AN EVALUATION AND CALIBRATION OF MDOT'S WORK ZONE DELAY MODEL

DRAFT FINAL REPORT

PREPARED FOR
MICHIGAN DEPARTMENT OF TRANSPORTATION

PREPARED BY
DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING
MICHIGAN STATE UNIVERSITY

Richard W. Lyles

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16. Abstract

The context for the study is the desire on MDOT's part to be able to predict user delays in work zones. MDOT currently uses a delay model (the ***Construction Congestion Cost Program***) and was interested in knowing the reasonableness of some of the input parameters and whether certain aspects of the delay estimates were accurate. More specifically, this study was directed to three objectives: verification/modification of the assumptions for "recommended work zone capacities;" examination of speeds in work zones when traffic volumes approach capacity; and measuring queue lengths in the field. The latter were to be compared to the model's estimates. Estimates of capacity at several sites showed that numbers larger than the "recommended" values were routinely obtained although if the recommended values were true averages, this might well be expected. Speed studies showed that speeds at capacity were in the range of 40-50 mph (although based on few data) while speeds in relatively free-flowing conditions in construction zones ranged as high as 70 mph for "low intensity" zones and less for "high intensity zones." The model was not found to be particularly accurate in estimating queue lengths. Moreover, the estimates were found, not surprisingly, to be very sensitive to assumed roadway capacity. While the model may have problems in predicting absolute values of queues and delays, using it for relative estimates (e.g., in an analysis of alternatives) was not contraindicated.

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INTRODUCTION

User delays caused by work zones constitute one of the key costs in constructing, reconstructing, rehabilitating, and generally maintaining the highway system. These user costs can loom large in the overall consideration of the costs of constructing various pavements and their subsequent upgrading/maintenance over the life of the installation. Reasonable estimates of these user costs are, thus, important to the Michigan Department of Transportation (MDOT) in their life-cycle cost analysis for pavements, traffic maintenance schemes, and related decisions. There are various models that are available for predicting delay including the ***Construction Congestion Cost Program*** which was developed for MDOT in 1996 and 1997 and has been used selectively by MDOT personnel since then. For this model, it is assumed that there are two components of delay experienced by motorists who traverse the work zone: that which is experienced in the queues that sometimes form prior to the lane closure for freeway work; and that which is experienced as a result of lower (than normal) operating speeds through the zone. In addition, there are delays which detoured or diverted motorists experience. While the model includes some consideration of these latter changes in travel, these delays are extremely site-specific and depend, for example, on the availability of readily identified detours or alternative routes. Thus, the focus of this project is on the delays encountered in and prior to the zone and not those experienced by the detoured/diverted motorists.

Like any model, the ***Construction Congestion Cost Program*** (referred to herein as either the CO^3 model or, more simply, the "delay model") is limited (at a minimum) by the accuracy and reasonableness of the data used as inputs (e.g., vehicular volumes on the roadway). In addition to the data that are specific to a particular site, this model requires some assumed values of the capacity of roadway sections. In this context, MDOT established the following general objectives for this project:

- verify and/or modify the input assumptions for "recommended work zone capacities" (see table 1);
- conduct speed studies at work zones when the traffic "demand" equals capacity; and
- measure queue lengths in the field.

The verification of work zone capacities is clear enough—are the capacities used as input assumptions accurate or not? It was understood from the outset of the project that not all possible combinations of "normal" and "open" lanes (table 1) would be considered. The combinations studied would depend in part on the work zones identified by MDOT. It should also be noted that only freeway sites were of concern in this project.

Table 1. Recommended work zone capacities[1]

number of lanes		average capacities[2]	
normal	open	vehicles/hour	vehicles/lane/hour
3	1	1,400	1,400
2	1	1,550	1,550
5	2	3,200	1,600
4	2	3,400	1,700
3	2	3,400	1,700
4	3	5,250	1,750

[1] from MDOT and CO[3] manual

[2] subject to correction factors: if % heavy trucks > 10% reduce VPH by 10%; if entrance ramp within closure zone, reduce freeway lane 1 VPHL by the minimum of the ramp volume or 800 VPHL; and add/subtract 10% of the VPH for above/below "average" work activities

The purpose of the speed studies was to allow estimation of speeds through work zones that could then be then be used as input parameters to the delay model. Finally, the field measurements of queue length were to be done to verify the outputs of the delay model—i.e., given various input assumptions, was the queue length predicted by the model accurate for a given situation.

BASIC APPROACH

The basic approach to the project included undertaking some basic manipulation of the model to get a sense of its sensitivity to variations in input parameters; collection of field data on work zone volumes, queue lengths, and vehicle speeds; comparison of observed field data and model estimates; and comparison of observed field data with input assumptions (e.g., comparison of observed volumes in work zones with those noted in table 1).

Data collection was done using videotaping equipment (i.e., traffic was videotaped from freeway overpasses and later processed to obtain basic speed and volume data), tube- and loop-based automatic counters (although these were used sparingly), and manual observations in the field.

SITE SELECTION/DATA COLLECTION

The data that were used in this project were collected at a variety of sites—some sites were used exclusively for this project while others were used for other projects as well. Some data collected separately by MDOT (for other purposes) were also used.

A "good" site for this project would have been one where there was, predictably, no congestion at some times of the day and congested conditions at others. For example, a site where traffic flow was relatively light leading up to rush hour (e.g., no congestion at, say, 3:00 PM) and then picked up during rush hour so that there was congestion and queuing would have been ideal. Work in the zone would have had to have been continuous and similar throughout the period. Moreover, the site should have been relatively free of other characteristics that might affect traffic flow (e.g., variations in lane width, nearby ramps). With this sort of site, field observations would have shown the effects of the work zone on capacity and queuing (and the cause of queuing) and analysis would have been reasonably straightforward.

Basically, what was desired from the capacity perspective was a site where sufficient data could have been collected to illustrate a parabolic) speed versus volume plot (theoretically parabolic-shaped) that starts out at low volume (and relatively high speed), shows decreasing speed with increasing volume, and finally, as traffic volume reaches and exceeds capacity, begins showing decreasing speed and decreasing (through) volume (highly congested conditions).

In addition, sites had to be consistent with the data collection procedures. Sites which did not afford appropriate vantage points for the videotaping equipment had significantly less utility. In some instances, tube-based counters were used although even that was difficult as the data collection equipment had to be placed by Michigan State University (MSU) personnel, a problematic activity in high-traffic areas. Finally, sites had to be safe enough to allow manual collection of data (which eliminated other sites).

Finding sites such as just described posed significant problems from the outset. Many sites which would have been useful had restrictions on construction (e.g., nighttime work only) or varying conditions during the day. Thus, for example, a site that would have been "good" had work been done during the day was generally not useful. Moreover, even acquiring lists of projects that MDOT identified as potentially useful was problematic. Other sites, where work was done during the day, often proved to be inappropriate since congestion-related delays were simply not a problem or occurred only sporadically (and, most probably, for reasons other than capacity problems). In these instances, although there were delays due to reduced speed through the work zones, there were no queue-induced delays as a general result of the traffic volume exceeding capacity. In these latter instances, measurement of traffic volumes to approximate capacity was fruitless.

Notwithstanding the substantial problems in identifying appropriate sites, there were three primary sources for the data used in this project. Data were collected at several new sites specifically for this project. Data collected at other sites in prior years (e.g., during a work zone speed project which included data collection in 1997) were re-processed to show speed vs. volume relationships. Finally, some data from construction sites on I-94 and I-275 which had been collected by MDOT for other purposes were also used.

ANALYSIS AND RESULTS

The next several sections are addressed to the findings of the project regarding the objectives identified earlier: verification and/or modification of the "recommended work zone capacities;" results of speed studies at work zones when the traffic "demand" equals capacity; and measurement of queue lengths in the field. It should be noted that what was really observed in the field were 15-minute flow rates rather than volumes *per se*. This should not adversely affect the results that are reported.

VERIFICATION/MODIFICATION OF WORK ZONE CAPACITIES

The basic question to be addressed was "what are the lane-by-lane and overall capacities of lanes through a work zone?" The answer to the question was basically determined graphically by constructing speed versus volume plots for given situations. Theoretically, principles of traffic flow theory suggests that some sort of parabolic-shaped curve should be observed with the apex of the curve indicating the capacity. In reality, the data from the sites that were used did not generally produce such "clean" outcomes. However, sufficient data were obtained in several instances to approximate capacity under certain conditions.

The results shown in table 2 are from sites where data were collected by MSU or MDOT. The latter were part of an extra Michigan State Police enforcement effort in work zones that was funded by MDOT. Many other sites were also observed during the summer of 1998 specifically for this project (e.g., US-127 near I-69, US-27 near Mt. Pleasant, and I-69 southwest of Flint). Unfortunately, the data from these sites were often not useful for the reasons stated earlier—e.g., there was no congestion and/or queuing or volume decreases occurred for other reasons (not related to traffic volumes exceeding capacity in the conventional sense). Data from these sites are not shown here and, in many instances, were not even processed once it was clear that they would not be useful for the task at hand.

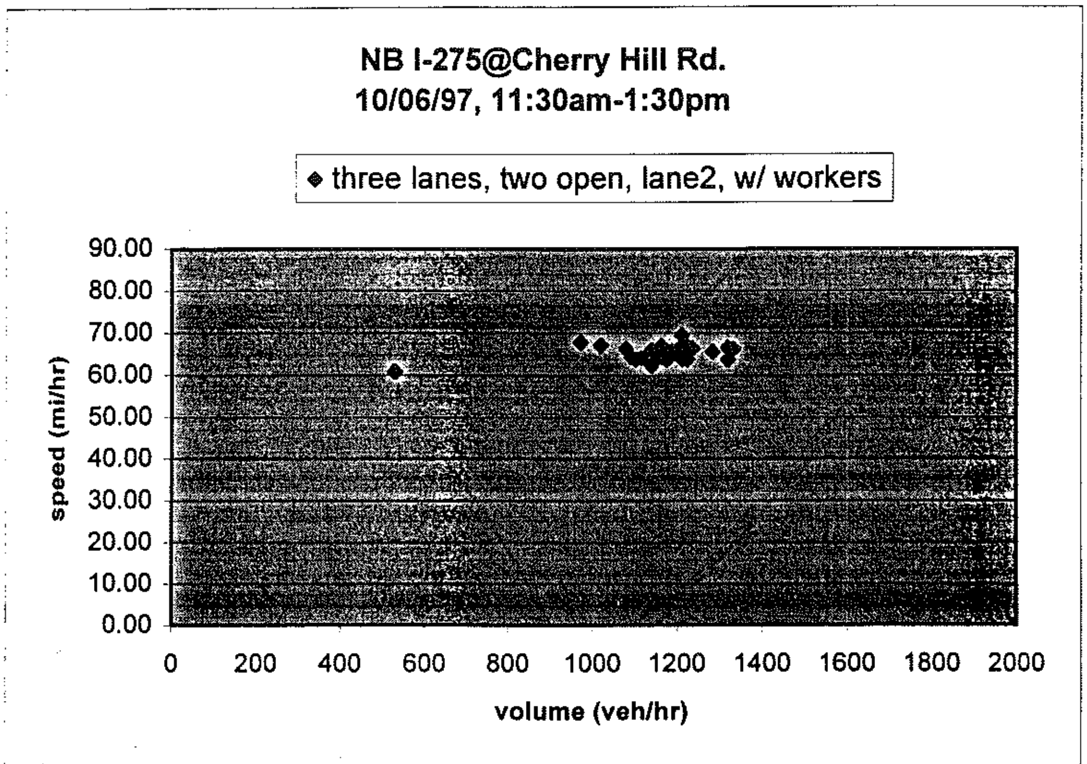
Turning to the results in table 2, the first three columns are reproduced from the delay model documentation (which, in turn, comes from MDOT). The numbers in column 3 (recommended VPHPL) are the ones that are being verified. The rest of the columns show the results—i.e., what was observed in the field. It should be noted that data were only available for three lane reduction scenarios: 3→1, 2→1, and 3→2. No data were collected where lanes were reduced 5→2, 4→2, or 4→3 as MDOT identified no sites with these configurations. While the unavailability of data for all conditions is unfortunate (although not unexpected), some of the most common lane reduction scenarios encountered by motorists are accounted for in the table.

Note that the observed VPHPL values are not necessarily the maximum that could have been observed (i.e., capacity)—they are the maximum observed during the data collection period and based on 15-minute data collection periods. In several instances, the speed vs. volume plot did not show specific evidence of capacity having been reached (i.e., the theoretical parabolic shape resulting from a roadway becoming so congested that speeds and volume both decrease). Figure 1 provides examples of data from each of two lanes (one graph each) at one site where the maximum volume (capacity) may not have been achieved. In each of the instances shown, what appears to be the case is that these are relatively free-flowing vehicles with the variations noted within the time period. Figure 1

Table 2. Observed and current "recommended" work zone capacities

# of lanes		average recommended	observed		workers	police		range	average	
normal	open	VPHPL[1]	VPHPL	lane #	presence	presence	site	observed	speed	other comments
3	1	1400	1600	n/a	unk	yes	I275	300-600	15-65	some evidence of parabola
			1600	n/a	unk	no	I275	200-1600	15-70	some evidence of parabola
2	1	1550	1600	2	yes	no	WB M14@Dixboro	1100-1600	20-45	
			1700	2	yes	no	EB M14@Dixboro	1200-1700	50-60	
5	2	1600	not observed							
4	2	1700	not observed							
3	2	1700	1700	2	yes	no	NB I275@Joy Road	1300-1700	20-40	
			1900	3	yes	no	NB I275@Joy Road	1400-1900	20-40	
			1350	2	yes	no	NB I275@Cherry Hill	900-1350	60-70	outlier at 550
			1200	3	yes	no	NB I275@Cherry Hill	700-1250	65-75	outlier at 550
			1800	1	yes	no	WB I94@Junction	200-1800	40-60	
			2300	2	yes	no	WB I94@Junction	200-2300	45-65	outlier at 2550
			1250	1	yes	no	WB I94@Junction	250-1300	50-60	
			1750	2	yes	no	WB I94@Junction	200-1750	55-65	
			1700	1	unk	no	EB I94@Junction	200-1700	25-60	some evidence of parabola
			2200	2	unk	no	EB I94@Junction	150-2200	25-65	some evidence of parabola
4	3	1750	not observed							

Notes: 1. "recommended" is the current recommended practice from MDOT and delay model manual



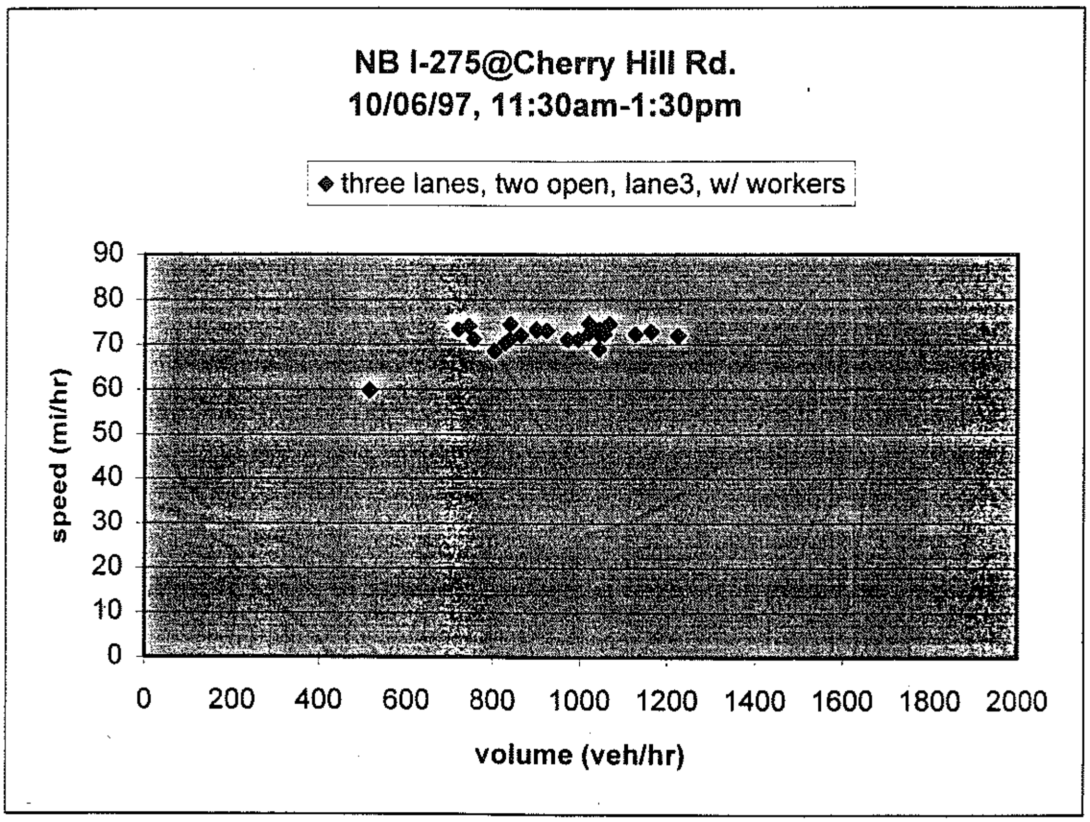


Figure 1. Examples of speed vs. volume plots for two adjacent lanes—free flow

is reasonably typical of sites where the data did not evidence of decreasing speeds with increasing volumes. Again, the volume shown as "capacity" is really the maximum volume that was observed—capacity could, in fact, be higher.

On the other hand, for a couple of sites there was some evidence of the expected shape (although it did not "fit" very well statistically). As an example, figure 2 shows data from I-275 (one lane open) where the speed decreases (from 50-60 mph to just under 50 mph) as volume increases to at least 1600 VPHPL. There are then additional data at relatively low speeds (40 mph and below) with lower observations of VPHPL. Other examples are shown in appendix A.

Although based on relatively few observations at several sites, it seems clear that there is consistent evidence that the observed values of VPHPL exceed those of that are currently "recommended" (table 1) for all three lane-closure scenarios that were examined. These data also provide evidence that there is variation between the lanes. This is not unexpected, but the implicit assumption in table 1 was that both lanes had the same capacity. Using the averages of the maximum volumes of the two adjacent lanes as a comparable value in the multiple lane situation, the observed maximum volumes were generally about 200 vehicles higher than those in the "recommended" column. That is, for a 3→1 lane closure, the observed VPHPL was 1600 vs. the "recommended" 1400; for a 2→1 closure the observed-recommended comparison was 1650-1550; and for a 3→2 closure it is 1900-2000 vs. 1700.

In conclusion, it appears that, based on the data at hand, that the recommended values of the capacity could be increased on the order of 200 VPHPL. At a minimum, when analyses are done that require use of a capacity assumption, alternative analyses should be done with the currently recommended figures as well as +200 values. As a caveat, it should be noted that "capacity" is affected by several things such as lane width, offset of obstructions (e.g., barrier walls) from the traveled way, the adjacent work activity, motorist aggressiveness, and so on. The data shown here indicate that for the several situations observed, higher volumes were accommodated than would be expected from the figures in table 1. Neither set of numbers is "absolutely" applicable for all situations.

Finally, it should also be noted that the term "average capacity" is used when referring to the numbers shown in table 1. However, it is not clear over what range these "averages" were calculated nor is there any indication of a confidence level or standard deviation about this average. If, in fact, they truly are average values, then the observation of some volumes greater than those shown in the table obviously would have occurred (unless there was zero variance). In this context, the "+200" adjustment represents an increase of about 11-14% over the current figures which is likely within what might be expected for a confidence interval about a mean value.

So, while the volumes observed in the field were consistently higher than the current recommendations in table 1, they may well be within the range of "normal" expectations of variation. What is ***strongly recommended*** is that any calculations of delay based on

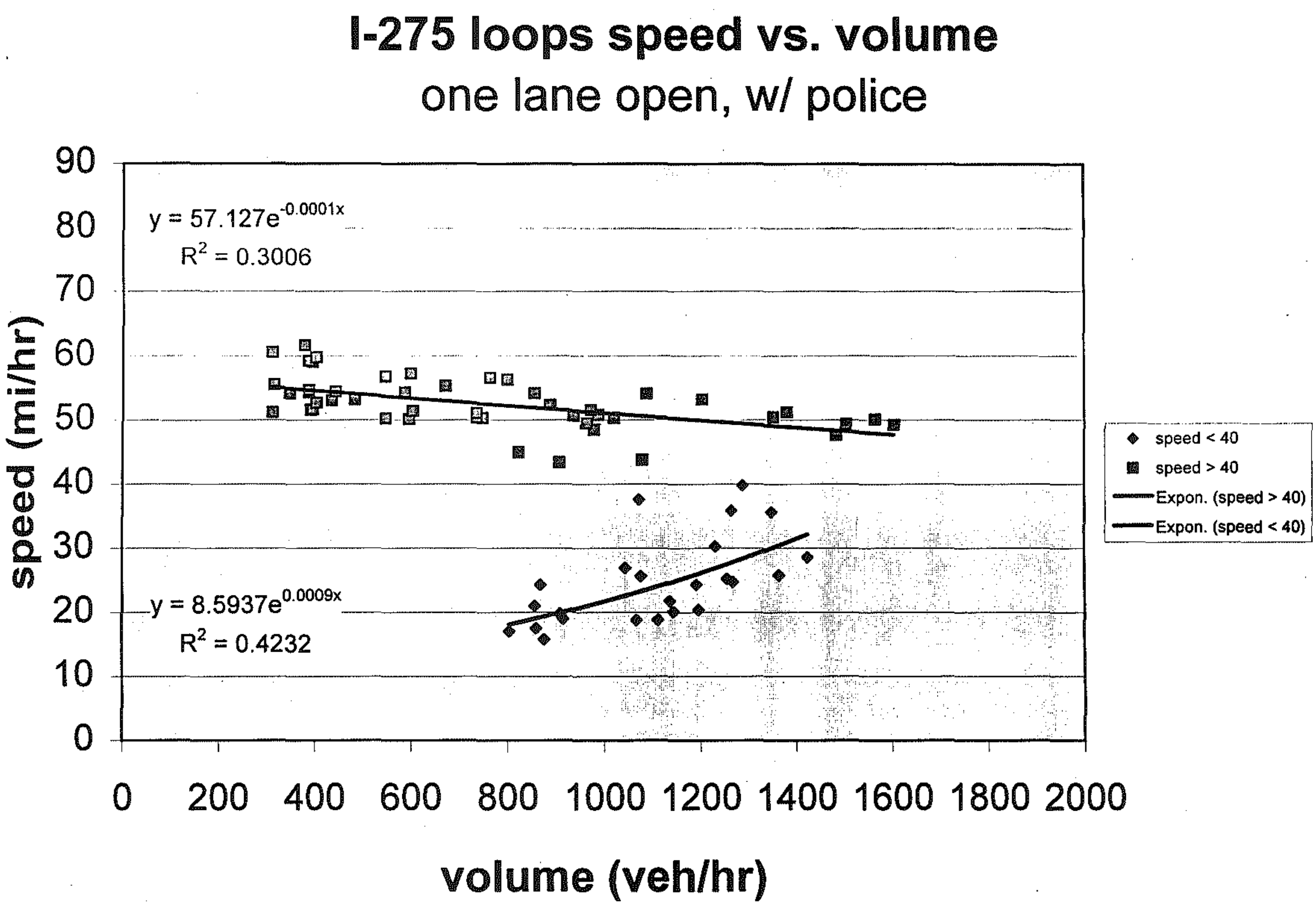


Figure 2. Example of speed vs. volume plot—showing capacity

volumes exceeding assumed lane capacities (whether using the delay model or any other approach) be done for a range of assumed values of capacity. The sensitivity of any findings (e.g., when to do reconstruction) with respect to such assumptions should be thoroughly investigated.

OBSERVATIONS OF VEHICLE SPEED WHEN TRAFFIC VOLUMES APPROACH CAPACITY

MDOT also desired to know about the relationship between speed and traffic volumes near capacity. The ranges of vehicle speeds observed at different volumes for the selected sites were also shown in table 2. The relationships shown in figures 1 and 2 are also characteristic of relationships observed in the field.

In general, inspection of these graphs tends to show one of two patterns. The first pattern that emerged is that when congestion does not appear to be slowing vehicles, they travel at more-or-less an "average" speed for the conditions that are present; and that average does not vary much with volume or decreases very slightly with increasing volume. This is evident in figure 1—average vehicle speeds were relatively high (60-70 mph in lane 2; 70-75 in lane 3) and did not vary much although volumes changed in the one instance from about 700 to 1200 vehicles. This same trend was seen at other sites and under other conditions. Figure 3 is another example. In this instance there is a decrease of about 5-10 mph (from 65 or so to about 55) in the average speed as volumes increase in the lane from about 200 to over 2300. Also in this instance, there is more variation in average speeds at high volumes, which would be expected.

The second trend can be seen in figure 2 (already presented). When congestion is "reached," there appear to be two distinct regions—relatively free-flowing conditions where average speeds decrease slightly as volumes increase (in this instance about 5 mph over a range from 300 to 1600 vehicles; and, then, once congested conditions are reached, significant decreases in average speeds (average speeds in what is seen to be the "congested region" of figure 2 range from about 15 to 40-45 mph).

