismic holes and reclaim the surrounding area affected by them if the Commission is unable to enforce its Rules and Regulations and laws, up to and including legal action where appropriate, requiring the Owner, Operator, geophysical/seismic company, client company, or hole plugger to plug and reclaim and if there exists neither a plugging bond nor other security adequate to properly plug and abandon and rehabilitate the surface. The Supervisor shall establish and maintain a well plugging schedule which prioritizes wells for plugging through an assessment of the well's	

State or Province	Statutes and/or regulations specific to orphan/abandoned well program	Referenced information provided.	Comments
		potential to adversely impact public health, public safety, surface or ground waters, surface use, or other mineral resources. W.S. §9-2-3201 and 9-2-3204 create the Wyoming Department of Administration and Information General Services Division and sets out requirements for procurement of supplies and services. The WOGCC works with the A&I General Services Division to create, advertise, and evaluate bids related to orphan wells, plugging, reclamation, and any other work related to these projects.	
Alberta	Not Submitted		Questionnaire not submitted. Statutes and/or regulations available at https://www.alberta.ca/oil-acts-and-regulations
British Columbia	Yes	Part 4 of the Energy Resource Activities Act Funding through the Orphan Liability Levy, as set out in the Fee Levy and Security Regulation Part 5 of the Drilling and Production Regulation ((Drilling and Production Regulation (gov.bc.ca)))	Part 4 of ERAA enables our ability to complete work on orphan sites, including what constitutes an orphan site. Part 5 of the DPR establishes requirements permit holders must meet when decommissioning wells. Further guidance is provided via the BC Well Decommissioning Guidelines (Well Decommissioning BC Energy Regulator (BCER) (bc-er.ca))
Saskatchewan	Not Submitted		Questionnaire not submitted. Statutes and/or regulations available at https://www.saskatchewan.ca/business/agriculture-natural-resources-and-industry/oil-and-gas/oil-and-gas-legislation-regulations-and-ministers-orders

Table 3. State/Province Questionnaire¹⁷⁶: Section 3: Plugging Materials and Plug Placement; Subsection 1: Well Plugging Materials and Alternate Plugging Materials

State or Province	List of approved plugging materials	Referenced information provided	Comments
Alabama	No		
Alaska	Not Submitted		
Arizona	No ¹⁷⁷		
Arkansas	Yes	RULE B-9: WELL PLUGGING METHODS AND PROCEDURES a) Definitions: 1) "Cased Well" means a well in which production casing has been set and cemented. 2) "Cement" means a class A or H neat cement with a minimum weight of 14.5 pounds per gallon, unless the cement contains additives which improve the ability of the cement to provide necessary protection and which maintains a minimum compressive strength of 500 PSI after 72 hours. 3) "Circulation Method" means placement of cement used in plugging a well by circulating cement by positive pressure displacement through tubing set at a specified depth in the well. 4) "Dump Bailer Method" means placement of cement used in plugging a well by using a dump bailer on a wire line. 5) "General Oilfield Waste" means oily rags, chemical containers including any unused chemicals, oil filters and gaskets, used motor oil, lubricating oils, hydraulic fluids, diesel fuels, paint and solvent wastes and other similar wastes generated during drilling, completion, production, workover and plugging activities and which are not exempt from the provisions of Subtitle C of the Federal Resource Conservation Recovery Act of 1976. 6) "Mud" means only a fresh-water based drilling mud with a minimum weight of 9 pounds per gallon with a minimum viscosity of 45 seconds using API Full Funnel Method. Mud may contain water (fresh or brine), Bentonite, Attapulgitite or other additives if they do not reduce the weight or viscosity below the required minimum. 7) "Plugging Fluid Waste" means plugging fluids, including cement, that are generated from the well during plugging activities.	

¹⁷⁶ Appendix D State/Province Survey Questionnaire

¹⁷⁷ Respondent reports no known orphan wells. See Appendix B – Reference Documents; Idle and Orphan Oil and Gas Wells: State and Provincial Regulatory Strategies 2021; Interstate Oil and Gas Compact Commission; Table 3. Documented and Undocumented Orphan Wells (2018 – 2020); page 28

State or Province	List of approved plugging materials	Referenced information provided	Comments
		8) "Uncased Well" means a well in which production casing has not been set or is set, but not cemented. b) Uncased Wells 1) Uncased wells shall be plugged when required by General Rule B-7. 2) Notice of the plugging of uncased wells shall be given to the Commission Regional Office where the well is located, in accordance with General Rule B-7. Following initial notice to the Commission Regional Office, additional requirements concerning the wellplugging operation, may be given to the Permit Holder or the Permit Holder's authorized representative. 3) Uncased wells where intermediate casing has been set, shall be subject to all the required plugging time frames for uncased wells and the applicable plugging requirements for cased wells in (c) below with respect to the protection of freshwater and oil and gas zones. 4) Plugging Requirements A) The uncased well bore shall be filled with mud from the total depth of the well to the base of the surface casing prior to commencing plugging operations. B) Any zones which have been productive of oil and or gas occurring in wells within ½ mile of the uncased well, shall have a one hundred (100) foot cement plug placed above each such correlated interval in the uncased well. C) A zone which contains any amount of hydrogen sulfide gas, or any other zone within the well which does not contain hydrogen sulfide gas, but hydrogen sulfide gas is present within the same zone within any well within one-half (1/2) mile, shall be covered, at a minimum, with a cement plug from one hundred (100) feet below to one hundred (100) feet above the zone or with a greater amount of cement sufficient to shut-off and control the flow of hydrogen sulfide gas. D) If surface casing has been set to a depth of at least five hundred (500) feet in the well, a one hundred (100) foot cement plug shall be placed, utilizing the circulation method, from a depth of fifty (50) feet below the base of the surface casing, or from the depth of any deeper freshwater well within ½ mile of the dry hole, and extending fifty (50) feet into the cemented surface casing.	

State or Province	List of approved plugging materials	Referenced information provided	Comments
		E) If surface casing has not been set to a minimum depth of five hundred (500) feet in the well, a cement plug shall be placed, from a depth of at least five hundred (500) feet or from the depth of any deeper freshwater well within one-half (½) mile of the dry hole, extending to fifty (50) feet into the cemented surface casing. F) Any zones not covered by the surface casing plug specified above, which produced water during the drilling or subsequent plugging operations, shall be covered at a minimum, with a cement plug from fifty (50) feet below to fifty (50) feet above the zone or a greater amount of cement sufficient to shut-off the flow of water. G) A cement plug shall be placed from a minimum depth of fifty (50) feet to a depth of three (3) feet below the surface of the ground and the casing cut off three (3) feet below the ground surface, or deeper if surface use conditions indicate, and a plate welded onto the top of the casing and the remaining wellbore filled with soil and leveled in such manner as not to interfere with soil cultivation or surface use. 5) In the case of lost tools or stuck drill pipe, every reasonable attempt should be made to recover the tools or drill pipe, at least to a depth of the required surface casing plug, and the required surface casing plugs placed as required above. In the event the lost tools or stuck drill pipe cannot be recovered from a depth below the required depth of the surface casing plug, the Director may vary the plugging requirements of this subparagraph and specify alternative plugging requirements. In determining whether to approve and in selecting an alternative plugging requirement, the Director shall consider the potential for damage to fresh water, the depth of the lost tools or equipment in relation to the depth of fresh water zones, well construction characteristics, and the potential for upward migration of wellbore fluids into the fresh groundwater. c) Cased Wells 1) Cased wells shall be plugged when required by General Rule B-7. 2) Notice of the plugging of cased wells shall be given to the Commission Regional Office where the well is located, in accordance with General Rule B-7. 3) Plugging Requirements	

State or Province	List of approved plugging materials	Referenced information provided	Comments
		A) The wellbore shall be filled with mud from total depth of the well to the base of the surface casing prior to commencing plugging operations. B) Cast iron bridge plugs may be set above the lowernmost perforated interval or between perforated intervals prior to filling the wellbore with mud, in which case the wellbore need only be filled with mud from the top of the uppermost cast iron bridge plug to the base of the surface casing prior to commencing plugging operations. C) If using the circulation method, a cement plug of not less than one hundred (100) feet in length, shall be placed from fifty (50) feet below, or total depth if well bore did not extend to a point fifty (50) feet below, and extend across the perforated interval, to a point fifty (50) feet above each perforated interval. D) If using the dump bailer method, a cast iron bridge plug, shall be placed inside the cemented portion of the production casing, immediately above each perforated interval, with each bridge plug covered with a minimum of ten (10) feet of cement. In the alternative a cast iron bridge plug may be placed over the lower most perforated interval and the wellbore casing filled with cement to a point fifty (50) feet above the top of the uppermost perforated interval, provided the production casing/wellbore annulus is filled with cement to a point fifty (50) feet above the uppermost perforated interval. E) If cement is not present on the outside of the production casing at the location of each required cement plug, specified in F), G) and H) below, cement shall be placed on the outside of the production casing in the production casing/wellbore annulus from a point fifty (50) feet below, or total depth if the well bore did not extend to a point fifty (50) feet below, and extending across the required interval to be plugged, to a point fifty (50) feet above each required interval to be plugged. However, the Director may approve alternative, but equally protective, placement of cement plugs, openhole devices or plugging materials when necessary due to well construction limitations. F) Any zones not covered by the surface casing, which produce water during the plugging operation or are known to be significant water producing formations or	

State or Province	List of approved plugging materials	Referenced information provided	Comments
		which are known to be over-pressured, shall be covered at a minimum, with a cement plug from fifty (50) feet below to fifty (50) feet above the zone or a greater amount of cement sufficient to shut-off the flow of water. The Director may approve alternative, but equally protective, plugging materials or other open-hole devices sufficient to shut-off the flow of water. G) If surface casing has been set to a minimum depth of five hundred (500) feet in the well, a one hundred (100) foot surface casing cement plug shall be placed, on the outside and inside of the production casing if production casing is not removed, from a depth of fifty (50) feet below the base of the surface casing, or from the depth of any deeper freshwater well within ½ mile of the wellbore, and extend fifty (50) feet into the cemented surface casing. H) If surface casing has not been set to a minimum depth of five hundred (500) feet in the well, a cement plug shall be placed, on the outside and inside of the production casing, if production casing is not removed, from a depth of at least five hundred (500) feet or from the depth of any deeper freshwater well within ½ mile of the well bore and extend fifty (50) feet into the cemented surface casing present in the wellbore. However, if it can be demonstrated that no freshwater bearing zones are present below the existing surface casing set in the well, the Director may approve an alternative surface casing plug extending from fifty (50) feet below the existing surface casing and extending fifty (50) feet into the cemented surface casing present in the wellbore. I) The casing shall be cut off three (3) feet below the ground surface, or deeper if surface use conditions indicate, and a plate welded onto the top of the casing and the remaining wellbore filled with soil and leveled in such manner as not to interfere with soil cultivation or surface use. A cement plug, not less than three (3) feet, shall be also be placed below the plate that is welded onto the top of the casing. 4) Foreign Material Prohibited A) Except for an unavoidable loss of drilling and logging tools, production equipment or the presence of damaged casing obstructing the wellbore, placing or lodging any material or substance, in an unplugged well to either fill or bridge	

State or Province	List of approved plugging materials	Referenced information provided	Comments
		the hole for the purpose of avoiding proper plugging procedures is prohibited. B) Foreign materials which have been placed in the hole shall be removed before plugging operations are commenced. 5) Plugging A Bridged Well A) When a well becomes obstructed because of the loss of drilling or logging tools or producing equipment, which would be impractical to remove, the Director may vary the plugging requirements of this subparagraph and specify alternative plugging requirements. B) In determining whether to approve and in selecting alternative plugging requirements, the Director shall consider the time and cost of removing lost tools or equipment, the potential for damage to fresh water, the depth of the lost tools or equipment in relation to the depth of fresh water zones, well construction characteristics, and the potential for upward migration of wellbore fluids into the fresh groundwater. d) Horizontal Well Plugging Procedures 1) For an uncased well, the plugging procedures shall be in accordance with subparagraph (b) above with the exception that (i) the production interval plug shall be placed at the beginning of the well curve “kick-off point” and the required cement placed or extend above that point, and (ii) oil-based drilling mud may be used to fill the horizontal lateral of the wellbore up to the “kick-off point” provided the “kick-off point” is below any known fresh groundwater. 2) For an cased well, the plugging procedures shall be in accordance with subparagraph (c) above with the exception that (i) the production interval plug shall be placed at the beginning of the well curve “kick-off point” and the required cement placed or extend above that point, and (ii) oil-based drilling mud may be used to fill the horizontal lateral of the wellbore up to the “kick-off point” provided the “kick-off point” is below any known fresh groundwater. 3) If a vertical “pilot hole” is drilled below the well curve “kick-off point”, and the pilot hole encountered another producing interval in the vertical pilot hole below the “kick-off point”, a one hundred (100) foot cement plug shall be placed above each such correlated interval	

State or Province	List of approved plugging materials	Referenced information provided	Comments
		encountered in the vertical pilot hole, prior to drilling the horizontal portion of the well, unless approval has been granted to produce the other interval encountered in the pilot hole in accordance with applicable general rules or order of the Commission. Additionally, the Director may approve alternative forms of zonal isolation based on the productive potential of the isolated zone. 4) Well-site clean-up shall be in accordance with sub-paragraph (e) below. e) Well Site Clean-Up 1) When plugging a well, the permit holder shall provide at least one (1) pit as described in subparagraph e) 2) below, or leak free, above ground, portable container into which plugging fluid wastes shall be deposited. 2) Plugging pits, shall be constructed with sufficient capacity to contain all plugging fluid wastes within the pits, and maintained in a manner that reasonably prevents overflow during plugging operations. Plugging pits shall be used only for the temporary storage of plugging fluid wastes, and shall not be used for the disposal of general oilfield wastes. 3) All general oilfield wastes generated during plugging activities shall be temporarily stored in on-site containers, and shall be removed from the site at the conclusion of plugging activity. General oilfield wastes shall not be disposed of through on-site burial or in plugging pits. 4) All plugging pits shall be filled and graded within thirty (30) days after conclusion of plugging activities, unless an extension has been granted by the Director. All plugging pits shall be closed allowing no subsidence or leakage of fluids, and where applicable, with sufficient compaction to support agriculture or forestry machinery. 5) All production equipment, concrete bases, machinery, and equipment debris shall be removed from the site. 6) Any drilling rat holes shall be filled with mud to a depth of ten (10) feet below the surface, at which point a cement plug shall be placed from ten (10) feet to three (3) feet below ground level and leveled to the surface with soil. 7) Any other excavations shall be filled and the overall well site graded or contoured to prevent erosion. f) Alternative plugging methods maybe authorized by the Director, provided the	

State or Province	List of approved plugging materials	Referenced information provided	Comments
		same or equal level of protection for the freshwater and oil and gas zones can be maintained. (Original rule Repealed Effective October 15, 2006; new rule March 25, 2010; amended October 1, 2015)	
California	No		California regulations state "... cement plugs will be placed across specified intervals to protect oil and gas zones, to prevent degradation of usable waters, to protect surface conditions, and for public health and safety purposes. Cement may be mixed with or replaced by other substances with adequate physical properties, which substances shall be approved by the Supervisor". (State Oil and Gas Supervisor). "Mud fluid having the proper weight and consistency to prevent movement of other fluids into the well bore shall be placed across all intervals no plugged with cement, and shall be surface poured into all open annuli."
Colorado	No		
Idaho	No ¹⁷⁸		
Illinois	Not Submitted		
Indiana	Not Submitted		
Kansas	Not Submitted		
Kentucky	No		Although Kentucky does not have a list of approved materials, we do have a staff of very knowledgeable oil and gas inspectors and technical advisors and we hold our operators and contractors to a very high standard, that meets or exceeds the industry standard on materials and techniques used for plugging and abandonment.
Louisiana	No		
Maryland	No ¹⁷⁹		
Michigan	No	Pursuant to Part 615, the materials used must be approved by the Supervisor. There is no specific list of approved materials. The Supervisor of Wells issue plugging instruction, or must approve any plugging instructions submitted by operators for approval.	Part 615 of the NREPA R 324.902 PLUGGING INSTRUCTIONS; METHODS AND MATERIALS. Rule 902.

