Chapter 10

CORSIM Calibration

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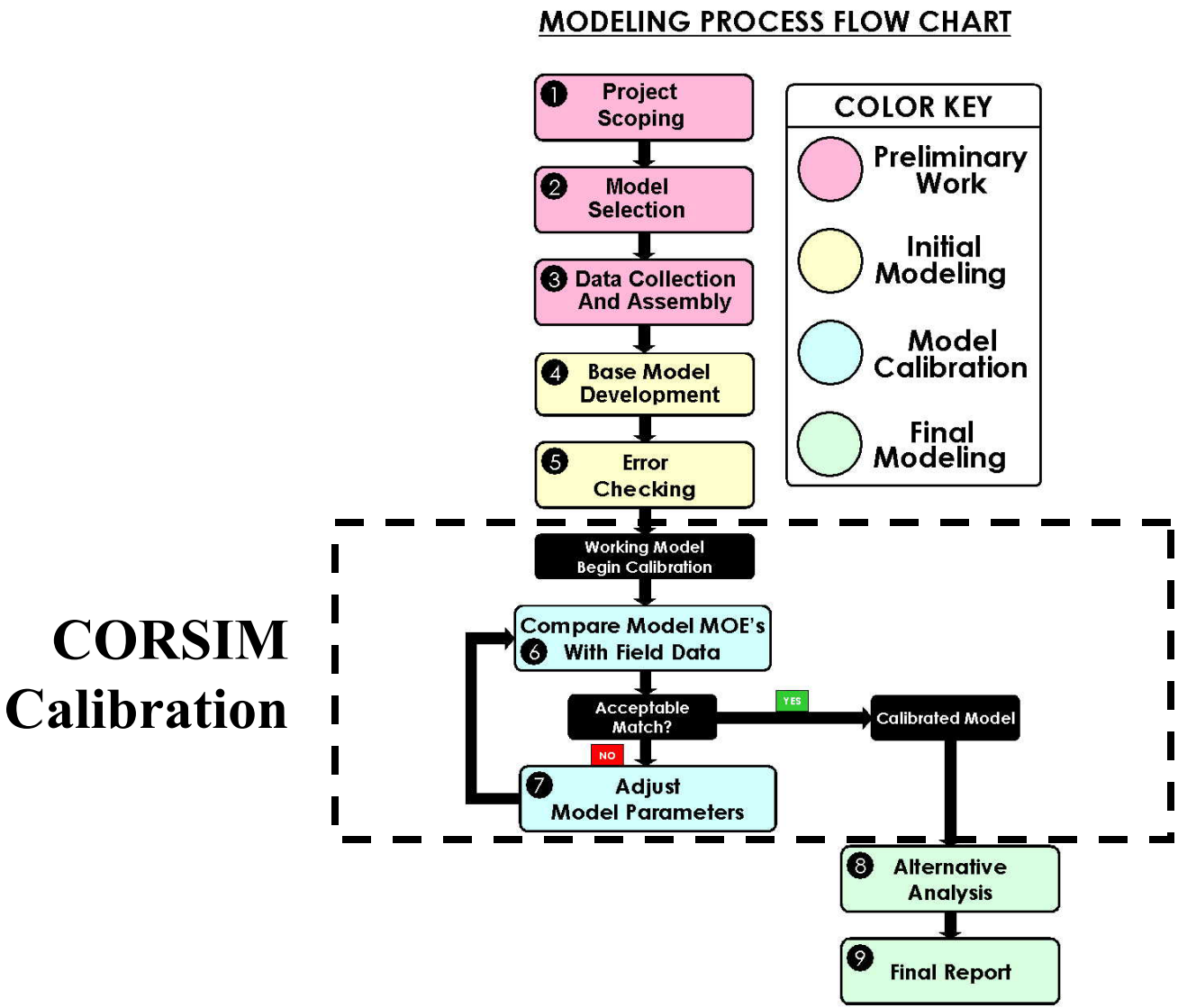
Modeling Process



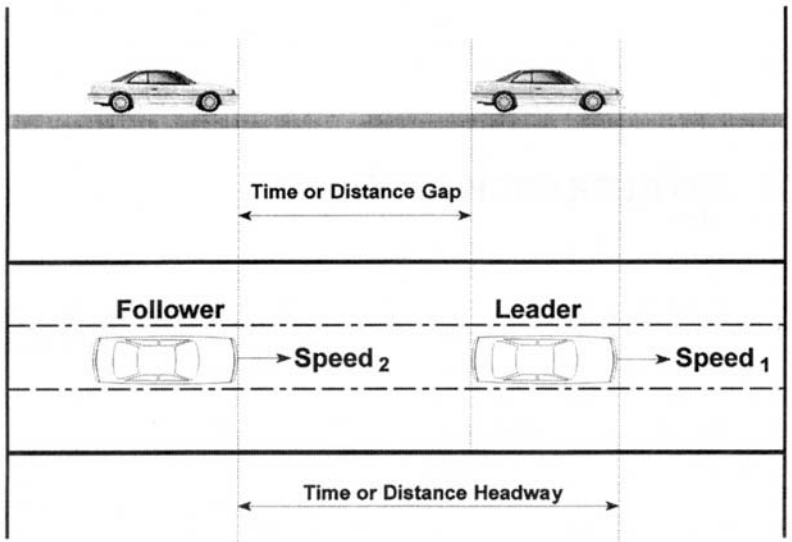
Calibration Requirements

- Error Free Base Model That Has Been Through An Internal Quality Control/Quality Assurance Process
- Sound Understanding Of Existing Conditions. Including Measures That Can Be Compared To Model Output
- Understanding Of The CORSIM Model Logic And Parameters
- Follow A Logical Process
  - Methodical Trial And Error
  - Identify Cause And Effect Of Model Changes

Car Following Model Overview

- CORSIM Uses the Pitt Car Following Model
- Car Following: Leader-Follower Relationship
- Lane Changing Logic

Car Following Model



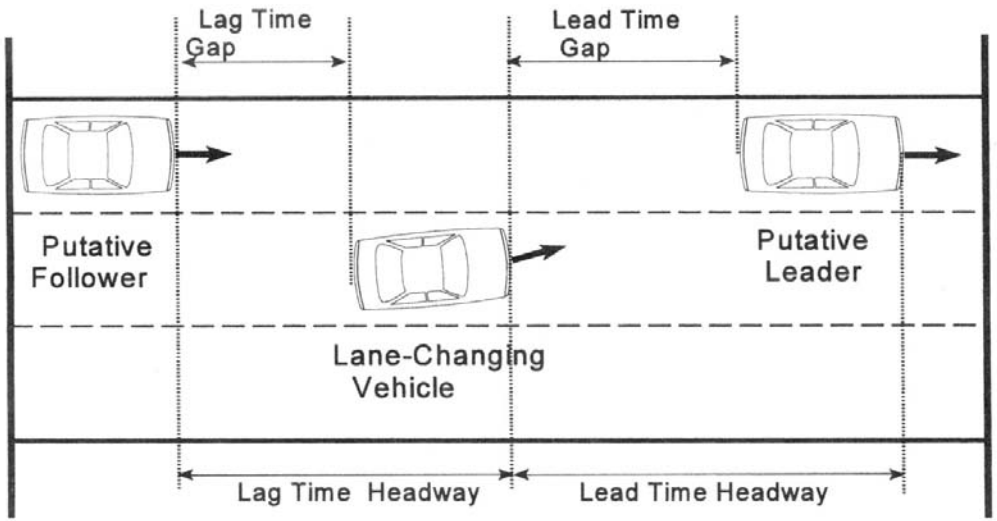
Source: NCHRP Report 385 Fig 1-1

- Follower Rules
  - Will maintain ‘safe’ gap from leader
  - Insufficient gap = follower will decelerate
- Leader Rules
  - Dependent on upcoming geometry
  - Lane Changing Logic Governs

Lane Changing Logic

- Mandatory Lane Change
  - Traveling in acceleration lane and must get out
  - Moving to proper lane to exit freeway (Warning Sign)
  - Moving out of a lane drop (Warning Sign)
  - Moving out of a blocked lane=Incident (Warning Sign)
- Discretionary Lane Change
- Anticipatory Lane Change (warning sign & threshold speed)

