

STATE OF ALASKA



DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES Northern REGION



PRELIMINARY ENGINEERING STUDY OLD RICHARDSON HIGHWAY INTERSECTION IMPROVEMENTS

PROJECT NO.: NFHWY00158 / 0620010

January 2019

For:

Alaska Department of
Transportation & Public Facilities
Northern Region
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NOTICE TO USERS

This report reflects the thinking and design decisions at the time of publication. Changes frequently occur during the evolution of the design process, so persons who may rely on information contained in this document should check with the Alaska Department of Transportation and Public Facilities for the most current design. Contact the Project Manager, Jeff Organek, P.E., at 907-451-2274 for this information.

TABLE OF CONTENTS

1	Introduction	1
1.1	Project Description	1
1.2	Report Scope.....	1
2	Purpose and need.....	3
2.1	Project Purpose	3
2.2	Project Need	3
2.2.1	Transportation Demand and Capacity	3
2.2.2	Safety	3
2.2.3	Federal, State, or Local Government Authority.....	3
2.2.4	Modal Interrelationships	3
2.2.5	Social Demands or Economic Developments	4
3	Existing Conditions	5
3.1	Existing Roadway Characteristics.....	5
3.1.1	Functional Classification and Typical Section.....	5
3.1.2	Typical Section	5
3.1.3	Right-of-Way	6
3.1.4	Drainage.....	6
3.1.5	Geotechnical Data.....	6
3.1.6	Pavement Conditions	6
3.1.7	Intersections and Signalization	7
3.1.8	Utilities.....	10
3.2	Multimodal Characteristics	11
3.2.1	Pedestrian and Bicycle Facilities	11
3.2.2	Transit	12
3.2.3	Freight.....	12
3.2.4	Railroad Crossings	12
3.3	Environmental Characteristics.....	12
3.3.1	Land Use Data	12
3.3.2	Community Services.....	13
3.3.3	Historic Sites/Districts	13
3.3.4	Natural and Biological Features.....	13
3.3.5	Potential Contamination Sites.....	13
4	Design Standards and Criteria.....	15
4.1	Design Standards	15
4.2	Design Criteria	15
4.2.1	Design Speed	15
4.2.2	Typical Section	15
4.2.3	Pedestrian & Bicycle Improvements	16
4.2.4	Transit	16

4.2.5	Freight.....	16
4.2.6	Railroad.....	16
4.2.7	Illumination.....	17
4.2.8	Design Exceptions or Waivers.....	17
5	Traffic.....	18
5.1	Existing Traffic Conditions	18
5.2	Crash Analysis.....	22
5.3	Multimodal Transportation Systems Considerations.....	22
5.4	Future Level of Service.....	23
5.4.1	Assumptions and Background Development.....	23
5.4.2	Design Year (No-Build) Level of Service	27
5.4.3	Design Year Multimodal Transportation	27
5.4.4	Future Year Improvements	27
6	Alternative Analysis	28
6.1	Alternatives.....	28
6.1.1	No-Build Alternative (Alternative 1).....	28
6.1.2	Pedestrian and Railroad Crossing Treatments (Alternative 2).....	28
6.1.3	Roundabout Installation (Alternative 3)	30
6.1.4	Signal Installation (Alternative 4).....	31
6.1.5	Reroute School Bus Traffic (Alternative 5).....	31
6.1.6	School Bus Demand Management (Alternative 6)	33
6.1.7	Add Bus-only Through Lane to Eastbound NPHS Boulevard (Alternative 7)	34
6.1.8	Improve Intersection Sight Distance (Alternative 8)	36
6.1.9	Santa Claus and 5 th Avenue Safety Enhancements (Alternative 9)	37
6.2	Utilities	37
6.3	Environmental Impacts	38
6.3.1	Natural Environment.....	38
6.3.2	Cultural Resources	38
6.3.3	Community Services.....	38
6.3.4	Construction.....	38
6.4	Bicycle and Pedestrian Accommodations	39
6.5	Transit Accommodations	39
6.6	Design Exceptions	39
6.7	Right of Way.....	39
6.8	Estimated Costs.....	40
6.9	Comparison Matrix	41
6.10	Recommended Alternative	42

LIST OF FIGURES

Figure 1: Location and Vicinity Map.....	2
Figure 2: Existing 5 th Avenue/Santa Claus Lane Intersection	8

Figure 3: Existing TMVs, AM Peak	19
Figure 4: Existing TMVs, Middle and High School Dismissal Peak	20
Figure 5: Existing TMVs, PM Peak.....	21
Figure 6: Forecasted 2040 TMVs, AM Peak	24
Figure 7: Forecasted 2040 TMVs, Middle and High School Dismissal Peak.....	25
Figure 8: Forecasted 2040 TMVs, PM Peak.....	26
Figure 9: Pedestrian Connection on E 5 th Avenue	29
Figure 10: Pedestrian Crossing at NPHS Boulevard/Old Richardson Highway/8 th Avenue	30
Figure 11: Roundabout Installation at NPHS Boulevard/Old Richardson Highway/8 th Avenue.....	31
Figure 12: Reroute School Bus Traffic Alternative	33
Figure 13: Add Bus-only Through Lane to Eastbound NPHS Boulevard	35
Figure 14: Improve Intersection Sight Distance	36
Figure 16: Sign Post Reflector	37
Figure 15: LED-Embedded Stop Sign	37

LIST OF TABLES

Table 1: Lighting Design Criteria	17
Table 2: Intersection Lighting Design Criteria	17
Table 3: 2016 AADT	18
Table 4: Summary of ROW Impact Costs	40
Table 5: Summary of Cost Estimates.....	40
Table 6: Comparison of Alternatives	41

LIST OF ACRONYMS

AADT	Annual Average Daily Traffic
AASHTO	American Association of State Highway and Transportation Officials
ACS	Alaska Communications
ADA	Americans with Disabilities Act
ADEC	Alaska Department of Environmental Conservation
ARRC	Alaska Railroad Corporation
ATM	Alaska Traffic Manual
BMP	Best Management Practice
CAR	critical accident rate
cd	candela
DOT&PF	Alaska Department of Transportation and Public Facilities
DT	Diagnostic Team
fc	foot-candle
FNSB	Fairbanks North Star Borough
FNSBSD	Fairbanks North Star Borough School District
FHWA	Federal Highway Administration
FMATS	Fairbanks Metropolitan Area Transportation System
GCI	General Communications Incorporated
GDBF	Guide for the Development of Bicycle Facilities
GVEA	Golden Valley Electric Association
HMCP	Hazardous Material Control Plan
HPCM	Alaska Highway Preconstruction Manual
HPS	High Pressure Sodium
IES	Illuminating Engineering Society
LOS	Level of Service
MACS	Metropolitan Area Commuter System
MEV	million entering vehicles
MPH	Miles Per Hour
MTP	2040 Metropolitan Transportation Plan
MUTCD	Manual on Uniform Traffic Control Devices
NEPA	National Environmental Protection Act
NMTP	Nonmotorized Transportation Plan
NRHP	National Register of Historic Places
PDOPF	Guide for the Planning, Design and Operation of Pedestrian Facilities
PGDHS	A Policy on Geometric Design of Highways and Streets
RPRL	Recommended Practice for Roadway Lighting
ROW	Right-of-Way
SF	square foot
SWPPP	Storm Water Pollution Prevention Plan

TIP	Transportation Improvement Program
TMV	turning movement volume
TSAR	Old Richardson Highway Intersection Improvements Traffic and Safety Analysis Report
TWSC	two-way stop control

1 INTRODUCTION

1.1 Project Description

The Alaska Department of Transportation and Public Facilities (DOT&PF), in cooperation with the Federal Highway Administration (FHWA), is considering options to improve the intersections of 5th Avenue/Santa Claus Lane, 5th Avenue/Old Richardson Highway, and Old Richardson Highway/8th Avenue/NPHS Boulevard in North Pole, Alaska. The purpose of this report is to document the engineering assessment of the project and recommend a course of action.

The project is located in Sections 9 and 16, Township 2S, Range 2E, Fairbanks meridian. See Figure 1 for location and vicinity map.

1.2 Report Scope

The purpose of this reconnaissance engineering study is to document any system deficiencies or potential project needs at the project location, consider actions that can be taken to address those needs, and identify impacts of those actions. No-build and feasible build alternatives, if any, will be presented for further analysis through the National Environmental Protection Act (NEPA) process and detailed engineering analyses.

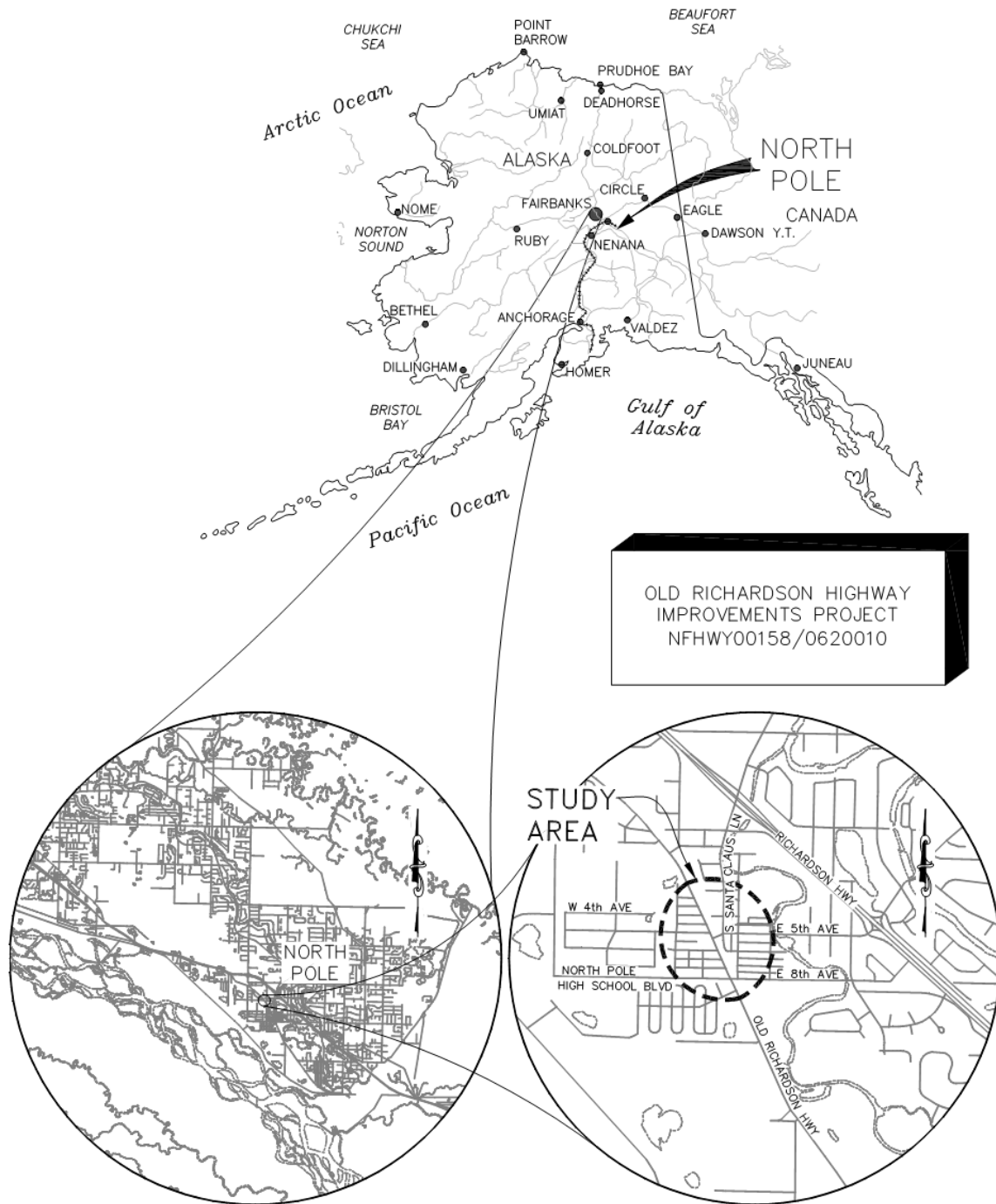


Figure 1: Location and Vicinity Map

2 PURPOSE AND NEED

2.1 Project Purpose

The purpose of the project is to improve the traffic operations, pedestrian facilities, and safety of the 5th Avenue/Santa Claus Lane, 5th Avenue/Old Richardson Highway, and Old Richardson Highway/8th Avenue/NPHS Boulevard intersections in North Pole, Alaska.

2.2 Project Need

2.2.1 Transportation Demand and Capacity

The Traffic and Safety Analysis Report (TSAR) reported excessive congestion and delay of school bus traffic at the eastbound leg of Old Richardson Highway/8th Avenue/NPHS Boulevard intersection during the high school and middle school release time. This is largely due to the railroad crossing very near to the intersection, at which buses are required to stop and look for oncoming trains before continuing. Future traffic conditions are likely to exacerbate this delay.

2.2.2 Safety

The safety analysis conducted as part of the Existing Conditions Report found the intersection of 5th Avenue /Old Richardson Highway and Old Richardson Highway/8th Avenue/NPHS Boulevard to have crash rates above the statewide average, and the latter intersection having a crash rate higher than the critical accident rate (CAR). This indicates these intersections are candidates for safety improvements. Crash patterns have been predominately angle, left-turn, and rear-end type crashes.

