DEPARTMENT OF ECOLOGY
State of Washington

Crude Oil Movement by Rail and Pipeline

Quarterly Report: October 1, 2019 through December 31, 2019

February 2020
Publication 20-08-001

Publication and Contact Information

This report is available on the Department of Ecology's website at
https://fortress.wa.gov/ecy/publications/SummaryPages/2008001.html

For more information contact:

Spill Prevention, Preparedness, and Response Program
P.O. Box 47600
Olympia, WA 98504-7600
Phone: 360-407-7455

Washington State Department of Ecology — www.ecology.wa.gov

- Headquarters, Olympia 360-407-6000
- Northwest Regional Office, Bellevue 425-649-7000
- Southwest Regional Office, Olympia 360-407-6300
- Central Regional Office, Union Gap 509-575-2490
- Eastern Regional Office, Spokane 509-329-3400

Crude Oil Movement by Rail and Pipeline

Quarterly Report: October 1, 2019 through December 31, 2019

Spill Prevention, Preparedness, and Response Program
Washington State Department of Ecology
Olympia, Washington

This page is purposely left blank.

Table of Contents

Page

List of Figures and Tables ii

Introduction 1

Crude Oil by Rail Summary 2

Crude Oil by Pipeline Summary 9

Crude Oil Spills – Rail and Pipeline 9

Crude Oil Movement by Vessel 10

An Overview of Crude Oil Movement in Washington 11

Contact Information 13

Appendix A – Washington Railroad Routes 14

Appendix B – API Gravity and Crude Oil Types 15

List of Figures and Tables

Page

Figures

Figure 1: Weekly total volumes of crude oil by rail for the 4th Quarter of 2019 7

Figure 2: Crude oil movement by route for the 4th Quarter of 2019 8

Figure 3: 12-month crude oil movement by mode 11

Figure 4: Quarterly crude oil movement by mode, January 2019 – December 2019 12

Tables

Table 1: Crude oil movement by rail 3

Table 2: Crude oil movement by pipeline 9

Table 3: Crude oil movement by vessel 10

Table 4: Crude type by API gravity 15

Introduction

To enhance crude oil spill preparedness and response in Washington State, on August 24, 2016, Ecology adopted the rule, Oil Movement by Rail and Pipeline Notification. The rule establishes reporting standards for facilities that receive crude oil by rail and pipelines that transport crude oil in or through the state.[1] Additionally, the rule identifies reporting standards for Ecology to share information with emergency responders, local governments, tribes, and the public.

This rule is the result of 2015 Legislative direction to provide a better understanding of the changing risk picture for crude oil transported in Washington State as a result of the introduction of crude oil transport by rail and the associated changes in both the volume and properties of crude moving through Washington.

Timely notice of oil movement information is necessary for emergency responders and planners to effectively prepare for and respond to oil spills and other incidents associated with transporting crude oil by rail and pipeline. Providing adequate information about the dates, routes, and properties of crude oil can help protect people living and working near railroads and pipelines, the economy, and environmental resources of Washington State.

Ecology is required to publish information collected under the rule to its website on a quarterly basis. The quarterly reports provide:

- Aggregated information on crude oil transported by rail to facilities in Washington.
- Information about crude oil movement by pipeline in or through the state.
- Reported spills during transport and delivery of crude by rail and pipeline.
- Volume of crude oil transported by vessel.

The reports are intended to inform the public about the nature of crude oil movement through their communities.

The reporting period for this quarterly report is October 1, 2019 through December 31, 2019.

[1] Chapter 173-185 WAC, Oil Movement by Rail and Pipeline Notification

Crude Oil by Rail Summary

Movement of crude oil by rail in Washington State began in 2012 and has continued to increase since that time. Rail routes transporting crude oil enter the state from Idaho near Spokane and from British Columbia near Bellingham, and Ecology continues to monitor other potential routes. Large segments of the rail routes travel along the I-5 corridor, and cross or run next to major waterways, including the Columbia River and Puget Sound. (See Appendix A for a map of railroad routes in the state.)

Capturing information on the properties of crude oil, the volume transported, and the routes used to transport it allows for proper planning, placement of resources, and opportunities to provide detailed information to responders in the event of a spill, ensuring a more effective overall response. The rule directs Ecology to gather this information by requiring facilities receiving crude oil by rail to report all scheduled crude oil deliveries to be received by the facility each week for the succeeding seven-day period. Facilities enter this information into Ecology's Advance Notice of Transfer (ANT) database.

Information reported by facilities on scheduled crude oil deliveries includes the region of origin of crude oil, the railroad route taken to the facility within the state (if known), scheduled time and volume in barrels (bbls) of the delivery, and gravity of the oil. Ecology uses the standard American Petroleum Institute (API) gravity ranges to define the crude type in the ANT database. (See Appendix B for the API gravity definition and crude type ranges.)