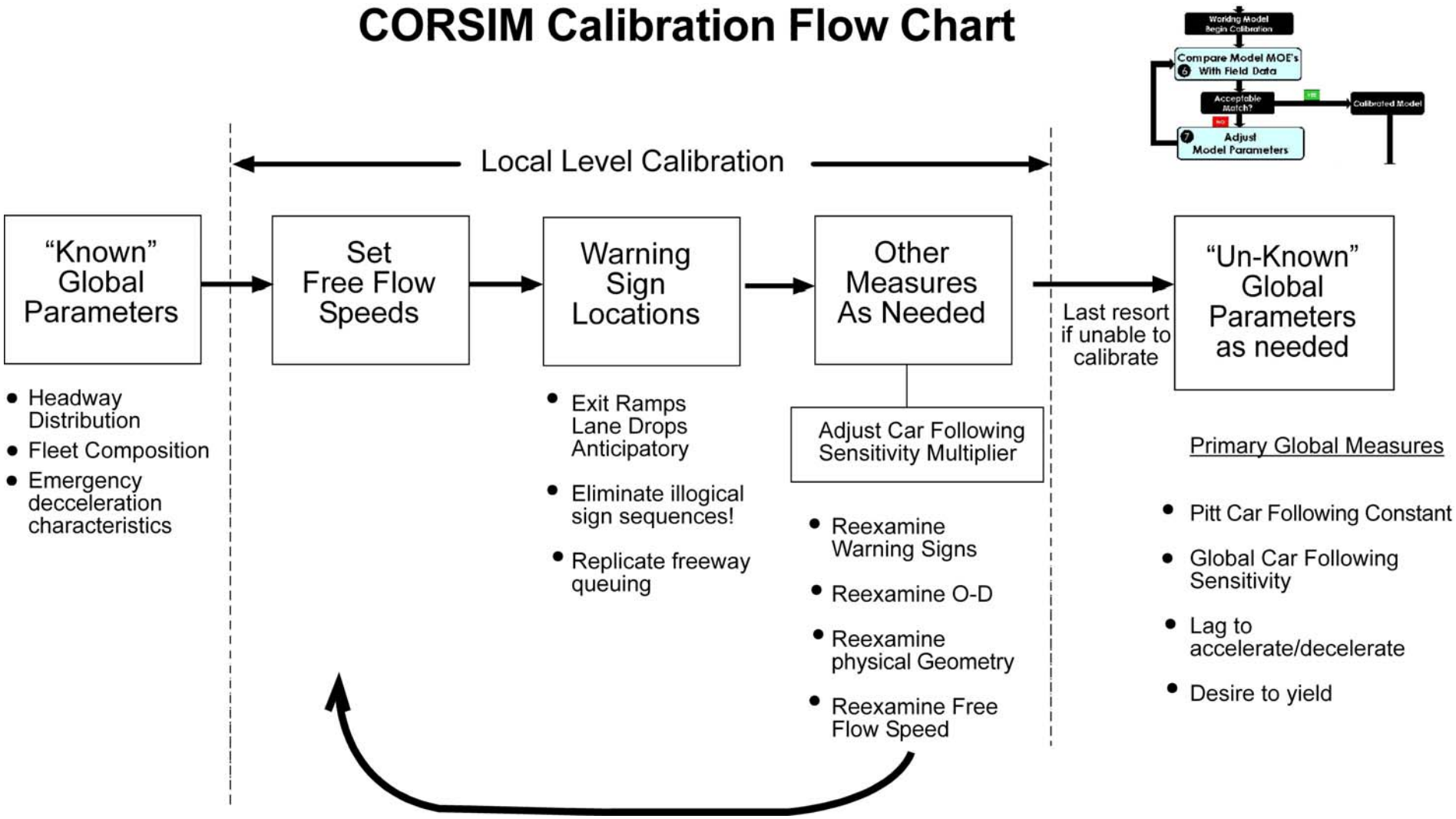
Discretionary Lane Change



Source: NCHRP Report 385 Fig 1-2

- Based on three Parameters:
  - Motivation = Desire to make a lane change based on speed.
  - Advantage = Will the driver move into a better situation?
  - Urgency = Impatience factor which is tied to the driver type.
- Considered to be part of the “unknown” global parameters

CORSIM Calibration Steps



Known Global Parameters

- Headway Distribution
  - Record Type 2
  - Use Erlang Distribution
- Fleet Composition
  - RT 58 NETSIM model
  - RT 71 FRESIM sub model
- Emergency Deceleration RT 70

Link Level Calibration Parameters

- Free-Flow Speed
- Car Following Sensitivity Multiplier
- Mean Start-up time
- Physical Geometry
  - Radius of Curvature
  - Super Elevation
  - Grades
  - Pavement Code

Free Flow Speed

- Generally, the speed that traffic will operate at during un-congested conditions
- Fixing Free Flow Speed to match observed speeds during congestion should be avoided
- Maximum value 70 mph
  - May be problematic on freeways operating at or above these speeds

Warning Signs

- Three Types Of Warning Signs
  - Exits (Ramps And HOV)
  - Lane Drops
  - Anticipatory
- Overlapping Signs Could Result In Illogical Lane Changing
- Each Case Is Unique- Sign Locations Need To Be Evaluated On A Case-by-Case Basis

Anticipatory Lane Changing

- Warning Sign Located Upstream From Entrance Ramp
- Speed Value Assigned
  - If Entering Vehicle is Below the Assigned Speed the Mainline Traffic Will Change Lanes
  - Lower Speed Assigned Results in Minimal Lane Changing
  - Higher Speed Assigned Results in Higher Lane Changing

