NATMEC 2010

Effective Ways for Transportation Planning to Develop Working Relationships with Intelligent Transportation Systems Groups

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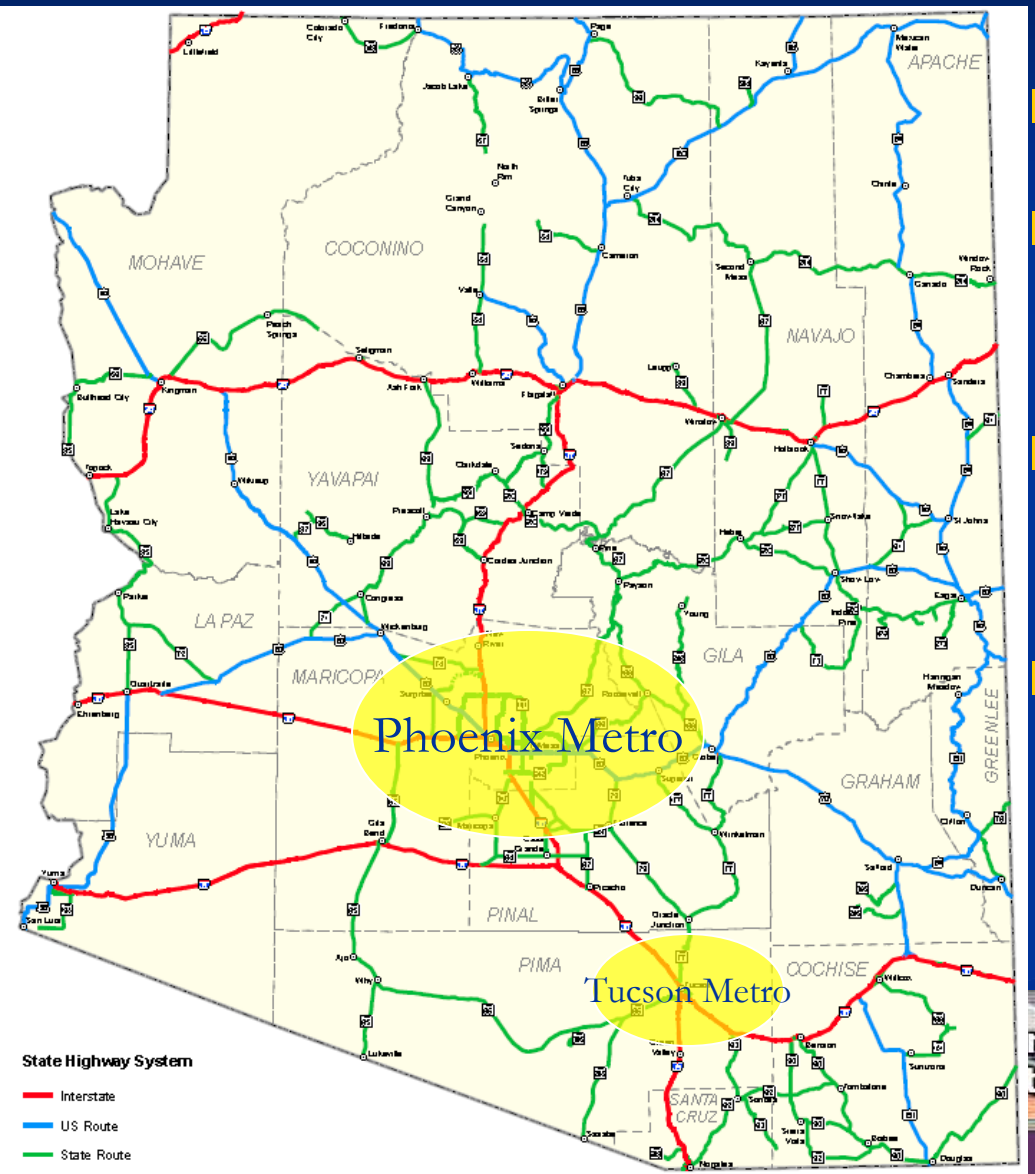
Tomás Guerra – OZ Engineering

June 22, 2010

Develop Working Relationship

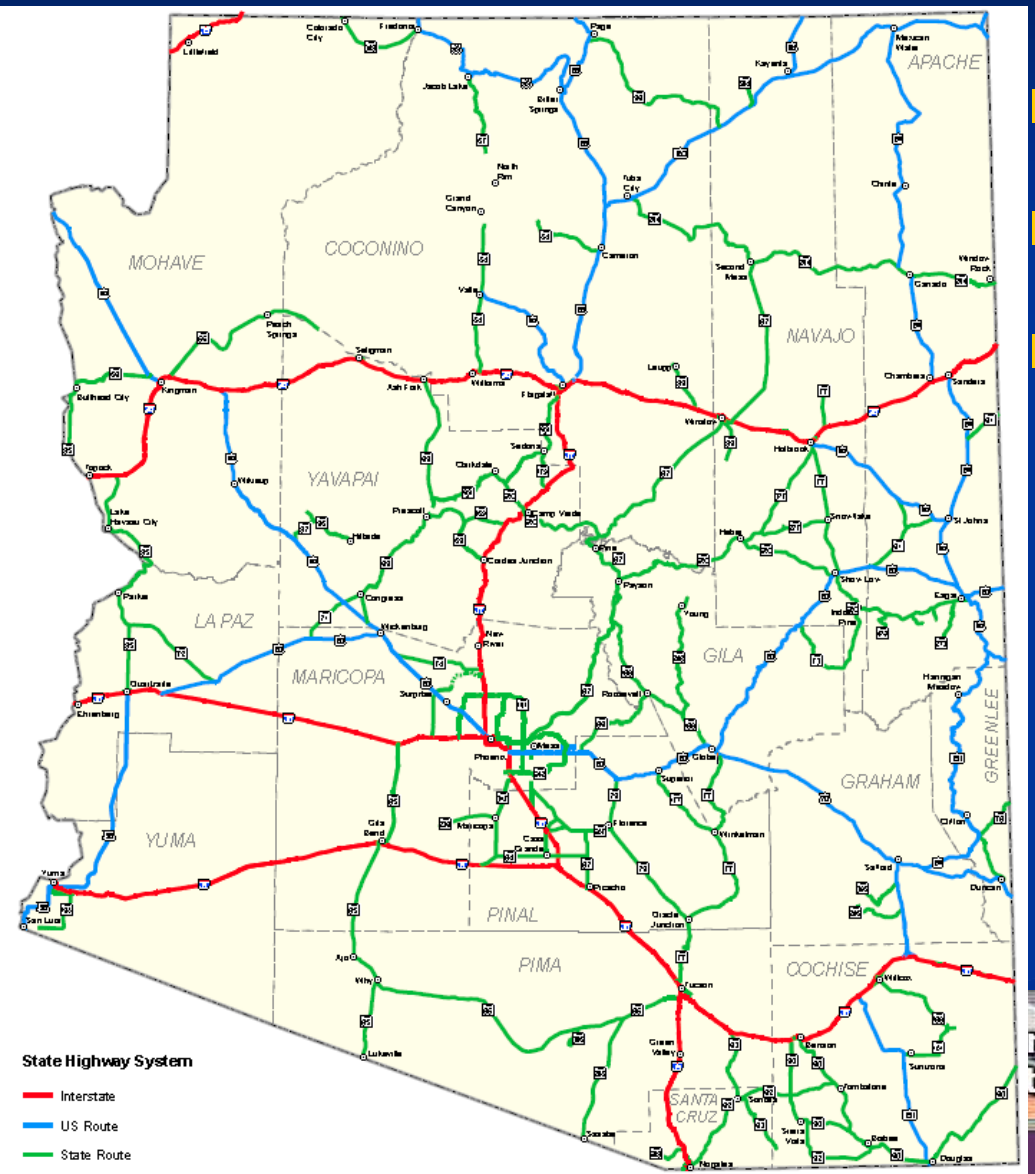
- Communicate to Traffic Operations the data quality that the Planning Division requires.

