HazMat Analysis: Petroleum Supply Chain

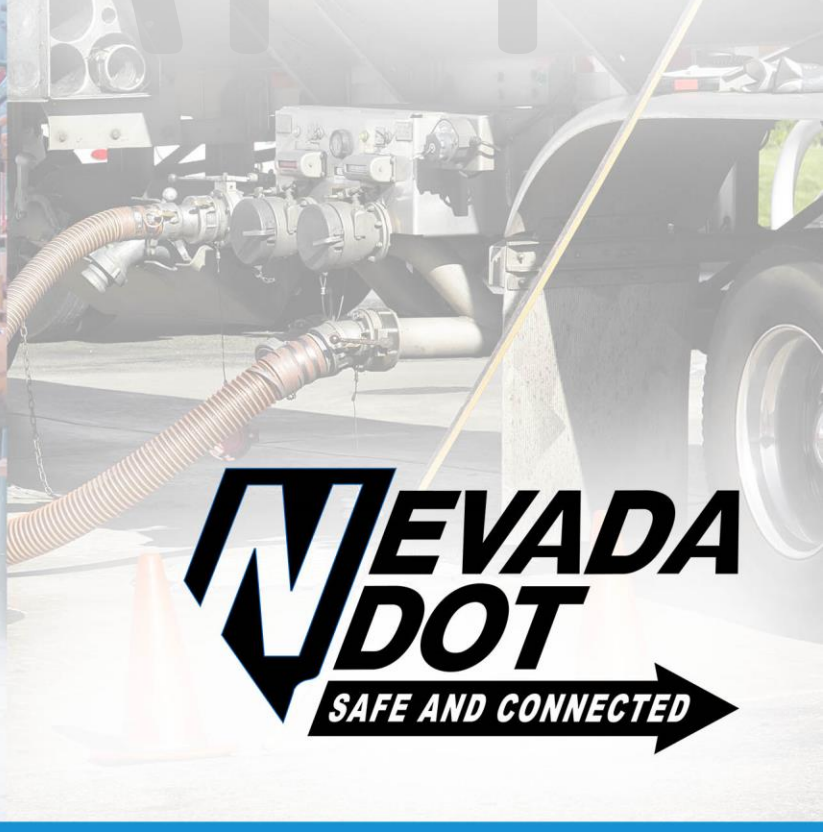
Nevada Hazardous Commodity Flow Study

prepared for

Nevada Department of Transportation

prepared by

Cambridge Systematics, Inc.



NEVADA DOT
SAFE AND CONNECTED

March 14, 2019

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date

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Glossary

Atmospheric Crude Distillation Unit (ACDU) operating capacity: The operating capacity of a refinery as determined by the maximum amount of crude oil that can flow into the distillation unit.

Barrel: A unit of volume equal to 42 U.S. gallons.

Barrels per calendar day (b/cd): The capacity of a refinery as defined by the number of barrels that a distillation facility can process in a 24-hour period under usual operating conditions.

Barrels per stream day: The capacity of a refinery as defined by the maximum number of barrels that a distillation facility can process within a 24-hour period when operating at full capacity without any downtown. Barrels per stream day is typically about 6% higher than calendar day capacity.

Barrels per day (b/d): A measure of refinery output represented by the number of barrels produced in a single day.

California Air Resources Board (CARB) gasoline: Gasoline that conforms to the gasoline and diesel specifications as defined by the California Air Resources Board. CARB diesel requires lower aromatic hydrocarbon content and a higher cetane number.

Distillate: Distillate is a general category of refined petroleum that includes diesel and fuel oils.

Ethanol: Ethanol is a clear, colorless alcohol made from a variety of biomass materials called feedstocks. Gasoline is blended with 10% ethanol to make E10 fuel.

Petroleum Administration for Defense Districts (PADDs): Geographic aggregations of the 50 States and the District of Columbia into five districts. The PADDs allow data users to analyze patterns of crude oil and petroleum product movements throughout the nation.

Petroleum Administration for Defense District (PADD) 5: The West Coast PADD district includes the western states of California, Arizona, Nevada, Oregon, Washington, Alaska, and Hawaii.

Rack: A loading facility for truck distribution to petroleum retail facilities.

Transmix: A mixture of gasoline, diesel, and/or jet fuel. Transmix forms when transported in pipelines. Transmix processing plants use distillation to separate the mix into individual transportation fuels, specifically gasoline, diesel, and jet fuel. After distillation, some additional treatments may be necessary in order to meet fuel specifications.

Transportation fuel: A category of fuel that includes the different types of gasoline, diesel, and jet fuel needed to provide fuel for automobiles, trucks, and airplanes.

1.0 Introduction

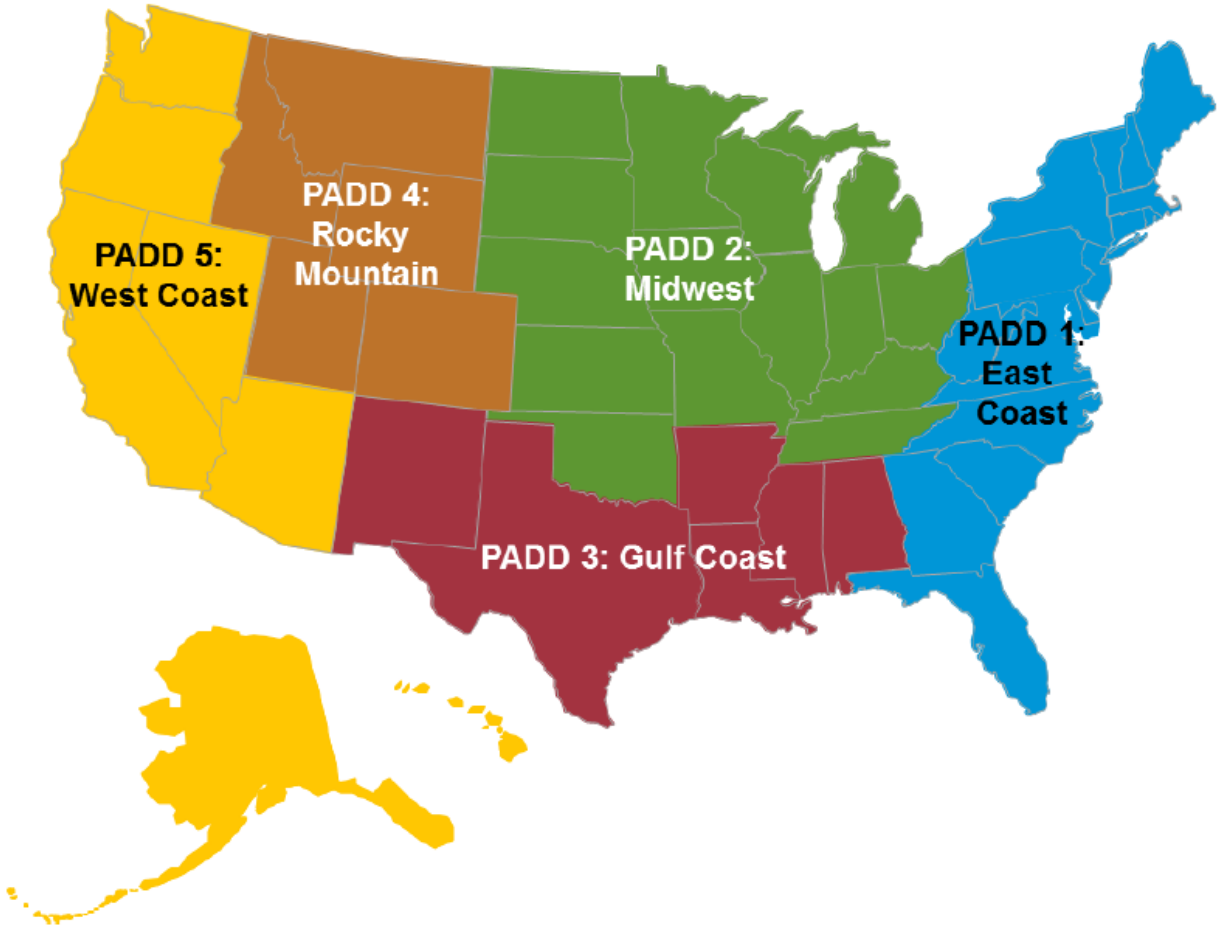
This Petroleum Supply Chain Analysis was conducted as part of the Nevada Hazardous Commodity Flow Study. This research is important as flammable liquids, especially refined petroleum products, represent 85 percent of all hazmat shipments transported in the United States.[1] Refined petroleum products include the transportation fuels needed to provide fuel for automobiles, trucks, and airplanes throughout Nevada. Though the volume of petroleum products on the roads is greater than any other hazardous material, emergency responders are well experienced in handling petroleum-related incidents. Since refined petroleum product movements comprise such a large portion of hazardous material shipments, this analysis provides insight into majority of hazardous material movements in Nevada, while at the same allowing the overall hazmat analysis to proceed with the other chemicals in the supply chain that may be less common and more dangerous due to either the nature of the chemical or the lack of preparedness.