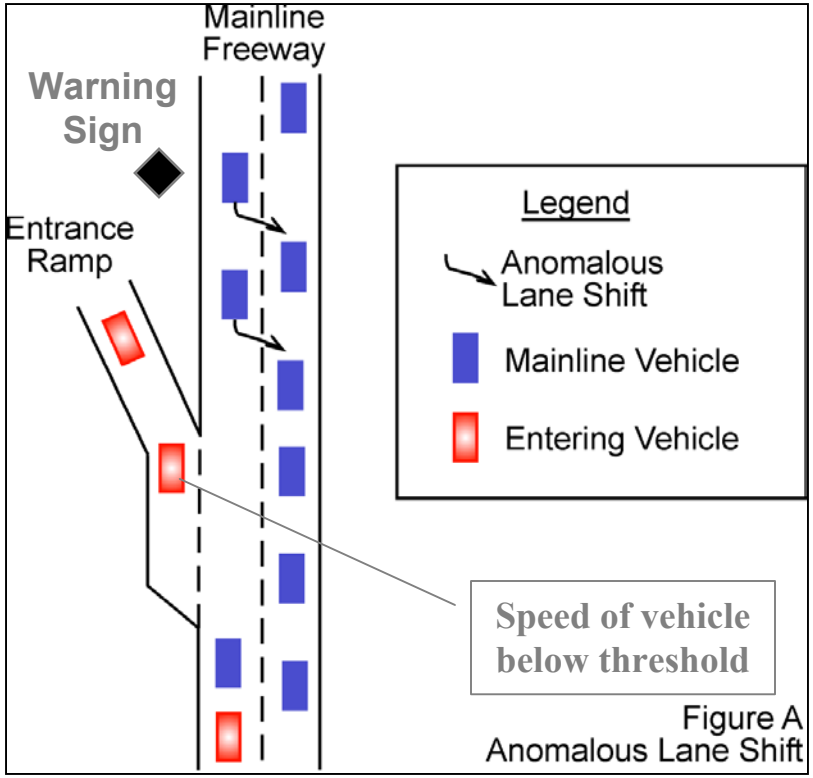
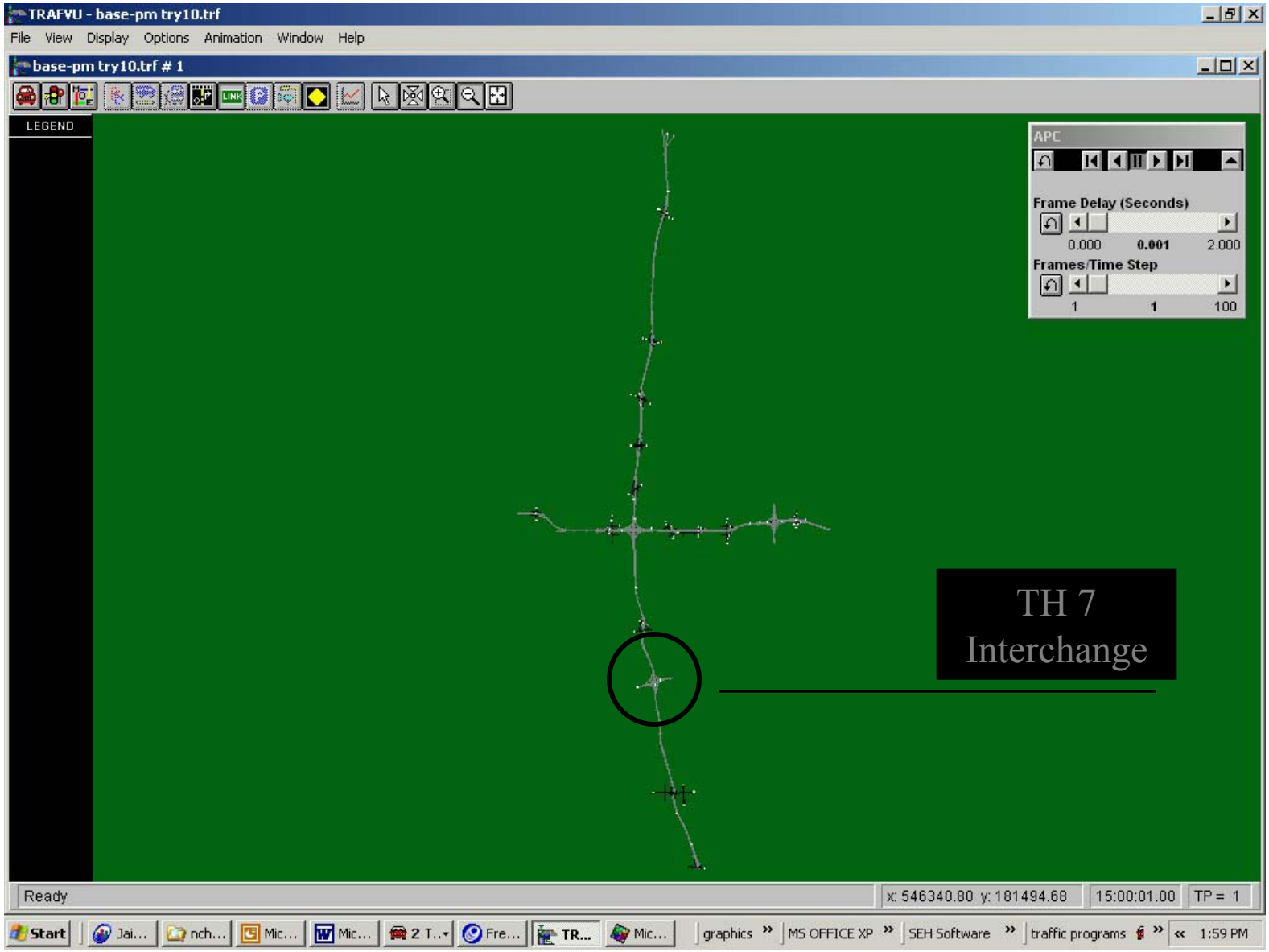
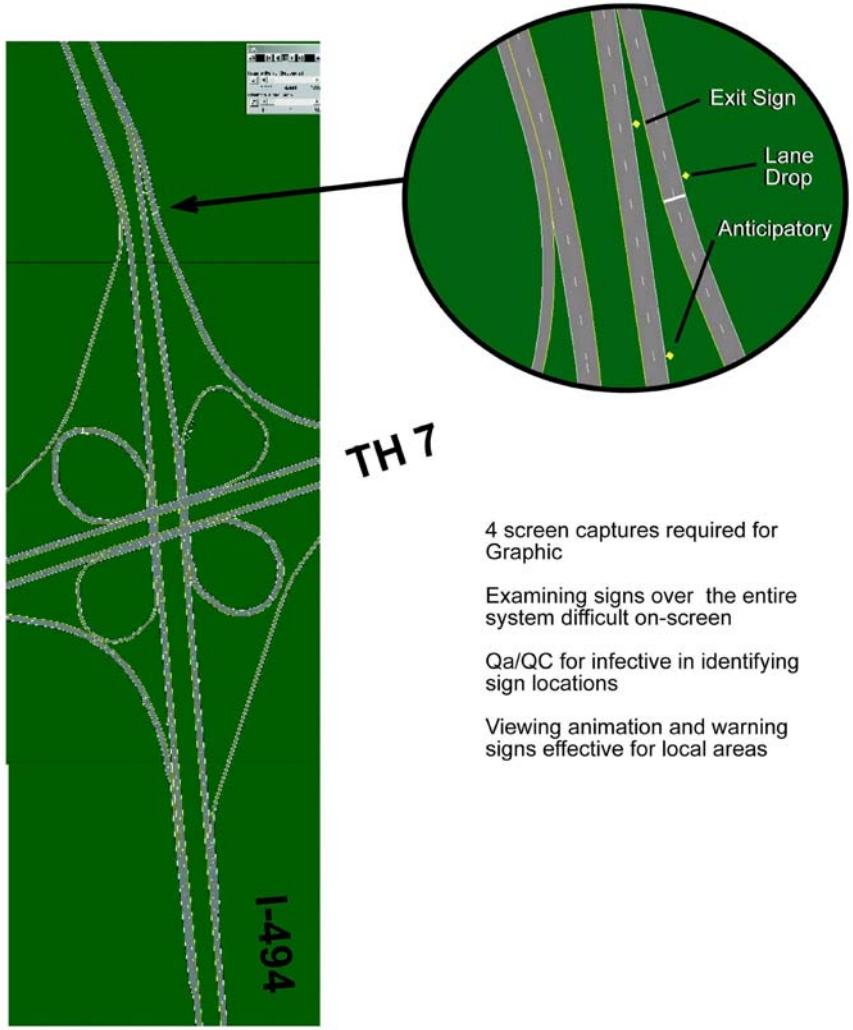


Figure A
Anomalous Lane Shift

I-494/I-394 Freeway Model



I-494/ TH 7 Interchange Area



4 screen captures required for Graphic

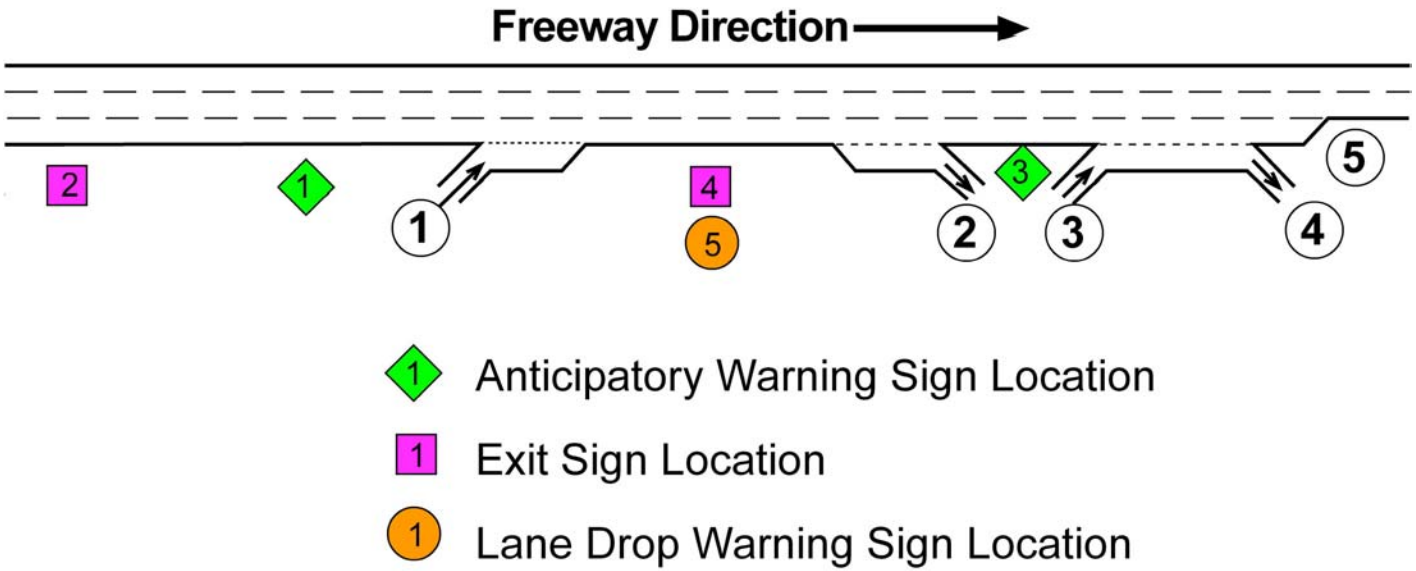
Examining signs over the entire system difficult on-screen

Qa/QC for infective in identifying sign locations

Viewing animation and warning signs effective for local areas

- Warning Signs Can Be Examined In TRAFED
- All Sign Types Have The Same Graphic
- With Animation Lane Changing Can Be Observed

Warning Sign Location Illustration



- Signs Should Generally Follow Sequentially
- Default Values May Result in Illogical Overlaps of Warning Signs
- Lane Drop Warning Signs Are Easily Overlooked

