



Ministry of Transportation  
and Infrastructure

# Highway 1 Operations Lynn Valley to Willingdon

**PARSONS**

# 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

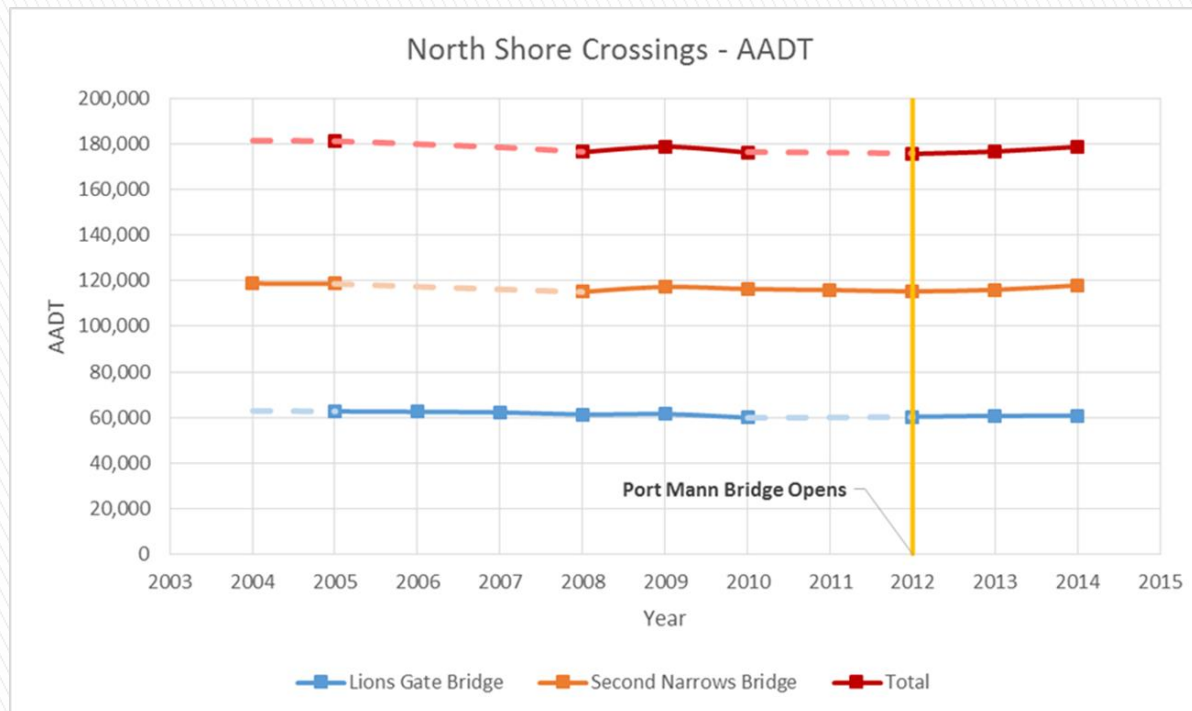
- ▶ Broader interest in 10 interchanges and their on / off ramps as they influence congestion approaching / departing the Ironworkers Memorial Bridge (IWMB)
- ▶ More detailed focus on immediate bridge and North Shore influences:
  - Hastings Street / Cassiar Street
  - McGill Street
  - Dollarton Highway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

