Background and Study Objectives

- Investigate current traffic operations on Highway 1 between Lynn Valley Road and Willingdon Avenue interchanges
- Review recent changes in peak and daily traffic volume and how they are affecting operations
- Identify problem areas
- Identify potential short term improvements, taking into consideration committed improvements at Lower Lynn / Mountain Highway
Study Focus

- Broader interest in 10 interchanges and their on/off ramps as they influence congestion approaching/departing the Ironworkers Memorial Bridge (IWMB)
- More detailed focus on immediate bridge and North Shore influences:
  - Hastings Street / Cassiar Street
  - McGill Street
  - Dollarton Highway / Main Street
  - Fern Street
  - Mountain Highway
  - Lynn Valley Road
Data Sources

- Data collection is a challenge as there is only one 24/7/365 counter on the IWMB
- Permanent count station on the IWMB includes directional distribution over 10 years, hourly and daily trends (15 minute intervals), heavy vehicle counts
- Supplemented with available turning movement counts from CNV / DNV, short manual counts, and detector data from Highway 1 corridor south of Cassiar
- Population, employment and building permit trends
Traffic Trends

- Less than half a percentage point per annum increase in daily traffic over Burrard Crossings (10 years)
- Since Port Mann Bridge completed in 2012, 0.6% and 1.7% increases have been observed on IWMB in 2013 and 2014, respectively
Demographic Trends

- Over same 10 year period, North Shore grew by 0.5% per annum while Metro Vancouver grew by 1.5% per annum
- Daily traffic growth over 10 years slightly less than North Shore population growth
- % of North Shore residents with a Place of Work on North Shore increased from 46% to 50%
- Jobs filled by workers south of Burrard Inlet increased from 17,260 to 19,660 (+14%)
- Building / demo permits grew by 3.9% per annum over last five years (value increased by 12.6% per annum)
- Sea to Sky traffic growth 3.0% per annum
- Horseshoe Bay ferry traffic down
Seasonal data aggregated to highlight differences
Summer days average highest daily volumes (2% higher than fall)
August had highest weekday average traffic in 2014
Identifying the Peak

- Seasonal trends hold when broken down by day of the week
- Tuesday, Wednesday, Thursday counts screened out as highest volumes
- During the two years following the completion of Port Mann / Highway 1, average August weekday volume has increased by over 4,800 daily vehicles
Weekday and Weekend Variation

Weekday and Weekend Average Daily Traffic

- Lions Gate - MF
- Lions Gate - T/WH
- Lions Gate - SS
- Second Narrows - MF
- Second Narrows - T/WH
- Second Narrows - SS

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Effects of Congestion From North Shore

- When a transportation facility reaches maximum capacity, growth in traffic volume typically occurs in the shoulder hours adjacent to the peak hour – “peak spreading”
- Eastbound traffic profile (from North Shore) shows significant spread during the afternoon peak over the last five years
- Near / over capacity thresholds throughout a four hour period from 2:00 PM to 6:00 PM
Effects of Congestion From North Shore

Second Narrows Bridge EB August 2010-2014 (TWTH)

Volume

Time

12:00:00 AM
1:00:00 AM
2:00:00 AM
3:00:00 AM
4:00:00 AM
5:00:00 AM
6:00:00 AM
7:00:00 AM
8:00:00 AM
9:00:00 AM
10:00:00 AM
11:00:00 AM
12:00:00 PM
1:00:00 PM
2:00:00 PM
3:00:00 PM
4:00:00 PM
5:00:00 PM
6:00:00 PM
7:00:00 PM
8:00:00 PM
9:00:00 PM
10:00:00 PM
11:00:00 PM
12:00:00 AM

2010E
2014E
PM Peak Spreading From North Shore
By grouping blocks of adjacent hours, we can observe aggregate growth even when peak capacity is constrained.

Peak period traffic from the North Shore has grown much more significantly in the PM peak (+4.4%) than in the AM peak (+0.5%).
Westbound traffic profile (to North Shore) shows significant spread during the morning peak over the last five years.

Near / over capacity thresholds throughout a three hour period from 6:00 AM to 9:00 AM.
AM Peak Spreading To North Shore

August AM WB Peak Spreading

Volume

5:00:00 AM 6:00:00 AM 7:00:00 AM 8:00:00 AM 9:00:00 AM

2010 2014
Peak period traffic to the North Shore has grown much more significantly in the AM peak (+7.8%) than in the PM peak (+0.7%)
Heavy Vehicles

- Summer season proportion highest (includes recreational vehicles in the mix)
- Less than 2% of daily and peak hour totals
- Heavy vehicles from the North Shore peak through mid-day, avoiding commuter peaks
- Heavy vehicles to the North Shore peak just before and just after the AM commuter peak hour
- Does not include light commercial service vehicles
Heavy Vehicles From North Shore

Heavy Vehicle Average Hourly Profile EB

- 2010 E
- 2014 E
Heavy Vehicles To North Shore

Heavy Vehicle Average Hourly Profile WB

- **Volume**
- **Time**

- **2010 W**
- **2014 W**
Used the October 2014 bridge counts as these were the highest peak hour counts when work and schools are in full session

Balanced observed bridge counts with isolated counts collected at interchange terminals and ramps

Conducted traffic engineering analysis to identify the key congestion triggers as these create queues that spill back and affect the entire network
Traffic Operations

- **AM Peak Chokepoints From the North Shore**
  - Weave between Fern Street on ramp and Main Street off ramp
  - Dollarton on ramp
  - IWMB on upgrade

- **PM Peak Chokepoints From the North Shore**
  - Weave between Fern Street on ramp and Main Street off ramp
  - Dollarton on ramp
Traffic Operations

- **AM Peak Chokepoints To the North Shore**
  - Hastings on ramp
  - Dollarton / Main Street off ramp
  - Weave between Dollarton on ramp and Mount Seymour / Lillooet off ramp
  - Merge / diverge between Fern Street on ramp and Mountain Highway off ramp

- **PM Peak Chokepoints To the North Shore**
  - Hastings on ramp
  - Dollarton / Main Street off ramp
  - Weave between Dollarton on ramp and Mount Seymour / Lillooet off ramp
  - Merge / diverge between Fern Street on ramp and Mountain Highway off ramp
Geometric Constraints

- North shore interchanges designed / built over 50 years ago
- Numerous elements do not meet modern best practices
  - Short weave distances
  - Short sequential spacing between on / off ramps
  - Limited shy distance to barriers
  - Lane imbalances
- Result is system has less processing capacity, and congestion rapidly spills over to adjacent locations
Summary

- Traffic growth and congestion has most significantly increased in what have traditionally been thought of as “counter-peak” direction.
- Growth corresponds to growth in employment and building activity, rather than population growth.
- Traffic to the North Shore in the morning and from the North Shore in the afternoon is over facility capacity for multiple adjacent hours.
- Congestion stems from several key chokepoints which limit how much traffic can cross IWMB.
- Geometric constraints and interchange spacing compound the effects of volume beyond capacity thresholds.
Next Steps

- Generate potential mitigation measures
- Include Lower Lynn and Mountain Highway Interchange improvements
- Identify any further optimizations