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TECHNICAL MEMORANDUM

Seward Highway O'Malley Road to Dimond Boulevard Reconstruction

Project No.: 0537008/CFHWY00012

Final Traffic and Safety Report

Date:	September 10, 2018	KAI Project #: 18409
To:	James Potts, PE, Jacobs	
From:	Brett Korporaal, Andrew Ooms PE, and Brian L. Ray	

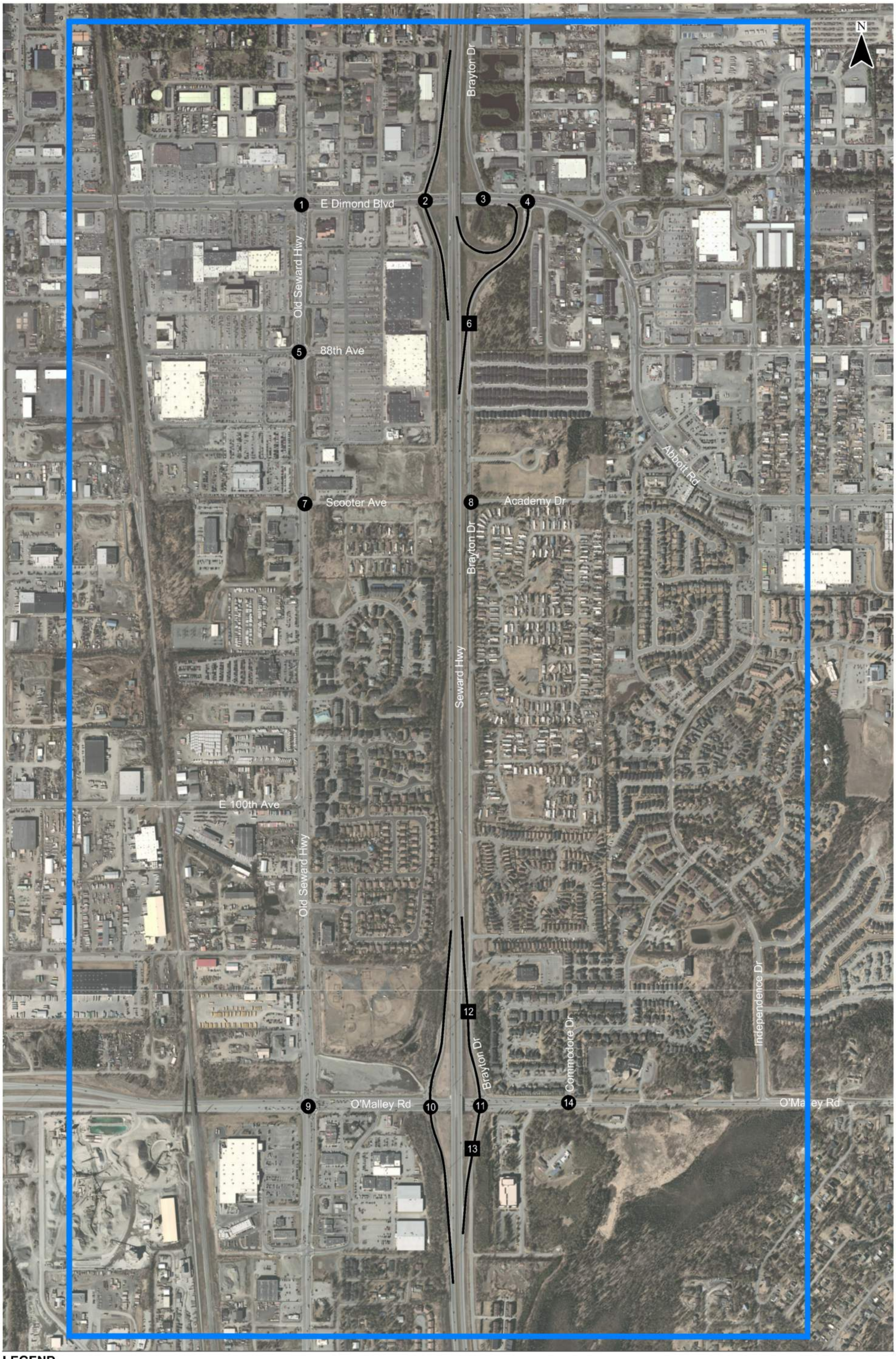
INTRODUCTION

The Alaska Department of Transportation & Public Facilities (DOT&PF) Central Region is preparing to construct mainline highway and interchange improvements on the Seward Highway between O'Malley Road and Dimond Boulevard in the Municipality of Anchorage. The proposed improvements include widening the highway to six lanes (three in each direction), reconfiguring two existing interchanges (O'Malley Road and Dimond Boulevard), and constructing a new grade separation at Scooter Avenue.

Kittelson & Associates, Inc. (Kittelson) evaluated the existing and proposed roadway network. This memorandum summarizes the existing and 2040 proposed roadway network conditions within the study area of the Seward Highway O'Malley Road to Dimond Boulevard project. This memorandum documents the current facilities and their operational and safety performance for each travel mode within the study area; the concepts development and evaluation process; and concept selection.

STUDY AREA

The study area is located approximately five miles southeast of downtown within the Municipality of Anchorage (MOA). The study area includes a 1.5-mile corridor of Seward Highway from the O'Malley Road Interchange to the Dimond Boulevard Interchange. To provide context, the study area also includes Old Seward Highway on the west, Dimond Boulevard on the north, Brayton Drive on the east, and O'Malley Road on the south. Figure 1 illustrates the study area and study intersections.



LEGEND

- \# - Study Intersection
- \# - Study Junction
- Study Merge/Diverge Segment
- Study Area

Study Area
Anchorage, Alaska

Figure 1

Study Intersections

Kittelson analyzed the following intersections to understand the existing corridor and intersection conditions of Seward Highway and adjacent roadways with respect to operations, pedestrian facilities, bike facilities, and transit routes. While the project area is limited to the three interchanges and mainline segments along the Seward Highway, adjacent intersections on Old Seward Highway were included to capture signal interactions and identify potential impacts of this project.

1. Old Seward Highway / Dimond Boulevard
2. Seward Highway Southbound Ramp Terminus / Dimond Boulevard
3. Seward Highway Northbound Ramp Terminus / Brayton Drive / Dimond Boulevard
4. Brayton Drive / Dimond Boulevard/Abbott Road / Sandlewood Place
5. Old Seward Highway / 88th Avenue
6. Seward Highway Northbound Dimond Off-Ramp / Brayton Drive – (merge segment)
7. Old Seward Highway / Scooter Avenue
8. Brayton Drive / Academy Drive
9. Old Seward Highway / O’Malley Road / Minnesota Drive
10. Seward Highway Southbound Ramp Terminus / O’Malley Road
11. Seward Highway Northbound Ramp Terminus / O’Malley Road
12. Seward Highway Northbound O’Malley Road On-Ramp / Brayton Drive – (merge segment)
13. Seward Highway Northbound O’Malley Road Off-Ramp / Brayton Drive – (merge segment)
14. O’Malley Road / Commodore Drive

Turning movement count data was collected at each of the intersections in July 2016 and Kittelson staff conducted a field visit confirming roadway facilities and operational results in September 2016. Study intersection lane configurations are illustrated in Figure 2.

LEGEND

- Study Intersection
- Study Junction
- Stop Sign
- Traffic Signal

Existing Lane Configuration and Traffic Control Devices
Anchorage, Alaska

Figure 2

H:\18\18409 - Seward Highway Improvements-O'Malley to Dimond\dwgs\figs\18409_Figures.dwg Oct 09, 2018 - 4:52pm - bkorporaal Layout Tab: LaneConfig

Kittelson & Associates, Inc.
Transportation Engineering/Planning

Land Use and Zoning

The MOA Land Use Plan Map identified in the *Anchorage 2040 Land Use Plan* (Reference 1) designates desired land uses within the study area. An excerpt of that plan is shown in Exhibit 1. Industrial zones are found in the northeast and west and regional commercial in the northwest. Residential zoning is generally designated to the southern portion of the study area. Residential zoning varies from single unit housing, compact mixed housing, and multifamily housing east and west of Seward Highway.

Exhibit 1. Site Vicinity 2040 Land Use Map (Source: MOA Planning)

Roadway Facilities

Table 1 summarizes of the roadway facilities that were studied.

Table 1. Study Roadway Facilities

Roadway	Functional Classification[1]	# of Travel Lanes	Posted Speed (mph)	Pedestrian Facilities	Bicycle Facilities	Average Annual Daily Traffic (AADT)[2]
88th Street	Commercial / Industrial Collector	2	25	Partial	None	6,000
Scooter Avenue	Minor Collector	2	25	Partial	None	800
Academy Drive	Minor Collector	2	25	Partial	None	1,500
Brayton Drive	Major Collector	2 (one-way)	45	None	None	2,500
Dimond Boulevard / Abbott Road	Principal Arterial	4/6	40	Yes	Path	39,000
O'Malley Road	Principal Arterial	4	50	Yes	Path/ Sidewalk	30,000
Old Seward Highway	Principal Arterial	5	45	Yes	Path	19,000
Seward Highway	Interstate	4	65	Partial	Partial Path	37,000

[1] Per DOT&PF Statewide Functional Classification GIS Map

[2] Representative AADT volumes per DOT&PF 2014 Annual Average Daily Traffic (AADT) GIS Map

EXISTING MOTOR VEHICLE CONDITIONS

This section summarizes the existing traffic operations analysis within the study area. Since the start of this study in 2016, multiple projects have been constructed on the Seward Highway north of the study area, and on Scooter Avenue O'Malley Road east of the Seward Highway. These new projects have changed existing conditions over the course of this study. This report reflects the changes to the study corridor up to September 2018; however, traffic volumes since 2016 are based on DOT&PF estimates and traffic reallocations by Kittelson due to continued construction disruptions.

Daily Traffic Volumes on Seward Highway

DOT&PF publishes the *Annual Traffic Volume Report* (Reference 2) that provides average annual daily traffic (AADT) volumes along Seward Highway from 1995 to 2013). Kittelson extracted AADTs for 2014 through 2017 from DOT&PF'S online AADT GIS Map (Reference 3). The AADT along Seward Highway includes two-way traffic volumes between 76th Avenue and Huffman Road. In 2017, AADT along Seward Highway varied from 42,500 north of Dimond Boulevard to 26,500 south of O'Malley Road. Traffic volumes for 2016 and 2017 are DOT&PF estimates due to ongoing construction along the corridor.

Exhibit 2 represents the range of AADT on Seward Highway since 2000 along each of the three Seward Highway study segments. Over the past 15 years, AADT consistently declined along Seward Highway ranging from 23 percent north of Dimond Boulevard, to 17 percent between Dimond Boulevard and O'Malley Road, and 6 percent south of O'Malley Road. These three study segments have had a range of a 0.4 to 1.3 average percent decline annually since year 2000.

The decrease in AADT north of Dimond Boulevard can be attributed to removing the northbound on-ramp on the north side of Dimond Boulevard as part of constructing the eastbound to northbound loop ramp in year 2003. This configuration change eliminated all westbound to northbound vehicles at Dimond Boulevard from the count location as they enter the highway near 76th Avenue to the north of the count station, contributing to the sharp decline in 2004. However, traffic counts at this location have declined 14.8 percent since the change was made in 2004. The traffic reduction is likely caused by diversion to new parallel north/south connections at C Street and Elmore Road completed during this time period.

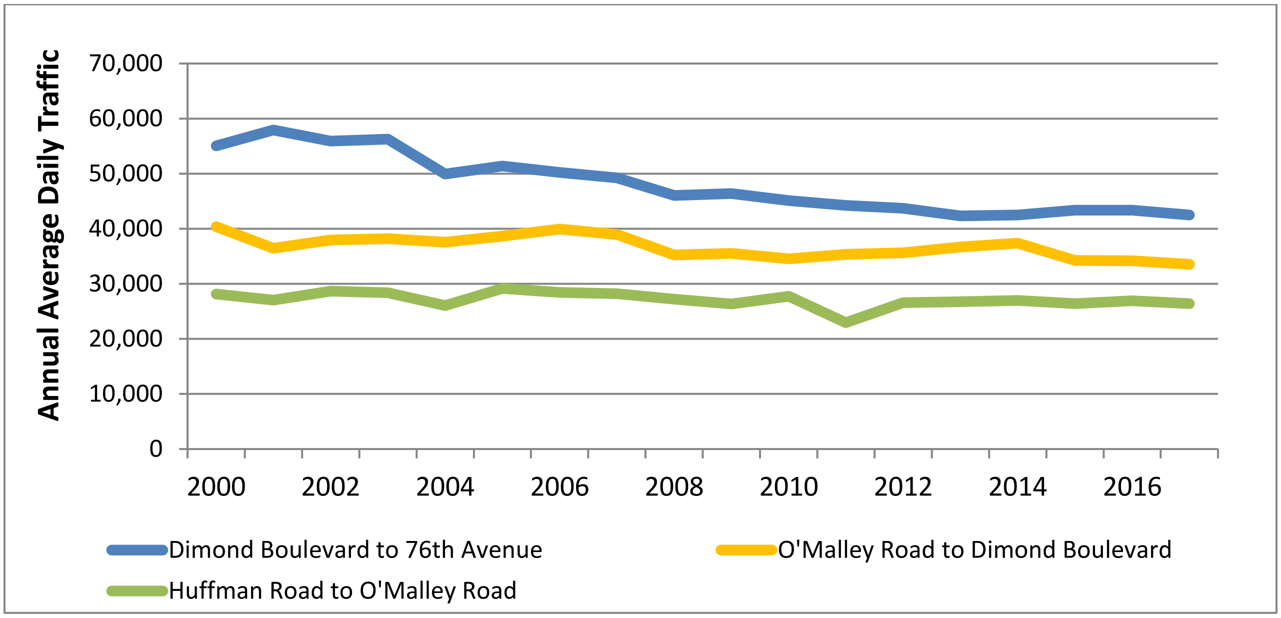


Exhibit 2. Historical (2000 - 2017) AADT on Seward Highway

Similarly, Dimond Boulevard traffic volumes have consistently declined since 2004, decreasing 32 percent from that highest volume year. Current 2017 volumes are 10 percent below year 2000 volumes, as shown in Exhibit 3.

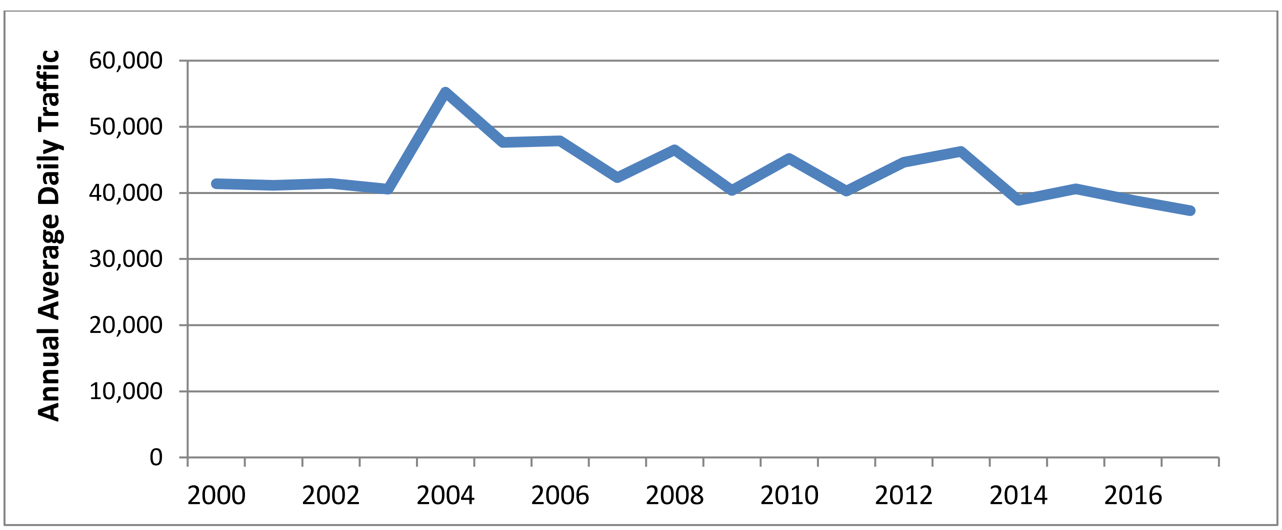


Exhibit 3. Historical (2000 - 2017) AADT on Dimond Boulevard

Exhibit 4 summarizes a typical mid-weekday (Tuesday – Thursday), 24-hour profile of the AADT volumes on Seward Highway from Dimond Boulevard to O'Malley Road. Consistent with the segments north of Dimond Boulevard and south of O'Malley Road, Seward Highway has a distinct a.m. peak in the northbound direction from 7:00 a.m. to 8:00 a.m. and in the southbound direction during the p.m. peak from 5:00 p.m. to 6:00 p.m.

