AMATS: Ocean Dock Road Reconnaissance Engineering Study

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Abbreviations

AADT	Average Annual Daily Traffic
AASHTO	American Association of Highway and Transportation Officials
AHRS	Alaska Heritage Resource Survey
AMATS	Anchorage Metropolitan Area Transportation Solutions
AML	Alaska Marine Lines
ANC	Ted Stevens Anchorage International Airport
APE	Area of Potential Effect
APV	Accident Prediction Value
ARRC	Alaska Railroad Corporation
CAR	Critical Accident Rate
CCS	Continuous Count Station
DOT&PF	Alaska Department of Transportation and Public Facilities
FHWA	Federal Highway Administration
GDHS	*A Policy on Geometric Design of Highways and Streets*
HI	Hazard Index
HSIP	Highway Safety Improvement Program
JBER	Joint Base Elmendorf-Richardson
KE	Kinney Engineering
LED	Light Emitting Diode
LOS	Level of Service
MOA	Municipality of Anchorage
MEV	Million Entering Vehicles
mph	Miles per Hour
NB	Northbound
NHS	National Highway System
NRHP	National Register of Historic Places
PHF	Peak Hour Factor
POA	Port of Alaska in Anchorage
ROW	Right-of-Way
SB	Southbound
SSD	Stopping Sight Distance
STRAHNET	Strategic Highway Network
USDOT	United States Department of Transportation
WIM	Weigh-in-motion

Definition of Terms

Active Traffic Control: Traffic control devices at a rail-road at-grade crossing that are activated by detection of an approaching train. These include flashing lights and/or automatic gates.

Average Annual Daily Traffic (AADT): A measurement of the number of vehicles traveling on a segment of highway each day, averaged over the year.

Accident Prediction Value (APV): A calculated value intended to predict the likelihood of a crash occurring over a given period of time given conditions at a railroad crossing.

Capacity: Value of the maximum sustainable hourly flow rate, considering prevailing roadway, environmental, traffic, and control conditions.

Critical Accident Rate (CAR): Threshold crash rate for which a calculated higher than average crash rate is considered statistically different from the average population rate, signifying that the elevated crash rate may be caused by underlying contributing factors, instead of randomness.

Frog: Part of a railroad turnout that allows a flanged wheel to track along a rail that is crossing another rail. (See Figure 19, on page 22)

Hazard Index (HI): A qualitative rating of relative safety at rail crossings. The Hazard Index computes a rating based on vehicle traffic, train traffic, and a traffic control factor.

Head Room: Amount of space required to place a length of railroad cars on a track.

Lead Track: Railroad track that connects the main or main servicing track to a customer facility; also the track that serves as a connecting link between parallel yard tracks.

Level of Service (LOS): Performance measure concept used to quantify the operational performance of a facility and present the information to users and operating agencies. The actual performance measure used varies by the type of facility and the type of user; however, all use a scale of A (best conditions for individual users) to F (worst conditions). Often, LOS C or D in the most congested hours of the day will provide the optimal societal benefits for the required construction and maintenance costs.

Passive Traffic Control: Traffic control devices at a rail-road at-grade crossing that are static, such as signs and pavement markings.

Peak Hour Factor (PHF): Measure of traffic variability over an hour period calculated by dividing the hourly flowrate by the peak 15-minute flowrate. PHF values can vary from 0.25 (all traffic for the hour arrives in the same 15-minute period) to 1.00 (traffic is spread evenly throughout the hour).

Point of Switch: The actual beginning point of the railroad switch at a railroad turnout. (See Figure 19, on page 22)

Railroad Degree of Curvature: Measurement of the angle between two lines of radii connecting to either end of a 100-foot chord. Larger values for degree of curvature correspond to sharper curves and require slower train speeds to navigate. (See Figure 18, on page 21)

Railroad Turnout Number (size): Value which describes the size of a turnout based on the angle between two diverging tracks at the point where they cross the frog. A smaller turnout number corresponds to a sharper curve and requires a slower train speed to navigate. (See Figure 19, on page 22)

Switch Points: The moveable section of track at a railroad turnout that aligns the rails for the train to make either a through or diverging movement. (See Figure 19, on page 22)

Switch Stand: a device that is connected with a rod to the switch points that indicates which direction trains will be diverted. In addition, there is a handle and lever that allows personnel to shift the switch points to the direction desired.

Shippers: Companies that ship products or commodities by rail.

Sight Triangle: An area free of obstructions, which allows a vehicle approaching a rail-road at-grade crossing to safely observe an approaching train.

> ***Case I:*** Sight triangle for a vehicle moving at the posted speed limit and a train traveling at the maximum timetable speed approaching the crossing.
>
> ***Case II:*** Sight triangle for a stopped vehicle departing from the crossing and a train traveling at the maximum timetable speed approaching the crossing.

Stopping Sight Distance (SSD): Distance at which a driver on the road can see an object on the road ahead. Minimum SSDs, as listed in roadway design guidelines, are adequate for passenger cars to judge and slow or stop without striking the object in the road. The SSD calculation assumes driver eye height of 3.5 feet from the road surface, object height of 2.0 feet from the road surface, and a deceleration rate of 11.2 feet per seconds squared. For heavy truck drivers, the desirable SSD calculation includes driver eye height of 7.5 feet and a deceleration rate of 6.0 feet per seconds squared.

Tail Track: The stub end of a track used to assist in switching railroad cars.

Turnout: A combination of railroad track components that are used to guide trains from one track to another track. A turnout typically consists of switch points, rails including specialized rails called stock and closure rails, a frog, and miscellaneous components include railroad ties that support the turnout. (See Figure 19, on page 22)

Vehicle Clear Storage: The distance desired to contain queued vehicles between a rail-road at-grade crossing and another control point (such as an intersection or another rail-road at-grade crossing).

Executive Summary

The Alaska Department of Transportation and Public Facilities (DOT&PF) has retained Kinney Engineering, LLC (KE), to prepare a Reconnaissance Engineering Study for the Anchorage Metropolitan Area Transportation Solutions (AMATS): Ocean Dock Road Reconnaissance Engineering Study. Figure 1 shows the project vicinity.

The Ocean Dock Road Reconnaissance Engineering Study builds off a 2018 study which focused on the intersection of Ocean Dock Road with the C Street ramps (*AMATS: C Street/Ocean Dock Road Access Ramps Reconnaissance Engineering Study*), expanding the study area to allow for opportunities to reconfigure the railroad tracks and road segments and their crossings.

The study area is of economic and military significance, including portions of both the Port of Alaska in Anchorage (POA) and the Alaska Railroad Corporation (ARRC) main freight and passenger terminal, and located near Joint Base Elmendorf-Richardson (JBER) and the Ted Stevens Anchorage International Airport (ANC). The POA handles half of all Alaska inbound freight, which is then transported to its final destination via pipeline, truck, rail, or a combination of these modes. The port is a Department of Defense commercial strategic seaport, and Ocean Dock Road (the main road into and out of the port) is designated part of both the National Highway System (NHS) and the Strategic Highway Network (STRAHNET, which are roads of military significance). Thus, improvements to the study area benefit the State and nation economically and strategically.

The main focuses of this study are to reduce delay caused by train and truck interactions at the existing rail-road at-grade crossings and to decrease the potential for crashes.

The primary users of the transportation system in the study corridor are freight and passenger trains, freight trucks, and pipeline connections to Nikiski, JBER, and ANC. The transportation corridor is also used by commuters traveling to and from POA or railroad facilities, residents of the Government Hill neighborhood to the northeast of the study area, tourists who arrive at the POA by cruise ship and are carried to nearby destinations by tour bus, and recreational users (including people coming to fish in Ship Creek, pedestrians and bicyclists, and users of the small boat launch).

This Ocean Dock Road Reconnaissance Engineering Study first identifies concerns for the study area and a range of feasible improvements for addressing the concerns, including railroad track realignments and reconfigurations, road realignments and reconfigurations, and potential improvements to drainage systems and the non-motorized network. These potential improvements are discussed in Section 6 of this report. Based on input from stakeholder groups, the most promising of these concepts have been combined into a feasible alternative that meets the project’s purpose and need. This proposed alternative was further analyzed and refined and is presented in Section 9.2 of this report.

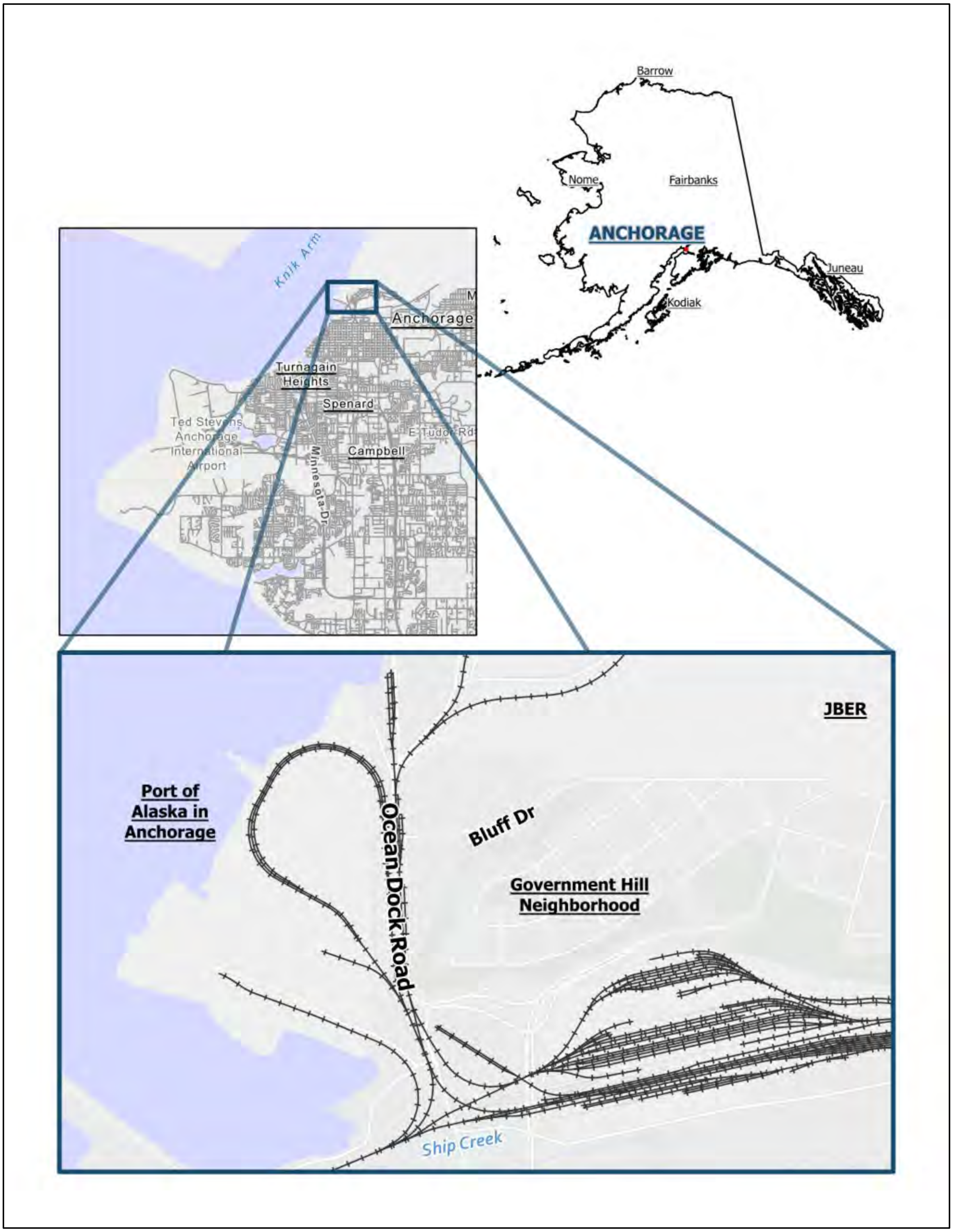

Figure 1: Vicinity Map

1 Introduction

The Alaska Department of Transportation and Public Facilities (DOT&PF) has retained Kinney Engineering, LLC (KE), to prepare a Reconnaissance Engineering Study for the Anchorage Metropolitan Area Transportation Solutions (AMATS): Ocean Dock Road Reconnaissance Engineering Study.

Reconnaissance studies:

(1) Describe the problem to be solved. This includes identifying existing concerns for all modes and users within the study area, including freight, recreational, tourist, commuter, and non-motorized users

(2) Identify and analyze opportunities for improvement. The Alaska Railroad Corporation (ARRC) identified reducing the number or impact of rail-road at-grade crossings as of particular interest for this study.

(3) Provide comparisons of the alternatives. This comparison provides the information needed to make recommendations, program future projects, and procure funding.

Figure 2 shows the steps involved for this Reconnaissance Engineering Study. The Conceptual Study described concerns collected through stakeholder interviews and engineering analysis and presented a range of qualitative conceptual options that could improve the safety for all user types, increase freight mobility, and reduce maintenance of the corridor. These options were presented to the Advisory Council, which included stakeholders from ARRC, DOT&PF, AMATS, and the Alaska Trucking Association. Following the Conceptual Study phase and the Advisory Council Meeting, a few of the most promising options were identified for further analysis and refinement. A Draft Reconnaissance Engineering Study report was prepared, which described the existing conditions, concerns and issues discovered during the Conceptual Phase, and presented the proposed alternative for the study area, which meets the purpose and need. Public input was gathered from the draft study report and comments have been addressed. This final Reconnaissance Engineering Study report is an update from the draft report and presents the final proposed alternative, as refined from the public input received on the draft study report.

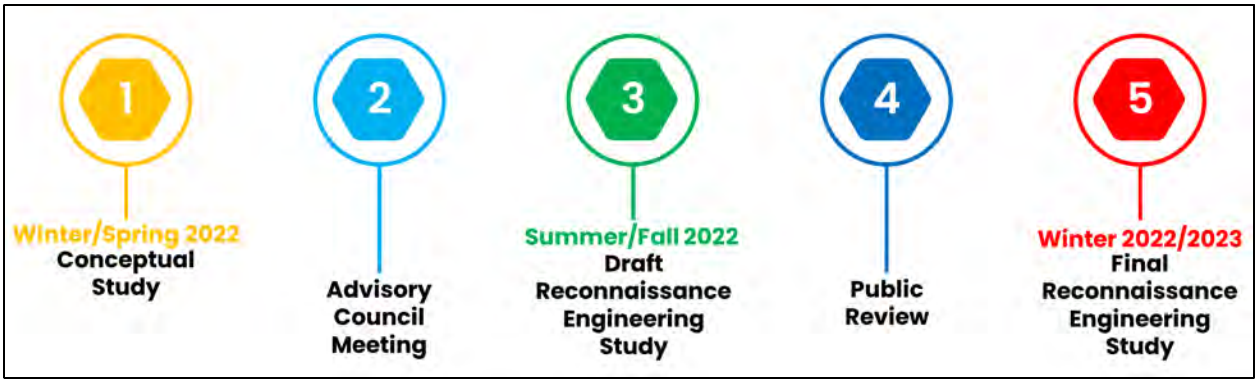

Figure 2: Study Process

The intersection of Ocean Dock Road at the C Street ramps was previously studied in 2018 (*AMATS: C Street/Ocean Dock Road Access Ramps Reconnaissance Engineering Study)*. This current study looks at a larger area of the Ocean Dock Road corridor from Whitney Road to Roger Graves Road within the Port of Alaska (POA) in Anchorage, as depicted in Figure 3. The proposed alternative from that study is incorporated into this Reconnaissance Engineering Study with minor adjustments due to the proposed railroad improvements.

Figure 4 presents a larger area map to show the industrial area in the vicinity of the study area.

Figure 3: Study Area

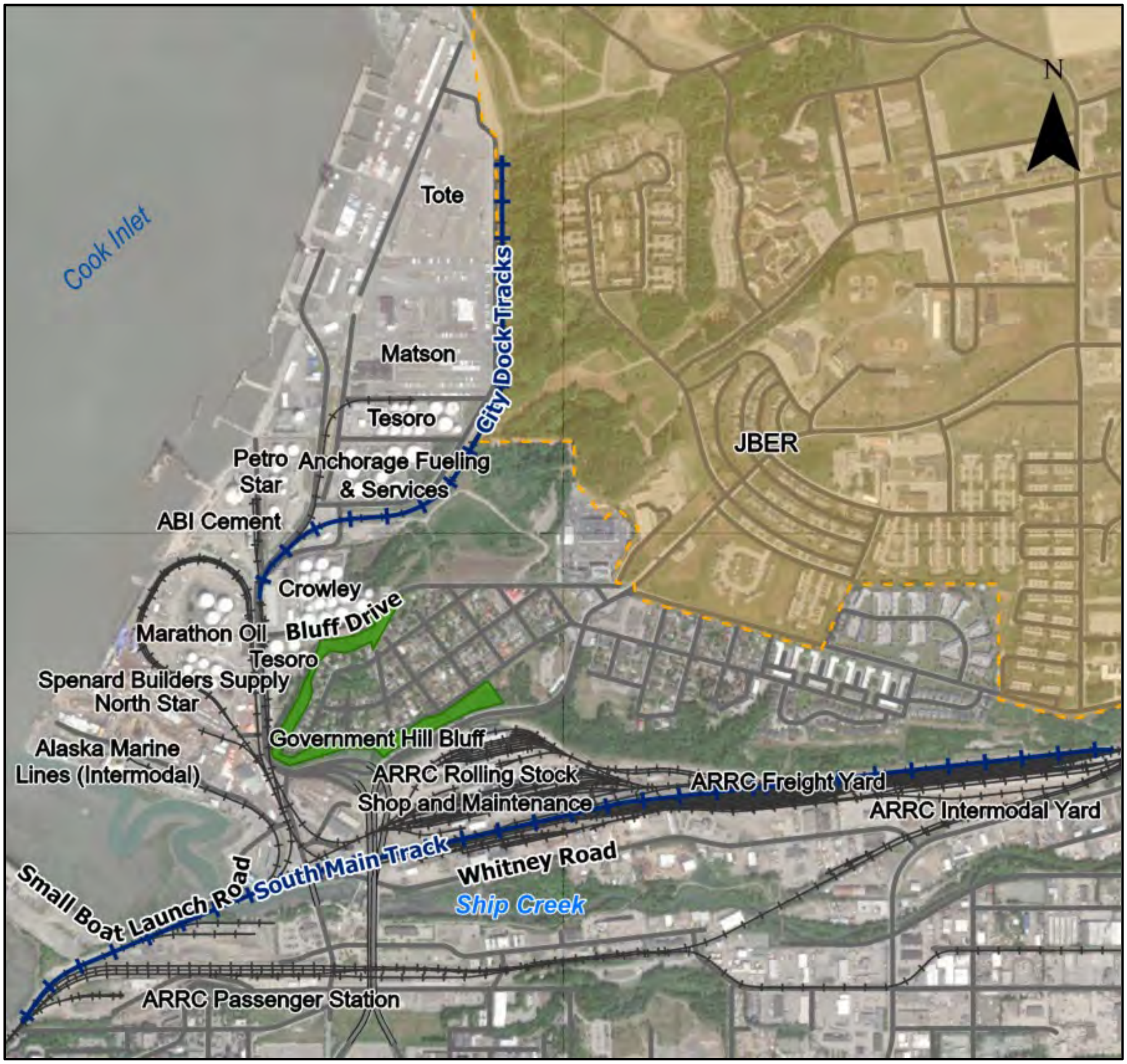

Figure 4: Overview Map of Port Industrial Area

2 Freight Transportation in the Study Area

In 1915, Congress authorized construction of the only federally-owned railroad in the nation's history at the time. Construction headquarters was a tent town located at the mouth of Ship Creek in present-day Anchorage near the study area's southern boundary. Barges and small boats carried goods to supply construction of the railroad. Anchorage and its port expanded greatly as a result of World War II with the establishment of the Elmendorf and Fort Richardson Military Bases. Anchorage's deep-water port (now the POA) was built in 1961 and became the prominent port in Alaska after the 1964 earthquake damaged the other ports in Southcentral. The Cold War and construction in the 1970s for the trans-Alaska pipeline furthered growth in the area with the Alaska railroad carrying heavy freight into the interior. Passenger train traffic also increased as cruise ships began offering links for passengers to travel from the Anchorage Passenger terminal to see sites throughout Alaska.

Today, goods entering Alaska at the POA arrive via sea vessels. Tote and Matson both have container ships that bring goods to the POA twice weekly, with both arrivals scheduled for Tuesdays and Sundays. Goods from the ships are unloaded and carried by truck or rail to their final destinations throughout Alaska.

Bulk goods (such as cement and different types of fuel) also enter Alaska at the POA. In general, these goods are unloaded directly from ships or fuel barges into holding tanks at the POA and then carried by truck, rail, or pipeline to their various destinations.

2.1 Alaska Railroad Corporation Yard and Port Area Rail Characteristics

The ARRC operates freight and passenger trains along 656 miles of rail between Seward, Whittier, Anchorage, and Fairbanks, as shown in Figure 5. Freight trains run year-round and serve ports in Seward and Whittier, the POA, and potentially a future connection to the Matanuska-Susitna Borough's Port MacKenzie. Freight from the ports is transported via rail to the state's interior with the rail line ending at Eielson Air Force Base, which is about 8 miles east of downtown North Pole. Major freight commodities hauled include consumer products, coal, gravel, and petroleum products.

ARRC's Anchorage Terminal yard is the central processing facility for nearly all ARRC train traffic, but also includes major maintenance and storage facilities. Peak operations for passenger trains are between mid-May and mid-September, offering multiple daily train services on multiple routes. Off-peak passenger operations consist of 2-8 passenger trains per week.

Within the project study area is the maintenance facilities for ARRC's locomotives, passenger, and freight equipment, as well as facilities for maintaining passenger equipment owned by various cruise ship companies. The tracks serving shippers in the POA originate in ARRC's west freight rail yard area and extend northward to serve the entire Port. ARRC noted that they own the land used by the shippers and lease it to them.

Tracks serving the POA connect to the ARRC freight yard and main tracks immediately north of the Ship Creek bridge. Shippers are connected to the railroad via spur tracks that provide service to their facilities at the POA.

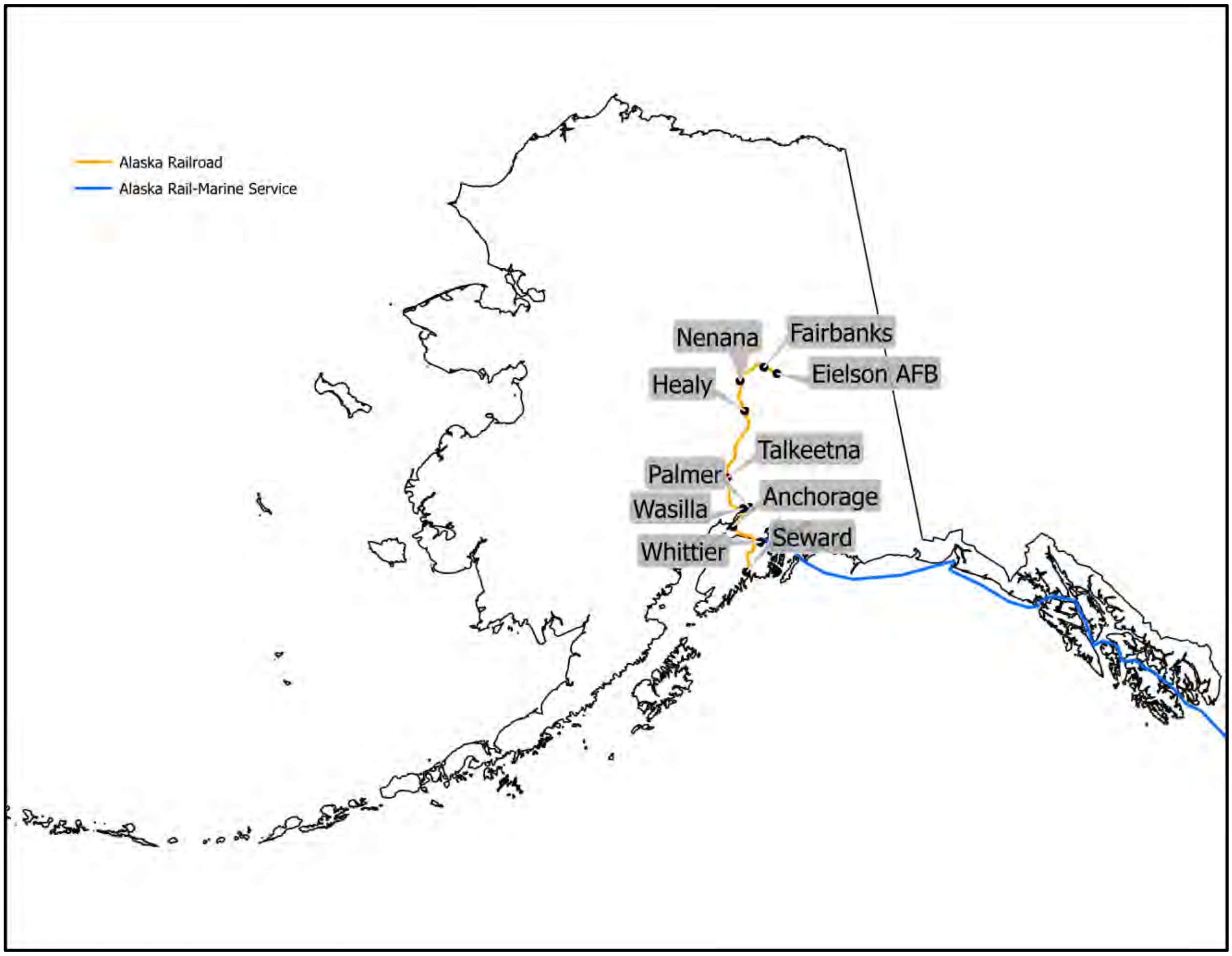

Figure 5: Alaska Railroad Route and Connecting Carriers

2.2 ARRC Operations

ARRC tracks in the southern part of the project area are shown and identified in Figure 6. ARRC tracks north of this area, shown in Figure 7, are used to serve shippers in the northern portions of the POA.

South Main – This is the main track accessing the west end of ARRC's Anchorage Freight Train Yard. All freight trains arriving or departing from the Anchorage yard use this track.

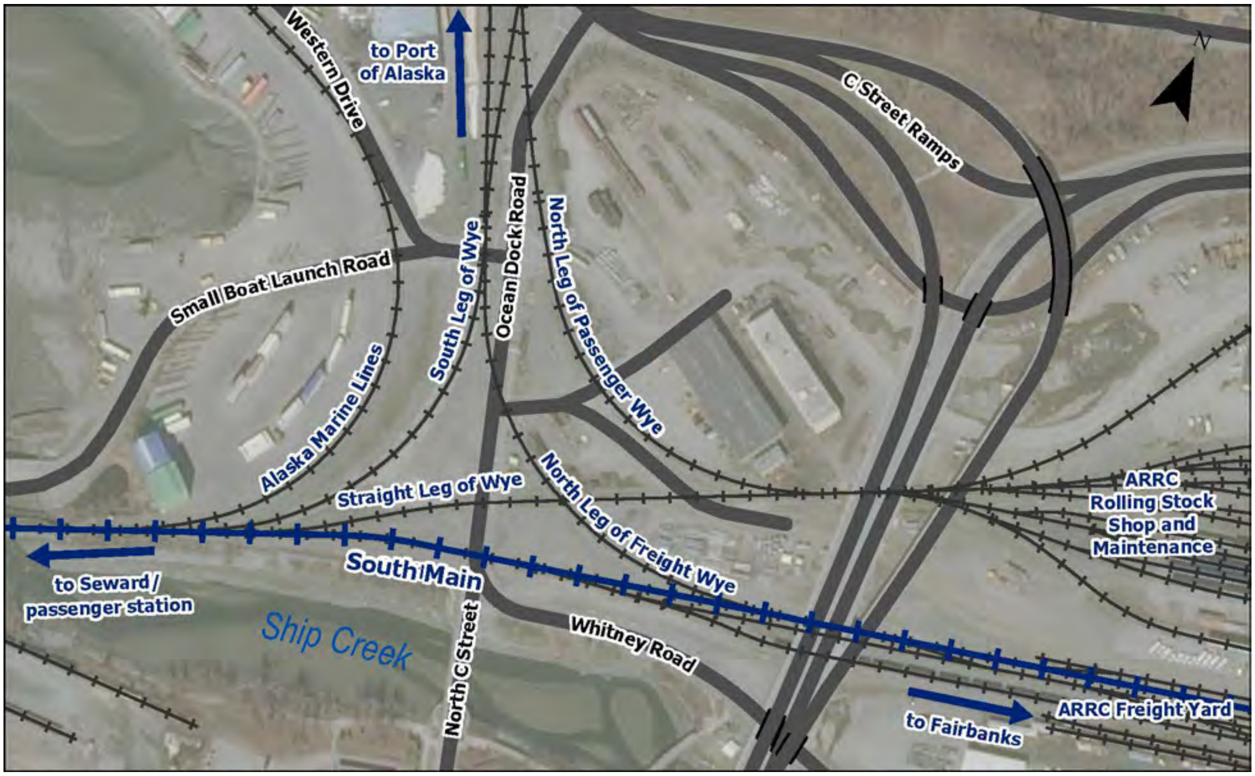

Figure 6: ARRC Track Layout (South Study Area)

Straight Leg of Wye – This track is used to access the ARRC freight and passenger rolling stock shops and equipment maintenance areas to and from the main track at the west end of the yard. Freight equipment from the Anchorage yard is backed up to the west out of the yard onto this track to access the shops. All passenger equipment is pushed onto this track to access the various maintenance shops built for the owners of the passenger equipment.

North Leg of Freight Wye – This track is used to turn around (reverse operating ends of) cars and locomotives. The equipment traverses this leg of the wye northwards, then traverses the South Leg of Wye to complete the turning movement before coming back into the freight yard following the South Main.

North Leg of Passenger Wye – This track is used to turn passenger equipment and, if needed, freight equipment that has been in the shops/maintenance area. Equipment traverses this leg of the wye track to the track connecting to the South Leg of Wye, traversing south and west to where the equipment, now reversed, accesses either the South Main (freight equipment) or Straight Leg of Wye (passenger equipment). Nearly every passenger train serving Anchorage uses these tracks to change operating ends between its arrival and departure, keeping locomotives at the front of the train and allowing the passenger cars to face the correct direction of travel.

Figure 7: ARRC Track Layout (North Study Area)

The wye tracks in the study area are an essential component of both ARRC's passenger and freight operations. There is not another close location available to perform the movements, as the nearest one to Anchorage is 40 miles away in Palmer. Passenger trains use the North Leg of Passenger Wye to get turned, crossing Ocean Dock Road at the base of its connection with the C Street ramps and then traveling on the South Leg of Wye and back into the maintenance facilities using the Straight Leg of Wye. All freight service to the Asphalt Spur (Tesoro), Crowley, ABI Cement, Petro Star, the City Dock Tracks, and Marathon Oil, as shown in Figure 7, use the same track as the passenger trains. The Marathon Oil Loop track is served from the freight yard using the North Leg of Freight Wye, crossing Ocean Dock Road, and staying west of it to the loop tracks. Several other shippers, including North Star and Alaska Marine Lines (AML), are served west of Ocean Dock Road. These switching functions cannot be moved to the east end of the yard due to security issues related to the railroad's close proximity to JBER.

ARRC provided information on the number of train crossings per week for summertime and wintertime traffic across the rail-road at-grade crossings in the study area. Maneuver volumes vary between the two seasons, with peak passenger traffic occurring in the summer. Figure 8 presents the average train crossings per week in the summer and winter.

Figure 8: Average Weekly Train Crossing Volumes – Summer & Winter

2.3 Truck Operations

Trucks that carry goods out of the industrial area surrounding the POA generally either head north (using the Glenn Highway) or head south to destinations within Anchorage or south of Anchorage. Within the study area, trucks travel into and out of the POA using either the C Street ramps or Whitney Road. During interviews, the POA tenants were asked what routes their trucks use to travel outside of the study area. Figure 9 presents the truck routes that were identified.

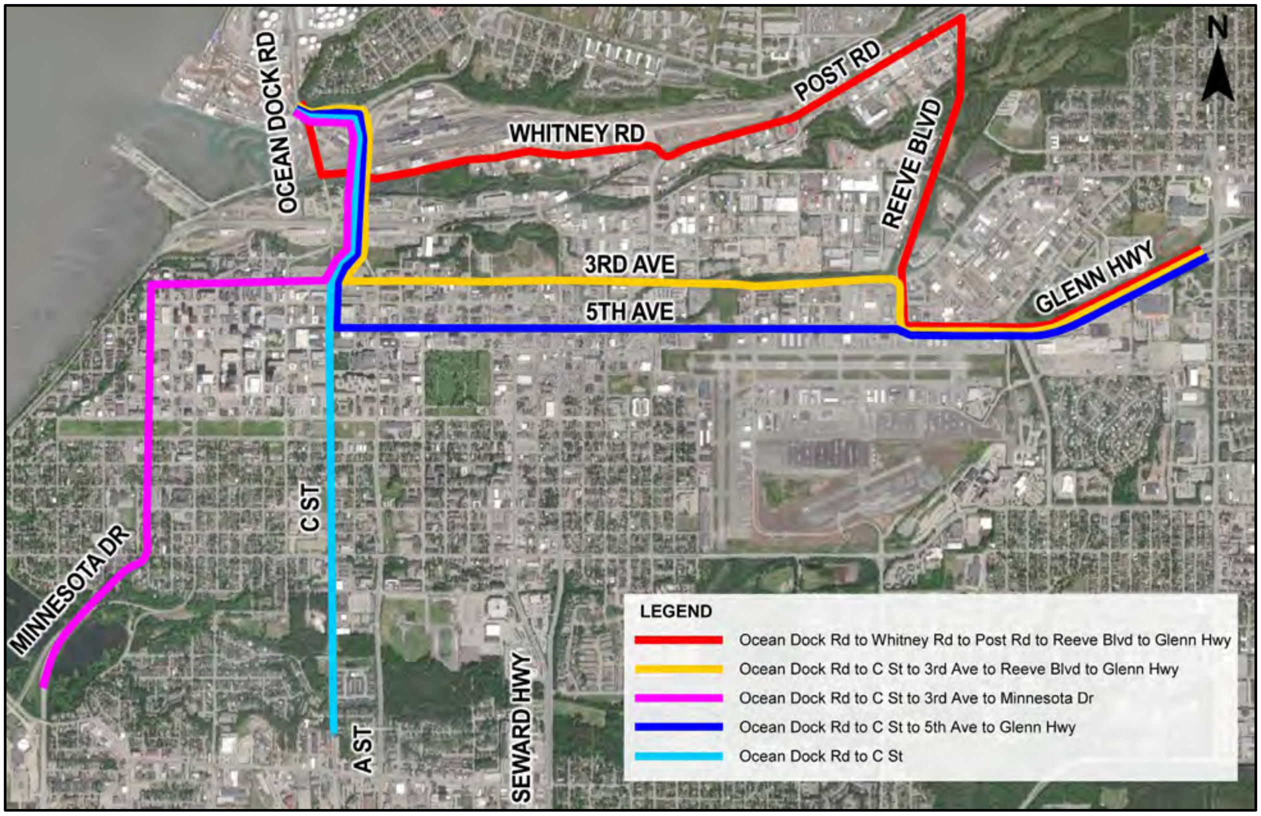

Figure 9: Truck Routes

As illustrated in Figure 10, the highest truck volumes occur on Tuesdays, the day container ships arrive from Tote and Matson.

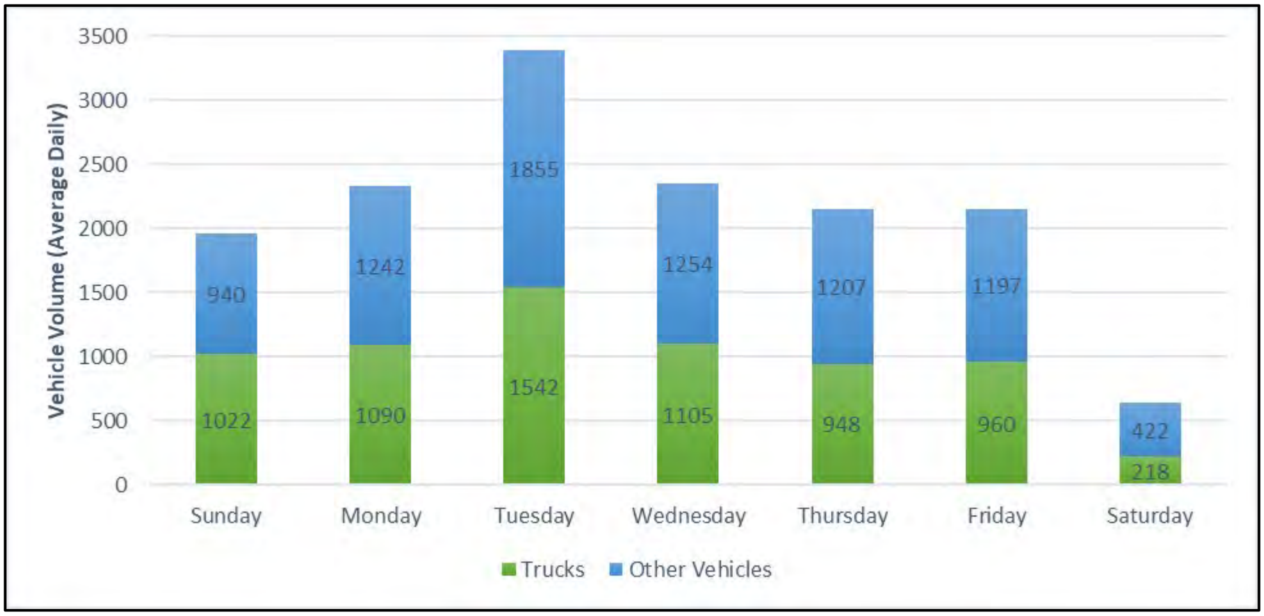

Figure 10: Vehicle Volume Entering and Exiting the POA by Day of the Week (July 2021)

Figure 11 presents the average 2019 truck crossing volumes at the rail-road at-grade crossings on a Tuesday. The highest volume of trucks uses the Ocean Dock Road 5 (868539B) crossing just north of the C Street ramps, which is currently the only route in or out of the POA. South and east of that crossing, trucks use either Whitney Road or C Street to travel in and out of the POA, with counts showing a little more than half the trucks use the C Street bridge.

