



**U.S. FISH & WILDLIFE SERVICE
REGION 6**



ENVIRONMENTAL CONTAMINANTS PROGRAM

**Reserve Pit Management:
Risks to Migratory Birds**

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September 2009

Executive Summary

This document is intended to help U.S. Fish and Wildlife Service (Service) employees and other natural resource managers understand reserve pits, their uses, associated mortality risk to birds and other wildlife, and alternatives to the use of reserve pits in drilling for oil and gas. The information is provided to help Service employees in the review of oil and gas development projects and development of recommendations to prevent or minimize impacts to Service trust resources such as migratory birds, federally-listed threatened and endangered species, and National Wildlife Refuge system lands. The document also provides a summary of state and federal oil and gas rules that relate to reserve pits.

Earthen pits, also known as reserve pits, excavated adjacent to drilling rigs are commonly used for the disposal of drilling muds and well cuttings in natural gas or oil fields. The contents of reserve pits depend on the type of drilling mud used, the formation drilled, and other chemicals added to the mud circulation system during the drilling process. If the reserve pit contains oil or oil-based products (*i.e.*, oil-based drilling fluids), the pit can entrap and kill migratory birds and other wildlife. During the drilling process, reserve pits probably do not attract aquatic migratory birds such as waterfowl due to human activity and noise. However, once the drilling rig and other equipment are removed from the well pad, the reserve pit is attractive to birds and other wildlife. Birds are attracted to reserve pits by mistaking them for bodies of water. Insects entrapped in reserve pit fluids also attract songbirds, bats, amphibians, and small mammals. The sticky nature of oil entraps birds in the pits and they die from exposure and exhaustion. Birds and other wildlife can also fall into oil-covered reserve pits when they approach the pit to drink.

Following well completion, reserve pits are often left in place after the drilling rig and other equipment are removed from the site. Reserve pit fluids are allowed to dry and the remaining solids are encapsulated with the reserve pit synthetic liner and buried in place. Depending on state regulations, oil operators are allowed from 30 days to one year after well completion to close a reserve pit. The longer the reserve pit is left on site, the greater the probability that aquatic birds will land on the pit. If the reserve pit contains oil, condensates, or other hydrocarbons or hydraulic fracturing fluids, the risk of bird mortality is very high. Hydraulic fracturing fluids can contain chemicals that may be harmful to birds (*e.g.*, surfactants, hydrochloric acid, caustic potash, and diesel fuel).

Bird and other wildlife mortality in reserve pits is preventable. Several states recommend or require netting or screening of reserve pits containing oil to prevent access by wildlife. Immediate removal of the drilling fluids after well completion is the key to preventing wildlife mortality in reserve pits. An alternative to the use of earthen reserve pits is closed-loop drilling systems using steel tanks to hold the drilling muds and cuttings. Other options to dispose of drilling wastes include: downhole injection; solidification and burial; or treatment and reuse.

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Introduction

Earthen pits excavated adjacent to drilling rigs are commonly used for the disposal of drilling muds and well cuttings in oil and gas fields (Figure 1). These pits are referred to as reserve pits. The contents of reserve pits depend on the type of drilling mud used, the formation drilled, and other chemicals added to the mud circulation system during the drilling process.



Figure 1. Reserve pit adjacent to a drilling rig near La Barge, Wyoming.
(USFWS Photo by P. Ramirez)

Reserve pit size depends on well depth. The average reserve pit volume for wells less than 4,000 feet in depth is approximately 3,600 barrels (bbls) and for wells greater than 15,000 feet in depth is more than 15,000 bbls (USOTA 1992). Reserve pits in the Pinedale Anticline and Jonah natural gas fields in Wyoming average 0.6 acres in size (approximately 120 by 200 feet). Reserve pits in the natural gas fields near Wamsutter, Wyoming average 0.3 acres in size (approximately 85 by 140 feet).

Drilling fluids or muds consist of a base fluid or carrier (water, diesel, mineral oil, or a synthetic compound), weighting agents (typically barium sulfate or barite), and bentonite clay to remove the cuttings from the well and line the walls of the hole (Figure 2). Drilling fluid also contains lignosulfonates and lignites to keep the mud in a fluid state. Water-based muds are typically used in drilling due to their lower cost. Oil-based muds are used in wells drilled in reactive shales, deep wells, and horizontal and extended-reach wells, where drilling is more difficult and water-based muds do not perform as well. Synthetic-based muds use nonaqueous fluids (other than oils) as their base and include internal olefins, esters, linear alpha-olefins, poly alpha-olefins, and linear paraffins. Synthetic-based muds have drilling properties similar to those of oil-based muds but do not have polynuclear aromatic hydrocarbons (PAHs), are less toxic, biodegrade faster, and have a lower bioaccumulation potential.

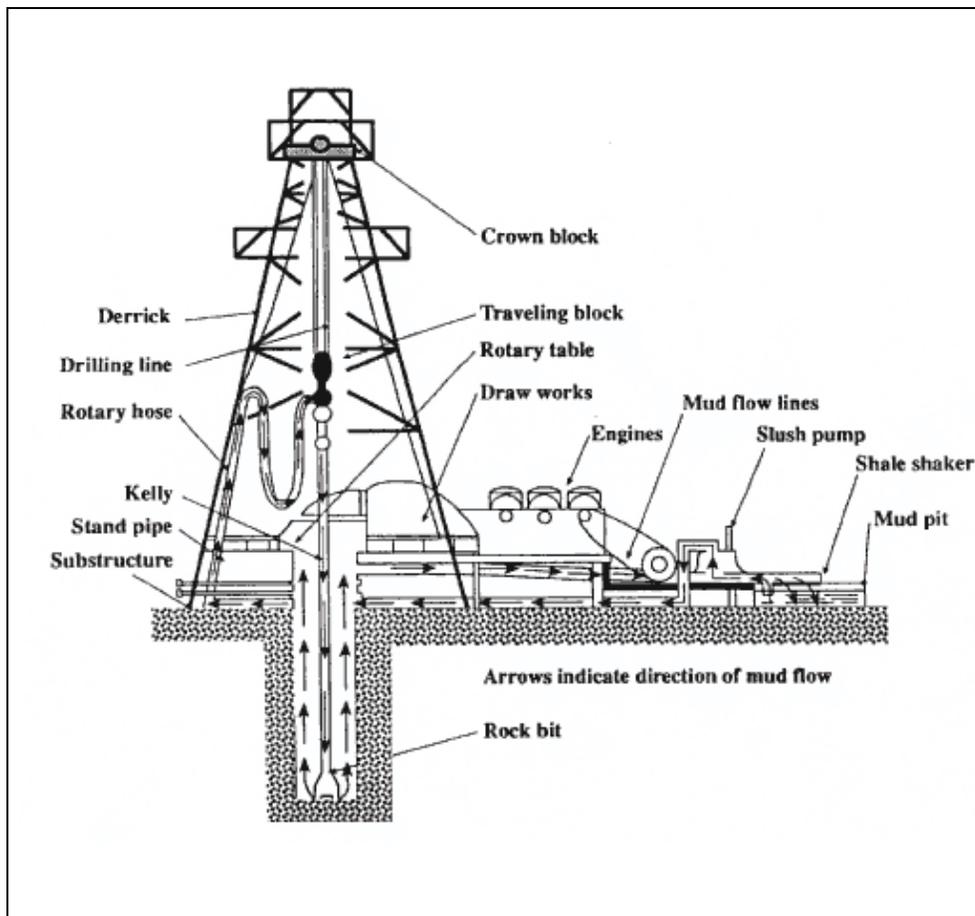


Figure 2. Rotary drilling rig diagram with reserve pit (mud pit).

Following well completion, reserve pits are left in place after the drilling rig and other equipment are removed from the site (Figure 3). Reserve pit fluids are allowed to dry (Figure 4) and the remaining solids are encapsulated with the reserve pit synthetic liner and buried in place (Figure 5).



Figure 3. Reserve pit at a completed well site near Parachute, Colorado. (USFWS Photo by P. Ramirez)



Figure 4. Reserve pit after fluids have evaporated. (USFWS Photo by P. Ramirez)



Figure 5. On-site burial of reserve pit wastes, Carbon County, Wyoming.