The important point here though is that in both patterns there appears to be a "natural" (or reasonable) speed that is established by the response of motorists to site conditions which can be fairly well maintained until congestion (or some other "extra" event) occurs, then it breaks down. Previous work (more specifically, the ***1997 Work Zone Speed Study*** by Lyles, Sisiopiku et al. in 1998) has shown that this speed is a function of site characteristics—principal among them are the number of open lanes, whether the lane has reduced width, the type of separation between the travel lane and the workers/work activity (e.g., barrier walls, drums), and whether workers were present or not. That work also showed that the posted speed limit was almost certain to be violated (i.e., average speeds would be considerably higher than the posted limit) when congested conditions were not present. In a separate analysis of the same data reported in the ***1997 Work Zone Speed Study***, it was shown by Krunz (1998) that a "work zone intensity factor" based on these factors showed promise in predicting work zone speeds under non-congested

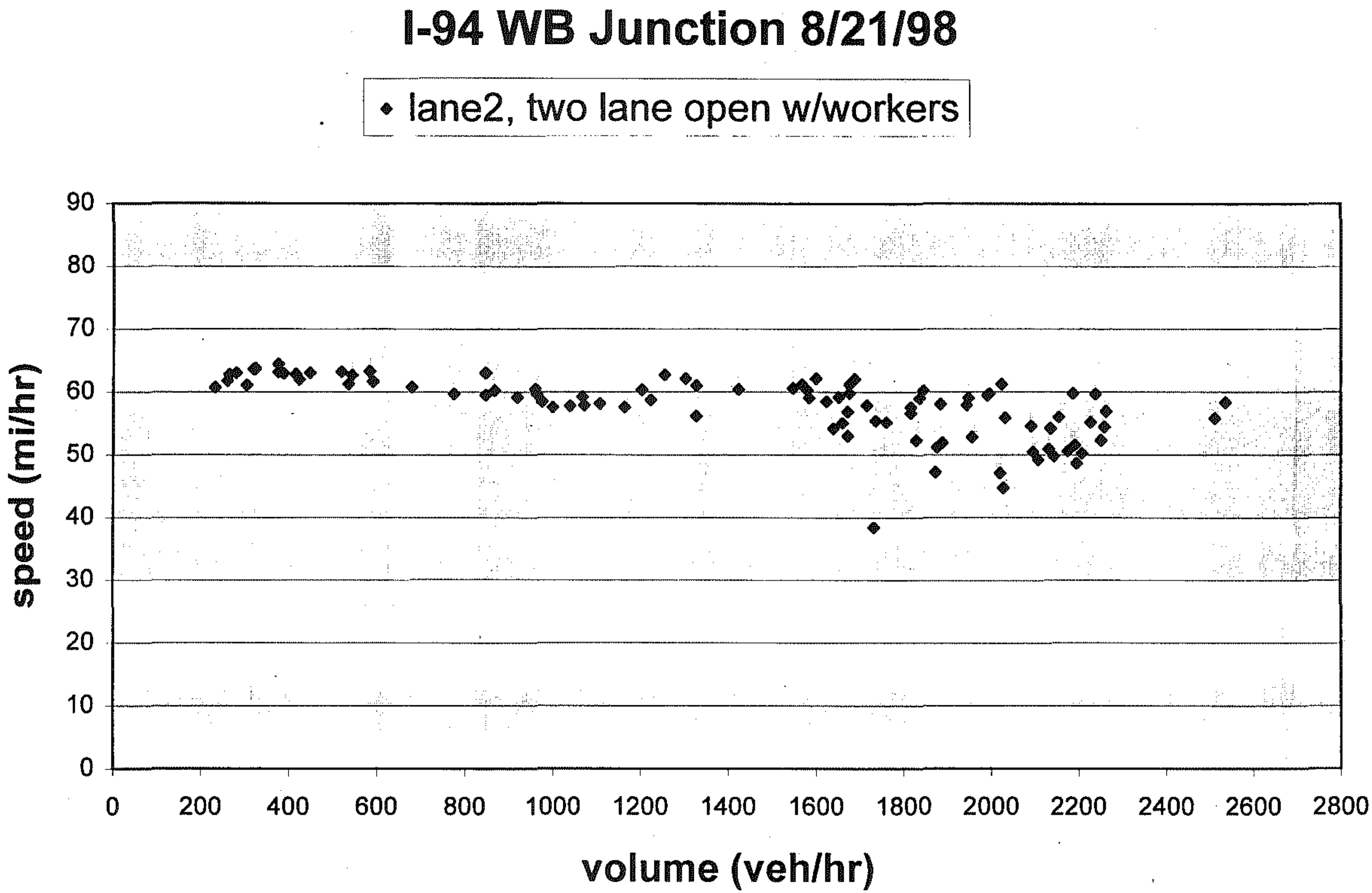


Figure 3. Speed vs. volume plot showing speed decreases w/increasing volume

conditions. The intensity factor varied from 1 to 18 where 1 meant that the work zone was "least intensive" (three open lanes, no lane width reduction, barrier walls separating the work from the travel lanes, and no workers present) and 18 represented the "most intensive" situation (one open lane, lane width reduction, cones separating work from travel lanes, and workers present). The average speeds observed ranged from just under 70 in a least-intensive zone to about 54 in a most-intensive (one-lane open) zone. It should be noted that none of the zones studied had significant lane shifts or high-volume ramps near to where the speed data were collected—the point being that there are other factors that could affect the overall travel speed through the zone as well. An excerpt from the analysis by Krunz, average speeds calculated for various levels of work zone intensity, is shown in table 3.

Table 3. Work zone intensity and observed speed

number of open lanes	lane reduction	lane separation	worker presence	assigned intensity	observed average speed (mph)
3	no	walls	no	1	69.58
3	no	walls	yes	2	68.57
3	no	drums	no	3	---
3	no	drums	yes	4	---
3	no	cones	no	5	---
3	no	cones	yes	6	---
2	yes	walls	no	7	65.2
2	yes	walls	yes	8	---
2	yes	drums	no	9	64.93
2	yes	drums	yes	10	64.85
2	yes	cones	no	11	---
2	yes	cones	yes	12	---
1	yes	walls	no	13	---
1	yes	walls	yes	14	56.85
1	yes	drums	no	15	58.41
1	yes	drums	yes	16	54.38
1	yes	cones	no	17	---
1	yes	cones	yes	18	53.79

In this context, the prediction of speeds in work zones (so that delay in traveling through the zone can be estimated) is seen to be fairly difficult. If vehicles are relatively free-flowing (i.e., there is not congestion within the zone), the average speed appears to be a function of the characteristics of the zone itself. Data collected during the 1997 and 1998 construction seasons showed that average speeds in uncongested zones could range from about 50 to greater than 70 mph but that the average speed was virtually always higher than the posted speed limit. Based on the sparse evidence reported earlier (table 2), when congested conditions are reached, average speeds can and do drop well below 40 mph. In these situations, the "speed at capacity" appears to have been in the 40-50 mph range.

But, when work is "intense" and traffic volumes high, it is obvious from anecdotal experience that traffic through the zone can become "stop and go" with average speeds at 20 mph or lower.

In conclusion, the selection of an assumed speed for travel through a work zone for the purposes of calculating delay is fraught with problems. The most significant (and fairly obvious) one is that each work zone is unique—there are numerous factors that change from zone to zone and the interaction among these factors is what motorists respond to when "selecting" the speed that they think is appropriate. Based on previous work on work zone speeds and the observations and data from the 1998 season, the following rough guidelines are offered as estimates of the realistic speeds that are being achieved through work zones in uncongested situations:

- for least-intensive work zones with multiple open lanes, barrier wall separations, and no lane width reductions—65-70 mph;

- for moderately-intensive work zones with multiple open lanes, less than barrier wall separations, and lane width restrictions—60-65 mph; and

- for most-intensive work zones with single open lanes, less than barrier wall separations, and lane width restrictions—50-60 mph.

When it is expected that the zone will be operating near capacity, the assumed average speed should probably be in the 40-50 mph range and much lower speeds are probably more appropriate if congestion is expected. Anticipated areas of "spot" congestion through the zone should also be factored in to lowering the average travel speed. An example of this would be a zone that generally falls into the least-intensive category but it is known that there will be one or more areas where work will be more intensive (e.g., work on an overpass which would require a lane narrowing or minor shift within an overall zone which is fairly open) or where there is an artifact such as a difficult/awkward entrance-ramp merge (because of construction).

Finally, as with the assumptions for capacity, it is ***strongly recommended*** that any analyses should be done with a range of assumed operating speeds so that the sensitivity of the analysis to changes in the assumptions is clear.

QUEUE LENGTH VERIFICATION

The last objective for the project was to measure queue lengths in the field and compare them with those predicted by the delay model. The basic problem was finding sites where queuing was occurring (as noted earlier)—e.g., many otherwise appropriate sites were restricted to nighttime work when volumes were lower and/or appropriate volume data could not be collected; many sites where work was being done during the day did not have sufficient traffic volumes to result in queuing. Other sites were quite short-term and opportunities were missed when they were "checked out" one day and deemed good to use only to return later and find that the work was either completed or that the work site configuration had significantly changed so that the queuing problem no longer existed. So, while some data were collected at numerous sites, only a very few were fruitful.

Relatively detailed analyses were, however, done at two sites. These serve to show at least some difficulties with using the delay model to predict queue length. The two sites that were monitored were US-127 NB in the vicinity of its junction with I-96 and I-196 WB in Grand Rapids.

It should be pointed out that despite the relatively complex instructions for the model and the sometimes daunting spreadsheet print-outs that are produced, the basic queuing model is fairly simple and deterministic. The fundamental model is that queuing will occur if the volume to be accommodated exceeds capacity. It does **not** easily allow for the effects of, say, lane shifts, near the start of a zone or narrowed lanes. These "allowances" or accommodations have to be made by the model's user through adjustment of assumed capacity or operating speeds.

US-127 NB AT INTERCHANGE WITH I-96

The construction work being done at this site was a bridge deck replacement on northbound US-127. The actual work site was about 0.5 miles in length. The work was done during the day and resulted in one of two lanes being closed (day and night) for the duration of the work period. There was a barrier wall adjacent to the actual work area although the wall did not extend very far beyond the actual work area. During (relatively) high-volume times, and especially the AM rush period, there was considerable queuing of northbound traffic. The posted speed limit through the construction zone was 45 mph. The site was complicated by the fact that a ramp from eastbound I-96 merges with northbound US-127 immediately prior to the lane closure area.

Actual speed and volume data were collected at the site and queues were observed and measured. The volume and speed data were used in the delay model with other standard assumptions. The maximum hourly volume was 1012 for 5:00-6:00 PM while the maximum AM rush volume was 993 for 6:00-7:00 AM. Average overall speeds through the zone varied between 34 and 39 mph and dropped during congestion periods to 5-15 mph. The model was then used to predict average delays in time and queue lengths (i.e., number of vehicles queued, length of queue in distance). The detailed summary outputs from the model are provided in appendix B for a variety of conditions. Results are summarized in the paragraphs that follow and in table 4.

The model was initially run at assumed capacities of 1,550 and 1,400 (the one-lane capacities from table 1) with various speed assumptions. No queuing or significant delays were predicted as the actual traffic flow never exceeded the assumed capacity. These numbers were not, however, adjusted for the ramp intersection (which was not actually within the closure zone *per se*). The model was then run at an assumed capacity of 1,000 VPHPL. This volume, on the other hand, is considerably lower than the recommended

Table 4. Model outputs for US-127 site for various assumptions of capacity and speed

assumed capacity	zone speed low volumes	zone speed near capacity	max queue vehicles	max queue distance	max delay minutes	user costs of delay
1000	45	15	0	0.0	1.6	$2,222
1000	45	10	0	0.0	2.5	$3,434
1000	45	5	0	0.0	5.2	$6,852
1000	39	15	0	0.0	1.6	$2,325
1000	39	10	0	0.0	2.5	$3,537
1000	39	5	0	0.0	5.2	$6,955
1000	34	15	0	0.0	1.6	$2,438
1000	34	10	0	0.0	2.5	$3,650
1000	34	5	0	0.0	5.2	$7,069
900	45	15	74	0.4	6.5	$4,219
900	45	10	68	0.4	7.1	$5,408
900	45	5	50	0.3	8.9	$8,855
900	39	15	74	0.4	6.5	$4,297
900	39	10	68	0.4	7.1	$5,487
900	39	5	50	0.3	8.9	$8,934
900	34	15	74	0.4	6.5	$4,383
900	34	10	68	0.4	7.1	$5,574
900	34	5	50	0.3	8.9	$9,022
800	45	15	177	1.0	14.8	$10,370
800	45	10	168	1.0	15.2	$11,417
800	45	5	141	0.8	16.1	$14,462
800	39	15	177	1.0	14.8	$10,425
800	39	10	168	1.0	15.2	$12,084
800	39	5	141	0.8	16.1	$14,518
800	34	15	177	1.0	14.8	$10,484
800	34	10	168	1.0	15.2	$11,533
800	34	5	141	0.8	16.1	$14,580

"average capacity" for a two-to-one lane closure (see table 1) since there needed to be a correction for ramp traffic. At an assumed capacity of 1,000, there were still no appreciable delays or queuing predicted (again, the actual volume never exceeded the assumed capacity). The results of several runs of the model are shown in table 4. The "zone speed low volumes" are the expected speeds of vehicles through the work zone when there is low volume (e.g., free-flow vehicles). The numbers shown (45, 39, and 34 mph) are, respectively, the work zone's posted speed limit and observed average speeds. The "zone speed near capacity" are the speeds expected through the lane closure area when congestion is present. (It should be pointed out that in this instance, these speeds were "known" from measurements. In an actual pre-construction application of the model, these speeds would have to be estimated.) The time delays are derived from the differences between the normally posted speeds and the work zone speeds—in essence, a "base" for the zone without congestion. The model was then run for assumed capacities of 900 and 800. (In the latter situation, this is the equivalent of assuming that US-127 and the ramp have almost equal volumes since the default ramp volume correction factor is 800.)

The results of these model runs show the following:

- The predicted maximum queue of vehicles (and distance) is very sensitive to the assumption of capacity. For example, although several (observed) hours had volumes near, but not over, 1,000 vehicles (see detailed printout of the model's spreadsheets in appendix B for the actual 24-hour volumes at the site), there was no queuing predicted when capacity was assumed to be 1,000. However, when capacity was lowered to 900, maximum queue lengths were quite large. When the capacity assumption is lowered even further (i.e., when the default correction for the merging ramp is incorporated), the queue increases more than two-fold—even though the assumption is thought to be excessive.

- The queue lengths observed in the field were typically in excess of one mile during the AM rush period—significantly longer than predicted by the model, even under the worst-case scenario of capacity being set at 800 (based on the ramp merge).

- The model outputs on user cost are relatively insensitive to modest changes in the "off-peak" speed through the zone.

Basically, the model did not predict the queuing outcomes very accurately—the capacity assumption had to be reduced to an apparently artificially low level to even "come close." In point of fact, the capacity of the roadway with respect to the mainline volume was at least 1,000 since that many vehicles were, in fact, accommodated (i.e., the actually counted mainline traffic approached 1,000). However, rather than showing that the model is inherently "incorrect," it demonstrates that the uniqueness of this zone is not easily modeled by a straightforward application. Indeed, much of the queuing was probably caused by the action of motorists on NB US-127 who consistently allowed ramp traffic (which was STOP-controlled at the end of the ramp) to merge into mainline traffic. Queues on the ramp were typically just a few vehicles (if that) while mainline queues, as noted, often exceeded one mile. The problem with underestimating queue lengths is that user costs are also then underestimated.

The flaw in the model is that complex situations (such as queue formulation) cannot be easily modeled directly. At the same time, if the work zone can be well enough described in terms of the likely capacity, then the model would probably compensate in a relative sense. However, it should be noted that the work on capacity reported earlier indicated that the capacities given in table 1 might be higher rather than lower.

WB I-196 Grand Rapids

Including the areas where the construction zone signing was placed, this site extended from about milepoint 73 to about exit 67 on I-196. One of two lanes was closed and there were several ramps within the work area. Without going into the same level of detail as the US-127 site, there were similar problems in predicting the queues that were observed. Unless the assumed capacity was lowered to 800 VPMPL, no queuing was predicted by the model, and even then it was not long (e.g., 27 vehicles). The observed queues, on the other hand, were in excess of three miles.

On-site observations indicated that the actual queues and congestion resulted from several factors (which would, indeed, lower capacity a significant, although hard to predict, amount). These included workers at one bridge who would stop traffic whenever a construction vehicle was repositioned, a relatively high-volume entrance ramp, early traffic shifting for the lane closure, and, to some extent, slow-moving trucks in the traffic stream.

Discussion

For the two, quite different, work zones discussed in the previous sections, the delay model was seen to not predict queuing very well. In order to get the model to even show queuing, it was necessary to lower the assumed capacity to what seems to be an artificially low level. For example, it was clear (from observation) that from 900 to near 1,000 vehicles/hour were passing through the US-127 site at some points—but fixing the capacity at 1,000 produced no queues. Adjusting the capacity downwards to 900 and lower in the model produced queues although not as long as were noted in the field. Perhaps more importantly, if an engineer was modeling the likely outcome of this work zone when it was being designed, it is not at all clear that the far lower capacities would have been selected—if not, the queues that formed would have been unexpected.

The model, as noted, is fairly simplistic in how it predicts queues—if "demand" exceeds the assumed capacity, queues form. However, the model does not take into account the probabilistic nature of flow variation nor does it take into account other factors that will cause queuing (e.g., flow disruptions when a construction vehicle is repositioned or enters/leaves a site, the stop and go nature of some ramp merges). Moreover, the actual length of the queues (as opposed to the number of vehicles) is predicated on assumed, but consistent, spacing of vehicles. It was often observed in the field that there is often significant variation in vehicle spacing in work zone queues which will cause the actual length to be different from that predicted by any model using simplistic assumptions.

SUMMARY, CONCLUSIONS, AND DISCUSSION

The following summarizes the results of the three parts of this project:

- The "recommended work zone capacities" (table 1) were observed to be exceeded for the three scenarios (of lane closures) that were studied. Based on the observations made (which were of maximum flow rates and not necessarily capacity *per se*), it appears that the table 1 values could be increased by 200 VPHPL. At the same time, if the values in table 1 are really "averages" for capacity, the observations that were made are within what would likely be an expected variation around a mean value.

- Capacity is clearly dependent on a variety of factors. It was noted, anecdotally, that flow rates were decreased in any number of situations such as when construction vehicles interfered with traffic flow, when workers were very close to the traveled lane, when ramp traffic merged in an awkward fashion with mainline traffic, or when there were lane shifts. The point being that the capacity measurements reported above were taken in "good" locations within work zones. At other locations, capacity could be restricted rather quickly and unexpectedly—these sorts of variations are very difficult to realistically model or anticipate.

- Traffic speeds in work zones vary significantly. For uncongested conditions, there appears to be a "natural" or "reasonable" speed that is predicated on the motorist's perception of what is a safe speed which is, in turn, based on, what has been called here, the "intensity" of the work zone. While more detail was provided in the appropriate section, in summary, in less intensive situations (e.g., where there are multiple lanes of traffic maintained, lanes are not reduced, and the separation between the work and the motorists is done with a barrier wall) average speeds around 70 mph were observed while in more intensive situations (e.g., one lane open, lanes are reduced, separation between workers and traffic is with cones) average speeds were nearer to 50 mph. In congested conditions, traffic speeds are extremely difficult to predict and depend on the volumes themselves as well as worker activity and myriad other factors. If capacity is simply a "volume" phenomenon, the speed at capacity appears to be between 40 and 50 mph (based on limited data). With other factors involved, speeds can easily drop below 40 mph and stop-and-go conditions may occur. It is not at all clear that speeds in truly congested conditions can be accurately predicted.

- Queue lengths were not well predicted by the delay model. For the two sites that were studied in detail, assumed capacities had to be adjusted downward from what might have been otherwise used in order to get the model to "produce queuing." Even then, the predicted queue lengths were significantly shorter than what was observed in the field.

One of the overarching recommendations that result from the above is the absolute need to do sensitivity analysis for any application of the delay (or any other) model when using it to predict delay times and costs. For example, for straightforward sites (e.g., "low intensity" sites with no ramp problems) various assumptions of capacity (e.g., the currently recommended value ±200 VPHPL) should be used in combination with expected daily variations in traffic flow to assess user costs. For complex sites (e.g., "high intensity" sites with high-volume ramps, work-related vehicles expected to disrupt traffic flow), the range of combinations (and most importantly, capacity) considered should be even more extensive.

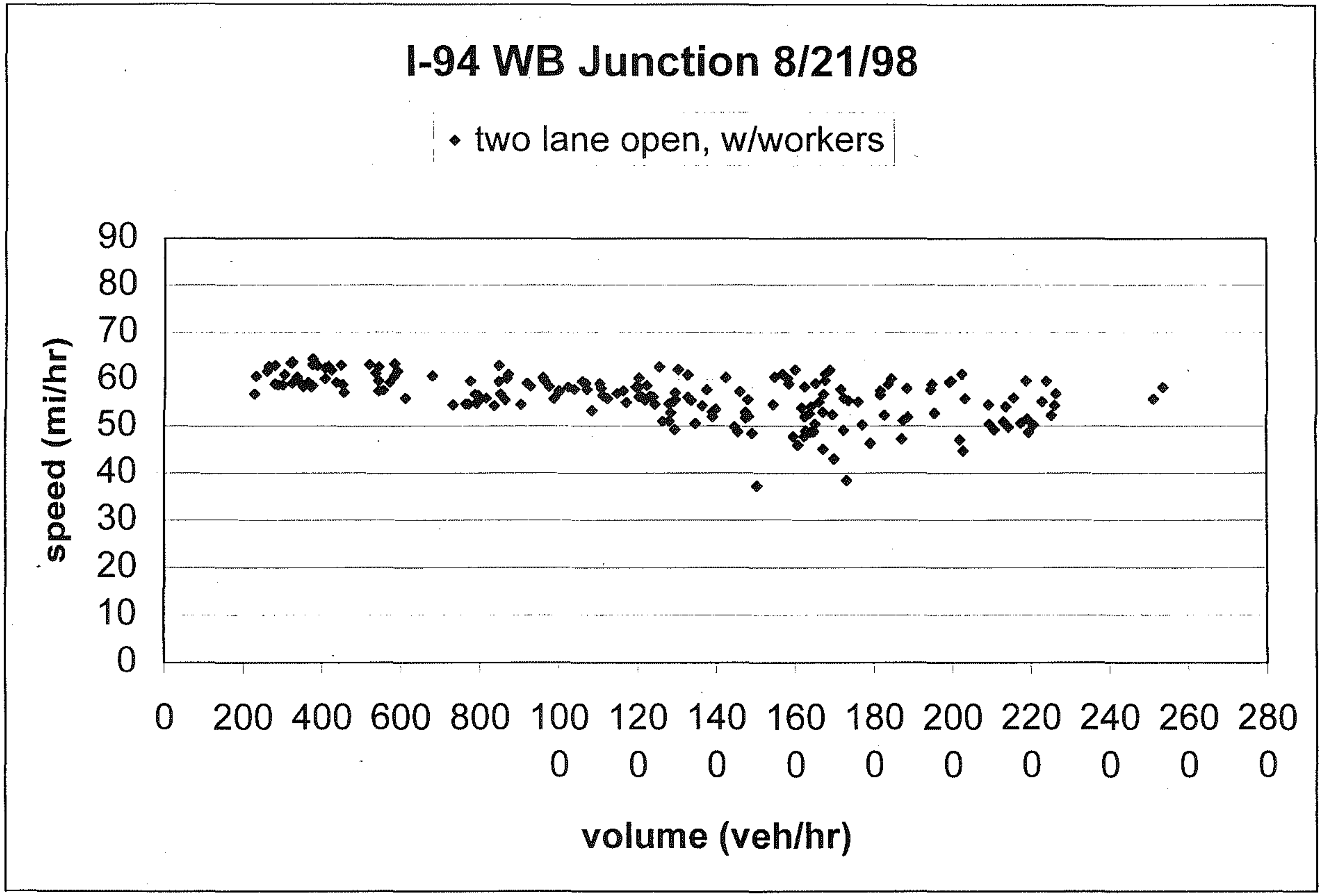
The sensitivity of the delay model to assumed values of capacity is not unexpected—the capacity value (relative to the expected volume on the roadway) triggers the queue formation. The model is simplistic and, arguably, does not provide reliable estimates of queue length and associated delay costs. The question is whether queue formation and delay can ever be simply and accurately modeled. Observation of the several work zone sites where both this study and others have been done over the last two years give credence to the assertion that "all sites are different"—they certainly appear to be unique. The I-69 site southwest of Flint that was used extensively in the 1998-99 speed-related study is a case in point. This site seemed very likely to produce high travel speeds through the zone—visibility was good, the work area was not very "intensive" (although it was restricted to only one lane), and I-69 is generally perceived to be a reasonably high-speed road when construction is not present. However, in this case minor shifts in the lane (e.g., a lane was moved toward the median by a foot or two although it was not narrowed) and other minor attributes of the site seemed to cause speed reductions in addition to a relatively high incidence of through trucks slowing the traffic.

The above points to the need for users of the model to closely evaluate what the likely capacity is not only for the work zone as a whole but at critical points in the zone. This suggests not only the standard sensitivity analysis suggested above, but also perhaps even more specific analysis of "what if" scenarios—e.g., *what if* construction vehicles are likely to inhibit flow at a bridge site once or twice an hour; *what if* the merging of a high-volume ramp is very awkward, causing mainline vehicles to slow or even stop for entering traffic from the ramp; *what if* effective capacity is reduced to 500 or 600 VPHPL. Simply picking a typical value from the "recommended work zone capacities" from table 1 (and the manual) and running the model is not nearly sufficient. The value for capacity must be estimated with care and sensitivity analysis is critical.

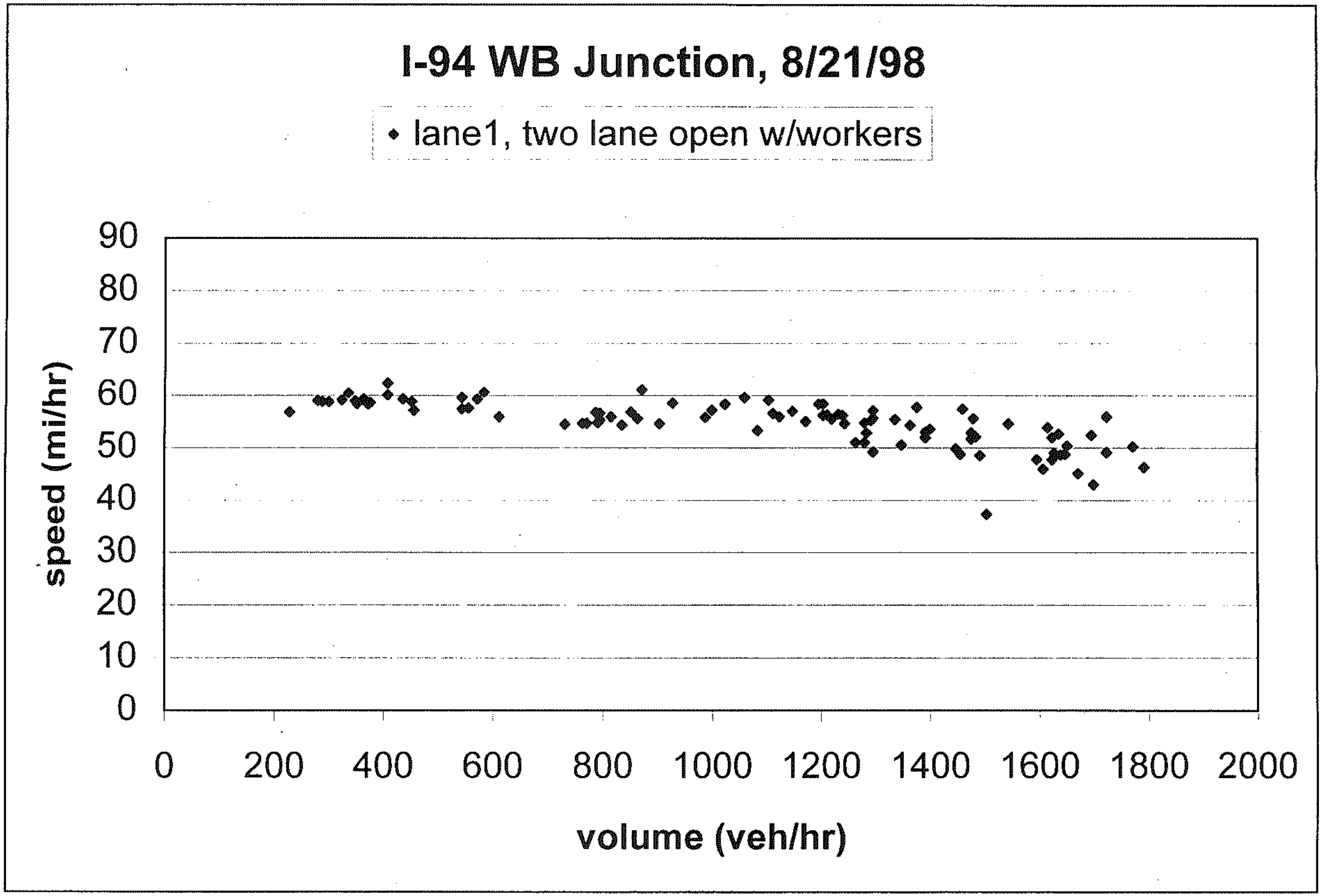
On a more positive note, the delay model does provide consistent results and it is relatively easy to track the effects of changing the values of the input parameters. This is also a function of its simplicity. (Simplicity refers to the root operating structure of the model and not necessarily to the "instructions" and the array of worksheets it produces.) That is, if alternative scenarios are being compared, the potential errors in queue length or delay time predictions will be consistent across alternatives. The model will perform better in this situation (alternatives analysis) since what is desired knowledge about *relative* differences between alternatives and not *absolute* values.

