DEPARTMENT OF ECOLOGY
State of Washington

Crude Oil Movement by Rail and Pipeline

Quarterly Report: January 1, 2018 through March 31, 2018

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Olympia, Washington

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Table of Contents

List of Figures and Tables

Page

Figures

Tables

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 January 1, 2018 through March 31, 2018.

[1] Chapter 173-185 WAC

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 January 1, 2018 through March 31, 2018, representing the 1st quarter of 2018. 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)

Thirteen calendar weeks are reported in the 1st quarter of 2018 starting at calendar week 1 and ending at calendar week 13.

Table 1: Crude Oil Movement by Rail

Calendar Week 1

Route Segments	Region of Origin	Crude Type	Volume (bbls)	Est # Cars
1A, 2, 3, 4	North Dakota	Light Crude	325,000	477
1A, 2, 3, 4, 5	North Dakota	Light Crude	214,500	315
1B, 2, 3	Alberta	Heavy Crude	118,036	173
		Weekly totals:	**657,536**	**965**

** Week 1 contains six days of reported ANT volumes due to the dates of the reporting period.*

Calendar Week 2

Route Segments	Region of Origin	Crude Type	Volume (bbls)	Est # Cars
1A, 2, 3	North Dakota	Light Crude	206,343	303
1A, 2, 3, 4	North Dakota	Light Crude	325,000	477
1A, 2, 3, 4, 5	North Dakota	Light Crude	496,500	730
1B, 2, 3	Alberta	Heavy Crude	117,662	173
5	Alberta	Light Crude	64,000	94
		Weekly totals:	**1,209,505**	**1,777**

Calendar Week 3

Route Segments	Region of Origin	Crude Type	Volume (bbls)	Est # Cars
1A, 2, 3	North Dakota	Light Crude	206,006	302
1A, 2, 3, 4	North Dakota	Light Crude	390,000	573
1A, 2, 3, 4, 5	North Dakota	Light Crude	356,000	523
1B, 2, 3	Alberta	Heavy Crude	59,028	86
		Weekly totals:	**1,011,034**	**1,484**

Calendar Week 4

Route Segments	Region of Origin	Crude Type	Volume (bbls)	Est # Cars
1A, 2, 3	North Dakota	Light Crude	131,076	192
1A, 2, 3, 4	North Dakota	Light Crude	390,000	573
1A, 2, 3, 4, 5	North Dakota	Light Crude	485,300	713
1B, 2, 3	Alberta	Medium Crude	172,809	254
		Weekly totals:	**1,179,185**	**1,732**

Calendar Week 5

Route Segments	Region of Origin	Crude Type	Volume (bbls)	Est # Cars
1A, 2, 3	North Dakota	Light Crude	208,226	306
1A, 2, 3, 4	North Dakota	Light Crude	390,000	573
1A, 2, 3, 4, 5	North Dakota	Light Crude	567,000	833
1B, 2, 3	Alberta	Medium Crude	59,061	86
4, 5	Saskatchewan	Heavy Crude	7,980	11
		Weekly totals:	**1,232,267**	**1,809**

Calendar Week 6

Route Segments	Region of Origin	Crude Type	Volume (bbls)	Est # Cars
1A, 2, 3	North Dakota	Light Crude	138,556	203
1A, 2, 3, 4	North Dakota	Light Crude	390,000	573
1A, 2, 3, 4, 5	North Dakota	Light Crude	355,000	522
1B, 2, 3	Alberta	Medium Crude	58,000	85
4, 5	Saskatchewan	Heavy Crude	9,120	13
5	Saskatchewan	Light Crude	68,000	100
		Weekly totals:	**1,018,676**	**1,496**