QA/QC Form Warning Sign Review

	Link Description		Link Geometrics					Warning Sign Distance	Anticipatory Chg.	
	From	To	Node From	Node To	Receiv-ing Node	Length	Type		Min. Speed to Trigger	Distance to Rx Pt.
NORTH BOUND I-494	**NB I-494**		110	111	112	1378	0			
		Valley View Road On Ramp	111	112	113	510	0			
	Valley View Road On Ramp		112	113	114	1493	0		10	500
			113	114	115	798	0			
			114	115	116	1101	0			
			115	116	117	1005	0			
		TH 62 Off Ramp	116	117	118	1570	0	5000		
	TH 62 Off Ramp		117	118	119	1147	0			
		TH 62 On Ramp	118	119	120	987	0			
	TH 62 On Ramp		119	120	121	1505	0		50	1000
			120	121	122	2142	0			
			121	122	123	1070	0			
			122	123	124	940	0			
			123	124	125	1077	0			
			124	125	126	1220	0			
			125	126	127	685	0			
		EB TH 7 Off Ramp	126	127	128	1529	0	5000		
	EB TH 7 Off Ramp	EB TH 7 On Ramp	127	128	129	1093	0			
	EB TH 7 On Ramp	WB TH 7 Off Ramp	128	129	130	374	0	5000	25	500
	WB TH 7 Off Ramp	WB TH 7 On Ramp	129	130	131	1276	0			
	WB TH 7 On Ramp		130	131	132	1517	0		25	500
			131	132	133	1748	0			
		Minnetonka Blvd Off Ramp	132	133	134	1478	0	5000		
	Minnetonka Blvd Off Ramp		133	134	135	500	0			
		Minnetonka Blvd On Ramp	134	135	136	461	0			
	Minnetonka Blvd On Ramp		135	136	137	1542	0		25	500
			136	137	138	950	0			
			137	138	139	1648	0			
			138	139	140	1550	0			
			139	140	141	1400	0			
		EB I-394 Off Ramp	140	141	142	1530	0	5000		
	EB I-394 Off Ramp	EB I-394 On Ramp	141	142	143	1104	0			
	EB I-394 On Ramp	WB I-394 Off Ramp	142	143	144	468	0	5000	10	500
	WB I-394 Off Ramp	WB I-394 On Ramp	143	144	145	1105	0			
	WB I-394 On Ramp		144	145	146	973	0		10	500
		Carlson Parkway Off Ramp	145	146	147	922	0	2000		
	Carlson Parkway Off Ramp		146	147	148	1179	0			
		Carlson Parkway On Ramp	147	148	149	1377	0			
	Carlson Parkway On Ramp		148	149	150	1537	0		10	500
		County Road 6 Off Ramp	149	150	151	928	0	2500		
	County Road 6 Off Ramp		150	151	152	1095	0			
		County Road 6 On Ramp	151	152	153	1091	0			
	County Road 6 On Ramp		152	153	154	945	0		10	500
			153	154	155	944	0			
		TH 55 Off Ramp	154	155	156	835	0	2500		
	TH 55 Off Ramp		155	156	157	1213	0			
		TH 55 On Ramp	156	157	158	1254	0			
	TH 55 On Ramp		157	158	159	1258	0		10	500
			158	159	160	1652	0			
		Rockford Road Off Ramp	159	160	161	1433	0	5000		
	Rockford Road Off Ramp		160	161	162	976	0			
		Rockford Road On Ramp	161	162	163	969	0			
	Rockford Road On Ramp		162	163	164	1385	0		10	500
			163	164	165	2116	0			
			164	165	166	1636	0			
			165	166	167	1900	0			
			166	167	168	1568	0			
			167	168	169	2172	0			
		Bass Lake Road Off Ramp	168	169	170	1445	0	5000		
	Bass Lake Road Off Ramp		169	170	171	1263	0			
		Bass Lake Road On Ramp	170	171	172	1296	0			
	Bass Lake Road On Ramp		171	172	173	1524	0		10	500
			172	173	174	1580	0			
			173	174	175	1548	0			
		Diverge	174	175	176	1502	0	5000		
	Diverge	WB I-94	175	176	8176	1292	0			

- Exit Ramp Signs Examined In The Context Of Other Ramp Locations
  - Default Location 2500' Upstream
- Anticipatory Lane Change Location And Speeds Usually Require Modification
  - Default Location 1500' Upstream
  - Default Speed 43 Mph

Car Following Sensitivity Multiplier

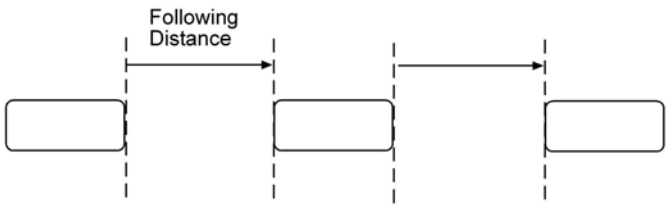
- Major tool for calibrating complex problems
- Adjusts the car following model at a link specific level.
- Used to modify the global car following parameter.
- Default value 100%

Car Following Sensitivity Multiplier:
Cause and Effect

Low Volume Scenario:

Greater Following Distance Maintained

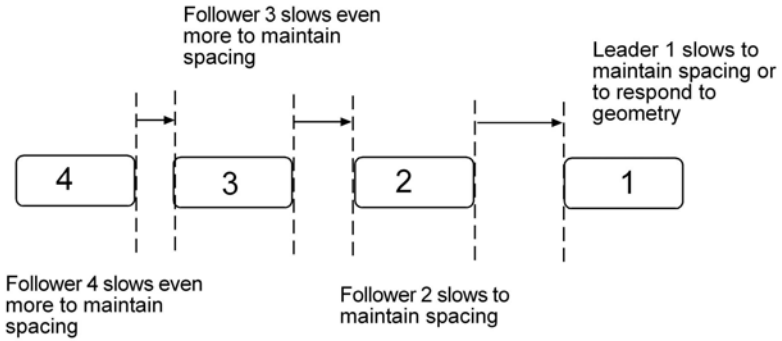
Speed = Free Flow

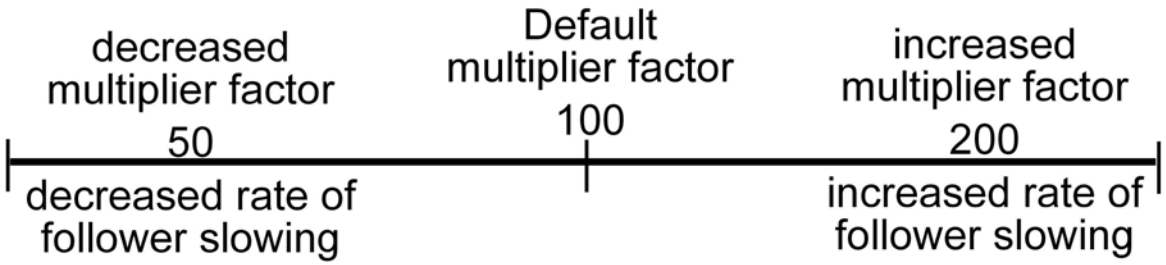


High Volume Scenario:

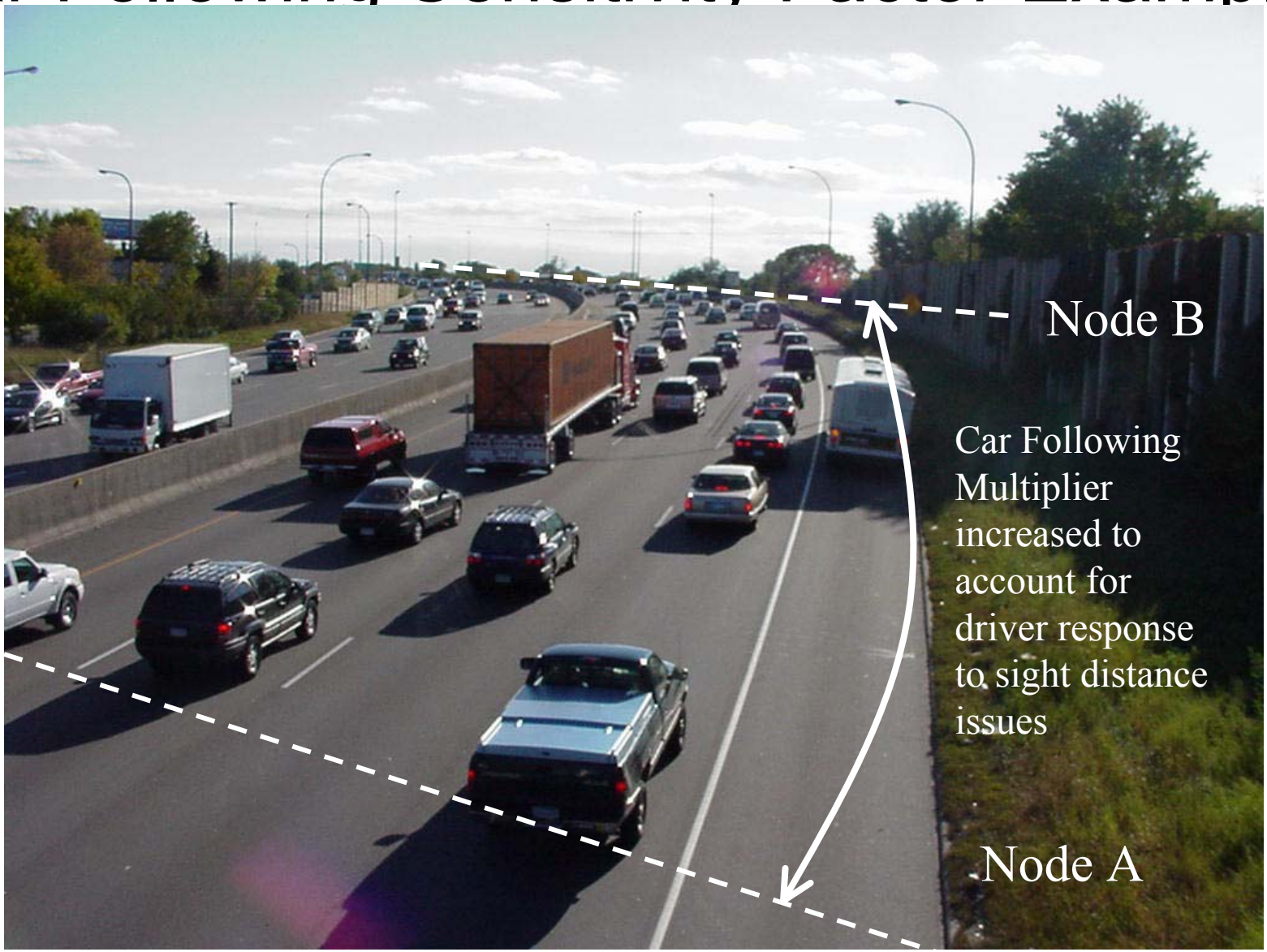
Following Distance Decreases as Speeds Decrease