Figure 11: Average 2019 Daily Truck Volumes on Tuesdays

2.4 Multimodal Operations

The POA has limited facilities for transferring goods directly from the sea vessels to railcars. Most non-bulk goods leave the POA on trucks. Some of these are transferred to rail in nearby intermodal yards, such as the AML intermodal yard along Small Boat Launch Road or the ARRC intermodal yard accessed from Whitney Road, as shown on Figure 4.

2.5 Pipeline

Fuel arriving via sea vessels is transferred to storage tanks inside the POA by pipelines. From the storage tanks, located north of the study area, three pipelines convey fuel southbound and run alongside and under Ocean Dock Road, crossing the road at a number of locations. Two lines head westerly at Small Boat Launch Road, while the third line continues along Ocean Dock Road until Whitney Road, where it then veers east. Figure 12 shows the approximate location of the pipelines. The majority of the piped fuel feeds the air traffic of Ted Stevens Anchorage International Airport (ANC).

Figure 12: Study Area Fuel Pipelines

3 Existing Conditions

3.1 Functional Classification

Ocean Dock Road is classified by DOT&PF as a principal arterial, which indicates the primary purpose of the roadway is to serve through traffic making long distance trips. While the road carries relatively low volumes at lower speeds than what is typical for arterials, it receives the designation of arterial because it is the terminal segment of a National Highway System (NHS) corridor and is the primary access route to the POA. For many vehicles, travel on Ocean Dock Road in the study area is part of long distance trips to other parts of the state. As such, access management and conflict reduction is valuable to maximize the arterial function.

The NHS is comprised of the Interstate Highway System and other roads throughout the country that are important to the United States' economy, defense, and mobility. Ocean Dock Road between Whitney Road and the POA is part of the NHS. The corridor between the C Street ramps and the POA is also designated as an Intermodal/STRAHNET[1] Connector. The intermodal label identifies Ocean Dock Road as a connection between different modes of transportation; it connects the POA and the railroad to the rest of the highway system. STRAHNET is a designation given to roads that provide mobility during war or peace to personnel and equipment for emergency and defensive purposes. The POA provides transport of equipment and materials for the military installations located in Alaska.

3.2 Roadway Design Speed and Geometry

Evaluation of the existing roadway geometry was performed using *A Policy on Geometric Design of Highways and Streets* (GDHS), published by American Association of Highway and Transportation Officials (AASHTO).

3.2.1 Roadway Design Speed

Ocean Dock Road between Whitney Road and just north of the C Street ramps has a posted speed limit of 30 miles per hour (mph). North of the C Street ramps, the road is posted for 20 mph and enters a secured area. Based on the design speed and according to GDHS, Ocean Dock Road is considered a low-speed urban road. Design speed is used to analyze the existing layout of the corridor.

3.2.2 Horizontal Curves

The Ocean Dock Road alignment contains three primary horizontal curves, as presented in Figure 13. The southwest quadrant of the Ocean Dock Road and the C Street ramps intersection contains a relatively large radius return. Additionally, the southbound right-turn movement does not have to stop. For the purposes of this study, this radius return was analyzed as an additional

[1] Strategic Highway Network

horizontal curve, which is identified as Curve 2 on Figure 13. Curves 1, 2, and 3 are within the 30-mph section of the road and the remaining one is within the 20-mph section. Curve radii were determined from as-built drawings. Existing cross slopes along each curve were measured using a digital level. Measurements at the mid-point of curve were used to determine required minimum horizontal curve radius.

Table 3-13b of GDHS presents minimum radii corresponding to speed and superelevation for low-speed urban roads. Table 1 on page 16 lists the evaluation of the horizontal curves.

Curve 1 does not meet the posted speed limit. This curve is preceded/followed by a T-intersection, where northbound vehicles are required to stop. There is adequate length of roadway for a vehicle to stop after the curve; therefore, it is expected vehicles will enter curve 1 at the posted speed limit. Curve 1 can accommodate speeds up to 25 mph, which is less than the posted speed limit; therefore, it has a radius below desirable levels for the posted speed limit.

Curve 2 is technically a radius return at an intersection. Expected intersection turning speeds are 10 mph or less. Curve 2 can accommodate speeds up to 20 mph; therefore, has an appropriate radius for expected intersection turning speeds; however, truck operations could benefit from increasing this radius to accommodate a greater speed.

The radius at curve 3 can accommodate speeds up to 25 mph, which is less than the posted speed limit; and therefore, has a less than desirable radius.

Curve 4 is within the 20 mph section of road. The existing radius can accommodate speeds up to 30 mph in the northbound direction and 35 mph in the southbound direction; therefore, the existing radius is adequate.

Figure 13: Existing Horizontal Curve Locations

Table 1: Existing Horizontal Curves

Curve No.	Posted Speed Limit	Design Speed	Direction	Center of Lane Existing Radius	Approx. Curve Mid-Point Cross Slope	Minimum Radius*	Operating Speed**	Meets Desired Radius?
1	30 mph	30 mph	NB	194 ft	1.1%	294 ft	25 mph	No
			SB	206 ft	-2.5%	343 ft	25 mph	No
2	N/A	10 mph	SB	~120 ft	3.3%	N/A	20 mph	N/A
3	30 mph	30 mph	NB	240 ft	0.6%	288 ft	25 mph	No
			SB	252 ft	-0.1%	300 ft	25 mph	No
4	20 mph	20 mph	NB	444 ft	-	107 ft	30 mph	Yes
			SB	456 ft	-	107 ft	35 mph	Yes

* Based on Posted Speed & Cross Slope in accordance with AASHTO GDHS 2011, Table 3-13b.
** Based on Existing Radius & Cross Slope in accordance with AASHTO GDHS 2011, Table 3-13b.

3.2.3 Roadway Sight Distance

3.2.3.1 Stopping Sight Distance

Stopping Sight Distance (SSD) is the required distance a driver needs to see in order to perceive a road condition requiring a stop and to complete the stopping maneuver. The GDHS provides guidance for calculating the minimum SSD, which is described in Equation 1.

$$SSD = 1.47Vt + \frac{V^2}{30\left[\left(\frac{a}{32.2}\right) \pm G\right]}$$

Where:
V = design speed (mph)
t = brake reaction time (2.5 s)
a = deceleration (11.2 ft/s^2 for passenger cars; 6.5 ft/s^2 for heavy trucks)
G = road grade, rise/run (ft/ft)

Equation 1: Stopping Sight Distance

Roadway design typically applies SSD for passenger cars regardless of the design vehicle. Recent research shows newer heavy trucks and trailers are equipped with antilock brakes, which allow trucks to stop in relatively the same distance as passenger vehicles. Trucks with hydraulic brake systems, built before 1999, may not have antilock brakes[2]; and thus, would require longer distances to stop compared to passenger cars. A 2001 study looked at the deceleration rate of heavy trucks. Out of those without antilock brakes, the worst deceleration rate was 5 ft/s^2 and the best was 8 ft/s^2. For this current study, an average of the worst and best rate of 6.5 ft/s^2 is used.

For vertical sight restrictions, such as a crest vertical curve, the slower deceleration rate of a truck would be outweighed by the fact that their drivers sit higher and have a better vantage point than passenger car drivers and, theoretically, have more time to react to situations. Where the visual encroachment impedes sight around horizontal curves, however, truck drivers may not be able to benefit from sitting higher. Given the percentage of heavy vehicles in the study area, SSD for trucks is presented in addition to SSD for passenger cars.

Aerial imagery was used to measure approximate sight distance for the four horizontal curves in the study area. Table 2 presents the minimum required horizontal SSD for passenger cars and trucks and the existing sight distance at each horizontal curve. The existing SSD measured is approximate given measurement from aerial imagery. The actual SSD may be greater or less than the numbers in the table. Because of the approximate measurement, if the measured SSD is

[2] 49 CFR § 393.55

close to the minimum required SSD, the curve is conservatively treated as not meeting the minimum.

Figure 14 through Figure 17 show the existing sight distance estimated at each horizontal curve. SSD is met at all locations for a passenger car; however, the SSD required for trucks is not met at some curves. Existing fence and debris stacks obstruct the truck SSD for the northbound direction on Curve 1. An existing retaining wall obstructs the truck SSD for the northbound direction on Curve 3. The truck SSD measurement for the southbound direction is close to the minimum required. Because the aerial measurement may contain some error, the truck SSD in this direction should also be considered as inadequate.

Table 2: Roadway Horizontal Stopping Sight Distance

Curve No.	Design Speed	Driving Direction	Passenger Car SSD	Heavy Truck SSD	Existing Sight Distance	Heavy Truck SSD Met?
1	30 mph	NB	197 feet	259 feet	190 feet	No
		SB	197 feet	259 feet	377 feet	Yes
2	20 mph	SB	112 feet	140 feet	202 feet	Yes
3	35 mph	NB*	246 feet	366 feet	225 feet	No
	30 mph	SB	197 feet	259 feet	271 feet	No
4	20 mph	NB	112 feet	140 feet	348 feet	Yes
		SB	112 feet	140 feet	413 feet	Yes

* Within the SSD, the average roadway grade of 3% downhill is incorporated into the minimum required SSD calculation.

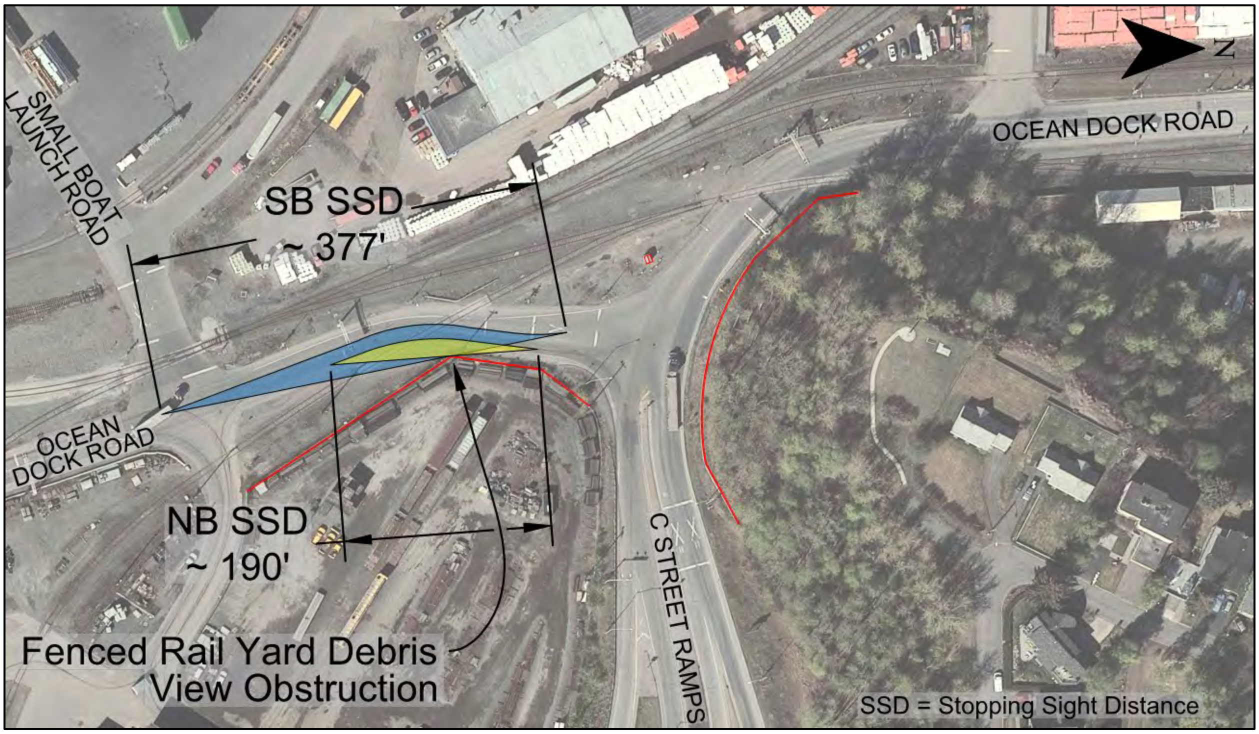

Figure 14: Stopping Sight Distance - Curve 1

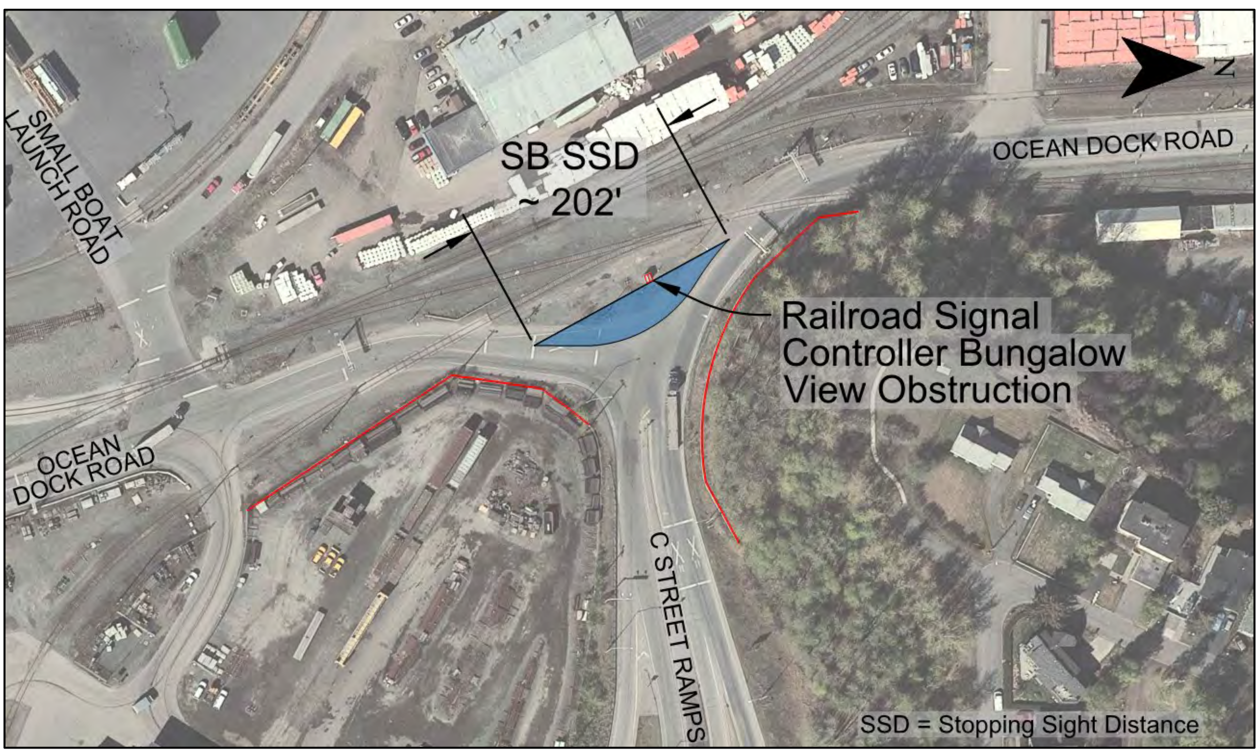

Figure 15: Stopping Sight Distance - Curve 2

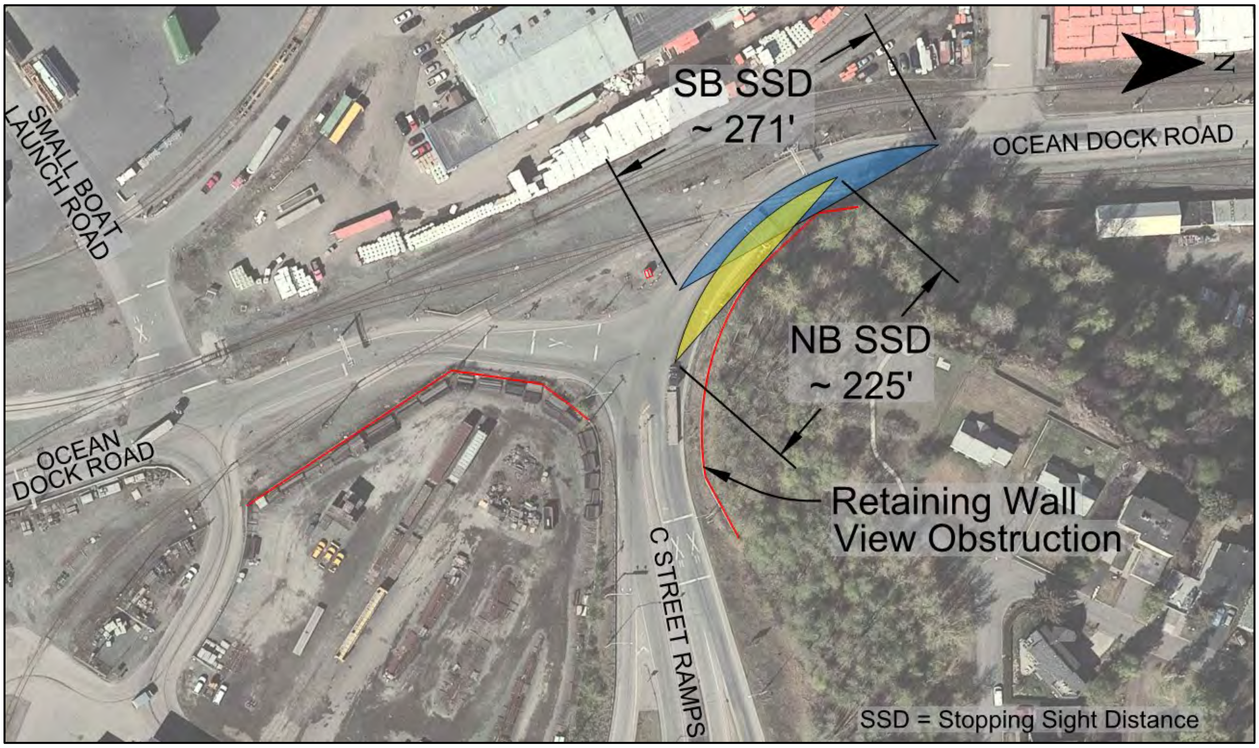

Figure 16: Stopping Sight Distance - Curve 3

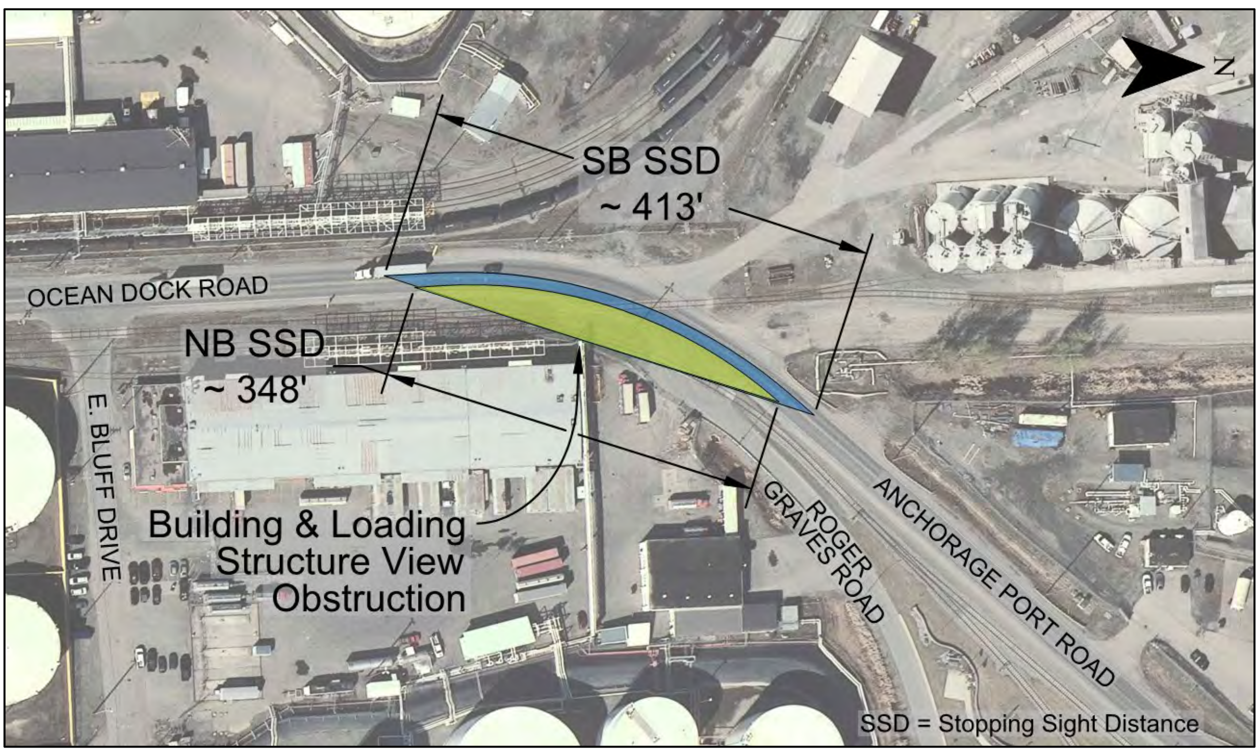

Figure 17: Stopping Sight Distance - Curve 4

The vertical grades along Ocean Dock Road are fairly flat; therefore, it is assumed the sight distance relating to vertical curves along this road is met. Using historical as-builts, a high-level review of the vertical grades along the C Street ramps was done. The review indicates sight distance relating to vertical curves is met on the ramps within the study area.

3.3 Rail Geometry

Vertical and horizontal rail geometry is dependent on the type of track based on both its location and usage. The entire study area, which includes the west end of ARRC's freight yard, rail access to its rolling stock service facilities, ARRC material storage areas, and other tracks, provides functionality for the railroad and service access to the shippers at the POA.

Two key design requirements for the layout of railroad tracks are the degree of curvature (or sharpness of the curve) and characteristics of turnouts, where a single track diverges to two tracks.

Degree of curvature is measured as the angle between two lines of radii connecting to either end of a 100-foot chord, as shown in Figure 18. Larger values for degree of curvature correspond to sharper curves and require slower train speeds to navigate.

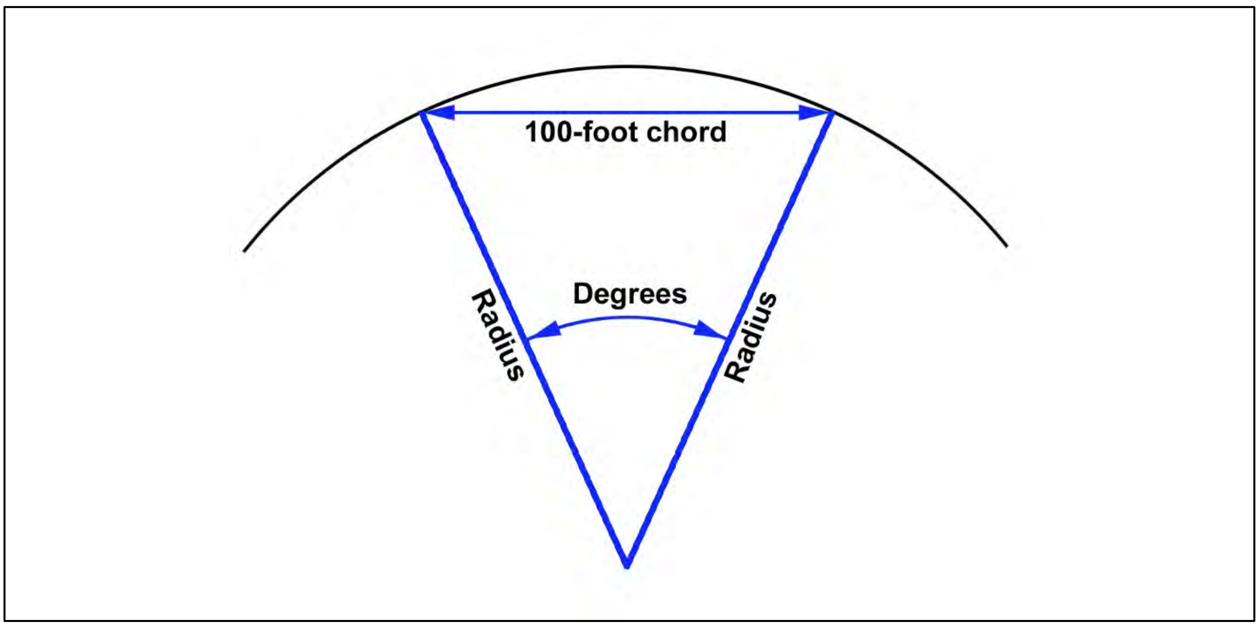

Figure 18: Railroad Track Degree of Curvature

Figure 19 shows the parts of a turnout. The switch (the moveable parts at a turnout) that align the rails to allow the train to either go through on the same track or diverge to another track. The angle between the tracks at the location of the frog is described by the turnout number. A smaller turnout number corresponds to a sharper curve on the diverging side of the turnout and requires a slower train speed to navigate.

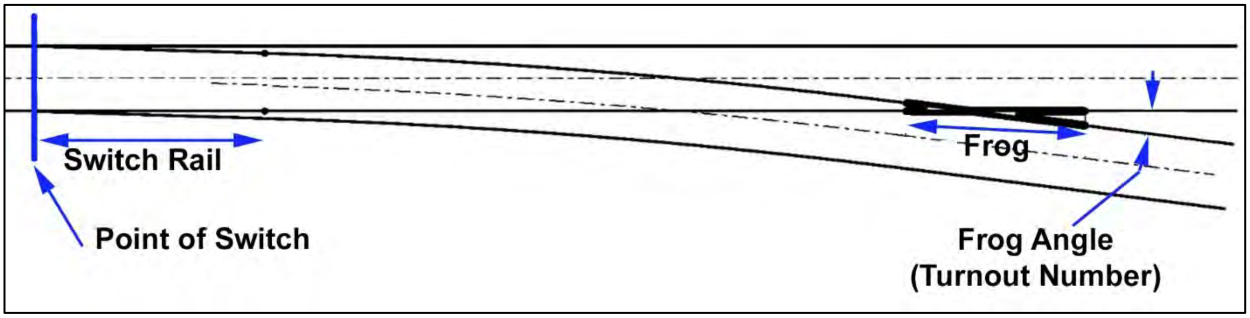

Figure 19: Parts of a Railroad Turnout

Existing rail geometry within the project area consists of:

- Existing curves with degrees of curvature as high as 14 degrees, 30 minutes.
- Existing turnouts are typically a size No. 9; however, some may be a smaller turnout number, with a sharper turnout curve, especially in the shipper facilities and the lead track to ARRC's Anchorage Yard.

Proposed standards to be used for railroad alignment alternatives to reduce rail/vehicle delays include:

- Curves with degrees of curvature of up to:
  - 12 degrees for running tracks
  - 14 degrees for industrial tracks
- Turnouts are all No. 9 Turnouts
- Tangents between reversing curves are a minimum of 67 feet long
- The Point of Switch of proposed turnouts are placed a minimum of 60 feet from the nearest curve or the point of switch of an adjacent turnout.
  - Where the adjacent curve or turnout would form a reversing curve, this distance is increased to 67 feet

These are typical freight and ARRC standards. The existing conditions generally meet or exceed these.

3.4 Rail-Road At-Grade Crossings

For this study, crossings were analyzed for safety and operations performance to determine impacts to the public. Safety analysis includes performing a collision history and collision risk assessment. Safety evaluations also include geometrics of the roadway approach with the railroad tracks. Operational performance is related to traffic delay caused by vehicles stopping and waiting while a train occupies a crossing.

3.4.1 Crossing Inventory

The study area includes 15 rail-road/driveway at-grade crossings, as shown in Figure 20; hereafter referred to as crossings. Six of the crossings are located on Ocean Dock Road. The remaining nine crossings are located on driveways or intersecting roadway approaches. Seven additional crossings are near the study area but were not evaluated. All tracks within the study area are rated at 10 mph and primarily carry freight and passenger trains.

Table 3 presents an inventory of the 14 evaluated crossings. Additional crossing information is included as Appendix A: Inventory of Evaluated Crossings.

Figure 20: Rail-Road At-Grade Crossing Locations

Table 3: At-Grade Road-Rail Crossings Inventory

DOT Crossing Inventory Number	Crossing Name	Branch or Line	Number of Tracks	Maximum Total Trains per Day	Existing Protection Type
Ocean Dock Road Crossings					
868537M	Ocean Dock Road 1 & 2	South Main & Straight Leg of Wye	2	19	Active - Flashing Lights & Gates
910348D	Ocean Dock Road 3	North Leg Freight Wye	1	10	Active - Flashing Lights
868538U	Ocean Dock Road 4	North Leg Passenger Wye	1	12	Active - Flashing Lights
868539B	Ocean Dock Road 5	Crowley, ABI Cement, Marathon, & City Dock Lead	1	32	Active – Flashing Lights & Gates
868543R	Ocean Dock Road 6	ABI Cement Lead	1	8	Passive - Signs only
Driveway/Approach Crossings					
910327K	Small Boat Launch Road 1	North Leg Wye & South Leg Wye	2	20	Passive - Signs only
910314J	ARRC Anchorage Yard	North Leg of Wye	1	12	Passive - Signs only
910328S	North Star 1	Marathon Oil Loop Track	1	2	Passive - Signs only
868541C	Tesoro 1	Crowley, ABI Cement, Marathon, and City Dock Lead, 2trk	2	32	Passive - Signs only
910329Y	Marathon 1	Marathon Oil South Driveway	1	2	Passive - Signs only
910300B	Tesoro 2	Crowley, ABI Cement, Marathon, and City Dock Lead, 2trk	1	8	Passive - Signs only
868544X	Marathon 2	Marathon Oil Unloading Leads and Loop Track	2	2	Passive - Signs only
868542J	Bluff Drive	Marathon Oil & City Dock Tracks Lead	3	8	Active – Flashing lights & gate
910379C	Roger Graves Road 1	Marathon Oil & City Dock Tracks Lead	1	8	Passive - Signs only

3.4.2 Crossing Geometrics

Safety and operational issues may arise due to sight distance and vehicle clear storage deficiencies and/or rail-road skew at the crossings. Geometrics of rail-road at-grade crossings are described below. Desktop evaluation of the crossings' geometrics were performed using Google Earth and are summarized in Table 4. Crossing geometrics were evaluated for crossings within the study area and not for the near-by crossings.

3.4.2.1 Sight Distance

Sight distance triangles are areas describing the need for unobstructed views for motorists on a road to see an approaching train on the railroad track and safely navigate the crossing. The required sight distances vary based on the maximum potential train speed and posted roadway speed limit.

There are two sight distance scenarios for safe operations at a crossing. Both scenarios involve a train traveling toward the crossing at the maximum train speed for that location. The two cases are described below:

> *Case I (Approach Sight Triangle)*: In the Case I scenario, also called "moving vehicle" case, a vehicle traveling toward the crossing at the posted speed limit must be able to see the moving train far enough in advance of the crossing to have time to decide whether to stop or proceed through the crossing, and then be able to successfully complete the chosen action. Case I sight triangles (approach sight triangles) do not necessarily have to be met where the road is stop controlled or has active traffic control devices but is desirable at all crossings.

> *Case II (Clearing Sight Triangle)*: In the Case II scenario, also called "stopped vehicle" case, a vehicle stopped at the crossing must be able to see far enough down the tracks to have time to accelerate and clear the crossing before an approaching train reaches the crossing. At all rail-road at-grade crossings, Case II sight triangles (clearing sight triangles) must be met, as a minimum, or flashing light signals with gates should be considered. This case is considered not met at crossings with multiple tracks in close proximity to the crossing where the presence of a train on one track can restrict or obscure a driver's view of a second train approaching on an adjacent track.

Figure 21 demonstrates the approach and clearing sight triangles that are formed from the required distance along the railroad from the crossing (d_T) and the required distance along the roadway from the crossing (d_H). The GDHS lists the required sight distances for varying train and roadway speeds. The listed sight distances are to be adjusted for approach grade and skew.

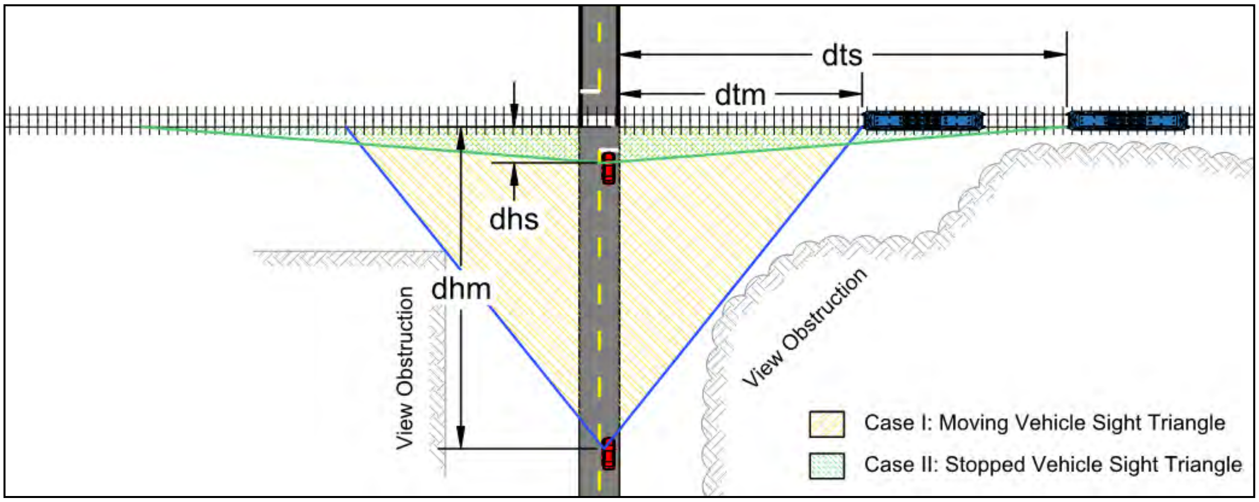

Figure 21: Rail-Road At-Grade Crossing Sight Distance Triangle Diagram
(Note sight distance triangle dimensions are adjusted for approach grade and skew and for multiple tracks at a crossing.)

Figure 22 through Figure 26 shows the desktop evaluation of the sight triangles for the study crossings.

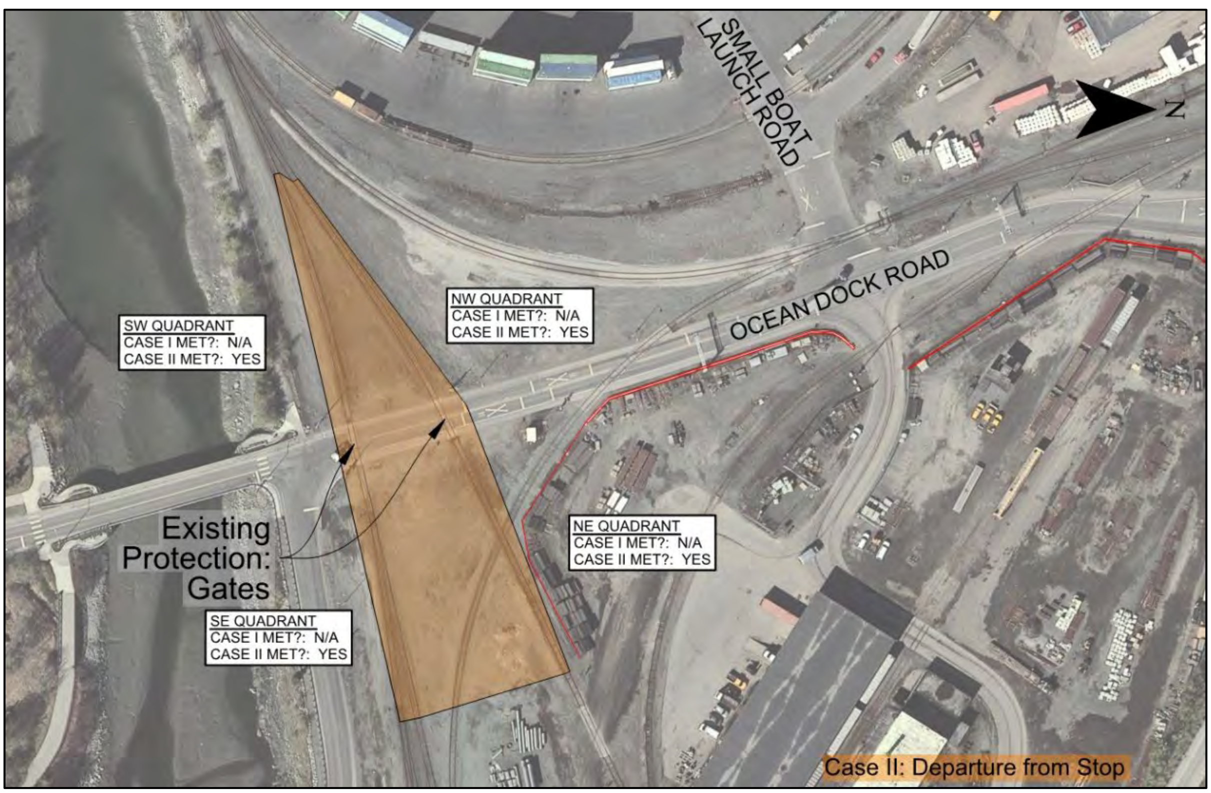

Figure 22: Rail-Road Ocean Dock Road 1 & 2 (868537M) Crossing Sight Triangles
(Note: Case I Sight Distance not evaluated due to active traffic control devices.)

