

Preliminary Estimate of 2010 Olympics I-5 & Cross-border Auto Traffic

Prepared by Whatcom Council of Governments

For the International Mobility and Trade Corridor Project – **IMTC**

Background

The Whatcom Council of Governments (WCOG), the federally designated, regional, metropolitan planning organization (MPO) located in Bellingham, Washington, is lead agency of the International Mobility and Trade Corridor Project (IMTC). IMTC is a U.S.-Canadian coalition of government and business entities formed to identify and implement improvements to the cross-border transportation and inspection systems that connect Washington State and British Columbia through the *Cascade Gateway*—the grouping of the Peace Arch, Pacific Highway, Aldergrove-Lynden, and Sumas-Huntingdon land border ports-of-entry.¹

In July of 2003, The International Olympic Committee (IOC) announced its selection of Vancouver & Whistler, British Columbia as the host cities of the 2010 Winter Olympic Games.

In the month following the announced selection of Vancouver for the 2010 Games, the IMTC Core Group approved the following addition to its formal Objectives List:

“Pursue IMTC Objectives (...improve safety, mobility, and security in the Cascade Gateway) with specific attention to improvements that support efficient, predictable international travel to and from the 2010 Winter Olympic Games in British Columbia.”

In March of 2004, WCOG, with support from the U.S. Federal Highway Administration’s Transportation Planning Capacity Building Program, organized and conducted a peer-exchange through which representatives from Whatcom County and Washington State spent three days meeting with transportation and event planners from Salt Lake City, Utah regarding the 2002 Winter Olympics held there. This exchange availed meaningful information not previously captured in published reports and assessments of those games. Information on Olympic attendee demographics, length-of-stay, and event-attendance patterns for the 2002 Games has been valuable for understanding the variables that will likely determine the influence of the Vancouver games on adjacent regions, travel patterns, and more.²

Estimating Olympics-related traffic on Interstate 5

Introduction

Soon after the announcement of the selection of Vancouver, public dialogue ensued about the possible effects of the Games on surrounding areas such as Whatcom County. The hospitality industry, economic development interests, and other industry sectors saw opportunity. Transportation agencies saw needs for construction-schedule modifications, system improvements, and operations upgrades. The Olympic announcement triggered a lot of regional interest. With this analysis, WCOG has estimated travel patterns and volumes on Interstate 5 and across the border.

The resulting spreadsheet analysis (Appendix A) is based on information from both the Vancouver/Whistler Bid Book and several variables based on the 2002 Salt Lake City experience. To be sure, this analysis should be fine-tuned when and if pre-games demographic information is available from the Vancouver Olympic Committee (VANOC).

¹ Additional information about IMTC is available at www.wcog.org/imtc

² The full peer exchange report is available at <http://www.planning.dot.gov/Peer/Olympics/whatcom.htm>