An important source for this research is the Energy Information Administration's Petroleum Administration for Defense District 5 (PADD 5) Transportation Fuels Markets Study conducted in 2015 (EIA Report). The EIA Report examined the supply, demand, and distribution of transportation fuels in PADD 5, which includes the western states of California, Arizona, Nevada, Oregon, Washington, Alaska, and Hawaii as shown in Figure 1.1. Using a 2013 base year, The EIA Report examined PADD 5 petroleum product regional markets, marine vessel availability, and distribution infrastructure such as storage terminals, pipelines, rail facilities, marine loading and unloading facilities.[2] This study supplemented the petroleum distribution trends apparent in the EIA Report with interviews of mid-stream petroleum operators. The combination of commodity flow information and operator interviews provides a comprehensive look at the supply, demand, and distribution of transportation fuels in Nevada.

[1] BTS Freight Facts & Figures 2017 - Chapter 2: Freight Moved in Domestic and International Trade ,Table 2-6

[2] Sources included Stillwater Associates, Califor/nia Energy Commission (CEC), the Army Corps of Engineers Waterborne Commerce Statistics Center, and publicly available data from various sources.

Figure 1.1 Petroleum Area Defense Districts (PADDs)

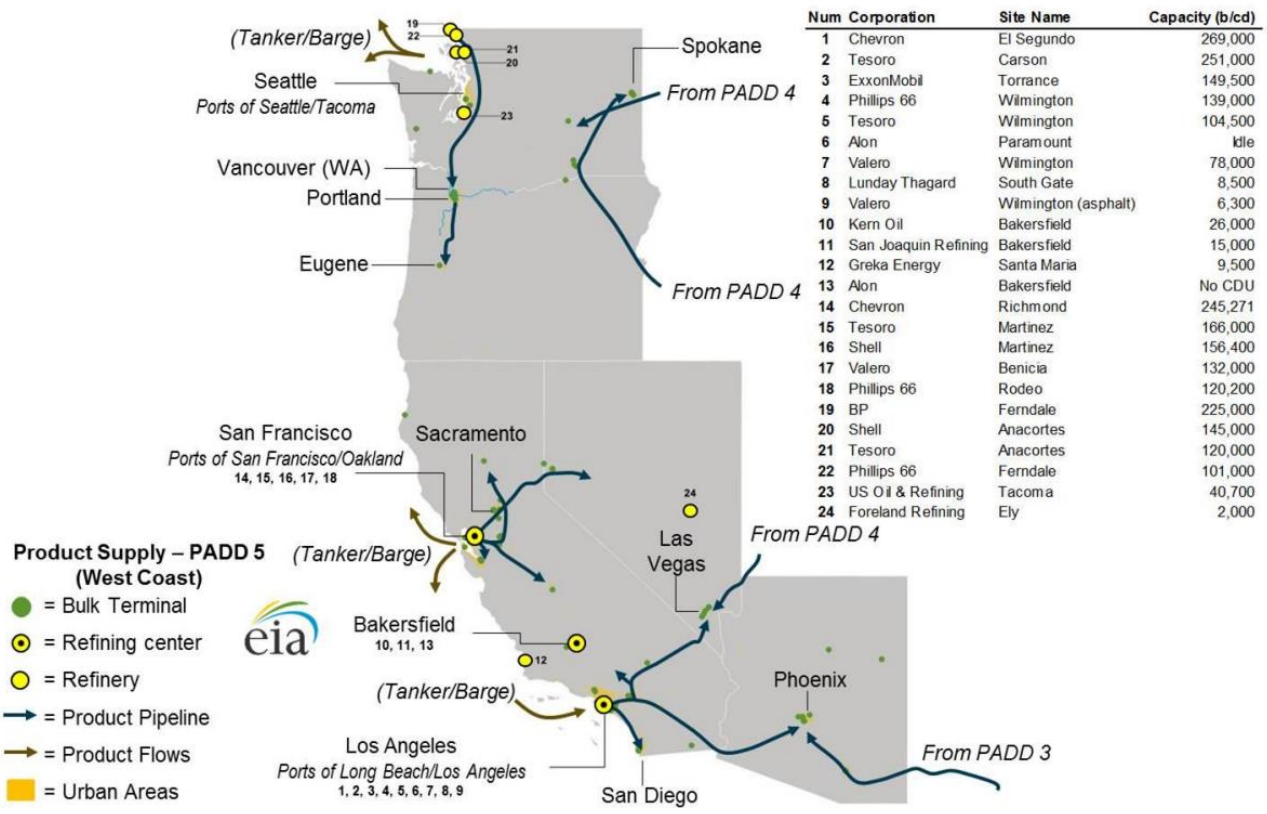


Source: U.S. Energy Information Administration

2.0 PADD 5 Transportation Fuel Supply and Demand

The PADD 5 district has limited petroleum infrastructure connections to other districts. Highways and four pipelines connect PADD 5 to PADDs 3 and 4. The Pacific coastline also connects PADD 5 with maritime transportation, but vessels must travel for 10 days from the Gulf Coast and three weeks from Asia. The infrastructure limitation stems from the lack of pipeline infrastructure that traverses the mountainous and oceanic geography between PADD 5 and other districts, as well as governance constraints dictating different fuel specifications between states. As a result, PADD 5 manufacturers and consumes the majority of its own fuel, and is essentially self-sufficient. Even so, PADD 5 does have some exchanges with other districts. The districts rely on each other to supplement any fuel type/specification shortfalls or to consume any local surpluses. The interior PADD 5 regions of Arizona, Las Vegas, and Eastern Washington do benefit from their proximity and pipeline connections to PADD 3 and 4 refineries, but the majority of the supply comes from PADD 5 production. Overall, PADD 5 has limited infrastructure for exchanging fuel with other districts and international markets, and has refineries that are able to satisfy the majority of the district's demand.

Figure 2.1 PADD 5 Refineries and Petroleum Product Distribution



Num	Corporation	Site Name	Capacity (b/cd)
1	Chevron	El Segundo	269,000
2	Tesoro	Carson	251,000
3	ExxonMobil	Torrance	149,500
4	Phillips 66	Wilmington	139,000
5	Tesoro	Wilmington	104,500
6	Alon	Paramount	Idle
7	Valero	Wilmington	78,000
8	Lunday Thagard	South Gate	8,500
9	Valero	Wilmington (asphalt)	6,300
10	Kern Oil	Bakersfield	26,000
11	San Joaquin Refining	Bakersfield	15,000
12	Greka Energy	Santa Maria	9,500
13	Alon	Bakersfield	No CDU
14	Chevron	Richmond	245,271
15	Tesoro	Martinez	166,000
16	Shell	Martinez	156,400
17	Valero	Benicia	132,000
18	Phillips 66	Rodeo	120,200
19	BP	Ferndale	225,000
20	Shell	Anacortes	145,000
21	Tesoro	Anacortes	120,000
22	Phillips 66	Ferndale	101,000
23	US Oil & Refining	Tacoma	40,700
24	Foreland Refining	Ely	2,000

Source: Energy Information Administration's PADD 5 Transportation Fuels Markets Study, 2015

PADD 5 refineries may produce enough volume for the district, but petroleum products are not fungible and the production of gasoline, jet fuel, and diesel does not match demand for various fuel specifications. In 2013, PADD 5 refineries supplied 91 percent of gasoline demand, 96 percent of jet fuel demand, and 113 percent of distillate demand. PADD 5 refineries produce more distillate than used by the district, but does not produce enough gasoline or jet fuel for internal demand. Only a limited number of refineries outside of PADD 5 actually supply refined petroleum products that meet specifications for PADD 5 states. For example, California Air Resources Board (CARB) gasoline is expensive and difficult to manufacture, and other areas of PADD 5, such as Arizona, also require special gasoline formulas. Despite fuel specification requirements, there are exchanges between PADD 5, other PADD districts, and the global market. The vast majority of gasoline, jet fuel, and diesel are produced locally. Since more distillate is produced than needed, PADD 5 exports some distillate and brings in a small amount of gasoline and jet fuel in order to meet demand and supply shortfalls. Based on this pattern, it would be expected that imports into Nevada from non-PADD 5 states would mostly be gasoline or jet fuel. This finding is consistent with the ratio of fuel that arrives in Nevada from PADD 4 discussed in Section 3.2.2.