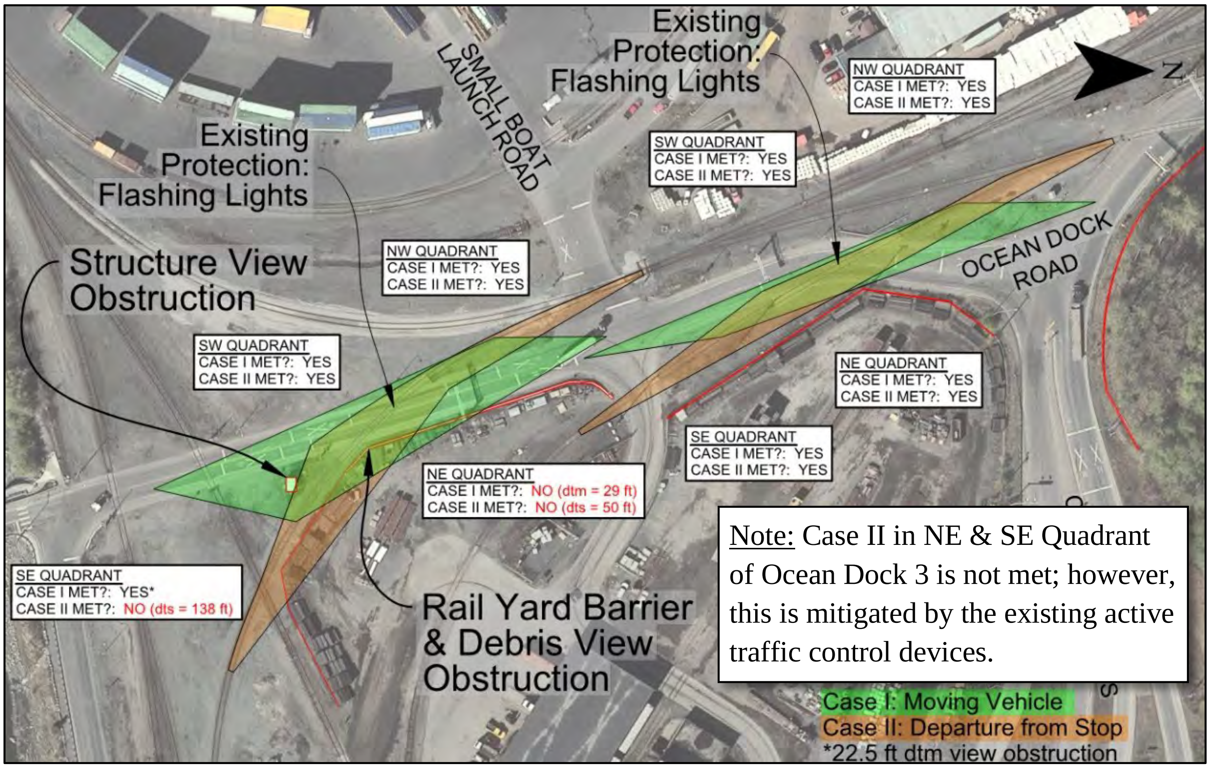

Figure 23: Rail-Road Ocean Dock Road 3 (910348D) & 4 Crossings Sight Triangles

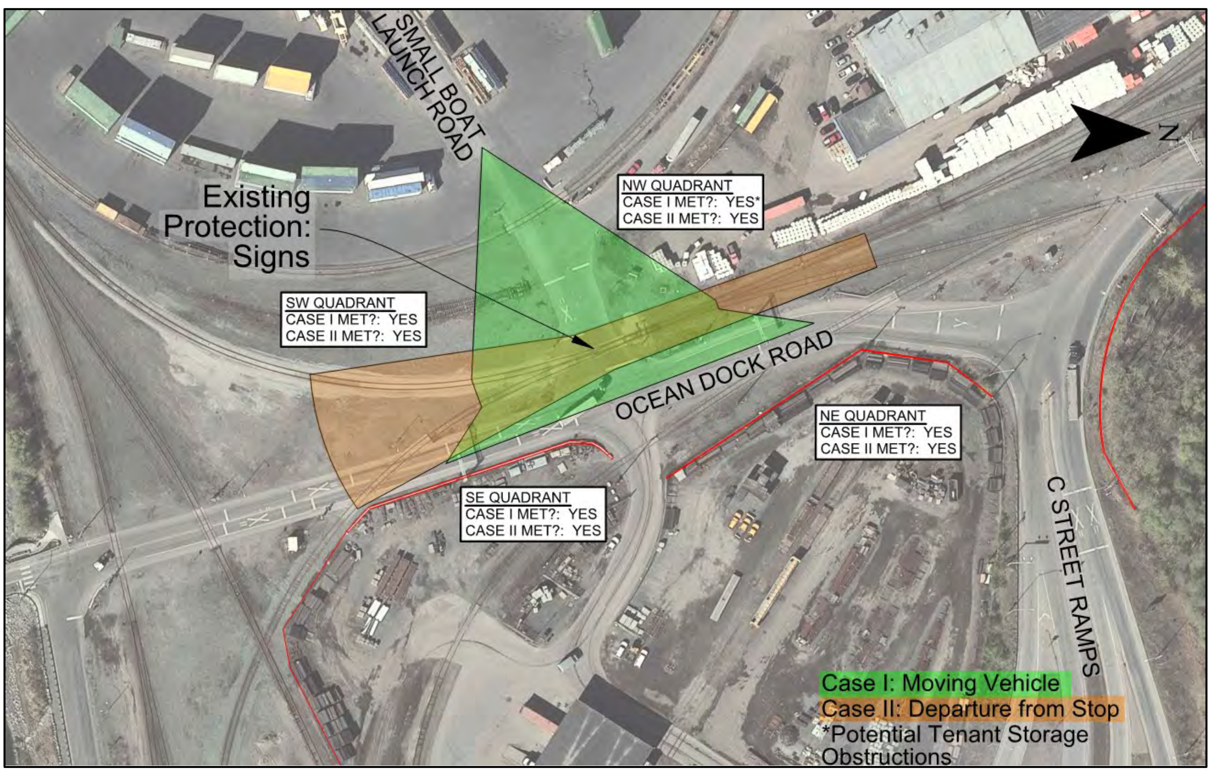

Figure 24: Rail-Road Small Boat Launch Road Crossing 1 Sight Triangles

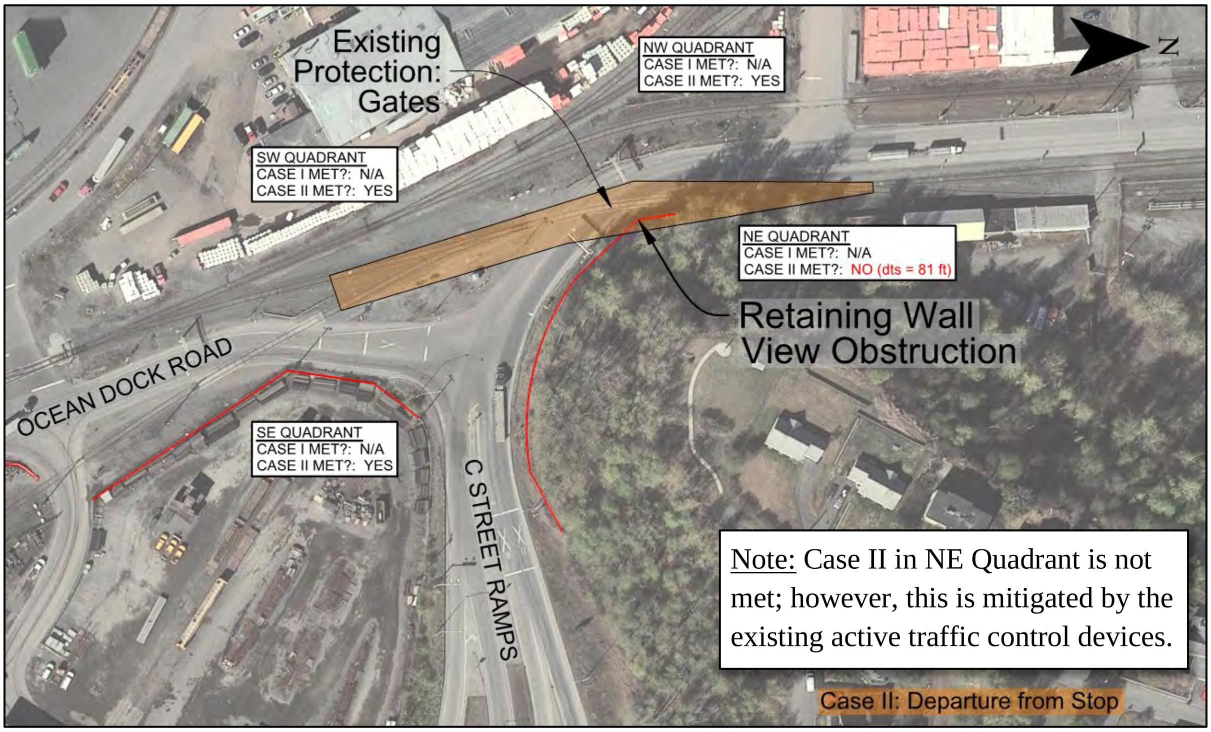

Figure 25: Rail-Road Ocean Dock Road 5 (868539B) Crossing Sight Triangles

(Note: Case I Sight Distance not evaluated due to active traffic control devices.)

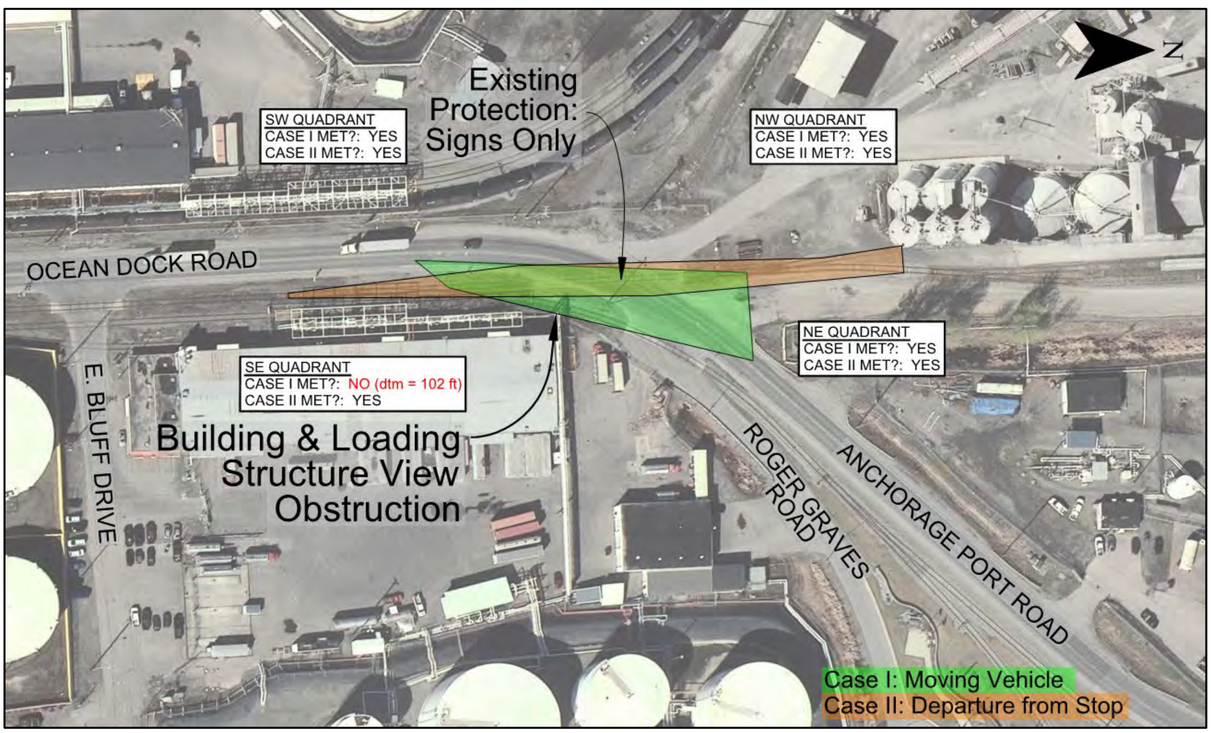

Figure 26: Rail-Road Ocean Dock Road 6 (868543R) Crossing Sight Triangles

3.4.2.2 Approach Skew

Roadway alignment should intersection railroad tracks at or nearly 90 degrees, particularly for new crossings. Skew angle approaches below 75 degrees should be avoided. Sharp skews at a crossing restrict a driver's ability to adequately assess approaching trains by requiring them to rotate their head and body to an unnatural twist. Improper risk assessment by the driver could result in crashes. Figure 27 shows an example of an excessive approach skew. Approach skews for each crossing are presented in Table 4.

Figure 27: Approach Skew

3.4.2.3 Vehicle Clear Storage

Adequate vehicle clear storage at the crossings is desirable for safer operations. Inadequate vehicle clear storage may result from the crossing being too close to another roadway intersection, railroad crossing, or pedestrian crossing and may contribute to crashes between trains and stopped vehicles and/or between opposing vehicles. The minimum vehicle clear storage length should be at least one design vehicle length; however, storage of the anticipated queue length of vehicles is desired. For the purposes of this study, the minimum storage length is equal to the length of one WB-67 semi-truck equaling 73.5 feet. Figure 28 shows the vehicle clear storage requirements. Vehicle clear storage assessments for each crossing are presented in Table 4.

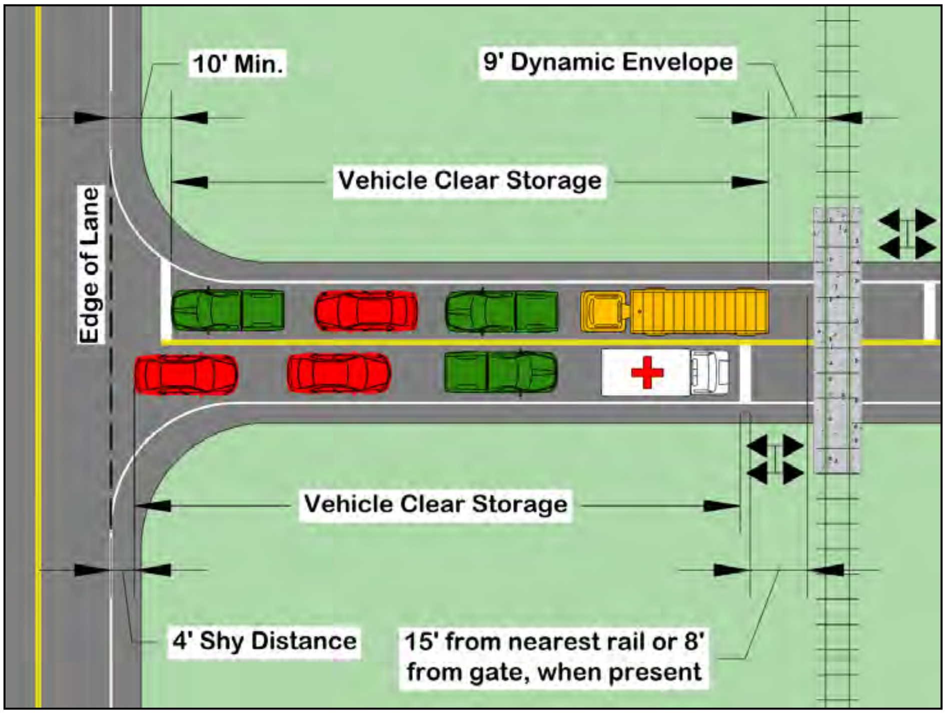

Figure 28: Vehicle Clear Storage Requirements

Table 4: Rail-Road At-Grade Crossings Evaluated Geometrics

DOT Crossing Inventory Number	Crossing Name	Sight Distance Met?	Approximate Skew		Vehicle Clear Storage	
			Approx. Measurement	Criteria Met?	Approx. Measurement	Criteria Met?
Ocean Dock Road Crossings						
868537M	Ocean Dock Road 1 (South Main)	Case I: N/A Case II: Yes	NB: 87.1° SB: 87.1°	Yes	NB: N/A SB: 125 ft	Yes
	Ocean Dock Road 2 (Straight Leg of Wye)	Case I: N/A Case II: Yes	NB: 79.8° SB: 79.8°	Yes	NB: >500 ft SB: N/A	Yes
910348D	Ocean Dock Road 3	Case I: No Case II: No	NB: 28° SB: 23°	No	NB: 89 ft SB: 362 ft	No
868538U	Ocean Dock Road 4	Case I: Yes Case II: Yes	NB: 8° SB: 36°	No	NB: 350 ft SB: 265 ft	Yes
868539B	Ocean Dock Road 5	Case I: N/A Case II: No	NB: 37° SB: 18°	No	NB: 331 ft SB: >500 ft	Yes
868543R	Ocean Dock Road 6	Case I: No Case II: Yes	NB: 13° SB: 29°	No	NB: >500 ft SB: >500 ft	Yes
Driveway/Approach Crossings						
910327K	Small Boat Launch Road 1	Case I: N/A Case II: Yes	EB1: 86.1° EB2: 92.4°	Yes	33 ft* EB Storage: 107 ft	** Yes
910314J	Anchorage Yard	–	–		34 ft*	**
910328S	North Star 1	–	–		35 ft*	**
868541C	Tesoro 1	–	–		16 ft*	**
910329Y	Marathon 1	–	–		33 ft*	**
910300B	Tesoro 2	–	–		17 ft*	**
868544X	Marathon 2	–	–		33 ft*	**
868542J	Bluff Drive	–	–		18 ft*	**
910379C	Roger Graves Road 1	–	–		15 ft*	**

* Vehicle clear storage on driveways/approaches is the distance between the nearest roadway lane line to the nearest track.

** Vehicles wishing to turn into the driveway will stop on Ocean Dock Road while a train is present in the crossing instead of occupying the vehicle clear storage area on the driveways; therefore, holding up through traffic on Ocean Dock Road.

3.4.3 Crossing Safety

The primary systematic method used for determining the safety needs of rail-road at-grade crossings is a collision prediction model. Collision prediction methods compute the predicted collision occurrence at a crossing and compares that to a set threshold to determine if improvements are needed. The method uses characteristics of the crossing to calculate risk. It should be noted that this method is not used exclusively in determining whether a crossing needs improvement. Engineering studies, where other considerations are investigated, such as sight distance, vehicle clear storage, and cost-benefit analysis, assist in the final safety improvement recommendations.

3.4.3.1 Accident Prediction Value

The most commonly used collision prediction formula is the United States Department of Transportation (USDOT) Accident Prediction Model. This model incorporates multiple physical elements and traffic data of the crossing, as well as past collision history, to calculate a predicted likelihood of a crash occurring over a period of time, known as the Accident Prediction Value (APV). Equation 2 presents the APV equations. Refer to the Federal Highway Administration (FHWA) Railroad-Highway Grade Crossing Handbook, 2nd edition for more information.

(1) $$a = K * EI * MT * DT * HP * MS * HT * HL$$

Where:

a = initial collision prediction, collisions per year at crossing

K = formula constant

EI = factor for exposure index based on product of highway and train traffic

MT = factor for number of main tracks

DT = factor for number of through trains per day during daylight

HP = factor for highway paved (yes or no)

MS = factor for maximum train speed

HT = factor for highway type

HL = factor for number of highway lanes

(2) $$B = \frac{T_0}{T_0+T} a * \frac{T}{T_0+T}\left(\frac{N}{T}\right)$$

Where:

B = second collision prediction, collisions per year at the crossing

a = initial collision prediction from basic formula, collisions per year at the crossing

$\frac{N}{T}$ = collision history prediction, collisions per year, where N is the number of observed collisions in T years at the crossing

Equation 2: Accident Prediction Formula

The calculated APV of a crossing is then compared to threshold values provided in the *Alaska Policy on Railroad/Highway Crossings* (1988) and *Alaska Traffic Manual*. Table 5 presents the threshold values. The threshold values correspond to minimum levels of traffic control or crossing protection required at a crossing. Crossing protection is classified as passive or active. Passive crossings entail traffic control devices in the form of signs only. Active traffic control devices include automatic gates and/or flashing lights at the crossing.

Table 5: Threshold APVs

ALASKA POLICY ON RAILROAD/HIGHWAY CROSSINGS APPENDIX B Changes in Level of Protection Revised September 1 ,1988		
Existing traffic control device	**Calculated Accident Prediction Value (APV)**	**Recommended Action for Improvement**
Passive	0.08 to 0.12	*See note below.
	0.12 to 0.15	Flashing lights.
	0.15 to 0.23	Flashing lights or gates and flashing lights.
	0.23 to 12.4	Gates and flashing lights.
	12.4 to 18.5	Gates and flashing lights or grade separation.
	Greater than 18.5	Grade separation.
Flashing lights	0.12 to 0.18	*See note below.
	0.18 to 3.7	Gate and flashing lights.
	3.7 to 5.6	Gates and flashing lights or grade separation.
	Greater than 5.6	Grade separation.
Gates	1.32 to 1.98	*See note below.
	Greater than 1.98	Grade separation.

* NOTE - When the calculated hazard index falls within this range the decision may be to do nothing, improve the existing traffic control system, install a different type of traffic control system, or make some other improvement at the crossing.

Crash history is a factor in the APV calculation. Crashes were obtained from ARRC and are described in Section 3.5.4. However, only crashes from the most recent 5-year period (2017-2021) were used based on recommendations from the *Railroad/Highway Grade Crossing Handbook*. Additionally, crashes involving traffic control equipment, such as gates or flashing lights being hit, were excluded from the crash total. Crashes due to crossing geometrics or traffic were included.

The normalizing factors used are for the year 2013. At this time, these are the most recent normalizing factors available. Normalizing factors allow the USDOT collision prediction model to be calibrated with current collision trends.

Table 6: Rail-Road At-Grade Crossings Safety Indices

DOT Crossing Inventory Number	Crossing Name	APV	Minimum Level of Crossing Protection Required	Existing Level of Crossing Protection
Ocean Dock Road Crossings				
868537M	Ocean Dock Road 1 & 2	0.0557	Passive	Active – Automatic Gates
910348D	Ocean Dock Road 3	0.0227	Passive	Active – Flashing Lights
868538U	Ocean Dock Road 4	0.1173	Passive *	Active – Flashing Lights
868539B	Ocean Dock Road 5	0.0898	Passive	Active – Automatic Gates
868543R	Ocean Dock Road 6	0.0284	Passive	Passive
Driveway/Approach Crossings				
910327K	Small Boat Launch Road 1	0.0251	Passive	Passive
910314J	Anchorage Yard	0.0220	Passive	Passive
910328S	North Star 1	0.0067	Passive	Passive
868541C	Tesoro 1	0.0096	Passive	Passive
910329Y	Marathon 1	0.0040	Passive	Passive
910300B	Tesoro 2	0.0062	Passive	Passive
868544X	Marathon 2	0.0040	Passive	Passive
868542J	Bluff Drive	0.0048	Passive	Passive
910379C	Roger Graves Road 1	0.0102	Passive	Passive

* Calculated APV near Active - Flashing Lights

3.5 Safety

The DOT&PF provided available crash data along the Ocean Dock Road study area for the most recent 10-year period, from 2008 through 2017. Crashes from the most recent 5-year period (2013-2017) were used to calculate and compare intersection and segment crashes with 5-year statewide average crash rates for similar facilities. The full 10-year period was used to analyze historical crash trends. The crash type and location for each crash listed in the DOT&PF database were carefully reviewed and adjusted using engineering judgement.

The *AMATS: C Street/Ocean Dock Road Access Ramps Reconnaissance Engineering Study* reports no visible crash patterns at the Ocean Dock Road at C Street ramps intersection since there were only a few crashes reported: four crashes for a 13-year study period from 2000 through 2012.

3.5.1 Crash Rates

Crash rates were calculated based on the number of crashes, number of years in the study period, and annual average daily traffic (AADT). The crash rates were compared to the statewide averages for similar facilities and then the Critical Accident Rate (CAR) was calculated. The most recent published statewide averages are found in the 2018 *Highway Safety Improvement Program Handbook* (HSIP). The CAR is a threshold above which the observed rate is statistically higher than average at a 95% confidence level. When a crash rate exceeds the CAR, there is strong evidence that crashes are caused by underlying contributing factors instead of just random occurrences.

Table 7 presents the Ocean Dock Road intersection crash rates, given in terms of crashes per million entering vehicles (MEV). The Ocean Dock Road at C Street ramps intersection falls below the statewide average, indicating that there is no statistical evidence that the intersection has poor safety performance or an unusually high crash rate. The Ocean Dock Road and Whitney Road intersection has a crash rate above the statewide average but below the CAR, indicating that the crash rate is not statistically different from the average for similar facilities.

Table 7: Intersection Crashes (2013 to 2017)

Intersection	Total Crashes	Entering AADT (vehicles/day)	Crash Rate (Crashes/MEV)			Above Average?	Above CAR?
			Calculated	Statewide Average	CAR @ 95% Confidence		
Ocean Dock Rd and Whitney Rd	5	4,599	0.60	0.52	1.00	Yes	No
Ocean Dock Rd and C St Ramps	3	4,514	0.36	0.52	1.00	No	No

No segment crashes were reported on Ocean Dock Road during the most recent 5-year period (2013 through 2017) needed to calculate segment crash rates and to compare with state averages.

3.5.2 Intersection Crashes

Figure 29 presents the crash frequency at the intersections by crash type from 2008 through 2017.

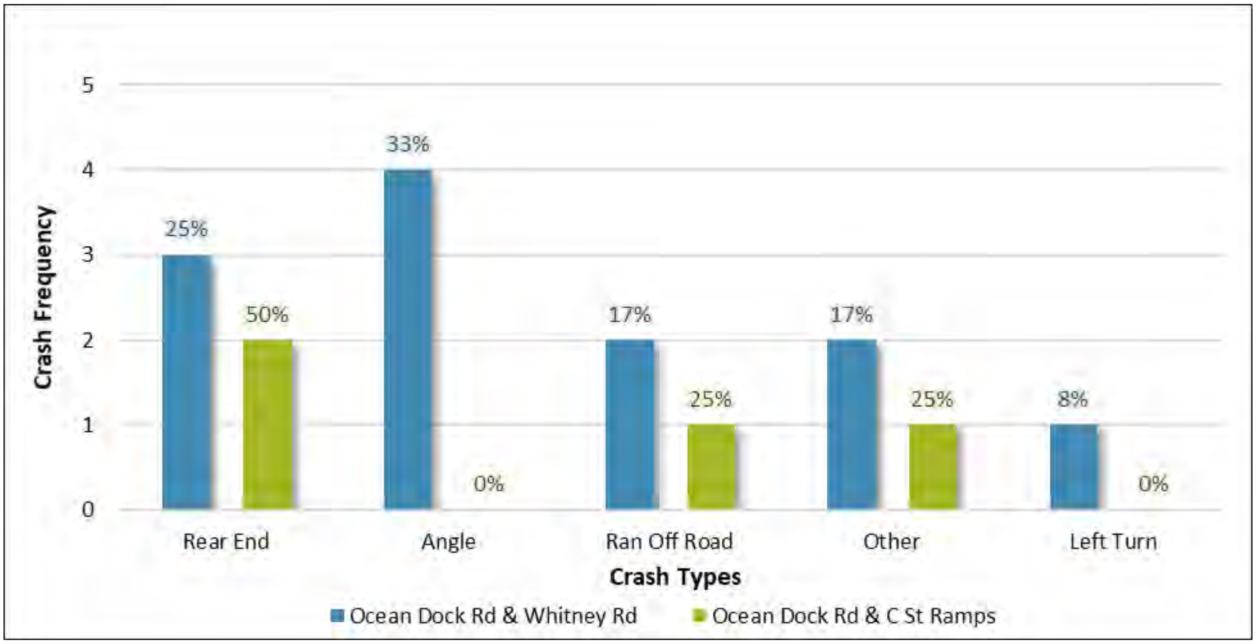

Figure 29: Crash Type at Intersections (2008-2017)

At the Ocean Dock Road and Whitney Road intersection, the predominant crash types were angle and rear-end crashes. There were four angle crashes at the intersection: two were between southbound Ocean Dock Road vehicles and Whitney Road vehicles turning left, one was between a northbound Ocean Dock Road vehicle and a Whitney Road vehicle turning left, and one was between a southbound Ocean Dock Road vehicle and a Whitney Road vehicle turning right and swinging wide. The three rear-end crashes all occurred on Whitney Road.

At the Ocean Dock Road and C Street ramps intersection, the predominant crash type was rear-end crashes. Both crashes involved northbound vehicles on Ocean Dock Road striking stopped northbound vehicles at the intersection.

Figure 30 presents the severity of intersection crashes from 2008 through 2017. Most intersection crashes in the study area resulted in property damages only with no injuries. Two crashes at the Ocean Dock Road and Whitney Road intersection were reported to have sustained minor injuries. One minor injury crash involved a speeding vehicle on Whitney Road running off the road. The second minor injury crash occurred when a southbound vehicle turning left from Ocean Dock Road to Whitney Road was struck by a northbound vehicle that failed to yield to the turning vehicle.

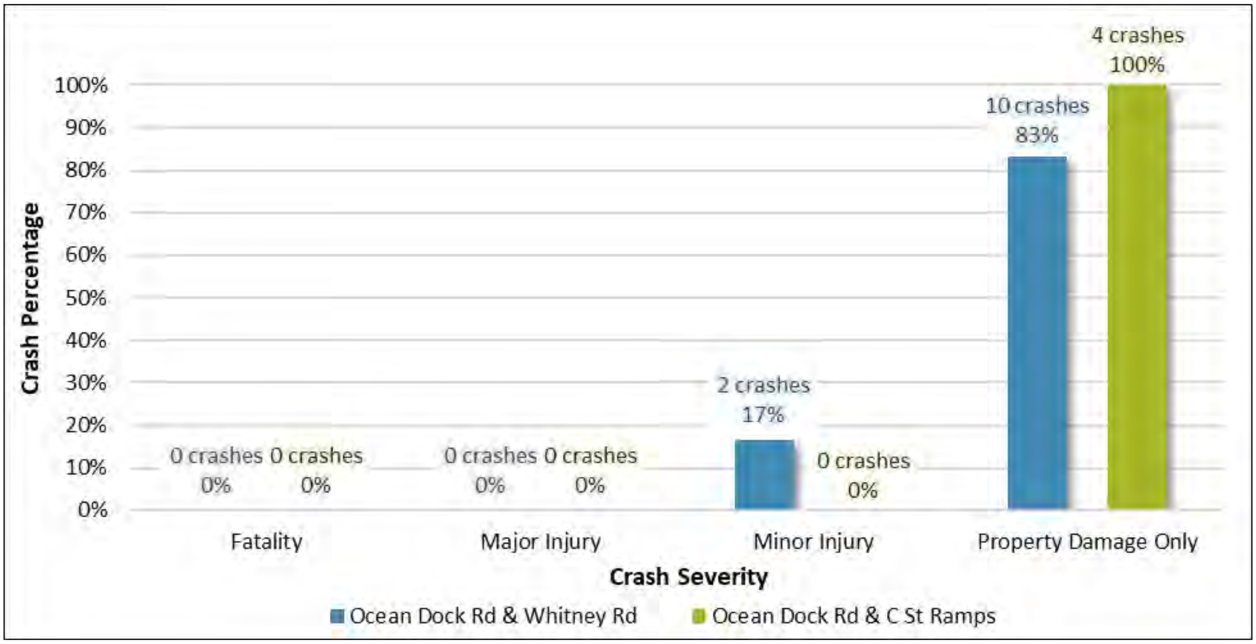

Figure 30: Crash Severity at Intersections (2008-2017)

Crashes that almost happened (also known as near misses or close calls) are not reported to DOT&PF. Truck drivers expressed concerns at the Ocean Dock Road and Whitney Road intersection citing near misses involving northbound North C Street drivers disregarding the stop sign as they were coming off the Ship Creek Bridge.

3.5.3 Segment Crashes

While no segment crashes were reported during the 5-year period (2013 through 2017) used to determine crash rates, two crashes were reported on the Ocean Dock Road segment between 2008 and 2013. The first crash occurred near the POA entrance gate in January 2010, where a northbound vehicle rear ended a stopped vehicle. The second crash occurred in July 2012 and involved a southbound vehicle running off the road north of Whitney Road near a railroad crossing. Both crashes resulted in property damages only (no injuries).

3.5.4 Road-Rail At-Grade Crossing Crashes

ARRC provided railroad crossing crashes from 2006 to 2021. The most recent 10 years of data (2012 to 2021) were analyzed for crash patterns. Note that the crashes provided is not a complete list, and more crashes may have occurred but not have been captured. A total of 59 vehicle-related crashes were reported in the study area during the 10-year period. Figure 31 presents vehicle-related crashes reported by ARRC from 2012 to 2021.

Crashes with rail equipment are the most predominant crashes; 51 crashes involved either vehicles knocking off/striking railroad equipment (gate or cantilever), or vehicles being struck by lowering gates. Most of the crashes occurred at Ocean Dock Road 1 or Ocean Dock Road 2 (868537M) crossings.

Seven crash events involved vehicles driving down the tracks and getting stuck in a yard. Six of these crashes occurred on Ocean Dock Road between Whitney Road and the C Street ramps: one from Ocean Dock Road 1 or 2 (868537M), three from Ocean Dock Road 4 (868538U), and two from Ocean Dock Road and ending in the Anchorage Yard. The remaining crash event of this type occurred from the Ocean Dock Road 5 (868539B) crossing.

DOT&PF and ARRC reviewed sight distance concerns at the Ocean Dock Road 6 (868543R) crossing and have nominated improvements at the crossing for HSIP funding.

The crashes reported by ARRC are not included in the roadway intersection and segment crash rates because these types of crashes are typically not reported in Department of Public Safety crash forms (which eventually get transferred to DOT&PF), and therefore, are not included in calculations for statewide averages.

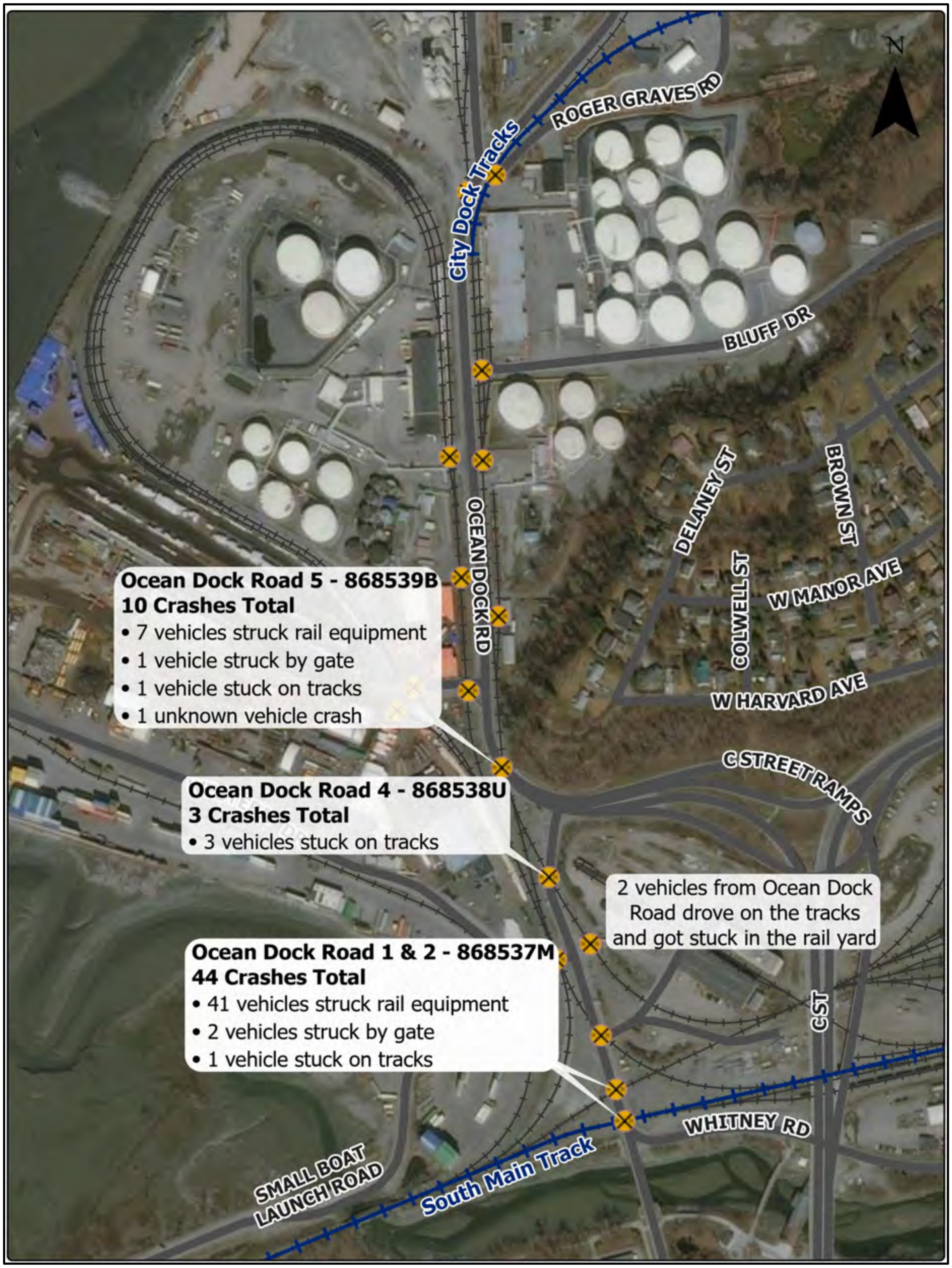

Figure 31: ARRC Reported Vehicle Crashes (2012 to 2021)

3.6 Operations

3.6.1 Historical AADT

AADT volumes were collected using the online DOT&PF traffic data portal. Table 8 summarizes the historical AADT volumes for the road segments in the study area. Note that pre-pandemic volumes (2019 AADTs and earlier) were used in the operational analyses due to the shift in people working out of the home to working in the home during the pandemic.