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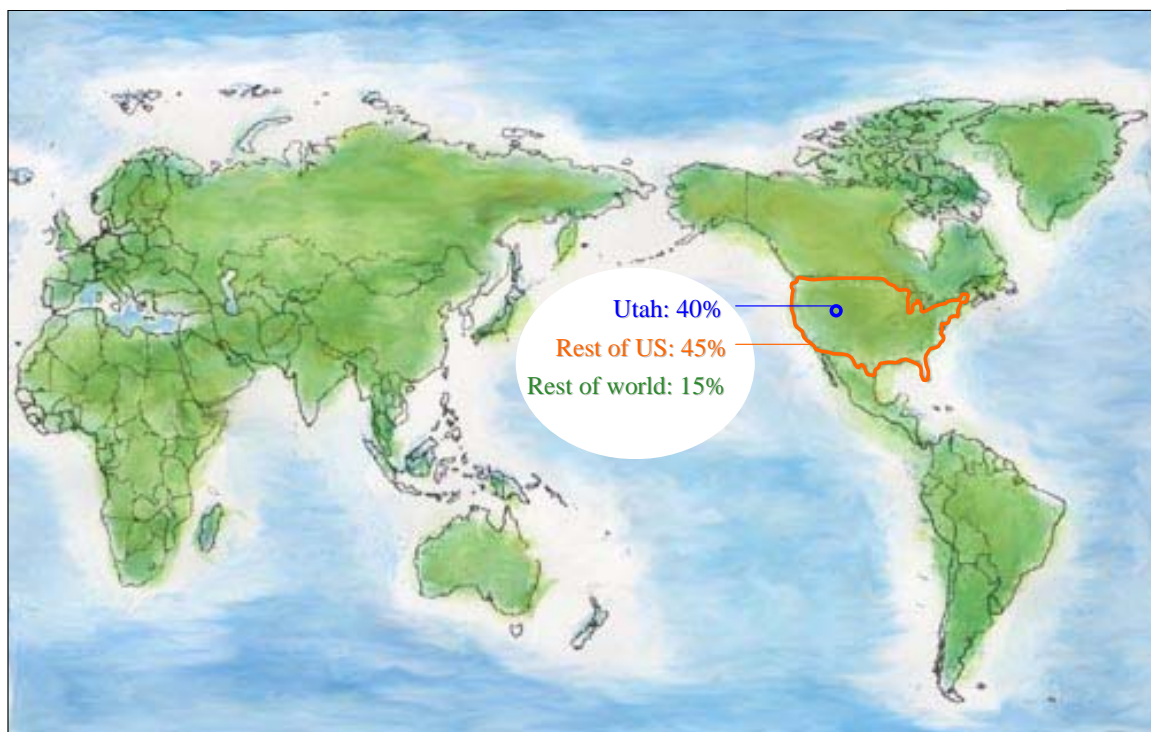
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Estimation of attendee origins

The initial step of estimating the amount of future Olympics-related travel on I-5 was to make some informed allocations of traveler-*origins* to areas of the U.S. and Canada that attendees might be expected to drive from rather than fly from to Vancouver or take Amtrak passenger rail.

The first information to consider was the Salt Lake City experience in 2002. Illustrated in Chart 1, the geographic allocation of attendee-origins was 40 percent from Utah (with the majority of those being from the Salt Lake City area), 45 percent from the rest of the United States (with the majority of that being from the Western United States – especially California), and 15 percent from the rest of the world.

