Appendix F. Forecasts

Introduction

The purpose of this memo is to establish traffic volume forecasts for the major roadways within the Auke Bay Corridor Study. The study area includes Glacier Highway between the Ferry Terminal and Fritz Cove Road, Mendenhall Loop Road from Glacier Highway to past the University of Alaska Southeast entrance, and approaches of minor cross-streets within the project study limits.

The Design Year is 2029 for this study.

Past Work and References

> Table A1, Appendix A, of the *Juneau Access Environmental Impact Statement*, State of Alaska Department of Transportation and Public Facilities (DOT&PF), (copy of table provided by DOT&PF);
> *Southeast Area Transportation Plan* (SATP), 1999, KJS and Associates for DOT&PF;
> *Juneau Area Wide Transportation Plan* (AWTP), 2001, Kittelson and Associates for City and Borough of Juneau (CBJ);
> *Southeast Region Traffic and Report* and web-based AADT maps for years 1994 to 2001;
> *Managerial Statistics,* Albright-Winston-Zappe, Duxbury, 2000;
> *Trip Generation, 6th Edition,* Institute of Transportation Engineers;
> Unpublished work on the Port of Anchorage Intermodal Marine Facility;
> DOT&PF, Department of Labor, Department of Community and Economic Development web sites;
> *University of Alaska Southeast Campus Facilities Master Plan*, February 2002, Cunningham Group for UAS; and
> U.S. Census web site.

Past Traffic Volumes

The Department has published AADT maps for the Juneau area. The most current 5 years between 1997 and 2001 are posted on their web site. The project team obtained 1994 to 1996 AADT maps from the Department's Southeast Region Offices. Table 2 summarizes past Glacier Highway AADT within the project study area.

Year	Between → →	Auke Bay Ferry Terminal / Auke Nu Drive	Auke Nu Drive / Harbor Drive/ Auke Bay Float Road	Harbor Drive/ Auke Bay Float Road / Fritz Cove Road	Fritz Cove Road / Engineers Cut-Off Road
1994		3,900	5,200	8,000	10,000
1995		4,010	5,390	8,320	10,200
1996		4,010	5,360	8,420	10,240
1997		4,014	5,485	9,096	11,640
1998		4,126	5,590	7,804	11,853
1999		3,986	5,460	7,684	11,743
2000		4,097	5,612	7,863	11,743
2001		4,117	5,668	7,977	12,013
1994 to 2001 Growth Rate (%/Year)		0.78%	1.24%	-0.04%	2.65%
Weighted Average		1.40%			

Table 2 - Glacier Highway 1994 to 2001 AADT

Table 3 summarizes other significant roadway AADT within the study area.

Year	Fritz Cove Road Approach To Glacier Highway	College Road- UAS South Entrance	College Road- UAS North Entrance	Mendenhall Loop Road- Glacier Highway To UAS Entrance	Mendenhall Loop Road, East Of UAS Entrance	Harbor Drive/ Auke Bay Float Road
1994	1,300	1,700	700	no data	1,700	1,400
1995	1,320	1,220	540	no data	1,510	2,540
1996	1,320	790	540	1,650	1,790	850
1997	1,316	1,728	543	2,121	1,955	850
1998	1,316	1,728	661	2,121	1,955	850
1999	1,316	1,728	661	2,121	1,915	850
2000	1,352	1,525	661	2,121	2,048	850
2001	1,352	1,525	661	2,121	2,352	850
1994 to 2001 Growth Rate (%/Year)						
	0.56%	-1.54%	-0.82%	5.15%	4.75%	-6.88%
Weighted Average	1.59%					

Table 3 - Study Area Roadway AADT, 1994 to 2001

Vehicle classification observations in the 1990s show about 4% trucks within the project limits. There are permanent traffic recorders at 16 Mile Glacier Highway, and 3 Mile Egan Drive that show the average peak hour to be about 9% of the AADT volumes (1999 *Southeast Region Traffic and Safety Report*). The 30th highest volume, normally the time of concern for design, was about 15% of the 1999 AADT. Since Table 2 shows slow growth in segment volumes,

these peak hour and design hour percentages would probably hold through 2001, and should be valid for future growth as well.

Results of Past Studies and Plans

The SATP did not address area AADT. The AWTP prepared evening peak hour forecasts for Juneau, which were presented in Figures 9A, 9B, and 9C of the plan. The AWTP documents that were downloaded from the CBJ web site did not have these figures included. A progress document, titled No Build Analysis was found on the consultant's web site, www.kittelson.com/juneauawtp/fid.htm, which contained 2020 evening peak hour volumes. These were forecasted using a 1.5% per year growth rate based on a two-decade trend area traffic growth of 2% per year, and population growth of 1% per year. This is a valid approach for the CBJ as a whole (the subject matter of the plan), and agrees very well with the compound growth rates for roadway segments shown in Tables 2 and 3 (weighted averages). In summary, the No Build Analysis memo shows:

  ➢ Ferry Terminal to Mendenhall Loop Road forecasts a 2020 pm peak volume of about 400 vehicles per hour (vph).
  ➢ Between Mendenhall Loop Road and Fritz Cove Road, the pm peak hour volume in 2020 is shown to be about 1,500 vph.
  ➢ Between Fritz Cove Road and Engineer's Cutoff Road , the forecasted 2020 pm peak hour is about 1,800 vph.
  ➢ Mendenhall Loop Road to the north of the UAS north entrance (College Road) has a 2020 pm peak hour volume of about 1,000 vph.
  ➢ The peak hour splits (inbound vs. outbound) is about 70/30 for the Glacier Highway segment between Mendenhall Loop Road and the Ferry Terminal, about 55/45 for the Glacier Highway segment between Mendenhall Loop and Engineer's Cutoff, and about 60/40 for Mendenhall Loop Road.
  ➢ An area-wide growth rate of 1.5% per year.

Method of Study

Two methods of forecasting are used for this study.

  ➢ Time Series Forecast - This method establishes the past trend for growth over time and extrapolates that trend line into the future.
  ➢ Multiple Variable Regression - In this method, traffic growth is determined from other demographic and economic variables. Several of the variables have future forecasts developed. Functional relationships of AADT, as the dependent variable, and employment, population, and university enrollment are determined through multiple variable stepwise regressions. Stepwise regression will eliminate independent variables that have insignificant influence on AADT. Future AADT can be computed by inputting the forecasted demographic and economic values into the regression equation.

Extraordinary development or traffic patterns that would be outside of the forecast relationships are considered separately. An example of this is the traffic generated by a road connection from Juneau to Skagway.

Segment AADT History and Extrapolation (Time Series)

2029 ADT 21,100

AADT = 315.81(Year) - 619651
R^2 = 0.8011, Good Fit

AADT = -70.786(Year) + 149540
R^2 = 0.1433, Poor- Not useable

2029 AADT 7,200

AADT = 57.036(Year) - 108458
R^2 = 0.8256, Good Fit

2029 AADT 4,900

AADT = 23.738(Year) - 43384
R^2 = 0.5756, Acceptable Fit

AADT (y-axis): 2,000 – 22,000

Year (x-axis): 1992 – 2028

Legend:
- Auke Bay Ferry Terminal to Auke Nu Drive
- Auke Nu Drive to Harbor Drive/ Auke Bay Float Road
- Harbor Drive/ Auke Bay Float Road to Fritz Cove Road
- Fritz Cove Road to Engineers Cut-Off Road
- Linear (Auke Bay Ferry Terminal to Auke Nu Drive)
- Linear (Auke Nu Drive to Harbor Drive/ Auke Bay Float Road)
- Linear (Harbor Drive/ Auke Bay Float Road to Fritz Cove Road)
- Linear (Fritz Cove Road to Engineers Cut-Off Road)

Figure 1 - AADT Time Series Forecasts

Time Series Forecast Method

Figure 1 presents the time series trend lines for segments within the project area. The trend lines shown are the best-fit relationships of those reviewed, including straight line, power, exponential, and polynomial functions.

The roadway segment between Harbor Drive/Auk Bay Float Road to Fritz Cove Road has a negative sloping trend line between 1994 and 2001, whereas the other segments show a increase in traffic over the past 8 years. This is not explained well by those data, the area it serves, nor the adjoining roadway segments. As such, it appears that these data may be erroneous and would not be applicable in this segment forecast.

The graph shows that the trend line extrapolation for the segments yields a 2029 AADT of 4,900 for the Ferry Terminal to Auke Nu Drive segment, 7,200 for the Auke Nu Drive to Harbor Drive/Auke Bay Float Road, and 21,100 for the Fritz Cove Road to Engineer's Cut-Off Road. The Harbor Drive/Auke Bay Float Road to Fritz Cove Road segment is not defined by a time-series extrapolation model, but is estimated to be about the average of the adjoining segments, or a 2029 AADT of 14,000.

Figure 1 shows than the past traffic growth trend line is best represented in a straight line, or as a uniform gradient (a constant increase in AADT per year), rather than the geometric growth (% per year increase). With the geometric growth model, using the 1.5% per year growth rate recommended by AWTP applied to the 2001 AADT, 2029 segment AADT would be computed with the following formula:

$$AADT_{2029} = AADT_{2001} \times (1.015)^{28} \text{ (Equation 1)}.$$

Segment AADT volumes computed by the growth rate would be:

➢ 6,200 AADT for the Ferry Terminal to Auke Nu Drive Segment (significantly higher than straight line estimate of 4,900);
➢ 8,600 AADT for the Auke Nu Drive to Harbor Drive / Auke Bay Float Road Segment (higher than straight line estimate of 7,200);
➢ 12,100 AADT for the Harbor Drive / Auke Bay Float Road to Fritz Cove Road Segment (lower than the straight line estimate of 14,000); and
➢ 18,300 AADT for the Fritz Cove to Engineer's Cutoff Road segment (lower than the straight line estimate of 21,100).

Multiple Variable Regression Forecast Method

Five demographic and economic characteristics were selected as possible independent variables for an AADT regression model. These include:

➢ CBJ population;
➢ Immediate area population corresponding to the CBJ Service Areas 4 and 8 (pre-1997) and Geographic Areas of West Mendenhall Valley-Mendenhall Peninsula-Auke Bay and Glacier Highway Waydelich Creek to the End of Road (1997 to 2001);
➢ CBJ Employment;
➢ Immediate area employment corresponding to the 1990 Census BN 9770 and 2000 Census employment information from U.S. Census Bureau, 2000 Census of Population

& Housing, Summary File 3, Alaska Department of Labor & Workforce Development, Research & Analysis, Census & Geographic Information Network; and

➢ University of Alaska Southeast Enrollment, as Full-Time Equivalent Students.

Table 4 presents past population provided by CBJ, and the 2018 population forecasts prepared by the Alaska Department of Labor & Workforce Development, Research & Analysis Section.

Year	Population
1991	28,965
1992	29,251
1993	28,791
1994	29,078
1995	29,755
1996	30,093
1997	30,396
1998	30,684
2000	30,711
2001	30,903
2018 Low	33,120
2018 Medium	34,447
2018 High	37,248

Table 4 - CBJ Population by Year
(No Information for 1999),
with DOLForecasts for 2018

Figure 2 presents the trend line and extrapolation to year 2029 for each growth scenario (Low, Medium, High). Several forms of the trend line were reviewed and the straight line was found to be a good fit of the three growth scenarios. The model presents that the low, medium, and high population projections for CBJ in 2029 are 35,000, 37,000, and 40,000, respectively.
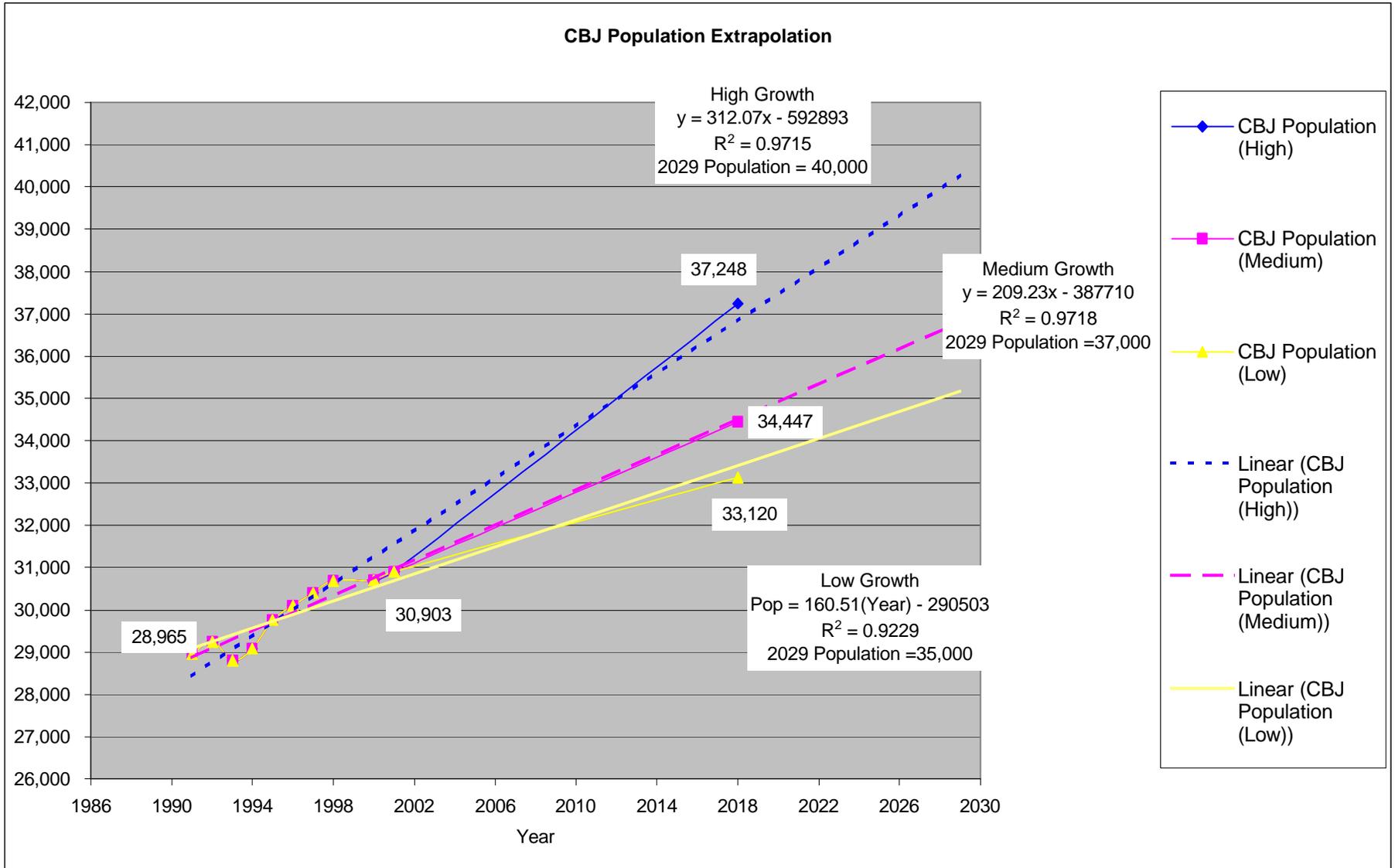
Figure 2 - CBJ Population, Past with Future Growth Scenarios