2.2.3 Federal, State, or Local Government Authority

This project is identified in the Fairbanks Metropolitan Area Transportation System (FMATS) 2017-2020 Transportation Improvement Program (TIP) as Need 30100, and is described as

“Analyze, design, and construct intersection and safety improvements with emphasis on safety for all users, road function, and quality of life. The intersections to be considered are Santa Claus Lane and E 5th Avenue and NPHS Boulevard at Old Richardson Highway and 8th Avenue however, the analysis and solution may be more farreaching. The railroad crossing will also be brought to current standards under this project.”

The project includes federal funding under the Community Transportation Program.

The project is not included in the FMATS 2040 Metropolitan Transportation Plan (MTP).

2.2.4 Modal Interrelationships

Various modes of traffic are present within the project area. The Alaska Railroad Corporation (ARRC) Eielson Branch passes through the project area, parallel to and east of the Old Richardson Highway. Freight transportation travel through the intersection to the refinery south of the project limits. Pedestrians and bicyclists traverse the intersection to gain access to school and/or public facilities.

In addition, the Non-Motorized Transportation Plan (NMTP) identified the 5th Avenue/Old Richardson Highway as having “challenging crossing issues”. The TSAR indicated pedestrians currently experience minor delays in crossing the Old Richardson Highway at 5th Avenue and NPHS Boulevard/8th Avenue,

but in the future would experience excessive delays, which may tempt them to risk crossing the highway at less than safely accepted gaps in traffic occur.

2.2.5 Social Demands or Economic Developments

Vacant land in the project area continues to be developed with housing. The Brookside Park development is planned south of the project. This is approximately 218 acres of multi-family, light industrial, and general commercial development.

3 EXISTING CONDITIONS

3.1 Existing Roadway Characteristics

3.1.1 Functional Classification and Typical Section

Old Richardson Highway (CDS 188200) is classified as a major collector owned and maintained by DOT&PF. Old Richardson Highway runs north/south through North Pole. Access to the east side is limited by the parallel railroad tracks. Old Richardson Highway has one lane in each direction with paved shoulders. At the NPHS Boulevard intersection there are left turn lanes and a channelized southbound right turn lane.

NPHS Boulevard (CDS 188859) is classified as a major collector between North Pole High School and Old Richardson Highway. It is owned and maintained by the City of North Pole. West of North Pole High School it is a local road. NPHS Boulevard has one lane in each direction, a paved shoulder on the north side, and a concrete sidewalk on the southside. The approach to Old Richardson Highway also features a dedicated left turn lane.

Santa Claus Lane (CDS 188285) north of 5th Avenue is classified as a minor arterial and a local road south of 5th Avenue. It is owned and maintained by DOT&PF.

8th Avenue (CDS 188858) and East 5th Avenue (CDS 188855) are classified as minor collectors and are owned and maintained by the City of North Pole.

Other project area roads are local roads and are owned and maintained by the City of North Pole.

3.1.2 Typical Section

All of the roads in the project area are paved with hot mix asphalt.

Old Richardson Highway varies in width from 32 feet (comprised of 2 12-foot lanes and 4-foot shoulders) to 56 feet (comprised of 4 12-foot lanes and 4-foot shoulders). Old Richardson Highway has roadside ditches on both sides.

NPHS Boulevard has a roadway width of 28 feet, striped as two lanes. There is curb and gutter with an attached sidewalk on the south side, although these features are slated to be removed under project NFHWY00282 and replaced with a separated path on the north side of NPHS Boulevard.

Santa Claus Lane has a roadway width of approximately 50 feet (comprised of 3 12-foot lanes and 7-foot shoulders), with curb and gutter. Attached sidewalks exist on both sides of the road and are approximately 6 feet wide.

8th Avenue has a roadway width of 28 feet (comprised of 2 12-foot lanes and 2-foot shoulders). There is no curb and gutter, and there is a separated asphalt multi-use path on the south side of the road.

5th Avenue has a roadway width of 30 feet. Pavement markings are intermittent, so there is no consistent lane or shoulder width. Curb and gutter exists east of Santa Claus Lane.

Patriot Drive has a roadway width of 36 feet (comprised of 2 12-foot lanes and 6-foot shoulders). There is no curb and gutter.

3.1.3 Right-of-Way

At the 5th Avenue/Old Richardson Highway intersection, most of the project area is within an ARRC permit, E5. Permit E5 extends from approximately the edge of pavement on the west side of Old Richardson Highway to 50 feet east of the centerline of the road. This permit also includes a 100-foot width across 5th Avenue at the intersection to the eastern edge of the ARRC right-of-way (ROW). To the west side of Old Richardson Highway, the DOT&PF ROW extends from the edge of Permit E5 to 100 feet west of the road centerline.

Santa Claus Lane has a 100-foot wide ROW. 5th Avenue, outside of the ARRC ROW, has a 60-foot ROW.

At the Old Richardson Highway/8th Avenue/NPHS Boulevard intersection, most of the project area is within ARRC permits - E5 to the north and E8 to the south. Permits E5 and E8 extend from approximately the edge of pavement on the west side of Old Richardson Highway to 40 feet east of the centerline of the road. These permits also include an 83-foot width across 8th Avenue at the intersection to the eastern edge of the ARRC ROW. To the west side of Old Richardson Highway, the DOT&PF ROW extends from the edge of the permits to 100 feet west of the road centerline until it intersects with the NPHS Boulevard ROW, at which point it becomes 152 feet west of the road centerline.

NPHS Boulevard and 8th Avenue have a ROW width of 83 feet.

Patriot Drive has a 60-foot wide ROW.

3.1.4 Drainage

Drainage is conveyed to roadside ditches to Beaver Creek, east of Old Richardson Highway. No piped storm drain systems exist in the project area.

3.1.5 Geotechnical Data

The Old Richardson Highway roughly parallels the Tanana River. The project study area is situated on Tanana River floodplain sediments which generally consists of two to ten feet of wind-deposited silt and silty organic soils over thick, well-sorted gravel and sand deposits. Permafrost in this region is characterized as discontinuous. The water table is less than ten feet below natural ground at most locations in the study area.

The *Geotechnical Report - Old Richardson Highway Improvements* (Project No. IM-0001(127)/61077, January 2005) indicates the existing road structure has a relatively thin pavement structure. The total embankment is as little as 1.6 ft. Asphalt thicknesses varied between 2.5 to 5.5 inches, except at the railroad crossing where asphalt thickness increase to 10.5 to 13.4 inches.

3.1.6 Pavement Conditions

Old Richardson Highway was reconstructed in 2006 under the Old Richardson Highway Improvements projects. This project replaced the existing pavement structure with 2 inches of asphalt over 4 inches of asphalt treated base course over 12 inches of selected material, type A over 18 inches of selected material, type B. That project also rebuilt, for a short distance from the intersection, the 5th Avenue, 8th Avenue, and NPHS Boulevard pavement structure with the same materials.

3.1.7 Intersections and Signalization

Figure 2 presents the existing configuration of the project area intersections. Detailed descriptions are provided in the subsequent sections.



Figure 2: Existing 5th Avenue/Santa Claus Lane Intersection

3.1.7.1 5th Avenue/Santa Claus Lane Intersection

The 5th Avenue/Santa Claus Lane intersection is a four-leg, two-way, stop controlled (TWSC) approach, with the Santa Claus Lane approaches being the stopped traffic. Active railroad tracks are about 150 feet west of the intersection. North, east, and west of the intersection has continuous lighting. The intersection contains overhead utilities above the east and westbound approaches.

5th Avenue is generally a westbound-eastbound road. At the intersection, each approach contains one shared left-turn, right-turn, and through lane.

Santa Claus Lane is generally a northbound-southbound road. At the intersection, the northbound approach has one shared left-turn, right-turn, and through lane. The southbound approach has two lanes;

3.1.7.2 5th Avenue/Old Richardson Highway Intersection

The 5th Avenue/Old Richardson Highway intersection is about 250 feet west of the 5th Avenue/Santa Claus Lane intersection. It is a three-leg, TWSC approach, with the 5th Avenue leg being the stopped approach. Active railroad tracks are about 50 feet east of the intersection. South and east of the intersection is continuous lighting. There is one overhead utility above the southbound approach.

At this intersection, 5th Avenue is composed of one westbound approach with a single shared left-turn, right-turn, and through lane.

Old Richardson Highway is generally a northbound-southbound route. At the intersection, the northbound and southbound approaches each contain one shared turn and through lane.

3.1.7.3 Old Richardson Highway/8th Avenue/NPHS Boulevard Intersection

The Old Richardson Highway/8th Avenue/NPHS Boulevard intersection is approximately 950 feet south of the 5th Avenue/Old Richardson Highway intersection. It is a four-leg, TWSC approach, with the 8th Avenue and NPHS Boulevard approaches being the stopped traffic. Active railroad tracks are about 50 feet east of the intersection. The intersection and roads have continuous lighting. The intersection contains overhead utilities above the east and westbound approaches.

At the intersection, the Old Richardson Highway northbound approach contains two lanes; a shared right-turn and through lane and a dedicated left-turn lane. The southbound approach has three lanes; a dedicated left-turn lane, a through lane, and a channelized right-turn lane.

The westbound approach at the intersection is 8th Avenue, which is a paved two-way road with one lane in each direction. This approach contains one shared left-turn, right-turn, and through lane.

The eastbound approach at the intersection is NPHS Boulevard. At the approach, there are two lanes; a shared right-turn and through lane and a dedicated left-turn lane.

3.1.8 Utilities

There are numerous utilities within the project limits. These utilities include:

- Interior Gas: Gas
- Golden Valley Electric Association (GVEA): Electric power
- Alaska Communications (ACS): Telephone and fiber optics
- General Communications Inc. (GCI): Fiber optics and cable TV
- City of North Pole: Water and sewer

3.1.8.1 Electric/Power

GVEA power lines run along the west side of Old Richardson Highway with overhead crossings at 5th Avenue and Patriot Drive.

In the east-west direction, GVEA has power lines along W 4th Avenue, W 5th Avenue, North Pole High School Boulevard, Patriot Drive, E 4th Avenue, between E 6th Avenue and E 7th Avenue, and between E 7th Avenue and E 8th Avenue. In the north-south direction, power lines run along Snowman Lane, Manley Street and Bald Eagle Court/Stone Way.

There are several overhead power lines crossings: on Snowman Lane at E 4th Avenue and south of E 7th Avenue; on E 8th Avenue at Snowman Lane; on Patriot Drive at Bald Eagle Court/Stone Way; and on North Pole High School Boulevard west of Owen Street.

3.1.8.2 Communications

ACS has underground cables running throughout the project area, consisting both of fiber optic and coaxial cables. Fiber optics run along the east side of Old Richardson Highway, while both coaxial and fiber optics cables run along the west side. There are underground cable crossings on Old Richardson Highway south of W 4th Avenue. Cables run east-west along W 4th Avenue, E 4th Avenue, W 5th Avenue, Patriot Drive, and along the alleys south of 5th Avenue. North-south cables run along Santa Claus Lane, Snowman Lane, Manley Street, Bald Eagle Court, and two south of Patriot Drive east of Nordic Street.

GCI has overhead communications cables along both sides of Old Richardson Highway throughout the project area. Overhead cables also cross Old Richardson Highway at 5th Avenue, as well as along. The lines consist of coaxial cables and fiber optic cables on power poles.

East of Old Richardson Highway, GCI overhead cables run along Santa Claus Lane, Snowman Lane, E 4th Avenue and along the alleys between E 5th Avenue and E 6th Avenue, between E 6th Avenue and E 7th Avenue and between E 7th Avenue and E 8th Avenue.

On the west side of Old Richardson Highway, GCI overhead cables run on W 4th Avenue, W 5th Avenue, between W 5th Avenue and W 6th Avenue, between W 6th Avenue and W 7th Avenue, between W 7th Avenue and North Pole High School Boulevard, and on Patriot Drive. Overhead cables running north-south on Manley Street between W 6th Avenue and North Pole High School Boulevard, and multiple cables running south of Patriot Drive.

3.1.8.3 Water and Sewer

The City of North Pole owns and maintains water and sewer mains within the project area. All of the area lots are served by the water and sewer utility. Water and sewer pipes generally have a minimum burial depth of 5 feet, which limit the potential for conflict.

Water mains existing on nearly every street in the project area, ranging in size from 6 to 12 inches in diameter. Considering their burial depth, the pipes are unlikely to conflict with any potential project improvements, except potentially new pole foundations. The primary risk for conflicts with the water system are surface appurtenances, such as hydrants, valve boxes, and well houses.

In the project area, there are 2 fire hydrants located near the west side of Old Richardson Highway at W 6th Avenue, and at Patriot Drive (all on the north side). There are 2 fire hydrants on W 5th Avenue between Holiday Road and Old Richardson Highway. One fire hydrant is located on the northeast quadrant at the intersection of Santa Claus Lane and E 5th Avenue. Another fire hydrant is located on the east side of South Santa Claus Lane at the curve to E 6th Avenue. On North Pole High School Boulevard, there are 3 fire hydrants on the south side of the road: at Holiday Road, midblock between Homestead Drive and North Pole High School Road, and midblock between Holiday Road and Old Richardson Highway. There are also 2 fire hydrants on the north side of 8th Avenue: one midblock between Snowman Lane and Davis Street, and one midblock east of Davis Street.

Two pump houses are located in the project area. A pump house and fire well station is located on the south side of E 8th Avenue just east of Snowman Lane. The other pumphouse station is located on the south side of Patriot Drive at Bald Eagle Court/Stone Way.

The sewer system segments in the project area that might conflict with this project include a 10-inch force main along NPHS Boulevard between North Pole High School and Holiday Road, including a crossing on the west side of the North Pole High School parcel; a 10-inch gravity main along Patriot Drive; and a 14-inch crossing of Old Richardson Highway at Sixth Avenue. In addition, there is a lift station at the west end of Patriot Drive, on the north side of the road

3.1.8.4 Natural Gas

A buried 8-inch gas line runs along the west side of Old Richardson Highway throughout the project area. An 8-inch line crosses Old Richardson Highway just south of the Old Richardson Highway/8th Avenue/NPHS Boulevard intersection.