Calendar Week 7

Route Segments	Region of Origin	Crude Type	Volume (bbls)	Est # Cars
1A, 2, 3	North Dakota	Light Crude	68,353	100
1A, 2, 3, 4	North Dakota	Light Crude	329,550	484
1A, 2, 3, 4, 5	North Dakota	Light Crude	71,500	105
1B, 2, 3	Alberta	Heavy Crude	117,334	172
4, 5	Saskatchewan	Heavy Crude	570	0
		Weekly totals:	**587,307**	**861**

Calendar Week 8

Route Segments	Region of Origin	Crude Type	Volume (bbls)	Est # Cars
1A, 2, 3	North Dakota	Light Crude	203,300	298
1A, 2, 3, 4	North Dakota	Light Crude	399,100	586
1A, 2, 3, 4, 5	North Dakota	Light Crude	286,000	420
		Weekly totals:	**888,400**	**1,304**

Calendar Week 9

Route Segments	Region of Origin	Crude Type	Volume (bbls)	Est # Cars
1A, 2, 3	North Dakota	Light Crude	200,417	294
1A, 2, 3, 4	North Dakota	Light Crude	399,100	586
1A, 2, 3, 4, 5	North Dakota	Light Crude	272,500	400
1B, 2, 3	Alberta	Heavy Crude	119,350	175
		Weekly totals:	**991,367**	**1,455**

Calendar Week 10

Route Segments	Region of Origin	Crude Type	Volume (bbls)	Est # Cars
1A, 2, 3	North Dakota	Light Crude	132,055	194
1A, 2, 3, 4	North Dakota	Light Crude	403,650	593
1A, 2, 3, 4, 5	North Dakota	Light Crude	363,000	533
		Weekly totals:	**898,705**	**1,320**

Calendar Week 11

Route Segments	Region of Origin	Crude Type	Volume (bbls)	Est # Cars
1A, 2, 3	North Dakota	Light Crude	203,370	299
1A, 2, 3, 4	North Dakota	Light Crude	390,000	573
1A, 2, 3, 4, 5	North Dakota	Light Crude	505,500	743
1B, 2, 3	Alberta	Medium Crude	118,677	174
		Weekly totals:	**1,217,547**	**1,789**

Calendar Week 12

Route Segments	Region of Origin	Crude Type	Volume (bbls)	Est # Cars
1A, 2, 3	North Dakota	Light Crude	337,898	496
1A, 2, 3, 4	North Dakota	Light Crude	399,100	586
1A, 2, 3, 4, 5	North Dakota	Light Crude	716,300	1,053
1B, 2, 3	Alberta	Medium Crude	59,115	86
		Weekly totals:	**1,512,413**	**2,221**

Calendar Week 13

Route Segments	Region of Origin	Crude Type	Volume (bbls)	Est # Cars
1A, 2, 3	North Dakota	Light Crude	133,513	196
1A, 2, 3, 4	North Dakota	Light Crude	338,650	498
1A, 2, 3, 4, 5	North Dakota	Light Crude	563,500	828
1B, 2, 3	Alberta	Medium Crude	59,366	87
		Weekly totals:	**1,095,029**	**1,609**

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.*

2018 Quarter 1 Total Volume (bbls): 13,498,971

A summary of the data shows:

- Three regions of origin were reported: Alberta, North Dakota, and Saskatchewan.
- Three types of crude oil were reported: heavy, medium, 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 13,498,971 barrels (566,956,782 gallons).
- The average weekly volume of crude oil transported by rail was 1,038,382 barrels (43,612,060 gallons).
- The total number of rail cars moving crude oil by rail was 19,822 cars.
- The average number of rail cars per week moving crude oil by rail was 1,525 cars.
- 92.0% of crude oil transported by rail was light crude, 4.1% was heavy crude, and 3.9% was medium crude.
- North Dakota was the region of origin for 91.1% of crude oil transported by rail. Alberta was the region of origin for 8.3% of crude oil transported by rail, and Saskatchewan was the region of origin for 0.6% of crude oil transported by rail.