Contaminants in Reserve Pits

Reserve pits can contaminate soil, groundwater, and surface water with metals and hydrocarbons if not managed and closed properly. As reserve pit fluids evaporate, water-soluble metals, salts, and other chemicals become concentrated. Precipitation, changes in shallow groundwater levels, and flooding can mobilize these contaminants into adjacent soils and groundwater. Liners most often do not adequately seal the drilling wastes, especially if they are torn (Figure 6). Beal *et. al.* (1987) documented the migration of leachate 400 feet from reserve pits buried in 1959 in north-central North Dakota and reported groundwater contamination 50 feet below the buried reserve pits. Migration of salts from buried drilling wastes from unlined reserve pits has been documented in U.S. Fish and Wildlife Service (Service) managed Waterfowl Production Areas in northeastern Montana and northwestern North Dakota (K. Nelson, U.S. Fish & Wildlife Service, pers. com., Dec. 10, 2008). Caustic soda, rig wash, diesel fuel, waste oil from machinery, and other refuse could be placed in reserve pits either deliberately or inadvertently. Reis (1996) states that “improper reserve pit management practices have created sources of benzene, lead, arsenic, and fluoride, even when these contaminants were not detected or were not present in the drilling mud system.” Water-based drilling muds can contain glycols, chromium, zinc, polypropylene glycol, and acrylamide copolymers (Fink 2003). Synthetic-based muds contain mineral oil and oil-based muds can contain diesel oil, although diesel oil is being replaced by a palm oil derivative or hydrated castor oil (Fink 2003).

Other additives typically used in drilling fluids include: polymers (partially hydrolyzed polyacrylamide (PHPA) and polyanionic cellulose (PAC)); drilling detergents; and sodium carbonate (soda ash) (Papp 2001). PHPA is used to increase viscosity of fluid and inhibit clay and shale from swelling and sticking. PAC is used to increase the stability of the borehole in unconsolidated formations. Drilling detergents or surfactants are used

with bentonite drilling fluids to decrease the surface tension of the drill cuttings. Soda ash is used to raise the pH of the water and precipitate calcium out of the water.



Figure 6. Reserve pit with torn synthetic liner. (USFWS Photo by P. Ramirez)

Disposal of Drilling Wastes

The most recent data on drilling waste disposal by the American Petroleum Institute (API) (2000) shows the oil industry used reserve pits in 68 percent of the oil and conventional natural gas wells drilled in 1995 and closed loop drilling systems in 25 percent of the wells. An estimated 92 percent of onshore drilling wastes were derived from freshwater based mud systems, compared to 64 percent of drilling wastes in 1985. In 1995, 68 percent of drilling wastes were disposed onsite through evaporation and burial. Approximately 1.2 bbls of drilling waste are produced per foot of well depth drilled (API 2000). In 1995, an estimated 148 million bbls of drilling waste were produced. According to the U.S. Energy Information Administration, a total of 335 million feet were drilled in the exploration and development of oil and natural gas in 2008 (EIA 2009). Assuming the drilling of those wells resulted in an average of 1.2 bbls of drilling waste per foot of well depth drilled; approximately 402 million bbls of drilling waste were produced in 2008.

On-site Disposal and Burial of Reserve Pit Wastes

On-site disposal and burial involves allowing reserve pit fluids to dry and encapsulating the remaining solids with the reserve pit synthetic liner and burying the wastes in place. Depending on state regulations, oil operators are allowed from 30 days to one year after well completion to close a reserve pit. Assuming that 68 percent of the drilling wastes are currently disposed onsite through evaporation and burial, an estimated 273 million bbls of drilling wastes were disposed onsite in 2008.

Solidification of Drilling Wastes

If reserve pits must be used, cost-effective technology exists to solidify pit fluids immediately following well completion. Solidification can add to the waste volume but prevents mobilization of potential contaminants into the soil and/or groundwater (EPA 2000). Solidification involves the removal of the free liquid fraction of reserve pit fluids and then adding solidifiers such as commercial cement, fly ash, or lime kiln dust. Removal and off-site disposal of liquids removes most of the water soluble metals, salts, and chemicals from the drilling waste material.

Pitless or Closed Loop Drilling

Pitless drilling or closed-loop drilling reduces the amount of drilling waste, recycles drilling fluids, and reduces drilling costs (Rogers et. al. 2006a and b). Pitless drilling can reduce the volume of waste by 60 to 70 percent (Rogers et. al. 2006b). Pitless drilling also conserves water and prevents soil contamination.

Pitless drilling systems are equipped with a “chemically-enhanced” centrifuge that separates drilling mud liquids from solids (Rogers et. al. 2006b). The separated drilling mud solids are stored in a steel tank and then transferred to a synthetically-lined clay pad for drying (Figure 7). The pads are designed to prevent the runoff of any liquids. The drill cuttings are either buried on site or are transferred to an approved commercial disposal facility for disposal (Rogers et. al. 2006b). The drill cuttings can create environmental problems and pose a risk to wildlife if the trench or excavated burial pit collects water from snowmelt or rainfall. Pondered water in the trench or burial pit may become contaminated with hydrocarbons present in the drill cuttings. Immediate burial of drill cuttings and contouring of the site should prevent the ponding of snowmelt or rainwater. Sheens, oil, and sludges in the disposal pit will pose a risk to migratory birds and other wildlife (Figures 8 and 9). Additionally, if the pits are not lined, soil and groundwater contamination can occur if the drill cuttings contain leachable concentrations of hydrocarbons and metals.

Treatment and Reuse of Drilling Fluids

Operators in the Jonah natural gas field in southwestern Wyoming are currently using new technology to treat and reuse drilling fluids (Figure 10). Drilling fluids are treated using a patented combination of fluid and thermal dynamics to remove oil and salts. The treatment separates the drilling fluid into fresh water, heavy brine, condensate, and methanol. The condensate is recovered and sold. The methanol and brine are reused in drilling fluids. The fresh water is either reused at other drilling locations or is used for the benefit of livestock or wildlife.



Figure 7. Closed-loop or pitless drilling site with synthetically-lined pad for temporary storage of drill cuttings.



Figure 8. Trench used for burial of drill cuttings from closed-loop drilling. Sheens are visible on the water surface. (USFWS Photo by P. Ramirez)



Figure 9. Ponding of snowmelt and rainfall in trench used for the disposal of drill cuttings from closed-loop (pitless) drilling system.



Figure 10. Treatment facility at the Jonah Gas Field, Sublette County, Wyoming used to separate condensate, methanol, brine, and water from drilling fluids.
(USFWS Photo by P. Ramirez)

Down-hole Disposal of Drilling Fluids

Oil operators in Alaska inject the drill cuttings underground after the solids are finely ground and mixed with a liquid to form a slurry (Veil and Dusseault 2003). This disposal technique is typically used in conjunction with pitless drilling. Open earthen reserve pits are not used to temporarily store the drilling fluids. The elimination of open pits removes the mortality threat to migratory birds and other wildlife. Slurry injection of drilling wastes also poses less environmental impacts when properly managed and monitored as the wastes are disposed deep underground and isolated from aquifers (Veil and Dusseault 2003).

Threats to Migratory Birds

Reserve pits containing oil or oil-based products (i.e. oil-based drilling fluids) can entrap and kill migratory birds and other wildlife. Birds, including hawks, owls, waterfowl, and songbirds, are attracted to reserve pits by mistaking them for bodies of water. Reserve pits also attract other wildlife such as insects, bats, small mammals, amphibians, and big game. Wildlife can fall into oil-covered reserve pits while attempting to drink along the pits' steep sideslopes. The steep, synthetically-lined pit walls make it almost impossible for entrapped wildlife to escape. Insects entrapped in the oil can also attract songbirds, bats, amphibians, and small mammals. The struggling birds or small mammals in turn attract hawks and owls to the oil-covered pit. The sticky nature of oil entraps birds in the reserve pits and they die from exposure and exhaustion. Birds that do manage to escape die from starvation, exposure or the toxic effects of oil ingested during preening. Birds ingesting sublethal doses of oil can experience impaired reproduction. Cold stress can kill the animal if oil damages the insulation provided by feathers or fur. Animals not killed in the reserve pits can suffer ill effects later from contact with the oil and chemicals in the pits. If they absorb or ingest oil in less than acutely lethal amounts they may suffer a variety of systemic effects and may become more susceptible to disease and predation. During the breeding season, birds can transfer oil from their feet and feathers to their eggs. In some cases, a few drops of oil on an egg shell can kill the embryo (King and LeFever 1979).