A 4-inch gas line crosses 8th Avenue east of the Old Richardson Highway/8th Avenue/NPHS Boulevard intersection.

A 2-inch gas line runs along the north side of 8th Avenue, east from Snowman Lane. Additionally, a 2-inch gas line also runs along the north side of Patriot Drive with crossings at each side street.

Gas lines are typically buried a minimum of 36 inches deep; however, depths vary and may be considerably deeper when directionally bored.

3.2 Multimodal Characteristics

3.2.1 Pedestrian and Bicycle Facilities

The Old Richardson Highway Improvement project constructed an 8-foot wide bicycle pathway along the eastside of Old Richardson Highway from Homestead Drive to Santa Claus Lane. At East 5th Avenue, there is a break in the pathway. Pathway users must then use the striped roadway shoulder across the railroad tracks to the east in order to regain access to the pathway. The pathway begins again on the other side of the railroad tracks at East 5th Avenue and continues to Laurance Road.

To the north and east of 5th Avenue/Santa Claus Lane, concrete sidewalks with non-ADA-compliant curb ramps are present.

At Snowman Lane and 8th Avenue, there is a pathway connection to a concrete sidewalk on the southside of NPHS Boulevard that leads to the North Pole High School and library. East of this intersection, a separated asphalt pathway follows 8th Avenue past the North Pole Middle School.

With the exception of Old Richardson Highway/8th Avenue/NPHS Boulevard intersection, none of the non-motorized pathways have ADA-compliant crossings with roadways or railroads.

Currently, pedestrians are only accommodated on Old Richardson Highway between Homestead Drive and 5th Avenue; 5th Avenue east of the intersection with Santa Claus Lane, on NPHS Boulevard, and for a short distance on 8th Avenue east of the intersection with Old Richardson Highway. E 5th Avenue includes a separated concrete sidewalk on the north side. An abutting concrete sidewalk is located on the south side.

3.2.2 Transit

Metropolitan Area Commuter System (MACS) provides bus transit service to the Fairbanks area, including North Pole. One MACS route, the Green Line, traverse the project area, with stops just north of the 5th Avenue/Santa Claus Lane intersection, south of the 5th Avenue/Old Richardson Highway intersection, and at the Old Richardson Highway/8th Avenue/NPHS Boulevard intersection. The Green line operates with two-hour headways throughout the day and connects North Pole with Fairbanks. At the 5th Avenue/Santa Claus Lane intersection, the Green Line completes a southbound right-turn and continues to the 5th Avenue-Old Richardson Highway intersection. There the bus makes a westbound left-turn and continues to the Old Richardson Highway/8th Avenue/NPHS Boulevard intersection. At this intersection, the bus uses the channelized right-turn lane and continues west to the library. After which it heads westbound on NPHS Boulevard through the Old Richardson Highway/8th Avenue/NPHS Boulevard intersection and leaves the project area.

3.2.3 Freight

Historically, the project area has experienced substantial truck traffic. There is a large heavy industrial area just south of the project area, which includes the former Flint Hills Refinery, Petro Star Refinery, and GVEA plant. Activity at that site will influence truck traffic through the project area.

3.2.4 Railroad Crossings

There are two Alaska Railroad Crossings in the project area, at 5th Avenue (DOT Crossing Inventory Number 868461J) and 8th Avenue (DOT Crossing Inventory Number 868463X). According to ARRC, these crossings experience train traffic 4 or 5 times a week. The 5th Avenue crossing was last improved in 2015. The 8th Avenue crossing was last improved in 2011.

3.3 Environmental Characteristics

3.3.1 Land Use Data

3.3.1.1 Existing Land Use

Adjacent parcels around 5th Avenue/Santa Claus Lane intersection are zoned for General Commercial. The northwest quadrant contains a developed park/playground area. The northeast and southeast quadrants are developed with one-story commercial businesses. The southwest quadrant is undeveloped. The ARRC ROW runs along the intersection ROW on the west side.

Adjacent parcels around 5th Avenue/Old Richardson Highway intersection are zoned for Central Business District and General Commercial. All parcels surrounding this intersection are currently undeveloped. The ARRC ROW abuts the intersection ROW along the east side.

Adjacent parcels around Old Richardson Highway/8th Avenue/NPHS Boulevard intersection are zoned for GC, Multiple-Family Residential/Mobile Home Subdivision (MF/MHS), and Rural and Agricultural – 5 (RA-5). The northwest quadrant is developed with a city water service station. The southwest quadrant contains residential condominiums. The ARRC ROW occupies the land in the northeast and southeast quadrants. Beyond the ARRC ROW in the southeast quadrant, lies the North Pole Middle School.

3.3.1.2 Future Land Use

The North Pole Land Use Plan recommends supporting relocating the ARRC ROW and tracks to run along the west side of the community.

The land to the southeast of the Old Richardson Highway/8th Avenue/NPHS Boulevard intersection has been proposed to be rezoned. The proposal includes increasing residential density. Although the area of proposed rezoning is not immediately adjacent to the intersection, effects of the rezoning may impact operation of this intersection.

3.3.2 Community Services

Public facilities near the project include North Pole High School, North Pole Middle School, North Pole Elementary, and North Pole Branch Library. These facilities are all along NPHS Boulevard and 8th Avenue, but outside the area of the potential build alternative. No adverse impacts are anticipated as a result of the build alternatives.

3.3.3 Historic Sites/Districts

One historic site is located in North Pole – Chugwater Site; however, it is outside of the project limits and will not be affected by this project. No structures listed on the National Register of Historic Places (NRHP) are in the project area.

3.3.4 Natural and Biological Features

According to the national wetlands inventory, no wetlands exist in the project vicinity.

No threatened or endangered species habitat ranges exist in the project area, according to the US Fish and Wildlife website.

3.3.5 Potential Contamination Sites

There are active contaminated sites near the project area as follows:

- Hazard ID 25469 – City of North Pole Fire Well Pump House 8th Avenue: 2009 diesel spill at the pump house resulted in contamination of the soil. Site is located on the southeast quadrant of 8th Avenue and Snowman Lane.
- Hazard ID 3810 – Williams North Pole Refinery RR: Gasoline spill from a broken rail car armature resulted in contaminated soil. Site is reported at 1100 H&H Lane, though shown at 5th Avenue and Old Richardson Highway on the contaminated sites GIS.

- Hazard ID 3815 – Williams Refinery Crude Unit 2: Underground pipe failure released ethylene glycol to soils. Site is reported at Fire Hall Building, 1100 H&H Lane, though shown at the northeast quadrant of 5th Avenue and Santa Claus Lane.
- Sulfolane Plume – A sulfolane plume has been identified in the area ground water, originating from the Flint Hills Refinery. In the project area, the plume is west of Owens Street. The Alaska Department of Environmental Conservation has developed a management plan for construction projects that require dewatering within the sulfolane plume.

If these sites are expected to be impacted, a phase II environmental site assessment will be required to determine the extent of the contamination likely to be encountered during construction activities.

4 DESIGN STANDARDS AND CRITERIA

4.1 Design Standards

The Alaska Highway Preconstruction Manual (HPCM), published in June 2018 is the primary design guide for this project. Further design guidance is contained in the following publications:

- ADA Standards for Accessible Design, United States Department of Justice, September 15, 2010.
- A Policy on Geometric Design of Highways and Streets (PGDHS or “Green Book”), American Association of State Highway and Transportation Officials (AASHTO), 2011.
- The Alaska Traffic Manual (ATM), consisting of the Manual on Uniform Traffic Control Devices (MUTCD), 2009 as amended, U.S. Department of Transportation, FHWA, and the Alaska Traffic Manual Supplement, 2012, State of Alaska, Department of Transportation and Public Facilities.
- Guide for the Development of Bicycle Facilities (GDBF), AASHTO, 2012.
- Guide for the Planning, Design and Operation of Pedestrian Facilities (PDOPF), AASHTO, 2004
- Recommended Practice for Roadway Lighting (RP-8-14) (RPRL), Illuminating Engineering Society (IES), 2014.
- Roadside Design Guide, 4th Edition, AASHTO, 2011.
- Technical Standards for Roadway, Trail, and Utility Facilities in the ARRC Right-of-Way, Alaska Railroad Corporation (ARRC), 2014

4.2 Design Criteria

4.2.1 Design Speed

Old Richardson Highway has a posted speed limit of 35 mph. A vehicle speed study performed by KE in 2017 indicated the 85th percentile speed is 32 mph in the southbound direction and 34 mph in the northbound direction.

The posted speed limit on Santa Claus Lane is 25 mph. The 2017 vehicle speed study indicated the 85th percentile speed is 28 mph in the southbound direction and 27 mph in the northbound direction.

NPHS Boulevard and 8th Avenue have a posted speed limit of 20 mph. A vehicle speed study was not performed on these roads.

4.2.2 Typical Section

The PGDHS states that lane widths should be 12 feet, although they may be as narrow as 10 feet. Median islands should be at least 4 feet wide, or 6 feet wide if they are intended to provide pedestrian refuge. Shoulders should be provided with a minimum width of 4-feet. The PGDHS recommends 2 feet of shy distance to curb faces, but no less than 1.5 feet.

Structural sections will be finalized when geotechnical explorations are complete. For design purposes, the existing structural section should be used, as described in Section 3.1.6.

4.2.3 Pedestrian & Bicycle Improvements

DOT&PF is developing a project to construct new pedestrian facilities on the west side of Snowman Lane, between E 5th Avenue and E 8th Avenue, and on the north side of North Pole High School Boulevard, between Old Richardson Highway and the North Pole Library. The new sidewalk on North Pole High School Boulevard will replace the existing sidewalk on the south side of North Pole High School Boulevard, which suffers from drainage problems and is constrained by right of way.

The Fairbanks North Star Borough (FNSB) North Pole Land Use Plan (adopted 2010) and the FMATS NMTP (2012) recommends for a pedestrian/bicycle connection along 5th Avenue across the railroad tracks between the existing pathways.

Sidewalks can be as narrow as four feet wide (per PDOPF) but would need to be widened to five feet every couple hundred feet to comply with ADA standards. PDOPF identifies desirable sidewalk widths as six to eight feet, plus two feet where the sidewalk is adjacent to the curb. Facilities intended for use by pedestrians and bicycles should be at least 8 feet wide.

Newly constructed pedestrian road and railroad crossing will be required to conform to ADA guidelines, including appropriate installation of detectable warning tiles.

4.2.4 Transit

The design of the intersection improvements will need to accommodate transit vehicles and patrons.

4.2.5 Freight

The geometric design of any improvements will need to accommodate freight traffic, including tractors with double trailers.

4.2.6 Railroad

The railroad crossings at 5th Avenue and 8th Avenue are within the project limits. A diagnostic team (DT) analysis per the Alaska Policy on Railroad/Highway Crossings (1988) was conducted to evaluate the existing conditions and proposed design alternatives as to the safety and traffic operations the crossings.

The DT met to review the traffic control devices, sight distance, and vehicle storage at each railroad/highway crossing. The existing traffic control configuration of both crossings meet the requirements of the policy and Alaska Traffic Manual. At the 5th Avenue crossing, sight distance requirements are not met to the north of the crossing for eastbound and westbound approaching traffic due to vegetation and utility appurtenances, including a railroad signal controller unit. At the 8th Avenue crossing, desirable sight distance requirements are not met to the north for westbound approaching traffic due to vegetation encroachment. Vehicle storage for westbound traffic after the crossing is insufficient at the 5th Avenue crossing. Vehicle storage on the east side of the 8th Avenue crossing is inadequate as well. At least 64 feet of storage space beyond the nearest rail and next stop bar is recommended to avoid conflicts between vehicles stopped past the crossing and passing trains or crossing traffic.

The DT also evaluated the design alternatives and provided recommendations to improve sight distance and/or interfacing of the alternatives with the crossings. Railroad/highway recommendations for each design alternative is further discussed in Section 6.1.

4.2.7 Illumination

DOT&PF relies on IES guidance for street lighting design, and the current IES street light reference is the RPRL. Recommended lighting criteria are based on the roadway classifications and area land uses. Given that this location is on the edge of the central business district, where pedestrian volumes are not quite as high, the “medium” area type has been used to determine the target street segment lighting values.

Table 1: Lighting Design Criteria

Road	Functional Class	Veiling Luminance	Luminance	Luminance Uniformity	
		Max/avg (max)	cd/m ² (min)	Avg/min (max)	Max/min (max)
Old Richardson Highway	Collector	0.4:1	0.6	3.5:1	6:1
NPHS Boulevard	Collector	0.4:1	0.6	3.5:1	6:1
Santa Claus Lane	Major	0.3:1	0.9	3:1	5:1
5 th Avenue	Collector	0.4:1	0.6	3.5:1	6:1
8 th Avenue	Collector	0.4:1	0.6	3.5:1	6:1
fc: foot-candle, cd: candela					

Intersection lighting is considered differently.

Table 2: Intersection Lighting Design Criteria

Intersection	Illumination	Uniformity
	fc (avg)	Avg/min (max)
5 th Avenue/Santa Claus Lane	2.2	3:1
5 th Avenue/Old Richardson Highway	2.6	3:1
Old Richardson Highway/8 th Avenue/NPHS Boulevard	2.2	3:1

The lighting design should comply with the October 29, 2015 Highway Lighting Norther Region Design Directive 15-02 from DOT&PF. Among other things, the directive recommends the use of LED fixtures where lighting criteria can be met, and the use of luminaires capable of accepting adaptive control modules in the photocell receptacle.