Nevada only has two operating refineries. One of the refineries, Foreland Refining Corporation Eagle Springs Refinery in Ely, produces thick asphalt and fuel oils from locally sourced crude. The other refinery, Golden Gate Petroleum in Storey County east of Reno, is a splitting facility which distills transmix into individual transportation fuels. Transmix is a mixture of gasoline, diesel, and/or jet fuel that forms when petroleum is transported in pipelines. Transmix processing plants (also referred to as splitters) use distillation to separate

the mix into individual transportation fuels, specifically gasoline, diesel, and jet fuel. After distillation, some additional treatments may be necessary in order to meet fuel specifications. The majority of the transportation fuels studied in this analysis supplying Nevada are refined in California and Utah, but Golden Gate Petroleum does account for some additional production as a transmix processing plant. Golden Gate Petroleum also blends their fuel with additional additives before distributing to their retail centers. Figure 2.1 shows all 24 refineries in PADD 5 and petroleum product flows between Nevada's major cities (Reno and Las Vegas) and California and Utah refineries. Golden Gate Petroleum is not listed in this EIA report, and this may be because though the facility is considered by the EPA to be a refinery, it is not a typical refinery as it does not process crude oil.

Figure 2.2 PADD 5 Regional Markets in California/Nevada, with SCSN Counties

Source: Cambridge Systematics. Energy Information Administration's PADD 5 Transportation Fuels Markets Study, 2015.

Within PADD 5, regional fuel markets can be identified based on product flows. The refineries in PADD 5 together can produce 2.5 million barrels of refined petroleum products per day (bbl/d). Southern California and Utah refineries supply Southern Nevada, and Northern California refineries supply Northern Nevada. The PADD 5 regional fuel markets in Nevada are shown in Figure 2.2. The Northern California/Northern Nevada (NCNN) region is typically able to produce enough gasoline, diesel, and jet fuel to supply the local region demand as well as exports to other regional markets and the international market. NCNN does not have any pipeline connection to other PADD districts, but is able to export product for maritime transportation via the Pacific Coast. Table 2.1 summarizes petroleum demand and production in the NCNN and SCSN regions. In 2013, NCNN refineries produced 102 percent of gasoline demand, 108 percent of jet fuel demand, and 147 percent of diesel fuel demand. The Southern California/Southern Nevada (SCSN) region

produces and consumes the most transportation fuels between the regions. In 2013, SCSN produced 87 percent of gasoline demand, 117 percent of distillate demand, and 92 percent of jet fuel demand. The gasoline and jet fuel production shortfall in SCSN is supplemented by the oversupply in NCNN and the UNEV pipeline from PADD 3 (Salt Lake City, Utah) and Las Vegas.

Table 2.1 Petroleum Demand and Production, by Region

Region	Fuel Type	2013 Refinery Production (b/d)	2013 Demand (b/d)	2013 Refinery Production / Demand (%)
SCSN	Gasoline[1]	526,800	606,600	87%
SCSN	Jet Fuel	178,100	194,100	92%
SCSN	Distillate	182,500	155,500	117%
NCNN	Gasoline	421,000	412,000	102%
NCNN	Jet Fuel	96,000	88,200	108%
NCNN	Distillate	185,000	125,600	147%
	SCSN Subtotal	887,400	956,200	93%
	NCNN Subtotal	702,000	625,800	112%

Note: Volumes for gasoline include 10 percent ethanol blending.
Source: Cambridge Systematics. Energy Information Administration's PADD 5 Transportation Fuels Markets Study, 2015.

Table 2.2 combines the NCNN and SCNN demand and production. When totaled, NCNN and SCSN produce 93 percent of gasoline demand, 99 percent of jet fuel demand, and 129 percent of diesel fuel demand. Combining all of the fuel types together, NCNN and SCSN actually produce quantities of fuel equivalent to 100 percent of the regions' demand, but the regions do not actually consume 100 percent of their own fuel. NCNN also produces enough product to satisfy internal demand as well as contribute to SCSN supply.

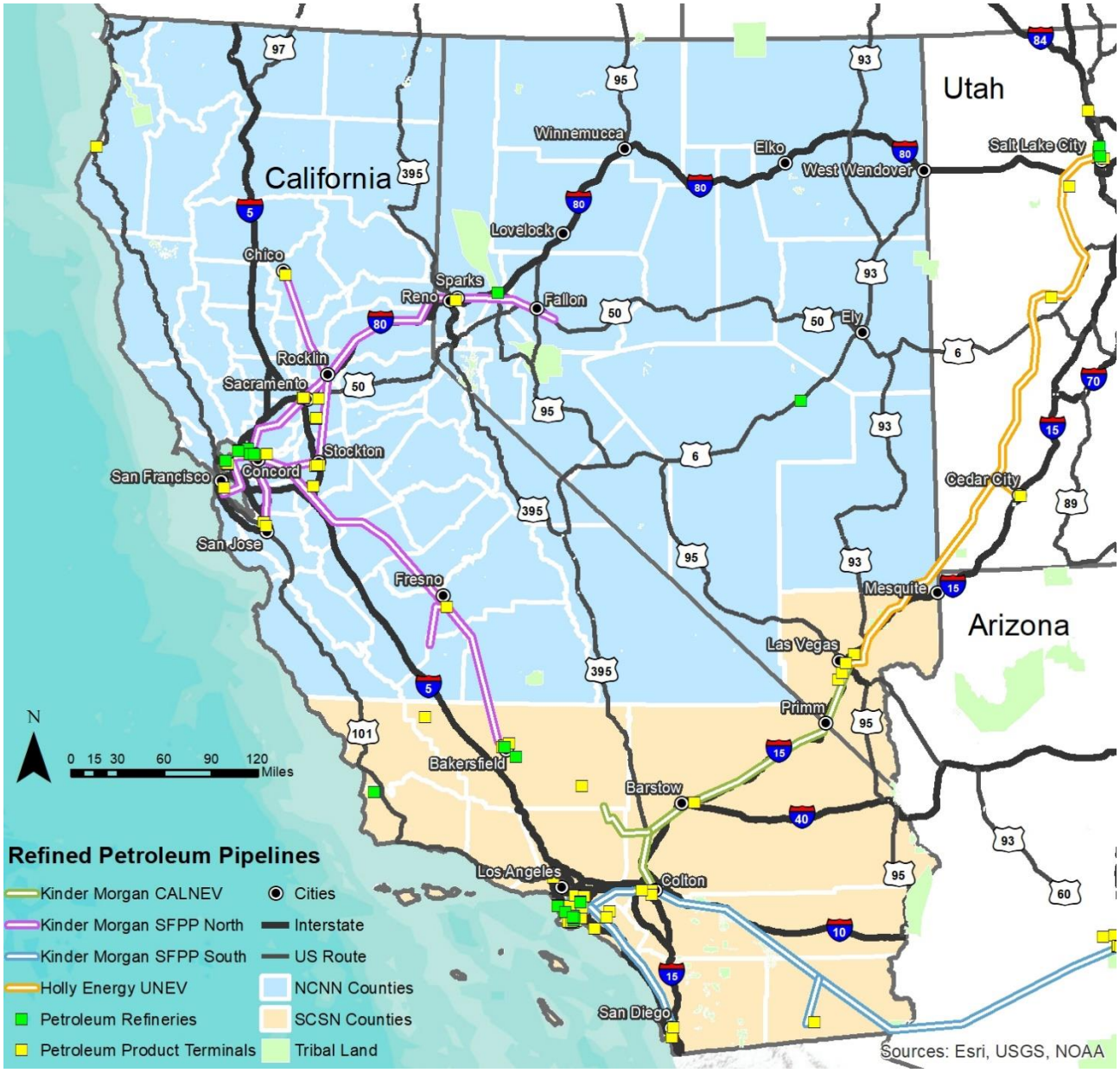
Table 2.2 Petroleum Demand and Production for California and Nevada, by Fuel Type

Fuel Type	2013 Refinery Production (b/d)	2013 Demand (b/d)	2013 Refinery Production / Demand (%)
Gasoline[1] Subtotal	947,800	1,018,600	93%
Jet Fuel Subtotal	274,100	282,300	97%
Distillate Subtotal	367,500	281,100	131%
Total	1,589,400	1,582,000	100%

Note: Volumes for gasoline include 10 percent ethanol blending.
Source: Cambridge Systematics. Energy Information Administration's PADD 5 Transportation Fuels Markets Study, 2015.