Figure 1 shows the weekly total volumes of crude transported by rail for each calendar week in the 1st quarter of 2018.

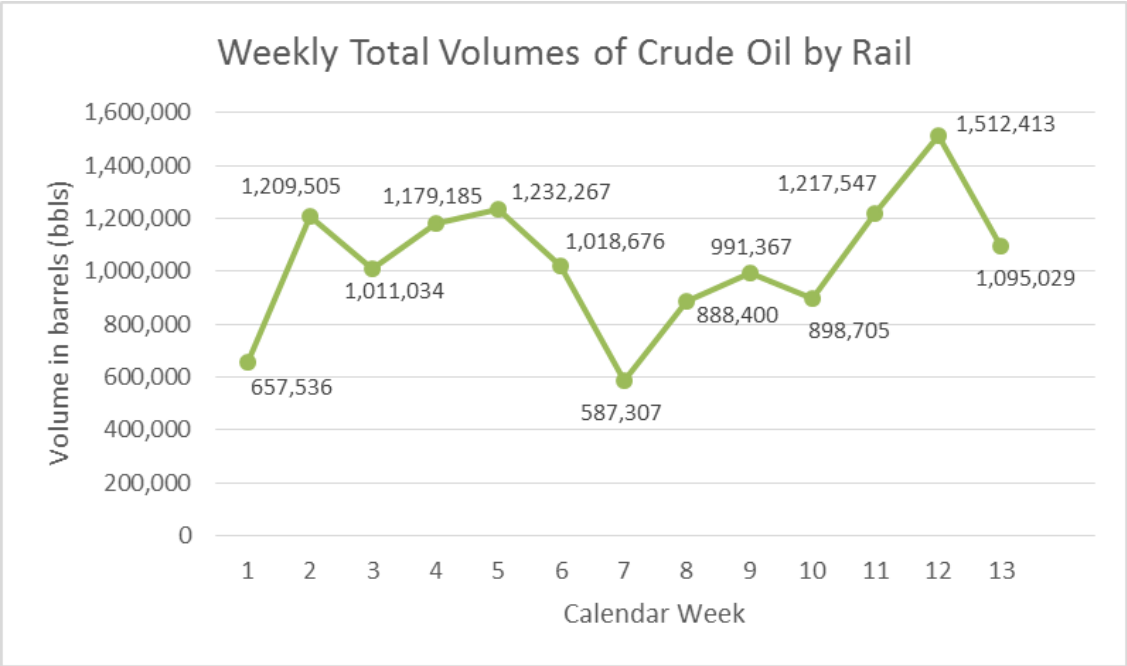


Figure 1: Weekly Total Volumes of Crude Oil by Rail for the 1st Quarter of 2018

** Week 1 contains six days of reported ANT volumes due to the dates of the reporting period.*

The lowest weekly volume was 587,307 barrels (24,666,894 gallons) in Week 7. The highest weekly volume of crude transported by rail was 1,512,413 barrels (63,521,346 gallons) in Week 12.

Figure 2 displays crude transported by rail by route for the 1st quarter of 2018.