Speed = Congested Flow





I-35W SB
Car Following Sensitivity Factor Example



Unknown Global Parameters

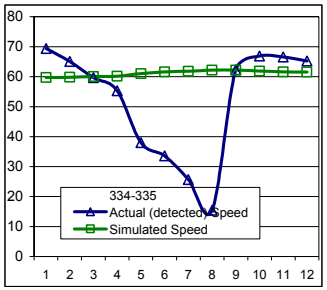
- Used as a Last Resort Changes Would Affect Entire Model Including Areas That May Not Need to be Changed
- RT 68 Global Car Following Sensitivity
  - Car Following Sensitivity For Each Driver Type
  - Pitt Car Following Constant
- Lag to Deceleration/Acceleration
- Desire to Yield

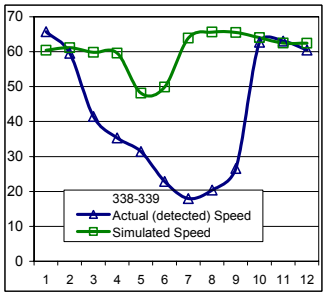
I-494 Southbound Calibration Example

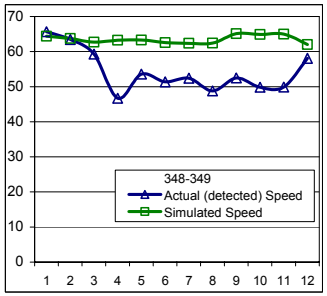
- CORSIM Model Developed to Evaluate:
  - I-494 Expansion From TH 5 to TH 55
  - I-394 Interchange Modification
- Model limits
  - I-494 From Fish Lake Interchange (I-94) to Valley View Road
  - I-394 From Central Avenue to TH 169/General Mills Interchange
  - 17 Service Interchanges
  - 3 Systems Interchanges

SB I-494 Try 1

		Link Description		Link Geometrics					Car
		From	To	Node From	Node To	Receiving Node	Length	Speed	Following Factor
SOUTHBOUND I-494	107	**SB I-494**	WB I-94/694 On Ramp	300	310	311	1028	65	100
	108	WB I-94/694 On Ramp		310	311	312	1604	65	100
	109			311	312	313	2021	65	100
	110			312	313	314	1917	65	100
	111		Bass Lake Road Off Ramp	313	314	315	1535	65	100
	112	Bass Lake Road Off Ramp		314	315	316	1289	65	100
	113		Bass Lake Road On Ramp	315	316	317	1368	65	100
	114	Bass Lake Road On Ramp		316	317	318	1399	65	100
	115			317	318	319	2076	65	100
	116			318	319	320	1495	65	100
	117			319	320	321	1719	65	100
	118			320	321	322	1570	65	100
	119			321	322	323	2113	65	100
	120		Rockford Road Off Ramp	322	323	324	1180	65	100
	121	Rockford Road Off Ramp		323	324	325	1077	65	100
	122		Rockford Road On Ramp	324	325	326	1015	65	100
	123	Rockford Road On Ramp		325	326	327	1447	65	100
	124			326	327	328	1547	65	100
	125		TH 55 Off Ramp	327	328	329	1341	65	100
	126	TH 55 Off Ramp		328	329	330	1199	65	100
	127		TH 55 On Ramp	329	330	331	1227	65	100
	128	TH 55 On Ramp		330	331	332	927	65	100
	129			331	332	333	1096	65	100
	130		County Road 6 Off Ramp	332	333	334	804	65	100
	131	County Road 6 Off Ramp		333	334	335	1244	65	100
	132		County Road 6 On Ramp	334	335	336	1176	65	100
	133	County Road 6 On Ramp		335	336	337	971	65	100
	134		Carlson Parkway Off Ramp	336	337	338	1022	65	100
	135	Carlson Parkway Off Ramp		337	338	339	1635	70	100
	136		Carlson Parkway On Ramp	338	339	340	1545	70	100
	137	Carlson Parkway On Ramp		339	340	341	747	70	100
	138		WB I-394 Off Ramp	340	341	342	771	70	100
	139	WB I-394 Off Ramp	WB I-394 On Ramp	341	342	343	1291	70	100
	140	WB I-394 On Ramp	EB I-394 Off Ramp	342	343	344	392	70	100
	141	EB I-394 Off Ramp	EB I-394 On Ramp	343	344	345	1117	70	100
	142	EB I-394 On Ramp		344	345	346	1508	70	100
	143			345	346	347	1500	70	100
	144			346	347	348	1499	70	100
	145			347	348	349	1100	70	100
	146			348	349	350	1501	70	100
	147		Minnetonka Blvd Off Ramp	349	350	360	1510	70	100
	148	Minnetonka Blvd Off Ramp	Minnetonka Blvd On Ramp	350	360	361	975	70	100
	149	Minnetonka Blvd On Ramp		360	361	362	1670	70	100
	150			361	362	363	1755	70	100
	151		WB TH 7 Off Ramp	362	363	364	1502	70	100
	152	WB TH 7 Off Ramp	WB TH 7 On Ramp	363	364	365	1310	70	100
	153	WB TH 7 On Ramp	EB TH 7 Off Ramp	364	365	366	292	70	100
	154	EB TH 7 Off Ramp	EB TH 7 On Ramp	365	366	367	1058	70	100
	155	EB TH 7 On Ramp		366	367	368	1474	70	100
	156			367	368	369	1465	70	100
	157			368	369	370	1487	70	100
	158			369	370	371	960	70	100
	159			370	371	372	1503	70	100
	160			371	372	373	1500	70	100
	161		TH 62 Off Ramp	372	373	374	1893	70	100
	162	TH 62 Off Ramp		373	374	375	1045	70	100
	163		TH 62 On Ramp	374	375	376	1045	70	100
	164	TH 62 On Ramp		375	376	377	975	70	100
	165			376	377	378	1505	70	100
	166			377	378	379	1071	70	100
	167			378	379	380	1120	70	100
	168		Valley View Road Off Ramp	379	380	381	1499	70	100
	169	Valley View Road Off Ramp	**SB I-494**	380	381	8381	1566	70	100



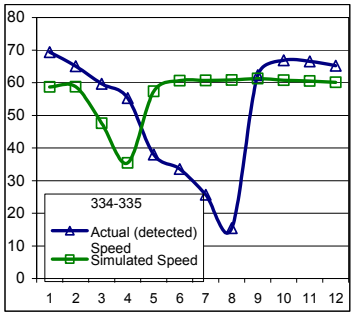


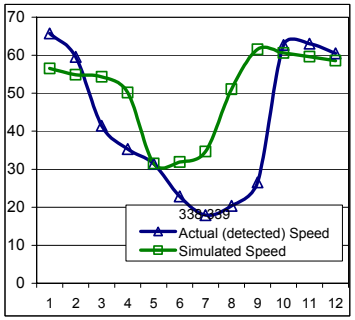


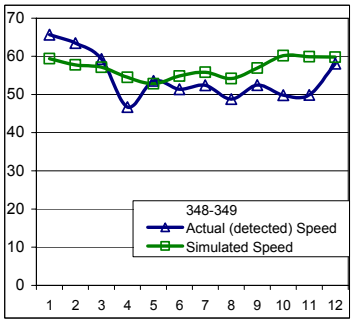
- Default Car Following Factors
- Estimated Free Flow Speeds