APPENDIX A

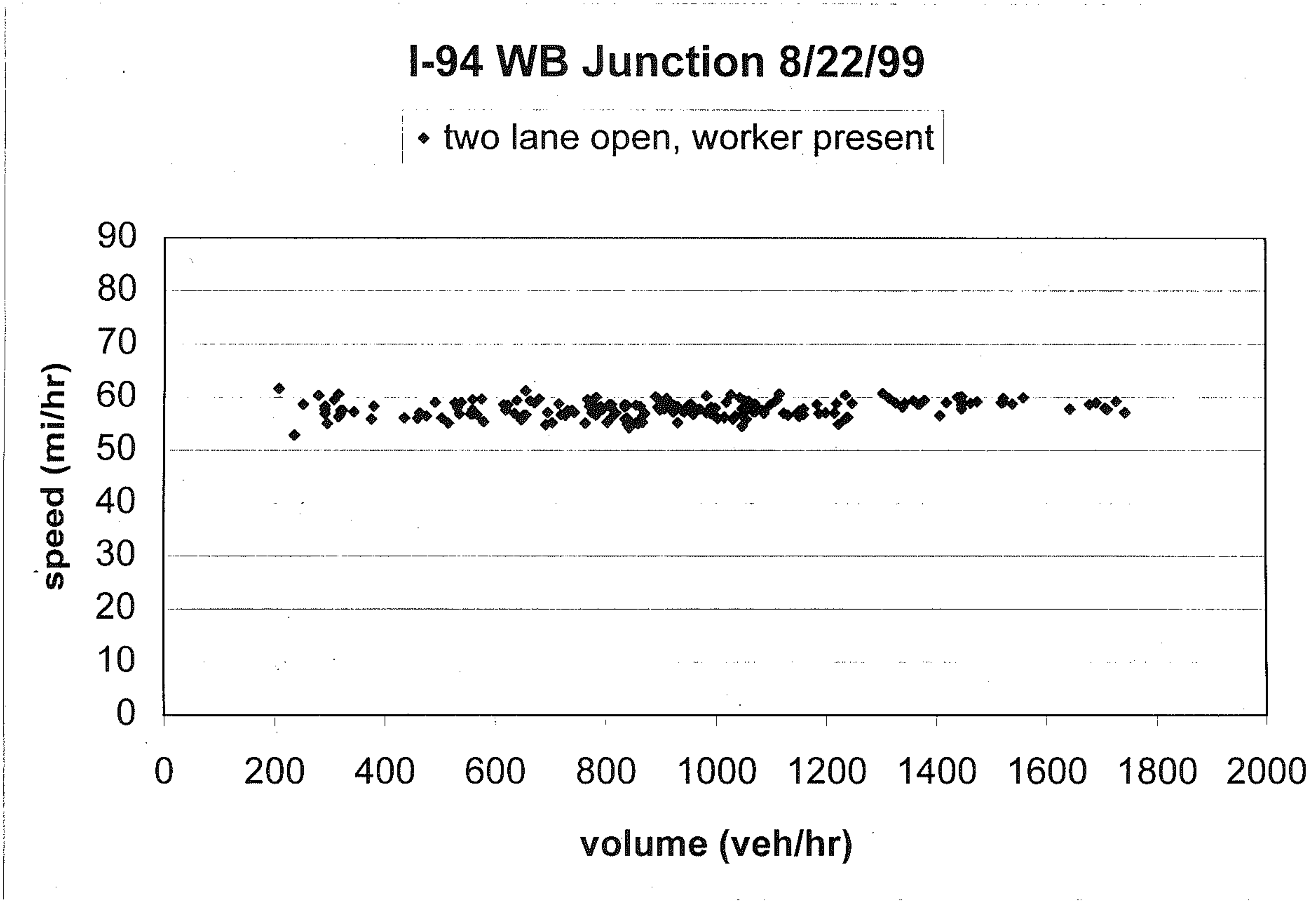
Examples of Speed vs. Volume Graphs



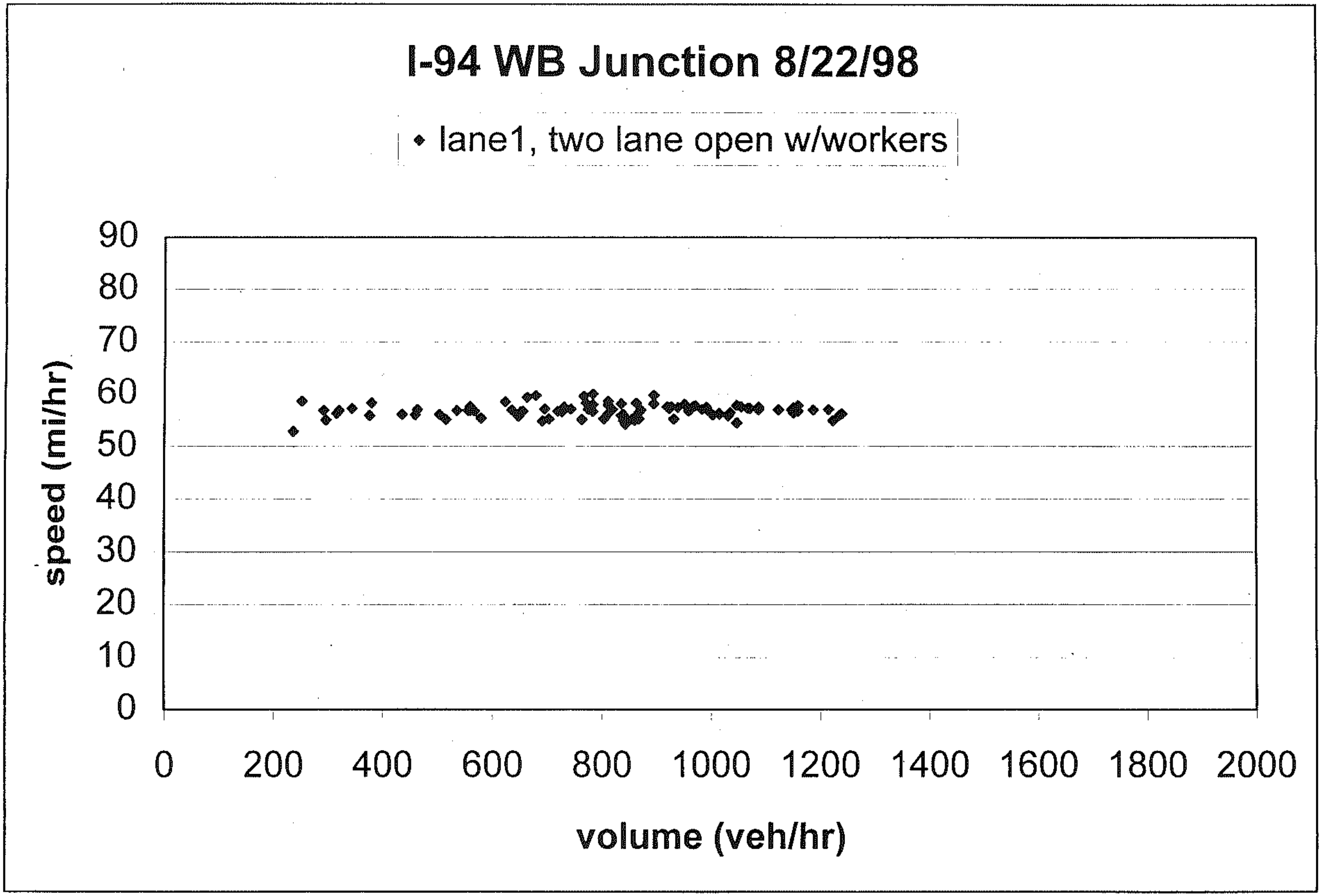
I-94 WB Junction 8/21/98
two lane open, w/workers
speed (mi/hr)
90
80
70
60
50
40
30
20
10
0
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
2400
2600
2800
volume (veh/hr)



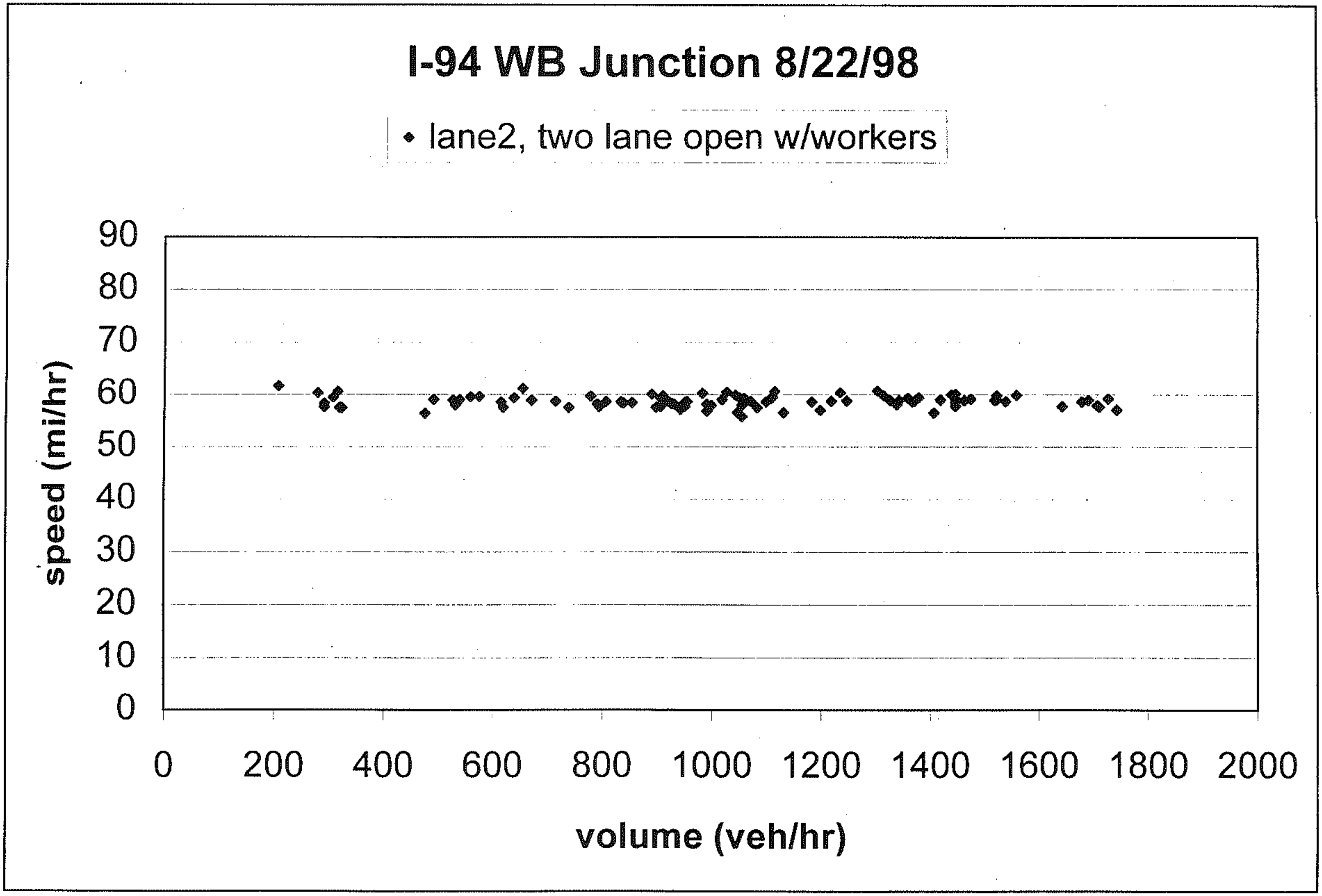
I-94 WB Junction, 8/21/98
lane1, two lane open w/workers
speed (mi/hr)
0
10
20
30
40
50
60
70
80
90
0
200
400
600
800
1000
1200
1400
1600
1800
2000
volume (veh/hr)

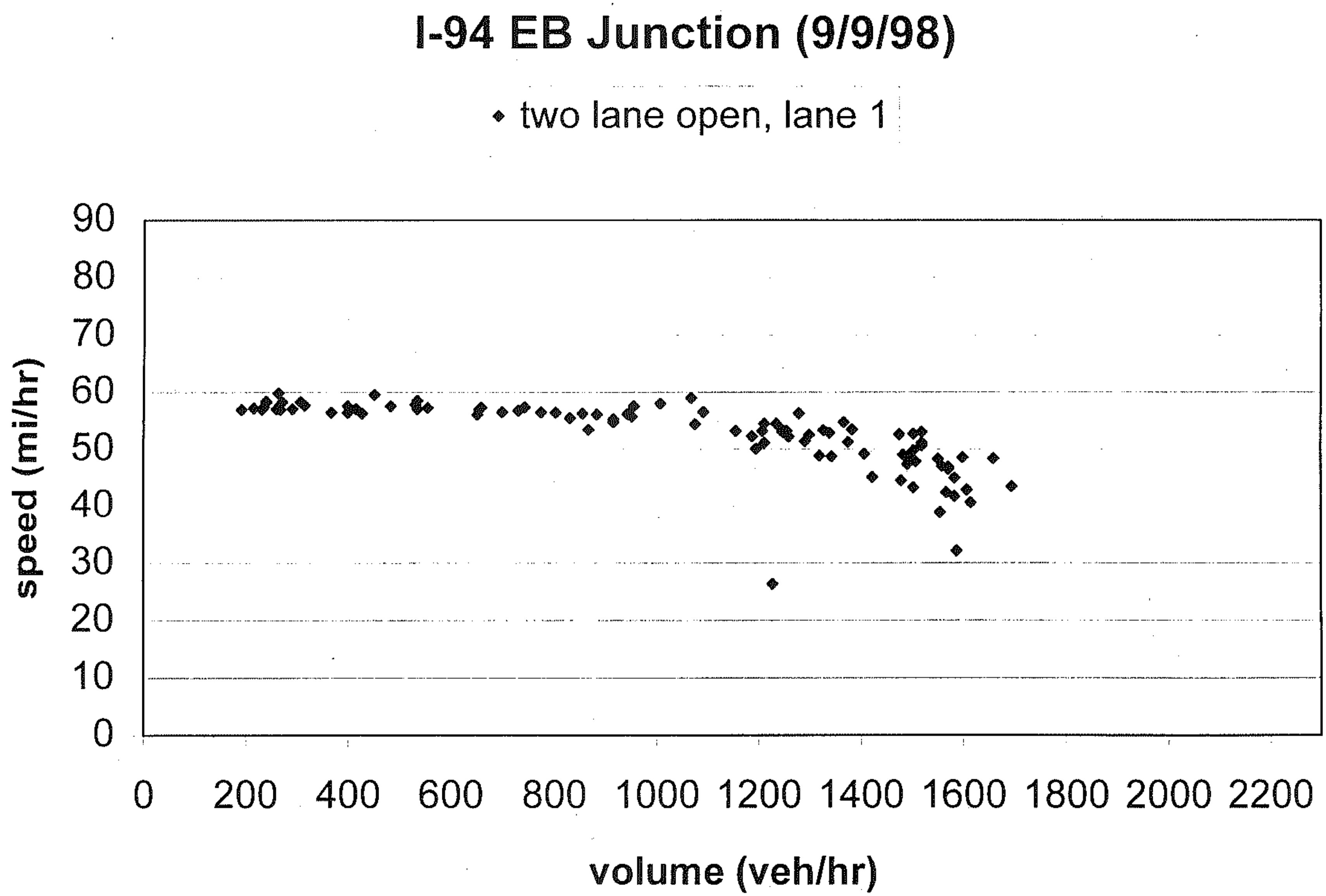


I-94 WB Junction 8/22/99
two lane open, worker present
speed (mi/hr)
90
80
70
60
50
40
30
20
10
0
0
200
400
600
800
1000
1200
1400
1600
1800
2000
volume (veh/hr)

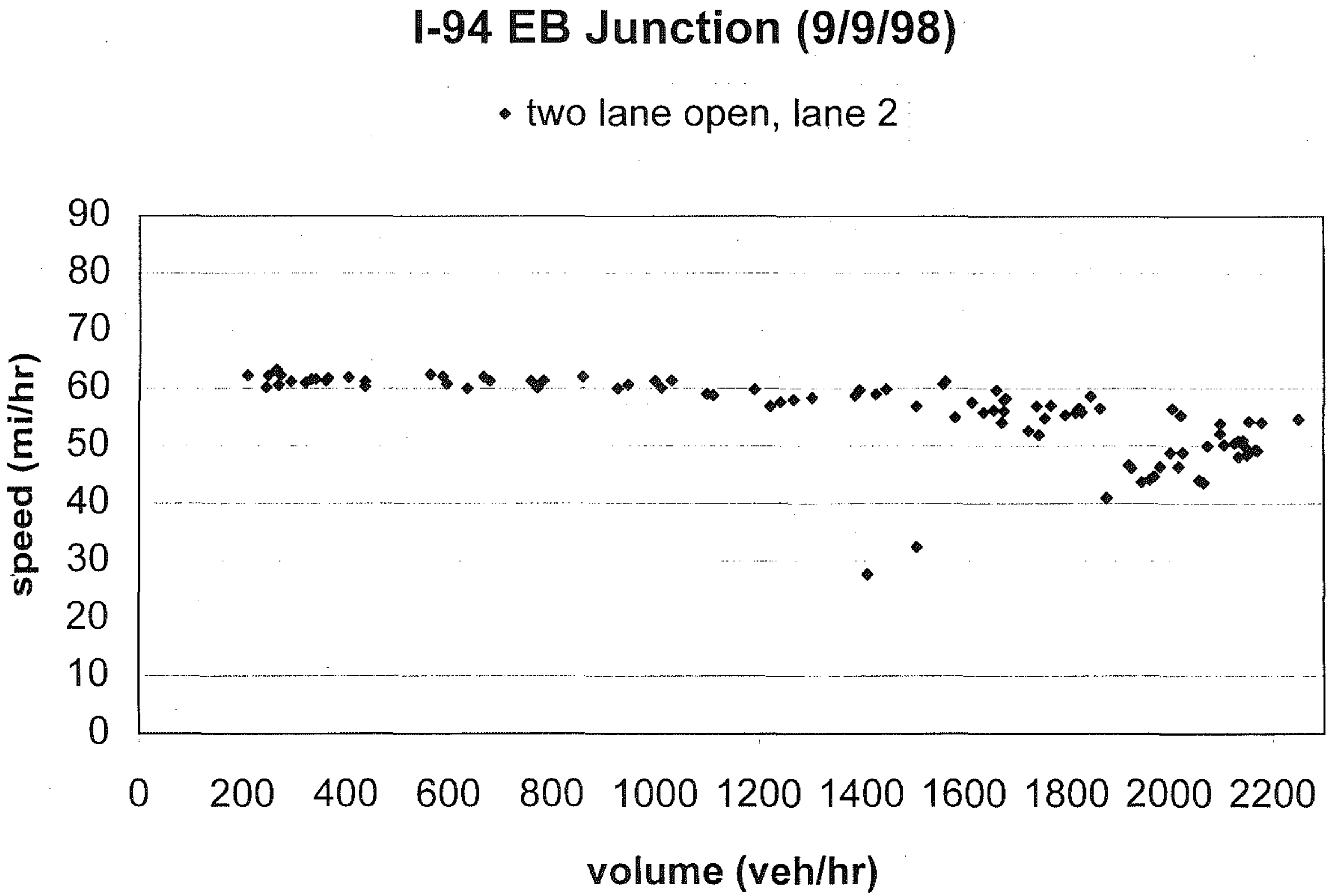


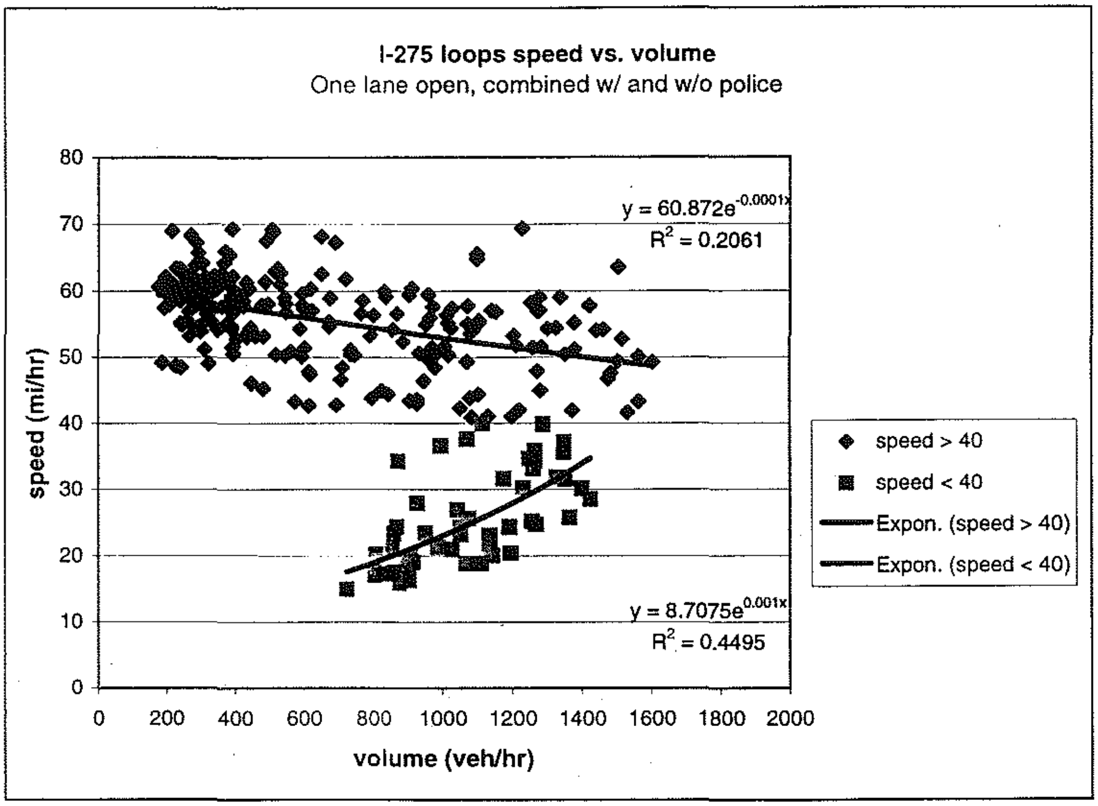
I-94 WB Junction 8/22/98
lane1, two lane open w/workers
speed (mi/hr)
90
80
70
60
50
40
30
20
10
0
0
200
400
600
800
1000
1200
1400
1600
1800
2000
volume (veh/hr)

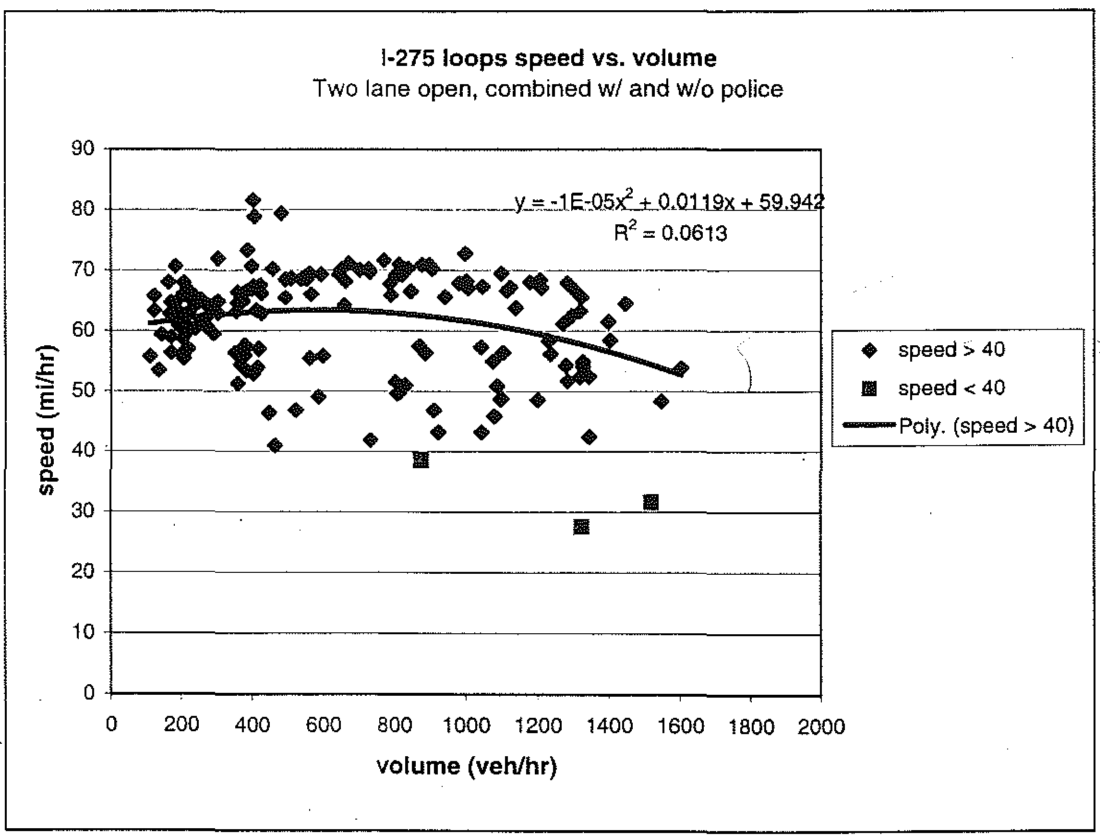

I-94 WB Junction 8/22/98
lane2, two lane open w/workers
speed (mi/hr)
90
80
70
60
50
40
30
20
10
0
0
200
400
600
800
1000
1200
1400
1600
1800
2000
volume (veh/hr)