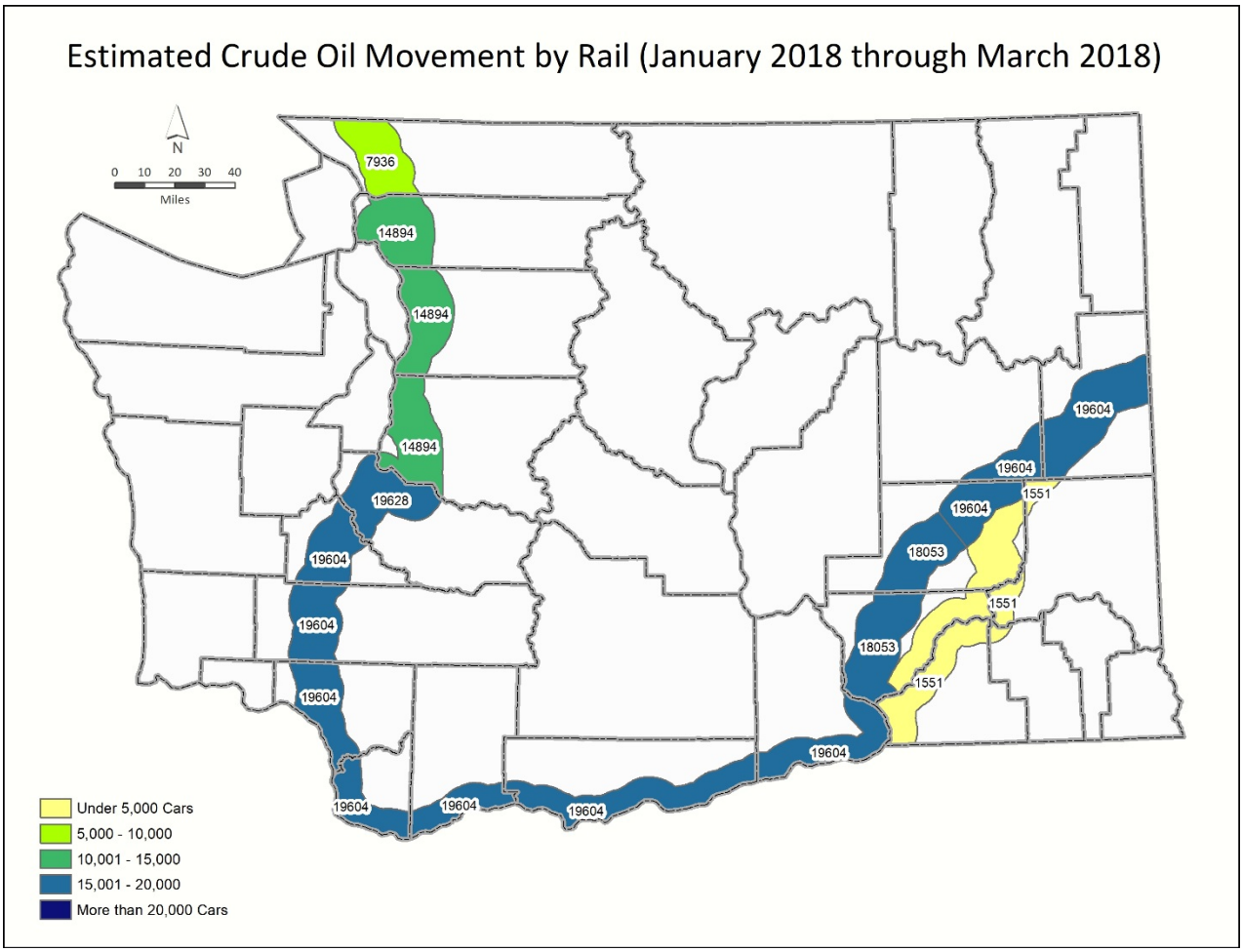


Figure 2: Crude Oil Movement by Route for the 1st Quarter of 2018

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, 2017 through December 31, 2017. 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, 2017 – December 31, 2017	Alberta	31,273,477

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, 2018 through June 30, 2018 and must be submitted to Ecology by July 31, 2018.

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

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 environment during the transport and delivery of crude oil by rail and pipeline in each quarterly report.[3] For the period of January 1, 2018 through March 31, 2018, zero crude oil spills to the environment 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.