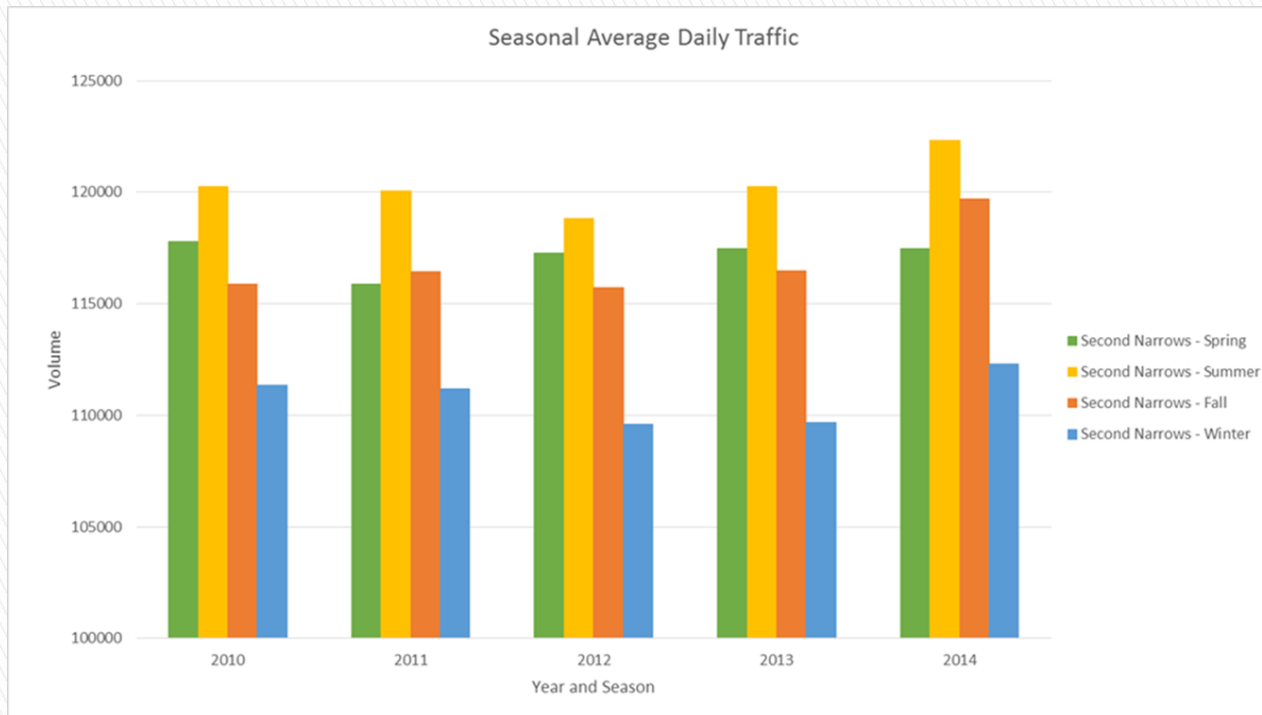


# Demographic Trends

- ▶ 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

# Identifying the Peak

- ▶ Seasonal data aggregated to highlight differences
- ▶ Summer days average highest daily volumes (2% higher than fall)
- ▶ August had highest weekday average traffic in 2014