Table 8: Historical AADT Volumes (2011-2020)

Road Segment	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Ocean Dock Rd: Whitney Rd to C St Ramps	2,550	2,590	2,580	2,697	2,738	2,788	1,990	3,164	3,226	2,290
Ocean Dock Rd: C St Ramps to POA	1,968	2,002	1,892	1,902	1,931	2,011	2,053	2,047	2,087	1,810
Whitney Rd: Craig Taylor Equipment to Ocean Dock Rd	2,923	1,813	3,344	2,989	2,430	3,456	3,291	2,572	2,648	1,760
North C St: Whitney Rd to West 1st Ave	3,461	3,362	3,284	2,531	3,982	3,992	3,898	3,087	3,359	2,340
C St Northbound Off-Ramp: C St to Ocean Dock Rd	2,121	1,669	2,056	1,984	2,058	2,112	1,463	1,344	1,752	580
C St Southbound Off-Ramp: C St to Ocean Dock Rd	328	328	304	342	339	322	300	319	302	250
C St Southbound On-Ramp: Ocean Dock Rd to C St	2,041	1,977	2,091	1,901	1,794	1,704	1,206	1,489	1,543	1,280
C St Northbound On-Ramp: Ocean Dock Rd to C St	420	430	430	361	450	399	316	496	450	370

3.6.2 Turning Movement Volumes

Turning movements were collected for the Ocean Dock Road intersection at Whitney Road. Observations were conducted on Tuesdays to collect activity when sea vessels are docked at the POA. Figure 32 presents the existing turning movement volumes during the AM, midday, and PM peak hour periods, as well as the percent of heavy trucks on each approach.

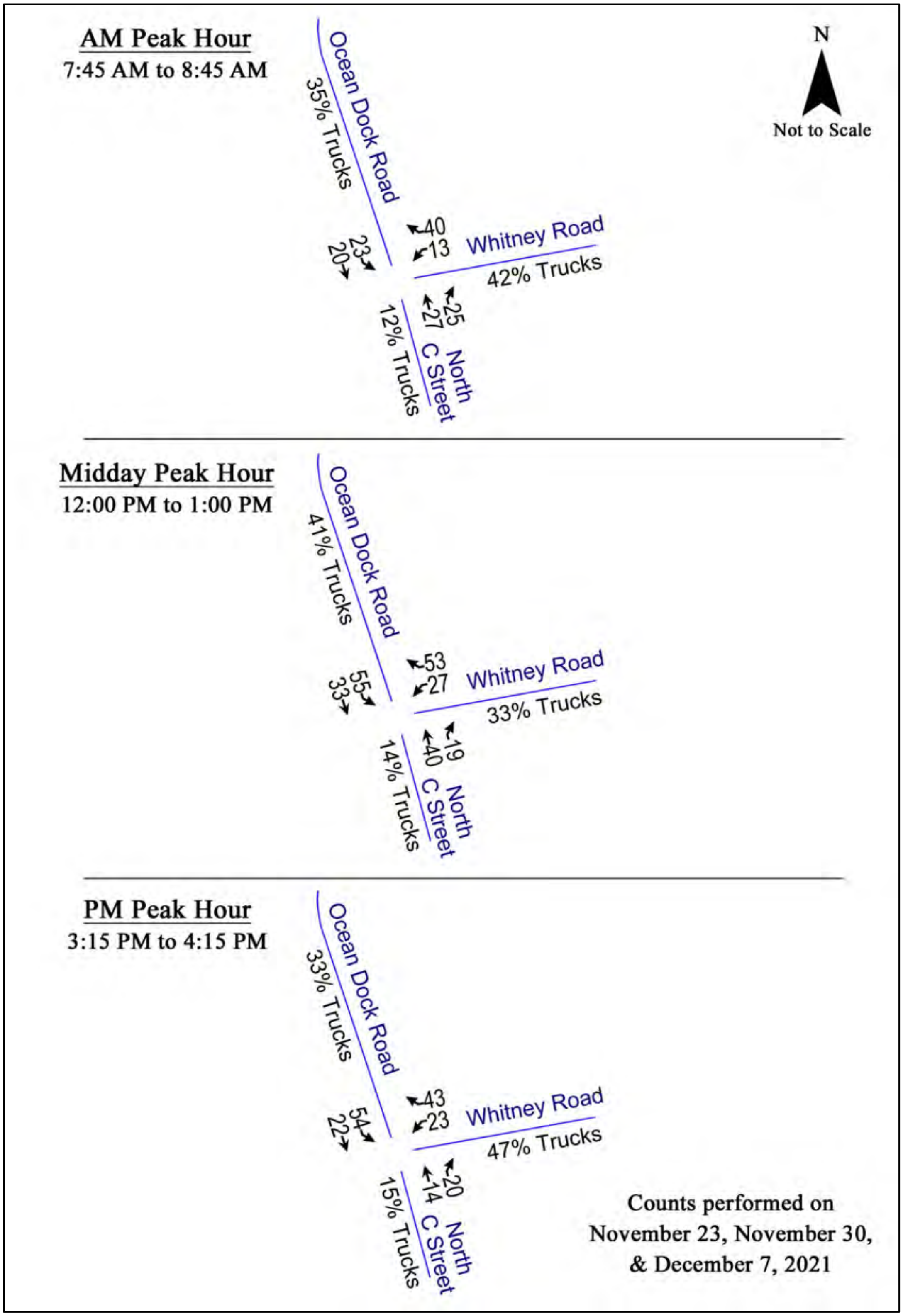

Figure 32: Existing Turning Movement Volumes – Ocean Dock Road and Whitney Road

3.6.2.1 Peak Hour Factors

Peak hour factors (PHFs) convert hourly volumes to 15-minute design flow rates for capacity analysis and represent the uniformity of traffic volumes arriving at the intersection over an hourly period. PHFs range from 0.25 (all traffic arrives in one 15-minute period with no additional traffic arriving for the rest of the period) to 1.0 (equal number of vehicles arrive during each 15-minute period). Table 9 presents the observed AM, midday, and PM peak hours at the Ocean Dock Road and Whitney Road intersection. The PHFs indicate that volumes vary among the 15-minute periods, with some periods having higher volumes than others.

Table 9: Existing PHFs for Peak Periods – Ocean Dock Road and Whitney Road

Peak Period	PHF
AM	0.79
Midday	0.73
PM	0.79

3.6.2.2 Heavy Vehicle Percentages

Truck volumes were collected from the turning movement counts at the Ocean Dock Road at Whitney Road intersection. Figure 33 compares the volumes of cars and trucks observed during the 13-hour count at the intersection, counted from 5:00 AM to 8:00 AM and from 2:15 PM to 6:15 PM.

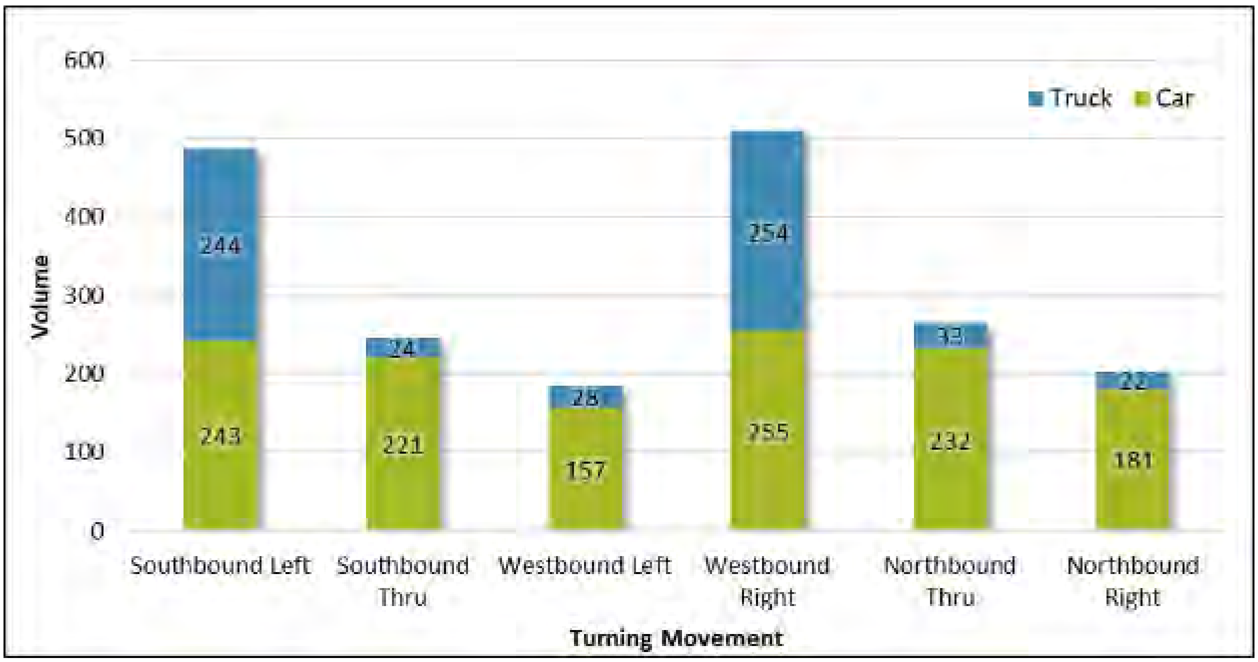

Figure 33: 13-hour Volumes on a Tuesday - Ocean Dock Road and Whitney Road

Existing peak hour heavy vehicle percentages were determined from the turning movement counts. Table 10 presents the heavy vehicle percentages by peak hour. The percentages are also depicted in Figure 32.

Table 10: Peak Hour Heavy Vehicle Percentages – Ocean Dock Road and Whitney Road

Peak Hour	Southbound Ocean Dock Road	Westbound Whitney Road	Northbound North C St
AM	35%	42%	12%
Midday	41%	33%	14%
PM	33%	47%	15%

3.6.3 Intersection Operations

The traffic control at the Ocean Dock Road and Whitney Road intersection is unconventional for a T-intersection with the northbound North C Street and the westbound Whitney Road approaches under stop-control and the southbound approach of Ocean Dock Road operating freely (no control). Because of the unconventional traffic control, the intersection was analyzed in a microsimulation using PTV Vissim simulation software.

Table 11 presents the average approach and intersection delays after 10 simulation runs during the peak hour periods. The intersection operates at Level of Service (LOS) A (delay less than 10 seconds per vehicle) during the peak periods with the stop-controlled approaches operating at LOS B.

Table 11: Existing LOS at Ocean Dock Road and Whitney Road Intersection

AM Peak	**WBL**	**WBR**	**NBT**	**NBR**	**SBL**	**SBT**
Approach Delay (seconds/vehicle)	12		11		0	
Approach LOS	B		B		Free	
Intersection Delay (seconds/vehicle)	8					
Intersection LOS	A					
Midday Peak	**WBL**	**WBR**	**NBT**	**NBR**	**SBL**	**SBT**
Approach Delay(seconds/vehicle)	12		11		0	
Approach LOS	B		B		Free	
Intersection Delay (seconds/vehicle)	7					
Intersection LOS	A					
PM Peak	**WBL**	**WBR**	**NBT**	**NBR**	**SBL**	**SBT**
Approach Delay (seconds/vehicle)	13		11		0	
Approach LOS	B		B		Free	
Intersection Delay (seconds/vehicle)	7					
Intersection LOS	A					

Existing operations at the Ocean Dock Road at C Street ramps were analyzed in the 2018 Reconnaissance Engineering Study for the intersection. The study reported the intersection movements operate at LOS B conditions or better on cargo days (Tuesdays). The northbound Ocean Dock Road approach had the most delay of 12 seconds per vehicle during the midday peak.

3.6.4 Estimate of At-Grade Road-Rail Crossing Delay

Traffic operations while a train crosses the study area was analyzed by estimating total crossing delay. The total crossing delay is the sum of delays incurred by all vehicles stopped for a crossing train, which includes the time for the train to cross and time for vehicle queues to dissipate. The total crossing delay was evaluated based on the average number of trains crossing the study area on Tuesdays when traffic volumes are generally higher.

Crossing delay was estimated for the peak period (summer train volumes on Tuesdays). To estimate crossing delay, train movements were assigned four periods of the day: morning, afternoon, evening, and late evening. Traffic volumes for these periods were based on turning movement counts for the AM peak, midday peak, PM peak, and off peak, respectively. The crossing delay is dependent on the length of the train, which varies for each train; however, for analysis purposes, a length of 5,000 feet for each train was assumed in the calculation; this equates to approximately 5.5 minutes of the train occupying the road, assuming the train is traveling at its maximum timetable speed.

Table 12 and Figure 34 present the total crossing delay and the cost of delays for the rail-road at-grade crossings within the study area on a Tuesday. The value of time is described in Section 3.6.4.1. Rail-road crossings Ocean Dock Road 1 (868537M) and Ocean Dock Road 5 (868539B) incur the most crossing delay due to the high volume of trains crossing at these locations combined with a higher volume of cars and trucks. The Small Boat Launch Road 1 (910327K) crossing has high train crossing volumes, but traffic volumes at this location are small relative to volumes on Ocean Dock Road. Note that the crossing delays are an estimate to compare the operation and find differences among the crossings in the study area; actual delay experienced may be different than the delays shown in the table.

Table 12: Estimated Existing Tuesday Crossing Delay and Cost of Delay

Crossing Name	Maximum Hourly Volume (vehicle/hour)	Average Daily Train Crossings, Tuesday (train/day)	Daily Delay, Tuesday (vehicle-hour)	Cost of Delay, Tuesday ($/day)
Ocean Dock Road 1 (868537M)	226	22	26.3	$1,147
Ocean Dock Road 2 (868537M)	226	4	2.1	$92
Ocean Dock Road 3 (910348D)	226	11	10.5	$457
Ocean Dock Road 4 (868538U)	204	16	13.5	$586
Ocean Dock Road 5 (868539B)	343	34	57.6	$2,509
Ocean Dock Road 6 (868543R)	343	8	12.2	$533
Small Boat Launch Road 1 (910327K)	97	22	5.7	$250

Figure 34: Estimated Existing Daily Crossing Delay

3.6.4.1 Value of Time

The cost of delay was determined by multiplying the total crossing delay by the value of time for a vehicle user. The value of time was calculated with the methodology presented in the USDOT publication *The Value of Time Savings: Departmental Guidance for Conducting Economic Evaluations, Revision 2 (2016 Update)* and is determined based on the median household income, average vehicle occupancy, and the value of travel time for personal, business, and vehicle operator (such as truck driver) travels.

Travel costs were calculated by multiplying the median household income by the value of travel time savings for each travel purpose and by a vehicle occupancy rate, then divided by 2,080 hours a year, which is the total hours a person works at 40 hours per week and 52 weeks a year. For vehicle operator travel cost, its recommended to also multiply the median household income by a factor of 1.54. The median 2019 household income for the Municipality of Anchorage (MOA) is $84,928. The recommended value of travel time savings is 50% for personal purposes and 100% for business and vehicle operator purposes. The average vehicle occupancy for Anchorage is 1.1, taken from the 2016 MOA *Status of the System Report*.

The value of travel time is calculated as a weighted average cost of personal and business travel; the default values for these are 95.4% for personal travel and 4.6% for business travel. However, since there is a large percentage of vehicle operator travel in the study area, a different distribution was used. It was assumed that 44% of the travel time value would be vehicle operator travel; this value is the average daily heavy vehicle percentage on Tuesdays collected by the DOT&PF Weigh-in-Motion (WIM) at Ocean Dock Road in 2019. The remaining 56% were distributed to personal and business travel based on the default travel distribution, which resulted in 53.4% for personal travel and 2.6% for business travel. Using these values with the travel costs, the value of time in Anchorage is $43.59 per vehicle-hour.

3.6.5 Pedestrian Operations

Pedestrians and bicycles are accommodated on shoulders along Ocean Dock Road throughout the study area. A pathway is provided on the south side of Whitney Road, connecting Ocean Dock Road to a pedestrian bridge crossing Ship Creek.

A marked crosswalk is provided at the Ocean Dock Road and Whitney Road intersection on the south leg. At this crossing, the southbound through vehicle movement is the only movement pedestrians encounter that is uncontrolled; the other movements crossing the crosswalk are stop-controlled and are assumed to wait for the pedestrian to finish crossing before proceeding through the intersection. Pedestrian delay for crossing the south leg was calculated as the time to wait for a gap in southbound through vehicles to cross, assuming no vehicles would yield to pedestrians. Existing pedestrian delay is about 1 second per pedestrian during the peak hour periods.

A pedestrian facility is provided along the C Street bridge for pedestrians and bicycles traveling between downtown and Government Hill. However, it does not serve users of Ship Creek or the Coastal Trail since they must travel out of their way to access the bridge, which can add an additional 0.5 to 1 mile of travel depending on their destination. This makes the Ocean Dock Road corridor a more desirable route to use.

The 2018 *AMATS: C Street/Ocean Dock Road Access Ramps Reconnaissance Engineering Study* analyzed pedestrian operations at the C Street ramps intersection. The study reported that pedestrians and bicycles were observed traveling along the C Street ramps, although signs are present prohibiting the travel movements. Desire paths are shown between the Government Hill neighborhood to the provided crosswalks on the ramps, east of the intersection. Figure 35 presents the pedestrian and bicycle routes observed in the 2018 study. The study reported that pedestrians crossing the C Street ramps could experience between 1 to 5 seconds of delay per pedestrian during the peak hour periods, depending on the pedestrian platoon size and assuming no vehicles yielded to pedestrians. Pedestrian delay crossing the ramps is minimal throughout the day; however, the heavy truck volumes and lack of upstream pedestrian sight distance on the ramps while pedestrians are crossing is of concern.

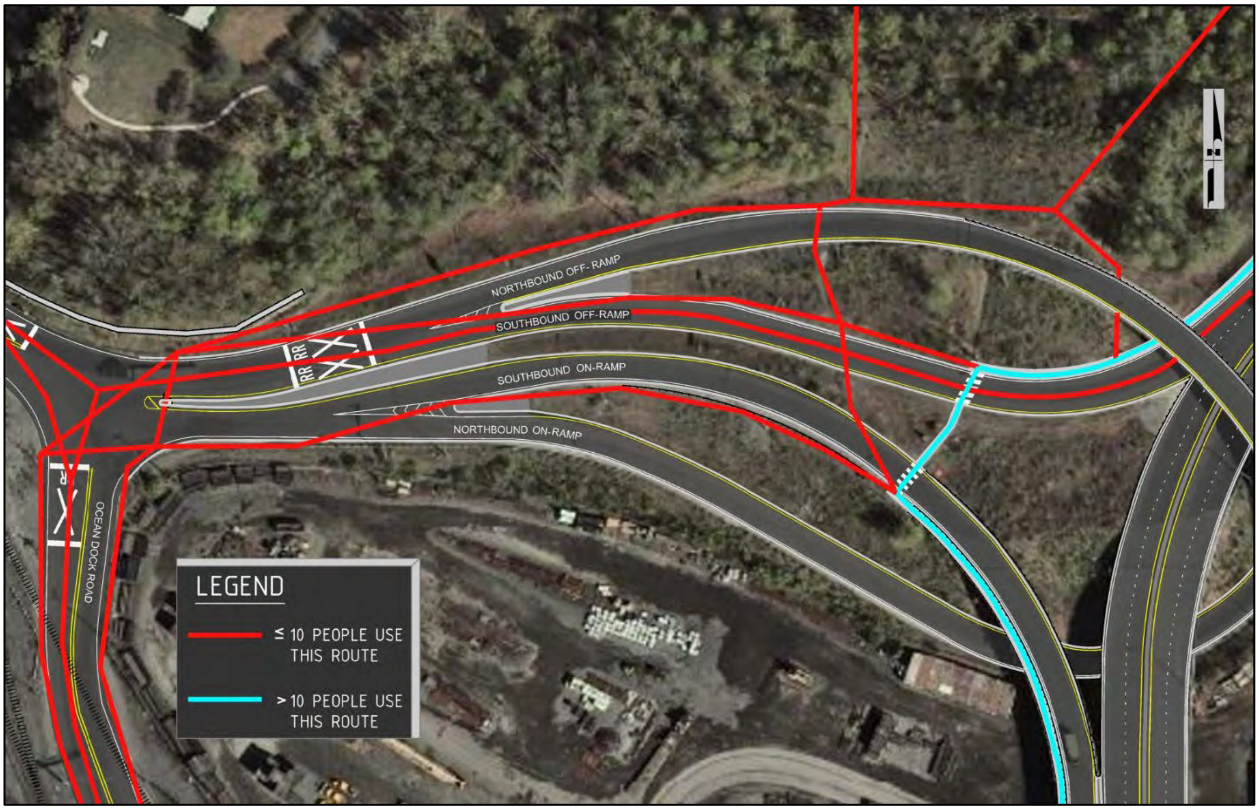

Figure 35: Observed Pedestrian and Bicycle Routes (April 26 and May 11, 2017)
Source: *AMATS: C Street/Ocean Dock Road Access Ramps Reconnaissance Study*, Figure 21

3.7 Environmental

Because the study area is characterized as an area of heavy previous disturbance, negative environmental impacts are expected to be minimal.

3.7.1 Land Use and Transportation Plans

The project is listed in the AMATS 2015-2018 Transportation Improvement Program.

3.7.2 Historic Properties

A desktop review of previously documented cultural resources and investigations within the Ocean Dock Road transportation corridor was undertaken, as well as a windshield reconnaissance survey to verify the results of the desktop review and document the existing built environment of the project study area. Based on these analyses, it is recommended a thorough inventory and evaluation of the properties along Ocean Dock Road in the direct Area of Potential Effect (APE) be undertaken to ensure proper adherence to Section 106. The evaluation should solicit input from the various property holders, including but not limited to building construction dates and previous and current land development plans. The Government Hill Federal Housing Historic District is within the direct APE and also within the visual APE. Any project proposing to cut away at the bluff would likely cut away at the boundaries of the district as well, resulting in an adverse effect to the district. Avoidance of the Government Hill Greenbelt (located in part of the bluff area surrounding the Government Hill neighborhood) is recommended.

Two National Register of Historic Places (NRHP) sites, Government Hill Federal Housing Historic District and Brown's Point Park Historic Site, are adjacent to the project area and are cited in the Alaska Heritage Resource Survey (AHRS) as historically significant. There are two bridges and a building that are considered to have historical significance but are unlikely to be affected by this project at this time. If the project area changes as design develops, this will need to be re-examined.

3.7.3 Section 4(f)/6(f) Impacts

Whether the project would result in a potential for Section 4(f) or 6(f) impacts will need to be examined when project is further developed. Any adverse Section 106 impact will involve a 4(f) determination.

3.7.4 Contaminated Sites and Hazardous Materials

The Alaska Department of Environmental Conservation contaminated sites mapper (accessed June 29, 2022) for the study area lists a groundwater plume located under the railroad yard and approaching Whitney Road under the C Street bridge.

3.7.5 Wetlands/Waterbodies

No wetlands are present within the project area. Ship Creek is unlikely to be disturbed. The need to acquire wetlands or water body permits is not expected.

3.7.6 Fish and Wildlife, Threatened and Endangered Species

No threatened or endangered species or habitats are present within the project area. Impacts to Ship Creek are unlikely; therefore, no measures need to be taken to preserve an essential fish habitat. KE environmental staff conducted an eagle's nest survey in the project area on May 18, 2022, for a nearby project that included the Ocean Dock Road project area. No bird nests of any type were observed. A few sea gulls were present in the small boat harbor area. Few trees and some shrubs were present in areas. No eagles were observed in the 1-hour period on-site along the Ocean Dock Road project area. The U.S. Fish and Wildlife confirmed that no known eagle nests are present in the project area.

3.7.7 Invasive Species

According to the Alaska Exotic Plants Information Clearinghouse data portal the presence of the following invasive plant species within the project limits includes: vicia cracca, bromus inermis, melilotus officinalis, melilotus albus, linaria vulgaris, and crepis tectorum. Measures to avoid the spread of these species will need to be taken during construction activities.

3.7.8 Air Quality

The project is listed on the AMATS 2015-2018 Transportation Improvement Program. According to state and federal regulations, all transportation projects listed in the program have been included in the Air Quality Determination required for the program and have been approved for not adversely impacting air quality.

3.7.9 Floodplains

The project area is not located within a flood zone. Ship Creek is within a 100-year flood zone; however, the Ship Creek area is unlikely to be disturbed.

3.7.10 Noise

Noise analysis would be required if the project involves any of the following Type I project actions:

- Construction of highway on a new location.
- Substantial alteration in vertical or horizontal alignment as defined in 23 CFR 772.5.
- An increase in the number of through lanes.
- Addition or relocation of interchange lanes or ramps added to a quadrant to complete an existing partial interchange.
- Restriping existing pavement for the purpose of adding a through-traffic lane or auxiliary lane, except when the auxiliary lane is a turn lane.
- Addition of a new or substantial alteration of a weigh station, rest stop, ride-share lot, or toll plaza.

The POA is already a busy and noisy area due to railroad and port activities. Construction may increase noise in the area; however, the impact will be minimal and temporary.

3.7.11 Water Quality

Currently the roads are not draining at an optimal level and sediment and debris have built up in the current storm drains. Drainage improvements could trap more sediment before the water enters the storm drains, improving water quality.

3.8 Drainage

Drainage field inspection on Ocean Dock Road and on the C Street ramps was conducted by KE in May 2017 as part of the *C Street/Ocean Dock Road Access Ramps Reconnaissance Engineering Study*; the full Hydrologic and Hydraulic Recommendations Report can be found in Appendix E of that study. The field visit inspected storm drain pipes, inlets, and drainage structures within the intersection project area.

The existing storm drain system is shown in Figure 36. The issues and findings identified in the 2017 field inspection include:

- Two storm drain structures were identified as being structurally inadequate: field inlet F-9 and manhole M-58.
- All storm drain pipes, inlets, and manholes need to be cleaned due to sediment and debris collected inside them for the drainage system to function properly; the system did not appear to be functioning at the time of the field inspection.
- Surface water sheet flows on the C Street ramps and is not completely captured by the existing curb inlets. Additional sheet flows occur in the spring when snow and ice in the C Street ramp medians melt.
- Potholes frequently develop on the C Street on-ramp immediately east of the intersection. This location is a low point where surface water can drain to, contributing to roadway saturation and pavement deterioration.
- Continuous baseflow was observed in manhole MH-59 and is suggested to be from infiltration because inlet structures connecting to manhole MH-60 were dry. The groundwater infiltration indicates that a structural section and/or subgrade of roadway is saturated. A saturated roadway increases the rate of pavement degradation and weakens soils beneath the pavement.
- No erosion issues due to surface water flows were found.
- Localized ponding was observed near railroad tracks.

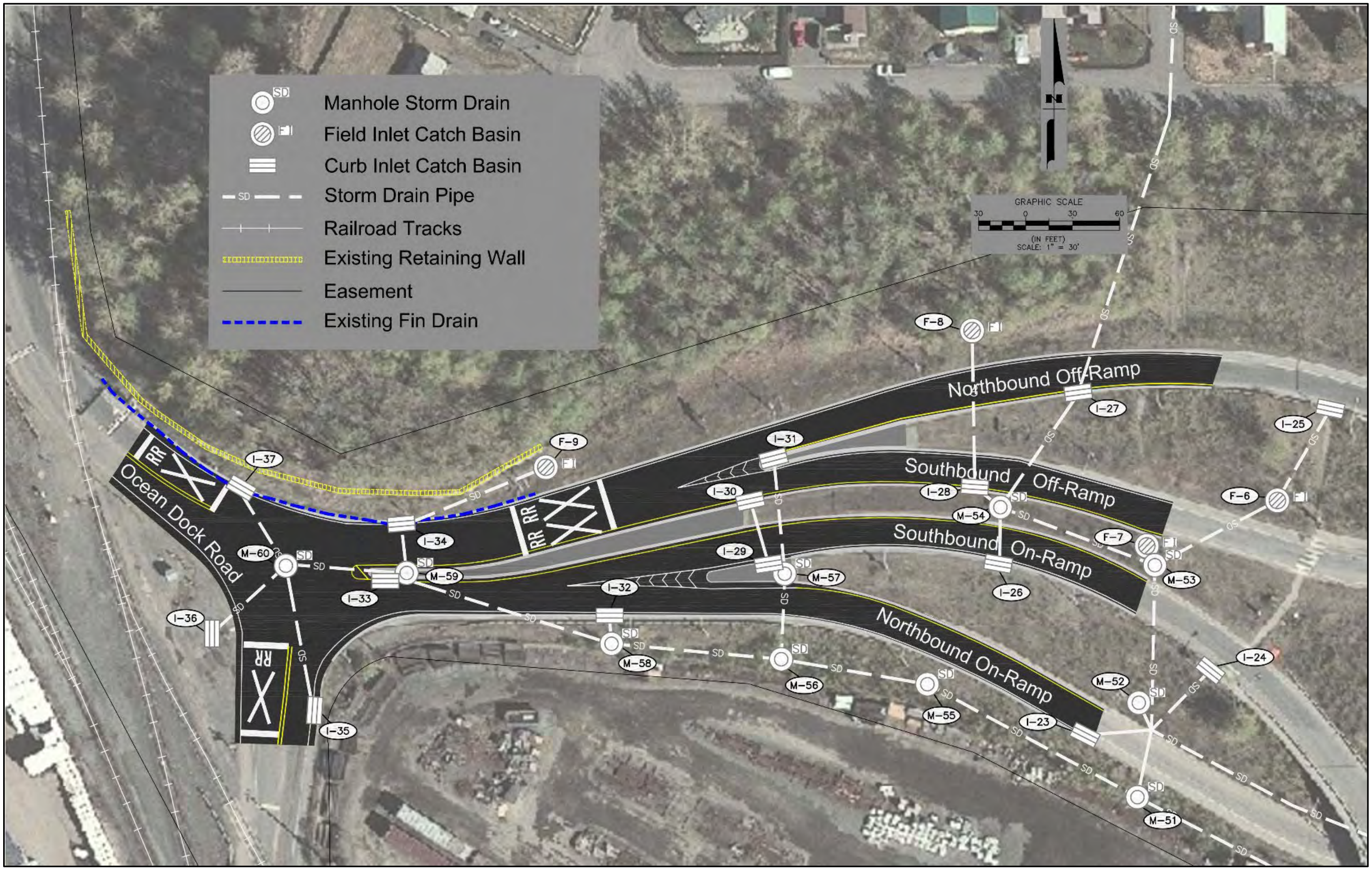

Figure 36: Existing Storm Drain System

Source: *AMATS: C Street/Ocean Dock Road Access Ramps Reconnaissance Engineering Study*, Figure 8

The expanded study area north of the C Street on-ramp and off-ramps also coincides with a grade break or high point of Ocean Dock Road. Drainage in the expanded study area generally flows north along Ocean Dock Road and then is directed to outfalls along Cook Inlet. The storm drain systems in this area are separate from the storm drain in the previous study area. The Bluff Drive and Ocean Dock Road storm drain is maintained by MOA Street Maintenance and is part of the joint MOA/DOT MS4 permit. A separate storm drain parallels the MOA's system to provide drainage for the tank farm facilities. This system and the remainder of the storm drain to the north are part of POA's MS4 permit and are maintained by the Port of Alaska.

The general issues identified in the expanded study area include:

- The Municipalities' Bluff Drive and Ocean Dock Road storm drain system is surcharged. The oil and grit separator structure west of Ocean Dock Road has an outlet at 13.6 feet and an inlet of 4.4 feet. Elevating the storm drain system within Ocean Dock Road or West Bluff Drive would conflict with multiple utilities, including sewer main crossings.
- Lack of vertical relief leads to ponding in ditches along Roger Graves Road.
- The railroad tracks and driveways adjacent to Ocean Dock Road restrict allowable grades and the use of ditching.

It is recommended that all the drainage features in the study area be modified (as necessary) to meet current design standards during the design life of the project.

4 Stakeholder Engagement

An agency and stakeholder field visit was held on October 26, 2021, to identify existing concerns, non-motorized needs, and opportunities to reduce railroad crossings along Ocean Dock Road. Attendees walked along Ocean Dock Road to discuss known concerns. Representatives from the DOT&PF, POA, AMATS Planning, MOA, Alaska Trucking Association, Weaver Brothers, and JBER participated in the field visit.

One-on-one meetings with POA tenants were held to discuss their current and future rail and/or freight operations, concerns and problems they have, and any suggestions or comments regarding the Ocean Dock Road corridor. Meetings were held virtually or in-person between October 27 and November 1, 2021. Port tenants who participated in the meetings include Menzies, Tote Maritime, Marathon Petroleum, Alaska Basic Industries, North Start AK, and Matson. Three companies (Crowley, Petro Star, and Delta Western) declined or did not respond to requests to participate.

The following subsections present concerns identified by the stakeholders.

4.1 Ocean Dock Road

Concerns identified by the stakeholders for the general Ocean Dock Road corridor include the following:

- Trucks often experience significant delays (30 to 45 minutes) when trains occupy the rail-road at-grade crossings. Delays negatively impact customer deliveries and satisfaction.
- Mechanical issues with railroad gate arms cause delay.
- Drainage structure across from the Small Boat Launch Road needs to be cleaned out.
- The MOA maintains marking, striping, and signage on POA roads inside the security gate. They are converting crossing markings to methyl methacrylate (MMA) for ease of maintenance.

4.2 Ocean Dock Road and Whitney Road

The identified concerns at the Ocean Dock Road and Whitney Road intersection are as follows:

- Turning radius is too small. Some drivers stop far behind the stop bar on Whitney Road to avoid being hit by a turning truck. Railroad personnel have to flag the Ocean Dock Road 1 (868537M) crossing when oversize vehicles travel through the intersection to/from Whitney Road.
- Northbound drivers do not always comply with the stop sign. Some close calls have been observed with northbound traffic not stopping.

- The road-rail crossing automatic gate just north of the intersection frequently gets hit.
- Westbound traffic backs up when trains are crossing.
- When the crossing just north of the intersection is closed, westbound drivers desiring to turn left will sometimes use the oncoming lane to get around vehicles stopped for the crossing and make their movement.

4.3 Ocean Dock Road and C Street Ramps

The following are concerns stakeholders identified for the Ocean Dock Road and C Street ramps intersection:

- Winter maintenance switches control from POA plowing to DOT&PF plowing at the intersection. As a result, sometimes the transition area is not plowed or sanded well.
- C Street ramps can get very icy in the winter resulting in concern for trucks coming down the ramps to the POA.
- The Ocean Dock Road 5 (868539B) crossing has poor lighting and limited sight distance, which is of concern for port users who walk or bike to the POA.

4.4 Ocean Dock Road/Roger Graves Road

The Ocean Dock Road 6 (868543R) crossing near the Ocean Dock Road and Roger Graves intersection was identified as having the following safety concerns:

- There is limited sight distance for southbound and westbound traffic due to the adjacent fenced area. Railroad personnel have to flag the Ocean Dock Road 6 (868543R) crossing when a train is present due to the limited sight distance.
- Drivers ignore the yield sign at nearby crossing. Near misses have been reported between trucks and trains.
- Trucks frequently travel at speeds above the 20-mph speed limit.

4.5 Other Locations

Operational concerns were identified by port tenant North Star. Trucks experience significant delay at the North Star driveway when the train shifts operations to serve Marahon Oil Loop. Drainage is also of concern at the east end of the North Star area.

