PIERCE COUNTY
HAZARD IDENTIFICATION & RISK ASSESSMENT

PIPELINES HAZARD

Table of Contents

Identification Description

Definition

Although there are many different substances transported through pipelines including sewage, water and even beer, this chapter will focus on transportation arteries carrying hazardous liquids and gaseous substances.[1] According to the U.S. Code Title 49 Subtitle VIII Chapter 601, "Pipeline transportation means transporting gas and transporting hazardous liquid."[2] Pipelines may be buried or above ground.

Types

This chapter is concerned with the two interstate pipelines that transport petroleum products and natural gas through Pierce County and the pipeline that delivers jet fuel to Joint Base Lewis/McChord. Any of these three could have a catastrophic spill or leak that could devastate a large area in its proximity. While there are crude oil pipelines in Washington, there are none in Pierce County.

In addition, the small gas pipeline systems for local distribution, while not operated or controlled by the pipeline companies, can also pose a safety risk. Cities, towns and those portions of the County that have gas distribution systems need to be conscious of the condition of any underground gas pipeline systems serving their facilities. For the purposes of this section we will consider only those three companies transporting large quantities of product over distance, not the distribution and residential systems prevalent in many of our communities.

Profile

Location and Extent

Current Pierce County pipelines include Northwest Pipeline Corp, Olympic Pipeline Company, and Par Pacific. Combined they contain 80.93 miles of natural gas pipeline and 44.68 miles of liquid petroleum product pipeline. (See Map P-1 Pierce County Pipelines.)

Northwest Pipeline LLC[3] is a primary conveyer of natural gas to the Pacific Northwest and the Intermountain Region. It transports natural gas at a pressure of up to 960 pounds per square inch (psi). A subsidiary of Williams Pipeline, it enters the County as a 30-inch line from the north on the Muckleshoot Indian Reservation. Crossing to the west of Lake Tapps, it skirts the eastern edge of Sumner and the southeastern portions of Puyallup. Here at 192nd it joins a 36-inch line that replaces an old 26-inch line[4]. It then crosses Meridian around 122nd and continues southwest until just east of McKenna where it crosses the Nisqually River.

Olympic Pipeline Company has a 14-inch gasoline pipeline that runs through Pierce County coming in from the north along the I-5 corridor, passing through the west edge of Milton and the south section of Fife. In Fife, the main line turns south, crosses the Puyallup River and proceeds to Fredrickson. From there it changes direction going southwest. It crosses Joint Base

Lewis/McChord, goes through Roy and crosses the Nisqually River downstream of McKenna. It carries gasoline, diesel and aviation fuel at pressures of up to 1,400 psi.

There are two transfer points for fuel in Pierce County. The first, the Tacoma Delivery Facility, delivers fuel through feeder lines to a number of points in the Tacoma port/industrial area. The second, the Spanaway Delivery Facility, delivers fuel to Puget Power.[6]

McChord Pipeline is a wholly owned subsidiary of Par Pacific Holdings Inc. At 14.25 miles in length it is the shortest of the pipelines in Pierce County. It transports JP-8 jet fuel from the terminal in the Port of Tacoma, to Joint Base Lewis/McChord.[7]

Table P-1 Cities & Towns with Interstate Pipelines within, or within 1 Mile of City Limits[5]

Bonney Lake
Edgewood
Fife
Lakewood
Milton
Puyallup
Roy
Sumner
Tacoma

Occurrences

One of the larger pipeline incidents, and one that could have caused even greater damage, was the rupture of the 16-inch gasoline line owned by Olympic Pipe Line Company, on the afternoon of June 10, 1999 in Bellingham. That spill of 277,200 gallons of gasoline into Hanna and Whatcom creeks exploded killing three boys. The resulting fireball sent a plume of smoke 30,000 feet into the air.[8] (See Figure P-1 Olympic Pipe Line Rupture 06/10/99.) That incident could have been much worse if the gasoline had not ignited before entering much the downtown portions of Bellingham. Instead, by igniting when it did, most of the damage was confined to Whatcom Falls Park, a few residences and the water treatment plant located at the park.