Arizona



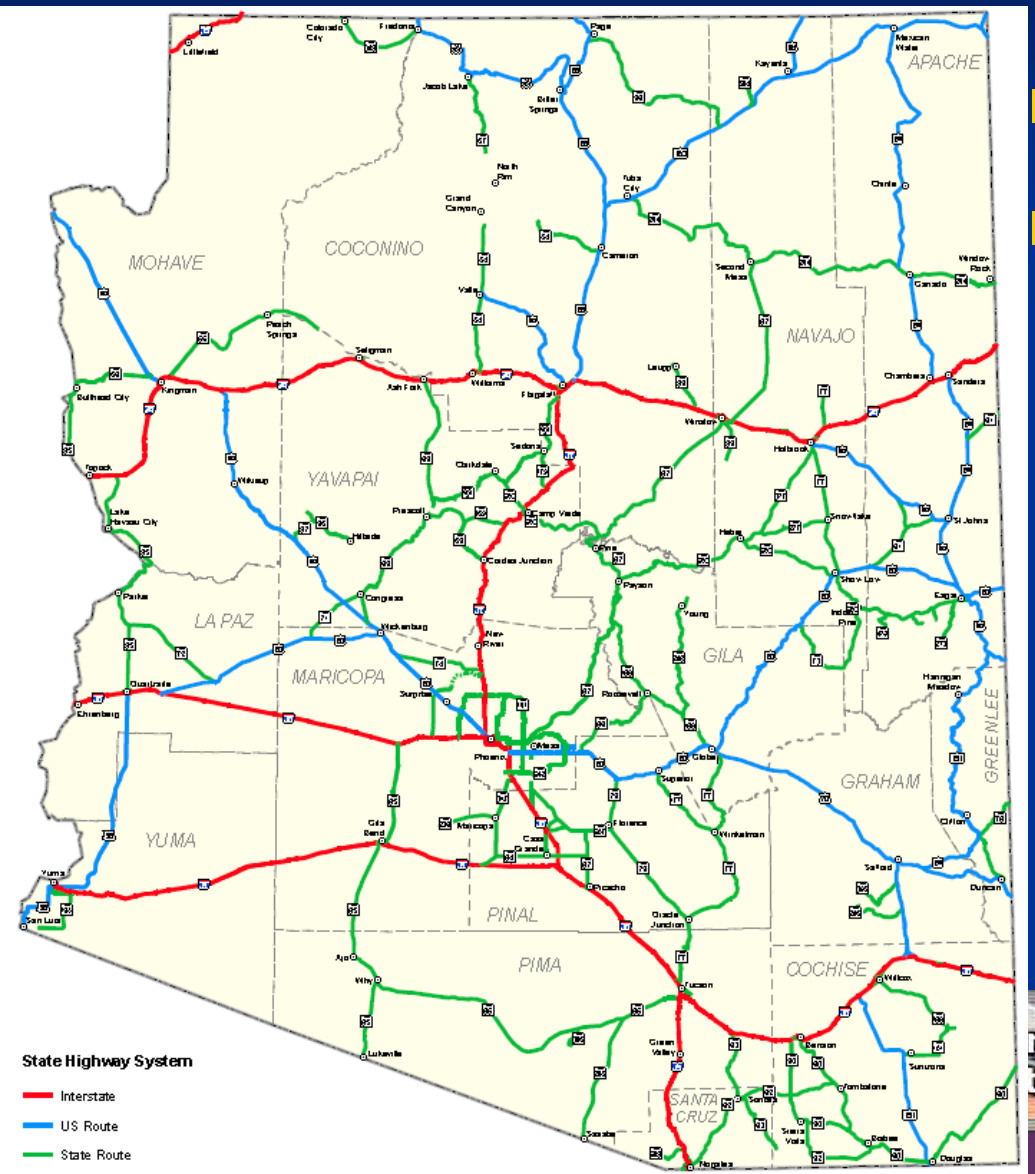
- 6.5 million people (14th)
- Since 2000 up 28.6% U.S. up 9.1%
- 4 million in Maricopa County
- 1 million in Pima County

Arizona



- 310 miles wide
- I-10, I-40
- State Highway System covers 6200-miles

State Highway System



- 175 Permanent ATRs
- This does not include what Traffic Operations monitors

MPD Data Collections

- Collect and disseminate traffic volume, vehicle classification and speed data
- Involved in FHWA's HPMS and summit data monthly to TMAS
- Perform highway inventories
  - Photolog van

Develop Working Relationship

- Communicate what data fields are needed
- Find out what methods Traffic Operations uses to collect and process the data

