1 Background

In December, 2013, the Whatcom Council of Governments (WCOG) submitted an application to the U.S. Federal Highway Administration's (FHWA) Integrated Corridor Management (ICM) planning grant program for $144,609. The required 20 percent match funding ($36,152) was committed by the British Columbia Ministry of Transportation and Infrastructure (BC MoTI). The estimated total project cost was $180,761. The application proposed planning and development efforts for border operations in the Cascade Gateway to be undertaken in coordination across multiple agencies on both sides of the U.S.-Canada border through the IMTC Program. WCOG's ICM proposal was titled Dynamic Border Management (DBM). It listed four challenges and four strategies for addressing them:

Cascade Gateway Challenges

- Maintaining wait time system accuracy
- Underused infrastructure capacity
- Inefficient lane-to-booth allocation
- Reactive queue management

DBM Strategies

- Border traffic simulation modeling enhancements
- Integrated ATIS (border wait time measurement systems) validation
- Active lane and booth management methods
- Near-term border traffic prediction

2 Current opportunity

As of this writing, the ICM Planning Grant initiative has not made selections for awards nor has indicated an expected timeline. In the meantime, FHWA's Border Planning Office has provided WCOG $150,000 of MAP-21 research funds to employ the DBM strategies towards reducing congestion and improving border transportation operations at Cascade Gateway border crossings. BC MoTI has confirmed it is able to shift its previous match commitment from the ICM application to this FHWA research funding. With the 20 percent match, available funding is $187,500.

3 Intermediate actions

WCOG has conferred with IMTC agencies who submitted support letters for the ICM application: Washington State Department of Transportation (WSDOT), US Customs and Border Protection (USCBP), Canada Border Services Agency (CBSA), Transport Canada (TC), and the British Columbia Ministry of Transportation and Infrastructure (MoTI). FHWA has advised that while the objectives and vision of the initial ICM application are what they would like the research funds to advance, it is not necessary that WCOG and other IMTC partners stay with the original list of DBM strategies detailed in the December 2013 application. Additionally, there is a preference for a narrower scope focused more on implementation than feasibility studies.

4 Scope of work

Discussions with IMTC agencies have identified three initiatives that fit with the DBM vision and reflect current priorities as well as an expectation that these initiatives will offer lasting functionality and benefits.

4.1 Element 1 - Border area simulation modeling

Simulation modeling will inform comparisons of investment alternatives and other operations and policy changes to border transportation and inspection systems.

4.1.1 Need

In pursuit of the need for agencies to serve growing demand with limited resources, there are proposed operational changes at land border ports-of-entry that require evaluation by more than one agency (sometime several agencies) to identify preferred options, present findings to agency headquarters managers, and advocate for funding (often in the context of a multi-agency partnership). The benefits of using a general purpose micro-simulation model were clearly illustrated when one was used to test alternatives and develop a business case for the 2011/12 rerouting and booth reallocation at the southbound Pacific Highway truck crossing. Statistically robust and visual output based on data collected and validated by partnering agencies is needed as a base resource for testing various operational alternatives – alternative operations that will likely become more numerous as binational initiatives like the conclusion of a preclearance agreement under the Beyond the Border initiative create more land-use and data sharing options.

4.1.2 Benefit

The benefits of applying a micro-simulation model over a basic spreadsheet analysis are many. A simulation model runs system transactions hundreds of times to produce a range of system results, better illustrating forecasted averages and expected peak demand conditions. In a micro-simulation model, appropriate statistical distributions can be applied to inputs to best leverage the available data. Most contemporary micro-simulation models also support animation of results. Such visualizations, along with inter- and intra-agency validations of source data facilitate the selection of preferred alternatives.

4.1.3 Tasks

a. Research software options.

b. Document scope of transactions to be modeled, along with desired outputs.

c. Write RFP for consultant support

d. Conduct consultant selection process

e. Manage consultant

f. Evaluate options for supporting ongoing application.