SB I-494 Try 12

		Link Description		Link Geometrics					Car Following Factor
		From	To	Node From	Node To	Receiving Node	Length	Speed	
SOUTHBOUND I-494	176	**SB I-494**	WB I-94/694 On Ramp	300	310	311	1028	70	100
	177	WB I-94/694 On Ramp		310	311	312	1604	70	105
	178			311	312	313	2021	70	105
	179			312	313	314	1917	70	100
	180		Bass Lake Road Off Ramp	313	314	315	1535	70	100
	181	Bass Lake Road Off Ramp		314	315	316	1289	70	100
	182		Bass Lake Road On Ramp	315	316	317	1368	70	100
	183	Bass Lake Road On Ramp		316	317	318	1399	70	100
	184			317	318	319	2076	70	100
	185			318	319	320	1495	70	100
	186			319	320	321	1719	70	100
	187			320	321	322	1570	70	100
	188			321	322	323	2113	70	100
	189		Rockford Road Off Ramp	322	323	324	1180	70	100
	190	Rockford Road Off Ramp		323	324	325	1077	70	100
	191		Rockford Road On Ramp	324	325	326	1015	70	100
	192	Rockford Road On Ramp		325	326	327	1447	70	100
	193			326	327	328	1547	70	100
	194		TH 55 Off Ramp	327	328	329	1341	70	100
	195	TH 55 Off Ramp		328	329	330	1199	70	100
	196		TH 55 On Ramp	329	330	331	1227	70	100
	197	TH 55 On Ramp		330	331	332	927	70	100
	198			331	332	333	1096	70	100
	199		County Road 6 Off Ramp	332	333	334	804	70	100
	200	County Road 6 Off Ramp		333	334	335	1244	65	100
	201		County Road 6 On Ramp	334	335	336	1176	65	130
	202	County Road 6 On Ramp		335	336	337	971	65	130
	203		Carlson Parkway Off Ramp	336	337	338	1022	65	130
	204	Carlson Parkway Off Ramp		337	338	339	1635	65	130
	205		Carlson Parkway On Ramp	338	339	340	1545	65	130
	206	Carlson Parkway On Ramp		339	340	341	747	65	130
	207		WB I-394 Off Ramp	340	341	342	771	65	130
	208	WB I-394 Off Ramp	WB I-394 On Ramp	341	342	343	1291	65	130
	209	WB I-394 On Ramp	EB I-394 Off Ramp	342	343	344	392	65	100
	210	EB I-394 Off Ramp	EB I-394 On Ramp	343	344	345	1117	65	100
	211	EB I-394 On Ramp		344	345	346	1508	65	100
	212			345	346	347	1500	65	100
	213			346	347	348	1499	65	100
	214			347	348	349	1100	65	120
	215			348	349	350	1501	65	120
	216		Minnetonka Blvd Off Ramp	349	350	360	1510	70	120
	217	Minnetonka Blvd Off Ramp	Minnetonka Blvd On Ramp	350	360	361	975	70	120
	218	Minnetonka Blvd On Ramp		360	361	362	1670	70	100
	219			361	362	363	1755	70	100
	220		WB TH 7 Off Ramp	362	363	364	1502	70	100
	221	WB TH 7 Off Ramp	WB TH 7 On Ramp	363	364	365	1310	70	100
	222	WB TH 7 On Ramp	EB TH 7 Off Ramp	364	365	366	292	70	100
	223	EB TH 7 Off Ramp	EB TH 7 On Ramp	365	366	367	1058	70	100
	224	EB TH 7 On Ramp		366	367	368	1474	70	100
	225			367	368	369	1465	70	100
	226			368	369	370	1487	70	100
	227			369	370	371	960	70	100
	228			370	371	372	1503	70	100
	229			371	372	373	1500	70	100
	230		TH 62 Off Ramp	372	373	374	1893	70	100
	231	TH 62 Off Ramp		373	374	375	1045	70	100
	232		TH 62 On Ramp	374	375	376	1045	70	100
	233	TH 62 On Ramp		375	376	377	975	70	100
	234			376	377	378	1505	70	100
	235			377	378	379	1071	70	100
	236			378	379	380	1120	70	100
	237		Valley View Road Off Ramp	379	380	381	1499	70	100
	238	Valley View Road Off Ramp	**SB I-494**	380	381	8381	1566	70	100







- Car Following Factors Modified
- Free Flow Speeds Modified

I-494 Southbound MOE’S

Try 1 MOE’s

TH 55 Off Ramp		328	329	1,199	3,199	3,205	6	61	26	C				9,389	9,469	80
	TH 55 On Ramp	329	330	1,227	3,199	3,203	4	61	26	C	61	26	C	9,389	9,475	86
TH 55 On Ramp		330	331	927	3,865	3,848	-17	60	21	C				11,627	11,729	102
		331	332	1,096	3,865	3,850	-15	62	21	C	61	20	C	11,627	11,730	103
	County Road 6 Off Ramp	332	333	804	3,865	3,852	-13	61	19	B				11,627	11,738	111
County Road 6 Off Ramp		333	334	1,244	3,429	3,441	12	61	18	B				10,445	10,539	94
	County Road 6 On Ramp	334	335	1,176	3,429	3,444	15	62	18	B	61	18	B	10,445	10,535	90
County Road 6 On Ramp		335	336	971	3,817	3,840	23	59	18	B				11,639	11,732	93
	Carlson Parkway Off Ramp	336	337	1,022	3,817	3,841	24	60	21	C	60	20	C	11,639	11,728	89
Carlson Parkway Off Ramp		337	338	1,635	2,812	2,966	154	64	21	C				9,660	9,757	97
	Carlson Parkway On Ramp	338	339	1,545	2,812	2,979	167	57	29	D	61	25	C	9,660	9,756	96
Carlson Parkway On Ramp		339	340	747	3,156	3,343	187	46	33	D				10,340	10,443	103
	WB I-394 Off Ramp	340	341	771	3,156	3,360	204	40	40	E	43	37	E	10,340	10,440	100
WB I-394 Off Ramp	WB I-394 On Ramp	341	342	1,291	2,985	3,220	235	26	74	F				9,740	9,834	94
WB I-394 On Ramp	EB I-394 Off Ramp	342	343	392	3,373	3,597	224	16	82	F				10,884	10,883	-1
EB I-394 Off Ramp	EB I-394 On Ramp	343	344	1,117	2,839	3,090	251	14	106	F				8,842	8,837	-5
EB I-394 On Ramp		344	345	1,508	3,829	4,081	252	32	55	F				11,341	11,307	-34
		345	346	1,500	3,829	4,088	259	59	35	D				11,341	11,300	-41
		346	347	1,499	3,829	4,091	262	61	34	D				11,341	11,296	-45
		347	348	1,100	3,829	4,092	263	62	33	D	56	37	E	11,341	11,295	-46
		348	349	1,501	3,829	4,100	271	63	33	D				11,341	11,285	-56
	Minnetonka Blvd Off Ramp	349	350	1,510	3,829	4,111	282	63	30	D				11,341	11,279	-62
Minnetonka Blvd Off Ramp	Minnetonka Blvd On Ramp	350	360	975	3,566	3,839	273	63	30	D				10,541	10,457	-84
Minnetonka Blvd On Ramp		360	361	1,670	3,912	4,192	280	54	31	D				11,273	11,185	-88
		361	362	1,755	3,912	4,189	277	61	34	D	59	32	D	11,273	11,181	-92
	WB TH 7 Off Ramp	362	363	1,502	3,912	4,189	277	62	30	D				11,273	11,175	-98
WB TH 7 Off Ramp	WB TH 7 On Ramp	363	364	1,310	3,573	3,848	275	56	37	E				10,151	10,083	-68
WB TH 7 On Ramp	EB TH 7 Off Ramp	364	365	292	3,637	3,906	269	50	30	D				10,295	10,228	-67
EB TH 7 Off Ramp	EB TH 7 On Ramp	365	366	1,058	3,334	3,625	291	48	47	F				9,496	9,497	1
EB TH 7 On Ramp		366	367	1,474	3,969	4,243	274	45	41	E				11,179	11,150	-29
		367	368	1,465	3,969	4,246	277	61	34	D				11,179	11,146	-33
		368	369	1,487	3,969	4,245	276	62	34	D				11,179	11,142	-37
		369	370	960	3,969	4,247	278	60	35	E	58	35	E	11,179	11,141	-38
		370	371	1,503	3,969	4,241	272	55	38	E				11,179	11,138	-41
		371	372	1,500	3,969	4,241	272	62	34	D				11,179	11,128	-51
	TH 62 Off Ramp	372	373	1,893	3,969	4,237	268	61	32	D				11,179	11,115	-64