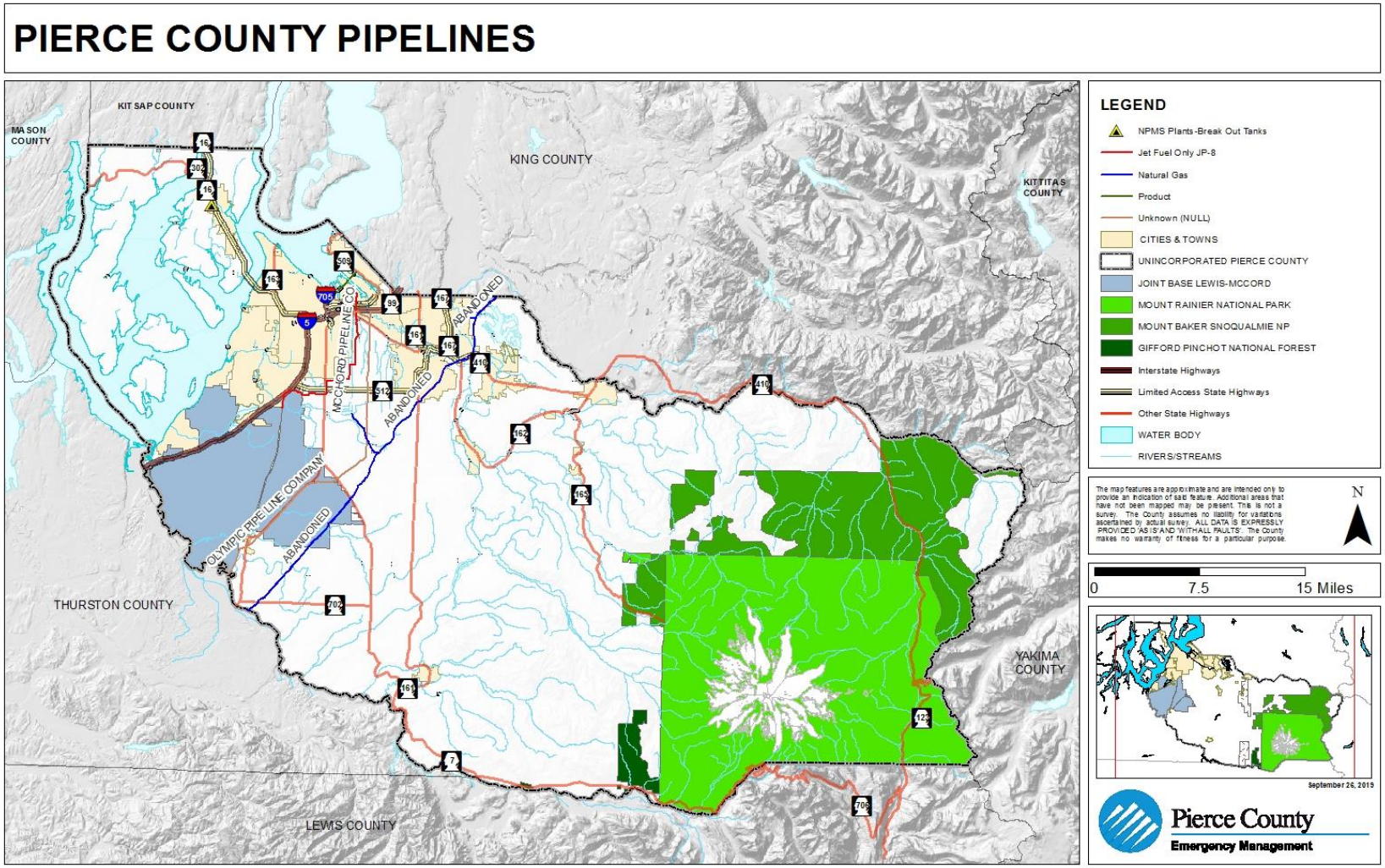
Figure P-1 Olympic Pipe Line Rupture 06/10/99

The only significant occurrence of a spill, on any line, natural gas or petroleum product, was the Northwest Pipeline Corporation natural gas incident May 1st 2003, in Sumner[9]. This incident, caused by pipe corrosion, did not result in an explosion. However, the venting gas was heard for some distance and a small area nearby was evacuated. The line was shut down and repaired without further incident.

Recurrence Rate

The transportation of both natural gas and refined petroleum products is most safely done through the use of pipelines. Due to the immense quantities of product that have to be delivered throughout the country, not only would it be nearly impossible to fill the need with trucks, it would also increase dramatically the potential for accidents and the resulting spills on the highways. While minor leaks happen in the local distribution systems, a major leak from either a natural gas or gasoline pipeline is a rare occurrence. With only one Pierce County incident recorded in the past ten years the recurrence rate is estimated to be ten years or more.