These a.m. and p.m. peak hour volumes account for approximately 7.8 percent and 12.4 percent of AADT, respectively.

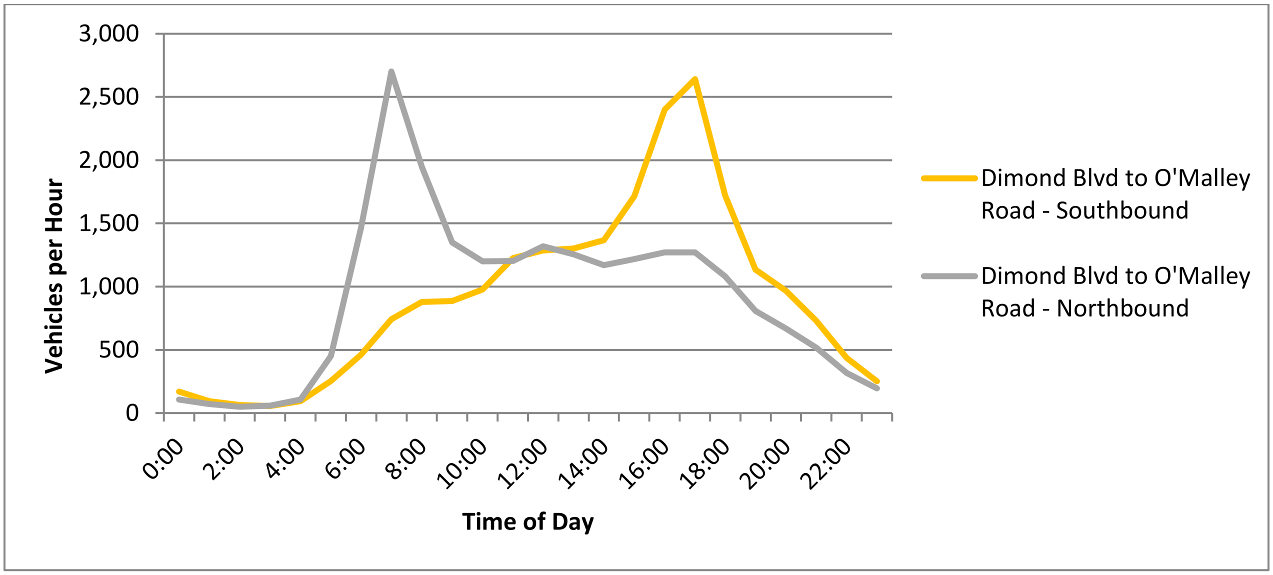


Exhibit 4. Hourly AADT Profile by Direction on Seward Highway between Dimond Blvd and O'Malley Rd

Exhibit 5 presents the weekly profile of AADT by direction on Seward Highway between Dimond Boulevard and O'Malley Road. The typical mid-week day (Tuesday – Thursday) volumes were relatively equal, with a increase in volume on Fridays and a decrease in AADT on Saturday and Sunday. Sundays result in approximately 30 percent less traffic than a typical mid-week day.

Because of the consistency of AADT during the typical mid-week days, Kittelson averaged these volumes for the merge, diverge and freeway segment analyses presented later in this section.

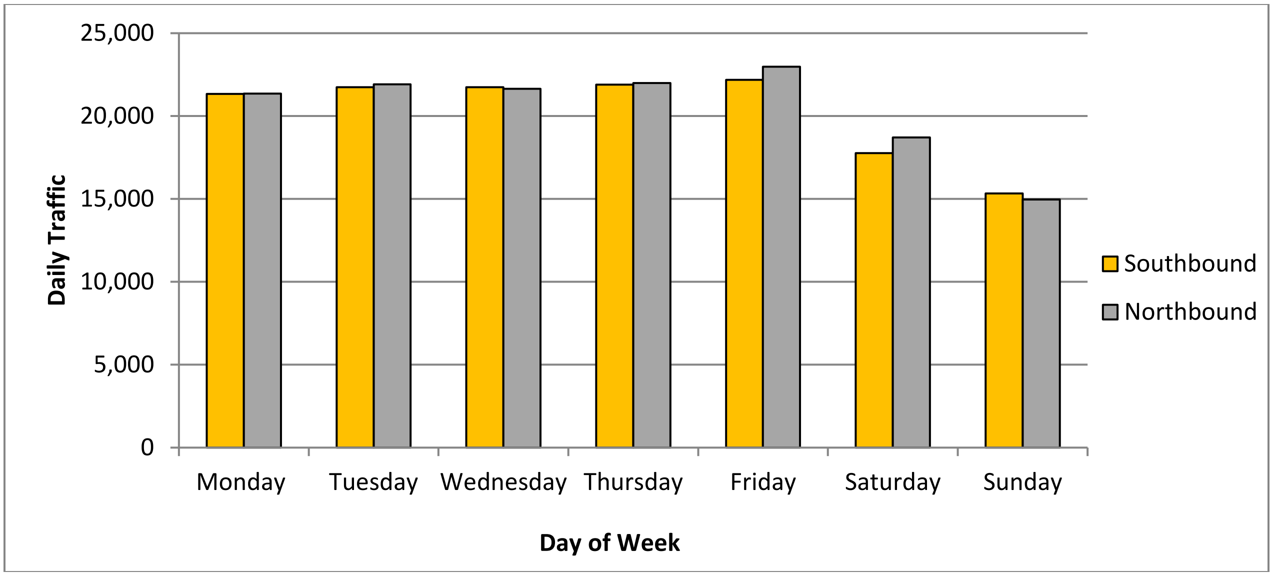


Exhibit 5. Weekly AADT Profile by Direction on Seward Highway between Dimond Blvd and O'Malley Rd

Vehicle Classification

Vehicle classification data is reported in the DOT&PF *Annual Traffic Volume Report,* aggregated by month. Kittelson averaged the monthly data to develop the generalize annual vehicle class proportions shown in Exhibit 6. Over 93 percent of vehicles on the Seward Highway are standard sized vehicles (passenger cars/SUVs/vans/pick-up trucks), 6 percent are single-unit trucks and less than 1 percent are heavy trucks.

The weigh-in-motion station located on the Seward Highway at 76th Avenue also collects speed data, but only for commercial vehicle classes. The average truck speeds reported in April 2015 was 62 mph with an 85th percentile truck speed of 69 mph.

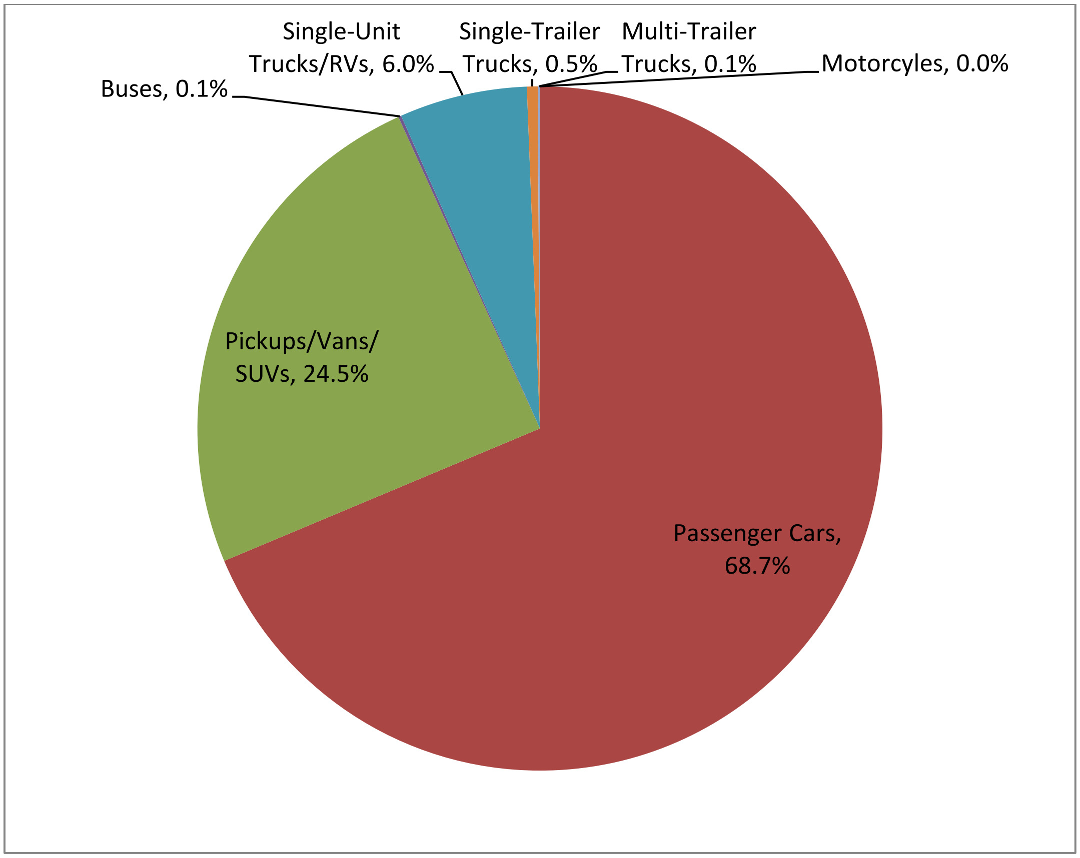


Exhibit 6. Average Vehicle Classification: Seward Highway at 76th Avenue

Operations Analysis Methodology

Kittelson conducted the intersection operational analysis for signalized, stop-controlled, and yield-controlled intersections using Synchro 9 and following the Highway Capacity Manual (HCM) 2000 (Reference 4) analysis procedures. For signalized intersections, Kittelson obtained traffic signal timings from the MOA Traffic Department to model and analyze each intersection.

All intersection level-of-service (LOS) analyses use the peak 15-minute flow rate during the weekday a.m. and p.m. peak hours. Using the peak 15-minute flow rate represents a reasonable worst-case scenario. For this reason, the analysis reflects conditions likely to occur for 15 minutes out of each average peak hour. The intersections will likely operate better than the conditions described in this report during all other time periods.

Kittelson completed the merge and diverge (on- and off-ramp) segment and freeway segment analyses and roundabout capacity analysis using the Highway Capacity Software (HCS), Version 7. This version implements the HCM 6th Edition (Reference 5) methodology in determining the level of service on the freeway mainline and at merge segment locations based on variety of factors including volume, speed, number of lanes, length of segment, and terrain. Freeway count data from June 2015 was provided by DOT&PF. Hourly freeway count data was not completed for the freeway segment north of Dimond Boulevard to 76th Avenue. Therefore, Kittelson calculated peak hour freeway volumes in this section using freeway count data south of Dimond Boulevard and on- and off-ramps data at the Dimond Boulevard interchange.

Intersection Operating Standards

Kittelson assessed vehicle operations at intersections by the volume-to-capacity ratio at average vehicle delay. The intersection LOS is based on average vehicle delay. Signalized intersection LOS is based on the intersection as a whole, while LOS for unsignalized intersections are based on the critical movement, typically a minor street turning movement.

DOT&PF uses LOS thresholds for determining an intersection's operating standards. DOT&PF identified acceptable intersection operational standards as operating at LOS C or better. However, where LOS C can only be accomplished by alternatives with excessive impacts or cost, LOS D may be acceptable. Volume-to-capacity (V/C) ratio is a supplemental means of considering intersection performance. At signalized or unsignalized intersections, a critical movement's V/C ratio of 0.90 is typically considered acceptable.

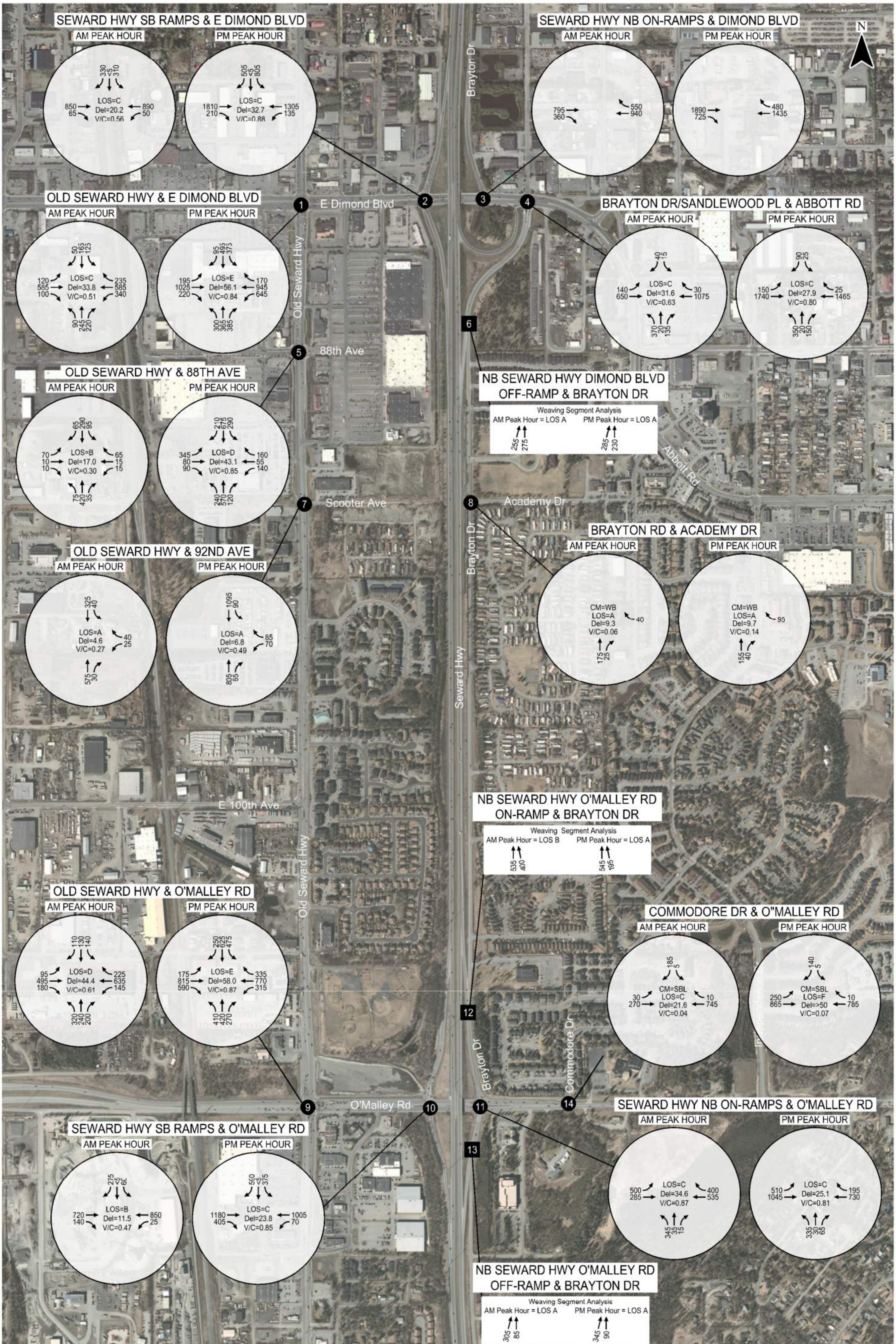
Weekday AM and PM Peak Hour Traffic Conditions

Turning movement counts were collected at each of the study intersections in July 2016 except counts at the unsignalized Commodore Drive/O'Malley Road and Scooter Avenue/Old Seward Highway intersections. Kittelson derived these counts from the *Seward Highway: 92nd Avenue Connector Project* and the *AMATS: O'Malley Road Reconstruction, Phase I, Seward Highway to Livingston Street Project*, respectively (References 6 & 7). Kittelson manually balanced vehicle counts as necessary where no driveways and/or side streets exist between two intersections. The volumes were not seasonally adjusted because they were collected in a peak month. Appendix 1 includes the existing weekday a.m. and p.m. peak period counts at each of the study intersections.

The July 2016 turning movement counts were collected during a typical mid-week (Tuesday – Thursday) a.m. (7:00 a.m. to 9:00 a.m.) and p.m. (4:00 p.m. to 6:00 p.m.) peak periods. Kittelson determined the system wide peak hour for the a.m. (7:35 a.m. to 8:35 a.m.) and p.m. (4:55 p.m. to 5:55 p.m.) peak periods.

Figure 3 summarizes the study intersection turning movement counts and operational results for the existing weekday a.m. and p.m. peak hour traffic conditions. Ten of the study intersections operate at acceptable operating standards during the existing conditions weekday a.m. and p.m. peak hours while the following intersections do not meet the acceptable operating standards:

- **Old Seward Highway & E Dimond Boulevard** operates at LOS E with a v/c ratio of 0.84 during the weekday p.m. peak hour.