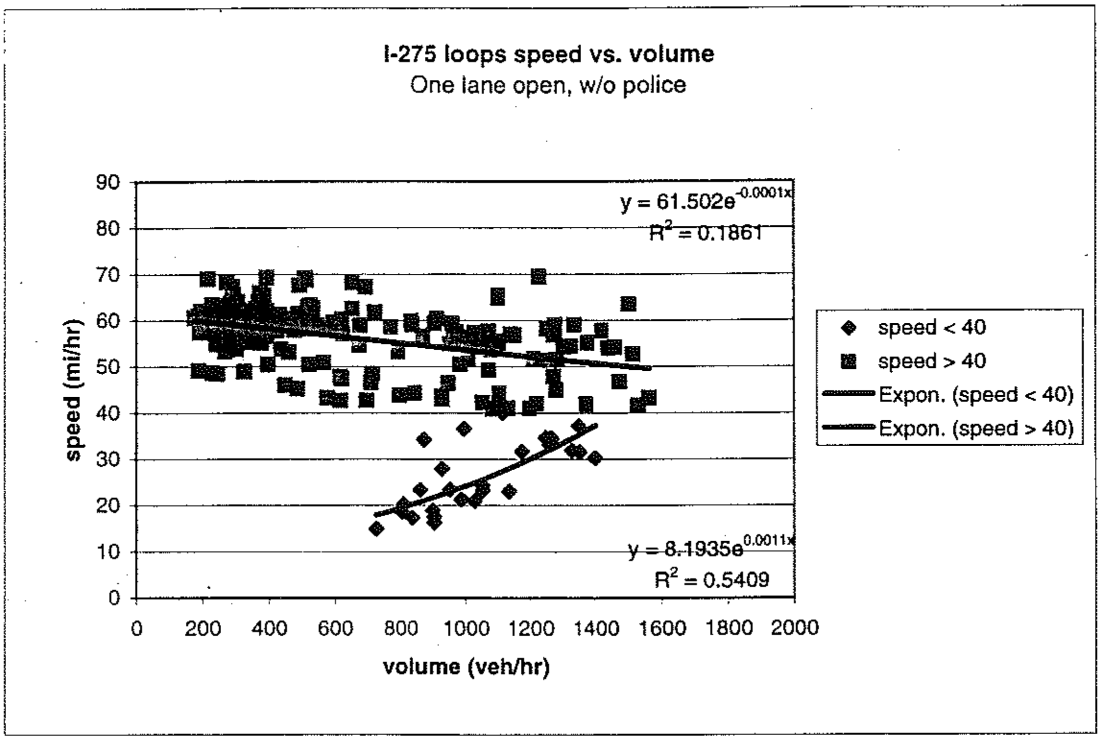


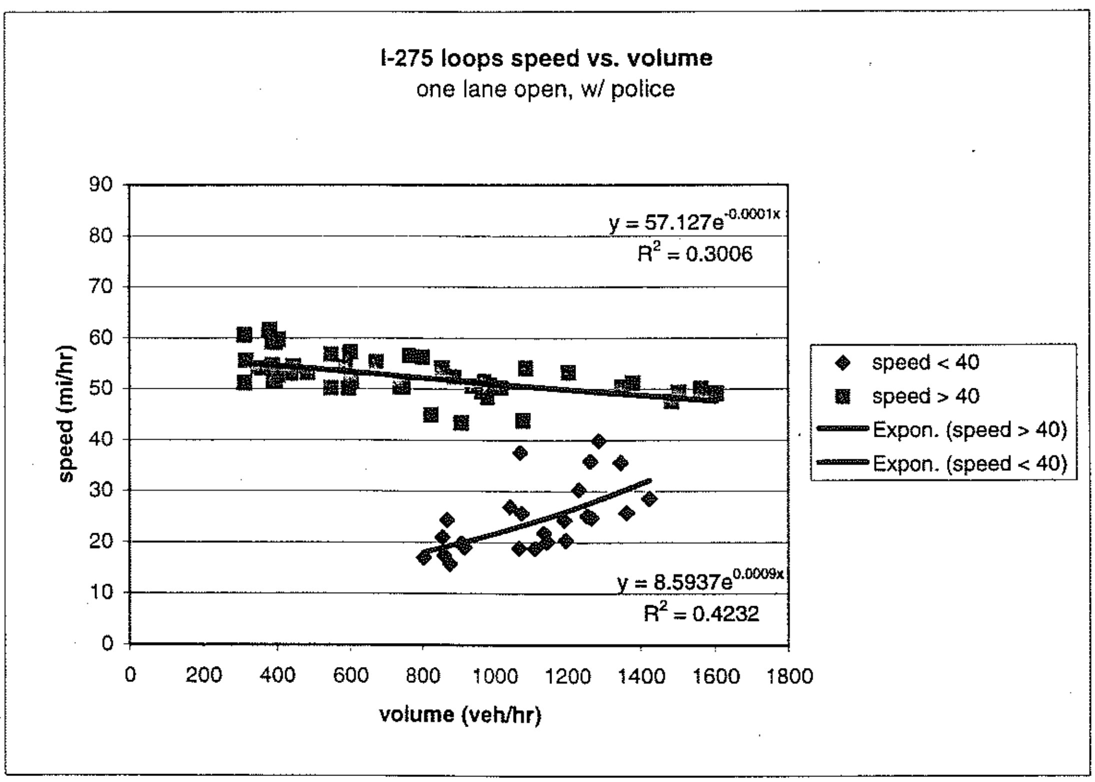
I-94 EB Junction (9/9/98)
two lane open, lane 1
90
80
70
60
50
40
30
20
10
0
speed (mi/hr)
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
volume (veh/hr)

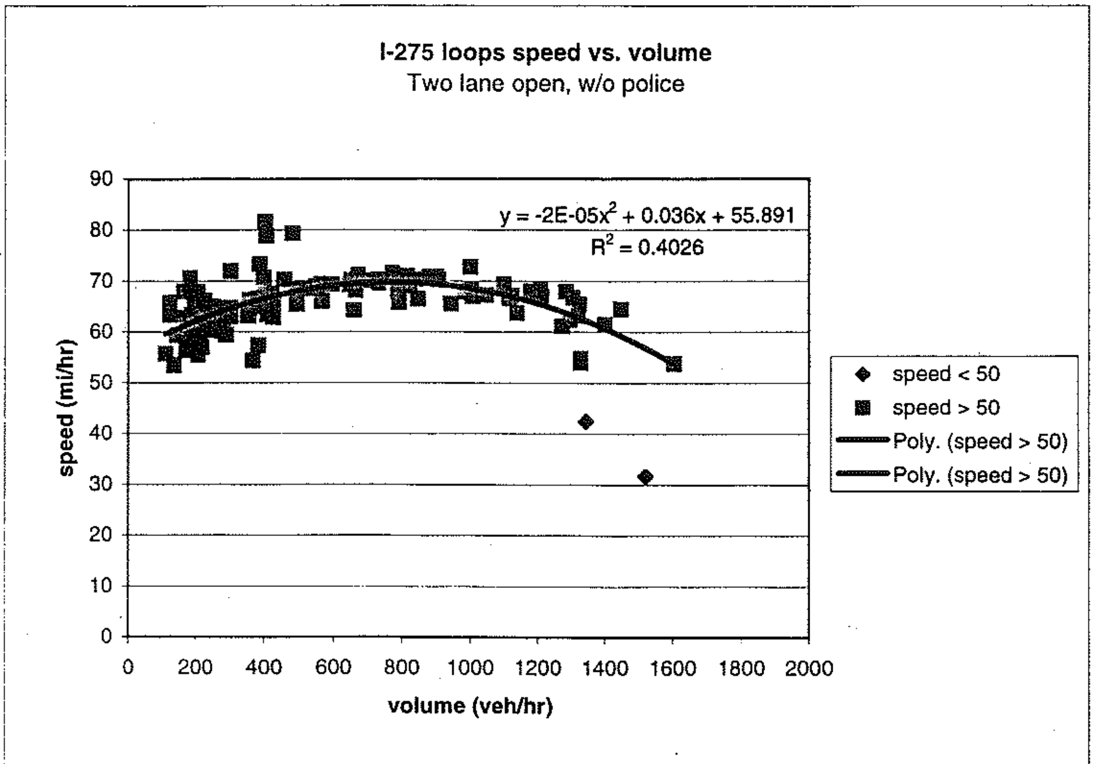

I-94 EB Junction (9/9/98)
two lane open, lane 2
speed (mi/hr)
90
80
70
60
50
40
30
20
10
0
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
volume (veh/hr)


I-275 loops speed vs. volume
One lane open, combined w/ and w/o police
y = 60.872e^-0.0001x
R^2 = 0.2061
y = 8.7075e^0.001x
R^2 = 0.4495
speed (mi/hr)
volume (veh/hr)
0
10
20
30
40
50
60
70
80
0
200
400
600
800
1000
1200
1400
1600
1800
2000
speed > 40
speed < 40
Expon. (speed > 40)
Expon. (speed < 40)

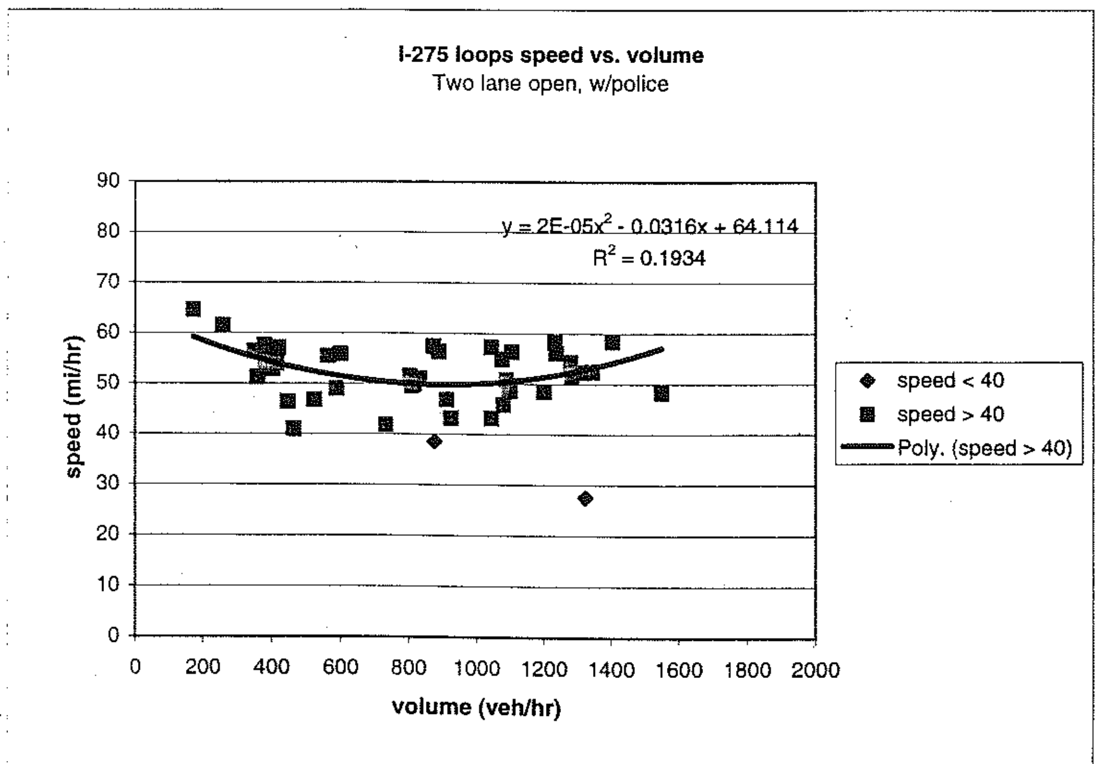

I-275 loops speed vs. volume
Two lane open, combined w/ and w/o police
y = -1E-05x^2 + 0.0119x + 59.942
R^2 = 0.0613
speed (mi/hr)
volume (veh/hr)
0
10
20
30
40
50
60
70
80
90
0
200
400
600
800
1000
1200
1400
1600
1800
2000
speed > 40
speed < 40
Poly. (speed > 40)


I-275 loops speed vs. volume
One lane open, w/o police
y = 61.502e-0.0001x
R2 = 0.1861
y = 8.1935e0.0011x
R2 = 0.5409
speed (mi/hr)
volume (veh/hr)
speed < 40
speed > 40
Expon. (speed < 40)
Expon. (speed > 40)

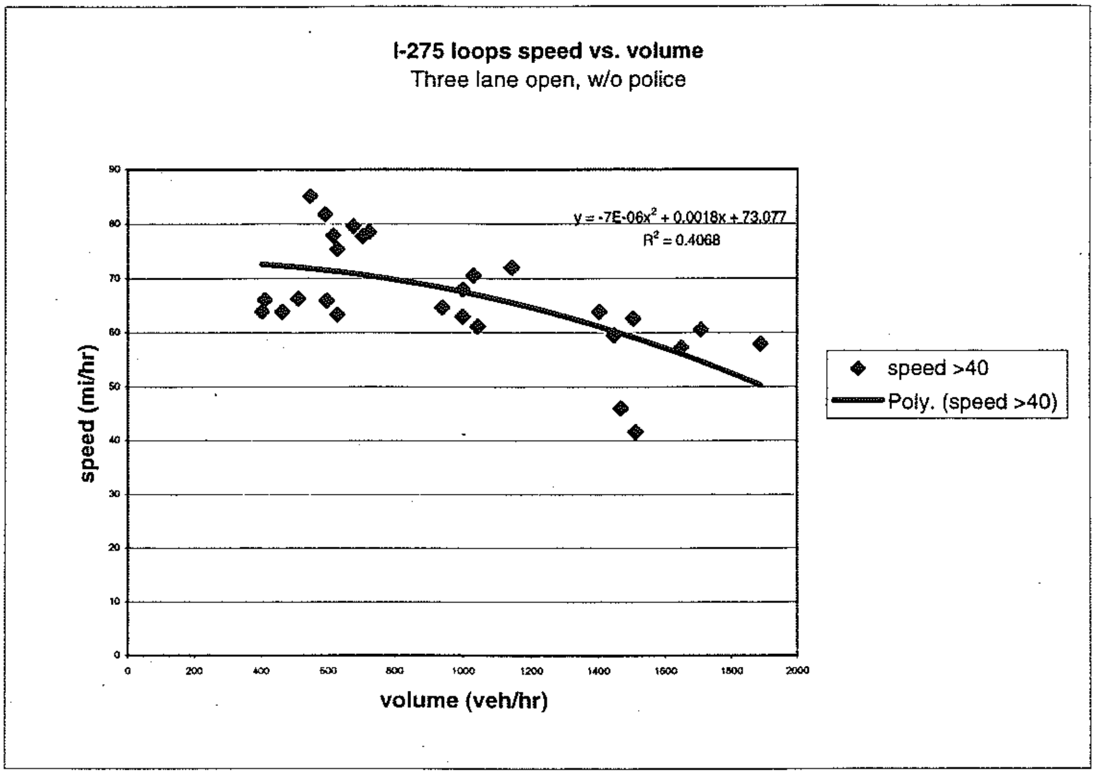

I-275 loops speed vs. volume
one lane open, w/ police
y = 57.127e-0.0001x
R2 = 0.3006
y = 8.5937e0.0009x
R2 = 0.4232
speed (mi/hr)
volume (veh/hr)
speed < 40
speed > 40
Expon. (speed > 40)
Expon. (speed < 40)



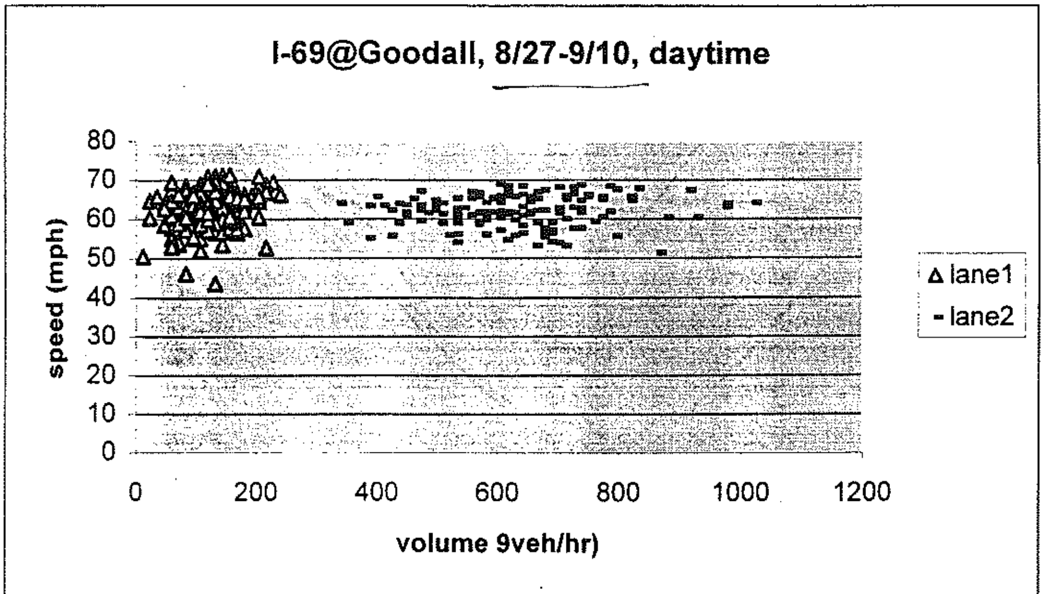
I-275 loops speed vs. volume
Two lane open, w/o police
y = -2E-05x2 + 0.036x + 55.891
R2 = 0.4026
speed (mi/hr)
0
10
20
30
40
50
60
70
80
90
0
200
400
600
800
1000
1200
1400
1600
1800
2000
volume (veh/hr)
speed < 50
speed > 50
Poly. (speed > 50)
Poly. (speed > 50)

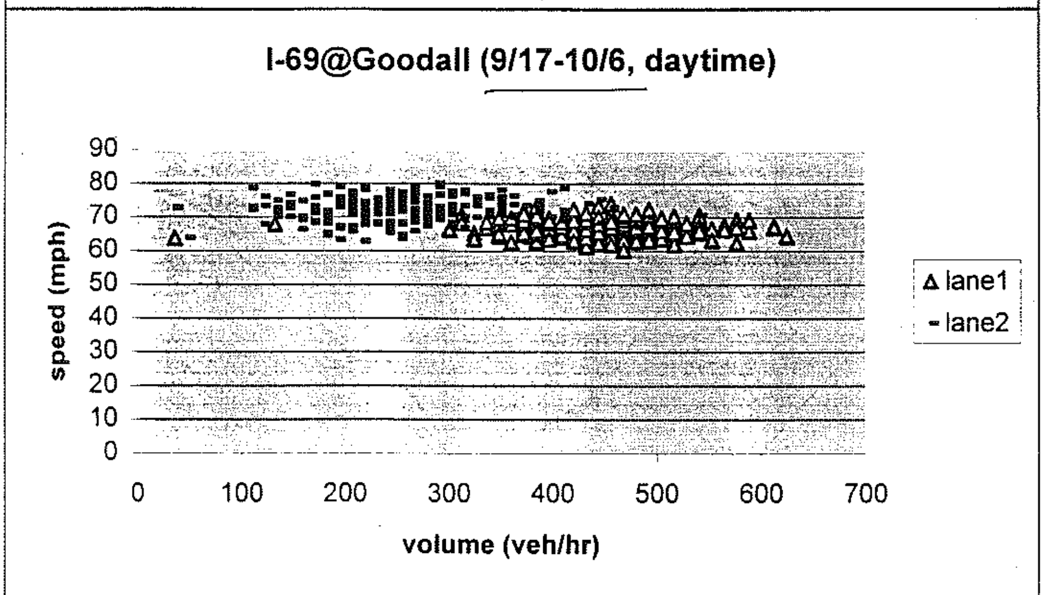


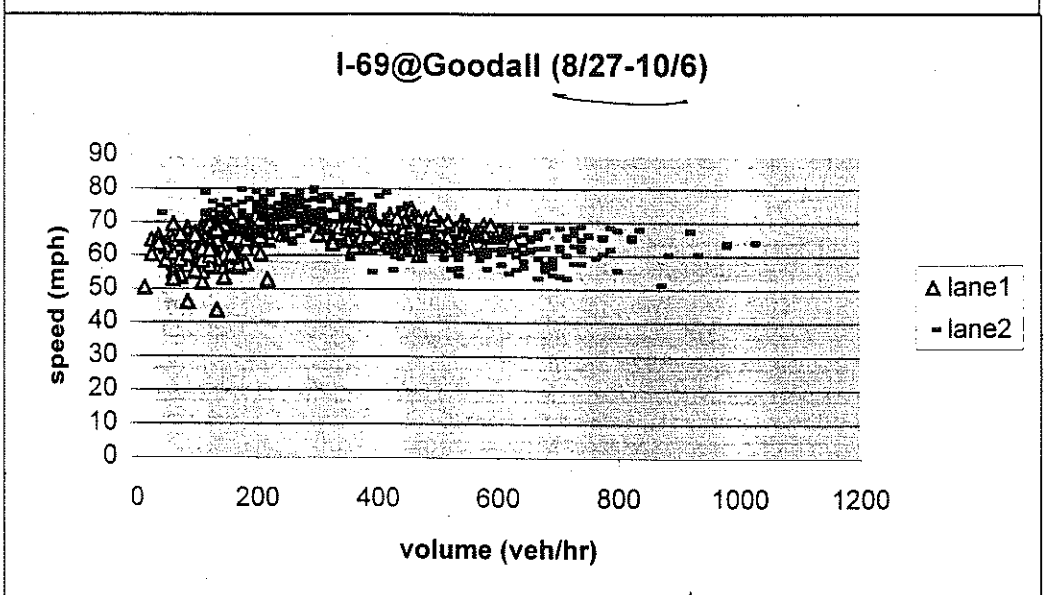
I-275 loops speed vs. volume
Two lane open, w/police
y = 2E-05x2 - 0.0316x + 64.114
R2 = 0.1934
speed (mi/hr)
0
10
20
30
40
50
60
70
80
90
0
200
400
600
800
1000
1200
1400
1600
1800
2000
volume (veh/hr)
speed < 40
speed > 40
Poly. (speed > 40)

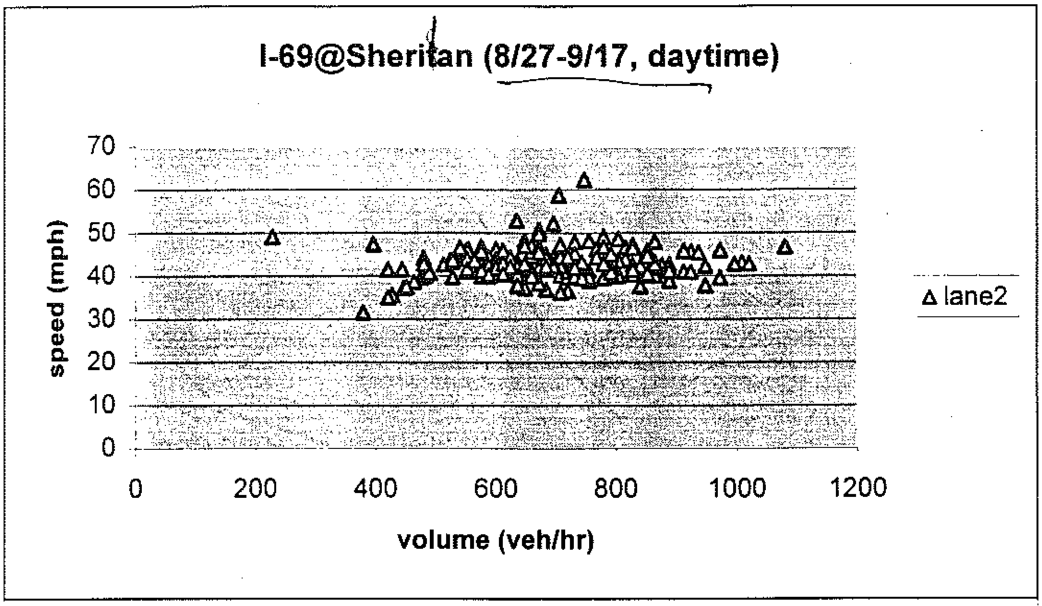


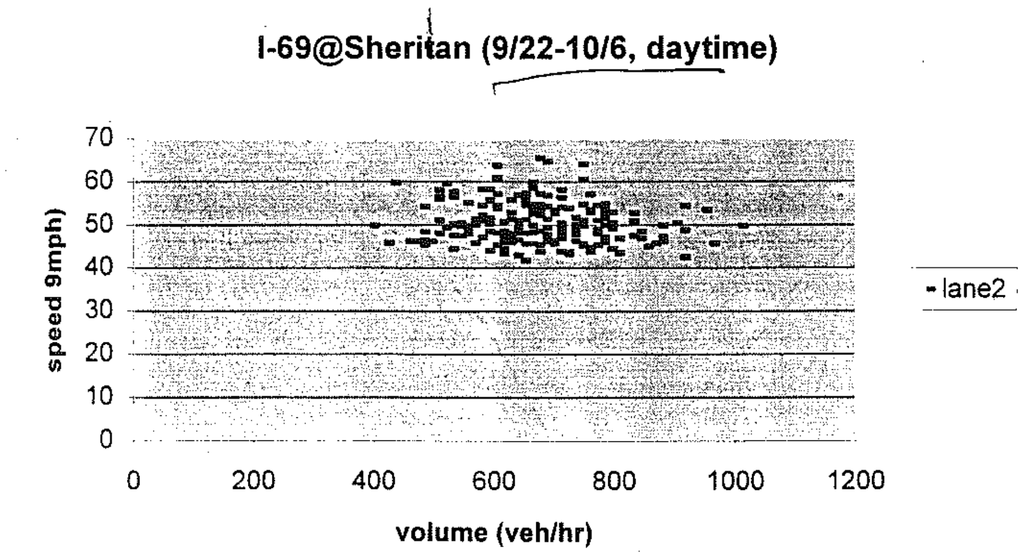
I-275 loops speed vs. volume
Three lane open, w/o police
y = -7E-06x² + 0.0018x + 73.077
R² = 0.4068
speed (mi/hr)
volume (veh/hr)
speed >40
Poly. (speed >40)