Figure 2.3 shows the refined petroleum pipelines that flow into Northern and Southern Nevada. The following sections will further evaluate the supply, demand, and distribution of fuels separately for Northern and Southern Nevada.

Figure 2.3 California and Nevada Refined Petroleum Pipelines



Source: Cambridge Systematics. U.S. Energy Information Administration

3.0 Southern Nevada Supply, Demand, and Storage

SCSN is reliant on the refineries, pipelines, ports, and storage facilities for the effective functioning of the petroleum supply chain. Refineries receive crude oil and produce specified petroleum products. Pipelines transfer products between refiners and storage facilities. Ports import and export products by maritime transport, and storage facilities hold product until it is sold and brought to market. In the SCSN region, Watson Station, a pipeline hub in Carson, California, is also an important part of infrastructure for the petroleum supply chain. Watson Station is a non-redundant pipeline hub, and refineries to the West, such as Chevron, Shell Carson, Tesoro, Phillips, and ExxonMobil must move product through Watson Station to reach bulk storage and distribution facilities to the east and south in Colton and San Diego. Without Watson

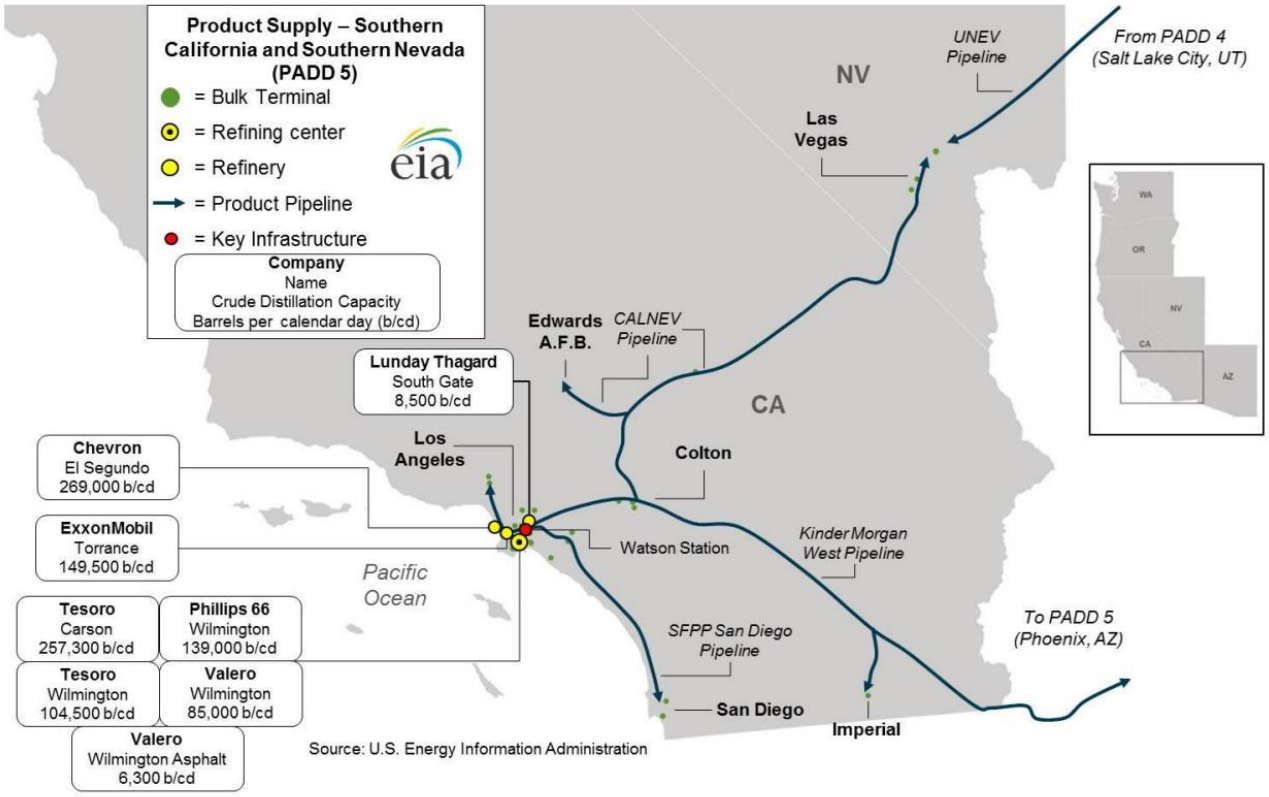
Station, product would not be able to move by pipeline from 88 percent of the SCSN refineries to the rest of the region east of Los Angeles. Watson Station, therefore, is particularly important to the pipeline flow of refined petroleum products from refinery to market. Refinery outages also affect the ability of SCSN to provide enough fuel for the region. When a refinery is unable to produce, such as the outage at the Torrance refinery in March 2015, maritime deliveries of supply from other regions, districts, and counties are critical for meeting the shortfall. Each part of the supply chain: production, transportation, and storage of petroleum is important for meeting the demand of SCSN. The following sections will examine the refineries, storage, and distribution of petroleum in Southern Nevada.

3.1 Southern California Southern Nevada (SCSN) Region Profile

The Southern California and Southern Nevada (SCSN) region is the largest demand area in PADD 5. SCSN includes the southernmost counties of California and the Las Vegas metropolitan area in Southern Nevada. SCSN has large metropolitan areas and many military air bases and large commercial aviation hubs. In 2013, the SCSN region accounted for 39 percent of total PADD 5 demand, which is the largest share of gasoline, diesel, and jet fuel demand of the six regional PADD 5 markets. The SCSN region consumes the most petroleum products in PADD 5.

There are eight operating refineries in the California part of the SCSN region, which supply the region's majority of motor gasoline, diesel and jet fuel. All eight refineries are located in the Los Angeles metropolitan area. Figure 3.1 shows the petroleum product bulk terminals, refineries, and pipelines in the SCSN region. Table 3.1 lists the refineries with their location, markets served, and operating capacities. The refineries have combined capacity of 1,019,100 b/cd, but only produced 940,080 b/d in 2013. Overall demand in the SCSN regional market was 956,200 b/d in 2013. SCSN has the capacity to supply all of the demand in SCSN; however, in 2013 only operated at 92 percent of capacity, and only produced 98 percent of demand. Since some of the product does not conform to the specifications required for the area even if it is produced in the area, some products are exported to other markets. SCSN provides product to Arizona and international markets by maritime exports, and receives product from Utah, NCNN, and maritime imports. SCSN is mostly self-sufficient, but does rely on other markets for selling and buying transportation fuels.

Figure 3.1 Southern California and Southern Nevada Product Flows



Source: Energy Information Administration's PADD 5 Transportation Fuels Markets Study, 2015.

Table 3.1 Southern California Petroleum Refineries

Company	Location	Atmospheric Crude Distillation Unit (ACDU) operating capacity b/cd	Markets served
Valero Asphalt	Wilmington, California	6,300	
Lunday Thagard	Southgate, California	8,500	Local
Valero	Wilmington, California	85,000	Southern California (S. CA), Las Vegas, Phoenix
Tesoro	Wilmington, California	104,500	S. CA, Las Vegas
Phillips 66	Wilmington, California	139,000	S. CA, Las Vegas
ExxonMobil	Torrance, California	149,500	S. CA
Tesoro	Carson, California	257,300	S. CA, Las Vegas
Chevron	El Segundo, California	269,000	S. CA, Las Vegas, Phoenix
	Total	1,019,100	

Source: Energy Information Administration's PADD 5 Transportation Fuels Markets Study, 2015.