[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 January 1, 2018 through March 31, 2018. 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)
Inbound	24,135,617
Outbound	475,679

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:

- The total volume of crude oil transferred to or from vessels for the 1st quarter of 2018 was 24,611,296 barrels (1,033,674,430 gallons).
- The total volume of crude oil transferred inbound from vessels to facilities was 24,135,617 barrels (1,013,695,930 gallons).
- The total volume of crude oil transferred outbound from facilities to vessels was 475,679 barrels (19,978,500 gallons).
- There were 75 total vessel transfers of crude oil (inbound or outbound).
- The average volume of crude oil transferred to or from vessels per week was 1,893,177 barrels (79,513,418 gallons).[5]

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

[5] The quarterly average was calculated using 13 calendar weeks instead of 14 calendar weeks because Calendar Week 53 contains only one day of reported ANT volumes due to the dates of the reporting period.

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 April 1, 2017 through March 31, 2018.*

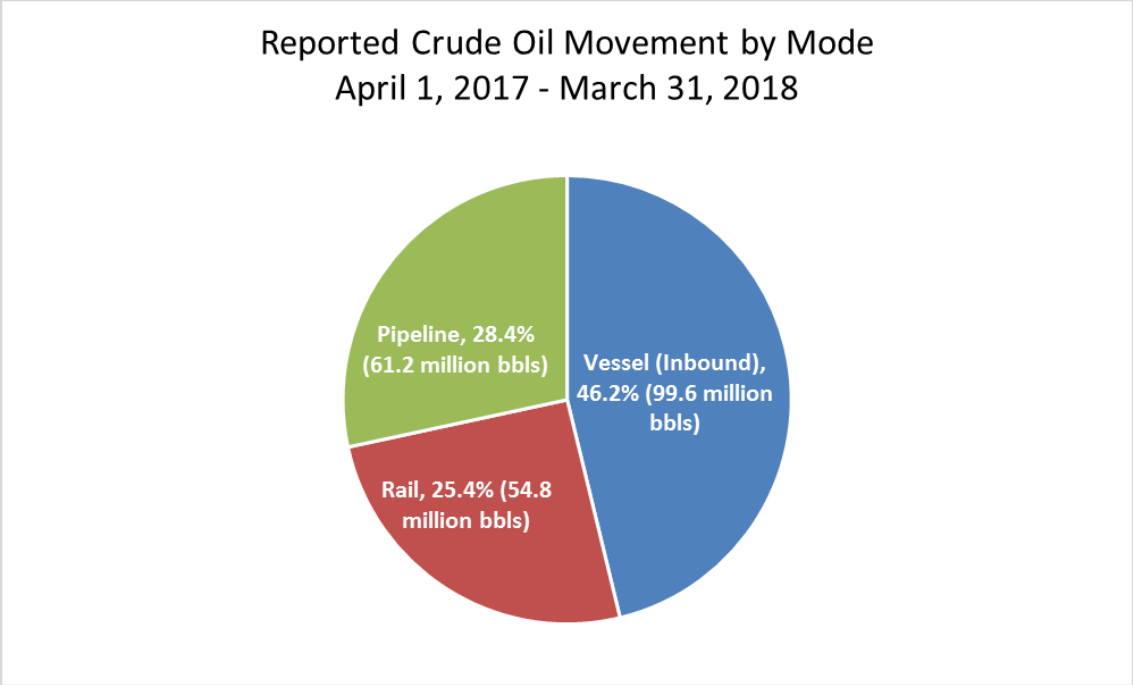
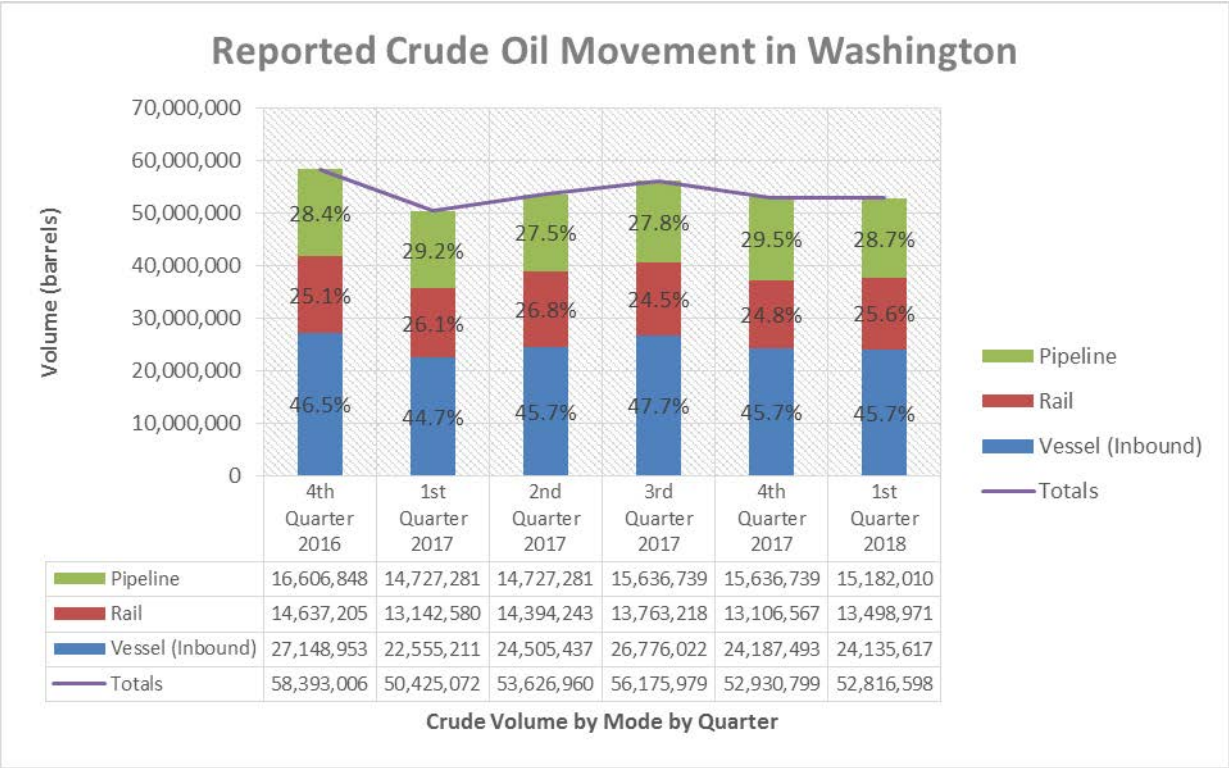