¹⁷⁸ Respondent reports no known orphan wells. See Appendix B – Reference Documents; Idle and Orphan Oil and Gas Wells: State and Provincial Regulatory Strategies 2021; Interstate Oil and Gas Compact Commission; Table 3. Documented and Undocumented Orphan Wells (2018 – 2020); page 28

¹⁷⁹ Respondent reports no known orphan wells. See Appendix B – Reference Documents; Idle and Orphan Oil and Gas Wells: State and Provincial Regulatory Strategies 2021; Interstate Oil and Gas Compact Commission; Table 3. Documented and Undocumented Orphan Wells (2018 – 2020); page 28

State or Province	List of approved plugging materials	Referenced information provided	Comments
			(1) The supervisor or authorized representative of the supervisor shall issue plugging instructions after receipt of notification pursuant to R 324.901. The plugging instructions shall specify all of the following information: (a) The type and amount of plugging material to be used. (b) The depths at which bridges are to be set. (c) The depths and lengths of cement plugs. (d) The amount of casing to be pulled. (e) Other requirements the supervisor determines are necessary for the proper plugging of the well. (2) A permittee of a well shall ensure that all oil, gas, brine, and fresh water is confined to the strata in which the oil, gas, brine, and fresh water occur by using cement plugs or other plugs approved by the supervisor. A permittee of a well shall ensure that the well is plugged under static hole conditions at all times, unless otherwise approved by the supervisor or authorized representative of the supervisor. (3) A permittee of a well shall ensure that each cement plug, except for the bottom hole plug required by subrule (5) of this rule, the plug to be set at the base of the surface casing required by subrule (6) of this rule, and the surface plug required by subrule (7) of this rule, is a minimum of 200 feet in length or contains 50 sacks of cement, whichever is the greater volume of cement, unless otherwise approved by the supervisor or authorized representative of the supervisor. (4) A permittee of a well shall ensure that each cement plug, except for the bottom hole plug required by subrule (5) of this rule and the plug to be set at the base of the surface casing required by subrule (6) of this rule, is allowed to set undisturbed for a minimum of 1 hour and that the fluid level in the casing is continuously observed. If the observed fluid level in the casing drops during the hour, then the cement plug shall be tagged to ensure that the plug is still in place before setting the next plug uphole. If the plug is found not to be in place, then the plug shall be reset.

State or Province	List of approved plugging materials	Referenced information provided	Comments
			(5) A permittee of a well shall ensure that the bottom hole cement plug is either: (a) A minimum of 200 feet in length, is allowed to set undisturbed for a minimum of 4 hours, has reached a compressive strength of 100 psi or more, and is tagged to ensure that it is still in place before setting the next plug uphole; however, if the bottom hole cement plug in a dry hole drilled by rotary methods is a minimum of 400 feet in length and the fluid level in the hole is observed to remain static, then the bottom hole plug is not required to be tagged. (b) A mechanical bridge plug or other approved bridge has been set and a minimum of 50 feet of cement has been placed on the bridge before setting the next plug uphole. (6) A permittee of a well shall set the plug at the base of the surface casing using either of the following methods as approved by the supervisor or authorized representative of the supervisor: 62 (a) In static hole conditions, a cement plug shall be set at a minimum of 100 feet below the surface casing and shall extend a minimum of 100 feet into the surface casing. The cement plug shall be allowed to set undisturbed a minimum of 4 hours, shall have reached a compressive strength of 100 psi or more, and shall be tagged to ensure that it is still in place before setting the next plug uphole. If the plug is found not to be in place, then the plug shall be reset. (b) A mechanical open hole bridge plug or other approved bridge shall be set a minimum of 100 feet below the surface casing. A cement plug shall then be placed on the mechanical open hole bridge plug or other approved bridge. The cement plug shall extend a minimum of 100 feet into the surface casing, unless otherwise approved by the supervisor or authorized representative of the supervisor. (7) A permittee of a well shall set a cement surface plug a minimum of 30 feet below the surface and within 5 feet of the surface, unless otherwise approved by the supervisor or

State or Province	List of approved plugging materials	Referenced information provided	Comments
			authorized representative of the supervisor. (8) If surface casing is not present, a permittee of a well shall set a mechanical open hole bridge plug or other approved bridge a minimum of 100 feet below the base of the glacial drift or 100 feet below the deepest fresh water stratum, whichever is the greater depth, and shall circulate cement to within 5 feet of the surface. (9) A permittee of a well shall ensure that the surface pipe or conductor pipe abandoned with the hole is cut off at a point not less than 4 feet below grade, a 1/2-inch steel welded plate or another type of seal approved by the supervisor or authorized representative of the supervisor is placed across the top of the pipe or pipes, and the permit number of the well is permanently affixed to the plate or approved seal at the top of the well. (10) A permittee shall file, within 60 days after plugging, the final plugging forms and certified copies of the service company records, which shall include all of the following information: (a) The type of cement and number of sacks used, including the additives and percentages of the additives for each cement bridge plug. (b) The type and volume of plugging material used if other than cement. (c) The number of bridge plugs set in the hole and the depth and length of each plug. (d) Other materials left in the hole. (e) Service companies' records of cementing operations if requested by the supervisor or authorized representative of the supervisor. (f) All available graphics, if requested by the supervisor or authorized representative of the supervisor, showing the all of following information: (i) Pumping. (ii) Placement of cement. (iii) Weights. (iv) Times. (v) Pump rates. (vi) Other pertinent data dealing with the plugging operations. (g) The amounts and type of mix water used for each sack of cement.

State or Province	List of approved plugging materials	Referenced information provided	Comments
			(h) The volume and types of spacers and flushes used. (i) The operator's daily plugging records. (11) At a permittee's option, the well bore may be plugged from bottom to top with a material approved by the supervisor if the hydrostatic pressure of the material used is not allowed to exceed the fracturing pressure of the strata. History: 1996 AACS. R 324.903 COMMENCEMENT OF PLUGGING OPERATIONS. Rule 903. (1) A permittee of a well shall commence plugging operations within 90 days after drilling completion or well completion as a dry hole, when the well has not economically produced or has not been utilized for its permitted use for more than 12 consecutive months, when a change of well status has not been granted, or when the permitted use has been suspended for more than 12 consecutive months. The supervisor may require, or a permittee may submit, proof that is necessary to determine if the well is being economically produced. (2) After receiving a written request showing just cause why the well should not be plugged, the supervisor or authorized representative of the supervisor may grant temporary abandonment status pursuant to
Mississippi	Yes	Rule 28	
Missouri	No		
Montana	No		
Nebraska	No	028.02 The operator shall have the option as to the method of placing cement in the hole by (1) dump bailer, (2) pumping through tubing or drill pipe, (3) pump and plug or (4) other method approved by the Director or authorized deputy.	
Nevada	Not Submitted		
New Mexico	Not Submitted		
New York	No		
North Dakota	Not Submitted		
Ohio	Yes	Approved cement for well plugging must adhere to API 10A or ASTM C150/C595 specifications. Approved cement types:	While the plugging of cable-tool drilled wells with approved clay is permitted under Ohio law, the Division's Orphan Well Program does not utilize approved clay for plugging

State or Province	List of approved plugging materials	Referenced information provided	Comments
		https://ohiodnr.gov/discover-and-learn/safety-conservation/about-ODNR/oil-gas/oil-gas-resources/cement-approval Approved clay sourced: https://ohiodnr.gov/discover-and-learn/safety-conservation/about-ODNR/oil-gas/oil-gas-resources/approved-clay-sources	orphan wells and does not anticipate using it in the future. The Chief of the Division may approve the use of a fine grout that is able to attain a minimum compressive strength of five hundred pounds per square inch after twenty-four hours.
Oklahoma	Yes	165:10-11-6(e)(f)	Mud requirements. Before or after running a plug, the operator shall remove or displace all oil and saltwater in the wellbore, and the operator shall fill the wellbore and/or casing with drilling (plug) mud. The minimum mud weight shall be nine pounds per gallon. The minimum viscosity for the drilling mud shall be 36 (API Full Funnel Method). If the operator removes casing from the wellbore, the operator shall keep the wellbore filled with drilling mud meeting or exceeding the weight and viscosity requirements of this subsection. (f) Cement requirements. (1) Quality of cement. All cement and/or alternative materials used in plugging wells shall meet or exceed the following specifications: (A) Minimum compressive strength: 500 psi; (B) Maximum Young's modulus: < 1.2 x 10⁶ psi; (C) Permeability: < 0.1 mD; and (D) Minimum concentration of Portland cement: approximately 20%
Pennsylvania	No		PA DEP does not maintain a list of approved plugging materials. PA DEP regulations 25 Pa. Code § Chapter 78. Oil and Gas Wells includes a regulatory definition of <i>cement</i> which is referenced in § 78.1. <i>Definitions</i>. PA DEP also allows the use of mechanical plugs in lieu of cement plugs. The PA DEP allows the use of other materials approved by the Department. A well operator may request approval from the Department to use an alternative method or material for the casing, plugging or equipping of a well under section 3221 of the act (relating to alternative methods 78.75).
South Dakota	Not Submitted		
Tennessee	Yes	0400-52-09-.01 PLUGGING WELLS. https://publications.tnsosfiles.com/rules/0400/0400-52/0400-52-09.20130618.pdf	It is written within the rules and regulations the type of plugs that can be used and where they are to be placed - 0400-52-09-.01 PLUGGING

State or Province	List of approved plugging materials	Referenced information provided	Comments
			WELLS. Also, alternative methods not defined in the rule may be approved by the Supervisor
Texas	Not Submitted		
Utah	Yes	Rule R649-3-24 requires use of cement and bridge plugs for plugging a well but does allow for the Division to approve a different method and procedure (R649-3-24.4). Other material that has been considered in the past has been bentonite in conjunction with cement plugs. See language of R649-3-24 for more information. https://adminrules.utah.gov/public/rule/R649-3/Current%20Rules?searchText=R649	
Virginia	No		Virginia does not maintain a specific list. Regulation specifies acceptable materials and allows for alternatives if approved by the program director. 4VAC25-150-435 B.5
West Virginia	No		
Wyoming	No		We don't maintain a list of approved plugging materials, but the WOGCC Rules and Regulations (Chapter 3, Section 18) does maintain a minimum set of standards for cement and additives, stating all cement and additives shall consist of API class cement and additives, unless the use of non-API cement and additives has prior approval from the Supervisor. WOGCC rules and regulations are located on the Wyoming Secretary of State website at https://rules.wyo.gov/ and searching by Oil and Gas Conservation Commission. A pdf copy of the WOGCC Rules and Regulations are attached to the email response to this document.
Alberta	Not Submitted		
British Columbia	Yes	https://www.bc-er.ca/files/operations-documentation/Well-Decommissioning/Well-Decommissioning-Guidelines.pdf	Note that the DPR does not provide a mechanism for formally approving either a well decommissioning program, or a particular material being used for decommissioning. The BC Well Decommissioning Guidelines generally specifies the use of class G cement as a plugging material. However, as the use of class G cement is not prescribed by the Act or the Regulation, alternative plugging materials may be used. Where a permit holder proposes the use of an alternative material, they are expected to demonstrate that the results obtained from the alternative material will meet

State or Province	List of approved plugging materials	Referenced information provided	Comments
			or exceed the ability to provide isolation of class G cement. Some alternative materials/techniques proposed recently include resins/polymers, tin-bismuth alloy, thermite, controlled deformation of casing (for shutting off surface casing vent flow) and bio-squeeze. The Guideline differentiates between “routine” and “non-routine” decommissioning programs, and any use of an alternative material/technique would be considered “non-routine” and subject to further review by BCER technical staff.
Saskatchewan	Not Submitted		

Table 3. State/Province Questionnaire¹⁸⁰: Section 3: Plugging Materials and Plug Placement; Subsection 1: Well Plugging Materials and Alternate Plugging Materials

State or Province	Plugging materials defined by statute / rule	Referenced information provided	Comments
Alabama	Yes	Rule 400-1-4-.14 states that plugging material shall meet American Petroleum Institute (API) standards. https://www.ogb.state.al.us/ogb/rules	
Alaska	Not Submitted		
Arizona	No ¹⁸¹		
Arkansas	Yes	See Rule 9 above	
California	Yes	https://www.conservation.ca.gov/index/Pages/California-Geologic-Energy-Management-Division-Statutes-and-Regulations.aspx See California Code of Regulations Title 14 Chapter 4 Sub-Chapter 1 Article 3 Section 1723	California regulations state "... cement plugs will be placed across specified intervals to protect oil and gas zones, to prevent degradation of usable waters, to protect surface conditions, and for public health and safety purposes. Cement may be mixed with or replaced by other substances with adequate physical properties, which substances shall be approved by the Supervisor". (State Oil and Gas Supervisor). "Mud fluid having the proper weight and consistency to prevent movement of other fluids into the well bore shall be placed across all intervals no plugged with cement, and shall be surface poured into all open annuli."
Colorado	Yes	https://ecmc.state.co.us/documents/reg/Rules/LATEST/400%20Series%20-%20Operations%20and%20Reporting.pdf From Rule 406.e. Conductors (4) If the Operator has not drilled the Well within 3 months of setting the conductor on Crop Land locations or within 6 months on rangeland then the Operator will plug the conductor and perform Reclamation as follows: A. Cut the conductor pipe four feet below ground level; B. Fill the conductor pipe with material that is clean, inert, and free from contaminants; C. Seal the conductor pipe with either a cement plug and a screw cap or a cement plug	

¹⁸⁰ Appendix D State/Province Survey Questionnaire

¹⁸¹ Respondent reports no known orphan wells. See Appendix B – Reference Documents; Idle and Orphan Oil and Gas Wells: State and Provincial Regulatory Strategies 2021; Interstate Oil and Gas Compact Commission; Table 3. Documented and Undocumented Orphan Wells (2018 – 2020); page 28

State or Province	Plugging materials defined by statute / rule	Referenced information provided	Comments
		and a welded steel plate, and backfill the hole to ground level; D. Remove the cellar ring; E. Within 30 days of the plugging, submit a Form 4 – Report of Work Done, Other: Plugged Conductor for the Oil and Gas Location, to report the plugging of the conductor(s), that includes photo documentation demonstrating compliance with Rules 406.e.(4).A–D, above; and F. Perform Reclamation pursuant to either Rule 1003 or Rule 1004 From Rule 434.a. Plugging (1) An Operator will plug a dry or abandoned Well, seismic, core, or other exploratory hole, in such a manner that oil, gas, water, or other substance will be confined to the formation in which it originally occurred, isolating all zones specified in Rule 408.e, and zones identified and approved on the Form 6, Well Abandonment Report – Notice of Intent to Abandon. If the wellbore is not static before setting a plug in an open hole or after casing is removed from the wellbore, then the Operator will circulate any produced Fluids from the wellbore and will fill the wellbore with wellbore Fluids sufficient to maintain a balance or overbalance of the producing formation. Wellbore Fluids will be in a static state prior to pumping balanced cement plugs, unless the Operator is placing the cement plug as a preliminary step to counteract a high pressure or a lost circulation zone before establishing a static state. The Operator will fill intervals between plugs with wellbore Fluids of sufficient density to exert hydrostatic pressure exceeding the greatest formation pressure encountered while drilling such interval. If mud is necessary to maintain wellbore Fluids in a static state prior to setting plugs, the Operator will use a minimum mud weight of 9 pounds per gallon. The Operator will use	

State or Province	Plugging materials defined by statute / rule	Referenced information provided	Comments
		water spacers both ahead of and behind balanced plug cement slurry to minimize cement contamination by any wellbore Fluids that are incompatible with the cement slurry. Any cement plug will be a minimum of 100 feet in length and will extend a minimum of 100 feet above each zone to be isolated. The material an Operator uses in plugging, whether cement, mechanical plug, or some other equivalent method approved in writing by the Director, will be placed in the Well in a manner to permanently prevent migration of oil, gas, water, or other substance from the formation in which it originally occurred. Cement will conform to the requirements in Rule 408.f. The Operator will ensure the slurry design achieves a minimum compressive strength of 300 psi after 24 hours and 800 psi after 72 hours measured at 95° Fahrenheit, or at the minimum expected downhole temperature, and at 800 psi confining pressure. ... (3) An Operator will not place substances of any nature or description other than that normally used in plugging operations in any Well at any time during plugging operations. An Operator will submit all final reports of Plugging and Abandonment on a Form 6 and include an operations summary or cement verification report from the plugging contractor, specifying the type of Fluid used to fill the wellbore, type and slurry volume of API Class cement used, date of work, and depth the plugs were placed. ... (5) All abandoned Wells will have a plug or seal placed in the casing and all open annuli from a depth of 50 feet to the surface of the ground or the bottom of the cellar in the hole in such manner	

State or Province	Plugging materials defined by statute / rule	Referenced information provided	Comments
		as not to interfere with soil cultivation or other surface use. For below-grade markers, the Operator will fit the top of the casing with a screw cap or a steel plate welded in place with a weep hole. For above-grade markers, the Operator will fit the top of the casing with a screw cap or a steel plate welded in place with a weep hole, and a permanent monument that will be a pipe not less than four inches in diameter and not less than 10 feet in length, of which four feet will be above ground level and the remainder embedded in cement or welded to the surface casing. Whether a below-grade or an above-grade marker is used, the Operator will inscribe the marker with the Well's legal location, Well name and number, and API Number. The Operator will not cap or seal the Well until 5 days after placing the last plug to allow monitoring for successful plugging and will cap or seal the Well within 90 days after placing the last plug.	
Idaho	No ¹⁸²		
Illinois	Not Submitted		
Indiana	Not Submitted		
Kansas	Not Submitted		
Kentucky	No		Our regulations call for a "hydraulic cement" and by Division policy that has always referred to the industry standard which has been Class A Portland at 15.6 ppg. Everyone operating in the state understands this and that is what was used.
Louisiana	Yes	LAC 43:XIX.137.F requires use of cement or cement and bridge plugs for isolation. https://www.doa.la.gov/media/t3qldhn5/43v19.pdf	
Maryland	No ¹⁸³		
Michigan	No		The plugging section of Part 615 dictates the material used, it must be approved cement plugs. Any other materials would have to be reviewed and approved for adequacy prior to use in plugging of a well.

