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LEASING YOUR OIL AND GAS RIGHTS

The Potential Impacts of Well Drilling and Operation On Your Land

By

Fred N. Swader

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PREFACE

The thought of a producing oil or gas well on "my property" is often the stimulus for imaginations of gushers, expensive cars, magnificent homes and financial independence. Not many wells produce these kinds of oil, gas, or incomes. The process of drilling, developing, and operating gas or oil wells can be destructive to your land resources.

There is no guarantee that the well(s) on your land will be profitable. You may find your land damaged by the exploration activity, without even enough return to pay the cost of repairing the property damage.

Before you sign a lease, please take a few moments to consider some of the potential impacts to the land.

More specific information may be obtained from your (county) Cooperative Extension office and/or your (county) Soil and Water Conservation District.

NOTES

1. The photographs used in this article were taken in New York State in April of 1980. They depict actual conditions observed at that time, and are used to illustrate some of the processes used and some of the damages that may occur. Most leases are likely to contain some provisions for site reclamation. These pictures do not portray such reclaimed sites, nor are they intended to imply that such reclamation is not usually done. The methods of reclamation may, however, simply conceal some real problems with the use of such sites for farming. This publication is intended to alert you to such potential problems.

2. This manuscript was developed during a period of great public interest in exploration for natural gas. Many of the same points are true for oil exploration and production.

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The Potential Impacts of Well Drilling and Operation On Your Land

by

Fred N. Swader*

Installing oil or gas wells may have spectacular, and perhaps serious, impacts on your land. These impacts may be very disruptive on active farmland, but they may also have substantial consequences for the future use of idle land.

The development of oil and gas supplies (well and associated piping) is a business that requires large capital investments. The investments in modern machinery and the costs of maintaining highly skilled work crews make down-time (non-productive time) very expensive. These costs continue, regardless of the weather, and the drilling company must meet production goals to make a profit. Large, powerful earthmoving equipment make it possible to work through wet soils as only an inconvenience.

Under such construction-schedule pressures, the well development crews may not consider the impacts of well installation and operation on future uses of the area. Building access roads, drilling, developing and operating wells may change the natural patterns of surface water flow; may destroy existing crops or conservation practices; may seriously change the chemical and physical properties of the soils; and may require expensive inputs to reclaim or revegetate such disturbed areas. These effects should be considered carefully before legal commitments are made. Advance planning may allow you to avoid some of these problems, especially if done before a lease is signed.

ACCESS ROADS

Alignment: The drilling crew have one major consideration -- to do their jobs; to drill wells wherever specified in the most economical manner (and the shortest time). The first major problem is to get the drilling rig and the associated machinery to the job site.

The shortest distance from the highway to the drilling site is a straight line and a straight road. These are often made by bulldozing the topsoil from the roadway. Traffic to and from the drilling site will quickly form ruts in the access road, and the ruts will act like ditches during some part of the year. They may collect water and channel the flow swiftly down the slope, eroding soil and carrying it to the nearest road ditch or field. (Figure 1).

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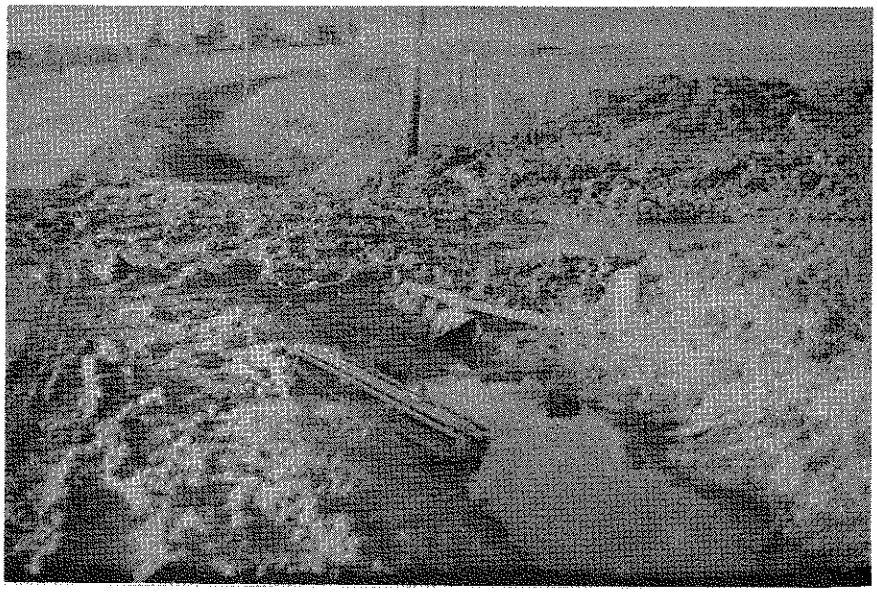
Figure 1.

Access roads are necessary to get the drilling and development equipment to the well site. The topsoil is often bulldozed aside and the road may be designed to go up the slope, resulting in erosion during the wet parts of the year.