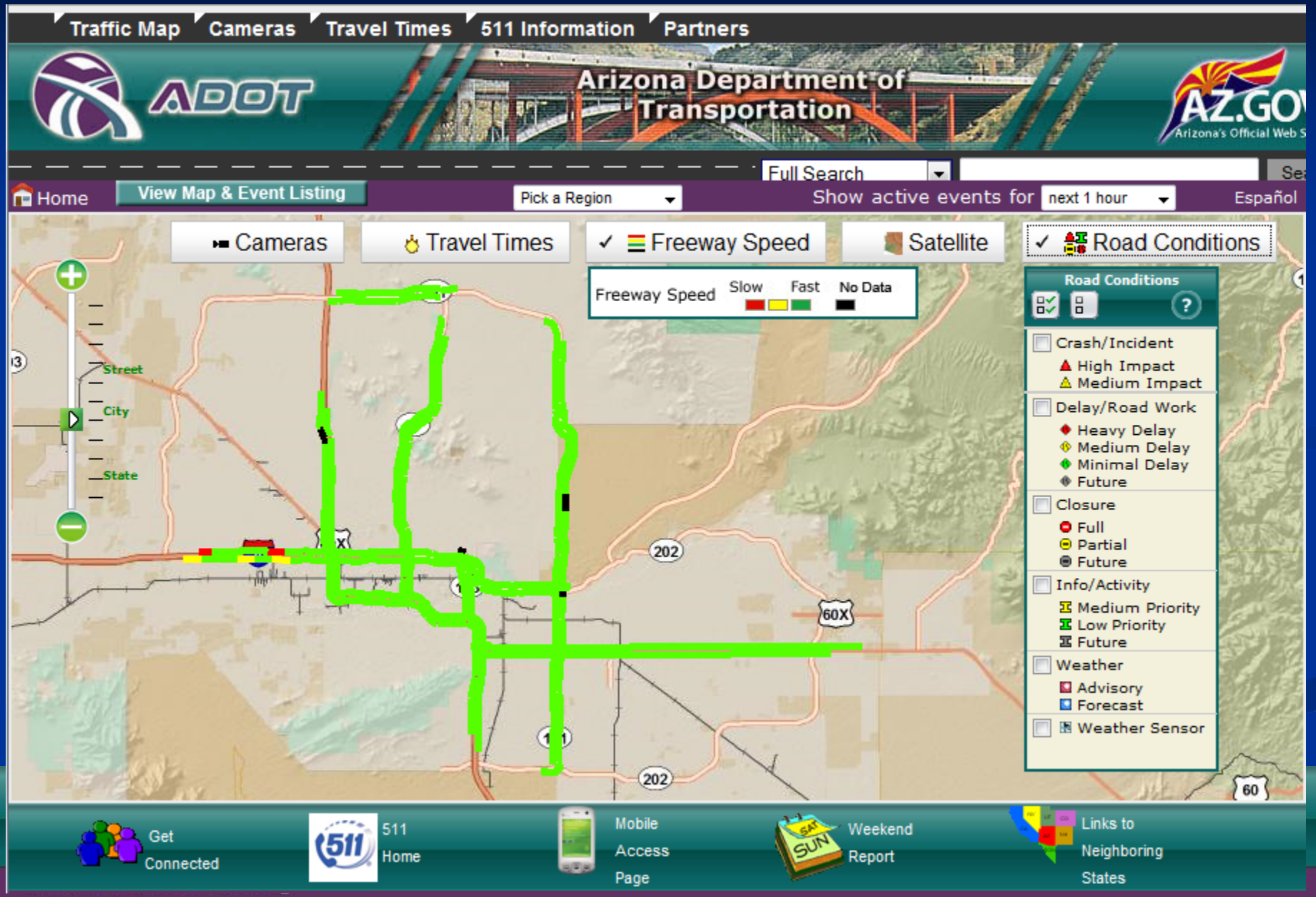
Freeway Management System since 1993

ADOT

Arizona Department of Transportation

AZ.GOV
Arizona's Official Web Site

www.az511.gov



Detector Station

- Volume, Occupancy, Speed (8 lanes)
  - Trap Travel Times (Dual loop support)
- 20-second cycle
- FHWA classifications (3 bins)
  - < 30 ft
  - 30 to 55 ft
  - > 55 ft

179 Controller Hardware

- OS-9
- Circa 1986 (New York State)
- 1200 baud -> 9600 baud
- 179 Controller no longer manufactured

2070 ATC Controller Hardware

- 179 upgrade to 2070 ATC (over time)
- ITS partnered with Planning to define system specifications
- Will contain speed and volume length binning!

Detector Station

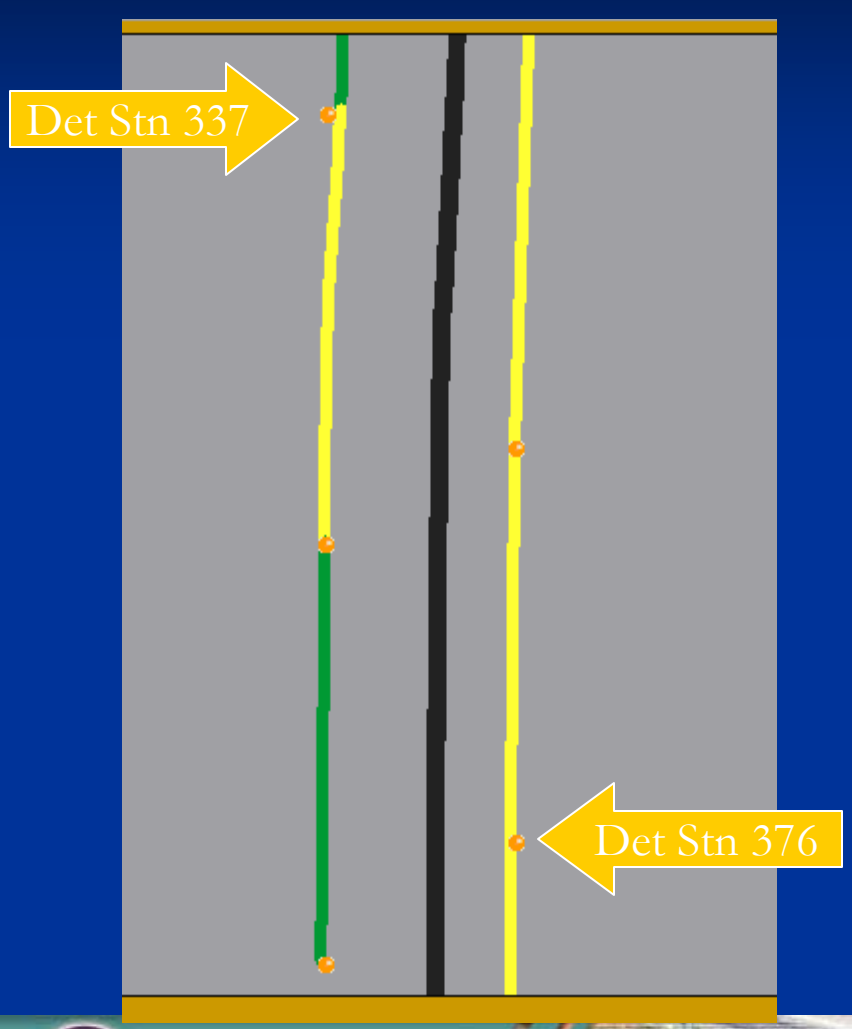
- 606 stations -> 286 Stations
  - 1/3 mile -> 1 mile
- Regional Traffic Monitoring – 58 stations
  - High-priority operation / maintenance
  - Compared to 150 ATRs (+40%)