¹⁸² Respondent reports no known orphan wells. See Appendix B – Reference Documents; Idle and Orphan Oil and Gas Wells: State and Provincial Regulatory Strategies 2021; Interstate Oil and Gas Compact Commission; Table 3. Documented and Undocumented Orphan Wells (2018 – 2020); page 28

¹⁸³ Respondent reports no known orphan wells. See Appendix B – Reference Documents; Idle and Orphan Oil and Gas Wells: State and Provincial Regulatory Strategies 2021; Interstate Oil and Gas Compact Commission; Table 3. Documented and Undocumented Orphan Wells (2018 – 2020); page 28

State or Province	Plugging materials defined by statute / rule	Referenced information provided	Comments
Mississippi	Yes	Rule 28	
Missouri	No	Rule just states the well has to be plugged total depth top to bottom with cement slurry being no less than 15lbs/gal density.	
Montana	No		
Nebraska	No	028.06 Before a producing well, or any well with production casing in the hole, is plugged, the operator shall notify the office of the Director by submitting Form 4, "Sundry Notices." Operator shall fully describe the proposed plugging and abandonment procedure on said form and shall set out the volume and position of each plug to be placed in the hole and the manner in which said plug will be positioned. A fee, paid in advance, of one hundred dollars (\$100) and payable to the Nebraska Oil and Gas Conservation Commission must be remitted with each Form 4 which gives notice of operator's intention to abandon a well with production casing in the hole.	
Nevada	Not Submitted		
New Mexico	Not Submitted		
New York	No		
North Dakota	Not Submitted		
Ohio	Yes	OAC 1501:9-11 Plugging of Wells https://codes.ohio.gov/ohio-administrative-code/chapter-1501:9-11 *See Rule 1501:9-11-07 - Materials	
Oklahoma	Yes	165:10-11-6(e)(f)	Mud requirements. Before or after running a plug, the operator shall remove or displace all oil and saltwater in the wellbore, and the operator shall fill the wellbore and/or casing with drilling (plug) mud. The minimum mud weight shall be nine pounds per gallon. The minimum viscosity for the drilling mud shall be 36 (API Full Funnel Method). If the operator removes casing from the wellbore, the operator shall keep the wellbore filled with drilling mud meeting or exceeding the weight and viscosity requirements of this subsection. (f) Cement requirements. (1) Quality of cement. All cement and/or alternative materials used in plugging wells shall meet or exceed the following specifications: (A) Minimum compressive strength: 500 psi; (B) Maximum Young's modulus: < 1.2 x 10 ⁶ psi; (C) Permeability: < 0.1 mD; and (D) Minimum concentration of Portland cement: approximately 20%

State or Province	Plugging materials defined by statute / rule	Referenced information provided	Comments
Pennsylvania	Yes	25 Pa. Code Subchapter A, General Provisions (pacodeandbulletin.gov)	PA DEP regulations 25 Pa. Code § Chapter 78. Oil and Gas Wells includes a regulatory <i>cement</i> definition along with other materials permitted by regulation to be used in the plugging process. <i>Cement</i> —A mixture of materials for bonding or sealing that attains a 7-day maximum permeability of 0.01 millidarcies and a 24-hour compressive strength of at least 500 psi in accordance with applicable standards and specifications. <i>Gel</i> —A slurry of clay or other equivalent material and water at a ratio of not more than seven barrels of water to each 100 pounds of clay or other equivalent matter <i>Noncementing material</i> —A mixture of very fine to coarse grained nonbonding materials, including unwashed crushed rock, drill cuttings, earthen mud or other equivalent material approved by the Department <i>Nonporous material</i> —Nontoxic earthen mud, drill cuttings, fire clay, gel, cement or equivalent materials approved by the Department that will equally retard the movement of fluids.
South Dakota			
Tennessee	Yes	0400-52-09-.01 PLUGGING WELLS. https://publications.tnsosfiles.com/rules/0400/0400-52/0400-52-09.20130618.pdf	It is written within the rules and regulations the type of plugs that can be used and where they are to be placed - 0400-52-09-.01 PLUGGING WELLS . Also, alternative methods not defined in the rule may be approved by the Supervisor
Texas	Not Submitted		
Utah	Yes	https://adminrules.utah.gov/public/rule/R649-3/Current%20Rules?searchText=R649	As discussed other options could be considered at the discretion of the Division. Those options are not identified.
Virginia	Yes	Regulation generally specifies acceptable materials and allows for alternatives approved by the program director. https://law.lis.virginia.gov/admincode/title4/agency25/chapter150/section435/	
West Virginia	Yes	W. Va. Code §§ 22-6-24 W. Va. CSR 35-3-8, 35-4-14, 35-8-20	
Wyoming	No		
Alberta	Not Submitted		
British Columbia	No		As before, our guidance document directs permit holders, generally, to use class G cement, but alternatives may be proposed by the permit holder if they can demonstrate the alternative materials' performance will meet or exceed that of class G cement.
Saskatchewan	Not Submitted		

Table 3. State/Province Questionnaire¹⁸⁴: Section 3: Plugging Materials and Plug Placement; Subsection 1: Well Plugging Materials and Alternate Plugging Materials

State or Province	Alternate plugging materials allowed by statute / rule	Referenced information provided	Comments
Alabama	Yes	Rule 400-1-4-.14(7) states “Other plugging methods and procedures may be required by the Supervisor” https://www.ogb.state.al.us/ogb/rules	
Alaska	Not Submitted		
Arizona	No ¹⁸⁵		
Arkansas	Yes	See Rule 9 above	
California	Yes	California regulations state “Cement may be mixed with or replaced by other substances with adequate physical properties, which substances shall be approved by the Supervisor”. (State Oil and Gas Supervisor). https://www.conservation.ca.gov/index/Pages/California-Geologic-Energy-Management-Division-Statutes-and-Regulations.aspx See California Code of Regulations Title 14 Chapter 4 Sub-Chapter 1 Article 3 Section 1723	
Colorado	Yes	https://ecmc.state.co.us/documents/reg/Rules/LATEST/400%20Series%20-%20Operations%20and%20Reporting.pdf See detailed response above for full rule citations. Rule 434.a.(1) allows for the following: The material an Operator uses in plugging, whether cement, mechanical plug, or some other equivalent method approved in writing by the Director. Rule 434.a.(3) restricts materials to those that are normally used for plugging oil and gas wells:	

¹⁸⁴ Appendix D State/Province Survey Questionnaire

¹⁸⁵ Respondent reports no known orphan wells. See Appendix B – Reference Documents; Idle and Orphan Oil and Gas Wells: State and Provincial Regulatory Strategies 2021; Interstate Oil and Gas Compact Commission; Table 3. Documented and Undocumented Orphan Wells (2018 – 2020); page 28

State or Province	Alternate plugging materials allowed by statute / rule	Referenced information provided	Comments
		An Operator will not place substances of any nature or description other than that normally used in plugging operations in any Well at any time during plugging operations.	
Idaho	No ¹⁸⁶		
Illinois	Not Submitted		
Indiana	Not Submitted		
Kansas	Not Submitted		
Kentucky	No		We do not have any statutes or regulations that define “alternate plugging materials” however, it is common to use bridges or LCM’s etc. in the plugging process by inspector approval depending on downhole conditions and the cementing process. The materials used in plugging wells in Kentucky are primarily cement. Other materials are allowed and can be used here by Division approval. A bridge plug is a good example. Our staff has a lot of plugging experience pertaining to materials and techniques and are able to make these calls as they occur on a per well basis which is how all plugging and abandonment must take place.
Louisiana	No		
Maryland	No ¹⁸⁷		
Michigan	No		Michigan requires adherence to Part 615 Plugging requirements. Any deviation from the plugging requirements in Part 615 would have to be preapproved, prevent waste, prevent movement of fluids, and only be considered if there are issues in the downhole environment that prevents execution of the approved plugging plan such as collapsed casing, lost zones, cavernous porosity, abnormal pressure. In those cases plugging must be as deep as possible, involve setting of mechanical plugs and cement plugs to prevent any migration to shallower formations and freshwater.
Mississippi	Yes		As approved by the Board. Rule 28(3)(B)(2)b and (3)(B)(2)(3)c.
Missouri	Yes	10 CSR 50-2-060 (3)(C) 8. Alternative plugging methods may be authorized by the state geologist when geologic conditions or conditions in the casing or wellbore warrant.	

¹⁸⁶ Respondent reports no known orphan wells. See Appendix B – Reference Documents; Idle and Orphan Oil and Gas Wells: State and Provincial Regulatory Strategies 2021; Interstate Oil and Gas Compact Commission; Table 3. Documented and Undocumented Orphan Wells (2018 – 2020); page 28

¹⁸⁷ Respondent reports no known orphan wells. See Appendix B – Reference Documents; Idle and Orphan Oil and Gas Wells: State and Provincial Regulatory Strategies 2021; Interstate Oil and Gas Compact Commission; Table 3. Documented and Undocumented Orphan Wells (2018 – 2020); page 28

State or Province	Alternate plugging materials allowed by statute / rule	Referenced information provided	Comments
Montana	Yes	Not specifically defined, alternatives would be considered on case-by-case basis.	
Nebraska	Yes	If approved by Director	
Nevada	Not Submitted		
New Mexico	Not Submitted		
New York	No		
North Dakota	Not Submitted		
Ohio	Yes	OAC 1501:9-11 Plugging of Wells https://codes.ohio.gov/ohio-administrative-code/chapter-1501:9-11 *See Rule 1501:9-11-07 (I) A person may only place materials or substances in a wellbore that have been approved by the Chief.	Operators are allowed to include up to 50 percent pozzolanic materials in well plugging cement blends. The Chief may also approve the use of fine grout. For any cement or grout blend, mixtures must still meet compressive strength requirements of 500 psi after 24 hours. Other alternate materials may be approved for use by the Chief of the Division in the event that wellbore conditions are such that standard cement blends and cementing techniques are not adequate to provide zonal isolation.
Oklahoma	Yes	165:10-11-6(b)(1) Alternate plugging materials and procedures	The Manager of Field Operations, or other designated Conservation Division staff member, may approve the use of an alternate material other than cement or in combination with cement for wells listed in subsection (a), provided alternate plugging materials shall not be used to plug or plug back wells listed in subsection (a)(2), wells drilled or used for disposal or enhanced recovery injection, subsection (a)(3), wells used in subsurface gas storage units, subsection (a)(5)(B), wells plugged back for disposal or injection, and underground injection wells authorized under the Oklahoma Brine Development Act, 17 O.S. Section 500 et seq
Pennsylvania	Yes	25 Pa. Code § 78.75. Alternative methods. (pacodeandbulletin.gov)	PA DEP regulations 25 Pa. Code § Chapter 78. Oil and Gas Wells allows the use of other materials approved by the Department. A well operator may request approval from the Department to use an alternative method or material for the casing, plugging or equipping of a well under section 3221 of the act (relating to alternative methods 78.75).
South Dakota	Not Submitted		
Tennessee	Yes	0400-52-09-.01 PLUGGING WELLS. https://publications.tnsosfiles.com/rules/0400/0400-52/0400-52-09.20130618.pdf	Requests may be submitted to and approved by the Supervisor prior to plugging.
Texas	Not Submitted		
Utah	Yes	Rule R649-3-24 requires use of cement and bridge plugs for plugging a well but does allow for the Division to approve a different method and procedure. Other materials that have been considered in the past has been bentonite in conjunction with	

State or Province	Alternate plugging materials allowed by statute / rule	Referenced information provided	Comments
		cement plugs. See language of R649-3-24 for more information. https://adminrules.utah.gov/public/rule/R649-3/Current%20Rules?searchText=R649	
Virginia	Yes	Regulation specifies acceptable materials and allows for alternatives approved by the program director. 4VAC25-150-435.3 https://law.lis.virginia.gov/admincode/title4/agency25/chapter150/section435/	
West Virginia	Yes	W. Va. CSR 35-4-18 W. Va. CSR 35-8-14	
Wyoming	Yes	Chapter 3, Section 18 allows for use of non-API class cement and additives if prior approval of the Supervisor is granted.	WOGCC rules and regulations are located on the Wyoming Secretary of State website at https://rules.wyo.gov/ and searching by Oil and Gas Conservation Commission. A pdf copy of the WOGCC Rules and Regulations are attached to the email response to this document.
Alberta	Not Submitted		
British Columbia	Yes	https://www.bccr.ca/files/operations-documentation/Well-Decommissioning/Well-Decommissioning-Guidelines.pdf	When permit holders are demonstrating the appropriateness of the alternative material, we often ask them to follow the process outlines in Energy Safety Canada IRP 27 (Energy Safety Canada -)
Saskatchewan	Not Submitted		

Table 3. State Questionnaire¹⁸⁸: Section 3: Plugging Materials and Plug Placement Subsection 2: Plug Placement, Volume, Materials, and Methods

State or Province	Plug placement and volume defined by statute / rule	Referenced information provided	Comments
Alabama	Yes	Rule 400-1-4-.14 (Plugging and Abandonment of Wells) https://www.ogb.state.al.us/ogb/rules	
Alaska	Not Submitted		
Arizona	No ¹⁸⁹		
Arkansas	Yes	See Rule 9 above	
California	Yes	https://www.conservation.ca.gov/index/Pages/California-Geologic-Energy-Management-Division-Statutes-and-Regulations.aspx See California Code of Regulations Title 14 Chapter 4 Sub-Chapter 1 Article 3 Section 1723	
Colorado	Yes	https://ecmc.state.co.us/documents/reg/Rules/LATEST/400%20Series%20-%20Operations%20and%20Reporting.pdf See detailed response above for full rule citations. Plug placement is well-specific. Operators or the Orphaned Well Program staff submit plans, and ECMC Engineering Unit staff review and approve the plugging plans on Form 6, Well Abandonment Report – Notice of Intent to Abandon. Rule 434.a.(1) requires: An Operator will plug a dry or abandoned Well, seismic, core, or other exploratory hole, in such a manner that oil, gas, water, or other substance will be confined to the formation in which it originally occurred, isolating [Potential Flow Zones, which includes oil-bearing formations, gas-bearing formations, groundwater formations, salt formations, and formations known to produce hydrogen	

¹⁸⁸ Appendix D State/Province Survey Questionnaire

¹⁸⁹ Respondent reports no known orphan wells. See Appendix B – Reference Documents; Idle and Orphan Oil and Gas Wells: State and Provincial Regulatory Strategies 2021; Interstate Oil and Gas Compact Commission; Table 3. Documented and Undocumented Orphan Wells (2018 – 2020); page 28

State or Province	Plug placement and volume defined by statute / rule	Referenced information provided	Comments
		sulfide gas], and zones identified and approved on the Form 6, Well Abandonment Report – Notice of Intent to Abandon. Rule 434.a.(1) requires that Any cement plug will be a minimum of 100 feet in length and will extend a minimum of 100 feet above each zone to be isolated. Rule 434.a.(5) All abandoned Wells will have a plug or seal placed in the casing and all open annuli from a depth of 50 feet to the surface of the ground or the bottom of the cellar in the hole in such a manner as not to interfere with soil cultivation or other surface use.	
Idaho	No ¹⁹⁰		
Illinois	Not Submitted		
Indiana	Not Submitted		
Kansas	Not Submitted		
Kentucky	Yes	805 KAR 1:060 Title 805 Chapter 1 Regulation 060 • Kentucky Administrative Regulations • Legislative Research Commission Also KRS 353.120; KRS 353.130.	Our statutes do cover plug placement-- it does not cover volumes. Volumes are calculated either by a technical staff member or our inspectors in the field. Calculated volumes are not anything that you would want to add into statute or regulation because the exact volume of cement it will take to emplace a plug of a length is never certain and is based on downhole conditions and the cementing process.
Louisiana	Yes	LAC 43:XIX.137.F.3.a-g https://www.doa.la.gov/media/t3qldhn5/43v19.pdf	
Maryland	No ¹⁹¹		
Michigan	Yes	Part 615, Administrative Rule 902. R 324.902 PLUGGING INSTRUCTIONS; METHODS AND MATERIALS. Rule 902. (1) The supervisor or authorized representative of the supervisor shall issue plugging instructions after receipt of notification pursuant to R 324.901. The	