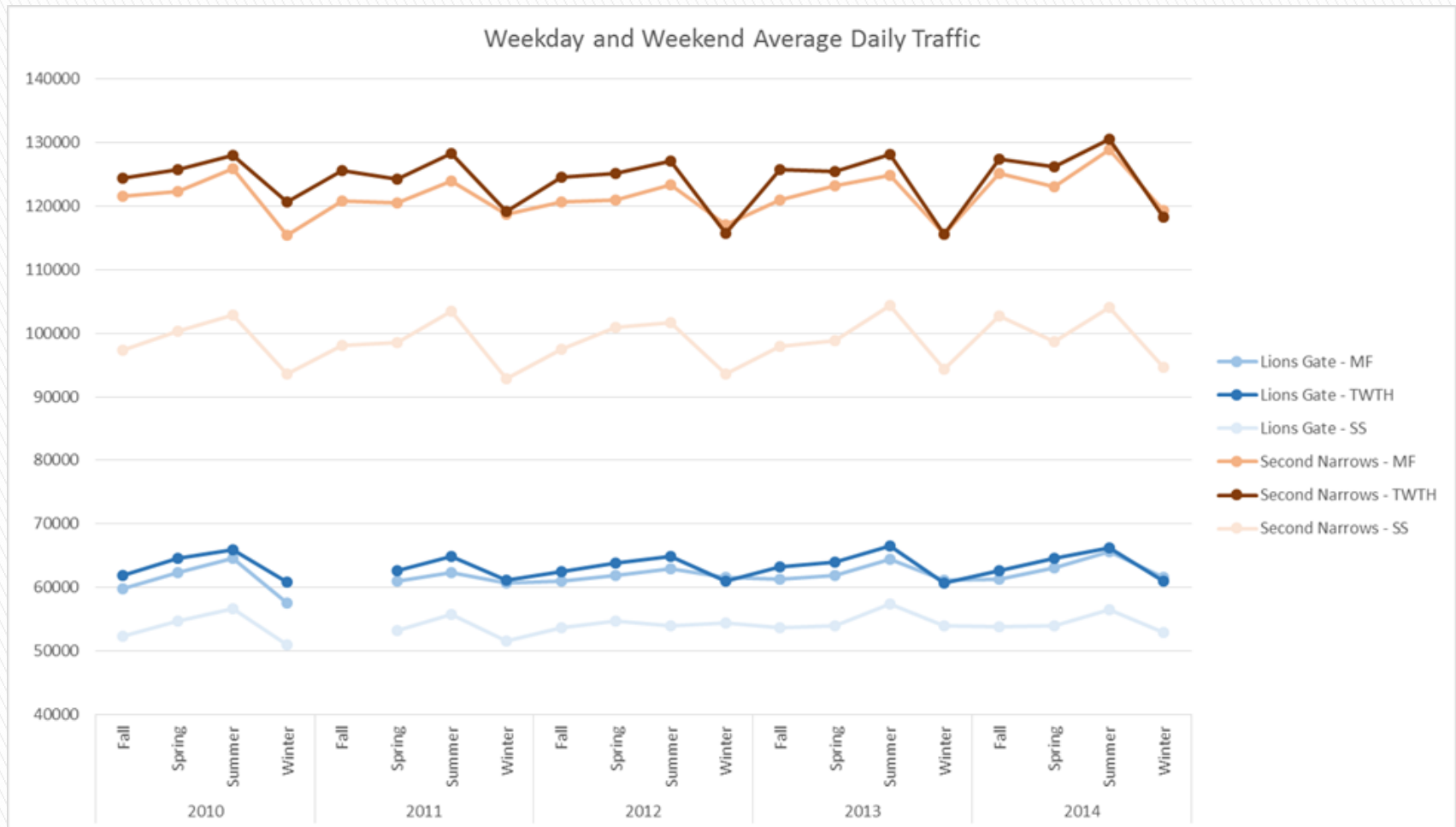


# Identifying the Peak

- ▶ 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



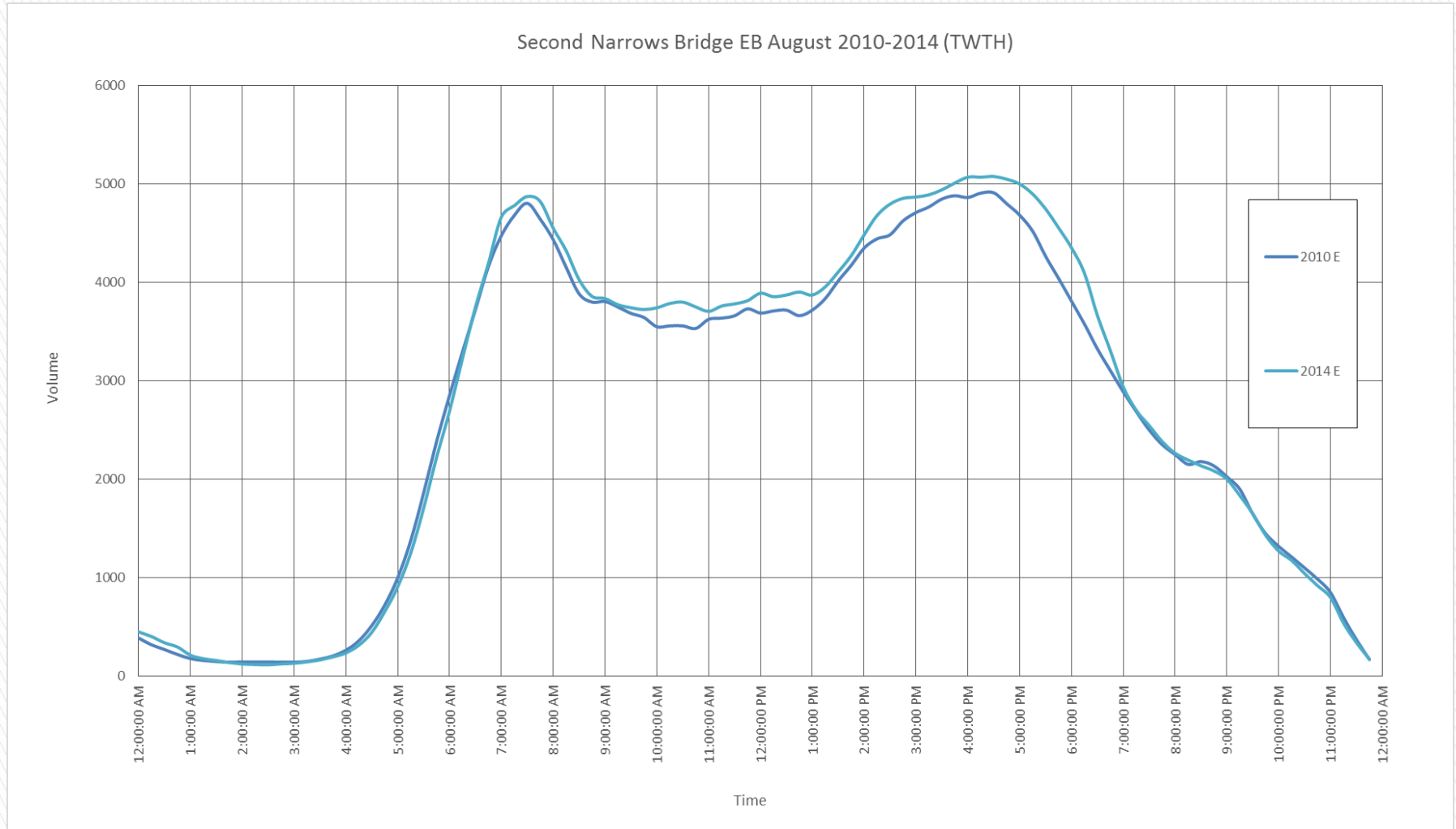
# Weekday and Weekend Variation



# Effects of Congestion From North Shore

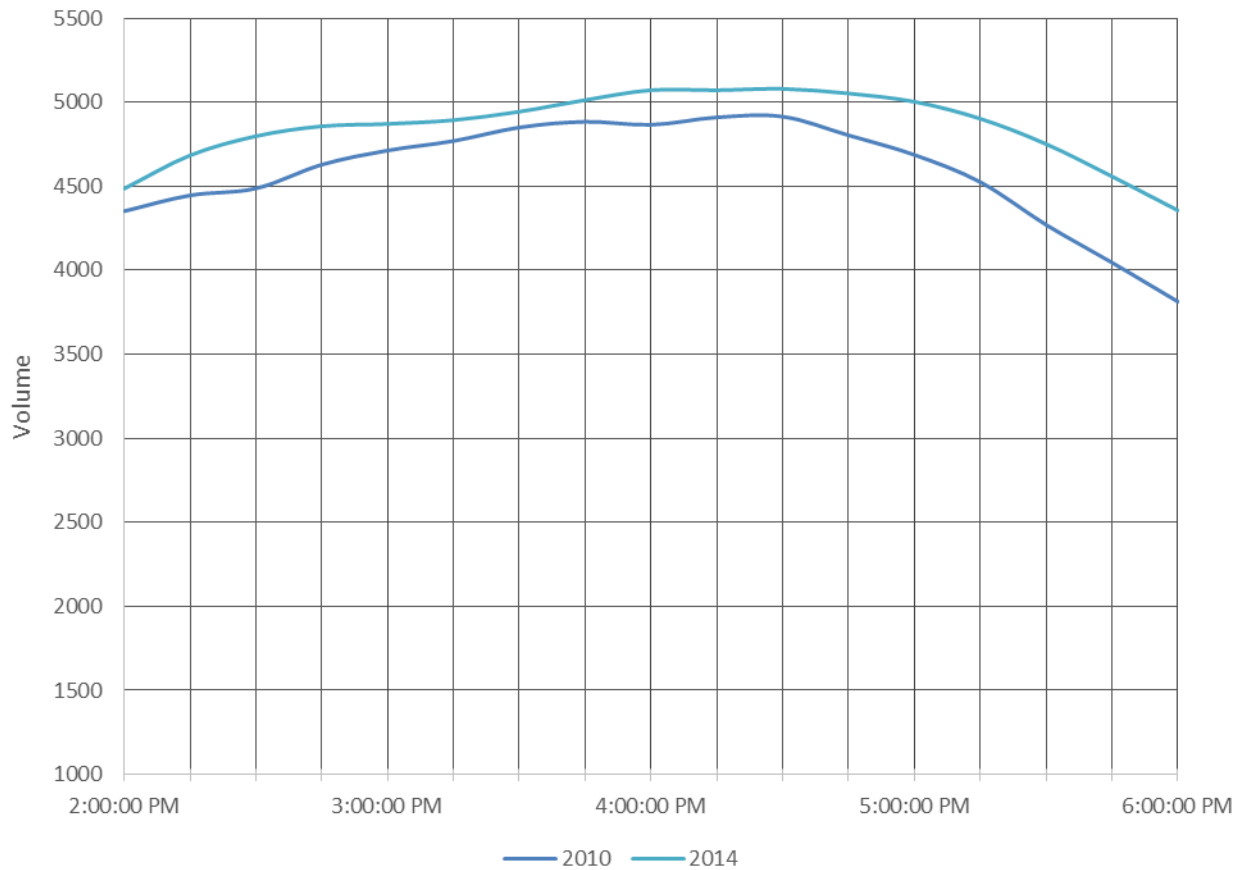
- ▶ When a transportation facility reaches maximum capacity, growth in traffic volume typically occurs in the shoulder hours adjacent to the peak hour – “peak spreading”
- ▶ Eastbound traffic profile (from North Shore) shows significant spread during the afternoon peak over the last five years
- ▶ Near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

