3.18 HEALTH AND SAFETY

3.18.1 Affected Environment

The affected environment consists of resources that could be potentially impacted by an accident involving the proposal, and existing facilities and activities that could present a health or safety impact, with or without the project. Because a major issue is the potential for a petroleum spill or transport accident with or without the project, the affected environment includes major transport and handling routes and locations affected by the project and by No Action. In general, these include:

- pipeline alignment from Snohomish County to Pasco,
- truck terminal at Kittitas,
- barge activity areas near Harbor Island, Cherry Point, Marche Point, Puget Sound, and the Strait of Juan de Fuca,
- barge routes along the Pacific Coast and up the Columbia River to Portland,
- barge routes up the Columbia and Snake Rivers, and
- truck/barge terminals at Portland, Clarkston, and Umatilla.

The greatest geographical concentration of product per mile at a common location is along the pipeline. The greatest distance involved with transport of northwest refinery product to Pasco is via barge.

Resources that could be potentially impacted by an accident include vegetation, wetlands, wildlife, water (including Puget Sound, the Pacific Ocean, the Columbia and Snake Rivers, and dozens of smaller rivers), fisheries, people, and other resources. These are described in other sections of this EIS.

Existing facilities and activities that could present a health or safety impact include OPL's existing pipeline system, current petroleum product barging and terminal operations, and existing petroleum product trucking. This existing risk is summarized below, with the details presented in Appendix A. In addition, there are other pipeline systems, such as gas pipelines, that could be damaged during construction, thereby presenting a health or safety impact.

The design and operation of pipelines, barges, and trucks are closely regulated by federal and state agencies, as summarized below.

3.18.1.1 Applicable Regulations

Regulations are in place to reduce the potential for accidents involving pipelines, barges, and trucks. The transportation of hazardous liquids by pipeline is governed by 40 CFR Part 195, which prescribes safety standards and reporting requirements. The regulation prescribes minimum design requirements for pipelines and specifies the requirements for operation and maintenance.

The U.S. Coast Guard (USCG), through Title 33 (Navigation and Navigable Waters) and Title 46 (Shipping) of the Code of Federal Regulations, is the federal agency responsible for vessel inspection, marine terminal operations safety, coordination of federal responses to marine emergencies, enforcement of marine pollution statutes, and marine safety (e.g., navigational aids), and is the lead agency for marine spill response.

Subchapter C of CFR Title 49, Hazardous Materials Regulations, prescribes the requirements of the U.S. Department of Transportation (USDOT) governing the transportation of hazardous materials by, among other modes, interstate carriers by motor vehicle. The requirements also cover the manufacture, fabrication, marking, maintenance, reconditioning, repairing, or testing of containers, including cargo tanks, which are used in the transportation of hazardous materials, including petroleum products.

The Washington Utilities and Transportation Commission (WUTC) regulates public utilities in Washington such as telephone, electricity, natural gas, and refined petroleum. Part of this authority includes pipeline safety.

3.18.1.2 Existing Risk of Oil Spills, Fires, or Explosions

Existing petroleum transport facilities and activities, including pipelines, marine vessels, and trucks, have been involved in accidents in the past and have the potential to become involved again. Types of accidents include product releases, fires, and explosions and in the case of trucks, freeway and roadway accidents with the potential for collision, fires, injuries, and fatalities.

Product releases due to human error and at transfer points/fittings are the most common type of accident. This includes all points at which transfer moves from one mode of transport or storage to another. It also includes all physical transfer points such as pumps, valves, and hoses. In most cases, the released product flows with the terrain and collects in low spots. The released product can also begin producing flammable vapors after it is released. These vapors are blown with the wind and can ignite if they encounter an ignition source. If the vapors ignite, they normally burn back to the liquid and the vapors emanating from the pool begin to burn. An explosion is possible but unlikely.

The U.S. Coast Guard (DOT 1992) found that 80 percent of the volume of spills from vessels was from groundings, and that double hulls would prevent most grounding spills. In Washington from 1983 to 1996, major pipeline spills were smaller in volume than major vessel spills, but out of the 44 spills tracked, 86 percent were due to human or program error. In general, the less amount of human involvement in transport, the fewer number of spills.

Gasoline has a low flash point and is classified as a flammable material. The flash point of a liquid is the temperature at which sufficient vapors are produced at the surface of the liquid to be ignited by a flame. Gasolines are capable of producing a flammable vapor cloud at ambient temperatures. Diesel and jet fuel have flash points above 38°C (100°F) and are classified as combustible instead of flammable. They are not capable of producing a flammable vapor cloud under 38°C (100°F) unless heated to or above their flash points. If a combustible fuel were to be released under pressure as a spray, the resulting aerosol cloud may be flammable.

Estimates for the expected likelihood of accidents are presented in Appendix A and summarized below. The possibility of accidents from the existing OPL facilities remains the same, with or without the project, and constitutes a component of the existing environment.

Existing Olympic Pipeline. The existing 644 km (400-mile) OPL pipeline system in western Washington has had a total of 42 releases over its 32-year operating life (OPL 1998, Table 2.9-1), which is a spill rate exceeding one spill per year. Of these, 17 have been spills greater than or equal to 50 barrels (bbls) or 2,100 gallons in volume. Twelve of the releases have been along the pipeline and 29 at terminals, junctions, or stations. Statistics are included in Appendix A. The 400-mile distance involves main lines and all branch and delivery lines, pump stations, valves, and transfer points owned by OPL as part of the system from the northwest refineries to Portland.

Based on OPL=s history and historical data on liquid pipeline failure rates, zero to two releases per year can be expected from the existing pipeline system, with zero to one of these releases possibly being over 50 bbls in volume. Based on historical experience, the chance is greater than 50 percent that these releases would occur at an OPL terminal, junction, or station, where the probability is high that the spill would be contained by the facility itself.

Existing Barging. A portion of the demand for refined petroleum products in eastern Washington is served by barge transportation of products. Barges on the Columbia River are loaded at the Tidewater Barge Lines, Inc. (Tidewater) terminal in Portland, Oregon, or at Vancouver, Washington, with products transshipped from oceangoing barges or tanker ships, or from the Olympic pipeline at OPL=s Vancouver, Washington, terminal. Essentially all upriver petroleum transport is conducted by Tidewater. These barges move upriver and discharge their cargos at Chevron=s terminal on the Snake River at Pasco, at the Tidewater terminals immediately upriver in Pasco, or at Tidewater terminals at Umatilla and near Clarkston. In 1995, approximately 43 percent of the demand for petroleum products in eastern Washington, or about 35,000 bbls per day, was met by barges traveling up the Columbia River (Energy Analysts International, Inc. 1995). In 1993, Tidewater carried an average of 33,000 bbls per day (Columbia River Towboat Association n.d.).