Ecology is required to aggregate the information provided on a statewide basis by route, week, and type of crude oil. Aggregate information from the ANT database is provided in Table 1 for the period October 1, 2019 through December 31, 2019, representing the 4th Quarter of 2019. Each week is numbered by calendar week and is aggregated by route and type of crude. The information provided includes:

- Total weekly volume in barrels (bbls) of crude oil transported by rail
- Route
- Region of origin
- Crude type
- Route volume
- Estimated number of railcars per route delivering crude oil (assumes each car holds 680 bbls)

Fourteen calendar weeks are reported in the 4th Quarter of 2019 starting at calendar week 40 and ending at calendar week 53.

Table 1: Crude oil movement by rail

Calendar week 40

Week 40 consists of only five days of reported ANT volumes due to the dates of the reporting period.

Route Segments	Region of Origin	Crude Type	Volume (bbls)	Est # Cars
1A, 2, 3	North Dakota	Light Crude	277,743	408
1A, 2, 3, 4	North Dakota	Light Crude	195,000	286
1A, 2, 3, 4, 5	North Dakota	Light Crude	210,447	309
1B, 2, 3	Alberta	Heavy Crude	58,684	86
5	Alberta	Light Crude	1,890	2
5	Saskatchewan	Light Crude	63,821	93
Weekly totals			**807,585**	**1,184**

Calendar week 41

Route Segments	Region of Origin	Crude Type	Volume (bbls)	Est # Cars
1A, 2, 3	North Dakota	Light Crude	199,181	292
1A, 2, 3, 4	North Dakota	Light Crude	390,000	573
1A, 2, 3, 4, 5	North Dakota	Light Crude	203,001	298
1B, 2, 3	Alberta	Heavy Crude	61,113	89
5	Alberta	Light Crude	4,305	6
5	Saskatchewan	Light Crude	63,689	93
Weekly totals			**921,289**	**1,351**

Calendar week 42

Route Segments	Region of Origin	Crude Type	Volume (bbls)	Est # Cars
1A, 2, 3	North Dakota	Light Crude	68,255	100
1A, 2, 3, 4	North Dakota	Light Crude	390,000	573
1A, 2, 3, 4, 5	North Dakota	Light Crude	345,416	507
1B, 2, 3	Alberta	Heavy Crude	122,362	179
5	Alberta	Light Crude	7,995	11
Weekly totals			**934,028**	**1,370**

Calendar week 43

Route Segments	Region of Origin	Crude Type	Volume (bbls)	Est # Cars
1A, 2, 3	North Dakota	Light Crude	267,391	393
1A, 2, 3, 4	North Dakota	Light Crude	260,000	382
1A, 2, 3, 4, 5	North Dakota	Light Crude	491,327	722
1B, 2, 3	Alberta	Heavy Crude	60,971	89
4, 5	Alberta	Heavy Crude	60,928	89
5	Alberta	Light Crude	12,915	18
5	Saskatchewan	Light Crude	64,230	94
Weekly totals			**1,217,762**	**1,787**

Calendar week 44

Route Segments	Region of Origin	Crude Type	Volume (bbls)	Est # Cars
1A, 2, 3	North Dakota	Light Crude	197,884	291
1A, 2, 3, 4	North Dakota	Light Crude	195,000	286
1A, 2, 3, 4, 5	North Dakota	Light Crude	345,624	508
1B, 2, 3	Alberta	Heavy Crude	61,069	89
5	Alberta	Light Crude	6,765	9
5	Saskatchewan	Light Crude	64,365	94
Weekly totals			**870,707**	**1,277**

Calendar week 45

Route Segments	Region of Origin	Crude Type	Volume (bbls)	Est # Cars
1A, 2, 3	North Dakota	Light Crude	205,250	301
1A, 2, 3, 4	North Dakota	Light Crude	390,000	573
1A, 2, 3, 4, 5	North Dakota	Light Crude	491,189	722
1B, 2, 3	Alberta	Heavy Crude	61,681	90
5	Saskatchewan	Light Crude	64,337	94
Weekly totals			**1,212,457**	**1,780**

Calendar week 46

Route Segments	Region of Origin	Crude Type	Volume (bbls)	Est # Cars
1A, 2, 3	North Dakota	Light Crude	131,978	194
1A, 2, 3, 4	North Dakota	Light Crude	325,000	477
1A, 2, 3, 4, 5	North Dakota	Light Crude	354,165	520
1B, 2, 3	Alberta	Heavy Crude	123,889	182
5	Saskatchewan	Light Crude	63,641	93
Weekly totals			**998,673**	**1,466**

