

WHITE PAPER COMPARISON: 2-Channel and 4-Channel sets on Multi-Lane Roads

Teresa Rappe', on behalf of the City of Bothell requested a comparison test between the road setting techniques of 2-channel vrs 4-channel equipment and protocols on multi-laned roads. Their concerns centered around the cost and accuracy claims of both techniques.

With **4-channel sets**, each lane is set and analyzed independently from it's neighbor, so the axle/tube strikes of each lane are accurately analyzed during the software download as to the FHWA classification standards for HVs [trucks] axle spacing and identification.

Four-Channel sets give a highly accurate classification of the actual vehicles; their volume, speed, class and lane gap. See the DVD offer at the end of this document.

With **2 channel machines**, [assuming standard FHWA analysis parameters], you will see **more** trucks classed than real (see charts below), and fewer number of overall vehicles, than actual.

With **2-channel** (tube) sets, the hose strikes of multiple lanes are combined together. Two channel machines are purported to distinguish the differing speeds of vehicles, therefore knowing which hose strikes [axel hits] belong to which vehicle.

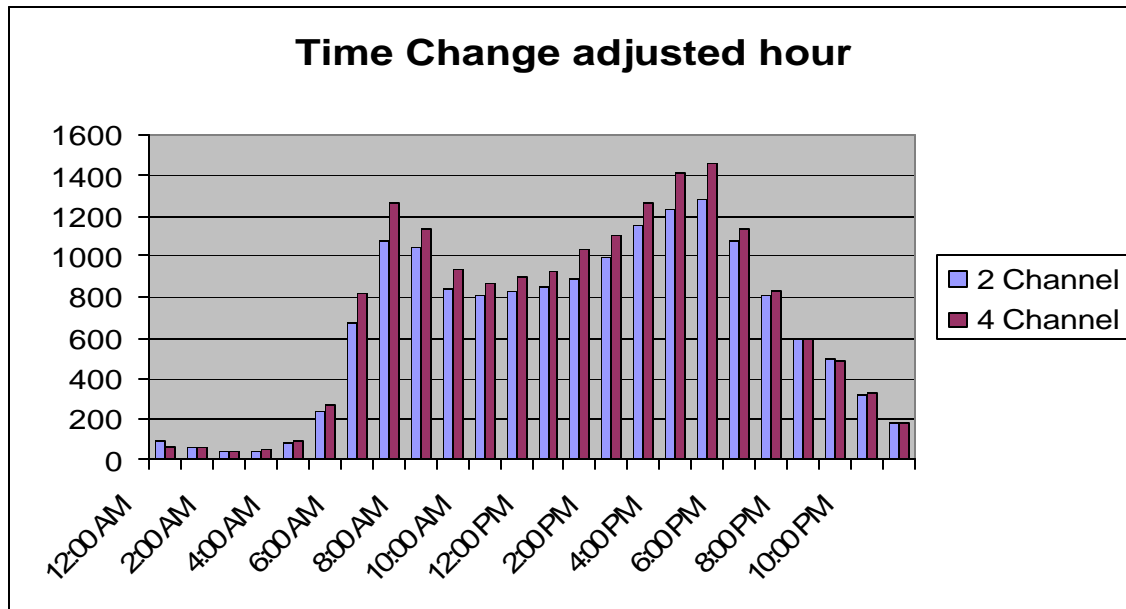
Four-channel machines set a pair of hoses over **each** lane. The software of the machine analyses the hits on the curb lane that occur independent of the median [passing] lane. Therefore, each lane's axle/hose hits are computed *independently* of the other lane.

When truck data is IMPORTANT, you need accurate data collection methods.

COMPARISON STUDY PROCEDURE:

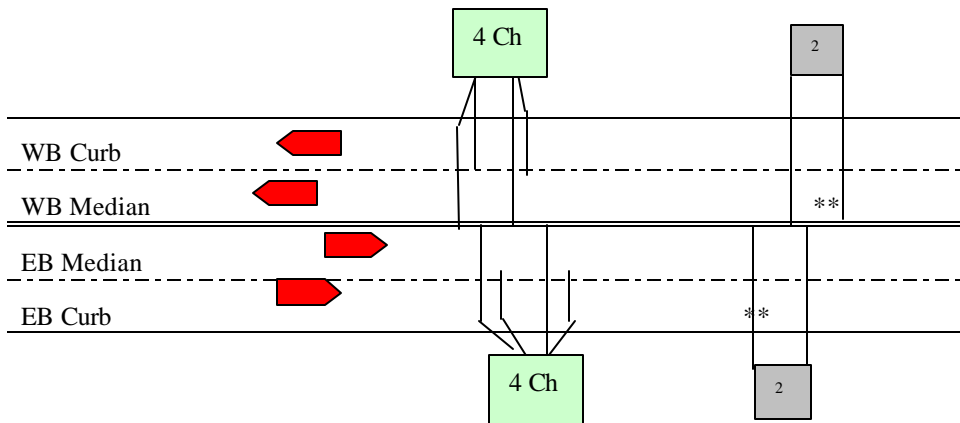
Procedure: Thursday, Dec 17th, 2009 was the first comparison day. The 2-channel equipment was set on SR 522, NE of 96th Ave NE, just west of the Midas Shop at 17740 SR 522. The 4-channel set was placed Thursday night, one hour before the start of Friday, Dec 17th, ~one hundred feet east of the 2-channel set.

With a side by side comparison, the **ebb and flow** of the traffic volumes lined up very well.



Both study techniques *ebb and flow* identically.

Notice that at the peak hours, the 4-channel study captures more vehicles than the 2-channel set. When tabled, the peak hours are **11 – 17% low in the 2-channel set**. It is explained by the dynamic of multiple vehicles abreast of each other in side by side, *same direction* lanes. See diagram below:



The two red ‘vehicles’ (totaling 4 axles) approaching both sets are analyzed by each lane’s hose strikes in the 4-channel set, distinguishing the two separate vehicles.

The 2-channel set uses the speed of the axles to determine how many of the hose strikes belong to each vehicle. If the two vehicles are traveling the same speed, they could be analyzed as two, two axle vehicles or one four axle truck, or to not fit any wheel base protocol and be one, “*Not Classed*” vehicle. Likewise, three two axle vehicles in staggered proximity can return a classification of one multi axle truck, two or three two axle vehicles or all be designated as: “*Not Classed*” with the 2-channel set.

CLASSIFICATION RESULTS of two and four-channel sets.

Dec 17th CLASSIFICATION reports.

2-Channel set Report:

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All Traffic Data Services Inc.
2225 NE 27th St
Renton, WA 98056
Ph. 206-251-0300

Site Code: 43 CLASS
SR 522 N/O 96TH AVE NE

SB	Start Time	17-Dec-0 Thu	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Not Classed	Thu Total
	12:17:00	0	91	52	0	10	0	0	4	0	0	0	0	0	0	158
	01:00	0	43	37	2	8	0	0	0	0	0	0	0	0	0	91
	02:00	0	30	23	0	5	1	0	0	0	1	0	0	0	0	61
	03:00	0	16	24	0	4	0	0	0	0	0	0	0	0	0	44
	04:00	0	14	21	1	5	0	0	0	0	0	0	0	0	0	42
	05:00	0	36	31	1	11	1	0	1	1	1	0	0	0	0	84
	06:00	1	82	87	4	45	2	1	6	1	0	0	0	0	0	234
	07:00	8	241	227	16	96	4	2	34	2	4	1	1	0	0	671
	08:00	3	369	370	23	148	7	2	75	3	13	3	2	1	0	1078
	09:00	5	369	356	10	141	5	3	90	3	12	3	1	1	0	1048
	10:00	3	282	315	14	106	6	5	58	1	9	4	1	3	0	846
	11:00	6	236	298	12	113	9	3	69	4	9	0	1	0	0	805
	12 PM	1	265	338	9	88	4	5	69	4	10	2	0	2	0	829
	13:00	7	296	289	14	116	6	6	75	4	6	1	0	0	0	854
	14:00	3	310	304	13	117	9	3	73	0	12	1	2	0	0	892
	15:00	7	383	316	8	92	10	2	107	4	11	3	1	1	0	996
	16:00	5	409	407	5	106	11	2	122	2	12	1	1	1	0	1151
	17:00	8	484	405	10	76	10	2	141	0	12	2	0	1	0	1228
	18:00	7	537	387	4	76	7	4	151	0	25	4	0	0	0	1277
	19:00	8	446	391	2	53	2	1	101	0	10	1	0	0	0	1075
	20:00	4	334	306	7	46	6	0	65	1	2	1	1	0	0	807
	21:00	1	270	227	2	24	3	0	36	1	4	0	0	0	0	588
	22:00	3	229	201	2	24	4	1	21	0	0	0	0	0	0	499
	23:00	1	137	144	3	20	1	0	16	0	0	0	0	0	0	324
Percent		0.5%	37.6%	35.4%	1.0%	9.8%	0.7%	0.3%	8.4%	0.2%	1.0%	0.2%	0.1%	0.1%	4.8%	

