



DRAFT

Memorandum

To: Internal for Review

From: Ron Davis

Date: March 7, 2013

Subject: Columbia River Crossing Origin Destination Survey Results Summary

Survey Process

An online origin-destination (O-D) survey was conducted for the Columbia River Crossing Traffic and Revenue Study on motorists that traveled across the I-5 Bridge over the Columbia River. The survey was conducted to obtain actual data on trip movements in both the northbound and southbound directions across the bridge.

Motorists were identified for the survey first by capturing license plate numbers using video on both directions of the I-5 Bridge, on the northbound I-5 exit ramp to Hayden Island, and on the southbound I-5 entrance ramp from Hayden Island. The survey was conducted on both weekdays and weekend days. About 95 percent of the weekday plate numbers used were taken during daytime hours on Wednesday, October 24, 2012 with the rest taken on Thursday, October 25, 2012. The weekend plate numbers were almost exclusively taken during daytime hours on Sunday, November 4, 2012. The weekday license plate capture results were delivered to CDM Smith on November 14, 2012 and the weekend results on November 21, 2012. This work was conducted by the sub-consultant National Data & Surveying Services (NDS).

The plate numbers were then queried with the Oregon Department of Motor Vehicles (DMV) and the Washington State Department of Licensing (DOL) to obtain the addresses of the vehicle owners. Addresses were obtained from Oregon on December 7, 2012 and from Washington on January 10, 2013. A postcard was mailed on January 23, 2013 to the vehicle owners to invite them to take an online O-D survey. The survey asked about their most recent trip on the I-5 Bridge. Surveys began to be answered on January 28, 2013 and the online form remained open until the end of February 18, 2013. Images of the postcard and online survey form are included in **Appendix 1** of this memo. The survey contained nine questions, including one question to ask respondents if they would be willing to participate in a follow-up survey (this will be the stated preference survey).

The remainder of this memo provides a description of the survey response rates and a summary of the results.

Response Rates

A breakdown of the license plate capture data collection results is shown in **Table 1**. A total of 154,041 vehicles were observed in the license plate capture process, with 129,101 (84 percent) having visible license plates. In past O-D surveys it has been found that commercial vehicle survey response rates are not high enough to be statistically valid. Thus only passenger car plates were retained for use in the survey. Of the visible license plates, 95 percent (123,000) corresponded to passenger cars. Of the passenger car visible license plates, 38 percent (46,761) were identified as Oregon plates, 55 percent (67,834) as Washington plates, and 2 percent (2,587) as plates from other states (or Canada). Five percent (5,818) of the passenger car visible plates had states that could not be identified. Duplicate plate numbers occurred in the data collection when the same license plate was observed multiple times during the collection period. Thirty percent (123,000 minus 86,111 divided by 123,000) of the total visible passenger car plates were duplicates.

Table 1: License Plate Capture Data Collection Results Breakdown

Parameter	All Vehicles		Visible Plate #'s: Passenger Cars Only				
	Total	Visible Plate #'s	Plates	OR Plates	WA Plates	Other State Plates	Unknown State Plates
All Plates							
Weekday NB	42,526	35,954	33,602	11,857	19,070	638	2,037
Weekday SB	41,054	32,810	30,384	11,805	15,510	520	2,549
Weekend NB	34,632	30,002	29,297	11,527	16,308	754	708
Weekend SB	35,829	30,335	29,717	11,572	16,946	675	524
Weekday	83,580	68,764	63,986	23,662	34,580	1,158	4,586
Weekend	70,461	60,337	59,014	23,099	33,254	1,429	1,232
Total	154,041	129,101	123,000	46,761	67,834	2,587	5,818
Duplicate Plates Removed							
Weekday	67,573	52,757	48,895	17,556	26,333	950	4,056
Weekend	53,160	43,036	41,927	16,209	23,561	1,180	977
Total	115,915	90,975	86,111	32,182	47,085	2,085	4,759

Notes:

1. Most weekday and weekend plates were collected on Wed Oct 24 and Sun Nov 4, 2012, respectively
2. Weekday plates were collected from around 8:15am to 5:30pm, weekend from 8:00am to 5:00pm
3. The number of vehicles in the "Total" column are based on NDS' counts. The counts were comparable to counts from ODOT permanent counter stations on the I-5 Bridge.
4. The "Total" row under "Duplicate Plates Removed" has additional duplicates removed from between weekdays and weekends. Thus "Weekday" plus "Weekend" does not equal "Total" in this section.