4.2.8 Design Exceptions or Waivers

No design exceptions or waivers are anticipated.

5 TRAFFIC

Traffic data and conditions are summarized below and discussed in more detail in the TSAR.

5.1 Existing Traffic Conditions

Average Annual Daily Traffic (AADT) for 2016 is listed in Table 3.

Table 3: 2016 AADT

Segment Name	Extents	2016
Old Richardson Highway	5 th Avenue to Richardson Highway	1,997
Old Richardson Highway	Patriot Drive to 5 th Avenue	3,289
Old Richardson Highway	Laurance Road to Patriot Drive	1,136
5 th Avenue	Road Begin to Old Richardson Highway	1,232
North of North Pole High School Boulevard	Old Richardson Highway to North Pole High School Road	1,032
Santa Claus Lane	Second Avenue to 5 th Avenue	3,824
8 th Avenue	Saint Nicholas Drive to Old Richardson Highway	745

Figure 3 through Figure 5 depict existing TMVs for the AM, middle and high school dismissal, and PM peak hours.

DOT&PF's 2015 vehicle classification summary reports that heavy vehicle traffic on Old Richardson Highway varies from 9% of total traffic north of Laurance Road to 17% near the Richardson Highway intersection north of North Pole. Data collected for this project in November 2017 at the intersection of North Pole High School Boulevard/8th Avenue and Old Richardson Highway indicate heavy vehicles make up approximately 8% of total traffic on Old Richardson Highway. Approximately one third of the heavy vehicles were identified as buses.

A capacity analysis was conducted using the reported traffic volumes projected 2018 and the existing lane and traffic control configurations at the intersection. AASHTO recommends maintaining a level of service (LOS) of at least C at urban arterial intersections and at least LOS D at urban collector and local intersections. The analysis revealed that the majority of movements at the studied intersections operate at a LOS B or better during AM and PM peak hour periods, with only the AM peak hour eastbound left-turn movement at operating at LOS C. However, field observations, conducted at the Old Richardson Highway/8th Avenue/NPHS Boulevard intersection during the high school and middle school release period, reported excessive school bus queuing and delay. School buses are required to stop at the railroad crossing just east of the intersection, which causes queues on NPHS Boulevard and blocks side street traffic from enter the road. The bus delay from the railroad stopping requirement also delays other traffic on the eastbound leg of the intersection.



*Old Richardson Highway Intersection Improvements
Project NFHWY00158 / 0620010*

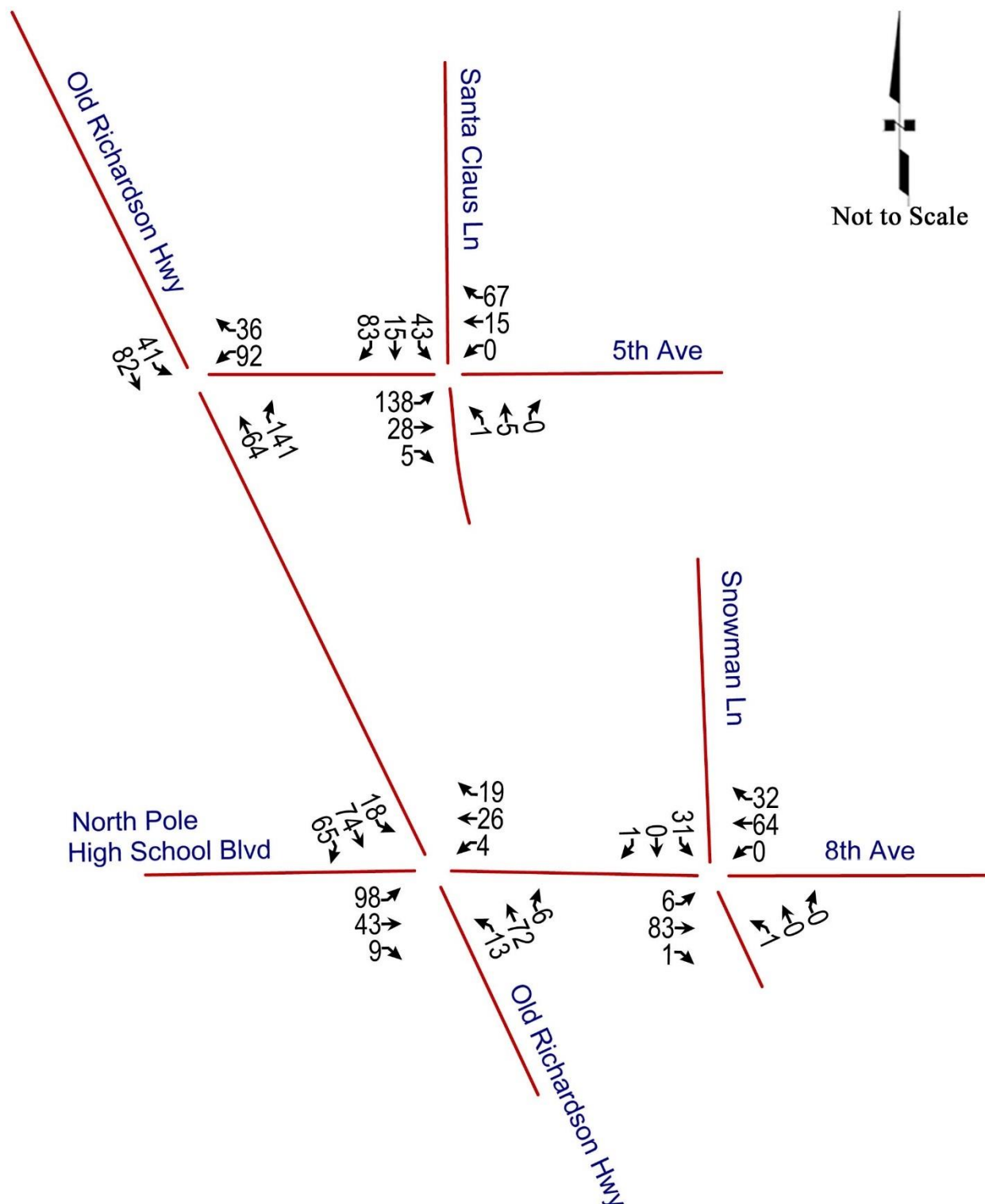


Figure 4: Existing TMVs, Middle and High School Dismissal Peak

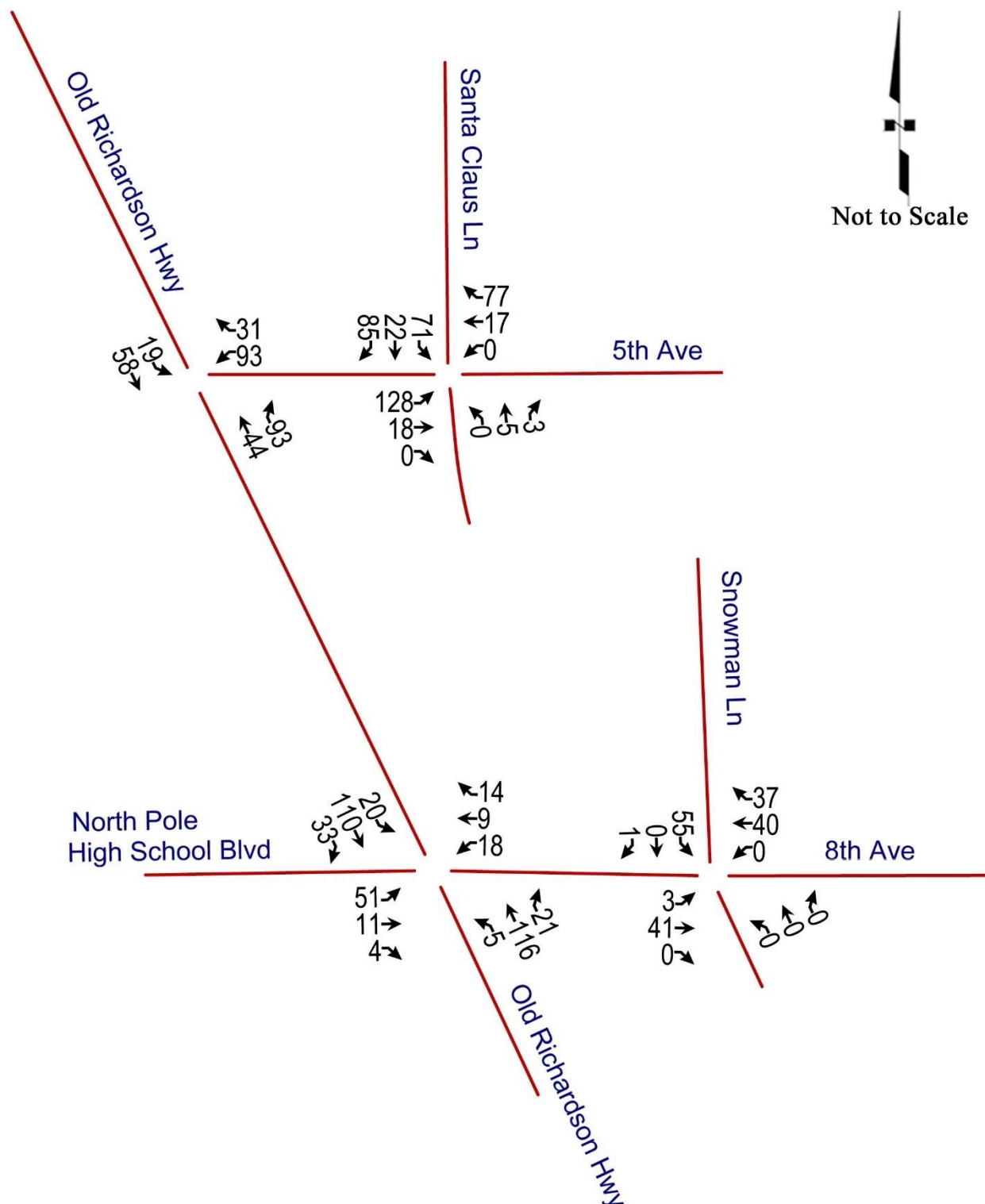


Figure 5: Existing TMVs, PM Peak

5.2 Crash Analysis

DOT&PF provided crash data for the 10-year period spanning 2005 to 2014; however, only partial data is available for 2005 to 2012. Crash rates were calculated based on the full crash data for 2013 and 2014. The following tables summarize the crash rates at each intersection:

Intersection	Total Crashes	Entering AADT	Crash Rate (Crashes / MEV)			Above Average?	Above CAR?
			Calculated	Statewide Average	CAR @ 95.00% Confidence		
5th Avenue/Santa Claus Lane	0	2,923	0.00	0.52	1.58	No	No
5th Avenue/Old Richardson Highway	3	3,430	1.20	0.55	1.53	Yes	No
Old Richardson Highway/ 8th Avenue/NPHS Boulevard	5	4,043	1.69	0.55	1.44	Yes	Yes

* MEV = Million Entering Vehicles

The crash rate for 5th Avenue/Old Richardson Highway and Old Richardson Highway/8th Avenue/NPHS Boulevard intersections exceed the statewide average for similar facilities. Old Richardson Highway/8th Avenue/NPHS Boulevard intersection has a crash rate that also exceeds CAR at a 95% confidence. This indicates that there is strong evidence that crashes are caused by underlying contributing factors instead of just random occurrences.

Crash patterns were analyzed using all the crash data obtained for 2005 through 2014. Several crash patterns at 5th Avenue/Old Richardson Highway and at Old Richardson Highway/8th Avenue/NPHS Boulevard that could be partially addressed with engineering measures were identified, including:

- Angle crashes
- Left-turn crashes

The left turn crashes and angle crashes may be mitigated by providing positive offsets on the opposing left turns on the Old Richardson Highway. Under the current intersection configuration, left turning traffic waiting to turn impacts sight distance for opposing left turning traffic, making it difficult for left turning motorists to view and judge gaps in oncoming traffic. Providing positive offset of the left turn lanes would ensure that adequate sight distance is provided even when opposing left turners are queued up. The crash reduction factor for this mitigation method is 38 percent for left turn crashes, or 1-2 fewer crashes over the study period.

5.3 Multimodal Transportation Systems Considerations

Pedestrian and bicycle counts were taken within the project area in October through December 2017. Pedestrian delay crossing the Old Richardson Highway was analyzed and resulted in less than 30 seconds at the two studied intersections on the highway. This suggests that there is a low to moderate likelihood that pedestrians would take risks in crossing the highway with less than adequate gaps in traffic.

5.4 Future Level of Service

5.4.1 Assumptions and Background Development

The analysis year for the future conditions is 2040, which is approximately 20 years after any construction might occur. The forecasted daily traffic volumes and peak hour turning movement volumes were developed using the 2040 FMATS travel demand model. The 2040 model was adjusted to develop a design-level travel demand model for the project area.

Turning movement volume (TMV) projections are shown in Figure 6 through Figure 8.