The current Tidewater fleet operating on the Columbia River consists of three large liquid bulk barges with approximately 65,000 bbls capacity each, and smaller 30,000 bbls capacity dual-use dry/liquid bulk barges. Currently, about 292 barge trips per year are made. The current trend is to discontinue the use of small dual-purpose barges for transport of product cargos, and to utilize the existing fleet of larger liquid bulk barges (OPL 1998, Appendix B-2, Product Spill Analysis). As barges are replaced, new barges will be double-hulled.

These barges receive product for upriver shipment via two major modes, the Olympic Pipeline and tanker shipment from the four northwest refineries through the Strait of Juan de Fuca.

Existing Trucking. Truck transportation has a higher historical number of releases per volume of product transported per mile than pipelines or marine vessels. Volume per release is much smaller. In addition, it has the highest fatality rate of the three transport modes because accidents may result in the truck driver=s death or the death of an occupant in another vehicle or vehicles involved in the accident. The maximum amount of product that can be released from a truck accident is less because a release is limited to the amount of product that can be carried in a truck (generally, 8,000 gallons). For an accident in which gasoline is released, a fire may occur due to the flammable properties of gasoline and the possible sources of ignition (e.g., sparks, electrical sources, ignition of the vapor cloud from nearby vehicles, or other sources). There is a relatively low probability that spills of diesel or jet fuel would ignite, due to the higher flash point of these products.

Fatality Rates. The USDOT Research and Special Programs Administration=s 1990 National Transportation Statistics - Annual Report provides information which puts the relative safety of trucks and pipelines, as well as other modes of transportation, in perspective.

The fatality rate for each mode was determined by dividing the number of fatalities by the number of ton-miles transported. The results are summarized in Table 3.18-1, with the risks normalized to produce a value of 1 for the lowest rate of the four categories so that the relative risks of the transportation modes may be more easily seen. Pipelines had the fewest number of fatalities per ton-mile transported. As shown in Table 3.18-1, highway transportation results in roughly 300 times more fatalities than pipelines for a given number of ton-miles transported. Order-of-

Table 3.18-1. Normalized Fatality Rates for Transportation Modes

Mode	Rate
Pipelines (all fatalities)	1
Marine (excluding recreational boating fatalities)	3
Rail (all fatalities including those at grade crossings):	40
Highway (only truck fatalities)	300

Source: USDOT Research and Special Programs Administration=s 1990 National Transportation Statistics - Annual Report.

Note: The fatality rate for each mode was determined by dividing the number of fatalities by the number of ton-miles transported. The risks are normalized to produce a value of 1 for pipelines, so that the relative risks of the transportation modes may be more easily seen.

magnitude comparisons between the other modes could be stated similarly.

Because truck accidents often, in addition, result in fatalities to persons in automobiles which are not included in the statistics, the trucking fatality figure shown in the table is low. That is, if the fatality figures for automobile passengers in truck-related accidents were included, the highway fatality rate listed in the table would be higher. Such statistics, however, are not readily available.

Product Releases. The expected number of petroleum product releases per year of any volume from the 65 tanker trucks per day presently transporting petroleum product to eastern Washington across Stevens and Snoqualmie Passes is 4.3. See Appendix A for details.

3.18.1.3 Potential Sizes of Releases to the Environment

Releases of petroleum product to the environment can impact many resources, including biological resources, water, land uses, and public safety. The previous section addressed the potential for accidents. This section addresses the potential size of releases.

Pipeline Systems. Leaks in pipeline systems can occur in gaskets, valves, tanks, and the pipeline itself. Most leaks are small (defined as less than 50 bbls [2,100 gallons] in volume, but frequently are much smaller such as would occur at a gasket or seal leak). However, pipeline ruptures can result in the release of a great deal of product (50 to 5,000 bbls or more).

The amount of product that can escape from a pipeline is comprised of the amount of product that can escape due to pumping prior to discovery of the leak and stopping of the pipeline pumps, plus the amount of product that can drain from the pipeline after the pumps are stopped. The amount of product that can be released from a pipeline is also a function of the diameter of the pipeline, the size of the hole in the pipeline, the pumping rate of the pipeline, the location of the leak relative to the elevation profile of the pipeline, the location of the pipeline valves, and the time it takes to detect the leak, shut down the pumps, and close appropriate valves.

The potential for small releases is greater than for a large release because small releases have historically occurred much more frequently. A study by the California State Fire Marshal (1993) regarding spill size distribution for releases from the approximately 12,553 km (7,800 miles) of hazardous-liquid pipelines in California resulted in the following conclusions:

- Twenty-seven percent of the incidents resulted in spill volumes of 1 bbl (42 gallons) or less.
- The median spill volume was 5 bbls (210 gallons).
- Sixty-one percent of the incidents resulted in spill volumes of 10 bbls (420 gallons) or less.
- Eighty-two percent of the incidents resulted in spill volumes of 100 bbls (4,200 gallons) or less (thus 18 percent of the spills were greater than 100 bbls [4,200 gallons]).

- Ninety percent of the incidents resulted in spill volumes of 650 bbls (27,300 gallons) or less.

- Ninety-five percent of the incidents resulted in spill volumes of 1,750 bbls (73,500 gallons) or less.

- The largest spill volume was 31,000 bbls (1,302,000 gallons).

Marine Vessels. Marine vessel transportation of petroleum products can result in releases during transfer and transit. Chambers Group, Inc. (1994) shows that the historical spill size distribution from terminals is approximately the same whether loading barges or tankers. Loading and unloading releases are normally small, while releases during transit are larger. The potential impacts from marine vessel spills are usually quite different than from pipeline or truck releases because the latter spills are not always in rivers or marine waters. The maximum size spill from a marine tanker or barge can equal the loaded capacity of the vessel, which can be 65,000 bbls (2.7 million gallons) for a barge or more for a tanker.

Trucks. The maximum size release from a tanker truck is the entire contents of the truck, which is approximately 190 bbls (8,000 gallons). Table 3.18-2 presents historical data on spill size distributions from truck releases which shows that most of the maximum load capacity is spilled 25 percent of the time when there is a release.

Table 3.18-2. Historical Spill Size Distributions from Truck Releases

Spill Size		
Barrels	**Gallons**	**Percent**
2.4	< 100	44
2.4 - 24	100 - 1,000	19
24 - 119	1,000 - 5,000	12
119 -190	5,000 - 8,000	25

Source: FEMA/USDOT/USEPA (undated).