Chart title: **CBJ Population Extrapolation**

High Growth
$y = 312.07x - 592893$
$R^2 = 0.9715$
2029 Population = 40,000

Medium Growth
$y = 209.23x - 387710$
$R^2 = 0.9718$
2029 Population = 37,000

Low Growth
Pop = 160.51(Year) - 290503
$R^2 = 0.9229$
2029 Population = 35,000

Data labels: 37,248; 34,447; 33,120; 28,965; 30,903

Legend:
- CBJ Population (High)
- CBJ Population (Medium)
- CBJ Population (Low)
- Linear (CBJ Population (High))
- Linear (CBJ Population (Medium))
- Linear (CBJ Population (Low))

X-axis: Year
Y-axis: 26,000 to 42,000

CBJ provided sub-area population information. Prior to 1997, CBJ tracked population by service areas, of which Service Areas 4 and 8 comprise the areas that are immediately served by this road project. From 1997 forward, the sub-areas were reconfigured to geographic areas of which the West Mendenhall Valley-Mendenhall Peninsula-Auke Bay Geographic Area and Glacier Highway Waydelich Creek to the End of Road Geographic Area are of interest, and approximately coincide with the service area system.

The Department of Labor tracks employment for CBJ. Sub-area employment for CBJ Service Areas 4 and 8 (Pre-1997), and the West Mendenhall Valley-Mendenhall Peninsula-Auke Bay Geographic and Glacier Highway Waydelich Creek to the End of Road Geographic Areas is available from census data. These areas approximately coincided with 1990 census area BNA 9770 and 2000 Census Tract 1 (U.S. Census Bureau, 2000 Census of Population & Housing, Summary File 3).

UAS tracks enrollment as full-time equivalent students and publishes the data within an annual report titled University of Alaska in Review. *University of Alaska Southeast Campus Facilities Master Plan, February 2002,* provided a 2012 forecast of enrollment for their planning purposes

Table 5 presents past employment, population, and enrollment parameters. Empty cells indicate that data were either not available or not obtained

Year	CBJ Employment	Immediate Sub-Area Population	Immediate Sub-Area Employment	UAS Full Time Equivalents
1990	14,425		2,067	
1991	14,385	4,051		
1992	14,974	4,046		1,042
1993	15,363	3,995		935
1994	15,419	4,074		1,059
1995	15,718	4,207		1,108
1996	16,196	4,616		1,018
1997	16,289	4,565		1,091
1998	16,178	4,566		1,037
1999	16,354			1,039
2000	16,295	4,500	2,760	1,067
2001	16,051	4,468		1,110
2012				1,870

Table 5 - Employment, Population, UAS Enrollment

Figure 3 presents the data in time-series graphical form, as well as the best-fit trend line for each parameter, and an extrapolation of the values to 2029.
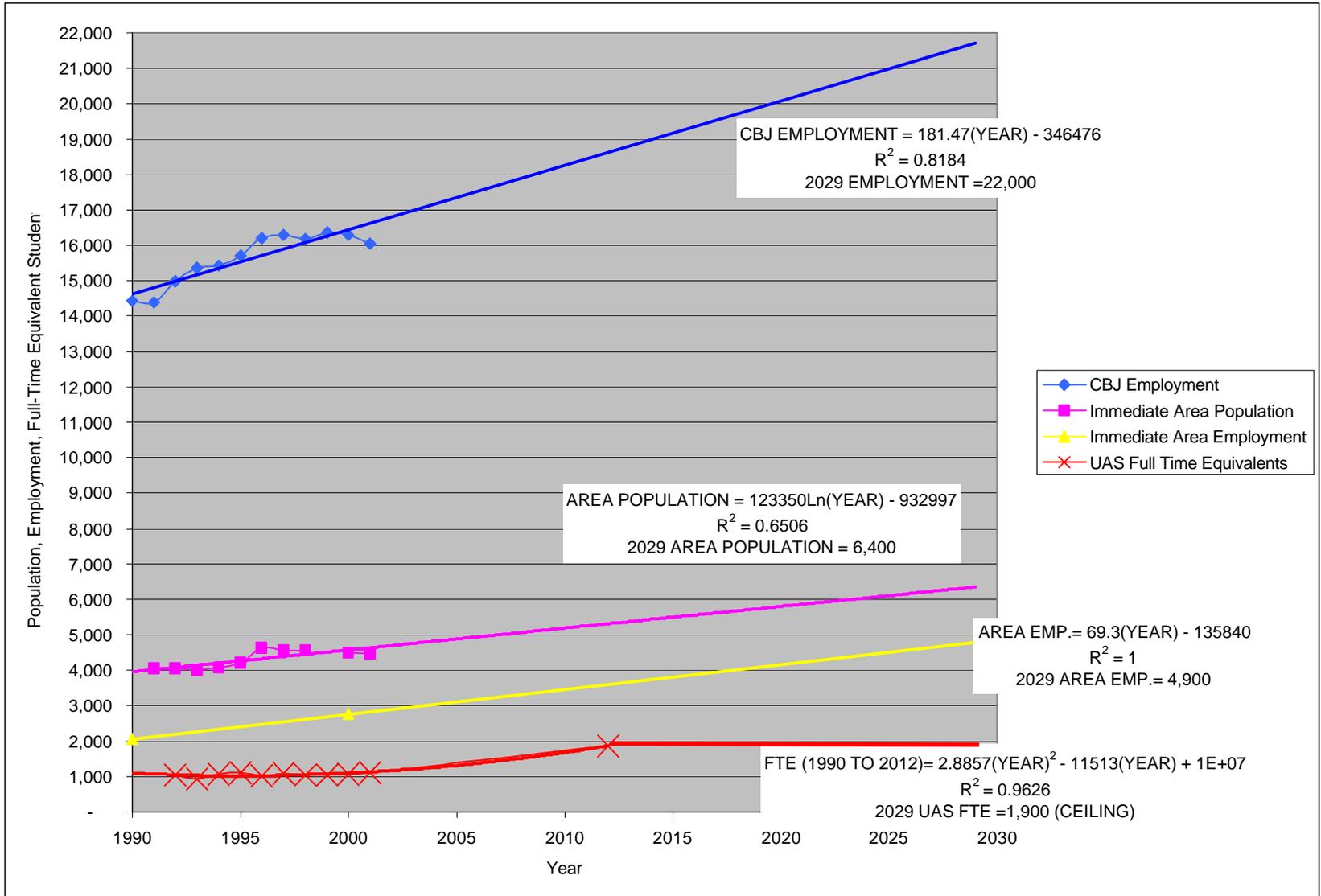
Figure 3 - Population, Employment, Enrollment Trend Lines, and Extrapolations

The chart shows the following labeled trend lines and equations:

CBJ EMPLOYMENT = 181.47(YEAR) - 346476
$R^2 = 0.8184$
2029 EMPLOYMENT = 22,000

AREA POPULATION = 123350Ln(YEAR) - 932997
$R^2 = 0.6506$
2029 AREA POPULATION = 6,400

AREA EMP.= 69.3(YEAR) - 135840
$R^2 = 1$
2029 AREA EMP.= 4,900

FTE (1990 TO 2012)= 2.8857(YEAR)^2 - 11513(YEAR) + 1E+07
$R^2 = 0.9626$
2029 UAS FTE =1,900 (CEILING)

Legend:
- CBJ Employment
- Immediate Area Population
- Immediate Area Employment
- UAS Full Time Equivalents

Y-axis: Population, Employment, Full-Time Equivalent Studen
X-axis: Year

The demographic and economic variables were evaluated with a step-wise regression EXCEL add-in routine to determine which ones are meaningful factors in determining AADT for each roadway segment except the Harbor to Fritz Cove segment. Only CBJ Population and CBJ Employment were meaningful variables. Sub-area employment and population, and UAS enrollment were not significant in the regression function.

The regression function for the roadway between the Ferry Terminal and Auke Nu Drive is:

$$AADT = 0.1014 \times CBJPopulation + 962,$$ (Equation 2) R^2 = 0.62 (reasonably good fit).

The regression function for the roadway between Auke Nu Drive and Harbor Drive/Auke Bay Float Road is:

$$AADT = 0.3404 \times CBJPopulation - 0.2423 \times CBJEmployment - 947,$$ (Equation 3) R^2 = 0.90 (excellent fit).

The regression function for the roadway between Fritz Cove Road and the Engineer's Cutoff is:

$$AADT = 1.2799 \times CBJPopulation - 27,588,$$ (Equation 4) R^2 = 0.81 (good fit).

The segment of roadway between Harbor Drive/Auke Bay Float Road cannot be estimated with a regression relationship, and therefore will be estimated as an average of the two adjoining segments.

Table 6 presents the results of these regression equations for 2029, where the CBJ Population assumes low, medium, and high growth values. These AADT presented in this table are developed from the above equations, and do not consider extraordinary development or traffic patterns. Tables 7 and 8 present construction year (2009) and mid-life (2019) AADT using the above equations.

CBJ Population Growth Scenario	→ Between →	Auke Bay Ferry Terminal	Auke Nu Drive	Harbor Drive/ Auke Bay Float Road	Fritz Cove Road
		Auke Nu Drive	Harbor Drive/ Auke Bay Float Road	Fritz Cove Road	Engineers Cut-Off Road
Low		4,600	5,400	11,400	17,300
Medium		4,800	6,100	13,000	19,800
High		5,100	7,100	15,400	23,700
		Time Series Results (as comparisons)			
Uniform Gradient Time Series Forecasts		4,900	7,200	14,200	21,100
Geometric Gradient (1.5%/Year) Time Series Forecasts Using 2001 as Base		6,200	8,600	12,100	18,200

Table 6 - 2029 (Design Year) AADT Forecasts, General Demographic and Economic Factors Only

CBJ Population Growth Scenario	→ Between →	Auke Bay Ferry Terminal	Auke Nu Drive	Harbor Drive/ Auke Bay Float Road	Fritz Cove Road
		Auke Nu Drive	Harbor Drive/ Auke Bay Float Road	Fritz Cove Road	Engineers Cut-Off Road
Low		4,300	*4,400*	8,900	13,400
Medium		4,300	*4,600*	9,400	14,200
High		4,500	*5,100*	10,600	16,000
		Time Series Results (as comparisons)			
Uniform Gradient Time Series Forecasts		4,300	6,100	10,500	14,800
Geometric Gradient (1.5%/Year) Time Series Forecasts Using 2001 as Base		4,600	6,400	9,400	13,600

Table 7 - 2009 (Construction Year) AADT Forecasts, General Demographic and Economic Factors Only

CBJ Population Growth Scenario	Between	Auke Bay Ferry Terminal	Auke Nu Drive	Harbor Drive/ Auke Bay Float Road	Fritz Cove Road
		Auke Nu Drive	Harbor Drive/ Auke Bay Float Road	Fritz Cove Road	Engineers Cut-Off Road
Low		4,400	*4,900*	10,100	15,300
Medium		4,500	*5,300*	11,100	16,900
High		4,800	6,200	13,200	20,200
		Time Series Results (as comparisons)			
Uniform Gradient Time Series Forecasts		4,600	6,700	12,200	18,000
Geometric Gradient (1.5%/Year) Time Series Forecasts Using 2001 as Base		5,400	7,400	10,500	15,700

Table 8 - 2019 (Mid-Life Year) AADT Forecasts, General Demographic and Economic Factors Only

The bold, italicized numbers in Tables 7 and 8 show that the future AADT predicted by the regression model for the Auke Nu Drive to Harbor Drive segment is actually less than the volume recorded in 2001 (5,668, Table 1). Although design year volumes predicted by the model are good, the model is weak for early life volumes. As such, the uniform growth time series is adopted for this segment as representative of future AADT growth.

The medium CBJ population growth scenario is reasonably consistent with uniform growth and geometric growth for the Ferry Terminal to Auke Nu Drive segment and Fritz Cove Road to Engineer's Cutoff Road Segment, and should be used in the growth model.

Table 9 summarizes proposed AADT volumes for the project segments based upon the above discussions.