Map P-1 Pierce County Pipelines



Impacts

The impacts from a natural gas pipeline incident compared to one from a petroleum product pipeline can be quite different. This section will therefore treat the two as separate incidents.

It must also be acknowledged that this section is based on a single break at any one time. In the advent of an earthquake there could be many breaks along one or more of the pipelines at the same time. This will increase the risk near the pipelines to individuals, businesses, the infrastructure and the environment.

Health and Safety of Persons in the Affected Area at the Time of the Incident

Natural Gas Pipeline

Natural gas is listed as a hazardous material due to its flammability. While it is non-toxic it can replace the oxygen in the blood stream causing suffocation. [10] Natural gas is 40 percent lighter than air so a release from a rupture will tend to rapidly rise into the atmosphere. This limits the potential for suffocation unless a person is in an enclosed space directly within the area of the leak where the gas may be able to replace the oxygen.

While flammability and the explosive nature of the gas is the main threat it takes a proper ratio of gas to air to create a combustible mixture. The approximate range of flammability is from 4.0 to 14.0 percent.[11] Unless there is the proper mixture of gas and air combined with a spark or fire, there will be no explosion. In most cases of natural gas pipeline ruptures there are no fiery explosions, no injuries and no deaths. Data from all natural gas pipeline incidents in Washington State from 2000 to 2009 show a total of only seven incidents, none of which had a fatality or injury associated with it.[12]

Health and safety impacts in the affected area can range from minor burns, including frostbite from the cooling gas, and difficulty breathing, to death from aspiration or explosion.

Petroleum Product Pipeline

Petroleum product vapors coming from a liquid spill are the initial threat to persons in the impacted area. The vapors are heavier than air and so will pool in low areas. Inhalation of the vapors can cause nose or lung irritation, produce dizziness or headaches, vomiting, and in large enough quantities can lead to coma and death.[13] Suffocation is a real possibility in low areas, gullies, creeks or basins. Of the three people killed by June 10, 1999 Olympic Pipe Line rupture in Bellingham one, while fishing, was overcome by the fumes, fell into the creek and drowned prior to the ignition[14].

The biggest threat to lives is through ignition of the product. Ignition of the various petroleum products, whether they are gasoline, diesel, or a kerosene product can injure anyone in the vicinity. Burns ranging from minor to fatal would be the primary impact on those in the vicinity of an explosion.

Health and Safety of Personnel Responding to the Incident

Natural Gas Pipeline

With the natural tendency of the gas to escape into the atmosphere there should be little threat to first responders. As soon as a leak or rupture is discovered Northwest Pipeline will shut off the gas flow and allow the remaining gas in the line to dissipate. If the gas has ignited, shutting it off will allow the flame to burn itself out. Then a repair crew will go in and repair the line.

A threat to first responders is possible when a person is injured requiring aid, in the vicinity of the leak or break. The possibility of an ignition source close to the break causing it to ignite, or medical or rescue personnel themselves, unwittingly causing it to explode, could cause injury or death to the responders.

Petroleum Product Pipeline

The threat to rescuers is the same as for the public. Petroleum product vapors coming from a liquid spill will be a threat to first responders attempting to rescue those in the impacted area. Entering the impacted area could open first responders to both the explosive potential of the product as well as the physical consequences of inhaling the vapors. As with the public, the biggest threat to lives is through ignition of the product.

Continuity of Operations and Delivery of Services

Natural Gas Pipeline

A rupture of a natural gas pipeline could cause a disruption in the delivery of services to the localized area impacted by the break. Due to natural gas being forty percent lighter than air there will be little if any dispersion into the surrounding community. If a break occurred near or under a major transportation route it could require rerouting of services around the area until the line is repaired. If in a community, it could require the evacuation of residents, businesses, or governmental offices for a period of time until the line is closed, the pressure reduced and the gas line purged of any remaining product. If a rupture resulted in a fire, local buildings may be directly impacted and if they belong to a local governmental body it could further delay some services. Due to the limited area impacted by any natural gas pipeline rupture, there should be no loss of service delivery for any extended period of time and no disruption of governmental operations.

Petroleum Product Pipeline

Both petroleum pipelines are located in areas that include high industrial, business and infrastructure use. The 1999 Olympic Pipe Line rupture and spill in Bellingham provides a perfect example of the kind and size of spill that is possible in Pierce County. Depending on its location, a break causing a significant release, with or without an explosion or fire, could require evacuation of many homes, businesses, schools, and government buildings. In the right place it could require the closing of the interstate or State Route 512. While a release, even with an explosion and fire will not shut down the County's operations, it will prevent the delivery of services to the impacted area. Depending on the size of the spill, its location, the population

impacted, and whether it ignites, service delivery could be compromised for a period ranging from a couple of days to weeks.