4-Channel set Raw Data:

Traffic Count Consultants, Inc.
Woodinville Washington

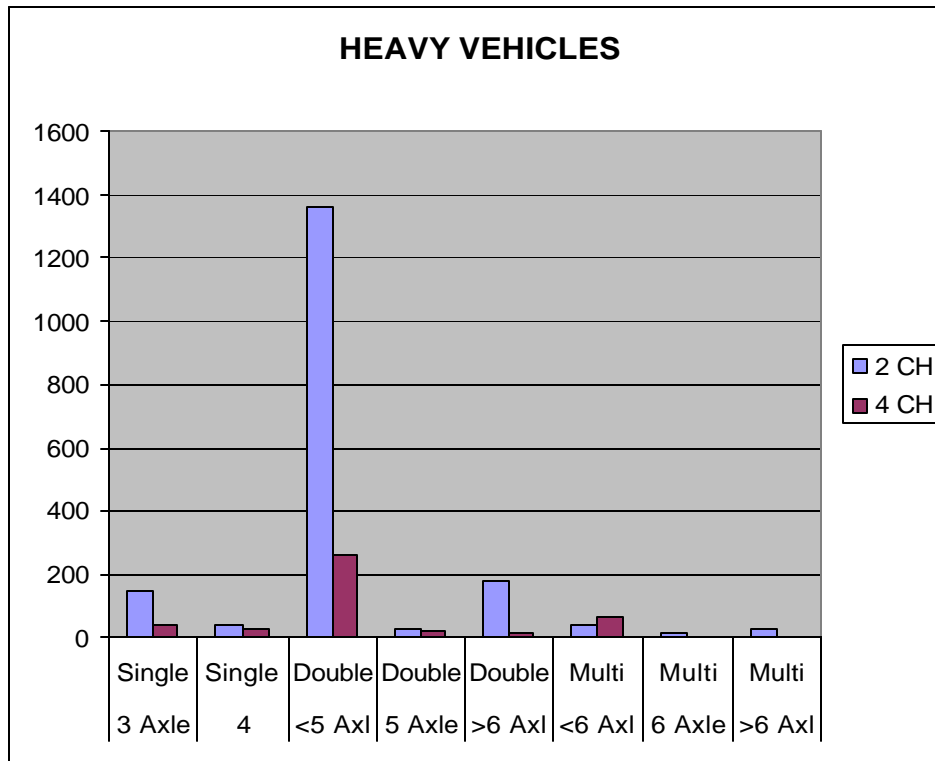
Title1 : WB SR 522 at 17440
Title2 : 4 Channel Delta
Title3 :

Site: 6386
Date: 12/17/09

Direction: WB Combined Curb + Pass

Begin Time	Total	1 Bikes	2 Cars & Trls	3 2 Axle Long	4 Buses	5 2 Axle 6 Tire	6 3 Axle Single	7 4 Axle Single	8 <5 Axl Double	9 5 Axle Double	10 >6 Axl Double	11 <6 Axl Multi	12 6 Axle Multi	13 >6 Axl Multi
12:AM	69	0	59	6	0	1	1	0	1	0	1	0	0	0
01:00	58	0	46	5	0	1	0	0	5	0	1	0	0	0
02:00	41	0	33	4	0	3	0	0	1	0	0	0	0	0
03:00	48	0	37	6	1	3	1	0	0	0	0	0	0	0
04:00	92	0	64	16	1	7	1	0	1	2	0	0	0	0
05:00	269	2	171	73	1	18	0	0	3	1	0	0	0	0
06:00	817	5	557	178	26	23	4	2	15	1	2	3	0	1
07:00	1259	2	949	242	19	18	7	3	13	3	1	2	0	0
08:00	1138	1	841	214	14	36	5	0	16	1	5	5	0	0
09:00	935	7	661	163	24	37	4	3	32	0	0	4	0	0
10:00	864	2	581	227	22	10	1	0	14	1	0	6	0	0
11:00	627	4	393	172	14	23	0	0	16	0	0	5	0	0
12:PM	924	8	688	170	16	18	0	0	17	0	0	7	0	0
01:00	1032	3	774	195	23	13	5	2	12	0	1	3	1	0
02:00	1107	9	872	163	11	16	1	1	28	1	1	4	0	0
03:00	675	2	511	110	13	12	1	2	22	0	0	2	0	0
04:00	1411	6	958	399	14	15	2	3	7	1	0	6	0	0
05:00	1455	3	1033	358	22	16	4	1	14	0	0	4	0	0
06:00	1136	3	822	237	32	8	2	6	17	2	0	7	0	0
07:00	834	5	653	141	16	9	0	0	8	0	0	2	0	0
08:00	599	2	458	112	8	7	0	0	7	2	0	3	0	0
09:00	486	1	383	86	4	5	0	0	4	0	0	2	0	1
10:00	328	3	262	45	2	8	1	0	6	0	0	1	0	0
11:00	189	0	162	25	0	0	0	0	2	0	0	0	0	0
Daily Totals	16,393	68	11,968	3,347	283	307	40	23	261	15	12	66	1	2
Percent of Total		0.4	73.0	20.4	1.7	1.9	0.2	0.1	1.6	0.1	0.1	0.4	0.0	0.0