	Between → →	Auke Bay Ferry Terminal	Auke Nu Drive	Harbor Drive/ Auke Bay Float Road	Fritz Cove Road
		Auke Nu Drive	Harbor Drive/ Auke Bay Float Road	Fritz Cove Road	Engineers Cut-Off Road
Method of Computation → Year		Equation 2, Medium CBJ Growth Scenario	Uniform Time Series Figure 1	Average of Segments ←→	Equation 4, Medium CBJ Growth Scenario
2009		4,300	6,100	10,200	14,200
2019		4,500	6,700	11,800	16,900
2029		4,800	7,200	13,500	19,800

Table 9 - Traffic Forecasts for 2009, 2019, and 2029; Demographic and Economic Factors Only

The permanent traffic recorders at 16 Mile Glacier Highway (CDS MP 27.86) and 3 Mile Egan Drive (CDS MP 40.80) show that June is the highest monthly average daily traffic, at about 115% of the AADT (weighted average). In addition, the 30th highest hour volume for this area is about 15% of the AADT.

Extraordinary Traffic Generators and Traffic Patterns

We expect that the traffic yielded by the above models addresses the expansion of businesses, residential areas, institutions, and other activities within the context of current growth patterns and development. However, there are several potential developments, anticipated facilities, or transportation improvements, which are well outside of the above models and are significant traffic generators or would change circulation. These include:

➢ Juneau Access Road
➢ Regional and Community Ferry Service as described for Zone 2 of the Southeast Area Transportation Plan (SATP);
➢ Mendenhall Peninsula Development (330 lots potential development);
➢ Pedersen Hill Development (330 lots potential development);
➢ Lena Point Development (NOAA Facility Relocation, 100 lots); and
➢ University Expansion (Master Plan).

The volumes generated by these developments would overlay the base traffic forecast shown in Table 9. Each of these generators is discussed in more detail below. Other potential developments considered, but not considered extraordinary, include:

➢ Auke Bay Commercial Loading Facility - This was not considered because the overall context of the facility would fit within expected development patterns and area growth.
➢ Alaska Marine Highway Traffic Mainline Service - Additional "fast" ferries are a part of the SATP, and would be brought on-line during this project's life. The M/V Kennicott and M/V Matanuska class mainline service would add one mainline vessel, increasing the mainline arrivals and departures to once per week. Any related traffic growth is within the model.
➢ Seafood Processing Plant - This facility will employ about 20 people, and will fit within the expected growth and development patterns.

➢ Tourism Increase - The SATP would increase ferry-oriented tourism travel. In addition, cruise-oriented tourism is expected to grow as well. However, tourism traffic growth is within the model.

Juneau Access Road

The Juneau Access Draft Environmental Impact Statement (EIS) shows that the East Lynn Canal Alternative would have a 2005 AADT of 618, and a 2025 AADT of 918. Summer peak 2005 AADT would be 1,429 and summer peak 2025 AADT would be 2,123. Other alternatives would have less impact on volumes.

For this analysis, the East Lynn Canal route is the condition of concern. The impact of the Access Road would increase AADT on all segments by 700 in 2009, 850 in 2019, and 1,000 in 2029.

Regional and Community Ferry Service

The SATP calls for regional routes and point-to-point community routes, in addition to the main line service that is now provided.

The regional route would be an Aurora class ferry (250 passengers, 34 vehicles). The plan shows one arrival and departure daily at the Auke Bay Terminal during the summer.

Community service would be provided by T-Class ferries (30 vehicles, 150 passengers), and Fast Passenger Ferries (FPF, 150 passengers). The SATP shows a summer service schedule that would have six T-Class arrivals and departures per week, and six FPF arrivals and departures per week.

The summer service is expected to extend from May to September. Winter service levels are expected to be about 40% of the summer service. Each ferry arrival and departure would require support and service. A study for the Port of Anchorage (by Kinney Engineering and Tryck Nyman Hayes) used 10 support vehicles per cruise ship docking (20 trip ends). If each vehicle carried three passengers, the number of passengers that would require surface transportation could be computed as the difference of the total passengers less the product of the number of vehicles by 3. About 50% of the passengers requiring surface transportation to or from the ferry terminal are expected to use buses, with the remainder in taxis or private automobiles (occupancy of 3 with driver). Each ferry-borne vehicle generates one trip end or one AADT. Service vehicles and passenger-transportation vehicles would generate two trip ends or 2 AADT each per arrival and departure.

Table 10 summarizes AADT that would be added to the project roadway segments with the implementation of regional and community service. The values shown apply to the entire design life.

Event	Summer Daily Frequency Arrival and Departures	Ferry Borne Vehicles	Passengers	Summer Daily Traffic (5 months)	Winter Daily Traffic (40% of Summer)	Additional AADT (Weighted Average of Summer and Winter)
Regional (Aurora Class)	2	34	250	216	86	150
T-Class	0.86	30	150	144	58	100
Fast Passenger Ferry	0.86	0	150	148	59	100
Total Ferry Oriented AADT for 2009 through 2029 for All Project Segments						350

Table 10 - Regional and Community Ferry-Oriented AADT

Residential / NOAA Development

Seven-hundred-sixty lots are proposed as potential development that would affect AADT on the project. The Department of Community and Economic Development web site shows in a community profile that the average family size per household is 3.1 residents. If that current occupancy is applied to the proposed potential development, then 2,400 new residents would fill the new residential areas.

The medium CBJ population growth scenario forecast shows that Juneau will have 37,000 residents in 2029, about 6,000 more than today. As such, the new development would fit within the medium growth patterns for the community.

From another perspective, Figure 3 shows that the immediate area population will grow from its current level of 4,500 to about 6,400 in 2029. The predicted growth by the existing trend line is about 1,900 trips. Therefore, only a population of 500 (total 2,400 less 1,900) should be considered as outside of the regression model limits.

The number of lots and trips generated by the developments that should be considered as extraordinary to normal development trends is proportional to the population that is considered extraordinary to population trends. By dividing 500 by 2,400, we arrive at a value of 21%.

Single-family detached dwellings generate about 9.57 trips per household daily (ITE *Trip Generation*).

The development would be phased, and is assumed 10% full in 2009, 55% full in 2019, and 100% full in 2029.

Mendenhall Peninsula Development

The proposed 330 lots would generate about 3,100 trips daily. At full development, about 3,100 trip ends use the roadway system, of which, 21% or 670 trips are considered outside of the above models. This subdivision would use Fritz Cove Road and Engineers Cutoff Road for access. The origin-destination study shows 65% of Fritz Cove Road traffic travels towards Juneau, 28% would travel the Harbor Road-Fritz Cove Road Segment, and 8% would travel the Ferry Terminal to Harbor Segment. Total 2029 additional AADT on this corridor would be:

➢ Auke Bay Ferry Terminal to Harbor Drive segment - 0, 10 and 20 trips for 2009, 2019, and 2029, respectively;

- Harbor Drive to Fritz Cove Road - 20, 100, and 180 trips for 2009, 2019, and 2029, respectively; and
- Fritz Cove Road to Engineer's Cutoff and to town - 40, 240, and 430 trips for 2009, 2019, and 2029, respectively.

Pedersen Hill Development

Pedersen Hill Development has the same trip generation and travel pattern characteristics as the Mendenhall Peninsula Development. Total 2029 additional AADT on this corridor would be:

- Auke Bay Ferry Terminal to Harbor Drive segment - 0, 10 and 20 trips for 2009, 2019, and 2029, respectively;
- Harbor Drive to Fritz Cove Road - 20, 100, and 180 trips for 2009, 2019, and 2029, respectively; and
- Fritz Cove Road to Engineer's Cutoff and to town - 40, 240, and 430 trips for 2009, 2019, and 2029, respectively.

Lena Point Residential Development

The proposed 100 lots would generate about 960 trips daily. About 21%, or 200 trips are considered outside the model. 2009, 2019, and 2029 AADT contributions to all segments of the project corridor are 20, 110 and 200, respectively, from the Lena Point Development.

Lena Point NOAA Development

The Lena Point facility is planned for 107 NOAA employees. About 95 are currently located in downtown Juneau, and 100 are currently located in the Auke Bay facility and currently use the existing corridor.   The additional traffic generated by the increase in employees is insignificant and addressed within the regression models. However, since the facility will be located beyond the end of the project, the Ferry Terminal to Harbor Road segment will carry volumes that it wouldn't have if the facility was not relocated. Office employees generate about 3.32 trips per employee (ITE *Trip Generation*). Therefore, the net increase of AADT on the project segments between the Ferry Terminal and Harbor Road will be the product of 107 employees by 3.32 trips/employee or about 350 AADT. This development is expected to be on-line by 2009 and not change significantly throughout the project life.

Development Summary

Table 11 summarizes the Development Impact on AADT for all segments.

Year	Development	Between	Auke Bay Ferry Terminal / Auke Nu Drive	Auke Nu Drive / Harbor Drive/Auke Bay Float Road	Harbor Drive/Auke Bay Float Road / Fritz Cove Road	Fritz Cove Road / Engineers Cut-Off Road
2009	Mendenhall Peninsula		-	-	20	40
	Pedersen Hill		-	-	20	40
	Lena Point Residential		20	20	20	20
	Lena Point NOAA		350	350		
	2009 Total AADT		**370**	**370**	**60**	**100**
2019	Mendenhall Peninsula		10	10	100	240
	Pedersen Hill		10	10	100	240
	Lena Point Residential		110	110	110	110
	Lena Point NOAA		350	350		
	2019 Total AADT		**480**	**480**	**310**	**590**
2029	Mendenhall Peninsula		20	20	180	430
	Pedersen Hill		20	20	180	430
	Lena Point Residential		200	200	200	200
	Lena Point NOAA		350	350		
	2029 Total AADT		**590**	**590**	**560**	**1,060**

Table 11 - Development-Oriented AADT

University of Alaska Southeast Campus Facilities Master Plan

As Figure 1 shows, the enrollment has been around 1,100 full time equivalent (FTE) students between 1990 and 2001, and wasn't a significant independent variable in the step-wise regression models for determining AADT. However, the UAS Master Plan forecasts a significant increase in enrollment to about 1,900 FTE by 2012, a 73% increase, which cannot be adequately addressed in the regression or time-series models. The 2009 enrollment interpolates to about 1,600 FTEs.

College Road North UAS Access off of Mendenhall Loop Road has an AADT of 661 and College Road South UAS Access has an AADT of 1,525 (Table 3). The total trips into and out of the campus at both entrances is 2,200 per day on the average, with 30% using the north entrance (off Mendenhall Loop) and 70 percent using the south entrance (off Glacier).

On the high side, the future UAS-oriented AADT is expected to increase proportionally with the 73% increase in enrollment. If so, then the south access would increase 73% and have an additional 1,100 trips added to the current AADT, and the north access would have an additional 500 trips. There is no increase projected beyond 2,012 because that is the planning horizon for the master plan.

Using similar methods, the 2009 UAS-oriented AADT would be about 45% or 1,000 trips over the current AADT.

In addition, the master plan shows that the primary campus entrance would be off Mendenhall Loop Road (scheduled for 2004). Because the primary entrance is a longer trip for most of the traffic, a strict inverse change from its current patterns would probably not be reasonable. Instead, we estimate that the new primary north entrance would have 60% of UAS trips, and the south access would have 40% trips. Table 12 presents the additional AADT on project segments that would result from the explosive enrollment increases and the traffic redistribution by the change in primary entrances. We estimated the traffic circulation patterns using the origin-destination study.

Year	➔ Between ➔	Auke Bay Ferry Terminal / Auke Nu Drive	Auke Nu Drive / Harbor Drive/ Auke Bay Float Road	Harbor Drive/ Auke Bay Float Road / Fritz Cove Road	Fritz Cove Road / Engineers Cut-Off Road
2009		100	100	500	500
2019		100	100	800	800
2029		100	100	800	800

Table 12 - UAS-Oriented Additional AADT, By Enrollment Increases and Circulation Changes

Proposed Annual Average Daily Traffic Summary

Table 13 presents the combined AADT summary for the project segments.

