Analysis and Classification of HOT Lane Violations

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Executive Summary

For three consecutive days in February 2003, three consecutive days in April 2003, and another three consecutive days in October 2003, researchers examined the use of the Katy (I-10) Freeway and Northwest (US 290) Freeway high-occupancy/Toll (HOT) lanes during the morning and evening peak periods. Information collected included the type of vehicle, the number of vehicle occupants, the visible appearance of a toll transponder, and the visible appearance of a QuickRide hang pass. Using these data, researchers determined approximate violation rates for the HOT lanes monitored.[1] Details regarding the type and extent of HOT lane violations presented here are based on this information and actual transponder readings during the data collection periods.

While difficulties correlating all of the manually and electronically collected information make definitive results elusive, some general conclusions can be drawn. For vehicles in the QuickRide period with two occupants and a visible transponder:

- More than one-half of those vehicles recorded by the automatic vehicle identification (AVI) system as QuickRide enrollees were not visibly displaying their QuickRide hang pass.
- Approximately one-fourth of vehicles recorded were lacking both a QuickRide transponder and a QuickRide hang pass (these are likely HCTRA transponders and not enrollees of QuickRide).
- More than one-half of those vehicles with a transponder and QuickRide pass could not be matched to valid QuickRide transponder accounts. This is likely caused by either (a) vehicles with HCTRA accounts but no QuickRide account who are in violation of the HOT lane, or (b) a QuickRide patron whose transponder was not read.
- A very small number of former QuickRide enrollees, whose accounts were no longer valid, were recorded by the AVI system and were displaying an "out of date" hang pass.

Introduction

The objective of this analysis was to compare manually collected data on the use of the HOT lanes by two-person vehicles during the QuickRide period with data collected by electronic QuickRide billing readers on those lanes. Four HOT-lane entrance/exit locations were monitored during the morning and afternoon QuickRide periods on February 26–28, April 23–25, and October 15-17, 2003. Manually collected data included vehicle type, number of passengers, and, for two-person vehicles, the presence

[1] An analysis of violation rates is provided in a separate report.

of a visible windshield-mounted transponder and a QuickRide hang pass on the rear-view mirror. The electronic data output included all transponders read on the HOT lane throughout the day. Transponders used in other local electronic billing programs, but not registered for use in the QuickRide program, were removed from this data set.

Due to infrastructure constraints and safety issues, data collectors could not be positioned in the immediate vicinity of the HOT lane billing readers. In order for researchers to compare the manually and electronically collected data, it was necessary to determine the precise time at which each vehicle passed the manual data collection point. This was accomplished using video/audio recordings made by data collectors during the HOT lane monitoring sessions. The clock on the video camera had previously been synchronized with that of the AVI reader. As each two-person vehicle displaying a toll transponder (with or without a QuickRide pass) passed the manual data collection point, the time displayed by the camera was noted by researchers reviewing the data. These data were then compared to information recorded by the closest AVI billing reader using an estimated time displacement.

Data Collection Sites

Researchers evaluated HOT lane violations at four data collection points: the Eastern Extension and Post Oak entry/exit points on the Katy Freeway and the Dacoma and Northwest Transit Center entry/exit points on the Northwest Freeway. The data were adjusted based on assumed average HOT lane speeds of 45 mph for the Katy Freeway collection points, 35 mph for the Dacoma collection point, and 20 mph at the Northwest Transit Center (see Table 1). Although somewhat slower than what may be expected, researchers felt that these average HOT lane speeds were representative of the monitored locations due to the presence of law enforcement and data collectors at the HOT lane entry and exit ramps, both of which reduce rates of speed. Speeds are also affected by the geometry of the roadway, particularly at the Northwest Transit Center.

Table 1. Readers Used for Electronic Data

Manual Data Collection Point	AVI Reader #	Distance between Collection Point and Reader (miles)	Assumed Speed (mph)	Time Displacement (seconds)
Katy: Eastern Extension	18	1.62	45	130
Katy: Post Oak	18	0.87	45	70
Northwest: Dacoma	41	0.11	35	11
Northwest: Northwest Transit Center	42	0.22	20	39

Data Collection Improvements

Review of the February HOT lane data and observations highlighted various issues that precluded analysis of data collected at the Northwest Freeway locations for that month.

Many of these issues were addressed prior to the April data collection effort, but some remained beyond the control of the researchers. The most prevalent of these was the high variability in traffic speeds observed on the HOT lanes.

In some cases, speeds varied greatly from vehicle to vehicle and according to the time of day, location, weather conditions, the presence of law enforcement, and other factors. The resulting margin of error in the time displacement calculation has the potential to significantly skew the data. Speed guns were employed in April and October to minimize this problem; however, the use of portable AVI transponder readers much closer to the data collection sites is required to significantly reduce uncertainties concerning the travel time displacement.

Data correlation difficulties also resulted from unclear audio/video records. Clear and concise observer callouts of vehicle information are necessary for post-collection data analysis. Data collectors typically worked in teams of two. One person focused on observing vehicle information and calling it out for the audio record, while the other visually verified (or corrected) the observer's callout and recorded it. The quality of the video footage did not enable the researchers reviewing the tape to determine the classification of each vehicle visually; therefore, they had to rely upon the audio record of the data collectors for this information.

The speed of the vehicles and their proximity to one another during traffic bursts created challenges for data collectors. Erroneous observer callouts that were checked and changed by the recorder had to be audibly corrected to maintain the integrity of the audio record. This occasionally led to simultaneous or unintelligible callouts as vehicles passed the data collection site. This problem was greatly reduced during the April and October data collection event by focusing on the standardized use of a simpler, clearer vehicle classification method. For instance, "no pass, tag, two" identified a two-person vehicle with a transponder (toll tag) but no QuickRide pass. In some instances, the camera angle was also adjusted to ensure that researchers reviewing the tape had the same perspective as the data collectors so that there would be no confusion regarding the vehicle being commented on.

While it is important to recognize that these improvements increased confidence in the classification of violator types, they are unlikely to provide a basis for claiming a specific level of statistical accuracy based on analysis of the data.

Data

Tables of the data compiled from each of the ten collection times can be found in the Appendix to this report. Time segments were chosen based on data collector feedback regarding favorable viewing conditions, weather, and other factors conducive to accurate data collection. The first column of each table indicates where the vehicle entered or exited the HOT lane. The second column indicates when the vehicle passed the manual observation point. The third column is the estimated travel time (time displacement) between the manual observation point and the closest electronic billing reader. This value was calculated using an assumed average speed over the distance between the manual and electronic data collection sites. The fourth column indicates whether the observed

vehicle displayed a QuickRide pass and a toll transponder, or only the transponder. It is important to note that failure to display a visible QuickRide pass does not necessarily mean that the vehicle is not enrolled in the QuickRide program. QuickRide enrollees may forget to display their passes, or their passes may be obscured by separate hang passes (for example, parking permits), windshield tinting, or other obstructions. The fifth column is the observed time plus the time displacement from column three. The sixth column contains the times obtained from the AVI system for all ***QuickRide*** transponders read during the data collection period. Note, many additional transponders were read by the AVI reader but only those transponder numbers with current or old QuickRide accounts were examined. The seventh column lists whether the transponder was valid or invalid. An invalid read indicates a toll transponder used by someone who had previously been registered for the QuickRide program but has since quit the program. The last column indicates the actual vehicle speed assuming a correct match was made between the manually and electronically collected data.

Data Analysis

As previously mentioned, several difficulties were encountered in the comparison of manually and electronically collected QuickRide data. A principal area of concern with respect to the data analysis was the assumed average vehicle speed. The distances between the manual data collection sites and the AVI billing reader locations necessitated the addition or subtraction of relatively large time displacements to the manually collected data. The margin of error inherent in this activity was compounded by variability in vehicle speed and the difficulty in estimating rates of speed over the entire displacement distance (much of which was outside of the data collectors' range of view). For example, it is possible that vehicles on the Katy East Extension were traveling at an average rate of speed of 60 miles per hour as opposed to 45 miles per hour between the manual and electronic data collection sites. This would yield a time displacement of 33 seconds less than that calculated. In an effort to reduce the level of uncertainty in this area, speed guns were used by data collectors in the April and October data collection efforts.

Another problem encountered in the data analysis was the disparity between the number of toll transponders observed by data collectors and the number recorded by AVI readers. The research team identified more two-person vehicles with transponders than were recorded by AVI readers. This could be explained by a number of factors, including the existence of non-QuickRide enabled toll transponders; faulty, dead, or disabled QuickRide transponders; data collector error; or reader malfunction. The extent of each of these potential problems is not known.

It is also possible that drivers are purposefully violating QuickRide regulations. A QuickRide enrollee who discovers the ability to use the HOT lane in a two-person vehicle during the QuickRide period with an old pass and a broken or disabled transponder may be inclined to continue that behavior in the absence of penalties. Data collectors occasionally observed drivers holding toll transponders against their windshield as they passed the manual data collection sites. This behavior combined with data that indicates the existence of a significant number of dormant and rarely used QuickRide accounts appears to support at least the possibility of purposeful violation.

Results

February 27, 2003 – Katy Freeway, 5:15-5:45 PM (see Figure 1)

During the 30-minute data collection period, 46 two-person vehicles displaying transponders (tags) were observed (see Figure 1). Only 16 (35%) of those vehicles also had a QuickRide pass. For all 46 vehicles, 31 (67%) were matched with a valid QuickRide transponder, 1 (2%) was matched with an invalid QuickRide transponder, and 14 (31%) could not be matched with a QuickRide transponder read. For the 16 vehicles with a transponder and pass, 12 (75%) were identified by the AVI reader and 4 (25%) were not. For the 30 vehicles with a transponder only, 20 (67%) were identified by the AVI reader and 10 (33%) were not.

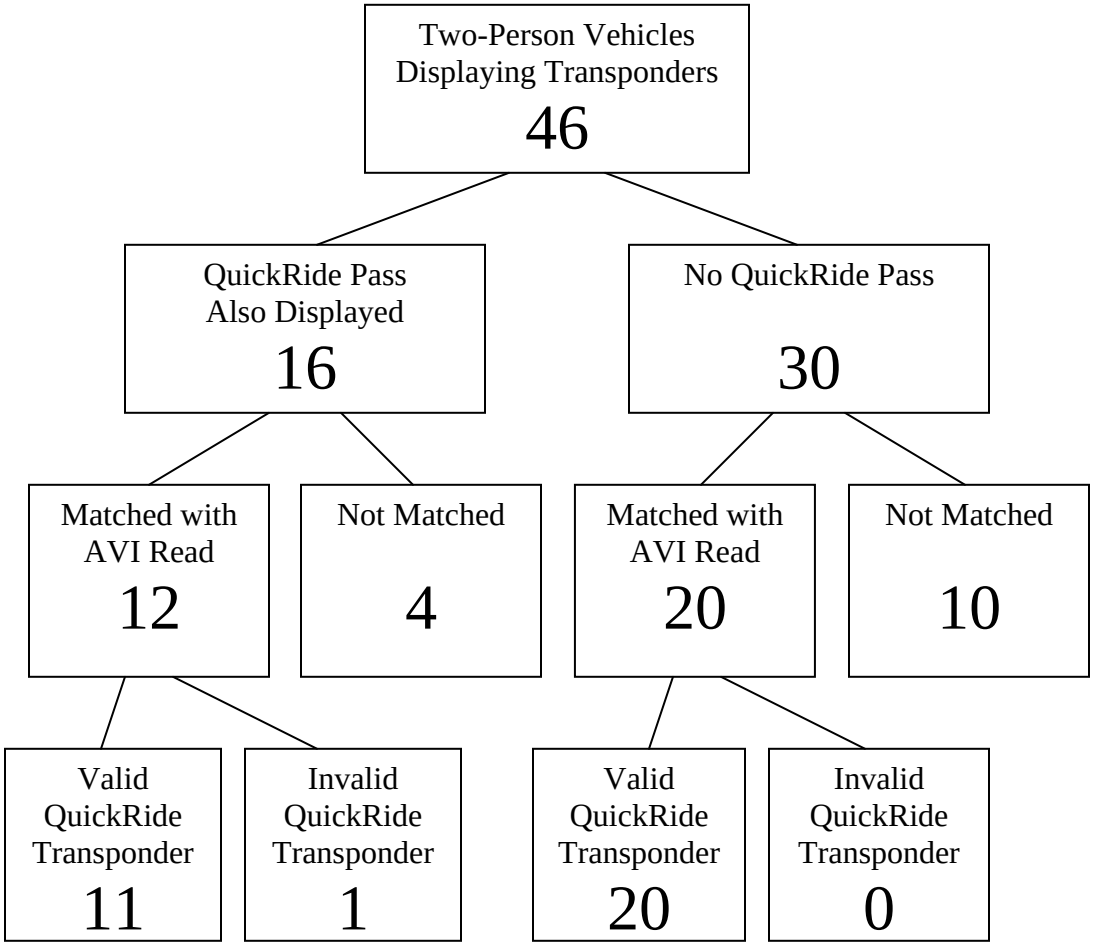

Figure 1: Data Analysis Results, Katy Freeway, 2/27/03.