3.2 Pipelines and Storage Facilities in Southern Nevada

Two pipelines bring petroleum products into Southern Nevada from California and Utah: Kinder Morgan's Calnev and Holly Energy's UNEV. The following section will examine the pipeline and storage terminal capacities in Southern Nevada.

3.2.1 Calnev Pipeline and Las Vegas Terminal: Kinder Morgan

The Calnev pipeline transports gasoline, jet fuel, and diesel fuel from Colton Terminal in Southern California to Kinder Morgan's Las Vegas Terminal (Las Vegas Terminal – KM) adjacent to Nellis Air Force Base in Southern Nevada. Colton Terminal is a 108 acre fuel storage complex on the Rialto-Colton border. Las Vegas Terminal – KM is operated by Kinder Morgan on 66 acres, where 41 refined petroleum tanks have a combined storage capacity of 1.8 million barrels.[3] Figure 3.2 is an aerial photo of Las Vegas Terminal – KM and its tanks that store gasoline, diesel, and jet fuel before it is transported to market. Gasoline and ethanol are blended before being transported by truck to Nevada retail gas stations. Diesel fuel is transported by truck to retail gas stations and to fuel mine operations. Jet fuel is stored adjacent to the air force base. Las Vegas Terminal – KM stores the vast majority of Southern Nevada's petroleum supply before it is released to the market.

The gasoline stored at Las Vegas Terminal – KM are blended with ethanol at the "rack" or loading facility before distribution to retail facilities in Southern Nevada. Ethanol is transported to the terminal via Union Pacific Railroad. Union Pacific transports approximately 2,000 railcars of ethanol per year to Las Vegas Terminal – KM. Reports from Kinder Morgan indicate that construction growth in Las Vegas is having an impact on rail capacity in the city. Asphalt cars have been displacing ethanol cars, resulting in 50-60 tank cars lined up at the terminal with no place to store or turn around since there are no sidings. The result is tank cars stored on the main line north of the terminal before unloading at the terminal can occur. Ethanol delivery to Las Vegas Terminal – KM is important for blending the gasoline with ethanol to make finished gasoline. Union Pacific is the primary deliverer of ethanol to Las Vegas Terminal – KM, a necessary part of the process for making finished gasoline.

The monthly supply of petroleum to Las Vegas Terminal – KM is roughly double the storage capacity. Figure 2.3 shows the Kinder Morgan Calnev pipeline and other Kinder Morgan facilities in Southern Nevada, Southern California, and Arizona. The Calnev pipeline is 566 miles long, operated by Kinder Morgan, and consists of 14 inch and 8 inch parallel pipes. The supply consists of gasoline, diesel, and jet fuel. The refined petroleum capacity from Colton to Las Vegas is currently 157,000 b/d.[4] The actual refined petroleum throughput from Colton to Las Vegas is currently 5,000 barrels per hour, which translates to 120,000 b/d or 3.6 million barrels per month.[5] Of the 3.6 million monthly barrels, approximately 1.1 million represent jet fuel supplied to the neighboring Nellis Air Force Base, 1 million barrels are gasoline, 0.5 million are diesel fuel, and the remaining 1 million barrels are dedicated to other terminals. Table 3.2 summarizes the Calnev pipeline batches transported from California refineries. The Calnev pipeline is responsible for delivering a

[3] Kinder Morgan. United States Securities and Exchange Commission: Form 10-K for the fiscal year ended December 31, 2016. https://ir.kindermorgan.com/sites/kindermorgan.investorhq.businesswire.com/files/report/additional/KMI-2016-10K_Final_with_Exhibits.pdf)

[4] Bannigan, Tom. "Products Pipelines." Kinder Morgan Presentation. https://ir.kindermorgan.com/sites/kindermorgan.investorhq.businesswire.com/files/event/additional/2008_Analysts_Conf_05_Products_Pipelines.pdf

[5] Interview with Kinder Morgan Terminal Manager August 7, 2018.

vast majority of Southern Nevada's petroleum supply, and Las Vegas Terminal – KM is where it is stored until it is distributed to the market.

Figure 3.2 Kinder Morgan Terminal near Nellis Air Force Base

Source: Imagery ©2018 Google

Table 3.2 Refined Petroleum Supply to Las Vegas, Kinder Morgan

Refined Product	Approximate Barrels per Month
Gasoline	1,000,000
Diesel Fuel	500,000
Jet Fuel	1,100,000
Distribution to other Terminals[6]	1,000,000
Total	3,600,000

Note: Other terminals include Pacific Tank Lines, Haycock Petroleum Company (Sinclair) and Pro Petroleum
Source: Kinder Morgan

[6] Other terminals include Pacific Tank Lines, Haycock Petroleum Company (Sinclair) and Pro Petroleum

3.2.2 UNEV Pipeline and Las Vegas Terminal: Holly Energy

The UNEV pipeline is another pipeline that transports petroleum products into Las Vegas. The UNEV pipeline transports gasoline and diesel fuel from Woods Cross, Utah near Salt Lake City to Holly Energy's Las Vegas Terminal (Las Vegas Terminal – HE) at Apex Industrial Park in Southern Nevada, roughly 20 miles northeast of the Las Vegas Terminal – KM discussed in Section 3.2.1. Las Vegas Terminal – HE is operated by Holly Energy on 53 acres, where 12 refined petroleum tanks have a combined storage capacity of 330,000 barrels.[7] Figure 3.3 is an aerial photo of Las Vegas Terminal – HE and its tanks which store gasoline and diesel before it is transported to market. Gasoline and ethanol are blended before being transported by truck to Nevada retail gas stations. Diesel fuel is transported by truck to retail gas stations and to mines fuel operations. Pro Petroleum also operates from this facility, and 10 to 20 trucks per day transport refined petroleum to the mines in Northern Nevada. Las Vegas Terminal – HE stores a minority of Southern Nevada's petroleum supply before it is released to the market.

Figure 3.3 Holly Energy Terminal, Apex Industrial Park

Source: Imagery ©2018 Google

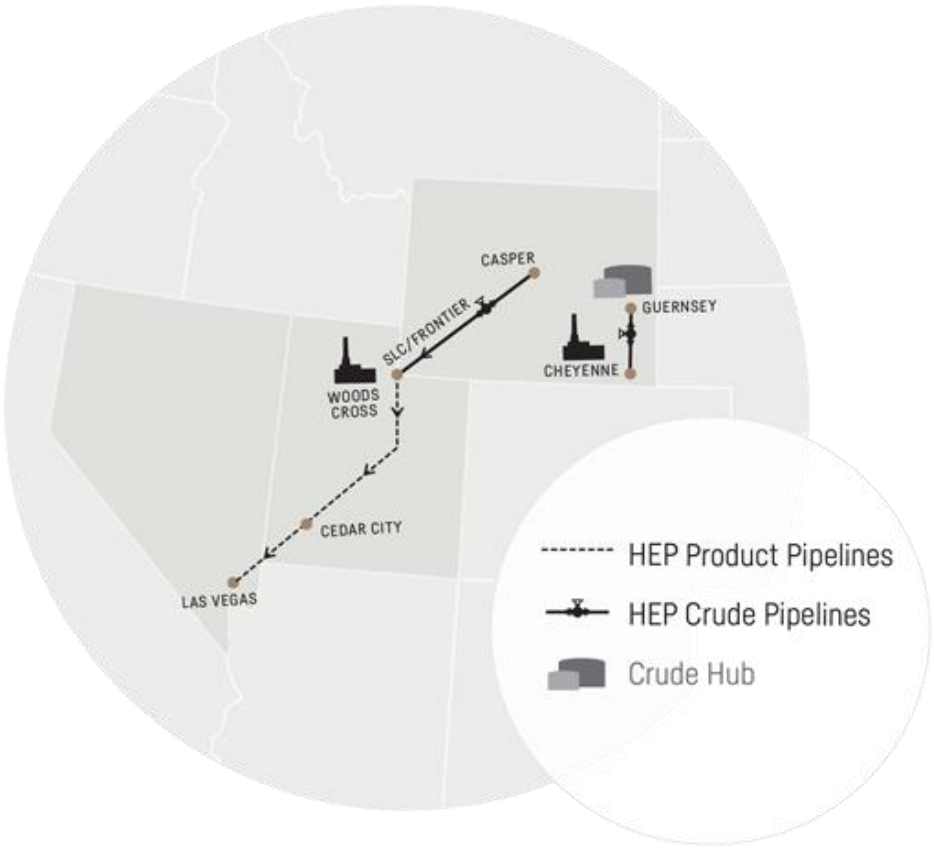
The gasoline stored at Las Vegas Terminal – HE is blended with ethanol at the "rack" or loading facility before distribution to retail facilities in Southern Nevada. Ethanol is transported to Apex Industrial Park by

[7] 378,000 barrel storage capacity is listed in 2017 Annual Report, but 2018 interview of UNEV listed 330,000 barrel storage capacity for petroleum products. http://www.annualreports.com/HostedData/AnnualReports/PDF/NYSE_HEP_2017.pdf

rail, and stored in tanks on site. Ethanol is then blended with gasoline to be transported to retail petroleum facilities throughout Nevada.[8] Railroad is the primary delivery method for ethanol to Las Vegas Terminal – HE, a necessary part of the process for making finished gasoline.