LEGEND

CM = CRITICAL MOVEMENT (UNSIGNALIZED)
LOS = INTERSECTION LEVEL OF SERVICE (SIGNALIZED)/CRITICAL MOVEMENT LEVEL OF SERVICE (UNSIGNALIZED)
Del = INTERSECTION AVERAGE CONTROL DELAY (SIGNALIZED)/CRITICAL MOVEMENT CONTROL DELAY (UNSIGNALIZED)
V/C = CRITICAL VOLUME-TO-CAPACITY RATIO

- Study Intersection
- Study Junction

Existing Traffic Conditions Weekday AM and PM Peak Hour Anchorage, Alaska

Figure 3

- **Old Seward Highway & 88th Avenue** operates at LOS D during the weekday p.m. peak hour. This intersection was a past Highway Safety Improvement Program project that created dual eastbound and westbound left-turn lanes to eliminate the split phase signal phasing. This has resulted in greater delay for the northbound and southbound left-turn movements, resulting in intersection v/c ratios of 0.86 and 0.90 during the weekday p.m. peak hour, respectively.
- **Old Seward Highway & O'Malley Road** operates at LOS D and E during the weekday a.m. and p.m. peak hours, respectively.
- **Seward Highway NB On-Ramp & O'Malley Boulevard** operates at LOS C during the a.m. and p.m. peak hours, however, the eastbound left-turn lane operates at LOS D and LOS E, respectively with queue lengths at or exceeding queue storage during both peak hours.
- **Commodore Drive & O'Malley Road -** the critical movement is the southbound approach that operates at LOS D during the weekday a.m. peak hour and LOS F and a v/c ratio of greater than 1.0 during the weekday p.m. peak hour. The 140 right turns at this location exhibit moderate delay after the recent O'Malley Road Reconstruction project added a separate right-turn lane.

Appendix 2 includes the traffic operation worksheets for the year 2016 existing traffic conditions scenarios.

95th Percentile Queuing Analysis

Kittelson assessed 95th percentile queues to determine queue spillback and storage length capacity during the weekday a.m. and/or p.m. peak hours. The 95th percentile queue lengths, calculated using Synchro 9, represent the worst-case queue that would be expected to be exceeded 5 percent of the time during the peak 15 minutes of the peak hour. Kittelson rounded queue lengths up to the nearest 25 feet, assuming each vehicle uses 25 feet of space. Table 2 summarizes the 95th percentile queue lengths at the each of the signalized study intersections. The bold text and highlighted cells indicate 95th percentile queues that equal or exceed the existing storage length during the p.m. peak hour.

Table 2. 95th Percentile Queue Lengths Summary

Study Ramp Terminals	Peak Period	95th Percentile Queue Lengths (ft)[1]							
		EBL	EBR	WBL	WBR	NBL	NBR	SBL	SBR
1. Old Seward Hwy & E Dimond Blvd	Storage Length[2]	285	435	375	-	360	200	225	-
	AM Peak	100	25	175	-	75	50	75	-
	PM Peak	125	75	**375**	-	200	125	250	-
2. Seward Hwy SB Ramps & E Dimond Blvd	Storage Length[2]	-	60	150	-	-	-	300	300
	AM Peak	-	25	100	-	-	-	250	150
	PM Peak	-	50	**250**	-	-	-	**575**	**450**
4. Brayton Rd/Sandlewood Place & Dimond Blvd	Storage Length[2]	185	-	-	-	350	180	65	-
	AM Peak	**225**	-	-	-	175	50	50	-
	PM Peak	175	-	-	-	200	100	50	-
5. Old Seward Hwy & 88th Ave	Storage Length[2]	150	-	-	-	-	-	400	-
	AM Peak	50	-	-	-	-	-	75	-
	PM Peak	**225**	-	-	-	-	-	300	-
9. Old Seward Hwy & O'Malley Rd	Storage Length[2]	560	-	370	-	390	300	315	550
	AM Peak	150	-	100	-	200	50	100	50
	PM Peak	250	-	200	-	250	75	275	75
10. Seward Hwy SB Ramps & O'Malley Rd	Storage Length[2]	-	-	150	-	-	-	495	495
	AM Peak	-	-	0	-	-	-	75	100
	PM Peak	-	-	100	-	-	-	375	250
11. Seward Hwy NB/Brayton Rd & O'Malley Rd	Storage Length[2]	350	-	-	-	-	-	-	-
	AM Peak	**400**	-	-	-	-	-	-	-
	PM Peak	**375**	-	-	-	-	-	-	-

Notes: [1] 95th percentile queues were rounded up to the nearest 25 feet, one vehicle represents 25 feet; [2] Storage lengths were reported where applicable at the respective intersection; **Bold** and highlighted cells indicate 95th percentile queues at or exceeding existing storage length.

The 95th percentile queue lengths that equal or exceed the existing storage available during the a.m. and/or p.m. peak hour are listed below:

- **Old Seward Highway & Dimond Boulevard:** the westbound left-turn queue is at or near the 375 feet of available storage during the p.m. peak hour. The southbound left-turn queue length is 250 feet during the p.m. peak hour and exceeds the turn storage length of 225 feet.
- **Seward Highway SB Ramps & Dimond Boulevard:** the westbound left-turn lane queue length is 250 feet, exceeding the 150 feet of storage during the p.m. peak hour. Additionally, the southbound left-turn lane queue length of 575 feet exceeds the 300 foot left-turn lane storage during the p.m. peak hour.
  - The three southbound queue storage lengths are striped for approximately 300 feet; continuing past the storage lanes, there are two lanes, each providing approximately 275 feet of additional storage where Homer Drive and the Seward Highway southbound off-ramp merge.
  - The southbound movement has been reported by DOT&PF to spill back onto the mainline Seward Highway.
- **Brayton Road/Sandlewood Place & Dimond Boulevard:** the eastbound left-turn queue of 225 feet exceeds the 185 feet of storage during the a.m. peak hour. However, the left turn volumes used in this analysis were estimated by reallocating the turning movements displaced when the eastbound left turn movement was removed from the Northbound

Seward Highway/Brayton Drive intersection to the west. The actual queues under current roadway configurations without area construction may be less than estimated.

- **Old Seward Highway & 88th Avenue:** the eastbound left-turn queue of 225 feet, exceeds the 150 feet of storage during the p.m. peak hour. Site visit observations revealed the southbound left-turn queue to extend past the available storage during the p.m. peak hour though queuing analysis does not show this movement's queue to extend past its available storage.
- **Seward Highway NB On-Ramp & O'Malley Boulevard:** the eastbound left-turn queue of 400 feet during the a.m. peak hour exceeds the existing storage length of 350 feet. During the p.m. peak hour, this turn movement has queue length of 375 feet. Because of the distance between the ramp terminal intersections, queues backing past the storage length will extend into the Seward Highway SB Ramps/O'Malley Road intersection.

Appendix 3 includes Synchro 9 queue reports at each study intersection.

Existing AM and PM Peak Hour Ramp and Freeway Operations

Kittelson evaluated the on-ramps (referred to as merge segments) and off-ramps (referred to as diverge segments). All existing condition ramp and freeway operation results are displayed in Figure 4. Appendix 4 includes the operation worksheets for the ramp and freeway analyses.

Existing AM and PM Merge and Diverge Operations

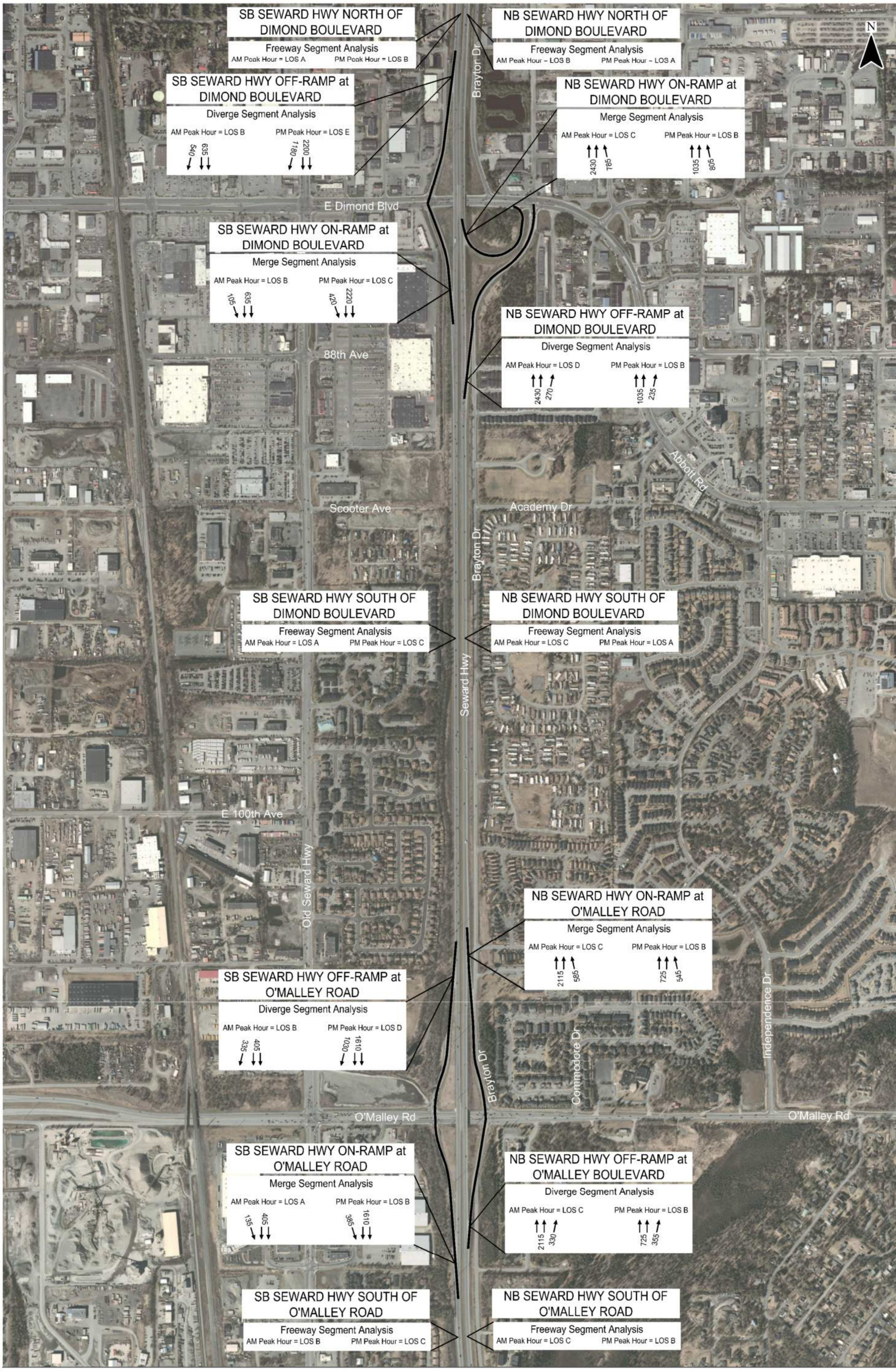
The study merge and diverge segments include ramps at the Dimond Boulevard and O'Malley Road interchanges. Under existing conditions, no merge segments operate below LOS standards. The northbound and southbound off-ramps at both interchanges are tapered exit and entrance configurations.

The following diverge segments fall below LOS standards under existing conditions:

- NB Off-Ramp at Dimond Boulevard operates at LOS D during the a.m. peak hour.
- SB Off-Ramp at Dimond Boulevard operates at LOS E during the p.m. peak hour.
- SB Off-Ramp at O'Malley Road operates at LOS D during the p.m. peak hour.

Existing AM and PM Freeway Operations

Freeway mainline segment LOS is driven by free flow speeds. HCS calculates free flow speed for a mainline segment using traffic volume, number of lanes and their width, shoulder width, terrain, and total ramp density within the segment. Based on these parameters the freeway segments operate at or above LOS C.



LEGEND

- Study Merge/Diverge Segment

Existing Ramp and Freeway Segment Traffic Conditions
Weekday AM and PM Peak Hour
Anchorage, Alaska

Figure 4

EXISTING PEDESTRIAN AND BICYCLE CONDITIONS

Pedestrian and bicycle conditions and facilities are summarized in Figure 5.

Existing Nonmotorized Activity

Peak hour pedestrian and bicycle intersection volume counts were collected by Kittelson to assess nonmotorized travel activity in the study area. No long-term pedestrian or bicycle count data is available for the study area. These counts, shown in Table 3, indicate non-motorized travel activity varies across the study area. The Dimond Center shopping area and nearby transit stops are substantial pedestrian generators and exhibit the highest pedestrian activity in the study area. Peak hour bicycle use was low during the observed period, though the closure of the path on the west side of Seward Highway between Dimond Boulevard and O'Malley Road may have reduced bicycle activity in the area.

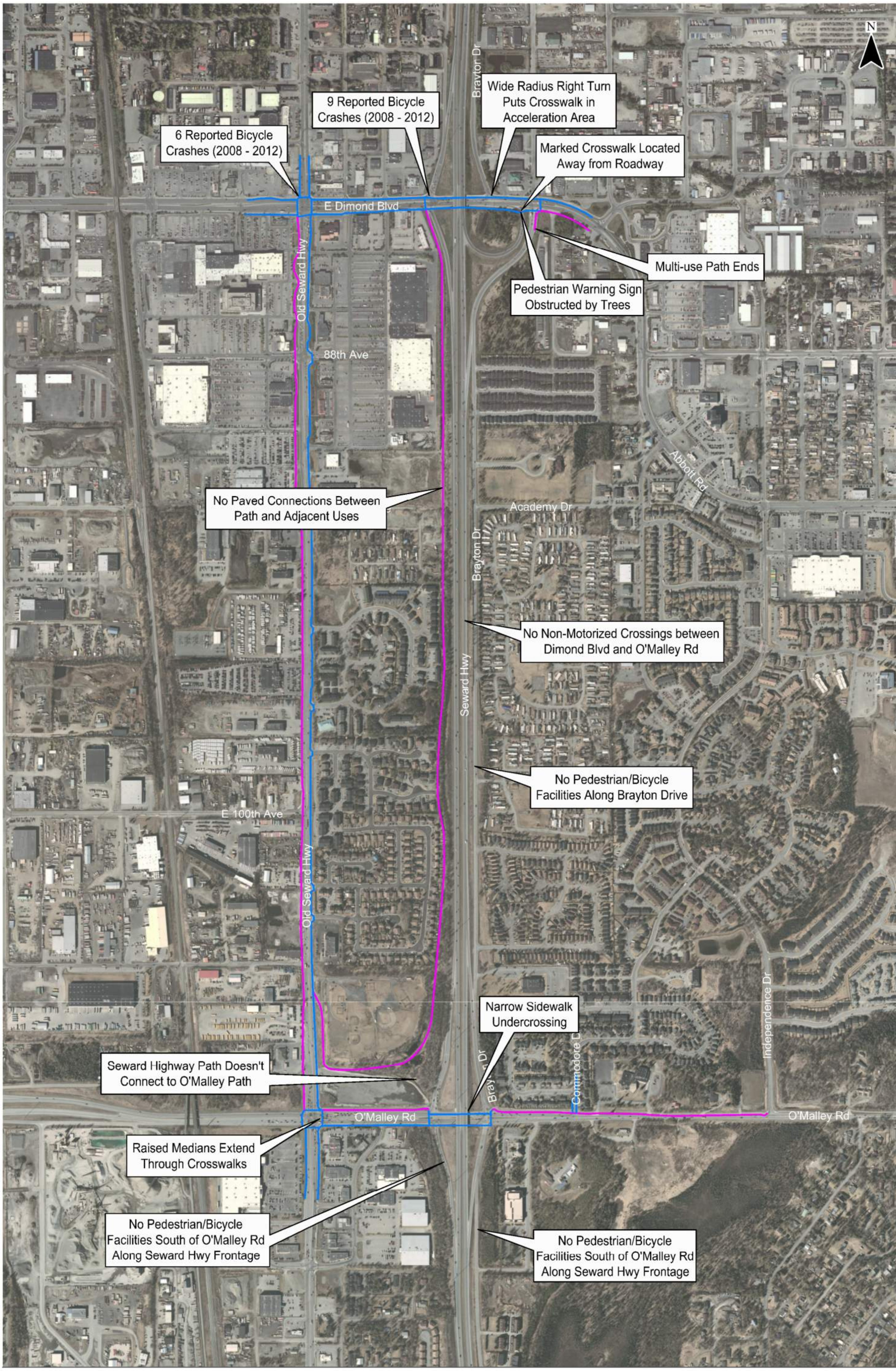
Table 3. Nonmotorized Peak Hour Intersection Counts

Intersection	Pedestrian Crossings		Bicycle Movements	
	Weekday AM Peak Hour	Weekday PM Peak Hour	Weekday AM Peak Hour	Weekday PM Peak Hour
Old Seward Hwy/E Dimond Blvd	17	32	2	0
Seward Hwy SB Ramps/E Dimond Blvd[1]	18	23	1	0
Seward Hwy NB On-Ramp/Dimond Blvd	6	25	1	0
Brayton Dr/Dimond Blvd	10	26	0	0
Old Seward Hwy/88th Ave	12	53	0	0
Brayton Dr/Seward Hwy NB Off-Ramp	0	2	4	1
Old Seward Highway/Scooter Avenue	0	0	0	0
Brayton Dr/Academy Dr	0	1	4	1
Old Seward Hwy/O'Malley Rd	7	16	0	2
Seward Hwy SB Ramps/O'Malley Rd	18	8	0	0
Brayton Dr/O'Malley Rd	4	9	0	0
Brayton Dr/Seward Hwy NB On-Ramp	1	0	0	1
Brayton Dr/Seward Hwy NB Off-Ramp	0	0	0	1
Commodore Dr/O'Malley Rd	4	9	0	0

[1] The Seward Highway multiuse path was closed for construction during this count.