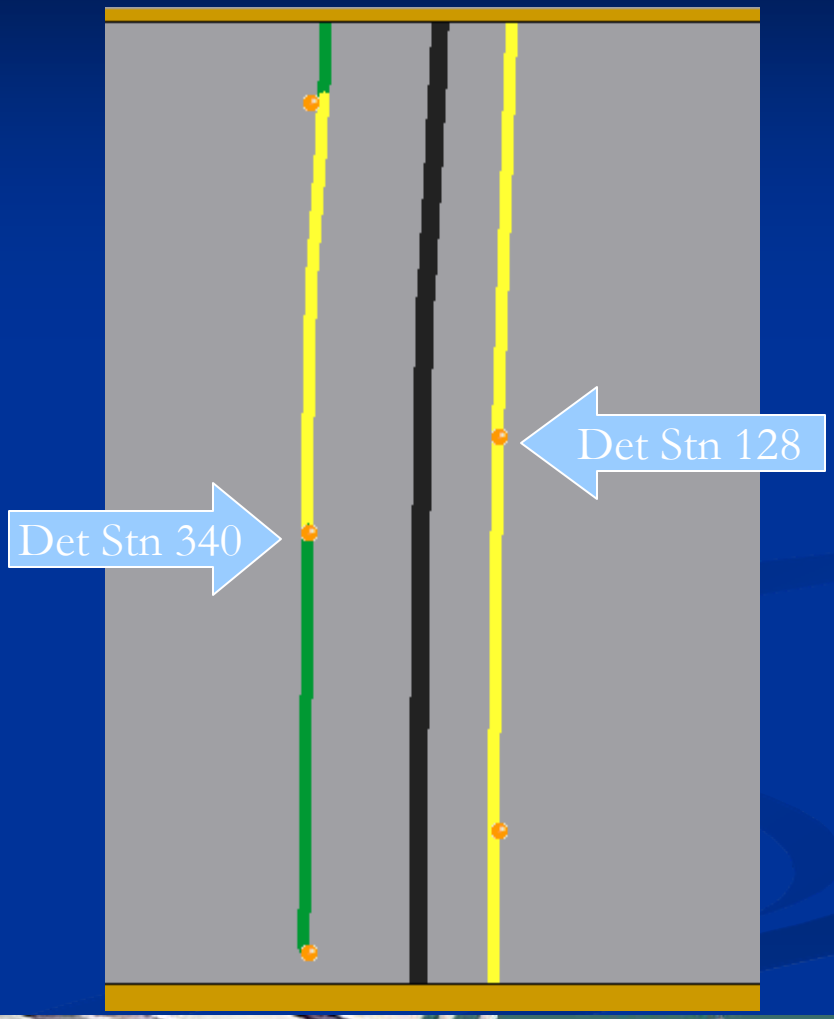
Develop Working Relationship

- Tell them what you do
- Find out what they do
- Start using their data…

FMS ATRs

ATR 0178 – I17 NB/SB





Primary Detectors

Alternate Detectors

Define FMS ATRs

RADS ITS Data System | ADOT Freeway Management System | FMS ATR | **ATR Detector Station Details**

January 2009 Generate TMG

ATR: 0076 - I-10 MP 153.539 FMS

Order	Det Stn #	Dir	Milepost	Location	Controller	Entrance	Slot A	Slot B	Slot C	Slot D	Slot E	Slot F	Slot G	Slot H	Detector Type	Station	FMS Phase	High Pri
1	66	WB	154.259	ALAMEDA ST	D1015391		lane5 ⚑	lane4 ⚑	lane3 ⚑	lane2 ⚑	lane1 ⚑	HOV ⚑			loops	8118+60	Ph1/Ph7a	Yes
2	63	WB	153.701	53RD ST	D1015357		lane4 ⚑	lane3 ⚑	lane2 ⚑	lane1 ⚑	HOV ⚑		exit to SR143 NB lane1	exit to SR143 NB lane2	loops	8100+70	Ph1/Ph7a	
3	425	WB	154.89	MEADOWLARK CIR	D1015489		lane4 ⚑	lane3 ⚑	lane2 ⚑	lane1 ⚑	HOV ⚑	entr from US60 WB lane1	entr from US60 WB lane2	entr from US60 WB lane3	3 SAS PADs	8169+80	Ph7b	
1	64	EB	153.539	53RD ST	D1115357	entr from Broadway Rd	lane5 ⚑	lane4 ⚑	lane3 ⚑	lane2 ⚑	lane1 ⚑	HOV ⚑			loops	8101+70	Ph1/Ph7a	Yes
2	393	EB	154.63	SOUTHERN AVE	D1115463		lane3 ⚑	lane2 ⚑	lane1 ⚑	HOV ⚑	exit to US60 EB HOV	exit to US60 EB lane1	exit to US60 EB lane2	exit to US60 EB lane3	3 SAS PADs	8154+80	Ph7b	

⚑ Denotes usage in the ATR calculations

Detector Station: 66

Data Validity Checks

- Monitoring Urban Freeways in 2003: Current Conditions and Trends from Archived Operations Data
- FHWA-HOP-05-018
- Prepared by:
  - Texas Transportation Institute
  - Cambridge Systematics, Inc.

Data Validity Checks

1. number of samples w/ valid date
2. number of samples w/ valid time of day
3. number of samples w/ valid location identifier
4. number of samples w/ volume <= configured maximum
5. number of samples w/ occupancy <= configured maximum
6. number of samples w/ speed > configured minimum
7. number of samples w/ speed <= configured maximum

Data Validity Checks (cont)

8. number of samples w/ speed > 0 when volume&occupancy > 0
9. number of samples w/ volume > 0 when speed > 0
10. number of samples w/ volume&speed > 0 when occupancy > 0
11. number of samples w/ vol <= func(elapsedTime, speed) if occupancy = 0
12. number of samples w/ func(vol, pollCycle, speed) <= 220
13. number of samples w/o consecutive identical VOS values