April 24, 2003 – Katy Freeway, 5:15–5:45 PM (see Figure 2)

During the 30-minute data collection period, 63 two-person vehicles displaying transponders (tags) were observed (see Figure 2). Only 29 (46%) of those vehicles also had a QuickRide pass. For all 63 vehicles, 30 (48%) were matched with a valid QuickRide transponder, 2 (3%) were matched with an invalid QuickRide transponder, and 31 (49%) could not be matched with a QuickRide transponder read. Of the 29 vehicles with a transponder and pass, 14 (48%) were identified by the AVI reader and 15 (52%) were not. For the 34 vehicles with a transponder only, 18 (53%) were identified by the AVI reader and 16 (47%) were not.

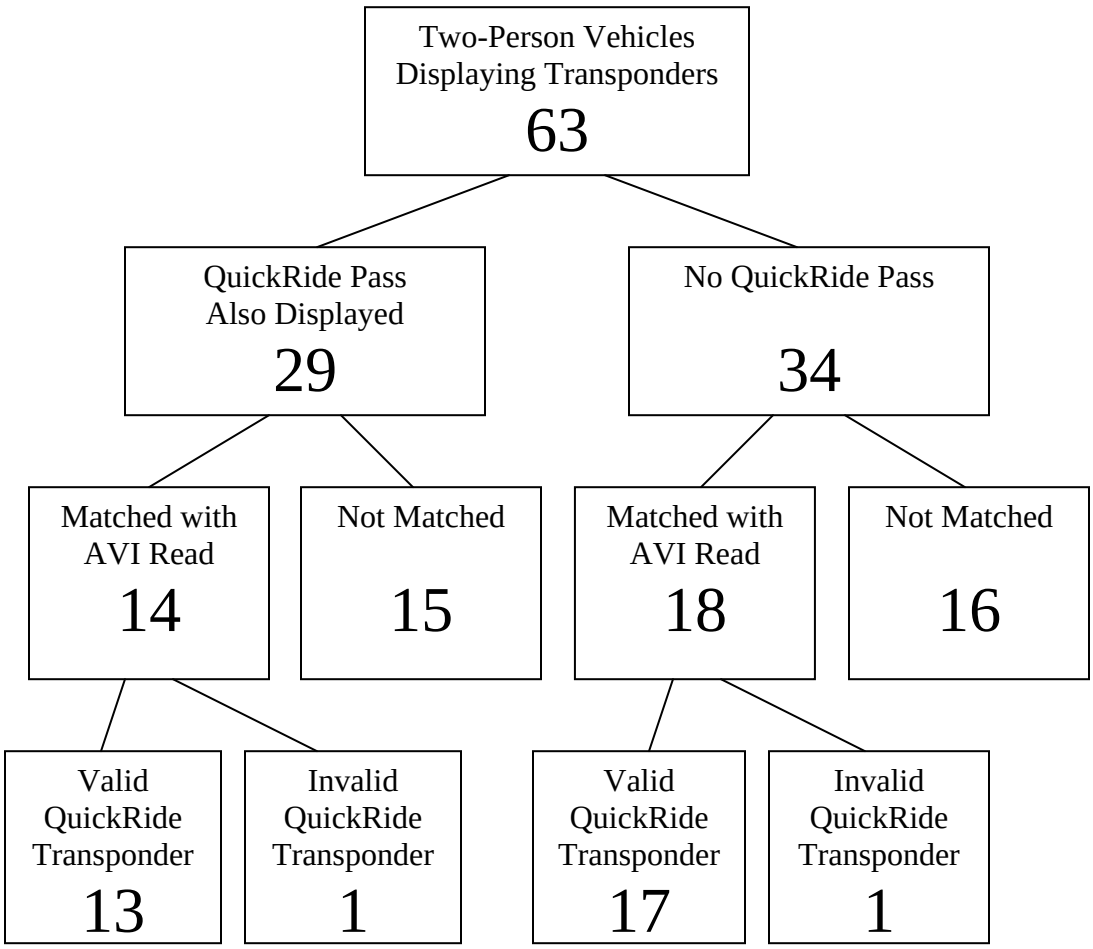

Figure 2: Data Analysis Results, Katy Freeway, 4/24/03.

April 25, 2003 – Northwest Freeway at Dacoma, 7:15–7:45 AM (see Figure 3)

During the 30-minute data collection period, 16 two-person vehicles displaying transponders (tags) were observed (see Figure 3). Only 5 (31%) of those vehicles also had a QuickRide pass. For all 16 vehicles, 9 (56%) were matched with a valid QuickRide transponder, 0 (0%) were matched with an invalid QuickRide transponder, and 7 (44%) could not be matched with a QuickRide transponder read. The AVI reader identified all of the 5 vehicles with a transponder and pass. For the 11 vehicles with a transponder only, 4 (36%) were identified by the AVI reader and 7 (64%) were not. All QuickRide transponders were valid transponders.

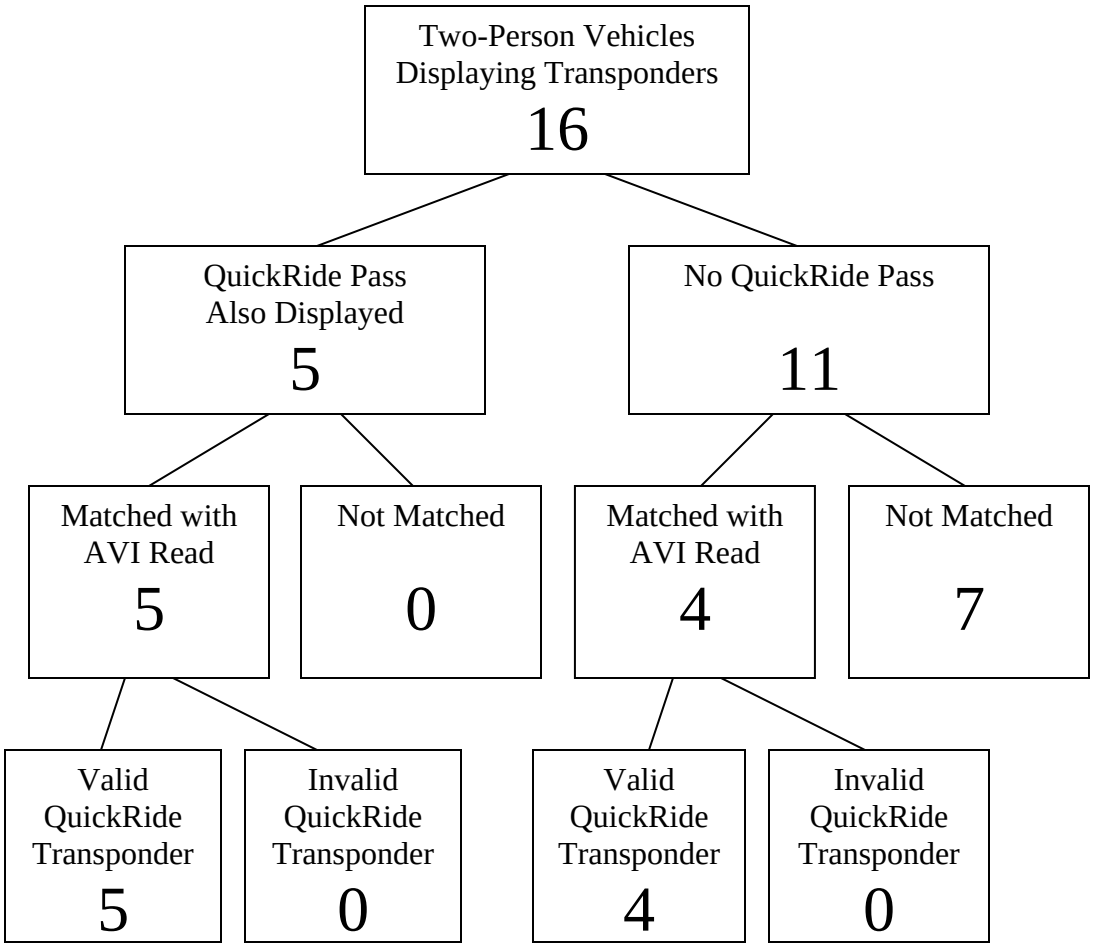

Figure 3: Data Analysis Results, Northwest Freeway at Dacoma, 4/25/03.

April 25, 2003 – Northwest Freeway at Northwest Transit Center, 7:15–7:45 AM (see Fig. 4)

During the 30-minute data collection period, 57 two-person vehicles displaying transponders (tags) were observed (see Figure 4). Only 31 (54%) of those vehicles also had a QuickRide pass. For all 57 vehicles, 25 (44%) were matched with a valid QuickRide transponder, 0 (0%) were matched with an invalid QuickRide transponder, and 32 (56%) could not be matched with a QuickRide transponder read. For the 31 vehicles with a transponder and pass, 13 (42%) were identified by the AVI reader and 18 (58%) were not. For the 26 vehicles with a transponder only, 12 (46%) were identified by the AVI reader and 14 (54%) were not. All QuickRide transponders recorded by the AVI system were valid.

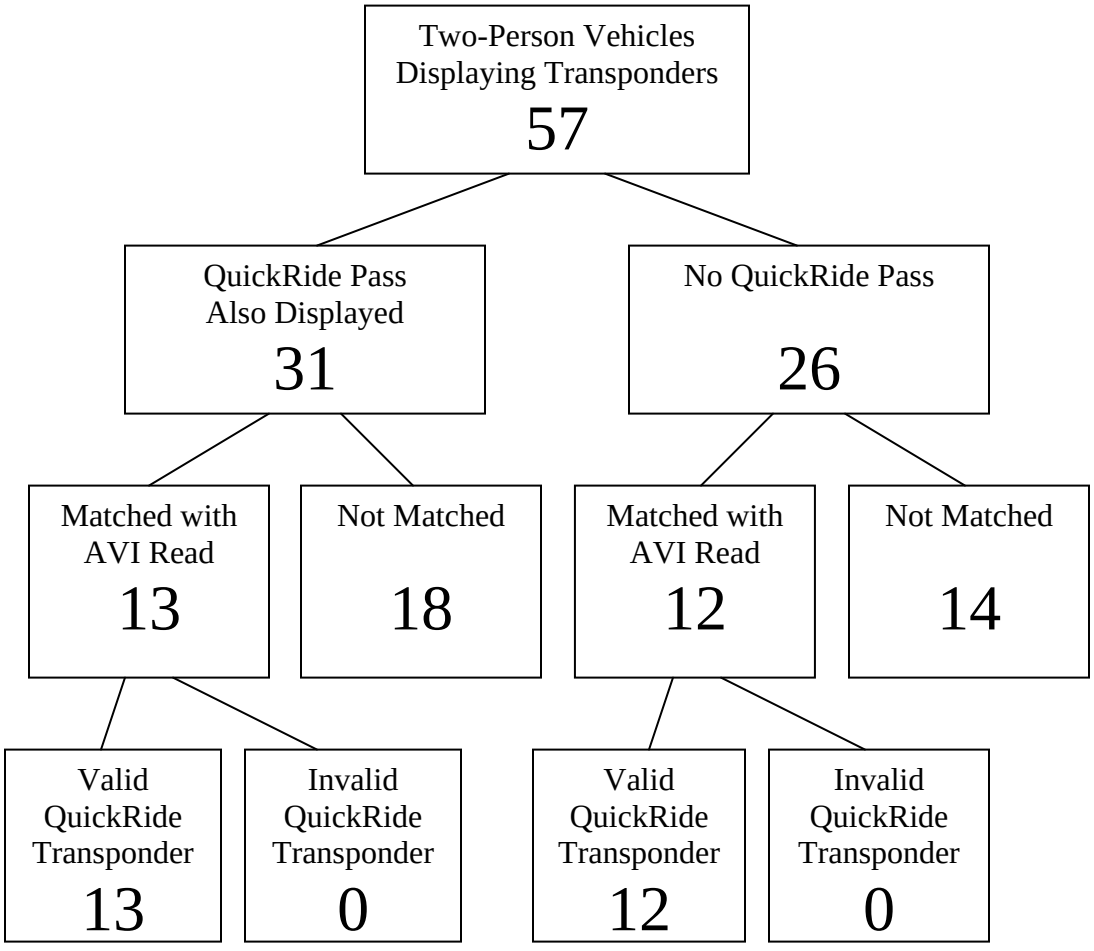

Figure 4: Data Analysis Results, Northwest Freeway at Northwest Transit Center, 4/25/03.

