5.4.7 Natural Gas Development

This section provides a profile and vulnerability assessment for the hazard posed by incidents involving the natural gas infrastructure within Chenango County.

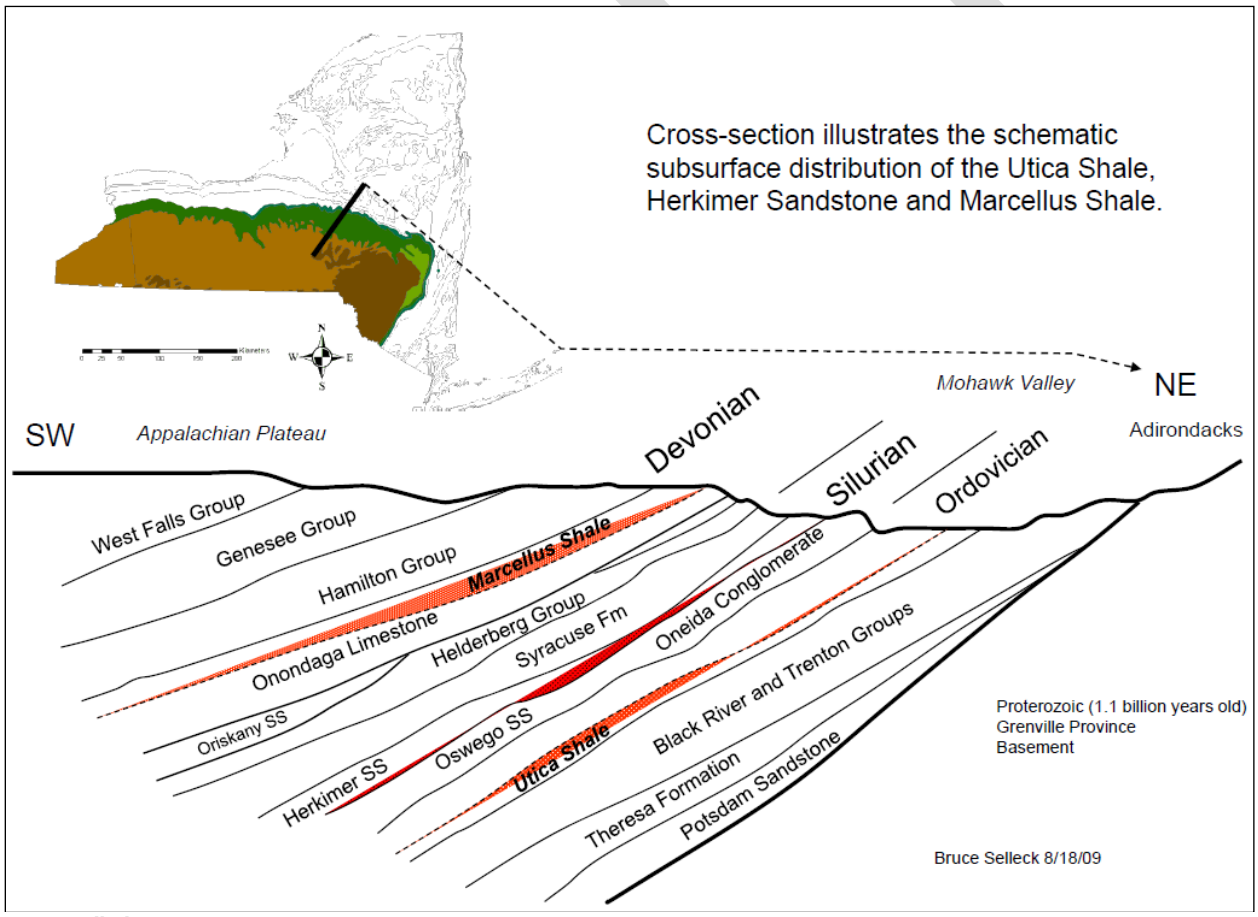
5.4.7.1 Hazard Profile

This section provides a profile and vulnerability assessment for the hazards posed primarily by the ongoing and potential development of the natural gas industry and natural gas infrastructure within Chenango County.

Description

Natural gas is a mixture of hydrocarbon gases- mostly methane with some ethane, propane, and butane (Selleck, 2009). It is created by the breakdown of organic matter at high temperature and pressure under the Earth's surface. Different layers of sedimentary rock in the Earth's crust have varying potential to contain natural gas. Figure 5.4.7-1 shows an exaggerated cross-section of the sedimentary rock layers in New York State around Chenango County (Selleck, 2009).