# Effects of Congestion From North Shore



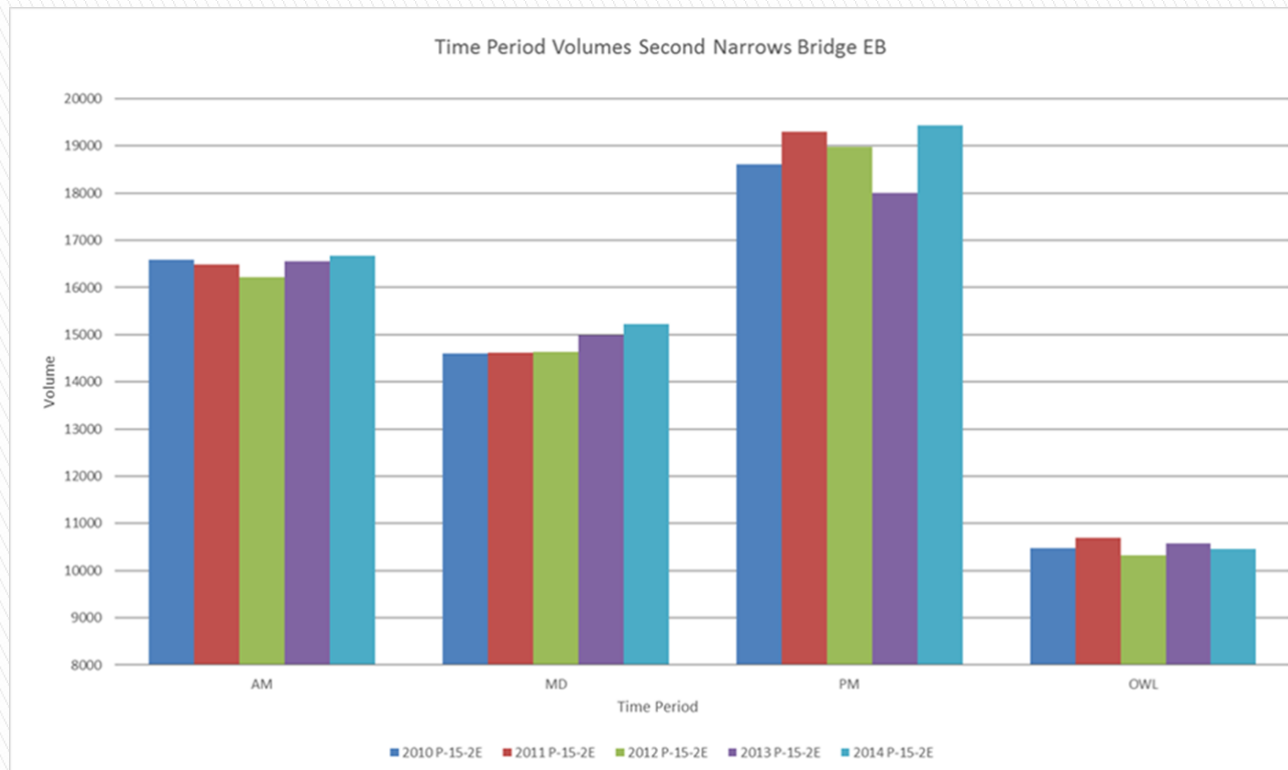
# PM Peak Spreading From North Shore

August PM EB Peak Spreading



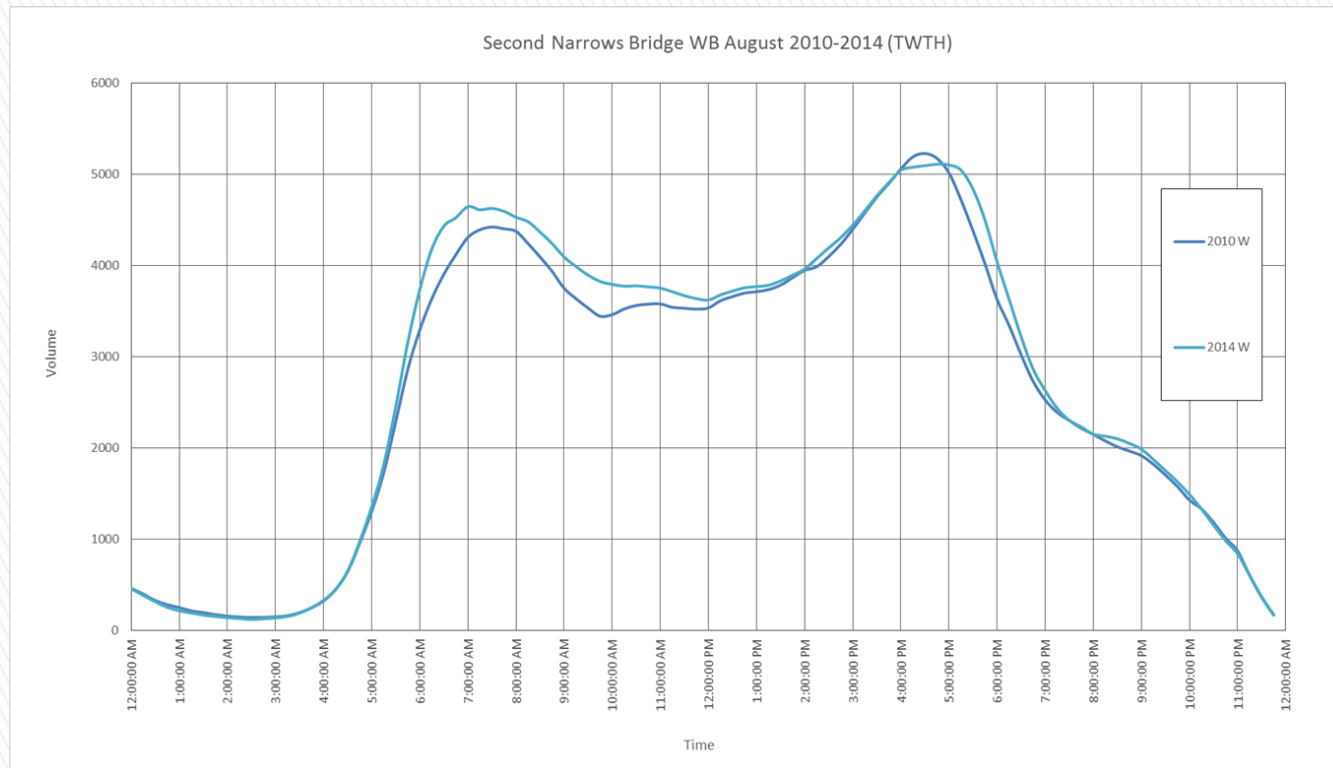
# Traffic Growth From North Shore

- ▶ 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%)