Year	ADT Element	➜ Between ➜	Auke Bay Ferry Terminal — Auke Nu Drive	Auke Nu Drive — Harbor Drive/ Auke Bay Float Road	Harbor Drive/ Auke Bay Float Road — Fritz Cove Road	Fritz Cove Road — Engineers Cut-Off Road
2009	Base		4,300	4,400	8,900	13,400
	Juneau Access		700	700	700	700
	Ferry		350	350	350	350
	Development		370	370	60	100
	UAS		100	100	500	500
	2009 Total AADT		**5,820**	**5,920**	**10,510**	**15,050**
2019	Base		4,400	4,900	10,100	15,300
	Juneau Access		850	850	850	850
	Ferry		350	350	350	350
	Development		480	480	310	590
	UAS		100	100	800	800
	2019 Total AADT		**6,180**	**6,680**	**12,410**	**17,890**
2029	Base		4,800	6,100	13,000	19,800
	Juneau Access		1,000	1,000	1,000	1,000
	Ferry		350	350	350	350
	Development		590	590	560	1,060
	UAS		100	100	800	800
	2029 Total AADT		**6,840**	**8,140**	**15,710**	**23,010**

Table 13 - 2009, 2019, and 2029 AADT

Appendix G. Turning Movement Counts

Auke Bay Corridor Turning Movement Counts, 2002 AM Peak

Mendenhall Loop & UAS North Entrance
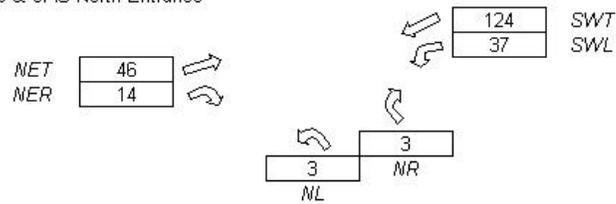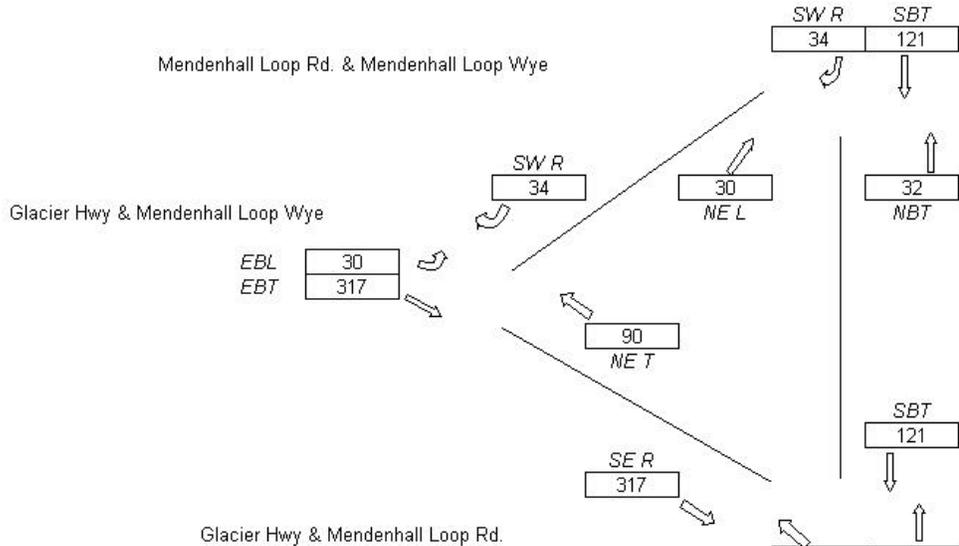
NET	46
NER	14

	SWT
124	SWT
37	SWL

3	
NL	NR
	3

Mendenhall Loop Rd. & Mendenhall Loop Wye

SW R	SBT
34	121

Glacier Hwy & Mendenhall Loop Wye

SW R
34

NE L
30

NBT
32

EBL	30
EBT	317

NE T
90

Glacier Hwy & Mendenhall Loop Rd.

SBT
121

SE R
317

NW L	NBT
90	32

Glacier Hwy & Harbor Rd.

SBL	SBT
11	427

EBL	10
EBR	16

NBL	NBT
14	112

Glacier Hwy & Fritz Cove

SBR	SBT	SBL
6	1	13

EBL	7
EBT	413
EBR	7

	WBR
56	WBR
146	WBT
6	WBL

NBL	NBT	NBR
23	3	35
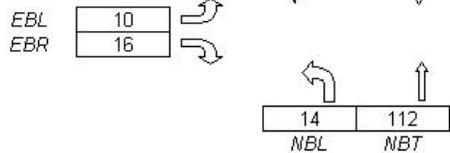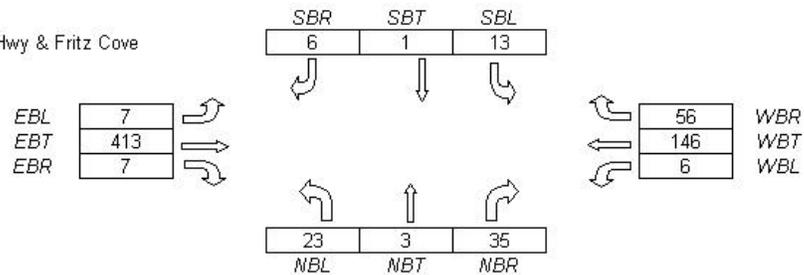
Auke Bay Corridor Turning Movement Counts, 2002 PM Peak

Mendenhall Loop & UAS North Entrance
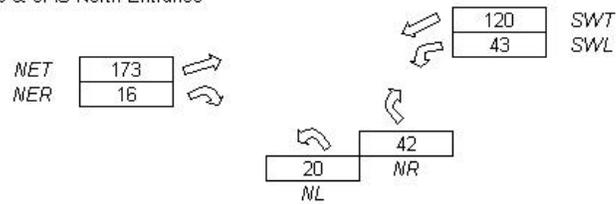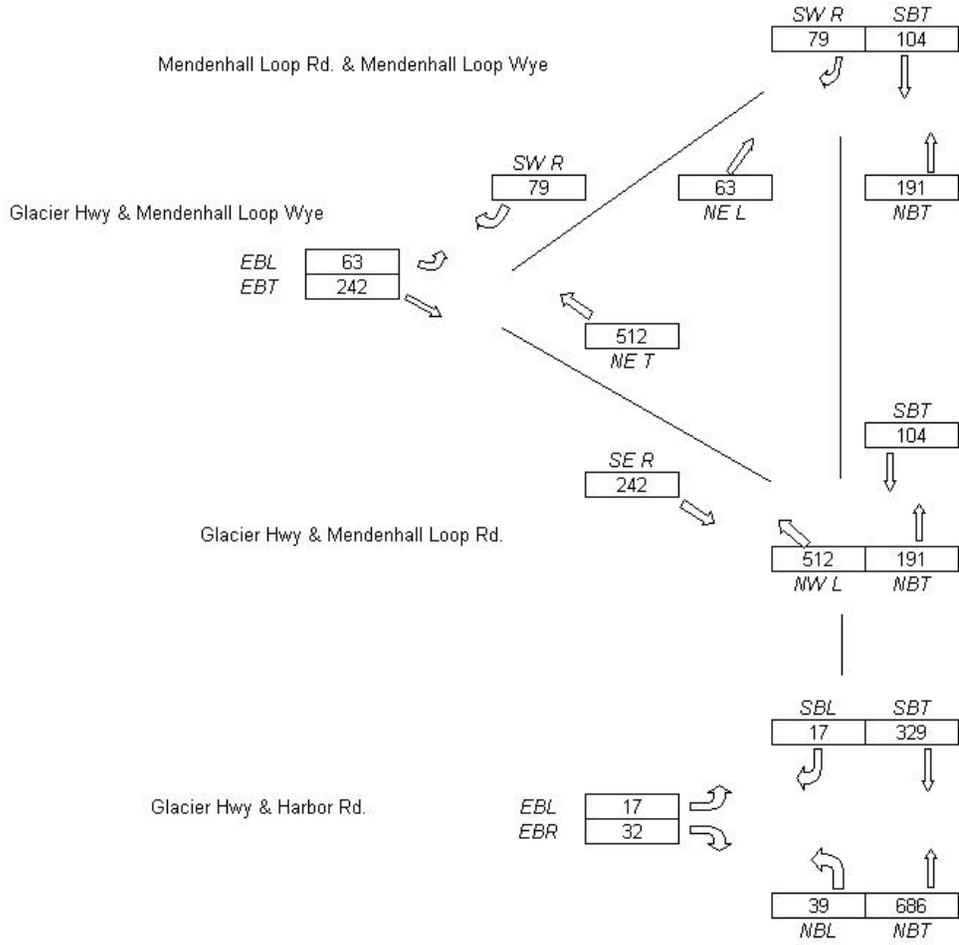
SWT	120
SWL	43

NET	173
NER	16

	42
20	NR
NL	

Mendenhall Loop Rd. & Mendenhall Loop Wye

SW R	SBT
79	104

Glacier Hwy & Mendenhall Loop Wye

SW R		63		191
79		NE L		NBT

EBL	63
EBT	242

512
NE T

SBT
104

SE R
242

Glacier Hwy & Mendenhall Loop Rd.

512	191
NW L	NBT

Glacier Hwy & Harbor Rd.

SBL	SBT
17	329

EBL	17
EBR	32

39	686
NBL	NBT

Glacier Hwy & Fritz Cove

SBR	SBT	SBL
15	2	89

EBL	14			173	WBR
EBT	368			842	WBT
EBR	34			83	WBL

20	4	26
NBL	NBT	NBR
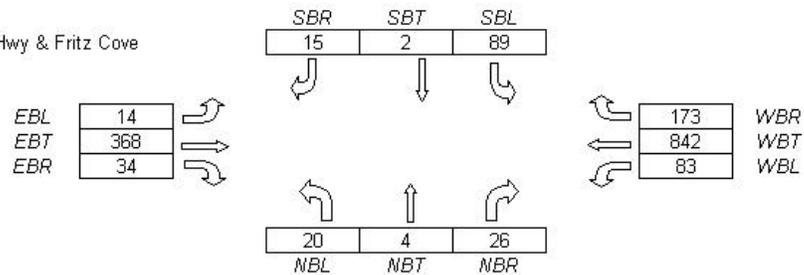
Auke Bay Corridor Turning Movement Counts, 2009 AM Peak

Mendenhall Loop & UAS North Entrance
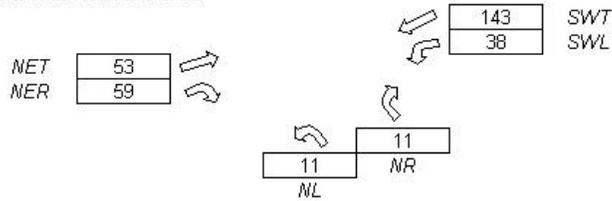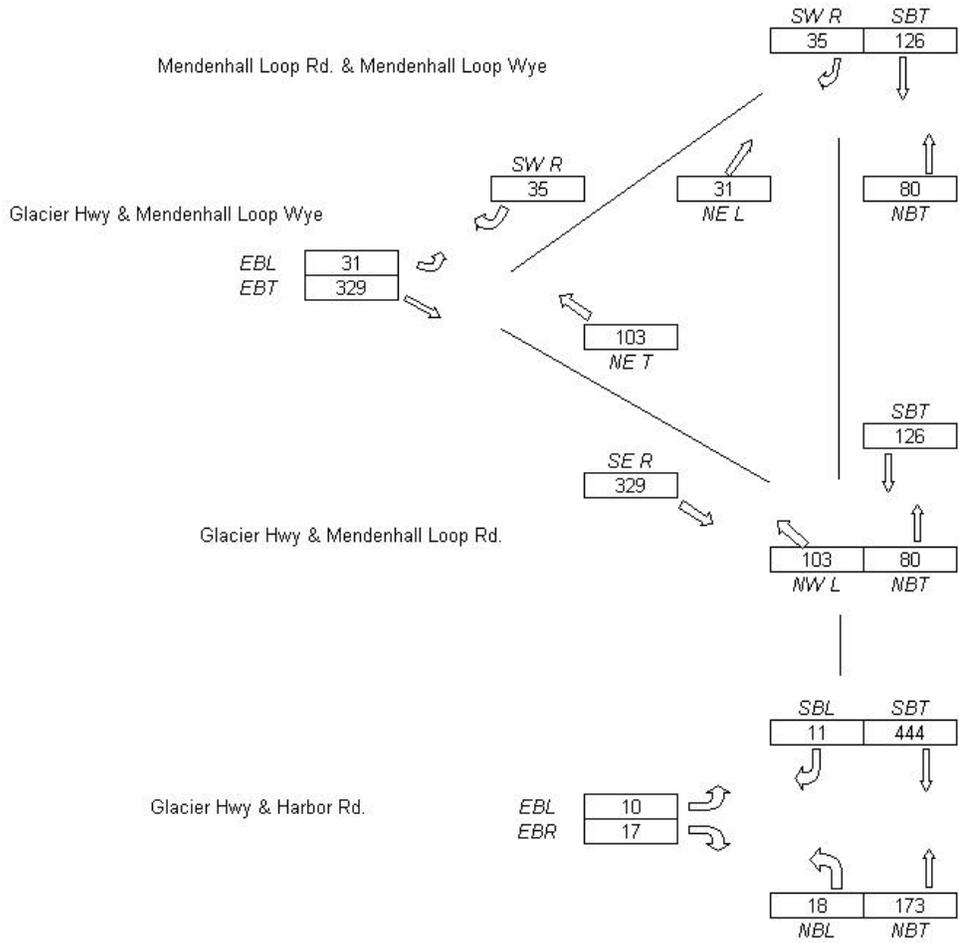
| | 143 | SWT |
| | 38 | SWL |

| NET | 53 |
| NER | 59 |

| 11 |
| NR |

| 11 |
| NL |

| SW R | SBT |
| 35 | 126 |

Mendenhall Loop Rd. & Mendenhall Loop Wye

| SW R |
| 35 |

| 31 |
| NE L |

| 80 |
| NBT |

Glacier Hwy & Mendenhall Loop Wye

| EBL | 31 |
| EBT | 329 |

| 103 |
| NE T |

| SBT |
| 126 |

| SE R |
| 329 |

Glacier Hwy & Mendenhall Loop Rd.

| 103 | 80 |
| NW L | NBT |

| SBL | SBT |
| 11 | 444 |

Glacier Hwy & Harbor Rd.

| EBL | 10 |
| EBR | 17 |

| 18 | 173 |
| NBL | NBT |

| SBR | SBT | SBL |
| 7 | 1 | 15 |

Glacier Hwy & Fritz Cove

EBL	8
EBT	523
EBR	9

66	WBR
177	WBT
7	WBL

| 28 | 4 | 43 |
| NBL | NBT | NBR |
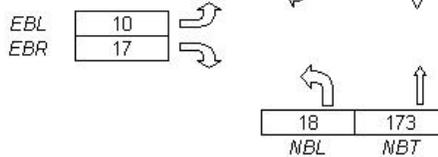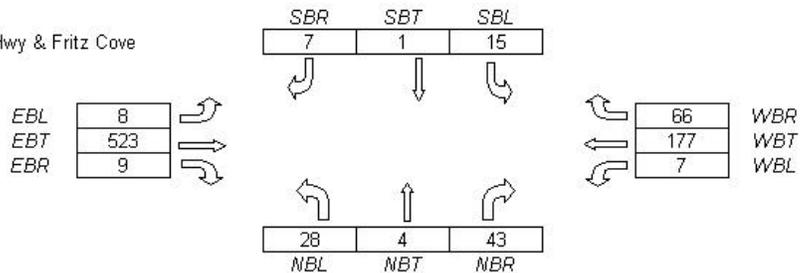
Auke Bay Corridor Turning Movement Counts, 2009 PM Peak

Mendenhall Loop & UAS North Entrance
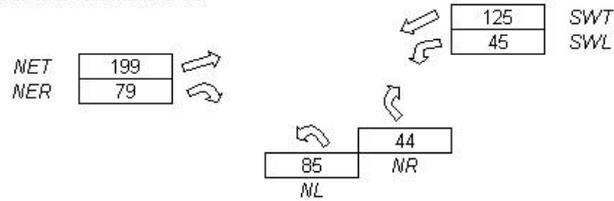
			SWT
		125	
		45	SWL

NET | 199
NER | 79

44 | NR
85 |
NL

Mendenhall Loop Rd. & Mendenhall Loop Wye

SW R | SBT
82 | 108

65 | NE L
363 | NBT

Glacier Hwy & Mendenhall Loop Wye

SW R
82

EBL | 65
EBT | 251

583
NE T

SBT
108

SE R
251

Glacier Hwy & Mendenhall Loop Rd.