Calendar week 47

Route Segments	Region of Origin	Crude Type	Volume (bbls)	Est # Cars
1A, 2, 3	North Dakota	Light Crude	269,486	396
1A, 2, 3, 4	North Dakota	Light Crude	260,000	382
1A, 2, 3, 4, 5	North Dakota	Light Crude	487,998	717
1B, 2, 3	Alberta	Heavy Crude	64,950	95
5	Saskatchewan	Light Crude	64,288	94
Weekly totals			**1,146,722**	**1,684**

Calendar week 48

Route Segments	Region of Origin	Crude Type	Volume (bbls)	Est # Cars
1A, 2, 3	North Dakota	Light Crude	135,634	199
1A, 2, 3, 4	North Dakota	Light Crude	260,000	382
1A, 2, 3, 4, 5	North Dakota	Light Crude	489,356	719
1B, 2, 3	Alberta	Heavy Crude	61,500	90
5	Alberta	Light Crude	2,460	3
Weekly totals			**948,950**	**1,393**

Calendar week 49

Route Segments	Region of Origin	Crude Type	Volume (bbls)	Est # Cars
1A, 2, 3	North Dakota	Light Crude	197,683	290
1A, 2, 3, 4	North Dakota	Light Crude	325,000	477
1A, 2, 3, 4, 5	North Dakota	Light Crude	492,582	724
1B, 2, 3	Alberta	Heavy Crude	124,115	182
5	Alberta	Light Crude	2,460	3
5	Saskatchewan	Light Crude	64,220	94
Weekly totals			**1,206,060**	**1,770**

Calendar week 50

Route Segments	Region of Origin	Crude Type	Volume (bbls)	Est # Cars
1A, 2, 3	North Dakota	Light Crude	266,962	392
1A, 2, 3, 4	North Dakota	Light Crude	65,000	95
1A, 2, 3, 4, 5	North Dakota	Light Crude	637,428	937
1B, 2, 3	Alberta	Heavy Crude	62,252	91
Weekly totals			**1,031,642**	**1,515**

Calendar week 51

Route Segments	Region of Origin	Crude Type	Volume (bbls)	Est # Cars
1A, 2, 3	North Dakota	Light Crude	268,945	395
1A, 2, 3, 4	North Dakota	Light Crude	325,000	477
1A, 2, 3, 4, 5	North Dakota	Light Crude	485,252	713
1B, 2, 3	Alberta	Heavy Crude	114,481	168
5	Saskatchewan	Light Crude	65,475	96
Weekly totals			**1,259,153**	**1,849**

Calendar week 52

Route Segments	Region of Origin	Crude Type	Volume (bbls)	Est # Cars
1A, 2, 3	North Dakota	Light Crude	203,089	298
1A, 2, 3, 4	North Dakota	Light Crude	195,000	286
1A, 2, 3, 4, 5	North Dakota	Light Crude	283,444	416
5	Saskatchewan	Light Crude	64,087	94
Weekly totals			**745,620**	**1,094**

Calendar week 53
Week 53 consists of only three days of reported ANT volumes due to the dates of the reporting period.

Route Segments	Region of Origin	Crude Type	Volume (bbls)	Est # Cars
1A, 2, 3	North Dakota	Light Crude	69,726	102
1A, 2, 3, 4, 5	North Dakota	Light Crude	212,272	312
1B, 2, 3	Alberta	Heavy Crude	52,603	77
Weekly totals			**334,601**	**491**