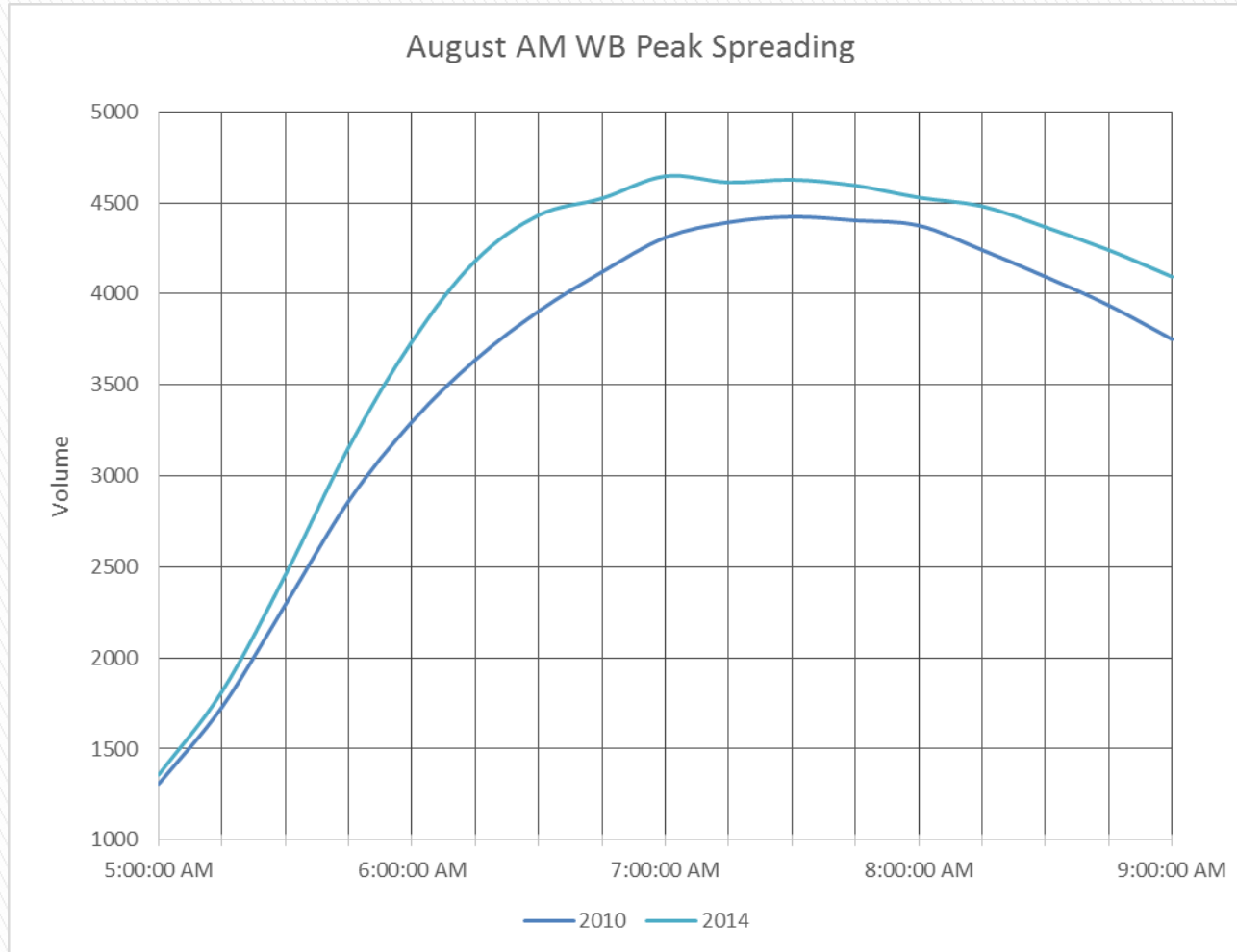


# Effects of Congestion To North Shore

- ▶ 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