5 Purpose and Need

The study area includes Ocean Dock Road from Ship Creek on the south to Roger Graves Road at the POA. This roadway is the only public access into and out of the POA. It also accesses the ARRC Anchorage rail yard and the small boat harbor. As such, the study area is included as part of both the NHS and the STRAHNET (designating roads of military significance). There is significant train and truck traffic through the study area that interacts at numerous rail-road crossings, resulting in delay for both trains and trucks. Furthermore, the area is frequently used by pedestrians, bicyclists, and recreational vehicles accessing the small boat launch. **The PURPOSE of this study is to reduce delay and improve safety for the multi-modal transportation network into and out of the POA and rail yard.**

Transportation improvements will address the following **NEEDS**:

- **Delay at Rail-Road Crossings.** There are six at-grade road-rail crossings on Ocean Dock Road north of Whitney Road. Vehicles experience delay each time the crossings are occupied by a train. Trains experience delay whenever they pause in their operations to clear the crossing and allow vehicles to pass. In addition, some vehicles (such as tour buses and trucks carrying hazardous materials) must stop at each crossing, which also causes delay. Delays could be exacerbated in the future with an increase of goods and materials being shipped to the POA resulting in more freight traffic.
- **Truck Operations.** Sight distance on the Ocean Dock Road curve just north of the C Street ramp intersection is limited because of the retaining wall on the north side of road. While the minimum passenger car sight distance is met, truck drivers have expressed concerns about being able to stop when coming down the hill from the C Street ramps towards the POA. Furthermore, truck drivers leaving the POA slow down due to the tightness of the curve, and then have difficulty maintaining adequate speeds to climb the C Street ramps, especially in winter conditions.
- **Crash Potential.** The number of vehicle-train interactions is a safety concern because the potential for a crash is correlated to the frequency of vehicle and train interactions. While there have been no major injuries or fatalities in the corridor, any collision between a vehicle and a train could be catastrophic. Any crash involving passenger vehicles, commercial trucks, trains, and/or non-motorized users results in traffic delays while the crash is being cleared from the road. Public comments identified the uncommon traffic control at the Ocean Dock Road and Whitney Road intersection (where northbound and westbound vehicles stop and yield to all southbound vehicles) as a safety concern. Sight distance at rail-road crossings is also of concern. The retaining wall near the C Street ramps intersection obstructs sight distance at Ocean Dock Road 5 (868539B) and stakeholders identified sight distance issues for southbound vehicles at Ocean Dock Road 6 (868543R).

- **Maintenance.** There are multiple agencies in charge of maintaining different segments of Ocean Dock Road, within a short distance. This is reported to result in unmaintained or poorly maintained areas where the management transitions between agencies. Furthermore, from 2012 thru 2021, there were 51 crashes reported involving a vehicle striking rail equipment (such as the gate or cantilever). The damaged equipment requires repairs by ARRC maintenance crews and causes train delays.
- **Drainage.** Water sheet flows across the C Street ramps and is not completely captured by the existing drainage system. The existing drainage system is filled with sediment and debris and is not functioning properly. Water ponds at a low point on the C Street ramps causing potholes to develop. Ponding water was observed near railroad tracks throughout the study area. Saturated roadways increase the deterioration rate of pavements and railroad tracks, which increase maintenance needs. Drainage systems north of the C Street ramps need improvements to adequately convey runoff.
- **Non-Motorized Connectivity and Safety.** There are insufficient non-motorized facilities to serve pedestrian and bicycle demand in the area. There are numerous non-motorized generators, such as Government Hill residences, Ship Creek fishing, and the Ship Creek trail system in the area. People employed within the POA also sometimes walk or bike through the area. Safer non-motorized facilities are needed along such a truck-heavy roadway between the POA and the downtown Anchorage business core.

6 Opportunities for Improvement

6.1 Railroad Options

Potential rail options were developed for track realignments in the project area, with the goal of reducing conflicts between vehicle traffic and trains, reducing the total amount of time crossings are blocked when passenger trains are being turned, and maintaining rail operations and geometry standards to minimize service impacts to ARRC. All concepts include a realignment of the North Leg of Passenger Wye to allow for a more compact wye track arrangement. This realignment would condense the rail-road at-grade crossings into a smaller area, shifting the North Leg of Passenger Wye out of the C Street ramp area, while allowing for a slightly larger curve radius on the North Leg of Passenger Wye.

The rail concepts are divided into two basic families: Concept 1 involves significant rebuilding of the rail corridor along Ocean Dock Road to transform it into a safer, more effective railroad corridor, while the remaining concepts propose spurs to be used as a tail track for turning passenger trains; Concept 2 and 2a propose a spur to the south of the Marathon Oil Loop and Concept 3 proposes a spur on the west side of and parallel to Ocean Dock Road.

6.1.1 Rail Concept 1

Concept 1, shown in Figure 37, involves the relocation of the North Leg of Passenger Wye along Ocean Dock Road from the east side of the street to the west side of the street. Beginning at the south end of the project area, the North Leg of Passenger Wye is reconfigured to tie into the lead track along Ocean Dock Road south of its current location, allowing a more compact area of railroad crossings on Ocean Dock Road. North of this location, the lead track is relocated to the west side of Ocean Dock Road. This will relocate the major train movements off of the crossing just west of the intersection of Ocean Dock Road and the C Street ramps, reducing the risk of conflicts at this location. This reconfiguration also allows for a reduction in roadway user delay by passenger train turning operations, which currently block this crossing twice for each turning movement. Under this concept, traffic from the C Street ramps heading into the POA will not be impacted by the turning passenger trains, and the blockages of Ocean Dock Road will be confined to a more compact area of crossings further south. Additionally, the Ocean Dock Road 6 (868543R) crossing is eliminated, which mitigates sight distance issues at this location.

Rail Concept 1 Summary

- Concept Recommended
- Significant reduction in train crossing delay (-53%) from existing.
- Significant reduction (-30% change) in vehicle-train interaction from existing.
- Elimination of the higher-risk Ocean Dock Road 5 (868539B) and Ocean Dock Road 6 (868543R) crossings.

In the tight area between Marathon Petroleum and Crowley, Ocean Dock Road is shifted to the east, closer to the existing tracks on the east side to coincide with the current rail alignment in order to free up space for the relocated track on the west side. This reconfiguration of Ocean Dock Road covers the area roughly from the driveway to North Star facilities on the south to the intersection with Terminal Road on the north and requires revisions to the intersections of Bluff Drive, Roger Graves Road, and Terminal Drive as well as any driveways that connect to Ocean Dock Road within this segment. The rail connections to any rail-served industries along this stretch are also revised to accommodate the realigned track. Two of these connections, to Crowley and to the asphalt plant, require new rail crossings of Ocean Dock Road. Rail service to these industries is either light or is expected to occur during non-peak traffic hours, and thus congestion at these crossings is expected to be minimal.

Concept 1 is expected to have significant utility impacts, especially with pipelines that are present on the west side of Ocean Dock Road. One location of major concern is a junction box north of the intersection of Ocean Dock Road and Roger Graves Road. There may be revisions that can be made to the alignment to lessen the impacts once those utility conflicts are better understood.

Figure 37: Rail Concept 1

6.1.2 Rail Concept 2

Rail Concept 2 Summary

- Concept NOT recommended
- Minor decrease in train crossing delay (-7%) from existing
- Minor decrease (-5% change) in vehicle-train interaction from existing.
- No improvements to the higher-risk Ocean Dock Road 5 (868539B) and Ocean Dock Road 6 (868543R) crossings.

Concept 2, shown in Figure 38, involves the addition of a new track along the south side of the Marathon Oil Loop tracks. This track has sufficient length to allow an entire passenger train to vacate the turnout from the North Leg of Passenger Wye without causing vehicle delays. The turning passenger trains would use this new track, instead of blocking road crossings along the current alignment adjacent to Ocean Dock Road.

Similar to Concept 1, this concept features the revised North Leg of Passenger Wye, which tightens up the crossings on Ocean Dock Road and also pulls the turnout further south, making it possible to provide the head room for passenger trains north of this turnout. A new turnout installed just north of the reconfigured North Leg of Passenger Wye allows access to the existing trackage on the east side of Ocean Dock Road. A minor crossing realignment is required near the intersection of Ocean Dock Road and the C Street ramps.

The final piece of this concept is the construction of the new tail track to the south of the Marathon Oil Loop tracks, in area currently leased by North Star. A minimum of 20 feet of right-of-way (ROW) is needed along the north edge of the property for the proposed tail track adjoining the Loop tracks. This tail track extends nearly all the way to the seawall, providing the head room required for a passenger train to clear the turnout of the North Leg of Passenger Wye. The turnout can then be routed to the west leg of the wye, and the passenger train will back out in continuation of the turning maneuver providing the same functionality of the existing track layout. Note that building track in an area leased by ARRC will result in a reduction in lease income for ARRC.

This concept has fewer utility and road conflicts than Concept 1 by virtue of its simpler design and fewer track improvements. The primary impacts are a reduction in available area to the North Star site (resulting in reduced lease revenue for the railroad) and minor impacts to the industrial tracks in the area.

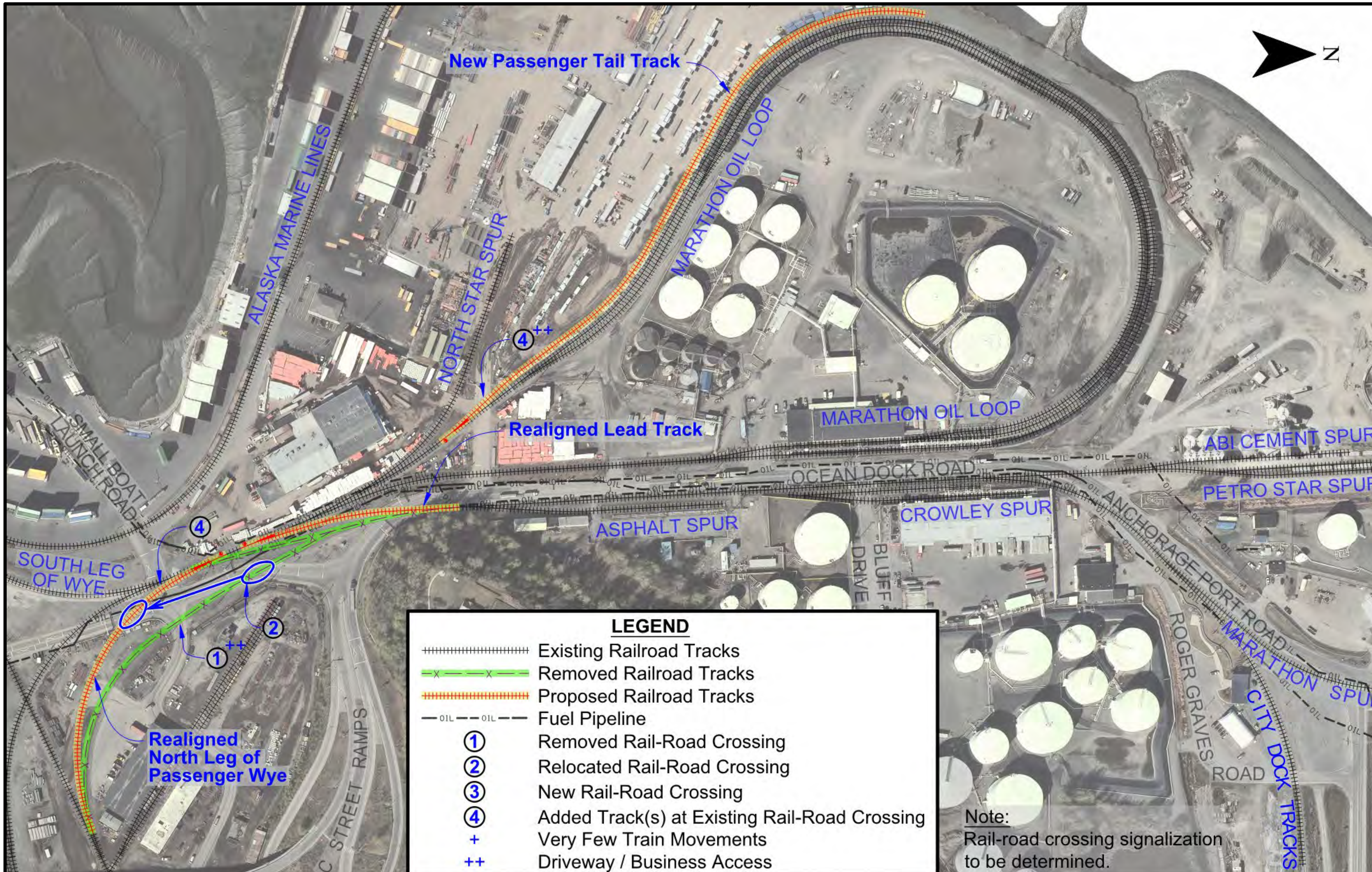

Figure 38: Rail Concept 2

6.1.3 Rail Concept 2a

This concept, illustrated in Figure 39, is a hybrid option between Concepts 1 and 2. It features the siding along the south side of the Marathon Oil Loop tracks utilized in Concept 2 and the revised North Leg of Passenger Wye discussed in the previous concepts. The primary difference is the relocation of the ARRC lead track along Ocean Dock Road from the east side of the street to the west for the portion of the road between the intersection with the C Street ramps and the Crowley Spur. Similar to the previous concepts, this option provides a reduction in the impacts from turning passenger trains; however, unlike Concept 2, this concept also shifts a high-traffic rail-road crossing out of a horizontal curve to a location along the tangent of Ocean Dock Road. Rail sidings to the Marathon Oil Loop and asphalt plant are modified to tie in with this new alignment.

Rail Concept 2a Summary

- Concept NOT recommended
- Minor decrease in train crossing delay (-7%) from existing
- Minor decrease (-4% change) in vehicle-train interaction from existing.
- Improvement to the sight distance at the Ocean Dock Road 5 (868539B) crossing.
- No improvements to the higher-risk Ocean Dock Road 6 (868543R) crossing.

This concept features all the impacts of Concept 2 but will have some additional utility conflicts for the lead track relocation along Ocean Dock Road. No major relocations of Ocean Dock Road are expected with this concept.

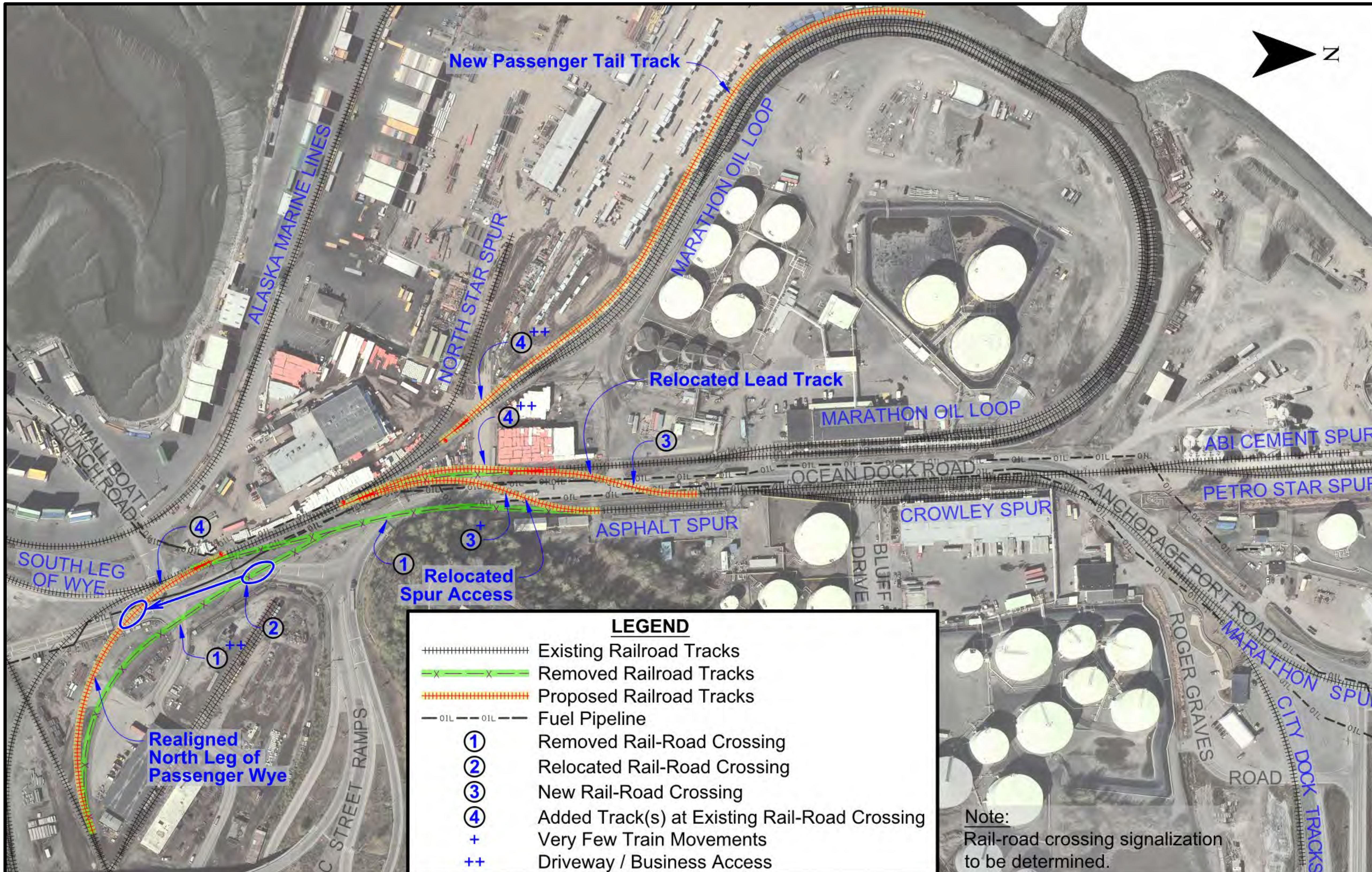

Figure 39: Rail Concept 2a

6.1.4 Rail Concept 3

The concept, shown in Figure 40, places a new passenger tail track along the west side of Ocean Dock Road with sufficient length to provide head room for the turning passenger trains. This track is placed between the Marathon Oil Loop tracks and the roadway. The connection to the existing lead track on the east side of Ocean Dock Road, which provides access to the Asphalt Spur and Crowley Spur, as well as the industries farther north in the POA, is slightly realigned in the area of the C Street ramps intersection.

Rail Concept 3 Summary

- Concept NOT recommended
- Minor decrease in train crossing delay (-7%) from existing
- Minor decrease (-5% change) in vehicle-train interaction from existing.
- Sight distance concerns at the Ocean Dock Road 5 (868539B) and Ocean Dock Road 6 (868543R) crossings are not addressed

Concept 3 was suggested by ARRC after the review of the previously listed concepts. ARRC had concerns about the impacts to the storage area currently leased by North Star. ARRC noted a significant loss of revenue by placing the tail track in the North Star area. While Concept 3 reduces the ROW impacts, there will be greater conflicts with the utilities and underground pipelines along Ocean Dock Road. These impacts are less than in Concept 1 because of the smaller scope of new and relocated tracks. There will also be some minor roadway impacts at the Ocean Dock Road 5 (868539B) crossing due to the track shift of the existing lead track along Ocean Dock Road. Similar to the other concepts, this concept allows the reduction of vehicle-train conflicts at the crossing near the C Street ramps by removing the passenger train movements that frequently block the crossing and shifting them to the west side of Ocean Dock Road.

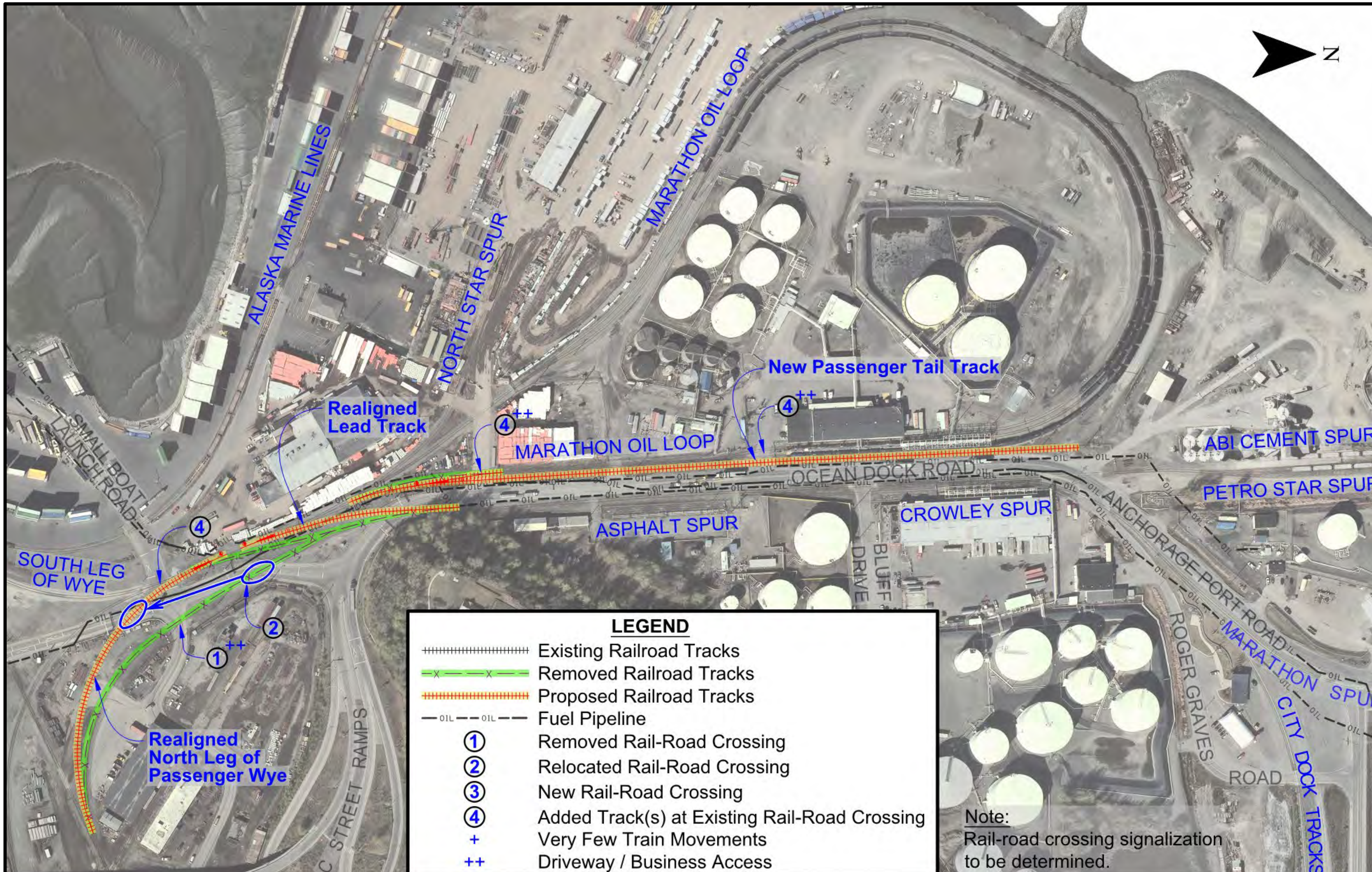

Figure 40: Rail Concept 3

6.1.5 Other Concepts

Numerous other concepts aimed at creating more separation between Whitney Road and the South Main track were considered but rejected due to significant adverse effects on railroad safety and operations. Some of these constraints are described in the following paragraphs.

The South Main track is used as the main track entrance to the Freight Yard; therefore, it must be designed as a main track rather than a yard track. This imposes geometry restrictions to allow the safe passage of full-sized freight trains, which include:

- Any curves should have a long radius or flat curvature, typically 6 degrees of curvature or flatter. The proposed realignment increases the curvature to an approximate maximum of 10 degrees.
- Reversing curves, which would be required for any track realignment to move the track northward, require longer tangents between and connecting the curves, typically 150 feet of length or longer.
    - Reversing curves are undesirable for tracks where railroad switching operations occur and can be a major cause of derailments.
    - Points of compound curvature, especially when used for reversing curves, are not allowed.

Any realignments that added a new diamond crossing were rejected. Diamond at-grade track crossings are an extremely high maintenance track feature and increase the potential for derailments. Railroads avoid these on main tracks and, if possible, on secondary tracks. Turnouts and track alignments are configured to avoid the use of a diamond at-grade track crossing, especially for main tracks. Placing one on the main track accessing the yard, with the amount of traffic going into and out of the yard in addition to the railroad switching movements, is not a feasible design option.

There are numerous turnouts in this area and many of the options considered affect these turnouts. Installing turnouts on main tracks have restrictions on how close the turnout can be placed to a curve, typically 100 feet or more from each end of the turnout. Turnouts also must be kept clear of road crossings, preferably by 50 feet or more.

Operationally, the track just north of Whitney Road includes ARRC’s primary switching lead used to build and break up all freight trains arriving and departing from Anchorage. Railroad operational impacts caused by changes in this area need to avoid the following impacts:

- Space between the west yard turnouts and the actual yard track lead allows for locomotives and short strings of cars to be switched between tracks to avoid impacts from other yard operations. This is critical to the timely switching of trains and flow of freight through the yard and reduces some of the use of the main track which would cause the crossing signals to be activated more frequently.

- The current ARRC switching operation calls for shoving large groups of freight cars into the yard to be coupled to other groups of cars. The crews rely on clear lines of sight on this end of the yard in order to do this safely and efficiently. Due to security restrictions around JBER, regular switching cannot occur on the north end of the yard, which is why the switching train movement extends on the freight main track across Ocean Dock Road.

6.2 Road Options

6.2.1 Road Concept A – Flattened Curve at Ocean Dock Road and C Street Ramps Intersection

This concept, previously presented as Alternative 3 in the 2018 *AMATS: Ocean Dock Road/C Street Access Ramps Reconnaissance Study*, increases the radius of (or flattens) the horizontal curve of Ocean Dock Road at the C Street ramps. Increasing the radius improves sight distance and allows trucks from the POA to maintain speed around the curve, giving them momentum to climb the C Street ramps. To increase the radius, the road is widened towards the hill to the north and the hill is cut back to provide sufficient sight distance for trucks driving around the curve. Increasing the sight distance allows drivers more time to see and respond to conditions ahead, including train activity at rail-road crossings.

Road Concept A Summary

- Concept Recommended
- Improvement of sight distance at the C Street ramps intersection and Ocean Dock Road 5 (868539B) rail-road crossing.
- Improvement of truck operations by increasing the curve radius, which allows trucks from the POA to maintain speed to comfortably climb the C Street ramps.
- Requires cutting back hill near Government Hill

Demand for pedestrian and bicycle connectivity is provided by installing sidewalks along the C Street ramps and along Ocean Dock Road (between the C Street ramps and Whitney Road) to connect C Street to the Ship Creek Bridge. On the C Street ramps, the sidewalk runs along the north side. From the C Street ramps, the sidewalk runs southward along Ocean Dock Road and ties into pedestrian facilities at the Ship Creek Bridge. Pedestrian safety is also improved by widening the median at the C Street ramps crossing, providing a safe refuge area so pedestrians only encounter traffic from one direction at a time.

Concept A was combined with compatible railroad options. Rail Concepts 1 and 2a allow for a new northbound left-turn lane on Ocean Dock Road at the North Star access. The northbound left-turn lane reduces the likelihood of traffic being blocked by left turners waiting for a gap in oncoming traffic. It also reduces the risk of rear-end crashes.

Rail Concepts 2 and 3 do not allow for a northbound left-turn lane at the North Star access because the concepts realign the lead track across Ocean Dock Road near the access. For these rail concepts, a center median is present around the horizontal curve. This increases driver comfort by providing additional separation between opposing traffic.

Figure 41 through Figure 44 present Road Concept A with the various rail concepts.

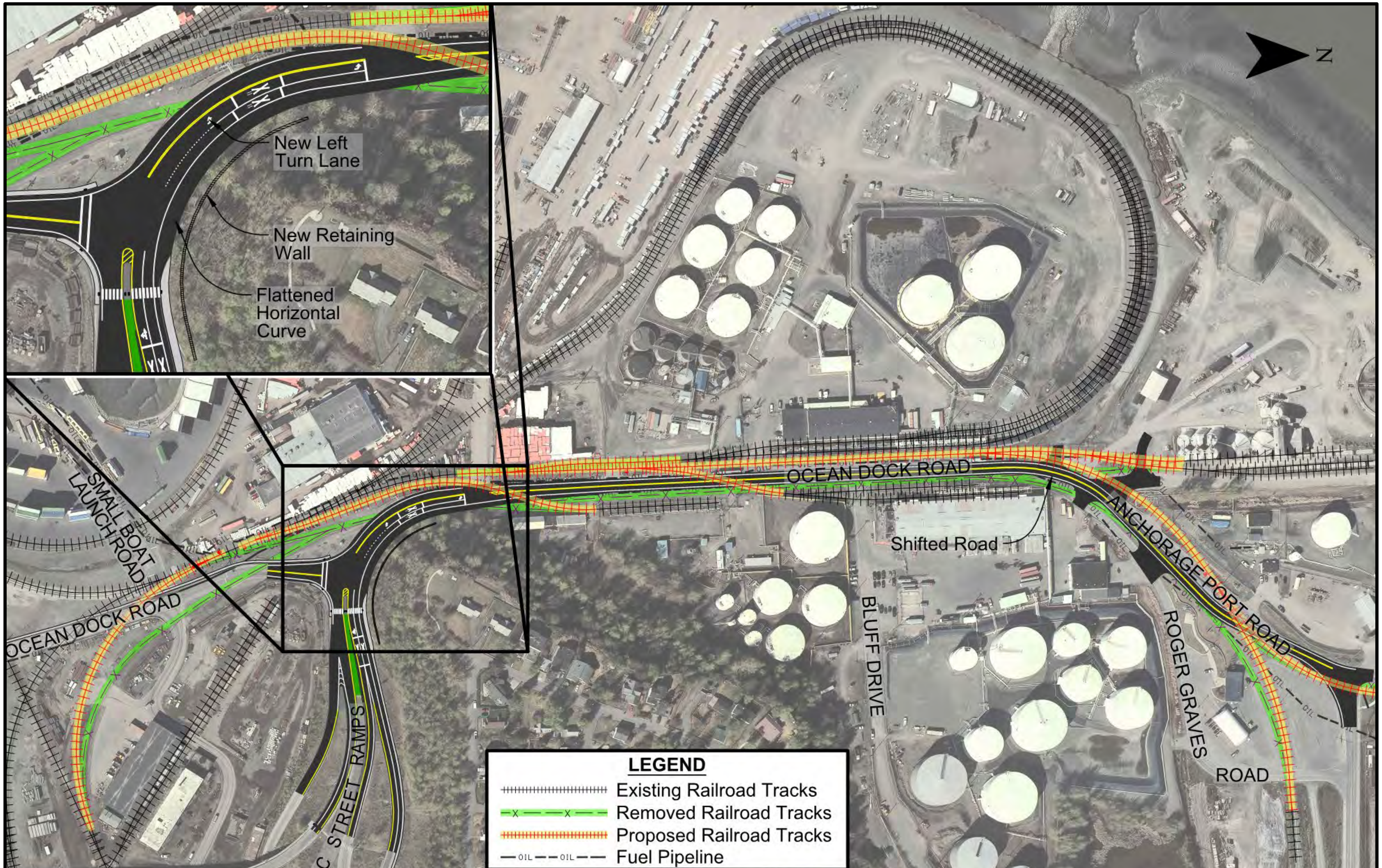

Figure 41: Road Concept A (Flattened Curve) and Left Turn Lane at North Star Access with Rail Concept 1

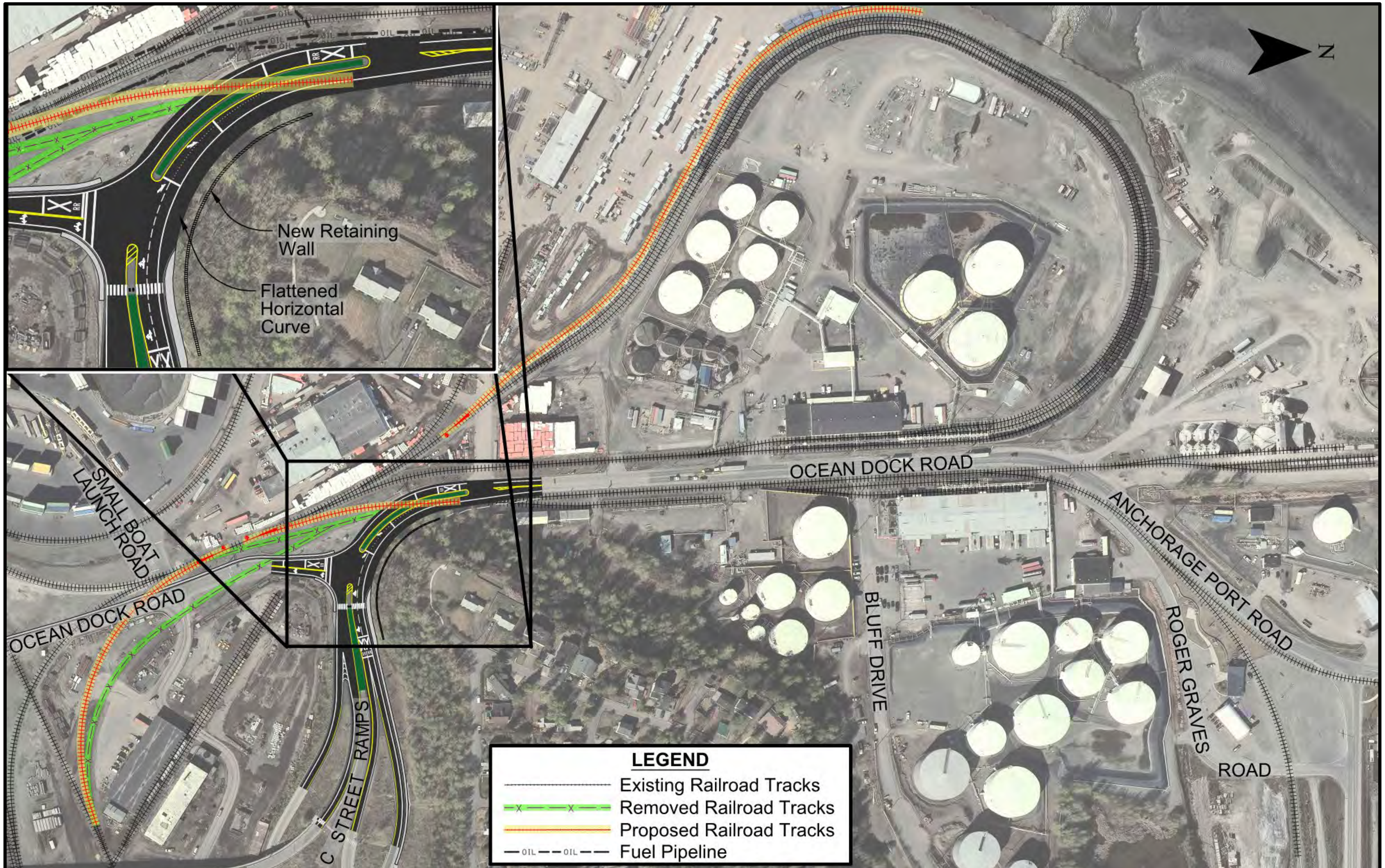

Figure 42: Road Concept A (Flattened Curve) with Rail Concept 2

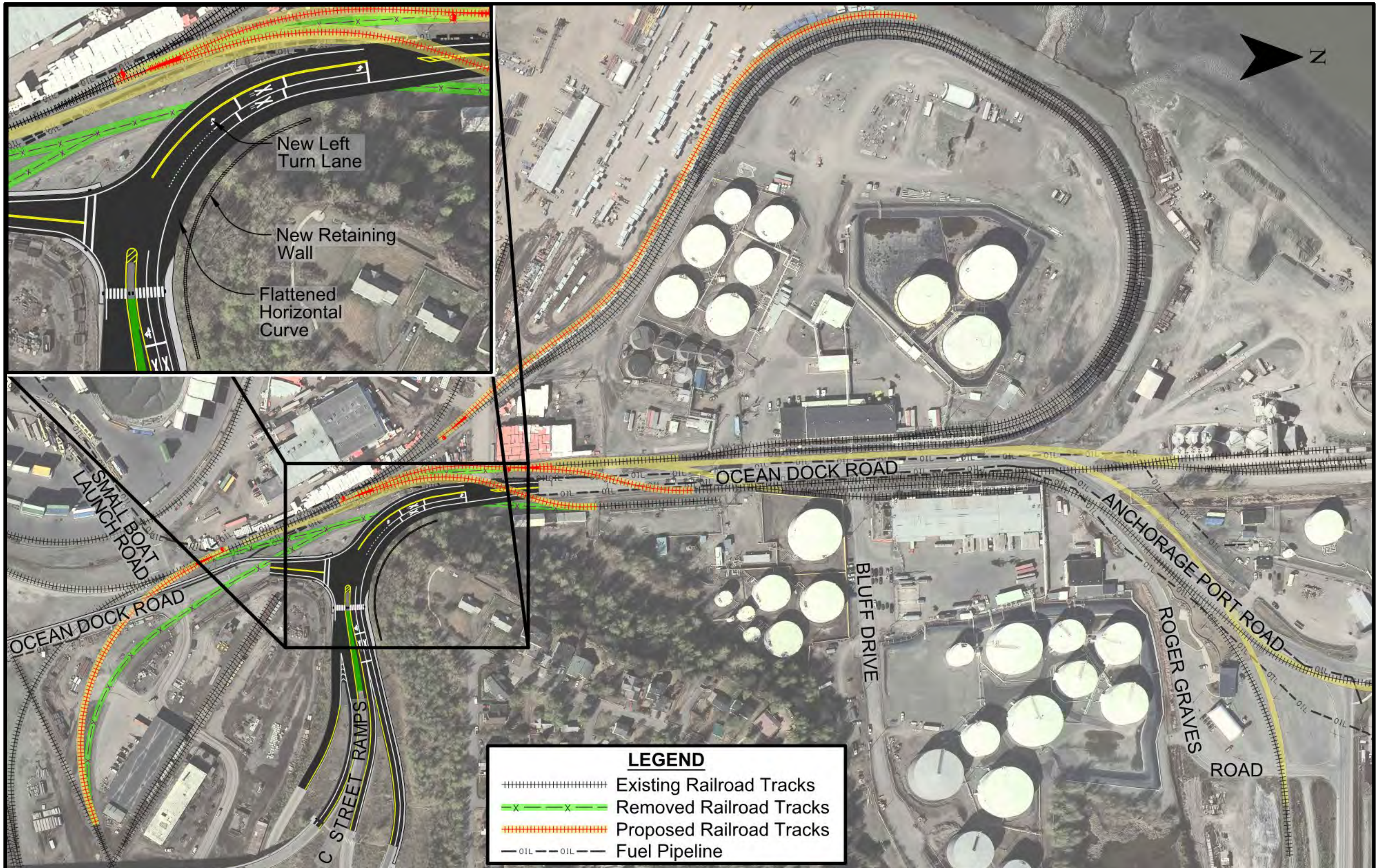

Figure 43: Road Concept A (Flattened Curve) and Left Turn Lane at North Star Access with Rail Concept 2a

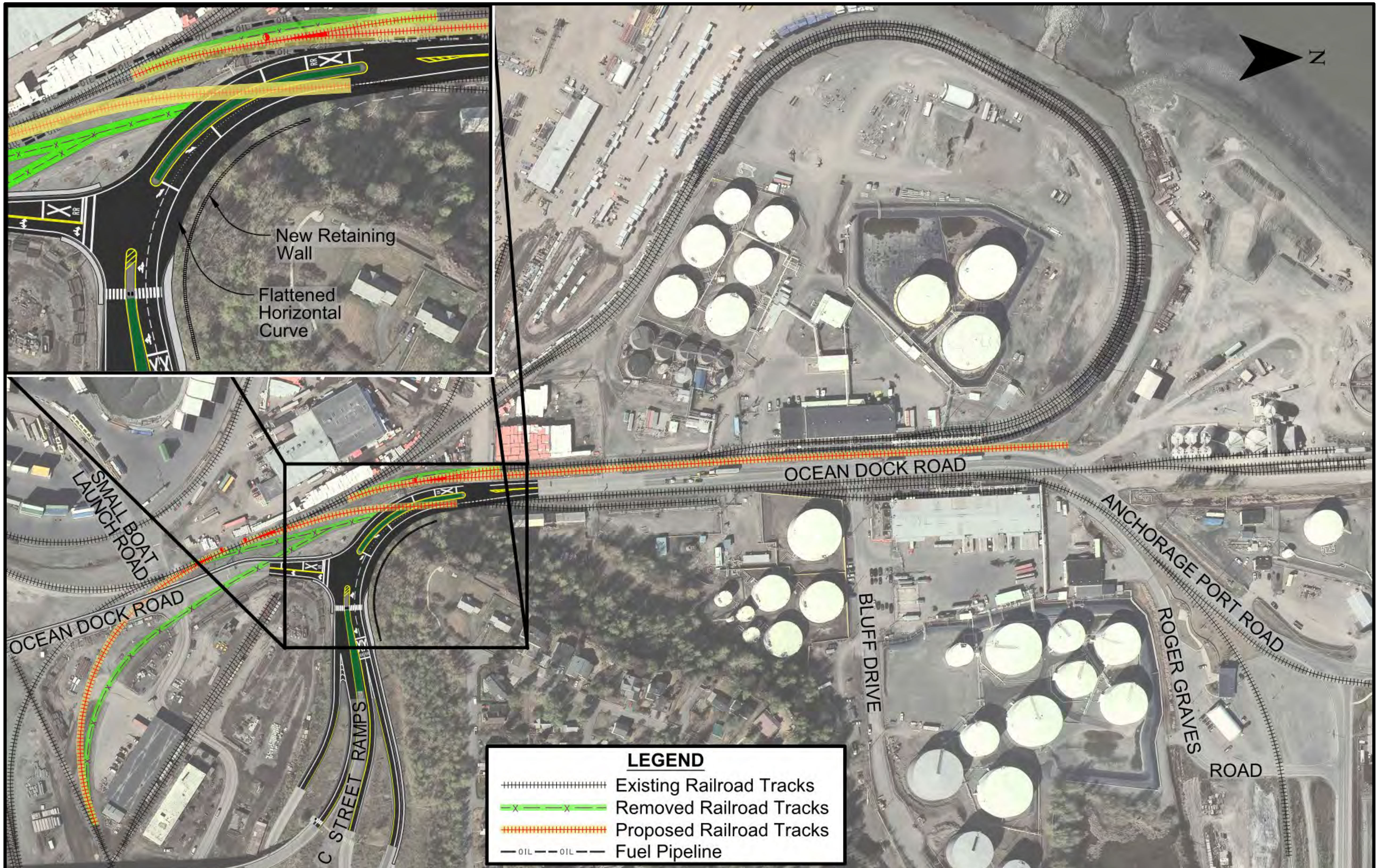

Figure 44: Road Concept A (Flattened Curve) with Rail Concept 3

6.2.2 Road Concept B – Realign Ocean Dock Road and C Street Ramps to T-Intersection

Concept B, previously presented as Alternative 4 from the 2018 *AMATS: Ocean Dock Road/C Street Access Ramps Reconnaissance Study*, realigns and reconfigures the Ocean Dock Road intersection at the C Street ramps into a T-intersection with the purpose of removing the horizontal curve on Ocean Dock Road. This mitigates sight distance issues that heavy trucks experience around the curve. Under this option, the westbound (C Street ramps) left-turn movements heading towards Whitney Road are stop-controlled, while westbound traffic destined for the POA uses a channelized right-turn lane under yield-control. Both Ocean Dock Road approaches operate free from control and left turns from the POA to the C Street ramps yield to any oncoming traffic. Concept B includes an auxiliary southbound left-turn lane to mitigate queues backing up over the nearby rail-road crossing.