Assess the Data

http://itsradsaz.org - Sensor Lane Data - Mozilla Firefox

Station Id | Sensor Lane Data

Location: Cabinet ID: D1115145

Tests Passed

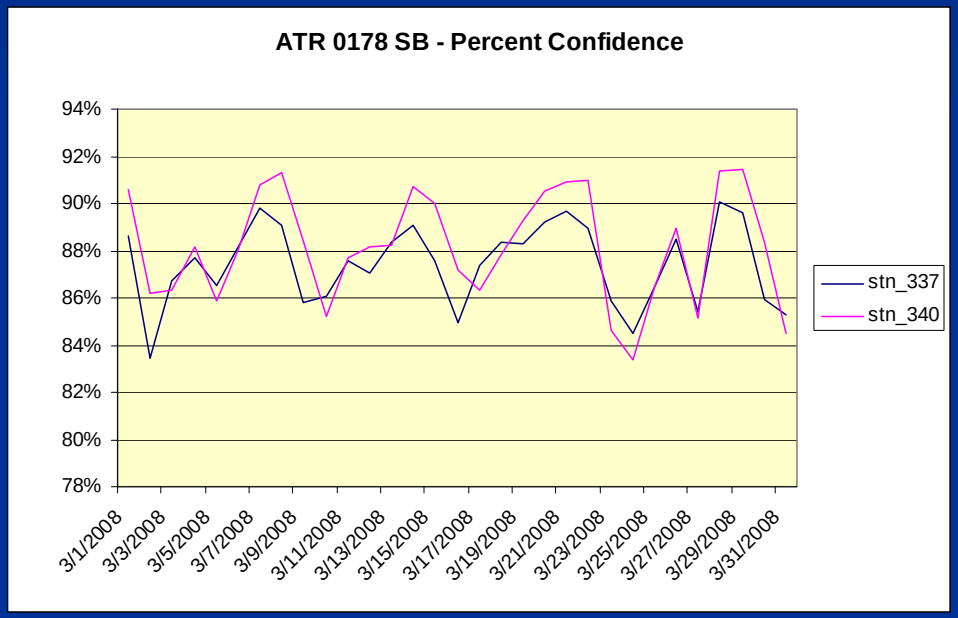
Date	Time	Slot#	Vol	Truck1	Truck2	Occ	Speed	failUp	failDwn	#err	01	02	03	04	05	06	07	08	09	10	11	12	13
2007-11-25	00:00	1	0	2	3	0	0	0	0	0	15	15	15	15	15	15	15	15	15	15	15	15	15
2007-11-25	00:00	2	0	0	1	0	0	0	0	0	12	12	12	12	12	12	12	12	12	12	12	12	12
2007-11-25	00:00	3	0	1	2	0	0	0	0	0	14	14	14	14	14	14	14	14	14	14	14	14	14
2007-11-25	00:00	4	0	0	1	0	0	0	0	0	14	14	14	14	14	14	14	14	14	14	14	14	14
2007-11-25	00:00	5	0	0	0	0	0	0	0	0	10	10	10	10	10	10	10	10	10	10	10	10	10
2007-11-25	00:05	1	0	0	1	0	0	0	0	0	12	12	12	12	12	12	12	12	12	12	12	12	12
2007-11-25	00:05	2	0	0	1	0	0	0	0	0	14	14	14	14	14	14	14	14	14	14	14	14	14
2007-11-25	00:05	3	0	1	0	0	0	0	0	0	15	15	15	15	15	15	15	15	15	15	15	15	15
2007-11-25	00:05	4	0	0	1	0	0	0	0	0	13	13	13	13	13	13	13	13	13	13	13	13	13
2007-11-25	00:05	5	0	1	0	0	0	0	0	0	9	9	9	9	9	9	9	9	9	9	9	9	9
2007-11-25	00:10	1	0	1	2	0	0	0	0	0	14	14	14	14	14	14	14	14	14	14	14	14	14
2007-11-25	00:10	2	0	0	3	0	0	0	0	0	13	13	13	13	13	13	13	13	13	13	13	13	13
2007-11-25	00:10	3	0	0	2	0	0	0	0	0	13	13	13	13	13	13	13	13	13	13	13	13	13
2007-11-25	00:10	4	0	0	0	0	0	0	0	0	15	15	15	15	15	15	15	15	15	15	15	15	15
2007-11-25	00:10	5	0	0	0	0	0	0	0	0	13	13	13	13	13	13	13	13	13	13	13	13	13
2007-11-25	00:15	1	0	0	1	0	0	0	0	1	13	13	13	13	13	13	13	13	13	12	13	13	13
2007-11-25	00:15	2	0	0	3	0	0	0	0	0	14	14	14	14	14	14	14	14	14	14	14	14	14

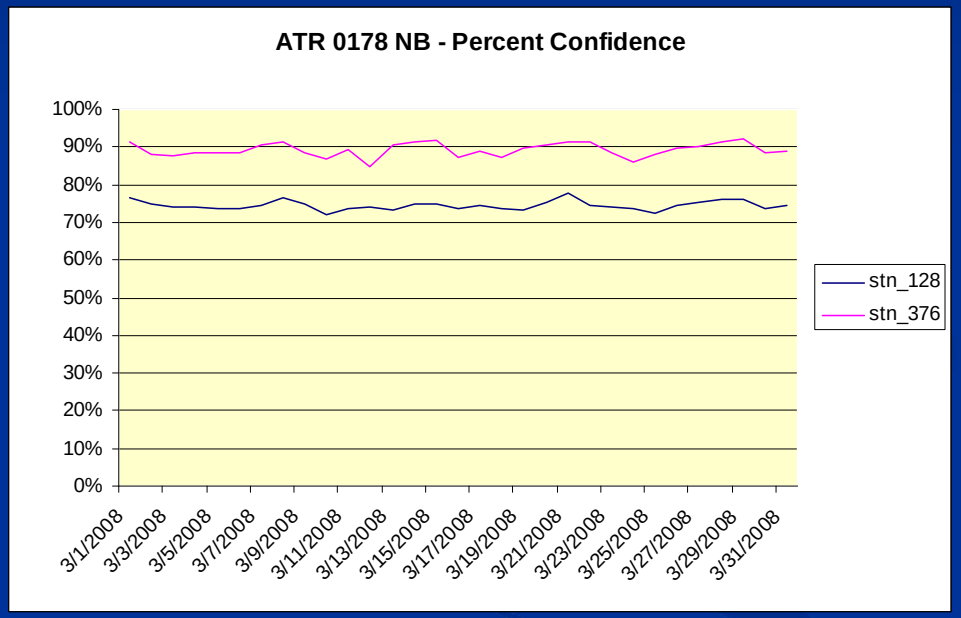
Done

Develop Working Relationship

- Tell them what you do
- Find out what they do
- Start using their data
- Be honest…evaluate…

ATR 0178 – I17 NB/SB





Automatic Warnings

- Between 7am and 7pm, 0 vol in 60-sec
- 4 consecutive, 20-sec duplicate intervals
- ADDT > threshold
- Directional split "lopsided" (per site)
- Over 10% trucks (variable)
- Warnings logged – emails dispatched