Service law enforcement agents and environmental contaminants specialists have documented bird mortality in reserve pits in Colorado, Montana, North Dakota, Utah, and Wyoming. The presence of small amounts of hydrocarbons, such as diesel, and condensate, can create sheens on the reserve pit fluid. The presence of visible sheens on reserve pit fluids is just as deadly to birds that come into contact with them (Figure 11). A light sheen will coat the bird's feathers with a thin film of oil. Although light oiling on a bird may not immediately immobilize the bird, it will compromise the feathers' ability to insulate the bird. Furthermore, the affected bird will ingest the oil when it preens its feathers and suffer acute or chronic effects.

Well stimulation chemicals, such as corrosion inhibitors and surfactants, disposed into reserve pits, pose additional risk to migratory birds. Surfactants reduce the surface tension of water; thus, allowing water to penetrate through feathers and onto skin. This compromises the insulation properties of the feathers and subjects the bird to hypothermia (Stephenson 1997). Furthermore, loss of water repellency in feathers due to reductions in surface tension will cause the bird to become water logged.



Figure 11. Reserve pit with visible sheen on surface. Sheens on the fluid surface can be lethal to birds landing on reserve pits. (USFWS Photo by P. Ramirez)

Loss of buoyancy will cause the bird to drown. Stephenson (1997) reports that water surface tension reduced to approximately 38 to 50 mNm^{-1} will cause feather wetting in adult waterfowl and could result in potential mortality. The unit mNm^{-1} is defined as microNewtons per meter, the force necessary to break a film of a given length. Pure water has a surface tension of approximately 72 mNm^{-1} . Storage of hydraulic fracturing (frac) fluids in reserve pits can present a risk to migratory birds if the frac fluids contain hydrocarbons or surfactants.

During the drilling process, human activity and noise discourage aquatic migratory birds such as waterfowl from accessing reserve pits. However, once the drilling rig and other equipment are removed from the well pad, the reserve pit is attractive to birds and other wildlife. The longer the reserve pit is left on site, the greater the probability that aquatic birds will land on the pit. If the reserve pit contains oil, condensates, or other hydrocarbons or surfactants, the risk of bird mortality is very high. Mortality events are episodic in reserve pits. Total bird carcasses recovered from individual reserve pits range from a few birds to large mortality incidents involving many birds. The largest mortality incident in Wyoming occurred at a reserve pit in Carbon County where Service personnel recovered 77 birds, primarily puddle ducks, between July 2008 and September 2008 (Figure 12 and 13). The pit remained at the well site for over a year and contained oil and sludges on the surface.

Bird carcasses recovered from reserve pits in Colorado, Montana, North Dakota, and Wyoming include passerine songbirds, raptors, shorebirds and waterfowl (Table 1 and Figure 14). Service personnel have observed songbirds landing at the edges of reserve pits and drinking water from pits.



Figure 12. Reserve pit in Carbon County, Wyoming, site of a large waterfowl mortality incident (77 bird carcasses recovered). (USFWS Photo by P. Ramirez)

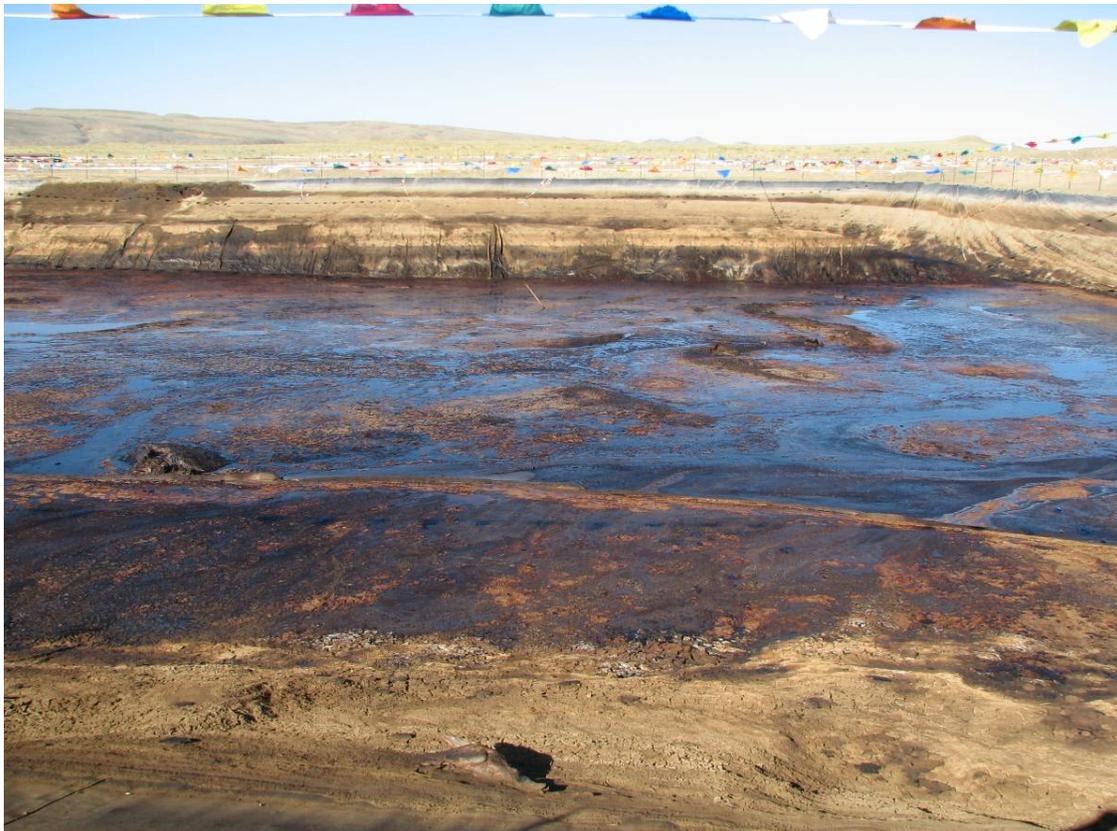


Figure 13. Duck carcass (lower center) in a reserve pit. (USFWS Photo by P. Ramirez)

Table 1. Bird species recovered from reserve pits in Colorado, Montana, North Dakota, and Wyoming.

Waterfowl		Passerine Birds	
Mallard	<i>Anas platyrhynchos</i>	Eastern Kingbird	<i>Tyrannus tyrannus</i>
Blue-winged Teal	<i>Anas discors</i>	Horned Lark	<i>Eremophila alpestris</i>
Green-winged Teal	<i>Anas crecca</i>	Barn Swallow	<i>Hirundo rustica</i>
Northern Shoveler	<i>Anas clypeata</i>	Gray Catbird	<i>Dumetella carolinensis</i>
Common Goldeneye	<i>Bucephala clangula</i>	Vesper Sparrow	<i>Pooecetes gramineus</i>
Gadwall	<i>Anas strepera</i>	Lark Sparrow	<i>Chondestes grammacus</i>
		Song Sparrow	<i>Melospiza melodia</i>
		Dark-eyed Junco	<i>Junco hyemalis</i>
		Red-winged Blackbird	<i>Agelaius phoeniceus</i>
		Brewer's Blackbird	<i>Euphagus cyanocephalus</i>
		Brown-headed Cowbird	<i>Molothrus ater</i>
		Common Grackle	<i>Quiscalus quiscula</i>
Other Aquatic Birds			
Grebe			
White-faced Ibis	<i>Eudocimus albus</i>		
Raptors			
Great Horned Owl	<i>Bubo virginianus</i>		
American Kestrel	<i>Falco sparverius</i>		



Figure 14. Songbird in a reserve pit in North Dakota. (USFWS Photo by P. Ramirez)

Prevention of Bird Mortality in Reserve Pits

Bird and other wildlife mortality in reserve pits is preventable. Several states regulations address or recommend the netting or screening of reserve pits containing oil to prevent access by birds and other wildlife (Figure 15). However, enforcement is inconsistent. Immediate removal of the drilling fluids after well completion is the key to preventing wildlife mortality in reserve pits. The best options are to eliminate the use of open reserve pits and use closed-loop drilling systems or downhole disposal of drill cuttings. Care is still required with closed-loop systems to prevent ponding of water in the solids disposal trenches.