Figure 3: 12-Month Crude Oil Movement by Mode

**Note: The most recent biannual notices from pipelines were submitted to Ecology for the period from July 1, 2017 through December 31, 2017. The next biannual notices submitted by pipelines will cover the period from January 1, 2018 through June 30, 2018 and must be submitted to Ecology by July 31, 2018. For Figure 2, Ecology estimated crude oil movement by pipeline for the period based on data provided in previous biannual notices.*

Between April 1, 2017 and March 31, 2018, vessels were responsible for 46.2% of reported crude oil movement into the state, while rail was responsible for 25.4% and pipeline for 28.4%.

Figure 4 shows crude oil movement by mode for each quarter that rail and pipeline crude oil data has been collected, covering the period of October 1, 2016 through March 31, 2018.



	4th Quarter 2016	1st Quarter 2017	2nd Quarter 2017	3rd Quarter 2017	4th Quarter 2017	1st Quarter 2018
Pipeline	16,606,848	14,727,281	14,727,281	15,636,739	15,636,739	15,182,010
Rail	14,637,205	13,142,580	14,394,243	13,763,218	13,106,567	13,498,971
Vessel (Inbound)	27,148,953	22,555,211	24,505,437	26,776,022	24,187,493	24,135,617
Totals	58,393,006	50,425,072	53,626,960	56,175,979	52,930,799	52,816,598