Nonmotorized Travel Routes

The activity tracking company Strava has assembled a data set based on reported bicycle trips. While this data is informal and potentially biased towards recreational users, Strava is working with cities across the country to apply their dataset to bicycle planning efforts. The Strava Heatmap dataset (Reference 8) in Exhibit 6 shows relative bicycle use across the roadway network. The colored routes show relative bicycle usage, ranging from low-volume light-blue segments to red, high-demand facilities.



LEGEND
- Sidewalk / Marked Crosswalk
- Multi-Use Path

Existing Pedestrian and Bicycle Conditions
Anchorage, Alaska

Figure
5

These data, along with analysis of the existing bicycle network, including the 2016 Anchorage Bicycle Map (Reference 9), indicate the current paths used by cyclists to navigate the study area. The Seward Highway and the Alaska Railroad Corporation tracks restrict east/west travel and concentrate trips on the north side of the Dimond Boulevard and O'Malley Road undercrossings. While Old Seward Highway has some bike usage, the primary north/south routes in the area are C Street and Lake Otis Parkway. Additionally, direct through routes away from major arterials are popular with cyclists, such as 100th Avenue, Independence Drive, Jamestown Drive, and Dimond Boulevard/84th Court. The bike path adjacent to the Seward Highway sees little relative use. The Brayton Drive shoulder is used by cyclists but provide travel only for northbound road users, though it has been observed to be used by cyclists traveling against the direction of travel.

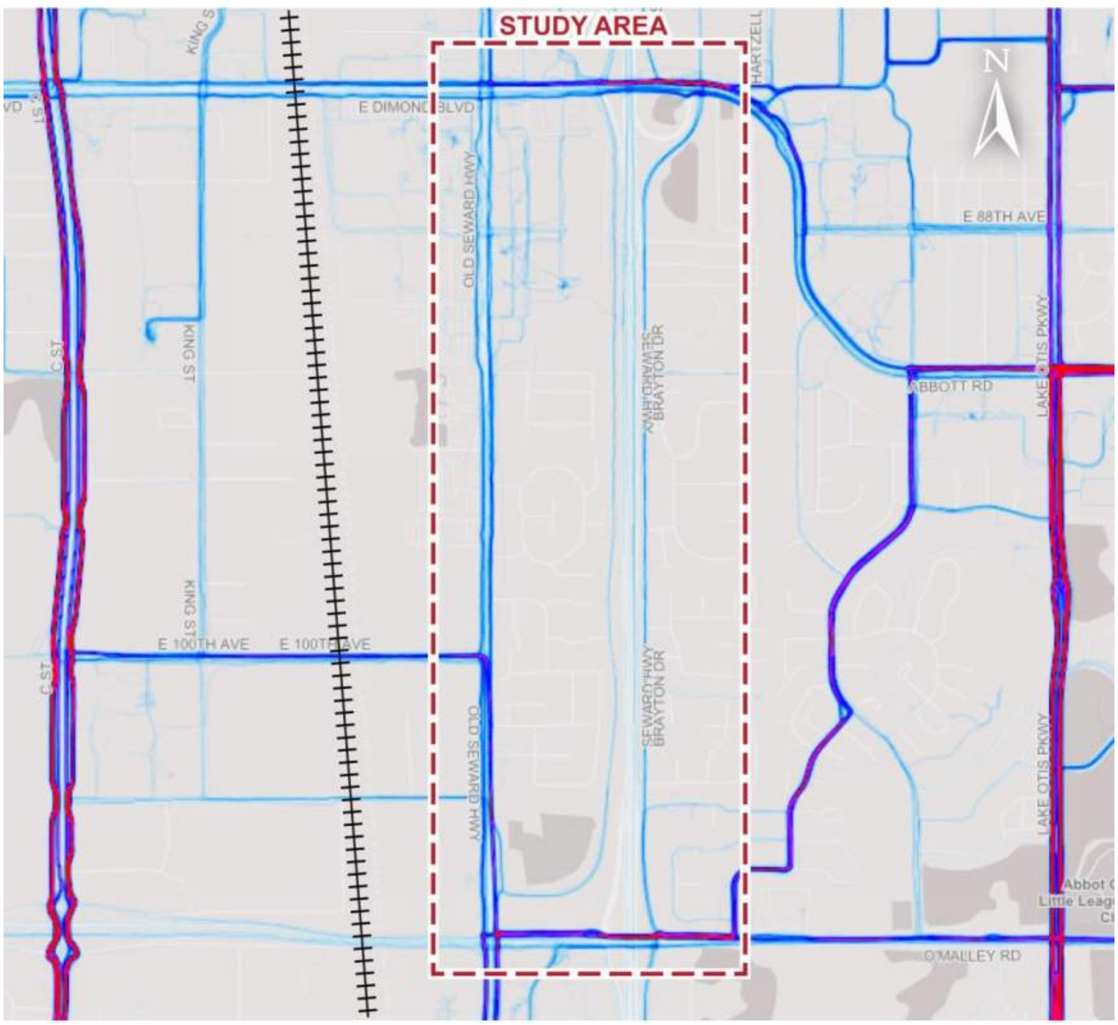


Exhibit 7. Bicycle Route Relative HeatMap (Source: Strava, 2015)

TRANSIT FACILITIES

The Anchorage transit system People Mover has stops along study corridors and a transit center at the Dimond Center, which is served by three separate bus lines, as shown in Exhibit 8. No scheduled service utilizes the Seward Highway.

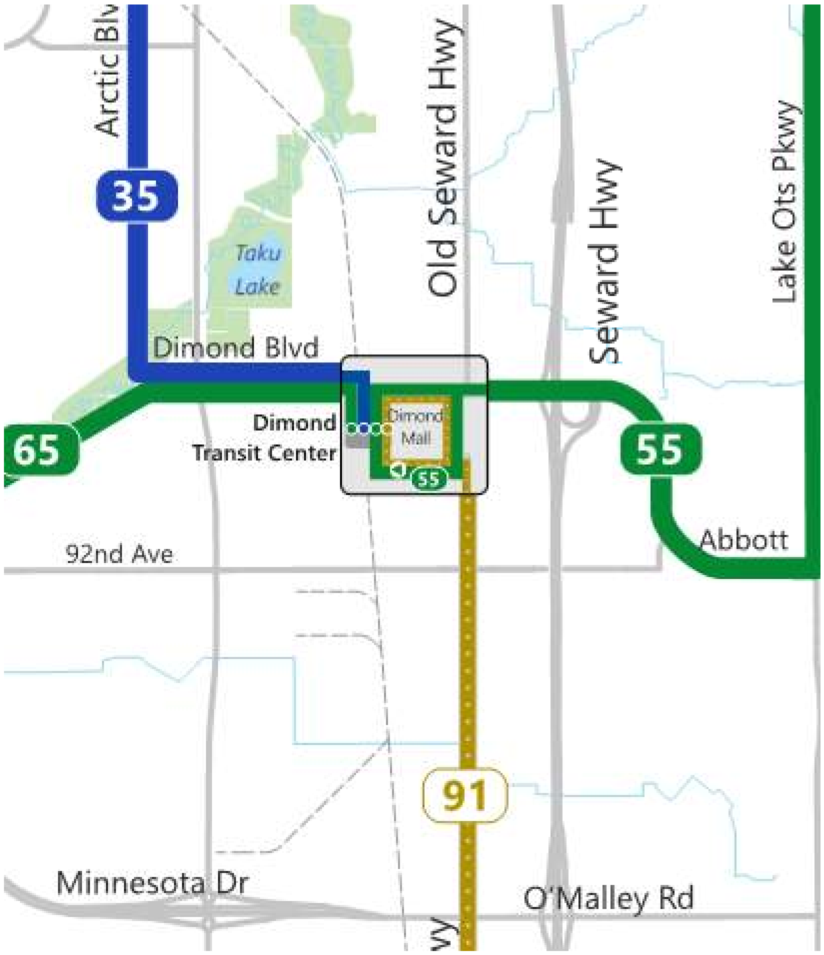


Exhibit 8. Study Area Transit Routes (Source: People Mover)

Routes 55 and 65 generally operate with 60-minute headways, while route 35 has 30-minute headways during weekday daytime hours. Route 91 operates rush hour service only.

EXISTING SAFETY ASSESSMENT

Kittelson performed a crash analysis of the corridor including reviewing crash histories for trends and patterns and calculating critical crash rates by intersection.

Crash records were obtained from DOT&PF for January 1, 2008 through December 31, 2012. A summary of the crash data over the five-year period is provided in Table 4. Appendix 5 contains the crash data worksheets.

Table 4 Study Area Crash Summary (2008-2012)

Intersection	Collision Type							Severity			Total Crashes
	Angle	Side-swipe	Rear End	Head On	Fixed Object	Ped / Bike	Other	PDO	Injury	Fatality	
Brayton Dr/Dimond Blvd/Sandlewood Pl	21	2	29	0	4	2	1	39	20	0	59
Brayton Dr/Academy Dr	2	1	1	0	1	1	1	5	2	0	7
Dimond Blvd/Briarwood St	19	1	16	0	0	3	5	25	19	0	44
Old Seward Hwy/88th Ave	52	5	35	3	2	1	3	75	26	0	101
Old Seward Hwy/Scooter Ave	5	1	4	0	2	0	2	10	4	0	14
Old Seward Hwy/Dimond Blvd	82	11	162	0	14	7	13	208	81	0	289
Old Seward Hwy/O'Malley Rd/Minnesota Dr	25	2	68	3	8	1	5	82	30	0	112
O'Malley Rd/Commodore Dr	7	0	4	0	0	0	4	10	5	0	15
Seward Hwy NB Dimond Off-Ramp/Brayton Dr	0	0	0	0	2	0	0	1	1	0	2
Seward Hwy NB O'Malley Off-Ramp/Brayton Dr	1	0	1	0	0	0	0	1	1	0	2
Seward Hwy NB O'Malley On-Ramp/Brayton Dr	5	0	3	0	1	0	4	10	3	0	13
Seward Hwy NB Ramp Terminus/Brayton Dr/ Dimond Blvd	18	1	15	0	2	2	7	34	11	0	45
Seward Hwy NB Ramp Terminus/O'Malley Rd	41	1	30	0	5	0	4	47	34	0	81
Seward Hwy SB Ramp Terminus/Dimond Blvd	28	4	71	0	1	9	5	77	41	0	118
Seward Hwy SB Ramp Terminus/O'Malley Rd	28	0	17	0	2	1	3	32	19	0	51

The above crash data reveals the Old Seward Highway and Dimond Boulevard intersection had the highest crash occurrence with 289 reported crashes. There were 162 reported rear end crashes with 63 of the rear end crashes occurring on the westbound travel direction of Dimond Boulevard. Rear end crashes mostly occurred before and into the PM peak hour from 1:00 to 5:00 p.m. There were 82 reported angle crashes with 50 of those angle crashes occurring as straight ahead movements on the eastbound and westbound travel directions of Dimond Boulevard. Fourteen of the angle crashes occurred between eastbound and southbound vehicles. While 54 of the angle crashes occurred at or within the intersection, another 28 angle crashes were reported at driveways adjacent to the intersection. There were six reported bicycle-related crashes, all with non-incapacitating/minor injuries. Three of the six bicycle-related crashes occurred in the eastbound travel direction. At least half of the total bicycle-related crashes occurred at driveway accesses within 150 feet of the intersection. Dimond Boulevard between Old Seward Highway and Seward Highway has been ranked a top ten statewide bicycle crash location.

The Seward Highway Southbound Ramp Terminus and Dimond Boulevard intersection included 118 reported crashes. Most crashes were rear end crashes (71 crashes). Nearly half of reported rear end crashes occurred on westbound Dimond Boulevard. Eastbound and southbound travel directions at this intersection had 19 and 18 rear end crashes, respectively. There were nine reported bicycle-related crashes. Seven of the nine bicycle-related crashes occurred on the southbound travel direction with at least five of those crashes involving southbound right turning vehicles. The bike path that follows Seward Highway from Dimond Boulevard to O'Malley Road begins adjacent to the southern leg of this intersection. Bicyclists crossing Dimond Boulevard to get to or from the bike path must cross in front of right turning vehicles from the Seward Highway off ramp.

There were 101 reported crashes over the five-year study period at the Old Seward Highway and 88th Avenue intersection. Of the 101 crashes, 52 were angle crashes and 21 of those involved left turning or u-turning vehicles from the northbound or southbound approaches. These movements operate as protected/permitted via a five-section "doghouse" signal. There were 35 reported rear end crashes with 24 of the 35 crashes occurring on southbound Old Seward Highway.

There were 81 reported crashes at the Seward Highway Northbound Ramp Terminal intersection with O'Malley Road. The majority, 41 crashes, were angle crashes. Left turns accounted for 32 of the 41 angle crashes.

There were 44 reported crashes at the Dimond Boulevard and Briarwood Street intersection. This intersection includes a left turn lane from eastbound Dimond Boulevard to northbound Briarwood Street. This left turn lane requires crossing three lanes of Dimond Boulevard and 12 angle crashes occurred on this eastbound left turn. This intersection also had 16 rear end crashes. Most of the rear end crashes occurred on westbound and eastbound Dimond Boulevard where queueing forms from the Seward Highway southbound ramp terminal and Old Seward Highway intersections.

The Old Seward Highway and O'Malley Road/Minnesota Drive intersection had 112 reported crashes over the five year period. Over half of the crashes (68) were rear end crashes with the highest frequency of rear end crashes (25) occurring on westbound O'Malley Road.

DOT&PF provided statewide average crash rates at a variety of intersection configurations based on number of approaches and traffic control types. The average crash rate represents the approximate number of crashes that are typical of similarly configured intersections. Kittelson used this average crash rate to calculate the critical crash rate for each study intersection based on the DOT&PF HSIP Manual methodology.

The summary crash data in Table 5 reports the observed crashes, million entering vehicles (MEV), the observed crash rate per MEV, the statewide average crash rate, critical crash rate, and safety index (the observed crash rate over the critical crash rate), for study intersections. Some intersections did not adequately fit any approach styles used in the DOT&PF HSIP Manual methodology, so applicable data was denoted with an "N/A" and was not reviewable. Additionally, some intersections lacked average daily traffic (ADT) counts, so applicable data was denoted with an "N/A" and was not reviewable.

Table 5 Crash Rate Analysis (2008-2012)

Intersection	Total Crashes	Total Million Entering Vehicles (MEVs)	Crash Rate (per MEV)	DOT&PF Average Crash Rate (per MEV)	Critical Crash Rate	Safety Index
Brayton Dr/Dimond Blvd/Sandlewood Pl	59	86.7	0.68	1.47	1.69	0.40
Brayton Dr/Academy Dr	7	6.4	1.09	0.51	1.05	**1.04**
Dimond Blvd/Briarwood St	44	N/A	N/A	N/A	N/A	N/A
Old Seward Hwy/88th Ave	101	65.4	1.54	1.47	1.72	**0.90**
Old Seward Hwy/Scooter Ave	14	43.7	0.32	0.47	0.65	0.49
Old Seward Hwy/Dimond Blvd	289	114.2	2.53	1.47	1.66	**1.52**
Old Seward Hwy/O'Malley Rd/Minnesota Dr	112	119.5	0.94	1.47	1.66	0.57
O'Malley Rd/Commodore Dr	15	44.7	0.34	0.47	0.65	0.52
Seward Hwy NB Dimond Off-Ramp/Brayton Dr	2	11.4	0.17	N/A	N/A	N/A
Seward Hwy NB O'Malley Off-Ramp/Brayton Dr	2	9.6	0.21	N/A	N/A	N/A
Seward Hwy NB O'Malley On-Ramp/Brayton Dr	13	16.1	0.81	N/A	N/A	N/A
Seward Hwy NB Ramp Terminus/Brayton Dr/ Dimond Blvd	45	98.6	0.46	0.52	0.64	0.71
Seward Hwy NB Ramp Terminus/O'Malley Rd	81	63.9	1.27	1.13	1.36	**0.93**
Seward Hwy SB Ramp Terminus/Dimond Blvd	118	106.3	1.11	1.13	1.31	0.85
Seward Hwy SB Ramp Terminus/O'Malley Rd	51	79.2	0.64	1.13	1.34	0.48

Table 5 shows that four of the eleven intersections have safety indices at or above 0.90, indicating a high degree of confidence the intersections exhibit more crashes than typical for similar facilities:

- Brayton Drive/Academy Drive
- Old Seward Highway/88th Avenue
- Old Seward Highway/Dimond Boulevard
- Seward Hwy NB Ramp Terminus/O'Malley Road

FIELD SAFETY AND OPERATIONS ASSESSMENT

Kittelson performed an assessment in September 2016 and in August 2018 to observe the existing user behavior, roadway conditions, and operations. This section reflects the observed existing conditions during the field visits.