583 | 363
NW L | NBT

Glacier Hwy & Harbor Rd.

SBL | SBT
18 | 342

EBL | 17
EBR | 34

50 | 929
NBL | NBT

Glacier Hwy & Fritz Cove

SBR | SBT | SBL
18 | 2 | 106

EBL | 17
EBT | 466
EBR | 43

205 | WBR
1022 | WBT
101 | WBL

24 | 5 | 32
NBL | NBT | NBR
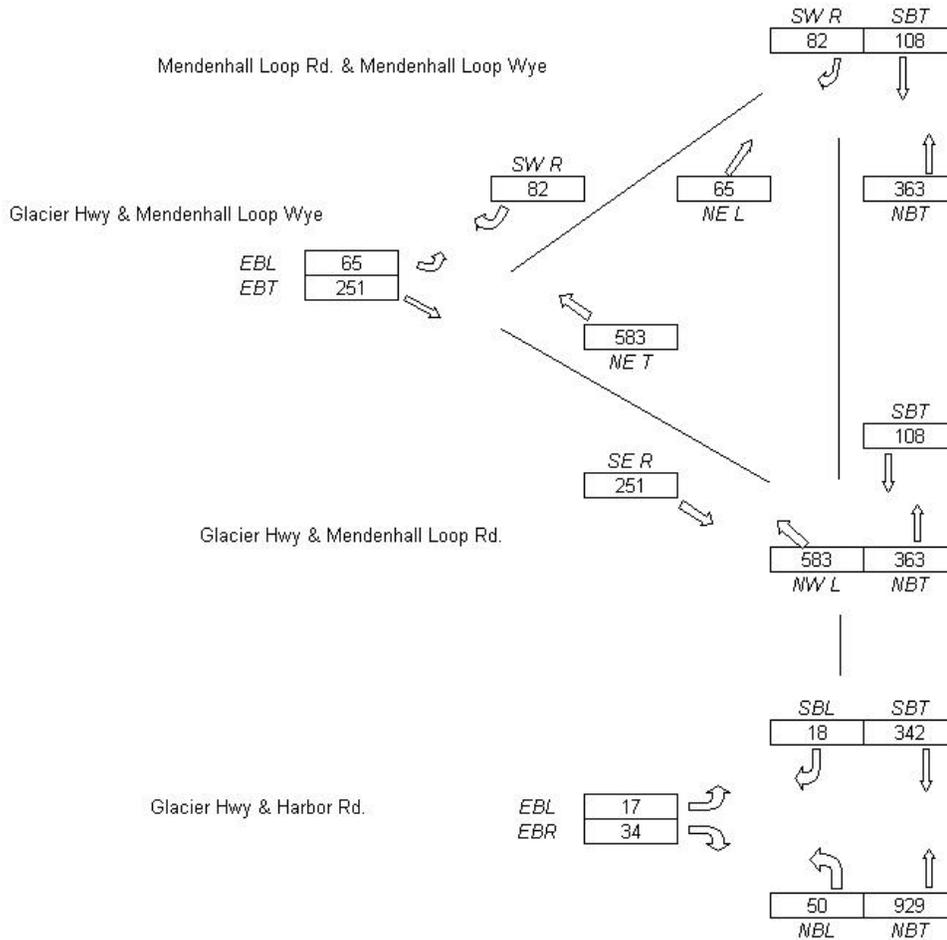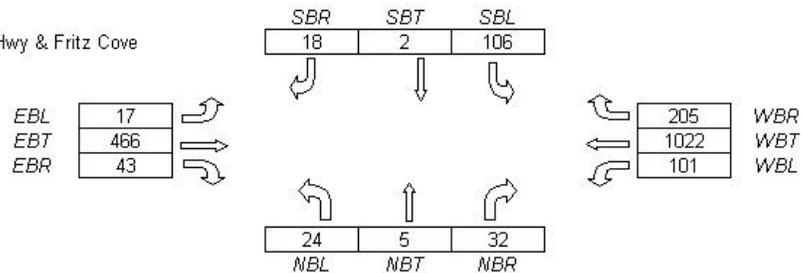
Auke Bay Corridor Turning Movement Counts, 2019 AM Peak

Mendenhall Loop & UAS North Entrance
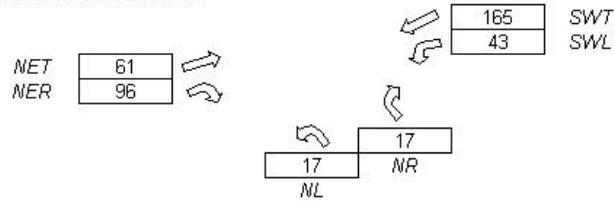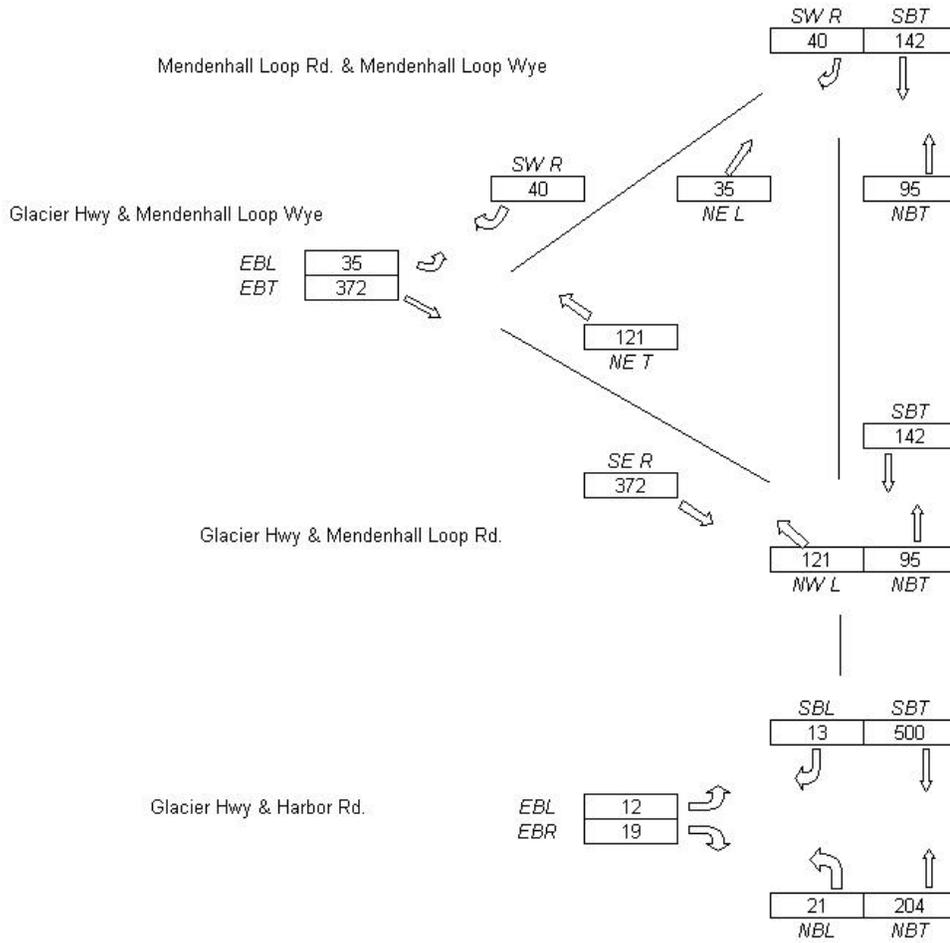
	165	SWT
	43	SWL

NET | 61 |
NER | 96 |

| 17 | |
| NR | |

| 17 | |
| NL | |

Mendenhall Loop Rd. & Mendenhall Loop Wye

SW R | SBT
40 | 142

SW R
40

NE L
35

NBT
95

Glacier Hwy & Mendenhall Loop Wye

EBL | 35
EBT | 372

NE T
121

SBT
142

SE R
372

Glacier Hwy & Mendenhall Loop Rd.

| 121 | 95 |
| NW L | NBT |

Glacier Hwy & Harbor Rd.

SBL | SBT
13 | 500

EBL | 12
EBR | 19

| 21 | 204 |
| NBL | NBT |

Glacier Hwy & Fritz Cove

| SBR | SBT | SBL |
| 9 | 1 | 19 |

EBL | 10
EBT | 618
EBR | 10

81	WBR
211	WBT
9	WBL

| 33 | 4 | 51 |
| NBL | NBT | NBR |
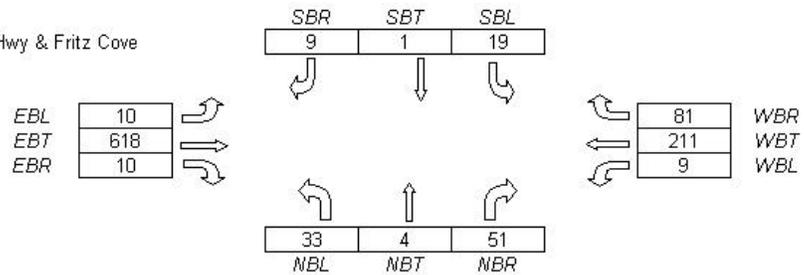
Auke Bay Corridor Turning Movement Counts, 2019 PM Peak

Mendenhall Loop & UAS North Entrance
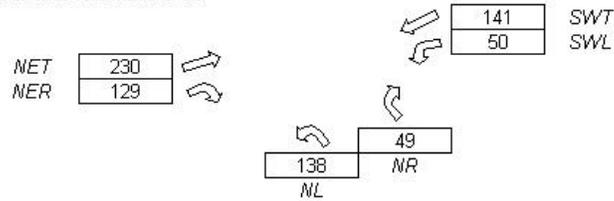
SWT	141
SWL	50

NET	230
NER	129

49	NR
138	
NL	

Mendenhall Loop Rd. & Mendenhall Loop Wye

SW R	SBT
93	122

Glacier Hwy & Mendenhall Loop Wye

SW R		73		428
93		NE L		NBT

EBL	73
EBT	284

688
NE T

SBT
122

Glacier Hwy & Mendenhall Loop Rd.

SE R
284

688	428
NW L	NBT

Glacier Hwy & Harbor Rd.

SBL	SBT
20	386

EBL	20
EBR	38

59	1097
NBL	NBT

Glacier Hwy & Fritz Cove

SBR	SBT	SBL
22	3	129

EBL	21
EBT	550
EBR	51

251	WBR
1215	WBT
120	WBL

29	6	38
NBL	NBT	NBR
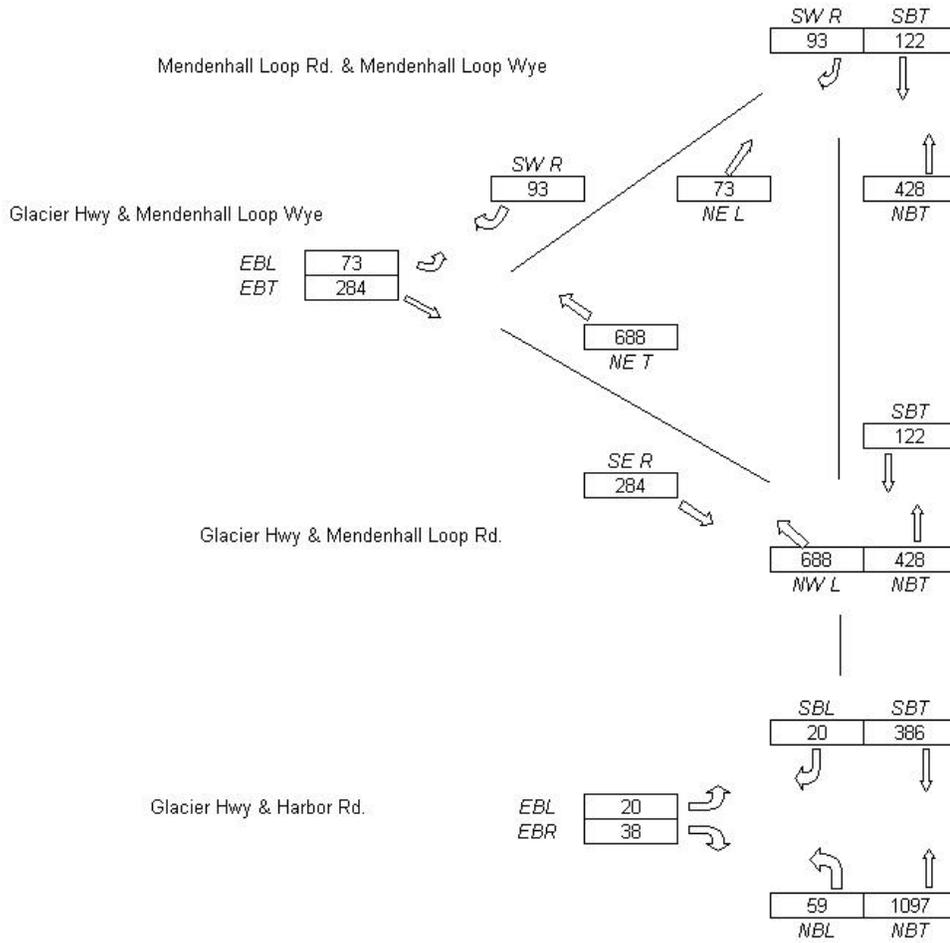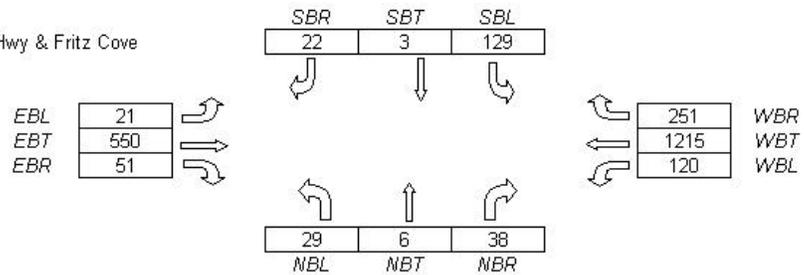
Auke Bay Corridor Turning Movement Counts, 2029 AM Peak