The monthly supply of petroleum to Las Vegas Terminal – HE is roughly double the storage capacity. Figure 2.3 shows the Holly Energy UNEV pipeline in Southern Nevada and Utah. A schematic of the UNEV pipeline is also shown in Figure 3.4 below. The UNEV pipeline is 427 miles long and operated by Holly Energy. The monthly supply of petroleum to Las Vegas Terminal – HE is 70 percent gasoline and 30 percent diesel fuel.[9] The refined petroleum capacity from Woods Cross to Las Vegas is currently 62,000 b/d with the availability to expand up to 118,000 b/d with limited capital investment.[10] The UNEV pipeline is responsible for delivering a minority of Southern Nevada's petroleum supply to storage at Las Vegas Terminal – HE for distribution to the market.

Figure 3.4 Holly Energy's UNEV Pipeline Map



Source: Holly Energy.

[8] Interview with Holly Energy Apex Terminal Manager August 2, 2018.

[9] Interview with Holly Energy Apex Terminal Manager July 2018.

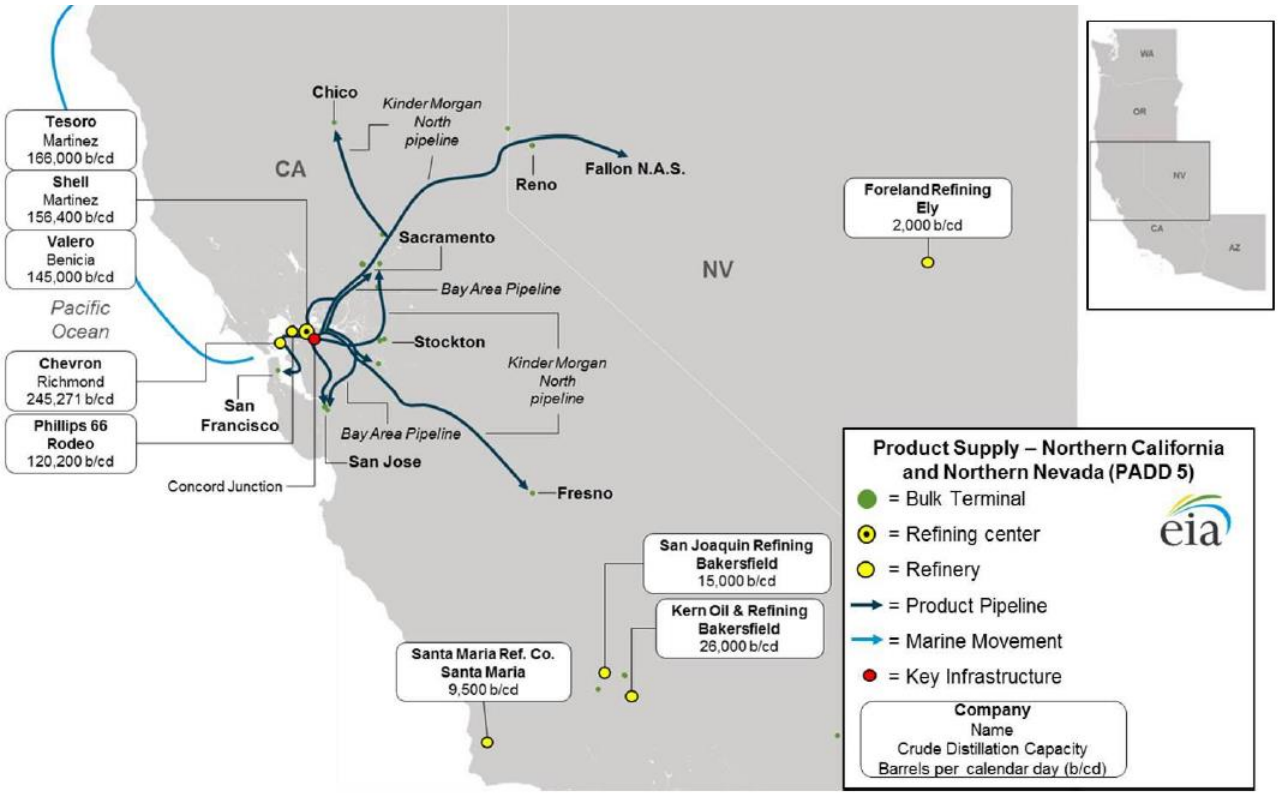
[10] http://www.annualreports.com/HostedData/AnnualReports/PDF/NYSE_HEP_2017.pdf

4.0 Northern Nevada Supply, Demand, and Storage

4.1 Northern California Northern Nevada (NCNN) Region Profile

The Northern California and Northern Nevada region (NCNN) is the most self-sufficient regional market in PADD 5. NCNN includes and all of Nevada except for Clark county and the counties of California north of San Luis Obispo, Kern, and San Bernardino counties. In 2013, the NCNN region accounted for 37 percent of total PADD 5 demand, which is the second largest of the six regional PADD 5 markets. The NCNN region is the least reliant on other regional markets and the second-largest regional market in PADD 5.

Figure 4.1 Northern California and Nevada Refineries and Petroleum Flows



Source: Energy Information Administration's PADD 5 Transportation Fuels Markets Study, 2015.

There are 10 operating refineries in the NCNN region which supply most of the motor gasoline, diesel and jet fuel for the region. Five refineries are located in the San Francisco Bay area which is the largest concentration of refining capacity in the region, three refineries are located north of Los Angeles near Bakersfield and Santa Maria, Golden Gate Petroleum (GGP) in Storey County east of Reno distills transmix and blends fuel with additives for the retail market, and Eagle Foreland Refinery in Ely, Nevada produces only asphalt and fuel oil which is mined locally. Figure 4.1 shows the petroleum product bulk terminals, refineries, and pipelines in the NCNN region. Golden Gate Petroleum is located between Reno and Fallon N.A.S. Table 4.1 lists the refineries with their location, markets served, and operating capacities. The refineries have combined capacity of 887,371 b/cd. In 2013, the refineries produced 744,100 b/d in 2013 (excludes Golden Gate Petroleum). Overall demand in the NCNN regional market was 625,800 b/d in 2013. NCNN has more capacity and production than the demand in NCNN, and in 2013 operated at only 84

percent of capacity but produced 119 percent of demand. NCNN provides product to other parts of PADD 5, such as SCNN, and international markets by maritime exports. NCNN is self-sufficient, and provides fuel to other markets.

NCNN is reliant on the refineries, pipelines, ports, and storage facilities for the effective functioning of the petroleum supply chain. Refineries receive crude oil and produce specified petroleum products. Pipelines transfer products between refiners and storage facilities. Ports import and export products by maritime transport, and storage facilities hold product until it is sold and brought to market. In the NCNN region, product is shipped by pipeline from NCNN refineries in San Francisco Bay, Santa Maria, and Bakersfield to storage and distribution terminals near San Francisco, Fresno, Chico, and Reno. The Concord pipeline junction is an important gateway pipeline transmissions in NCNN as it is the gathering and entry point for the main trunk of the Kinder Morgan pipeline system. NCNN region is not connected by pipeline to any other region or PADD, and supply from NCNN region to other markets is moved by marine vessel through ports in the San Francisco Bay. Supply chain disruptions can be caused by power outages, earthquakes, and heavy fog in the Bay. Each part of the supply chain: production, transportation, and storage of petroleum is important for meeting the demand of NCNN. The following section will examine the storage and distribution of petroleum in Northern Nevada.