Old Seward Highway / Dimond Boulevard

- Pedestrians using the crosswalks must cross as many as nine vehicle lanes resulting in pedestrian crossing times of over 30 seconds.
- Multiple driveway accesses are located within 150 feet of the intersection, leading to potential vehicle movement conflicts and queue interactions.
- Vehicles performing u-turns conflict with vehicles turning right on red.
- Citizens have reported to the Public Transportation Advisory Board conflicts with drivers turning right on red not looking for and not yielding to pedestrians in the crosswalk.

Seward Highway Southbound Ramp Terminus / Dimond Boulevard

- Bicyclists cross the west leg of this intersection to access the Seward Highway multiuse path.

Seward Highway Northbound Ramp Terminus / Brayton Drive / Dimond Boulevard

- The westbound right turn radius is large, contributing to higher turning speeds and longer pedestrian crossings.
- The westbound right-turn lane is a drop lane. Drivers were observed to make late lane changes to continue westbound on Dimond Boulevard.

Brayton Drive / Abbott Road / Sandlewood Place/Dimond Boulevard

- The path along Brayton Drive ends just south of the intersection, reducing nonmotorized connectivity.
- The multiuse path along the south side of Dimond Boulevard crosses the eastbound loop on-ramp set back from the intersection, which reduces pedestrian visibility.
- A crosswalk pedestrian sign also tells bicyclists to “Walk Bikes.” This sign does not reflect recent changes in Municipal Code Title 9, which gives bicyclists moving at a reasonable speed priority at this intersection.

Old Seward Highway / 88th Avenue

- The northbound and southbound left-turns operate as protected/permitted with five-section “doghouse” signal heads. The MOA is moving to flashing-yellow arrow signal heads on all protected/permitted locations.

Old Seward Highway / O’Malley Road

- Three crosswalks at this intersection have a raised median within the crosswalk. The raised median on the east leg crosswalk spans the entire width of the crosswalk and is not

ADA compliant. The planned Minnesota Dr: Seward to Tudor Pavement Preservation project is expected to address this condition.

Seward Highway Southbound Ramp Terminus / O’Malley Road

- The sidewalks along O’Malley Road under the Seward Highway are narrow and do not provide a buffer between sidewalk users and the motor vehicle lanes.
- The Seward Highway path does not directly connect to this intersection which creates out of direction travel.

Seward Highway Northbound Ramp Terminus / O’Malley Road

- Permissive eastbound left-turns were observed to be difficult during peak periods, which is consistent with the delay shown in the existing conditions analysis.

Seward Highway Mainline

- Barrier fences are routinely damaged by those seeking to cross the Seward Highway at grade. Pedestrians crossing the mainline Seward Highway near Scooter Avenue and Academy Drive were reported by DOT&PF.

RECENT AND NEAR-TERM PLANNED ROADWAY IMPROVEMENTS

The section describes the recently completed and near-term planned roadway improvements that will influence existing intersection operations.

Seward Highway, Scooter Avenue Connector

DOT&PF recently completed the first phase of the Scooter Avenue and Academy Drive grade separation project. The first phase of the project included adding a southbound auxiliary lane from Dimond Boulevard to O'Malley Road, and reconstructing Scooter Avenue from the Old Seward Highway to the New Seward Highway. The Scooter Avenue reconstruction included a new traffic signal at the Old Seward Highway & Scooter Avenue intersection. (Reference 10).

Ultimately, the project will connect Academy Drive to the west beneath the Seward Highway with Scooter Avenue. This connection is intended to alleviate congestion in the Dimond Boulevard / Seward Highway area, providing an option for east/west traffic between Dimond Boulevard and O’Malley Road to access Seward Highway via a new grade separation at Scooter Avenue.

Seward Highway Dimond Boulevard to Dowling Road Project

The Seward Highway Dimond Boulevard to Dowling Road project is under construction and involves improvements to the Seward Highway from south of the Dimond Boulevard Interchange to Dowling

Road. The project will provide an additional lane in both directions and includes an auxiliary lane in the southbound direction between 76th Avenue and Dowling Road. A new Seward Highway crossing is under construction at 76th Avenue to improve access and connectivity. Dimond Boulevard interchange improvements have included a new northbound on-ramp allowing westbound traffic on Dimond Boulevard/Abbott Road to access the freeway without having to travel through the new 76th Avenue intersection. (Reference 11).

O'Malley Road Reconstruction, Phase I – Seward Highway to Livingston Street

Phase I of this project is nearing completion and included roadway improvements along O'Malley Road from Seward Highway to Livingston Street. Roadway improvements include widening the road to four lanes, two lanes in each direction. The roadway will include a 16-foot raised median to separate oncoming traffic and a 10-foot separated, paved, multi-use pathway on both the north side and south side of O'Malley Road. In addition to continuous illumination along this stretch of roadway, a left-turn lane has been provided for eastbound left-turns at the Commodore Drive and Independence Drive intersections. (Reference 12).

Academy Drive/Vanguard Drive Area Traffic Circulation Improvements

This project is being funded by the MOA to run concurrent with DOT&PF's Scooter Avenue Connector project. The project defined the transportation and safety issues along Academy Drive and Vanguard Drive and presented potential improvements. The project includes widening Academy Drive to create left-turn lanes and a median. The preferred alternative includes a proposed traffic signal at the Academy Drive & Abbott Road intersection. Currently the project is in the design phase (Reference 13).

Minnesota Dr: Seward to Tudor Pavement Preservation

This project includes ADA and pedestrian improvements on O'Malley Road, such as removing a median in the crosswalk and improving pedestrian ramps and signal pushbuttons.

100th Avenue Extension

This project is currently under construction and will connect 100th Avenue between Minnesota Drive and C Street. Upon completion, 100th Avenue will serve as a collector from the Old Seward Highway west past Minnesota Drive, including an at-grade crossing of the Alaska Railroad tracks.

EXISTING CONDITIONS SUMMARY

This existing conditions assessment can be summarized to a few key points:

- High vehicle delay, long queues, and safety issues associated with eastbound to northbound Seward Highway movements at O'Malley Road.
- Vehicle delay and queues at the southbound Seward Highway off-ramp at Dimond Boulevard.
- High Old Seward Highway intersection delay at Dimond Boulevard, 88th Avenue, Scooter Avenue, and O'Malley Road.
- Seward Highway is a barrier to pedestrians between Dimond Boulevard and O'Malley Road.
- The study area lacks a complete bicycle network and has a history of bicycle crashes and intersection conflicts.

FUTURE TRAFFIC CONDITIONS

Kittelson developed traffic projections to evaluate the safety and operations of the future no-build condition to assess the impacts of planned near-term projects and identify additional issues.

Year 2040 No Build Model

Roadway Network

In 2015, Anchorage Metropolitan Area Transportation Solutions (AMATS) released a Travel Demand Model Update with a calibrated base year of Year 2013 and a 2040 land use forecast. The distribution of traffic demand growth is shown in Exhibit 9. The 2040 travel demand model is currently being updated as part of the 2040 Metropolitan Transportation Plan (MTP) and is not yet available for use at the time of this report.

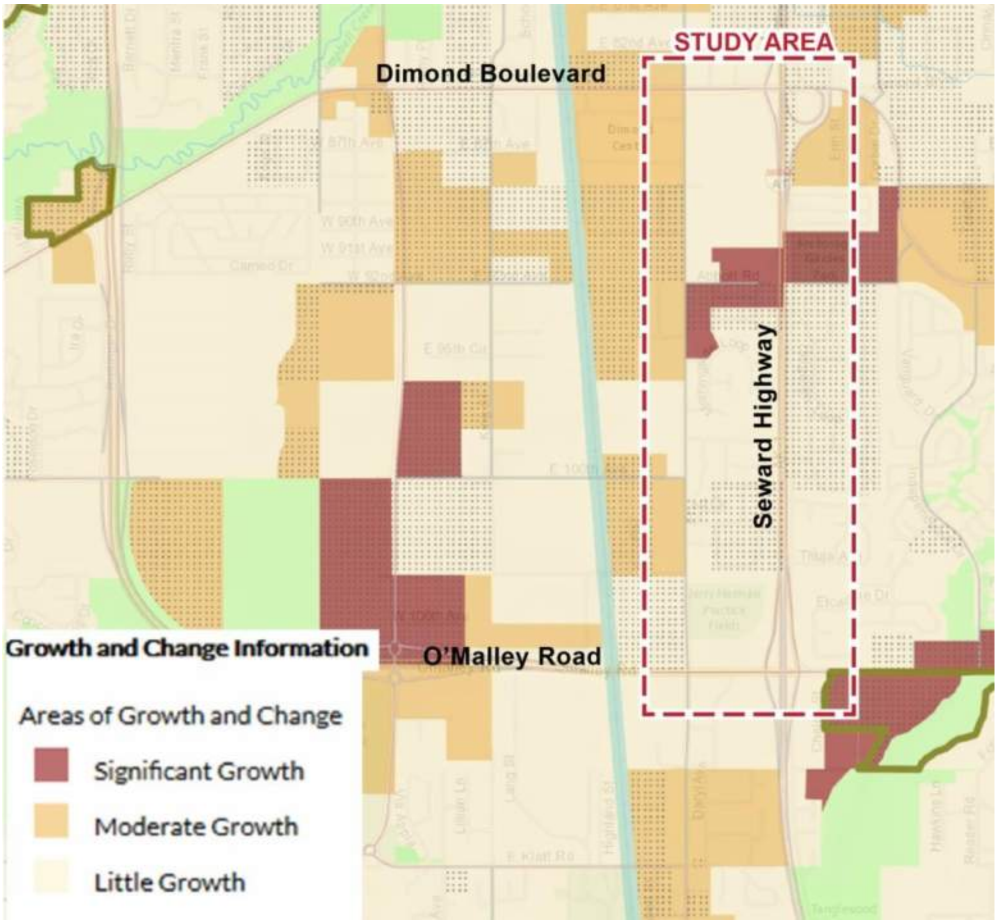


Exhibit 9. 2013 to 2040 Planned Growth

To develop the 2040 MTP network for use on this project, Kittelson added the 2035 Interim MTP projects to the 2013 base year network. However, to document the project no-build conditions, the 2035 Interim MTP projects not yet built or under construction in the study area were not added to the 2040 MTP No Build model roadway network:

- 107: Seward Hwy - O'Malley Rd to Dimond Blvd
- 211: Seward Hwy/ O'Malley Rd Interchange

Kittelson ran an additional no build model network with the Scooter Avenue interchange to test the impact of the crossing.

Year 2040 MTP No Build Model Results

Before developing the various project concepts, Kittelson reviewed the results from the Year 2040 MTP No Build model run. Screenline volume checks were conducted to make sure the forecasted results are reasonable based on comparison to existing counts, changes in future land use forecasts, engineering judgment, and verifying the output included no zero volume segments. Additionally, traffic volumes in the study area were reviewed and several network refinements were made, such as adding additional centroid connectors, to enhance the regional model's usefulness over the smaller study area. These model runs are summarized in Exhibits 10-13. While these raw daily model link volumes are valuable to estimate the shifts in future demand, Kittelson put the peak hour model volumes under additional scrutiny and adjusted for reasonableness when converted to intersection turning movements.

Exhibit 10. 2013 to 2040 Daily Traffic Volume Growth for the 2040 MTP No Build Scenario

Exhibit 10 shows the impacts of the forecasted growth on the Seward Highway. Additionally, the 76th Avenue interchange is forecast to reduce traffic volumes on Dimond Boulevard from 2013 to 2040. Exhibit 11 displays the daily traffic volume forecasts for the study area.

Exhibit 11. 2040 Daily Traffic Volume for the 2040 MTP No Build Scenario

Exhibit 12 shows the forecast 2040 MTP No Build Scenario volumes with the addition of the Scooter Avenue grade separation as previously designed including the existing southbound ramps. The shift in traffic volumes from O'Malley Road and Dimond Boulevard to Scooter Avenue is shown in Exhibit 13.

Exhibit 12. 2040 Daily Traffic Volume for the 2040 MTP No Build with Scooter Crossing Scenario

Exhibit 13. 2040 Daily Traffic Volume Change for the 2040 MTP No Build with Scooter Crossing Scenario

The 2040 MTP No Build model forecasts substantial traffic growth on the Seward Highway in the study area, including a doubling of daily volumes between 2016 and 2040 for the segment between Dimond Boulevard and 76th Avenue. The planned Seward to Glenn highway connection increases forecasted traffic on the Seward Highway in the study area. Exhibit 14 shows the historical Seward Highway daily traffic volumes from Exhibit 2 as a solid line with the forecast model volumes, shown in dashed lines. The forecasted volume growth, resulting from the local and regional assumed 2040 development in the AMATS model, is a change from the historical trends of steady or declining traffic volumes. These past trends reflect region-wide travel patterns as well recent north/south connections.

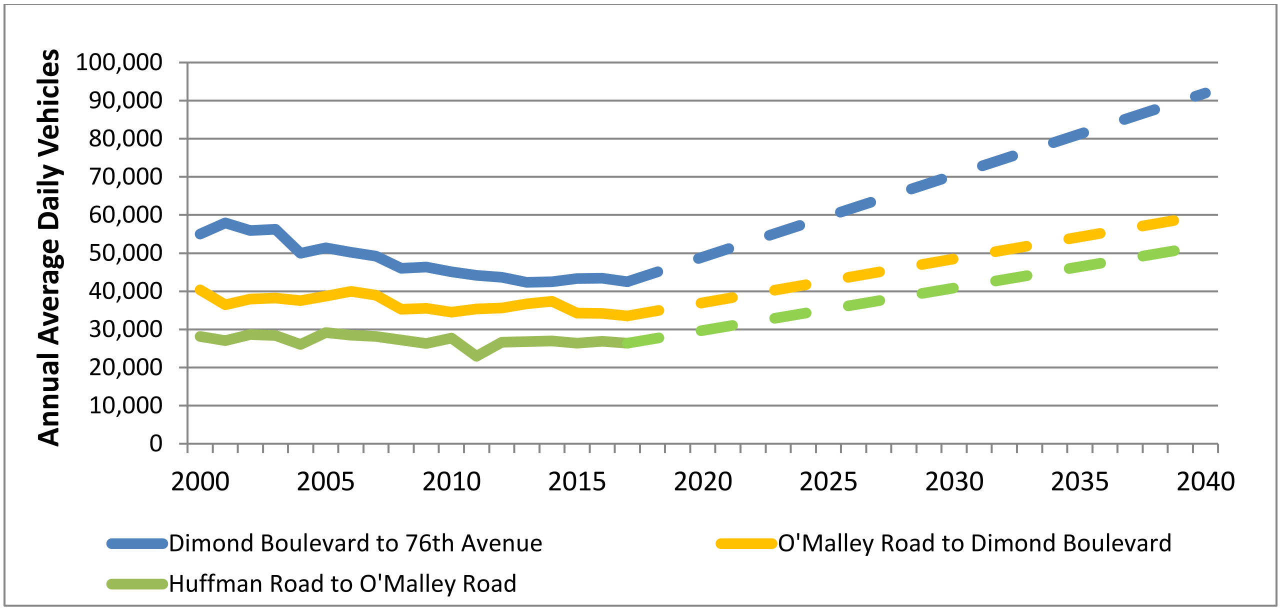


Exhibit 14. Historical and Forecasted Seward Highway Volumes (2000-2040)

CORRIDOR CONCEPT DEVELOPMENT

Three corridor access concepts were developed by the project team, DOT&PF staff, and MOA staff in the March 3, 2017 Corridor Planning Workshop. The ramp configurations and roadway network of these concepts formed the basis of the travel demand model networks for the 2040 traffic volumes forecast. The project team iterated through a range of interchange forms, arterial lane configurations, and ramp locations to evaluate and refine the initial three corridor concepts and develop the preferred concept. This concept underwent further iterations of traffic forecasting and interchange evaluation to arrive at the preferred interchange configurations to support the preferred corridor concept.

This section discusses all four corridor concepts, while the interchange operations and evaluation is presented in the following section.