Mendenhall Loop & UAS North Entrance
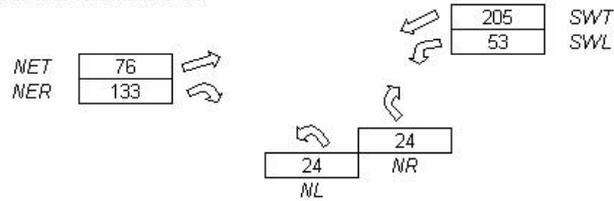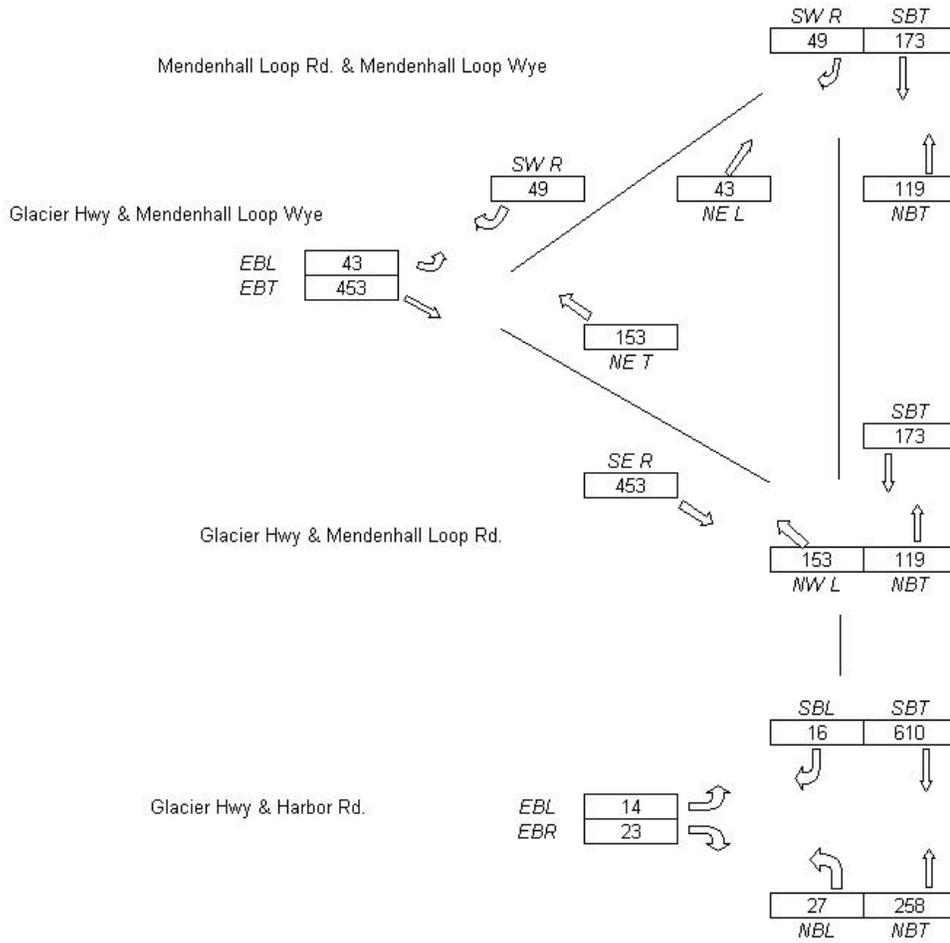
205	SWT
53	SWL

| NET | 76 |
| NER | 133 |

24	NR
24	
NL	

Mendenhall Loop Rd. & Mendenhall Loop Wye

SW R	SBT
49	173

Glacier Hwy & Mendenhall Loop Wye

SW R
49

43
NE L

119
NBT

| EBL | 43 |
| EBT | 453 |

153
NE T

SBT
173

SE R
453

Glacier Hwy & Mendenhall Loop Rd.

153	119
NW L	NBT

SBL	SBT
16	610

Glacier Hwy & Harbor Rd.

| EBL | 14 |
| EBR | 23 |

27	258
NBL	NBT

Glacier Hwy & Fritz Cove

SBR	SBT	SBL
10	2	22

EBL	12
EBT	782
EBR	13

	96	WBR
	271	WBT
	11	WBL

43	5	65
NBL	NBT	NBR
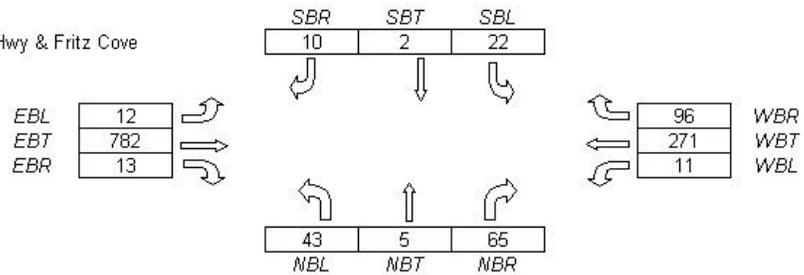
Auke Bay Corridor Turning Movement Counts, 2029 PM Peak

Mendenhall Loop & UAS North Entrance
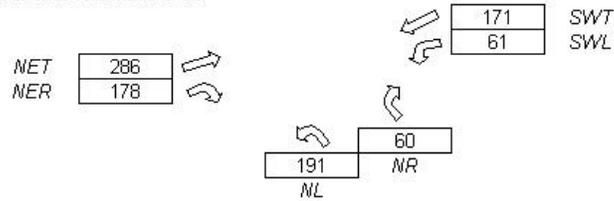
			SWT
	171		
	61		SWL

NET	286
NER	178

	60	
191		NR
NL		

Mendenhall Loop Rd. & Mendenhall Loop Wye

SW R	SBT
113	149

Glacier Hwy & Mendenhall Loop Wye

SW R
113

	90		542
	NE L		NBT

EBL	90
EBT	346

871
NE T

SBT
149

SE R
346

Glacier Hwy & Mendenhall Loop Rd.

871	542
NW L	NBT

SBL	SBT
24	470

Glacier Hwy & Harbor Rd.

EBL	24
EBR	46

74	1388
NBL	NBT

Glacier Hwy & Fritz Cove

SBR	SBT	SBL
26	3	153

EBL	25
EBT	697
EBR	64

297	WBR
1563	WBT
154	WBL

37	7	48
NBL	NBT	NBR
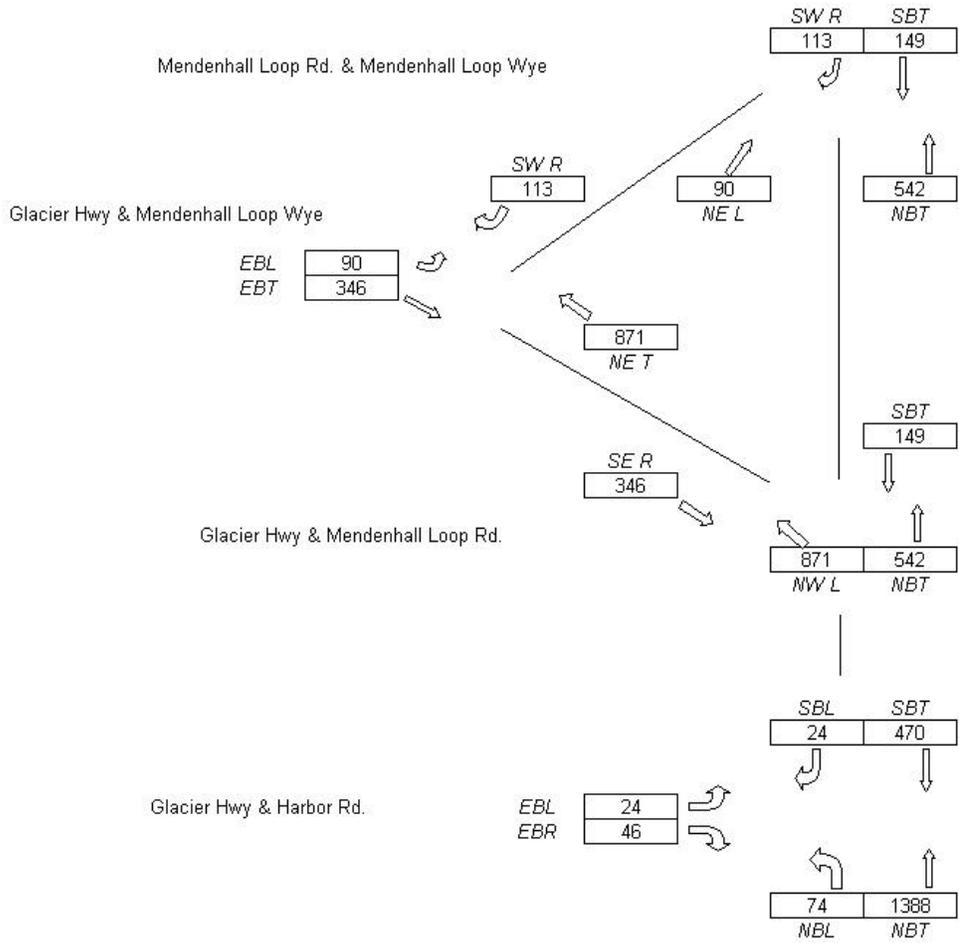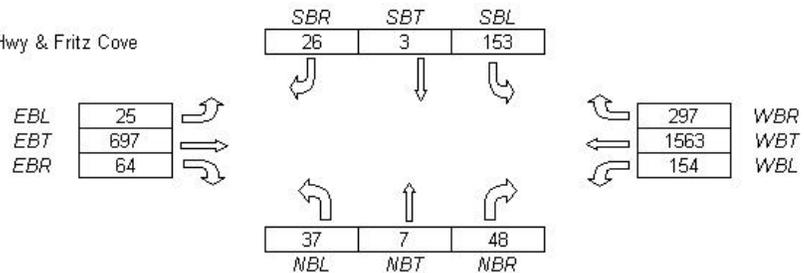
Appendix H. Peak Hour Movements

LOCATION: **Glacier Hwy., Fritz Cove Rd., UAS entrance 4-way intersection**
PERIOD: **AM Peak**

PEAK HOUR VOLUMES				
DIRECTION	LEFT	THRU	RIGHT	TOTAL
Northbound on Fritz Cove Rd.	23	3	35	61
Southbound on UAS	6	1	13	20
Eastbound on Glacier Hwy.	7	413	7	427
Westbound on Glacier Hwy.	56	146	6	208
TOTAL	92	563	61	716

LOCATION: **Glacier Hwy., Fritz Cove Rd., UAS entrance 4-way intersection**
PERIOD: **PM Peak**

PEAK HOUR VOLUMES				
DIRECTION	LEFT	THRU	RIGHT	TOTAL
Northbound on Fritz Cove Rd.	20	4	26	50
Southbound on UAS	15	2	89	106
Eastbound on Glacier Hwy.	14	368	34	416
Westbound on Glacier Hwy.	173	842	83	1098
TOTAL	222	1216	232	1670

LOCATION: **Glacier Hwy. and Auke Bay Harbor Road**
PERIOD: **AM Peak**

PEAK HOUR VOLUMES				
DIRECTION	LEFT	THRU	RIGHT	TOTAL
Northbound on Glacier Hwy.	39	686		725
Southbound on Glacier Hwy.		329	17	346
Eastbound on Auke Bay Harbor Rd.	17		32	49
TOTAL	56	1015	49	1120

LOCATION: **Glacier Hwy. and Auke Bay Harbor Road**
PERIOD: **PM Peak**

PEAK HOUR VOLUMES				
DIRECTION	LEFT	THRU	RIGHT	TOTAL
Northbound on Glacier Hwy.	14	112		126
Southbound on Glacier Hwy.		427	11	438
Eastbound on Auke Bay Harbor Rd.	10		16	26
TOTAL	24	539	27	590

LOCATION: **Glacier Hwy. and Mendenhall Lp Rd**
PERIOD: **AM Peak**

PEAK HOUR VOLUMES				
DIRECTION	LEFT	THRU	RIGHT	TOTAL
Northwestbound on Glacier Hwy.		90	32	122
Southeastbound on Glacier Hwy.		317		317
Southbound on Mendenhall Lp. Rd.			121	121
TOTAL	0	407	153	560