Regulations on Netting or Screening of Pits or Open Tanks

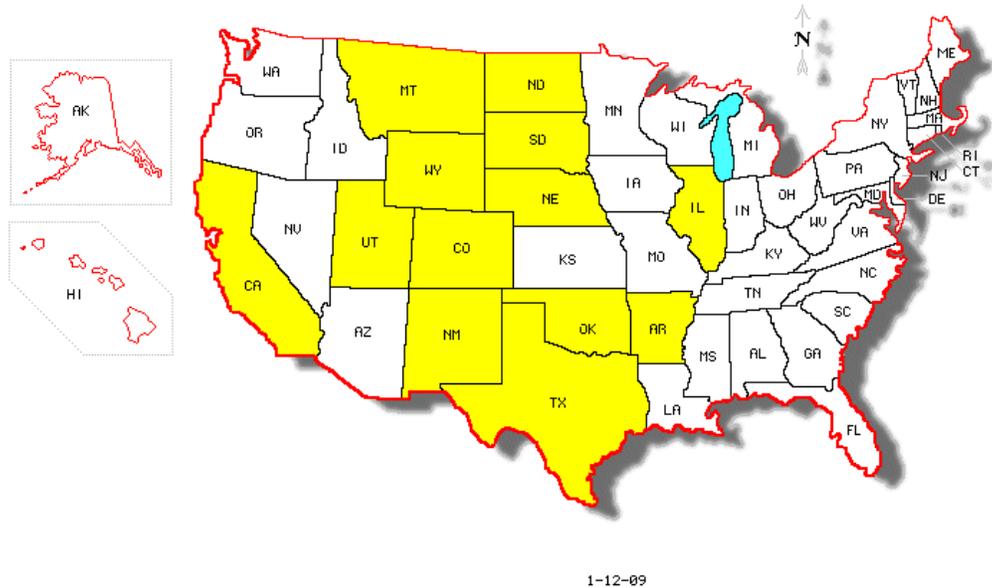


Figure 15. States with oil and gas regulations recommending or requiring netting or screening of pits or open tanks to prevent the mortality of migratory birds and other wildlife.

State and Federal Reserve Pit Regulations

The use of reserve pits for the storage of drilling fluids is regulated by state oil and gas regulatory agencies in private and state-owned mineral estates and by the U.S. Bureau of Land Management (BLM) in federal and tribally-owned mineral estates. Reserve pit construction requirements vary from state to state but generally, the regulations are designed to protect surface and groundwater from contamination.

The BLM requires operators to construct reserve pits at least 50 percent below ground level to prevent pit dike failure. The BLM also restricts the construction of reserve pits in areas with shallow groundwater and requires 2 feet of freeboard on reserve pits.

The BLM provides the following standard operating procedures and guidelines for reserve pits in their *Gold Book* (US DOI 2006).

Reserve pits should be appropriately fenced to prevent access by persons, wildlife, or livestock. During drilling in active livestock areas, the reserve pit must be fenced with an enclosure fence on three sides and then fenced on the fourth side once drilling has been completed. Refer to Figure 1 for recommended fence construction standards in active livestock areas. In areas where livestock will not be present, other types of fences may be appropriate. The fence should remain in place until pit reclamation begins. After cessation of drilling and completion operations, any visible or measurable layer of oil must be removed from the surface of the reserve pit and the pit kept free of oil. In some situations and locations, precautions, such as netting, may be required in order to prevent access and mortality of birds and other animals.

The BLM's **Onshore Oil and Gas Order No. 7 Disposal of Produced Water** also requires fencing and other enclosures to prevent access by livestock, wildlife, and unauthorized personnel:

***E. Design requirements for pits.** c. The pit shall be fenced or enclosed to prevent access by livestock, wildlife, and unauthorized personnel. If necessary, the pit shall be equipped to deter entry by birds. Fences shall not be constructed on the levees.*

After the well is completed, reserve pits are left in place after the drilling rig and other equipment are removed from the site. Operators typically have up to one year to allow the reserve pit fluids to dry and close the pit. Alabama, Kentucky, and Tennessee allow only 30 days for reserve pit closure while several states allow up to one year (Table 2 and Figure 16).

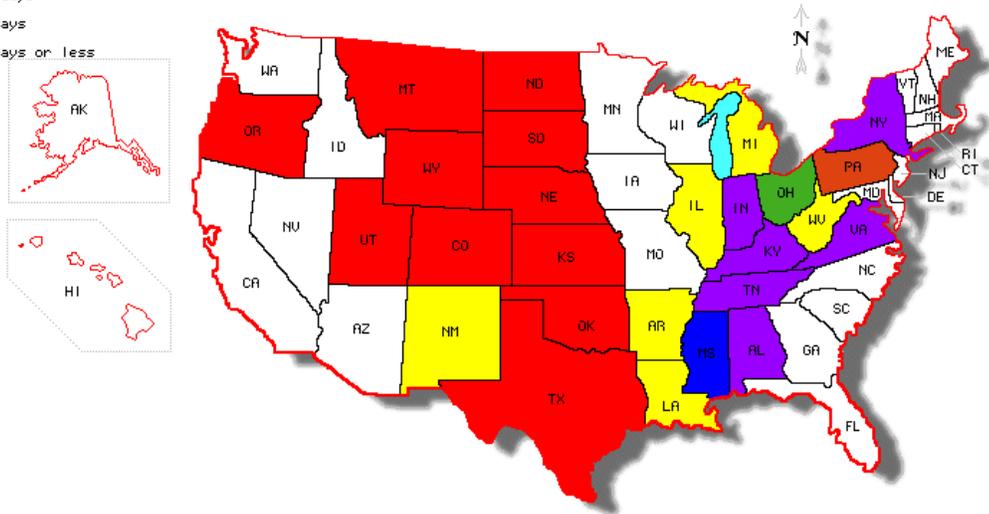
Table 2. States with specific time frames for reserve pit closure.

State	Pit Closure (in days)*	State	Pit Closure (in days)
Alabama	30	Pennsylvania	270
Kentucky	30	Kansas	365
Tennessee	30	Montana	365
New York	45	Nebraska	365
Mississippi	90	North Dakota	365
Ohio	150	Oregon	365
Arkansas	180	South Dakota	365
Illinois	180	Utah	365
Louisiana	180	Wyoming	365
Michigan	180	Texas	30 to 365
New Mexico	180	Colorado	90 to 180
West Virginia	180	Oklahoma	90 to 365

* Indiana and Virginia require immediate closure of reserve pits after well completion.

Reserve Pit Closure in Days

- - 365 days
- - 270 days
- - 180 days
- - 150 days
- - 90 days
- - 45 days or less



1-12-09

Figure 16. Maximum number of days allowed for the closure of reserve pits following well completion.

Oil operators in Alaska do not use open earthen pits for the disposal and or temporary storage of drilling fluids. The drill cuttings are injected underground. California does not specify a time limit for reserve pit closure; however, the performance bond is not released until the site is reclaimed (including reserve pit closure) (Rob Hauser, California Division

of Oil, Gas and Geothermal Resources, pers. com., January 12, 2009). The performance bond release serves as an incentive to close the reserve pit and restore the site as soon as possible. The Maryland Department of the Environment does not specify a time limit for the closure of reserve pits; however, their policy recommends pit closure within 30 days of well completion (Mollie Edsall, Senior Geologist, Maryland Department of the Environment, pers. com., January 14, 2009).

Acknowledgements: Thanks are extended to Roy Brown, Tim Eicher, Kevin Ellis, Richard Grosz, and Ron Armstrong of the U.S. Fish and Wildlife Service for providing data on bird mortality in reserve pits. Thanks are also extended to Pat O'Dell, Petroleum Engineer, U.S. National Park Service, Scott Covington, Scott Hicks, John Isanhart and Kevin Johnson, U.S. Fish and Wildlife Service for reviewing this manuscript.

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Appendix A

State Rules and Regulations Pertaining To Reserve Pits

Alaska

20 AAC 25.047. Reserve pits and tankage

(a) Before a person commences drilling a well, a reserve pit must be constructed or tankage installed for the reception and confinement of drilling fluids and cuttings, to facilitate the safety of the drilling operation, and to prevent contamination of freshwater and damage to the surface environment. The confining surface of a reserve pit must be impervious. If practical, confinement diking in construction of a reserve pit must be avoided. If confinement dikes are necessary, they must be kept to a minimum. Dikes must be constructed and maintained to ensure their confinement integrity.

(b) Upon completion, suspension, or abandonment of the well, the operator shall proceed with diligence to leave the reserve pit in a condition that does not constitute a hazard to freshwater.