October 16, 2003 – Katy Freeway, 5:15-5:45 PM (see Figure 5)

During the 30-minute data collection period, 67 two-person vehicles displaying transponders (tags) were observed (see Figure 1). Only 33 (49%) of those vehicles also had a QuickRide pass. For all 67 vehicles, 28 (42%) were matched with a valid QuickRide transponder, 0 (0%) were matched with an invalid QuickRide transponder, and 39 (58%) could not be matched with a QuickRide transponder read. For the 33 vehicles with a transponder and pass, 15 (45%) were identified by the AVI reader and 18 (55%) were not. For the 34 vehicles with a transponder only, 13 (38%) were identified by the AVI reader and 21 (62%) were not.

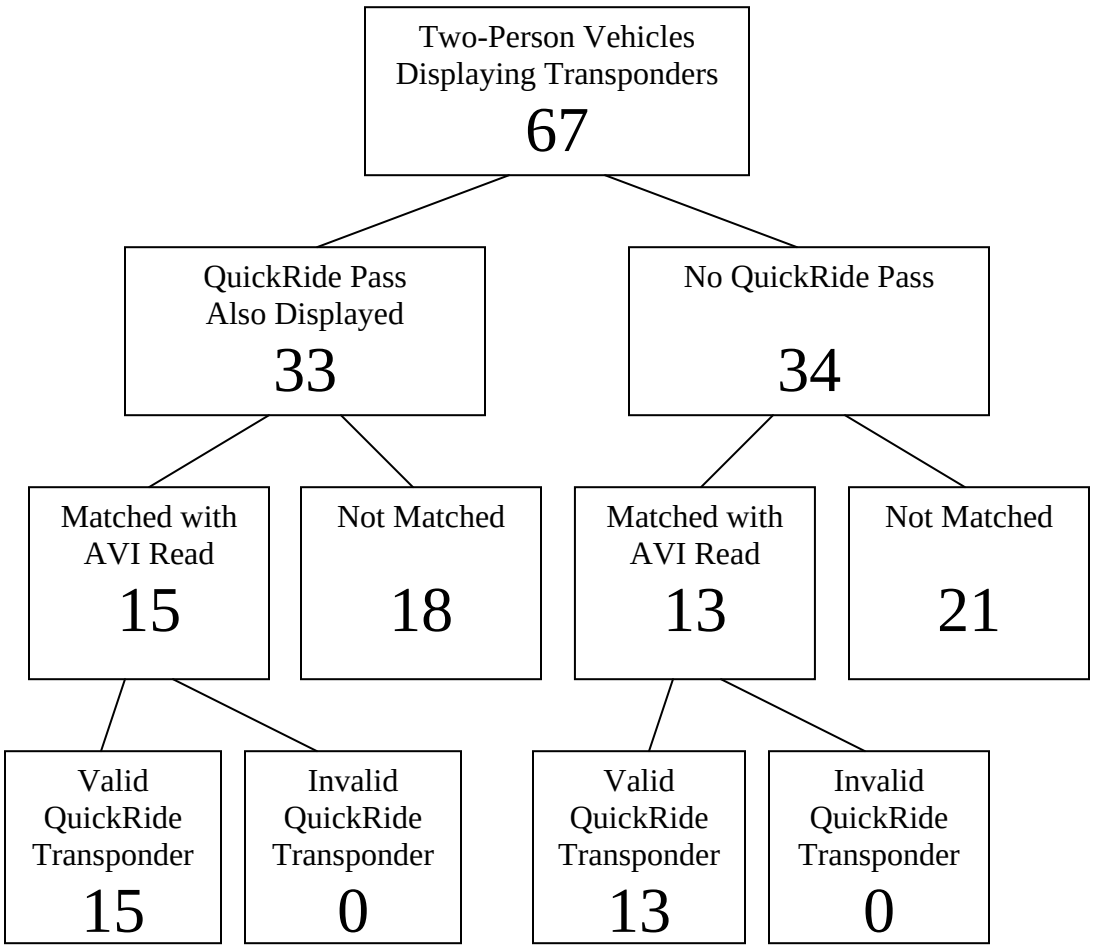

Figure 5: Data Analysis Results, Katy Freeway, 10/16/03.

October 17, 2003 – Katy Freeway, 5:00–5:30 PM (see Figure 6)

During the 30-minute data collection period, 67 two-person vehicles displaying transponders (tags) were observed (see Figure 2). Only 32 (48%) of those vehicles also had a QuickRide pass. For all 67 vehicles, 22 (33%) were matched with a valid QuickRide transponder, 0 (0%) were matched with an invalid QuickRide transponder, and 45 (67%) could not be matched with a QuickRide transponder read. Of the 32 vehicles with a transponder and pass, 10 (31%) were identified by the AVI reader and 22 (69%) were not. For the 35 vehicles with a transponder only, 12 (34%) were identified by the AVI reader and 23 (66%) were not.

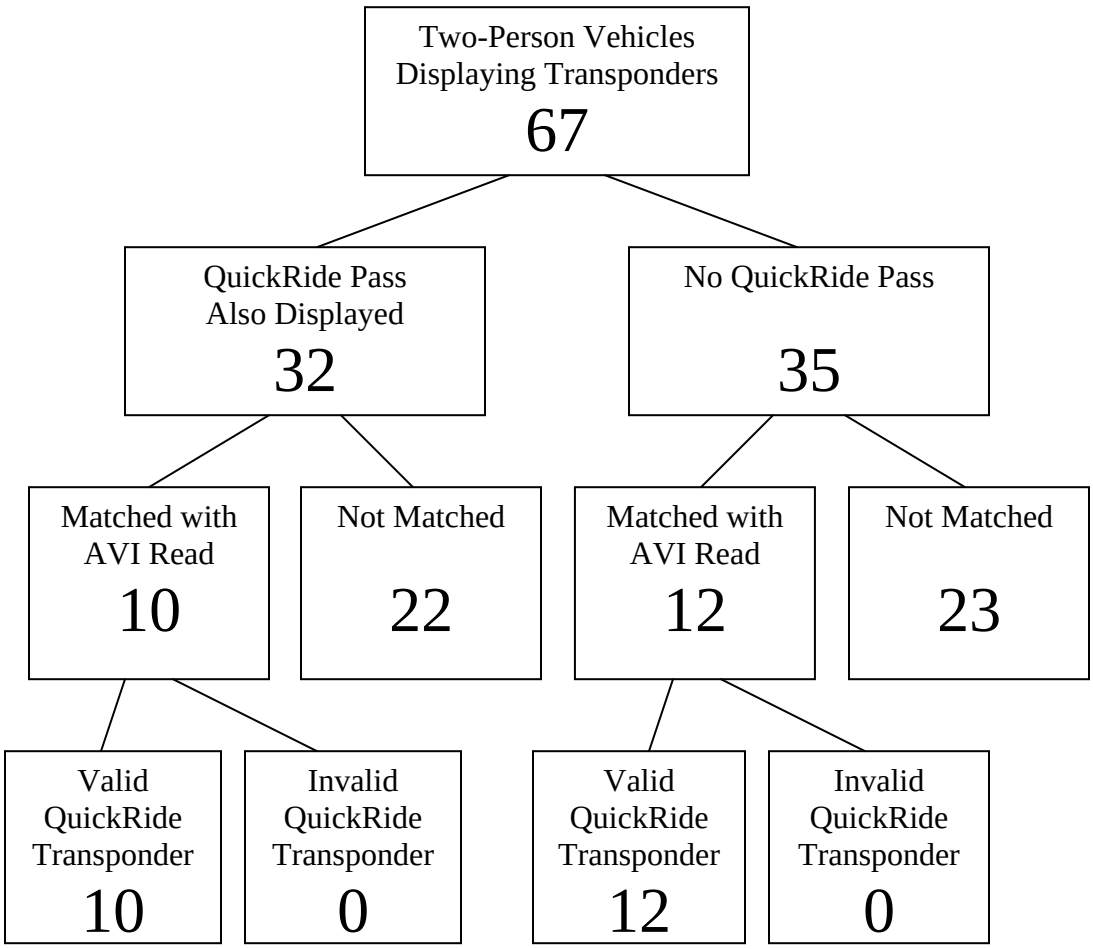

Figure 6: Data Analysis Results, Katy Freeway, 10/17/03.

October 16, 2003 – Northwest Freeway at Dacoma, 7:15–7:45 AM (see Figure 7)

During the 30-minute data collection period, 11 two-person vehicles displaying transponders (tags) were observed (see Figure 3). Only 4 (36%) of those vehicles also had a QuickRide pass. For all 11 vehicles, 5 (45%) were matched with a valid QuickRide transponder, 0 (0%) were matched with an invalid QuickRide transponder, and 6 (55%) could not be matched with a QuickRide transponder read. The AVI reader identified half of the 4 vehicles with a transponder and pass. For the 7 vehicles with a transponder only, 3 (43%) were identified by the AVI reader and 4 (57%) were not. All QuickRide transponders were valid transponders.

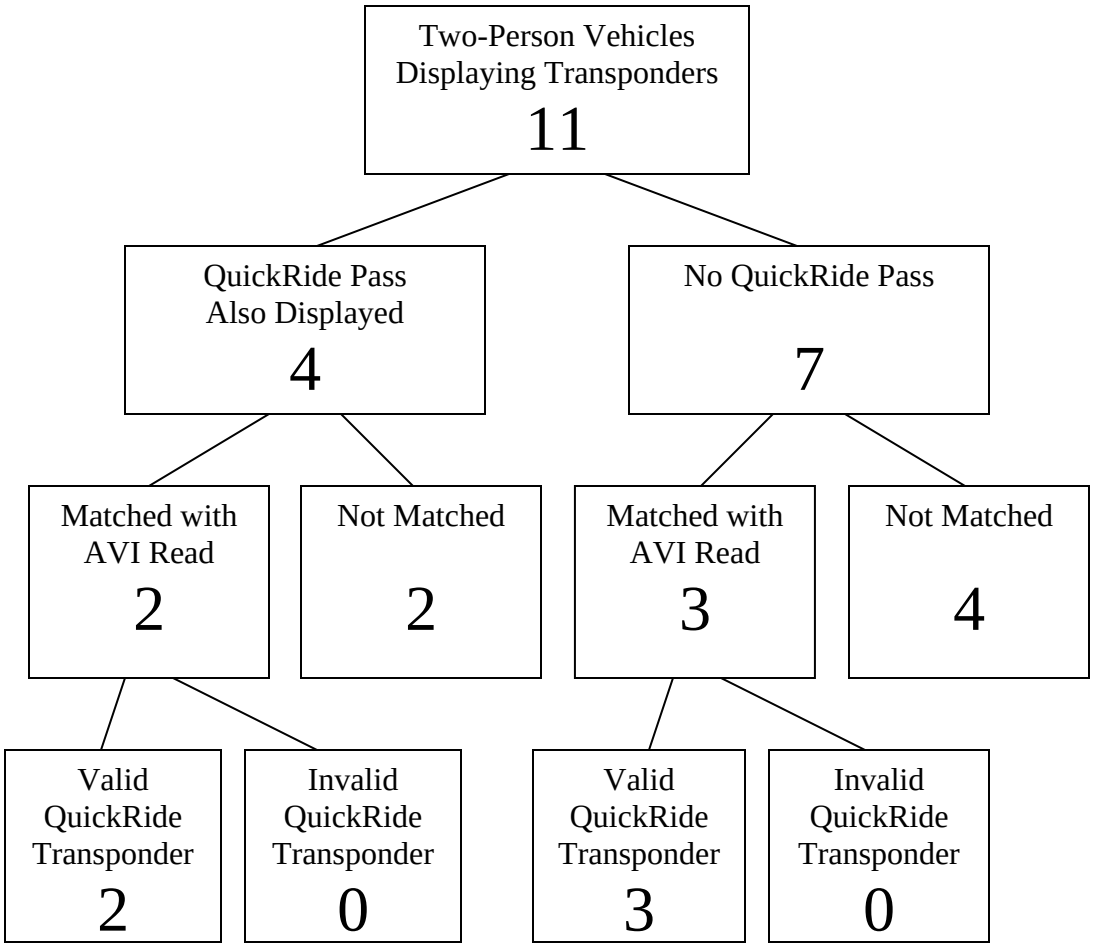

Figure 7: Data Analysis Results, Northwest Freeway at Dacoma, 10/16/03.