Concept 1: Dimond Loop Ramp

This concept maintains the eastbound-to-northbound loop ramp at Dimond Boulevard, provides a southbound off ramp at Scooter Avenue, and a northbound off ramp at Dimond Boulevard, as shown in Exhibit 15.

Exhibit 15. Corridor Concept 1: Dimond Boulevard Loop Ramp (Source: Jacobs)

Concept 2: Dimond Boulevard Full Access

This concept includes a tight diamond interchange at Dimond Boulevard with a southbound on ramp and a northbound off ramp to Dimond Boulevard, as shown in Exhibit 16.

Exhibit 16. Corridor Concept 2: Dimond Boulevard Full Access (Source: Jacobs)

Concept 3: Scooter Avenue Full Access

This concept includes a tight diamond interchange at Dimond Boulevard with a southbound off ramp and a northbound on ramp to Scooter Avenue, as shown in Exhibit 17.

Exhibit 17. Corridor Concept 3: Scooter Full Access (Source: Jacobs)

Concept 4: Preferred Corridor Concept

As a result of the preliminary analysis and evaluation process documented in this report, these three corridor concepts were combined into a preferred corridor concept. This concept combines elements of Concepts 2 and 3 and includes a tight diamond interchange form at Dimond Boulevard, a southbound off ramp at Scooter Avenue and a northbound off ramp to Dimond Boulevard. A refined version of this concept, including diverging diamond interchanges (DDI) at Dimond Boulevard and O’Malley Road, is shown in Exhibit 18.

Exhibit 18. Preferred Corridor Concept (Source: Jacobs)

CORRIDOR CONCEPT MODELING

Future traffic volumes were developed via the AMATS 2040 travel demand model for the four corridor concepts. Kittelson modified the AMATS 2040 MTP No Build model to reflect each concept into a distinct roadway network by adjusting the ramp configurations, facility type, area type, speed and number of lanes. Turning prohibitions were also updated where applicable. The changes in

Seward Highway ramp configurations shifted traffic within the study area roadway network. The daily 2040 volumes for each corridor concept scenario are shown in the following exhibits.

Exhibit 19. Corridor Concept 1: Dimond Loop Ramp 2040 Daily Volumes

Exhibit 19 depicts Concept 1 2040 daily volumes. This concept has volumes similar to the 2040 MTP No Build with Scooter Crossing volumes shown in Exhibit 12.

Exhibit 20. Corridor Concept 2: Dimond Full Access 2040 Daily Volumes

Concept 2, with its full access to Seward Highway at Dimond Boulevard, shifts some vehicle traffic to Dimond Boulevard from Scooter Avenue compared to Concept 1, as shown in Exhibit 20.

Exhibit 21. Corridor Concept 3: Scooter Full Access 2040 Daily Volumes

Concept 3, shown in Exhibit 21, focuses traffic volumes on Scooter Avenue compared to Concepts 1 and 2.

Exhibit 22. Proposed Corridor Concept 2040 Daily Volumes

The preferred concept, shown in Exhibit 22, with its three Seward Highway ramps at both Scooter Avenue and Dimond Boulevard, distribute traffic volumes between the two roadways.

2040 Peak Hour Intersection Turning Movements

The AMATS Travel Demand Model provides AM peak 2-hour period link volumes and PM peak 3-hour period link volumes. To convert from the peak period link volumes to peak hour intersection turning movement and ramp volumes, Kittelson factored the link volumes to peak hour link volumes, then converted to peak hour turning movement volumes. The peak period to peak hour conversion factor for a.m. peak hour was 0.53 and 0.37 for the p.m. peak hour, based on the existing peak hour counts and the existing daily traffic counts. To translate the link volumes into the intersection turning movements, Kittelson applied the *Analytical Travel Forecasting Approaches for Project-Level Planning* *and Design* method as described in the Transportation Research Board (TRB)'s National Cooperative Highway Research Program (NCHRP) Report 765 (Reference 14). This method seeks to create intersection turning movements that balance model link volumes in and out of the intersection. Finally, Kittelson reviewed, adjusted, and balanced the resulting forecast 2040 peak hour turning movement volumes. Additional intersection volume adjustments were made to model each interchange form, such as assigning volumes to DDI movements.

Dimond Boulevard Forecast Volumes

The forecast 2040 traffic volumes indicate a substantial reduction of vehicle trips on Dimond Boulevard from existing volumes. This is supported by the following data:

- Dimond Boulevard volumes have been declining for more than 10 years, as shown in Exhibit 3.
- The Seward Highway currently funnels traffic to Dimond Boulevard. The nearest existing crossings are Dowling Road 1.5 miles to the north and O'Malley Road 1.5 miles to the south. New adjacent and parallel road projects are expected to reduce travel demand on Dimond Boulevard:
    - Dowling Road Extension (open during 2016 counts)
    - Scooter Avenue southbound ramps (0.5 miles south of Dimond Boulevard, opened after 2016 counts)
    - 76th Avenue crossing (0.5 miles north of Dimond Boulevard, under construction)
    - 100th Avenue Extension (under construction)
    - Scooter Avenue Interchange (0.5 miles south of Dimond Boulevard, proposed with this project)
- The additional crossings of the New Seward Highway near Dimond Boulevard are forecast to balance traffic demand as the total screenline volumes increased by over 40 percent from 2016 to 2040, as shown in Exhibit 23.

Based on coordination with DOT&PF and MOA staff, the 2040 peak hour turning movements at the Dimond Boulevard interchange used for the capacity analysis were an average of existing turning movements and those forecast by the 2040 travel demand model. These volumes result in a sensitivity analysis where less traffic is shifted from Dimond Boulevard.

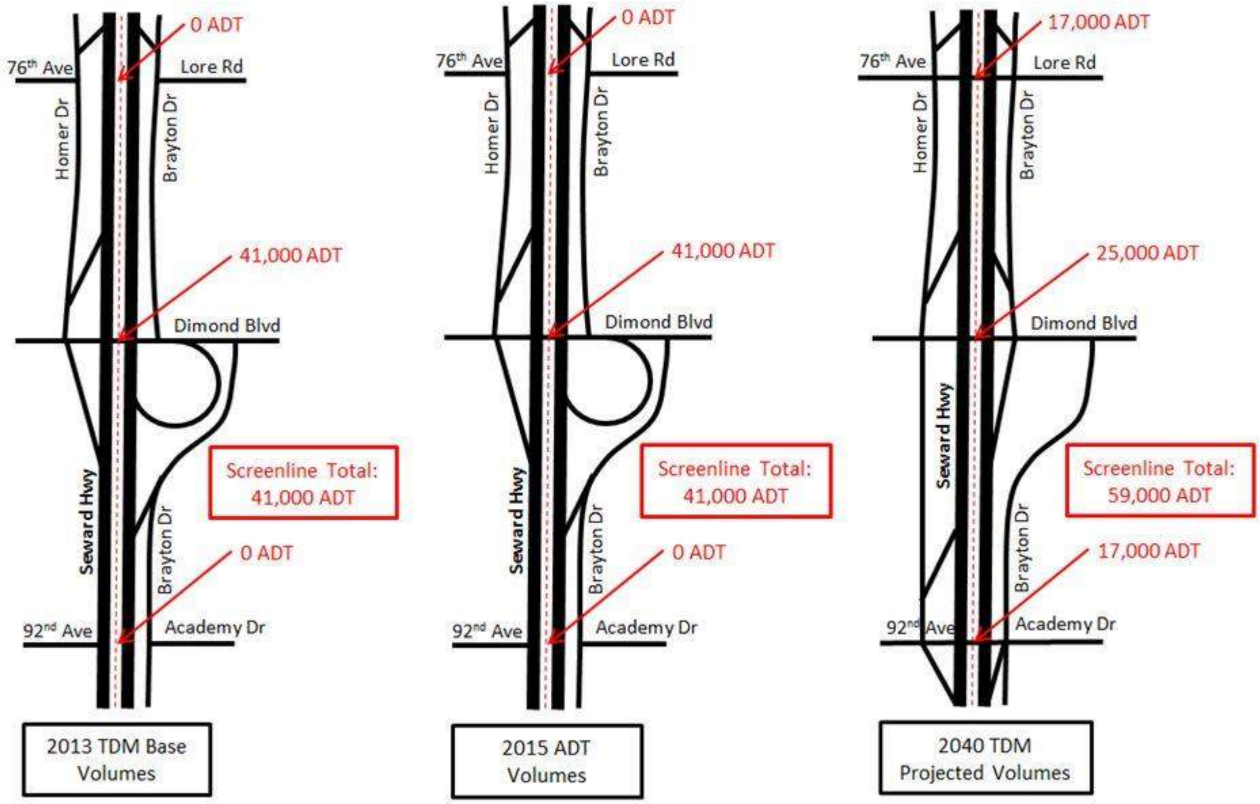


Exhibit 23. Seward Highway Screenline Daily Volumes

CONCEPT SCREENING

The project team collaborated through an iterative process with DOT&PF staff to:

1. Develop and refine interchange concepts for Dimond Boulevard, Scooter Avenue, and O'Malley Road under each corridor ramp configuration concept.
2. Evaluate and screen interchange concepts.
3. Develop preferred corridor concept.
4. Refine and select preferred interchange concepts.

Preliminary capacity analysis based on the 2040 peak hour turning movements was used to screen interchange forms for further analysis, leading to the preferred concept. For each concept, the lane configuration required to provide LOS C (or LOS D if LOS C was not feasible) was determined and evaluated by the project team.

The key evaluation goals and considerations for this concept screening phase were:

- Preserve existing overpass bridges at O'Malley Road and Dimond Boulevard.

- Maintain O'Malley Road access from the Seward Highway to stay within the scope of the environmental document. Preliminary analysis and other recent studies have not demonstrated a need for a higher order interchange at this location.
- Provide acceptable capacity and level of service for the study interchanges.
- Improve the safety performance and pedestrian and bicycle connectivity in the study area.

The following documents the interchange concepts considered and a summary of the screening results. Each interchange concept was applicable to one or more corridor concepts.

Further discussion of the corridor and interchange concept development, evaluation, and selection is included in the Design Study Report.

Dimond Boulevard Interchange

Four interchange concepts were developed and evaluated for the Dimond Boulevard interchange.

Existing Eastbound Loop Ramp (Concept 1)

This concept maintains the general configuration of the Dimond Boulevard interchange, including prohibiting the eastbound left turning onto northbound Brayton Drive/Seward Highway. This concept was eliminated from further consideration because of capacity and queuing concerns at the southbound ramp terminal intersection associated with the eastbound to northbound demand on the loop ramp. Additionally, the Dimond Boulevard overpass bridge would need to be widened.

Exhibit 24. Dimond Loop Ramp Concept (Source: Jacobs)

Single Point Diamond Interchange (Concepts 2 and 3)

The single point diamond form is a high capacity diamond form that routes ramp traffic and cross street traffic through a single signalized intersection under the overpass bridge. This concept was eliminated as width under the existing bridge was insufficient to provide the needed number of through and left-turn storage lanes.

Exhibit 25. Single Point Diamond Interchange Concept (Source: Jacobs)

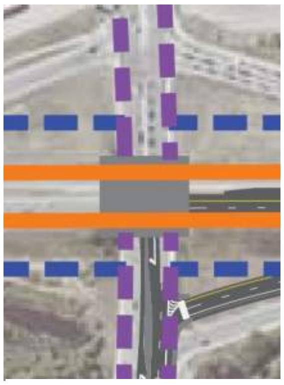


Exhibit 26: Tight Diamond Interchange Concept (Source: Jacobs)

Tight Diamond Interchange (Concepts 2 and 3)

A tight diamond interchange is a high capacity diamond interchange form. By bringing the ramp terminal intersections closer together and modifying the signal timing strategy, vehicles would queue on Dimond Boulevard east and west of the ramp terminal intersections instead of queuing between the two traffic signals. This concept was eliminated from further consideration because the dual eastbound left turn lanes required to serve the heavy traffic demand cannot be provided under the existing overpass bridge.

Diverging Diamond Interchange (Concepts 2, 3, and 4)

A Diverging Diamond Interchange (DDI) is a high capacity interchange form that simplifies signal phasing to two phases and provides free-flowing turning movements. Crossover intersections transpose vehicle travel directions between the two signalized ramp terminal intersections. This concept was selected as the preferred concept because:

- The DDI provides high capacity to efficiently serve the forecast traffic demand.
- The efficient traffic signal operation and five lane cross section under the existing bridge can accommodate vehicle traffic and bicycle and pedestrian facilities through the interchange.
- Improved vehicle safety performance over

Exhibit 27. Dimond Boulevard Diverging Diamond Interchange Concept (Source: Jacobs)

typical diamond interchange forms.

- While DDIs do not provide for ramp through movements or frontage road continuity at the interchange ramp terminals, emergency vehicle preemption, the southbound off ramp at Scooter Avenue, and the Sandlewood Place extension to Lore Road allow for effective circulation on the secondary road network under the preferred corridor concept.

The traffic operations, safety, and pedestrian and bicycle features of the interchange are described in more detail in following sections. A comprehensive description of the interchange forms and screening process is included in the design study report.

Scooter Avenue Interchange

There are two interchange ramp terminal intersection control options for the proposed Scooter Avenue interchange: tight diamond interchanges controlled by traffic signals or roundabouts.

Signalized Tight Diamond Interchange (Concept 1, 2, and 3)

A tight diamond interchange controlled by traffic signals was evaluated. However, as at Dimond Boulevard, the eastbound and westbound left-turn lanes required for efficient operation and queue storage required a wider bridge than the roundabout concept. This concept was ultimately eliminated for reasons beyond traffic operations.

Roundabout Tight Diamond Interchange (Concepts 1, 2, 3, and 4)

The forecast 2040 peak hour traffic volumes can be accommodated by a pair of multilane roundabouts as shown in Exhibit 28. This concept was selected as the preferred concept because:

- The roundabouts require a shorter overpass bridge length because of fewer required cross street lanes.
- Provides higher capacity than a traffic signal in the same footprint.
- Roundabouts result in 60 percent fewer injury crashes than comparable traffic signals.
- The intersections operate with lower delay than signalized terminals on a 24 hour basis.

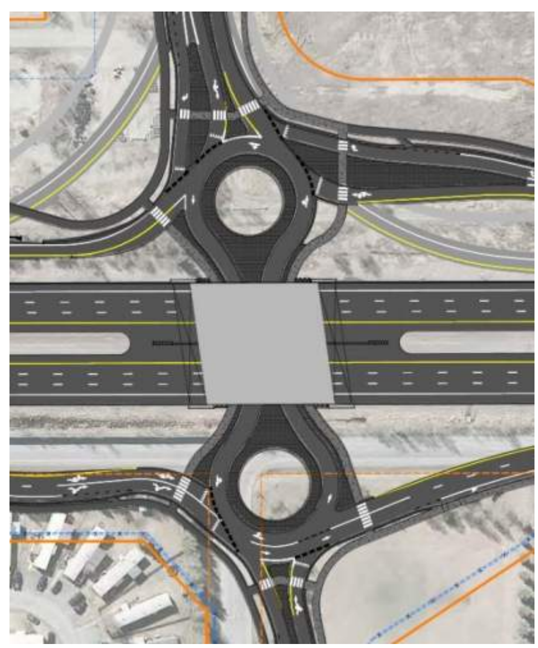


Exhibit 28. Scooter Avenue Roundabout Diamond Interchange Concept (Source: Jacobs)

O'Malley Road Interchange

Two interchange concepts were developed for the O'Malley Road interchange to improve the intersection operations while maintaining the existing overpass bridge and Seward Highway access.

Eastbound Dual Left-Turn Lanes (Concepts 1, 2, and 3)

In this concept, a second eastbound left-turn lane is added at the northbound ramp terminal on O'Malley Road to add capacity to the critical movement at the interchange. This treatment improves intersection operations, though eastbound left-turn delay and queue lengths remain marginal (LOS F, over 50 seconds of delay/vehicle, v/c of 0.84). As a result, this concept was eliminated from further consideration.