CLASSIFICATION COMPARISON CHART



When tabled, the Heavy Vehicles (3 axle or greater) are:

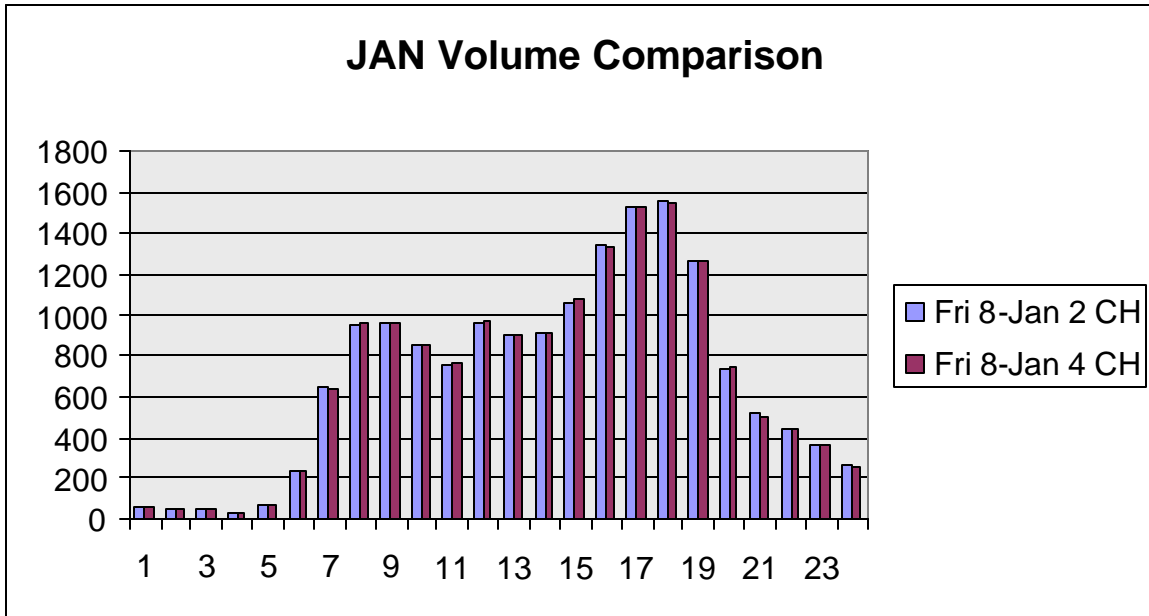
	3 Axle Single	4 Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Not Classed
2 CH	150	37	1362	24	180	38	14	21	735
4 CH	40	23	261	15	12	66	1	2	

T HVs	2 CH	1826	-----	435% high	plus 735 "Not Classed"
T HVs	4 CH	420			

In early January, 2010, The City of Bothell suggested another comparison test.

The 2-channel sets were placed to run January 6th to Friday the 8th, 2010. The 4-channel set was placed to run concurrently on Friday the 8th, at SR 522 east of 91st Ave NE. Both sets were again placed within 100 feet of each other.

Four-channel data was submitted to the City the next week. Several weeks later, the 2 channel data was shared with TC²inc. The total volumes on both the 2-channel and the 4-channel sets, *at that time*, were virtually identical.