Figure 5.4.7-1. Sedimentary Rock Layers

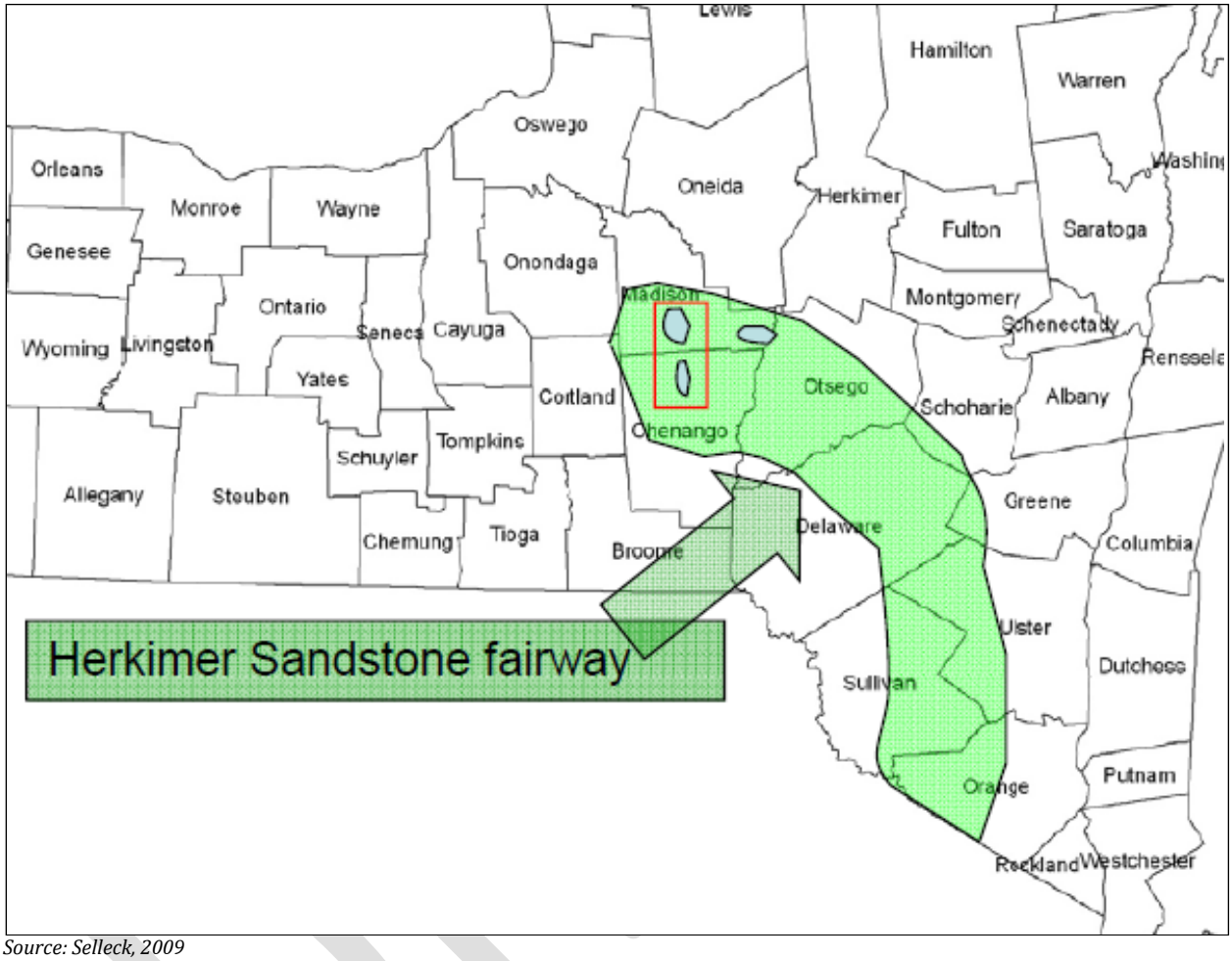


Source: Selleck, 2009

Three layers of rock are particularly relevant to natural gas drilling in Chenango County. The first is the Herkimer Sandstone, which is the layer from which most of the active natural gas wells in Chenango County draw natural gas, as shown in Figure 5.4.7-2. The indicated "fairway" is the region with a high probability of

drawing natural gas from the Herkimer Sandstone. The red box highlights an area of Madison and Chenango Counties in which there are numerous active natural gas wells drawing from the Herkimer Sandstone.