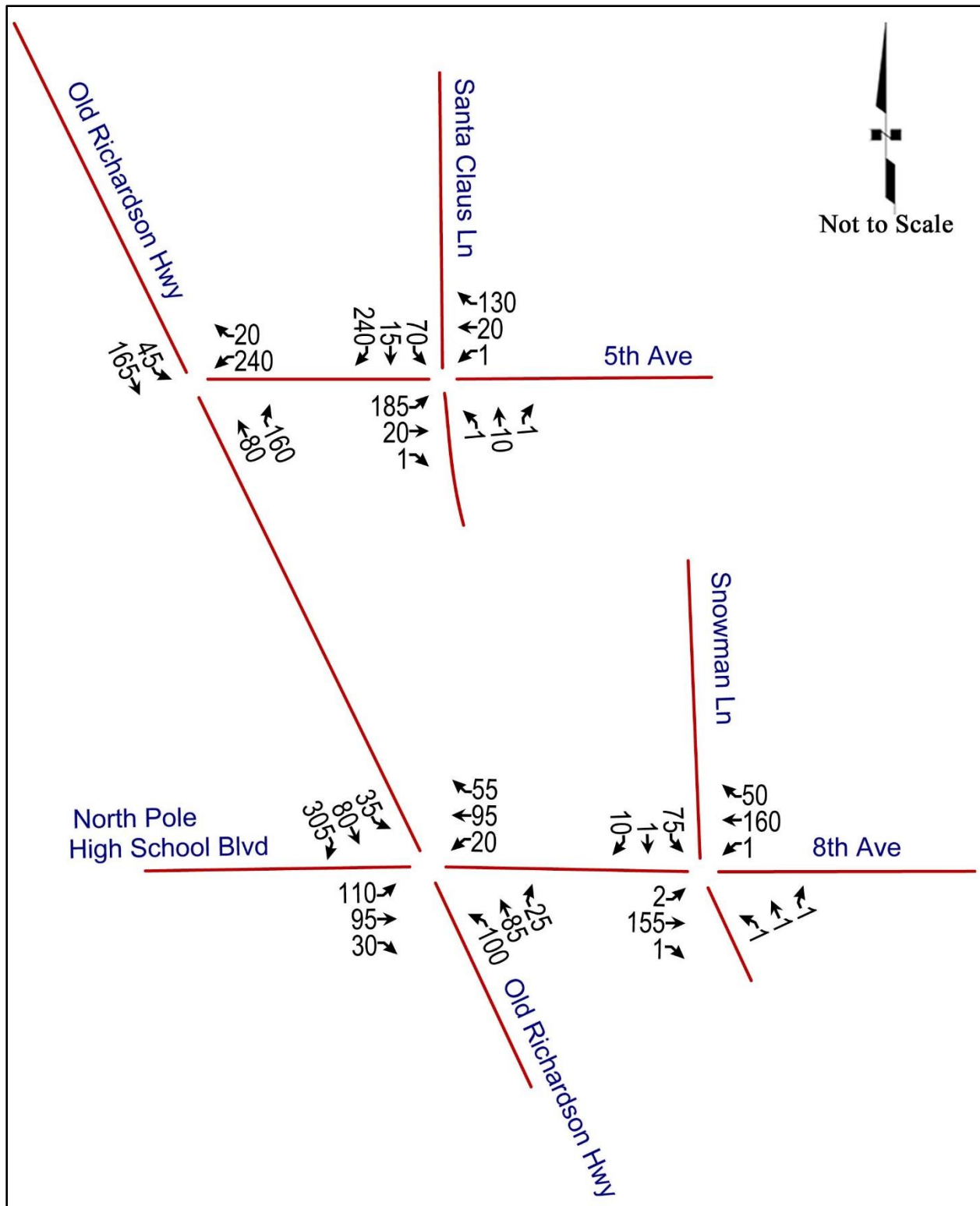


Figure 6: Forecasted 2040 TMVs, AM Peak

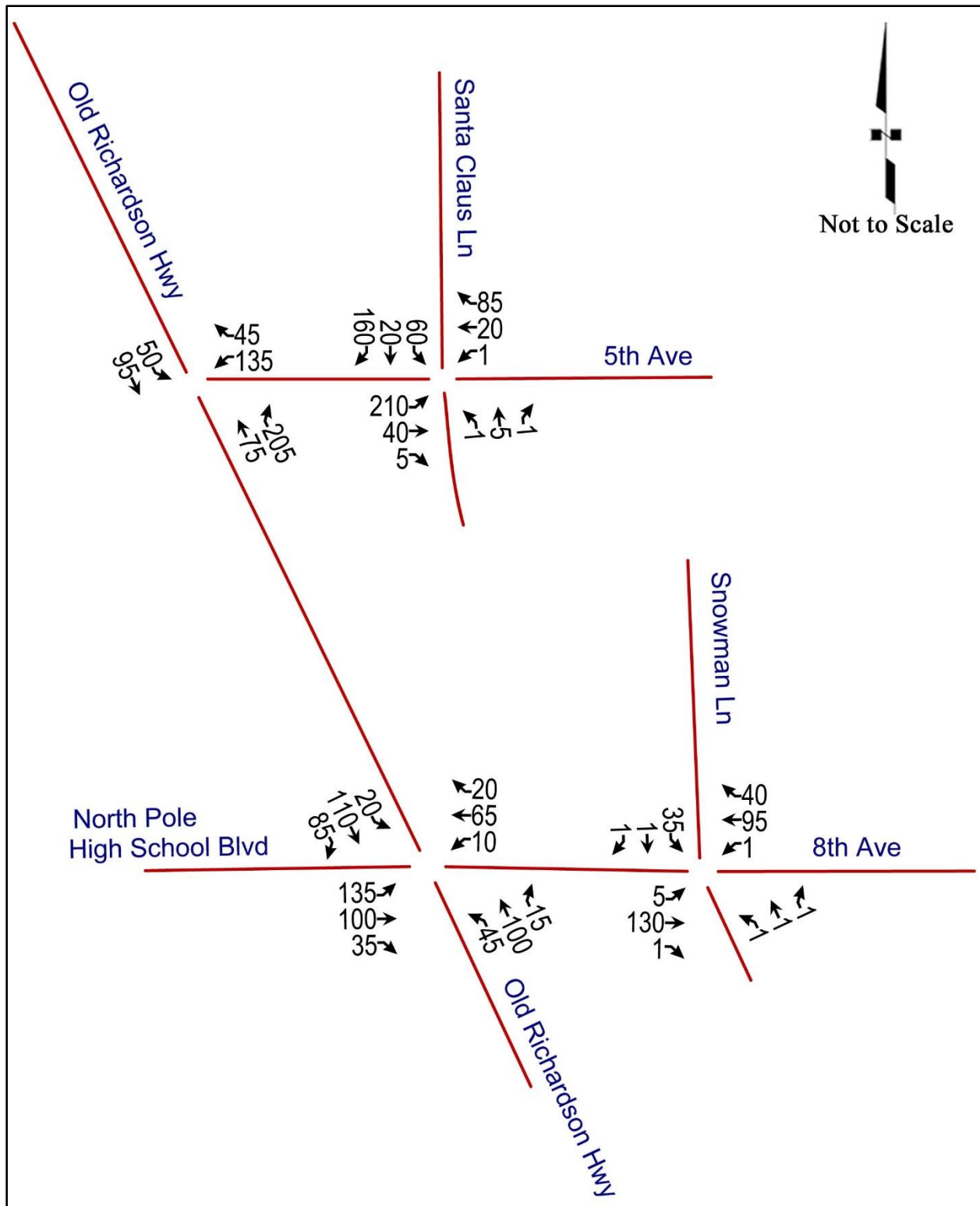


Figure 7: Forecasted 2040 TMVs, Middle and High School Dismissal Peak

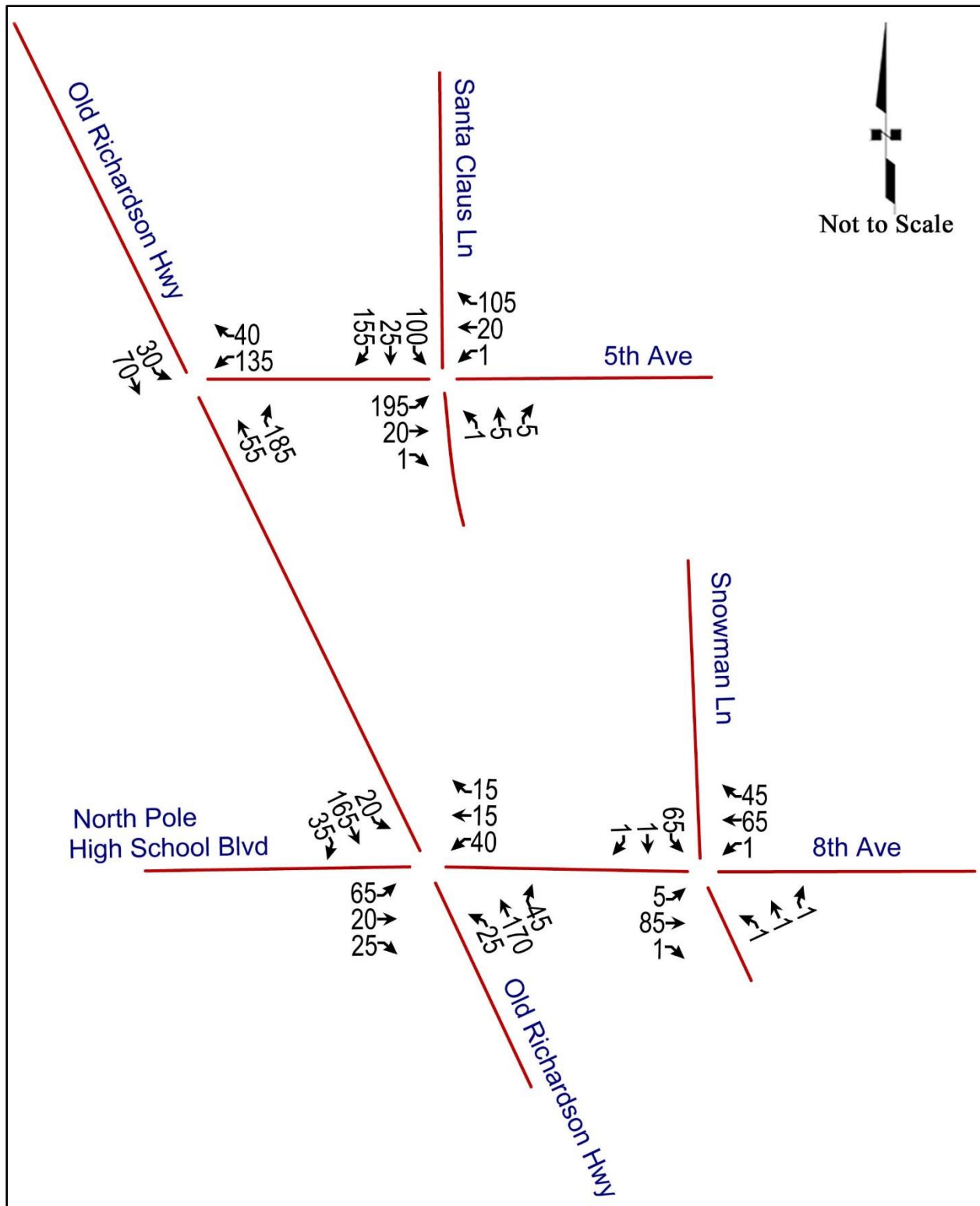


Figure 8: Forecasted 2040 TMVs, PM Peak

5.4.2 Design Year (No-Build) Level of Service

The forecasted 2040 volumes were used to model the future performances for 3 intersections included in the project. Most of the movements at the intersections are expected to operate at a LOS C or better. At the Old Richardson Highway/8th Avenue/NPHS Boulevard, the AM peak hour eastbound left turn movement degrades to LOS F. In addition, the queue length at this intersection and peak hour for the westbound movements exceeds the available storage and blocks operations at the adjacent intersection.

5.4.3 Design Year Multimodal Transportation

Freight and transit will experience the same LOS as other vehicles. Buses currently do not complete movements associated with the less than acceptable queue and delay; and therefore are expected to experience a LOS C or better in the future.

Pedestrian delay for future no build condition was analyzed. Pedestrians wishing to cross Old Richardson Highway at NPHS Boulevard/8th Avenue during the school dismissal and PM peak hours are projected to experience delays greater than 30 seconds. Furthermore, pedestrians crossing Old Richardson Highway at 5th Avenue will also have a delay greater than 30 seconds in the PM peak hours. The longer delays suggest pedestrians are highly likely to attempt crossing the highway with shorter vehicle gaps than may be safe.

5.4.4 Future Year Improvements

The TSAR identified operational and safety issues to be addressed with this project:

5th Avenue/Old Richardson Highway

- Pedestrian crossing delay

Old Richardson Highway/8th Avenue/NPHS Boulevard

- High crash rate
- School Bus congestion and delay associated with the interaction between buses and the railroad at-grade crossing
- Eastbound left turn delay during the AM peak hour
- Pedestrian crossing delay

6 ALTERNATIVE ANALYSIS

6.1 Alternatives

The TSAR examined improvements for the intersections where operational analyses indicated deficiencies. The alternatives that were explored are described below, including the no-build alternative.

None of the alternatives presented would fix all of the identified operational and safety issues identified. However, many of them could be combined with others to address multiple issues.

6.1.1 No-Build Alternative (Alternative 1)

Issues Improved by this Alternative: None

The no-build alternative would maintain the existing intersection configurations. This alternative would do nothing to improve the traffic flow, which is projected to fall below AASHTO recommendations for certain movements by the design year. The no-build alternative would also not improve the above-average crash rate observed at the Old Richardson Highway/8th Avenue/NPHS Boulevard intersection. This alternative would not mitigate sight distance or vehicle storage issues at the railroad/highway crossings.

6.1.2 Pedestrian and Railroad Crossing Treatments (Alternative 2)

Issues Improved by this Alternative: Pedestrian Delay

This alternative address pedestrian connectivity issues identified during the project scoping and analysis process, and railroad crossing deficiencies identified by the DT.