20 AAC 25.528. Open pit storage of oil

An operator may not, except during an emergency, store or retain crude oil in an open earthen confinement or in an open receptacle.

<http://www.aogcc.alaska.gov/Regulations/RegIndex.shtml>

Arkansas

RULE B-26 (j) (4) (E) - If the Director determines, based on a review of the information submitted by the operator and surface owner, the pit is not exempted, the pit shall be closed, within six (6) months.

RULE B-26 (c) (8) -All open top tanks shall be covered with bird netting, or other system designed to keep birds and flying mammals from landing in the tank.

<http://www.aogc.state.ar.us/OnlineData/Forms/Rules%20and%20Regulations.pdf>

Arizona

R12-7-108. Pit for Drilling Mud and Drill Cuttings - D. Any mud contained in an earthen pit shall be water-based and contain no more than one pound per barrel of thinner for each 25 pounds per barrel of barite or hematite. Mud containing chromium lignosulfonate, ferrochrome lignosulfonate or other chromium compounds shall not be used.

E. Drilling mud shall be disposed of by either recycling or commercial off-site disposal. Mud described in subsection (D) may be disposed of by evaporation and subsequent leveling of the pits.

http://www.azsos.gov/public_services/Title_12/12-07.pdf

California

1770. Oilfield Sumps. – (b) (3) - (3) Any sump, except an operations sump, which contains oil or a mixture of oil and water shall be covered with screening to restrain entry of wildlife in accordance with Section 1778(d).

1775. Oilfield Wastes and Refuse. – (b) Drilling mud shall not be permanently disposed of into open pits. Cement slurry or dry cement shall not be disposed of on the surface.

3781. The Legislature hereby finds and declares that it is essential in order to protect the wildlife resources of California that all hazardous exposed oil sumps in this state be either screened or eliminated.

3783. Whenever the supervisor receives notification from the Department of Fish and Game pursuant to subdivision (a) of Section 1016 of the Fish and Game Code that an oil sump is hazardous to wildlife, he shall forthwith give written notice of such hazardous condition to the owner, lessee, operator, or person responsible for the existence of the condition and set forth the hazardous conditions as specified by the Department of Fish and Game. The owner, lessee, operator, or person responsible shall, within 30 days from the date of such notification, or such longer period as may be mutually agreed upon by the supervisor, the Department of Fish and Game, and the owner, lessee, operator, or person responsible, clean up or abate the condition to the satisfaction of the supervisor and the Department of Fish and Game. If the owner, lessee, operator, or person responsible does not clean up or abate the condition to the satisfaction of the supervisor and the Department of Fish and Game within the required period of time, the supervisor shall forthwith order the closure of the oil and gas production operation maintaining the oil sump.

3782. The supervisor shall promulgate rules and regulations for the adequate screening of oil sumps to protect wildlife and shall order the closure of any oil and gas production operation maintaining an exposed or inadequately screened oil sump in violation of such rules and regulations.

http://www.conservation.ca.gov/dog/pubs_stats/Pages/law_regulations.aspx

Colorado

902. PITS - GENERAL AND SPECIAL RULES

c. Any accumulation of oil or condensate in a pit shall be removed within twenty-four (24) hours of discovery. Only de minimis amounts of hydrocarbons may be present unless the pit is specifically permitted for oil or condensate recovery or disposal use. A Form 15 pit permit may be revoked by the Director and the Director may require that the pit be closed if an operator repeatedly allows more than de minimis amounts of oil or condensate to accumulate in a pit. This requirement is not applicable to properly permitted and properly fenced, lined, and netted skim pits that are designed, constructed, and operated to prevent impacts to wildlife, including migratory birds.

d. Where necessary to protect public health, safety and welfare or to prevent significant adverse environmental impacts resulting from access to a pit by wildlife, migratory birds, domestic animals, or members of the general public, operators shall install appropriate netting or fencing.

1003. INTERIM RECLAMATION

d. Drilling pit closure. As part of interim reclamation, drilling pits shall be closed in the following manner:

(1) Drilling pit closure on crop land and within 100-year floodplain. On crop land or within the 100-year floodplain, water-based bentonitic drilling fluids, except de minimis amounts, shall be removed from the drilling pit and disposed of in accordance with the 900 Series rules. Operators shall ensure that soils meet the concentration levels of Table 910-1, above. Drilling pit reclamation, including the disposal of drilling fluids and cuttings, shall be performed in a manner so as to not result in the formation of an impermeable barrier. Any cuttings removed from the pit for drying shall be returned to the pit prior to backfilling, and no more than de minimis amounts may be incorporated into the surface materials. After the drilling pit is sufficiently dry, the pit shall be backfilled. The backfilling of the drilling pit shall be done to return the soils to their original relative positions. Closing and reclamation of drilling pits shall occur no later than three (3) months after drilling and completion activities conclude.

(2) Drilling pit closure on non-crop land. All drilling fluids shall be disposed of in accordance with the 900 Series rules. Operators shall ensure that soils meet the concentration levels of Table 910-1, above. After the drilling pit is sufficiently dry, the pit shall be backfilled. Materials removed from the pit for drying shall be returned to the pit prior to the backfilling. No more than de minimis amounts may be incorporated into the surface materials. The backfilling of the drilling pit will be done to return the soils to their original relative positions so that the muds and associated solids will be confined to the pit and not squeezed out and incorporated in the surface materials. Closure and reclamation of drilling pits shall occur no later than six (6) months after drilling and completion activities conclude, weather permitting.

<http://cogcc.state.co.us/>

Florida

62C 27.001 General. (4) Mud Tanks, Reserve Pits, and Dikes. Before spudding the well, mud tanks of sufficient size to hold the active mud volume at the surface shall be installed for containment of all active drilling fluids. Earthen mud pits shall not be used for this purpose.

<http://www.dep.state.fl.us/geology/rules/oilandgasrules.htm>

Illinois

Section 240.540 Drilling and Completion Pit Restoration

a) Sediment, drilling fluid circulation and reserve pits, except sediment pits used as completion pits, shall be filled and leveled within 6 months after drilling ceases. Drilling fluid wastes may be disposed of by on-site burial or surface application in accordance with subsection (b) of this Section at the site of drilling. Saltwater or Oil Drilling Fluid wastes shall be removed from the site and disposed of in an Illinois Environmental Protection Agency permitted special waste landfill, injected in a Class II well, disposed of in a well during the plugging process or buried in one of the lined pits and the liner folded over and additional liner material added to completely cover the drilling waste buried at least 5 feet below the ground surface.

Section 240.810 Tanks, Tank Batteries and Containment Dikes

(b) (4) All open top tanks shall be covered with bird netting, or other system designed to keep birds and flying mammals from landing in the tank.

Section 240.861 Existing Pit Exemption For Continued Production Use

(g) (4) All pits shall be covered with bird netting or other systems designed to keep birds and flying mammals from landing in the pit.

<http://dnr.state.il.us/legal/adopted/62-240.pdf>

Indiana

312 IAC 16-5-12 Mud pits, Authority: IC 14-37-3, Affected: IC 14-37

Sec. 12. (a) An owner or operator shall construct and maintain necessary mud circulation and reserve pits.

(b) Upon completion of a well, pits shall be filled and leveled. The surface shall be restored as nearly as practicable to conditions existing before drilling commenced.

(Natural Resources Commission; 312 IAC 16-5-12; filed Feb 23, 1998, 11:30 a.m.: 21 IR 2342; readopted filed Nov 17, 2004, 11:00 a.m.: 28 IR 1315)

<http://www.in.gov/legislative/ic/code/title14/ar37/index.html>

Kansas

82-3-602. TIME LIMITATION; PENALTY; CLOSURE OF PITS; CLOSURE FORMS; DRILLING FLUID MANAGEMENT; WASTE TRANSFER; SURFACE RESTORATION.

(a) (1) The time limitation for the closure of each pit, unless otherwise specified in writing by the commission, shall be according to the following schedule:

(A) Drilling pits or haul-off pits shall be closed within a maximum of 365 calendar days after the spud date of a well.

(B) Work-over pits shall be closed within a maximum of 365 days after work-over operations have ceased.