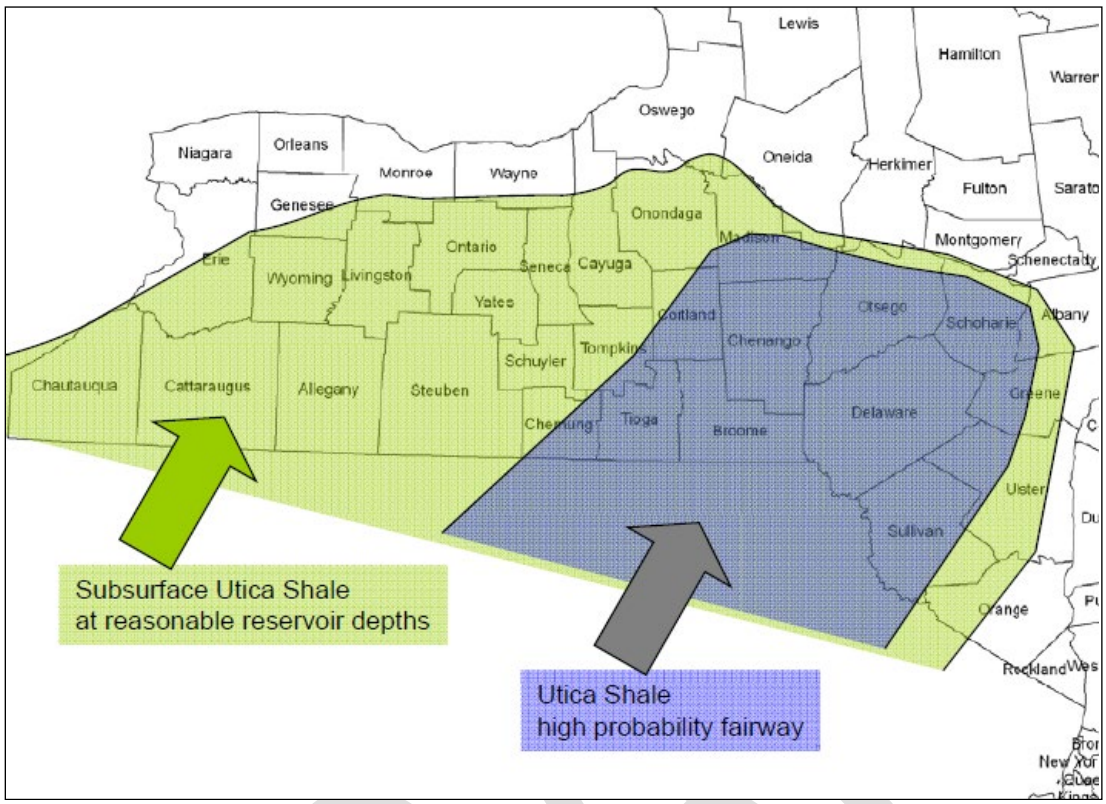
Figure 5.4.7-2. Herkimer Sandstone Fairway



Source: Selleck, 2009

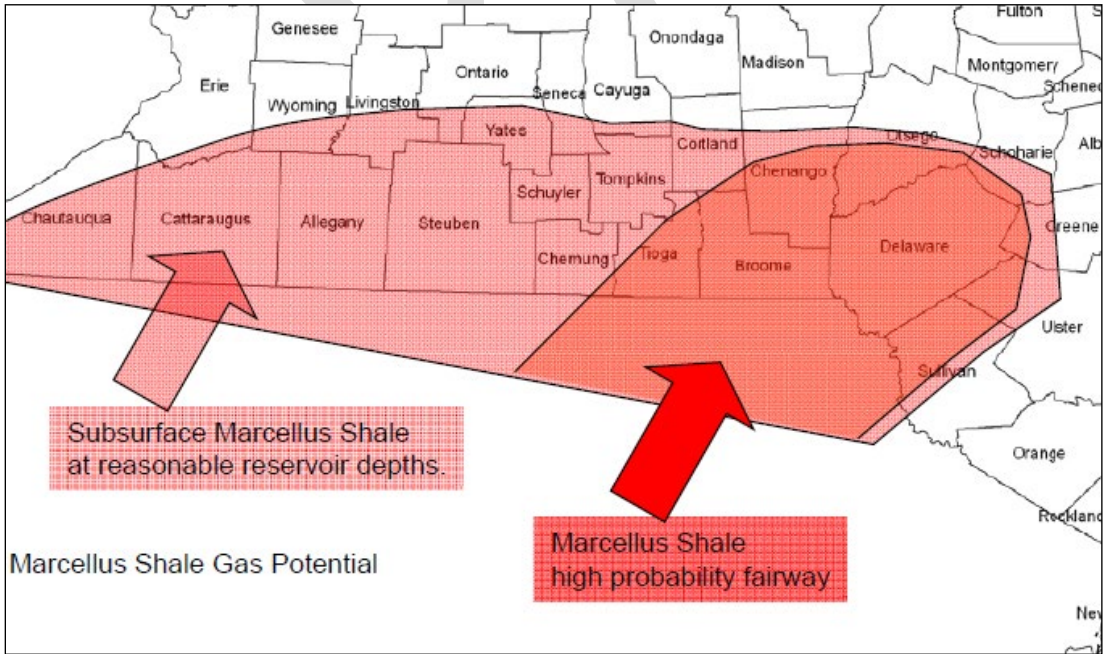
The other two layers, the Marcellus Shale and Utica Shale, have recently been targeted by natural gas drilling companies in West Virginia, Pennsylvania, Ohio, and New York State. However, unlike the Herkimer Sandstone, these two layers require horizontal drilling and high-volume hydraulic fracturing of the rock itself to release sufficient quantities of natural gas to make drilling economical. Figure 5.4.7-3 and Figure 5.4.7-4 show the Utica Shale and Marcellus Shale fairways, respectively. All of Chenango County is within the Utica Shale fairway, making the entire County potentially attractive for natural gas drilling in the Utica Shale. All but the northern parts of Chenango County are within the Marcellus Shale fairway.