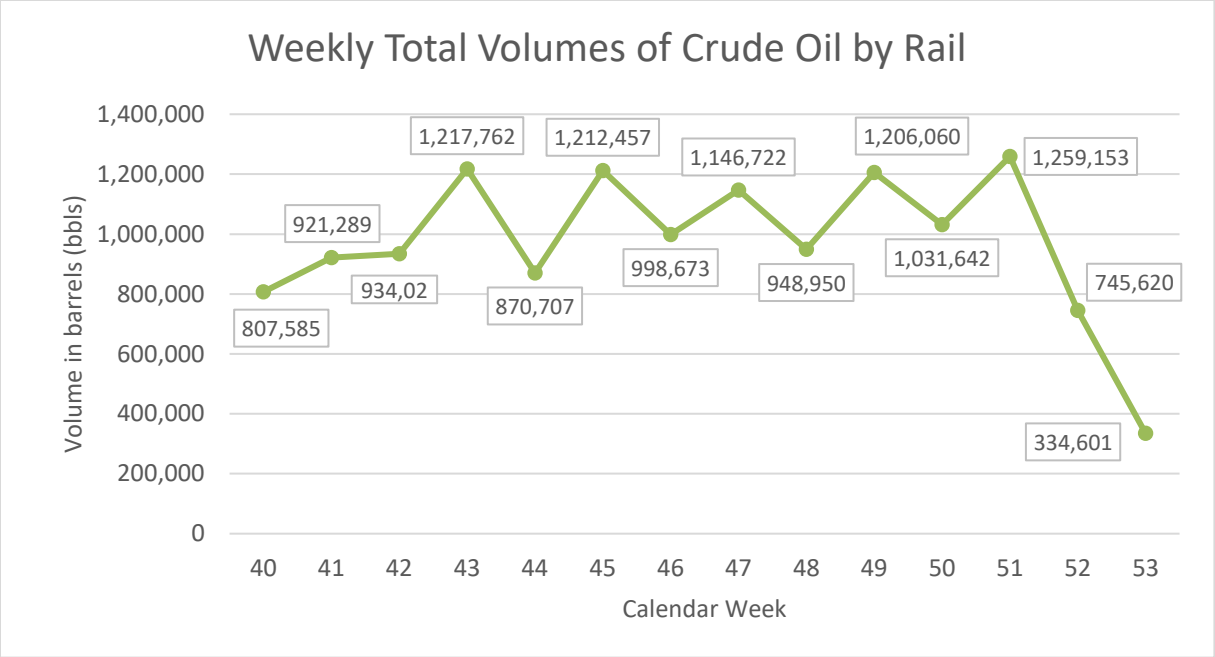
Note: *The data provided in Table 1 was reported to Ecology by the receiving facility into the ANT database as required by Chapter 173-185 WAC. Ecology cannot confirm the data or verify its accuracy.*

2019 Quarter 4 total volume (bbls): 13,635,249

A summary of the data shows:

- Three regions of origin were reported: North Dakota, Alberta, and Saskatchewan.
- Two types of crude oil were reported: heavy and light.
- Routes 1A, 1B, and 2 through 5 were used to transport crude by rail.
- The total volume of crude oil transported by rail during the quarter was 13,635,249 barrels (572,680,458 gallons).
- The average weekly volume of crude oil transported by rail was 1,037,465 barrels (43,573,513 gallons).
- The total number of rail cars moving crude oil by rail was 20,011 cars.
- The average number of rail cars per week moving crude oil by rail was 1,523 cars.
- 92.00 percent of crude oil transported by rail was light crude.
  8.00 percent of crude rail transported by rail was heavy crude.
- North Dakota was the region of origin for 87.01 percent of crude oil transported by rail.
  Alberta was the region of origin for 8.28 percent of crude oil transported by rail.
  Saskatchewan was the region of origin for 4.71 percent of crude oil transported by rail.

Figure 1 shows the weekly total volumes of crude transported by rail for each calendar week in the 4th Quarter of 2019.



Note: *Week 40 consists of only 5 days of reported ANT volumes due to the dates of the reporting period. Week 53 consists of only 3 days of reported ANT volumes due to the dates of the reporting period.*

Figure 1: Weekly total volumes of crude oil by rail for the 4th Quarter of 2019

The lowest weekly volume was 745,620 barrels (31,316,040 gallons) in Week 52. The highest weekly volume of crude transported by rail was 1,259,153 barrels (52,884,426 gallons) in Week 51.

Figure 2 displays crude transported by rail, by route, for the 4th Quarter of 2019.