Confidence Report

Arizona Department of Transportation
ATR Confidence Report

Confidence Percentage Report for 03-2009

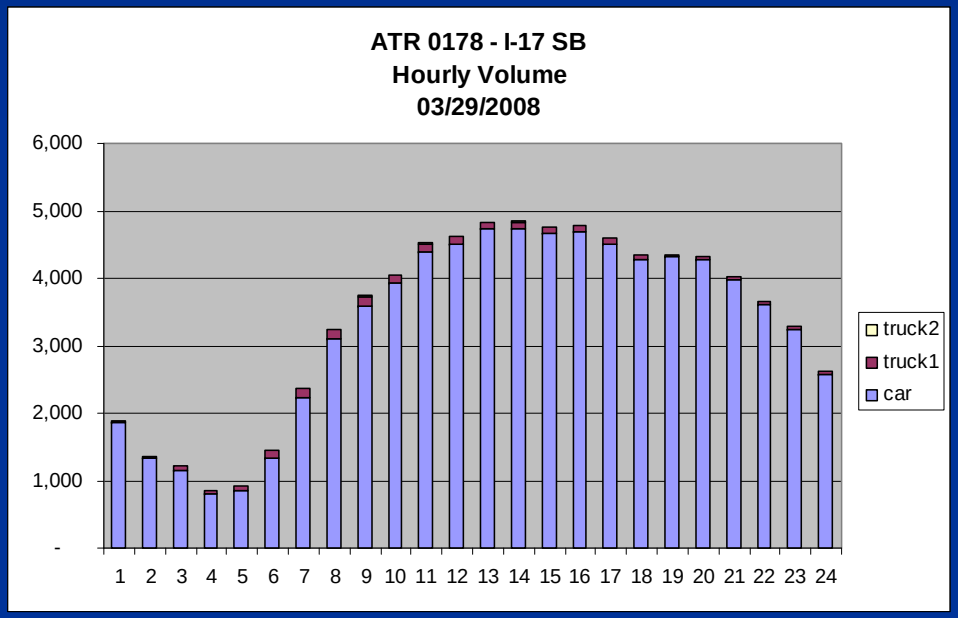
March 2009 Submit

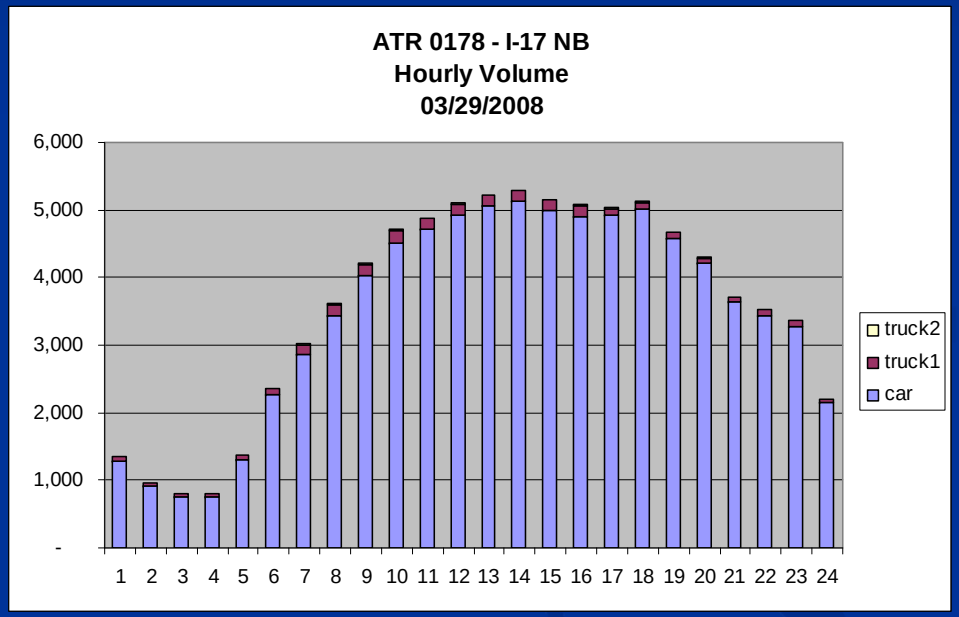
Key % 90+ 89-70 69-0

			S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T
ID	Dir	Det Stn #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0067	N	139	99	98	98	98	98	99	99	99	98	0	0	42	94	95	96	86	99	99	99	99	99	99	100	99	99	99	99	99	99	99	99
	P	85	99	99	98	97	98	99	100	99	99	0	0	42	94	95	96	86	99	99	99	99	99	99	100	99	99	99	99	99	99	99	99
0068	P	87	94	95	94	94	95	96	96	94	94	0	0	42	92	95	96	86	99	99	99	99	99	99	100	99	99	99	99	99	44	58	99
		89	95	96	96	96	96	97	97	96	96	0	0	42	92	95	96	86	99	99	99	99	99	99	100	99	99	99	97	99	99	99	99
0070	N	92	97	97	97	97	97	97	98	97	96	0	0	42	92	95	96	86	99	99	99	99	99	99	100	99	99	99	99	99	99	99	99
	P	149	95	96	96	96	96	97	97	95	96	0	0	42	93	95	96	86	99	99	99	99	99	99	100	99	99	99	99	99	99	99	99
0071	N	144	95	96	96	95	92	95	95	92	93	0	0	42	92	95	96	86	99	99	99	99	99	99	100	99	99	99	99	99	99	99	99
	P	93	96	97	96	96	97	97	98	96	96	0	0	42	93	95	96	86	99	99	99	99	99	99	100	99	99	99	99	99	99	99	99
0073	N	53	98	98	97	98	98	98	99	98	98	0	0	34	75	81	81	69	81	81	81	81	81	81	80	79	79	79	79	81	81	82	82
	P	50	98	98	97	98	98	98	99	98	97	0	0	42	94	93	94	86	93	95	96	99	99	99	100	99	99	99	99	99	99	99	99
0075	N	60	94	96	96	95	95	96	96	95	95	0	0	42	92	95	96	86	99	99	99	99	99	99	100	99	99	99	99	99	99	99	99
	P	59	99	100	99	99	99	99	100	99	99	0	0	42	95	95	96	86	99	99	99	99	99	99	100	99	99	99	99	99	99	99	99
		55	94	54	68	96	96	97	96	94	96	0	0	41	92	93	94	86	93	54	71	94	95	47	62	99	99	99	99	99	99	99	99
0076	N	66	98	98	97	97	97	98	98	98	97	0	0	42	94	95	96	85	99	99	99	99	99	99	100	99	99	98	98	99	99	98	98
		63	97	97	97	96	97	97	98	98	97	0	0	42	94	95	96	86	99	99	99	99	99	99	100	99	99	99	99	99	99	99	99
		425	76	77	76	77	77	77	77	77	77	0	0	34	74	81	81	69	81	81	81	81	81	81	80	79	80	79	79	79	79	79	79
	P	64	98	98	97	97	98	98	99	98	97	0	0	41	93	95	96	86	99													99	99
		393	80	96	95	96	96	96	97	95	95	0	0	42	92	95	96	86	99													99	99
0077	N	423	94	95	94	94	95	95	96	95	94	0	0	42	91	95	96	86	99													99	99
	P	396	95	96	95	95	95	96	97	95	94	0	0	42	92	95	96	86	99													99	99
		397	95	95	94	95	95	96	96	94	94	0	0	42	92	93	94	86	99													99	98
0078	N	417	93	94	93	94	94	95	95	94	94	0	0	42	91	95	96	86	99													99	99
		420	95	95	95	95	95	96	97	95	95	0	0	42	92	95	96	86	99													99	99
	P	401	95	96	95	95	96	97	97	96	95	0	0	42	92	95	96	85	99													99	99
		399	95	96	95	96	96	97	97	96	95	0	0	43	92	95	96	86	99													99	99
0079	N	410	40	40	40	40	40	40	40	40	40	0	0	17	70	93	94	86	99													99	99