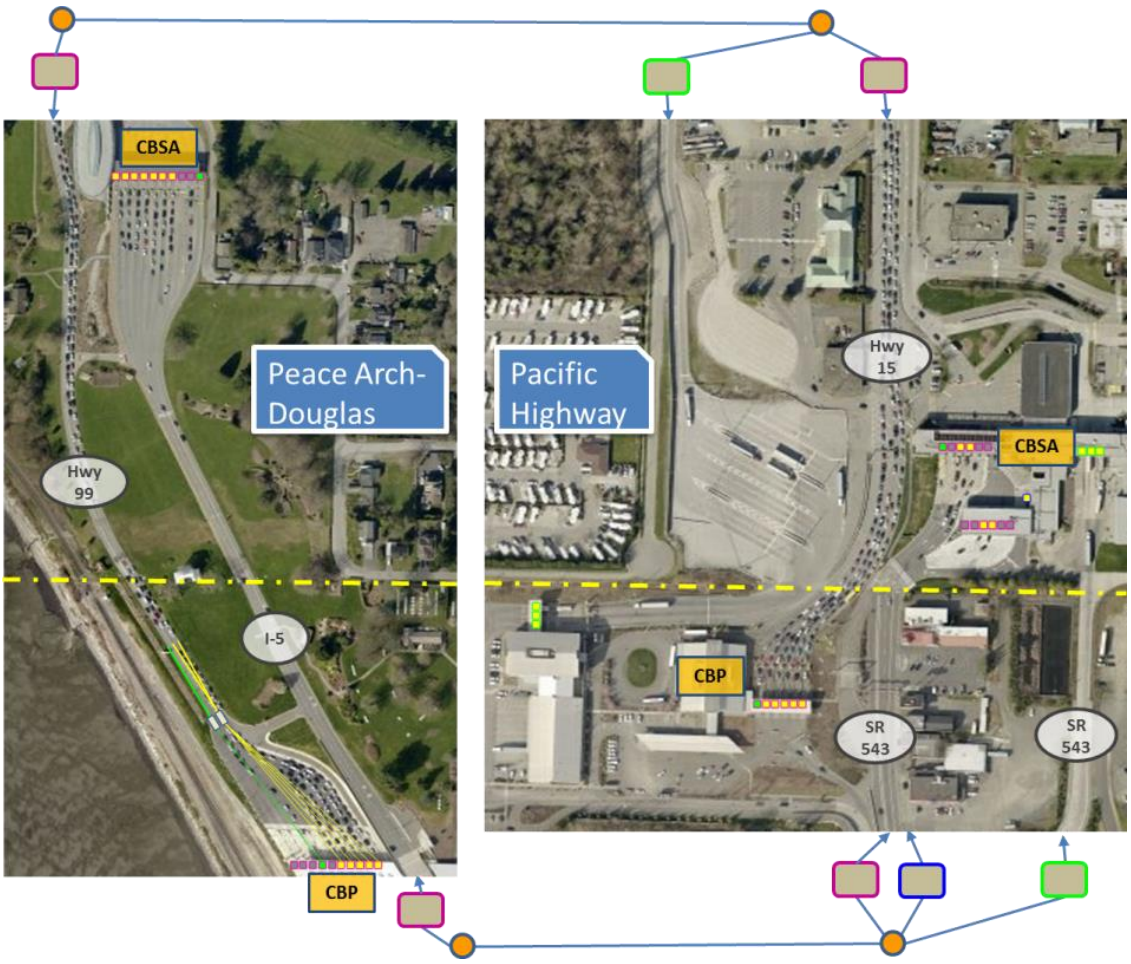
g. Element 1 technical memo

4.1.4 Products

This task will result in:

- Selection and acquisition of off-the-shelf, general purpose micro-simulation software.
- (With support from a consultant) Micro-simulation of the existing operations at Peace Arch – Douglas and Pacific Highway ports-of-entry, along with the roads that serve and connect them.
- Development of alternatives for at least two operational questions. One of these will be recently discussed alternative options for northbound trucks and buses at Pacific Highway.
- A report documenting:
    - Software selection criteria
    - Modeled system setup and data inputs
    - Custom outputs that align with IMTC-identified system performance measures
    - Technical memo on results of the one or two selected operational alternatives analyses.