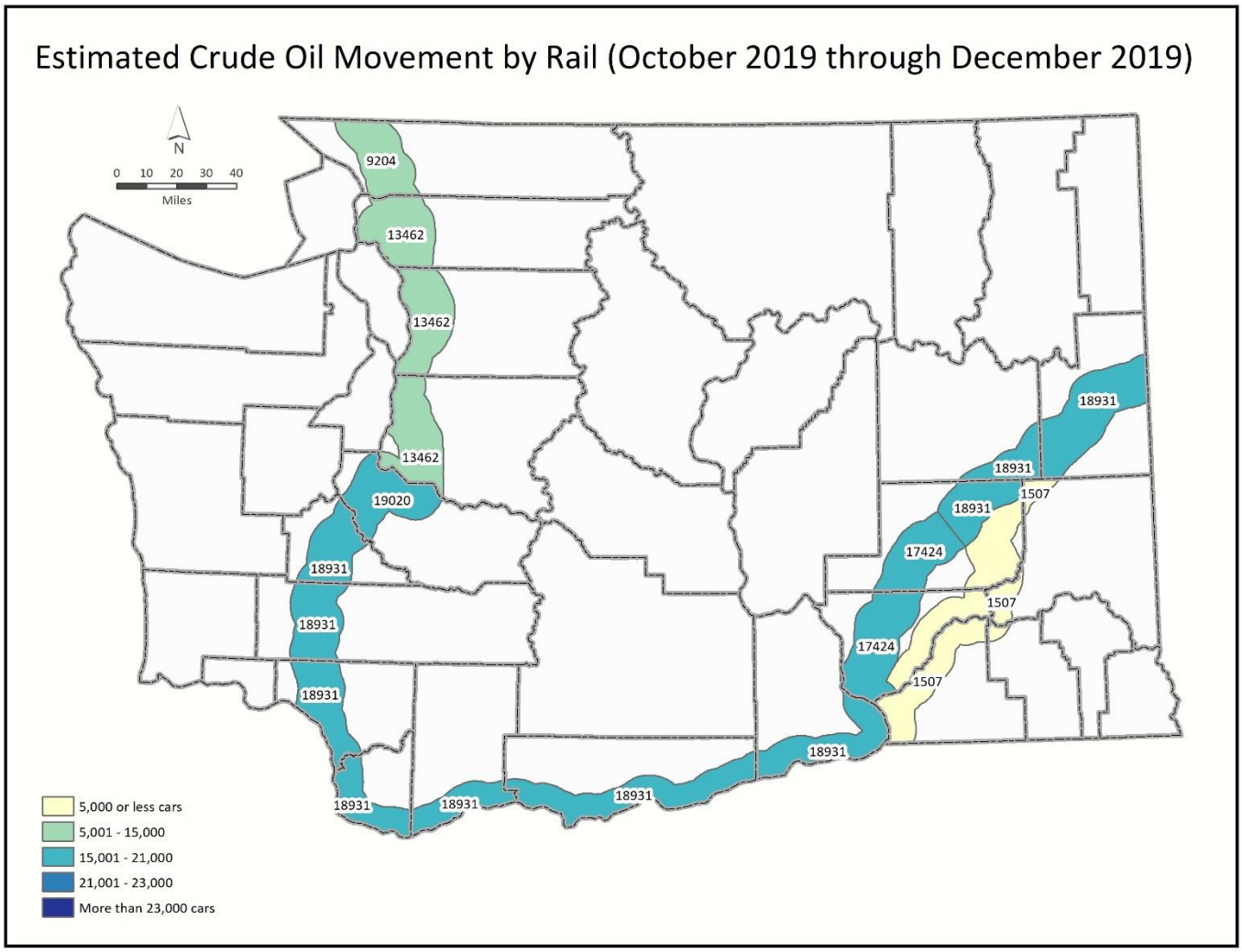


Figure 2: Crude oil movement by route for the 4th Quarter of 2019

Crude Oil by Pipeline Summary

Pipelines exist inland and may be located near waterbodies and populated areas. Knowing the types and quantities of crude oil transported through pipelines in Washington State helps Ecology properly plan for and execute a rapid, aggressive, and well-coordinated response to a spill.

Under the rule, transmission pipelines that transport crude oil in or through the state must provide Ecology biannual notice of all crude oil transported in or through the state.[2] Biannual notice must be submitted each year by July 31 for the period from January 1 through June 30, and by January 31 for the period from July 1 through December 31. Biannual notice provided by pipelines includes contact information for the pipeline and the total volume of crude oil transported in or through the state during the reporting period by state or province of origin.

The most recent biannual notices from pipelines covered the period from July 1, 2019 through December 31, 2019. Table 2 below provides the total volume of crude oil transported in or through the state by pipelines during this period.

Table 2: Crude oil movement by pipeline

Period	State or Province of Origin	Volume (bbls)
July 1, 2019 – December 31, 2019	Alberta	37,924,846
July 1, 2019 – December 31, 2019	British Columbia	16,053

Note: *The data provided in Table 2 was reported to Ecology by the pipelines transporting crude oil in or through the state, as required by Chapter 173-185 WAC. Ecology cannot confirm the data or verify its accuracy.*

The next biannual notices from pipelines will cover the period from January 1, 2020 through June 30, 2020 and must be submitted to Ecology by July 31, 2020.

Crude Oil Spills – Rail and Pipeline

Oil spills can have significant impacts to the public, environment, and economy. Ecology strives to protect Washington's environment, economy, and public health and safety through a comprehensive spill prevention, preparedness, and response program.

The rule directs Ecology to provide the number and volume of spills to the waters of the state during the transport and delivery of crude oil by rail and pipeline in each quarterly report.[3] For the period of October 1, 2019 through December 31, 2019, zero crude oil spills to the environment by rail or pipeline were reported. In the event there are spills to report in the future, Ecology will provide this information and include the date of the spill, the county where the spill occurred, the source, material, and volume of the spill.

[2] Chapter 173-185 WAC, Oil Movement by Rail and Pipeline Notification
[3] Chapter 173-185 WAC, Oil Movement by Rail and Pipeline Notification

Crude Oil Movement by Vessel

In 2006, the state adopted rules for advance notice of oil transfers for vessels and facilities. Ecology has been receiving advance notice of transfer data for all transfers to or from vessels in Washington State since that time.