<http://www.kcc.state.ks.us/conservation/index.htm>

Kentucky

401 KAR 5:090 Section 10 - Drilling Pits

Drilling pits shall be constructed to have the capability and the capacity to contain drilling fluids so that contamination of the waters of the Commonwealth do not occur. Spills or releases having the potential of degrading the environment or impacting human health and safety must be reported to the Environmental Response Team at (502) 564-2380 or 1-800-928-2380. For drilling and workover activities, the following need to be addressed:

- A pit must be constructed which will contain all the cuttings and fluids anticipated for the area and depth to be drilled. Adequate freeboard (distance of fluid level in pit to upper rim) should be maintained and checked regularly during drilling. If necessary, a secondary pit should be constructed in such a manner as to contain or prevent overflow.

- Containment structures should be placed to contain all spilled fuel, crude oil and drilling fluids.
- Consideration given to the type of material used in the construction of the pit to prevent groundwater contamination and leakage.

Within thirty (30) days following completion of drilling activities, the pits shall be closed. Waste shall be removed from the pit and disposed of in accordance with Kentucky laws and regulations. All visible contamination must be removed from the pit during closure. The appropriate waste disposal method is dependent upon the waste's components (make-up). The pit area shall be backfilled, graded and revegetated. The vegetative cover shall be capable of preventing soil erosion. Pits in place longer than thirty (30) days shall be considered as "Holding Pits" and shall meet their requirements (See Holding Pits). However, the Director of the Division of Water may, with good cause, extend the pit's life up to a maximum of ninety (90) days. A written request seeking that extension should be submitted before the day of completion

401 KAR Chapter 30, 401 KAR 31:030, 401 KAR 47:030 and 401 KAR 47:150 - Disposal of Completion Fluids

Completion fluids fall under the definition of solid non-hazardous waste. Temporary storage of these fluids is regulated as a solid waste permit-by-rule. Permit-by-rule sites do not need to submit any paperwork to the Division, but do need to comply with the environmental performance standards. Disposal of such waste is not covered by a permit-by-rule, and the applicable regulations depend on the disposal method to be employed. In order to dispose of the waste at the site by applying it to the land, a permit shall be obtained. The waste can be hauled off-site and disposed of in a permitted solid waste landfill, as long as it is allowed under the permit for that landfill.

<http://www.lrc.ky.gov/kar/401/005/090.htm>

Louisiana

§307. Pit Classification, Standards, and Operational

B. Reserve pits 4. Pits shall be emptied of fluids in a manner compatible with all applicable regulations, and closed in accordance with §311 and §313 within six months of completion of drilling or work over operations.

<http://dnr.louisiana.gov/title43/43v19.pdf>

Michigan

R 324.407 Drilling mud pits. Rule 407. The drilling mud pit shall be carefully encapsulated and buried as soon as practical after drilling completion, but not more than 6 months after drilling completion.

<http://www.deq.state.mi.us/documents/deq-ogs-land-fuelsmineral-oilandgas-regs.pdf>

Montana

36.22.1005 DRILLING WASTE DISPOSAL AND SURFACE RESTORATION

(1) The operator of a drilling well must contain and dispose of all solid waste and produced fluids that accumulate during drilling operations so as not to degrade surface water, groundwater, or cause harm to soils. Said waste and fluids must be disposed of in accordance with all applicable local, state and federal laws and regulations.

(2) When a salt-based or oil-based drilling fluid is used to drill a well located within a floodplain, as defined by ARM 36.15.101, or in irrigated cropland, drilling waste and produced fluids that accumulate during drilling operations must be disposed of off-site in a manner allowed by local, state, and federal laws and regulations unless an alternative on-site disposal method is approved in writing by the board administrator.

(3) The operator of a drilling well must construct, close, and restore any reserve pits in a manner that will prevent harm to the soil and will not degrade surface waters or groundwater. When a salt-based or oil-based drilling fluid is used, the reserve pit must be lined with a synthetic liner approved by the board administrator.

(4) **Within 10 days after the cessation of drilling or completion operations, all hydrocarbons must be removed from earthen pits used in association with drilling or completion operations or such pits must be fenced, screened, and netted.** Such pits that contain water with more than 15,000 parts per million total dissolved solids or salt-based drilling fluids must be fenced within 90 days after the cessation of drilling and completion operations.

(5) Earthen pits used in association with drilling and completion operations must not be used for the disposal of any additional fluids or materials after the cessation of drilling and completion operations.

(6) All earthen pits used in association with drilling and completion operations must be closed and the surface restored according to board specifications **within one year after the cessation of drilling operations.** Upon written application by the operator, an exception to the one-year pit closure requirement may be granted in writing by the board administrator upon a showing that:

- (a) no dumping or disposal of waste or fluids in the pit will occur; and
- (b) delayed closure of the pit will not present a risk of contamination to soils or water or a hazard to animals or persons.

http://data.opi.mt.gov/bills/mca_toc/82.htm

Nebraska

012.14 All pits shall be backfilled within one year after completion of drilling operations.

022.12A All pits or ponds used to retain produced water shall:

- Be constructed in cut material or at least fifty (50) percent below original ground level.
- Be lined with a material compatible with the waste contained.

- Not be located in a natural drainage and shall be constructed above the seasonal high water table.
- Be bermed or diked and shall have at least two (2) feet of freeboard between the normal operating level of the water in the pit and the top of the banks, dikes or berms.
- Be fenced, screened, or netted to prevent access by livestock, wildlife and migratory birds if free oil is likely to be discharged to the pits.

<http://www.nogcc.ne.gov/NOGCCrulesstatutesindex.htm>

Nevada

NAC 522.350 Open reservoirs. Oil or the waste from an oil field may not be stored or retained in unlined pits in the ground or open receptacles without the approval of the division. [Div. of Mineral Res., § 407, eff. 12-20-79]—(NAC A by Dep’t of Minerals, 7-22-87)

NAC 522.255 Collecting pits. 1. No operator who conducts oil or gas development and production may use unlined collecting pits for storage and evaporation of brines from the oil field. The division may approve the use of impervious collecting pits in conjunction with approved operations for disposal of salt water. 2. The provisions of subsection 1 do not apply to burning pits which are used exclusively for the burning of the accumulated waste from the bottom of a tank. [Div. of Mineral Res., § 200 subsec. 3, eff. 12-20-79]—(NAC A by Dep’t of Minerals, 7-22-87)

<http://www.leg.state.nv.us/NAC/NAC-522.html>

New Mexico

19.15.17.11 DESIGN AND CONSTRUCTION SPECIFICATIONS:

E. Netting. The operator shall ensure that a permanent pit or a permanent open top tank is screened, netted or otherwise rendered non-hazardous to wildlife, including migratory birds. Where netting or screening is not feasible, the operator shall on a monthly basis inspect for, and within 30 days of discovery, report discovery of dead migratory birds or other wildlife to the appropriate wildlife agency and to the appropriate division district office in order to facilitate assessment and implementation of measures to prevent incidents from reoccurring.

19.15.17.12 OPERATIONAL REQUIREMENTS

(4) The operator shall remove all free liquids from a temporary pit within 30 days from the date that the operator releases the drilling or workover rig.

19.15.2.50 PITS AND BELOW-GRADE TANKS

C. Design, construction, and operational standards.

(1) In general. Pits, sumps and below-grade tanks shall be designed, constructed and operated so as to contain liquids and solids to prevent contamination of fresh water and protect public health and the environment.

(2) Special requirements for pits.

(e) Disposal or storage pits. No measurable or visible layer of oil may be allowed to accumulate or remain anywhere on the surface of any pit. Spray evaporation systems

shall be operated such that all spray-borne suspended or dissolved solids remain within the perimeter of the pond's lined portion.

(f) Fencing and netting. All pits shall be fenced or enclosed to prevent access by livestock, and fences shall be maintained in good repair. Active drilling or workover pits may have a portion of the pit unfenced to facilitate operations. In issuing a permit, the division may impose additional fencing requirements for protection of wildlife in particular areas. All tanks exceeding 16 feet in diameter, exposed pits, and ponds shall be screened, netted, covered, or otherwise rendered non-hazardous to migratory birds. Drilling and workover pits are exempt from the netting requirement. Immediately after cessation of these operations such pits shall have any visible or measurable layer of oil removed from the surface. Upon written application, the division may grant an exception to screening, netting, or covering requirements upon a showing that an alternative method will adequately protect migratory birds or that the tank or pit is not hazardous to migratory birds.