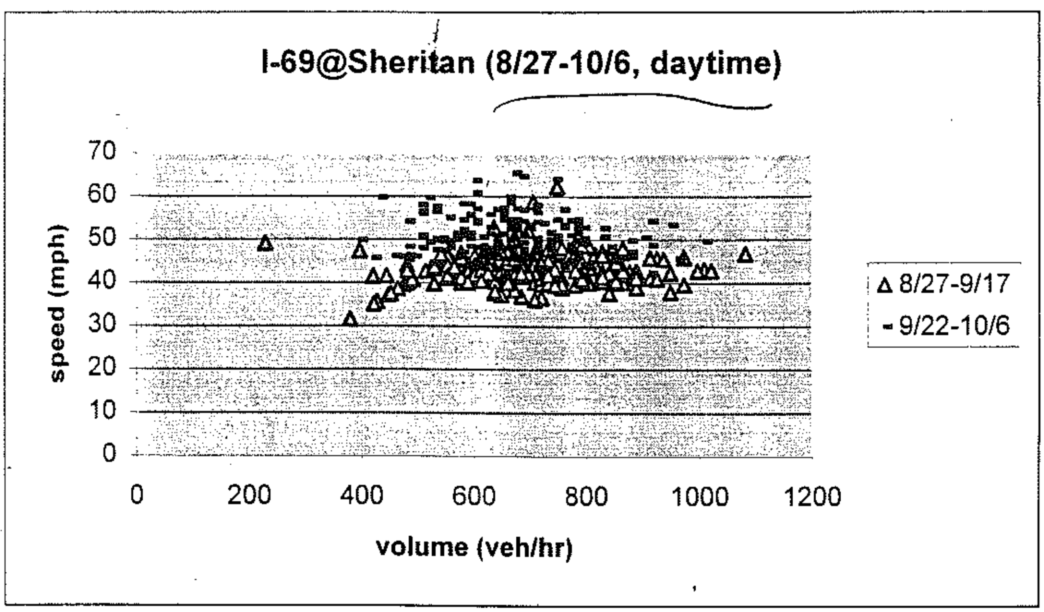

I-69@Goodall, 8/27-9/10, daytime
80
70
60
50
40
30
20
10
0
speed (mph)
0
200
400
600
800
1000
1200
volume 9veh/hr)
lane1
lane2

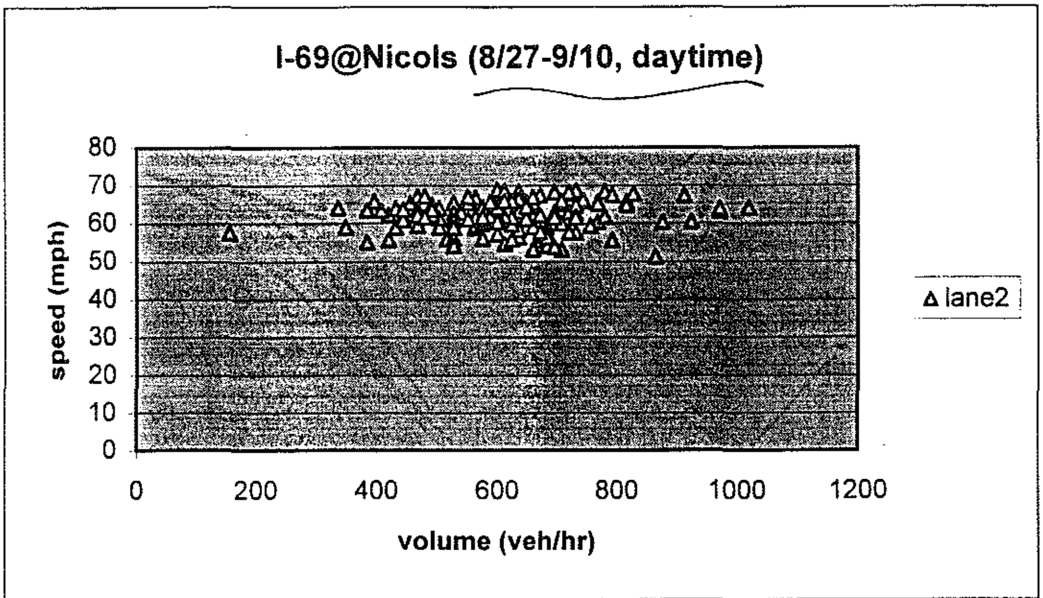

I-69@Goodall (9/17-10/6, daytime)
90
80
70
60
50
40
30
20
10
0
speed (mph)
0
100
200
300
400
500
600
700
volume (veh/hr)
lane1
lane2

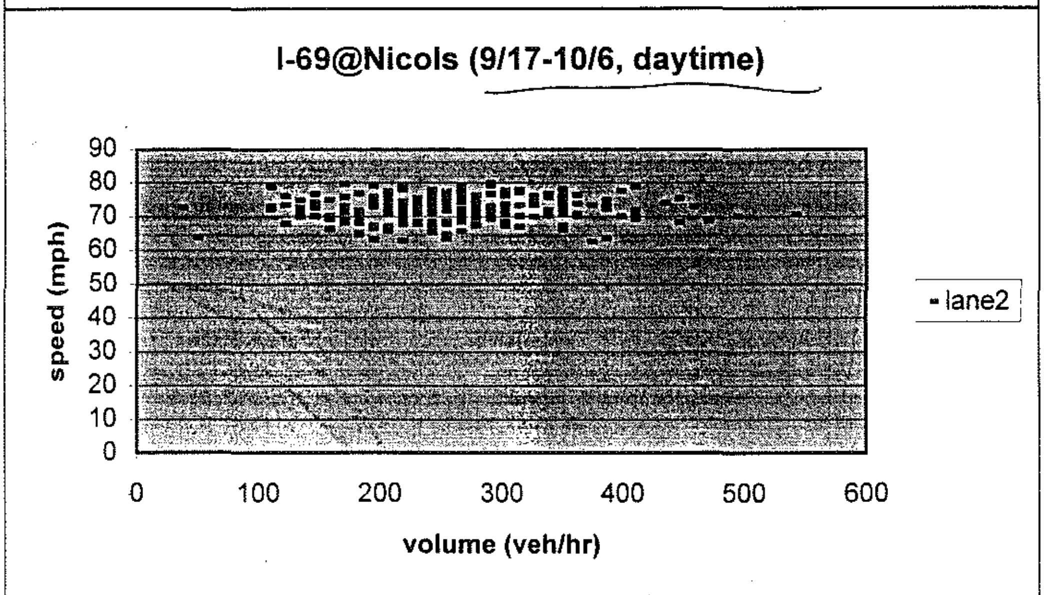

I-69@Goodall (8/27-10/6)
90
80
70
60
50
40
30
20
10
0
speed (mph)
0
200
400
600
800
1000
1200
volume (veh/hr)
lane1
lane2

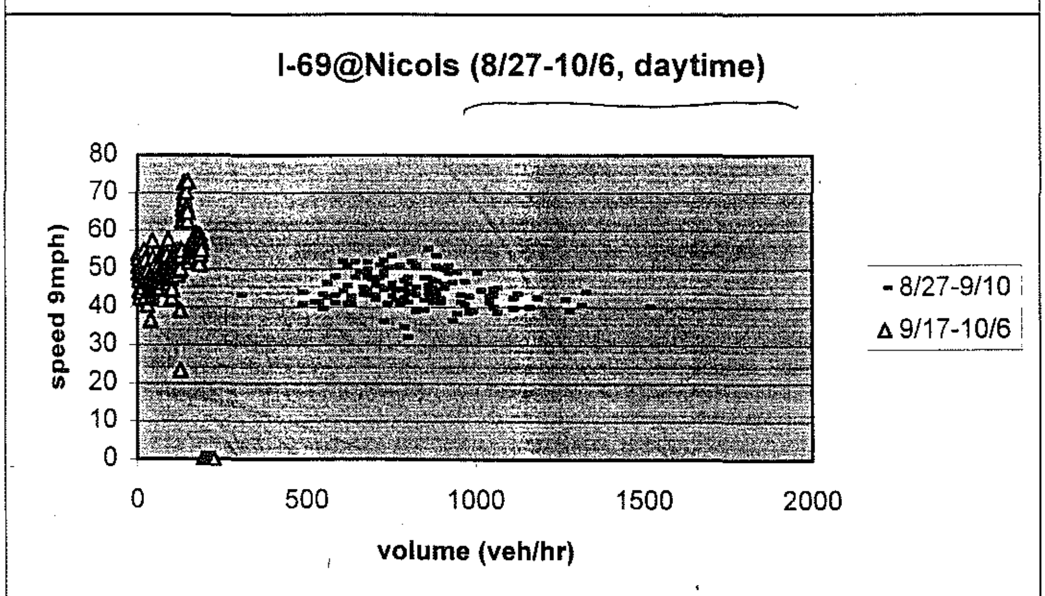

I-69@Sheritan (8/27-9/17, daytime)
speed (mph)
70
60
50
40
30
20
10
0
0
200
400
600
800
1000
1200
volume (veh/hr)
lane2


I-69@Sheritan (9/22-10/6, daytime)
speed 9mph)
70
60
50
40
30
20
10
0
0
200
400
600
800
1000
1200
volume (veh/hr)
lane2


I-69@Sheritan (8/27-10/6, daytime)
speed (mph)
70
60
50
40
30
20
10
0
0
200
400
600
800
1000
1200
volume (veh/hr)
8/27-9/17
9/22-10/6


I-69@Nicols (8/27-9/10, daytime)
speed (mph)
volume (veh/hr)
lane2


I-69@Nicols (9/17-10/6, daytime)
speed (mph)
volume (veh/hr)
lane2


I-69@Nicols (8/27-10/6, daytime)
speed 9mph)
volume (veh/hr)
8/27-9/10
9/17-10/6

APPENDIX B

Summary of Delay Model Outputs

period length (min)	60	
annual traffic growth (%)	5.00%	
years of growth	0	
VEHICLE INPUT	cars	trucks
design demand (%)	75.0%	25.0%
user cost per hour ($/V hr)	$10.79	$10.79
user cost per mile, ($/V mi)	$0.30	$1.00
user cost per cancellation, ($/V)	$1.00	$2.00

PROJECT INFORMATION	
PROJECT TITLE	WZ DELAY
C.S.	
JOB #	
START DATE	

REPORT INFORMATION	
REPORT TITLE	DETAILED USER COST REPORT SUMMARY SHEET
DIVISION	
REPORT BY	
REPORT DATE	

NOTES: US-127NB@I-96

METHOD INPUT		METHOD 1		METHOD 2		METHOD 3		METHOD 4	
	method title	10-12PM							
DISTANCE AND SPEED	(mi) (mph)	distance	speed	distance	speed	distance	speed	distance	speed
work zone	method travel	0.5	see delay		see delay		see delay		see delay
	normal travel	0.5	70.0						
diversion	method travel								
	normal travel								
SPEED DELAY		threshold	range	threshold	range	threshold	range	threshold	range
capacity for speed delay (V/period)		1000							
speed (when D~0) (mph)		45							
speed (when D=C) (mph)		15							
DECREASE TO DEMAND		threshold	range	threshold	range	threshold	range	threshold	range
capacity for decreases to design demand (V/period)		1000							
canceled cars (with no delay) (%)		1.0%							
canceled trucks (with no delay) (%)									
canceled cars (with delay) (%/min)		1.0%							
canceled trucks (with delay) (%/min)									
diverted cars (with no delay) (%)									
diverted trucks (with no delay) (%)									
diverted cars (with delay) (%/min)									
diverted trucks (with delay) (%/min)									

OTHER USER COST INPUT	cars	trucks	cars	trucks	cars	trucks	cars	trucks
other user cost per actual demand ($/V)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
user cost per diversion ($/V)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

PERIOD INPUT			backup at start (V)		0	0	0	0	0	0	0	0
direction:	NB		NB		NB							
period	historical demand		design demand		capacity		capacity		capacity		capacity	
(hr)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)
12 A	119		119	0	1000							
1 A	72		72	0	1000							
2 A	75		75	0	1000							
3 A	78		78	0	1000							
4 A	104		104	0	1000							
5 A	333		333	0	1000							
6 A	993		993	0	1000							
7 A	942		942	0	1000							
8 A	800		800	0	1000							
9 A	713		713	0	1000							
10 A	682		682	0	1000							
11 A	700		700	0	1000							
12 P	655		655	0	1000							
1 P	683		683	0	1000							
2 P	885		885	0	1000							
3 P	941		941	0	1000							
4 P	648		648	0	1000							
5 P	1012		1012	0	1000							
6 P	654		654	0	1000							
7 P	433		433	0	1000							
8 P	374		374	0	1000							
9 P	441		441	0	1000							
10 P	321		321	0	1000							
11 P	185		185	0	1000							
Total		0	12843	0	24000	0	0	0	0	0	0	0

SUMMARY OUTPUT								
traffic method	24 hr							
direction	NB		NB		NB		NB	
total user cost	$2,412	$0	$0	$0	$0	$0	$0	$0
user cost of delays	$2,222	$0	$0	$0	$0	$0	$0	$0
user cost of decreases	$190	$0	$0	$0	$0	$0	$0	$0
maximum backup (V)	0	0	0	0	0	0	0	0
maximum backup length (lane mi)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
maximum delay (min.)	1.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
average delay, except diversions (min)	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total delay, except diversions (V hr)	206	0	0	0	0	0	0	0
total vehicles canceled(V)	190	0	0	0	0	0	0	0
total vehicles diverted (V)	0	0	0	0	0	0	0	0
total decrease in demand (V)	190	0	0	0	0	0	0	0
% decrease in demand	1.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
delay per diverted vehicle (min)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total diversion delay (V hr)	0	0	0	0	0	0	0	0
average delay, including diversions (min)	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total delay, including diversions (V hr)	206	0	0	0	0	0	0	0
user cost / design demand	$0.19	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
delay cost / actual demand	$0.18	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Calc: ON Print: ON Now: OK validity of output	VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID

SummaryView

period length (min)	60	
annual traffic growth (%)	5.00%	
years of growth	0	
VEHICLE INPUT	cars	trucks
design demand (%)	75.0%	25.0%
user cost per hour ($/V hr)	$10.79	$10.79
user cost per mile, ($/V mi)	$0.30	$1.00
user cost per cancellation, ($/V)	$1.00	$2.00

PROJECT INFORMATION	
PROJECT TITLE	WZ DELAY
C.S.	
JOB #	
START DATE	
NOTES:	US-127NB@I-96

REPORT INFORMATION	
REPORT TITLE	DETAILED USER COST REPORT SUMMARY SHEET
DIVISION	
REPORT BY	
REPORT DATE	

METHOD INPUT	METHOD 1		METHOD 2		METHOD 3		METHOD 4	
method title	10-12PM							
DISTANCE AND SPEED (mi) (mph)	distance	speed	distance	speed	distance	speed	distance	speed
work zone — method travel	0.5	see delay		see delay		see delay		see delay
work zone — normal travel	0.5	70.0						
diversion — method travel								
diversion — normal travel								
SPEED DELAY	threshold	range	threshold	range	threshold	range	threshold	range
capacity for speed delay (V/period)	1000							
speed (when D~0) (mph)	45							
speed (when D=C) (mph)	10							
DECREASE TO DEMAND	threshold	range	threshold	range	threshold	range	threshold	range
capacity for decreases to design demand (V/period)	1000							
canceled cars (with no delay) (%)	1.0%							
canceled trucks (with no delay) (%)								
canceled cars (with delay) (%/min)	1.0%							
canceled trucks (with delay) (%/min)								
diverted cars (with no delay) (%)								
diverted trucks (with no delay) (%)								
diverted cars (with delay) (%/min)								
diverted trucks (with delay) (%/min)								
OTHER USER COST INPUT	cars	trucks	cars	trucks	cars	trucks	cars	trucks
other user cost per actual demand ($/V)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
user cost per diversion ($/V)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

PERIOD INPUT	backup at start (V)				0	0	0	0	0	0	0	0
direction:	NB		NB		NB							
period	historical demand		design demand		capacity		capacity		capacity		capacity	
(hr)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)
12 A	119		119	0	1000							
1 A	72		72	0	1000							
2 A	75		75	0	1000							
3 A	78		78	0	1000							
4 A	104		104	0	1000							
5 A	333		333	0	1000							
6 A	993		993	0	1000							
7 A	942		942	0	1000							
8 A	800		800	0	1000							
9 A	713		713	0	1000							
10 A	682		682	0	1000							
11 A	700		700	0	1000							
12 P	656		655	0	1000							
1 P	683		683	0	1000							
2 P	885		885	0	1000							
3 P	941		941	0	1000							
4 P	648		648	0	1000							
5 P	1012		1012	0	1000							
6 P	654		654	0	1000							
7 P	433		433	0	1000							
8 P	374		374	0	1000							
9 P	441		441	0	1000							
10 P	321		321	0	1000							
11 P	185		185	0	1000							
Total		0	12843	0	24000	0	0	0	0	0	0	0

SUMMARY OUTPUT	METHOD 1		METHOD 2		METHOD 3		METHOD 4	
traffic method	24 hr							
direction	NB		NB		NB		NB	
total user cost	$3,676	$0	$0	$0	$0	$0	$0	$0
user cost of delays	$3,434	$0	$0	$0	$0	$0	$0	$0
user cost of decreases	$243	$0	$0	$0	$0	$0	$0	$0
maximum backup (V)	0	0	0	0	0	0	0	0
maximum backup length (lane mi)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
maximum delay (min.)	2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
average delay, except diversions (min)	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total delay, except diversions (V hr)	318	0	0	0	0	0	0	0
total vehicles canceled(V)	243	0	0	0	0	0	0	0
total vehicles diverted (V)	0	0	0	0	0	0	0	0
total decrease in demand (V)	243	0	0	0	0	0	0	0
% decrease in demand	1.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
delay per diverted vehicle (min)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total diversion delay (V hr)	0	0	0	0	0	0	0	0
average delay, including diversions (min)	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total delay, including diversions (V hr)	318	0	0	0	0	0	0	0
user cost / design demand	$0.29	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
delay cost / actual demand	$0.27	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
AID: ON · Print: ON · Now: OK · validity of output	VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID

period length (min)	60	
annual traffic growth (%)	5.00%	
years of growth	0	
VEHICLE INPUT	cars	trucks
design demand (%)	75.0%	25.0%
user cost per hour ($/V hr)	$10.79	$10.79
user cost per mile, ($/V mi)	$0.30	$1.00
user cost per cancellation, ($/V)	$1.00	$2.00

PROJECT INFORMATION	
PROJECT TITLE	WZ DELAY
C.S.	
JOB #	
START DATE	
NOTES:	US-127NB@I-96

REPORT INFORMATION	
REPORT TITLE	DETAILED USER COST REPORT SUMMARY SHEET
DIVISION	
REPORT BY	
REPORT DATE	

METHOD INPUT	METHOD 1		METHOD 2		METHOD 3		METHOD 4	
method title	10-12PM							
DISTANCE AND SPEED (mi) (mph)	distance	speed	distance	speed	distance	speed	distance	speed
work zone — method travel	0.5	see delay		see delay		see delay		see delay
work zone — normal travel	0.5	70.0						
diversion — method travel								
diversion — normal travel								
SPEED DELAY	threshold	range	threshold	range	threshold	range	threshold	range
capacity for speed delay (V/period)	1000							
speed (when D=0) (mph)	45							
speed (when D=C) (mph)	5							
DECREASE TO DEMAND	threshold	range	threshold	range	threshold	range	threshold	range
capacity for decreases to design demand (V/period)	1000							
canceled cars (with no delay) (%)	1.0%							
canceled trucks (with no delay) (%)								
canceled cars (with delay) (%/min)	1.0%							
canceled trucks (with delay) (%/min)								
diverted cars (with no delay) (%)								
diverted trucks (with no delay) (%)								
diverted cars (with delay) (%/min)								
diverted trucks (with delay) (%/min)								
OTHER USER COST INPUT	cars	trucks	cars	trucks	cars	trucks	cars	trucks
other user cost per actual demand ($/V)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
user cost per diversion ($/V)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

PERIOD INPUT			backup at start (V)		0	0	0	0	0	0	0	0
direction:	NB		NB		NB							
period	historical demand		design demand		capacity		capacity		capacity		capacity	
(hr)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)
12 A	119		119	0	1000							
1 A	72		72	0	1000							
2 A	75		75	0	1000							
3 A	78		78	0	1000							
4 A	104		104	0	1000							
5 A	333		333	0	1000							
6 A	993		993	0	1000							
7 A	942		942	0	1000							
8 A	800		800	0	1000							
9 A	713		713	0	1000							
10 A	682		682	0	1000							
11 A	700		700	0	1000							
12 P	655		655	0	1000							
1 P	683		683	0	1000							
2 P	885		885	0	1000							
3 P	941		941	0	1000							
4 P	648		648	0	1000							
5 P	1012		1012	0	1000							
6 P	654		654	0	1000							
7 P	433		433	0	1000							
8 P	374		374	0	1000							
9 P	441		441	0	1000							
10 P	321		321	0	1000							
11 P	185		185	0	1000							
Total		0	12843	0	24000	0	0	0	0	0	0	0

SUMMARY OUTPUT								
traffic method	24 hr							
direction	NB		NB		NB		NB	
total user cost	$7,245	$0	$0	$0	$0	$0	$0	$0
user cost of delays	$6,852	$0	$0	$0	$0	$0	$0	$0
user cost of decreases	$393	$0	$0	$0	$0	$0	$0	$0
maximum backup (V)	0	0	0	0	0	0	0	0
maximum backup length (lane mi)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
maximum delay (min.)	5.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
average delay, except diversions (min)	3.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total delay, except diversions (V hr)	635	0	0	0	0	0	0	0
total vehicles canceled(V)	393	0	0	0	0	0	0	0
total vehicles diverted (V)	0	0	0	0	0	0	0	0
total decrease in demand (V)	393	0	0	0	0	0	0	0
% decrease in demand	3.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
delay per diverted vehicle (min)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total diversion delay (V hr)	0	0	0	0	0	0	0	0
average delay, including diversions (min)	3.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total delay, including diversions (V hr)	635	0	0	0	0	0	0	0
user cost / design demand	$0.56	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
delay cost / actual demand	$0.55	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Auto: ON / Print: ON / Now: OK / validity of output	VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID

period length (min)	60	
annual traffic growth (%)	5.00%	
years of growth	0	
VEHICLE INPUT	cars	trucks
design demand (%)	75.0%	25.0%
user cost per hour ($/V hr)	$10.79	$10.79
user cost per mile, ($/V mi)	$0.30	$1.00
user cost per cancellation, ($/V)	$1.00	$2.00

PROJECT INFORMATION	
PROJECT TITLE	WZ DELAY
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REPORT INFORMATION	
REPORT TITLE	DETAILED USER COST REPORT SUMMARY SHEET
DIVISION	
REPORT BY	
REPORT DATE	

NOTES: US-127NB@I-96

METHOD INPUT	METHOD 1		METHOD 2		METHOD 3		METHOD 4	
method title	10-12PM							
DISTANCE AND SPEED (mi) (mph)	distance	speed	distance	speed	distance	speed	distance	speed
work zone method travel	0.5	see delay		see delay		see delay		see delay
work zone normal travel	0.5	70.0						
diversion method travel								
diversion normal travel								
SPEED DELAY	threshold	range	threshold	range	threshold	range	threshold	range
capacity for speed delay (V/period)	1000							
speed (when D~0) (mph)	39							
speed (when D=C) (mph)	15							
DECREASE TO DEMAND	threshold	range	threshold	range	threshold	range	threshold	range
capacity for decreases to design demand (V/period)	1000							
canceled cars (with no delay) (%)	1.0%							
canceled trucks (with no delay) (%)								
canceled cars (with delay) (%/min)	1.0%							
canceled trucks (with delay) (%/min)								
diverted cars (with no delay) (%)								
diverted trucks (with no delay) (%)								
diverted cars (with delay) (%/min)								
diverted trucks (with delay) (%/min)								

OTHER USER COST INPUT	cars	trucks	cars	trucks	cars	trucks	cars	trucks
other user cost per actual demand ($/V)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
user cost per diversion ($/V)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

PERIOD INPUT				backup at start (V)	0	0	0	0	0	0	0	0
direction:	NB		NB		NB							
period	historical demand		design demand		capacity		capacity		capacity		capacity	
(hr)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)
12 A	119		119	0	1000							
1 A	72		72	0	1000							
2 A	75		75	0	1000							
3 A	78		78	0	1000							
4 A	104		104	0	1000							
5 A	333		333	0	1000							
6 A	993		993	0	1000							
7 A	942		942	0	1000							
8 A	800		800	0	1000							
9 A	713		713	0	1000							
10 A	682		682	0	1000							
11 A	700		700	0	1000							
12 P	655		655	0	1000							
1 P	683		683	0	1000							
2 P	885		885	0	1000							
3 P	941		941	0	1000							
4 P	648		648	0	1000							
5 P	1012		1012	0	1000							
6 P	654		654	0	1000							
7 P	433		433	0	1000							
8 P	374		374	0	1000							
9 P	441		441	0	1000							
10 P	321		321	0	1000							
11 P	185		185	0	1000							
Total		0	12843	0	24000	0	0	0	0	0	0	0