Road Concept B Summary

- Concept NOT Recommended
- Improvement of sight distance at the C Street ramps intersection
- Improvement of truck operations for southbound and northbound movements by providing a free-flow, continuous movement between the POA and the Whitney Road intersection.
- Decrease in bridge climbing speeds (trucks start the climb from a turn) decreases truck operations for southbound right-turning movement at the C Street ramps.

Similar to Road Concept A, demand for pedestrian and bicycle connectivity with this concept is provided by installing sidewalks along the C Street ramps and along Ocean Dock Road (between the C Street ramps and Whitney Road) to connect C Street to the Ship Creek Bridge. On the C Street ramps, the sidewalk runs along the north side of the road. Pedestrians cross only the westbound right-turn lane and use the channelized island as a pedestrian refuge. Pedestrians cross Ocean Dock Road at the channelized island and a sidewalk is provided running southbound along Ocean Dock Road, which connects with the pedestrian facilities at Whitney Road. Pedestrian crossings at a channelized island improve pedestrian visibility to motorists by placing the pedestrian crossing into a more direct view of the approaching vehicle. This also separates the pedestrian-vehicle interactions from the vehicle-vehicle interactions, by allowing turning vehicles to first encounter and focus on the pedestrian crossing activities before proceeding to focus on roadway operations.

One disadvantage of Concept B, as compared to Concept A, is that truck traffic leaving the POA may come to a stop to yield to oncoming traffic before turning left to use the C Street ramps. This could make it difficult for trucks to get up to speed as they climb these ramps, as that is already a concern under the existing condition.

Concept B was combined with compatible railroad options. Rail Concepts 1 and 2a allow for a northbound left-turn lane on Ocean Dock Road at the North Star access. The northbound left-turn lane reduces the likelihood of traffic being blocked by left turners waiting for a gap in oncoming traffic. Rail Concepts 2 and 3 realign the lead track across Ocean Dock Road near the North Star access; and therefore, does not allow for a northbound left-turn lane at this location.

Figure 45 through Figure 48 present Road Concept B with Rail Concepts 1 and 2a, respectively.

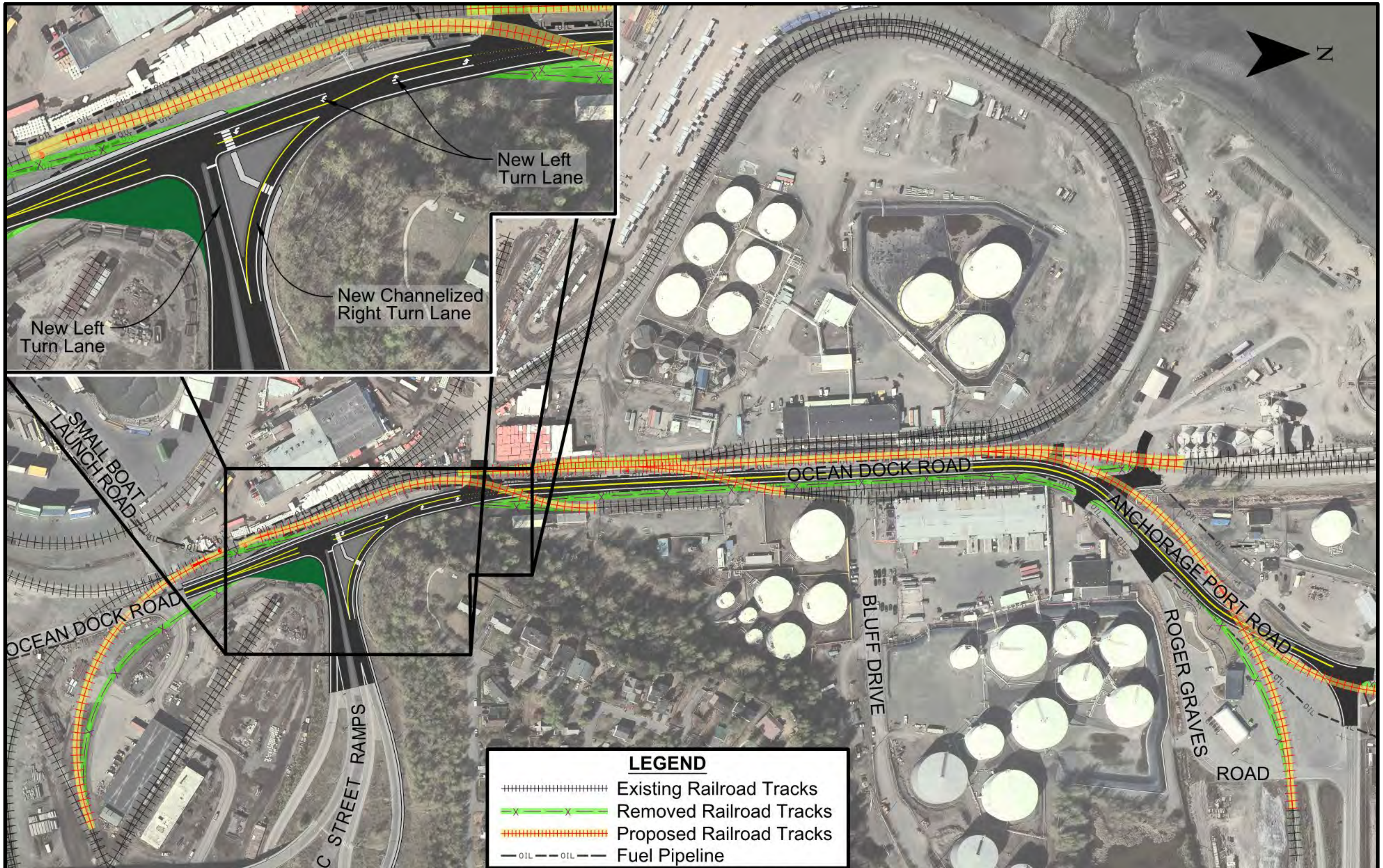

Figure 45: Road Concept B (Realigned T Intersection) and Left Turn Lane at North Star Access with Rail Concept 1

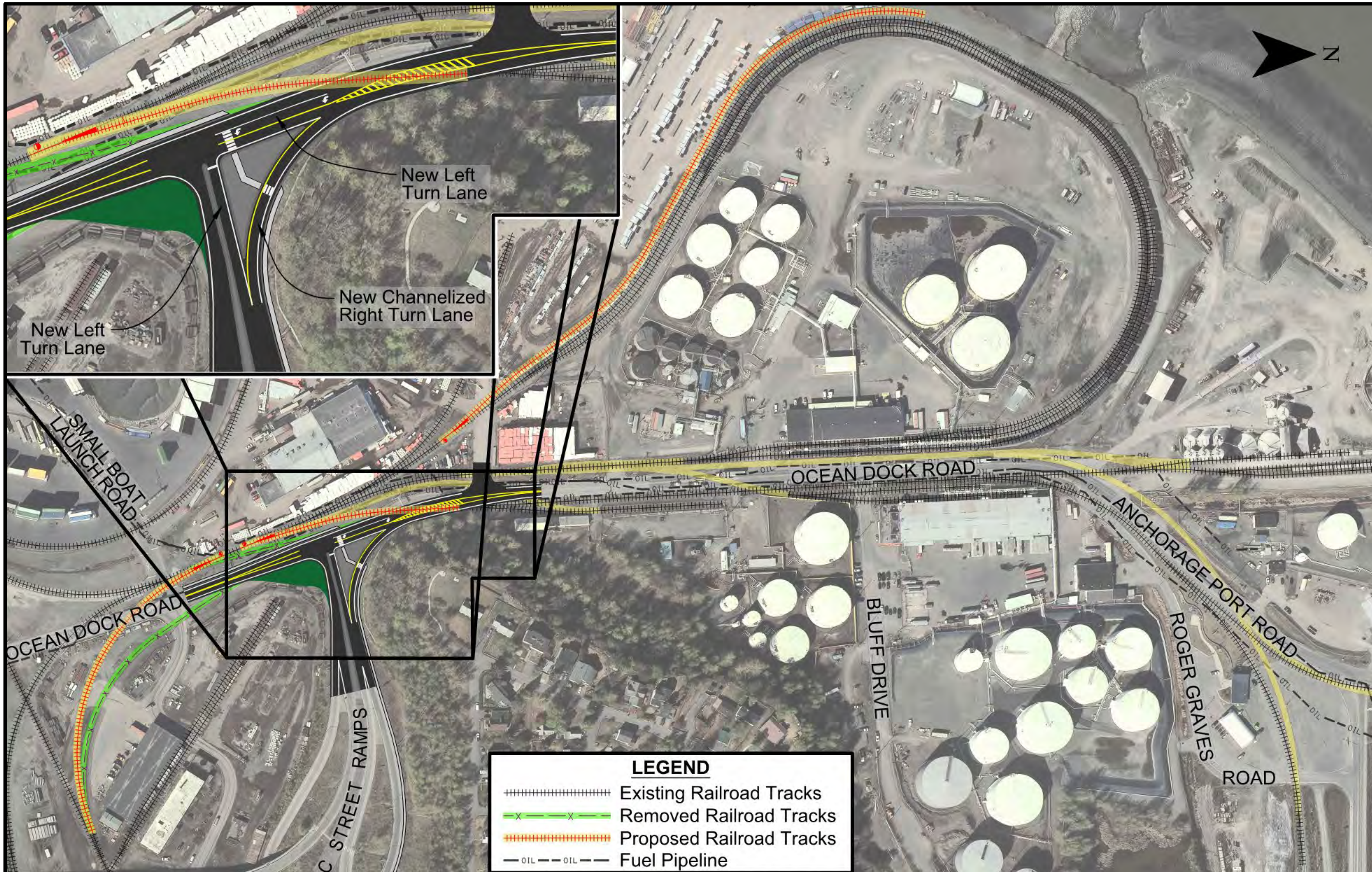

Figure 46: Road Concept B (Realigned T Intersection) with Rail Concept 2

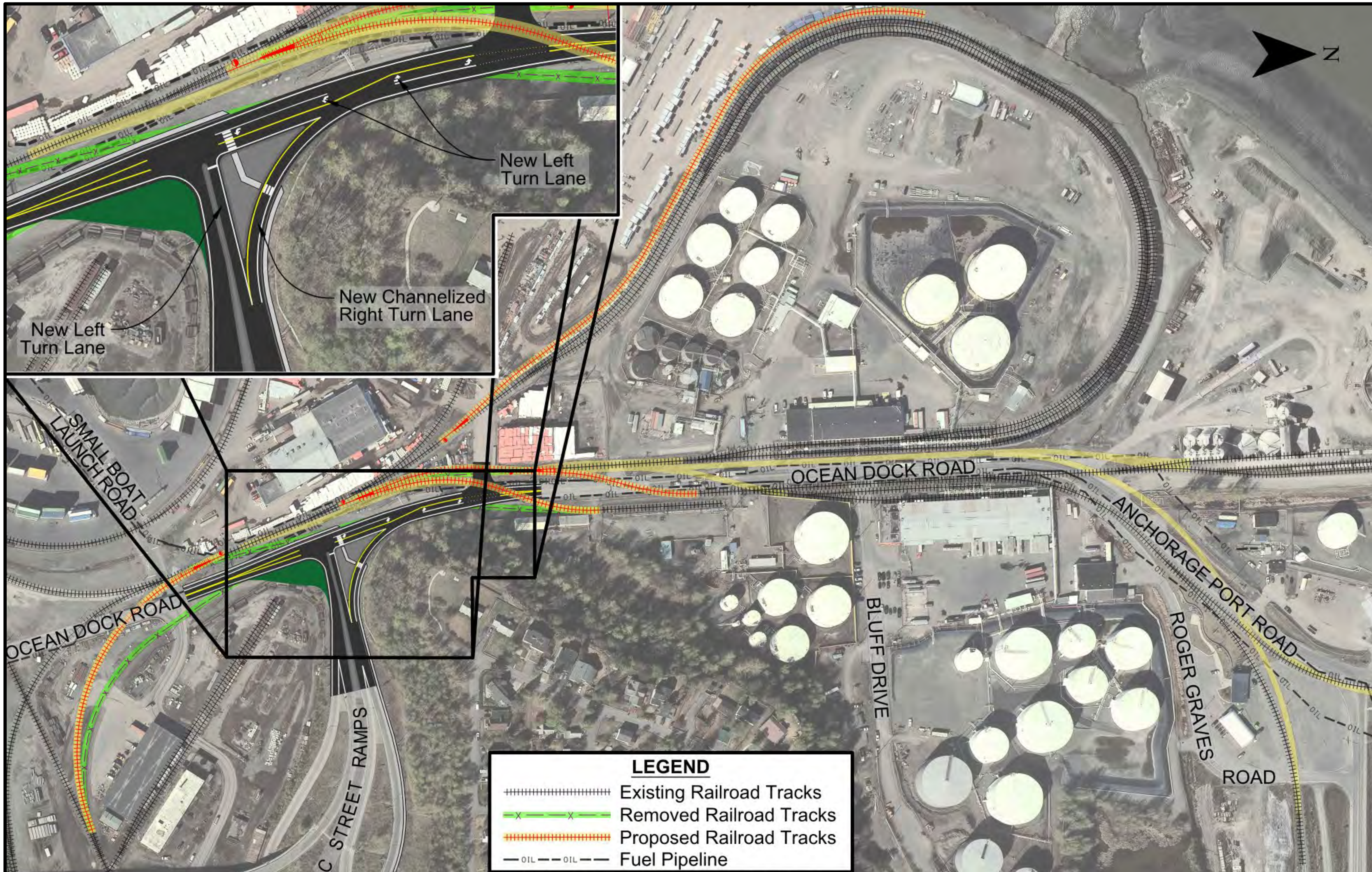

Figure 47: Road Concept B (Realigned T Intersection) and Left Turn Lane at North Star Access with Rail Concept 2a

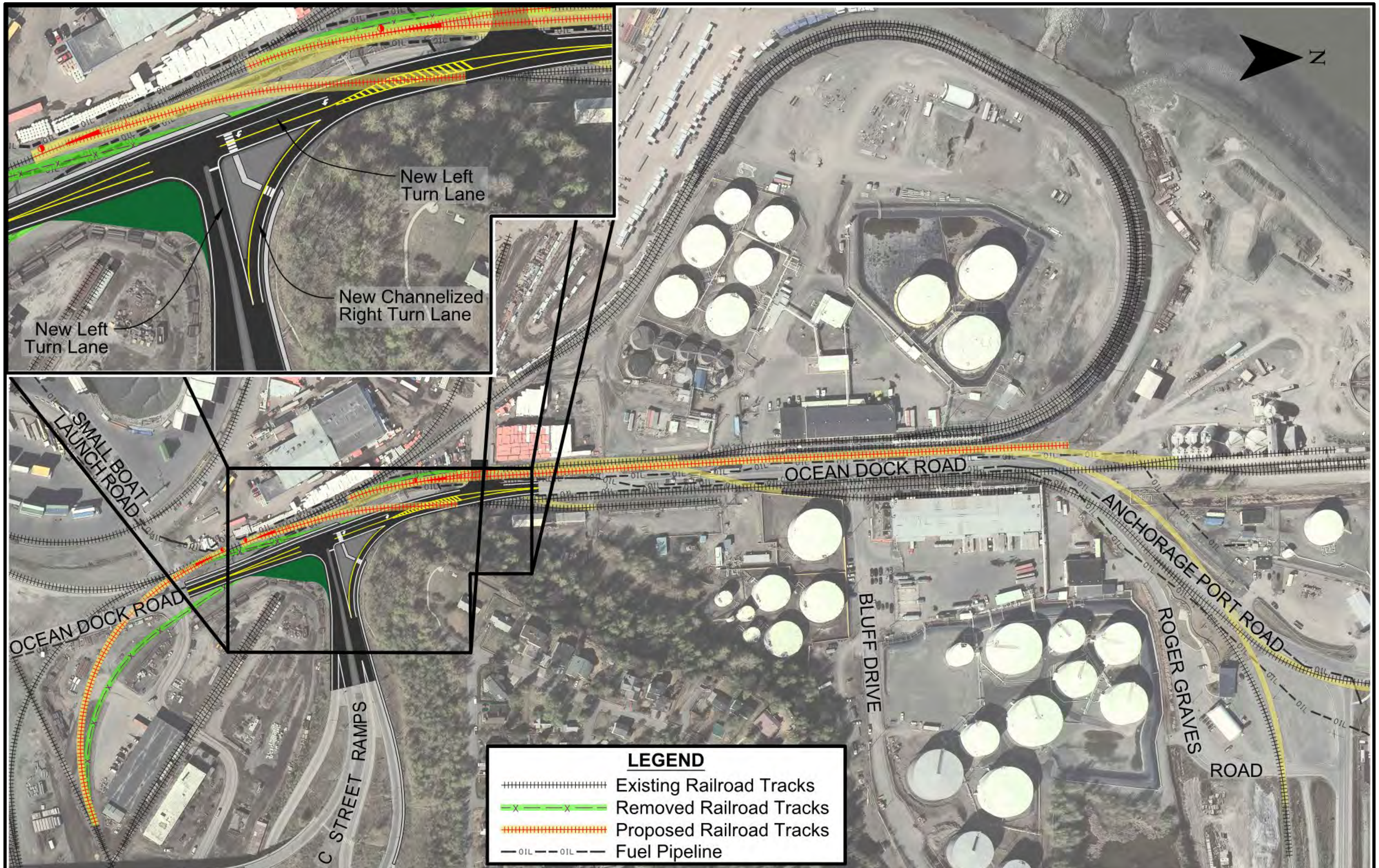

Figure 48: Road Concept B (Realigned T Intersection) with Rail Concept 3

6.2.3 Road Concept C – Flashing Lights at Ocean Dock Road and Whitney Road

Road Concept C installs overhead flashing lights above the Ocean Dock Road and Whitney Road intersection to increase driver awareness of the traffic control. The northbound North C Street and westbound Whitney Road approaches receive flashing red lights to indicate a stop, while the southbound Ocean Dock Road approach receives a flashing yellow light to caution of possible vehicles or pedestrians in the intersection. Additionally, a larger warning sign indicating opposing traffic does not stop (W4-4bP) could be installed to reduce the likelihood that northbound drivers will expect southbound drivers to stop. A light emitting diode (LED) enhanced stop sign could be installed to enhance conspicuity of the stop condition. Figure 49 shows the flashing lights at Whitney Intersection Options.

Road Concept C Summary

- Concept NOT Recommended
- Improvement in the adherence to the traffic control at the Whitney Road intersection.
- No improvement to the tight turn between Whitney Road and Ocean Dock Road.
- No reduction in the potential of striking the signal gate arm located north of the intersection.

Figure 49: Road Concept C

6.2.4 Road Concept D – Realign Ocean Dock Road and Whitney Road

Road Concept D realigns Ocean Dock Road and reconfigures the intersection with Whitney Road. Ocean Dock Road is curved to smoothly transition into Whitney Road. The curve provides a direct route for the primary truck movements, which under the existing condition is southbound, left-turning and westbound, right-turning vehicles at the Ocean Dock Road and Whitney Road intersection, removing the need for these heaviest movements to stop or slow to turn. Traffic from North C Street stops or yields at the new road alignment and turn to access Ocean Dock Road or Whitney Road. This configuration addresses the concerns at the intersection. It reduces the likelihood of vehicles knocking off or striking the railroad gate arms for the crossings north of the intersection caused by the tight turning radius from Whitney Road to Ocean Dock Road. It also eliminates the unusual stop configuration that has resulted in northbound vehicles disregarding the stop sign. Two example configurations were conceptualized for the realignment.

Road Concept D Summary

- Refined Concept Recommended
- Improvement in the adherence to the traffic control at the Whitney Road intersection.
- Removal of the tight turn between Ocean Dock Road and Whitney Road.
- Improvement in truck operations by providing a continuous movement between the C Street ramps though Whitney Road.
- Reduction in the likelihood of the rail-road crossing signal gate arm being knocked off or struck.

Figure 50 shows one realignment option. Whitney Road intersects the reconfigured Ocean Dock Road in a T configuration with all movements occurring in the same intersection. Pavement widening is needed to accommodate trucks making eastbound left and southbound right movements, which results in a wide rail-road crossing.

Figure 51 shows another realignment option. This option splits the intersection in two; the north intersection is used by northbound vehicles on North C Street heading towards the POA and vice versa, while the southern intersection is used by eastbound/westbound vehicles. This intersection layout provides the majority of the truck movements with free-flow travel; however, it adds low volume rail-road crossings within the corridor.

A refined realignment option was developed with input from ARRC and is presented as part of the proposed alternative in Section 9.2.

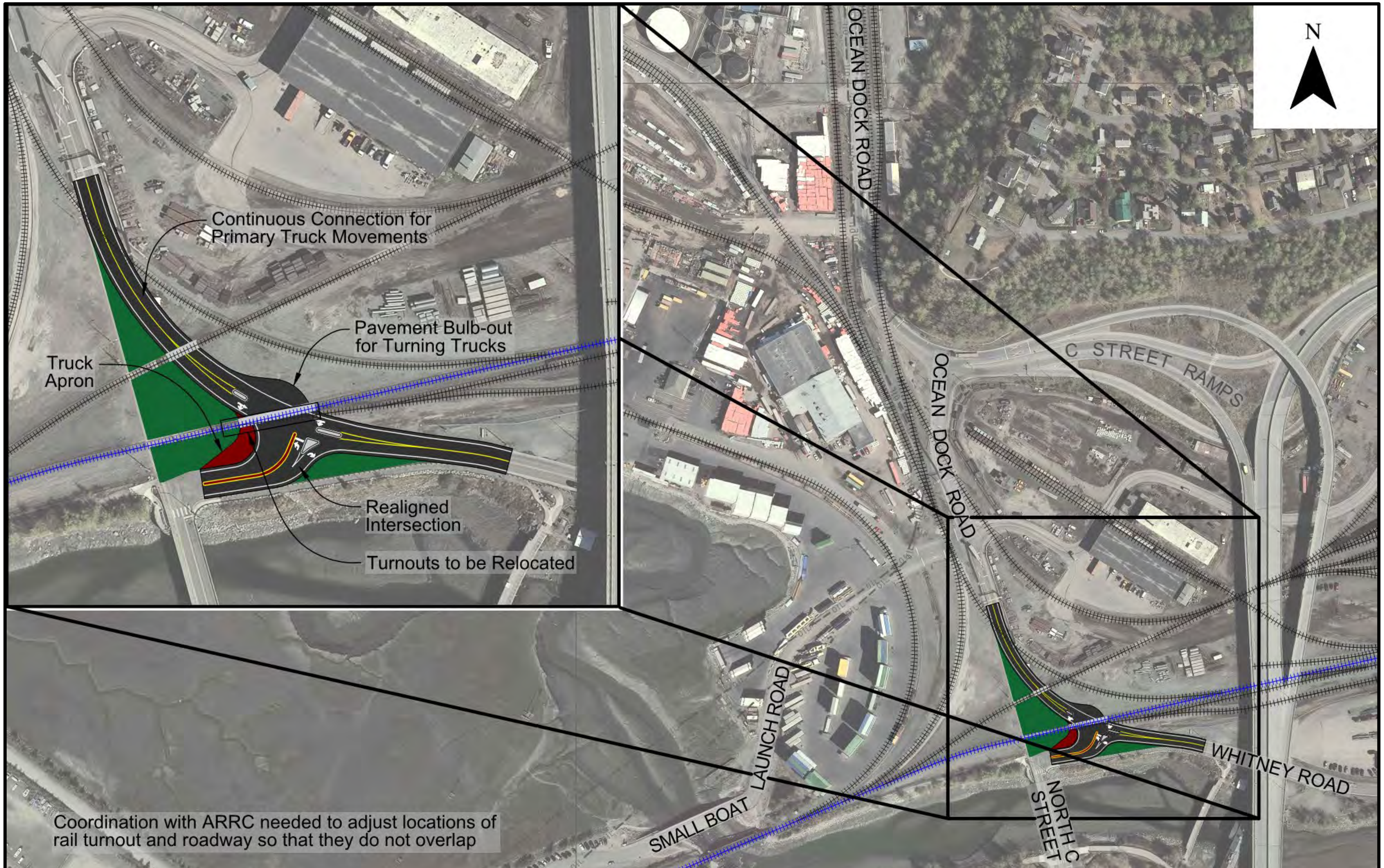

Figure 50: Road Concept D – Whitney Road Intersection Realignment – Option 1

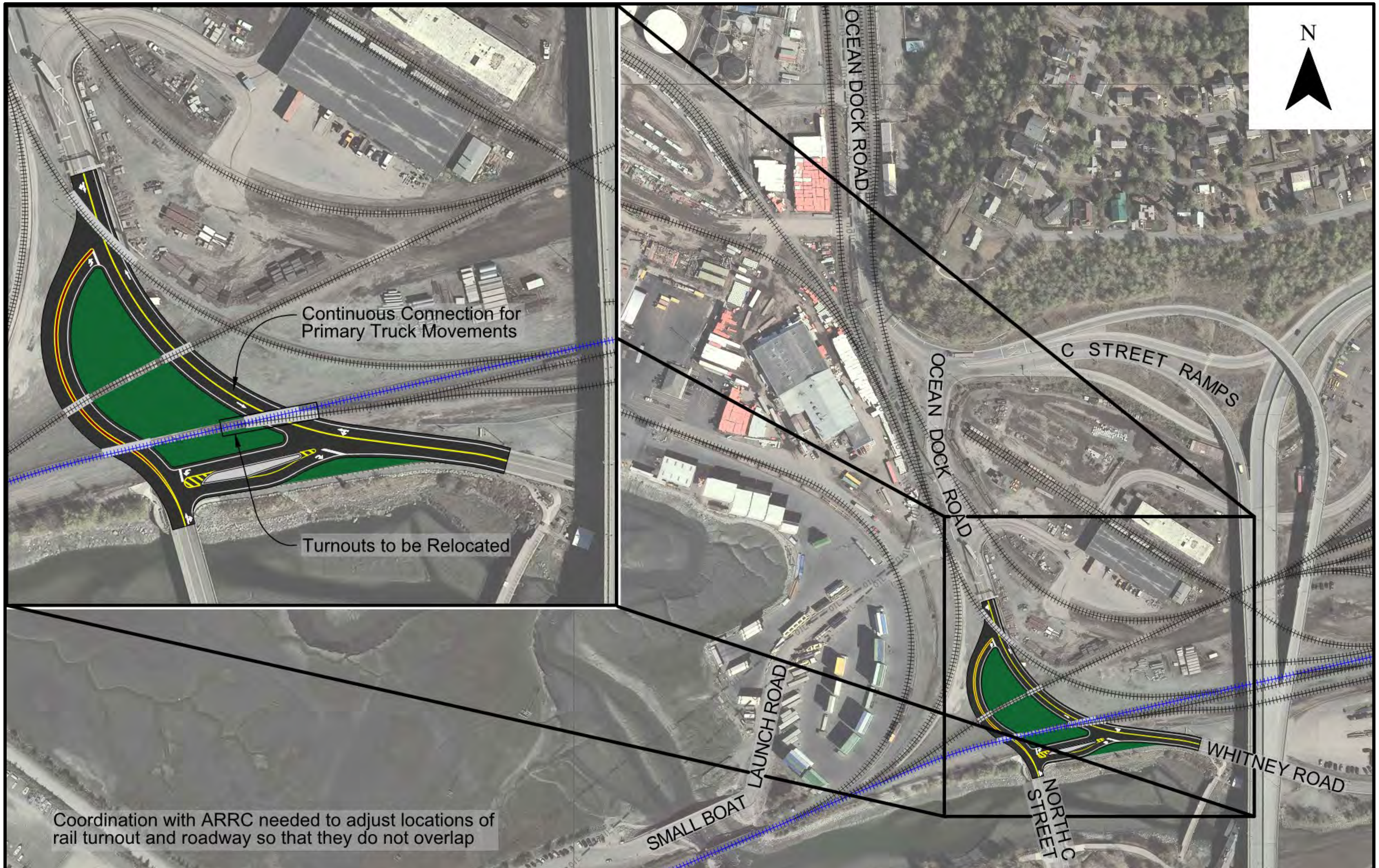

Figure 51: Road Concept D – Whitney Road Intersection Realignment – Option 2

6.3 Active Transportation Options

Potential active transportation infrastructure options were developed for the project area, with the following goals:

- Connecting non-motorized generators, such as Government Hill residences, Ship Creek fishing, the Ship Creek trail system in the area, and POA employment
- Minimizing the length of pedestrian road crossings and encouraging crossing at locations with lower volumes of truck traffic
- Improving the safety of pedestrian rail crossings

6.3.1 Install Chicanes at Rail-Road At-Grade Crossings

Chicanes are physical barriers that create an "S" shape path for pedestrians and bicycles to go around. Installing chicanes would slow down bicyclists right before a rail-road at-grade crossing and would increase their awareness of the crossing. These could be installed at the higher-train-volume rail-road at-grade crossings. Figure 52 presents an example of chicanes installed south of the study area at the rail-road at-grade crossings on North C Street.

Figure 52: Example of Chicanes
Source: Google Street View

6.3.2 Perpendicular Design of Non-Motorized Facilities at Rail-Road At-Grade Crossings

When installing facilities to be used by bicycles, such as pathways or sidewalks, the facility should be designed to be perpendicular with rail-road at-grade crossings to increase safety. This option allows bicycles to traverse rail-road at-grade crossings perpendicularly, which reduces the potential of bicycle tires getting stuck in the gap between the tracks and the concrete slabs. Figure 53 presents an example of pathways intersecting perpendicular to rail-road at-grade crossings.

Figure 53: Example of Pedestrian Pathways at Rail-Road At-Grade Crossings

6.3.3 Install Bicycle Facilities

The GDHS states that bicycle facilities should be considered for arterial roadways. The AASHTO *Guide for Development of Bicycle Facilities* recommends the installation of bike lanes or shared use paths based on the road conditions of Ocean Dock Road. The FHWA *Bikeway Selection Guide* also recommends bike lanes based on the AADT volumes and 30-mph posted speed limit on Ocean Dock Road; however, the guidance mentions that high percentages of heavy vehicles increase the risks and discomfort for bicycles and can decrease motorist visibility to see the bicyclists. Additional buffer or separation between the travel can improve visibility and safety.

A separated shared use path is recommended on Ocean Dock Road from the C Street ramps to Whitney Road to provide a separation between the heavy vehicles and non-motorized users.

Furthermore, the separated pathways can be designed to cross rail-road crossings at a more perpendicular angle compared to bike lanes, which would reduce the potential of bicycle tires getting stuck in the gaps between the railroad tracks and concrete slabs. Where the posted speed limit on Ocean Dock Road drops to 20 mph (near the entrance and inside of the POA), the FHWA guidance recommends shared lanes as the selected bicycle facility. The shared lanes is an appropriate treatment since the POA is not open to the public and low bicycle and pedestrian volumes are expected.

6.3.4 Install Pedestrian Facilities

The GDHS states that pedestrians need to be accommodated on most arterial streets with facilities including sidewalks and crosswalks. As proposed in the *2018 AMATS: Ocean Dock Road/C Street Access Ramps Reconnaissance Study*, a pedestrian pathway is recommended along the north side of the northbound C Street Off-Ramp to accommodate pedestrian and bicycle demand between C Street and Ocean Dock Road. The pathway would encourage compliance since pedestrian and bicycle travel is prohibited on the C Street ramps.

A separated pathway is recommended on the east side of Ocean Dock Road between the C Street ramps and Whitney Road. There are more opportunities on the east side of Ocean Dock Road to design the pathway to be perpendicular to the rail-road crossings to increase the safety at the crossings.

6.4 Drainage Options

6.4.1 Clean Existing Drainage Structures

The existing drainage structures are filled with sediment and debris and are not functioning properly. The 2018 *AMATS: Ocean Dock Road/C Street Access Ramps Reconnaissance Study* proposed that the drainage pipes and structures should be cleaned and repaired (if needed) to adequately drain water out of the study area and to meet current design standards. Drainage features to be cleaned or repaired include culverts, pipes, inlets, and manholes.