A truck spill would normally occur on the roadway and flow with the contour of the road and surrounding terrain. It is also possible that such a release can enter an enclosed storm drain, drainage ditch, culvert, or the soil, or eventually enter a stream, lake, or wetland.

3.18.1.4 Safety

Pipeline, barge, and truck accidents can all present hazards to the public. Petroleum products, especially gasoline, can ignite and produce radiant heat that can burn people in or near the fire. Gasoline vapors may also travel with the wind away from the actual release area and ignite. A truck carrying a petroleum product may become involved in an accident with another vehicle, causing death or injury to the truck driver and/or occupants of the other vehicle and property damage. (A May 1998 tanker truck accident in Pennsylvania resulted in the death of the driver and another vehicle driver, included a tour bus, and closed a major freeway for 2 months due to fire damage.) A spill from a marine vessel, although likely to produce water pollution and associated impacts, does not normally present a safety hazard because the spill is on water and away from members of the public. (A large barge spill near Rhode Island included 1,000,000 gallons of product on waters and beaches with no loss of human life or injury.) Spills at storage terminals are generally contained by required secondary containment facilities. Fires or explosions at terminals are rare and much less frequent than at refineries or processing facilities which involve pressurized vessels and higher temperatures. Combinations of these examples (i.e., a tanker truck accident and fatality at a product terminal near Portland in early 1998) can happen as well. All modes of transport present safety issues.

3.18.1.5 Solid, Hazardous, and Toxic Materials and Waste

Petroleum products are, in most cases, hazardous materials. If ingested, most petroleum products, including gasoline, fuels, oils, etc. are toxic. Ingestion, however, is not a reasonable result of construction or operation of a petroleum product pipeline system. Petroleum products are not designated as hazardous wastes, although used or waste oils sometimes are. The proposed pipeline would not transport used or waste petroleum products.

3.18.1.6 Emergency Response Plans

Emergency response plans (also called Spill Prevention, Control, and Countermeasure [SPCC] plans) are required and have been prepared for the existing OPL facilities. The outline for the existing plan is included as an appendix to the amended ASC (OPL 1998). These plans provide detailed actions to be taken in the event of potential accidents. The plans include specific notification lists and procedures, and the equipment, personnel, and contractors available for response actions. Response action management and responsibilities are designated, including capabilities and responsibilities of local emergency response facilities and personnel. The plans cover actions including shutdown of the system, pinpointing the location of a release as necessary, closure of valves, procedures and actions for containment and recovery of spilled materials, stream and river protective actions, cleanup, and other areas.

Emergency response plans are reviewed and updated periodically. The plans are intrinsic parts of personnel training and are required to be developed and in place before operation of a facility. Because they include description of names, phone numbers, equipment specifications, and locations, they are not available during the licensing process but are developed during design and construction. An SPCC plan will be required before operation of the proposed line under USDOT regulations.

3.18.1.7 Monitoring and Detection

The existing OPL pipeline system includes a Supervisory Control and Data Acquisition system, referred to as a SCADA system. In addition to providing for control and operation of the pipeline, the SCADA system provides leak detection capability by continuously monitoring (24 hours per day for 365 days per year) pipeline pressures, throughput, valve positions, pumping actions, and other variables. If the pipeline system parameters vary beyond normal values, the SCADA system provides warnings, alarms, or system shutdown as necessary.

The SCADA system can detect leaks or releases from the OPL pipeline system. The time required for detection varies inversely with the rate of release. That is, large leaks or ruptures are detected quickly, while small leaks require more detection time. A major failure or a leak greater than a few percent of flow can be detected immediately and the line shut down in minutes. A slow leak, near or below 1 percent of flow, may not be detected by SCADA and may not be detectable until it is visible at the leak location, via color, sheen, or vegetation effect.

The pipeline ROW is patrolled regularly by OPL personnel. This inspection is intended to detect activities on or near the ROW that could pose a threat to the pipeline, such as construction or excavation, as well as to detect discolored soil, dead vegetation, or other evidence of small leaks. This includes ground patrols and aerial fixed-wing aircraft inspections (at an average height of about 300 m or 1,000 feet above ground level) every 2 weeks.

The pipeline cathodic protection system is inspected periodically for proper operation. This system impresses a continuous electrical voltage on the metallic pipe itself, creating a barrier at the pipe surface, preventing electrolytic deterioration of the metal in water, wet soil, or other corrosive conditions over time. The current is supplied from anodes buried in the soil at intervals along the pipeline or at the other facilities. There are two types of cathodic protection: impressed current systems and galvanic systems. An impressed current anode is located in the soil either in a deep, well-ground bed or in a horizontal ground bed. The anode is interconnected to a direct current (DC) source, called a rectifier that is energized by conventional alternating current (AC) power sources.

3.18.2 Environmental Consequences

3.18.2.1 Proposed Petroleum Product Pipeline

Construction Impacts. Construction of the pipeline system pump stations and terminal has little or no potential for impacts on public health and safety, although construction accidents could affect construction workers. Potential traffic/transportation impacts are discussed in greater detail in Section 3.10, Traffic and Transportation. Impacts would be minimal because when trenching across roads, every effort would be made to maintain one lane of traffic through the use of flaggers and steel plates over open trench areas. If construction was not completed during work hours, all trenches across public roads would either be backfilled to grade or heavy steel plates would be placed across the trench and the location appropriately marked with warning signs prior to the completion of the day's work activities. Also, temporary closures would be planned to avoid peak travel times.

Construction workers could be at risk during construction in the Snoqualmie Tunnel (see Section 3.2, Geology, Soils, and Seismicity).

Construction activities could conceivably result in damage to other underground utilities. If such a utility were a flammable-gas pipeline or a flammable-liquid pipeline, any resulting fire could pose a hazard to nearby members of the public. However, because of the extensive efforts taken to locate and identify underground utilities in the vicinity of excavation work (a requirement of law), such damage to underground pipelines during construction would be extremely unlikely.

Impacts to traffic safety, and to the public, at road crossings or due to construction in or near road ROW can be mitigated by normal warning signing and lighting, and traffic control measures during construction. The potential impact would be negligible.

Operational Impacts - Overall Proposal. No health and safety impacts are expected to occur during operation unless an abnormal situation arises, such as an accident. Normal operation of a buried pipeline, pump stations, and terminal would not impact health or safety. However, because the probability of a spill over a projected 30-year project life approaches 100 percent, the project is likely to cause a pipeline spill over that period. (The project would also reduce the potential for other spills, as discussed for No Action later in this section). The preparation and implementation of emergency response plans for the system may result in impacts on community emergency response resources and personnel (see Section 3.17, Public Services and Utilities for impacts to fire fighting departments), merely by the required existence of the plans. These plans, developed in concert with the agencies and local emergency response personnel, can contain commitments to assist and enhance local capabilities.