Table 2 shows the results breakdown for the DMV/DOL queries, the postcard mailing, and the survey responses. Note that different compiling methodologies were used for **Table 1** and **Table 2** so comparable values may be slightly different in each table. Plates positively identified as from Oregon or Washington were queried with the corresponding DMV/DOL. Plates with states that could not be identified were queried with both the Oregon DMV and Washington DOL. It can be observed that the overall match rate of 80 percent for Oregon was much higher than the 49 percent match rate for Washington. It is assumed this was caused by a less streamlined query process when working with the Washington DOL and because Washington distinguishes between zeros and O's on their plates while Oregon treats them all as zeros. This latter factor made formatting the plates for the Washington DOL query challenging and more prone to errors. A total survey response rate of 9 percent was obtained with 4,891 responses to 55,007 postcards mailed. This response rate compares well with other surveys conducted by CDM Smith in urban areas. Of the total responses 95 percent (4,667) were usable which is also normal.

Table 2: DMV/DOL Query, Postcard, and Survey Response Results Breakdown

Parameter	Known State Queries	Unknown State Queries	Total Queries	Address Match	Total Match Rate	Post-cards Mailed	Total Re-sponses	Usable Re-sponses
Weekday OR	16,004	4,452	20,456	14,592	71%	14,129	1,118	1,057
Weekday WA	26,011	4,453	30,464	15,361	50%	15,211	1,587	1,515
Weekend OR	16,104	1,138	17,242	15,433	90%	14,996	1,122	1,086
Weekend WA	23,614	1,035	24,649	11,862	48%	10,671	1,012	980
OR	32,108	5,590	37,698	30,025	80%	29,125	2,240	2,143
WA	49,625	5,488	55,113	27,223	49%	25,882	2,599	2,495
Total	81,733	11,078	92,811	57,248	62%	55,007	4,891	4,667

Notes:

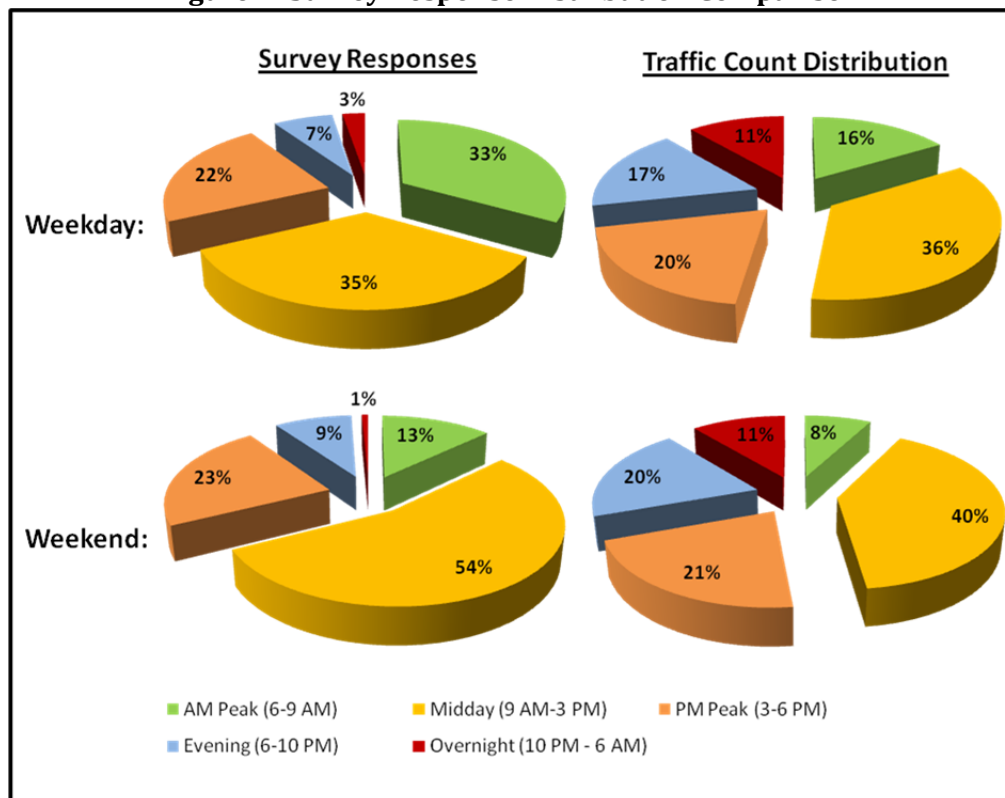
1. Most plates from unknown states were queried with both the OR DMV and WA DOL. Differences between the two states are due to additional plates being removed for the WA query after the OR query was finalized.
2. Duplicate plate numbers between weekdays and weekend days were removed from the OR query but not the WA query because of how the queries were structured
3. One survey card was sent to CDM Smith and is not included in this table
4. The "Total" row in the survey response columns includes survey responses where the state of query was unknown. Thus, "Total" is larger than adding the "OR" and "WA" rows together.