Figure 5.4.7-3. Utica Shale Fairway



Source: Selleck, 2009

Figure 5.4.7-4. Marcellus Shale Fairway



Source: Selleck, 2009

Once the gas has been extracted from the ground, it must be distributed to customers. In New York State, over 4.7 million natural gas customers are served by a local gas distribution company (New York State Energy Planning Board, 2009). New York State Electric and Gas (NYSE&G), has natural gas franchise agreements with several municipalities in Chenango County where the infrastructure is available. At this time the primary natural gas customers in Chenango County are residents/businesses in close proximity to the NYSE&G pipeline or the City of Norwich and Village of Oxford. The franchise agreements allows for infrastructure development to provide additional service to potential natural gas customers in Chenango County.

Natural gas is primarily transported by pipelines. Interstate pipelines are regulated by the Federal Energy Regulatory Commission (FERC) and intrastate pipelines are regulated by the New York State Public Service Commission (NYSPSC). The intrastate pipelines are under the jurisdiction of the NYSPCS Gas Safety Division (Chenango County Natural Gas Advisory Committee, 2011). Low-pressure (<125 psi) gathering pipelines are regulated by the Gas Safety Division. Towns do not have regulatory authority over them. The PSC has regulatory authority over intrastate lines at all levels, including, but not limited to, the safety division.

There are a few potential negative impacts of natural gas drilling, which could adversely affect Chenango County. First, natural gas could leak from the well site. This could cause a hazardous situation if the gas were to collect and pool in or near occupied structures, as it could cause direct health effects or ignite. Ignition and explosion of natural gas is the second negative potential impact of natural gas drilling. Third, natural gas and/or flowback fluids could contaminate the environment. Finally, the increased truck traffic directly related to well drilling could result in an increase of transportation accidents. These impacts are described in the sections below.

Extent

Natural gas is flammable and has the potential to cause significant impacts (Lycoming County, 2010). If a large volume of natural gas escapes from a well or pipeline, it has the potential to explode. This explosion, depending on its magnitude, could injure or kill people (potentially overwhelming the local emergency medical services [EMS]), destroy property, cause urban or wildland fires, close roads, force evacuations, cause power or telephone outages (if transmission lines are damaged), etc.

The extent of impacts from natural gas incidents depends on several factors (Lycoming County, 2010):

- Compliance with applicable site design, building, and fire codes
- Maintenance of equipment
- Weather conditions
- Micro-meteorological effects of buildings and terrain
- Warning time for affected populations
- Response time for emergency response units

Site design, and building and fire code compliance are the primary factors which can be controlled by humans. By ensuring that the drill site is properly designed, drilling operations follow established regulations, well(s) are properly designed and constructed. It is also important to ensure that drilling equipment is inspected and maintained regularly, in accordance with equipment specifications and regulations, so that any defects can be addressed before a release.

Should there be an incident that releases natural gas from the well site or pipeline, weather conditions and micro-meteorological effects will affect the spread of any natural gas released in the incident. Natural gas is lighter than air, and will rise when released. Ambient weather conditions and effects of terrain or buildings may keep the gas closer to the ground.