Local residents expressed concern about the gap in the path network between Santa Claus Lane and Old Richardson Highway at E 5th Avenue. To address their concerns, this alternative includes constructing a new pathway on the north side of East 5th Avenue between Santa Claus Lane and Old Richardson Highway. However, pedestrian delay at 5th Avenue/ Old Richardson Highway does not warrant any crossing treatments treatment at the highway. When constructing pedestrian facilities, utility appurtenances that obstruct railroad crossing sight distance should be relocated outside of the sight triangles.

Pathways adjacent to railroad/highway crossings are required to have the same traffic control as the highway; however, attached pedestrian facilities are allowed to use the roadway traffic control. The DT recommends constructing an attached sidewalk to minimize the amount of traffic control devices in the area.

In addition, per the DT recommendations, improvements at the 5th Avenue intersection should include relocating the westbound stop bar at the intersection closer to Old Richardson Highway. Vehicles stopped at the existing intersection stop bar may not clear the active train area and risk collision with passing trains.

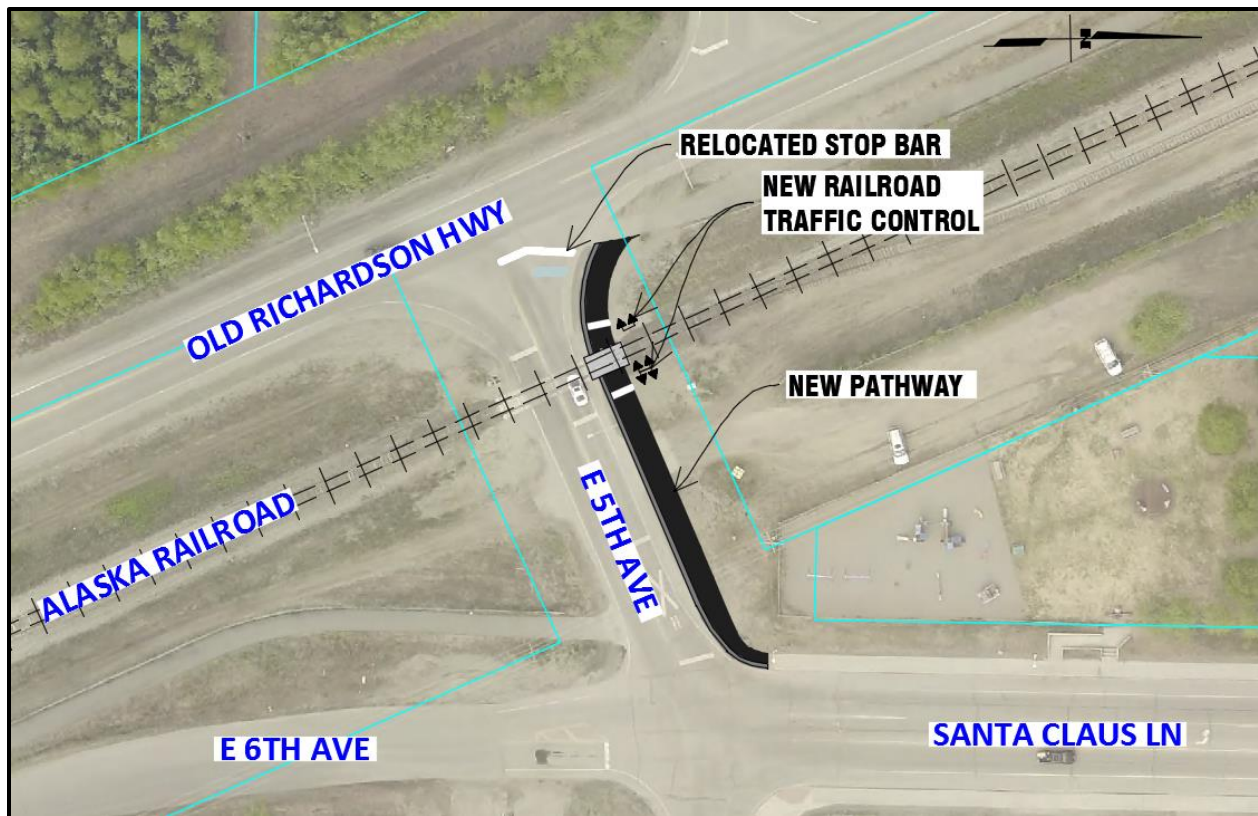


Figure 9: Pedestrian Connection on E 5th Avenue

At Old Richardson Highway/8th Avenue/NPHS Boulevard, Alaska Traffic Manual guidance suggests installing a marked cross walk across Old Richardson Highway. This improvement would reduce pedestrian crossing times in the 2040 PM peak hour. The resulting delays are still higher than desirable for pedestrian crossings but warrants for further treatments were not met.

The DT recommends constructing pedestrian facilities on the north side of 8th Avenue to connect with the future new sidewalk to be installed on the north side of NPHS Boulevard. Constructing a new connection along the north side of 8th Avenue, as shown in Figure 10, will provide a direct connection to the pathway along Snowman Lane. It will also facilitate the removal of the crosswalk on 8th Avenue east of Snowman Lane, which impinges on the vehicle storage space next to the railroad crossing. Relocating the crosswalks will address the issue of stopped vehicles conflicting with trains, as noted by the DT.

In addition, the DT recommends for any improvements in the project area that work include clearing vegetation between Old Richardson Highway and the ARRC tracks from 5th Avenue to 8th Avenue to provide adequate sight distance between vehicles and trains.

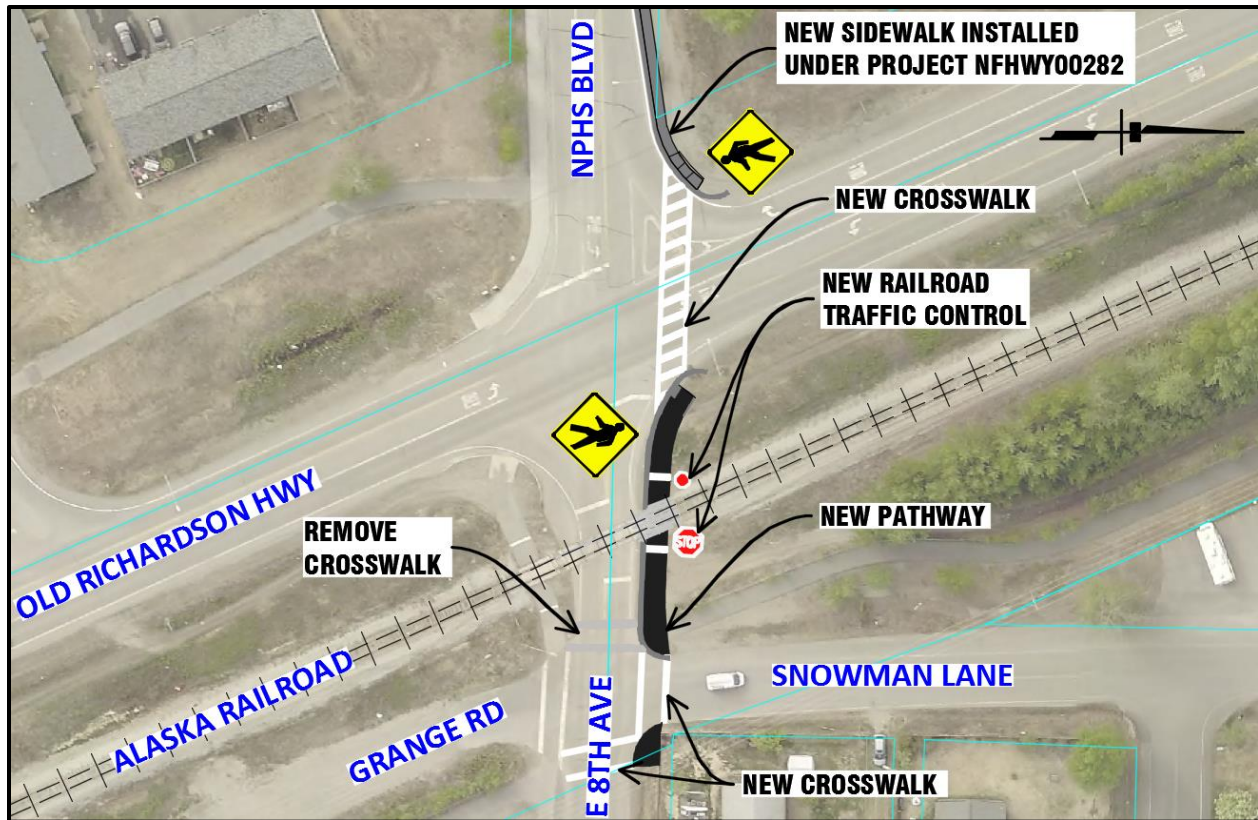


Figure 10: Pedestrian Crossing at NPHS Boulevard/Old Richardson Highway/8th Avenue

6.1.3 Roundabout Installation (Alternative 3)

Issues Improved by this Alternative: Pedestrian Delay, High Crash Rate, AM Peak Hour Delay

The TSAR investigated installing a roundabout at the Old Richardson Highway/8th Avenue/NPHS Boulevard Intersection. Based on the projected 2040 traffic volume at this intersection, a single-lane roundabout would operate well at this intersection.

Operational analysis indicated the intersection would operate at LOS C or better for all movements in a roundabout scenario. Delay for the northbound and southbound movements would be introduced in a roundabout layout whereas in the existing configuration, those movements do not experience delay.

Installing a roundabout would reduce delay for pedestrians crossing Old Richardson Highway. Roundabouts allow pedestrians to cross the road in two stages by using the splitter islands as refuges. Roundabouts also shorten the distance a pedestrian has to cross compared with the existing roadway configuration. Pedestrian delay would be reduced to 10 seconds, reducing the likelihood of risk-taking behavior.

However, due to the proximity of this intersection with a railroad crossing, a roundabout installation would introduce other conflicts. The DT does not recommend proceeding with this alternative.

- Westbound approach queues for the intersection would extend past the railroad crossing, while eastbound traffic stopped for a train would back up into the roundabout, quickly causing the roundabout to lock up. It may be possible to overcome this by installing a gate on the westbound

exit from the roundabout and installing signs directing motorists to use E 5th Avenue when there is a train.

- The school release time bus congestion would also block all traffic movements within the roundabout. School bus traffic would need to be addressed separately, either by re-routing over Patriot Drive and providing a separate northbound right turn lane, metering the bus traffic so it does not queue up at the intersection, or by providing buses their own separate lane through the intersection and across the tracks. The school bus options are discussed further in later sections.

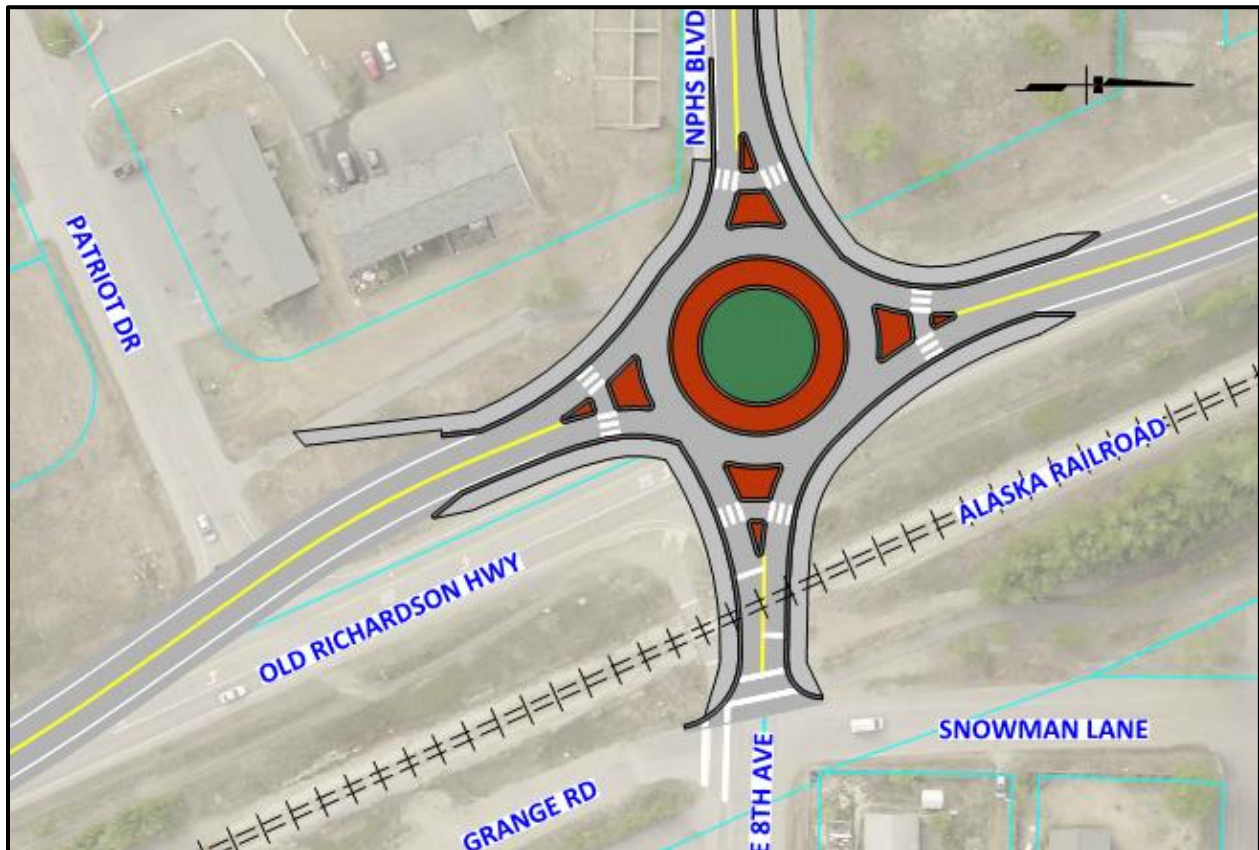


Figure 11: Roundabout Installation at NPHS Boulevard/Old Richardson Highway/8th Avenue

6.1.4 Signal Installation (Alternative 4)

Issues Improved by this Alternative: Not Evaluated

Based on a signal warrant analysis, a signal is warranted at the Old Richardson Highway/8th Avenue/NPHS Boulevard intersection by MUTCD Warrant 9 – Intersection Near a Grade Crossing. However, other traffic control devices are in place to deter queuing traffic to be stopped on the railroad tracks; and therefore, a signal is not recommended and was not analyzed further.