SUMMARY OUTPUT	METHOD 1		METHOD 2		METHOD 3		METHOD 4	
traffic method	24 hr							
direction	NB		NB		NB		NB	
total user cost	$2,520	$0	$0	$0	$0	$0	$0	$0
user cost of delays	$2,325	$0	$0	$0	$0	$0	$0	$0
user cost of decreases	$195	$0	$0	$0	$0	$0	$0	$0
maximum backup (V)	0	0	0	0	0	0	0	0
maximum backup length (lane mi)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
maximum delay (min.)	1.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
average delay, except diversions (min)	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total delay, except diversions (V hr)	215	0	0	0	0	0	0	0
total vehicles canceled(V)	195	0	0	0	0	0	0	0
total vehicles diverted (V)	0	0	0	0	0	0	0	0
total decrease in demand (V)	195	0	0	0	0	0	0	0
% decrease in demand	1.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
delay per diverted vehicle (min)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total diversion delay (V hr)	0	0	0	0	0	0	0	0
average delay, including diversions (min)	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total delay, including diversions (V hr)	215	0	0	0	0	0	0	0
user cost / design demand	$0.20	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
delay cost / actual demand	$0.18	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Calc: ON Print: ON Now: OK validity of output	VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID

SummaryView

period length (min)	60	
annual traffic growth (%)	5.00%	
years of growth	0	
VEHICLE INPUT	cars	trucks
design demand (%)	75.0%	25.0%
user cost per hour ($/V hr)	$10.79	$10.79
user cost per mile, ($/V mi)	$0.30	$1.00
user cost per cancellation, ($/V)	$1.00	$2.00

PROJECT INFORMATION	
PROJECT TITLE	WZ DELAY
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REPORT INFORMATION	
REPORT TITLE	DETAILED USER COST REPORT SUMMARY SHEET
DIVISION	
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NOTES: US-127NB@I-96

METHOD INPUT	METHOD 1		METHOD 2		METHOD 3		METHOD 4	
method title	10-12PM							
DISTANCE AND SPEED (mi) (mph)	distance	speed	distance	speed	distance	speed	distance	speed
work zone — method travel	0.5	see delay		see delay		see delay		see delay
work zone — normal travel	0.5	70.0						
diversion — method travel								
diversion — normal travel								
SPEED DELAY	threshold	range	threshold	range	threshold	range	threshold	range
capacity for speed delay (V/period)	1000							
speed (when D~0) (mph)	39							
speed (when D=C) (mph)	10							
DECREASE TO DEMAND	threshold	range	threshold	range	threshold	range	threshold	range
capacity for decreases to design demand (V/period)	1000							
canceled cars (with no delay) (%)	1.0%							
canceled trucks (with no delay) (%)								
canceled cars (with delay) (%/min)	1.0%							
canceled trucks (with delay) (%/min)								
diverted cars (with no delay) (%)								
diverted trucks (with no delay) (%)								
diverted cars (with delay) (%/min)								
diverted trucks (with delay) (%/min)								
OTHER USER COST INPUT	cars	trucks	cars	trucks	cars	trucks	cars	trucks
other user cost per actual demand ($/V)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
user cost per diversion ($/V)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

PERIOD INPUT		backup at start (V)			0	0	0	0	0	0	0	0
direction:	NB		NB		NB							
period	historical demand		design demand		capacity		capacity		capacity		capacity	
(hr)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)
12 A	119		119	0	1000							
1 A	72		72	0	1000							
2 A	75		75	0	1000							
3 A	78		78	0	1000							
4 A	104		104	0	1000							
5 A	333		333	0	1000							
6 A	993		993	0	1000							
7 A	942		942	0	1000							
8 A	800		800	0	1000							
9 A	713		713	0	1000							
10 A	682		682	0	1000							
11 A	700		700	0	1000							
12 P	655		655	0	1000							
1 P	683		683	0	1000							
2 P	885		885	0	1000							
3 P	941		941	0	1000							
4 P	648		648	0	1000							
5 P	1012		1012	0	1000							
6 P	654		654	0	1000							
7 P	433		433	0	1000							
8 P	374		374	0	1000							
9 P	441		441	0	1000							
10 P	321		321	0	1000							
11 P	185		185	0	1000							
Total		0	12843	0	24000	0	0	0	0	0	0	0

SUMMARY OUTPUT	Method 1		Method 2		Method 3		Method 4	
traffic method	24 hr							
direction	NB		NB		NB		NB	
total user cost	$3,784	$0	$0	$0	$0	$0	$0	$0
user cost of delays	$3,537	$0	$0	$0	$0	$0	$0	$0
user cost of decreases	$247	$0	$0	$0	$0	$0	$0	$0
maximum backup (V)	0	0	0	0	0	0	0	0
maximum backup length (lane mi)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
maximum delay (min.)	2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
average delay, except diversions (min)	1.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total delay, except diversions (V hr)	328	0	0	0	0	0	0	0
total vehicles canceled(V)	247	0	0	0	0	0	0	0
total vehicles diverted (V)	0	0	0	0	0	0	0	0
total decrease in demand (V)	247	0	0	0	0	0	0	0
% decrease in demand	1.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
delay per diverted vehicle (min)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total diversion delay (V hr)	0	0	0	0	0	0	0	0
average delay, including diversions (min)	1.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total delay, including diversions (V hr)	328	0	0	0	0	0	0	0
user cost / design demand	$0.29	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
delay cost / actual demand	$0.28	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Calc: ON / Print: ON / Now: OK — validity of output	VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID

SummaryView

period length (min)	60	
annual traffic growth (%)	5.00%	
years of growth	0	
VEHICLE INPUT	cars	trucks
design demand (%)	75.0%	25.0%
user cost per hour ($/V hr)	$10.79	$10.79
user cost per mile, ($/V mi)	$0.30	$1.00
user cost per cancellation, ($/V)	$1.00	$2.00

PROJECT INFORMATION	
PROJECT TITLE	WZ DELAY
C.S.	
JOB #	
START DATE	

REPORT INFORMATION	
REPORT TITLE	DETAILED USER COST REPORT SUMMARY SHEET
DIVISION	
REPORT BY	
REPORT DATE	

NOTES: US-127NB@I-96

METHOD INPUT		METHOD 1		METHOD 2		METHOD 3		METHOD 4	
	method title	10-12PM							
DISTANCE AND SPEED	(mi) (mph)	distance	speed	distance	speed	distance	speed	distance	speed
work zone	method travel	0.5	see delay		see delay		see delay		see delay
	normal travel	0.5	70.0						
diversion	method travel								
	normal travel								
SPEED DELAY		threshold	range	threshold	range	threshold	range	threshold	range
	capacity for speed delay (V/period)	1000							
	speed (when D~0) (mph)	39							
	speed (when D=C) (mph)	5							
DECREASE TO DEMAND		threshold	range	threshold	range	threshold	range	threshold	range
	capacity for decreases to design demand (V/period)	1000							
	canceled cars (with no delay) (%)	1.0%							
	canceled trucks (with no delay) (%)								
	canceled cars (with delay) (%/min)	1.0%							
	canceled trucks (with delay) (%/min)								
	diverted cars (with no delay) (%)								
	diverted trucks (with no delay) (%)								
	diverted cars (with delay) (%/min)								
	diverted trucks (with delay) (%/min)								
OTHER USER COST INPUT		cars	trucks	cars	trucks	cars	trucks	cars	trucks
	other user cost per actual demand ($/V)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
	user cost per diversion ($/V)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

PERIOD INPUT				backup at start (V)	0	0	0	0	0	0	0	0
direction:	NB		NB		NB							
period	historical demand		design demand		capacity		capacity		capacity		capacity	
(hr)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)
12 A	119		119	0	1000							
1 A	72		72	0	1000							
2 A	75		75	0	1000							
3 A	78		78	0	1000							
4 A	104		104	0	1000							
5 A	333		333	0	1000							
6 A	993		993	0	1000							
7 A	942		942	0	1000							
8 A	800		800	0	1000							
9 A	713		713	0	1000							
10 A	682		682	0	1000							
11 A	700		700	0	1000							
12 P	655		655	0	1000							
1 P	683		683	0	1000							
2 P	885		885	0	1000							
3 P	941		941	0	1000							
4 P	648		648	0	1000							
5 P	1012		1012	0	1000							
6 P	654		654	0	1000							
7 P	433		433	0	1000							
8 P	374		374	0	1000							
9 P	441		441	0	1000							
10 P	321		321	0	1000							
11 P	185		185	0	1000							
Total		0	12843	0	24000	0	0	0	0	0	0	0

SUMMARY OUTPUT								
traffic method	24 hr							
direction	NB		NB		NB		NB	
total user cost	$7,353	$0	$0	$0	$0	$0	$0	$0
user cost of delays	$6,955	$0	$0	$0	$0	$0	$0	$0
user cost of decreases	$397	$0	$0	$0	$0	$0	$0	$0
maximum backup (V)	0	0	0	0	0	0	0	0
maximum backup length (lane mi)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
maximum delay (min.)	5.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
average delay, except diversions (min)	3.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total delay, except diversions (V hr)	645	0	0	0	0	0	0	0
total vehicles canceled(V)	397	0	0	0	0	0	0	0
total vehicles diverted (V)	0	0	0	0	0	0	0	0
total decrease in demand (V)	397	0	0	0	0	0	0	0
% decrease in demand	3.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
delay per diverted vehicle (min)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total diversion delay (V hr)	0	0	0	0	0	0	0	0
average delay, including diversions (min)	3.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total delay, including diversions (V hr)	645	0	0	0	0	0	0	0
user cost / design demand	$0.57	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
delay cost / actual demand	$0.56	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Calc: ON Print: ON Now: OK validity of output	VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID

SummaryView

period length (min)	60	
annual traffic growth (%)	5.00%	
years of growth	0	
VEHICLE INPUT	cars	trucks
design demand (%)	75.0%	25.0%
user cost per hour ($/V hr)	$10.79	$10.79
user cost per mile, ($/V mi)	$0.30	$1.00
user cost per cancellation, ($/V)	$1.00	$2.00

PROJECT INFORMATION	
PROJECT TITLE	WZ DELAY
C.S.	
JOB #	
START DATE	

REPORT INFORMATION	
REPORT TITLE	DETAILED USER COST REPORT SUMMARY SHEET
DIVISION	
REPORT BY	
REPORT DATE	

NOTES: US-127NB@I-96

METHOD INPUT	METHOD 1		METHOD 2		METHOD 3		METHOD 4	
method title	10-12PM							
DISTANCE AND SPEED (mi) (mph)	distance	speed	distance	speed	distance	speed	distance	speed
work zone method travel	0.5	see delay		see delay		see delay		see delay
work zone normal travel	0.5	70.0						
diversion method travel								
diversion normal travel								
SPEED DELAY	threshold	range	threshold	range	threshold	range	threshold	range
capacity for speed delay (V/period)	1000							
speed (when D~0) (mph)	34							
speed (when D=C) (mph)	15							
DECREASE TO DEMAND	threshold	range	threshold	range	threshold	range	threshold	range
capacity for decreases to design demand (V/period)	1000							
canceled cars (with no delay) (%)	1.0%							
canceled trucks (with no delay) (%)								
canceled cars (with delay) (%/min)	1.0%							
canceled trucks (with delay) (%/min)								
diverted cars (with no delay) (%)								
diverted trucks (with no delay) (%)								
diverted cars (with delay) (%/min)								
diverted trucks (with delay) (%/min)								
OTHER USER COST INPUT	cars	trucks	cars	trucks	cars	trucks	cars	trucks
other user cost per actual demand ($/V)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
user cost per diversion ($/V)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

PERIOD INPUT			backup at start (V)		0	0	0	0	0	0	0	0
direction:	NB		NB		NB							
period	historical demand		design demand		capacity		capacity		capacity		capacity	
(hr)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)
12 A	119		119	0	1000							
1 A	72		72	0	1000							
2 A	75		75	0	1000							
3 A	78		78	0	1000							
4 A	104		104	0	1000							
5 A	333		333	0	1000							
6 A	993		993	0	1000							
7 A	942		942	0	1000							
8 A	800		800	0	1000							
9 A	713		713	0	1000							
10 A	682		682	0	1000							
11 A	700		700	0	1000							
12 P	655		655	0	1000							
1 P	683		683	0	1000							
2 P	885		885	0	1000							
3 P	941		941	0	1000							
4 P	648		648	0	1000							
5 P	1012		1012	0	1000							
6 P	654		654	0	1000							
7 P	433		433	0	1000							
8 P	374		374	0	1000							
9 P	441		441	0	1000							
10 P	321		321	0	1000							
11 P	185		185	0	1000							
Total		0	12843	0	24000	0	0	0	0	0	0	0

SUMMARY OUTPUT								
traffic method	24 hr							
direction	NB		NB		NB		NB	
total user cost	$2,638	$0	$0	$0	$0	$0	$0	$0
user cost of delays	$2,438	$0	$0	$0	$0	$0	$0	$0
user cost of decreases	$200	$0	$0	$0	$0	$0	$0	$0
maximum backup (V)	0	0	0	0	0	0	0	0
maximum backup length (lane mi)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
maximum delay (min.)	1.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
average delay, except diversions (min)	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total delay, except diversions (V hr)	226	0	0	0	0	0	0	0
total vehicles canceled(V)	200	0	0	0	0	0	0	0
total vehicles diverted (V)	0	0	0	0	0	0	0	0
total decrease in demand (V)	200	0	0	0	0	0	0	0
% decrease in demand	1.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
delay per diverted vehicle (min)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total diversion delay (V hr)	0	0	0	0	0	0	0	0
average delay, including diversions (min)	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total delay, including diversions (V hr)	226	0	0	0	0	0	0	0
user cost / design demand	$0.21	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
delay cost / actual demand	$0.19	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
GRD: ON | Print: ON | Now: OK | validity of output	VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID

SummaryView

period length (min)	60	
annual traffic growth (%)	5.00%	
years of growth	0	
VEHICLE INPUT	cars	trucks
design demand (%)	75.0%	25.0%
user cost per hour ($/V hr)	$10.79	$10.79
user cost per mile, ($/V mi)	$0.30	$1.00
user cost per cancellation, ($/V)	$1.00	$2.00

PROJECT INFORMATION	
PROJECT TITLE	WZ DELAY
C.S.	
JOB #	
START DATE	

REPORT INFORMATION	
REPORT TITLE	DETAILED USER COST REPORT SUMMARY SHEET
DIVISION	
REPORT BY	
REPORT DATE	

NOTES: US-127NB@I-96

METHOD INPUT	METHOD 1		METHOD 2		METHOD 3		METHOD 4	
method title	10-12PM							
DISTANCE AND SPEED (mi) (mph)	distance	speed	distance	speed	distance	speed	distance	speed
work zone — method travel	0.5	see delay		see delay		see delay		see delay
work zone — normal travel	0.5	70.0						
diversion — method travel								
diversion — normal travel								
SPEED DELAY	threshold	range	threshold	range	threshold	range	threshold	range
capacity for speed delay (V/period)	1000							
speed (when D~0) (mph)	34							
speed (when D=C) (mph)	10							
DECREASE TO DEMAND	threshold	range	threshold	range	threshold	range	threshold	range
capacity for decreases to design demand (V/period)	1000							
canceled cars (with no delay) (%)	1.0%							
canceled trucks (with no delay) (%)								
canceled cars (with delay) (%/min)	1.0%							
canceled trucks (with delay) (%/min)								
diverted cars (with no delay) (%)								
diverted trucks (with no delay) (%)								
diverted cars (with delay) (%/min)								
diverted trucks (with delay) (%/min)								
OTHER USER COST INPUT	cars	trucks	cars	trucks	cars	trucks	cars	trucks
other user cost per actual demand ($/V)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
user cost per diversion ($/V)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

PERIOD INPUT			backup at start (V)		0	0	0	0	0	0	0	0
direction:	NB		NB		NB							
period	historical demand		design demand		capacity		capacity		capacity		capacity	
(hr)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)
12 A	119		119	0	1000							
1 A	72		72	0	1000							
2 A	75		75	0	1000							
3 A	78		78	0	1000							
4 A	104		104	0	1000							
5 A	333		333	0	1000							
6 A	993		993	0	1000							
7 A	942		942	0	1000							
8 A	800		800	0	1000							
9 A	713		713	0	1000							
10 A	682		682	0	1000							
11 A	700		700	0	1000							
12 P	655		655	0	1000							
1 P	683		683	0	1000							
2 P	885		885	0	1000							
3 P	941		941	0	1000							
4 P	648		648	0	1000							
5 P	1012		1012	0	1000							
6 P	654		654	0	1000							
7 P	433		433	0	1000							
8 P	374		374	0	1000							
9 P	441		441	0	1000							
10 P	321		321	0	1000							
11 P	185		185	0	1000							
Total		0	12843	0	24000	0	0	0	0	0	0	0

SUMMARY OUTPUT	METHOD 1		METHOD 2		METHOD 3		METHOD 4	
traffic method	24 hr							
direction	NB		NB		NB		NB	
total user cost	$3,902	$0	$0	$0	$0	$0	$0	$0
user cost of delays	$3,650	$0	$0	$0	$0	$0	$0	$0
user cost of decreases	$252	$0	$0	$0	$0	$0	$0	$0
maximum backup (V)	0	0	0	0	0	0	0	0
maximum backup length (lane mi)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
maximum delay (min.)	2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
average delay, except diversions (min)	1.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total delay, except diversions (V hr)	338	0	0	0	0	0	0	0
total vehicles canceled (V)	252	0	0	0	0	0	0	0
total vehicles diverted (V)	0	0	0	0	0	0	0	0
total decrease in demand (V)	252	0	0	0	0	0	0	0
% decrease in demand	2.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
delay per diverted vehicle (min)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total diversion delay (V hr)	0	0	0	0	0	0	0	0
average delay, including diversions (min)	1.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total delay, including diversions (V hr)	338	0	0	0	0	0	0	0
user cost / design demand	$0.30	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
delay cost / actual demand	$0.29	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Out: ON · Print: ON · Now: OK · validity of output	VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID

SummaryView

period length (min)	60		**PROJECT INFORMATION**		**REPORT INFORMATION**	
annual traffic growth (%)	5.00%		PROJECT TITLE	WZ DELAY	REPORT TITLE	DETAILED USER COST REPORT SUMMARY SHEET
years of growth	0					
VEHICLE INPUT	cars	trucks	C.S.		DIVISION	
design demand (%)	75.0%	25.0%	JOB #		REPORT BY	
user cost per hour ($/V hr)	$10.79	$10.79	START DATE		REPORT DATE	
user cost per mile, ($/V mi)	$0.30	$1.00	NOTES:		US-127NB@I-96	
user cost per cancellation, ($/V)	$1.00	$2.00				

METHOD INPUT		**METHOD 1**		**METHOD 2**		**METHOD 3**		**METHOD 4**	
	method title	10-12PM							
DISTANCE AND SPEED	(mi) (mph)	distance	speed	distance	speed	distance	speed	distance	speed
work zone	method travel	0.5	see delay		see delay		see delay		see delay
	normal travel	0.5	70.0						
diversion	method travel								
	normal travel								
SPEED DELAY		threshold	range	threshold	range	threshold	range	threshold	range
capacity for speed delay (V/period)		1000							
speed (when D~0) (mph)		34							
speed (when D=C) (mph)		5							
DECREASE TO DEMAND		threshold	range	threshold	range	threshold	range	threshold	range
capacity for decreases to design demand (V/period)		1000							
canceled cars (with no delay) (%)		1.0%							
canceled trucks (with no delay) (%)									
canceled cars (with delay) (%/min)		1.0%							
canceled trucks (with delay) (%/min)									
diverted cars (with no delay) (%)									
diverted trucks (with no delay) (%)									
diverted cars (with delay) (%/min)									
diverted trucks (with delay) (%/min)									
OTHER USER COST INPUT		cars	trucks	cars	trucks	cars	trucks	cars	trucks
other user cost per actual demand ($/V)		$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
user cost per diversion ($/V)		$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

PERIOD INPUT				backup at start (V)	0	0	0	0	0	0	0	0
direction:	NB		NB		NB							
period	historical demand		design demand		capacity		capacity		capacity		capacity	
(hr)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)
12 A	119		119	0	1000							
1 A	72		72	0	1000							
2 A	75		75	0	1000							
3 A	78		78	0	1000							
4 A	104		104	0	1000							
5 A	333		333	0	1000							
6 A	993		993	0	1000							
7 A	942		942	0	1000							
8 A	800		800	0	1000							
9 A	713		713	0	1000							
10 A	682		682	0	1000							
11 A	700		700	0	1000							
12 P	655		655	0	1000							
1 P	683		683	0	1000							
2 P	885		885	0	1000							
3 P	941		941	0	1000							
4 P	648		648	0	1000							
5 P	1012		1012	0	1000							
6 P	654		654	0	1000							
7 P	433		433	0	1000							
8 P	374		374	0	1000							
9 P	441		441	0	1000							
10 P	321		321	0	1000							
11 P	185		185	0	1000							
Total		0	12843	0	24000	0	0	0	0	0	0	0

SUMMARY OUTPUT								
traffic method	24 hr							
direction	NB		NB		NB		NB	
total user cost	$7,471	$0	$0	$0	$0	$0	$0	$0
user cost of delays	$7,069	$0	$0	$0	$0	$0	$0	$0
user cost of decreases	$402	$0	$0	$0	$0	$0	$0	$0
maximum backup (V)	0	0	0	0	0	0	0	0
maximum backup length (lane mi)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
maximum delay (min.)	5.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
average delay, except diversions (min)	3.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total delay, except diversions (V hr)	655	0	0	0	0	0	0	0
total vehicles canceled(V)	402	0	0	0	0	0	0	0
total vehicles diverted (V)	0	0	0	0	0	0	0	0
total decrease in demand (V)	402	0	0	0	0	0	0	0
% decrease in demand	3.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
delay per diverted vehicle (min)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total diversion delay (V hr)	0	0	0	0	0	0	0	0
average delay, including diversions (min)	3.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total delay, including diversions (V hr)	655	0	0	0	0	0	0	0
user cost / design demand	$0.58	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
delay cost / actual demand	$0.57	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Auto: ON / Print: ON / Now: OK / validity of output	VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID

SummaryView

	cars	trucks
period length (min)	60	
annual traffic growth (%)	5.00%	
years of growth	0	
VEHICLE INPUT	cars	trucks
design demand (%)	75.0%	25.0%
user cost per hour ($/V hr)	$10.79	$10.79
user cost per mile, ($/V mi)	$0.30	$1.00
user cost per cancellation, ($/V)	$1.00	$2.00

PROJECT INFORMATION	
PROJECT TITLE	WZ DELAY
C.S.	
JOB #	
START DATE	

REPORT INFORMATION	
REPORT TITLE	DETAILED USER COST REPORT SUMMARY SHEET
DIVISION	
REPORT BY	
REPORT DATE	

NOTES: US-127NB@I-96

METHOD INPUT	METHOD 1		METHOD 2		METHOD 3		METHOD 4	
method title	10-12PM							
DISTANCE AND SPEED (mi) (mph)	distance	speed	distance	speed	distance	speed	distance	speed
work zone: method travel	0.5	see delay		see delay		see delay		see delay
work zone: normal travel	0.5	70.0						
diversion: method travel								
diversion: normal travel								
SPEED DELAY	threshold	range	threshold	range	threshold	range	threshold	range
capacity for speed delay (V/period)	900							
speed (when D~0) (mph)	45							
speed (when D=C) (mph)	15							
DECREASE TO DEMAND	threshold	range	threshold	range	threshold	range	threshold	range
capacity for decreases to design demand (V/period)	900							
canceled cars (with no delay) (%)	1.0%							
canceled trucks (with no delay) (%)								
canceled cars (with delay) (%/min)	1.0%							
canceled trucks (with delay) (%/min)								
diverted cars (with no delay) (%)								
diverted trucks (with no delay) (%)								
diverted cars (with delay) (%/min)								
diverted trucks (with delay) (%/min)								
OTHER USER COST INPUT	cars	trucks	cars	trucks	cars	trucks	cars	trucks
other user cost per actual demand ($/V)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
user cost per diversion ($/V)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

PERIOD INPUT			backup at start (V)		0	0	0	0	0	0	0	0
direction:	NB		NB		NB							
period	historical demand		design demand		capacity		capacity		capacity		capacity	
(hr)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)
12 A	119		119	0	900							
1 A	72		72	0	900							
2 A	75		75	0	900							
3 A	78		78	0	900							
4 A	104		104	0	900							
5 A	333		333	0	900							
6 A	993		993	0	900							
7 A	942		942	0	900							
8 A	800		800	0	900							
9 A	713		713	0	900							
10 A	682		682	0	900							
11 A	700		700	0	900							
12 P	655		655	0	900							
1 P	683		683	0	900							
2 P	885		885	0	900							
3 P	941		941	0	900							
4 P	648		648	0	900							
5 P	1012		1012	0	900							
6 P	654		654	0	900							
7 P	433		433	0	900							
8 P	374		374	0	900							
9 P	441		441	0	900							
10 P	321		321	0	900							
11 P	185		185	0	900							
Total		0	12843	0	21600	0	0	0	0	0	0	0

SUMMARY OUTPUT								
traffic method	24 hr							
direction	NB		NB		NB		NB	
total user cost	$4,496	$0	$0	$0	$0	$0	$0	$0
user cost of delays	$4,219	$0	$0	$0	$0	$0	$0	$0
user cost of decreases	$278	$0	$0	$0	$0	$0	$0	$0
maximum backup (V)	74	0	0	0	0	0	0	0
maximum backup length (lane mi)	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
maximum delay (min.)	6.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
average delay, except diversions (min)	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total delay, except diversions (V hr)	391	0	0	0	0	0	0	0
total vehicles canceled(V)	278	0	0	0	0	0	0	0
total vehicles diverted (V)	0	0	0	0	0	0	0	0
total decrease in demand (V)	278	0	0	0	0	0	0	0
% decrease in demand	2.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
delay per diverted vehicle (min)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total diversion delay (V hr)	0	0	0	0	0	0	0	0
average delay, including diversions (min)	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total delay, including diversions (V hr)	391	0	0	0	0	0	0	0
user cost / design demand	$0.35	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
delay cost / actual demand	$0.34	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Auto: ON Print: ON Now: OK validity of output	VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID

SummaryView

period length (min)	60	
annual traffic growth (%)	5.00%	
years of growth	0	
VEHICLE INPUT	cars	trucks
design demand (%)	75.0%	25.0%
user cost per hour ($/V hr)	$10.79	$10.79
user cost per mile, ($/V mi)	$0.30	$1.00
user cost per cancellation, ($/V)	$1.00	$2.00