In this comparison test, the 2 channel volume data was identical to the 4-channel volumes

The following looks at the CLASSIFICATION data of both 'identical volume' studies.
January Classification Sets:

2-Channel Report :

WB	Start Time	08-Jan-10 Fri	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axle Double	5 Axle Double	>6 Axle Double	<6 Axle Multi	6 Axle Multi	>6 Axle Multi	Not Classsed	Fri Total
	01:00/10	0	54	8	0	0	0	0	0	1	0	0	0	0	0	63
	01:00	0	33	12	1	3	0	0	0	0	0	0	0	1	0	50
	02:00	0	34	9	0	3	0	0	0	0	0	0	0	0	0	46
	03:00	0	24	4	0	3	1	0	0	1	0	0	0	0	0	33
	04:00	0	51	17	0	5	1	0	2	0	0	0	0	0	2	78
	05:00	1	149	46	3	13	3	0	10	1	1	0	0	1	7	238
	08:00	3	425	114	9	36	6	1	24	4	2	0	1	0	27	652
	07:00	7	656	135	11	37	14	2	32	2	1	2	1	1	52	953
	09:00	4	659	148	4	44	5	1	32	1	3	2	0	3	60	996
	09:00	5	575	148	2	44	9	0	20	5	2	0	0	1	37	848
	10:00	3	513	130	5	29	7	2	20	7	4	3	0	3	35	761
	11:00	2	662	146	3	60	9	2	31	4	3	0	2	2	38	964
	12 PM	9	673	109	4	39	7	1	18	3	0	0	0	0	41	904
	13:00	1	684	122	7	26	9	0	18	1	5	3	0	1	41	918
	14:00	6	784	151	7	20	8	0	24	5	1	1	0	0	45	1052
	15:00	3	1051	161	4	24	9	0	25	1	1	2	0	0	65	1348
	16:00	11	1185	154	3	25	13	0	26	2	2	1	0	2	99	1523
	17:00	11	1274	134	3	23	9	0	25	1	1	1	1	0	75	1558
	18:00	7	1037	108	4	9	8	0	15	0	1	1	0	2	68	1200
	19:00	2	620	80	1	5	7	0	12	0	0	0	1	0	25	738
	20:00	2	438	44	1	3	1	0	3	0	1	0	0	0	26	519
	21:00	1	364	37	0	2	3	0	2	0	0	0	0	0	11	440
	22:00	3	308	36	0	7	0	0	3	0	0	0	0	0	4	361
	23:00	2	217	33	2	4	1	0	2	0	0	0	0	0	8	269
	Percent	0.5%	75.6%	12.5%	0.4%	2.8%	0.8%	0.1%	2.1%	0.2%	0.2%	0.1%	0.0%	0.1%	4.8%	

4-Channel Report :

Traffic Count Consultants, Inc
Woodinville, WA

Title1 : SR 522 WB
Title2 : e/o 91st
Title3 :