October 17, 2003 – Northwest Freeway at Dacoma, 7:15–7:45 AM (see Figure 8)

During the 30-minute data collection period, 12 two-person vehicles displaying transponders (tags) were observed (see Figure 4). Only 7 (58%) of those vehicles also had a QuickRide pass. For all 12 vehicles, 7 (58%) were matched with a valid QuickRide transponder, 0 (0%) were matched with an invalid QuickRide transponder, and 5 (42%) could not be matched with a QuickRide transponder read. The AVI reader identified 5 (71%) of the 7 vehicles with a transponder and pass. For the 5 vehicles with a transponder only, 2 (40%) were identified by the AVI reader and 3 (60%) were not. All QuickRide transponders were valid transponders.

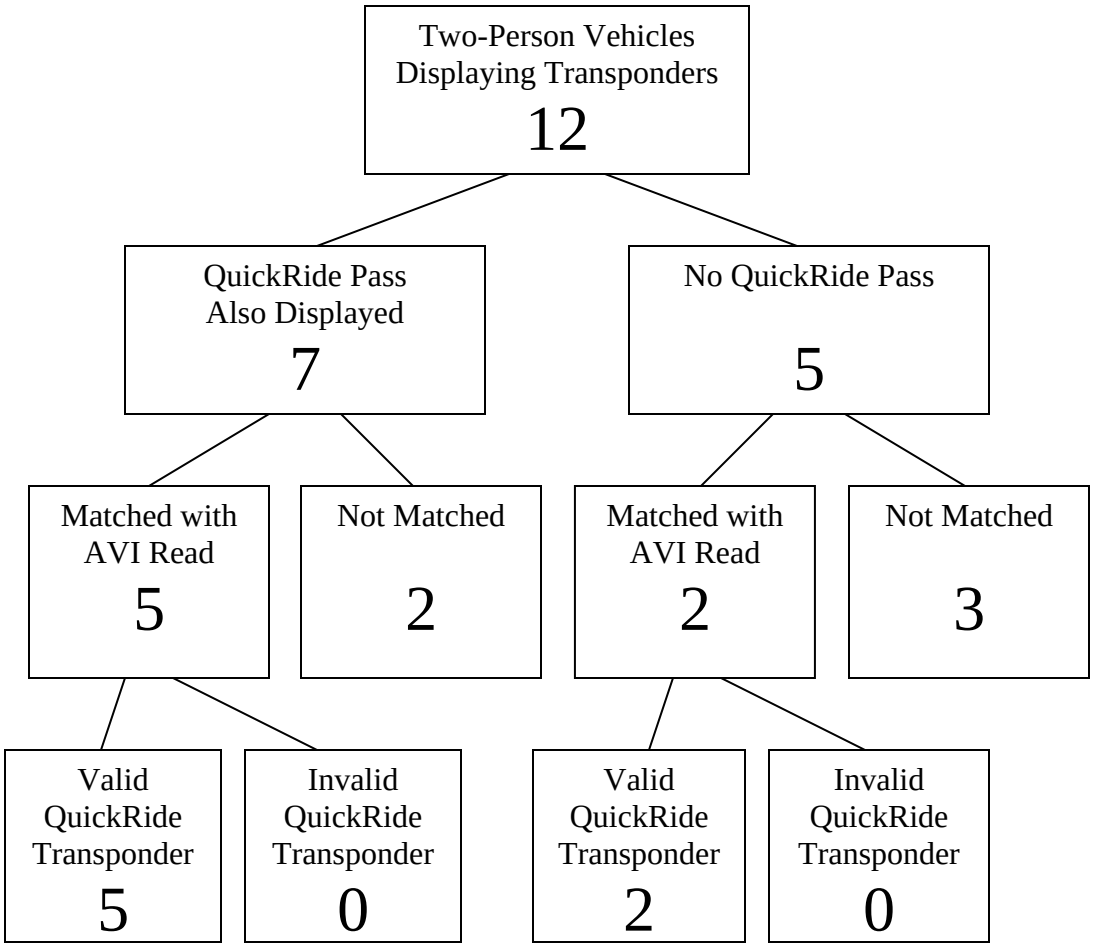

Figure 8: Data Analysis Results, Northwest Freeway at Dacoma, 10/17/03.

October 16, 2003 – Northwest Freeway at Northwest Transit Center, 7:15–7:45 AM (see Figure 9)

During the 30-minute data collection period, 55 two-person vehicles displaying transponders (tags) were observed (see Figure 5). 52 (95%) of those vehicles also had a QuickRide pass. For all 55 vehicles, 22 (40%) were matched with a valid QuickRide transponder, 0 (0%) were matched with an invalid QuickRide transponder, and 33 (60%) could not be matched with a QuickRide transponder read. For the 52 vehicles with a transponder and pass, 22 (42%) were identified by the AVI reader and 30 (58%) were not. For the 3 vehicles with a transponder only, 0 (0%) were identified by the AVI reader and 3 (100%) were not. All QuickRide transponders recorded by the AVI system were valid.

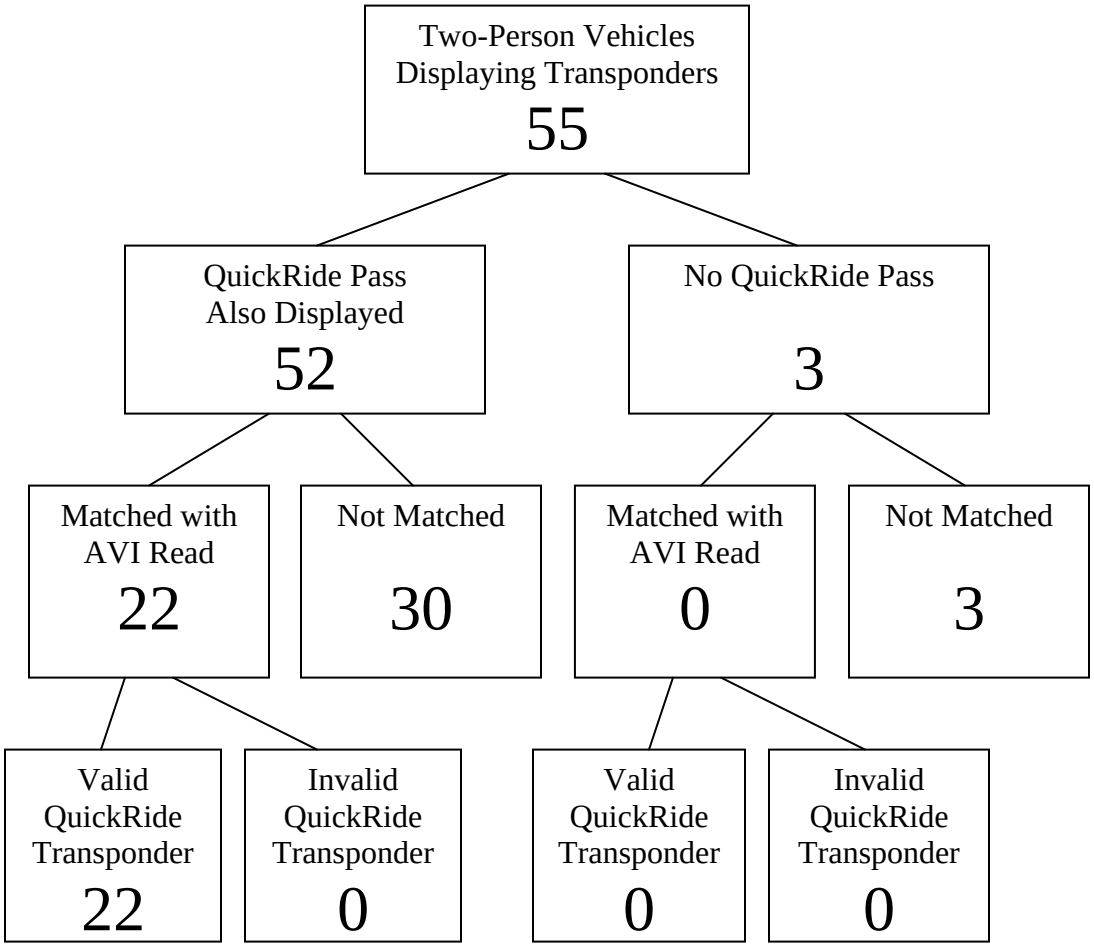

Figure 9: Data Analysis Results, Northwest Freeway at Northwest Transit Center, 10/16/03.

October 17, 2003 – Northwest Freeway at Northwest Transit Center, 7:15–7:45 AM (see Figure 10)

During the 30-minute data collection period, 56 two-person vehicles displaying transponders (tags) were observed (see Figure 6). 45 (80%) of those vehicles also had a QuickRide pass. For all 56 vehicles, 21 (38%) were matched with a valid QuickRide transponder, 1 (2%) was matched with an invalid QuickRide transponder, and 34 (61%) could not be matched with a QuickRide transponder read. For the 45 vehicles with a transponder and pass, 18 (40%) were identified by the AVI reader and 27 (60%) were not. For the 11 vehicles with a transponder only, 4 (36%) were identified by the AVI reader and 7 (64%) were not.

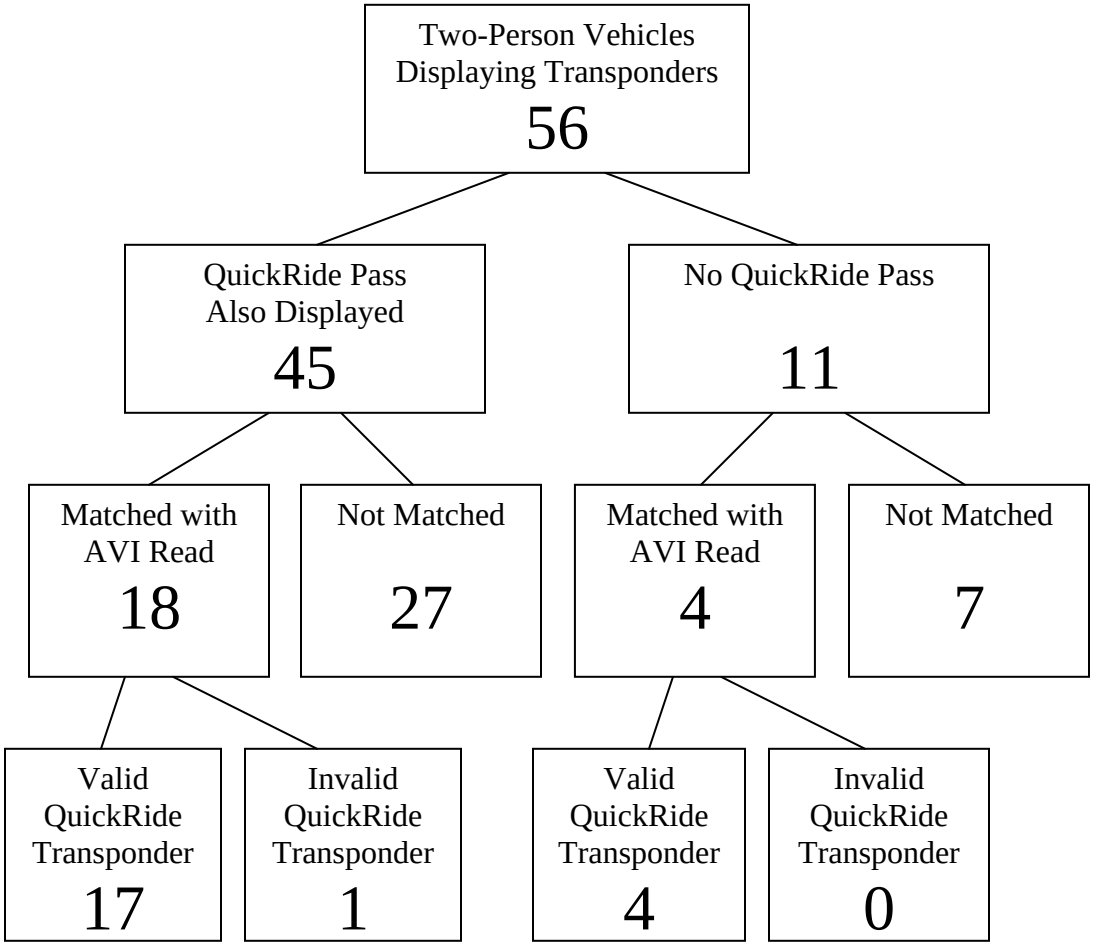

Figure 10: Data Analysis Results, Northwest Freeway at Northwest Transit Center, 10/17/03.