6.4.2 Replace Damaged Drainage Structures with a Fin Drain

Part of Alternative 2 in the 2018 reconnaissance study was to replace damaged drainage structures with a fin drain to improve drainage and reduce recurring pavement damage. Fin drains could help lower the high ground water table in the study area by using geotextiles and perforated pipes that are covered with a porous backfill, typically gravel. Figure 54 presents the location of the fin drains.

6.4.3 Relocate Manhole at Ocean Dock Road and C Street Ramps Intersection

A manhole is currently located in the middle of the Ocean Dock Road at the C Street ramps intersection. Due to the high traffic volumes, it is difficult to access the manhole for maintenance purposes without disrupting traffic flow. This option, presented as part of Alternative 2 in the

2018 reconnaissance study, would relocate the manhole towards the southeast quadrant of the intersection to better maintain operations and facilitate adequate drainage. The proposed location is shown in Figure 54.

6.4.4 West Bluff Drive Storm Drain Surcharge

Improvements to reduce the surcharging of the West Bluff storm drain may be beyond the scope of this project due to the project limits. There may be an opportunity to install storm drain piping for future use by others where improvements are needed outside the limits of this project.

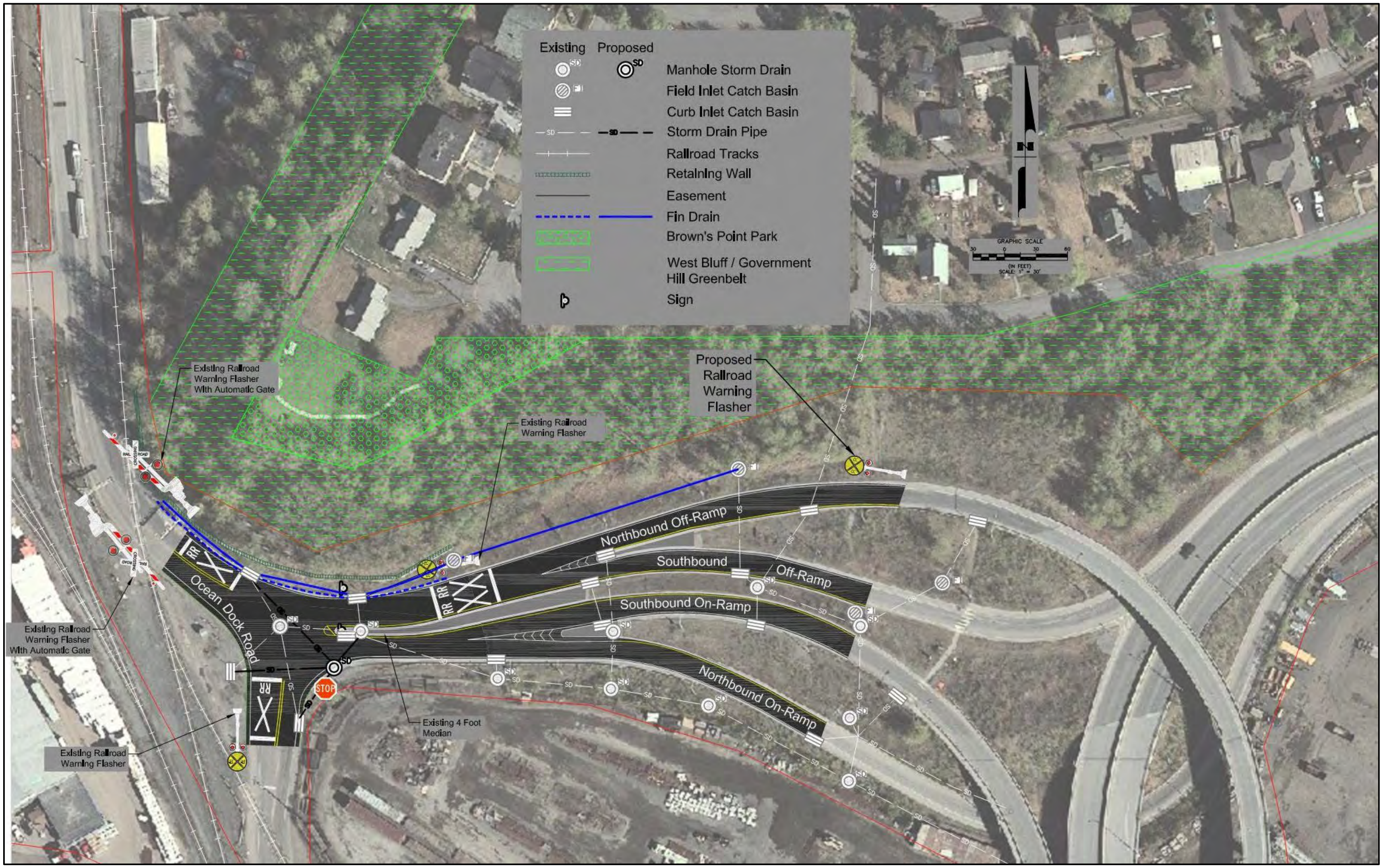

Figure 54: Fin Drain Location and Relocated Manhole

Source: *AMATS: C Street/Ocean Dock Road Access Ramps Reconnaissance Engineering Study*, Figure 26

7 Summary of Concerns and Concepts to Address Them

Through this study process, improvement needs in the area were identified. From those needs, a range of feasible concepts addressing the needs were presented, including rail, road, active transportation, and drainage improvements. Based on input from stakeholder groups, the most promising of these concepts were combined into a feasible alternative that, as a group, meet the proposed project purpose and need.

Several of the concepts presented in this study were previously developed in the 2018 *AMATS: C Street/Ocean Dock Road Access Ramps Reconnaissance Engineering Study*. The 2018 study looked closely at concerns related to the intersection of Ocean Dock Road at the C Street ramps. This new study expands the scope to examine concerns and concepts for improvement from Ship Creek to Roger Graves Road at the POA. Concerns identified in the 2018 study and concepts to address them have been included in this report. Thus, the purpose and need proposed in this report incorporate the concerns identified previously. The proposed alternative in this Reconnaissance Engineering Study report addresses those needs, in addition to the needs of the larger study area.

The rail and road concepts were assessed against the purpose and need statement to determine which concepts moved forward to the next stage of development. Table 13 compares how the concepts perform against the purpose and need.

Based on the table, it was proposed that Rail Concept 1, Road Concept A, and Road Concept D advance to the next stage and be presented to the public for input. Rail Concept 1 provides the highest benefit in crossing delays and vehicle-train interactions because the concept removes trains from crossing Ocean Dock Road north of the C Street ramps. The remaining rail concepts have little to no benefit for delay and vehicle-train interactions. Furthermore, Rail Concept 1 is the only rail concept to improve the sight distance at Ocean Dock Road 6 (868543R). Road Concepts A and D were proposed to move forward because they both meet purpose and need for their respective local concerns.

The following subsections describes the identified concerns and the concepts that address them.

Table 13: Comparison of Concepts against Purpose and Need

	Truck Operations			Crash Potential					Maintenance
	Reduce train crossing delay	Improve sight distance at C St Ramps/ Ocean Dock Rd	Gain speed to C St	Reduce vehicle-train interactions	Improve sight distance at Ocean Dock Rd 5	Improve sight distance at Ocean Dock Rd 6	Improve adherence to traffic control at Whitney Rd/Ocean Dock Rd	Mitigate tight turn at Whitney Rd/Ocean Dock Rd	Reduce potential of striking rail signal
Rail Concepts		**-**							
Rail Concept 1	**Yes (High Benefit)**	-	-	**Yes (High Benefit)**	**Yes**	**Yes**	-	-	-
Rail Concept 2	Yes (Low Benefit)	-	-	**Yes** (Low Benefit)	No	No	-	-	-
Rail Concept 2a	Yes (Low Benefit)	-	-	**Yes** (Low Benefit)	**Yes**	No	-	-	-
Rail Concept 3	Yes (Low Benefit)	-	-	**Yes** (Low Benefit)	No	No	-	-	-
Road Concepts								**-**	
Road Concept A	-	**Yes**	**Yes**	-	-	-	-	-	-
Road Concept B	-	**Yes**	No	-	-	-	-	-	-
Road Concept C	-		-	-	-	-	**Yes**	No	No
Road Concept D	-		-	-	-	-	**Yes**	**Yes**	**Yes**

7.1 Delay at Rail-Road At-Grade Crossings

Rail-road at-grade crossing delay is about two times higher at the Ocean Dock Road 5 (868539B) crossing (located just north of the Ocean Dock Road intersection with the C Street ramps) when compared to the crossing with the next highest delay. As such, the focus of the rail concepts is to either eliminate this crossing, or to reduce the number of trains using this crossing. No feasible concept was identified that reduced the truck volumes using the crossing.

The Ocean Dock Road 5 (868539B) crossing has the highest number of train movements per day (average of 34 per Tuesday in summer) because the crossing is used by passenger trains that daily turn around so the return trip will be in the forward direction. This is also the main track into the POA. Currently, only about 8 trains per day serve customers north of the crossing. Note that the mix of train and truck traffic could change in the future if containers that are currently trucked out of the port to be loaded on train cars in the nearby intermodal yards are loaded directly onto train cars at the port.

Estimates of daily crossing delays on Tuesdays were calculated for the rail concepts. Note that the crossing delays are an estimate to compare the operation and find differences among the crossings in the study area; actual delay experienced may be different than the delays shown in the table. Table 14 presents the daily delays for the rail concepts and compares them with daily delays in the existing condition for the same time period. Rail Concept 1 provides the highest benefit with the most reduction in delay. The remaining rail concepts have small crossing delay changes in comparison to Rail Concept 1.

Table 14: Comparison of Daily Crossing Delays, Rail Concepts

Concept	Crossing Delay* (veh-hrs)	Crossing Delay Change from Existing* (veh-hrs)	Percent Change
Existing	127.8		
Rail Concept 1	60.3	-67.6	-53%
Rail Concept 2	118.4	-9.4	-7%
Rail Concept 2a	118.4	-9.4	-7%
Rail Concept 3	118.4	-9.4	-7%

* Daily on a given Tuesday

Rail Concepts 1 and 2a move the track accessing the port to the west side of Ocean Dock Road and remove the Ocean Dock Road 5 (868539B) crossing. Rail Concept 1 moves the main tracks farther to the north, where there are fewer trucks and fewer train maneuvers. Rail Concept 2a moves the main tracks farther north on Ocean Dock Road where there are also fewer train maneuvers but similar truck volumes as Ocean Dock Road 5 (868539B). Rail Concepts 2 and 3 retain the Ocean Dock Road 5 (868539B) crossing but reduce the number of train maneuvers at the crossing by providing track that could be used for turning passenger trains on the west side of Ocean Dock Road.

Rail Concept 1 and 3 both require construction of new track on the west side of Ocean Dock Road, which will impact the fuel pipelines. These impacts may be costly.

7.2 Truck Operational Improvements

The road concepts included in this report that were previously presented in the 2018 *AMATS: C Street/Ocean Dock Road Access Ramps Reconnaissance Engineering Study* (Road Concept A and B) address sight distance and curve speed concerns that were identified in that report.

Road Concept A (Flattened Curve) maintains the existing traffic flow, with trucks to and from the C Street ramps continuing onto Ocean Dock Road to enter the port without stopping while northbound trucks from Whitney Road stop at the C Street ramp intersection. To improve the sight distance and curve speed, the concept proposes to cut into the bluff and construct a new retaining wall. However, the cultural resources desktop review undertaken for this current study recommends avoiding impacts to the bluff, as cutting into the bluff could create direct impacts to the Government Hill Federal Housing Historic District. Further discussion between a Qualified Professional and the Statewide Historic Preservation Office is recommended.

Road Concept B (Realigned T Intersection) changes the traffic flow at the C Street ramps intersection. Northbound and southbound through traffic will be unrestricted at the intersection. Westbound right-turning traffic will use the slip lane and yield to northbound traffic, while southbound left-turning traffic will come to a complete stop before proceeding onto Ocean Dock Road. Southbound left-turning traffic will now yield to oncoming northbound traffic. This could make it difficult for trucks to get up to speed as they climb these ramps, as that is already a concern under the existing condition. As such, this concept would be most compatible with improvements that would change the main route being followed by trucks in and out of the port from C Street to Whitney Road, such as improvements to the connection between Whitney Road and Ingra and Gambell Streets. This concept could be built without impacting the bluff.

7.3 Crash Potential Reductions

Crashes between vehicles, or between vehicles and trains, tend to be reported to DOT&PF, while crashes between vehicles and rail equipment (such as signals or gates) or where vehicles drive onto the tracks are more likely to be documented by ARRC. Crash reports from both sources were reviewed, with the following conclusions:

- Compared to crashes at similar intersections and road segments throughout the state as reported to DOT&PF, no unusual crash patterns were identified.

- Interviews with stakeholders undertaken during the 2018 study indicated concerns for crash potential due to snow and ice on the C Street ramps. The drainage options presented in 2018 and repeated in this report would address these concerns.
- The ARRC data indicated that 41 vehicles struck the rail equipment at the crossings just north of Whitney Road (Ocean Dock Road crossings 1 and 2). Anecdotal evidence indicates that this is due to the sharpness of the turn for the main truck movement, turning from Whitney Road to go north on Ocean Dock Road, and vice versa. Improvements to address this condition are presented in the next section.
- The Ocean Dock Road 5 (868539B) and Ocean Dock Road 6 (868543R) crossings were identified as having rail sight distance concerns. The curve at the C Street ramps intersection obstructs sight distance for westbound vehicles to view southbound trains. Similarly, the geometry at Ocean Dock Road 6 (868543R) and structures near the crossing obstructs south/westbound vehicles from northbound trains. Road Concept A removes the curve obstruction at the Ocean Dock Road 5 (868539B) crossing. Rail Concept 1 removes the Ocean Dock Road 5 (868539B) and Ocean Dock Road 6 (868543R) crossings, eliminating the conflict the vehicle-train conflict from these locations.
- Stakeholder outreach identified a concern that some northbound drivers at the Whitney Road intersection do not comply with the traffic control signage and do not yield to southbound drivers. This may in part be due to the unusual traffic control configuration at this intersection, where southbound vehicles do not stop and westbound and northbound vehicles are controlled by a stop sign. This configuration is intended to ensure that southbound queues do not form over the existing rail-road at-grade crossings. Road Concept C would install a flashing beacon and larger signs to alert the northbound drivers that they need to yield to southbound drivers. Road Concept D would realign the intersection, so that conventional traffic control could be used.
- Sidewalk or pathway improvements included in Road Concepts A and B and the active transportation options shown in this report would construct a separated pathway for pedestrian and bicycle traffic, formalize pedestrian road crossing locations, and improve rail-bicycle crossings, which would reduce the potential for pedestrian- and bicycle-related crashes.

The exposure factor (product of vehicular AADT and average daily train movements) may be used to correlate the potential conflicts between vehicles and trains. For each rail concept, vehicle-train interactions were quantified by calculating and summing the exposure factors of all the rail-road crossings within the study area. Exposure factors were calculated using existing AADTs and the estimated average train volumes per rail concept.

Table 15 compares the aggregate exposure factor under existing conditions and with the rail concepts. Rail Concept 1 provides the most reduction of the aggregate exposure factor since it removes the Ocean Dock Road 5 (868539B) crossing and moves the need to cross Ocean Dock Road farther north where there are fewer vehicles and fewer train maneuvers. As shown in Table 15, every rail concept reduces the exposure factor compared to the existing. This is because the rail concepts remove train movements at crossings with relatively high vehicle volumes and increase train movements at crossings with fewer vehicle volumes.

Table 15: Comparison of Rail-Road Aggregate Exposure Factors

Concept	Aggregate Exposure Factor	Aggregate Exposure Factor Change from Existing	Percent Change
Existing	258,308		
Rail Concept 1	180,700	-77,608	-30%
Rail Concept 2	246,284	-12,024	-5%
Rail Concept 2a	247,244	-11,064	-4%
Rail Concept 3	246,444	-11,864	-5%

7.4 Maintenance

As described in the previous section, 41 vehicles struck the rail equipment at the crossings just north of Whitney Road (Ocean Dock Road crossings 1 and 2). Road Concept D would reduce the likelihood of vehicle-rail equipment interactions by curving Ocean Dock Road to smoothly transition into Whitney Road, with North C Street stopping or yielding at a new intersection along the new alignment. From a road operations perspective, this concept makes sense, as it eliminates stopping and turning for the majority of the traffic traveling through this intersection.

7.5 Drainage

Options for improving drainage previously presented in the 2018 study include cleaning the existing structures and replacing damaged structures with a fin drain. New driveway or road approach configurations may require grading of the ditches. There may also be an opportunity to make phased improvements to the Bluff Drive storm drain system within Ocean Dock Road.

7.6 Non-Motorized Connectivity and Safety

The construction of a pathway or sidewalk connecting the existing sidewalk at the C Street ramps pedestrian crossing to the Ship Creek bridge is shown in Road Concepts A and B and would also be included with the improvements for Road Concept D. Options for improving the rail-road at-grade crossings to better accommodate pedestrians and bicycles include installing chicanes and designing the path to cross perpendicular to the railroad tracks.

8 Future Traffic Volumes

Future traffic volumes for the study area were developed using an annual growth rate of 0.5%. A preliminary version of the AMATS 2040 travel demand model forecasted volumes to have similar or fewer traffic volumes compared to historical volumes within the study area. Furthermore, historically traffic volumes in the project study area have been relatively flat. The Alaska Department of Labor and Workforce Development published *Alaska Population Projections: 2019 to 2045* in April 2020, which published forecasted populations to a 2045 horizon year. Based on the publication, the forecasts showed a baseline population growth rate of 0.38% for the entire state and 0.17% for the city of Anchorage. This study uses a rounded 0.5% growth rate for traffic volumes, which results in only small increases in volumes, consistent with the historical trends.

Table 16 shows the estimated 2022 AADT volumes and forecasted 2045 design year volumes. Estimated 2022 AADT volumes is the five-year average of AADTs from 2014 to 2019, excluding 2017 volumes since there was an unexplained decrease in volume in that year.

Table 16: Forecasted 2045 Average Annual Daily Traffic Volumes

Road Segment	Estimated 2022 AADT	Forecasted 2045 AADT
Ocean Dock Road: POA to C Street Ramps	1,996	2,238
Ocean Dock Road: C Street Ramps to Whitney Road	2,923	3,278
C Street Northbound Off-Ramp (Downtown to Ocean Dock Road)	1,850	2,075
C Street Southbound Off-Ramp (Government Hill to Ocean Dock Road)	325	364
C Street Southbound On-Ramp (Ocean Dock Rd to Downtown)	1,686	1,891
C Street Northbound On-Ramp (Ocean Dock Road to Government Hill)	431	484
Whitney Road: Ocean Dock Road to Craig Taylor Equipment	2,819	3,162
North C Street: Whitney Road to West 1st Avenue	3,390	3,802

8.1 Future Turning Movement Volumes

Future intersection turning movement volumes were calculated based on AADT projections for the approach roads, expected turning movement proportions, and design hour volume percentages determined from the WIM station on Ocean Dock Road. Future turning movement volumes were estimated for Tuesdays during the peak hour. The peak hour for the study area occurs during the middle part of the day. The design hour percentage on Tuesdays was assumed to be the 30th highest peak hour recorded from the Ocean Dock Road WIM station, which have historically ranged between 15% to 16%. A 16% design hour percentage was used for this analysis.

The trip distribution methodology normally used to calculate future turning movement volumes (NCHRP 765) produced unlikely results for both the C Street ramp intersection with Ocean Dock Road and the Whitney Road intersection. Therefore, simple growth rates were applied to each leg of the intersections to forecast future turning movements to the projected 2045 design year AADTs.

Figure 55 presents the projected 2045 turning movement volumes on Tuesdays for the Ocean Dock Road intersections at the C Street ramps and at Whitney Road.

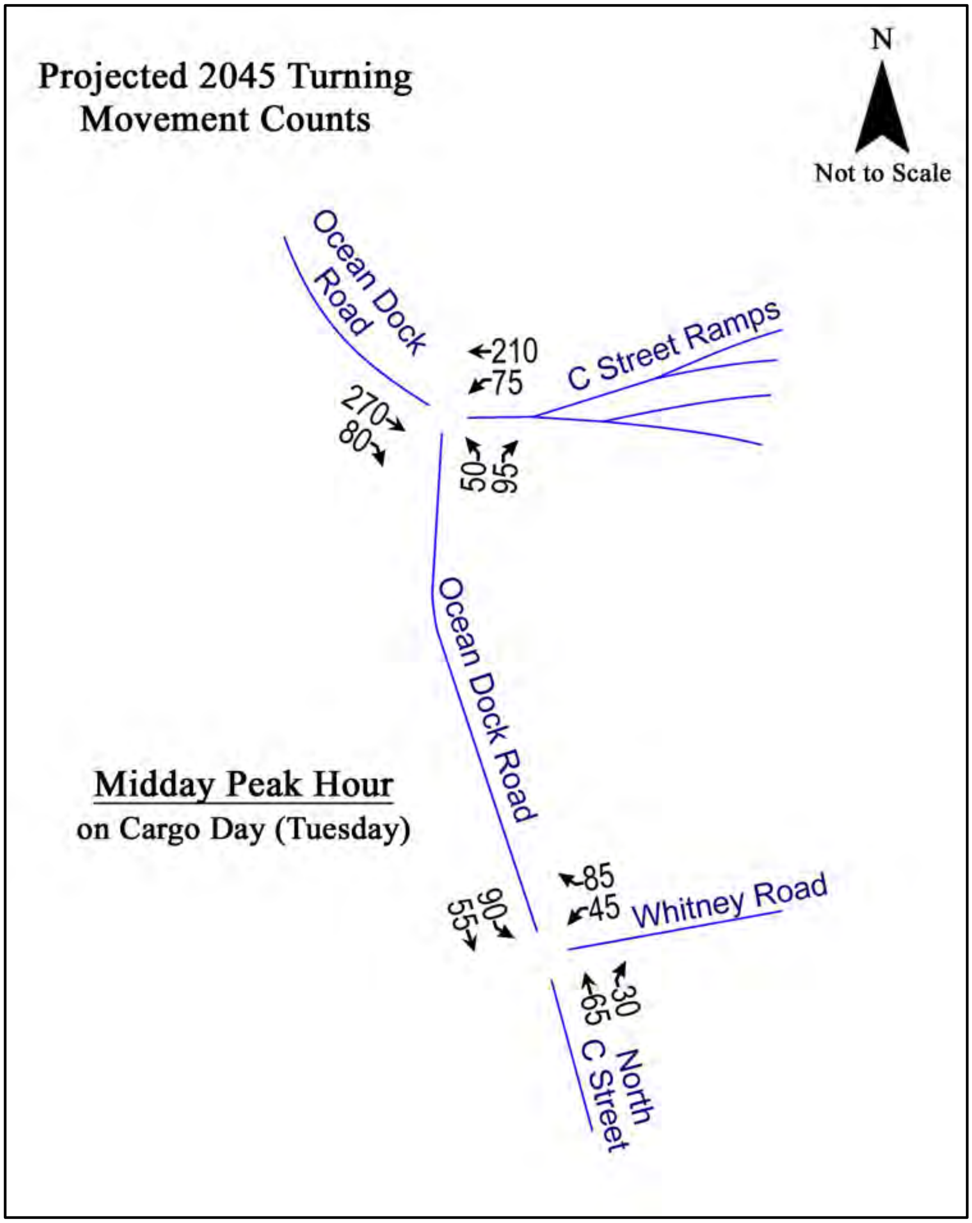

Figure 55: Forecasted Turning Movement Volumes – 2045 Midday Peak

9 Design Alternatives

Three road or rail concepts, discussed in Section 7, were recommended: Rail Concept 1, Road Concept A, and Road Concept D. The concepts were refined with active transportation and drainage solutions to develop one build alternative for the study. This section describes the build alternative and compares it to the no build alternative.

9.1 No Build Alternative

Under this alternative, no action would be taken for the study area. The Ocean Dock Road segments and intersections and the ARRC rail lines would remain the same. No identified concerns would be addressed.

9.1.1 Measures of Effectiveness

9.1.1.1 Safety

The no build alternative would not address the identified safety concerns. Limited sight distance around the retaining wall near Ocean Dock Road 5 (868539B) rail-road crossing and the limited sight distance at Ocean Dock Road 6 (868543R) rail-road crossing would remain a concern. The unconventional traffic control at the Whitney Road intersection would stay the same, and noncompliance of the stop sign by North C Street vehicles coming from the Ship Creek bridge would remain a concern.

9.1.1.2 Intersection Capacity

Future intersection capacity for the critical midday peak was determined using future volumes, existing PHFs, and existing truck percentages. The analysis was conducted using Highway Capacity Software 2010 software for the C Street ramps intersection and Vissim software for the Whitney Road intersection.

Table 17 presents the 2045 no build Ocean Dock Road intersection operations at the C Street ramps, while Table 18 presents the operations at the Whitney Road intersection. Vehicle delays at the intersections are expected to increase compared to existing operation; however, LOS would remain at LOS C or better.

Table 17: 2045 Midday Peak LOS at Ocean Dock Road and C Street Ramps Intersection – No Build Alternative

Midday Peak	EBT	EBR	WBL	WBT	NBL	NBR
Movement Delay (seconds/vehicle)	0		9	0	19	
Movement LOS	Free		A	Free	C	
v/c Ratio	-		0.10	-	0.40	

Table 18: 2045 Midday Peak LOS at Ocean Dock Road and Whitney Road Intersection – No Build Alternative

Midday Peak	WBL	WBR	NBT	NBR	SBL	SBT
Approach Delay (seconds/vehicle)	13		12		0	
Approach LOS	B		B		Free	

9.1.1.3 Truck Operations

At the C Street ramps intersection, trucks would continue to have difficulty gaining adequate speed on the C Street on-ramps, seeing around the curve, and navigating on the failing pavement due to poor drainage. At the Whitney Road intersection, due to the tight turning radius at the intersection, drivers on Whitney Road may continue to stop far behind the stop bar to avoid colliding with a turning truck from Ocean Dock Road.

9.1.1.4 Railroad Operations

Rail operations would not change with the no build alternative.

9.1.1.5 Pedestrian & Bicycle Operations

Table 19 presents the expected pedestrian delays in the 2045 design year under the no build alternative for the individual C Street ramps and at the marked south leg crossing of the Whitney Road intersection. It also presents the existing delay, for comparison.

Pedestrian delays on the C Street ramps are anticipated to be 6 seconds or less per pedestrian. However, pedestrian discomfort may continue due to heavy truck traffic, the two unmarked C Street ramp crossings, and difficulty seeing down the roadway due to the ramp curvatures. At the Whitney Road intersection, the pedestrian delay remains at about 1 second per pedestrian, assuming pedestrians only need to wait for the uncontrolled southbound Ocean Dock Road vehicles and that stop-controlled vehicles from North C Street and Whitney Road will yield.

Table 19: 2045 Pedestrian Crossing Delay, Midday Peak – No Build Alternative

Road Segment	Crossing Width (feet)	Volume (vehicle/hour)	2045 Delay (seconds/ pedestrian)	Existing Delay (seconds/ pedestrian)
at C St Ramps Intersection				
C St Northbound Off-Ramp	25	300	6	4
C St Southbound Off-Ramp	25	80	1	1
C St Southbound On-Ramp	23	200	3	3
C St Northbound On-Ramp	23	70	1	1
at Whitney Road Intersection				
North C St (South Leg)	26	55	1	<1

9.1.2 Hydrologic and Hydraulic Considerations

The no build alternative would not address the existing drainage concerns. No improvements would be made to the drainage system. Water ponding on the roadway and near railroad tracks would continue, as well as the seasonal potholes at the C Street ramps intersection without regular maintenance.

9.1.3 Environmental Considerations

No environmental considerations are taken into account under the no build alternative.

9.1.4 ROW and Utility Conflicts

There are no utility or ROW conflicts associated with the no build alternative.

9.1.5 Schedule Impacts

Scheduling impacts are not considered with the no build alternative.

9.1.6 Cost Estimates

No additional costs are associated with the no build alternative, apart from ongoing maintenance projects to preserve the pavement and repair damaged rail-road crossing devices.

9.2 Build Alternative

Figure 56 through Figure 60 depict the proposed build alternative for the project. Under the build alternative, the North Leg of Passenger Wye is relocated farther south to consolidate the area of railroad crossings on the south end of the study area. North of the C Street ramps, the lead track is relocated to the west side of Ocean Dock Road and crosses to the east side farther north, between Roger Graves Road and Terminal Road; new spur tracks are added for Crowley and the asphalt plant. This removes the Ocean Dock Road 5 (868539B) crossing and Ocean Dock Road 6 (868543R) crossing, both of which were identified of having sight distance concerns. The Ocean Dock Road 5 (868539B) crossing also experiences large volumes of train crossings; removing the crossing reduces the potential of vehicle-train intersections on Ocean Dock Road near the C Street ramps and eliminates the delay vehicles experience when a train occupies the crossing.

At the Ocean Dock Road and C Street ramps intersection, the radius of the horizontal curve is increased (or flattened) to allow trucks from the POA to maintain speed around the curve to climb the C Street ramps. The road is widened towards the hill which cuts back the hill, providing sufficient sight distance for trucks. A new northbound left-turn lane for the North Star driveway north of the C Street ramps intersection allows left-turning trucks to store inside the turn lane, preventing cars from backing up into the intersection and minimizing sight distance issues caused by vehicle queues.

At the Ocean Dock Road and Whitney Road intersection, Ocean Dock Road is realigned to curve into Whitney Road to create a more direct route for the primary truck movements. The curve eliminates the need for the heavy truck movements to stop or yield when turning into either Ocean Dock Road or Whitney Road. The realignment removes the tight turn between Ocean Dock Road and Whitney Road and reduces the likelihood of vehicles striking railroad gate arms. The intersection is reconfigured so that North C Street intersects perpendicular to Ocean Dock Road and Whitney Road, providing a traditional intersection configuration and eliminating the unusual stop configuration that results in the northbound stop sign being disregarded.

The alternative proposes pedestrian facilities and marked crossings to improve pedestrian and bicycle connectivity. The path is extended along the C Street ramps from the C Street Bridge to Ocean Dock Road, and then along Ocean Dock Road to Whitney Road. The facilities provide pedestrian and bicycle connectivity between Government Hill and attractions south of the study area such as Ship Creek and the Ship Creek Trail. Marked crossings along the study area encourage pedestrians to cross at designated locations with adequate sight distance. At the C Street ramps intersection, the widened median serves as a pedestrian refuge, allowing for two-stage crossings (crossing one direction of traffic at a time) and reducing crossing distances. Note that exact pedestrian crossing locations, markings, and signage will need to be evaluated during design, based on guidance in the Alaska Traffic Manual. Consideration could also be given to providing grade-separation of pedestrian crossings.

The alternative cleans the drainage features and, if needed, repairs or modifies them to meet current design standards, and installs a subdrain or fin drain. The manhole located in the C Street ramps intersection is moved to the southeast corner of the intersection to allow ease of access for maintenance.

This alternative improves sight distance, drainage and pavement issues, truck movements at the intersections, and reduces vehicle-train interactions and rail signal maintenance. Additionally, pedestrian and bicycle connectivity is provided.