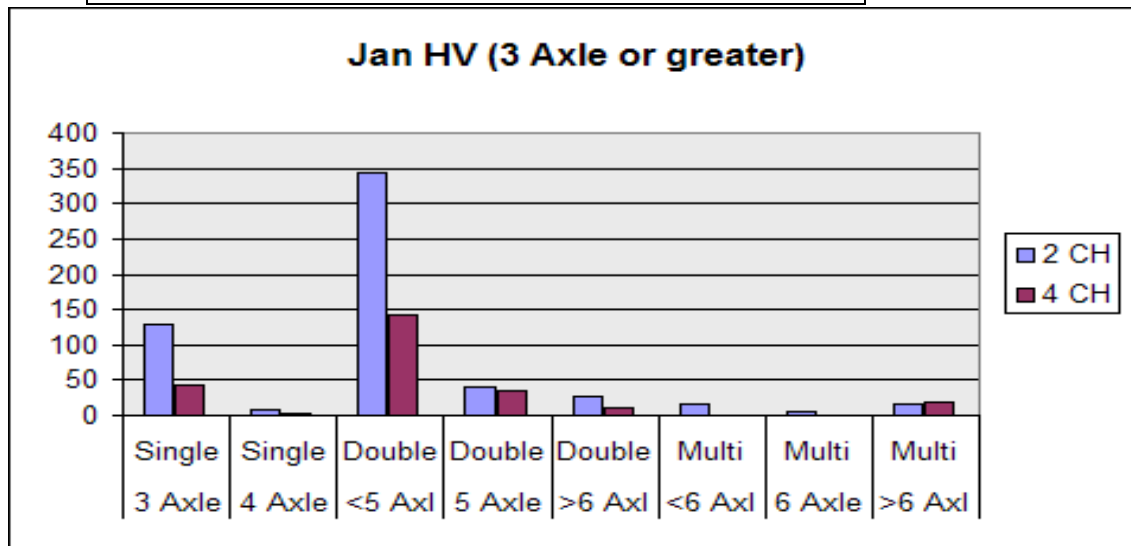
Site: 6387
Date: 01/08/10

Direction: WB1 +WB2

Begin Time	Direction: WB1 +WB2													
	1	2	3	4	5	6	7	8	9	10	11	12	13	
	Total	Bikes	Cars & Trls	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi
12:AM	62	0	51	10	0	0	0	0	0	1	0	0	0	0
01:00	50	0	33	12	1	3	0	0	0	0	0	0	0	1
02:00	47	0	33	10	0	4	0	0	0	0	0	0	0	0
03:00	33	0	24	4	0	3	1	0	0	1	0	0	0	0
04:00	73	0	48	16	0	6	1	0	2	0	0	0	0	0
05:00	236	1	147	58	1	20	1	0	5	1	1	0	0	1
06:00	640	0	409	149	10	53	2	0	12	4	1	0	0	0
07:00	955	2	650	185	16	71	6	1	17	4	0	0	0	3
08:00	959	0	651	195	6	76	3	0	18	2	3	0	0	5
09:00	855	1	555	208	1	69	5	0	9	6	0	0	0	1
10:00	774	0	496	182	8	61	7	1	9	6	2	0	0	2
11:00	976	0	651	199	6	95	3	1	12	3	1	0	0	5
12:PM	901	2	665	159	6	55	3	0	7	2	1	0	0	1
01:00	918	0	669	172	7	58	3	0	6	1	2	0	0	0
02:00	1,080	1	785	238	10	35	2	0	6	3	0	0	0	0
03:00	1,338	0	1,025	248	3	51	3	0	8	0	0	0	0	0
04:00	1,529	1	1,217	242	6	56	1	0	5	1	0	0	0	0
05:00	1,548	3	1,264	219	4	52	1	0	5	0	0	0	0	0
06:00	1,256	2	1,055	163	5	25	0	0	5	1	0	0	0	0
07:00	741	0	626	95	1	13	0	0	5	0	0	0	0	1
08:00	504	1	427	61	1	10	0	0	3	0	1	0	0	0
09:00	440	0	380	55	0	2	0	0	3	0	0	0	0	0
10:00	360	0	306	39	0	12	0	0	3	0	0	0	0	0
11:00	256	0	206	38	2	8	1	0	1	0	0	0	0	0
Daily Totals	16,531	14	12,373	2,957	94	838	43	3	141	36	12	0	0	20
Percent of Total		0.1	74.8	17.9	0.6	5.1	0.3	0.0	0.9	0.2	0.1	0.0	0.0	0.1

CLASSIFICATION CHART COMPARISON OF 2ND SET:

	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Not Classed
2 CH	130	9	344	39	28	16	6	17	766
4 CH	43	3	141	36	12	0	0	20	0



Two hundred percent **more** vehicles are classed as trucks by the 2-Channel set. The 766 "Not Classed" are **not** included in the 231%.

SPEED COMPARISON:

December's sets were placed where the speed is posted as 35 MPH

2-Channel summarized 45 as the 85th percentile

4-Channel summarized 38.7 as the 85th percentile

January's sets were placed where the speed is posted as 45 MPH

2-Channel summarized 47 as the 85th percentile

4-Channel summarized 48.9 as the 85th percentile

DVD VALIDATING ACCURACY of the FOUR-CHANNEL setting data:

Another comparison has been prepared to show the accuracy of the 4-channel setting equipment verses manual counting of 2 peak, two hour segments. The manual count was conducted from **video captured simultaneously to classification sets**, done south of the Cascadia Campus on SR 522; both EB and WB approaches of the south driveway.

A DVD of the 4-channel data, with a manual count, AND the actual video (*so you can double-check the reports' accuracy*) is available upon request*. All will show that the 4-channel sets depict *true accuracy* of Heavy Vehicles.

When truck data is IMPORTANT, you need *accurate* data collection methods.

* To obtain your free DVD, contact Lynne at Traffic Count Consultants, Inc. Team@TC2inc.com 425 861-8866
This manual vrs 4-channel data was paid by the City of Bothell, and as such, is shared as public record data.