Conclusion

Due to the above-mentioned problems, few definitive conclusions can be drawn from the data analysis. The speed of the vehicles coupled with difficulties inherent in the manual determination of vehicle occupancy and the existence of toll tags and passes presented challenges for the research team. Notwithstanding these challenges, the following general observations can be made regarding vehicles with two occupants displaying a transponder:

- More than one-half of the vehicles that were recorded by the AVI system as QuickRide enrollees were not displaying a visible QuickRide pass (see Figure 11, box *c*).
- A very small number of former QuickRide enrollees are continuing to use HOT lanes during the QuickRide period, despite having an invalid account and an "out of date" pass (boxes *i* and *k*).
- Approximately one-fourth of all observed two-person vehicles with transponders did not have either a QuickRide transponder or a pass. These may be HCTRA transponders that have not been registered for use in the QuickRide program (box *g*).
- The transponders of more than one-half of all two-person vehicles with a transponder and a QuickRide pass could not be matched to valid QuickRide transponder accounts. This is likely caused by either (a) vehicles with HCTRA accounts but no QuickRide account who are in violation of the HOT lane, or (b) a QuickRide patron whose transponder was not read. This appears to confirm the hypothesis of purposeful violation, or at least a lack of repair to inoperable transponders (box *e*).

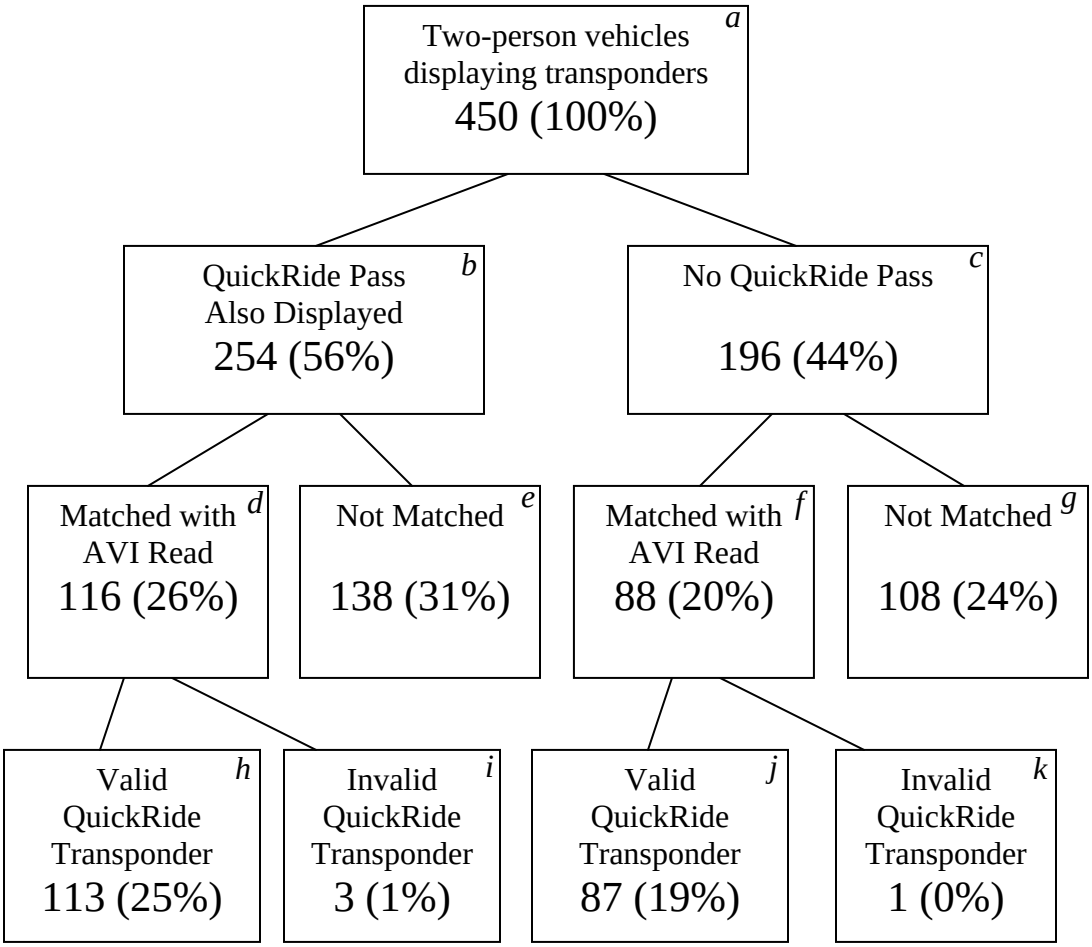

Figure 11. Data Analysis Results from all Periods.

In addition to these observations, potential improvements for future data collection efforts are suggested: (1) use of simple, clear data collection methods and terminology will enhance the ability of researchers to review and extract valuable information from video/audio records and (2) deployment of portable AVI readers at or in close proximity to the manual data collection points could greatly reduce or eliminate the margin of error associated with estimation of average vehicle speeds.

APPENDIX: COLLECTED DATA

Table A. Two-Person Vehicles with Transponders, Katy Freeway, 2/27/03.

Location	Time Observed	Time Displacement (45 mph)	Pass?	Estimated Read Time	Reader 18	Valid/Invalid	Actual Speed
East Ext.	17:15:09	02:10	Tag	17:17:19	17:17:12	Valid	47
East Ext.	17:16:16	02:10	Tag	17:18:26	17:18:35	Valid	42
East Ext.	17:17:04	02:10	Pass & Tag	17:19:14	17:18:48	Valid	56
East Ext.	17:17:36	02:10	Tag	17:19:46			
East Ext.	17:19:26	02:10	Tag	17:21:36	17:21:13	Valid	54
East Ext.	17:19:29	02:10	Pass & Tag	17:21:39	17:21:32	Valid	47
East Ext.	17:19:31	02:10	Pass & Tag	17:21:41	17:22:46	Valid	30
East Ext.	17:19:59	02:10	Pass & Tag	17:22:09	17:23:03	Valid	32
Post Oak	17:22:16	01:10	Pass & Tag	17:23:26	17:24:01	Valid	30
Post Oak	17:23:20	01:10	Pass & Tag	17:24:30	17:24:11	Valid	62
Post Oak	17:23:26	01:10	Tag	17:24:36			
East Ext.	17:22:33	02:10	Tag	17:24:43	17:25:46	Valid	30
Post Oak	17:24:54	01:10	Pass & Tag	17:26:04	17:25:53	Valid	53
East Ext.	17:24:49	02:10	Tag	17:26:59	17:26:24	Valid	61
East Ext.	17:24:59	02:10	Pass & Tag	17:27:09			
Post Oak	17:28:10	01:10	Tag	17:29:20	17:29:01	Valid	62
East Ext.	17:27:19	02:10	Tag	17:29:29	17:30:10	Valid	34
East Ext.	17:27:59	02:10	Pass & Tag	17:30:09	17:30:12	Valid	44
East Ext.	17:28:28	02:10	Pass & Tag	17:30:38			
East Ext.	17:28:58	02:10	Tag	17:31:08	17:31:42	Valid	36
Post Oak	17:30:34	01:10	Tag	17:31:44			
Post Oak	17:30:47	01:10	Tag	17:31:57			
East Ext.	17:29:31	02:10	Pass & Tag	17:31:41			
Post Oak	17:31:25	01:10	Pass & Tag	17:32:35			
East Ext.	17:30:14	02:10	Tag	17:32:24			
Post Oak	17:31:35	01:10	Tag	17:32:45			
East Ext.	17:31:09	02:10	Tag	17:33:19			
Post Oak	17:33:19	01:10	Pass & Tag	17:34:29	17:34:15	Valid	56
East Ext.	17:32:44	02:10	Tag	17:34:54	17:34:27	Valid	57
East Ext.	17:32:54	02:10	Pass & Tag	17:35:04	17:35:22	Valid	39
East Ext.	17:33:45	02:10	Pass & Tag	17:35:55	17:36:33	Valid	35
East Ext.	17:35:01	02:10	Tag	17:37:11	17:36:49	Valid	54
East Ext.	17:35:21	02:10	Tag	17:37:31	17:37:09	Valid	54
Post Oak	17:36:39	01:10	Tag	17:37:49			
East Ext.	17:36:56	02:10	Tag	17:39:06	17:38:56	Valid	49
Post Oak	17:38:14	01:10	Tag	17:39:24	17:39:12	Valid	54
Post Oak	17:38:17	01:10	Tag	17:39:27			
East Ext.	17:37:43	02:10	Tag	17:39:53	17:40:07	Valid	40
East Ext.	17:38:17	02:10	Tag	17:40:27	17:43:12	Valid	20
East Ext.	17:40:22	02:10	Tag	17:42:32	17:43:18	Valid	33
Post Oak	17:42:12	01:10	Tag	17:43:22	17:43:26	Valid	42
East Ext.	17:41:50	02:10	Tag	17:44:00	17:44:32	Valid	36
East Ext.	17:42:58	02:10	Pass & Tag	17:45:08	17:44:49	Invalid	53
Post Oak	17:44:18	01:10	Tag	17:45:28			
Post Oak	17:44:35	01:10	Tag	17:45:45	17:45:54	Valid	40
East Ext.	17:44:00	02:10	Tag	17:46:10	17:46:02	Valid	48

*only vehicles with transponders (tags) and two occupants are listed in this table.

Table B. Two-Person Vehicles with Transponders, Katy Freeway, 4/24/03.