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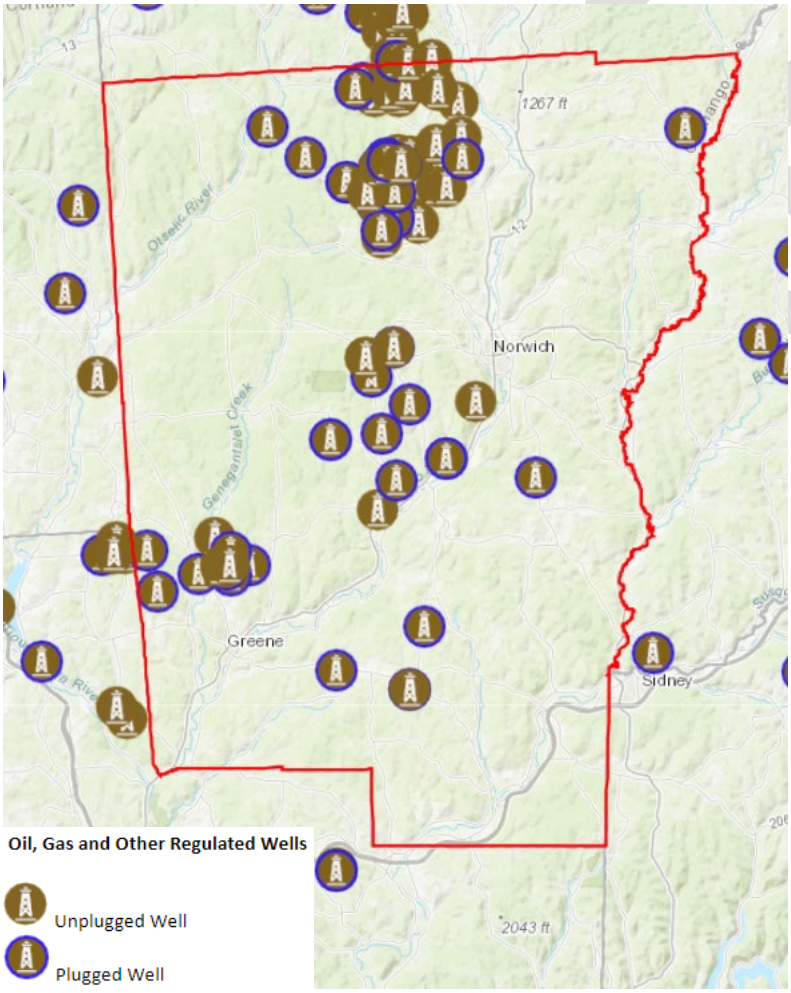
If natural gas escapes due to an incident, and it has the potential to affect people and property, those effects will depend on the warning time available for potentially-affected populations to seek appropriate shelter or evacuate the area. The sooner a qualified emergency response unit, whether from the local community or the infrastructure operator, arrives to address any incidents and releases, the less potential for negative consequences exists.

According to the *2020 Emergency Response Guidebook* published by the U.S. Department of Transportation (US DOT), a large spill of flammable gas, including natural gas from a well site or a point along a pipeline, may result in an initial downwind evacuation of ½ mile (USDOT 2020).

Location

The locations of well sites are tracked by the New York State Department of Environmental Conservation (NYSDEC). Locations of wells in Chenango County are shown in Figure 5.4.7-5. There are currently 42 active natural gas wells in Chenango County. Most gas wells are located in the Town of Smyrna in the northern part of the County.