If the water flows into a road ditch, the increased flow may be greater than the capacity of existing culverts in the ditch.* This could result in culvert washouts and restricted access to adjacent fields, or to houses along the road. Restricted field access, and repairing farm field entrances may be only a nuisance. If residential culverts and driveways are washed out, it is likely to be an expensive nuisance. The landowner should consider the matter of responsibility for such potential problems. (Figure 2).

Figure 2.



The construction and use of access roads may adversely affect culverts and highway ditches. The capacity of this culvert has been reduced, and may result in road flooding.

Field Wetness: The runoff water may not flow directly to the roadside ditch, however. It may spread out across the flatter parts of the field that are often adjacent to the highway. This would reduce the problems with highway ditch culverts but the increased water (and some of the eroded soil material) in the field is likely to aggravate the landowner's problems of using that part of the field. The increased wetness will delay farm operations and may have an adverse effect on the existing crop or vegetation.

Where it is necessary for the road to run up and down the slope, water bars should be installed at appropriate intervals to prevent the accumulation of large quantities of water, and every effort should be made to either avoid ruts, or to remove them.

Some advance planning and discussion may make it possible to avoid up- and down-hill roads, or to minimize them. The roads may be placed across the slope to reduce the problems of runoff and erosion. If they are, the landowner should carefully consider the effect of the roadway on the natural drainage of runoff waters. The natural draws that occur in the field carry runoff waters during storms and snowmelt periods. A road built across such draws may severely interfere with such natural surface drainage, causing more soil wetness problems above the road. To prevent such problems, provisions should be made to install culverts in the draws.

Diversion Ditches: An especially serious potential impact occurs when it is necessary for the drilling equipment to cross diversion ditches. Diversion ditches intercept water and conduct it away from the field. If the diversions are breached, the water will flow down the access road, greatly aggravating the problems of soil erosion, culvert capacity, field wetness, or all of these.

One possible solution would be to install a culvert in the channel of the diversion ditch, and build a ramp on the down-slope side. Information about culvert size and appropriate depth of soil cover may be obtained from your local Soil and Water Conservation District. In no case should the landowner allow a diversion ditch to be filled in or breached, as either could result in severe damage downslope.

Subsurface Drains: Tile drains may also be damaged by heavy equipment on wet access roads, or by the earthmoving done to construct suitable roadbeds. In the first case, the drains may be crushed or severely disrupted. The earthmoving operations may cut the drains, allowing water to flow to the surface, or plugging the drains, or both. Measures to protect such drains may include raising the roadbed, or installing steel pipe as the drain under the road right-of-way. These should be investigated and discussed before construction begins. (See Information Bulletin 108, Land Drainage, by F.N. Swader and C.S. Winkelblech, N.Y.S. College of Agriculture and Life Sciences, Cornell University or contact your Soil and Water Conservation District).

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*If the runoff water is eroding soil from the roadway, some of the soil will be deposited in the road ditch, further reducing ditch capacity and increasing the likelihood of such problems.

Field Operations: The effect of such roads on farm operations should also be considered. Will the road be constructed along the field edges, or will it cut the field in half? Will it be possible to cross the access road with a tractor-bailer-wagon or tractor-chopper-wagon combination? Will the road divide the field into inconvenient smaller fields? Such impacts remain long after the well is drilled and developed.

Access roads are a vital part of the development and operation of oil and gas well operations. The landowner would be well advised to consider the potential impacts of the access roads on runoff water, soil erosion, diversion ditches, tile drains, and field wetness. Roads should be constructed to keep water away from them, if possible; or with water bars when the slope becomes great enough to cause erosion; they should be built approximately on the contour when possible, and provision should be made to prevent the blocking of natural drainageways. Access roads should not cross diversion ditches, and provision should be made to protect subsurface drains.

DRILLING SITES

Site Preparation: The drilling equipment is heavy and expensive. The wells are drilled to great depths. To provide a reasonably level and stable surface for the drill rig, the site is often prepared by bulldozing enough material to make a level drilling site. This bulldozed material may block normal drainage channels, resulting in the ponding of water on — or adjacent to -- the drilling site. This may cause serious damage to existing crops, and may make it difficult (or costly) to harvest them. (Figure 3).

Subsurface Drains: Such bulldozing may also disrupt subsurface drains which are usually not more than 3 to 3 1/2 feet deep. Will there be provision to repair such drains when the well is completed?