Chart 1. Geographic distribution of 2002 Winter Olympics attendee origins

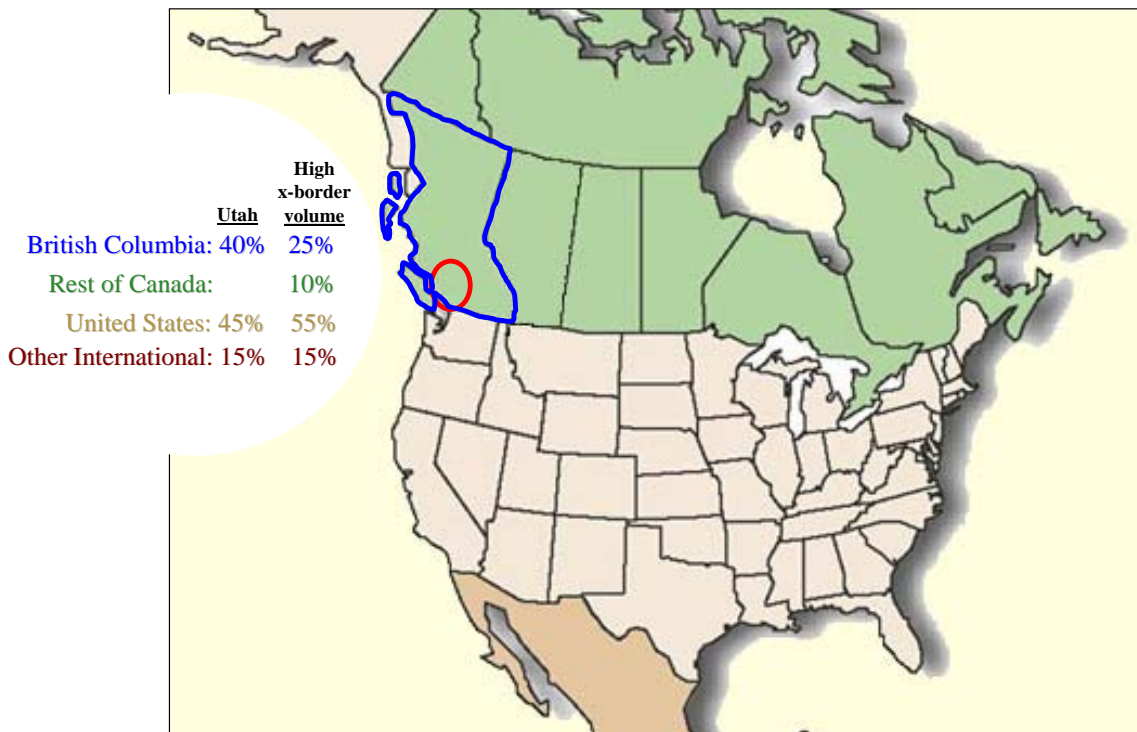


The next step was to transfer the Utah experience to the geography of the 2010 Olympics. Chart 2 illustrates this approach with some assumed allocations of attendee origins for two scenarios, a “Utah” scenario (which closely mirrors the above percentage breakdown) and “high cross-border volume” scenario that purposefully adjusts the allocation to provide a more conservative planning factor for this preliminary analysis. For the “high cross-border” scenario, attendance by British Columbia residents is lower than it probably will be (25 percent) and the complement of U.S. attendees is thus higher than it probably will be (55 percent). The amount of international attendees (a group that can be assumed to fly directly to Vancouver save a small fraction that may end up crossing the border because they fly in and out of Seattle instead) is kept low (15 percent). While demographic data from Winter Olympics prior to Utah seems unavailable (and not necessarily analogous even if they were available) it is likely that international attendance at Salt Lake City was lower than it would have been if the terrorist attacks of September 11, 2001 had not been so recent. The extent to which this suspected influence is real illustrates the potential difficulty in predicting travel from overseas locations.

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Chart 2. 2010 Olympic Game attendee trip origin scenarios



Estimation of regional distribution of probability of driving

Following conservative assumptions about geographic distribution of trip origins (explained above), the third step was to estimate the proportion of these trips that will be made by car, on I-5 and across the border rather than by air or rail³ to Vancouver.

Almost all future I-5 drivers will be coming from the United States. As shown in Chart 3, the U.S. has been divided between the West and other states, split further in the West, and thoughtfully assigned probabilities—the probability that an Olympic attendee from that region would drive. The probabilities and resulting joint probabilities are listed below with Chart 3.

The following steps, based on the above assumptions, were taken to parse out regional assignments of probability of driving.

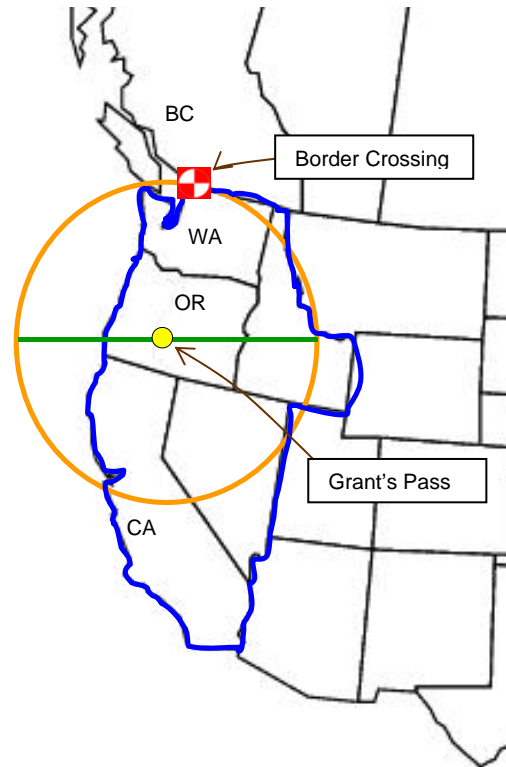
³ The potential for rail travel during the Olympics is not separately treated in this analysis. It can be said, however, inasmuch as this analysis is about who's not flying to Vancouver (and, instead, driving), Olympic rail travelers can be considered a subset of the total "I-5" travelers estimated here.