Figure 5.4.7-5. Natural Gas Wells Completed and Proposed in Chenango County

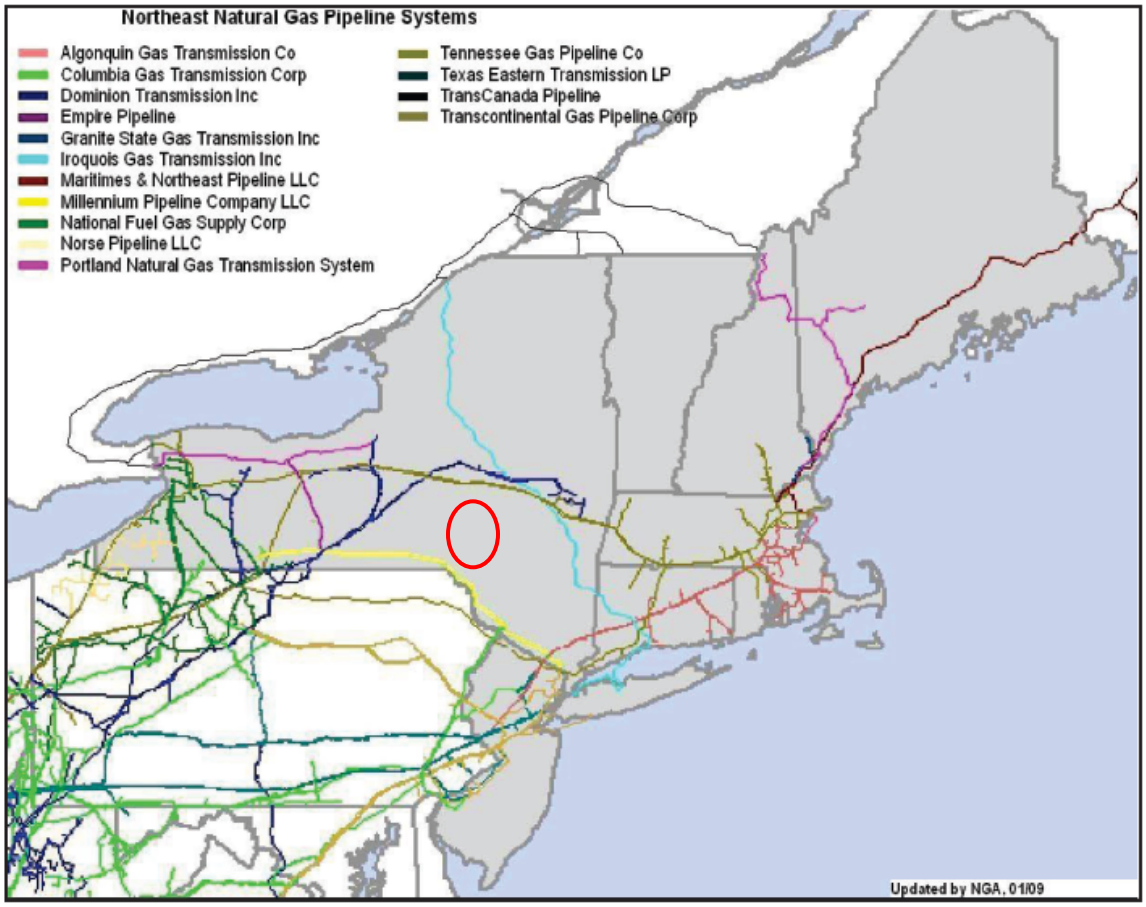


Source: NYSDEC Info Locator, 2020
Note: Chenango County is outlined in red.

There are no major (from a national perspective) pipelines running through Chenango County, as shown in Figure 5.4.7-6. The closest major pipeline is the Millennium Pipeline, running east-west, just south of Chenango County and the Tennessee and Dominion pipelines to the north. The Teppco Pipeline is a pipeline running east-west across Chenango County, through the Towns of McDonough, Preston, Oxford, and Norwich, supplying multiple products but not natural gas.

There is a low-pressure (< 125psi) natural gas gathering pipeline system connecting gas wells in the towns of Smyrna, Plymouth, and Preston. The specific locations of these pipelines have been deemed confidential due to issues related to homeland security. They are on file at the County Bureau of Fire.

Figure 5.4.7-6. Major Pipelines in the Northeast United States



Source: New York State Energy Planning Board, 2009
Note: The location of Chenango County is indicated by the red circle.

A major natural gas pipeline, The Constitution Pipeline, proposed in 2013, was to run from Pennsylvania, through to Albany, NY, passing through the Towns of Afton and Bainbridge in Chenango County. However, due to a New York Statewide ban on hydraulic fracking, the project was disbanded in February 2020 (Constitution Pipeline 2020; NRDC 2020).

Table 5.4.7-1 summarizes natural gas wells identified in the NYSDEC Oil and Gas database (http://www.dec.ny.gov/cfmx/extapps/GasOil/) as of December 2019. This table further identifies existing and proposed natural gas pipelines as identified by the Chenango County Department of Planning and Development, and Commerce Chenango as of 2020.

Table 5.4.7-1. Existing and Proposed Natural Gas Infrastructure

Municipality	Active Natural Gas Wells (as of 12/2019) (1)	Inactive Natural Gas Wells (as of 12/2019) (2)	Natural Gas Distribution System(s) – Existing (3)	Natural Gas Distribution System(s) – Proposed (3)
Afton (T, V)	-	7		Constitution Pipeline
Bainbridge (T, V)	-	1		Constitution Pipeline Leatherstocking Natural Gas Pipeline
Columbus (T)	-	-		
Coventry (T)	-	11		Leatherstocking Natural Gas Pipeline
Earlville (V)	-	-		
German (T)	-	4		
Greene (T, V)	-	-		Leatherstocking Natural Gas Pipeline
Guilford (T)	-	2		
Lincklaen (T)	-	-		
McDonough (T)	-	4		
New Berlin (T, V)	-	-	NYSE&G Pipeline – provides local natural gas service to portion of the Town	
North Norwich (T)	-	-		
Norwich (C, T)	-	-	NYSE&G Pipeline – provides local natural gas service	
Otselic (T)	-	-		
Oxford (T, V)	-	3	NYSE&G Pipeline – provides local natural gas service	
Pharsalia (T)	-	-		
Pitcher (T)	-	-		
Plymouth (T)	4	12	NYSE&G Pipeline – provides local natural gas service to portions of the Town EmKey gathering pipeline system	
Preston (T)	3	4	EmKey gathering pipeline system	
Sherburne (T, V)	-	-		
Smithville (T)	-	13		
Smyrna (T, V)	34	45	EmKey gathering pipeline system	