Mock-up of the envisioned micro-simulation coverage of Peace Arch-Douglas & Pacific Highway: Inputs (vehicle volumes, arrival rates) and parameters (distributions of: NEXUS, FAST; vehicle occupancy; vehicle type, etc.) would enter the simulated system at illustrated nodes.



4.1.5 Benefit measurement

This task shall be considered successful and completed when:

- The products described above are created
- The resulting software and project-based configuration serves as the basis for ongoing micro-simulation capability for the IMTC program
- The degree to which the chosen modeling software is used in other operational and/or policy evaluations in the Cascade Gateway

In addition to standard quantitative reporting, output from the simulation model shall be animated for improved communication of results. Additional development of outputs from a simulation model should align with border performance metrics identified in the Beyond the Border (BtB) Action Plan as well as metrics under consideration by IMTC agencies for ongoing project identification and systems management in the Cascade Gateway.

4.2 Element 2 - Cascade Gateway RFID pilot: targeted distribution

This task will advance a pilot project requiring the involvement of federal inspection agencies and ID-issuing agencies to proactively distribute vicinity readable RFID border crossing documents to pre-identified regular crossers already in possession of valid passports.

4.2.1 Need

The 2012 U.S.-Canada BtB Action Plan includes a section titled, "Invest in Improving Shared Border Infrastructure and Technology." An initiative under this section is, "Facilitate secure passage and expedite processing through implementing Radio Frequency Identification (RFID) technology at appropriate crossings."

At border stations equipped with vicinity RFID readers, an RFID-carrying individual's information can be queried when the traveler is next in line—before arrival at the booth. This is determined to save over 20 seconds per vehicle at the primary inspection booth because required queries can be completed *before* the driver pulls up to the inspection officer. U.S. and Canadian passport books, which most non-NEXUS travelers currently use, are equipped with proximity RFID so, while they are compliant with international passport standards and U.S. law, they must be *handed* to the inspection officer to be read.

The province of British Columbia and state of Washington have both offered RFID enhanced drivers' licenses (EDLs) since 2009. Development of EDLs was motivated by U.S. passage of the Western Hemisphere Travel Initiative (WHTI).

The NEXUS program uses vicinity RFID technology in its cards. But for the 65 percent or so of Cascade Gateway cross-border trips *not* being made through NEXUS booths, wider adoption of this time-saving RFID technology offers huge improvements in border efficiency, congestion relief, and reduction of greenhouse gas emissions from idling vehicles.

While U.S. CBP has developed the Ready Lane program to offer some travel time reduction incentive to RFID users, the dedicated Ready Lane inspection booth is at the end of the standard traffic queue like all the other non-NEXUS booths. Unlike NEXUS membership, n~~N~~on-NEXUS RFIDs (EDLs, U.S. Passport cards, etc.) do not offer an immediate benefit to *individuals*. The benefit of increasing RFID use is a *system benefit* that will be realized by all

users and system operators. This key difference makes it difficult to rely on travelers to voluntarily pay the approximately $20 premium for an EDL over a standard driver's license.

While EDLs have been acquired by WA residents in substantial numbers, uptake in BC has been less. EDLs are used infrequently as border crossing ID. If non-NEXUS vicinity RFID is going to provide a system benefit through increased overall efficiency, it will likely require a degree of public investment.

4.2.2 Benefit

This task will advance a publically funded, targeted distribution of RFIDs (EDLs or Passport Cards) to regional travelers observed to be frequent, non-NEXUS land-border crossers. The cards would be provided without charge to identified travelers as proposed in a recent *Border Brief* published by the Border Policy Research Institute at Western Washington University – *Pilot Project: Using RFID to Reduce Border Queues*.

4.2.3 Tasks

a. Establish an IMTC subcommittee to advise on and select elements of the preferred strategy.

b. Update baseline data related to inspection time comparisons for vicinity RFID and other acceptable border crossing documents.

c. Develop a pilot study plan inclusive of benefit-cost analysis, data sharing proposal, funding proposal, and schedule.

d. Support coordinated regional efforts and performance measurement.

e. Element 2 technical memorandum.