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- 1) **55 percent** of all 2010 **Olympic attendees (OAs)** will be from the U.S.
- 2) Two thirds of U.S. OAs, or **36 percent** of all OAs, will be from the U.S. West Coast ($.66 \times .55 = .36$)
- 3) A reasonable “drivable zone” is thought to extend from the border, along the U.S. West Coast as far south as San Francisco. This is estimated to cover 80 percent of the West Coast—or **29 percent** of all OAs ($.8 \times .36 = .288$)
- 4) Half of the drivable zone ($.5 \times .29 = .15$) or 15 percent of OAs, is south of Grant’s Pass. Because of the good chances of harsh winter driving conditions through the pass in February, it’s assumed only fourth of attendees from this area—or **4 percent** of OAs—will drive from here ($.25 \times .15 = .0375$)
- 5) For the other half of the drivable zone north of Grant’s Pass (another 15 percent of OAs per the joint probability in step 4 and for simplification), it is assumed that 90 percent of OAs living in that region would drive (includes metropolitan areas of Portland and Seattle). This then would equal an additional **14 percent** of OAs driving on I-5 to the games.
- 6) The last category to consider is the people who might fly into Seattle. This is likely to be U.S. residents avoiding the often-higher relative cost airfare to Vancouver. The added cost of car-rental, the difficulty of using a car in Vancouver during the Olympics, and the *absolute* inability to drive a personal vehicle to Whistler should dampen interest in this option but, for this analysis it is assumed that: 1) the pool of possible Olympic travelers to transit the Seattle airport is composed of non-West Coast U.S.OAs—19 percent ($.55 - .36 = .19$) AND the U.S. West Coast OAs who, based on the above, are assumed to be flying: 47 percent of OAs ($.55 - (.04 + .14) = .37$). 2) It is assumed that 10 percent of this combined group will fly to SeaTac and drive the rest of the way making for a total of **3 percent** of OAs ($.1 \times (.19 + .14) = .033$)

Chart 3. Drive-zone regions bounded by assigned probability of driving



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Combined estimate of I-5 Car travelers to & from the Olympics

Adding up the individual joint probabilities from the previous section, it is estimated, as shown in table 1, that 21 percent of all 2010 Olympic attendees will travel on Interstate 5 and through the border.

Table 1. Tally of regional probabilities of driving across the border to the 2010 Olympic Games

Area	Est. % of All Olympic Attendees Driving From the Defined Area
West Coast North of Grant's Pass	14%
West Coast South of Grant's Pass	4%
Air travelers to Seattle from all areas	3%
Total	21%

Estimation of resulting auto trips on Interstate 5 and across the border

Having developed a distribution of Olympic attendee origins that conservatively favors high volumes of cross-border trips and completed a conservatively high estimate of the percentage of attendees who might drive reasonable distances served by roads, this section will review, in more rapid succession, the other variables used in development of a spreadsheet model (Appendix A).

Total tickets sold

This is the starting point of the model. The Vancouver Bid Book⁴ states that an estimated **1,800,000 tickets** will be sold for the 2010 Olympic Games. In Utah, a consultant who advised on the Vancouver Bid Book reported that the number had since been revised downward to 1,400,000. A downward revision, even during final construction of venue improvements, was the experience in Utah. This is all to say that this basic and large variable should be watched closely by transportation agencies as the event approaches. For the purposes of the current, preliminary analysis, the standing official Bid Book number is used.

Average tickets used per-person

For the Salt Lake City Games in 2002, attendees, on average, used **four tickets** each. We have no other data that might give a sense a historical range for this variable.

Ticketed attendees

This calculated result is the product of dividing TOTAL TICKETS SOLD by AVERAGE TICKETS PER PERSON. The current estimate of ticketed attendees based on the above is **450,000 people** for the duration of the Games.