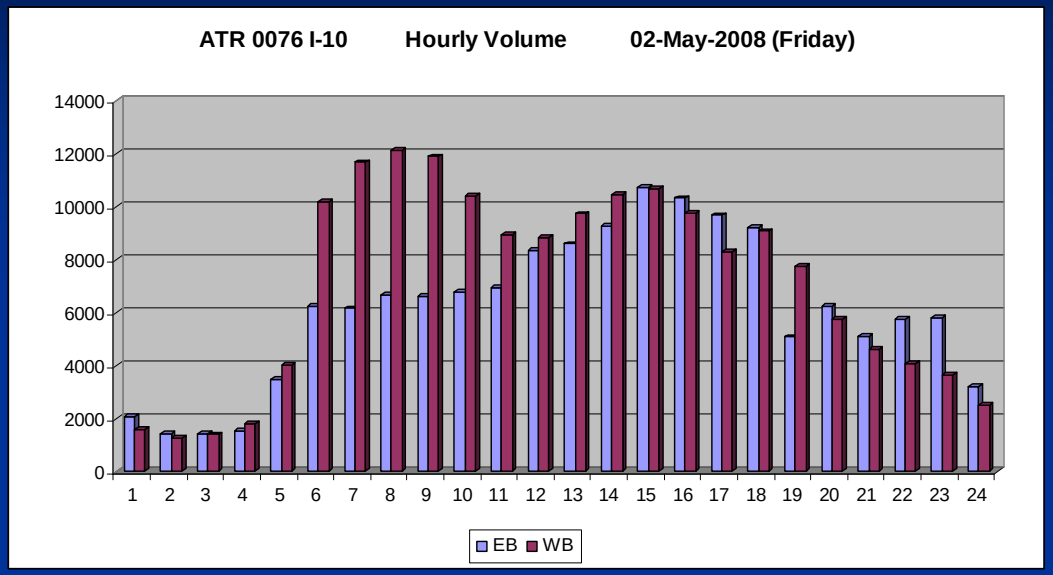
Improves ITS data quality by providing automatic feedback to Operations Center