Location	Time Observed	Time Displacement (45 mph)	Pass?	Estimated Read Time	Reader 18	Valid/Invalid	Actual Speed
Post Oak	17:15:19	01:10	Pass & Tag	17:16:29	17:16:58	Valid	32
Post Oak	17:15:21	01:10	Tag	17:16:31	17:17:15	Valid	28
Post Oak	17:16:43	01:10	Tag	17:17:53			
Post Oak	17:16:44	01:10	Pass & Tag	17:17:54			
East Ext.	17:15:55	02:10	Pass & Tag	17:18:05	17:18:03	Valid	46
Post Oak	17:17:08	01:10	Pass & Tag	17:18:18			
East Ext.	17:16:21	02:10	Pass & Tag	17:18:31	17:18:44	Valid	41
East Ext.	17:16:44	02:10	Tag	17:18:54	17:18:48	Valid	47
East Ext.	17:16:55	02:10	Pass & Tag	17:19:05			
Post Oak	17:18:15	01:10	Pass & Tag	17:19:25	17:19:29	Valid	42
Post Oak	17:18:17	01:10	Tag	17:19:27	17:19:35	Valid	40
East Ext.	17:18:32	02:10	Pass & Tag	17:20:42	17:20:09	Valid	60
East Ext.	17:19:03	02:10	Tag	17:21:13			
East Ext.	17:19:42	02:10	Tag	17:21:52			
East Ext.	17:19:53	02:10	Tag	17:22:03			
East Ext.	17:20:00	02:10	Tag	17:22:10			
Post Oak	17:21:39	01:10	Tag	17:22:49	17:22:48	Valid	46
East Ext.	17:20:53	02:10	Tag	17:23:03			
Post Oak	17:22:48	01:10	Tag	17:23:58	17:24:07	Valid	40
Post Oak	17:23:12	01:10	Tag	17:24:22	17:24:08	Valid	56
East Ext.	17:22:27	02:10	Pass & Tag	17:24:37	17:24:14	Valid	54
East Ext.	17:22:30	02:10	Pass & Tag	17:24:40			
East Ext.	17:22:35	02:10	Pass & Tag	17:24:45	17:24:44	Valid	45
East Ext.	17:22:42	02:10	Pass & Tag	17:24:52			
East Ext.	17:23:02	02:10	Pass & Tag	17:25:12			
Post Oak	17:24:48	01:10	Tag	17:25:58	17:25:36	Valid	65
East Ext.	17:24:01	02:10	Tag	17:26:11	17:26:18	Valid	43
Post Oak	17:25:42	01:10	Pass & Tag	17:26:52	17:26:38	Valid	56
East Ext.	17:24:45	02:10	Pass & Tag	17:26:55	17:26:49	Valid	47
East Ext.	17:25:21	02:10	Pass & Tag	17:27:31	17:27:23	Valid	48
East Ext.	17:25:28	02:10	Tag	17:27:38	17:28:27	Valid	33
East Ext.	17:26:59	02:10	Tag	17:29:09	17:28:59	Valid	49
East Ext.	17:27:15	02:10	Pass & Tag	17:29:25			
East Ext.	17:27:37	02:10	Pass & Tag	17:29:47	17:29:48	Invalid	44
Post Oak	17:29:11	01:10	Pass & Tag	17:30:21			
Post Oak	17:29:48	01:10	Tag	17:30:58			
Post Oak	17:30:12	01:10	Pass & Tag	17:31:22	17:31:16	Valid	49
East Ext.	17:29:32	02:10	Pass & Tag	17:31:42			
Post Oak	17:30:48	01:10	Tag	17:31:58			
Post Oak	17:32:21	01:10	Tag	17:33:31	17:33:20	Valid	53
East Ext.	17:31:22	02:10	Tag	17:33:32			
Post Oak	17:33:24	01:10	Tag	17:34:34	17:34:31	Valid	47
Post Oak	17:33:54	01:10	Pass & Tag	17:35:04			
East Ext.	17:32:58	02:10	Pass & Tag	17:35:08			
East Ext.	17:33:00	02:10	Tag	17:35:10			
Post Oak	17:34:51	01:10	Tag	17:36:01	17:37:20	Valid	21
Post Oak	17:36:20	01:10	Tag	17:37:30	17:37:45	Valid	37
Post Oak	17:37:46	01:10	Tag	17:38:56	17:38:50	Valid	49
East Ext.	17:36:50	02:10	Tag	17:39:00			
Post Oak	17:38:33	01:10	Pass & Tag	17:39:43	17:39:40	Valid	47
East Ext.	17:37:58	02:10	Pass & Tag	17:40:08			
East Ext.	17:39:48	02:10	Tag	17:41:58	17:42:05	Valid	43
Post Oak	17:42:23	01:10	Pass & Tag	17:43:33	17:43:24	Valid	52
East Ext.	17:41:26	02:10	Tag	17:43:36	17:43:32	Valid	46
Post Oak	17:42:30	01:10	Pass & Tag	17:43:40			
East Ext.	17:42:04	02:10	Pass & Tag	17:44:14			
Post Oak	17:43:50	01:10	Tag	17:45:00	17:44:57	Invalid	47
Post Oak	17:43:57	01:10	Tag	17:45:07			
East Ext.	17:43:06	02:10	Tag	17:45:16			
Post Oak	17:44:11	01:10	Tag	17:45:21			
East Ext.	17:44:21	02:10	Tag	17:46:31			
East Ext.	17:44:42	02:10	Pass & Tag	17:46:52			
East Ext.	17:44:43	02:10	Tag	17:46:53			

Table C. Two-Person Vehicles with Transponders, Northwest Freeway at Dacoma, 4/25/03.

Location	Time Observed	Time Displacement (35 mph)	Pass?	Estimated Read Time	Reader 41	Valid/Invalid	Actual Speed
Dacoma	7:16:41	0:00:11	Tag	7:16:30			
Dacoma	7:16:43	0:00:11	Tag	7:16:32			
Dacoma	7:17:02	0:00:11	Pass & Tag	7:16:51	7:16:49	Valid	31
Dacoma	7:18:43	0:00:11	Tag	7:18:32			
Dacoma	7:18:50	0:00:11	Tag	7:18:39			
Dacoma	7:20:42	0:00:11	Tag	7:20:31			
Dacoma	7:26:02	0:00:11	Tag	7:25:51			
Dacoma	7:26:09	0:00:11	Tag	7:25:58			
Dacoma	7:28:00	0:00:11	Tag	7:27:49	7:27:24	Valid	11
Dacoma	7:30:30	0:00:11	Tag	7:30:19	7:29:57	Valid	12
Dacoma	7:32:46	0:00:11	Pass & Tag	7:32:35	7:32:32	Valid	29
Dacoma	7:33:34	0:00:11	Pass & Tag	7:33:23	7:33:19	Valid	27
Dacoma	7:35:43	0:00:11	Pass & Tag	7:35:32	7:34:48	Valid	7
Dacoma	7:41:22	0:00:11	Tag	7:41:11	7:40:45	Valid	11
Dacoma	7:42:11	0:00:11	Pass & Tag	7:42:00	7:41:56	Valid	27
Dacoma	7:44:08	0:00:11	Tag	7:43:57	7:43:58	Valid	40

*only vehicles with transponders (tags) and two occupants are listed in this table.

Table D. Two-Person Vehicles with Transponders, Northwest Freeway at Northwest Transit Center, 4/25/03.

Location	Time Observed	Time Displacement (20 mph)	Pass?	Estimated Read Time	Reader 42	Valid/ Invalid	Actual Speed
NW Transit Center	7:15:50	0:00:39	Pass & Tag	7:15:11	7:15:16	Valid	23
NW Transit Center	7:16:30	0:00:39	Tag	7:15:51			
NW Transit Center	7:20:31	0:00:39	Tag	7:19:52	7:19:22	Valid	11
NW Transit Center	7:20:41	0:00:39	Tag	7:20:02			
NW Transit Center	7:21:00	0:00:39	Tag	7:20:21			
NW Transit Center	7:21:27	0:00:39	Tag	7:20:48			
NW Transit Center	7:23:51	0:00:39	Pass & Tag	7:23:12			
NW Transit Center	7:23:53	0:00:39	Tag	7:23:14			
NW Transit Center	7:23:56	0:00:39	Tag	7:23:17			
NW Transit Center	7:24:21	0:00:39	Pass & Tag	7:23:42			
NW Transit Center	7:24:27	0:00:39	Pass & Tag	7:23:48			
NW Transit Center	7:24:56	0:00:39	Tag	7:24:17	7:24:06	Valid	16
NW Transit Center	7:25:03	0:00:39	Pass & Tag	7:24:24			
NW Transit Center	7:26:03	0:00:39	Tag	7:25:24	7:25:15	Valid	16
NW Transit Center	7:26:18	0:00:39	Pass & Tag	7:25:39	7:25:24	Valid	14
NW Transit Center	7:26:24	0:00:39	Pass & Tag	7:25:45			
NW Transit Center	7:26:29	0:00:39	Pass & Tag	7:25:50			
NW Transit Center	7:26:35	0:00:39	Pass & Tag	7:25:56			
NW Transit Center	7:26:51	0:00:39	Pass & Tag	7:26:12			
NW Transit Center	7:27:00	0:00:39	Tag	7:26:21			
NW Transit Center	7:28:44	0:00:39	Tag	7:28:05			
NW Transit Center	7:28:57	0:00:39	Pass & Tag	7:28:18	7:28:19	Valid	20
NW Transit Center	7:29:40	0:00:39	Pass & Tag	7:29:01			
NW Transit Center	7:32:13	0:00:39	Pass & Tag	7:31:34	7:30:56	Valid	10
NW Transit Center	7:32:54	0:00:39	Tag	7:32:15	7:32:26	Valid	28
NW Transit Center	7:33:03	0:00:39	Pass & Tag	7:32:24	7:32:34	Valid	27
NW Transit Center	7:33:33	0:00:39	Pass & Tag	7:32:54	7:32:47	Valid	17
NW Transit Center	7:33:36	0:00:39	Tag	7:32:57	7:33:00	Valid	22
NW Transit Center	7:33:49	0:00:39	Pass & Tag	7:33:10	7:33:03	Valid	17
NW Transit Center	7:33:56	0:00:39	Tag	7:33:17			
NW Transit Center	7:33:58	0:00:39	Pass & Tag	7:33:19	7:33:31	Valid	29
NW Transit Center	7:34:24	0:00:39	Tag	7:33:45			
NW Transit Center	7:34:33	0:00:39	Tag	7:33:54			
NW Transit Center	7:34:51	0:00:39	Pass & Tag	7:34:12			
NW Transit Center	7:34:59	0:00:39	Pass & Tag	7:34:20			
NW Transit Center	7:36:10	0:00:39	Pass & Tag	7:35:31			
NW Transit Center	7:36:15	0:00:39	Pass & Tag	7:35:36	7:35:37	Valid	20
NW Transit Center	7:36:46	0:00:39	Pass & Tag	7:36:07			
NW Transit Center	7:36:57	0:00:39	Pass & Tag	7:36:18	7:36:17	Valid	19
NW Transit Center	7:37:00	0:00:39	Tag	7:36:21	7:36:27	Valid	24
NW Transit Center	7:37:02	0:00:39	Pass & Tag	7:36:23	7:36:39	Valid	34
NW Transit Center	7:37:45	0:00:39	Tag	7:37:06			
NW Transit Center	7:39:17	0:00:39	Pass & Tag	7:38:38	7:38:36	Valid	19
NW Transit Center	7:39:20	0:00:39	Pass & Tag	7:38:41	7:38:48	Valid	24
NW Transit Center	7:39:26	0:00:39	Tag	7:38:47			
NW Transit Center	7:39:30	0:00:39	Pass & Tag	7:38:51			
NW Transit Center	7:39:45	0:00:39	Pass & Tag	7:39:06			
NW Transit Center	7:40:01	0:00:39	Tag	7:39:22	7:39:37	Valid	32
NW Transit Center	7:40:25	0:00:39	Tag	7:39:46	7:40:01	Valid	32
NW Transit Center	7:41:38	0:00:39	Tag	7:40:59	7:41:12	Valid	30
NW Transit Center	7:42:41	0:00:39	Pass & Tag	7:42:02			
NW Transit Center	7:42:48	0:00:39	Tag	7:42:09			
NW Transit Center	7:42:54	0:00:39	Pass & Tag	7:42:15			
NW Transit Center	7:43:09	0:00:39	Tag	7:42:30	7:42:32	Valid	21
NW Transit Center	7:43:15	0:00:39	Pass & Tag	7:42:36	7:42:37	Valid	20
NW Transit Center	7:43:39	0:00:39	Tag	7:43:00	7:42:40	Valid	13
NW Transit Center	7:43:48	0:00:39	Tag	7:43:09			

*only vehicles with transponders (tags) and two occupants are listed in this table.

Table E. Two-Person Vehicles with Transponders, Katy Freeway, 10/16/03.