Diverging Diamond Interchange (Concepts 1, 2, 3, and 4)

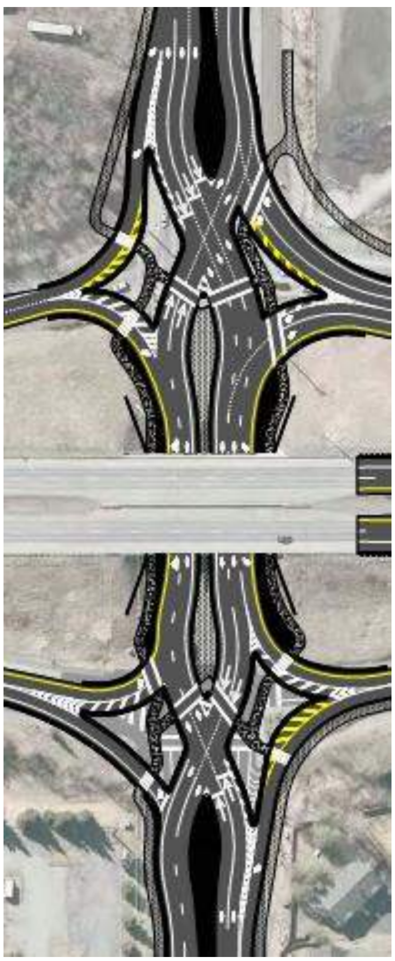


Exhibit 29. O'Malley Road Diverging Diamond Interchange Concept (Source: Jacobs)

As with Dimond Boulevard, a DDI provides numerous benefits including maintaining the existing overpass bridge. This concept was selected as the preferred concept because:

- The DDI provides high capacity to efficiently serve the forecast traffic demand.
- The bridge's existing five-lane crossing section can accommodate vehicle traffic and bicycle and pedestrian facilities through the interchange.
- Improved safety performance over typical diamond interchange forms.

Selection of a DDI would restrict frontage road continuity and eliminate direct access to Brayton Drive from northbound Seward Highway at O'Malley Road. Similarly, southbound through vehicles at any future Homer Drive extension could not be accommodated. A DDI complicates routing for oversize vehicles by-passing the overpass bridge and add circuitous vehicle routing for snow maintenance vehicles.

The traffic operations, safety, and pedestrian and bicycle features of the interchange are described in more detail in following sections.

Seward Highway Ramps and Mainline

A variety of ramp sequences were investigated to support freeway, interchange, and frontage road movements. The preferred Seward Highway ramps concept was selected to balance circulation and access needs and serve the highest demand flows while maximizing ramp spacing and reducing the effects of weaving.

- The southbound off ramp and northbound on ramp north of Dimond Boulevard were maintained.
- A southbound off ramp at Scooter Avenue provides the Scooter Avenue interchange direct access from the Seward Highway. Vehicles accessing southbound Seward Highway from Dimond Boulevard, which has lower demand, must traverse the Scooter Avenue southbound ramp terminal roundabout to use the Scooter Avenue southbound on ramp.
- The northbound on ramp at Dimond Boulevard was maintained to serve forecast demand. The spacing between Dimond Boulevard and Scooter Avenue does not provide sufficient distance to provide an off ramp to Brayton Drive.
- The southbound on ramp and northbound off ramp at Scooter Avenue meet ramp spacing principles.
- The O’Malley Road ramps were unchanged.

Mainline Seward Highway is proposed to be expanded to three basic lanes in each travel direction to:

- Ease merge and diverge movements at the new Scooter Avenue interchange ramps.
- Provide acceptable traffic operations. A two-lane southbound mainline is forecast to operate at LOS E between Dimond Boulevard and Scooter Avenue and at LOS D between Scooter Avenue and O’Malley Road under 2040 weekday p.m. peak hour conditions. These mainline segments operate at LOS C with a three-lane configuration.
- Provide continuity with the expanded six lane section between Dimond Boulevard and Dowling Road currently under construction.

PREFERRED CONCEPT EVALUATION

The project team evaluated and refined the preferred interchange concept under the preferred corridor concept, shown in Exhibit 18. The traffic operations, safety, and pedestrian and bicycle facilities were analyzed iteratively to inform the design process.

Intersection Traffic Operations

The future proposed lane configurations are shown in Figure 6. Figure 7 summarizes the forecast study intersection turning movement counts and operational results for the 2040 weekday a.m. and p.m. peak hour traffic conditions. Kittelson made the following assumptions to signal timing to reflect changes in vehicular volumes likely to occur before year 2040:

- Peak period cycle lengths at the two DDIs are 80 seconds to provide half-cycle coordination with adjacent Old Seward Highway intersections and capture the benefits of two-phase signals.

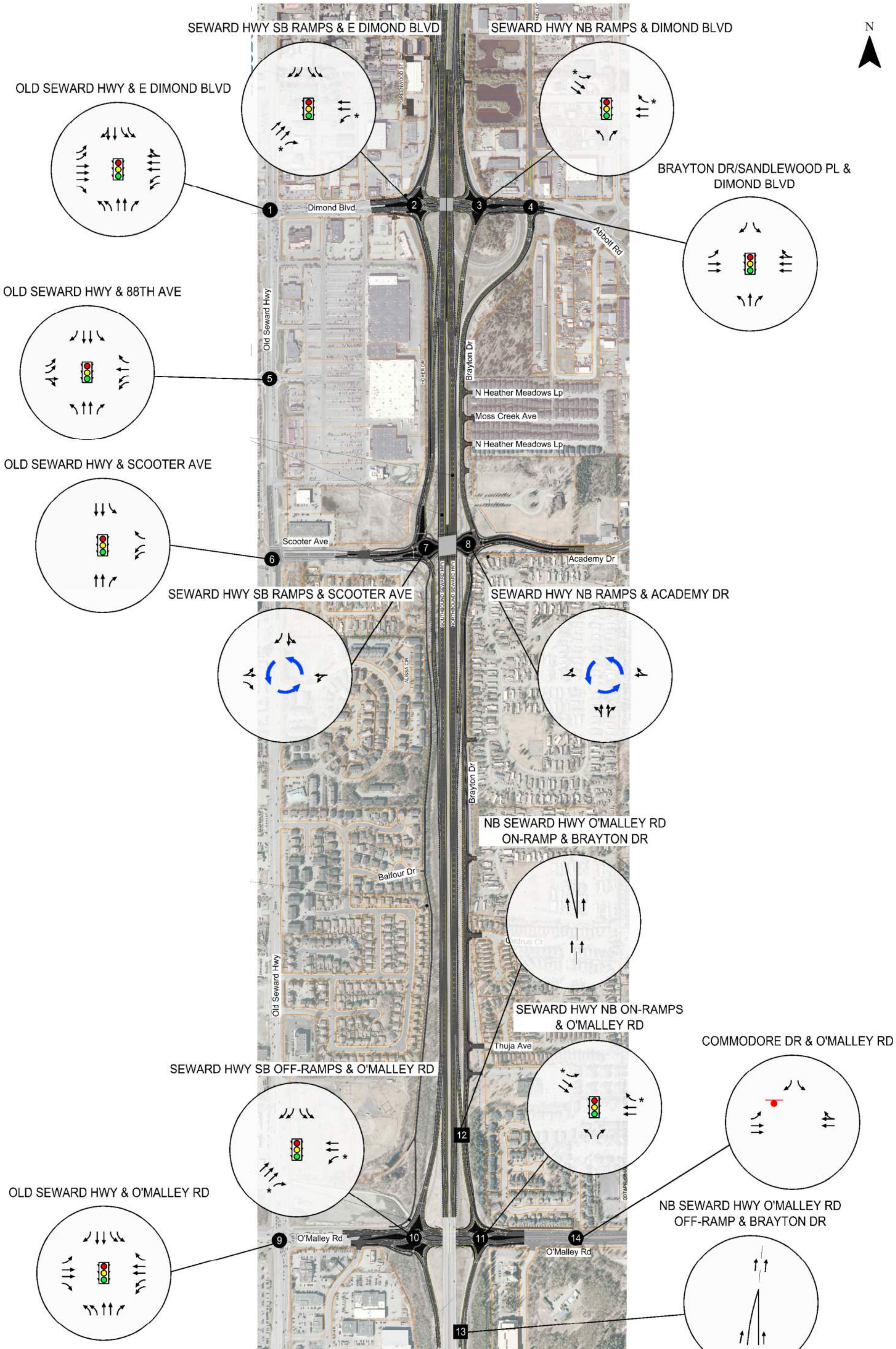
- Right- and left-turn-on-red will be prohibited at the two DDIs to minimize weaving issues downstream of the signal, respond to potential driver expectancy issues as vehicles will be approaching from an atypical direction, and due to restricted sight distance by the center walkway barrier.

- The Sandlewood Place/Dimond Boulevard intersection will use 80 second cycles to coordinate with the Dimond Boulevard DDI. To enable this, north/south left turns operate under permissive phasing and north/south pedestrians cross in two stages, per MOA direction.

- The signal cycle and length at the 88th Avenue and Old Seward Highway intersection was lengthened from 101 second cycle, actuated/uncoordinated “free” existing operations to 135 seconds during the p.m. peak hour. The change results in LOS D operations.

- The cycle length of the new intersection at Scooter Avenue and Old Seward Highway intersection is 90 seconds. The intersection operates under capacity and at LOS C. Kittelson recommends further signal timing refinements be made with the possibility of coordinating with the signal at 88th Avenue/Old Seward Highway a ¼-mile to the north.

The Alternative 4 hybrid volumes were coded into the synchro model for the PM peak hour using the signal timing provided by City of Anchorage. A corresponding VISSIM model was created for the same scenario, but a visual inspection of several runs of the VISSIM model revealed queue spillback in both directions of Dimond Boulevard between the interchange ramps and the Sandlewood Place/Brayton Drive intersection. One attributing factor to these issues was the four-phase operation at the Sandlewood Place/Brayton Drive intersection, which requires a longer cycle length than the interchange ramps to serve all phases. The queuing issues were mitigated by adjusting the signal timing at the interchange ramps and modifying the geometry and signal phasing at the Sandlewood Place/Brayton Drive intersection to run concurrent permissive left turn phasing northbound and southbound. The Synchro model was then updated to reflect these revisions.



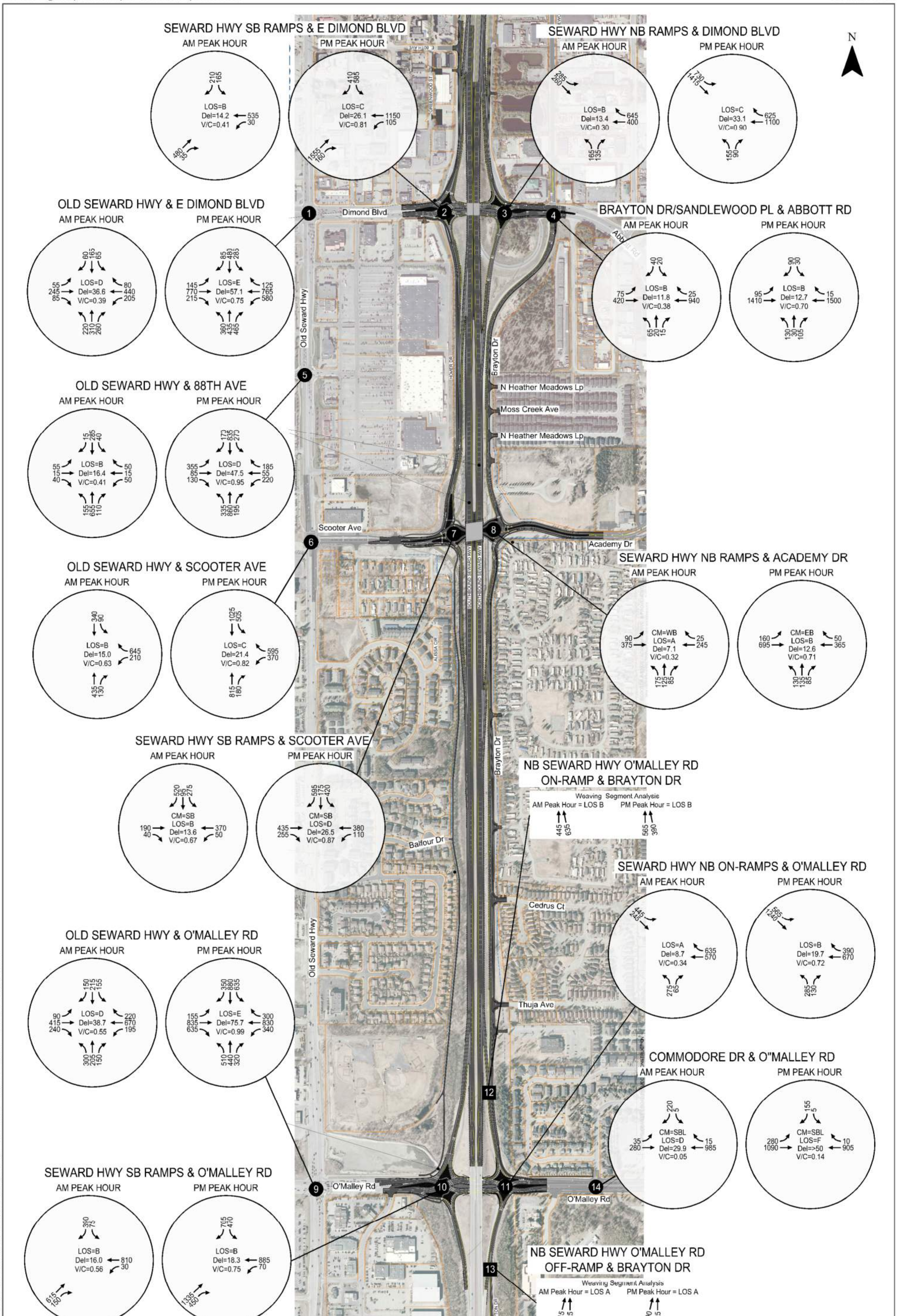
Note: * Denotes a free turning movement not associated with the traffic signal's operations.

LEGEND

- \# - Study Intersection
- \# - Study Junction
- Study Merge/Diverge Segment
- Stop Sign
- Traffic Signal
- Multilane Roundabout

Preferred Alternative Lane Configurations and Traffic Control Devices
Anchorage, Alaska

Figure 6



LEGEND

CM = CRITICAL MOVEMENT (UNSIGNALIZED)
LOS = INTERSECTION LEVEL OF SERVICE (SIGNALIZED)/CRITICAL MOVEMENT LEVEL OF SERVICE (UNSIGNALIZED)
Del = INTERSECTION AVERAGE CONTROL DELAY (SIGNALIZED)/CRITICAL MOVEMENT CONTROL DELAY (UNSIGNALIZED)
V/C = CRITICAL VOLUME-TO-CAPACITY RATIO

\# - Study Intersection
\# - Study Junction

Preferred Alternative Future Traffic Conditions
Weekday AM and PM Peak Hour
Anchorage, Alaska

Figure 7

Ramp terminal intersections operate at LOS C or better under the proposed improvements. Traffic operations at the DDIs were reported as two intersections each, combining the movement delay across the separate signal-controlled intersections. This approach captures all movements through the DDI and makes the DDI operations results comparable with other interchange intersection types.

- **Seward Highway & Dimond Boulevard** operates at LOS C or better during the 2040 weekday a.m. and p.m. peak hours under the DDI configuration. This configuration efficiently serves the heavy eastbound-to-northbound movement.
- **Seward Highway & Scooter Avenue** operates at LOS B or better during the 2040 weekday a.m. and p.m. peak hours with the single-lane roundabout diamond interchange. The roundabouts provide adequate capacity for all movements, however, the critical movement of the southbound through vehicles accessing Seward Highway from Dimond Boulevard is expected to operate at LOS D during the p.m. peak hour.
- **Seward Highway NB On-Ramp & O'Malley Boulevard** operates at LOS B or better during the 2040 a.m. and p.m. peak hours. The DDI reduces the delay associated with the eastbound-to-northbound movement.

Some of the study intersections adjacent to the redesigned interchanges are forecast to continue to operate worse than LOS C as follows:

- **Old Seward Highway & E Dimond Boulevard** continues to operate at LOS E with a v/c ratio of 0.68 during the 2040 weekday p.m. peak hour. While overall vehicle volume is reduced, particularly on Dimond Boulevard, the northbound left turn demand is forecast to increase. Overall, the average vehicle delay increases by three seconds while the v/c ratio decreases.
- **Old Seward Highway & 88th Avenue** continues to operate at LOS D during the 2040 weekday p.m. peak hour. While volumes have shifted with the Scooter Avenue interchange, this intersection is forecast to continue to have high turning movement demand.
- **Old Seward Highway & O'Malley Road** continues to operate at LOS D and E during the 2040 weekday a.m. and p.m. peak hours, respectively with the small forecast increase in peak hour demand.
- **Commodore Drive & O'Malley Road** has a critical movement at the southbound left-turn that operates at LOS D during the weekday a.m. peak hour and LOS F and a v/c ratio of greater than 1.0 during the weekday p.m. peak hour. This is the same as the existing conditions. The forecast demand for this movement is less than 10 vehicles based on both existing counts and forecast volumes. The 155 forecast right turns operate at LOS C during 2040 weekday p.m. peak hour conditions.

Appendix 6 includes the traffic operation worksheets for the year 2040 traffic conditions scenarios.

Additional operational concerns are being resolved in conjunction with relevant DOT&PF and MOA agencies:

- Emergency vehicles from Fire Station 12 on Homer Drive north of Dimond Boulevard will be accommodated at the DDI via signal preemption and an authorized vehicle only cut-through that allows them to continue south through the west crossover at the Dimond DDI.
- The project team has been in coordination with DOT&PF maintenance to best provide for their operational needs, include snow storage and vehicle routing.