PROJECT INFORMATION	
PROJECT TITLE	WZ DELAY
C.S.	
JOB #	
START DATE	

REPORT INFORMATION	
REPORT TITLE	DETAILED USER COST REPORT SUMMARY SHEET
DIVISION	
REPORT BY	
REPORT DATE	

NOTES: US-127NB@I-96

METHOD INPUT		METHOD 1		METHOD 2		METHOD 3		METHOD 4	
method title		10-12PM							
DISTANCE AND SPEED	(mi) (mph)	distance	speed	distance	speed	distance	speed	distance	speed
work zone	method travel	0.5	see delay		see delay		see delay		see delay
	normal travel	0.5	70.0						
diversion	method travel								
	normal travel								
SPEED DELAY		threshold	range	threshold	range	threshold	range	threshold	range
capacity for speed delay (V/period)		900							
speed (when D~0) (mph)		45							
speed (when D=C) (mph)		10							
DECREASE TO DEMAND		threshold	range	threshold	range	threshold	range	threshold	range
capacity for decreases to design demand (V/period)		900							
canceled cars (with no delay) (%)		1.0%							
canceled trucks (with no delay) (%)									
canceled cars (with delay) (%/min)		1.0%							
canceled trucks (with delay) (%/min)									
diverted cars (with no delay) (%)									
diverted trucks (with no delay) (%)									
diverted cars (with delay) (%/min)									
diverted trucks (with delay) (%/min)									

OTHER USER COST INPUT	cars	trucks	cars	trucks	cars	trucks	cars	trucks
other user cost per actual demand ($/V)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
user cost per diversion ($/V)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

PERIOD INPUT			backup at start (V)		0	0	0	0	0	0	0	0
direction:	NB		NB		NB							
period	historical demand		design demand		capacity		capacity		capacity		capacity	
(hr)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)
12 A	119		119	0	900							
1 A	72		72	0	900							
2 A	75		75	0	900							
3 A	78		78	0	900							
4 A	104		104	0	900							
5 A	333		333	0	900							
6 A	993		993	0	900							
7 A	942		942	0	900							
8 A	800		800	0	900							
9 A	713		713	0	900							
10 A	682		682	0	900							
11 A	700		700	0	900							
12 P	655		655	0	900							
1 P	683		683	0	900							
2 P	885		885	0	900							
3 P	941		941	0	900							
4 P	648		648	0	900							
5 P	1012		1012	0	900							
6 P	654		654	0	900							
7 P	433		433	0	900							
8 P	374		374	0	900							
9 P	441		441	0	900							
10 P	321		321	0	900							
11 P	185		185	0	900							
Total		0	12843	0	21600	0	0	0	0	0	0	0

SUMMARY OUTPUT								
traffic method	24 hr							
direction	NB		NB		NB		NB	
total user cost	$5,738	$0	$0	$0	$0	$0	$0	$0
user cost of delays	$5,409	$0	$0	$0	$0	$0	$0	$0
user cost of decreases	$330	$0	$0	$0	$0	$0	$0	$0
maximum backup (V)	68	0	0	0	0	0	0	0
maximum backup length (lane mi)	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
maximum delay (min.)	7.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
average delay, except diversions (min)	2.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total delay, except diversions (V hr)	501	0	0	0	0	0	0	0
total vehicles canceled(V)	330	0	0	0	0	0	0	0
total vehicles diverted (V)	0	0	0	0	0	0	0	0
total decrease in demand (V)	330	0	0	0	0	0	0	0
% decrease in demand	2.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
delay per diverted vehicle (min)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total diversion delay (V hr)	0	0	0	0	0	0	0	0
average delay, including diversions (min)	2.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total delay, including diversions (V hr)	501	0	0	0	0	0	0	0
user cost / design demand	$0.45	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
delay cost / actual demand	$0.43	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Calc: ON Print: ON Now: OK validity of output	VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID

SummaryView

period length (min)	60	
annual traffic growth (%)	5.00%	
years of growth	0	
VEHICLE INPUT	cars	trucks
design demand (%)	75.0%	25.0%
user cost per hour ($/V hr)	$10.79	$10.79
user cost per mile, ($/V mi)	$0.30	$1.00
user cost per cancellation, ($/V)	$1.00	$2.00

PROJECT INFORMATION	
PROJECT TITLE	WZ DELAY
C.S.	
JOB #	
START DATE	

REPORT INFORMATION	
REPORT TITLE	DETAILED USER COST REPORT SUMMARY SHEET
DIVISION	
REPORT BY	
REPORT DATE	

NOTES: US-127NB@I-96

METHOD INPUT		METHOD 1		METHOD 2		METHOD 3		METHOD 4	
method title		10-12PM							
DISTANCE AND SPEED	(mi) (mph)	distance	speed	distance	speed	distance	speed	distance	speed
work zone	method travel	0.5	see delay		see delay		see delay		see delay
	normal travel	0.5	70.0						
diversion	method travel								
	normal travel								
SPEED DELAY		threshold	range	threshold	range	threshold	range	threshold	range
capacity for speed delay (V/period)		900							
speed (when D~0) (mph)		45							
speed (when D=C) (mph)		5							
DECREASE TO DEMAND		threshold	range	threshold	range	threshold	range	threshold	range
capacity for decreases to design demand (V/period)		900							
canceled cars (with no delay) (%)		1.0%							
canceled trucks (with no delay) (%)									
canceled cars (with delay) (%/min)		1.0%							
canceled trucks (with delay) (%/min)									
diverted cars (with no delay) (%)									
diverted trucks (with no delay) (%)									
diverted cars (with delay) (%/min)									
diverted trucks (with delay) (%/min)									
OTHER USER COST INPUT		cars	trucks	cars	trucks	cars	trucks	cars	trucks
other user cost per actual demand ($/V)		$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
user cost per diversion ($/V)		$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

PERIOD INPUT			backup at start (V)		0	0	0	0	0	0	0	0
direction:	NB		NB		NB							
period	historical demand		design demand		capacity		capacity		capacity		capacity	
(hr)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)
12 A	119		119	0	900							
1 A	72		72	0	900							
2 A	75		75	0	900							
3 A	78		78	0	900							
4 A	104		104	0	900							
5 A	333		333	0	900							
6 A	993		993	0	900							
7 A	942		942	0	900							
8 A	800		800	0	900							
9 A	713		713	0	900							
10 A	682		682	0	900							
11 A	700		700	0	900							
12 P	655		655	0	900							
1 P	683		683	0	900							
2 P	885		885	0	900							
3 P	941		941	0	900							
4 P	648		648	0	900							
5 P	1012		1012	0	900							
6 P	654		654	0	900							
7 P	433		433	0	900							
8 P	374		374	0	900							
9 P	441		441	0	900							
10 P	321		321	0	900							
11 P	185		185	0	900							
Total		0	12843	0	21600	0	0	0	0	0	0	0

SUMMARY OUTPUT								
traffic method	24 hr							
direction	NB		NB		NB		NB	
total user cost	$9,338	$0	$0	$0	$0	$0	$0	$0
user cost of delays	$8,855	$0	$0	$0	$0	$0	$0	$0
user cost of decreases	$483	$0	$0	$0	$0	$0	$0	$0
maximum backup (V)	50	0	0	0	0	0	0	0
maximum backup length (lane mi)	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
maximum delay (min.)	8.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
average delay, except diversions (min)	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total delay, except diversions (V hr)	821	0	0	0	0	0	0	0
total vehicles canceled(V)	483	0	0	0	0	0	0	0
total vehicles diverted (V)	0	0	0	0	0	0	0	0
total decrease in demand (V)	483	0	0	0	0	0	0	0
% decrease in demand	3.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
delay per diverted vehicle (min)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total diversion delay (V hr)	0	0	0	0	0	0	0	0
average delay, including diversions (min)	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total delay, including diversions (V hr)	821	0	0	0	0	0	0	0
user cost / design demand	$0.73	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
delay cost / actual demand	$0.72	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Old: ON / Print: ON / Now: OK — validity of output	VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID

period length (min)	60	
annual traffic growth (%)	5.00%	
years of growth	0	
VEHICLE INPUT	cars	trucks
design demand (%)	75.0%	25.0%
user cost per hour ($/V hr)	$10.79	$10.79
user cost per mile, ($/V mi)	$0.30	$1.00
user cost per cancellation, ($/V)	$1.00	$2.00

PROJECT INFORMATION	
PROJECT TITLE	WZ DELAY
C.S.	
JOB #	
START DATE	

REPORT INFORMATION	
REPORT TITLE	DETAILED USER COST REPORT SUMMARY SHEET
DIVISION	
REPORT BY	
REPORT DATE	

NOTES: US-127NB@I-96

METHOD INPUT		METHOD 1		METHOD 2		METHOD 3		METHOD 4	
	method title	10-12PM							
DISTANCE AND SPEED	(mi) (mph)	distance	speed	distance	speed	distance	speed	distance	speed
work zone	method travel	0.5	see delay		see delay		see delay		see delay
	normal travel	0.5	70.0						
diversion	method travel								
	normal travel								
SPEED DELAY		threshold	range	threshold	range	threshold	range	threshold	range
capacity for speed delay (V/period)		900							
speed (when D~0) (mph)		39							
speed (when D=C) (mph)		15							
DECREASE TO DEMAND		threshold	range	threshold	range	threshold	range	threshold	range
capacity for decreases to design demand (V/period)		900							
canceled cars (with no delay) (%)		1.0%							
canceled trucks (with no delay) (%)									
canceled cars (with delay) (%/min)		1.0%							
canceled trucks (with delay) (%/min)									
diverted cars (with no delay) (%)									
diverted trucks (with no delay) (%)									
diverted cars (with delay) (%/min)									
diverted trucks (with delay) (%/min)									
OTHER USER COST INPUT		cars	trucks	cars	trucks	cars	trucks	cars	trucks
other user cost per actual demand ($/V)		$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
user cost per diversion ($/V)		$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

PERIOD INPUT			backup at start (V)		0	0	0	0	0	0	0	0
direction:	NB		NB		NB							
period	historical demand		design demand		capacity		capacity		capacity		capacity	
(hr)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)
12 A	119		119	0	900							
1 A	72		72	0	900							
2 A	75		75	0	900							
3 A	78		78	0	900							
4 A	104		104	0	900							
5 A	333		333	0	900							
6 A	993		993	0	900							
7 A	942		942	0	900							
8 A	800		800	0	900							
9 A	713		713	0	900							
10 A	682		682	0	900							
11 A	700		700	0	900							
12 P	655		655	0	900							
1 P	683		683	0	900							
2 P	885		885	0	900							
3 P	941		941	0	900							
4 P	648		648	0	900							
5 P	1012		1012	0	900							
6 P	654		654	0	900							
7 P	433		433	0	900							
8 P	374		374	0	900							
9 P	441		441	0	900							
10 P	321		321	0	900							
11 P	185		185	0	900							
Total		0	12843	0	21600	0	0	0	0	0	0	0

SUMMARY OUTPUT								
traffic method	24 hr							
direction	NB		NB		NB		NB	
total user cost	$4,578	$0	$0	$0	$0	$0	$0	$0
user cost of delays	$4,297	$0	$0	$0	$0	$0	$0	$0
user cost of decreases	$281	$0	$0	$0	$0	$0	$0	$0
maximum backup (V)	74	0	0	0	0	0	0	0
maximum backup length (lane mi)	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
maximum delay (min.)	6.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
average delay, except diversions (min)	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total delay, except diversions (V hr)	398	0	0	0	0	0	0	0
total vehicles canceled(V)	281	0	0	0	0	0	0	0
total vehicles diverted (V)	0	0	0	0	0	0	0	0
total decrease in demand (V)	281	0	0	0	0	0	0	0
% decrease in demand	2.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
delay per diverted vehicle (min)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total diversion delay (V hr)	0	0	0	0	0	0	0	0
average delay, including diversions (min)	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total delay, including diversions (V hr)	398	0	0	0	0	0	0	0
user cost / design demand	$0.36	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
delay cost / actual demand	$0.34	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Calc: ON Print: ON Now: OK validity of output	VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID

SummaryView

period length (min)	60	
annual traffic growth (%)	5.00%	
years of growth	0	
VEHICLE INPUT	cars	trucks
design demand (%)	75.0%	25.0%
user cost per hour ($/V hr)	$10.79	$10.79
user cost per mile, ($/V mi)	$0.30	$1.00
user cost per cancellation, ($/V)	$1.00	$2.00

PROJECT INFORMATION	
PROJECT TITLE	WZ DELAY
C.S.	
JOB #	
START DATE	

REPORT INFORMATION	
REPORT TITLE	DETAILED USER COST REPORT SUMMARY SHEET
DIVISION	
REPORT BY	
REPORT DATE	

NOTES: US-127NB@I-96

METHOD INPUT			METHOD 1		METHOD 2		METHOD 3		METHOD 4	
		method title	10-12PM							
DISTANCE AND SPEED		(mi) (mph)	distance	speed	distance	speed	distance	speed	distance	speed
	work zone	method travel	0.5	see delay		see delay		see delay		see delay
		normal travel	0.5	70.0						
	diversion	method travel								
		normal travel								
SPEED DELAY			threshold	range	threshold	range	threshold	range	threshold	range
capacity for speed delay (V/period)			900							
speed (when D=0) (mph)			39							
speed (when D=C) (mph)			10							
DECREASE TO DEMAND			threshold	range	threshold	range	threshold	range	threshold	range
capacity for decreases to design demand (V/period)			900							
canceled cars (with no delay) (%)			1.0%							
canceled trucks (with no delay) (%)										
canceled cars (with delay) (%/min)			1.0%							
canceled trucks (with delay) (%/min)										
diverted cars (with no delay) (%)										
diverted trucks (with no delay) (%)										
diverted cars (with delay) (%/min)										
diverted trucks (with delay) (%/min)										
OTHER USER COST INPUT			cars	trucks	cars	trucks	cars	trucks	cars	trucks
other user cost per actual demand ($/V)			$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
user cost per diversion ($/V)			$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

PERIOD INPUT			backup at start (V)		0	0	0	0	0	0	0	0
direction:	NB		NB		NB							
period	historical demand		design demand		capacity		capacity		capacity		capacity	
(hr)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)
12 A	119		119	0	900							
1 A	72		72	0	900							
2 A	75		75	0	900							
3 A	78		78	0	900							
4 A	104		104	0	900							
5 A	333		333	0	900							
6 A	993		993	0	900							
7 A	942		942	0	900							
8 A	800		800	0	900							
9 A	713		713	0	900							
10 A	682		682	0	900							
11 A	700		700	0	900							
12 P	655		655	0	900							
1 P	683		683	0	900							
2 P	885		885	0	900							
3 P	941		941	0	900							
4 P	648		648	0	900							
5 P	1012		1012	0	900							
6 P	654		654	0	900							
7 P	433		433	0	900							
8 P	374		374	0	900							
9 P	441		441	0	900							
10 P	321		321	0	900							
11 P	185		185	0	900							
Total		0	12843	0	21600	0	0	0	0	0	0	0

SUMMARY OUTPUT								
traffic method	24 hr							
direction	NB		NB		NB		NB	
total user cost	$5,820	$0	$0	$0	$0	$0	$0	$0
user cost of delays	$5,487	$0	$0	$0	$0	$0	$0	$0
user cost of decreases	$333	$0	$0	$0	$0	$0	$0	$0
maximum backup (V)	68	0	0	0	0	0	0	0
maximum backup length (lane mi)	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
maximum delay (min.)	7.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
average delay, except diversions (min)	2.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total delay, except diversions (V hr)	509	0	0	0	0	0	0	0
total vehicles canceled(V)	333	0	0	0	0	0	0	0
total vehicles diverted (V)	0	0	0	0	0	0	0	0
total decrease in demand (V)	333	0	0	0	0	0	0	0
% decrease in demand	2.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
delay per diverted vehicle (min)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total diversion delay (V hr)	0	0	0	0	0	0	0	0
average delay, including diversions (min)	2.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total delay, including diversions (V hr)	509	0	0	0	0	0	0	0
user cost / design demand	$0.45	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
delay cost / actual demand	$0.44	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Calc: ON / Print: ON / Now: OK — validity of output	VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID

SummaryView

period length (min)	60	
annual traffic growth (%)	5.00%	
years of growth	0	
VEHICLE INPUT	cars	trucks
design demand (%)	75.0%	25.0%
user cost per hour ($/V hr)	$10.79	$10.79
user cost per mile, ($/V mi)	$0.30	$1.00
user cost per cancellation, ($/V)	$1.00	$2.00

PROJECT INFORMATION	
PROJECT TITLE	WZ DELAY
C.S.	
JOB #	
START DATE	

REPORT INFORMATION	
REPORT TITLE	DETAILED USER COST REPORT SUMMARY SHEET
DIVISION	
REPORT BY	
REPORT DATE	

NOTES: US-127NB@I-96

METHOD INPUT	METHOD 1		METHOD 2		METHOD 3		METHOD 4	
method title	10-12PM							
DISTANCE AND SPEED (mi) (mph)	distance	speed	distance	speed	distance	speed	distance	speed
work zone – method travel	0.5	see delay		see delay		see delay		see delay
work zone – normal travel	0.5	70.0						
diversion – method travel								
diversion – normal travel								
SPEED DELAY	threshold	range	threshold	range	threshold	range	threshold	range
capacity for speed delay (V/period)	900							
speed (when D~0) (mph)	39							
speed (when D=C) (mph)	5							
DECREASE TO DEMAND	threshold	range	threshold	range	threshold	range	threshold	range
capacity for decreases to design demand (V/period)	900							
canceled cars (with no delay) (%)	1.0%							
canceled trucks (with no delay) (%)								
canceled cars (with delay) (%/min)	1.0%							
canceled trucks (with delay) (%/min)								
diverted cars (with no delay) (%)								
diverted trucks (with no delay) (%)								
diverted cars (with delay) (%/min)								
diverted trucks (with delay) (%/min)								

OTHER USER COST INPUT	cars	trucks	cars	trucks	cars	trucks	cars	trucks
other user cost per actual demand ($/V)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
user cost per diversion ($/V)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

PERIOD INPUT			backup at start (V)		0	0	0	0	0	0	0	0
direction:	NB		NB		NB							
period	historical demand		design demand		capacity		capacity		capacity		capacity	
(hr)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)
12 A	119		119	0	900							
1 A	72		72	0	900							
2 A	75		75	0	900							
3 A	78		78	0	900							
4 A	104		104	0	900							
5 A	333		333	0	900							
6 A	993		993	0	900							
7 A	942		942	0	900							
8 A	800		800	0	900							
9 A	713		713	0	900							
10 A	682		682	0	900							
11 A	700		700	0	900							
12 P	655		655	0	900							
1 P	683		683	0	900							
2 P	885		885	0	900							
3 P	941		941	0	900							
4 P	648		648	0	900							
5 P	1012		1012	0	900							
6 P	654		654	0	900							
7 P	433		433	0	900							
8 P	374		374	0	900							
9 P	441		441	0	900							
10 P	321		321	0	900							
11 P	185		185	0	900							
Total		0	12843	0	21600	0	0	0	0	0	0	0

SUMMARY OUTPUT								
traffic method	24 hr							
direction	NB		NB		NB		NB	
total user cost	$9,421	$0	$0	$0	$0	$0	$0	$0
user cost of delays	$8,934	$0	$0	$0	$0	$0	$0	$0
user cost of decreases	$487	$0	$0	$0	$0	$0	$0	$0
maximum backup (V)	50	0	0	0	0	0	0	0
maximum backup length (lane mi)	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
maximum delay (min.)	8.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
average delay, except diversions (min)	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total delay, except diversions (V hr)	828	0	0	0	0	0	0	0
total vehicles canceled(V)	487	0	0	0	0	0	0	0
total vehicles diverted (V)	0	0	0	0	0	0	0	0
total decrease in demand (V)	487	0	0	0	0	0	0	0
% decrease in demand	3.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
delay per diverted vehicle (min)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total diversion delay (V hr)	0	0	0	0	0	0	0	0
average delay, including diversions (min)	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total delay, including diversions (V hr)	828	0	0	0	0	0	0	0
user cost / design demand	$0.73	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
delay cost / actual demand	$0.72	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Grid: ON · Print: ON · Now: OK · validity of output	VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID

period length (min)	60	
annual traffic growth (%)	5.00%	
years of growth	0	
VEHICLE INPUT	cars	trucks
design demand (%)	75.0%	25.0%
user cost per hour ($/V hr)	$10.79	$10.79
user cost per mile, ($/V mi)	$0.30	$1.00
user cost per cancellation, ($/V)	$1.00	$2.00

PROJECT INFORMATION	
PROJECT TITLE	WZ DELAY
C.S.	
JOB #	
START DATE	

REPORT INFORMATION	
REPORT TITLE	DETAILED USER COST REPORT SUMMARY SHEET
DIVISION	
REPORT BY	
REPORT DATE	

NOTES: US-127NB@I-96

METHOD INPUT		METHOD 1		METHOD 2		METHOD 3		METHOD 4	
	method title	10-12PM							
DISTANCE AND SPEED	(mi) (mph)	distance	speed	distance	speed	distance	speed	distance	speed
work zone	method travel	0.5	see delay		see delay		see delay		see delay
	normal travel	0.5	70.0						
diversion	method travel								
	normal travel								
SPEED DELAY		threshold	range	threshold	range	threshold	range	threshold	range
	capacity for speed delay (V/period)	900							
	speed (when D~0) (mph)	34							
	speed (when D=C) (mph)	15							
DECREASE TO DEMAND		threshold	range	threshold	range	threshold	range	threshold	range
	capacity for decreases to design demand (V/period)	900							
	canceled cars (with no delay) (%)	1.0%							
	canceled trucks (with no delay) (%)								
	canceled cars (with delay) (%/min)	1.0%							
	canceled trucks (with delay) (%/min)								
	diverted cars (with no delay) (%)								
	diverted trucks (with no delay) (%)								
	diverted cars (with delay) (%/min)								
	diverted trucks (with delay) (%/min)								
OTHER USER COST INPUT		cars	trucks	cars	trucks	cars	trucks	cars	trucks
	other user cost per actual demand ($/V)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
	user cost per diversion ($/V)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

PERIOD INPUT			backup at start (V)		0	0	0	0	0	0	0	0
direction:	NB		NB		NB							
period	historical demand		design demand		capacity		capacity		capacity		capacity	
(hr)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)
12 A	119		119	0	900							
1 A	72		72	0	900							
2 A	75		75	0	900							
3 A	78		78	0	900							
4 A	104		104	0	900							
5 A	333		333	0	900							
6 A	993		993	0	900							
7 A	942		942	0	900							
8 A	800		800	0	900							
9 A	713		713	0	900							
10 A	682		682	0	900							
11 A	700		700	0	900							
12 P	655		655	0	900							
1 P	683		683	0	900							
2 P	885		885	0	900							
3 P	941		941	0	900							
4 P	648		648	0	900							
5 P	1012		1012	0	900							
6 P	654		654	0	900							
7 P	433		433	0	900							
8 P	374		374	0	900							
9 P	441		441	0	900							
10 P	321		321	0	900							
11 P	185		185	0	900							
Total		0	12843	0	21600	0	0	0	0	0	0	0

SUMMARY OUTPUT								
traffic method	24 hr							
direction	NB		NB		NB		NB	
total user cost	$4,668	$0	$0	$0	$0	$0	$0	$0
user cost of delays	$4,383	$0	$0	$0	$0	$0	$0	$0
user cost of decreases	$285	$0	$0	$0	$0	$0	$0	$0
maximum backup (V)	74	0	0	0	0	0	0	0
maximum backup length (lane mi)	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
maximum delay (min.)	6.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
average delay, except diversions (min)	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total delay, except diversions (V hr)	406	0	0	0	0	0	0	0
total vehicles canceled(V)	285	0	0	0	0	0	0	0
total vehicles diverted (V)	0	0	0	0	0	0	0	0
total decrease in demand (V)	285	0	0	0	0	0	0	0
% decrease in demand	2.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
delay per diverted vehicle (min)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total diversion delay (V hr)	0	0	0	0	0	0	0	0
average delay, including diversions (min)	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total delay, including diversions (V hr)	406	0	0	0	0	0	0	0
user cost / design demand	$0.36	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
delay cost / actual demand	$0.35	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Calc: ON Print: ON Now: OK validity of output	VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID

period length (min)	60	
annual traffic growth (%)	5.00%	
years of growth	0	
VEHICLE INPUT	cars	trucks
design demand (%)	75.0%	25.0%
user cost per hour ($/V hr)	$10.79	$10.79
user cost per mile, ($/V mi)	$0.30	$1.00
user cost per cancellation, ($/V)	$1.00	$2.00

PROJECT INFORMATION	
PROJECT TITLE	WZ DELAY
C.S.	
JOB #	
START DATE	
NOTES:	US-127NB@I-96

REPORT INFORMATION	
REPORT TITLE	DETAILED USER COST REPORT SUMMARY SHEET
DIVISION	
REPORT BY	
REPORT DATE	

METHOD INPUT		METHOD 1		METHOD 2		METHOD 3		METHOD 4	
	method title	10-12PM							
DISTANCE AND SPEED	(mi) (mph)	distance	speed	distance	speed	distance	speed	distance	speed
work zone	method travel	0.5	~~see delay~~		~~see delay~~		~~see delay~~		~~see delay~~
	normal travel	0.5	70.0						
diversion	method travel								
	normal travel								
SPEED DELAY		threshold	range	threshold	range	threshold	range	threshold	range
	capacity for speed delay (V/period)	900							
	speed (when D~0) (mph)	34							
	speed (when D=C) (mph)	10							
DECREASE TO DEMAND		threshold	range	threshold	range	threshold	range	threshold	range
	capacity for decreases to design demand (V/period)	900							
	canceled cars (with no delay) (%)	1.0%							
	canceled trucks (with no delay) (%)								
	canceled cars (with delay) (%/min)	1.0%							
	canceled trucks (with delay) (%/min)								
	diverted cars (with no delay) (%)								
	diverted trucks (with no delay) (%)								
	diverted cars (with delay) (%/min)								
	diverted trucks (with delay) (%/min)								
OTHER USER COST INPUT		cars	trucks	cars	trucks	cars	trucks	cars	trucks
	other user cost per actual demand ($/V)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
	user cost per diversion ($/V)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

PERIOD INPUT			backup at start (V)		0	0	0	0	0	0	0	0
direction:	NB		NB		NB							
period	historical demand		design demand		capacity		capacity		capacity		capacity	
(hr)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)
12 A	119		119	0	900							
1 A	72		72	0	900							
2 A	75		75	0	900							
3 A	78		78	0	900							
4 A	104		104	0	900							
5 A	333		333	0	900							
6 A	993		993	0	900							
7 A	942		942	0	900							
8 A	800		800	0	900							
9 A	713		713	0	900							
10 A	682		682	0	900							
11 A	700		700	0	900							
12 P	655		655	0	900							
1 P	683		683	0	900							
2 P	885		885	0	900							
3 P	941		941	0	900							
4 P	648		648	0	900							
5 P	1012		1012	0	900							
6 P	654		654	0	900							
7 P	433		433	0	900							
8 P	374		374	0	900							
9 P	441		441	0	900							
10 P	321		321	0	900							
11 P	185		185	0	900							
Total		0	12843	0	21600	0	0	0	0	0	0	0