6.1.5 Reroute School Bus Traffic (Alternative 5)

Issues Improved by this Alternative: School Bus Congestion

This alternative would re-route the bus traffic away from the Old Richardson Highway/8th Avenue/NPHS Boulevard intersection by constructing a new driveway from the North Pole High School bus parking lot

from Patriot Drive. Buses would then travel down Patriot Drive to Old Richardson Highway, turn north on to Old Richardson Highway, then east on to 8th Avenue. A northbound right turn lane would be constructed on Old Richardson Highway to provide space for buses to queue up while performing their safety check at the ARRC crossing.

This option should slightly reduce school bus delay by enabling buses to separate the tasks of finding acceptable crossing gaps in Old Richardson Highway traffic and performing safety stops at the ARRC crossing. It will also decrease the congestion at the Old Richardson Highway/8th Avenue/NPHS Boulevard intersection. However, it will increase congestion at the Patriot Drive/Old Richardson Highway intersection.

Representatives from the City of North Pole expressed concern about neighborhood objections to this alternative and stated that the city would likely require sidewalks be added to Patriot Drive if this option moves forward. The effects of adding a sidewalk were not included in this study.

Aside from the improvements listed under Alternative 2, the DT had no specific comments regarding this alternative.

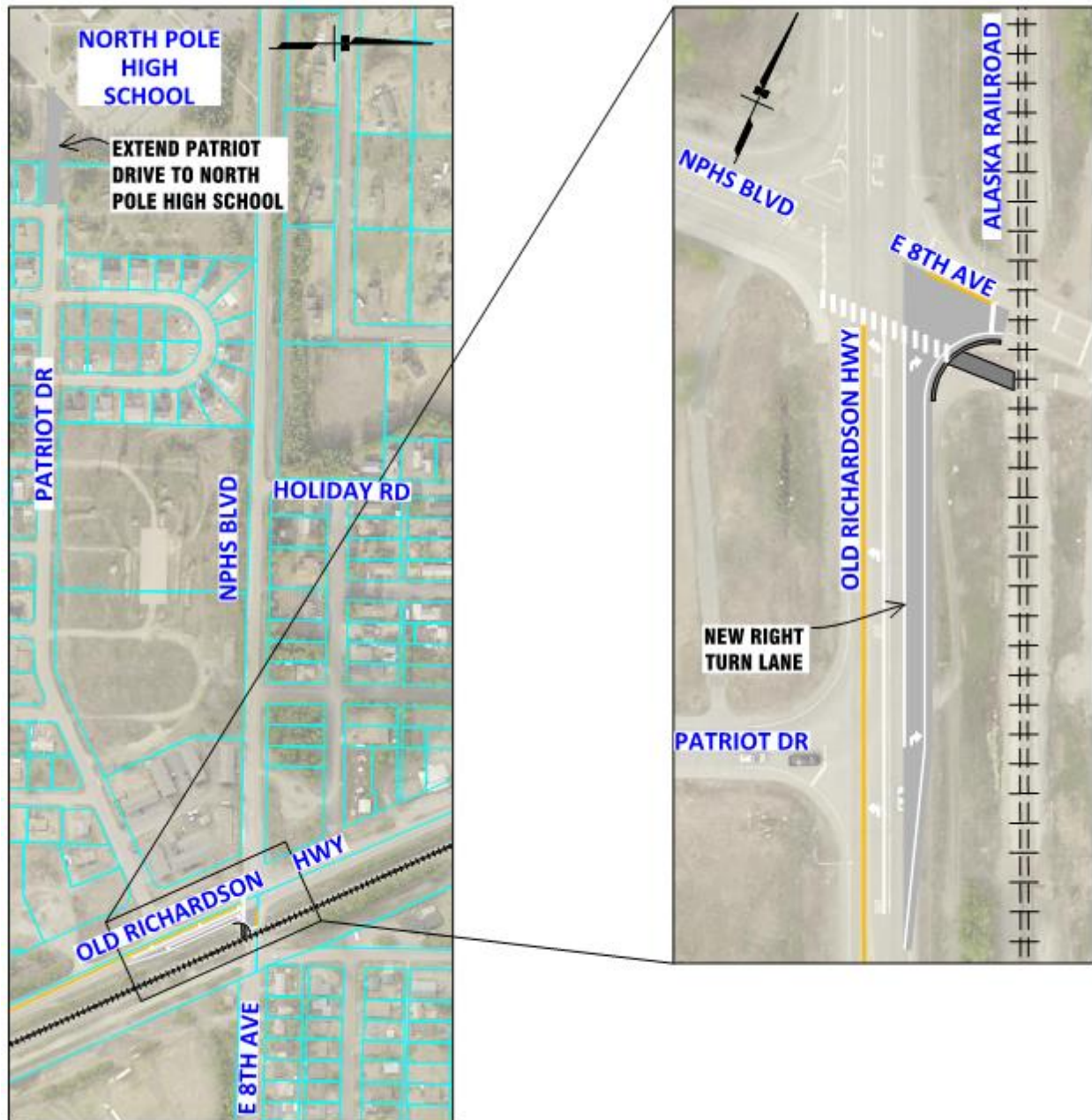


Figure 12: Reroute School Bus Traffic Alternative

6.1.6 School Bus Demand Management (Alternative 6)

Issues Improved by this Alternative: School Bus Congestion

The TSAR considered several options to reduce the school bus congestion at the Old Richardson Highway/8th Avenue/NPHS Boulevard intersection by changing how buses use the intersection. These options were discussed with the Fairbanks North Star Borough School District (FNSBSD) since they will potentially affect the cost and efficiency of their bussing operations. Due to FNSBSD's funding levels, transportation contract, and operational needs, the only feasible school bus demand management option is metering the bus departures from the high school.

Field observations of the bus congestion determined each bus takes 40 seconds to perform the required stop procedure. Metering the bus departures from the high school on a 40 second or longer interval would reduce congestion at the intersection without increasing delay to the bus traffic. This would allow other traffic to complete movements during the gaps induced between buses. This option would essentially move the bus queue from the Old Richardson Highway intersection to the high school parking lot. Delay to bus traffic would remain the same as existing.

6.1.7 Add Bus-only Through Lane to Eastbound NPHS Boulevard (Alternative 7)

Issues Improved by this Alternative: School Bus Congestion

This alternative would reconfigure the eastbound NPHS Boulevard approach to include a through-left lane and a bus-only through/right turn lane. The bus-only through lane would extend from North Pole High School to North Pole Middle School.

Providing a separate bus lane would separate school buses from other vehicles, allowing most passenger cars to be unaffected by the bus congestion. Note that eastbound right turn vehicles would still need to queue with buses, or access Old Richardson Highway through the neighborhood to the north.

This alternative would not address vehicular safety or future pedestrian and vehicular delay. This alternative also would not improve bus travel times through the intersection.

Aside from the improvements listed under Alternative 2, the DT had no specific comments regarding this alternative.

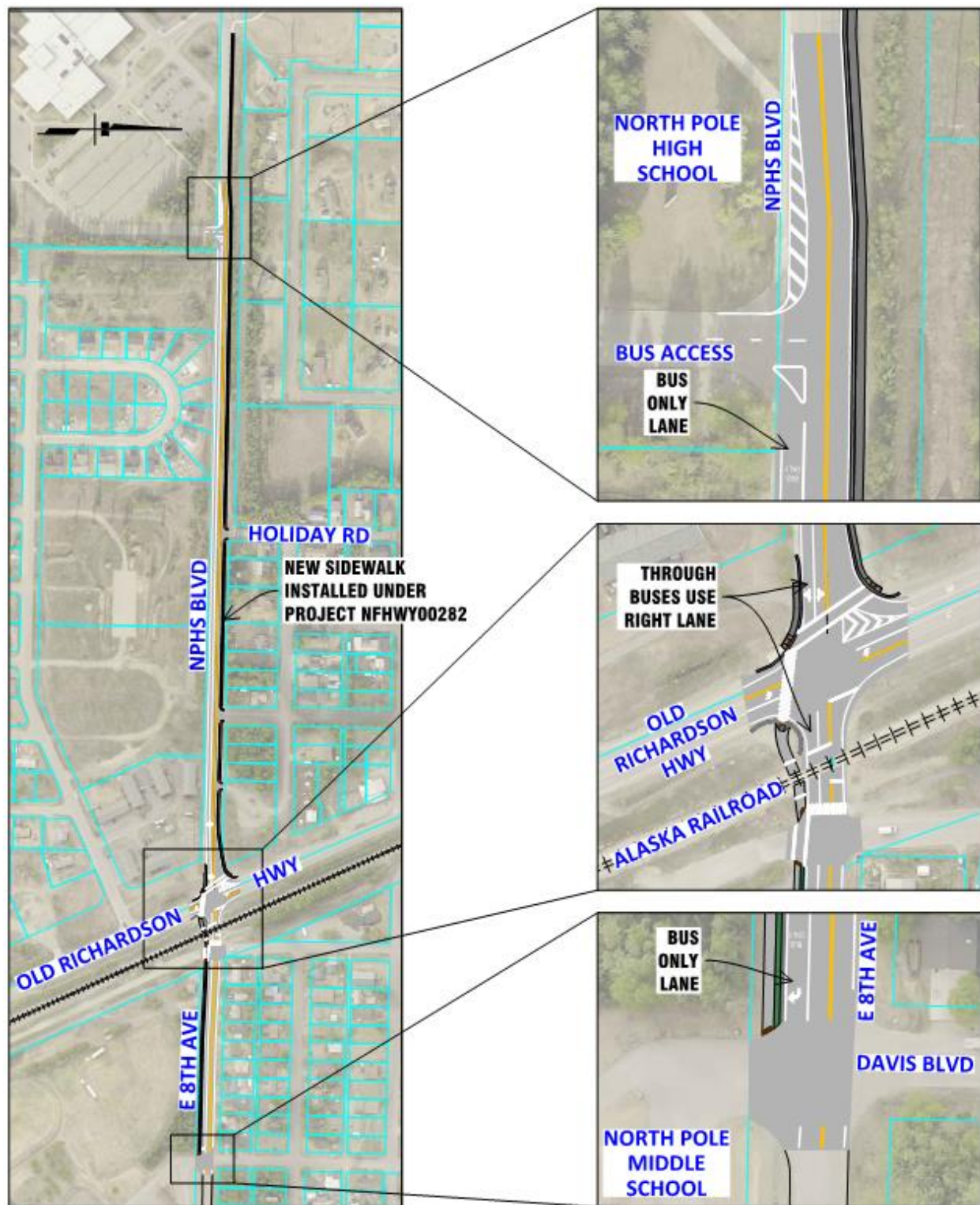
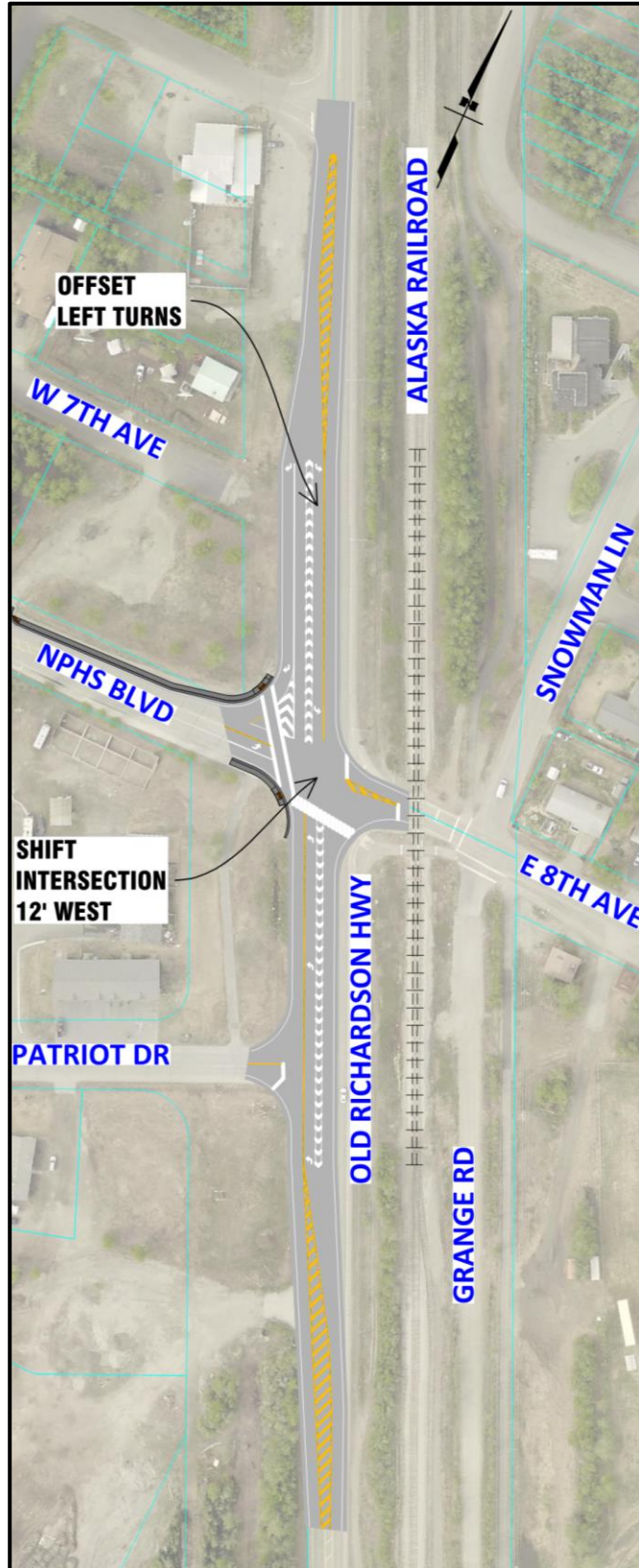


Figure 13: Add Bus-only Through Lane to Eastbound NPHS Boulevard



6.1.8 Improve Intersection Sight Distance (Alternative 8)

Issues Improved by this Alternative: High Crash Rate

This alternative was developed to address the observed crash patterns at the intersection. Specifically, this alternative reconstructs the Old Richardson Highway/8th Avenue/NPHS Boulevard intersection 12 feet west and offsets the left turn lanes on Old Richardson Highway by 6 feet. Shifting the intersection west enhances sight distance along Old Richardson Highway for motorists approaching the intersection on NPHS Boulevard. It also provides more space between Old Richardson Highway and the railroad tracks, which will help prevent buses conducting their safety stop from blocking the view of westbound traffic approaching the intersection on 8th Avenue.