F. Closure and restoration.

(1) Closure. Except as otherwise specified in Section 50 of 19.15.2 NMAC, a pit or below-grade tank shall be properly closed within six months after cessation of use. As

http://www.emnrd.state.nm.us/OCD/documents/RULEBOOK060328_002.pdf

New York

Part 554: Drilling Practices and Reports (Statutory authority: Environmental Conservation Law, §§ 23-0301, 23-0305[8])

§554.1 Prevention of pollution and migration

(c)(3) Storage of brine, salt water or other polluting fluids in such watertight tanks or earthen pits, prior to disposal, shall be for a maximum of 45 days after cessation of drilling operations, unless the department approves an extension based on circumstances beyond the operator's control.

§556.4 Safety

(a) Oil shall not be produced, stored or retained in earthen reservoirs.

<http://www.dec.ny.gov/energy/1630.html>

North Dakota

43-02-03-19. RESERVE PIT FOR DRILLING MUD AND DRILL CUTTINGS - RECLAMATION OF SURFACE. A reserve pit may be utilized to contain solids and fluids used and generated during well drilling and completion operations, providing the pit can be constructed, used and reclaimed in a manner that will prevent pollution of the land surface and freshwaters. In special circumstances, the director may prohibit construction of a reserve pit or may impose more stringent pit reclamation requirements. Under no circumstances shall reserve pits be used for disposal, dumping, or storage of fluids, wastes, and debris other than drill cuttings and fluids used or recovered while drilling and completing the well. Reserve pits shall not be located in, or hazardously near, bodies of water, nor shall they block natural drainages.

When required by the director, the reserve pit or site or appropriate parts thereof must be fenced.

1. Within a reasonable time, but not more than one year, after the completion of a well, the reserve pit shall be reclaimed. All pit water and oil on the pit must be removed prior to reclamation. Drilling waste should be encapsulated in the pit and covered with at least four feet [1.22 meters] of backfill and topsoil and surface sloped, when practicable, to promote surface drainage away from the reclaimed pit area.

43-02-03-19.1. FENCING, SCREENING, AND NETTING OF PITS. All open pits and ponds which contain saltwater must be fenced. All pits and ponds which contain oil must be fenced, screened, and netted. This is not to be construed as requiring the fencing, screening, or netting of a reserve pit or other earthen pit used solely for drilling, completing, recompleting, or plugging unless such pit is not reclaimed in excess of ninety days after completion of the operation.

History: Effective May 1, 1992.

<https://www.dmr.nd.gov/oilgas/rules/rulebook.pdf>

Ohio

[1509.07.2] 1509.072. Well owner's duty to restore disturbed land surface; waiver; extension.

No oil or gas well owner or agent of an oil or gas well owner shall fail to restore the land surface within the area disturbed in siting, drilling, completing, and producing the well as required in this section.

(A) Within five months after the date upon which the surface drilling of a well is commenced, the owner or the owner's agent, in accordance with the restoration plan filed under division (A)(10) of section 1509.06 of the Revised Code, shall fill all the pits for containing brine, other waste substances resulting, obtained, or produced in connection with exploration or drilling for, or production of, oil or gas, or oil that are not required by other state or federal law or regulation, and remove all concrete bases, drilling supplies, and drilling equipment.

<http://www.dnr.state.oh.us/Portals/11/publications/pdf/oil%20and%20gas%20laws%20and%20rules.pdf>

Oklahoma

165:10-7-16, Use of non-commercial pits

(B) The protection of migratory birds shall be the responsibility of the operator. Therefore, the Conservation Division recommends that to prevent the loss of birds, oil be removed or the surface area covered by the oil be protected from access to birds [See Advisory Notice 165: 10- 7-3(c)] .

(A) Any Category 1A, 1B, or 2 reserve/circulation pit, either on-site or off-site, shall be closed within twelve months after drilling operations cease.

(B) Any Category 3 (oil-based) reserve/circulation pit, either on-site or off-site, shall be closed within 6 months after drilling operations cease.

(C) Any Category 4 pit shall have closure procedures commenced within 30 days and completed within 90 days after drilling operations cease.

<http://www.occ.state.ok.us/Divisions/GC/OCCRULES/permrules/Ch%2010%20Oil%20and%20Gas%20Conservation%20Rules%20eff%20July%2011%202008.pdf>

Oregon

632-010-0140 - Reserve Pits or Sumps

Materials and fluids or any fluid necessary to the drilling, production, or other operations by the permittee shall be discharged or placed in pits and sumps approved by the department and the State Department of Environmental Quality. The operator shall provide pits, sumps, or tanks of adequate capacity and design to retain all materials. In no event shall the contents of a pit or sump be allowed to:

- (1) Contaminate streams, artificial canals or waterways, groundwaters, lakes, or rivers.
- (2) Adversely affect the environment, including but not limited to, persons, plants, fish, and wildlife and their populations.
- (3) When no longer needed and within one year of completion, suspension of abandonment, fluid in pits and sumps shall be disposed of in a manner approved by the Department of Environmental Quality and the sumps filled and covered and the premises reclaimed. The restoration need not be done if arrangements are made with the surface owner to leave the site suitable for beneficial subsequent use. The permittee shall notify the department to inspect the site reclamation

Stat. Auth.: ORS 520

Stats. Implemented: ORS 520.095

http://arcweb.sos.state.or.us/rules/OARS_600/OAR_632/632_010.html

Pennsylvania

§ 78.56. Pits and tanks for temporary containment.

(a) Except as provided in § 78.60(b) and 78.61(b) (relating to discharge requirements; and disposal of drill cuttings), the operator shall contain polluttional substances and wastes from the drilling, altering, completing, recompleting, servicing and plugging the well, including brines, drill cuttings, drilling muds, oils, stimulation fluids, well treatment and servicing fluids, plugging and drilling fluids other than gases in a pit, tank or series of pits and tanks.

(d) Unless a permit under The Clean Streams Law (35 P. S. § § 691.1—691.1001) or approval under § 78.57 or § 78.58 (relating to control, storage and disposal of production fluids; and existing pits used for the control, storage and disposal of production fluids) has been obtained for the pit, the owner or operator shall remove or fill the pit within 9 months after completion of drilling, or in accordance with the extension granted by the Department under section 206(g) of the act (58 P. S. § 601.206(g)). Pits used during servicing, plugging and recompleting the well shall be removed or filled within 90 days of construction.

<http://www.dep.state.pa.us/dep/deputate/minres/oilgas/laws®ulations.htm>

South Dakota

74:10:03:13. Pit construction and reclamation. All pits used for storage of exploration and production wastes must be constructed, maintained, and reclaimed so as to prevent contamination of soil and all waters of the state. Under no circumstances may these pits be used for disposal, dumping, or storage of solid or hazardous wastes, and other debris not commonly used in these operations.

(2) Pit reclamation procedures:

(a) Within one year of site abandonment the pit must be reclaimed in a manner approved by the secretary that will prevent ground water or surface water contamination. If conditions that prevent reclamation within one year exist, a six-month extension may be granted by the secretary.

74:10:05:15.01. Pits to be constructed and operated to protect certain birds and other species. Any permanent or semipermanent pit used for the production of oil or gas must be constructed and operated to protect migratory birds and state and federal threatened, endangered, or protected species.

74:10:05:11. Oil storage in open receptacles prohibited -- Fire walls required on oil tanks. Oil may not be stored or retained in earthen reservoirs or in open receptacles.

<http://legis.state.sd.us/rules/DisplayRule.aspx?Rule=74:10>

Tennessee

1040-2-6-.04 ENVIRONMENTAL PROTECTION All oil and gas operations shall be conducted in a manner that will prevent or mitigate adverse environmental impacts such as soil erosion and water pollution. All areas disturbed by the operations, including access roads, shall be reclaimed as prescribed in rule 1040-2-9-.05.

1040-2-9-.05 SURFACE RECLAMATION.

(1) Abandonment of well sites, oil or gas pipeline right-of-way, storage facility sites, and access roads.

(a) Except for active work areas, the operator shall drain and fill all surface pits that are not needed for production purposes, and shall grade and stabilize the well location and location road within thirty (30) days of the initial disturbance, in order to minimize surface run-off and prevent excessive erosion and sedimentation. All drilling supplies and equipment, trash, discarded materials and other refuse not contained and covered in the reclaimed pits shall be removed from the site. Temporary vegetative cover shall then be established on all graded areas.

(b) Within thirty (30) days of the plugging and abandonment of any well, the operator shall remove all production and storage structure, supplies and equipment, any oil, salt water and debris, fill any remaining excavations, and grade any remaining disturbed areas, including access roads.

