

Volume to Capacity of the Existing Juneau-Douglas Bridge

Introduction

The Alaska Department of Transportation (DOT&PF) has retained Kinney Engineering, LLC (KE) as a subconsultant to DOWL for the *Juneau-Douglas North Channel Crossing Planning & Environmental Linkage (PEL) Study*, which will evaluate alternatives and determine recommended crossing location(s) for a second bridge crossing of the channel between Juneau and Douglas Island, north of the existing Juneau-Douglas Bridge.

The purpose of this memorandum is to perform a high-level analysis of the volume to capacity of the existing Juneau-Douglas Bridge under existing conditions and in the 2050 design year, under the assumption of a 0.25% annual growth rate. KE will perform a more detailed volume forecast after the population forecast being prepared for this project is complete. The volume to capacity analysis considers the segment capacity of the bridge, as well as operations at the intersections on either end of the bridge (the roundabout on Douglas Highway and the signalized intersection of Egan Drive with 10th Street), as these intersections may limit capacity. While a second bridge across the north channel may be warranted for many reasons, this memo focuses on determining if volumes under existing conditions and/or in the 2050 design year suggest the need to construct a second channel crossing.

Operational analyses of the intersections at either end of the bridge rely on *Highway Capacity Manual* methodologies, utilize Synchro and McTrans Highway Capacity Software (HCS), and present qualitative level of service (LOS) scores. Capacity considerations for the bridge itself use the planning level average annual daily volumes presented in the *2020 Quality Level of Service Handbook* prepared as a guide by the Florida Department of Transportation.

Summary of Results

Egan Drive with 10th Street:

- Under existing conditions, the intersection operates at LOS D during both morning and evening peak hours.
- By 2050, the intersection LOS will deteriorate to LOS E in the AM peak but will continue to operate at LOS D in the PM peak.

Roundabout at Douglas Highway with Juneau-Douglas Bridge

- Under existing conditions, the roundabout operates at LOS E during the AM peak and LOS D or better during the PM peak.
- By 2050, the roundabout LOS will deteriorate to LOS F in the AM peak but will continue to operate at LOS D or better during the PM peak.

Juneau-Douglas Bridge

- Under existing conditions, the bridge operates under capacity during peak hours.
- By 2050, the bridge will operate at or near capacity during peak hours.

Figure 1 summarizes operations expected during the 2050 AM peak, which is the time of day expected to experience the most delay and capacity issues.

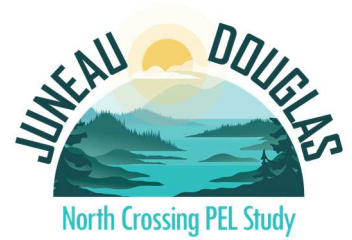


Figure 1: 2050 AM Peak

Figure 2 summarizes operations expected during the 2050 PM peak, which is not expected to experience as much delay as the AM peak.



Figure 2: 2050 PM Peak



Analysis

Juneau-Douglas Bridge

Historic Average Annual Daily Traffic (AADT) data was collected from the DOT&PF's online *Alaska Traffic Data* site. 2022 and 2050 design year AADT's were projected using a 0.25% annual growth rate, as shown in Table 1.

Table 1: AADT's on the Juneau-Douglas Bridge

Provided by DOT&PF								Projected by KE	
2014	2015	2016	2017	2018	2019	2020	2014–2020 Average*	2022	2050
11,524	11,695	8,562	8,471	14,016	15,556	12,800	13,198	13,297	14,260

- Counts denoted as "user supplied" by DOT&PF

- Counts estimated by DOT&PF, pandemic volumes

* Average does not include "user supplied" counts or 2020 pandemic volumes

The Florida Department of Transportation 2020 *Quality/Level of Service (Q/LOS) Handbook* provides guidance for developing and reviewing roadway capacity and Q/LOS at a generalized planning level. Volume tables in the handbook provide generalized annual average daily volumes for roadways by facility type.

The functional classification of the Juneau-Douglas Bridge is minor arterial, the downtown end of the bridge is controlled by a signalized intersection, the bridge is located in a transitioning area, and the posted speed limit is 30 mph. Based on these criteria, applicable average daily volumes for a given LOS are shown in Table 2.