⁴ The Vancouver Bid Book can be found online at
<http://www.vancouver2010.com/En/AboutVancouver2010/Vancouver2010BidBook/Default.htm>

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Non-ticketed attendees

In the Fall of 2002, the IMTC invited the Vancouver Olympic Bid Committee to give a presentation on the regional traffic impacts of the newly awarded 2010 Games. Mr. Doug Kelsey, President & CEO of West Coast Express and a member of the Bid Committee responsible for transportation issues gave a very detailed overview of the transportation section of the bid along with current estimates of non-ticketed attendees coming to the Olympics (athletes, media, “Olympic family,” entertainers, etc.). Based on notes from this presentation (printed versions of the presentation could not be distributed per IOC rules) and another presentation by Mr. Kelsey a couple of weeks later in Vancouver, WCOG estimated the portion of Vancouver 2010 non-ticketed attendees who might cross the border. As tabulated in Table 1, the total estimate of **73,150 people** (for the duration of the Games) is largely made up of an additional factor that WCOG added in—“fun seekers.” This addition allows for the possibility that the festivities in Vancouver (Olympic medals plaza, special entertainment, etc.) will, apart from ticketed events, draw spectators. The extent of this phenomenon will be affected by what kind of security perimeter is maintained around the medals plaza and what kind of ticket-holder identification is required to access official, VANOC/corporate-sponsored festivities.

Table 2. Estimate of non-ticketed attendees

Media	2,500	Est. of Vancouver Bid Committee
Broadcasters	7,600	Est. of Vancouver Bid Committee
Sponsors	3,050	Est. of Vancouver Bid Committee
Non ticketd "fun-seekers"	60,000	WCOG estimate
Total non-ticket holder population	73,150	

Total attendees

Based on summation of the above, the 2010 Olympic Games will be attended by an estimated **523,150 people**.

Length of Games

The Vancouver Bid Book shows that the Olympic Games events are scheduled over 17 days.

Average attendee length-of-stay

Discussions with planners and organizers of the Salt Lake City Games revealed that, on average, 2002 Olympic attendees did not stay long relative to the overall length of the Games. The average length of stay there was **three and one-half days**.

This variable is critical for traffic planning because it determines the level of peak arrival and departure volumes. If attendees all arrived towards the beginning of the event and stayed for 15 days, then we would have different concerns.

This part of the analysis should be refined when better event schedules will allow planning around actual flow in and out of the event venues and in and out of Lower Mainland, British Columbia.

Days of distributed, one-way travel

Possession of a decent average-length-of-stay number allows us to be much more confident about an estimate of daily vehicle volumes.

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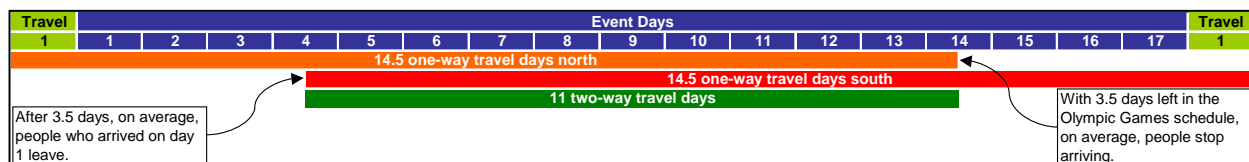
It is important to assess the transportation impacts of arrivals separate from departures. With regard to WCOG's analysis of Interstate 5 and border-crossing impacts, this can be thought about as northbound and southbound respectively.

Next, to time the beginning and end of system impacts relative to Games schedule, one travel day is added to each end of the 17-day event calendar.

While simple, it's worth noting that Olympic-related auto travel will appear first as northbound-traffic only (unless a sizable number of B.C. residents feel compelled to flee what they might consider mayhem). Then, as people's average, 3.5-day stays conclude, those attendees will start leaving southbound. With 3.5 days left in the Games schedule, traffic will again be, on average, a one-way flow. It's worth noting, but not of clear operational significance, that the 11 days in the middle of this time frame will consist of two-way auto travel on the system.

So, because the operational focus would be on serving directional traffic flows, both on roads and at border-crossings, this analysis will break down estimated total trips into **14.5 days of one-way travel**.