Location	Time Observed	Time Displacement (45 mph)	Pass?	Estimated Read Time	Reader 18	Valid/Invalid	Actual Speed
Post Oak	17:15:46	0:01:10	Tag	17:16:56			
East Ext.	17:15:34	0:02:10	Tag	17:17:44	17:17:50	Valid	43
Post Oak	17:16:43	0:01:10	Pass & Tag	17:17:53	17:17:59	Valid	41
Post Oak	17:17:08	0:01:10	Tag	17:18:18			
East Ext.	17:16:15	0:02:10	Pass & Tag	17:18:25			
East Ext.	17:16:33	0:02:10	Pass & Tag	17:18:43			
Post Oak	17:18:19	0:01:10	Tag	17:19:29			
Post Oak	17:18:23	0:01:10	Tag	17:19:33			
Post Oak	17:18:34	0:01:10	Tag	17:19:44	17:19:40	Valid	47
East Ext.	17:17:58	0:02:10	Pass & Tag	17:20:08	17:20:05	Valid	46
East Ext.	17:18:18	0:02:10	Pass & Tag	17:20:28	17:20:48	Valid	39
East Ext.	17:19:14	0:02:10	Pass & Tag	17:21:24			
East Ext.	17:19:51	0:02:10	Tag	17:22:01	17:21:55	Valid	47
Post Oak	17:20:54	0:01:10	Tag	17:22:04			
East Ext.	17:20:24	0:02:10	Tag	17:22:34	17:22:36	Valid	44
Post Oak	17:21:36	0:01:10	Pass & Tag	17:22:46			
East Ext.	17:21:22	0:02:10	Tag	17:23:32			
Post Oak	17:22:49	0:01:10	Tag	17:23:59	17:23:54	Valid	48
Post Oak	17:22:54	0:01:10	Pass & Tag	17:24:04			
Post Oak	17:24:02	0:01:10	Tag	17:25:12	17:25:08	Valid	47
East Ext.	17:23:28	0:02:10	Pass & Tag	17:25:38	17:25:29	Valid	48
East Ext.	17:23:40	0:02:10	Pass & Tag	17:25:50			
Post Oak	17:25:27	0:01:10	Tag	17:26:37	17:26:23	Valid	56
Post Oak	17:25:39	0:01:10	Pass & Tag	17:26:49	17:26:43	Valid	49
East Ext.	17:25:11	0:02:10	Pass & Tag	17:27:21			
East Ext.	17:25:14	0:02:10	Tag	17:27:24			
Post Oak	17:26:57	0:01:10	Pass & Tag	17:28:07	17:28:02	Valid	48
Post Oak	17:27:05	0:01:10	Pass & Tag	17:28:15	17:28:08	Valid	50
East Ext.	17:27:06	0:02:10	Pass & Tag	17:29:16	17:28:56	Valid	53
East Ext.	17:27:09	0:02:10	Pass & Tag	17:29:19			
Post Oak	17:28:15	0:01:10	Pass & Tag	17:29:25			
East Ext.	17:27:19	0:02:10	Tag	17:29:29			
East Ext.	17:27:24	0:02:10	Pass & Tag	17:29:34			
East Ext.	17:28:01	0:02:10	Pass & Tag	17:30:11			
East Ext.	17:28:43	0:02:10	Tag	17:30:53	17:30:50	Valid	46
Post Oak	17:29:53	0:01:10	Pass & Tag	17:31:03			
Post Oak	17:30:01	0:01:10	Tag	17:31:11			
Post Oak	17:30:35	0:01:10	Pass & Tag	17:31:45	17:31:40	Valid	48
Post Oak	17:31:35	0:01:10	Pass & Tag	17:32:45			
Post Oak	17:31:39	0:01:10	Pass & Tag	17:32:49	17:33:00	Valid	39
East Ext.	17:31:22	0:02:10	Pass & Tag	17:33:32	17:33:28	Valid	46
Post Oak	17:33:35	0:01:10	Pass & Tag	17:34:45	17:35:08	Valid	34
Post Oak	17:34:45	0:01:10	Tag	17:35:55	17:35:28	Valid	73
East Ext.	17:33:54	0:02:10	Pass & Tag	17:36:04			
East Ext.	17:33:57	0:02:10	Pass & Tag	17:36:07	17:36:10	Valid	44
East Ext.	17:34:42	0:02:10	Pass & Tag	17:36:52			
Post Oak	17:35:55	0:01:10	Tag	17:37:05	17:37:46	Valid	28
East Ext.	17:36:07	0:02:10	Tag	17:38:17	17:38:09	Valid	48
East Ext.	17:36:41	0:02:10	Pass & Tag	17:38:51	17:38:41	Valid	49
Post Oak	17:38:00	0:01:10	Tag	17:39:10			
Post Oak	17:38:19	0:01:10	Tag	17:39:29			
Post Oak	17:38:24	0:01:10	Pass & Tag	17:39:34			
Post Oak	17:38:40	0:01:10	Tag	17:39:50			
Post Oak	17:39:17	0:01:10	Tag	17:40:27	17:40:21	Valid	49
Post Oak	17:39:19	0:01:10	Tag	17:40:29			
Post Oak	17:39:52	0:01:10	Pass & Tag	17:41:02	17:40:52	Valid	52
East Ext.	17:39:01	0:02:10	Pass & Tag	17:41:11			
East Ext.	17:39:56	0:02:10	Tag	17:42:06			
Post Oak	17:41:07	0:01:10	Pass & Tag	17:42:17			
Post Oak	17:41:21	0:01:10	Tag	17:42:31			
East Ext.	17:41:08	0:02:10	Tag	17:43:18			
Post Oak	17:42:47	0:01:10	Tag	17:43:57			
Post Oak	17:43:32	0:01:10	Tag	17:44:42			

Post Oak	17:43:34	0:01:10	Tag	17:44:44			
Post Oak	17:43:54	0:01:10	Tag	17:45:04			
East Ext.	17:44:20	0:02:10	Tag	17:46:30			
East Ext.	17:45:00	0:02:10	Tag	17:47:10	17:47:34	Valid	38

*only vehicles with transponders (tags) and two occupants are listed in this table.

Table F. Two-Person Vehicles with Transponders, Katy Freeway, 10/17/03.

Location	Time Observed	Time Displacement (45 mph)	Pass?	Estimated Read Time	Reader 18	Valid/Invalid	Actual Speed
East Ext.	17:00:59	0:02:10	Tag	17:03:09			
East Ext.	17:01:24	0:02:10	Pass & Tag	17:03:34			
East Ext.	17:01:46	0:02:10	Tag	17:03:56			
East Ext.	17:02:28	0:02:10	Tag	17:04:38			
Post Oak	17:03:32	0:01:10	Tag	17:04:42			
East Ext.	17:03:18	0:02:10	Tag	17:05:28			
East Ext.	17:03:38	0:02:10	Tag	17:05:48			
East Ext.	17:04:51	0:02:10	Pass & Tag	17:07:01	17:06:47	Valid	50
East Ext.	17:05:01	0:02:10	Tag	17:07:11			
East Ext.	17:05:23	0:02:10	Tag	17:07:33			
East Ext.	17:06:00	0:02:10	Pass & Tag	17:08:10			
Post Oak	17:07:15	0:01:10	Tag	17:08:25			
Post Oak	17:07:33	0:01:10	Tag	17:08:43			
Post Oak	17:07:44	0:01:10	Pass & Tag	17:08:54			
Post Oak	17:08:10	0:01:10	Pass & Tag	17:09:20			
East Ext.	17:07:47	0:02:10	Tag	17:09:57	17:10:02	Valid	43
Post Oak	17:09:08	0:01:10	Pass & Tag	17:10:18			
Post Oak	17:09:10	0:01:10	Pass & Tag	17:10:20			
Post Oak	17:10:10	0:01:10	Tag	17:11:20	17:11:01	Valid	61
East Ext.	17:09:14	0:02:10	Pass & Tag	17:11:24			
Post Oak	17:10:34	0:01:10	Tag	17:11:44			
East Ext.	17:10:43	0:02:10	Pass & Tag	17:12:53	17:12:25	Valid	57
East Ext.	17:10:46	0:02:10	Pass & Tag	17:12:56	17:12:54	Valid	46
Post Oak	17:12:02	0:01:10	Pass & Tag	17:13:12			
Post Oak	17:12:14	0:01:10	Pass & Tag	17:13:24			
East Ext.	17:11:42	0:02:10	Pass & Tag	17:13:52			
East Ext.	17:12:36	0:02:10	Pass & Tag	17:14:46			
East Ext.	17:14:33	0:02:10	Pass & Tag	17:16:43	17:16:16	Valid	57
East Ext.	17:14:38	0:02:10	Pass & Tag	17:16:48			
East Ext.	17:15:13	0:02:10	Tag	17:17:23	17:17:56	Valid	36
East Ext.	17:16:07	0:02:10	Tag	17:18:17			
Post Oak	17:18:01	0:01:10	Pass & Tag	17:19:11	17:18:52	Valid	61
East Ext.	17:17:07	0:02:10	Tag	17:19:17	17:19:07	Valid	49
Post Oak	17:19:15	0:01:10	Tag	17:20:25	17:20:36	Valid	39
Post Oak	17:19:25	0:01:10	Tag	17:20:35	17:20:39	Valid	42
Post Oak	17:19:29	0:01:10	Tag	17:20:39			
Post Oak	17:19:36	0:01:10	Tag	17:20:46			
East Ext.	17:19:00	0:02:10	Pass & Tag	17:21:10			
East Ext.	17:19:02	0:02:10	Pass & Tag	17:21:12			
Post Oak	17:20:12	0:01:10	Tag	17:21:22			
East Ext.	17:19:20	0:02:10	Tag	17:21:30	17:21:54	Valid	38
East Ext.	17:20:26	0:02:10	Pass & Tag	17:22:36	17:22:20	Valid	51
East Ext.	17:20:27	0:02:10	Tag	17:22:37			
East Ext.	17:20:30	0:02:10	Tag	17:22:40			
East Ext.	17:20:37	0:02:10	Tag	17:22:47			
East Ext.	17:21:22	0:02:10	Tag	17:23:32	17:23:26	Valid	47
East Ext.	17:21:39	0:02:10	Pass & Tag	17:23:49			
East Ext.	17:22:16	0:02:10	Pass & Tag	17:24:26	17:24:27	Valid	45
East Ext.	17:22:25	0:02:10	Tag	17:24:35			
Post Oak	17:23:39	0:01:10	Tag	17:24:49			
East Ext.	17:23:19	0:02:10	Pass & Tag	17:25:29	17:25:40	Valid	41
East Ext.	17:24:22	0:02:10	Tag	17:26:32	17:26:34	Valid	44
Post Oak	17:25:29	0:01:10	Pass & Tag	17:26:39	17:26:41	Valid	43
East Ext.	17:24:32	0:02:10	Tag	17:26:42			
Post Oak	17:25:39	0:01:10	Pass & Tag	17:26:49			
Post Oak	17:25:44	0:01:10	Tag	17:26:54			
Post Oak	17:25:52	0:01:10	Pass & Tag	17:27:02			
East Ext.	17:25:40	0:02:10	Tag	17:27:50			
East Ext.	17:25:43	0:02:10	Pass & Tag	17:27:53			
East Ext.	17:26:33	0:02:10	Pass & Tag	17:28:43			
Post Oak	17:27:43	0:01:10	Pass & Tag	17:28:53			
Post Oak	17:28:38	0:01:10	Tag	17:29:48	17:29:44	Valid	47
East Ext.	17:27:50	0:02:10	Pass & Tag	17:30:00			
East Ext.	17:28:12	0:02:10	Pass & Tag	17:30:22			
East Ext.	17:28:44	0:02:10	Tag	17:30:54	17:30:47	Valid	47

East Ext.	17:28:46	0:02:10	Tag	17:30:56	17:31:06	Valid	42
East Ext.	17:29:08	0:02:10	Pass & Tag	17:31:18	17:31:09	Valid	48

Table G. Two-Person Vehicles with Transponders, Northwest Freeway at Dacoma, 10/16/03.

Location	Time Observed	Time Displacement (35 mph)	Pass?	Estimated Read Time	Reader 41	Valid/Invalid	Actual Speed
Dacoma	7:20:30	0:00:11	Pass & Tag	7:20:19	7:20:14	Valid	25
Dacoma	7:24:11	0:00:11	Pass & Tag	7:24:00			
Dacoma	7:24:41	0:00:11	Tag	7:24:30	7:24:28	Valid	30
Dacoma	7:26:26	0:00:11	Tag	7:26:15			
Dacoma	7:27:56	0:00:11	Tag	7:27:45			
Dacoma	7:32:25	0:00:11	Tag	7:32:14			
Dacoma	7:32:38	0:00:11	Tag	7:32:27			
Dacoma	7:40:15	0:00:11	Pass & Tag	7:40:04	7:40:00	Valid	26
Dacoma	7:40:19	0:00:11	Pass & Tag	7:40:08			
Dacoma	7:40:53	0:00:11	Tag	7:40:42	7:40:48	Valid	79
Dacoma	7:41:42	0:00:11	Tag	7:41:31	7:41:24	Valid	22

*only vehicles with transponders (tags) and two occupants are listed in this table.

Table H. Two-Person Vehicles with Transponders, Northwest Freeway at Dacoma, 10/17/03.