Figure 4: Quarterly Crude Oil Movement by Mode

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

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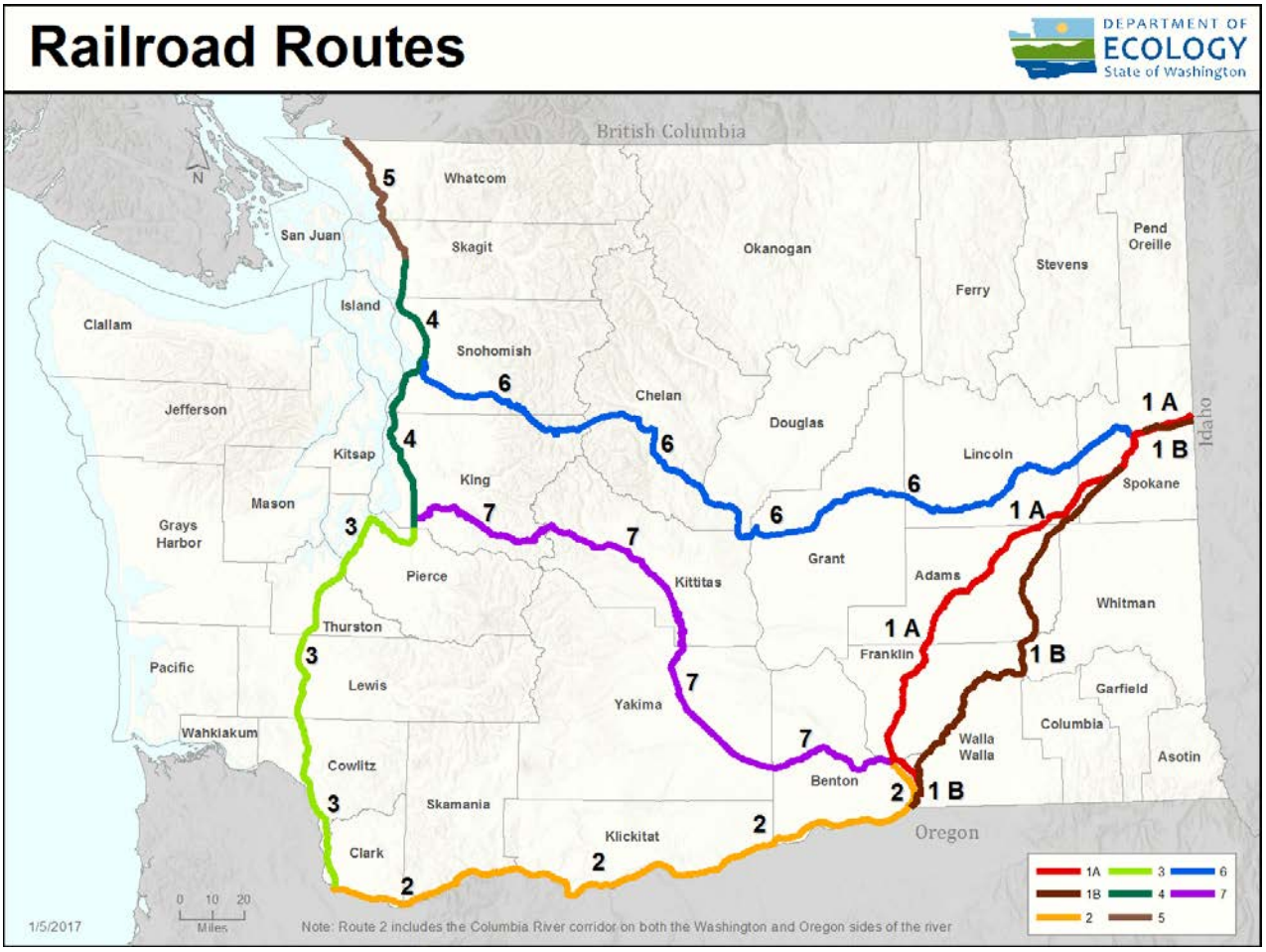
Appendix A – Washington Railroad Routes



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