Accidents associated with operation of the pipeline system can impact the health and safety of the public, as well as damaging other areas of the environment such as wetlands, fisheries, wildlife, and others. Spills of petroleum product at a pump station or at the Kittitas Terminal, although likely to be confined to the secondary containment areas, could ignite and pose the risk of radiant heat from the fire affecting members of the public who may be near the pump station or terminal. Fencing and security measures at each facility would limit public access.

The potential impacts resulting from a petroleum product release are a function of two measures: the probability of a release happening, and the possible volume of a spill. The actual risk of any facility can be expressed as frequency of occurrence times consequences of an event.

Probability of Pipeline Spill. The probability of a spill must take into account the characteristics of the proposed pipeline. The proposal is the construction of approximately 370 km (230 miles) of petroleum product pipeline, intended to initially transport 60,000 bbls per day (2,520,000 gallons per day) of gasoline, diesel, and jet fuel. The system would eventually expand to an ultimate capacity of 110,000 bbls per day (4,620,000 gallons per day) if demand supported such delivery.

The pipe would be 35.6 cm (14 inches) in outside diameter for approximately 200 km (124 miles) to Kittitas, and 30.5 cm (12 inches) in diameter for about 171 km (106 miles). The pipe wall thicknesses would be 0.71 cm (0.281 inch) for the 14-inch-diameter portion and 0.64 cm

(0.250 inch) for the 12-inch-diameter portion. Thicker pipe would be used at road, railroad, and stream crossings, and on bridges. The pipe material would be steel, with full-penetration, multiple-layer, X-ray checked, arc-welded connections. The pipe would be strengthened, coated, or protected with any of several materials as appropriate for the location (see project description in Chapter 2).

Several protective measures would be implemented, including cathodic protection of the steel pipe, burial in appropriate materials to a depth of a minimum 1.2 m (4 feet) below agricultural and other lands and deeper at other locations (including, at river crossings, burial to a minimum of 0.6 m [2 feet] below the scour depth), and clear marking of the ROW. Periodic tests and inspections of the pipeline would be carried out to meet or exceed legal requirements.

As described, the pipeline is state of the art, and its expected performance may be described through the use of statistics applicable to modern pipelines. Historically, leaks and ruptures in underground pipeline systems have been due to a number of causes (see Table 3.18-3). These causes are documented, for the most part, by the spill reports required by the USDOT Office of Pipeline Safety. Measures to reduce the causes of pipeline failure shown in Table 3.18-3 are as follows:

- **Third-party actions** have historically been the greatest causative factor in pipeline spills. Such activities include excavations during which the digging equipment hits and ruptures the pipeline or weakens slopes, post-hole drilling in which the pipe is pierced, and other such events. Marking and frequent surveillance of the ROW, as well as relatively recent legislation requiring notification of construction in the vicinity of pipelines and other underground utilities, are intended to reduce this cause of pipeline accidents.

- Cathodic protection electrical systems, pipeline wrapping and coating, use of corrosion inhibitors in the liquid being transported, and internal inspection of the pipe are intended to reduce the effects of **corrosion.**

- The use of computer-supported pipeline control and monitoring systems (see SCADA system description above) and operator training are intended to reduce the frequency of **operator error.**

- Construction techniques, particularly full-penetration arc welding and 100 percent X-ray inspection of welds, contribute to reduced incidence of **material and weld failures** in the pipe.

The age of a pipeline has been shown by historical experience to influence spill probability. A differentiation must be made between pipelines constructed in past years according to different (and usually less stringent) regulations, with poorer materials and methods, and with lesser protective measures, and the separate fact that pipelines experience an increasing probability of spill merely as a result of age, regardless of when they were built.

Table 3.18-3. U.S. Pipeline Failures by Cause

	Percentage in U.S.	
Cause of Spill	**1980-1990**	**1994-1996**
Third-Party Action, including Natural Causes	32	26
Corrosion (Internal and External)	27	23
Operator Error	7	7
Material Failure	4	5
Weld Failure	2	6
Other/Unknown (1)	29	33

Source: Office of Pipeline Safety, 1990, 1997.

(1) Since 1985, a separate recording of pipeline failures due to Amalfunction of equipment@ has been maintained by the USDOT Office of Pipeline Safety. This category appears to contain between 3 and 9 percent of all incidents. Prior to 1985, malfunction of equipment was included in the Aother@ category, and has been included here in the Aother@ category for consistency over the time period used.

There is a decided lack of usable data describing the increase in failure probability with age for modern pipelines (i.e., late 1980s and 1990s). Substantial data are available on the failure rate with increasing age for earlier pipelines. Considering the advances in construction methods, materials, inspection, control, and regulations, modern pipelines are expected to experience less increase in failure rate with age than older pipelines. Therefore, the use of age data for older pipelines is conservative (i.e., over-estimates the increase in failure rate of new pipelines with age).

The usual measure of pipeline spill probability is releases per mile per year. The expected rates of release for Aleaks@ (less than 50 bbls in volume) and Aruptures@ (50 bbls or more in volume) for the proposed pipeline are shown in Table 3.18-4. These rates are based on historical pipeline failure rates, adjusted for new construction and the diameter of the proposed project pipe. Data, methods used for the calculations, and references are contained in Appendix A.

Table 3.18-4 Projected Pipeline Project Failure Rates

Segment	Diameter (inches)		Pipeline Age: 0-5 years	5-15 years	15-25 years	25-30 years
			Failure Rate per Mile per Year			
Thrasher -Kittitas	14	Leaks	8.75×10^{-5}	1.75×10^{-4}	2.1×10^{-4}	4.9×10^{-4}
		Ruptures	3.75×10^{-5}	0.75×10^{-4}	0.9×10^{-4}	2.1×10^{-4}
Kittitas -Pasco	12	Leaks	1.05×10^{-4}	2.1×10^{-4}	2.5×10^{-4}	5.9×10^{-4}
		Ruptures	4.5×10^{-5}	0.9×10^{-4}	1.1×10^{-4}	2.5×10^{-4}

Note: A "leak" is a release of less than 50 barrels. A "rupture" is a release of 50 barrels or more.

Table 3.18-5. Estimated Spills per Year for the Proposed Project

Segment	Length (Miles)		Pipeline Age: 0 - 5 years	5 - 15 years	15 - 25 years	25 - 30 years
			Spills per year			
Thrasher - Kittitas	120	Leaks	0.0105	0.0210	0.0252	0.0588
		Ruptures	0.0045	0.0090	0.0108	0.0252
Kittitas - Pasco	107	Leaks	0.0112	0.0225	0.0268	0.0631
		Ruptures	0.0048	0.0096	0.0118	0.0268
Total Expected Spills per Year (Leaks+Ruptures)			0.031	0.0621	0.0746	0.1739
Expected Recurrence Interval (Years)			32	16	13	6
Probability of one or more spills per year			3%	6%	7%	17%

Note: A "leak" is a release of less than 50 barrels. A "rupture" is a release of 50 barrels or more.