¹⁹⁰ Respondent reports no known orphan wells. See Appendix B – Reference Documents; Idle and Orphan Oil and Gas Wells: State and Provincial Regulatory Strategies 2021; Interstate Oil and Gas Compact Commission; Table 3. Documented and Undocumented Orphan Wells (2018 – 2020); page 28

¹⁹¹ Respondent reports no known orphan wells. See Appendix B – Reference Documents; Idle and Orphan Oil and Gas Wells: State and Provincial Regulatory Strategies 2021; Interstate Oil and Gas Compact Commission; Table 3. Documented and Undocumented Orphan Wells (2018 – 2020); page 28

State or Province	Plug placement and volume defined by statute / rule	Referenced information provided	Comments
		plugging instructions shall specify all of the following information: (a) The type and amount of plugging material to be used. (b) The depths at which bridges are to be set. (c) The depths and lengths of cement plugs. (d) The amount of casing to be pulled. (e) Other requirements the supervisor determines are necessary for the proper plugging of the well. (2) A permittee of a well shall ensure that all oil, gas, brine, and fresh water is confined to the strata in which the oil, gas, brine, and fresh water occur by using cement plugs or other plugs approved by the supervisor. A permittee of a well shall ensure that the well is plugged under static hole conditions at all times, unless otherwise approved by the supervisor or authorized representative of the supervisor. (3) A permittee of a well shall ensure that each cement plug, except for the bottom hole plug required by subrule (5) of this rule, the plug to be set at the base of the surface casing required by subrule (6) of this rule, and the surface plug required by subrule (7) of this rule, is a minimum of 200 feet in length or contains 50 sacks of cement, whichever is the greater volume of cement, unless otherwise approved by the supervisor or authorized representative of the supervisor. (4) A permittee of a well shall ensure that each cement plug, except for the bottom hole plug required by subrule (5) of this rule and the plug to be set at the base of the surface casing required by subrule (6) of this rule, is allowed to set undisturbed for a minimum of 1 hour and that the fluid level in the casing is continuously observed. If the observed fluid level in the casing drops during the hour, then the cement plug shall be tagged to ensure that the plug is still in place before setting the next plug uphole. If the plug is	

State or Province	Plug placement and volume defined by statute / rule	Referenced information provided	Comments
		found not to be in place, then the plug shall be reset. (5) A permittee of a well shall ensure that the bottom hole cement plug is either: (a) A minimum of 200 feet in length, is allowed to set undisturbed for a minimum of 4 hours, has reached a compressive strength of 100 psi or more, and is tagged to ensure that it is still in place before setting the next plug uphole; however, if the bottom hole cement plug in a dry hole drilled by rotary methods is a minimum of 400 feet in length and the fluid level in the hole is observed to remain static, then the bottom hole plug is not required to be tagged. (b) A mechanical bridge plug or other approved bridge has been set and a minimum of 50 feet of cement has been placed on the bridge before setting the next plug uphole. (6) A permittee of a well shall set the plug at the base of the surface casing using either of the following methods as approved by the supervisor or authorized representative of the supervisor: 62 (a) In static hole conditions, a cement plug shall be set at a minimum of 100 feet below the surface casing and shall extend a minimum of 100 feet into the surface casing. The cement plug shall be allowed to set undisturbed a minimum of 4 hours, shall have reached a compressive strength of 100 psi or more, and shall be tagged to ensure that it is still in place before setting the next plug uphole. If the plug is found not to be in place, then the plug shall be reset. (b) A mechanical open hole bridge plug or other approved bridge shall be set a minimum of 100 feet below the surface casing. A cement plug shall then be placed on the mechanical open hole bridge plug or other approved bridge. The cement plug	

State or Province	Plug placement and volume defined by statute / rule	Referenced information provided	Comments
		shall extend a minimum of 100 feet into the surface casing, unless otherwise approved by the supervisor or authorized representative of the supervisor. (7) A permittee of a well shall set a cement surface plug a minimum of 30 feet below the surface and within 5 feet of the surface, unless otherwise approved by the supervisor or authorized representative of the supervisor. (8) If surface casing is not present, a permittee of a well shall set a mechanical open hole bridge plug or other approved bridge a minimum of 100 feet below the base of the glacial drift or 100 feet below the deepest fresh water stratum, whichever is the greater depth, and shall circulate cement to within 5 feet of the surface. (9) A permittee of a well shall ensure that the surface pipe or conductor pipe abandoned with the hole is cut off at a point not less than 4 feet below grade, a 1/2-inch steel welded plate or another type of seal approved by the supervisor or authorized representative of the supervisor is placed across the top of the pipe or pipes, and the permit number of the well is permanently affixed to the plate or approved seal at the top of the well. (10) A permittee shall file, within 60 days after plugging, the final plugging forms and certified copies of the service company records, which shall include all of the following information: (a) The type of cement and number of sacks used, including the additives and percentages of the additives for each cement bridge plug. (b) The type and volume of plugging material used if other than cement. (c) The number of bridge plugs set in the hole and the depth and length of each plug. (d) Other materials left in the hole. (e) Service companies' records of cementing operations if requested	

State or Province	Plug placement and volume defined by statute / rule	Referenced information provided	Comments
		by the supervisor or authorized representative of the supervisor. (f) All available graphics, if requested by the supervisor or authorized representative of the supervisor, showing the all of following information: (i) Pumping. (ii) Placement of cement. (iii) Weights. (iv) Times. (v) Pump rates. (vi) Other pertinent data dealing with the plugging operations. (g) The amounts and type of mix water used for each sack of cement. (h) The volume and types of spacers and flushes used. (i) The operator's daily plugging records. (11) At a permittee's option, the well bore may be plugged from bottom to top with a material approved by the supervisor if the hydrostatic pressure of the material used is not allowed to exceed the fracturing pressure of the strata. History: 1996 AACS.	
Mississippi	Yes		Rule 28(3)(B)(2)
Missouri	Yes	B. In lieu of prior notice and approval by the state geologist as detailed in paragraph (3)(B)1. of this rule, the operator may elect to plug a well from total depth to the surface with cement slurry, being no less than fifteen (15) pounds per gallon density, emplaced via a tremie pipe.	
Montana	No		
Nebraska	Yes	028.01 A dry or abandoned well must be plugged in such a manner that oil, gas, water or other substance shall be confined to the reservoir in which it originally occurred. The material used in plugging, whether mud-laden fluid, cement, mechanical plug or some other suitable material, must be placed in the well in a manner to permanently prevent migration of oil, gas, water or other substance from the formation or horizon in which it originally occurred.	

State or Province	Plug placement and volume defined by statute / rule	Referenced information provided	Comments
Nevada	Not Submitted		
New Mexico	Not Submitted		
New York	Yes	6 CRR-NY §555.5 Plugging methods, procedures and reports	
North Dakota	Not Submitted		
Ohio	Yes	OAC 1501:9-11 Plugging of Wells OAC 1501:9-11-08 Plugging with Cement https://codes.ohio.gov/ohio-administrative-code/rule-1501:9-11-08 OAC 1501:9-11-09 Plugging with Prepared Clay https://codes.ohio.gov/ohio-administrative-code/rule-1501:9-11-09	Cement volumes are dictated by the plug placement at required intervals/thicknesses in the wellbore to properly isolate oil, natural gas, hydrogen sulfide, brine, water, or other fluids to the reservoir rock in which it originates.
Oklahoma	Yes	165:10-11-6(h)(B)(C)(D)(I)(1)(A)(B)(2)	The annulus between the casing and the formation is filled with cement from a depth 50 feet below the base of the formation to a depth 50 feet above the top of the formation. (C) The bridge plug is set above the top of the perforations in the cemented interval described in (B) of this paragraph. (D) Sufficient cement is placed on top of the bridge plug to fill the casing from the top of the bridge plug to a depth ten feet above the top of the bridge plug) From a depth which is the lesser of total depth of the well or 50 feet below the lower of shoe of the casing or base of the liner. (B) To a depth of 50 feet above the lower of the casing shoe or the base of the liner; or (2) Have a cast iron bridge plug set above the top of the liner with cement.
Pennsylvania	Yes	25 Pa. Code § 78.91. General provisions. (pacodeandbulletin.gov) 25 Pa. Code § 78.92. Wells in coal areas—surface or coal protective casing is cemented. (pacodeandbulletin.gov) 25 Pa. Code § 78.93. Wells in coal areas—surface or coal protective casing anchored with a packer or cement. (pacodeandbulletin.gov) 25 Pa. Code § 78.94. Wells in noncoal areas—surface casing is not cemented or not present. (pacodeandbulletin.gov) 25 Pa. Code § 78.95. Wells in noncoal areas—surface casing is cemented. (pacodeandbulletin.gov)	PA DEP regulations 25 Pa. Code § Chapter 78. Oil and Gas Wells define plug placement intervals and lengths in the wellbore. Plug volumes would be dependent upon wellbore diameters.
South Dakota	Not Submitted		
Tennessee	Yes	0400-52-09-.01 PLUGGING WELLS. https://publications.tnsosfiles.com	Plug placements; Volumes are referred to in setting casings

State or Province	Plug placement and volume defined by statute / rule	Referenced information provided	Comments
		/rules/0400/0400-52/0400-52-09.20130618.pdf	
Texas	Not Submitted		
Utah	Yes	https://adminrules.utah.gov/public/rule/R649-3/Current%20Rules?searchText=R649	Typically it is a minimum 100' cement plug. Plugs are placed at top of producing formations open to the wellbore, across fresh water zones, at surface casing shoe and at surface. Plugs are required to be placed to prevention of migration of oil, gas, water or other substances from one formation to another. We require plugs at the top of formations.
Virginia	Yes	4VAC25-150-435. Plugging for abandonment or plug-back operations outlines requirements for plug placement and depth. https://law.lis.virginia.gov/admincode/title4/agency25/chapter150/section435/	
West Virginia	Yes	W. Va. Code § 22-6-24 W. Va. CSR 35-4-13 W. Va. CSR 35-3-7 W. Va. CSR 35-3-8 W. Va. CSR 35-8-19 W. Va. CSR 35-8-20	
Wyoming	Yes	Chapter 3, Section 18 of the WOGCC Rules and Regulations details plug placement, volume, density, and other information for vertical wells, horizontal wells, and Powder River Basin Coalbed Methane Wells.	WOGCC rules and regulations are located on the Wyoming Secretary of State website at https://rules.wyo.gov/ and searching by Oil and Gas Conservation Commission. A pdf copy of the WOGCC Rules and Regulations are attached to the email response to this document.
Alberta	Not Submitted		
British Columbia	No		While the Act and Regulation do not define plug placement and volume, both are referenced in the Well Decommissioning Guidelines. Again, alternative techniques may be proposed by permit holders where appropriate.
Saskatchewan	Not Submitted		

Table 3. State Questionnaire¹⁹²: Section 3: Plugging Materials and Plug Placement Subsection 2: Plug Placement, Volume, Materials, and Methods

State or Province	Packers, bridge plugs, tapered cement plugs, or other materials allowed as base for plugs	Referenced information provided	Comments
Alabama	Yes	Rule 400-1-4-.14(7) states “Other plugging methods and procedures may be required by the Supervisor” https://www.ogb.state.al.us/ogb/rules	
Alaska	Not Submitted		
Arizona	No ¹⁹³		
Arkansas	Yes	See Rule 9 above	
California	Yes	https://www.conservation.ca.gov/index/Pages/California-Geologic-Energy-Management-Division-Statutes-and-Regulations.aspx See California Code of Regulations Title 14 Chapter 4 Sub-Chapter 1 Article 3 Section 1723	
Colorado	Yes	https://ecmc.state.co.us/documents/reg/Rules/LATEST/400%20Series%20-%20Operations%20and%20Reporting.pdf See detailed response above for full rule citations. Rule 434.a.(1) allows for the following: The material an Operator uses in plugging, whether cement, mechanical plug, or some other equivalent method approved in writing by the Director.	
Idaho	No ¹⁹⁴		
Illinois	Not Submitted		
Indiana	Not Submitted		
Kansas	Not Submitted		
Kentucky	Yes	Title 805 Chapter 1 Regulation 060 • Kentucky Administrative	A bridge is mentioned in Section 3:1 and 4.1, and such are accepted in division-prescribed plugging protocols.

¹⁹² Appendix D State/Province Survey Questionnaire

¹⁹³ Respondent reports no known orphan wells. See Appendix B – Reference Documents; Idle and Orphan Oil and Gas Wells: State and Provincial Regulatory Strategies 2021; Interstate Oil and Gas Compact Commission; Table 3. Documented and Undocumented Orphan Wells (2018 – 2020); page 28

¹⁹⁴ Respondent reports no known orphan wells. See Appendix B – Reference Documents; Idle and Orphan Oil and Gas Wells: State and Provincial Regulatory Strategies 2021; Interstate Oil and Gas Compact Commission; Table 3. Documented and Undocumented Orphan Wells (2018 – 2020); page 28

State or Province	Packers, bridge plugs, tapered cement plugs, or other materials allowed as base for plugs	Referenced information provided	Comments
		Regulations • Legislative Research Commission	
Louisiana	Yes	LAC 43:XIX.137.F.3.a-b allows bridge plugs as a base for cement with District Manager approval. https://www.doa.la.gov/media/t3qldhn5/43v19.pdf	
Maryland	No ¹⁹⁵		
Michigan	Yes	Part 615 requires a bottomhole retainer or bridge plug. Again, Part 615 Administrative Rule 902	
Mississippi	Yes	Rule 28(3)(B)(2)	
Missouri	Yes	8. Alternative plugging methods may be authorized by the state geologist when geologic conditions or conditions in the casing or wellbore warrant.	A well plugging intent form would have to be filled out and approved by the state geologist.
Montana	Yes	Not defined in rule/statute	
Nebraska	Yes		
Nevada	Not Submitted		
New Mexico	Not Submitted		
New York	Yes	§ 23-0101. Definitions 13 "Plug and abandon" 6 CRR-NY §555.5 Plugging methods, procedures and reports	
North Dakota	Not Submitted		
Ohio	Yes	OAC 1501:9-11 Plugging of Wells OAC 1501:9-11-08 Plugging with Cement https://codes.ohio.gov/ohio-administrative-code/rule-1501:9-11-08 OAC 2501:9-11-09 Plugging with Prepared Clay https://codes.ohio.gov/ohio-administrative-code/rule-1501:9-11-09	The Chief of the Division may approve the use of mechanical bridge plugs, pre-cast cement bridge plugs, brush and stone bridges, packers, cement retainers, or other materials to help stabilize and isolate thief zones as well as provide a competent base to ensure plugging material stays at its intended interval.
Oklahoma	Yes	165:10-11-6(h)(1)(A)(B)(C)(D)(2)	(h) Use of bridge plugs. (1) Permitted use. Except as provided in (2) of this subsection for top plugs, a bridge plug may be used to permanently plug off a formation if: (A) The only openings from the formation into the wellbore are perforations in the casing. OAC 165:10 CORPORATION COMMISSION - 218 - (B) The annulus between the casing and the formation is filled with cement from a depth 50 feet below the base of the formation to a depth 50 feet above the top of the formation. (C) The

¹⁹⁵ Respondent reports no known orphan wells. See Appendix B – Reference Documents; Idle and Orphan Oil and Gas Wells: State and Provincial Regulatory Strategies 2021; Interstate Oil and Gas Compact Commission; Table 3. Documented and Undocumented Orphan Wells (2018 – 2020); page 28

State or Province	Packers, bridge plugs, tapered cement plugs, or other materials allowed as base for plugs	Referenced information provided	Comments
			bridge plug is set above the top of the perforations in the cemented interval described in (B) of this paragraph. (D) Sufficient cement is placed on top of the bridge plug to fill the casing from the top of the bridge plug to a depth ten feet above the top of the bridge plug. (2) Prohibited use for top plug. A bridge plug may not be used for a top plug described in (k) of this Section.
Pennsylvania	Yes	25 Pa. Code § 78.91. General provisions. (pacodeandbulletin.gov) 25 Pa. Code § 78.92. Wells in coal areas—surface or coal protective casing is cemented. (pacodeandbulletin.gov) 25 Pa. Code § 78.93. Wells in coal areas—surface or coal protective casing anchored with a packer or cement. (pacodeandbulletin.gov) 25 Pa. Code § 78.94. Wells in noncoal areas—surface casing is not cemented or not present. (pacodeandbulletin.gov) 25 Pa. Code § 78.95. Wells in noncoal areas—surface casing is cemented. (pacodeandbulletin.gov)	PA DEP regulations 25 Pa. Code § Chapter 78. Oil and Gas Wells allow for the use of nonporous material/gel spacers and bridge plugs as a base for cement plugs in the wellbore
South Dakota	Not Submitted		
Tennessee	Yes	0400-52-09-.01 PLUGGING WELLS. https://publications.tnsosfiles.com/rules/0400/0400-52/0400-52-09.20130618.pdf	
Texas	Not Submitted		
Utah	Yes	https://adminrules.utah.gov/public/rule/R649-3/Current%20Rules?searchText=R649	A bridge can be placed at the top of a formation etc. to help isolate and set plug.
Virginia	Yes	4VAC25-150-435. Plugging for abandonment or plug-back operations outlines various wellbore scenarios and options for the use of bridge plugs. https://law.lis.virginia.gov/admincode/title4/agency25/chapter150/section435/	
West Virginia	Yes	W. Va. Code § 22-6-24 W. Va. CSR 35-8-20	
Wyoming	Yes	Chapter 3, Section 18 requires use of mechanical cement retainers, bridge plugs, or bentonite chips in certain scenarios as cited in the rule.	WOGCC rules and regulations are located on the Wyoming Secretary of State website at https://rules.wyo.gov/ and searching by Oil and Gas Conservation Commission.