Sources:
(1) NYSDEC Gas Well Search Website: http://www.dec.ny.gov/cfmx/extapps/GasOil/search/wells/index.cfm . Identifies wells with "Well Status" identified as "Active"
(2) NYSDEC Gas Well Search Website: http://www.dec.ny.gov/cfmx/extapps/GasOil/search/wells/index.cfm . Identifies wells with "Well Status" identified as "Inactive", "Cancelled", "Expired Permit", "Refunded in Fee" or "Voided Permit"
(3) Chenango County Planning Committee, 2007, 2014; Chenango County Department of Planning and Development, 2020; Commerce Chenango, 2020.
Notes:
EmKey = EmKey Resources LLC
NYSE&G = New York State Electric and Gas

Previous Occurrences and Losses

Many sources provided information regarding previous occurrences of incidents at natural gas well sites and transmission pipelines, and possible environmental contamination due to the chemicals used in the drilling process, throughout the shale regions of Pennsylvania and New York. However, there were few records of incidents in Chenango County.

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In July 2008, a faulty valve on a well head blew out during pressure testing, causing eye and ear injuries to a worker (DeCordova 2008). The work crew took 30-45 minutes to get the resulting gas leak under control. No property damages were recorded.

On January 5, 2009, a fire erupted at a drilling rig in the Town of Smyrna (DeCordova 2009). Rocks were thrown out of the wellhead. One struck and broke a fluorescent light, causing a spark that ignited the gas coming from the well. The drilling rig was severely damaged, but no injuries were reported.

Probability of Future Events

As natural gas drilling has expanded in New York State, state and local representatives have used Pennsylvania's experience with the natural gas industry to inform their regulations and practices, to try to avoid the problems that Pennsylvania has experienced (NYSDEC 2011). Table 5.4.7-2 shows a sample of these problems, and potential solutions identified in New York's 2011 revised draft Supplemental Generic Environmental Impact Statement (rdSGEIS). These solutions were proposed to minimize the probability of New York State's communities, including Chenango County, experiencing these problems associated with natural gas drilling.

Table 5.4.7-2. Problems and Solutions Related to Natural Gas Drilling

Issue	Problems Identified	SGEIS Solution
Methane Gas Migration	• Improperly cased and cemented wells • Excessive pressures	• Proper well casing design and inspection • Specific requirements for cementing practices, testing, and use of intermediate casing
Fracturing Fluid Releases	• Poor site design • Equipment failure • Stormwater controls failure	• Inspection of well site • Pressure testing of equipment • Stormwater permitting • Secondary containment • Closed loop systems
Uncontrolled Wellborne Release of Flowback Water and Brine	• Inadequate equipment • Lack of certified well control personnel	• Pressure testing of equipment • Use of specialized equipment • Presence of a certified well control specialist
High Total Dissolved Solids (TDS) Discharges	• Lack of regulations for surface water quality	• Permitting and approval process for proposed discharge flowback water or brine to wastewater treatment plants • In-stream limits for TDS • State Pollutant Discharge Elimination System (SPDES) permit, which limits TDS based on stream's capacity to assimilate TDS

Future events related to natural gas exploration could also occur. Lycoming County, Pennsylvania, studied the increase in truck traffic through the county related to natural gas drilling (Lycoming County 2010). Table 5.4.7-3 shows the increase in truck traffic from each well.

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Table 5.4.7-3. Truck Loads for One Gas Well

Total Truck Loads for One Gas Well

Type of Vehicle	No. of Axles	Loaded Weight	Empty Weight	One Way Trips	Comments
Drilling Operations					
Rock Hauler	5	84,000	35,000	70	Pad Construction
Rig (install)	5	100,000	n/a	2	Rig Set-up
Rig (removal)	5	100,000	n/a	2	Rig Removal
Bob-Tail	5	50,000	20,000	20	Equipment
Bob-Tail	5	50,000	20,000	20	Equipment
Bob-Tail	5	50,000	20,000	8	Drilling Pipe
Bob-Tail	5	50,000	20,000	6	Cement
Bob-Tail	5	50,000	20,000	9	Drilling Mud
Fracing Operations					
Work-over Rig	5	80,000	n/a	2	Rig Set-up
Work-over Rig	5	80,000	n/a	2	Rig Removal
Tank Truck	5	80,000	35,000	70	Frac Tanks
Water Tanker	3	80,000	35,000	685	Water for Fracing
Water Tanker	3	80,000	35,000	214	Frac Water Removal (25 %)
Bob-Tail	5	80,000	35,000	24	Equipment
Production					
Tank Truck	5	80,000	35,000	353	Empty Dehydration Tanks

1,134 Heavy Truck Loads Plus 353 Trucks / Yr (Maint.) / Well Head

In Section 5.3, the identified hazards of concern for Chenango County were ranked. The probability of occurrence, or likelihood of the event, is one parameter used for ranking hazards. Based on historical records and input from the Planning Committee, the probability of occurrence for natural gas incidents at well sites in the County is considered 'Occasional' (between 10 and 100% annual chance of occurrence). Based on Cornell University's analysis of chemical spills related to drilling operations in Pennsylvania, Chenango County can expect one truck accident related to the natural gas industry every four years (Chenango County Natural Gas Advisory Committee 2011).