Table 3.18-5 shows the estimated number of failures for the proposed pipeline per year. These values were calculated by multiplying the length of each segment, in miles, by the failure rates in spills per mile per year from Table 3.18-4. The estimated spill rate for the new 370 km (230-mile) line when it is 30 years old is 0.1739 per year. This is less than one might expect, based on the 644 km (400-mile) existing line, which has 1.03 spills per year projected. This is due to risk factor improvements such as better welds, better pre-operation testing, better pipe materials, and construction techniques that reduce risks.

When first constructed, the proposed pipeline would have a total expected spill rate of 0.031 spills per year, or one spill over a 30-year life if the rate stayed constant (Table 3.18-5). This may be converted into a recurrence interval that is the statistically expected number of years between spills. When new, the proposed project is predicted to experience a spill every 32 years. With age, the recurrence interval between expected spills would fall from 32 years when the pipeline is new to 6 years after it has reached 25 to 30 years old. (If the new line spilled at the rate of the existing line, it would generate approximately one spill every 2 years.) Since the new pipeline would be constructed using the most recent construction techniques and materials, and would undergo inspection and maintenance techniques that were not available decades ago, the predicted spill rate as the pipeline ages is expected to increase less (i.e., the spill projections may be conservative in the later years of the proposed project=s life). Note that the existing 400-mile line, if it had a spill frequency of 4.9×10^{-4} (see Table 3.18-4), would be expected to have one spill every 5 years, which is a lower frequency than predicted (or observed) for the existing OPL line.

Volume of Pipeline Spill. The volume of a spill from a pipeline, should one occur, consists of three components or phases. The total volume of product spilled would be equal to the sum of the losses in Phases 1, 2, and 3 of a release:

- Phase 1: Spill from the moment of occurrence of the leak or rupture until the release is detected. This phase of the spill occurs with the product in the pipeline under operational pressure.

- Phase 2: Spill from the time that the release is detected until the pipeline system is shut down.

- Phase 3: Volume of product that drains from the point of release due to gravity, after the system and pumps have been shut down. This volume is influenced by the timing of valve closure, valve locations relative to the point of release, and the pipeline elevation profile as dictated by the intervening topography between the point of release and the nearest valves.

Phase 1 - Time to Detect a Spill. The proposal includes a leak detection capability as part of the SCADA system. The SCADA system would receive input data from pressure and temperature sensors along the pipeline, and compare the measured pressures to the profile of the calculated proper pressures in the line if the spill was of sufficient size to be detectable by the system. The characteristic of such a system is that the higher the rate of release during a spill, the more quickly the release is detected. A modern computer-supported leak detection system should be capable of detection, as a function of rate of release, as shown in Table 3.18-6.

Table 3.18-6. Time Required for Detection of Pipeline Leaks by a Modern Computer-Supported Leak Detection System

Rate of Releas (bbls/hr)	Time to Detect (hrs)
500	0.1 - 0.3
100	0.3 - 0.6
10	10 -14
1	24 - 30

The maximum amount of product that could be released prior to detection would occur at a release rate of 5 to 10 bbls (210 to 420 gallons) per hour for 10 to 14 hours. Over time, this 100 to 140 bbls (4,000 to 5,880 gallons) of product could be released in the hours before detection. Spills at lower rates than this, or below the detection level of the SCADA system selected, could continue for hours or days until detected at the spill location. Once detection occurs, additional spillage continues during shutdown.

Phase 2 - Time to Shut Down the Pipeline. Motor-operated valves (MOVs) or block valves such as those used for the proposed pipeline cannot be closed instantly, because the Ahydraulic hammer@ effect of suddenly stopping a long moving column of liquid could damage or rupture the pipe. MOVs could be closed in 5 minutes or less. For this phase of the spill, the time required to close the MOVs would result in the loss of approximately 385 bbls (16,170 gallons) at the ultimate capacity of the pipeline even if the pipeline were completely severed, or a loss of less than 10 bbls (420 gallons) in the event of a 100 bbl (4,200 gallon) per hour release.

Phase 3 - Drain-Down Spillage. Product loss from a leak or rupture in a pipeline can occur after shutdown as product runs out of the opening in the pipe due to gravity. Drain-down occurs because of changes in the elevation of the pipeline; product would run downhill in the pipe and out of an opening at a lower elevation. The topography in the vicinity of the leak is important because only product that is higher in elevation than the point of release would drain out. The line would not siphon until empty, it would drain until valves were closed or until that segment of the line was emptied from a higher elevation. Block valves, when closed, can prevent or reduce the volume of drain-down loss.

The project description (Chapter 2 of this EIS) lists the block valve locations on the proposed pipeline. The approximate volume per mile of a 12-inch and 14-inch line is 2,900 and 4,000 bbl, respectively. The volume that might actually spill at any location is determined largely by diameter and distance to the next high point between valves. The total volume between valves is not likely to be spilled because the elevation profile of the pipeline between any two block valves would allow only product that is higher than the point of opening to drain out. If the point of release were at the highest elevation between block valves, no drain-down loss would occur, and the total volume spilled would be limited to that lost in Phases 1 and 2 of the spill. If the point of opening in the pipe is not at the highest point between two block valves, much or all of the product in the pipe between the adjacent block valves and higher than the opening would drain out.

In any case, the maximum volume of product spilled in any scenario, during Phase 3 of a release, would be equal to or less than the volumes contained within segments between block valves. The greatest distance in steep topography in the Cascades is 13 miles, representing more than 50,000 bbl. Volumes are worst case for a detected spill because it is not likely that the entire volume could drain out.

Terminal Risks. The proposal includes the construction and operation of a terminal (the Kittitas Terminal), which would be located north of and adjacent to I-90 and east of Badger Pocket Road. This terminal would ultimately have nine tanks with an approximate storage capacity of 860,000 bbls (36,120,000 gallons) of product and a 420,000-gallon transmix/relief tank. It would include truck loading racks and parking for tanker trucks. The entire terminal would be fenced to control unauthorized access.

The terminal would include secondary containments for the storage tanks as required by law. A spill from a storage tank would be confined to the secondary containment but poses the threat of fire, or generation of a flammable gas cloud which could be ignited if a source of ignition is encountered before the gas has dispersed to a concentration below its lower flammability limit. The area of the truck loading racks would be sloped and curbed to direct product which might be spilled during loading away from the trucks and loading hoses.