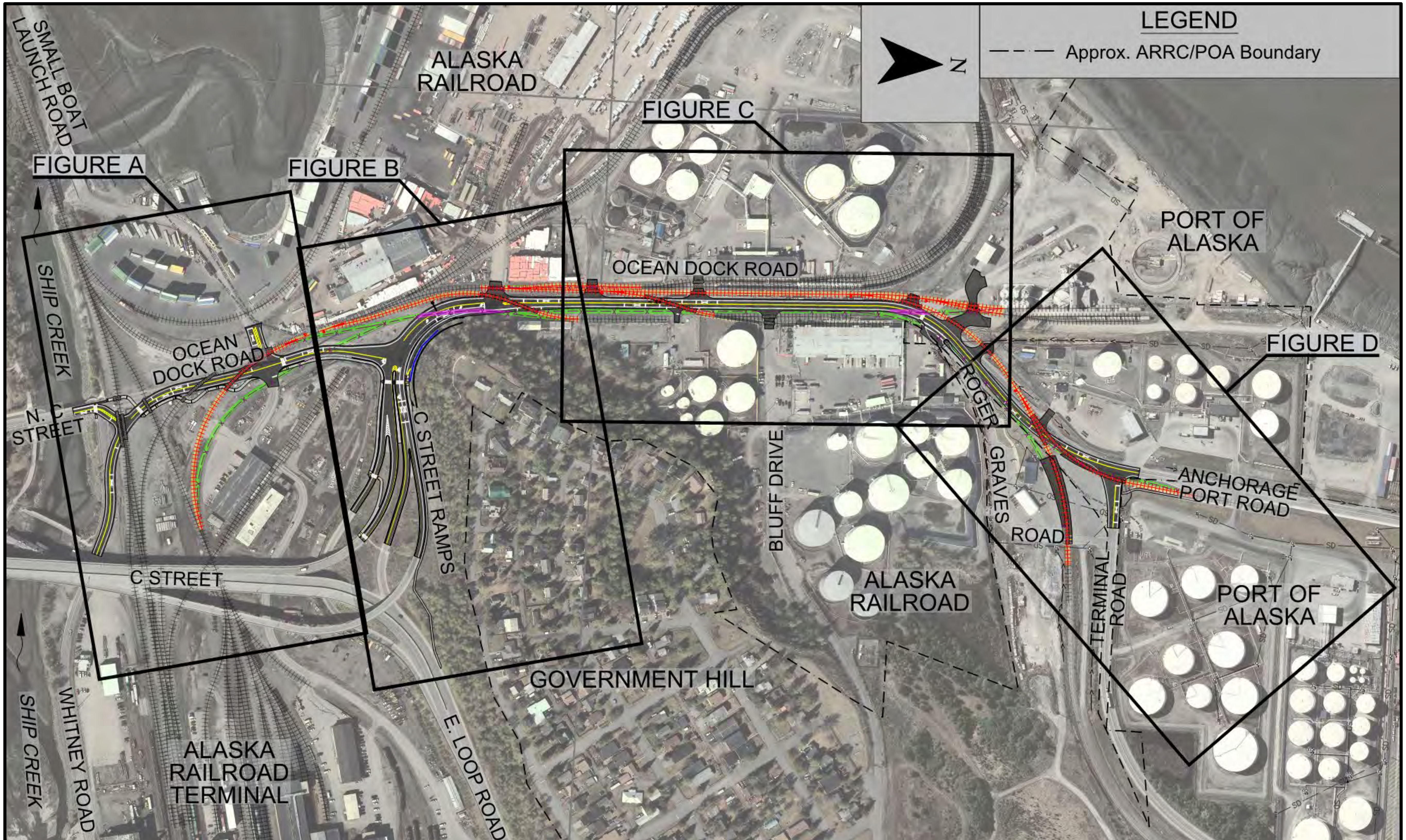

Figure 56: Build Alternative - Project Overview

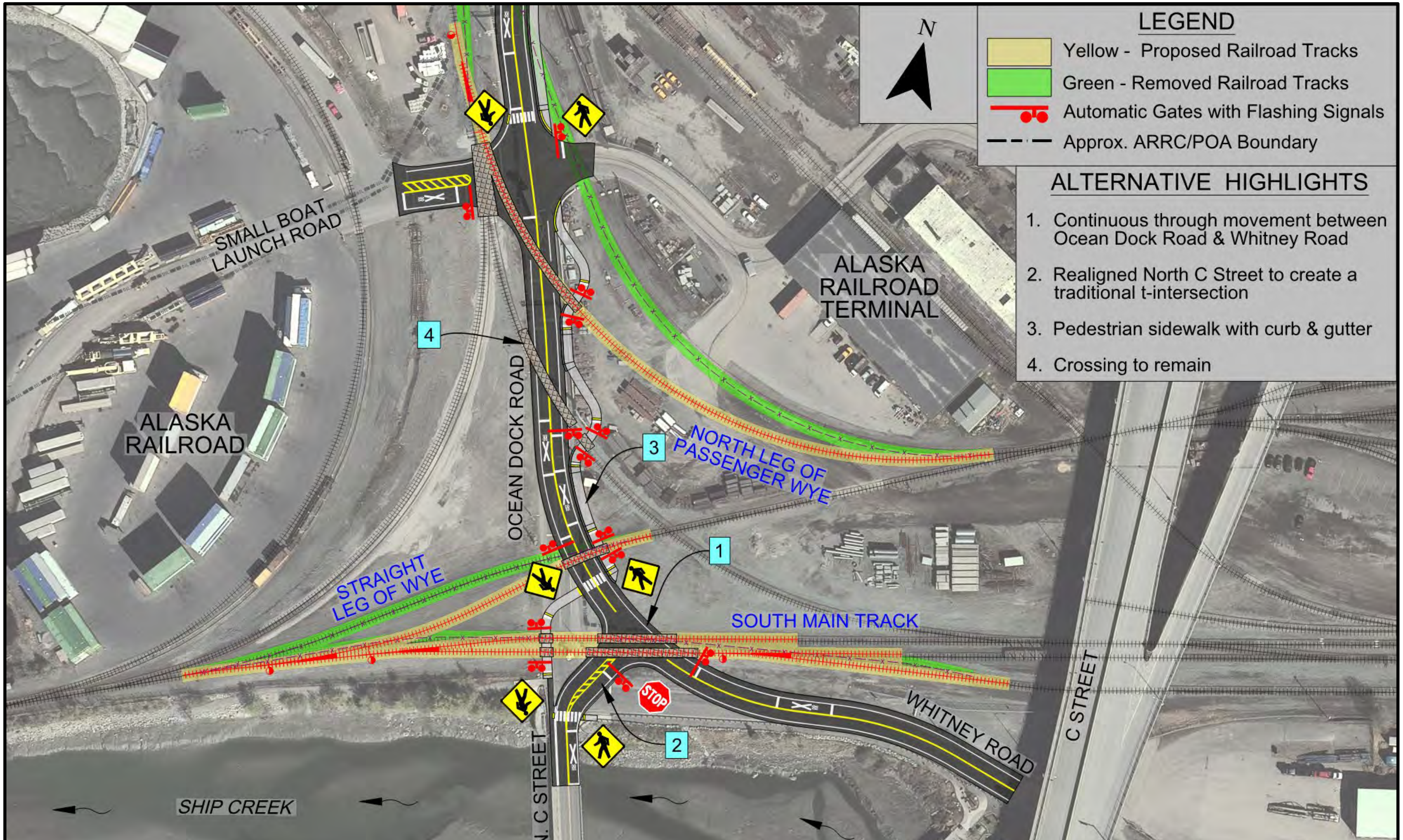

Figure 57: Build Alternative - Figure A

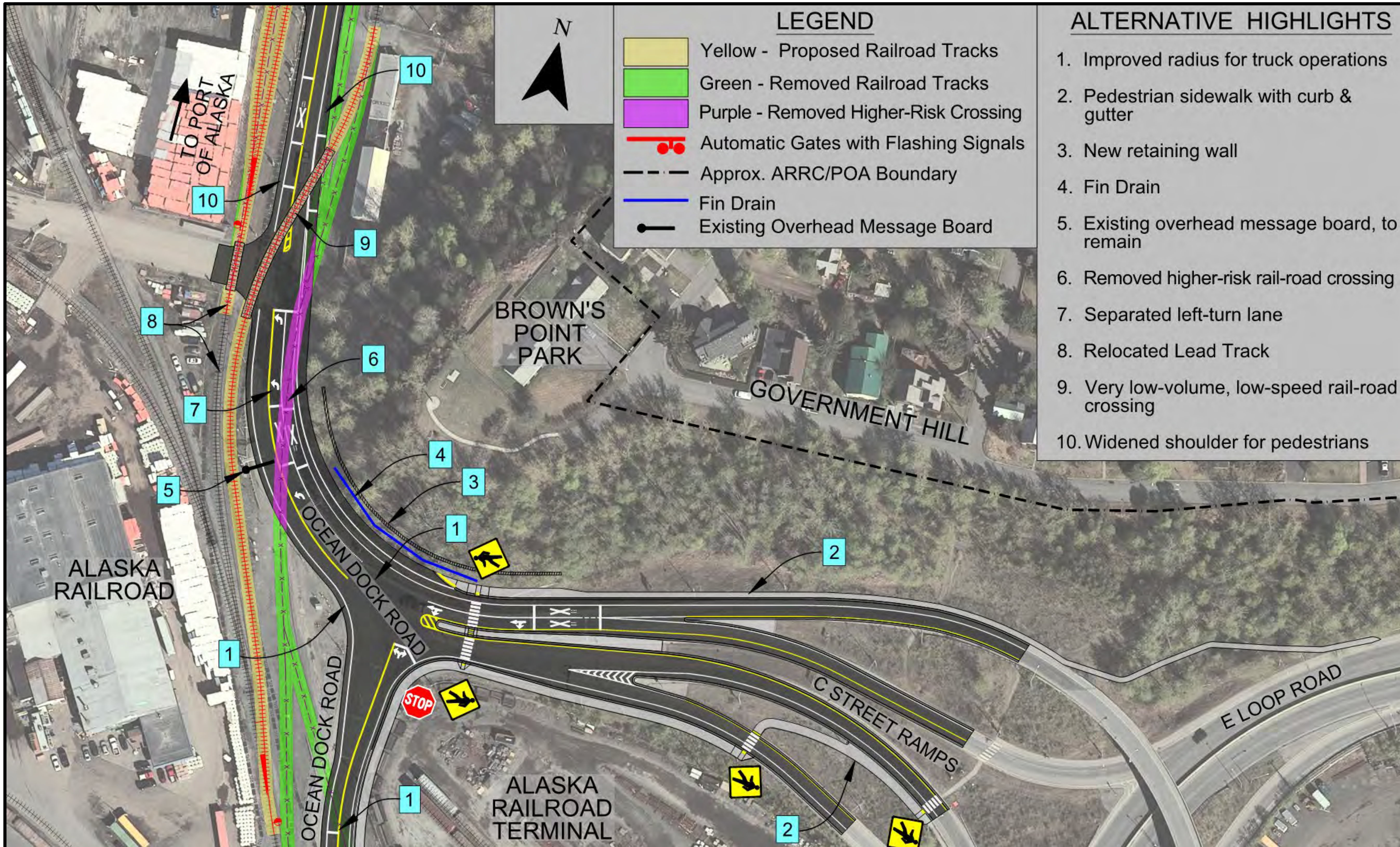

Figure 58: Build Alternative - Figure B

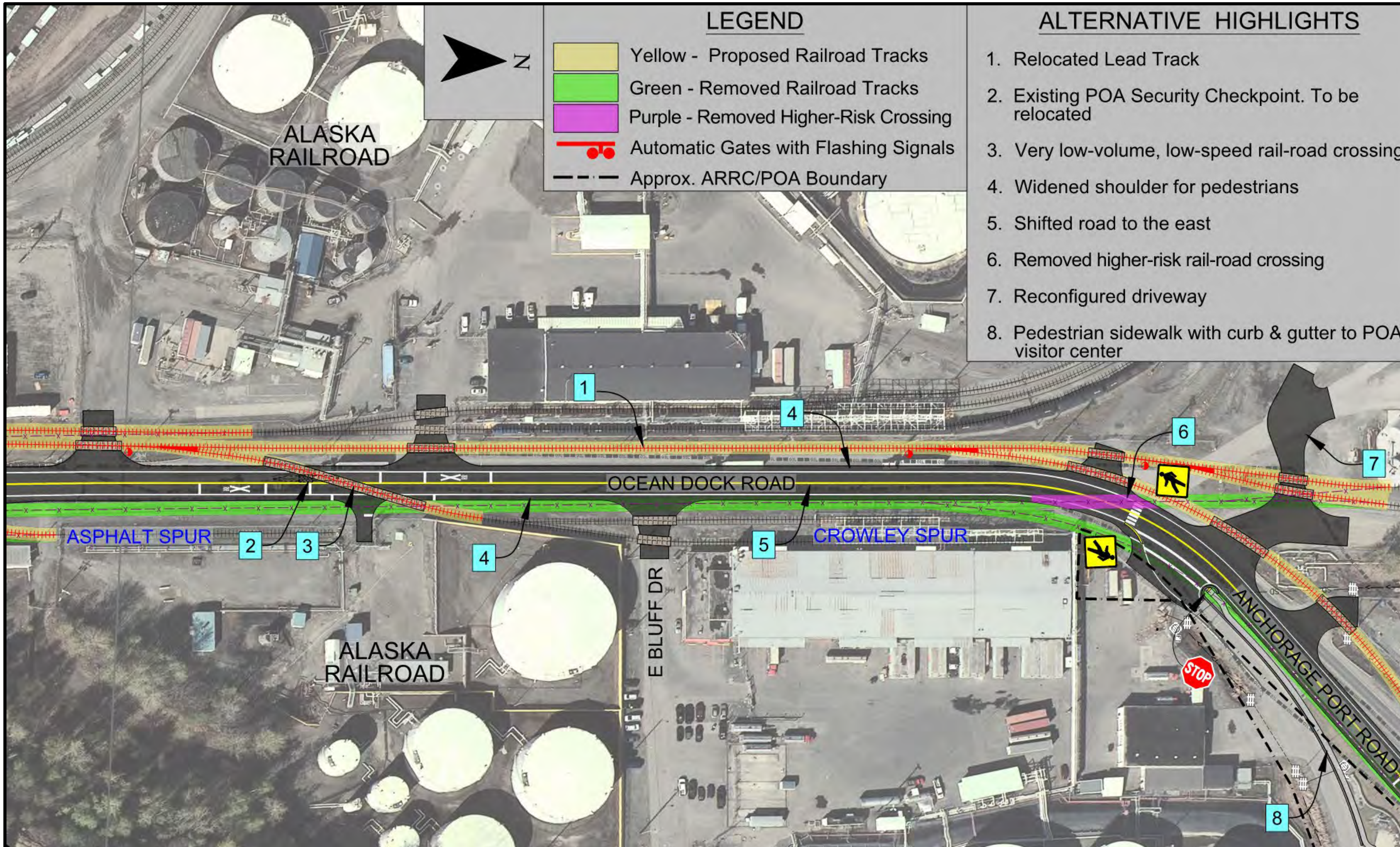

Figure 59: Build Alternative - Figure C

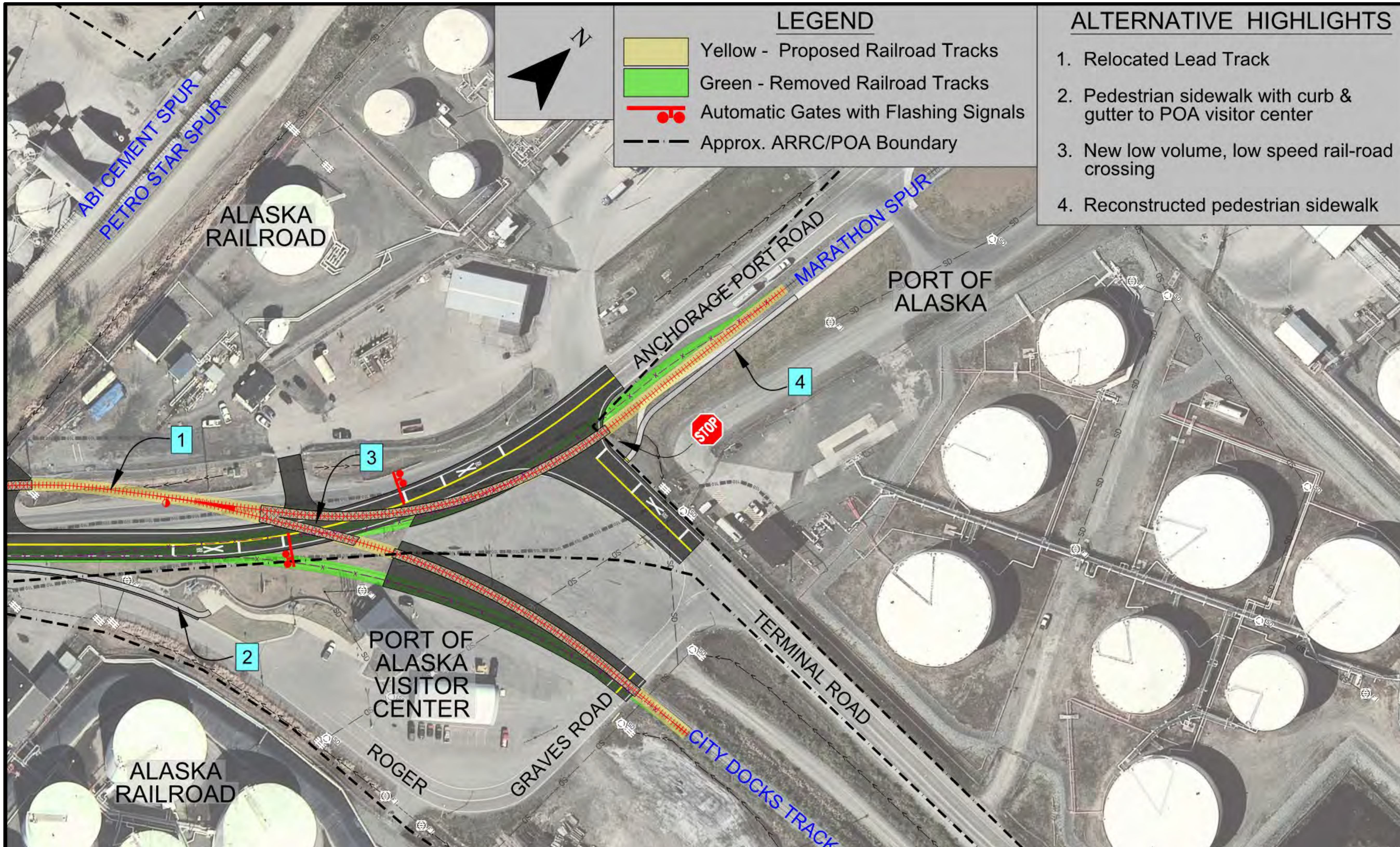

Figure 60: Build Alternative - Figure D

9.2.1 Measures of Effectiveness

9.2.1.1 Safety

The proposed build alternative improves safety of the study area.

All modes of traffic have appropriate and separate facilities. Most of the train traffic is separated from the vehicle traffic by relocating the train route to travel alongside Ocean Dock Road. Additionally, pedestrians and bicyclists have designated facilities separate from the road, with marked cross walks where needed, in order to safely traverse within the area.

The potential vehicle-train conflicts are reduced. The high-volume train route is relocated to the west side of Ocean Dock Road. Relocating the tracks so the heavy train volumes do not cross the heavy vehicle volumes reduces the potential number of times a truck and train will interact. Additionally, most crossings within the study have flashing signals with automatic gates, which is the highest at-grade crossing protection. Automatic gates reduce the risk of vehicle-train collisions due to driver error in detecting an approaching train.

Sight distance issues at Ocean Dock Road 5 (868539B) and Ocean Dock Road 6 (868543R) rail-road crossings are eliminated. Relocating the tracks to the west, eliminates the Ocean Dock 5 crossing. Additionally, Ocean Dock Road 6 (868543R) crossing is relocated, with the tracks reconfigured to cross the road farther north where there are currently no view restrictions.

Roadway sight distance and operating speed issues at Curve 1 and Curve 3 are addressed. Increasing the radius allows for vehicles to comfortably and safely travel at the posted speed limit.

Traffic control driver confusion at the Ocean Dock Road and Whitney Road intersection is corrected. Realigning the intersection of Ocean Dock Road-North C Street and Whitney Road to conform to the intended traffic flow makes it apparent to drivers which vehicle maneuver has the right of way. Additionally, the realignment removes the tight turns between Ocean Dock Road and Whitney Road. Trucks no longer have to occupy the entire road width to make the turns.

9.2.1.2 Intersection Capacity

Operations at the Ocean Dock Road at C Street ramps intersection is expected to be the same compared to No Build. While the horizontal curve is increased at the intersection, the intersection geometry is essentially the same as no build, producing the same operational results. The configuration does include a left-turn lane into the North Star driveway to prevent cars from backing up into the C Street intersection; however, delay due to left-turns with and without a left-turn lane was not calculated.

Table 20 presents the midday peak operations at the Ocean Dock Road at Whitney Road intersections under the build alternative. Since the proposed Whitney Road realignment results in a conventional intersection configuration, the intersection was analyzed using Highway Capacity Software 2010 software.

Table 20: 2045 Midday Peak LOS at Ocean Dock Road and Whitney Road Intersection – Build

Midday Peak	WBL	WBT	NBL	NBR	SBT	SBR
Movement Delay (seconds/vehicle)	10	0	10		0	
Movement LOS	A	Free	B		Free	
v/c Ratio	0.05	-	0.15		-	

Southbound Ocean Dock Road vehicles will remain operating with no delay and northbound North C Street vehicles will remain operating at LOS B conditions. Westbound Whitney Road vehicles desiring to head north on Ocean Dock Road are expected to experience little to no delay; however, some delay may occur if they arrive at the intersection when a vehicle is waiting to turn left to enter North C Street.

9.2.1.3 Truck Operations

The increased radius at the C Street ramps intersection allows trucks to maintain adequate speed to comfortably climb the C street ramps and would increase driver comfort maneuvering and seeing around the curve. The additional northbound left-turn lane to access the North Star driveway relieves delay caused by vehicles waiting in the through lane. At the Whitney Road intersection, the realignment allows the heavy truck movements (to and from Ocean Dock Road and Whitney Road) to operate freely without traffic controls. The realignment also removes the tight turn radius from Whitney Road to Ocean Dock Road.

9.2.1.4 Railroad Operations

The preferred alternative allows for all the existing train movements and meets railroad design criteria. Trains may experience some operational improvements due to the reduction in the number of crossings. For example, when the passenger trains are turning under the existing condition, the train uses the Ocean Dock 5 crossing twice. If long vehicle queues develop during the first crossing, the train may pause to allow the queues to disperse before making the second crossing to complete the turning maneuver. Under the proposed alternative, the train will not interact with the major traffic movement and will not need to pause before completing the turning maneuver.

The proposed alternative eliminates the need for ARRC flaggers. At the Ocean Dock Road 1 (868537M) crossing near Whitney Road, flaggers will no longer need to be present when oversize trucks are at the intersection due to removing the roadway tight turns. Additionally, vehicles will be less likely to strike railroad gate arm as a result of removing the tight turns; therefore, reducing the maintenance burden.

9.2.1.5 Pedestrian & Bicycle Operations

Figure 61 highlights the proposed pedestrian facilities. The facilities provide connectivity between Government Hill, the C Street Bridge, Ship Creek, and the POA Visitor Center. The proposed pedestrian facilities allow access to existing pedestrian facilities such as the Ship Creek Trail and the sidewalk along the C Street Bridge to downtown Anchorage. Enhanced pedestrian safety is provided by separating the non-motorized routes from the road by either a curb and gutter or widened roadway striping.

The build alternative adds marked crosswalks at multiple locations. The crossing locations were chosen to follow pedestrian desire paths, to shorten crossing distances, to encourage crossing at locations with adequate visibility, and to facilitate perpendicular crossing of the railroad tracks. A marked pedestrian crossing is provided on Ocean Dock Road north of the Whitney Road intersection. Crossings on the east side of the C Street ramps intersection and further east on the C Street Northbound On-Ramp (ramp from Ocean Dock Road to Government Hill) are also provided. The crossing location on the C Street Northbound On-Ramp allows trucks to stop at the apex of the roadway vertical curve, which will reduce impacts to momentum, fuel usage, and brake wear.

Two options are presented for pedestrian connectivity to the C Street Bridge and Government Hill. The first option builds a pathway within the median of the eastbound ramp to Government Hill and the eastbound ramp to C Street. This option meets ADA guidelines and provides a relatively direct route to Government Hill and the C Street Bridge; however, some pedestrians may experience discomfort traveling in the median between traffic. Under this option, pedestrians coming from Ocean Dock Road cross three ramps to get to Government Hill and one ramp to get to the C Street Bridge.

The second option, shown as the red dotted line in Figure 61, follows the eastbound ramp to Government Hill for a distance then continues up the embankment between the eastbound ramp to C Street and the westbound ramp to Ocean Dock Road. This option requires a switchback design to meet ADA-compliant grades, which results in a longer travel distance for pedestrians. The tight turns of the switchback may pose challenges for snow removal and bicycle operations. Additionally, the switchback option would substantially cut into the embankment near the bridge abutments. An analysis of the integrity of the abutments would be required before this option could proceed. Compared to the first option, this layout reduces the number of ramps pedestrians coming from Ocean Dock Road cross to get to Government Hill and eliminates conflicts between these pedestrians and trucks traveling uphill on the C Street ramps. (While the second option increases the number of crossings to get to the C Street Bridge, few pedestrians are expected to use this path to access the C Street Bridge since there are more direct routes to reach downtown.) Table 21 summarizes the two pedestrian facilities options at the C Street Ramps. Conceptual plan and profiles for the two options are attached to this report in Appendix C: Conceptual Plan and Profile for Pedestrian Options at the C Street Ramps.

Table 21: Pedestrian Facility Options at C Street Ramps Comparison

Comparing Measure	Median Pathway Option	Switchback Pathway Option
Pedestrian Crossings between Ocean Dock Road & Government Hill	3 • 2 @ 300 vpd & <10% trucks • 1 @ 1500 vpd & >25% trucks	2 • 2 @ 300 vpd & <10% trucks
Pedestrian Crossings between Ocean Dock Road & C Street Bridge	1 • 1 @ 300 vpd & <10% trucks	2 • 1 @ 300 vpd & <10% trucks • 1 @ 1500 vpd & >25% trucks
Pathway Length/Pedestrian Travel Distance	225 Feet	685 Feet
Cost	$	$$$
Other Considerations	• Pedestrian comfort walking between traffic.	• Snow removal challenges due to tight turns and space between pathway levels • Bicycle operation challenges due to tight turns • Significant embankment removed near bridge abutments

Table 22 presents the 2045 pedestrian crossing delays under the build alternative at the Ocean Dock Road intersections. Delays at the individual C Street ramps remain the same as no build since they experience the same traffic volumes. The new pedestrian crossing on the east leg of the C Street ramps intersection is anticipated to have 19 seconds of delay per pedestrian, assuming pedestrians cross in two stages; the median on the east leg would be widened to provide a pedestrian refuge for crossing, allowing pedestrians to cross in two stages and enhancing safety. It also presents the existing delay, for comparison.

At the Whitney Road intersection, pedestrians at the two marked crossings are expected to experience 10 seconds of delay or less per pedestrian. Delay is increased at the North C Street crossing because the crossing is no longer at a stop-controlled approach meaning pedestrians would need to wait for all approaching vehicles to either yield or pass by before crossing.

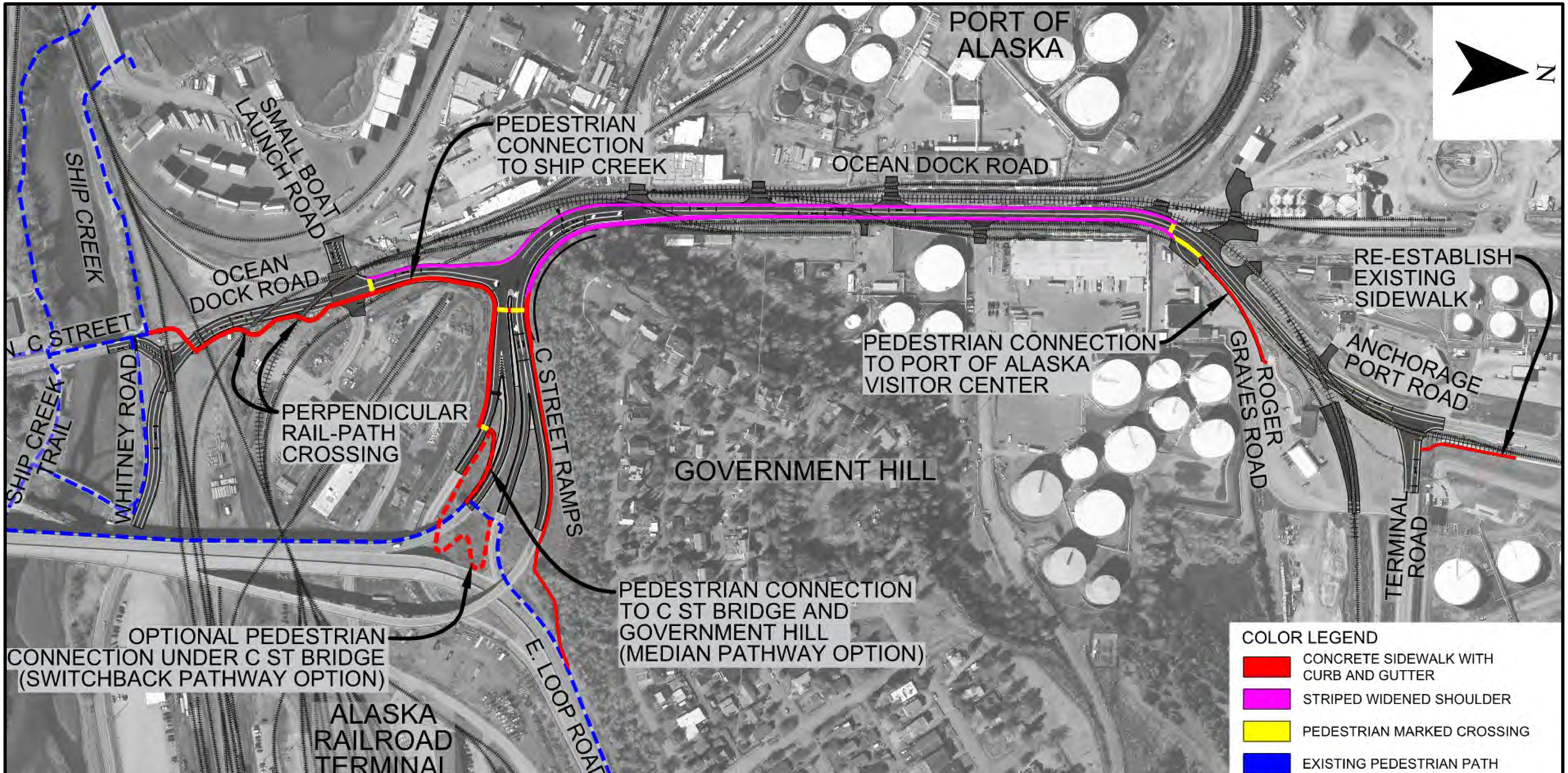

Figure 61: Proposed Pedestrian Facilities

Table 22: 2045 Pedestrian Crossing Delay, Midday Peak – Build Alternative

Road Segment	Crossing Width (feet)	Volume (vehicle/hour)	2045 Delay (seconds/ pedestrian)	Existing Delay (seconds/ pedestrian)
at C St Ramps Intersection				
C St Northbound Off-Ramp	25	300	6	4
C St Southbound Off-Ramp	25	80	1	1
C St Southbound On-Ramp	23	200	3	3
C St Northbound On-Ramp	23	70	1	1
Combined C St Ramps (East Leg)	33/27*	650	19	N/A
at Whitney Road Intersection				
North C St	30	195	5	N/A
Ocean Dock Rd	34	295	10	N/A

*Westbound/Eastbound
N/A: There is no existing combined C St Ramp crossing. Similarly, the build values for the Whitney Road intersection do not correspond to the existing intersection.

9.2.2 Hydrologic and Hydraulic Considerations

The build alternative includes repairs and upgrades to the drainage system. The existing storm drain system is cleaned and repairs are made to the drainage features including culverts, pipes, inlets, and manholes. It is recommended that all drainage features are modified, as necessary, to meet current design standards during the design life of this project.

The build alternative moves the manhole, which is currently in the middle of the C Street ramps intersection, to the southeast corner of the intersection. This places the manhole away from the roadway with high truck traffic, allowing easier maintenance access. Relocating the manhole requires redirecting the associated storm drain pipes from curb inlets.

To improve the drainage system, a 600-foot long subdrain or fin drain is recommended near the Government Hill retaining wall at the C Street ramps intersection. The recommended improvement lowers the potential for seasonal high groundwater table, which would lower the saturation levels of the roadway embankment and toe of the retaining wall. This also allows for proper drainage of water out of the project area when coupled with the drainage system cleaning and repairs.

At the intersection of Ocean Dock Road and Roger Graves Road, the ditches require grading to accommodate the new driveway and approach configurations. There may also be an opportunity to make phased improvements to the Bluff Drive storm drain system within Ocean Dock Road.

For most of the proposed roadway, curb & gutter and ditching are not recommended due to the grading requirements adjacent to the railroad tracks. In these areas subtle grading (2% maximum grade) and shallow field inlet structures will be required. Subdrains are also proposed at 3 to 6 feet deep to drain the roadway structural section.

Subdrains are proposed along Ocean Dock Road between Ship Creek and the C St ramp intersection. The proposed system would consist of a subdrain on each side of the roadway totaling 1200 feet of subdrain / storm drain, 10 inlet or clean-out structures, one Oil Grit Separator, and replacement of 370 feet of storm drain to the existing outfall. The groundwater elevation within this area should be investigated before installing the subdrain to confirm that the chlorinated solvent plume limits of Anchorage Terminal Reserve GW Area 6 do not extend to the project area.

Between the C Street ramps and Roger Graves Road, a subdrain system with shallow field inlet structures are also recommended between the railroad tracks and roadway on both sides of the road. The elevation of the subdrain proposed subdrain is above the water table where hydrocarbons have been detected in the past at approximately 9 feet below grade on West Hill Drive. The subdrain elevation will benefit from a shallow installation as there is an inlet / outlet offset within the first structure west of Ocean Dock Road and pipe or subdrain obverts that are more than 7 feet below grade will only operate under pressure flow. An alternative existing outfall was evaluated, through the Northstar Terminal that begins at the midpoint between the C Street ramp intersection and West Bluff Drive. The condition and full location of this existing storm drain are unknown and may require both reconstruction and the acquisition of property rights to perform maintenance. Therefore, it is recommended that the subdrain system be routed to the existing municipal outfall. Care will be required to avoid conflicts with existing natural gas, underground electrical power, and fuel lines. The proposed system would consist of 2,600 feet of subdrain, 12 inlet or clean-out structures, and would tie into the existing municipal outfall west of Roger Graves Road.

9.2.3 Environmental Considerations

As this project’s goal is to improve the transportation flow at the POA, adverse impacts to the human environment are expected to be minimal. Additional adverse impacts to the physical environment are not expected to be significant. No wetlands or water body permits are anticipated, and no fish or wildlife are likely to be threatened. The alternative would not involve any actions that would require a Type I noise analysis study.

The groundwater plume located under the railroad yard and approaching Whitney Road under the C Street bridge needs to be updated as the project evolves for any contaminated site and hazardous material impacts.

The proposed retaining wall north of the C Street ramps intersection is near two NRHP sites adjacent to the study area, Government Hill Federal Housing Historic District and Brown's Point Park Historic Site, that are cited in the AHRS as historically significant. Cutting into the district boundaries adversely affects the districts and would likely need a Section 4(f) consultation, if affected. Special construction methods, such as shoring or sheet piles, may be required to minimize the impact to the Government Hill Bluff and Brown's Point Park.

The potential for disproportionately high and adverse effects on Environmental Justice (E.O. 12898) populations needs to be examined as the alternative is developed. Social and economic impacts also need to be examined as the alternative develops.

Water quality of the surface runoff would improve due to the drainage improvements trapping more sediment before entering the drainage system.

Measures need to be taken to avoid the spread of invasive species present in the project area.

9.2.4 ROW Conflicts

The build alternative requires acquisition of ROW as shown in Figure 62. Parcel lines are approximate and were obtained from the MOA GIS online site. Lease and permit lines are approximate and were obtained from the ARRC GIS online site. The majority of Ocean Dock Road and the C Street ramps are located within a permit on land owned by ARRC. Additional ROW may require approval by both ARRC and MOA.

Reconstructing the roadway requires increasing the existing permit area. Most of the additional area is on ARRC-owned land without existing leases or other permits. A small amount requires takes on leases and permits. Additionally, some of the work is on land owned by POA.

Reconstruction of the rail facilities occupies additional land. Approximately half of the additional land required for the rail work is within ARRC-owned land without existing leases or permits, while the rest impacts leased and permitted land. Some of the rail work is also within POA-owned parcels.

Table 23 summarized the ROW impacts from the build alternative.

Table 23: Build Alternative ROW Impact Summary

Land Impact Type	Approximate Roadway Impact Area (Acre)	Approximate Railroad Impact Area (Acre)	Approximate Total Impact Area (Acre)	Notes
Additional ARRC Permit Area Needed	2.3	N/A	2.3	
Take Area on Leases	0.2	1.2	1.4	Reconstructing driveways is not included in lease takes
Take Area on Other Permits	0.3	0.3	0.6	
Take Area on Other ARRC Land	1.8	1.5	3.3	Not Permitted or Leased
Work Done on POA Land	0.3	0.5	0.8	
Total	4.9	3.5	8.4	

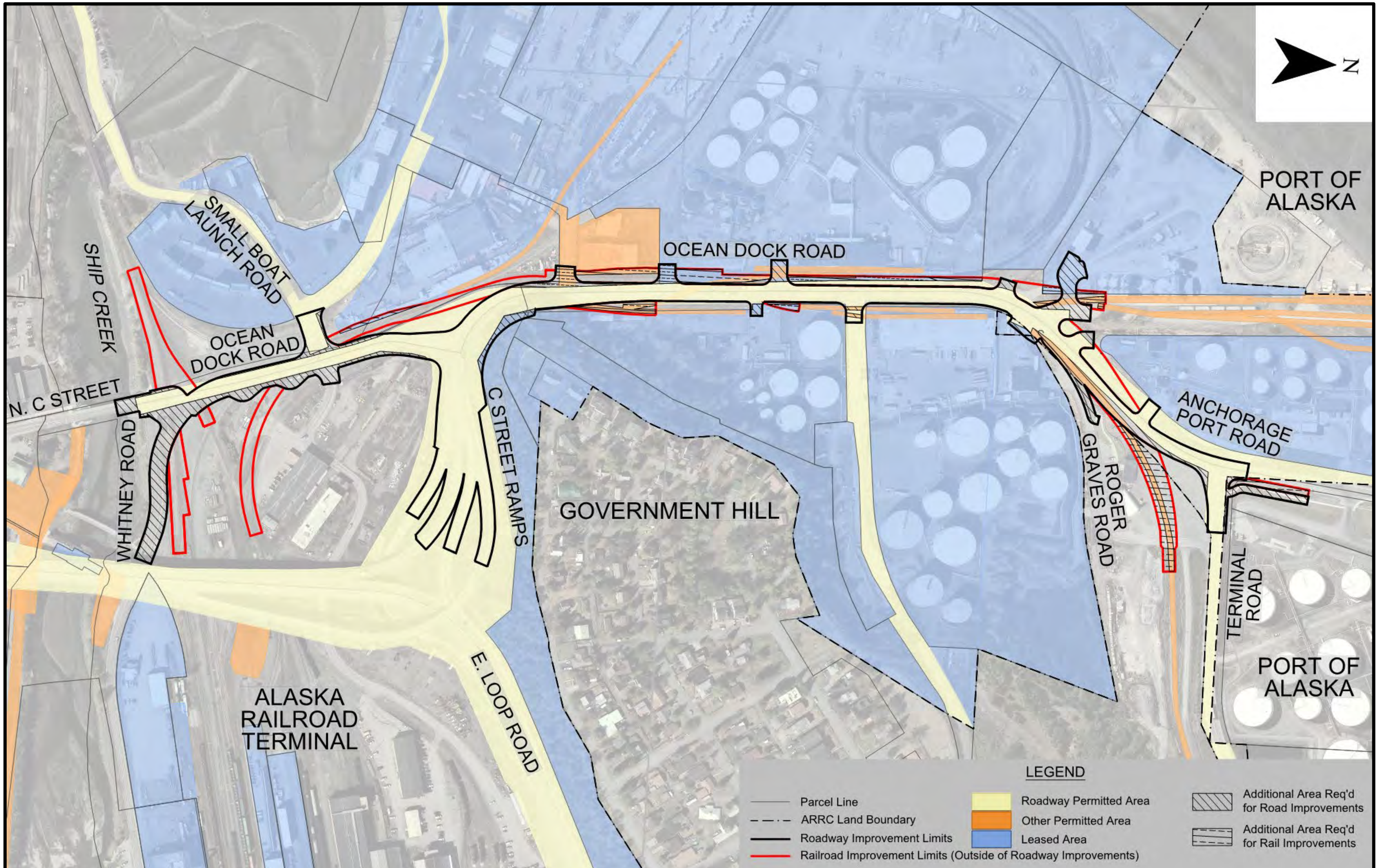

Figure 62: Build Alternative ROW Impacts

9.2.5 Utility Conflicts

A comprehensive account for all utilities within the study area, active or abandoned, is unattainable. Stakeholders have noted construction activities often encounter unknown utilities. For this study existing utilities were determined from roadway as-builts.

Known utilities within the study's corridor include underground gas, fuel, telephone, water, sanitary sewer, and overhead electric. Railroad is also considered a utility as a utility agreement with ARRC is required for work on their facilities. Water and sanitary sewer lines are typically buried ten feet below the ground and therefore, assumed to not be impacted except to adjust water valves and cleanouts to meet finish grade. All other utilities within the build alternative footprint are assumed to be removed and replaced.

9.2.6 Schedule Impacts

Schedule impacts due to ROW acquisitions should be typical of a roadway project. The majority of the impacted land is owned by ARRC; therefore, collaborating with only one party.

Many utilities are located within the footprint of the build alternative. Utility agreements and relocates may take longer than a typical roadway project. Requiring certain utilities, such as the fuel and gas lines, to be protected in place and not relocated could save time.

Due to sensitive factors within and near the build alternative footprint as noted in Sections 3.7 and 9.2.3, the environmental process may take longer than a typical roadway project. Additionally, public involvement should be robust and thorough.

Limitations on construction methods and sequencing is expected. Obstructing movement within the corridor is impractical, as Alaskans rely on movement of goods from the POA and in the Alaska Railroad Terminal. These limitations may result in extended construction time.

9.2.7 Construction Traffic Control Considerations

Construction of the proposed alternative will impact traffic in the area. It is vital to Alaskans to keep transportation of goods from the POA and through the Alaska Railroad Terminal uninterrupted. Construction should be limited as much as possible to non-barge days and should provide adequate detours. Use of Bluff Drive through Government Hill may be a consideration in cooperation with the community. Additionally, the construction should be phased to allow travel via C Street Ramps or Whitney Road at all times.

9.2.8 Cost Estimates

Table 24 summarizes the estimated costs associated with the build alternative.

Table 24: Build Alternative Cost Estimate

Work	Total Cost	Comments
Construction	$29,300,000	Including 15% construction contract administration
Design	$2,900,000	10% of construction costs
Right-of-Way (ROW)	$1,300,000	
Utilities	$6,100,000	Includes utility agreements and removal and relocation of all impacted utilities
Contingencies	$7,900,000	20% of Construction+Design+ROW+Utilities
Total Estimated Costs	**$47,500,000**	

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