95th Percentile Queuing Analysis

Kittelson assessed the 95th percentile queues at each of the study intersections with volumes from the preferred concept scenario for peak 2040 forecasts. The 95th percentile queue lengths, calculated using Synchro 9, represent the worst-case queue that would be expected to be exceeded 5 percent of the time during the peak 15 minutes of the peak hour. Kittelson rounded queue lengths up to the nearest 25 feet, assuming each vehicle uses 25 feet of space. Table 2 summarizes the 95th percentile queue lengths at the each of the signalized study intersections. The bold text and highlighted cells indicate 95th percentile queues that equal or exceed the existing storage length during the p.m. peak hour.

Table 3. Future Year 2040 95th Percentile Queues

Study Ramp Terminals	Peak Period	95th Percentile Queue Lengths (ft)[1]							
		EBL	EBR	WBL	WBR	NBL	NBR	SBL	SBR
1. Old Seward Hwy & E Dimond Blvd	Storage Length[2]	285	435	375	-	360	200	225	-
	AM Peak	50	0	100	-	125	75	50	-
	PM Peak	75	75	275	-	250	275	125	-
2. Seward Hwy SB Ramps & E Dimond Blvd	Storage Length[3]	-	-	-	-	-	-	125	125
	AM Peak	-	-	-	-	-	-	25	25
	PM Peak	-	-	-	-	-	-	125	125
3. Seward Hwy NB Ramps & Dimond Blvd	Storage Length[3]	-	-	-	-	525	535	-	-
	AM Peak	-	-	-	-	25	25	-	-
	PM Peak	-	-	-	-	75	50	-	-
4. Sandlewood Pl & Dimond Blvd/Brayton Rd	Storage Length[3]	165	-	-	-	-	-	75	-
	AM Peak	100	-	-	-	-	-	50	-
	PM Peak	150	-	-	-	-	-	75	-
5. Old Seward Hwy & 88th Ave	Storage Length[2]	150	-	150	-	410	410	350	100
	AM Peak	50	-	50	-	100	25	50	0
	PM Peak	**250**	-	125	-	**425**	50	325	**100**
7. Old Seward Hwy & Scooter Ave	Storage Length[3]	-	-	400	-	-	250	425	-
	AM Peak	-	-	50	-	-	50	50	-
	PM Peak	-	-	125	-	-	50	350	-
9. Old Seward Hwy & O'Malley Rd	Storage Length[2]	560	-	370	-	390	300	315	550
	AM Peak	125	-	125	-	150	25	100	25
	PM Peak	275	-	250	-	350	150	**400**	225
10. Seward Hwy SB Ramps & O'Malley Rd	Storage Length[3]	-	-	-	-	-	-	300	325
	AM Peak	-	-	-	-	-	-	0	75
	PM Peak	-	-	-	-	-	-	125	175
11. Seward Hwy NB/Brayton Rd & O'Malley Rd	Storage Length[3]	-	-	-	-	175	200	-	-
	AM Peak	-	-	-	-	75	25	-	-
	PM Peak	-	-	-	-	100	25	-	-

Notes: [1] 95th percentile queues were rounded up to the nearest 25 feet, one vehicle represents 25 feet; [2] Storage lengths were reported where applicable at the respective intersection; [3] Storage lengths were estimated based on concept design of the preferred concept at the respective intersection; **Bold** and highlighted cells indicate 95th percentile queues at or exceeding existing storage length.

The proposed interchange and ramps modifications are forecast to address the queueing issues at the Dimond Boulevard and O'Malley Boulevard ramp terminal intersections observed and calculated under existing conditions. Listed below are locations were 95th percentile queue lengths equal or exceed the existing storage available during the p.m. peak hour :

- **Old Seward Highway & 88th Avenue:** the expected eastbound left-turns queue of 250 feet exceeds the 150 feet of storage during the p.m. peak hour. The northbound left-turn is expected to operate at or near capacity with a v/c ratio of 0.95, resulting in the queue nearing or exceeding its storage length during the p.m. peak hour. Additionally, site observations revealed the southbound left-turn queue exceeds available storage. Future conditions confirm that the southbound left-turn's 95th percentile queue length will be near or greater than the available storage length. Queueing at this intersection is subject to future traffic shifts and integration with the planned Scooter Avenue traffic signal.
- **Old Seward Highway & O'Malley Road:** the southbound left-turn's expected 95th percentile queue of 400 feet exceeds the 315 feet of storage during the p.m. peak hour.

Appendix 7 includes Synchro 9 queue reports at each study intersection.

Freeway Traffic Operations

Freeway and ramp volumes were developed from the 2040 peak hour link volumes extracted from the travel demand model. The 2040 forecast ramp and freeway operation results are displayed in Figure 8. Appendix 8 includes the operation worksheets for the ramp and freeway analyses.

AM and PM Merge and Diverge Operations

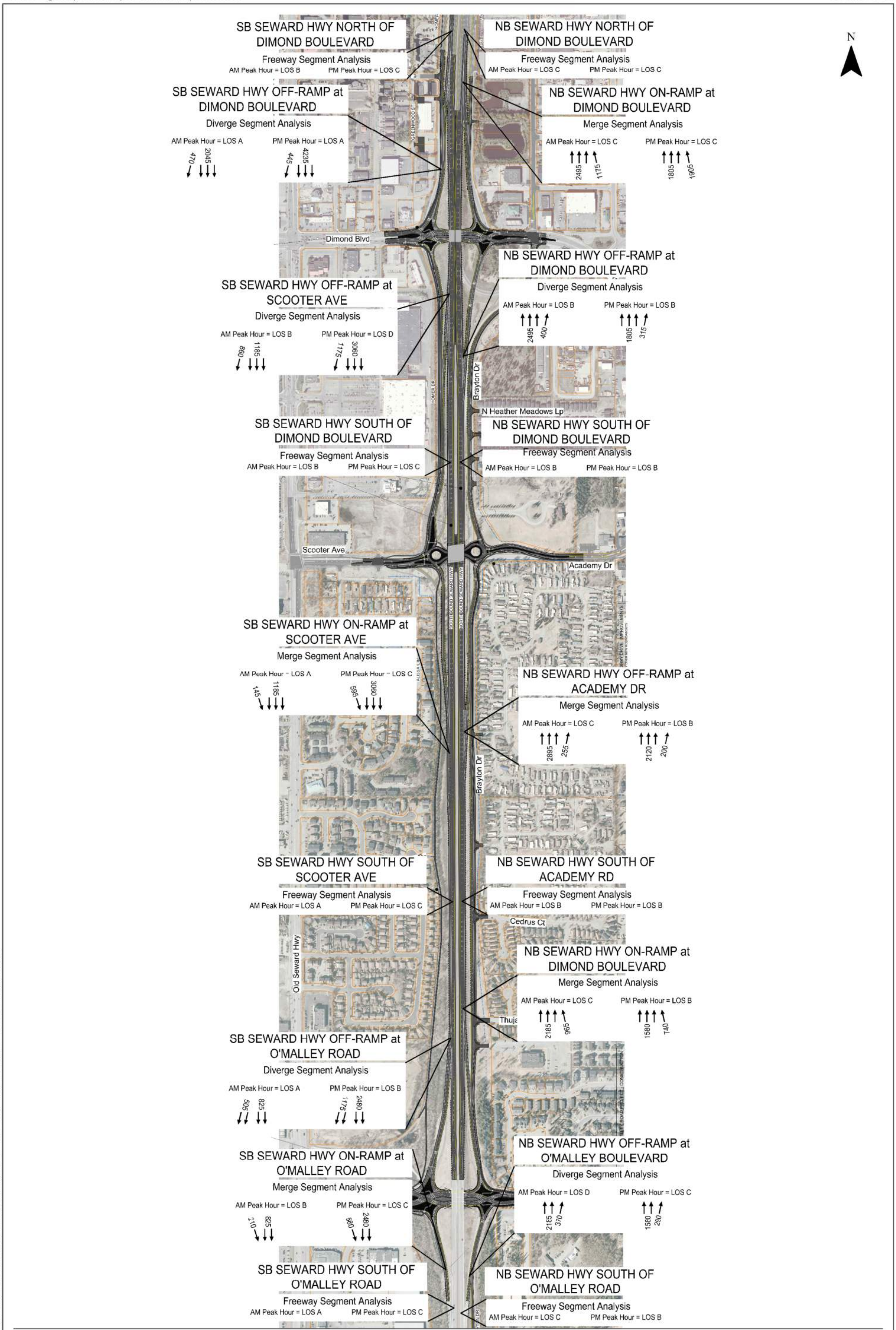
The study merge and diverge segments include ramps at the Dimond Boulevard and O'Malley Road interchanges. Ramp operations are improved because the additional interchange at Scooter Avenue shifts traffic flows and adding a third mainline Seward Highway lane in each direction decreases freeway per lane volumes. Under 2040 conditions, no merge segments operate below LOS C. The proposed ramp lengths and parallel ramp design offer additional acceleration distance beyond the existing taper ramp configuration.

Because of directional peaking characteristics of the Seward Highway, the following diverge segments are worse than LOS C under forecast 2040 conditions:

- SB Off-Ramp at Scooter Avenue operates at LOS D during the p.m. peak hour. This is an improvement over the existing LOS E at Dimond Boulevard, which is forecast to operate at LOS A.
- NB Off-Ramp at O'Malley Road operates at LOS D during the a.m. peak hour.

Existing AM and PM Freeway Segment Operations

With the proposed six-lane Seward Highway cross section, all segments in the study area are forecast to operate at LOS C or better during the 2040 weekday a.m. and p.m. peak hours.



Preferred Alternative Ramp and Freeway Segment Traffic Conditions
Weekday AM and PM Peak Hour
Anchorage, Alaska

Figure 8

Future Safety Evaluation

The proposed mainline Seward Highway and interchange changes are expected to have a number of safety performance benefits.

- **Dimond Boulevard and O’Malley Road DDIs**: DDIs reduce vehicle conflict points from 26 to 14. The FHWA Crash Modification Clearinghouse (Reference 15) CMF 6894 indicates that converting signalized diamond interchanges to DDIs reduces interchange crashes by 56 percent with a standard error of 2.8 percent. This configuration is expected to reduce the above average crash rate reported at the Seward Hwy NB Ramp Terminus/O’Malley Road intersection.
- **Scooter Avenue Crossing**: This proposed crossing, along with the 76th Avenue interchange currently under construction, is forecast to balance vehicle traffic, shifting vehicles from congested Dimond Boulevard and, to a lesser degree, O’Malley Road. These crossings are expected to shorten vehicle trips and exposure and route vehicles away from current high-crash locations. This crossing also establishes a more efficient pedestrian route across the Seward Highway, likely to reduce prohibited at-grade pedestrian freeway crossings.
- **Scooter Avenue Roundabouts**: Per DOT&PF’s *Highway Safety Improvement Program Handbook,* the proposed roundabouts are expected to result in 30 to 75 percent fewer crashes as compared to signalized ramp terminal intersections. This treatment is expected to address the above average crash rate at the Brayton Drive/Academy Drive intersection.

Pedestrian and Bicycle Evaluation

The proposed interchange configuration will reconstruct and/or address some of the key existing pedestrian and bicyclist connectivity issues identified in Figure 5 and the accompanying text.

- The Scooter Avenue interchange will provide paths under the Seward Highway and connect to Scooter Avenue at Old Seward Highway and Abbott Road at Vanguard Drive, reducing the barrier of the Seward Highway to east/west travel. This will reduce pedestrian and bicycle travel distances, address Seward Highway crossings at grade, and reduce the number of pedestrian and bicycle crashes along Dimond Boulevard.
- Bicycle lanes and a continuous sidewalk/path are proposed for Brayton Drive between Dimond Boulevard and O’Malley Drive to fill in a missing connection on the east side of Seward Highway. The pathways also eliminate the need for bicycle travel in the roadway against the flow of traffic and serve a broader array of users than the existing facilities.
- The multiuse path along the west side of the Seward Highway will directly connect to O’Malley Road.
- The reduced need for travel and turn lanes under the bridges over Dimond Boulevard and O’Malley Road allow more space to be allocated to improving the width, condition, and

separation of pedestrian and bicycle facilitates through the interchange. The design team is seeking to make the DDI pedestrian facilities as appealing as possible, including avoiding sunken pathways.

- Pedestrian crossings will be provided for all directions at each of the three interchanges.
- Transit vehicles will have less delay traveling along Dimond Boulevard compared to existing conditions.

Diverging Diamond Interchanges provide a number of benefits to pedestrians and bicyclists using the sidewalks or paths compared to existing conditions. Intersections and ramps crossings consist of three or fewer lanes at a time. Signalized crossings have short two-phase cycles, which reduce pedestrian wait times compared to traditional diamond forms. Pedestrians use a two stage crossing and cross one direction at a time. Both DDIs will accommodate pedestrians and bicyclists via a 10-foot minimum central walkway between the travel directions, accessed via crossings as shown in Exhibit 30. The two right-turning on-ramp movements will be uncontrolled and include marked crosswalks and the remaining crossings will be signal controlled.

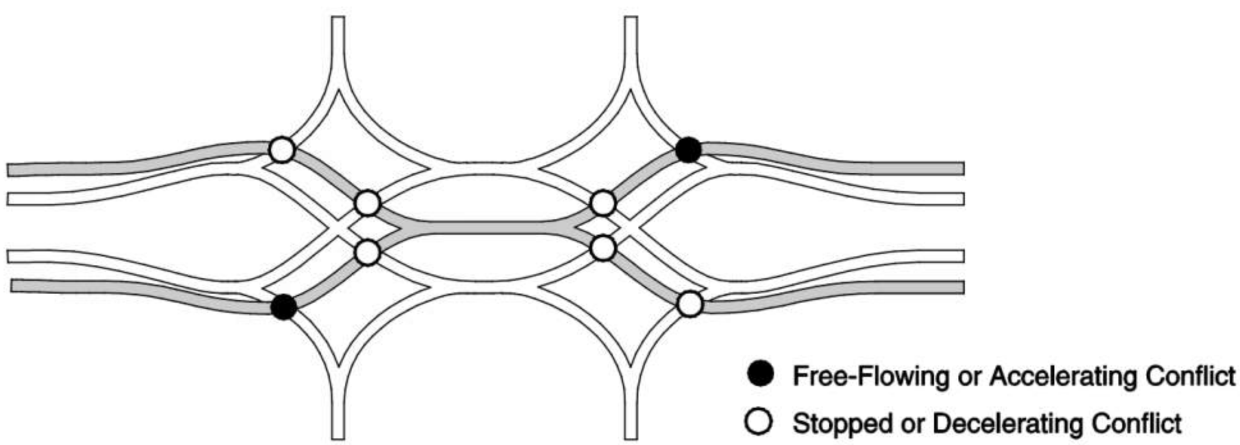


Exhibit 30. Pedestrian-Vehicle Conflicts with Center Walkway (Source: Reference 17)

Similar to the existing diamond interchanges, DDI configurations require pedestrians and bicyclists to cross uncontrolled ramps. The total number of crossings is greater than a conventional diamond interchange, though as noted each crossing is shorter than typical diamond interchange crosswalks. Depending on the movement and signal timing, the total time to cross through the interchange may increase from the existing conditions. Based on an 80-second signal cycle, average wait time per crossing is approximately 20 seconds per crossing, or approximately 80 seconds to travel the four crossings required to cross through the DDI from east to west or north to south, and vice versa. Actual wait time varies between zero delay when pedestrians arrive on the WALK indication, to approximately 50 seconds when arriving at the beginning of FLASH DON'T WALK. To minimize pedestrian delay, the project team recommends WALK times be as long as possible within the parameters of the phasing splits.

Additionally, vehicular traffic may be approaching the crosswalk from an unexpected direction at the cross overs. The roadway at these cross overs are designed to manage vehicle speed, crossing distance, pedestrian visibility, and truck movements.

Pedestrian crossing enhancements, such as crossing beacons and Accessible Pedestrian Signal features, were considered by the project team at the unsignalized crossings at the DDIs and the roundabouts to provide better driver yielding compliance and serve the wayfinding and crossing needs of the visually impaired. Per agency direction, crossing treatments beyond crosswalk markings and signage will be evaluated upon project completion and actual interchange operations can be observed and documented.

DDIs can also accommodate bicycle lanes through the crossovers. The O’Malley Road DDI transitions from a shoulder west of the Seward Highway to the existing bicycle lane to the east of the interchange. Cyclists can also access the pathways and cross the DDI as a pedestrian.

CONCLUSION

The proposed Seward Highway expansion, new Scooter Avenue interchange, and DDI conversions at Dimond Boulevard and O’Malley Road are forecast to improve the traffic operations, safety performance, and nonmotorized travel at the study intersections compared to existing conditions at the existing roadways.

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