The remote location of the terminal, where the general public is unlikely to be present (and public access would be virtually impossible inside the fence), poses little to no risk to the health and safety of the public. The four employees at the facility would be exposed to the risk of spill and fire. Employees, however, are aware of the risks, and are trained to prevent or minimize occurrence of an accident and how to deal with one should it occur. The public may generally be described as unaware of the risk to which they may be exposed, unwilling to accept the risk if they knew of it, and unprepared to act or respond effectively should an accident occur (response capability is addressed in Section 3.17, Public Services and Utilities). In contrast, employees are specifically made aware of risks at a facility, accept the risk as part of the job, and are trained to react effectively and in a safe manner should an accident occur. Hazards to employees at the terminal would be no greater than risks at similar modern petroleum storage and distribution facilities elsewhere.

Construction of the proposal may result in closure of marine terminals at Umatilla and Clarkston (see No Action Alternative below). Closure of two waterfront petroleum product terminals would reduce the risk to the environment and possibly to members of the public who may be in the vicinity of those terminals should an accident occur. Qualitatively, the closure of two older waterfront terminals would be expected to reduce the overall level of risk to the environment and the public by more than the construction of the one newer inland Kittitas Terminal would increase this risk.

Trucking Risks. The proposal would essentially eliminate the petroleum product tanker truck transshipment activity crossing Snoqualmie and Stevens Passes. Local deliveries would continue a similar levels with or without the project. Based on mileage estimates and further discussion included with No Action (below), the proposal would result in near elimination of the annual projected number of northwest refinery transshipment petroleum product truck accidents, projected to be 4.3 spills and 1.7 fatalities per year at 65 trucks per day in 1997 under the No Action Alternative (Table 3.18-7). There would continue to be a residual risk with or without the proposed project due to service station deliveries along the I-90 and SR 2 routes. By 2026, risk of spills and fatalities would be reduced further if the proposal is implemented, because of an increase in truck traffic projected for the No Action Alternative. These benefits would be reduced somewhat by more truck traffic in some areas in eastern Washington (see No Action discussion below).

Table 3.18-7. Projected Spills and Fatalities Due to Trucking Under the No Action Alternative

Year	Expected No. of Spills per Year	Expected No. of Fatalities per Year
1997	4.3	1.7
2014	6.7	2.7
2026	8.5	3.4

Tidewater Barge Company has stated in a letter (Hickey pers. comm.) that if the proposal is constructed, Tidewater will discontinue barge shipments of petroleum products, and will close its Umatilla and Clarkston terminals. If barge operations supporting petroleum product transportation are halted at these two terminals, additional trucking of product might occur. At the Umatilla terminal, approximately 25 trucks per day would potentially divert an additional 39 km (25 miles) to Pasco. For some trucks, the Pasco locations may actually reduce miles. At the Clarkston terminal, about 9 trucks per day would potentially be diverted or rerouted to other points, but projections of any specific distances or alternative routes of travel would be speculative. In summary, if the barge operations are stopped and the two terminals are closed as a result of the construction of the proposal, the risk posed by trucking petroleum products as replacement of those terminal operations would slightly lessen the trucking risk reduction which is estimated to occur if the proposal is constructed.

Barging Risks. The proposal would reduce the risk of barge spills on the Columbia and Snake Rivers by eliminating existing product barge operations tied to upriver delivery (see No Action discussion below). It would also reduce the risk of barge spill near Harbor Island, Cherry Point, and Marche Point in Puget Sound, and reduce petroleum product barge activity in the Strait of Juan de Fuca and along the Washington Coast. Texaco, for example, ships product via barge in Puget Sound and along the coast at a rate of approximately five shipments per month; the other refineries ship product via barge as well.

Operational Impacts - Columbia River Approach and Crossing Options. The risk of spill from a pipeline is related most importantly to the length of the pipeline, given that appropriate modern construction techniques are used to address individual circumstances along the pipeline route, such as road and railway crossings, watercourse crossings, areas of geologic instability, and others. Alternative routes for the proposal across the YTC and Columbia River are addressed below.

The options for crossing the YTC involve small changes in the overall length of the pipeline. The statistical effect of these length changes is much smaller than the level of uncertainty and the overall accuracy of the spill projections described earlier. Therefore, a route chosen to cross the YTC would have no measurable effect on the spill risk frequency for the proposal.

The options for crossing the Columbia River include different crossing techniques, but little change in the overall length of the proposed pipeline. The small length variations result in no major change in the spill risk projections based on pipeline length alone. However, the use of an overwater crossing of any type exposes the pipeline to hazards not relevant with underwater crossings. These hazards include vehicle or train accidents, depending on the bridge used, and vandalism, including gunfire damage, any of which could result in a spill. An armored buried crossing successfully constructed under the Columbia River would have a much lower expected spill frequency risk than an aerial crossing.

Cumulative Impacts. Because petroleum spills themselves are infrequent, and unpredictable as to time and location, there is no anticipated cumulative impact as a result of spills, nor is it anticipated that petroleum spills would be cumulative with any other project impacts.

In addition, it is not anticipated that spills from tanker trucks on the roadway or barges in Puget Sound, along the Washington Coast, or on the Columbia River would create cumulative impacts as a result of No Action. Although increased trucking would create cumulative traffic and accident incidents, and increased barging would contribute to increased lock usage, neither is considered a significant adverse impact.

3.18.2.2 No Action

Construction Impacts. There are no construction impacts on health and safety associated with the No Action Alternative.

Operational Impacts. Under the No Action Alternative, the proposal would not be built. The demand for petroleum products from northwest refineries in eastern Washington would continue to increase and would be met by using other methods of transporting products to those areas. These transportation modes would include combinations of increased trucking by road and increased barge/tanker operations in the Columbia River, Puget Sound, and along the coast. The No Action Alternative has a 100 percent probability of a spill over time just as the proposal does. The frequency and location would be different for No Action. In addition, No Action may create a greater direct risk to human health and safety than the proposal due to tanker truck activity.

From a health and safety risk assessment viewpoint, the No Action Alternative is compared to the proposal by comparing the potential safety impacts of the proposed pipeline combined with a reduction in truck and barge spill risk to the potential safety impacts of the levels of trucking and/or marine operations necessary to move the product if the new pipeline is not built. Some of these risks have been quantified. Those for which data were not available are discussed on a more qualitative basis. OPL=s existing pipeline would continue to operate at capacity in either case, and is not a factor in the health and safety differential which may exist between the proposal and the No Action Alternative. It is expected that the current trucking made necessary by capacity limitations of existing pipelines would be discontinued if the proposal is constructed, and therefore the trucking risks of the No Action Alternative must be evaluated on the total level of trucking projected, not just on the increase in trucking from the current level.