In order to provide a full picture of crude oil movement in Washington State, a summary of crude oil movement by vessel is provided below, which is in addition to the requirement for this quarterly report as described in the rule.[4]

Table 3 below provides the total volume of crude oil in barrels of inbound and outbound vessel transfers for the period of October 1, 2019 through December 31, 2019. Inbound vessel transfers refers to crude oil movement from vessels to facilities, while outbound vessel transfers refers to crude oil movement from facilities to vessels.

Table 3: Crude oil movement by vessel

Vessel transfers	Volume (bbls)	Volume (gallons)
Inbound	21,420,439	899,658,443
Outbound	543,776	22,838,580
Total	**21,964,215**	**922,497,023**

Note: *The data provided in Table 3 was reported to Ecology into the ANT database as required by Chapter 173-180 WAC and Chapter 173-184 WAC. Ecology cannot confirm the data or verify its accuracy.*

A summary of vessel transfer data for the quarter shows:

- There were 59 total vessel transfers of crude oil (inbound or outbound).
- The average volume of crude oil transferred to or from vessels per week was 1,671,190 barrels (70,189,991 gallons).

[4] Chapter 173-185 WAC, Oil Movement by Rail and Pipeline Notification

An Overview of Crude Oil Movement in Washington

A broad view of crude oil movement in Washington State can be seen when comparing the movement of crude oil transported into the state by vessel, rail, and pipeline.

Figure 3 shows the estimated percentage of crude oil transported by vessel (inbound only), rail, and pipeline for the last four quarters, covering the period of January 1, 2019 through December 31, 2019.[5]

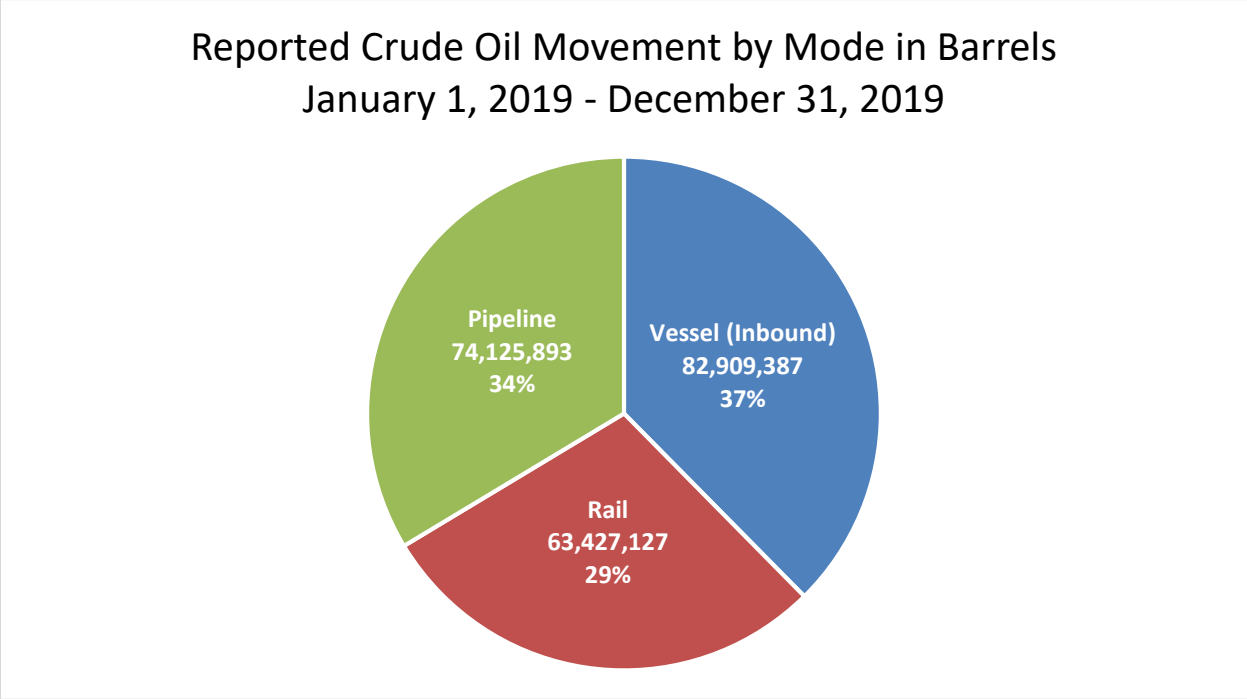
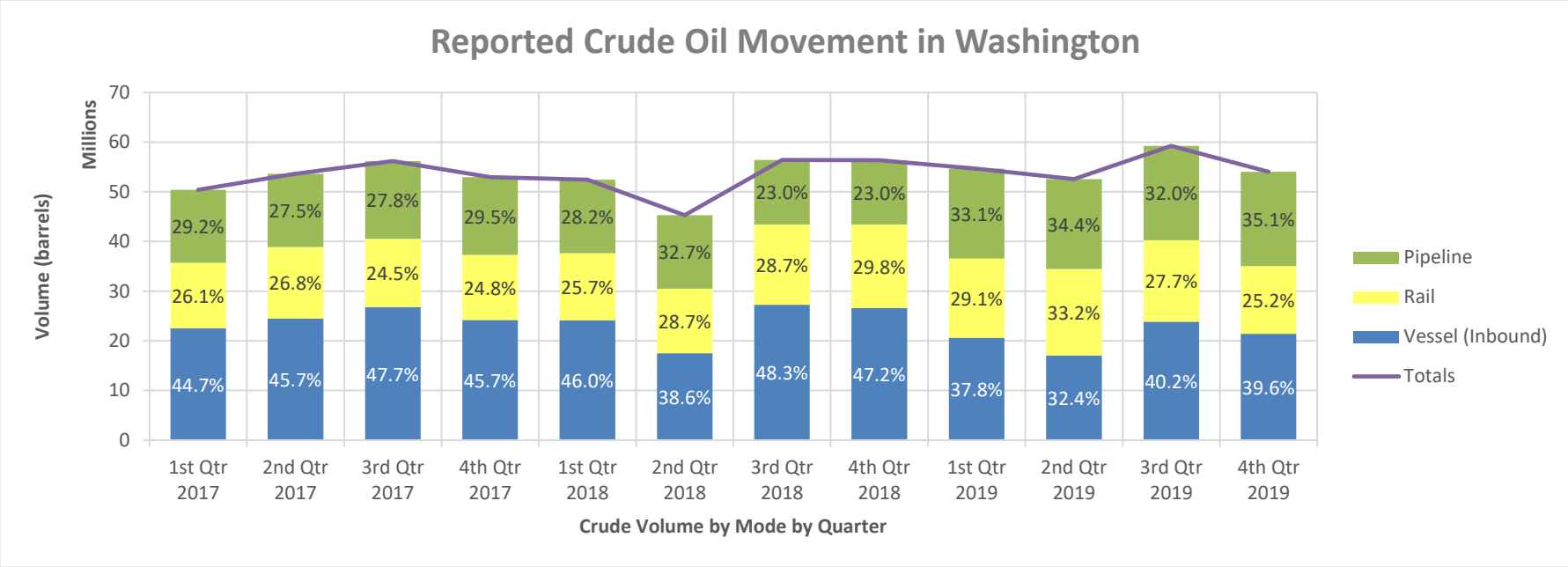