Table 4.1 Northern California and Northern Nevada Refineries

Company	Location	ACDU[1] operating capacity b/cd	Markets Served
Chevron	Richmond, California	245,271	
Tesoro	Martinez, California	166,000	
Shell	Martinez, California	156,400	Northern California (N. CA), Reno, Oregon
Valero	Benicia, California	145,000	N. CA, Reno
Phillips 66[2]	Rodeo, California	120,200	N.CA, Los Angeles, Reno, Nevada, exports
Kern Oil & Refining	Bakersfield, California	26,000	N.CA, Reno, Nevada, exports
San Joaquin Refining	Bakersfield, California	15,000	S. CA, Las Vegas
Santa Maria Refinery	Santa Maria, California	9,500	Central California
Foreland Refining	Ely, Nevada	2,000	Central California
Golden Gate Petroleum	Clark, Nevada	2,000[3]	N. CA, Reno
	Total	887,371	

Note: [1] Atmospheric Crude Distillation Unit
[2] A portion of this facility is actually located in San Luis Obispo County but is operated as part of the Rodeo refinery.
[3] This operating capacity came from interview with company, and is an approximation.

Source: Energy Information Administration's PADD 5 Transportation Fuels Markets Study, 2015. Interview with Golden Gate Petroleum December 2018.

Table 4.2 Northern California Northern Nevada Petroleum Summary

Fuel Type	2013 Demand (b/d)	Refinery Capacity (b/cd)	2013 Refinery Production (b/d)	Refinery Production / Demand (%)
Gasoline[1]	412,000	-	463,100	112%
Jet Fuel	88,200	-	96,000	108%
Distillate	125,600	-	185,000	147%
Total	**625,800**	**885,371**	**744,100**	**119%**

Note: Volumes for gasoline include 10 percent ethanol blending.
Source: Energy Information Administration's PADD 5 Transportation Fuels Markets Study, 2015.

4.2 Pipelines and Storage Facilities in Northern Nevada

Reno is critical to the distribution of product to Northern Nevada. At the Northeast border of Nevada and near the California border, Reno is removed from the refinery production in Northern California but is at the end of one pipeline that brings petroleum products from the San Francisco Bay Area into Northern Nevada. The following section will examine the pipeline and storage terminal capacities in Northern Nevada.

4.2.1 SFPP North Line and Sparks Terminal

Kinder Morgan's Santa Fe Pacific Pipeline (SFPP) North Line transports gasoline, jet fuel, and diesel fuel from Concord Station in Northern California to the Sparks Terminal in Northern Nevada. Concord station is a 25 acre fuel storage complex located just outside of San Francisco where there are 23 refined petroleum tanks with a total capacity of 1.2 million barrels. A 20-inch pipeline extends from Concord to Sacramento, then connects to Rocklin Station. From Rocklin, product is transported to the Sparks Terminal in Sparks, NV, a distance of 138 miles, where it is stored in 44 tanks. The pipeline between Rocklin and Reno varies between six, eight and ten inches in diameter, depending on geography. Figure 2.3 shows the Kinder Morgan SFPP North Line and other Kinder Morgan facilities in Northern Nevada and Northern California. The Sparks Terminal is operated by Kinder Morgan on 44 acres, where 45 refined petroleum tanks have a combined storage capacity of 748,377 barrels. Figure 4.2 is an aerial photo of the Sparks Terminal and its tank that store gasoline, diesel, and jet fuel before being transported to market. Gasoline and ethanol are blended before being transported by truck to Nevada retail gas stations. Diesel fuel is transported by truck to retail gas stations and to fuel mine operations. The Sparks Terminal stores the vast majority of Northern Nevada's petroleum supply before it is released to market.

Figure 4.2 Sparks Terminal

Source: Imagery ©2018 Google

The gasoline stored at the Sparks Terminal are blended with ethanol at the "rack" or loading facility before distribution to retail facilities in Northern Nevada. The Sparks Terminal is sandwiched between I-80 and the Union Pacific Railroad, and ethanol is transported to the terminal via Union Pacific Railroad. There are six truck loading racks, and ethanol is sequentially blended with gasoline for transport to retail gasoline stations throughout Northern Nevada. In several terminals, red dye is injected into diesel tanks dedicated to agricultural or military operations which are not taxed.

Many truck trips from the Sparks Terminal extend into Northern California to serve petroleum retail stations[11] since the closest alternative petroleum distribution facility is in Rocklin, California which is more than 100 miles away from the border, whereas the Sparks Terminal is less than 20 road miles from the border. Triple trailers are allowed in Nevada and commonly used for deliveries within the state. They consist of one 53 foot cargo tank trailer and two 28 foot "pups" for a total capacity of 20,000 gallons. However, triple trailers are not allowed in California and therefore not used for deliveries into California.

The monthly supply of petroleum to the Sparks Terminal is roughly double the storage capacity. The actual refined petroleum throughput from Rocklin to Reno is currently 48,000 b/d.[12] The supply consists of roughly 40 percent gasoline, 40 percent diesel, and 20 percent jet fuel. Of the 1.44 million monthly barrels, approximately 0.576 million barrels are gasoline, 0.576 million are diesel fuel, and the remaining 0.288 million barrels are jet fuel. Also, 6,000 b/d (250 barrels per hour) represent diesel supplied by a six-inch pipeline to the neighboring Fallon Naval Air Station located 70 miles east. The SFPP North Line is

[11] Interview with Kinder Morgan Terminal Manager August 20, 2018.

[12] Interview with Gary Kulaszewski (1,800-2,000 barrels/hour)

responsible for delivering a vast majority of Northern Nevada's petroleum supply, and the Sparks Terminal is where it is stored until it is distributed to the market.

4.2.2 Golden Gate Petroleum Refinery

Roughly 20 miles east of the Sparks Terminal is the Golden Gate Petroleum (GGP) splitter facility. GGP receives about 2,000 barrels of transmix per day, 50 percent arriving by rail and 50 percent by truck. The transmix is sourced by truck from pipeline terminals in California and Reno, and by rail from pipeline terminals in Phoenix and Denver. Another 2,000 barrels of diesel and gasoline leave the facility per day by truck. Golden Gate Petroleum has about 75,000 barrels of storage capacity for transmix, feedstock, gasoline, and diesel. GGP also uses some of the transmix as feedstock for their operations. For gasoline blending, GGP also brings in renewable diesel from California. GGP does not supply enough gasoline to supply all of their retail facilities and also buys finished gasoline. Other fuel additives are also used for fuel blending. Product leaving GGP is mostly going to GGP retail facilities, but a surplus of diesel is also sold on the open market.

5.0 Nevada Petroleum Distribution Profile

Petroleum products arriving in Nevada are likely to arrive by one of the three pipelines that supply the area from Northern California, Southern California, or Utah. These pipelines, Calnev, UNEV, and SFPP supply the vast majority of Nevada's petroleum usage. Each pipeline feeds a storage terminal, and together, these pipelines provide over 230,000 barrels per day of petroleum to Nevada, with 2,878,377 barrels of storage. The pipeline capacity and storage terminal capacity facilities in Nevada are summarized in Table 5.1. The facilities in Nevada are able to store roughly a 13 day supply of fuel.

Table 5.1 Nevada Petroleum Pipeline and Storage Summary

Pipeline	Company	Origin	Nevada Storage Terminal	Northern or Southern Nevada	Pipeline Throughput (b/d)	Storage Terminal Capacity (barrels)	Storage Turnover at 100% Throughput (days)
Calnev	Kinder Morgan	Colton, CA	Las Vegas	Southern	120,000	1,800,000	15
UNEV	Holly Energy	Woods Cross, UT	Las Vegas	Southern	62,000	330,000	5
SFPP	Kinder Morgan	Concord, CA	Reno	Northern	48,000	748,377	16
			Southern Nevada Subtotal		*182,000*	*2,130,000*	*12*
			Northern Nevada Subtotal		*48,000*	*748,377*	*16*
				Total	**230,000**	**2,878,377**	**13**