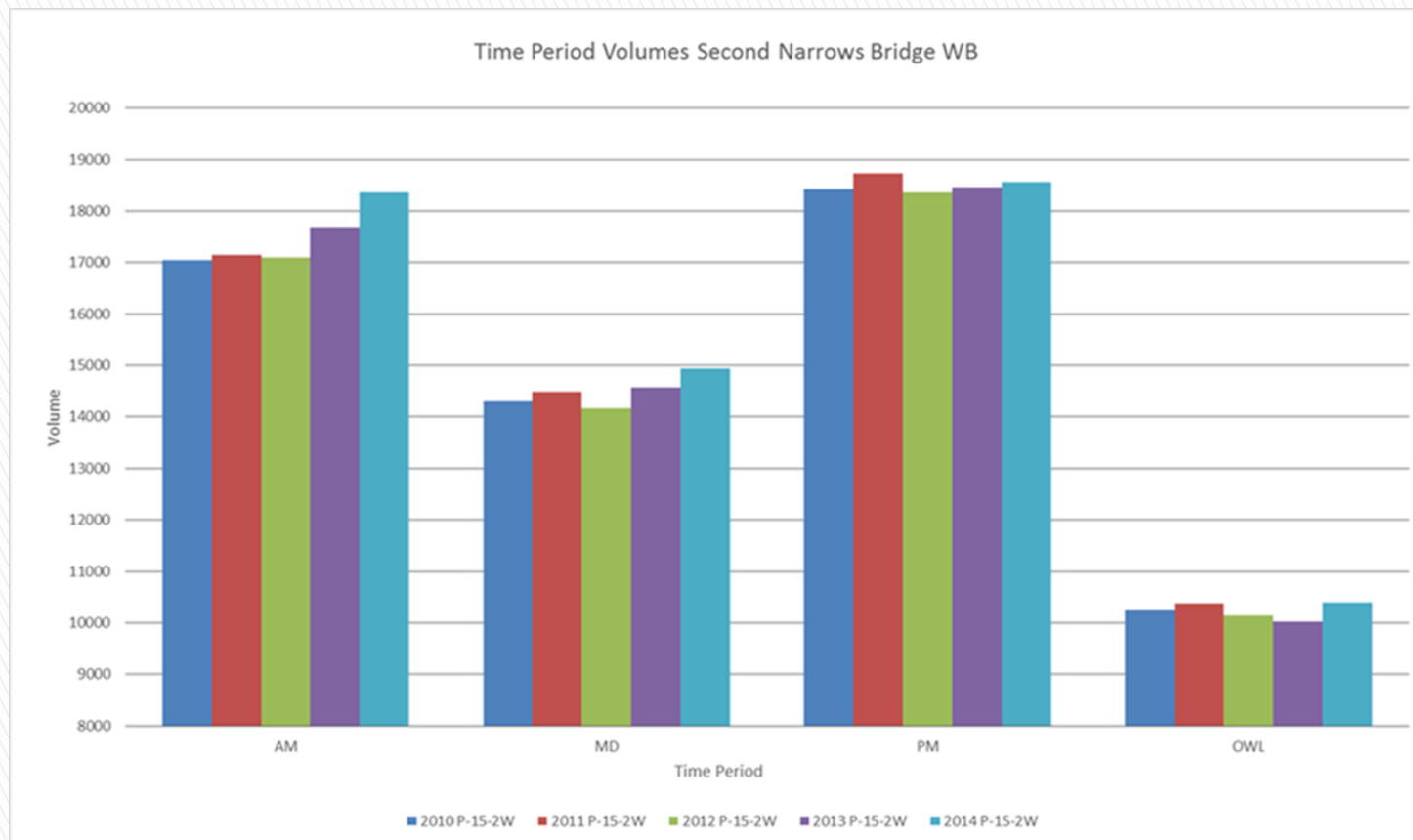


# AM Peak Spreading To North Shore



# Traffic Growth To North Shore

- ▶ 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%)