Results

Time Period of Trip

The first question on the survey asked respondents during what time of day they made their recent trip on the I-5 Bridge. Respondents were requested to check one of five time periods. **Figure 1** illustrates the survey response distributions on the left as well as the distribution based on traffic counts on the right. Weekday and weekend survey responses are broken out separately. The pie charts show that the weekday AM Peak time period is over-represented in the survey and the weekday Evening and Overnight periods are under-represented. For the weekend results the 6 AM to 3 PM period is over-represented and the Evening and Overnight periods are under-represented.

Figure 1: Survey Response Distribution Comparison



Trip Purpose

Commuter trips to and from work accounted for 44 percent of all weekday trip purposes. **Figure 2** shows the percentage of respondents within each trip purpose by time period. It can be observed that the commuter trips were, not surprisingly, concentrated in the AM and PM peak periods. During the AM peak 77 percent of respondents were commuting to work.

On the weekend survey social, shopping, and vacation/recreation trips accounted for nearly three quarters of all trip purposes as shown in **Figure 3**. The percentage of respondents within each trip purpose is shown as a daily total only for weekdays since the time period results showed comparatively little variation between them. As expected, work trips made up a much smaller share of trip purposes than on the weekdays.

Trip Frequency

Figure 4 shows the weekday trip frequency for each travel time period. Trip frequency responses were heavily concentrated in the less than one time per week and five times per week categories. Among all time periods, these two categories accounted for approximately 57 percent of responses. However, there is a sharp difference between the four time periods. During the AM peak period (when most drivers are traveling to work), the percentage of five times per week travelers is much higher compared to less than one time per week travelers (54 percent compared to 9 percent). During the Midday period this comparison is flipped, with less than one time per week at 43 percent and five times per week at 10 percent. In the PM peak period and Evening/Overnight periods these two categories are more similar.

Figure 5 shows the weekend daily trip frequency. The one every few months and one to three per month categories were the most prevalent responses.