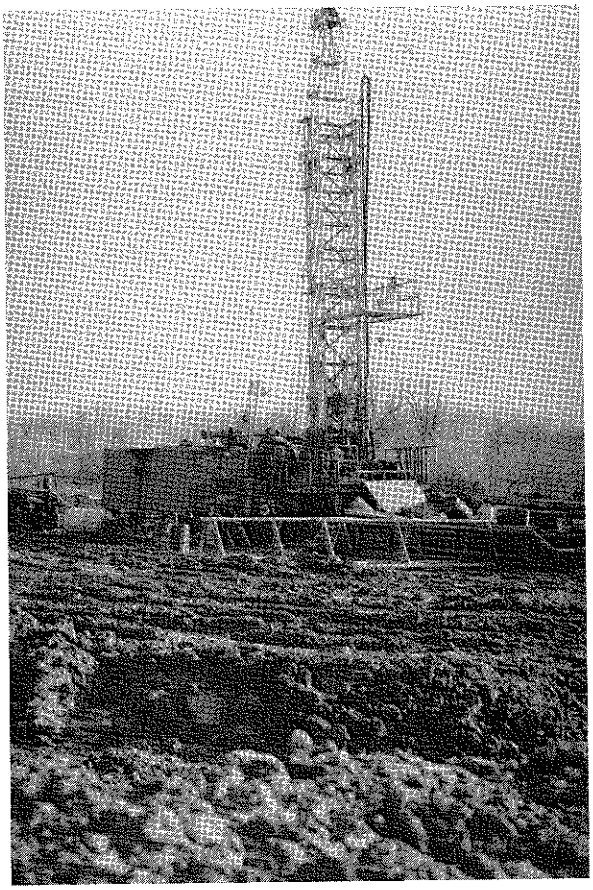
Vegetation: Site preparation will obviously destroy any vegetation or crops previously growing on the drilling site. Are there any provisions to re-vegetate the area when drilling is completed?

Trafficability: Farmers should be especially concerned about site preparation. On the acid soils which commonly occur in much of New York, the churning and mixing of a layer 2 to 4 feet thick may result in dramatic changes.

The soil structure is likely to be affected for some time. The excavated area will probably have a much lower "bearing capacity" when the soil is wet -- which means that farm machinery may easily become stuck in the mud.

Fertility: The soil structure problem may also be aggravated if the soil is simply bulldozed into a pile and later re-spread. The acid subsoil, mixed with original topsoil, may require many tons of lime (per acre!) to restore the pH to an acceptable level for plant growth. In high pH regions, excess lime may be mixed from the subsoil causing micronutrient problems. Site reclamation should include consideration of the necessary quantities of lime and fertilizer to restore soil productivity. The soil on the reclaimed site should be tested to determine the quantities of lime and fertilizer required (Cooperative Extension can assist in obtaining chemical soil tests).

Figure 3



The soils at the drilling site are severely disrupted. Such disruption may have serious affects on future use of the soils near the gas well. Proper reclamation methods can minimize long-term damages.

Structure: Such mixing is also likely to result in a soil which crusts easily making it difficult to grow crops, especially small seeded forage crops. The farmer (especially) should insist that, during site preparation, the topsoil is removed first, kept separate from the subsoil, and evenly redistributed over the drilling site (as topsoil) when the site is reclaimed.

Brine: During the well drilling operation, quantities of salt water (brine) may be encountered in the bore hole. The brine must be pumped out, and is usually pumped into brine pits -- dug at the drilling site -- to either evaporate or to soak into the soil.

The landowner should understand how the brine will be handled, including its ultimate disposal. How will it be kept from adjacent areas? How will the brine pit be reclaimed? They are usually covered with the material excavated from the site. To minimize the likelihood of salt damage to vegetation after the site is reclaimed, such pits should be covered with several feet of soil material, with the original topsoil placed on the top.

Drilling Mud: It is often necessary to use various kinds of materials (often special clays) to make the drilling fluid viscous enough to remove the pulverized rock material from the bore hole. These "muds" are usually pumped into a pit, where the rock particles settle out, and then the muds are re-used in the bore hole. There should be some understanding about the disposal of these materials. They may be trucked away, buried on the site, or mixed with the soil material during the site reclamation work. On idle land, the material may be simply covered. On active farmland, it should be (preferably) removed from the site, or mixed with the subsoil material. Drilling muds should not be mixed with topsoil. The drilling mud-subsoil mixture should be covered with topsoil.

WELL MAINTENANCE

Collection Lines: After the gas well is developed, it is necessary to install pipes to carry the gas to a transmission pipeline. The collection piping should not interfere with normal farm operations. The collection line should be clearly marked.

Installation of collection piping may disrupt subsurface drains. Provision should be made to insure that such drains will be repaired when they are disrupted. These items should be covered in the lease.

Access Roads: Gas wells require periodic maintenance, and may require some servicing with tank trucks. The landowner should understand whether the access road will be maintained (and by whom); and in what condition; whether the landowner's livestock are allowed to run on the access road, or must be fenced off; who is responsible for maintaining fences (if required); and for opening and closing gates.

SUMMARY

The drilling, development and operation of a gas well result in dramatic disruptions to the soils along the access roads and at the drilling site. Such disruptions may result in increased concentrations of runoff water, increased soil erosion, and increased soil wetness. Disruptions at the drilling site may increase problems of soil wetness and result in problems of high soil acidity, low soil fertility, and poor soil structure. The cost of correcting such conditions, as well as the cost of seed, should be considered. During site preparation and reclamation, the topsoil should be kept separate, and spread over the top of the drilling site. Collection lines may disrupt subsurface drainage. Access roads may require maintenance, and perhaps fencing to exclude livestock.

Most of these potential impacts can be eliminated or reduced by some advance planning. Technical assistance may be obtained from your local Cooperative Extension office or your local Soil and Water Conservation District.

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