LOCATION: **Glacier Hwy. and Mendenhall Lp. Rd.**
PERIOD: **PM Peak**

PEAK HOUR VOLUMES				
DIRECTION	LEFT	THRU	RIGHT	TOTAL
Northwestbound on Glacier Hwy.		512	191	703
Southeastbound on Glacier Hwy.		242		242
Southbound on Mendenhall Lp. Rd.			104	104
TOTAL	0	754	295	1049

LOCATION: Glacier Hwy. and Mendenhall Lp Wye
PERIOD: AM Peak

PEAK HOUR VOLUMES				
DIRECTION	LEFT	THRU	RIGHT	TOTAL
Northwestbound on Glacier Hwy.		90		90
Southeastbound on Glacier Hwy.	30	317		347
Southwestbound on Mendenhall Lp. Wye.			34	34
TOTAL	30	407	34	471

LOCATION: Glacier Hwy. and Mendenhall Lp. Wye.
PERIOD: PM Peak

PEAK HOUR VOLUMES				
DIRECTION	LEFT	THRU	RIGHT	TOTAL
Northwestbound on Glacier Hwy.		512		512
Southeastbound on Glacier Hwy.	63	242		305
Southwestbound on Mendenhall Lp. Wye.			79	79
TOTAL	63	754	79	896

LOCATION: **Mendenhall Lp. Rd. and Mendenhall Lp Wye**
PERIOD: **AM Peak**

PEAK HOUR VOLUMES				
DIRECTION	LEFT	THRU	RIGHT	TOTAL
Northeastbound on Mendenhall Lp. Wye.	30			30
Southbound on Mendenhall Lp. Rd.		121	34	155
Northbound on Mendenhall Lp. Rd.		32		32
TOTAL	30	153	34	217

LOCATION: **Mendenhall Lp. Rd. and Mendenhall Lp. Wye.**
PERIOD: **PM Peak**

PEAK HOUR VOLUMES				
DIRECTION	LEFT	THRU	RIGHT	TOTAL
Northeastbound on Mendenhall Lp. Wye.	63			63
Southbound on Mendenhall Lp. Rd.		104	79	183
Northbound on Mendenhall Lp. Rd.		191		191
TOTAL	63	295	79	437

LOCATION: **Mendenhall Lp. Rd. and UAS North Entrance**
PERIOD: **AM Peak**

PEAK HOUR VOLUMES				
DIRECTION	LEFT	THRU	RIGHT	TOTAL
Northeastbound on Mendenhall Lp. Rd.	✕	46	14	60
Southwestbound on Mendenhall Lp. Rd.	37	124	✕	161
Northbound on UAS North Entrance	3	✕	3	6
TOTAL	40	170	17	227

LOCATION: **Mendenhall Lp. Rd. and Mendenhall Lp. Wye.**
PERIOD: **PM Peak**

PEAK HOUR VOLUMES				
DIRECTION	LEFT	THRU	RIGHT	TOTAL
Northeastbound on Mendenhall Lp. Rd.	✕	173	16	189
Southwestbound on Mendenhall Lp. Rd.	43	120	✕	163
Northbound on UAS North Entrance	20	✕	42	62
TOTAL	63	293	58	414

Appendix I. Origin Destination Study

Auke Bay

A Discussion on Origin-Destination Studies
February 12, 2003

USKH Inc. / Kinney Engineering

Corridor Study

Origin-Destination Studies will define travel patterns. When counting cars at a single point, we can't determine where the driver started the trip, or where it will end. In order to do that, we set up a series of observation stations that track vehicles through a system. In this study, we used license plate observations as the tracking tool. A map showing the location of observations stations is located at the end of this memorandum.

The results of the study have been applied to volume forecasting, and will be applied to future improvements traffic distribution and assignments. The results of the study will be used to forecast volumes on a new by-pass corridor, for example.

Studies were conducted on Monday September 23, 2002 and Tuesday September 24, 2002. Observations were performed for 2 hours in the morning and 2 hours in the evening that coincided with the peak hour commutes. UAS classes typically have Monday-Wednesday or Tuesday-Thursday meetings, so we selected one day from each pair to ascertain if travel patterns could be affected by class schedules.

Stations were manned by one or two persons. At Fritz Cove Road (station 3), the UAS South Entrance (station 4), and the UAS North Entrance (station 11), traffic was light enough so that only one person was required to observe and record license plates in both directions of travel (inbound and outbound). Stations 9 (inbound) and 10 (outbound) on Mendenhall Loop Road, and stations 12 (outbound) and 13 (inbound) required one person per station direction of travel. All other stations required two persons, one acting as an observer and one as the recorder.

The study used citizens to do the work. They attended training on the afternoon of September 20 to familiarize themselves with objectives and procedures, and to obtain their assignments. They were briefed on safety and issued equipment.

The data was collected and entered into spreadsheets. It was then entered into a several step algorithm in which observations were linked into a trip chains. These were combined into aggregate classes from which system origin and destinations could be determined.

The following table presents the summary of observations for the four periods.

	Monday		Tuesday	
	7 to 9 AM	4 to 6 PM	7 to 9 AM	4 to 6 PM
Total Plates Observed	2,347	2,375	2,106	2,500
Number of Plates with Single Observation	1,194	991	995	1,015
Number of Plates that Form a Trip Chain	1,153	1,384	1,111	1,485

Those plates with only a single observation are assumed to be improperly entered in the field or in the office. There were many observations that were not fully recorded because speeds, leading vehicles blocking views of following vehicles, or lack of plates.   It is likely that the vast majority of those were part a trip chain, rather that truly a single observation.

The remaining observable trip chains are assumed to represent patterns by the whole population.

The following tables summarize the results.

Evening Results

Trip Description	Origin Station	Destination Station	MONDAY		TUESDAY	
			Observed Trip Ends	PM % of Total Origin Traffic	Observed Trip Ends	PM % of Total Origin Traffic
Mendenhall Lp to Juneau	9	2	77	35%	89	47%
Mendenhall Lp to Fritz Cove Road	9	3.2	8	4%	2	1%
Mendenhall Lp to North of Ferry Terminal	9	12	15	7%	12	6%
Mendenhall Lp to North UAS North Access	9	11.1	49	22%	46	24%
Mendenhall Lp to North of UAS South Access	9	4.1	16	7%	8	4%
Mendenhall Lp to Fisherman's Bend and Ferry Terminal	9	7	38	17%	25	13%
Mendenhall Lp to DeHart's and Fish Lab	9	6	18	8%	9	5%
			221	100%	191	100%

Trip Description	Origin Station	Destination Station	MONDAY		TUESDAY	
			Observed Trip Ends	PM % of Total Origin Traffic	Observed Trip Ends	PM % of Total Origin Traffic
Glacier Hwy NB (from JNU) to Mendenhall Lp	1	10	108	19%	75	15%
Glacier Hwy NB (from JNU) to Fritz Cove Rd	1	3.2	40	7%	41	8%
Glacier Hwy NB (from JNU) to North of Ferry Terminal	1	12	102	18%	96	20%
Glacier Hwy NB (from JNU) to North UAS Access	1	11.1	10	2%	14	3%
Glacier Hwy NB (from JNU) to South UAS Access	1	4.1	39	7%	59	12%
Glacier Hwy NB (from JNU) to Fisherman's Bend and Ferry Terminal	1	7	194	35%	152	31%
Glacier Hwy NB (from JNU) to DeHart's and Fish Lab	1	5	67	12%	55	11%
			560	100%	492	100%

Trip Description	Origin Station	Destination Station	MONDAY		TUESDAY	
			Observed Trip Ends	PM % of Total Origin Traffic	Observed Trip Ends	PM % of Total Origin Traffic
Fritz Cove Road to Mendenhall Lp	3.1	10	5	12%	3	6%
Fritz Cove Road to JNU	3.1	2	22	54%	31	66%
Fritz Cove Road to Glacier Hwy North of Ferry Terminal	3.1	12	3	7%	2	4%
Fritz Cove Rd to North UAS Access	3.1	11.1	0	0%	0	0%
Fritz Cove Road to South UAS Access	3.1	4.1	4	10%	2	4%
Fritz Cove Road to Fisherman's Bend and Ferry Terminal	3.1	7	3	7%	8	17%
Fritz Cove Rd to DeHart's and Fish Lab	3.1	5	4	10%	1	2%
			41	100%	47	100%

Trip Description	Origin Station	Destination Station	MONDAY Observed Trip Ends	MONDAY PM % of Total Origin Traffic	TUESDAY Observed Trip Ends	TUESDAY PM % of Total Origin Traffic
Glacier Hwy SB to JNU	13	2	86	65%	40	60%
Glacier Hwy SB to Fritz Cove Rd	13	3.2	7	5%	5	7%
Glacier Hwy SB to Mendenhall Lp	13	10	17	13%	8	12%
Glacier Hwy SB to UAS North Access	13	11.1	5	4%	1	1%
Glacier Hwy SB to UAS South Access	13	4.1	4	3%	4	6%
Glacier Hwy SB to DeHart's and Fish Lab	13	6	8	6%	3	4%
Glacier Hwy SB to Fisherman's Bend Area	13	8	5	4%	6	9%
			132	100%	67	100%

Trip Description	Origin Station	Destination Station	MONDAY Observed Trip Ends	MONDAY PM % of Total Origin Traffic	TUESDAY Observed Trip Ends	TUESDAY PM % of Total Origin Traffic
UAS South Access to JNU	4.2	2	29	63%	100	86%
UAS South Access to Mendenhall Lp	4.2	10	8	17%	4	3%
UAS South Access to Fritz Cove Road	4.2	3.2	3	7%	5	4%
UAS South Access to Glacier Hwy North of Ferry Terminal	4.2	12	3	7%	5	4%
UAS South Access to Fisherman's Bend and Ferry Terminal	4.2	7	3	7%	1	1%
UAS North Access to DeHart's and Fish Lab	4.2	5	0	0%	1	1%
			46	100%	116	100%

Trip Description	Origin Station	Destination Station	MONDAY		TUESDAY	
			Observed Trip Ends	PM % of Total Origin Traffic	Observed Trip Ends	PM % of Total Origin Traffic
UAS North Access to JNU	11.2	2	26	30%	17	26%
UAS North Access to Mendenhall Lp	11.2	10	45	52%	37	57%
UAS North Access to Fritz Cove Road	11.2	3.2	2	2%	1	2%
UAS North Access to Glacier Hwy North of Ferry Terminal	11.2	12	5	6%	2	3%
UAS North Access to Fisherman's Bend and Ferry Terminal	11.2	8	5	6%	1	2%
UAS North Access to DeHart's and Fish Lab	11.2	6	4	5%	7	11%
			87	100%	65	100%

Trip Description	Origin Station	Destination Station	MONDAY		TUESDAY	
			Observed Trip Ends	PM % of Total Origin Traffic	Observed Trip Ends	PM % of Total Origin Traffic
Fisherman Bend to JNU	8	2	109	46%	176	60%
Fisherman's Bend to Fritz Cove	8	3.2	21	9%	18	6%
Fisherman Bend to Mendenhall Lp	8	10	60	26%	48	16%
Fisherman's Bend to UAS North Access	8	11.1	8	3%	11	4%
Fisherman's Bend to UAS South Access	8	4.1	6	3%	13	4%
Fisherman's Bend to Dehart's-Fish Lab	8	6	16	7%	10	3%
Fisherman's Bend to North of Ferry Terminal	7	12	15	6%	15	5%
			235	100%	291	100%

Trip Description	Origin Station	Destination Station	MONDAY		TUESDAY	
			Observed Trip Ends	PM % of Total Origin Traffic	Observed Trip Ends	PM % of Total Origin Traffic
DeHart's-Fish Lab to JNU	6	2	87	28%	147	29%
DeHart's-Fish Lab to Fritz Cove	6	3.2	9	3%	17	3%
DeHart's-Fish Lab to Mendenhall Lp	5	10	45	15%	54	11%
DeHart's-Fish Lab to UAS North Access	5	11.1	4	1%	6	1%
DeHart's-Fish Lab to UAS South Access	6	4.1	2	1%	8	2%
DeHart's-Fish Lab to Fisherman's Bend-Ferry Terminal	5	7	119	39%	206	41%
DeHart's-Fish Lab to North of Ferry Terminal	5	12	40	13%	68	13%
			306	100%	506	100%

Morning Results

Trip Description	Origin Station	Destination Station	MONDAY		TUESDAY	
			Observed Trip Ends	AM % of Total Origin Traffic	Observed Trip Ends	AM % of Total Origin Traffic
Mendenhall Lp to JNU	9	2	87	41%	110	48%
Mendenhall Lp to Fritz Cove Road	9	3.2	2	1%	4	2%
Mendenhall Lp to North of Ferry Terminal	9	12	7	3%	6	3%
Mendenhall Lp to North UAS North Access	9	11.1	44	21%	27	12%
Mendenhall Lp to North of UAS South Access	9	4.1	5	2%	4	2%
Mendenhall Lp to Fisherman's Bend and Ferry Terminal	9	7	46	22%	43	19%
Mendenhall Lp to DeHart's and Fish Lab	9	6	20	9%	35	15%
			211	100%	229	100%

Trip Description	Origin Station	Destination Station	MONDAY		TUESDAY	
			Observed Trip Ends	AM % of Total Origin Traffic	Observed Trip Ends	AM % of Total Origin Traffic
Glacier Hwy NB (from JNU) to Mendenhall Lp	1	10	19	7%	23	9%
Glacier Hwy NB (from JNU) to Fritz Cove Rd	1	3.2	7	2%	14	5%
Glacier Hwy NB (from JNU) to North of Ferry Terminal	1	12	18	6%	36	14%
Glacier Hwy NB (from JNU) to North UAS Access	1	11.1	2	1%	3	1%
Glacier Hwy NB (from JNU) to South UAS Access	1	4.1	93	33%	65	25%
Glacier Hwy NB (from JNU) to Fisherman's Bend and Ferry Terminal	1	7	108	38%	77	30%
Glacier Hwy NB (from JNU) to DeHart's and Fish Lab	1	5	36	13%	37	15%
			283	100%	255	100%