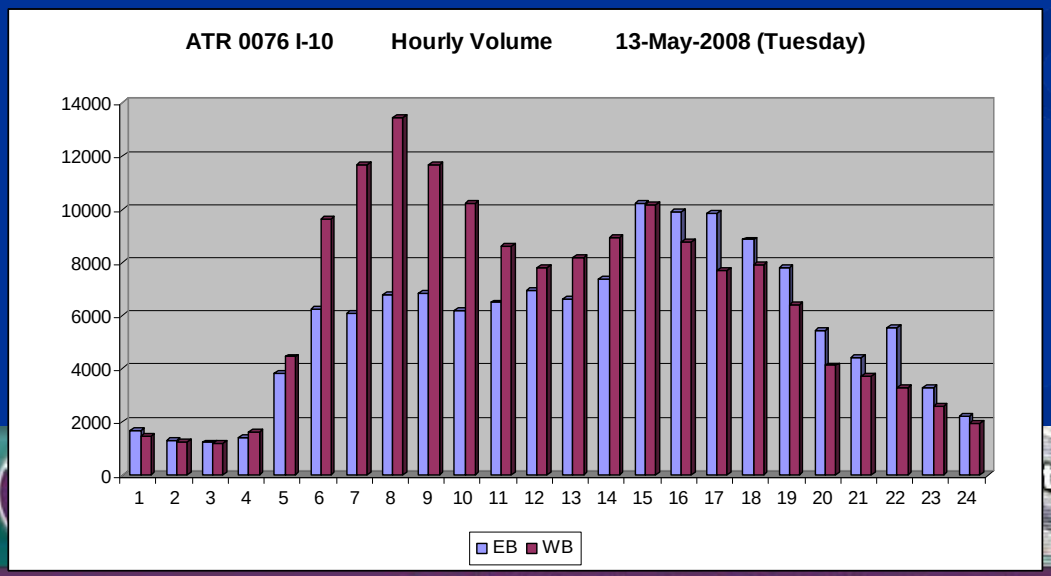
Hourly Volume





ATR 0076 – I10 EB/WB

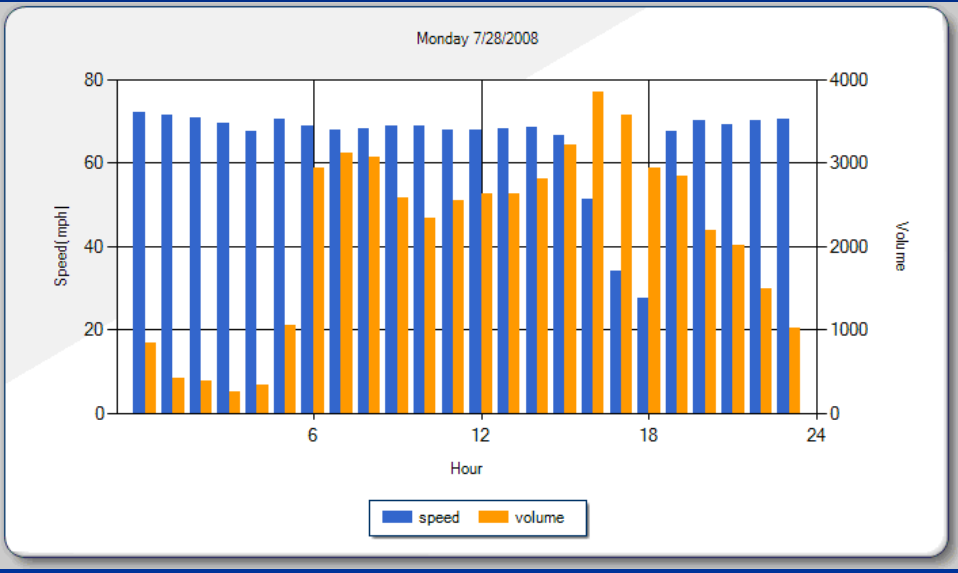


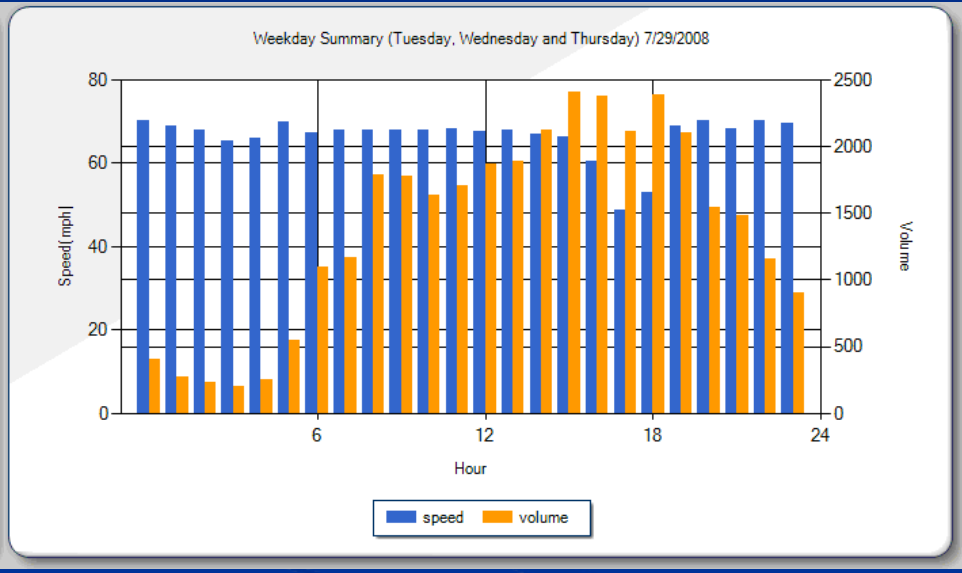


- EB Highest Hour
  10,721
  2:00pm 02-May

- WB Highest Hour
  13,448
  7:00am 13-May

Speed and Volume





Monthly Hourly Volume

FMS ATR | ATR Hour Report

Arizona Department of Transportation
ATR 0178 - NB Dir, Monthly Hourly Volume for March 2007

Order	Det #	Location	Milepost	Controller	Entrance	Slot A	Slot B	Slot C	Slot D	Slot E	Slot F	Slot G	Slot H	Detector Type	Station	Fms Phase
1	376	I-17 NB Indianola Ave	201.718	D2010675	Indian School Rd	lane 3	lane 2	lane 1	HOV					Sawcut Loops	0292+00	Ph1
2	128	I-17 NB Grand Ave	202.690	D2020275	Thomas Ave	lane 3	lane 2	lane 1	HOV					1 SAS PAD	0291+50	Ph1

Volume/Hour/Day

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	Total	Alt
01																										
02																										
03																										
04	1,728	1,346	1,183	992	1,059	1,826	2,218	2,362	2,730	3,824	4,413	4,973	5,468	5,489	4,967	4,718	4,745	4,858	4,785	4,171	3,450	3,127	2,311	1,527	78,270	128
05	1,239	1,066	1,284	1,247	2,854	4,668	4,905	5,440	5,716	5,525	5,240	5,109	5,239	5,333	5,597	5,274	5,415	5,053	4,613	3,729	3,274	3,139	2,232	1,432	94,723	
06	1,044	916	924	1,223	2,841	5,457	5,118	4,635	4,884	5,417	5,231	5,177	5,079	5,325	5,425	5,519	5,352	5,234	4,713	3,770	3,277	3,230	2,345	1,486	93,622	
07																										
08																										
09																										
10																										
11																										
12																										
13	1,071	890	957	1,302	3,119	5,574	4,958	4,848	5,556	5,642	5,150	5,217	5,052	5,189	5,416	5,627	5,202	5,002	4,662	4,024	3,487	3,344	2,381	1,563	95,233	
14																										
15																										
16																										
17																										
18																										
19																										
20	1,013	922	984	1,306	3,136	5,743	5,170	4,370	4,624	5,690	5,176	5,252	5,261	5,347	5,533	5,030	5,228	5,258	5,161	4,000	3,364	3,335	2,403	1,564	94,867	
21																										
22																										
23																										
24																										
25																										
26																										
27	1,091	913	976	1,346	3,212	5,653	4,578	4,480	4,221	4,891	5,055	4,946	5,153	5,124	5,511	5,551	5,275	4,828	4,491	3,782	3,222	3,116	2,298	1,543	91,246	128
28	1,021	923	979	1,344	3,004	5,233	3,413	4,834	5,084	5,514	5,052	4,994	5,168	5,394	5,073	4,883	5,212	5,252	4,620	4,037	3,428	3,259	2,369	1,529	91,619	128
29	1,033	899	1,008	1,344	3,196	5,118	5,039	4,471	5,291	5,694	5,069	4,973	5,328	4,163	5,346	5,802	5,468	5,359	4,917	4,026	3,472	3,324	2,439	1,507	94,286	
30	1,116	955	1,034	1,299	3,015	5,227	5,156	5,488	5,250	5,561	5,435	5,309	5,367	5,669	5,629	5,623	5,466	5,602	5,175	4,741	4,032	3,709	3,148	2,321	101,327	
31	1,532	1,315	1,205	1,143	1,484	2,783	3,307	3,893	4,449	4,825	4,903	5,102	5,453	5,285	5,176	4,908	4,955	4,918	4,985	4,427	3,999	3,858	3,451	2,540	89,896	

Done

TMG Format File -> FHWA TMAS

(one file per month per ATR)

Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://itsradsaz.org/atrdev/tmdReport.jsp?id=0076&y=2009&m=01

```
30411  0076300901015 1742 1896 1659 1181 1231 1597 1801 1893 2196 2559 3079 3781 3620 4253 4153 3606 3619 3729 4119 3105 3017 2308 2130 16190
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30411  0076300901026 1207  994  913 1163 1903 4081 6393 7190 6369 6106 5613 5822 6602 5890 5986 5457 5488 5852 5791 3761 3441 3287 2696 21640
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Done

Develop Working Relationship

- Tell them what you do
- Find out what they do
- Start using their data
- Be honest…evaluate
- Work together…
  attend meetings
  leverage resources…

In Conclusion

Doing More…
Gets You More…