State or Province	Packers, bridge plugs, tapered cement plugs, or other materials allowed as base for plugs	Referenced information provided	Comments
			A pdf copy of the WOGCC Rules and Regulations are attached to the email response to this document.
Alberta	Not Submitted		
British Columbia	Yes	https://www.bcer.ca/files/operations-documentation/Well-Decommissioning/Well-Decommissioning-Guidelines.pdf	The BCER's approach is that mechanical plugs, where used, are not considered by themselves to be adequate isolation (due to the limited lifespan of the elastomers), a role served by cement (or an alternative material). Our guidelines identify that where packers, bridge plugs, or other mechanical devices are used, they should only be seen as a base for a more resilient means of isolation.
Saskatchewan	Not Submitted		

Table 3. State Questionnaire¹⁹⁶: Section 3: Plugging Materials and Plug Placement Subsection 2: Plug Placement, Volume, Materials, and Methods

State or Province	Plug spacers and materials defined by statute / rule	Referenced information provided	Comments
Alabama	Yes	Rule 400-1-4-.14(6) states “The interval between plugs shall be filled with an approved fluid.” https://www.ogb.state.al.us/ogb/rules	
Alaska	Not Submitted		
Arizona	No ¹⁹⁷		
Arkansas	Yes	See Rule 9 above	
California	Yes	“Mud fluid having the proper weight and consistency to prevent movement of other fluids into the well bore shall be placed across all intervals no plugged with cement, and shall be surface poured into all open annuli.” https://www.conservation.ca.gov/index/Pages/California-Geologic-Energy-Management-Division-Statutes-and-Regulations.aspx See California Code of Regulations Title 14 Chapter 4 Sub-Chapter 1 Article 3 Section 1723	
Colorado	Yes	https://ecmc.state.co.us/documents/reg/Rules/LATEST/400%20Series%20-%20Operations%20and%20Reporting.pdf See detailed response above for full rule citations. Rule 434.a.(1) allows for the following: The Operator will fill intervals between plugs with wellbore Fluids of sufficient density to exert hydrostatic pressure exceeding the greatest formation pressure encountered while drilling such interval. If mud is necessary to maintain wellbore Fluids in a static state prior to setting plugs, the Operator will use a minimum mud weight of 9	

¹⁹⁶ Appendix D State/Province Survey Questionnaire

¹⁹⁷ Respondent reports no known orphan wells. See Appendix B – Reference Documents; Idle and Orphan Oil and Gas Wells: State and Provincial Regulatory Strategies 2021; Interstate Oil and Gas Compact Commission; Table 3. Documented and Undocumented Orphan Wells (2018 – 2020); page 28

State or Province	Plug spacers and materials defined by statute / rule	Referenced information provided	Comments
		pounds per gallon. The Operator will use water spacers both ahead of and behind balanced plug cement slurry to minimize cement contamination by any wellbore Fluids that are incompatible with the cement slurry.	
Idaho	No ¹⁹⁸		
Illinois	Not Submitted		
Indiana	Not Submitted		
Kansas	Not Submitted		
Kentucky	No		
Louisiana	Yes	LAC 43:XIX.137.F.3.h requires mud laden fluid of at least 9 ppg unless otherwise approved by District Manager. https://www.doa.la.gov/media/t3qldhn5/43v19.pdf	
Maryland	No ¹⁹⁹		
Michigan	No		Not in rule, it may be in some instructions. There are requirements for plug placement verification in Administrative Rule 902(4). (4) A permittee of a well shall ensure that each cement plug, except for the bottom hole plug required by subrule (5) of this rule and the plug to be set at the base of the surface casing required by subrule (6) of this rule, is allowed to set undisturbed for a minimum of 1 hour and that the fluid level in the casing is continuously observed. If the observed fluid level in the casing drops during the hour, then the cement plug shall be tagged to ensure that the plug is still in place before setting the next plug uphole. If the plug is found not to be in place, then the plug shall be reset.
Mississippi	Yes	Rule 28(3)(B)(2)	
Missouri	No		
Montana	No		
Nebraska	No		
Nevada	Not Submitted		
New Mexico	Not Submitted		
New York	No		
North Dakota	Not Submitted		
Ohio	No		
Oklahoma	Yes	165:10-11-6(e)	Mud requirements. Before or after running a plug, the operator shall remove or displace all oil and saltwater in the wellbore, and the operator

¹⁹⁸ Respondent reports no known orphan wells. See Appendix B – Reference Documents; Idle and Orphan Oil and Gas Wells: State and Provincial Regulatory Strategies 2021; Interstate Oil and Gas Compact Commission; Table 3. Documented and Undocumented Orphan Wells (2018 – 2020); page 28

¹⁹⁹ Respondent reports no known orphan wells. See Appendix B – Reference Documents; Idle and Orphan Oil and Gas Wells: State and Provincial Regulatory Strategies 2021; Interstate Oil and Gas Compact Commission; Table 3. Documented and Undocumented Orphan Wells (2018 – 2020); page 28

State or Province	Plug spacers and materials defined by statute / rule	Referenced information provided	Comments
			shall fill the wellbore and/or casing with drilling (plug) mud. The minimum mud weight shall be nine pounds per gallon. The minimum viscosity for the drilling mud shall be 36 (API Full Funnel Method). If the operator removes casing from the wellbore, the operator shall keep the wellbore filled with drilling mud meeting or exceeding the weight and viscosity requirements of this subsection
Pennsylvania	Yes	25 Pa. Code Subchapter A, General Provisions (pacodeandbulletin.gov)	PA DEP regulations 25 Pa. Code § Chapter 78. Oil and Gas Wells define <i>nonporous</i> material as material that can be used between cement plugs. <i>Nonporous material</i> —Nontoxic earthen mud, drill cuttings, fire clay, gel, cement or equivalent materials approved by the Department that will equally retard the movement of fluids.
South Dakota	Not Submitted		
Tennessee	No		
Texas	Not Submitted		
Utah	Yes	https://adminrules.utah.gov/public/rule/R649-3/Current%20Rules?searchText=R649	Spacer must be a noncorrosive fluid of adequate density to prevent migration of formation water into or through the well bore.
Virginia	No		Regulation does not specifically define when plug spacers can/should be used. If an operator submits a plugging plan utilizing spacers, the director may approve as long as plugging requirements are met.
West Virginia	Yes	W. Va. Code § 22-6-24 W. Va. CSR 35-3-8 W. Va. CSR 35-8-20	
Wyoming	Yes	Chapter 3, Section 18	WOGCC rules and regulations are located on the Wyoming Secretary of State website at https://rules.wyo.gov/ and searching by Oil and Gas Conservation Commission. A pdf copy of the WOGCC Rules and Regulations are attached to the email response to this document.
Alberta	Not Submitted		
British Columbia	No		Our guidelines do not mention plug spacers, other than a recommendation to establish an adequate base when circulating a cement plug, perhaps with a mechanical plug.
Saskatchewan	Not Submitted		

Table 3. State Questionnaire²⁰⁰: Section 3: Plugging Materials and Plug Placement Subsection 2: Plug Placement, Volume, Materials, and Methods

State or Province	Plug placement methods defined by statute / rule	Referenced information provided	Comments
Alabama	No		
Alaska	Not Submitted		
Arizona	No ²⁰¹		
Arkansas	Yes	See Rule 9 above	
California	Yes	https://www.conservation.ca.gov/index/Pages/California-Geologic-Energy-Management-Division-Statutes-and-Regulations.aspx See California Code of Regulations Title 14 Chapter 4 Sub-Chapter 1 Article 3 Section 1723	
Colorado	Yes	https://ecmc.state.co.us/documents/reg/Rules/LATEST/400%20Series%20-%20Operations%20and%20Reporting.pdf See detailed response above for full rule citations. Rule 434.a.(2) allows for the following: The Operator will have the option as to the method of placing cement in the hole by (a) dump bailer, (b) pumping a balanced cement plug through tubing or drill pipe, (c) pump and plug, or (d) equivalent method approved by the Director prior to plugging. Unless prior approval is given, all wellbores will have water, mud, or other approved Fluid between all plugs.	
Idaho	No ²⁰²		
Illinois	Not Submitted		
Indiana	Not Submitted		
Kansas	Not Submitted		
Kentucky	Yes	Title 805 Chapter 1 Regulation 060 • Kentucky Administrative Regulations • Legislative Research Commission . Also 805 KAR 1:130	Sections 3:5 and 4.6 give a general methodology but here in Kentucky it is required that cementing be done correctly and to the industry standard. This is enforced and witnessed by our field staff, and through the Division-prescribed

²⁰⁰ Appendix D State/Province Survey Questionnaire

²⁰¹ Respondent reports no known orphan wells. See Appendix B – Reference Documents; Idle and Orphan Oil and Gas Wells: State and Provincial Regulatory Strategies 2021; Interstate Oil and Gas Compact Commission; Table 3. Documented and Undocumented Orphan Wells (2018 – 2020); page 28

²⁰² Respondent reports no known orphan wells. See Appendix B – Reference Documents; Idle and Orphan Oil and Gas Wells: State and Provincial Regulatory Strategies 2021; Interstate Oil and Gas Compact Commission; Table 3. Documented and Undocumented Orphan Wells (2018 – 2020); page 28

State or Province	Plug placement methods defined by statute / rule	Referenced information provided	Comments
			plugging procedures of 805 KAR 1.130 Section 6. Plugging instructions are required to be given to the operators and contractors by the Division and these instructions are the basis for how each well is to be plugged.
Louisiana	Yes	LAC 43:XIX.137.F.3.i requires cement plugs be set by circulation. https://www.doa.la.gov/media/t3qldhn5/43v19.pdf	
Maryland	No ²⁰³		
Michigan	Yes	Part 615 requires placement under static conditions, and cement placement also addressed elsewhere in Administrative Rules Part 4 rules addressing cementing regulations during construction.	
Mississippi	Yes	Rule 63(10)	
Missouri	No		
Montana	No		
Nebraska	No		
Nevada	Not Submitted		
New Mexico	Not Submitted		
New York	Yes	6 CRR-NY §555.5 Plugging methods, procedures and reports	
North Dakota	Not Submitted		
Ohio	Yes	OAC 1501:9-11 Plugging of Wells OAC 1501:9-11-03 Objective and Methods https://codes.ohio.gov/ohio-administrative-code/rule-1501:9-11-03	The Chief may authorize alternate methods of plugging not specified in Chapter 1501:9-11 of the Administrative Code so long as the plugging method complies with Chapter 1509. of the Revised Code and rules adopted under it. The Chief also may require the installation of casing and a vault and a vent pipe to provide additional safety.
Oklahoma	Yes	165:10-6-11-6(g)	Approved cementing methods. (1) Cement plugs. (A) To plug or plug back a well, either the tubing and pump method or the pump and plug method shall be used and a continuous flow of cement shall be pumped for each stage. (B) Surface pumping and shut in pressures shall be of sufficient pressure to: (i) Squeeze off perforations in the casing. (ii) Prevent the plug from floating upward in the wellbore
Pennsylvania	No		PA DEP regulations 25 Pa. Code § Chapter 78. Oil and Gas Wells do not specify the method in which cement plugs are installed in the wellbore.
South Dakota	Not Submitted		
Tennessee	Yes	0400-52-09-.01 PLUGGING WELLS. https://publications.tnsosfiles.com	Yes, as to formation and water incepts

²⁰³ Respondent reports no known orphan wells. See Appendix B – Reference Documents; Idle and Orphan Oil and Gas Wells: State and Provincial Regulatory Strategies 2021; Interstate Oil and Gas Compact Commission; Table 3. Documented and Undocumented Orphan Wells (2018 – 2020); page 28

State or Province	Plug placement methods defined by statute / rule	Referenced information provided	Comments
		/rules/0400/0400-52/0400-52-09.20130618.pdf	
Texas	Not Submitted		
Utah	No		Utah typically requires placing plugs by balancing down a work string. A dump bailer method can also be used and has been authorized on a case by case basis.
Virginia	Yes	4VAC25-150-435. Plugging for abandonment or plug-back operations outlines various wellbore scenarios and cement/plug placement. https://law.lis.virginia.gov/admincode/title4/agency25/chapter150/section435/	
West Virginia	Yes	W. Va. Code § 22-6-24 W. Va. CSR 35-3-8 W. Va. CSR 35-8-20	
Wyoming	Yes	Chapter 3, Section 18	WOGCC rules and regulations are located on the Wyoming Secretary of State website at https://rules.wyo.gov/ and searching by Oil and Gas Conservation Commission. A pdf copy of the WOGCC Rules and Regulations are attached to the email response to this document.
Alberta	Not Submitted		
British Columbia	No		Again, while not specified in the Act or Regulation, the guideline does prescribe plug placement methods, both for mechanical plugs being used as a base, and for the cement/alternative material. Allowable methods include mechanical plugs capped with cement, cement squeezes with or without retainers, and circulated plugs. Section milling is contemplated as well, but is considered non-routine.
Saskatchewan	Not Submitted		

Table 3. State/Province Questionnaire²⁰⁴: Section 3: Plugging Materials and Plug Placement Subsection 3: Witnessing, Documentation, and Monitoring

State or Province	Witnessing of plugs by regulatory official required	Referenced information provided	Comments
Alabama	Yes	Rule 400-1-3-.03(2) states “The Supervisor may send a duly authorized representative to the location to witness activities...”. In practice, all critical plugging activities are witnessed by a Board agent.	
Alaska	Not Submitted		
Arizona	No ²⁰⁵		
Arkansas	Yes	RULE B-7: WHEN WELLS SHALL BE PLUGGED AND ABANDONED AND NOTICE OF INTENTION TO PLUG AND ABANDON WELLS a) The current permit holder is responsible for plugging wells as defined in this rule. In the case of leaking wells, plugging responsibility is in accordance with General Rule B-26 (k) and (l). b) All new wells drilled for liquid hydrocarbons, natural gas, or brine exploration, or brine production, water supply or injection purposes, except such holes as are described in Rule B-10, regardless of depth are required to be either properly cased with production casing or the uncased well or dry hole shall be plugged and abandoned in accordance with applicable commission rules, unless an extension of time to plug is granted in accordance with subparagraph (c) below. c) Uncased wells and dry holes 1) Any well in which production casing is not set and cemented shall be plugged in accordance with applicable commission rules, prior to the time that the equipment used to drill said well is released from the drilling operation. In the case of	Notice is required prior to plugging to allow an Oil and Gas Inspector to be present so an inspector may be present.