As discussed in the Crash Analysis section, providing positive offset of the left turn lanes would ensure adequate sight distance is provided for left turning vehicles even when opposing left turners are queued up.

Aside from the improvements listed under Alternative 2, the DT had no specific comments regarding this alternative.

Figure 14: Improve Intersection Sight Distance

6.1.9 Santa Claus and 5th Avenue Safety Enhancements (Alternative 9)

Local residents expressed concern about the 3-way stop controlled intersection at 5th Avenue and Santa Claus Lane. Based on the traffic analysis and documented crash history at this intersection, there are no operational or safety problems with the existing traffic control configuration. However, residents indicated there are numerous near-miss crashes due to drivers failing to notice the north (southbound) stop sign. To address this concern, any build alternative should also enhance the visibility of the stop sign. Treatments that may help increase the rate of drivers noticing and adhering to the stop sign include installing an oversized stop sign, installing a sign post reflector on the post, and/or installing an LED-embedded stop sign.

The FHWA Safety Office identifies larger stop signs as a strategy for reducing intersection crashes (and theoretically, near misses) and states that one limited study suggests installing larger stop signs may reduce crashes by 19%. Sign post reflectors are mentioned in the Unsignalized Intersection Improvement Guide (developed by the Institute of Transportation Engineers and FHWA) as a method to improve sign visibility and driver compliance. They are especially beneficial at night or in visually congested areas. LED-embedded signs have been implemented in various states with the objective to increase driver compliance of road signs. The FHWA Safety Office states that a recent study found that LED-embedded stop signs lead to about a 30% reduction in the number of vehicles not fully stopping at the intersection



Figure 16: LED-Embedded Stop Sign

Source: FHWA



Figure 15: Sign Post Reflector

Source: FHWA

6.2 Utilities

The following alternatives will have little to no conflict with area utilities: No-Build (Alternative 1), Reroute School Bus Traffic (Alternative 5), and School Bus Demand Management (Alternative 6).

Pedestrian Treatments (Alternative 2) will likely require relocating one or two overhead communications poles.

Installing a roundabout (Alternative 3) will require relocating one utility pole, approximately 1,000 feet of telecommunications line, and 250 feet of gas line.

Adding a bus-only lane to NPHS Boulevard (Alternative 7) will require relocating 3 utility poles, approximately 200 feet of telecommunications line, and 280 feet of gas line.

Improving intersection sight distance (Alternative 8) will require relocating one utility pole, approximately 1,500 feet of telecommunications line, and 250 feet of gas line.

6.3 Environmental Impacts

6.3.1 Natural Environment

According to the Alaska Department of Environmental Conservation (ADEC) Contaminated Sites Program map, none of the build alternatives would impact documented contaminated sites near the project site.

North Pole is in a nonattainment area for fine particulate air pollution (PM_{2.5}). A number of sources contribute to PM_{2.5} pollution, including vehicle emissions. Since the goal of the build alternatives will reduce vehicle delay, they will also reduce vehicle emissions; and therefore, will not worsen the PM_{2.5} pollution.

No endangered species are in the project area.

No wetlands exist in the project area.

The project area is protected from flooding by the Chena River Lakes Flood Control project

6.3.2 Cultural Resources

None of the build alternatives will impact historical sites or buildings.

6.3.3 Community Services

The Old Richardson Highway/8th Avenue/NPHS Boulevard intersection is heavily used for access to the high school, middle school, and library. The pedestrian treatment and roundabout alternatives (Alternatives 2 and 3) will improve the ability of people to access these sites. Improving intersection sight distance (Alternative 8) will enhance the safety of travelers to these facilities. Bus travel times between the high school and middle school should be slightly reduced by the reroute school bus traffic (Alternative 5) alternative. Implementing school bus demand management (Alternative 6) will affect bus traffic but should not materially change the travel times.

6.3.4 Construction

Construction activities for the build alternatives will generate noise, dust, vibrations, and traffic delays. Construction impacts will be temporary and will be mitigated through the requirements in DOT&PF's Standard Specifications for Highway Construction. Further mitigation can be implemented through the project special provisions.

The contractor will be required to prepare and implement a Storm Water Pollution Prevention Plan (SWPPP) that conforms to the DOT&PF best management practices (BMPs) for erosion and sediment control in accordance with the DOT&PF contract specifications. Appropriate erosion and siltation controls will be used and maintained in optimal condition during construction and all other exposed soils/fills will be permanently stabilized.

Hazardous material, if encountered, will be disposed of at an ADEC approved landfill and in accordance with the contractor's Hazardous Material Control Plan (HMCP). The HMCP discusses pollution prevention from hazardous material, including petroleum products, related to construction activities and equipment. The HMCP will be included as an appendix to the SWPPP.

6.4 Bicycle and Pedestrian Accommodations

The pedestrian treatments (Alternative 2) and roundabout (Alternative 3) would improve non-motorized transportation by reducing the pedestrian delay for crossing Old Richardson Highway. The pedestrian treatments (Alternative 2) could be combined with any other build alternative.

Constructing ADA-compliant curb ramps within the areas of improvement will also benefit non-motorized traffic.

6.5 Transit Accommodations

The MACS Green line has one stop within the proposed improvement area of the project. Stop ID 858 is located just west of the Old Richardson Highway/8th Avenue/NPHS Boulevard intersection. The location of this stop may need to be adjusted to accommodate the new intersection layout. No other MACS stops will be impacted by the improvements. By improving traffic flow and safety, most of the alternatives will potentially improve travel time reliability for MACS. Alternatives 1 and 2 (no-build and pedestrian treatments) will have no effect on MACS.

6.6 Design Exceptions

No design exceptions are required for the build alternatives.

6.7 Right of Way

The No-Build and School Bus Demand Management alternatives (1 and 6) will have no ROW impacts.

The remaining alternatives will all require coordination with ARRC since some construction will need to occur within their right of way.

The pedestrian treatments (Alternative 2) will have no other ROW impacts.

The roundabout installation (Alternative 3) will impact the parcel in the northwest corner of the Old Richardson Highway/8th Avenue/NPHS Boulevard intersection, requiring temporary construction access and approximately 350 square feet of permanent acquisition. However, in discussions with ARRC in January 2018, they expressed concern about constructing a roundabout close to the railroad crossing due to potential conflicts between vehicles and trains. It is unlikely they will agree to permit the roundabout at this location.

Rerouting school bus traffic (Alternative 5) will require 7,500 square feet of right of way from the parcel at the west end of Patriot Drive. In addition, the right turn lane on Old Richardson Highway will require approval from ARRC.

Adding the bus only lane (Alternative 7) will have the largest right of way impact. It requires approximately 1,800 square feet of temporary construction easements and 120 square feet of permanent acquisition from the two lots in the northwest corner of the Old Richardson Highway/8th Avenue/NPHS Boulevard intersection. This alternative will also require reconstructing the ARRC crossing.

Improving intersection sight distance (Alternative 8) will require approximately 570 square feet of temporary construction access and 200 square feet of permanent acquisition from the parcel in the northwest corner of the Old Richardson Highway/8th Avenue/NPHS Boulevard intersection.

Table 4: Summary of ROW Impact Costs

#	Alternative	Permanent ROW (SF)	Temporary ROW (SF)	Parcels Impacted	Approximate Cost
1	No Build	None	None	0	\$0
2	Pedestrian and Railroad Crossing Treatments	None	None	0	\$0
3	Roundabout Installation	350	430	1	\$12,000
4	Signal Installation	Not Evaluated			
5	Reroute Bus Traffic	7,500	0	1	\$10,000
6	Bus Demand Management	None	None	0	\$0
7	Bus-only Lane	120	1,800	2	\$23,000
8	Improve Sight Distance	200	570	1	\$12,000
9	Santa Claus & 5 th Avenue Safety Enhancements	None	None	0	\$0

6.8 Estimated Costs

Cost estimates for the presented alternatives are listed below:

Table 5: Summary of Cost Estimates

#	Alternative	Design and Engineering	ROW	Utilities	Construction	Total
1	No Build	\$0	\$0	\$0	\$0	\$0
2	Pedestrian and Railroad Crossing Treatments	\$70,000	\$0	\$25,000	\$460,000	\$555,000
3	Roundabout Installation	\$420,000	\$12,000	\$169,000	\$2,635,000	\$3,236,000
4	Signal Installation	Not Evaluated				
5	Reroute Bus Traffic	\$124,000	\$10,000	\$0	\$820,000	\$954,000
6	Bus Demand Management	\$0	\$0	\$0	\$0	\$0
7	Bus-only Lane	\$615,000	\$23,000	\$157,000	\$3,930,000	\$4,725,000
8	Improve Sight Distance	\$309,000	\$12,000	\$215,000	\$1,840,000	\$2,376,000
9	Santa Claus & 5 th Avenue Safety Enhancements	\$3,000	\$0	\$0	\$15,000	\$18,000

6.9 Comparison Matrix

As shown in Table 6, no single alternative addresses all the identified concerns. But there are opportunities to combine alternatives to address additional concerns. For example, improvements to the intersection sight distance could be combined with the installation of a bus-only lane to improve vehicular safety *and* reduce vehicular delay during the school dismissal period.

Table 6: Comparison of Alternatives

#	Alternative	2040 Pedestrian Delay	Vehicular Safety	Vehicular Delay at School Dismissal	2040 Vehicular Delay	ROW	Meets Purpose and Need	Estimated Cost
1	No Build	o	o	o	o	+	-	\$0
2	Pedestrian and Railroad Crossing Treatments	o ¹	o	o	o	+	+	\$555,000
3	Roundabout Installation	+	+	o	+	-	+	\$3,236,000
4	Signal Installation	Not recommended for consideration						
5	Reroute Bus Traffic	o	o	+	o	-	o	\$954,000
6	Bus Demand Management	o	o	+	o	+	o	\$0 ²
7	Bus-only Lane	o	o	+	o	-	o	\$4,725,000
8	Improve Sight Distance	-	+	o	o	-	+	\$2,376,000
9	Santa Claus & 5 th Avenue Safety Enhancements	o	+	o	o	+	+	\$18,000
<p>Legend: + Positive Impact o Neutral or Partial Impact - Negative Impact</p> <p>1. The only treatment warranted by guidelines in the ATM is signs and markings at 8th Avenue. These will alert road users of a designated crossing point, but would only have a small effect on pedestrian delay.</p> <p>2. This alternative does not result in a construction cost; however, maintenance and operational costs would be associated with managing the bus departures.</p>								

Although the roundabout option addresses the issues listed in the purpose and need statement, it cannot function without addressing the bus traffic (i.e., by also implementing Alternative 5, 6, or 7).

6.10 Recommended Alternative

The recommendation for the Old Richardson Highway Intersection Improvement project is to construct Alternatives 2 and 9 - the pedestrian and railroad crossing treatments and Santa Claus and 5th Avenue Safety Enhancements. These alternatives provide modest improvements to traveler safety (both motorized and non-motorized), with no negative impacts. While other alternatives would potentially provide larger safety and/or delay benefits, the costs and impacts were deemed too high for the expected benefits.

The recommended alternatives are expected to include attached pathways with curb and gutter the north side of 5th Avenue between Santa Claus Lane and Old Richardson Highway and on the north side of 8th Avenue between Snowman Lane and Old Richardson Highway. Utility poles would be relocated as necessary for construction of the pathways. A marked crosswalk would be placed across Old Richardson between 8th Avenue and NPHS Boulevard. The crosswalk would be marked with longitudinal lines bounded by transverse lines for added visual conspicuity. Marked crosswalks would also be placed across the north and east legs of 8th Avenue and Snowman Lane.

Traffic control devices associated with the railroad-highway crossings would be replaced at these locations. The pathway and roadway would use the same devices to reduce the amount of visual clutter in the area.

The stop bar on 5th Avenue at Old Richardson Highway would be relocated west to provide a larger vehicle storage area between the intersection and the railroad-highway crossing.