

Alaska Department of Transportation & Public Facilities Juneau's Adaptive Traffic Signal Control System

David B. Epstein, P.E., Southcoast Region Traffic and Safety Engineer

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Background

There are 17 traffic signals in Juneau

- 3 in downtown
- 4 in the Salmon Creek / Lemon Creek area
 - Area between downtown and Mendenhall Valley
- 10 in the Mendenhall Valley

A map of Alaska



The General Layout of Juneau



Keep Alaska Moving through service and infrastructure

Downtown Signals



Salmon Creek / Lemon Creek Signals



Mendenhall Valley Signals



"A Tale of Two Cities"

- Juneau's population is approx. 32,500
- There are seasonal increases due to the Legislature and tourism industry
- On any given day in the summer, there can be over 10,000 cruise ship passengers in town, many on their way to and from land-based excursions that generate traffic
- All this cast against the backdrop of a highly directional traffic flow during the workweek
- Many state offices are located downtown; many employees live in the Mendenhall Valley
- Major movements in the morning are from the Valley to downtown (~8 miles on Egan Drive)
- Reverse in the afternoon
- Juneau has grown from its gold rush roots as a fledgling Juneau-Douglas hub to a city with two population centers approx. 10 miles apart

The Challenge

The Juneau road system suffers from a lack of route diversity

One road provides a continuous connection from the Valley to downtown – Egan Drive

In the Valley, two roads provide access from residential areas to Egan Drive

The intersection of two main routes – Mendenhall Loop Road and Egan Drive – is subject to severe congestion during peak hours

The 5-signal Mendenhall Valley Adaptive Control Network



AM Peak - Loop and Egan



AM Peak – Riverside and Egan



Turning Movement Peak Hour Data Plot (8:15 AM)

Excessive queueing

The morning main movement is from Loop Road inbound to Egan Drive inbound.

Drivers with a destination of downtown approaching Egan on Loop Road from Valley residences have the signalized Mall Road intersection to traverse prior to Egan Drive (only 665 ft away).

The signals were running a peak hour plan but were not coordinated with one another.

This was true of not only the Loop/Mall Road and Loop/Egan intersections but also Riverside/Vintage and Riverside/Egan.

Excessive wasted green time, mainly on side streets.

Bad weather and city events that generated traffic caused significant increases in delay.

The relatively-distant "McNugget" signal also ran a peak hour plan but was not coordinated with any other signal.

Lengthy queues of a quarter-mile or more would develop in advance of the Mall Road intersection, and took multiple cycles to clear.

The Answer

Implement an adaptive traffic signal control system to optimize throughput for the main movement continuously through peak traffic times.

Do so with a goal of facilitating stop-free travel for a platoon beginning with the Mall Road signal through "McNugget".



What It Took

Software

• Southcoast Region selected FHWA's ACS Lite program

Robust detection

- Upgrade intersections in the network to radar detection stop bar and advance
- Southcoast Region selected Wavetronix Smart Sensor (already in use at other intersections)

The ability to observe operations

- Install a pan-tilt-zoom camera at each network intersection to observe the effectiveness of adaptive traffic signal control
- Establish a Traffic Command Center in Regional Headquarters

Lessons Learned

Know your system characteristics

- Accurate data on physical dimensions of the network
- Accurate speed data 85th percentile
- Valid traffic volume and turning movement data

Detector placement is critical

- Install and align advance and stop bar locations with uniformity across the network
- Maximize detection zones maximize available data
- Each lane requires its own detection zone parallel to one another and equidistant from stop bar

Provide sufficient bandwidth for communications and surveillance

- Networks are bandwidth-intensive
- PTZ cameras had their own sizeable data requirements
- Plan on upgrading your communications infrastructure in conjunction with going adaptive

Mid-day Madness

- Southcoast Region's adaptive traffic signal control network launched with three coordination plans

 morning, mid-day, and evening.
- While not as pronounced as during morning and evening peak times, prior to launch, the network was experiencing increased mid-day congestion.
- When adaptive launched, the mid-day coordination plan was not observed to be making a tangible improvement; in fact, delays increased!
- As it turned out, there was not enough volume to cause ACS Lite to make adjustments to the timing plan.
- The result: a lot of wasted green time and more delay.
- Mid-day plan was scrapped and signals returned to actuated mode.
- Moral of the story: the public will let you know when things aren't working!!
- Impending regionwide traffic signal upgrade system will addition of signals to adaptive network.

Linus bottomus (Latin for "The Bottom Line")



"A chain is only as strong as its weakest link"





Thank You

Questions ??

David Epstein 907-465-4483 david.epstein@alaska.gov

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