²⁰⁴ Appendix D State/Province Survey Questionnaire

²⁰⁵ Respondent reports no known orphan wells. See Appendix B – Reference Documents; Idle and Orphan Oil and Gas Wells: State and Provincial Regulatory Strategies 2021; Interstate Oil and Gas Compact Commission; Table 3. Documented and Undocumented Orphan Wells (2018 – 2020); page 28

State or Province	Witnessing of plugs by regulatory official required	Referenced information provided	Comments
		“staged” drilling operations, where multiple drilling rigs are used to drill the well over a period of time, production casing shall be set and cemented within 180 days after setting of the surface casing or the well shall be plugged, unless an extension of time to plug is granted in accordance with subparagraph 2) below. 2) The Director however, may grant an extension of time to plug an uncased well. In determining whether to grant an extension and in determining the length of an extension, the Director may consider: A) The permit holders specific plans for further wellbore utilization, B) The total depth of the well, C) The depth of surface and any intermediate casing, D) A description of the current condition of the hole including a description of the type of drilling fluids currently in the well, E) The location of the well. 3) If the Director determines that the uncased well presents a risk of contamination to the environment or a risk to public safety the Permit Holder shall be required to repair, case, plug or perform other remediation measures to the well, as determined by the Director, within twenty four (24) hours after notification by the Director. d) All cased wells utilized for liquid hydrocarbons, natural gas or brine production, water supply or injection purposes, except such holes as are described in Rule B-10 or liquid hydrocarbons production wells located on actively producing leases, shall be plugged and abandoned in accordance with applicable commission rules after the well has been idle for more than 24 months, or sooner should the Director determine that the cased well presents a risk of	

State or Province	Witnessing of plugs by regulatory official required	Referenced information provided	Comments
		contamination to the environment or a risk to public safety, unless an application is filed to request temporary abandonment status for the well in accordance with subparagraph h) below. Upon such determination by the Director or if temporary abandonment status is denied, the Permit Holder shall commence plugging the well within 30 days after notification by the Director. Failure to commence plugging the well within 30 days after notification by the Director may result in the initiation of well abandonment proceedings in accordance with General Rule G1. e) Prior to the commencement of any work in plugging and abandonment operations, the permit holder or other person responsible for the conduct of the drilling operations shall give notice of the intent to plug and abandon such well in a form prescribed by the Director as follows: 1) For uncased wells and dry holes, notice shall be provided via verbal or facsimile communication to the Commission Regional Office where the well is located, as soon as possible, but no less than 8 hours, prior to commencement of plugging operations. 2) For cased wells, written notice on a form prescribed by the Director shall be provided to the Commission Regional Office where the well is located, at least 72 hours prior to the commencement of plugging operations. f) Upon receipt and review of such verbal or written notice, the Commission Regional Office shall authorize the commencement of plugging operations and may send a duly authorized Commission representative to the well location to witness the plugging of such well.	

State or Province	Witnessing of plugs by regulatory official required	Referenced information provided	Comments
		g) Authorization to plug and abandon is not granted unless the appropriate notice, as specified in subparagraph (e) above, has been provided to the Oil and Gas Commission by the permit holder or person responsible for the plugging of the well. Plugging of the well without providing proper notice as required can result in the Permit Holder being required to drill out the well plugs and the well replugged under Commission observation. (Source: 1992 rule book; amended December 16, 2007; amended February 19, 2009; amended November 19, 2018)	
California	Yes	https://www.conservation.ca.gov/index/Pages/California-Geologic-Energy-Management-Division-Statutes-and-Regulations.aspx See California Code of Regulations Title 14 Chapter 4 Sub-Chapter 1 Article 3 Section 1723.7	
Colorado	No		Policy: Orphaned Well plugging is witnessed by ECMC staff.
Idaho	No ²⁰⁶		
Illinois	Not Submitted		
Indiana	Not Submitted		
Kansas	Not Submitted		
Kentucky	No	Title 805 Chapter 1 Regulation 060 • Kentucky Administrative Regulations • Legislative Research Commission . See also 805 KAR 1:130 Section 6 .	805 KAR 1:060 Section 2 of our Reg states that an inspector “may” be present, but does not require them to be present. However, 805 KAR 1:130 Section 6 requires operators and contractors to obtain written plugging instructions from the Division, and must give 5 days prior notice prior to any plugging. By Division policy the work is normally witnessed by our field inspectors or technical staff. Operators are required by statute and regulation to abide by Division plugging instructions for any well plugged within the Commonwealth.
Louisiana	No		LAC 43:XIX.137.F.2 requires 12 hours prior notice of P&A to allow witnessing. https://www.doa.la.gov/media/t3qlahn5/43v19.pdf

²⁰⁶ Respondent reports no known orphan wells. See Appendix B – Reference Documents; Idle and Orphan Oil and Gas Wells: State and Provincial Regulatory Strategies 2021; Interstate Oil and Gas Compact Commission; Table 3. Documented and Undocumented Orphan Wells (2018 – 2020); page 28

State or Province	Witnessing of plugs by regulatory official required	Referenced information provided	Comments
Maryland	No ²⁰⁷		
Michigan	No		The OGMD has inspections of plugging and cementing operations as high priority but is not required.
Mississippi	Yes		Only for Class II wells
Missouri	No	2. The operator shall notify the state geologist no later than five (5) business days before the plugging.	
Montana	No		Not required by statute, but if possible we do witness plugging of wellbores.
Nebraska	No	028.05 Before a dry hole is plugged, the operator shall notify the office of the Director or his authorized deputy.	
Nevada	Not Submitted		
New Mexico	Not Submitted		
New York	No	6 CRR-NY §555.4 Permanent abandonment	Staff are directed to observe critical plugging milestones for orphaned well plugging jobs as identified in guidance to staff. Regulations allow witnesses to observe company conducted plugging operations by requiring notice to DEC (as cited above).
North Dakota	Not Submitted		
Ohio	Yes	OAC 1501:9-11 Plugging of Wells OAC 1501:9-11-04 Notification and Supervision https://codes.ohio.gov/ohio-administrative-code/rule-1501:9-11-04	A minimum of twenty-four-hour notice must be provided to the Division Inspector prior to commencement of plugging operations.
Oklahoma	No		165:10-11-4. Notification and witnessing of plugging (a) Wells without production casing. The appropriate Conservation Division District Office shall be notified at least 12 hours prior to commencement of plugging operations and a plugging procedure agreed upon for any well without production casing. Each plugging operation may be witnessed by an authorized representative of the Conservation Division
Pennsylvania	No		
South Dakota	Not Submitted		
Tennessee	Yes	0400-52-02-.04 NOTIFICATION TO PLUG AND ABANDON. 0400-52-09-.02 INSPECTION. https://publications.tnsosfiles.com/rules/0400/0400.htm	The operator must give notice of plugging to the Supervisor and Inspector
Texas	Not Submitted		
Utah	Yes	R649-3-17 states the following:	See the following from the inspection policy handbook:

²⁰⁷ Respondent reports no known orphan wells. See Appendix B – Reference Documents; Idle and Orphan Oil and Gas Wells: State and Provincial Regulatory Strategies 2021; Interstate Oil and Gas Compact Commission; Table 3. Documented and Undocumented Orphan Wells (2018 – 2020); page 28

State or Province	Witnessing of plugs by regulatory official required	Referenced information provided	Comments
		1. Inspection of wells shall be performed by the division to determine operator compliance with the rules and orders of the board. 2. The inspection shall not interfere with the mechanical operation of facilities or equipment used in drilling and production operations. 3. Inspections of operations involving a safety hazard shall not be conducted, nor shall an inspection be conducted that may cause a safety hazard. It is the policy of the Division to witness all plugs if possible. On orphan well plugging a representative of the Division will be present during all plugging work.	Plugging/Cementing inspections are conducted throughout the activity to ensure essential actions are completed. Plugging/cementing inspections verify adequate measures are taken to protect potential oil or gas horizons, prevent movement of brine water from one horizon to another and assure contamination of underground or surface fresh water does not occur. UDOGM Oil & Gas Operations Manual Section 5.4 Engineering should be reviewed for additional information. Casing cementing inspections are performed to determine proper length and type of casing was set. Witness returned to surface or was as stipulated in the application. Cement Circulated to Surface Cement Fall Back Cement Volume Plugging inspections are a Tier I inspection type, as such they are among the highest priority activities Division Staff conduct. During critical steps of high priority plugging, witnessing plugging activities will be the sole focus for inspectors. Plugging activities often require inspectors to remain at the work site for the entire work day. As such, plugging inspection types are assigned a high WIT score of twenty (20) when compared to other non-emergency inspection types.
Virginia	Yes	4VAC25-150-460 requires that when any well is plugged, two persons, experienced in plugging wells, who participated in the plugging, shall complete the plugging affidavit designated by the director, setting forth the time and manner in which the well was plugged, and the permanent marker was placed. For orphaned or abandoned wells, this is Virginia Gas & Oil Program staff. https://law.lis.virginia.gov/admincode/title4/agency25/chapter150/section460/	For wells with identified owner/operators, Gas & Oil staff are not required by statute/regulation to be on site. However, staff make it a best practice to witness plugging operations. 4VAC25-150-460 applies to wells with owners.
West Virginia	No		There is no formal requirement, but it is a work priority for our inspectors.
Wyoming	No	Not required by rule/statute but the opportunity to witness is required by the Supervisor in the approval of each notice of intent to abandon based on Supervisor's discretion authority. 72 hour notice prior to commencement of abandonment work is included in the conditions of approval for every well plugging and WOGCC staff evaluate to determine if abandonment work should be witnessed.	

State or Province	Witnessing of plugs by regulatory official required	Referenced information provided	Comments
Alberta	Not Submitted		
British Columbia	No		
Saskatchewan	Not Submitted		

Table 3. State/Province Questionnaire²⁰⁸: Section 3: Plugging Materials and Plug Placement Subsection 3: Witnessing, Documentation, and Monitoring

State or Province	Documentation of plugging activity	Referenced information provided	Comments
Alabama	Yes	Rule 400-1-4-.15 (Report of Well Plugging) https://www.ogb.state.al.us/ogb/rules	
Alaska	Not Submitted		
Arizona	No ²⁰⁹		
Arkansas	Yes	See Rule 7 above	
California	Yes	https://www.conservation.ca.gov/index/Pages/California-Geologic-Energy-Management-Division-Statutes-and-Regulations.aspx See California Code of Regulations Title 14 Chapter 4 Sub-Chapter 1 Article 3 Sections 1714, 1722, 1723, 1724	
Colorado	Yes	https://ecmc.state.co.us/documents/reg/Rules/LATEST/400%20Series%20-%20Operations%20and%20Reporting.pdf From Rule Rule 435.b., Form 6, Subsequent Report of Abandonment (1) Within 30 days after abandonment, the Form 6, Well Abandonment Report – Subsequent Report of Abandonment will be filed with the Director. The abandonment details will include an account of the manner in which the abandonment or plugging work was performed. Copies of any casing pressure test results and downhole Logs run during Plugging and Abandonment will be submitted with the Form 6. Additionally, plugging verification reports detailing all procedures are required. A plugging verification report will be submitted for each person or contractor actually setting the plugs. The Form 6 – Subsequent Report of Abandonment and the	

²⁰⁸ Appendix D State/Province Survey Questionnaire

²⁰⁹ Respondent reports no known orphan wells. See Appendix B – Reference Documents; Idle and Orphan Oil and Gas Wells: State and Provincial Regulatory Strategies 2021; Interstate Oil and Gas Compact Commission; Table 3. Documented and Undocumented Orphan Wells (2018 – 2020); page 28

State or Province	Documentation of plugging activity	Referenced information provided	Comments
		plugging verification reports will detail the depths of mechanical plugs and casing cuts, the depths and volumes of all cement plugs, the amount, size, and depth of casing and junk left in the Well, the volume and weight of Fluid left in the wellbore, and the nature and quantities of any other materials used in the plugging. Plugging verification reports will conform with the Operator's report and both will show that plugging procedures are at least as extensive as those approved by the Director.	
Idaho	No ²¹⁰		
Illinois	Not Submitted		
Indiana	Not Submitted		
Kansas	Not Submitted		
Kentucky	Yes	Title 805 Chapter 1 Regulation 060 • Kentucky Administrative Regulations • Legislative Research Commission	Sections 3:6 and 4:7 require the operator to submit a Plugging Affidavit, Form OG-38, within 30 days of completion of the plugging activities. This plugging affidavit has all the pertinent information associated with the plugging and abandonment of that well.
Louisiana	Yes	LAC 43:XIX.137.F.4 requires cement plugs be set by circulation. https://www.doa.la.gov/media/t3qldhn5/43v19.pdf	
Maryland	No ²¹¹		
Michigan	Yes	Part 615 902 (10) 902(10) A permittee shall file, within 60 days after plugging, the final plugging forms and certified copies of the service company records, which shall include all of the following information: (a) The type of cement and number of sacks used, including the additives and percentages of the additives for each cement bridge plug. (b) The type and volume of plugging material used if other than cement. (c) The number of bridge plugs set in the hole and the depth and length of each plug.	

²¹⁰ Respondent reports no known orphan wells. See Appendix B – Reference Documents; Idle and Orphan Oil and Gas Wells: State and Provincial Regulatory Strategies 2021; Interstate Oil and Gas Compact Commission; Table 3. Documented and Undocumented Orphan Wells (2018 – 2020); page 28

²¹¹ Respondent reports no known orphan wells. See Appendix B – Reference Documents; Idle and Orphan Oil and Gas Wells: State and Provincial Regulatory Strategies 2021; Interstate Oil and Gas Compact Commission; Table 3. Documented and Undocumented Orphan Wells (2018 – 2020); page 28

State or Province	Documentation of plugging activity	Referenced information provided	Comments
		(d) Other materials left in the hole. (e) Service companies' records of cementing operations if requested by the supervisor or authorized representative of the supervisor. (f) All available graphics, if requested by the supervisor or authorized representative of the supervisor, showing the all of following information: (i) Pumping. (ii) Placement of cement. (iii) Weights. (iv) Times. (v) Pump rates. (vi) Other pertinent data dealing with the plugging operations. (g) The amounts and type of mix water used for each sack of cement. (h) The volume and types of spacers and flushes used. (i) The operator's daily plugging records.	
Mississippi	Yes		Rule 28, Form 7 (Plugging Record)
Missouri	Yes	(D) Reporting. The operator shall submit a plugging record completed in full on a form provided by the department along with the applicable fee pursuant to 10 CSR 50-1.050 to the state geologist within thirty (30) calendar days after completion of plugging activities.	
Montana	Yes	Intent to abandon: https://rules.mt.gov/gateway/RuleNo.asp?RN=36%2E22%2E1301 Subsequent report of abandonment: https://rules.mt.gov/gateway/RuleNo.asp?RN=36%2E22%2E1309	
Nebraska	Yes	If any well is plugged or abandoned, a record of work done must be filed on Form 6 with the Director within thirty (30) days after the work is completed. The report shall give a detailed account of the manner in which the abandonment or plugging work is carried out, including the nature and quantities of materials used in plugging and the location and extent (by depths) of the plugs of different materials; records of the amount, size and location (by depths) of casing and	

State or Province	Documentation of plugging activity	Referenced information provided	Comments
		junk left in the well, and a detailed statement of the volume and weight of mud fluid used. Upon written request, geological information will be kept confidential for twelve (12) months after the filing thereof unless written permission to release the information at an earlier date is obtained from the operator.	
Nevada	Not Submitted		
New Mexico	Not Submitted		
New York	Yes	6 CRR-NY §555.5 (d) Plugging methods, procedures and reports	(d) Within 30 days after the plugging of any well, a plugging report on form OG13 shall be filed with the department by the owner or operator or person responsible for the plugging operation. DEC receives these reports from the plugging contractor for orphan well plugging jobs.
North Dakota	Not Submitted		
Ohio	Yes	OAC 1501:9-11 Plugging of Wells OAC 1501:9-11-12 Plugging Report https://codes.ohio.gov/ohio-administrative-code/rule-1501:9-11-12	A plugging report documenting how the well was plugged along with cementing tickets or other supporting documentation must be submitted within thirty days of the well being plugged.
Oklahoma	Yes	165:10-11-7	165:10-11-7. Plugging record (a) Within 30 days after plugging a well, the owner or operator of the well shall submit for the well to the appropriate Conservation Division District Office: (1) Plugging Record (Form 1003). (2) Form 1003 shall be completed and signed by employees of both the operator and the cementer. (3) If a Completion Report (Form 1002A) has not been submitted for the well, Form 1002A shall be attached to the Form 1003
Pennsylvania	Yes	25 Pa. Code § 78.124. Certificate of plugging. (pacodeandbulletin.gov)	PA DEP regulations 25 Pa. Code § Chapter 78. Oil and Gas Wells (78.124) and section 3220 of the Oil and Gas Act require the well operator to submit a certificate of well plugging.
South Dakota	Not Submitted		
Tennessee	Yes	0400-52-02-.04 NOTIFICATION TO PLUG AND ABANDON. https://publications.tnsosfiles.com/rules/0400/0400-52/0400-52-02.20191215.pdf 0400-52-09-.02 INSPECTION. https://publications.tnsosfiles.com/rules/0400/0400-52/0400-52-09.20130618.pdf	Operator and Inspector must sign the Plug and Abandon Report (Form CN-0217)
Texas	Not Submitted		
Utah	Yes	R649-3-24.5 https://adminrules.utah.gov/public/rule/R649-3/Current%20Rules?searchText=R649	R649-3-24.5 5. Within 30 days after the plugging of any well has been accomplished, the owner or operator shall file a subsequent report of plugging with

State or Province	Documentation of plugging activity	Referenced information provided	Comments
			the division. The report shall give a detailed account of the following items: 5.1. The manner in which the plugging work was carried out, including the nature and quantities of materials used in plugging and the location, nature, and extent by depths, of the plugs. 5.2. Records of any tests or measurements made. 5.3. The amount, size, and location, by depths of any casing left in the well. 5.4. A statement of the volume of mud fluid used. 5.5. A complete report of the method used and the results obtained, if an attempt was made to part any casing.
Virginia	Yes	4VAC25-150-460 requires when any well or corehole has been plugged or replugged in accordance with 4VAC25-150-435, two persons, experienced in plugging wells or coreholes, who participated in the plugging of a well or corehole, shall complete the plugging affidavit designated by the director, setting forth the time and manner in which the well or corehole was plugged and filled, and the permanent marker was placed. https://law.lis.virginia.gov/admincode/title4/agency25/chapter150/section460/ https://law.lis.virginia.gov/admincode/title4/agency25/chapter150/section435/	
West Virginia	Yes	W. Va. Code § 22-6-23 W. Va. CSR 35-3-8 W. Va. CSR 35-4-13 W. Va. CSR 35-8-19	
Wyoming	Yes	Chapter 3, Section 17 requires submission of a subsequent report of abandonment within 30 days of the date of plugging to include a detailed account of the manner in which the abandonment or plugging work was carried out, including the weight of the mud and nature and quantities of materials used in the plugging and the location and extent (by depths) of the plugs of different materials and accompanied by a job log or cement verification reports from the plugging contractor specifying the type of fluid used to fill the wellbore, type of slurry volume of API class cement used, dates of work, and	WOGCC rules and regulations are located on the Wyoming Secretary of State website at https://rules.wyo.gov/ and searching by Oil and Gas Conservation Commission. A pdf copy of the WOGCC Rules and Regulations are attached to the email response to this document.