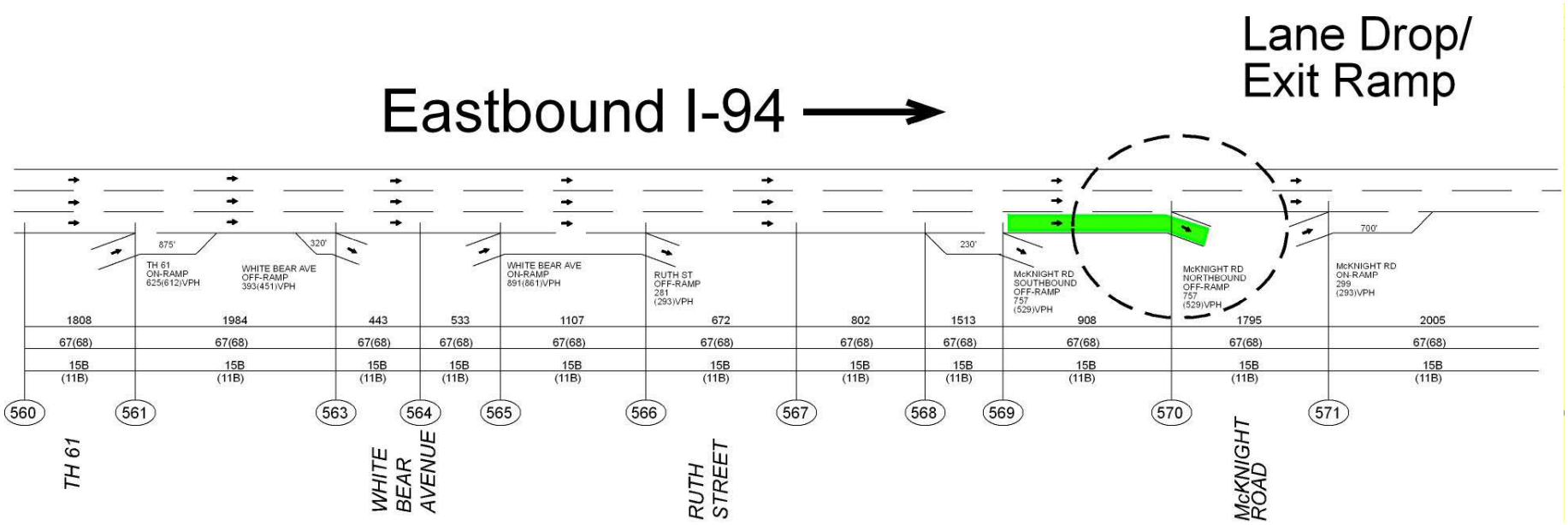
Try 12 MOE’s

TH 55 Off Ramp		328	329	1,199	3,199	3,160	-39	64	24	C				9,389	9,358	-31
	TH 55 On Ramp	329	330	1,227	3,199	3,160	-39	65	24	C	65	24	C	9,389	9,361	-28
TH 55 On Ramp		330	331	927	3,865	3,815	-50	63	20	B				11,627	11,592	-35
		331	332	1,096	3,865	3,818	-47	66	19	B	65	19	B	11,627	11,595	-32
	County Road 6 Off Ramp	332	333	804	3,865	3,819	-46	66	17	B				11,627	11,596	-31
County Road 6 Off Ramp		333	334	1,244	3,429	3,405	-24	62	18	B				10,445	10,413	-32
	County Road 6 On Ramp	334	335	1,176	3,429	3,408	-21	60	19	B	61	18	B	10,445	10,410	-35
County Road 6 On Ramp		335	336	971	3,817	3,823	6	55	20	C				11,639	11,587	-52
	Carlson Parkway Off Ramp	336	337	1,022	3,817	3,841	24	48	28	C	51	24	C	11,639	11,589	-50
Carlson Parkway Off Ramp		337	338	1,635	2,812	2,984	172	45	42	E				9,660	9,646	-14
	Carlson Parkway On Ramp	338	339	1,545	2,812	3,014	202	37	58	F	41	50	F	9,660	9,645	-15
Carlson Parkway On Ramp		339	340	747	3,156	3,365	209	29	54	F				10,340	10,327	-13
	WB I-394 Off Ramp	340	341	771	3,156	3,377	221	27	55	F	28	54	F	10,340	10,324	-16
WB I-394 Off Ramp	WB I-394 On Ramp	341	342	1,291	2,985	3,228	243	27	73	F				9,740	9,731	-9
WB I-394 On Ramp	EB I-394 Off Ramp	342	343	392	3,373	3,595	222	19	76	F				10,884	10,798	-86
EB I-394 Off Ramp	EB I-394 On Ramp	343	344	1,117	2,839	3,058	219	18	103	F				8,842	8,810	-32
EB I-394 On Ramp		344	345	1,508	3,829	4,022	193	30	61	F				11,341	11,267	-74
		345	346	1,500	3,829	4,022	193	39	55	F				11,341	11,263	-78
		346	347	1,499	3,829	4,022	193	31	68	F				11,341	11,258	-83
		347	348	1,100	3,829	4,023	194	40	50	F	42	50	F	11,341	11,251	-90
		348	349	1,501	3,829	4,023	194	54	37	E				11,341	11,242	-99
	Minnetonka Blvd Off Ramp	349	350	1,510	3,829	4,028	199	59	31	D				11,341	11,234	-107
Minnetonka Blvd Off Ramp	Minnetonka Blvd On Ramp	350	360	975	3,566	3,775	209	59	33	D				10,541	10,452	-89
Minnetonka Blvd On Ramp		360	361	1,670	3,912	4,114	202	53	31	D				11,273	11,185	-88
		361	362	1,755	3,912	4,115	203	60	34	D	59	32	D	11,273	11,178	-95
	WB TH 7 Off Ramp	362	363	1,502	3,912	4,117	205	63	30	D				11,273	11,173	-100
WB TH 7 Off Ramp	WB TH 7 On Ramp	363	364	1,310	3,573	3,770	197	62	30	D				10,151	10,089	-62
WB TH 7 On Ramp	EB TH 7 Off Ramp	364	365	292	3,637	3,830	193	55	24	C				10,295	10,226	-69
EB TH 7 Off Ramp	EB TH 7 On Ramp	365	366	1,058	3,334	3,555	221	54	37	E				9,496	9,497	1
EB TH 7 On Ramp		366	367	1,474	3,969	4,175	206	47	38	E				11,179	11,158	-21
		367	368	1,465	3,969	4,173	204	60	34	D				11,179	11,148	-31
		368	369	1,487	3,969	4,170	201	62	34	D				11,179	11,143	-36
		369	370	960	3,969	4,168	199	62	33	D	59	34	D	11,179	11,138	-41
		370	371	1,503	3,969	4,174	205	56	37	E				11,179	11,129	-50
		371	372	1,500	3,969	4,178	209	62	33	D				11,179	11,115	-64
	TH 62 Off Ramp	372	373	1,893	3,969	4,179	210	62	30	D				11,179	11,107	-72

I-94/Mcknight Example: Changing Geometry In Order To Calibrate

- Project to Add Lanes on I-94 and to Modify McKnight Interchange
- Model Limits
  - I-94 From TH 61 Interchange to I-494/I-694 Interchange
  - 3 Service Interchanges
  - 1 Systems Interchange
- Issue: Lane Drop on I-94 Eastbound at McKnight Interchange Loop Exit Ramp.

I-94 EB Lane Schematic



I-94 Base Model Treatment

1. Heavy Trucks Stuck in Exit Only Lane Blocking Exit Ramp Traffic
2. Lane 1 Traffic Upstream Heavier Than Observed

I-94 Alternate Lane Drop Treatment

1. Heavy Truck's Do Not Obstruct Exit Ramp Traffic
2. Lane Drop Provided Additional Warning Further Upstream of Lane Drop Lane 1 Traffic Matched Observed Conditions
3. Volume and Speeds Matched Closer to Observed

CORSIM Calibration Resource

Identifying and Assessing Key Weather-Related Parameters and Their Impacts on Traffic Operations Using Simulation

Report No. FHWA-

Prepared by:

ITT Industries Inc.
Systems Division
P.O. Box 15012
Colorado Springs, CO 80935-15012

Prepared for:

US Department of Transportation
Federal Highway Administration
Travel Management R&D

December 2, 2003

- Study Analyzed Sensitivity of CORSIM Input Parameters
- Study Focused on How the Model Could be Used to Analyze Weather Conditions
- All Case Studies Made Traffic Worse
- 45,000 CORSIM Runs Conducted
- Section 5 and Appendix A Contains CORSIM Sensitivity Findings
- Appendix A Includes 1 Page Summary of Individual Parameters
- Provides Guidance on Parameters in Terms of How Sensitive the Model is to Changing Variables

Sample Sensitivity Analysis Summary

Table 11. Car Following FRESIM Parameters Included in Sensitivity Analysis.

FRESIM Parameter	Definition
Car Following Sensitivity Factor	This factor is the primary user input in calculating the desired time (in seconds) headway between a leader-follower vehicle pair. A higher value means more space between vehicles. A different value is specified for each driver type (default = 1.25 to 0.35 sec. based on driver type, mean = 0.80 sec.).
Car Following Sensitivity Multiplier	A link-specific multiplier of the car-following sensitivity factor (default = 100%). The multiplier is applied to all driver types and therefore changes the overall mean of the sensitivity factor. This value can be used to calibrate car-following behavior on a link-by-link basis.
Pitt Car Following Constant	The minimum distance between the rear of the lead vehicle and front of the following vehicle, regardless of vehicle speed (default = 10 ft.).
Lag Acceleration/ Deceleration Time	The time delay (due to perception/reaction time) for motorists when starting to accelerate or decelerate (default = 0.3 sec.).
Maximum Non-Emergency Deceleration	The maximum deceleration on level grade and dry pavement in non-emergency conditions (i.e., normal lane changing and car following behavior). Reflects driving habits and not capability of the vehicle (default = 8 ft/sec^2).
Jerk Value	The maximum change in acceleration between consecutive intervals (default = 7 ft/sec^3). A higher value results in more aggressive driver behavior.