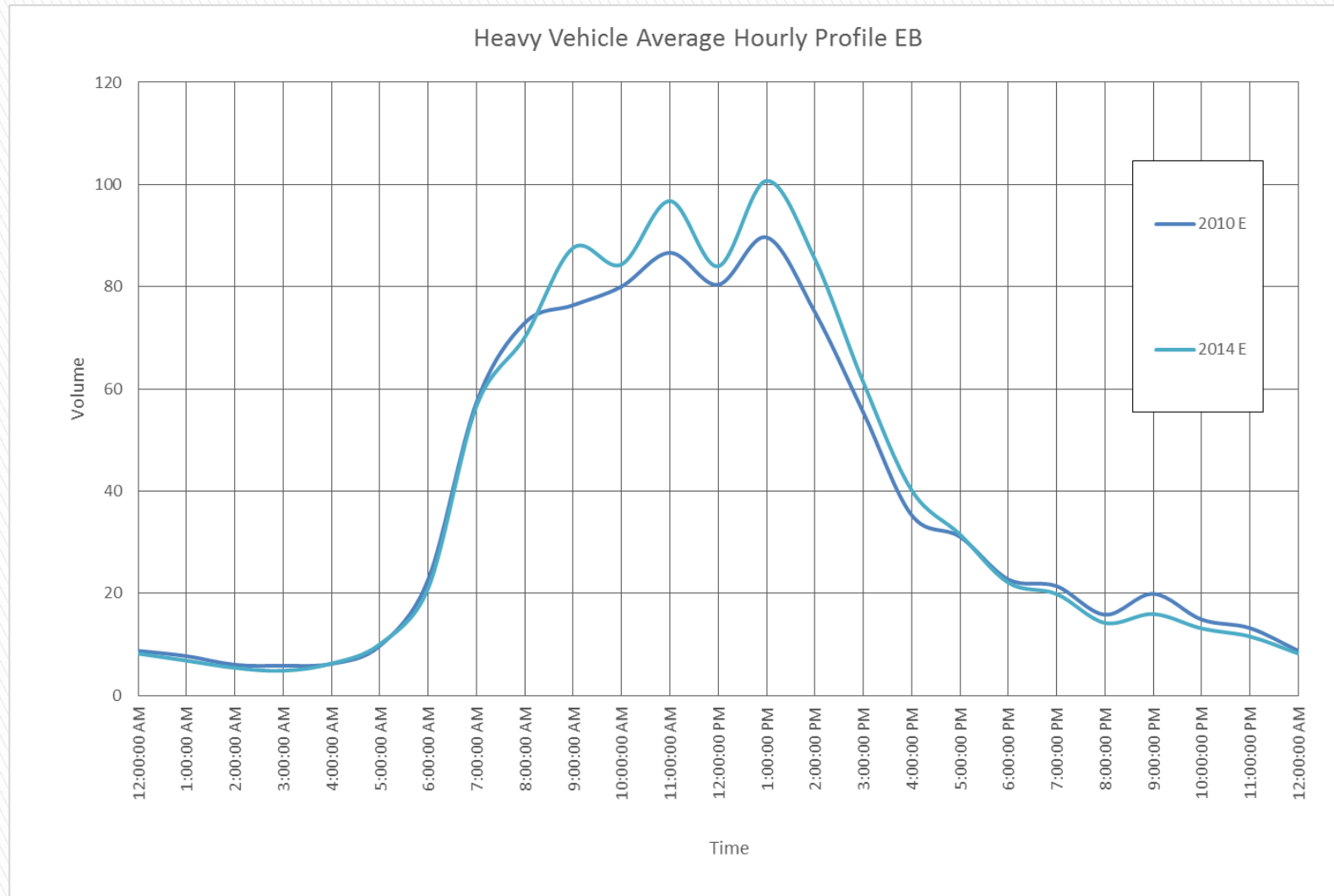




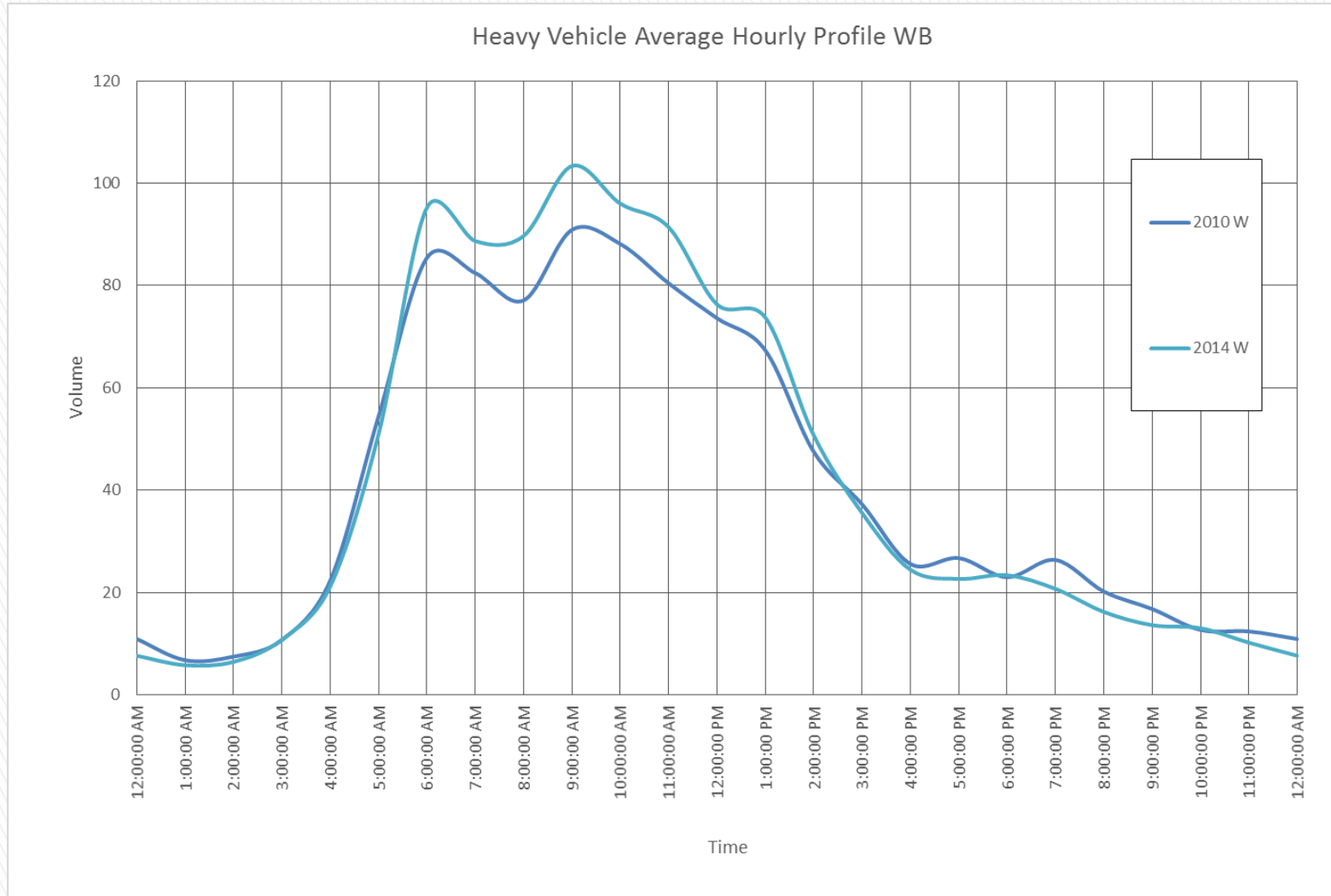
# Heavy Vehicles

- ▶ 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 Vehicles To North Shore



# Traffic Operations

- ▶ 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