Figure 3: 12-month crude oil movement by mode

Between January 1, 2019 and December 31, 2019, vessels were responsible for 37 percent of reported crude oil movement into the state, rail was responsible for 29 percent, and pipeline for 34 percent.

[5] The most recent biannual notices from pipelines were submitted to Ecology for the period from July 1, 2019 through December 31, 2019. The next biannual notices submitted by pipelines will cover the period from January 1, 2020 through June 30, 2020, and must be submitted to Ecology by July 31, 2020.

Figure 4 shows crude oil movement, by mode, covering the period of January 1, 2019 through December 31, 2019.



Mode	1st Qtr 2017	2nd Qtr 2017	3rd Qtr 2017	4th Qtr 2017	1st Qtr 2018	2nd Qtr 2018	3rd Qtr 2018	4th Qtr 2018	1st Qtr 2019	2nd Qtr 2019	3rd Qtr 2019	4th Qtr 2019
Vessel (Inbound)	44.7%	45.7%	47.7%	45.7%	46.0%	38.6%	48.3%	47.2%	37.8%	32.4%	40.2%	39.6%
Rail	26.1%	26.8%	24.5%	24.8%	25.7%	28.7%	28.7%	29.8%	29.1%	33.2%	27.7%	25.2%
Pipeline	29.2%	27.5%	27.8%	29.5%	28.2%	32.7%	23.0%	23.0%	33.1%	34.4%	32.0%	35.1%

Figure 4: Quarterly crude oil movement by mode, January 2019 – December 2019

Ecology will continue to receive information about crude oil movement and use the data to summarize changes over time.