Chart 4. Illustration of travel days as a function of event days and average-length-of-stay



Scenarios

Earlier in this paper, the percentage of total attendees that will drive to and from the 2010 Olympic Games via Interstate 5 and the border crossings is estimated at 21 percent. To illustrate a range and to gauge the sensitivity of spreadsheet model (Appendix A) variables, two additional scenarios are shown alongside the 21-percent number: a five-percent-higher 26 percent and a five-percent-lower 14 percent.

Estimated total number of attendees traveling via Interstate 5 and cross-border

Dividing the estimate of TOTAL ATTENDEES by the estimated Interstate-5 percent discussed above gives the corresponding estimate of attendees (*travelers*) to be using I-5. This is not yet a daily number estimate. And, this is not yet a vehicle number estimate. Based on the 21 percent I-5 scenario, the estimated attendees on I-5 will be **109,862 people** (in each direction) spread over the primary 19-day travel period discussed above.

Daily average additional travelers on Interstate 5 – one direction

Dividing the ESTIMATED TOTAL ATTENDEES TRAVELING VIA I-5 by ONE-WAY TRAVEL DAYS (14.5), gives the estimate of daily, average additional, one-way travelers.

This number is an *average* but there will be opportunities to refine the distribution of arrivals and departures based on event-schedules and demographic data on actual ticket sales. But, for now, travel demand across the schedule is assumed to be evenly distributed, thus.

This number is called *additional* because it's important to remember that the normal daily traffic on I-5 and at the border will still be there (and will be the bulk of travel on the system). The estimate being made here is for additional travelers on the system during the Olympic Games.

Preliminary Estimate of 2010 Olympics I-5 & Cross-border Auto Traffic

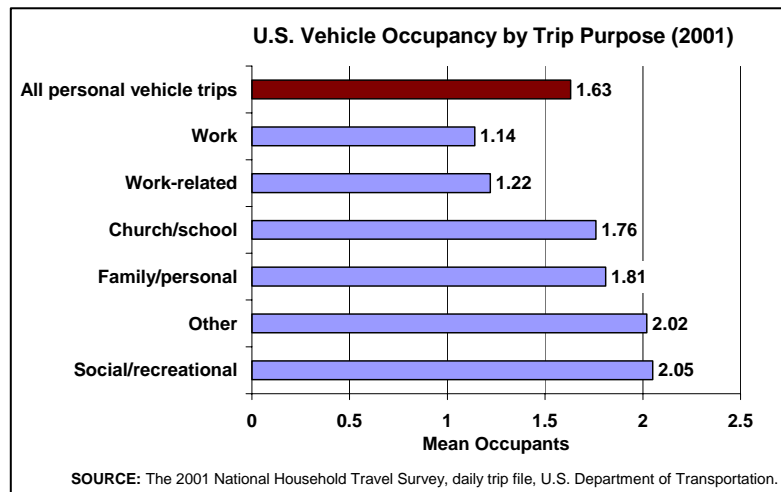
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Based on the 21 percent I-5 scenario, daily average additional travelers on I-5—one direction, is estimated to be **7,577 people**. This is still not a vehicle number estimate.

Average vehicle occupancy

Most people who drive to the Olympics will not be doing so in a single-occupant vehicle. The 2001 U.S. Federal Highway Administration National Personal Transportation Survey analysis of vehicle occupancy by trip purpose⁵ estimates that the average vehicle occupancy for social and recreational travel (such as travel to the Olympic Games) is **2.05 people per vehicle**. While there may likely be a difference between shorter-distance trips of this type (which this survey is based on) and long-distance trips (more like most car trips to the Olympics), this analysis will use this number for the analysis.



Daily average additional automobiles—one direction

This calculated result is the primary output of the spreadsheet model. By dividing the daily additional I-5 travelers by the chosen vehicle occupancy, the estimate of additional daily one-way cars, based on the 21 percent I-5 scenario, is **3,696 cars**

Northbound and southbound additional cars combined

The above number is simply doubled to obtain a bi-directional measure of total additional auto volume—**7,392 cars**. As shown in Chart 4, this volume is forecast by this analysis to be present on the middle 11 days of the Olympic Games event schedule. While not especially relevant for transportation planning and systems operation, this kind of information might be of interest to providers of other traveler services so that they can most appropriately time various ventures (events, services, product marketing, etc., aimed at Olympic pass-through traffic regardless of travel direction).