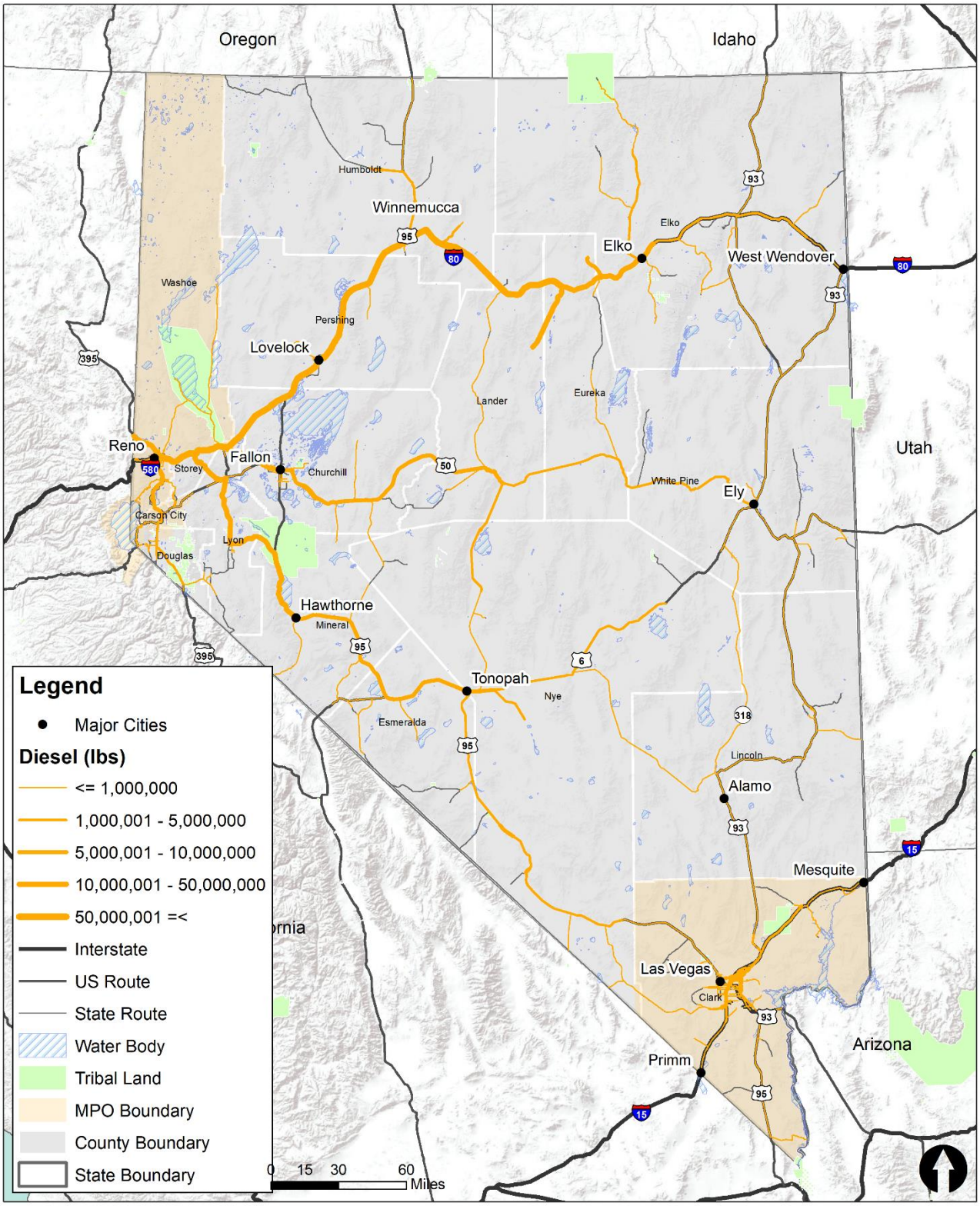
Source: Cambridge Systematics. Interviews with Kinder Morgan and Holly Energy.

The distribution process brings petroleum product from storage facilities to retail petroleum facilities. The Nevada Statewide Hazmat Database was used to identify refined petroleum facilities by type and thereby estimate refined petroleum distribution across the state. Assuming a 250 mile radius around Las Vegas for petroleum distribution, the Study Team used a shortest path algorithm to determine likely routing, assuming truck drivers will primarily stay on interstate and U.S. highways as much as possible. Figure 5.1 below

illustrates the likely distribution area for diesel by truck in Nevada. Figure 5.2 below illustrates the likely distribution area for gasoline by truck in Northern Nevada.

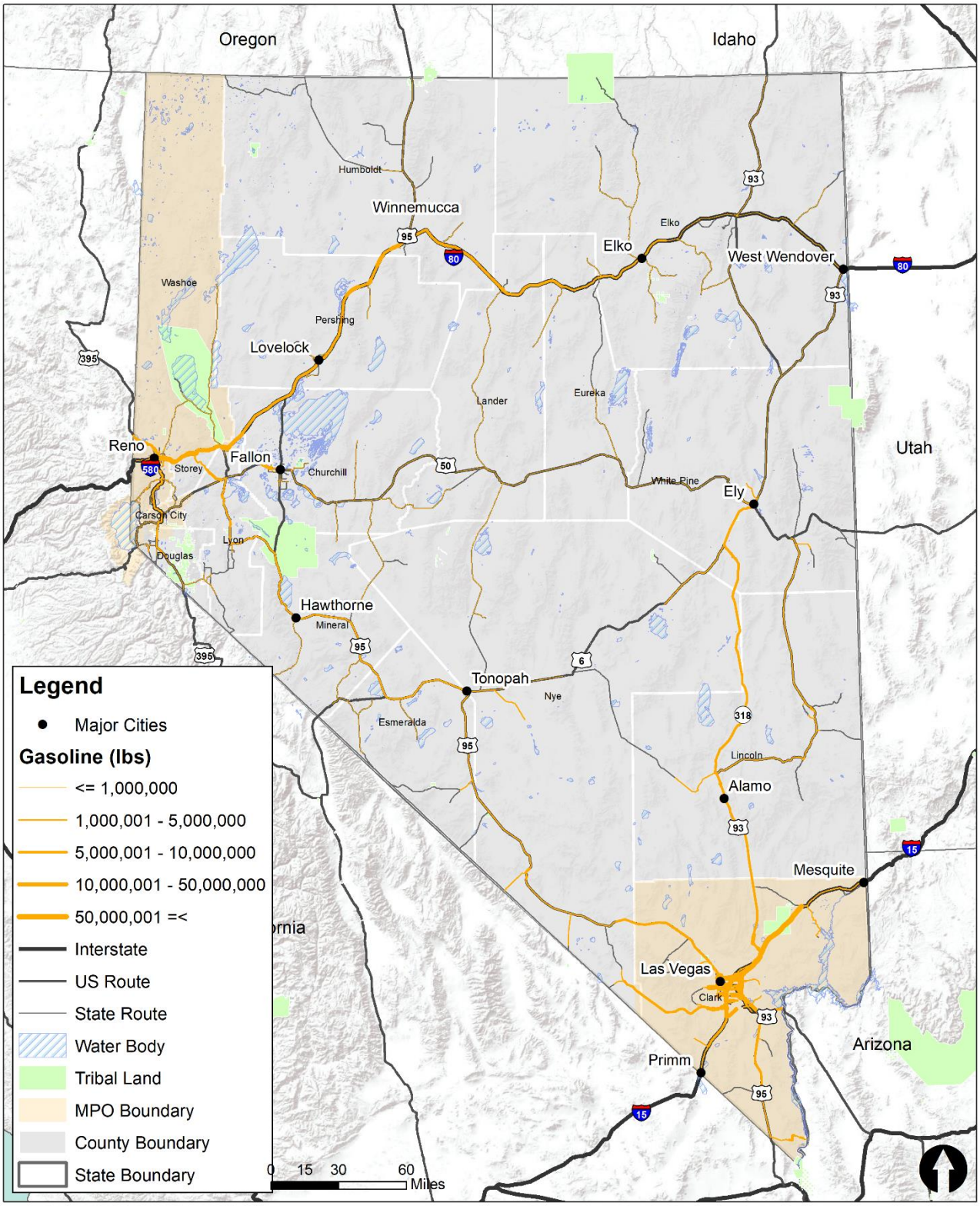
The petroleum distribution maps demonstrate that the volume of diesel on the roadways is greatest in northern Nevada, while southern Nevada is dominated by gasoline. These results are consistent the large urban population around Las Vegas and the increased prevalence of industrial facilities and mining operations in northern Nevada.

Figure 5.1 Nevada Petroleum Distribution, Diesel



Source: Cambridge Systematics. Statewide Hazmat Database.

Figure 5.2 Nevada Petroleum Distribution, Gasoline



Source: Cambridge Systematics. Statewide Hazmat Database.