Property, Facilities, and Infrastructure

Natural Gas Pipeline

During a rupture, the pressure in a natural gas pipeline can disrupt or blow the soil from above the break. Any facility or piece of infrastructure over, or adjacent to, the rupture could be damaged or destroyed. If the gas ignites it will set flammable objects above it, or near it, on fire. Depending on environmental factors such as wind, proximity of vegetation or other fuels, and dryness of the environment, the fire could spread to other nearby structures damaging or destroying them.

Petroleum Product Pipeline

A spill that does not ignite is treated as a very large hazardous chemical spill. It can contaminate buildings and destroy equipment and documents. As a liquid, its tendency to impregnate porous material can irreparably damage many items requiring their replacement.

The biggest threat from a petroleum product pipeline rupture is from the potential fire of explosion, if the spill ignites. It can destroy property, buildings, equipment, and business and government records. The heat can melt and ignite road asphalt, destroy electric powerlines, and weaken the metal on transmission and cell towers. It can damage bridges and railroad lines forcing a rerouting of normal traffic possibly for months.

Environment

Natural Gas Pipeline

Environmental damage from a natural gas pipeline should be very limited even if a fire has started. The immediate disruption to the surface environment will take a while to re-vegetate, but without a fire there should be no long-term effects. If a fire is initiated, the impact will be more apparent, but, like any other fire will eventually heal. With a natural gas line rupture there are few if any residual products in the soil that could cause environmental problems years later.

Petroleum Product Pipeline

Spills from a petroleum product pipeline can have a major long-term impact on the environment even if the product does not ignite. Petroleum products, in concentration, are hazardous to both plants and animals. Acute sort term exposure by animals can cause burns, eye irritation, neurological impacts and lung damage that can in many cases lead to coma and death.[15]

Liquid petroleum products will, like water, seek the lowest place. A large spill will therefore flow down gullies, entering streams and rivers damaging fish, fish habitat waterfowl, and mammals that rely on that watercourse.

Figure P-2 Whatcom Falls Park, 2003[16]

A spill's long-term environmental impacts can include pollution of the soil, the groundwater, and even, depending on the underlying strata, the local aquifer.

A large petroleum pipeline rupture resulting in an explosion and fire will effectively destroy all vegetation and animal life in the burned area. Eventually this will begin to return to the pre-spill condition, although, depending on the scale of the damage, it might take years. Figure P-2 shows the resurgence of vegetation in Bellingham's Whatcom Falls Park in 2003, four years after the spill and explosion that destroyed large portions of it. While the tall firs that were destroyed still stand the understory has already largely reclaimed the damaged property.

Economic and Financial Condition

Natural Gas Pipeline

Due to the usually limited nature of the damage from a natural gas pipeline rupture and explosion the economic impacts should be limited to any businesses in the immediate vicinity of the rupture and to the owner of the pipeline itself. Unless there is direct damage to roads or rail, rerouted traffic should be back to normal within a short period after the line has been purged and any fire put out.

Petroleum Product Pipeline

The economic and financial impact from a petroleum product pipeline rupture, spill and explosion would vary considerably depending on where in the County the incident happened. A rupture and resulting explosion in the Port of Tacoma could destroy a number of businesses, temporarily close down some international shipping terminals, and impact rail lines. If close to Interstate 5, it could close the freeway requiring a rerouting of north-south traffic until such time as the fire is put out and clean up around the freeway is complete.

In contrast, a rupture, with a resulting fire, in the southern portion of the County would impact a small, localized population. While the economic impact to those communities would be high the overall impact to the County would probably not be very great.

Public Confidence in the Jurisdiction's Governance

Natural Gas Pipeline

Unless there is some circumstance that exacerbates the problems associated with the rupture there should be little if any impact on the public's confidence in whichever jurisdiction the incident happens. Normal response should be similar to the natural gas line rupture in Sumner, May 1st, 2003. In this case there was a small evacuation, the fire department responded, Northwest Pipeline shut down the gas, bled out the line and repaired it.

If there are exacerbating problems, for example a highway closure, fiery explosion damaging buildings or causing deaths, the public's confidence will depend entirely on how effective the response was perceived to be. If there are questions about the response, the public's confidence will decrease. If the response is perceived to be good there will be no decrease in the public's perception of the incident, and it will be quickly forgotten.