Trucking of Additional Product. Under the No Action Alternative, trucking of product would occur to meet the increased demands for petroleum products in Washington (see Chapter 2). The existing trucking of product is being done because of lack of transportation capacity in existing pipelines. According to OPL, the number of trucks necessary in the future would likely increase from the current 65 tanker trucks per day to an average of 101 trucks per day in 2014 and to 128 trucks per day in 2026. Construction of the proposal would eliminate the need for the current level of trucking, as well as preventing the need for increases in the future in the number of trucks to transport product. Each truck would carry about 190 bbls (7,980 gallons) of product and would travel from western Washington to eastern Washington from various points between Cherry Point and Harbor Island across Stevens or Snoqualmie Passes, a distance estimated (one-way) to average 443 km (275 miles). Risk of accident on return trips has not been included in this analysis.

Because the increase in trucking would be driven by the increase in demand if the proposal is not built, the health and safety impacts of the product trucking would increase over what would have been the 30-year life of the proposed project. Historical information is available to indicate the number of truck accidents, spills per accident (only about 19 percent of tanker truck accidents result in a release of cargo), and the truck-related fatalities per barrel-mile of petroleum product transported by highway. The potential number of spills and fatalities has been calculated for the total level of trucking that is projected to occur if the proposal is not constructed, based on the fact that the current trucking would not be continued if the proposed project is constructed. Two future points in time have been selected for calculation: 2014 and 2026. The projected figures are shown in Table 3.18-7. Spill and fatality projections for 1997 are also shown, based on the same calculational methodology as for the later years, but using the current (1996) trucking rates of 65 trucks per day. Spill and fatality projections for other years can be interpolated. Detailed calculations, data, and references are contained in Appendix A.

Table 3.18-7 indicates that spills and fatalities may be expected due to the increasing level of petroleum product trucking that is projected to occur if the proposal is not constructed. The volume of the trucking spills is limited to the volume that can be carried in one truck, approximately 190 bbls (7,980 gallons) (volumes of single tankers and double tankers are similar due to weight restrictions). Spills from a truck accident would flow with the contour of the ground surface and could flow into roadside ditches or storm drains, or could pool in low areas. It is considered highly likely that petroleum product spilled as a result of a truck accident would be ignited, due to sparks during the accident, the heat of the truck exhaust, or any of the other numerous sources of ignition present on and near roadways.

Barge Transportation of Additional Product. Under the No Action Alternative, barge transportation of product would continue to occur and would increase to meet the increased demands for petroleum products in eastern Washington (see Chapter 2). According to OPL, the barges on the Columbia River from northwest refineries would likely carry 22.5 million bbls (945 million gallons) per year in 2014, and 39 million bbls (1.64 billion gallons) per year in 2026. Each barge is estimated to carry up to 65,000 bbls (2.73 million gallons) of product for purposes of the calculation, although smaller volumes can be carried.

Historical information is available to indicate the number of barge leaks and ruptures per barrel of product transported. The potential number of barge leaks and ruptures has been calculated for the total level of barge operations projected if the proposal is not constructed. Two points in time have been selected for calculation: 2014 and 2026 (in addition to the 1997 expected rates). Leak and rupture projections for other years can be interpolated. The projected figures are shown in Table 3.18-8. Detailed calculations, data, and references are contained in Appendix A. If smaller barges (less than 65,000 bbls) were used, the incidence of spills would increase because more trips and transfers would be required to transport the same volume of product.

Table 3.18-8. Projected Spills Due to Barge Operations Under the No Action Alternative

Year	Expected No. of Leaks per Year	Expected No. of Ruptures per Year
1997	0.131	0.025
2014	0.155	0.030
2026	0.175	0.034

Table 3.18-8 shows that leaks and ruptures may be expected due to the level of petroleum product barge transportation projected if the proposal is not constructed. The volume of barge spills would be limited to the volume that can be carried in one large barge, approximately 65,000 bbls (2,730,000 gallons). A barge leak, not involving rupture of the hull, would release much less than the maximum cargo. The category of leaks includes spills during loading and unloading of the barges. However, a rupture of the hull would not necessarily result in a full load spilled due to partitions within the hull.

Barge spill volume and frequency are uncertain due to two factors not incorporated quantitatively in the analysis. The first factor tends to reduce future spill risk without the project, while the second tends to increase spill risk without the project. First, Columbia River barges have begun to convert to double hull. This will reduce the spill risk from groundings both in frequency and volume. This would not have a significant risk reduction from collision or major accident and would offer no spill risk reduction from transfer operations. Overall spill risk by grounding without the project may be reduced with double hull barges. Single-hull barges are still operating. As the smaller single-hull barges convert to larger double-hull barges, the frequency of spills may decrease and the potential volume of spills may increase.

The second factor not included in the analysis is ocean and Puget Sound barge operations which occur during conditions of oversubscription. These activities are not incorporated into the overall quantitative rick assessment like the Columbia River barges are. No Action increases the risk of barge and tanker spill in Puget Sound and on the Pacific Coast of Washington. The number of barges moving on Puget Sound from the northwest refineries is currently greater than the number of barges hauled up the Columbia River.

Spills from a barge accident would float on the surface of the water, since all petroleum products at issue are lighter than water. It is possible that petroleum product spilled as a result of a barge accident would ignite, although this is not necessarily certain. A fire on the water=s surface could endanger any persons in the vicinity, including those engaged in response to the spill. Estimates of injury or death to people as a result of such a fire would be speculative and without basis. Other than the potential for injury or death if a barge spill of petroleum product is ignited, injury or death of persons as a result of a barge spill is unlikely.

Water pollution and attendant impacts would occur in the event of a spill of petroleum product from a barge. Recovery of much of the petroleum product spilled is not likely. Gasoline would probably evaporate before collection efforts could be completed. Spilled diesel and other fuel oils could be recovered to some extent, if proper containment and recovery actions are taken in a timely manner.

Spill Risk of Proposal Relative to Existing Pipeline. The product spill risk of the existing pipeline can be estimated using the same statistical descriptors given above for the proposal, as adjusted for the length(s), diameter(s), and year of construction of the existing pipeline.

Using the values for a total length of 644 km (400 miles), 35.6 cm (14-inch) diameter, and 30 years of age, the existing pipeline currently poses a spill risk of 1.02 spills per year which is consistent with the known spill record. As shown in Table 3.18-5, when first constructed the proposed pipeline would have a spill risk of 0.031 spills per year. The proposal is projected to increase the spill risk posed by the entire OPL system by 3 percent without consideration for the spill risk reduction achieved by fewer trucks and barges. Details and calculations are contained in Appendix A.