Table 25. General Sensitivity of FRESIM Car Following Parameters.

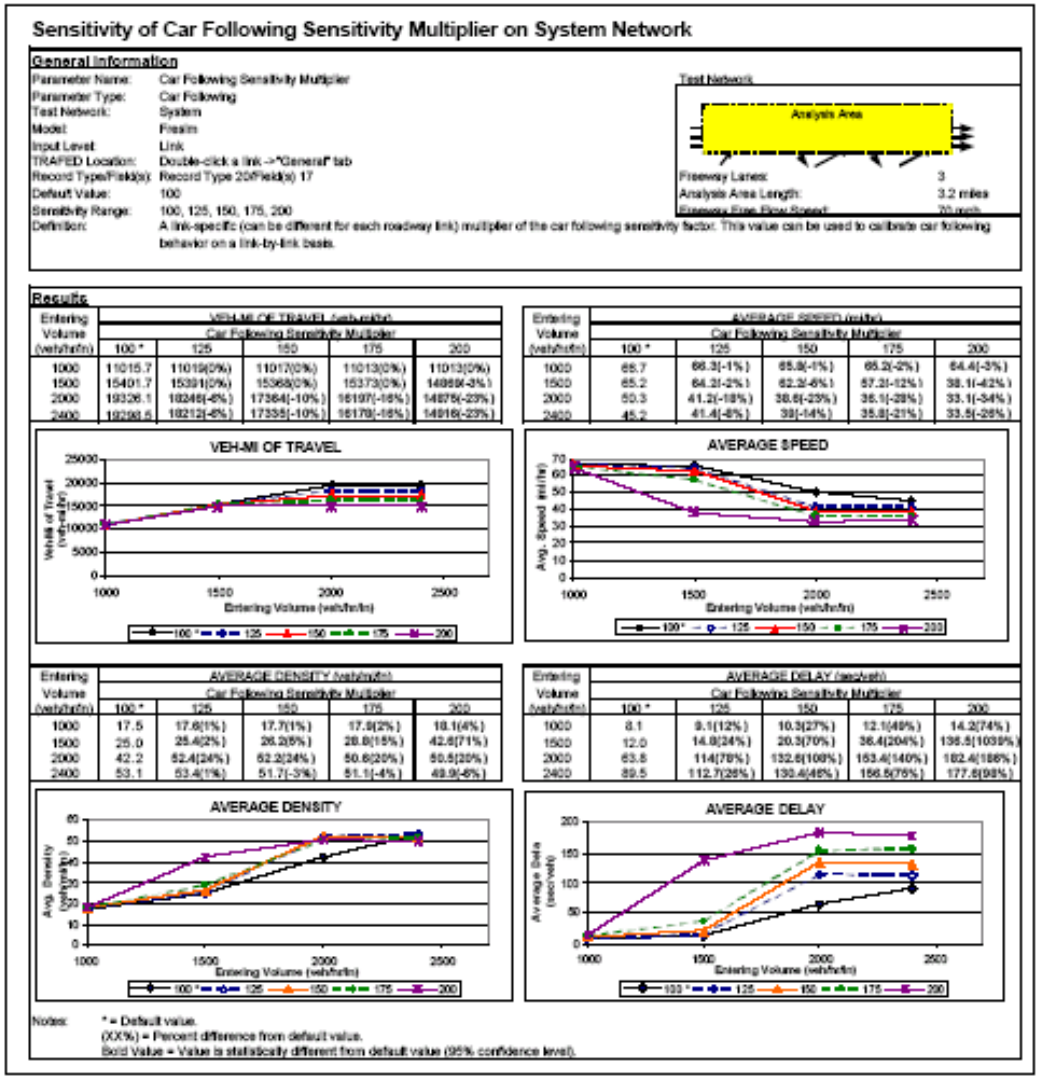
Parameter	Parameter Values	Sensitivity Group	Sensitivity Level	Comments
Car Following Sensitivity Factor	0.3*, 0.2, 0.1, 0.0**	No Effect	Low	This parameter overall has little sensitivity when changing the standard deviation of the sensitivity factor by driver types (but keeping the mean constant).
Car Following Sensitivity Multiplier	100*, 125, 150, 175, 200	Expected	High	The most sensitive car following parameter. Value of 125 yields statistically different MOEs than default at medium congestion levels (V/C of 0.63 and higher).
Pitt Car Following Constant	10*, 12, 15, 17, 20	Expected	Medium	CORSIM only allows values from 3 to 10. A modification was made to allow larger values. A value of 12 yields statistically different MOEs than default at higher congestion levels (V/C of 0.83 and higher).
Lag Acceleration /Deceleration Time	1, 3*, 5, 7, 9	Expected	Medium	MOEs worsen as value increases. Value of 5 yields statistically different MOEs on system network than default value. Value of 1 much more sensitive than other values.
Jerk Value	7*, 6, 5, 4, 3	No Effect	Low	Values show no statistically significant sensitivity under any network-congestion level scenario.

Notes: * - default value.
** - These values represent the standard deviation of the car following sensitivity factors for each of the 10 driver types. The default values (range from 1.25-0.35 for Driver Type 1 to 10) equal a mean value of 0.80 and standard deviation of 0.30. Each consecutive alternative has the same mean (0.80) but smaller standard deviation to represent more uniform driver behavior.

Source: Identifying and Assessing Key weather related Parameters and Their Impacts on Traffic Operations Using Simulation Dec 2, 2003

Sample Report: Car Following Multiplier Sensitivity

- Appendix A Contains 1 Page Summaries of Each Case Study (Over 100 Studies)
- This Report Demonstrates Affects of Increasing Car Following Multiplier Factor



Sensitivity of Car Following Sensitivity Multiplier on System Network

General Information

Parameter Name:	Car Following Sensitivity Multiplier
Parameter Type:	Car Following
Test Network:	System
Model:	Fresim
Input Level:	Link
TRAFED Location:	Double-click a link -> "General" tab
Record Type/Field(s):	Record Type 20/Field(s) 17
Default Value:	100
Sensitivity Range:	100, 125, 150, 175, 200
Definition:	A link-specific (can be different for each roadway link) multiplier of the car following sensitivity factor. This value can be used to calibrate car following behavior on a link-by-link basis.

Test Network

Analysis Area

Freeway Lanes:	3
Analysis Area Length:	3.2 miles
Freeway Free Flow Speed:	70 mph

Results

Entering Volume (veh/hr/ln)	VEH-MI OF TRAVEL (veh-mi/hr) Car Following Sensitivity Multiplier 100 *	125	150	175	200
1000	11015.7	11019(0%)	11017(0%)	11013(0%)	11013(0%)
1500	15401.7	15391(0%)	15368(0%)	15373(0%)	14869(-3%)
2000	19326.1	18248(-6%)	17364(-10%)	16197(-16%)	14875(-23%)
2400	19298.5	18212(-6%)	17335(-10%)	16178(-16%)	14916(-23%)

Entering Volume (veh/hr/ln)	AVERAGE SPEED (mi/hr) Car Following Sensitivity Multiplier 100 *	125	150	175	200
1000	66.7	66.3(-1%)	65.8(-1%)	65.2(-2%)	64.4(-3%)
1500	65.2	64.2(-2%)	62.2(-6%)	57.2(-12%)	38.1(-42%)
2000	50.3	41.2(-18%)	38.6(-23%)	36.1(-28%)	33.1(-34%)
2400	45.2	41.4(-8%)	38(-14%)	35.8(-21%)	33.5(-26%)

Entering Volume (veh/hr/ln)	AVERAGE DENSITY (veh/mi/ln) Car Following Sensitivity Multiplier 100 *	125	150	175	200
1000	17.5	17.6(1%)	17.7(1%)	17.9(2%)	18.1(4%)
1500	25.0	25.4(2%)	26.2(5%)	28.8(15%)	42.8(71%)
2000	42.2	52.4(24%)	52.2(24%)	50.6(20%)	50.5(20%)
2400	53.1	53.4(1%)	51.7(-3%)	51.1(-4%)	49.9(-6%)

Entering Volume (veh/hr/ln)	AVERAGE DELAY (sec/veh) Car Following Sensitivity Multiplier 100 *	125	150	175	200
1000	8.1	9.1(12%)	10.3(27%)	12.1(49%)	14.2(74%)
1500	12.0	14.8(24%)	20.3(70%)	36.4(204%)	136.5(1039%)
2000	63.8	114(78%)	132.6(108%)	153.4(140%)	182.4(186%)
2400	89.5	112.7(26%)	130.4(46%)	156.5(75%)	177.8(98%)

Notes: * = Default value.
(XX%) = Percent difference from default value.
Bold Value = Value is statistically different from default value (95% confidence level).

Figure 5. Summary of Sensitivity Analysis of Car Following Sensitivity Multiplier on FRESIM System Network.

Source: Identifying and Assessing Key weather related Parameters and Their Impacts on Traffic Operations Using Simulation Dec 2, 2003