Trip Description	Origin Station	Destination Station	MONDAY		TUESDAY	
			Observed Trip Ends	AM % of Total Origin Traffic	Observed Trip Ends	AM % of Total Origin Traffic
Fritz Cove Road to Mendenhall Lp	3.1	10	4	6%	5	7%
Fritz Cove Road to JNU	3.1	2	46	68%	54	73%
Fritz Cove Road to Glacier Hwy North of Ferry Terminal	3.1	12	1	1%	2	3%
Fritz Cove Rd to North UAS Access	3.1	11.1	0	0%	0	0%
Fritz Cove Road to South UAS Access	3.1	4.1	6	9%	4	5%
Fritz Cove Road to Fisherman's Bend and Ferry Terminal	3.1	7	10	15%	8	11%
Fritz Cove Rd to DeHart's and Fish Lab	3.1	5	1	1%	1	1%
			68	100%	74	100%

Trip Description	Origin Station	Destination Station	MONDAY		TUESDAY	
			Observed Trip Ends	AM % of Total Origin Traffic	Observed Trip Ends	AM % of Total Origin Traffic
Glacier Hwy SB to JNU	13	2	130	71%	76	59%
Glacier Hwy SB to Fritz Cove Rd	13	3.2	2	1%	1	1%
Glacier Hwy SB to Mendenhall Lp	13	10	9	5%	10	8%
Glacier Hwy SB to UAS North Access	13	11.1	8	4%	3	2%
Glacier Hwy SB to UAS South Access	13	4.1	2	1%	4	3%
Glacier Hwy SB to DeHart's and Fish Lab	13	6	23	13%	16	13%
Glacier Hwy SB to Fisherman's Bend Area	13	8	10	5%	18	14%
			184	100%	128	100%

Trip Description	Origin Station	Destination Station	MONDAY		TUESDAY	
			Observed Trip Ends	AM % of Total Origin Traffic	Observed Trip Ends	AM % of Total Origin Traffic
UAS South Access to JNU	4.2	2	14	61%	16	76%
UAS South Access to Mendenhall Lp	4.2	10	4	17%	1	5%
UAS South Access to Fritz Cove Road	4.2	3.2	1	4%	0	0%
UAS South Access to Glacier Hwy North of Ferry Terminal	4.2	12	0	0%	2	10%
UAS South Access to Fisherman's Bend and Ferry Terminal	4.2	7	1	4%	2	10%
UAS North Access to DeHart's and Fish Lab	4.2	5	3	13%	0	0%
			23	100%	21	100%

Trip Description	Origin Station	Destination Station	MONDAY Observed Trip Ends	MONDAY AM % of Total Origin Traffic	TUESDAY Observed Trip Ends	TUESDAY AM % of Total Origin Traffic
UAS North Access to JNU	11.2	2	4	36%	2	25%
UAS North Access to Mendenhall Lp	11.2	10	4	36%	4	50%
UAS North Access to Fritz Cove Road	11.2	3.2	1	9%	0	0%
UAS North Access to Glacier Hwy North of Ferry Terminal	11.2	12	0	0%	1	13%
UAS North Access to Fisherman's Bend and Ferry Terminal	11.2	8	0	0%	1	13%
UAS North Access to DeHart's and Fish Lab	11.2	6	2	18%	0	0%
			11	100%	8	100%

Trip Description	Origin Station	Destination Station	MONDAY Observed Trip Ends	MONDAY AM % of Total Origin Traffic	TUESDAY Observed Trip Ends	TUESDAY AM % of Total Origin Traffic
Fisherman Bend to JNU	8	2	171	67%	201	70%
Fisherman's Bend to Fritz Cove	8	3.2	9	4%	6	2%
Fisherman Bend to Mendenhall Lp	8	10	29	11%	27	9%
Fisherman's Bend to UAS North Access	8	11.1	13	5%	9	3%
Fisherman's Bend to UAS South Access	8	4.1	7	3%	5	2%
Fisherman's Bend to Dehart's-Fish Lab	8	6	20	8%	35	12%
Fisherman's Bend to North of Ferry Terminal	7	12	5	2%	3	1%
			254	100%	286	100%

Trip Description	Origin Station	Destination Station	MONDAY		TUESDAY	
			Observed Trip Ends	AM % of Total Origin Traffic	Observed Trip Ends	AM % of Total Origin Traffic
DeHart's-Fish Lab to JNU	6	2	93	49%	135	59%
DeHart's-Fish Lab to Fritz Cove	6	3.2	5	3%	3	1%
DeHart's-Fish Lab to Mendenhall Lp	5	10	20	10%	16	7%
DeHart's-Fish Lab to UAS North Access	5	11.1	7	4%	6	3%
DeHart's-Fish Lab to UAS South Access	6	4.1	4	2%	4	2%
DeHart's-Fish Lab to Fisherman's Bend-Ferry Terminal	5	7	58	30%	52	23%
DeHart's-Fish Lab to North of Ferry Terminal	5	12	4	2%	11	5%
			191	100%	227	100%

Origin and Destination Study
Observation Stations
September 23 and 24, 2002

9- IB

10- OB

7- OB

11- 11.1 is IB, 11.2 is OB

8- IB

5- OB

6- IB

4- 4.1 is OB, 4.2 is IB

Beyond Ferry Terminal
11- IB
12- OB

1-OB

2-IB

3- 3.1 is IB, 3.2 is OB

KEY
IB = Inbound traffic towards Juneau
OB = Outbound traffic away from Juneau
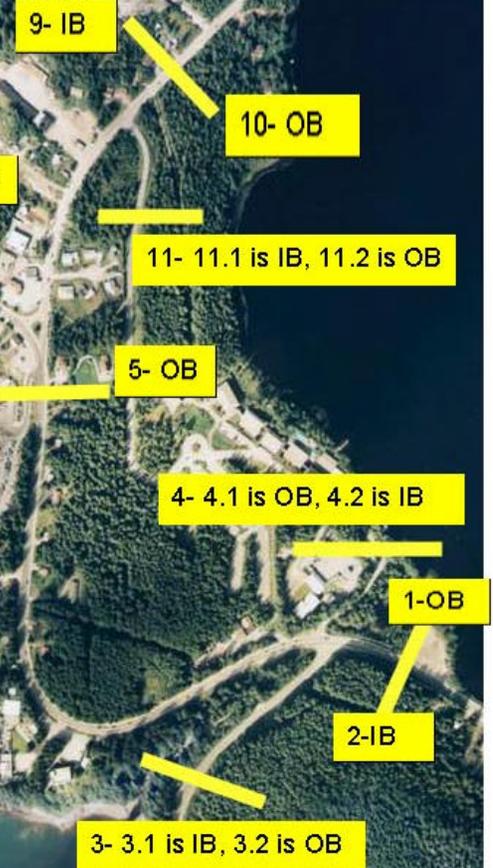
Appendix J. Turning Movement Future LOS

Glacier Hwy & Fritz Cove Intersection AM Turning Movement MOE Summary						
	Approach			Yr 2002	Yr 2009	Yr 2019	Yr 2029
Glacier Hwy/ Fritz Cove, AM peak	eastbound left	LOS	A	A	A	A
		v/c	0.01	0.01	0.01	0.01
		Control Delay	7.7	7.7	8	8.3
	westbound left	LOS	A	A	A	B
		v/c	0.01	0.01	0.01	0.02
		Control Delay	8.4	8.8	9.2	10
	northbound left/through/right	LOS	B	C	C	F
		v/c	0.39	0.86	0.36	0.69
		Control Delay	14.7	18	24.8	57.2
	southbound left	LOS	C	C	D	E
		v/c	0.06	0.09	0.16	0.32
		Control Delay	15.1	18.2	25.3	48.3

Glacier Hwy & Fritz Cove Intersection PM Turning Movement MOE Summary						
	Approach	MOE	Yr 2002	Yr 2009	Yr 2019	Yr 2029
Glacier Hwy/ Fritz Cove, PM peak	eastbound left	LOS	B	B	B	C
		v/c	0.02	0.03	0.05	0.09
		Control Delay	10.8	12.2	14.2	19.1
	westbound left	LOS	A	A	A	B
		v/c	0.08	0.11	0.14	0.21
		Control Delay	8.5	9	9.5	10.6
	northbound left/through/right	LOS	E	F	F	F
		v/c	0.39	0.86	2.26	13.86
		Control Delay	48.5	164.2	830	*
	southbound left	LOS	F	F	F	F
		v/c	1.45	3.44	9.65	194
		Control Delay	352.8	*	*	*

Glacier Hwy & Harbor Road Intersection AM Turning Movement MOE Summary						
	Approach	MOE	Yr 2002	Yr 2009	Yr 2019	Yr 2029
Glacier Hwy/ Harbor Road, AM peak	northbound left/through	LOS	A	A	A	A
		v/c	0.01	0.02	0.02	0.03
		Control Delay	8.5	8.6	8.8	9.3
	eastbound left/right	LOS	B	B	B	B
		v/c	0.04	0.05	0.06	0.08
		Control Delay	10.4	10.8	11.3	12.4

Glacier Hwy & Harbor Road Intersection PM Turning Movement MOE Summary						
	Approach	MOE	Yr 2002	Yr 2009	Yr 2019	Yr 2029
Glacier Hwy/ Harbor Road, PM peak	northbound left/through	LOS	A	A	A	A
		v/c	0.03	0.05	0.06	0.08
		Control Delay	8.2	8.2	8.4	8.8
	eastbound left/right	LOS	C	C	D	F
		v/c	0.14	0.19	0.29	0.59
		Control Delay	16	20.3	28.5	70

Glacier Hwy/ Mendenhall Lp Intersection AM Turning Movement MOE Summary						
	Approach	MOE	Yr 2002	Yr 2009	Yr 2019	Yr 2029
Glacier Hwy/ Mendenhall Lp., AM peak	westbound left	LOS	B	B	C	C
		v/c	0.23	0.26	0.33	0.48
		Control Delay	13.8	14.9	17.1	23.9

Glacier Hwy/ Mendenhall Lp Intersection PM Turning Movement MOE Summary						
	Approach	MOE	Yr 2002	Yr 2009	Yr 2019	Yr 2029
Glacier Hwy/ Mendenhall Lp., PM peak	westbound left	LOS	C	D	F	F
		v/c	0.36	0.48	0.69	1.34
		Control Delay	23.3	33.1	59.3	267.3

Glacier Hwy & Mendenhall Lp Wye Intersection AM Turning Movement MOE Summary						
	Approach	MOE	Yr 2002	Yr 2009	Yr 2019	Yr 2029
Glacier Hwy/ Mendenhall Lp Wye, AM peak	eastbound left/ through	LOS	A	A	A	A
		v/c	0.02	0.02	0.03	0.04
		Control Delay	7.5	7.5	7.6	7.7
	southbound right	LOS	A	A	A	A
		v/c	0.04	0.04	0.05	0.07
		Control Delay	8.9	9.1	9.2	9.5

Glacier Hwy & Mendenhall Lp Wye Intersection PM Turning Movement MOE Summary

	Approach	MOE	Yr 2002	Yr 2009	Yr 2019	Yr 2029
Glacier Hwy/ Mendenhall Lp Wye, PM peak	eastbound left/ through	LOS	A	A	A	B
		v/c	0.06	0.07	0.08	0.12
		Control Delay	8.7	8.9	9.4	10.3
	southbound right	LOS	B	B	C	C
		v/c	0.14	0.16	0.21	0.32
		Control Delay	12.4	13.3	15.1	19.9

Mendenhall Lp/Mendenhall Lp Wye Intersection AM Turning Movement MOE Summary

	Approach	MOE	Yr 2002	Yr 2009	Yr 2019	Yr 2029
Mendenhall Lp/ Mendenhall Lp Wye, AM peak	eastbound left	LOS	A	B	B	B
		v/c	0.04	0.05	0.06	0.08
		Control Delay	9.8	10.2	10.6	11.2

Mendenhall Lp/Mendenhall Lp Wye Intersection PM Turning Movement MOE Summary

	Approach	MOE	Yr 2002	Yr 2009	Yr 2019	Yr 2029
Mendenhall Lp/ Mendenhall Lp Wye, PM peak	eastbound left	LOS	B	B	C	C
		v/c	0.11	0.14	0.18	0.28
		Control Delay	11.4	13.6	15.2	19.4

Mendenhall Lp/UAS North Entrance Intersection AM Turning Movement MOE Summary

	Approach	MOE	Yr 2002	Yr 2009	Yr 2019	Yr 2029
Mendenhall Lp/ UAS North Entrance, AM peak	westbound left	LOS	A	A	A	A
		v/c	0.03	0.04	0.05	0.06
		Control Delay	7.5	7.7	7.8	8.1
	northbound left/ right	LOS	A	B	B	B
		v/c	0.01	0.03	0.06	0.1
		Control Delay	9.8	10.3	11	12.3

Mendenhall Lp/UAS North Entrance Intersection PM Turning Movement MOE Summary

	Approach	MOE	Yr 2002	Yr 2009	Yr 2019	Yr 2029
Mendenhall Lp/ UAS North Entrance, PM peak	westbound left	LOS	A	A	A	A
		v/c	0.03	0.04	0.05	0.06
		Control Delay	7.8	8	8.3	8.7
	northbound left/ right	LOS	B	B	C	D
		v/c	0.09	0.24	0.41	0.68
		Control Delay	10.4	13.2	17.1	30.6