3.18.3 Oil Spill Scenarios

An infinite number of pipeline spill Ascenarios@ could be postulated. The objective of selecting one or more hypothetical spill situations is to examine the environmental impacts of a spill at one or more selected locations and of some specific volume of spill at each location so that response plans may be prepared and/or potential impacts evaluated. The locations of the hypothetical spills selected for examination have considered the locations of resources especially sensitive to a petroleum product spill (e.g., wetland), locations where product would enter a waterway that would transport the spill into sensitive areas, or other considerations.

In its application for permits for the proposal, OPL carried out a product spill analysis (see Appendix B-2 of the ASC) that included a number of spill scenarios: 12 spill scenarios for the pipeline itself, two barge spills, two truck spills, and one tanker spill. The spill analysis assesses each of these hypothetical spill situations and draws a number of conclusions for each, including such information as magnitude or intensity of impact, extent and duration of impact, and the importance and sensitivity of receptors (the resources receiving the impacts).

Although the spill scenarios represent a small sample of the scope of possible product spills, the scenarios present a reasonable view of impacts that could result from petroleum product releases associated with the proposal and No Action Alternative. The only impact area not adequately covered in OPL=s choice of scenarios is the possibility of injury or death to persons, including the public, as a result of a trucking accident and spill. These impacts are discussed earlier under ATrucking of Additional Product@. A selected list of actual truck accidents is listed in Appendix A. The most recent one, a May 1998 gasoline tanker accident, killed two people.

The AVolume of Pipeline Spill@ subsection discusses the potential volume of a product release from a break at any point along the proposed pipeline. The maximum volume that could drain out of a break in the pipe, after the block valves on each side of the break have been closed, is the entire volume of product in the pipe between the block valves. It is unlikely that this entire volume would, in fact, drain out, due to elevation changes in the pipeline.

In the analysis of the 12 pipeline spill scenarios, OPL conducted a detailed drain-down analysis, considering the topography of the pipe, pipeline hydraulics, and block valve spacing (some valve locations have been relocated since the analysis). OPL calculated the Apractical worst-case discharge volumes@ for each of the 12 spill scenarios. Across the 12 scenarios, calculations indicated that 2 to 81 percent of the volume of product contained in the pipe between a particular pair of block valves would drain out. The average amount calculated to drain out was 21.5 percent of the pipe contents (details are provided in Appendix A). While this is not a definitive calculation applicable to all possible release locations along the pipeline, it is a reasonable proportion of the pipe contents that could be expected to drain out in the event of a break in the pipeline.

Scenarios demonstrated that a significant amount of product could be released with or without the project. Well over 100,000 gallons (over 24,000 bbl) of product could be released by the proposed pipeline or by the No Action barge alternative. The analysis assumed an average of 20 percent of the volume of the line to the next block valve might spill under certain scenarios, exceeding 160,000 gallons. The same 20 percent applied to a full barge yields 546,000 gallons. Total product loss of a full barge would be 2.7 million gallons. This has not happened on the Columbia River and double-hulled barges will reduce the chance of this happening in the future. It has happened elsewhere, e.g., the barge North Cape which spilled more than 800,000 gallons along the Rhode Island Coast in January 1997. In this case a double hull would have made no difference (Waterhouse et al. 1998). However, this size and location of a spill was not selected as a scenario.

Impacts are discussed in the scenarios with consideration for location, size and characteristics of the spill. These discussions are also scenarios to provide the reader with an indication of possible events. Actual events are impossible to predict. Because there are so many spill possibilities involving barging, the pipeline, or trucking, if any major spill did occur it is more likely that the spill would not match one of these scenarios than that it would match one. Actual spill events listed in Appendix A demonstrate that fact. A spill exceeding 50,000 gallons immediately adjacent to Puget

Sound last winter, for example, resulted in no release to waters, an occurrence which would not likely have been predicted in a scenario.

In conclusion, based on historical records and on product carrying capacity, both barge and pipeline are capable of spills exceeding 100,000 gallons.

3.18.3.1 Frequency vs. Volume and Spill Scenarios

The potential for a large volume spill exists with or without the project. A major pipeline rupture could release thousands of barrels of product, as shown in the spill analysis (ASC Appendix B-2 and in Appendix A of this document). Areas exposed to such pipeline spill potential would not be at risk if the proposal were not approved. A major barge accident could also release thousands of barrels into the Columbia or Snake Rivers or into Puget Sound or the Pacific Ocean. Areas exposed to barge spill risk would not be at reduced risk from northwest refinery product if the pipeline were approved. Areas along the pipeline corridor would be at reduced risk if the pipeline were not built, except for trucking activity close to some of the same resources. A 50,000 bbl spill, as an example, is possible from either scenario.

Accident and spill frequency is more likely from tanker trucks than from pipeline or barges. Spill volumes, however, are different. Maximum spill potential from a tanker truck would be 190 bbls (8,000 gallons). Such a spill could also affect the rivers and lakes along the I-90 corridor although not as directly as a pipeline crossing a river.

There are infinite spill scenarios involving size, location, season, and impact. This EIS does not attempt to describe them. As noted earlier, a number of spill scenarios are discussed in Appendix B-2 of the ASC. A major spill could occur with the project (from pipeline) or without the project (from barges). New areas and resources are at risk with the proposed pipeline. Truck spill accident risk and human health risk from traffic accident are greater without it.

3.18.4 Additional Proposed Mitigation Measures

3.18.4.1 Construction Mitigation and Subsequent Impacts

Damage to underground utilities during construction may be mitigated by liaison with the AUtilities Underground Location Center@ for the State of Washington which is located in Bellevue, Washington. This non-profit organization is run by the utility companies in Washington and has responsibility for the proposal area. The phone number for the locating service is (800) 424-5555. Upon contact by OPL, this service would notify all owners or operators of underground utilities in the vicinity of construction, who would then support the construction crews in locating and avoiding underground utilities. With this mitigation, the potential impact on other utilities from accidental damage during construction would be negligible.

3.18.4.2 Operational Mitigation and Subsequent Impacts

- # Exposure of the pipeline to vehicle or train accidents or vandalism for bridge crossings or the dam crossing of the Columbia River could occur, leading to a spill of product. Vandalism could be mitigated by applying extra protective coating, sheathing, or covering of the exposed pipeline for all exposed crossings. The impacts, after mitigation, are evaluated as negligible.

- # It is recommended that an additional block valve be placed at the west end of Lake Keechelus to reduce the potential spill volume from a leak or rupture along the lake and to remove all head pressure from a spill along the lake, which would reduce the potential spill rate.

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