State or Province	Documentation of plugging activity	Referenced information provided	Comments
		the depth of the plugs placed. Records of any test or measurement made, and records of the amount, size and location (by depths) of casing must be included.	
Alberta	Not Submitted		
British Columbia	Yes	https://www.bc-er.ca/files/documents/Drilling-and-Production-Regulation-unofficial-copy.pdf Section 26 (1) (c)	In addition to documentation, permit holders are required to submit an Abandonment Report, which includes the details of all plugs left in the well. This Report is reviewed by BCER staff, and plugging details are recorded in the BCER's data systems, and shared via the BCER's Data Downloads portal.
Saskatchewan	Not Submitted		

Table 3. State/Province Questionnaire²¹²: Section 3: Plugging Materials and Plug Placement Subsection 3: Witnessing, Documentation, and Monitoring

State or Province	Monitoring or inspection at plugging completion	Referenced information provided	Comments
Alabama	Yes	See answer to question regarding witnessing of plugs. Also, Rule 400-1-4-.16 (Restoration of Location). In practice, plugging activities and site restoration is witnessed by a Board agent and a site clearance is issued by the agent before the related Bond is released to the Operator. https://www.ogb.state.al.us/ogb/rules	
Alaska	Not Submitted		
Arizona	No ²¹³		
Arkansas	Yes	See Rule 7 above	
California	Yes	https://www.conservation.ca.gov/index/Pages/California-Geologic-Energy-Management-Division-Statutes-and-Regulations.aspx See California Code of Regulations Title 14 Chapter 4 Sub-Chapter 1 Article 3 Section 1723.7	
Colorado	Yes	https://ecmc.state.co.us/documents/reg/Rules/LATEST/400%20Series%20-%20Operations%20and%20Reporting.pdf See detailed response above for full rule citations. Rule 434.a.(5) requires a 5 to 90-day wait period after setting the surface plug and prior to cutting the casing and installing the above or below-grade marker: The Operator will not cap or seal the Well until 5 days after placing the last plug to allow monitoring for successful plugging and will cap or seal the Well within 90 days after placing the last plug.	

²¹² Appendix D State/Province Survey Questionnaire

²¹³ Respondent reports no known orphan wells. See Appendix B – Reference Documents; Idle and Orphan Oil and Gas Wells: State and Provincial Regulatory Strategies 2021; Interstate Oil and Gas Compact Commission; Table 3. Documented and Undocumented Orphan Wells (2018 – 2020); page 28

State or Province	Monitoring or inspection at plugging completion	Referenced information provided	Comments
Idaho	No ²¹⁴		
Illinois	Not Submitted		
Indiana	Not Submitted		
Kansas	Not Submitted		
Kentucky	Yes	805 KAR 1:170 Section 5 (Site Closure)	Per Regulation, plugged wells must be inspected for wellsite closure procedures and site reclamation. Division Policy is for inspectors to perform 1) a plugging witnessed inspection of the well that takes places as the plugging is occurring; 2) a final plugging inspection where an inspection is done post plugging to ensure the well is closed properly and not leaking; and 3) a well site reclamation inspection to assure prevention of erosion and sedimentation from the site.
Louisiana	No		Policy is to inspect sites following work to verify well is P&A and site is properly restored.
Maryland	No ²¹⁵		
Michigan	No		No specific inspection, only documentation and submittal of the record of well plugging. If the OGMD witnesses the plugging there will also be field notes of plugging activities.
Mississippi	Yes	Rule 28 C	
Missouri	No		
Montana	Yes	https://leg.mt.gov/bills/mca/title_0820/chapter_0110/part_0010/section_0230/0820-0110-0010-0230.html	Bond won't be released until Board determines the well is properly plugged and abandoned as provided in the board's rules.
Nebraska	No	028.08 Following abandonment, working pits, reserve pits and/or bum pits shall be backfilled, pads leveled, debris removed or buried and land restored to the reasonable satisfaction of the Director.	
Nevada	Not Submitted		
New Mexico	Not Submitted		
New York	No		
North Dakota	Not Submitted		
Ohio	Yes	OAC 1501:9-11 Plugging of Wells OAC 1501:9-11-10 Cutting off conductor pipe or surface casing below grade; identification tag https://codes.ohio.gov/ohio-administrative-code/rule-1501:9-11-10	Once plugging operations have been completed, the well must be left open for three business days to allow the Division to determine if any additional plugging work is required. If no additional plugging work is required, the casing is then cut off a minimum of thirty (30) inches below grade and an identification tag is welded to the top of the casing.

²¹⁴ Respondent reports no known orphan wells. See Appendix B – Reference Documents; Idle and Orphan Oil and Gas Wells: State and Provincial Regulatory Strategies 2021; Interstate Oil and Gas Compact Commission; Table 3. Documented and Undocumented Orphan Wells (2018 – 2020); page 28

²¹⁵ Respondent reports no known orphan wells. See Appendix B – Reference Documents; Idle and Orphan Oil and Gas Wells: State and Provincial Regulatory Strategies 2021; Interstate Oil and Gas Compact Commission; Table 3. Documented and Undocumented Orphan Wells (2018 – 2020); page 28

State or Province	Monitoring or inspection at plugging completion	Referenced information provided	Comments
Oklahoma	Yes	165:10-3-17(k)	Well site cleared. Within 90 days after a well is plugged and abandoned, the well site shall be cleared of all equipment, trash, and debris. Any foreign surface material is to be removed and the location site restored to as near to its natural state as reasonably possible, except by written agreement with the surface owner to leave the surface in some other condition. If the location site is restored but the vegetative cover is destroyed or significantly damaged, a bona fide effort shall be made to restore or re-establish the vegetative cover OAC 165:10 CORPORATION COMMISSION - 67 - within 180 days after abandonment of the well
Pennsylvania	No		
South Dakota	Not Submitted		
Tennessee	Yes	0400-52-02-.04 NOTIFICATION TO PLUG AND ABANDON. https://publications.tnsosfiles.com/rules/0400/0400-52/0400-52-02.20191215.pdf 0400-52-09-.02 INSPECTION. https://publications.tnsosfiles.com/rules/0400/0400-52/0400-52-09.20130618.pdf	
Texas	Not Submitted		
Utah	Yes	R649-3-34 and R649-3-24 https://adminrules.utah.gov/public/rule/R649-3/Current%20Rules?searchText=R649	Final inspection is required before a bond/liability will be released for each well. This review looks at surface reclamation being completed to requirements and any outstanding issues being remedied. From inspector handbook: Reclamation inspections are conducted to review requirements are met. Reclamation inspections w are compatible with intended land use. These ins Additional direction can be located in UDOGM C Procedures. Final Reclamation Intended Land Use Was Site Disturbed Well(s) Plugged Pits, Mouse/Rat Hole, Cellars Backfilled Debris Removed
Virginia	Yes	Final reclamation standards are outlined in 4VAC25-150-260 and permanent markers for plugged wells are outlined in 4VAC25-150-460. Gas & Oil staff inspect for compliance. Bonds are not released until inspection staff verify site is stable and permanent markers are installed. Note that variances are allowed. https://law.lis.virginia.gov/admincode/title4/agency25/chapter150/section260/	

State or Province	Monitoring or inspection at plugging completion	Referenced information provided	Comments
		https://law.lis.virginia.gov/admincode/title4/agency25/chapter150/section460/	
West Virginia	No		There is no specific statute/rule but as a procedural matter all permitted work, including plugging, is inspected upon completion in order to properly process the permit release.
Wyoming	Yes	Chapter 3, Section 17 requires an inspection when the rehabilitation of the surface is complete.	WOGCC rules and regulations are located on the Wyoming Secretary of State website at https://rules.wyo.gov/ and searching by Oil and Gas Conservation Commission. A pdf copy of the WOGCC Rules and Regulations are attached to the email response to this document.
Alberta	Not Submitted		
British Columbia	No	However, thorough engineering review is conducted and audits may occur through Orphan restoration staff. In addition, BCER inspectors may conduct inspections at sites on the basis of risk.	However, thorough engineering review is conducted and audits may occur through Orphan restoration staff. In addition, BCER inspectors may conduct inspections at sites on the basis of risk. In addition, the restoration of decommissioned well sites requires site inspections and followup reporting, to support the granting of a Certificate of Restoration.
Saskatchewan	Not Submitted		

Table 3. State/Province Questionnaire²¹⁶: Section 3: Plugging Materials and Plug Placement Subsection 3: Witnessing, Documentation, and Monitoring

State or Province	How is location of orphan / abandoned well documented?
Alabama	GPS units are used to record exact locations and data is stored on related tables and incorporated in our RBDMS database. That information is available through the AOGB website.
Alaska	Not Submitted
Arizona	No ²¹⁷
Arkansas	GPS
California	California has both well records and GIS mapping of idle, orphan, and abandoned wells. Every well drilled after the creation of CalGEM in 1915 has well records and is mapped in WellFinder. The public can access both the well files and the GIS maps to research well histories.
Colorado	https://ecmc.state.co.us/documents/reg/Rules/LATEST/200%20Series%20-%20General%20Provisions.pdf https://ecmc.state.co.us/documents/reg/Rules/LATEST/400%20Series%20-%20Operations%20and%20Reporting.pdf ECMC staff or contractors collect GPS measurements to document the location of wells and other oil and gas facilities. For large features, such as tank batteries or pits, the southeast corner of the feature is used. GPS measurements comply with Rule 216: 216. GLOBAL POSITIONING SYSTEMS Global Positioning Systems (“GPS”) may be used to locate facilities used in Oil and Gas Operations provided they meet the following minimum standards: a. GPS instruments are differential grade. b. GPS instruments are capable of 1-meter horizontal positional accuracy after differential correction. c. The Operator will report an accuracy value (in meters) or position dilution of precision (“PDOP”) value with all submitted GPS data. Accuracies of 1.0 meter or less and PDOP readings of 6.0 or less are acceptable. d. Elevation mask (lowest acceptable height above the horizon) will be no less than 15 degrees. e. Latitude and longitude coordinates will be provided in decimal degrees with an accuracy and precision of 5 decimals of a degree using the North American Datum (“NAD”) of 1983 (e.g., latitude 37.12345 N, longitude 104.45632 W). f. Raw and corrected data files will be held for a period of 3 years. g. Measurements will be made by a trained GPS operator familiar with the theory of GPS, the use of GPS instrumentation, and typical constraints encountered during field activities. Rule 435.d. requires:

²¹⁶ Appendix D State/Province Survey Questionnaire

²¹⁷ Respondent reports no known orphan wells. See Appendix B – Reference Documents; Idle and Orphan Oil and Gas Wells: State and Provincial Regulatory Strategies 2021; Interstate Oil and Gas Compact Commission; Table 3. Documented and Undocumented Orphan Wells (2018 – 2020); page 28

State or Province	How is location of orphan / abandoned well documented?
	As-Drilled Location. For all Wells being plugged, the Operator will report the latitude and longitude coordinates of the “as drilled” Well location on the Form 6. When plugging a Well for which this data has been obtained and submitted to the Commission previously, the Operator will submit this data on the Form 6 – Notice of Intent to Abandon. When plugging a Well for which this data has not yet been obtained and submitted to the Commission, the Operator will determine the “as drilled” location prior to plugging and submit the location on the Form 6 – Subsequent Report of Abandonment. The latitude and longitude coordinates will be in decimal degrees to an accuracy and precision of five decimals of a degree using the North American Datum (“NAD”) of 1983 (e.g., latitude 37.12345, longitude -104.45632). If the Operator uses GPS technology to determine the latitude and longitude, all GPS data will meet the requirements set forth in Rule 216. The Operator will report the accuracy value expressed in meters and the date of the GPS measurement on the Form 6. Orphaned Sites are plotted for public viewing on ECMC’s GIS, available at: https://ecmc.state.co.us/maps.html#gisonline
Idaho	No ²¹⁸
Illinois	Not Submitted
Indiana	Not Submitted
Kansas	Not Submitted
Kentucky	We only document the locations of wells identified as “abandoned”. The abandoned wells (by status) are documented by latitude and longitude and are saved into our database where they will be added to our mapping program. Determination of “orphan status” by our statute requires an investigation of each abandoned well and determination of status for the last know operator. After archive and historical research into the last known operators a well will be declared orphaned if there is no remaining viable entity or person with ability to plug the abandoned well.
Louisiana	Inspections collect GPS locations of wells.
Maryland	No ²¹⁹
Michigan	The OGMD has detailed coordinates from permitting, if they are not accurate the OGMD will relocated with accurate GPS and correct location in RMBDS Database.
Mississippi	By latitude and longitude
Missouri	We have developed an app to document the location of the orphan or abandoned well.
Montana	Field inspection, database records
Nebraska	Using database
Nevada	Not Submitted
New Mexico	Not Submitted
New York	Collection of gps point at well site. Entry into program database as an unknown, located well. Scoring of the well according to our orphan well scoring rubric for plugging priority.
North Dakota	Not Submitted
Ohio	-Assignment of an API number, surveyed GPS coordinates, County, Township, Lot/Section. Inspection and documentation of the well is completed by Division staff to account for wellsite conditions and surroundings. Wells are selected for plugging using a Risk Evaluation Matrix which determines plugging priority based on existing conditions and relative risk to human health and safety and the environment.