4.2.4 Products

This task will result in:

- **Business case:** Because full implementation of a pilot will depend on policy and funding decisions external to WCOG and IMTC agency representatives, work will begin with development of a business case and portrayal of operational benefits using the micro-simulation developed under Element 1.
- **Interagency implementation planning and facilitation:** In the event an implementation strategy is identified and approved by agency decision makers, work will continue on this task to support agency implementation as appropriate with regional communications, data collection, and performance measurement
- **Report:** Documentation will include analyses, the expected benefits, and an implementation plan including project performance measurement.

4.2.5 Benefit measurement

This task shall be considered sucessful and complete based on these measures:

- Achievement of requisite data-sharing between agencies to develop target population.
- Cost of deployment (not part of the work described here).

- Resulting shift in percentage of regional travelers using RFID – specifically using documents issued as part of a pilot.
- Reduction in wait times (controlling for overall traffic volume and share of traffic that is NEXUS).

4.3 Element 3 - Establishing an integrated border wait time validation & calibration methodology

This task shall develop, implement, and document a standardized method of validating regional advanced traveler information systems (ATIS). This methodology will validate state and provincial transportation agency systems and assist the federal inspection agencies (US CBP and CBSA) whose facilities and operations are a primary subject and who are interested stakeholders in data accuracy.

4.3.1 Need

Since BC MoT and WSDOT installed border wait time measurement systems, typical incremental changes to facilities (roadway and inspection) have resulted in often unexpected impacts to border wait time system accuracy. Other sources of periodic error have included failed hardware (loops, controllers, etc.) or operational changes (changed location of dedicated commuter lanes, etc.).

Border wait time measurement systems are a relatively new and geographically limited feature of the transportation network. They were installed without a program of periodic validation and, if needed, calibration (refinement of the estimation algorithm or other software or hardware fixes). Over the years, it has become clear that the regional border wait time measurement systems should be validated on a scheduled basis and supported by sufficient resources for ongoing adjustments and maintenance.

4.3.2 Benefit

This activity will build on the successful results and documentation of recent coordinated validation efforts between CBSA and WSDOT and establish proven methods and practices for maintaining wait time system information accuracy. Procedures will be established between both CBSA and WSDOT, and US CBP and BC MoTI. Ongoing benefits are expected to include more accurate system measurements and information for travelers, and avoidance of costly data collection.

Setting up a programmatic approach to maintaining these systems will result in more consistent accuracy, improved anticipation of likely system interruptions, and reduced time needed to schedule and perform system fixes.

4.3.3 Tasks

a. Establish an IMTC advisory group from agencies involved (WSDOT, US CBP, BC MoTI, and CBSA).

b. Inventory data needs, availability, data sharing options.

c. Finalize validation methodologies for both northbound and southbound wait time systems.

d. Document results and conclusions regarding needed improvements.

e. Explore options for applying the micro-simulation model (Element 1 above) to create a test environment for the border wait time system.

f. Element 3 technical memo

4.3.4 Products

The products from this task will include:

- A documented and replicable interagency process for data sharing and analysis to periodically validate and calibrate border wait-time measurement systems.
- Additionally, it is hoped that the micro-simulation model from Element 1 can be used to model the wait time system algorithms so that changes may be tested prior to implementation.

4.3.5 Benefit measurement

This task shall be considered successful and complete basd on the following measures:

- Agencies are able to share data in support of periodic validation efforts.
- Agencies agree on an optimal testing frequency and are able to meet that schedule over the next five years.
- Individual validation calibration exercises at single ports of entry result in system improvement.
- Over time, wait time estimations improve across the Cascade Gateway.

4.4 Task 4 – Project management

This project will be managed by WCOG. A project advisory group of IMTC agencies will be convened as appropriate.

4.4.1 Tasks

- Coordination of efforts by implementing agencies,
- Writing request for consultant proposals (for simulation modeling tasks),
- Consultant selection,
- Consultant management,
- Development of project performance measures,
- Documentation of methods, results and performance reporting.

5 Estimated cost

The table below lists the estimated cost by scope element.

Border area simulation modeling	$101,973
Cascade Gateway RFID pilot	$56,046
Integrated border wait time validation	$14,233
Project management	$15,202
Total	**$187,454**

6 Estimated timeline

The time line below shows estimated order and duration of tasks.