Spreadsheet model

The spreadsheet model is attached as **Appendix A**. An electronic copy of the model, useable for testing different values for the variables discussed above, can be obtained by contacting Hugh Conroy at the Whatcom Council of Governments—hugh@wcog.org.

Predicted influence on B.C.-WA land border ports-of-entry

The 2010 Winter Olympic Games will take place during the month of February. At the land-border ports-of-entry connecting Whatcom County, WA and Lower Mainland British Columbia,

⁵ http://www.bts.gov/publications/highlights_of_the_2001_national_household_travel_survey/html/table_a14.html

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February has, along with January and December, consistently ranked among the three lowest transborder traffic volume months of the year.⁶

Given the time of the year, the question becomes, will the addition of Olympic-related traffic in February result in a cross-border traffic volume that exceeds peak summer volumes?

One quick answer to this question is that annual cross-border auto volumes have gone down about 41 percent over the last 10 years (and more since the historical peak volumes in 1991). Capacity of existing port-of-entry *infrastructure* will probably not be a constraint during the Olympics.

The regulation of cross-border travel, though, is mostly a function of inspection process. And, this process has changed since the early 1990's—most dramatically since the terrorist attacks of 2001. So, while overall volumes are down, and border station staffing is up (at least for U.S. agencies), lengthy queues (45-90 minutes⁷) are common during peak travel periods.

So, given the array of, and fluctuation in, the variables that combine to produce border throughput capacity, a second spreadsheet model was set up (Appendix B) to estimate Olympic cross-border volumes (as a sum of predicted Olympic trips plus recent daily volumes in February) relative to contemporary annual peak daily volumes (typically observed in August). The analytical goal is to determine if Olympic volumes in February 2010 might exceed summer peak volume traffic.

Method

To set up the spreadsheet, 2003 monthly car counts, from U.S. Customs and Border Protection were used for both Peace Arch and for Pacific Highway for the months of February and August. The crossings are one mile apart and both serve I-5 auto traffic. Monthly counts were divided by 30 days to estimate daily counts. The estimated Olympic-related auto trips (produced by the spreadsheet model discussed previously) were added to the average daily traffic counts for February. Finally, the Olympic-enhanced February volume was compared to the standard summer peak volume.

Because out-of-area travelers often avoid the Pacific Highway crossing because unfamiliarity and reluctance to stray from the main route, it is important to consider what may happen if all Olympic travelers use the Peace Arch crossing. The spreadsheet is configured to provide these estimates.

Findings

As shown in Appendix B, it is estimated that, if all traffic stays on I-5 and crosses at Peace Arch, and the 21 percent I-5 scenario holds true, Peace Arch will experience 124 percent of daily summer-peak travel volume (in terms of 2003 traffic volumes).

If, however, Olympic travelers are informed enough, or tuned in enough to new Advanced Traveler Information Systems (ATIS) installed upstream from the border crossings, and as a result evenly distributed their cross-border routings between the Peace Arch crossing and the

⁶ Based on historical, monthly traffic counts for each port of entry provided by U.S. Customs and Border Protection and by Statistics Canada. Detailed data summaries available on www.wcog.org/imtc.

⁷ Good archival data on border wait-times is not available. Current southbound wait times are now displayed on-line at <http://www.th.gov.bc.ca/ATIS/index.htm>. Observations of this website confirm the cited wait-time. Archived wait time data from this as well as a matching northbound system will be available in 2006.

Preliminary Estimate of 2010 Olympics I-5 & Cross-border Auto Traffic

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Pacific Highway crossing, the two crossings together will experience 94.9 percent of daily summer-peak travel volume in February 2010.

Conclusions

1. Good, advanced traveler-information can have an important benefit to the cross-border systems during the 2010 Olympics.
2. The potential for construction at border crossings and along regional, alternative routes only emphasized the potential value of traveler information.
3. Knowing how best to disseminate useful traveler information will depend on information about ticket holders. This, in turn, underscores the importance of effective communication with VANOC ticket-sales and transportation-planning offices.
4. Full staffing will also help avoid long border wait-times during the Olympics.