Figure 2: Weekday Trip Purpose by Time Period

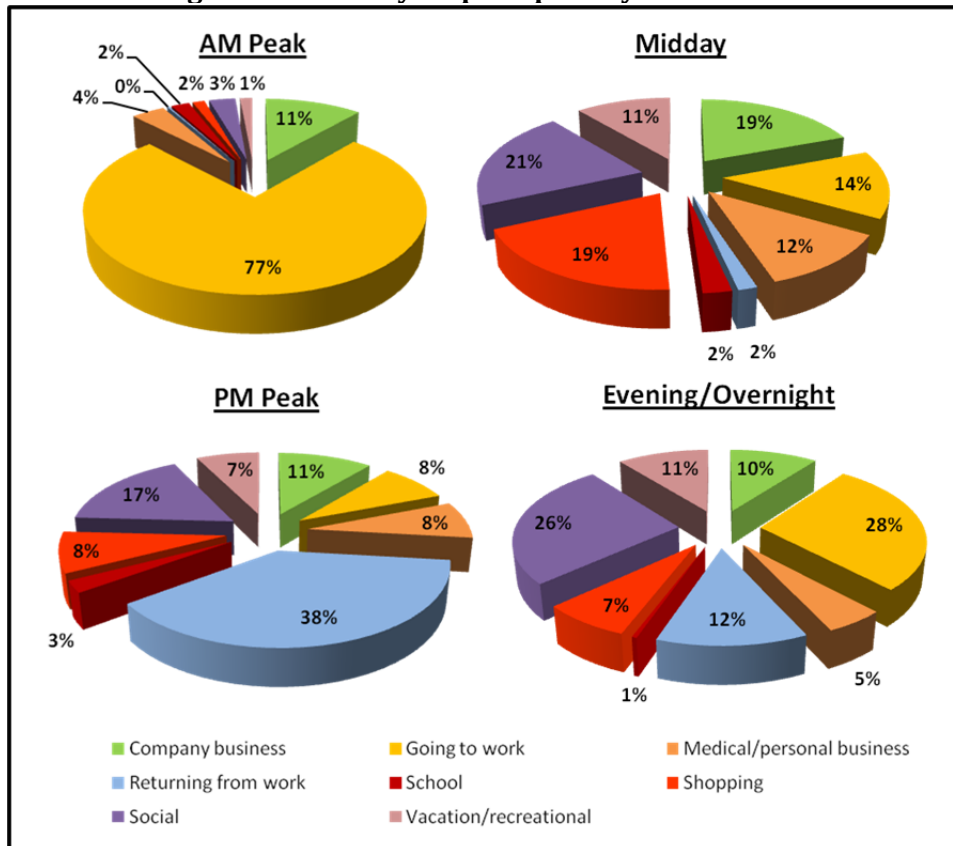


Figure 3: Daily Total Weekend Trip Purpose

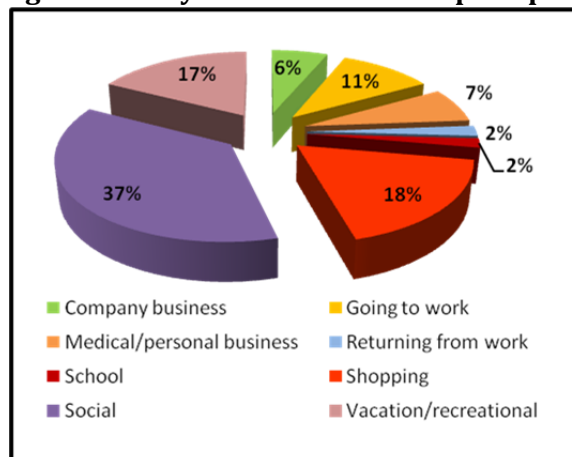


Figure 4: Weekday Trip Frequency per Week by Time Period

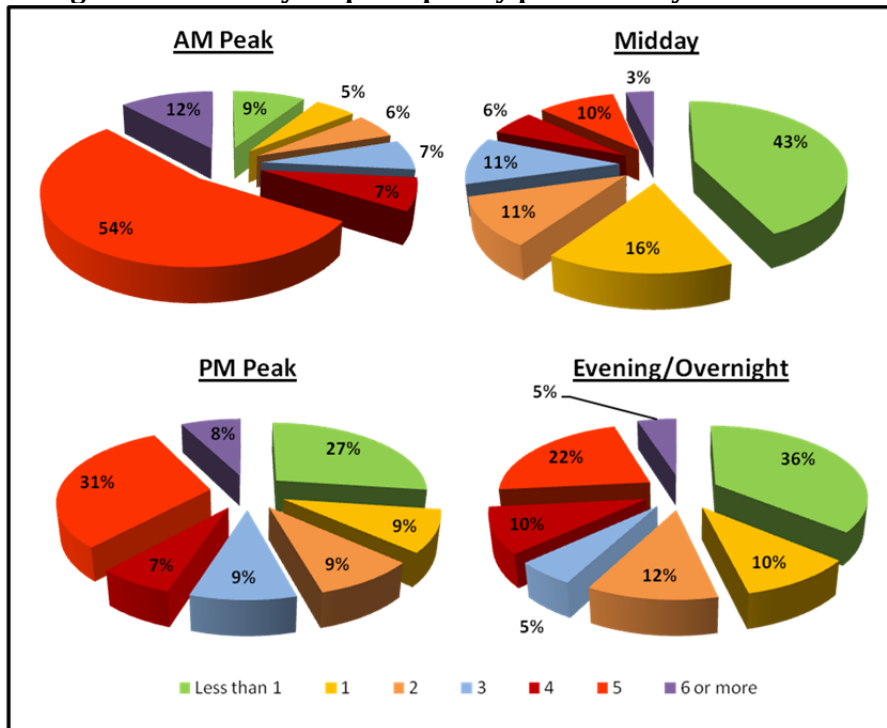
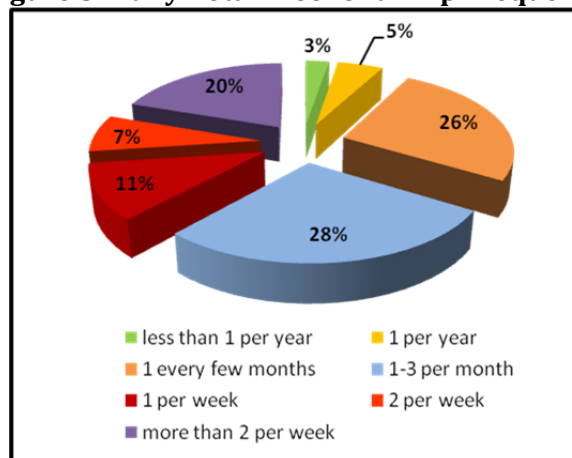


Figure 5: Daily Total Weekend Trip Frequency



Vehicle Occupancy

The vehicle occupancy question results are shown in **Table 3** for both the weekday and weekend survey versions. The average occupancy of the O-D survey results is higher than from the manual occupancy count performed on the I-5 Bridge for CDM Smith last fall. For example, the manual count showed 83 and 59 percent single occupancy on weekdays and weekends, respectively, compared to only 67 and 36 percent in the O-D survey results.

Table 3: Weekday and Weekend Vehicle Occupancy Proportion

Occupancy	Weekday	Weekend
1	67%	36%
2	25%	44%
3 or more	8%	20%

Most Common Origins and Destinations

A breakdown of the origins and destinations from the survey results is provided in **Table 4**. It can be seen that Portland and Vancouver are by far the most common origins and destinations