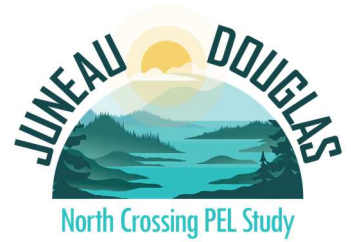
Table 2: Generalize Annual Average Daily Volumes

Source: Table 2 (Transitioning Areas and Areas Over 5,000 Not in Urbanized Areas) in the 2020 *Q/LOS Handbook*

State Signalized Arterials Class II (35 mph or slower posted speed limit)				
LOS	B	C	D	E
Transitioning Areas, 2 Lanes, Undivided	*	6,500	13,300	14,200

* Cannot be achieved using table input value defaults

The volumes presented in the *Q/LOS Handbook* tables are estimated to be the highest volumes at which a given LOS can be achieved at a planning level of analysis; volumes above those shown in the LOS E column are estimated to cause a given facility to operate over capacity. Table 2 shows that at a planning level of analysis, the Juneau-Douglas Bridge operates under capacity (LOS D) during peak hours under existing conditions. Assuming a 0.25% growth rate, the bridge will operate above capacity by 2050, likely resulting in standing queues and significant delays.



Egan Drive with 10th Street

Operational analysis indicates that the signalized intersection at Egan Drive with 10th Street operates at LOS D during peak hours under existing conditions. In the 2050 design year, overall operations at the intersection are expected to deteriorate to LOS E in the AM peak but remain at LOS D in the PM peak.

In the 2050 AM peak, vehicles traveling from the Mendenhall Valley and turning left onto 10th Street will experience LOS F. The following movements will experience LOS E:

- Vehicles traveling from Mendenhall Valley and continuing on Egan Drive (expected 95th percentile queues will exceed 600 feet),
- Vehicles heading from Douglas Island and turning onto Egan Drive towards the Mendenhall Valley (expected 95th percentile queues will exceed 500 feet),
- Vehicles heading from Douglas Island and continuing onto 10th Street (expected 95th percentile queues will exceed 500 feet), and
- Vehicles heading from downtown via Egan Drive and turning left towards Douglas Island.

In the 2050 PM peak, no movements experience LOS F. However, the following movements will experience LOS E:

- Vehicles traveling from the Mendenhall Valley and turning left onto 10th Street,
- Vehicles traveling from 10th Street towards Douglas Island,
- Vehicles traveling from downtown via Egan Drive and turning left towards Douglas Island, and
- Vehicles traveling from downtown via Egan Drive and continuing towards Mendenhall Valley (expected 95th percentile queues will exceed 700 feet).

Roundabout at Douglas Highway with Juneau-Douglas Bridge

Operational analysis indicates the roundabout at Douglas Highway with Juneau-Douglas Bridge operates well (LOS D or better) during the PM peak under existing conditions and in the 2050 design year.

Under existing conditions during the AM peak, significant delay (LOS F with queues over 500 feet) is experienced by vehicles entering the roundabout from West Juneau/Douglas and continuing onto North Douglas Highway or turning right onto the bridge (towards downtown). The through and right lane is shared and there is a high volume of vehicles wishing to turn right to cross the bridge (more than double the volume of any other movement entering the roundabout), causing some congestion. Additionally, vehicles entering the roundabout from North Douglas Highway and continuing onto the Juneau-Douglas Bridge have right-of-way in the roundabout over the vehicles entering from West Juneau/Douglas, exacerbating the congestion. By 2050 this delay is expected to cause the roundabout as a whole to operate at LOS F, and queues are expected to extend nearly 1,000 feet. (Note that during the PM peak a high number of vehicles turn left from the bridge towards West Juneau/Douglas; however, the bridge-leg of the roundabout has a dedicated left-turn and right-turn lane and there are fewer conflicting vehicles circulating within the roundabout, which ameliorates some of the congestion).

A Juneau resident has anecdotally reported that vehicles entering the roundabout experience about 5 minutes of delay during the AM peak and about 2 minutes of delay during the PM peak. While the operational analysis does not indicate that standing queues will build during the PM peak under either existing conditions or in the design year, SimTraffic microsimulation indicates that rolling queues are experienced under both volume cases.