The Whatcom Council of Governments prepared this analysis.

314 East Champion Street
Bellingham, WA 98225
(360) 676-6974

For information or questions regarding this document, please contact:

Hugh Conroy
Project Manager
hugh@wcog.org

August 15, 2005

Appendix A (Revised 2007)

Estimate of Olympics related traffic on I-5

Revised: October 2007

Prepared for by WCOG for the IMTC Project

Variable	Unit	Values		
Total tickets sold (revised down from 1.8 mil)	tickets	1,600,000		
Est tickets not reserved by VANOC (new parameter)	tickets	1,120,000		
Avg tickets per person	tickets	4.0		
Ticketed attendees	people	280,000		
Non-ticketed attendees	people	73,150		
Attendees (total)	people	353,150		
Length of Games	days	17.0		
Average stay of attendees	days	3.5		
Days of distributed, one-way travel	days	14.5		
		Scenarios		
		1	2	3
Percent of attendees arriving/departing via I-5 (SCENARIOS)	percent	26.25%	21.00%	15.00%
Est. total number of attendees on I-5 Whatcom	people	92,702	74,162	52,973
Daily average additional travelers (one direction)	people	6,393.2	5,114.6	3,653.3
Average vehicle occupancy	people	2.25	2.25	2.25
Daily average additional automobiles (one direction)	cars	2,841	2,273	1,624
North and South combined - avg. additional autos	cars	5,683	4,546	3,247

Data notes

Estimate revised by VANOC October 2007
Est. that 30 percent of tickets will be put aside for "Olympic Fan Factor reported by Salt Lake Olympic planners
Calculated: Tickets/attendees
Based on Van. Bid Committee and WCOG est. (worksheet)
Calculated: Ticketed attendees + non-ticketed attendees
Vancouver bid book -- official schedule
Factor reported by Salt Lake Olympic planners
17 event-days, 1 (1-way) travel day, less 3.5 days avg. stay.

Based on Utah experience, Vancouver population, West Coast geography. 26% would likely be very high.
Calculated: (I-5%) x (Attendees)
Calculated: (Total attendees on I-5) / (# travel days)
Assumption: based on national average for recreational travel.
Calculated: (Daily one-way I-5 travelers) / (# vehicle occupants)
Calculated: (Daily one way autos) x 2

Appendix B (Revised May 2008)

Adding Estimated Olympics-related Traffic to Typical February Cross-border Volumes

2007 Cross-border (one-way) Auto Volumes		Peace Arch- Douglas	Pacific Highway	Aldergrove- Lynden	Huntingdon- Sumas
Monthly counts:	February: the lowest volume month	101,488	70,335	36,176	29,371
	August: the highest volume month	169,043	113,201	58,840	66,665
Daily average counts:	February	3,625	2,512	1,292	1,049
	August	5,453	3,652	1,898	2,150
Addition of Olympics-related Autos:		Est. daily additional Olympics autos			
		2,273			
Olympic Autos Border Crossing Scenarios					
All via Peace Arch-Douglas	Est. Olympic (Feb.) daily volume	5,898			
	Percent of Aug. 2007 peak	108%			
Split between Peace Arch-Douglas & Pacific Highway	Est Olympic (Feb.) daily volume		8,410		
	Percent of Aug. 2007 peak		92%		
Split between Peace Arch-Douglas, Pacific Highway, & Lynden/Aldergrove	Est Olympic (Feb.) daily volume			9,702	
	Percent of Aug. 2007 peak			88%	

Conclusions

If all estimated Olympics-related cars use Peace Arch-Douglas, average daily volumes during the Olympics travel period will exceed 2007 August (peak) average daily volume by approximately 8 percent.

If Olympics related cars were distributed across two or three Cascade Gateway border crossing (Peace Arch-Douglas, Pacific Highway, & Aldergrove-Lynden) February Olympic travel days would reach an estimated 92 percent or 88 percent, respectively, of the combined August 2007 daily volume of those crossings.

These scenarios illustrate the value of traveler information, way-finding for out-of-area drivers, and access to and through the Pacific Highway Crossing which can appear, at times, to be a trucks-only route.