²¹⁸ Respondent reports no known orphan wells. See Appendix B – Reference Documents; Idle and Orphan Oil and Gas Wells: State and Provincial Regulatory Strategies 2021; Interstate Oil and Gas Compact Commission; Table 3. Documented and Undocumented Orphan Wells (2018 – 2020); page 28

²¹⁹ Respondent reports no known orphan wells. See Appendix B – Reference Documents; Idle and Orphan Oil and Gas Wells: State and Provincial Regulatory Strategies 2021; Interstate Oil and Gas Compact Commission; Table 3. Documented and Undocumented Orphan Wells (2018 – 2020); page 28

State or Province	How is location of orphan / abandoned well documented?
Oklahoma	In our RBDMS program the well is listed as (OR) for orphan and is GPS for location
Pennsylvania	PA DEP uses Global Position System equipment to identify the location of wells in accordance with PA DEP's locational accuracy policy. Orphan and abandoned well location data are added to PA DEP's data and mapping systems.
South Dakota	Not Submitted
Tennessee	In the permitting process, a well location plat from a registered Tennessee land surveyor is required. If the well location is moved prior to drilling, an amendment is required, including an updated plat. Oil and gas inspectors also inspect the site before a permit is issued and gather GPS coordinates. Location documents supplied by the operator and inspectors' reports for the location of the well are utilized to document the location of wells. During the enforcement process, another site inspection is also completed.
Texas	Not Submitted
Utah	R649-3-24.7 7. Unless otherwise approved by the division, any abandoned wells shall be marked with a permanent monument showing the well number, location, and name of the lease. The monument shall consist of a portion of pipe not less than four inches in diameter and not less than ten feet in length, of which four feet shall be above the ground level and the remainder shall be securely embedded in cement. The top of the pipe must be permanently sealed. We also allow subsurface markers as requested by landowner. These are typically plates with the relevant information required by rule welded or stamped on the plate and buried 3 or more feet below ground level.
Virginia	Orphaned and abandoned wells are located using current GPS survey methods.
West Virginia	When we become aware of an abandoned/orphaned well, an inspection is conducted which includes obtaining a GPS coordinate.
Wyoming	If the WOGCC has
Alberta	Not Submitted
British Columbia	As mapped on our webpage: Orphan Sites BC Energy Regulator (BCER) (bc-cr.ca) Further, the BCER's Data Downloads page provides location information for all wells, including abandoned/decommissioned wells.
Saskatchewan	Not Submitted

Table 3. State/Province Questionnaire²²⁰: Section 3: Plugging Materials and Plug Placement Subsection 4: New and Emerging Technologies

State or Province	New or emerging technologies or use of new material allowed by statute / rule	Referenced information provided	Comments
Alabama	Yes	Rule 400-1-4-.14(7) states “Other plugging methods and procedures may be required by the Supervisor” https://www.ogb.state.al.us/ogb/rules	
Alaska	Not Submitted		
Arizona	No ²²¹		
Arkansas	Yes	See Rule 9 above	
California	Yes	There is not a specific citation for this. New or emerging technologies or the use of new materials must be approved by the State Oil and Gas Supervisor. These technologies must be proven to be as effective or more effective than conventional methods (methods described in regulations).	
Colorado	Yes	https://ecmc.state.co.us/documents/reg/Rules/LATEST/400%20Series%20-%20Operations%20and%20Reporting.pdf See detailed response above for full rule citations. Normally, service providers and vendors test new processes or materials with oil and gas operators after seeking approval from ECMC’s engineering unit. However, in 2023, Colorado’s legislature passed a bill requiring ECMC and Colorado State University to conduct a study, which is currently in progress. The study is designed to evaluate the potential for use of Biochar in plugging materials for potential use in orphaned wells. The study and workgroup meetings with a diverse set of stakeholders are in progress as of May 2024.	

²²⁰ Appendix D State/Province Survey Questionnaire

²²¹ Respondent reports no known orphan wells. See Appendix B – Reference Documents; Idle and Orphan Oil and Gas Wells: State and Provincial Regulatory Strategies 2021; Interstate Oil and Gas Compact Commission; Table 3. Documented and Undocumented Orphan Wells (2018 – 2020); page 28

State or Province	New or emerging technologies or use of new material allowed by statute / rule	Referenced information provided	Comments
		Rule 434.a.(1) allows for the following: The material an Operator uses in plugging, whether cement, mechanical plug, or some other equivalent method approved in writing by the Director. Rule 434.a.(3) restricts materials to those that are normally used for plugging oil and gas wells: An Operator will not place substances of any nature or description other than that normally used in plugging operations in any Well at any time during plugging operations.	
Idaho	No ²²²		
Illinois	Not Submitted		
Indiana	Not Submitted		
Kansas	Not Submitted		
Kentucky	Yes	Title 805 Chapter 1 Regulation 060 • Kentucky Administrative Regulations • Legislative Research Commission	Any new materials proposed for industry use may only be used if the Division receives adequate documentation to assess and confirm the overall effectiveness of the material. Statutes can never be able to address new materials because of the time it takes to enact new laws. So new materials must be addressed and investigated as they are identified. If our staff confirms that they meet the requirements of our statutes and regulation, we would approve them for use in the plugging and abandonment process.
Louisiana	No		
Maryland	No ²²³		
Michigan	Yes	Rule 902 (11) – Material has to be approved by the OGMD Supervisor of Wells prior to plugging. Other statute and rule citations support this requirement for preapproval of materials and plugging plan prior to completing the work.	
Mississippi	Yes		Rule 28(3)(B)(2)b
Missouri	Yes	8. Alternative plugging methods may be authorized by the state	

²²² Respondent reports no known orphan wells. See Appendix B – Reference Documents; Idle and Orphan Oil and Gas Wells: State and Provincial Regulatory Strategies 2021; Interstate Oil and Gas Compact Commission; Table 3. Documented and Undocumented Orphan Wells (2018 – 2020); page 28

²²³ Respondent reports no known orphan wells. See Appendix B – Reference Documents; Idle and Orphan Oil and Gas Wells: State and Provincial Regulatory Strategies 2021; Interstate Oil and Gas Compact Commission; Table 3. Documented and Undocumented Orphan Wells (2018 – 2020); page 28

State or Province	New or emerging technologies or use of new material allowed by statute / rule	Referenced information provided	Comments
		geologist when geologic conditions or conditions in the casing or wellbore warrant.	
Montana	No	May be considered on case by case basis.	
Nebraska	Yes	If approved by Director	
Nevada	Not Submitted		
New Mexico	Not Submitted		
New York	No		The regulations are largely performance based and therefore not specific to a technology or material in most cases. Staff apply site specific permit conditions as necessary to ensure compliance with the law and regulations. DEC's Generic Environmental Impact Statement on the Oil, Gas and Solution Mining Regulatory Program provides more specifics for the plugging and abandonment of wells regulated under Article 23 of the Environmental Conservation Law. Generic Environmental Impact Statement On The Oil, Gas And Solution Mining Regulatory Program (GEIS) - NYSDEC https://dec.ny.gov/environmental-protection/oil-gas/geis
North Dakota	Not Submitted		
Ohio	Yes	https://codes.ohio.gov/ohio-revised-code/section-1509.071	ORC 1509.071 allows the Chief to make expenditures to utilize new technologies to locate and/or analyze orphan wells. The Division is currently using drone and ground-based magnetometers to locate abandoned and orphaned wells.
Oklahoma	Yes		Oklahoma will listen to new technologies and evaluate the materials. We also allow operators to transfer the orphan wells into their name with a lease assignment to operate the wells.
Pennsylvania	Yes	25 Pa. Code § 78.75. Alternative methods. (pacodeandbulletin.gov)	The PADEP allows the use of other materials approved by the Department. A well operator may request approval from the Department to use an alternative method or material for the casing, plugging or equipping of a well under section 3221 of the act (relating to alternative methods 78.75).
South Dakota	Not Submitted		
Tennessee	No		Not at present, but the operator can work with the Supervisor to see what might be used and then permission can be approved or denied.
Texas	Not Submitted		
Utah	Yes	R649-3-24.4 does allow for the Division to approve a different method and procedure. https://adminrules.utah.gov/public/rule/R649-3/Current%20Rules?searchText=R649	Engineers have latitude to review proposals and approve alternate methods, materials or technologies that meet the minimum requirements of the rules.

State or Province	New or emerging technologies or use of new material allowed by statute / rule	Referenced information provided	Comments
Virginia	Yes		Virginia's regulation does not explicitly allow emerging technology, but 4VAC25-150-435 states that: The director may, upon application by the permittee, approve a variance to the prescribed plugging methods if it is determined that the alternate plan meets the requirements of the Act https://law.lis.virginia.gov/admincode/title4/agency25/chapter150/section435/
West Virginia	Yes	W. Va. CSR 35-4-18 and W. Va. CSR 35-8-14 provide for the option of variances.	
Wyoming	Yes	There are not specific citations, but the rules and statutes allows discretion to the Supervisor to approve alternative materials or processes. See Chapter 3, Section 18 as an example.	WOGCC rules and regulations are located on the Wyoming Secretary of State website at https://rules.wyo.gov/ and searching by Oil and Gas Conservation Commission. A pdf copy of the WOGCC Rules and Regulations are attached to the email response to this document.
Alberta	Not Submitted		
British Columbia	Yes	https://www.bcer.ca/files/operations-documentation/Well-Decommissioning/Well-Decommissioning-Guidelines.pdf	Note that the DPR does not provide a mechanism for formally approving either a well decommissioning program, or a particular material being used for decommissioning. The BC Well Decommissioning Guidelines generally specifies the use of class G cement as a plugging material. However, as the use of class G cement is not prescribed by the Act or the Regulation, alternative plugging materials may be used. Where a permit holder proposes the use of an alternative material, they are expected to demonstrate that the results obtained from the alternative material will meet or exceed the ability to provide isolation of class G cement. Some alternative materials/techniques proposed recently include resins/polymers, tin-bismuth alloy, thermite, controlled deformation of casing (for shutting off surface casing vent flow) and bio-squeeze. The Guideline differentiates between "routine" and "non-routine" decommissioning programs, and any use of an alternative material/technique would be considered "non-routine" and subject to further review by BCER technical staff
Saskatchewan	Not Submitted		

Table 7. Orphan Well Plugging and Expenditures (2018-2020)

Table 7. Orphan Well Plugging and Expenditures (2018-2020)

Blank fields indicate that no data was reported or available.

Data as of December 31, 2018, 2019, and 2020.

State or Province	Orphan wells plugged			Expenditures for plugging (\$=US dollars; C\$=Canadian dollars)			Includes restoration (Yes or No)	Plugged since start of program
	2018	2019	2020	2018	2019	2020		
Alabama	0	0	0	\$0	\$0	\$0	Yes	
Alaska	0	0	0	\$0	\$0	\$0		0
Arizona								
Arkansas	25[1]	1	23	\$227,825	\$56,521	\$420,434	Yes	772
California	29[2]	60	43	\$5,896,686	\$9,981,893	\$14,072,753	Yes	210
Colorado	16[3]	10	61	\$644,880	\$672,992	\$1,990,278	No	
Idaho	0	0	0	\$0	\$0	\$0		0
Illinois	9	20	23	\$447,000	\$721,537	\$750,914	Yes	404+
Indiana	5	15	7	\$45,399	\$187,960	\$90,432	Yes	~800
Kansas	168	137	161	\$773,762	\$755,943	\$556,246	Yes	10,718
Kentucky	9	66	298	\$33,000	\$298,000	\$1,291,000	Yes	4,036
Louisiana	219	1	135	\$6,400,000	\$4,638,918	\$5,939,013	Yes	3,450
Maryland	0	0	0	\$0	\$0	\$0		0
Michigan	6	5	2	\$585,756	\$795,199	\$678,862	Yes	386
Mississippi	5	11	0	\$168,000	\$497,635	\$0	Yes	457
Missouri	0	0	0	\$0	\$0	\$0		
Montana	11	1	2	\$387,000	\$416,625	\$264,667	Yes	481
Nebraska	16	21	13	\$170,000	\$320,000	\$270,000	Yes	
Nevada	0	0	0	\$0	\$0	\$0		0
New Mexico	60	36	49	\$1,356,099	\$1,022,249	\$2,154,826	Yes	234[4]
New York	45	95	68	\$1,400,000	\$4,190,000	\$2,850,000	Yes	487
North Dakota	3	0	282	\$224,334	\$0	\$37,797,531	Yes	306
Ohio	51	92	150	\$3,000,000	\$8,867,580	\$14,035,390	Yes	2,347
Oklahoma	58	127	112	\$1,293,466	\$1,640,774	\$1,495,135	No	4,142
Pennsylvania	6	9	18	\$474,111	\$1,446,580	\$1,499,741	Yes	3,329
South Dakota	0	0	7	\$0	\$0	\$88,107	Yes	7
Tennessee	33	77	66	Unknown	\$213,505	\$131,000	Yes	~650
Texas	1,332	1,779	1,473	\$24,502,884	\$36,381,395	\$31,126,662	No	40,068
Utah	1	1	2	\$88,244	\$65,546	\$102,704	Yes	117
Virginia	0[5]	0	1	\$0	\$0	\$111,854	Yes	14
West Virginia	0	2	1	\$0	\$236,804	\$185,829	Yes	472
Wyoming	333[1]	529	1,066	\$2,200,000	\$3,165,531	\$5,813,669	Yes	4,475 +
Totals - States	2,440	3,271	4,063	\$50,318,446	\$76,573,187	\$123,717,047		~78,360
Alberta	799	982	1,922	C\$45,800,000	C\$46,200,000	C\$63,700,000	No	5,100
British Columbia	84	312	510	C\$8,500,000	C\$7,000,000	C\$18,500,000	No	510
Northwest Territories	0	0	0	C\$0	C\$0	C\$0		0
Saskatchewan	92	144	85	C\$2,248,411	C\$8,000,000	C\$3,000,000	No	670
Yukon	0	0	0	C\$0	C\$0	C\$0		0
Totals - Provinces	975	1,438	2,517	C\$56,548,411	C\$61,200,000	C\$85,200,000		6,280

[1] Revised 2018 orphan wells plugged to correct an error in the number reported in 2019.

[2] Revised 2018 orphan wells plugged to include wells plugged in state waters of the coastal zone.

[3] Revised 2018 orphan wells plugged to account for an orphan well that an operator plugged at no cost to the state.

[4] Number plugged since 2015.

[5] Revised 2018 orphan wells plugged because the numbers reported in 2019 were the total orphan wells plugged through 2018.

Table 12. Plugging Funds

Table 12. Plugging Funds

Blank fields indicate that no data was reported or available.

*An * indicates no plugging fund.*

State or Province	Year established	Last modified	Prioritization for plugging?	Emergency use for non-orphan wells?	Annual spending target?	Covers restoration?	Salvage recovered?
Alabama	1984[1]		Y	Y	N	Y	Y
Alaska*							
Arizona*							
Arkansas	2005		Y	Y	Y	Y	Y
California	1990	2017	Y	N	Y	Y	Y
Colorado	1990	2019	Y	Y	Y	Y	Y
Idaho*							
Illinois	1939		Y	Y	Y	Y	Y
Indiana	Unknown		Y	Y	Y	Y	Y
Kansas	1996	2021	Y	Y	N	Y	Y
Kentucky	1990	2019	Y	N	N	Y	Y
Louisiana	1993	2018	Y	Y	Y	Y	Y
Maryland*							
Michigan	1994		Y	Y	Y	Y	Y
Mississippi	1948	2019	Y	N	N	Y	N
Missouri	1983			Y	N	N	N
Montana	1989	2015	Y	Y	N	Y	N
Nebraska	2014		Y	Y	N	Y	Y
Nevada*			Y				
New Mexico	1977	2010	Y	Y	N	Y	Y
New York	1982	2021	Y	N	N	Y	N
North Dakota	1983	2019	Y	Y	Y	Y	Y
Ohio	1977	2018	Y	Y	Y	Y	Y
Oklahoma[2]	1990	2016	Y	Y	Y	N	Y
Pennsylvania	1985	2012	Y	N	N	Y	Y
South Dakota*[3]							N
Tennessee	1987	2019	Y	N	N	Y	N
Texas	1984	2013	Y	Y	N	Y	Y
Utah	1990	1992	Y		Y	Y	Y
Virginia	1991	2017	Y	N	N	Y	N
West Virginia	1977	2005	Y	Y	Y	Y	N
Wyoming*[3]			Y	Y	Y	Y	Y
Alberta	2002		Y	N	Y	Y	Y
British Columbia	2006	2019	Y	N	Y	Y	N
Northwest Territories *							
Saskatchewan	2007		Y	Y	Y	Y	Y
Yukon*[3]			N				

[1] For coalbed methane wells only.

[2] Has a separate restoration fund.

[3] Has access to other funding sources for plugging and restoration.

Table 13a. Updated Data on Documented Orphan Wells

Table 13a. Updated Data on Documented Orphan Wells

Data as of November 15, 2021, unless otherwise indicated.

See next page for additional explanations.

State	Total Documented Orphan Wells	Documented Orphan Wells on State and Private Lands	Date of Reported Numbers If other than November 15, 2021
Alabama	89	89	
Alaska	14	11	
Arizona	391	245	12/17/2021
Arkansas	423	423	
California	5,151	5,151	
Colorado	495	451	12/10/2021
Idaho	0	0	
Illinois	4,415[1]	3,663	12/10/2021
Indiana	1,442	1,441	
Kansas	5,486	5,486	
Kentucky	14,489	14,489	11/30/2021
Louisiana	4,601	4,601	11/22/2021
Maryland			
Michigan	442	441	
Mississippi	15	14	11/24/2021
Missouri	330	330	
Montana	279	279	11/29/2021
Nebraska	471	471	
Nevada	6	-	
New Mexico	3,375	1,749	11/17/2021
New York	7,040	6,937	
North Dakota	232	186	11/30/2021
Ohio	20,557	19,662	
Oklahoma	17,865	17,865	11/17/2021
Pennsylvania	27,991	16,056[2]	
South Dakota	19	19	
Tennessee	470	465	11/29/2021
Texas	7,436	7,396	10/31/2021
Utah	35	35	
Virginia	9	9	
West Virginia	6,309	6,245	
Wyoming	1,350	1,350	
Totals - States	131,227	115,314	

[1] Illinois has geographic coordinates for 3,663 wells. The locations of the remainder are being verified.

[2] Pennsylvania does not yet have geographic coordinates for 9,581 of the total documented orphan wells.