<http://www.state.tn.us/sos/rules/1040/1040-02/1040-02.htm>

Texas

RULE §3.22 Protection of Birds

(b) An operator must screen, net, cover, or otherwise render harmless to birds the following categories of open-top tanks and pits associated with the exploration, development, and production of oil and gas, including transportation of oil and gas by pipeline:

(1) open-top storage tanks that are eight feet or greater in diameter and contain a continuous or frequent surface film or accumulation of oil; however, temporary, portable storage tanks that are used to hold fluids during drilling operations, workovers, or well tests are exempt;

(2) skimming pits as defined in §3.8 of this title (relating to Water Protection) (Statewide Rule 8); and

(3) collecting pits as defined in §3.8 of this title (relating to Water Protection) that are used as skimming pits.

(c) If the commission finds a surface film or accumulation of oil in any other pit regulated under §3.8 of this title (relating to Water Protection), the commission will instruct the operator to remove the oil. If the operator fails to remove the oil from the pit in accordance with the commission's instructions or if the commission finds a surface film or accumulation of oil in the pit again within a 12-month period, the commission will require the operator to screen, net, cover, or otherwise render the pit harmless to birds.

RULE §3.8 Water Protection - (iii) The director may require that a person who uses or maintains a reserve pit, mud circulation pit, fresh makeup water pit, fresh mining water pit, completion/workover pit, basic sediment pit, flare pit, or water condensate pit backfill the pit sooner than the time prescribed by clause (i) of this subparagraph if the director determines that oil and gas wastes or oil field fluids are likely to escape from the pit or that the pit is being used for improper storage or disposal of oil and gas wastes or oil field fluids.

(iv) Prior to backfilling any reserve pit, mud circulation pit, completion/workover pit, basic sediment pit, flare pit, or water condensate pit whose use or maintenance is authorized by this paragraph, the person maintaining or using the pit shall, in a permitted manner or in a manner authorized by paragraph (3) of this subsection, dispose of all oil and gas wastes which are in the pit.

(G) Backfill requirements.

(i) A person who maintains or uses a reserve pit, mud circulation pit, fresh makeup water pit, fresh mining water pit, completion/workover pit, basic sediment pit, flare pit, or water condensate pit shall dewater, backfill, and compact the pit according to the following schedule.

(I) Reserve pits and mud circulation pits which contain fluids with a chloride concentration of 6,100 mg/liter or less and fresh makeup water pits shall be dewatered, backfilled, and compacted within one year of cessation of drilling operations.

(II) Reserve pits and mud circulation pits which contain fluids with a chloride concentration in excess of 6,100 mg/liter shall be dewatered within 30 days and backfilled and compacted within one year of cessation of drilling operations.

(III) All completion/workover pits used when completing a well shall be dewatered within 30 days and backfilled and compacted within 120 days of well completion. All completion/workover pits used when working over a well shall be dewatered within 30

days and backfilled and compacted within 120 days of completion of workover operations.

<http://www.rrc.state.tx.us/rules/rule.php>

Virginia

4 VAC 25-150-300. Pits.

A. General requirements.

1. Pits are to be temporary in nature and are to be reclaimed when the operations using the pit are complete.

2. Pits may not be used as erosion and sediment control structures or stormwater management structures, and surface drainage may not be directed into a pit.

3. Pits shall have a properly installed and maintained liner or liners made of 10mil or thicker high-density polyethylene or its equivalent.

C. 3. At the conclusion of drilling and completion operations or after a dry hole, well or corehole has been plugged, the pit shall be drained in a controlled manner and the fluids disposed of in accordance with 4 VAC 25-150-420. If the pit is to be used for disposal of solids, then the standards of 4 VAC 25-150-430 shall be met.

4 VAC 25-150-420. Disposal of pit and produced fluids.

A. Applicability. All fluids from a well, pipeline or corehole shall be handled in a properly constructed pit, tank or other type of container approved by the director. A permittee shall not dispose of fluids from a well, pipeline or corehole until the director has approved the permittee's plan for permanent disposal of the fluids. Temporary storage of pit or produced fluids is allowed with the approval of the director. Other fluids shall be disposed of in accordance with the operations plan approved by the director.

B. Application and plan. The permittee shall submit an application for either on-site or off-site permanent disposal of fluids on a form prescribed by the director. Maps and a narrative describing the method to be used for permanent disposal of fluids must accompany the application if the permittee proposes to land apply any fluids on the permitted site. The application, maps, and narrative shall become part of the permittee's operations plan.

C. Removal of free fluids. Fluids shall be removed from the pit to the extent practical so as to leave no free fluids. In the event that there are no free fluids for removal, the permittee shall report this on the form provided by the director.

<http://leg1.state.va.us/000/reg/TOC04025.HTM#C0150>

Utah

R649-1-1. Definitions. “Disposal Pit” means a lined or unlined pit approved for the disposal and/or storage of E and P Wastes.

R649-3-15. Pollution and Surface Damage Control.

1. The operator shall take all reasonable precautions to avoid polluting lands, streams, reservoirs, natural drainage ways, and underground water.
- 1.2. At a minimum, the owner or operator shall:
 - 1.2.1. Take reasonable steps to prevent and shall remove accumulations of oil or other materials deemed to be fire hazards from the vicinity of well locations, lease tanks and pits.
 - 1.2.4.1. The use of crude or produced water storage tanks without tops is strictly prohibited except during well testing operations.
 - 1.2.5. Catch leaks and drips, contain spills, and cleanup promptly.
 - 1.2.6. Waste reduction and recycling should be practiced in order to help reduce disposal volumes.
 - 1.2.7. Produced water, tank bottoms and other miscellaneous waste should be disposed of in a manner that is in compliance with these rules and other state, federal, or local regulations or ordinances.

R649-3-16. Reserve Pits and Other On-site Pits.

1. Small onsite oil field pits including, but not limited to, reserve pits, emergency pits, workover and completion pits, storage pits, pipeline drip pits, and sumps shall be located and constructed in such a manner as to contain fluids and not cause pollution of waters and soils. They shall be located and constructed according to the Division guidelines for onsite pits.
3. Following drilling and completion of the well the reserve pit shall be closed within one year, unless permission is granted by the Division for a longer period.

R649-9-3. Permitting of Disposal Pits.

- 2.3.6. The pit shall be fenced and maintained to prevent access by livestock, wildlife and unauthorized personnel and if required, equipped with flagging or netting to deter entry by birds and waterfowl.

<http://oilgas.ogm.utah.gov/Rules/Rules.htm>

West Virginia

'35-4-16. Reclamation.

16.4.h. All drilling pits and alternative overflow prevention facilities shall be constructed, maintained, and reclaimed so as not to be left in such condition as to constitute a hazard or to prevent use of the surface for agricultural purposes after the expiration of the six (6) month or extended period for reclamation prescribed by W. Va. Code '22-6-30.

<http://www.wvsos.com/csr/verify.asp?TitleSeries=35-04>

Wyoming

Chapter 4, Section 1. Pollution and Surface Damage

(bb) Reserve pits shall be completely fenced and, if oil or other harmful substances are present, netted or otherwise secured at the time the rig substructure has been moved from the location in a manner that avoids the loss of wildlife, domestic animals, or migratory birds. Because of the same concerns, produced water pits must be fenced and, if oil or other harmful substances are present, netted or secured in such a manner as to provide protection to wildlife, domestic animals, or migratory birds. The Commission recommends netting as the preferred means of securing pits.

(dd) All retaining pits shall be kept reasonably free of surface accumulations of oil and other liquid hydrocarbon substances and shall be cleaned within ten (10) days after discovery of the accumulation by the owner or notice from the Supervisor.

(ll) The Commission specifically prohibits the use of dispersants, wetting agents, surface reduction agents, surfactants, or other chemicals that destroy, remove, or reduce the fluid seal of a reserve pit and allow the fluids contained therein to seep, drain, or percolate into the soil underlying the pit.

(qq) **Reclamation.** Reclamation of unused production pits or any other temporary retaining pits, including reserve pits, shall be completed in as timely a manner as climatic conditions allow. Production pit areas and reserve pits will be reclaimed no later than one (1) year after the date of last use unless the Supervisor grants an administrative variance for just cause.

<http://soswy.state.wy.us/RULES/rules/6855.pdf>