Contact Information

Eli Seely
Department of Ecology
Spills Program
P.O. Box 47600
Olympia, WA 98504-7600

Phone: (360) 480-3095
Email: eli.seely@ecy.wa.gov

Kevin Truong
Department of Ecology
Spills Program
P.O. Box 47600
Olympia, WA 98504-7600

Phone: (206) 276-7286
Email: kevin.truong@ecy.wa.gov

Appendix A – Washington Railroad Routes

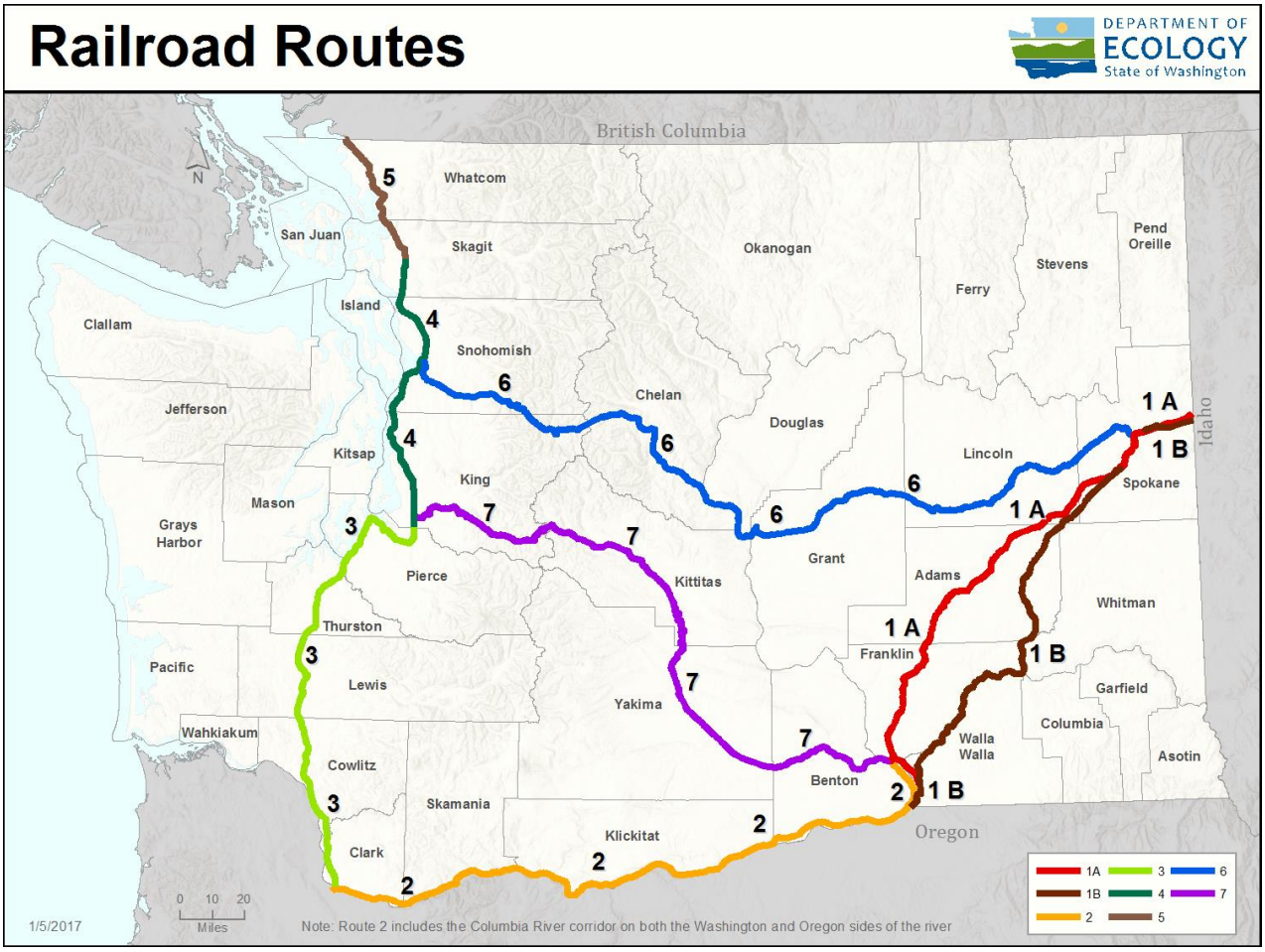


Figure 5: Railroad routes in Washington

Appendix B – API Gravity and Crude Oil Types

Information reported by facilities on scheduled crude oil deliveries includes the gravity of the oil. Ecology uses the standard American Petroleum Institute gravity (API gravity) ranges to define the crude type in the ANT database.

API gravity is the measure of the density of petroleum liquid in relation to the density of water and is used to classify oils as light, medium, heavy, and extra heavy. The lower the API gravity, the more likely it is to sink in water. Crude type by API gravity is shown in the table below.

Table 4: Crude type by API gravity

Crude Type	API Gravity Range
Light Crude	31.2-50 API
Medium Crude	22.3-31.1 API
Heavy Crude	10-22.2 API
Extra Heavy Crude	0-9.9 API