Petroleum Product Pipeline

The public's confidence will be directly related first to the immediate impact on themselves. A spill and explosion in the southern, more rural portion of the County that impacts very few people will not having people questioning the response nearly as much as one in the more populated, industrialized portions. This is especially true if there are many deaths, economic loss is great, or the infrastructure that impacts them personally is compromised. There will be comparisons with the 1999 Bellingham incident that will question whether the oversight that was implemented since then, was adequate and carried out.

Resource Directory

Regional

- **Municipal Research and Services Center of Washington**
  http://www.mrsc.org/Subjects/pubsafe/pipesafety.aspx
- **Pierce County Department of Emergency Management**
  https://www.piercecountywa.gov/2397/Local-Emergency-Planning-Committee
- **Washington State Citizens Committee on Pipeline Safety**
  http://wutc.wa.gov/pipeline/ccops
- **Washington State Utilities and Transportation Commission**
  http://wutc.wa.gov/home

National

- **Federal Energy Regulatory Commission**
  http://www.ferc.gov/
- **National Pipeline Mapping System**
  http://www.npms.phmsa.dot.gov/publicsearch/Attribute.asp?AreaType=COUNTY&AreaValue=53053
- **Pipeline and Hazardous materials Safety Administration**
  http://www.npms.phmsa.dot.gov
- **U.S. Department of Transportation, Office of Pipeline Safety**
  http://primis.phmsa.dot.gov/comm/Index.htm?nocache=6811

Endnotes

[1] Cornell University Law School Legal Information Institute. 49 U.S. Code § 60101 – Definitions. Retrieved March 18, 2015 from https://www.law.cornell.edu/uscode/text/49/60101
[2] Office of the Law Revision Council United States Code. Accessed Sept. 23, 2019 from https://uscode.house.gov/view.xhtml?path=/prelim@title49/subtitle8/chapter601&edition=prelim
[3] Williams Northwest Pipeline website on Northwest Pipeline Operations, http://www.northwest.williams.com/NWP_Portal/extLoc.action?Loc=FilesNorthwest&File=pipelineInfo.html
[4] Phone Conversation with Grant Jensen of Williams Pipeline Corp, 04/13/2010.
[5] Washington Counties, Cities and Towns with Interstate Pipelines, Municipal Research and Services Center of Washington, http://www.mrsc.org/Subjects/PubSafe/pipecities.aspx
[6] Olympic Pipe Line Company Spill Response Plan, prepared by TRP (Technical Response Planning Corporation, 8203 Willow Place South, Suite 160, Houston, Texas 77070, 2002, Appendix C, pp. 2-4
[7] McChord Pipeline Company website, http://www.mcchordpipeline.com/
[8] Olympic Pipe Line accident in Bellingham kills three youths on June 10, 1999, on historylink.org at http://www.historylink.org/index.cfm?DisplayPage=output.cfm&File_Id=5468
[9] Washington Significant Incidents Listing, U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration, http://primis.phmsa.dot.gov/comm/reports/safety/IncDetSt_st_WA_flt_sig.html?nocache=8206#_ngtrans
[10] Incident Response: Natural Gas and Electric Incidents, booklet published by Puget Sound Energy, 411 108th Ave. N.E., Bellevue, EA 98004, p.4
[11] The range can vary due to differences in the chemical composition of the gas, "as well as temperature pressure and humidity", Incident Response: Natural Gas and Electric Incidents, booklet published by Puget Sound Energy, 411 108th Ave. N.E., Bellevue, EA 98004, p.5
[12] Washington Significant Incidents Listing, U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration, http://primis.phmsa.dot.gov/comm/reports/safety/IncDetSt_st_WA_flt_sig.html?nocache=8206#_ngtrans
[13] Public Health Statement for Automotive Gasoline, Agency for Toxic Substances and Disease Registry, http://www.atsdr.cdc.gov/toxprofiles/phs72.html
[14] Olympic Pipe Line accident in Bellingham kills three youths on June 10, 1999, on historylink.org at http://www.historylink.org/index.cfm?DisplayPage=output.cfm&File_Id=5468
[15]The Oiled Wildlife Care Network, Wildlife Health Center, U. C. Davis, http://www.owcn.org/about-oiled-wildlife/effects-of-oil-on-wildlife
[16] Olympic Pipe Line accident in Bellingham kills three youths on June 10, 1999, on historylink.org at http://www.historylink.org/index.cfm?DisplayPage=output.cfm&File_Id=5468