Climate Change Impacts

It is difficult to assess the impacts that climate change will have on the frequency and severity of natural gas incidents in Chenango County. Unlike drought, winter storms, or flooding, which are natural hazards directly dependent on the climate, natural gas drilling and therefore incidents involving the release of natural gas are man-made issues. However, the extraction of natural gas from wells and transportation in pipelines results in the leakage of methane, which traps heat faster than carbon dioxide, and has the potential to increase the rate at which climate change and global warming occurs (UCS, 2014). Still, any link between climate change and the risks associated with the natural gas industry in the County cannot be made at this time.

5.4.7.2 Vulnerability Assessment

To understand risk, a community must evaluate what assets are exposed or vulnerable in the identified hazard area. For natural gas incidents, the entirety of Chenango County has been identified as the hazard area. Therefore, all assets in Chenango County, as described in the County Profile section, are vulnerable to these incidents. The following text evaluates and estimates the potential impact of natural gas incidents on the County.

Impact on Life, Health and Safety

The entire population of Chenango County is vulnerable to natural gas development incidents. According to the 2018 5-Year American Community Survey, the County had a population of 48,348. During a natural gas development incident, those populations located near the site of the incident are the most vulnerable and may need to seek appropriate shelter or evacuate the area. According to the *2020 Emergency Response Guidebook* published by the U.S. Department of Transportation (US DOT), a large spill of flammable gas, including natural gas from a well site or a point along a pipeline, may result in an initial downwind evacuation of ½ mile (800 meters) (USDOT, 2020).

Impact on General Building Stock and Critical Facilities

Any facilities located near natural gas wells are vulnerable to natural gas development incidents. Natural gas development incidents can largely impact water quality and water supply; therefore, general building stock and critical facilities related to water supply may be more vulnerable. As previously stated, the hazard area around a natural gas drilling site encompasses an area with a radius of one-half mile, which is the initial downwind evacuation distance for large spills. Although there is currently no active natural gas drilling sites, any buildings or critical facilities in Chenango County located within one-half mile of a former natural gas drilling site is still considered vulnerable.

Impact on Economy

The impact natural gas incidents have on the economy and estimated dollar losses are difficult to measure and quantify.

Impact on the Environment

Natural gas drilling, which is often the cause of related incidents, can have many negative impacts on the environment. This can include contamination of drinking, ground, and surface water, waste disposal issues for toxic substances that flow back during the drilling processes, and leakage during transportation and storage can result in leakage of methane which is known to increase the rate at which heat is trapped within the atmosphere. Crude oil spills can result in harm to human health and the environment, including injuries or fatalities to fish and wildlife populations.

Cascading Impacts on Other Hazards

The greatest risk associated with natural gas pipelines is fires or explosions caused by ignition of the gas, which can cause significant damage to an area like Chenango County, which is abundant in forested areas and populations living within the Wildland-Urban interface (WUI). Spills during transportation, either via pipelines, or by vehicles or trains, can cause spills that contaminate ground and drinking water supplies, affecting crop production in the County as well.

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Future Changes that May Impact Vulnerability

Understanding future changes that impact vulnerability in the county can assist in planning for future development and ensuring that appropriate mitigation, planning, and preparedness measures are in place. The county considered the following factors to examine potential conditions that may affect hazard vulnerability:

- Potential or projected development
- Projected changes in population.
- Other identified conditions as relevant and appropriate, including the impacts of climate change.

Projected Development and Change in Population

As discussed in Section 4 (County Profile), areas targeted for future growth and development have been identified across the County. Any areas of growth could be potentially impacted by natural gas incidents because the entire planning area is exposed and vulnerable.

According to population projections from the Cornell Program on Applied Demographics, Chenango County will continue to experience a population decrease through 2040 (a decline of over 7,500 people in total by 2040). This decrease will reduce the overall vulnerability of the county's population over time.

Climate Change

As discussed above, natural gas development incidents are man-made and the impacts of climate change on these events are difficult to quantify. However, as New York State has implemented a ban on natural gas drilling, the effects of the extraction of natural gas from wells which results in the leakage of methane into the atmosphere, which in turn increases the rate at which climate change and global warming occurs, should likely decrease the effects of climate change and its impacts on natural disasters.

Change of Vulnerability Since the 2015 HMP

Natural Gas hazards were identified in the 2015 HMP Update as having the potential to be frequently occurring and of medium risk to the County. Due to the statewide ban on fracking and drilling, the probability of natural gas hazards was lowered to occasional, but due to the number of wells and use of natural gas in businesses and homes, the risk is still 'medium' for the County.

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