Location	Time Observed	Time Displacement (35 mph)	Pass?	Estimated Read Time	Reader 41	Valid/Invalid	Actual Speed
Dacoma	7:20:18	0:00:11	Tag	7:20:07			
Dacoma	7:23:00	0:00:11	Tag	7:22:49	7:22:47	Valid	30
Dacoma	7:23:36	0:00:11	Pass & Tag	7:23:25			
Dacoma	7:26:45	0:00:11	Pass & Tag	7:26:34	7:26:31	Valid	28
Dacoma	7:27:20	0:00:11	Pass & Tag	7:27:09	7:27:05	Valid	26
Dacoma	7:31:59	0:00:11	Tag	7:31:48			
Dacoma	7:35:06	0:00:11	Pass & Tag	7:34:55	7:34:58	Valid	50
Dacoma	7:35:40	0:00:11	Tag	7:35:29			
Dacoma	7:36:40	0:00:11	Pass & Tag	7:36:29	7:36:26	Valid	28
Dacoma	7:40:30	0:00:11	Tag	7:40:19	7:40:25	Valid	79
Dacoma	7:40:56	0:00:11	Pass & Tag	7:40:45			
Dacoma	7:43:55	0:00:11	Pass & Tag	7:43:44	7:43:36	Valid	21

Table I. Two-Person Vehicles with Transponders, Northwest Freeway at Northwest Transit Center, 10/16/03.

Location	Time Observed	Time Displacement (20 mph)	Pass?	Estimamted Read Time	Reader 42	Valid/Invalid	Actual Speed
NW Transit Ctr	7:16:25	0:00:40	Pass & Tag	7:15:45			
NW Transit Ctr	7:17:05	0:00:40	Pass & Tag	7:16:25			
NW Transit Ctr	7:17:21	0:00:40	Pass & Tag	7:16:41	7:16:39	Valid	19
NW Transit Ctr	7:18:11	0:00:40	Pass & Tag	7:17:31	7:17:14	Valid	14
NW Transit Ctr	7:18:52	0:00:40	Pass & Tag	7:18:12			
NW Transit Ctr	7:19:54	0:00:40	Pass & Tag	7:19:14			
NW Transit Ctr	7:19:59	0:00:40	Pass & Tag	7:19:19	7:19:31	Valid	28
NW Transit Ctr	7:20:14	0:00:40	Pass & Tag	7:19:34	7:19:44	Valid	26
NW Transit Ctr	7:21:11	0:00:40	Pass & Tag	7:20:31	7:20:35	Valid	22
NW Transit Ctr	7:21:17	0:00:40	Pass & Tag	7:20:37			
NW Transit Ctr	7:22:23	0:00:40	Pass & Tag	7:21:43	7:21:30	Valid	15
NW Transit Ctr	7:22:43	0:00:40	Pass & Tag	7:22:03	7:21:52	Valid	16
NW Transit Ctr	7:23:05	0:00:40	Pass & Tag	7:22:25	7:22:25	Valid	20
NW Transit Ctr	7:24:02	0:00:40	Pass & Tag	7:23:22			
NW Transit Ctr	7:24:08	0:00:40	Pass & Tag	7:23:28			
NW Transit Ctr	7:24:28	0:00:40	Pass & Tag	7:23:48	7:23:57	Valid	26
NW Transit Ctr	7:24:51	0:00:40	Pass & Tag	7:24:11	7:24:14	Valid	21
NW Transit Ctr	7:25:01	0:00:40	Pass & Tag	7:24:21	7:24:19	Valid	19
NW Transit Ctr	7:25:06	0:00:40	Pass & Tag	7:24:26	7:24:23	Valid	18
NW Transit Ctr	7:26:09	0:00:40	Pass & Tag	7:25:29			
NW Transit Ctr	7:26:25	0:00:40	Pass & Tag	7:25:45			
NW Transit Ctr	7:27:16	0:00:40	Tag	7:26:36			
NW Transit Ctr	7:28:22	0:00:40	Pass & Tag	7:27:42	7:27:39	Valid	18
NW Transit Ctr	7:29:21	0:00:40	Pass & Tag	7:28:41			
NW Transit Ctr	7:30:05	0:00:40	Pass & Tag	7:29:25			
NW Transit Ctr	7:30:14	0:00:40	Pass & Tag	7:29:34			
NW Transit Ctr	7:30:21	0:00:40	Pass & Tag	7:29:41			
NW Transit Ctr	7:31:19	0:00:40	Pass & Tag	7:30:39			
NW Transit Ctr	7:31:22	0:00:40	Pass & Tag	7:30:42			
NW Transit Ctr	7:31:42	0:00:40	Pass & Tag	7:31:02			
NW Transit Ctr	7:32:40	0:00:40	Pass & Tag	7:32:00	7:31:49	Valid	16
NW Transit Ctr	7:33:58	0:00:40	Pass & Tag	7:33:18			
NW Transit Ctr	7:34:51	0:00:40	Pass & Tag	7:34:11			
NW Transit Ctr	7:34:54	0:00:40	Pass & Tag	7:34:14			
NW Transit Ctr	7:35:04	0:00:40	Pass & Tag	7:34:24	7:34:42	Valid	36
NW Transit Ctr	7:35:42	0:00:40	Pass & Tag	7:35:02			
NW Transit Ctr	7:36:11	0:00:40	Pass & Tag	7:35:31			
NW Transit Ctr	7:36:16	0:00:40	Pass & Tag	7:35:36			
NW Transit Ctr	7:37:04	0:00:40	Pass & Tag	7:36:24	7:36:23	Valid	19
NW Transit Ctr	7:37:32	0:00:40	Pass & Tag	7:36:52	7:36:56	Valid	22
NW Transit Ctr	7:37:39	0:00:40	Pass & Tag	7:36:59			
NW Transit Ctr	7:37:42	0:00:40	Pass & Tag	7:37:02			
NW Transit Ctr	7:38:12	0:00:40	Pass & Tag	7:37:32	7:37:43	Valid	27
NW Transit Ctr	7:38:41	0:00:40	Tag	7:38:01			
NW Transit Ctr	7:39:32	0:00:40	Pass & Tag	7:38:52	7:38:50	Valid	19
NW Transit Ctr	7:40:04	0:00:40	Pass & Tag	7:39:24			
NW Transit Ctr	7:40:16	0:00:40	Pass & Tag	7:39:36	7:39:42	Valid	23
NW Transit Ctr	7:42:17	0:00:40	Pass & Tag	7:41:37			
NW Transit Ctr	7:42:26	0:00:40	Pass & Tag	7:41:46			
NW Transit Ctr	7:43:15	0:00:40	Pass & Tag	7:42:35	7:42:30	Valid	18
NW Transit Ctr	7:43:36	0:00:40	Tag	7:42:56			
NW Transit Ctr	7:43:53	0:00:40	Pass & Tag	7:43:13			
NW Transit Ctr	7:44:26	0:00:40	Pass & Tag	7:43:46	7:43:33	Valid	15
NW Transit Ctr	7:44:35	0:00:40	Pass & Tag	7:43:55			
NW Transit Ctr	7:44:42	0:00:40	Pass & Tag	7:44:02			

*only vehicles with transponders (tags) and two occupants are listed in this table.

Table J. Two-Person Vehicles with Transponders, Northwest Freeway at Northwest Transit Center, 10/17/03.

Location	Time Observed	Time Displacement (20 mph)	Pass?	Estimated Read Time	Reader 42	Valid/Invalid	Actual Speed
NW Transit Ctr	7:15:33	0:00:40	Pass & Tag	7:14:53			
NW Transit Ctr	7:15:45	0:00:40	Tag	7:15:05	7:15:02	Valid	18
NW Transit Ctr	7:16:31	0:00:40	Tag	7:15:51			
NW Transit Ctr	7:16:46	0:00:40	Tag	7:16:06			
NW Transit Ctr	7:19:54	0:00:40	Tag	7:19:14			
NW Transit Ctr	7:20:09	0:00:40	Pass & Tag	7:19:29			
NW Transit Ctr	7:20:16	0:00:40	Pass & Tag	7:19:36			
NW Transit Ctr	7:20:19	0:00:40	Tag	7:19:39			
NW Transit Ctr	7:20:20	0:00:40	Pass & Tag	7:19:40			
NW Transit Ctr	7:20:39	0:00:40	Pass & Tag	7:19:59			
NW Transit Ctr	7:22:51	0:00:40	Pass & Tag	7:22:11			
NW Transit Ctr	7:23:35	0:00:40	Pass & Tag	7:22:55	7:23:07	Valid	28
NW Transit Ctr	7:24:59	0:00:40	Tag	7:24:19	7:24:11	Valid	17
NW Transit Ctr	7:25:21	0:00:40	Pass & Tag	7:24:41	7:24:32	Valid	16
NW Transit Ctr	7:25:32	0:00:40	Pass & Tag	7:24:52	7:24:42	Valid	16
NW Transit Ctr	7:25:56	0:00:40	Pass & Tag	7:25:16	7:25:13	Valid	18
NW Transit Ctr	7:26:15	0:00:40	Pass & Tag	7:25:35			
NW Transit Ctr	7:26:40	0:00:40	Pass & Tag	7:26:00			
NW Transit Ctr	7:27:01	0:00:40	Pass & Tag	7:26:21			
NW Transit Ctr	7:27:08	0:00:40	Pass & Tag	7:26:28			
NW Transit Ctr	7:27:23	0:00:40	Pass & Tag	7:26:43	7:26:45	Valid	21
NW Transit Ctr	7:28:36	0:00:40	Pass & Tag	7:27:56			
NW Transit Ctr	7:28:40	0:00:40	Tag	7:28:00			
NW Transit Ctr	7:28:41	0:00:40	Tag	7:28:01			
NW Transit Ctr	7:28:59	0:00:40	Pass & Tag	7:28:19			
NW Transit Ctr	7:29:05	0:00:40	Pass & Tag	7:28:25	7:28:35	Valid	26
NW Transit Ctr	7:29:24	0:00:40	Pass & Tag	7:28:44	7:28:55	Invalid	27
NW Transit Ctr	7:29:55	0:00:40	Pass & Tag	7:29:15			
NW Transit Ctr	7:30:11	0:00:40	Pass & Tag	7:29:31	7:29:24	Valid	17
NW Transit Ctr	7:31:31	0:00:40	Pass & Tag	7:30:51	7:30:38	Valid	15
NW Transit Ctr	7:32:59	0:00:40	Pass & Tag	7:32:19			
NW Transit Ctr	7:33:51	0:00:40	Pass & Tag	7:33:11			
NW Transit Ctr	7:33:56	0:00:40	Pass & Tag	7:33:16	7:33:19	Valid	21
NW Transit Ctr	7:34:35	0:00:40	Pass & Tag	7:33:55			
NW Transit Ctr	7:34:42	0:00:40	Tag	7:34:02	7:34:06	Valid	22
NW Transit Ctr	7:34:45	0:00:40	Pass & Tag	7:34:05			
NW Transit Ctr	7:35:04	0:00:40	Pass & Tag	7:34:24	7:34:31	Valid	24
NW Transit Ctr	7:35:57	0:00:40	Pass & Tag	7:35:17			
NW Transit Ctr	7:36:05	0:00:40	Pass & Tag	7:35:25	7:35:28	Valid	21
NW Transit Ctr	7:36:24	0:00:40	Pass & Tag	7:35:44			
NW Transit Ctr	7:37:09	0:00:40	Pass & Tag	7:36:29	7:36:41	Valid	28
NW Transit Ctr	7:37:39	0:00:40	Tag	7:36:59			
NW Transit Ctr	7:37:55	0:00:40	Pass & Tag	7:37:15			
NW Transit Ctr	7:38:27	0:00:40	Pass & Tag	7:37:47			
NW Transit Ctr	7:38:32	0:00:40	Pass & Tag	7:37:52			
NW Transit Ctr	7:38:38	0:00:40	Pass & Tag	7:37:58	7:38:02	Valid	22
NW Transit Ctr	7:38:48	0:00:40	Pass & Tag	7:38:08			
NW Transit Ctr	7:38:51	0:00:40	Pass & Tag	7:38:11			
NW Transit Ctr	7:39:18	0:00:40	Pass & Tag	7:38:38			
NW Transit Ctr	7:42:36	0:00:40	Pass & Tag	7:41:56	7:41:40	Valid	14
NW Transit Ctr	7:42:42	0:00:40	Pass & Tag	7:42:02	7:41:44	Valid	14
NW Transit Ctr	7:43:00	0:00:40	Pass & Tag	7:42:20	7:41:55	Valid	12
NW Transit Ctr	7:43:02	0:00:40	Pass & Tag	7:42:22	7:42:10	Valid	15
NW Transit Ctr	7:43:33	0:00:40	Pass & Tag	7:42:53			
NW Transit Ctr	7:43:58	0:00:40	Tag	7:43:18	7:43:12	Valid	17
NW Transit Ctr	7:44:05	0:00:40	Pass & Tag	7:43:25			