on both the weekdays and weekends. Other cities in the Portland/Vancouver Metro region including Beaverton, Battle Ground, Ridgefield, Hillsboro, and Camas had between 1 and 3 percent of the responses in the different categories. Also of note are the Seattle/Olympia Metro regions which showed a high weekend destination distribution of 10 percent. The breakdown by state shows that between 97 and 99 percent of the origins and destinations of the respondents were within Oregon and Washington.

Table 4: Survey Results Origin-Destination Breakdown

Region	Weekday		Weekend	
	Origin	Destin.	Origin	Destin.
Base Breakdown				
Portland	31%	42%	36%	36%
Vancouver	38%	33%	33%	28%
Beaverton	3%	3%	2%	3%
Battle Ground	2%	1%	2%	1%
Ridgefield	2%	1%	2%	1%
Hillsboro	2%	1%	1%	1%
Camas	2%	1%	2%	1%
Rest of Portland/ Vancouver Metro	10%	6%	8%	6%
Seattle/Olympia Metro	2%	4%	3%	10%
Rest of Oregon	3%	3%	6%	5%
Rest of Washington	3%	3%	3%	4%
Other	2%	2%	1%	3%
Total	100%	100%	100%	100%
Total Portland/ Vancouver Metro				
Total Portland/ Vancouver Metro	90%	88%	86%	77%
By State				
OR	45%	53%	51%	49%
WA	53%	45%	47%	48%
Other States/Countries	2%	2%	1%	3%
Total	100%	100%	100%	100%