SUMMARY OUTPUT								
traffic method	24 hr							
direction	NB		NB		NB		NB	
total user cost	$5,911	$0	$0	$0	$0	$0	$0	$0
user cost of delays	$5,574	$0	$0	$0	$0	$0	$0	$0
user cost of decreases	$337	$0	$0	$0	$0	$0	$0	$0
maximum backup (V)	68	0	0	0	0	0	0	0
maximum backup length (lane mi)	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
maximum delay (min.)	7.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
average delay, except diversions (min)	2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total delay, except diversions (V hr)	517	0	0	0	0	0	0	0
total vehicles canceled(V)	337	0	0	0	0	0	0	0
total vehicles diverted (V)	0	0	0	0	0	0	0	0
total decrease in demand (V)	337	0	0	0	0	0	0	0
% decrease in demand	2.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
delay per diverted vehicle (min)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total diversion delay (V hr)	0	0	0	0	0	0	0	0
average delay, including diversions (min)	2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total delay, including diversions (V hr)	517	0	0	0	0	0	0	0
user cost / design demand	$0.46	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
delay cost / actual demand	$0.45	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Calc: ON · Print: ON · Now: OK · validity of output	VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID

SummaryView

period length (min)	60	
annual traffic growth (%)	5.00%	
years of growth	0	
VEHICLE INPUT	cars	trucks
design demand (%)	75.0%	25.0%
user cost per hour ($/V hr)	$10.79	$10.79
user cost per mile, ($/V mi)	$0.30	$1.00
user cost per cancellation, ($/V)	$1.00	$2.00

PROJECT INFORMATION	
PROJECT TITLE	WZ DELAY
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NOTES:	US-127NB@I-96

REPORT INFORMATION	
REPORT TITLE	DETAILED USER COST REPORT SUMMARY SHEET
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REPORT BY	
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METHOD INPUT	METHOD 1		METHOD 2		METHOD 3		METHOD 4	
method title	10-12PM							
DISTANCE AND SPEED (mi) (mph)	distance	speed	distance	speed	distance	speed	distance	speed
work zone — method travel	0.5	see delay		see delay		see delay		see delay
work zone — normal travel	0.5	70.0						
diversion — method travel								
diversion — normal travel								
SPEED DELAY	threshold	range	threshold	range	threshold	range	threshold	range
capacity for speed delay (V/period)	900							
speed (when D~0) (mph)	34							
speed (when D=C) (mph)	5							
DECREASE TO DEMAND	threshold	range	threshold	range	threshold	range	threshold	range
capacity for decreases to design demand (V/period)	900							
canceled cars (with no delay) (%)	1.0%							
canceled trucks (with no delay) (%)								
canceled cars (with delay) (%/min)	1.0%							
canceled trucks (with delay) (%/min)								
diverted cars (with no delay) (%)								
diverted trucks (with no delay) (%)								
diverted cars (with delay) (%/min)								
diverted trucks (with delay) (%/min)								
OTHER USER COST INPUT	cars	trucks	cars	trucks	cars	trucks	cars	trucks
other user cost per actual demand ($/V)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
user cost per diversion ($/V)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

PERIOD INPUT			backup at start (V)		0	0	0	0	0	0	0	0
direction:	NB		NB		NB							
period	historical demand		design demand		capacity		capacity		capacity		capacity	
(hr)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)
12 A	119		119	0	900							
1 A	72		72	0	900							
2 A	75		75	0	900							
3 A	78		78	0	900							
4 A	104		104	0	900							
5 A	333		333	0	900							
6 A	993		993	0	900							
7 A	942		942	0	900							
8 A	800		800	0	900							
9 A	713		713	0	900							
10 A	682		682	0	900							
11 A	700		700	0	900							
12 P	655		655	0	900							
1 P	683		683	0	900							
2 P	885		885	0	900							
3 P	941		941	0	900							
4 P	648		648	0	900							
5 P	1012		1012	0	900							
6 P	654		654	0	900							
7 P	433		433	0	900							
8 P	374		374	0	900							
9 P	441		441	0	900							
10 P	321		321	0	900							
11 P	185		185	0	900							
Total		0	12843	0	21600	0	0	0	0	0	0	0

SUMMARY OUTPUT	METHOD 1		METHOD 2		METHOD 3		METHOD 4	
traffic method	24 hr							
direction	NB		NB		NB		NB	
total user cost	$9,513	$0	$0	$0	$0	$0	$0	$0
user cost of delays	$9,022	$0	$0	$0	$0	$0	$0	$0
user cost of decreases	$491	$0	$0	$0	$0	$0	$0	$0
maximum backup (V)	50	0	0	0	0	0	0	0
maximum backup length (lane mi)	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
maximum delay (min.)	8.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
average delay, except diversions (min)	4.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total delay, except diversions (V hr)	836	0	0	0	0	0	0	0
total vehicles canceled(V)	491	0	0	0	0	0	0	0
total vehicles diverted (V)	0	0	0	0	0	0	0	0
total decrease in demand (V)	491	0	0	0	0	0	0	0
% decrease in demand	3.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
delay per diverted vehicle (min)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total diversion delay (V hr)	0	0	0	0	0	0	0	0
average delay, including diversions (min)	4.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total delay, including diversions (V hr)	836	0	0	0	0	0	0	0
user cost / design demand	$0.74	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
delay cost / actual demand	$0.73	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Calc: ON · Print: ON · Now: OK · validity of output	VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID

SummaryView

period length (min)	60	
annual traffic growth (%)	5.00%	
years of growth	0	
VEHICLE INPUT	cars	trucks
design demand (%)	75.0%	25.0%
user cost per hour ($/V hr)	$10.79	$10.79
user cost per mile, ($/V mi)	$0.30	$1.00
user cost per cancellation, ($/V)	$1.00	$2.00

PROJECT INFORMATION	
PROJECT TITLE	WZ DELAY
C.S.	
JOB #	
START DATE	

REPORT INFORMATION	
REPORT TITLE	DETAILED USER COST REPORT SUMMARY SHEET
DIVISION	
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NOTES: US-127NB@I-96

METHOD INPUT			METHOD 1		METHOD 2		METHOD 3		METHOD 4	
		method title	10-12PM							
DISTANCE AND SPEED		(mi) (mph)	distance	speed	distance	speed	distance	speed	distance	speed
	work zone	method travel	0.5	see delay		see delay		see delay		see delay
		normal travel	0.5	70.0						
	diversion	method travel								
		normal travel								
SPEED DELAY			threshold	range	threshold	range	threshold	range	threshold	range
		capacity for speed delay (V/period)	800							
		speed (when D~0) (mph)	45							
		speed (when D=C) (mph)	15							
DECREASE TO DEMAND			threshold	range	threshold	range	threshold	range	threshold	range
		capacity for decreases to design demand (V/period)	800							
		canceled cars (with no delay) (%)	1.0%							
		canceled trucks (with no delay) (%)								
		canceled cars (with delay) (%/min)	1.0%							
		canceled trucks (with delay) (%/min)								
		diverted cars (with no delay) (%)								
		diverted trucks (with no delay) (%)								
		diverted cars (with delay) (%/min)								
		diverted trucks (with delay) (%/min)								
OTHER USER COST INPUT			cars	trucks	cars	trucks	cars	trucks	cars	trucks
		other user cost per actual demand ($/V)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
		user cost per diversion ($/V)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

PERIOD INPUT				backup at start (V)	0	0	0	0	0	0	0	0
direction:	NB		NB		NB							
period	historical demand		design demand		capacity		capacity		capacity		capacity	
(hr)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)
12 A	119		119	0	800							
1 A	72		72	0	800							
2 A	75		75	0	800							
3 A	78		78	0	800							
4 A	104		104	0	800							
5 A	333		333	0	800							
6 A	993		993	0	800							
7 A	942		942	0	800							
8 A	800		800	0	800							
9 A	713		713	0	800							
10 A	682		682	0	800							
11 A	700		700	0	800							
12 P	655		655	0	800							
1 P	683		683	0	800							
2 P	885		885	0	800							
3 P	941		941	0	800							
4 P	648		648	0	800							
5 P	1012		1012	0	800							
6 P	654		654	0	800							
7 P	433		433	0	800							
8 P	374		374	0	800							
9 P	441		441	0	800							
10 P	321		321	0	800							
11 P	185		185	0	800							
Total		0	12843	0	19200	0	0	0	0	0	0	0

SUMMARY OUTPUT								
traffic method	24 hr							
direction	NB		NB		NB		NB	
total user cost	$10,932	$0	$0	$0	$0	$0	$0	$0
user cost of delays	$10,370	$0	$0	$0	$0	$0	$0	$0
user cost of decreases	$561	$0	$0	$0	$0	$0	$0	$0
maximum backup (V)	177	0	0	0	0	0	0	0
maximum backup length (lane mi)	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
maximum delay (min.)	14.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
average delay, except diversions (min)	4.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total delay, except diversions (V hr)	961	0	0	0	0	0	0	0
total vehicles canceled(V)	561	0	0	0	0	0	0	0
total vehicles diverted (V)	0	0	0	0	0	0	0	0
total decrease in demand (V)	561	0	0	0	0	0	0	0
% decrease in demand	4.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
delay per diverted vehicle (min)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total diversion delay (V hr)	0	0	0	0	0	0	0	0
average delay, including diversions (min)	4.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total delay, including diversions (V hr)	961	0	0	0	0	0	0	0
user cost / design demand	$0.85	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
delay cost / actual demand	$0.84	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Calc: ON Print: ON Now: OK validity of output	VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID

SummaryView

period length (min)	60	
annual traffic growth (%)	5.00%	
years of growth	0	
VEHICLE INPUT	cars	trucks
design demand (%)	75.0%	25.0%
user cost per hour ($/V hr)	$10.79	$10.79
user cost per mile, ($/V mi)	$0.30	$1.00
user cost per cancellation, ($/V)	$1.00	$2.00

PROJECT INFORMATION	
PROJECT TITLE	WZ DELAY
C.S.	
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START DATE	

REPORT INFORMATION	
REPORT TITLE	DETAILED USER COST REPORT SUMMARY SHEET
DIVISION	
REPORT BY	
REPORT DATE	

NOTES: US-127NB@I-96

METHOD INPUT	METHOD 1		METHOD 2		METHOD 3		METHOD 4	
method title	10-12PM							
DISTANCE AND SPEED (mi) (mph)	distance	speed	distance	speed	distance	speed	distance	speed
work zone method travel	0.5	see delay		see delay		see delay		see delay
work zone normal travel	0.5	70.0						
diversion method travel								
diversion normal travel								
SPEED DELAY	threshold	range	threshold	range	threshold	range	threshold	range
capacity for speed delay (V/period)	800							
speed (when D~0) (mph)	45							
speed (when D=C) (mph)	10							
DECREASE TO DEMAND	threshold	range	threshold	range	threshold	range	threshold	range
capacity for decreases to design demand (V/period)	800							
canceled cars (with no delay) (%)	1.0%							
canceled trucks (with no delay) (%)								
canceled cars (with delay) (%/min)	1.0%							
canceled trucks (with delay) (%/min)								
diverted cars (with no delay) (%)								
diverted trucks (with no delay) (%)								
diverted cars (with delay) (%/min)								
diverted trucks (with delay) (%/min)								
OTHER USER COST INPUT	cars	trucks	cars	trucks	cars	trucks	cars	trucks
other user cost per actual demand ($/V)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
user cost per diversion ($/V)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

PERIOD INPUT			backup at start (V)		0	0	0	0	0	0	0	0
direction:	NB		NB		NB							
period	historical demand		design demand		capacity		capacity		capacity		capacity	
(hr)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)
12 A	119		119	0	800							
1 A	72		72	0	800							
2 A	75		75	0	800							
3 A	78		78	0	800							
4 A	104		104	0	800							
5 A	333		333	0	800							
6 A	993		993	0	800							
7 A	942		942	0	800							
8 A	800		800	0	800							
9 A	713		713	0	800							
10 A	682		682	0	800							
11 A	700		700	0	800							
12 P	655		655	0	800							
1 P	683		683	0	800							
2 P	885		885	0	800							
3 P	941		941	0	800							
4 P	648		648	0	800							
5 P	1012		1012	0	800							
6 P	654		654	0	800							
7 P	433		433	0	800							
8 P	374		374	0	800							
9 P	441		441	0	800							
10 P	321		321	0	800							
11 P	185		185	0	800							
Total		0	12843	0	19200	0	0	0	0	0	0	0

SUMMARY OUTPUT								
traffic method	24 hr							
direction	NB		NB		NB		NB	
total user cost	$12,026	$0	$0	$0	$0	$0	$0	$0
user cost of delays	$11,417	$0	$0	$0	$0	$0	$0	$0
user cost of decreases	$609	$0	$0	$0	$0	$0	$0	$0
maximum backup (V)	168	0	0	0	0	0	0	0
maximum backup length (lane mi)	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
maximum delay (min.)	15.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
average delay, except diversions (min)	5.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total delay, except diversions (V hr)	1058	0	0	0	0	0	0	0
total vehicles canceled(V)	609	0	0	0	0	0	0	0
total vehicles diverted (V)	0	0	0	0	0	0	0	0
total decrease in demand (V)	609	0	0	0	0	0	0	0
% decrease in demand	4.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
delay per diverted vehicle (min)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total diversion delay (V hr)	0	0	0	0	0	0	0	0
average delay, including diversions (min)	5.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total delay, including diversions (V hr)	1058	0	0	0	0	0	0	0
user cost / design demand	$0.94	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
delay cost / actual demand	$0.93	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
[illegible]: ON Print: ON Now: OK validity of output	VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID

SummaryView

period length (min)	60	
annual traffic growth (%)	5.00%	
years of growth	0	
VEHICLE INPUT	cars	trucks
design demand (%)	75.0%	25.0%
user cost per hour ($/V hr)	$10.79	$10.79
user cost per mile, ($/V mi)	$0.30	$1.00
user cost per cancellation, ($/V)	$1.00	$2.00

PROJECT INFORMATION	
PROJECT TITLE	WZ DELAY
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REPORT INFORMATION	
REPORT TITLE	DETAILED USER COST REPORT SUMMARY SHEET
DIVISION	
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NOTES: US-127NB@I-96

METHOD INPUT	METHOD 1		METHOD 2		METHOD 3		METHOD 4	
method title	10-12PM							
DISTANCE AND SPEED (mi) (mph)	distance	speed	distance	speed	distance	speed	distance	speed
work zone method travel	0.5	see delay		see delay		see delay		see delay
work zone normal travel	0.5	70.0						
diversion method travel								
diversion normal travel								
SPEED DELAY	threshold	range	threshold	range	threshold	range	threshold	range
capacity for speed delay (V/period)	800							
speed (when D~0) (mph)	45							
speed (when D=C) (mph)	5							
DECREASE TO DEMAND	threshold	range	threshold	range	threshold	range	threshold	range
capacity for decreases to design demand (V/period)	800							
canceled cars (with no delay) (%)	1.0%							
canceled trucks (with no delay) (%)								
canceled cars (with delay) (%/min)	1.0%							
canceled trucks (with delay) (%/min)								
diverted cars (with no delay) (%)								
diverted trucks (with no delay) (%)								
diverted cars (with delay) (%/min)								
diverted trucks (with delay) (%/min)								
OTHER USER COST INPUT	cars	trucks	cars	trucks	cars	trucks	cars	trucks
other user cost per actual demand ($/V)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
user cost per diversion ($/V)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

PERIOD INPUT		backup at start (V)			0	0	0	0	0	0	0	0
direction:	NB		NB		NB							
period	historical demand		design demand		capacity		capacity		capacity		capacity	
(hr)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)
12 A	119		119	0	800							
1 A	72		72	0	800							
2 A	75		75	0	800							
3 A	78		78	0	800							
4 A	104		104	0	800							
5 A	333		333	0	800							
6 A	993		993	0	800							
7 A	942		942	0	800							
8 A	800		800	0	800							
9 A	713		713	0	800							
10 A	682		682	0	800							
11 A	700		700	0	800							
12 P	655		655	0	800							
1 P	683		683	0	800							
2 P	885		885	0	800							
3 P	941		941	0	800							
4 P	648		648	0	800							
5 P	1012		1012	0	800							
6 P	654		654	0	800							
7 P	433		433	0	800							
8 P	374		374	0	800							
9 P	441		441	0	800							
10 P	321		321	0	800							
11 P	185		185	0	800							
Total		0	12843	0	19200	0	0	0	0	0	0	0

SUMMARY OUTPUT								
traffic method	24 hr							
direction	NB		NB		NB		NB	
total user cost	$15,212	$0	$0	$0	$0	$0	$0	$0
user cost of delays	$14,462	$0	$0	$0	$0	$0	$0	$0
user cost of decreases	$751	$0	$0	$0	$0	$0	$0	$0
maximum backup (V)	141	0	0	0	0	0	0	0
maximum backup length (lane mi)	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
maximum delay (min.)	16.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
average delay, except diversions (min)	6.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total delay, except diversions (V hr)	1340	0	0	0	0	0	0	0
total vehicles canceled(V)	751	0	0	0	0	0	0	0
total vehicles diverted (V)	0	0	0	0	0	0	0	0
total decrease in demand (V)	751	0	0	0	0	0	0	0
% decrease in demand	5.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
delay per diverted vehicle (min)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total diversion delay (V hr)	0	0	0	0	0	0	0	0
average delay, including diversions (min)	6.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total delay, including diversions (V hr)	1340	0	0	0	0	0	0	0
user cost / design demand	$1.18	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
delay cost / actual demand	$1.20	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Calc: ON / Print: ON / Now: OK / validity of output	VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID

SummaryView

period length (min)	60	
annual traffic growth (%)	5.00%	
years of growth	0	
VEHICLE INPUT	cars	trucks
design demand (%)	75.0%	25.0%
user cost per hour ($/V hr)	$10.79	$10.79
user cost per mile, ($/V mi)	$0.30	$1.00
user cost per cancellation, ($/V)	$1.00	$2.00

PROJECT INFORMATION	
PROJECT TITLE	WZ DELAY
C.S.	
JOB #	
START DATE	
NOTES:	US-127NB@I-96

REPORT INFORMATION	
REPORT TITLE	DETAILED USER COST REPORT SUMMARY SHEET
DIVISION	
REPORT BY	
REPORT DATE	

METHOD INPUT		METHOD 1		METHOD 2		METHOD 3		METHOD 4	
	method title	10-12PM							
DISTANCE AND SPEED	(mi) (mph)	distance	speed	distance	speed	distance	speed	distance	speed
work zone	method travel	0.5	see delay		see delay		see delay		see delay
	normal travel	0.5	70.0						
diversion	method travel								
	normal travel								
SPEED DELAY		threshold	range	threshold	range	threshold	range	threshold	range
capacity for speed delay (V/period)		800							
speed (when D~0) (mph)		39							
speed (when D=C) (mph)		15							
DECREASE TO DEMAND		threshold	range	threshold	range	threshold	range	threshold	range
capacity for decreases to design demand (V/period)		800							
canceled cars (with no delay) (%)		1.0%							
canceled trucks (with no delay) (%)									
canceled cars (with delay) (%/min)		1.0%							
canceled trucks (with delay) (%/min)									
diverted cars (with no delay) (%)									
diverted trucks (with no delay) (%)									
diverted cars (with delay) (%/min)									
diverted trucks (with delay) (%/min)									
OTHER USER COST INPUT		cars	trucks	cars	trucks	cars	trucks	cars	trucks
other user cost per actual demand ($/V)		$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
user cost per diversion ($/V)		$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

PERIOD INPUT			backup at start (V)		0	0	0	0	0	0	0	0
direction:	NB		NB		NB							
period	historical demand		design demand		capacity		capacity		capacity		capacity	
(hr)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)
12 A	119		119	0	800							
1 A	72		72	0	800							
2 A	75		75	0	800							
3 A	78		78	0	800							
4 A	104		104	0	800							
5 A	333		333	0	800							
6 A	993		993	0	800							
7 A	942		942	0	800							
8 A	800		800	0	800							
9 A	713		713	0	800							
10 A	682		682	0	800							
11 A	700		700	0	800							
12 P	655		655	0	800							
1 P	683		683	0	800							
2 P	885		885	0	800							
3 P	941		941	0	800							
4 P	648		648	0	800							
5 P	1012		1012	0	800							
6 P	654		654	0	800							
7 P	433		433	0	800							
8 P	374		374	0	800							
9 P	441		441	0	800							
10 P	321		321	0	800							
11 P	185		185	0	800							
Total		0	12843	0	19200	0	0	0	0	0	0	0

SUMMARY OUTPUT								
traffic method	24 hr							
direction	NB		NB		NB		NB	
total user cost	$10,988	$0	$0	$0	$0	$0	$0	$0
user cost of delays	$10,425	$0	$0	$0	$0	$0	$0	$0
user cost of decreases	$564	$0	$0	$0	$0	$0	$0	$0
maximum backup (V)	177	0	0	0	0	0	0	0
maximum backup length (lane mi)	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
maximum delay (min.)	14.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
average delay, except diversions (min)	4.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total delay, except diversions (V hr)	966	0	0	0	0	0	0	0
total vehicles canceled(V)	564	0	0	0	0	0	0	0
total vehicles diverted (V)	0	0	0	0	0	0	0	0
total decrease in demand (V)	564	0	0	0	0	0	0	0
% decrease in demand	4.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
delay per diverted vehicle (min)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total diversion delay (V hr)	0	0	0	0	0	0	0	0
average delay, including diversions (min)	4.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total delay, including diversions (V hr)	966	0	0	0	0	0	0	0
user cost / design demand	$0.86	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
delay cost / actual demand	$0.85	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Auto: ON Print: ON Now: OK validity of output	VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID

SummaryView

period length (min)	60	
annual traffic growth (%)	5.00%	
years of growth	0	
VEHICLE INPUT	cars	trucks
design demand (%)	75.0%	25.0%
user cost per hour ($/V hr)	$10.79	$10.79
user cost per mile, ($/V mi)	$0.30	$1.00
user cost per cancellation, ($/V)	$1.00	$2.00

PROJECT INFORMATION		REPORT INFORMATION	
PROJECT TITLE	WZ DELAY	REPORT TITLE	DETAILED USER COST REPORT SUMMARY SHEET
C.S.		DIVISION	
JOB #		REPORT BY	
START DATE		REPORT DATE	
NOTES:	US-127NB@I-96		

METHOD INPUT		METHOD 1		METHOD 2		METHOD 3		METHOD 4	
method title		10-12PM							
DISTANCE AND SPEED	(mi) (mph)	distance	speed	distance	speed	distance	speed	distance	speed
work zone	method travel	0.5	see delay		see delay		see delay		see delay
	normal travel	0.5	70.0						
diversion	method travel								
	normal travel								
SPEED DELAY		threshold	range	threshold	range	threshold	range	threshold	range
capacity for speed delay (V/period)		800							
speed (when D~0) (mph)		39							
speed (when D=C) (mph)		10							
DECREASE TO DEMAND		threshold	range	threshold	range	threshold	range	threshold	range
capacity for decreases to design demand (V/period)		800							
canceled cars (with no delay) (%)		1.0%							
canceled trucks (with no delay) (%)									
canceled cars (with delay) (%/min)		1.0%							
canceled trucks (with delay) (%/min)									
diverted cars (with no delay) (%)									
diverted trucks (with no delay) (%)									
diverted cars (with delay) (%/min)									
diverted trucks (with delay) (%/min)									
OTHER USER COST INPUT		cars	trucks	cars	trucks	cars	trucks	cars	trucks
other user cost per actual demand ($/V)		$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
user cost per diversion ($/V)		$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

PERIOD INPUT			backup at start (V)		0	0	0	0	0	0	0	0
direction:	NB		NB		NB							
period	historical demand		design demand		capacity		capacity		capacity		capacity	
(hr)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)
12 A	119		119	0	800							
1 A	72		72	0	800							
2 A	75		75	0	800							
3 A	78		78	0	800							
4 A	104		104	0	800							
5 A	333		333	0	800							
6 A	993		993	0	800							
7 A	942		942	0	800							
8 A	800		800	0	800							
9 A	713		713	0	800							
10 A	682		682	0	800							
11 A	700		700	0	800							
12 P	655		655	0	800							
1 P	683		683	0	800							
2 P	885		885	0	800							
3 P	941		941	0	800							
4 P	648		648	0	800							
5 P	1012		1012	0	800							
6 P	654		654	0	800							
7 P	433		433	0	800							
8 P	374		374	0	800							
9 P	441		441	0	800							
10 P	321		321	0	800							
11 P	185		185	0	800							
Total		0	12843	0	19200	0	0	0	0	0	0	0

SUMMARY OUTPUT								
traffic method	24 hr							
direction	NB		NB		NB		NB	
total user cost	$12,084	$0	$0	$0	$0	$0	$0	$0
user cost of delays	$11,472	$0	$0	$0	$0	$0	$0	$0
user cost of decreases	$611	$0	$0	$0	$0	$0	$0	$0
maximum backup (V)	168	0	0	0	0	0	0	0
maximum backup length (lane mi)	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
maximum delay (min.)	15.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
average delay, except diversions (min)	5.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total delay, except diversions (V hr)	1063	0	0	0	0	0	0	0
total vehicles canceled(V)	611	0	0	0	0	0	0	0
total vehicles diverted (V)	0	0	0	0	0	0	0	0
total decrease in demand (V)	611	0	0	0	0	0	0	0
% decrease in demand	4.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
delay per diverted vehicle (min)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total diversion delay (V hr)	0	0	0	0	0	0	0	0
average delay, including diversions (min)	5.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total delay, including diversions (V hr)	1063	0	0	0	0	0	0	0
user cost / design demand	$0.94	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
delay cost / actual demand	$0.94	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
[illegible]: ON Print: ON Now: OK validity of output	VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID

period length (min)	60	
annual traffic growth (%)	5.00%	
years of growth	0	
VEHICLE INPUT	**cars**	**trucks**
design demand (%)	75.0%	25.0%
user cost per hour ($/V hr)	$10.79	$10.79
user cost per mile, ($/V mi)	$0.30	$1.00
user cost per cancellation, ($/V)	$1.00	$2.00

PROJECT INFORMATION	
PROJECT TITLE	WZ DELAY
C.S.	
JOB #	
START DATE	

REPORT INFORMATION	
REPORT TITLE	DETAILED USER COST REPORT SUMMARY SHEET
DIVISION	
REPORT BY	
REPORT DATE	

NOTES: US-127NB@I-96

METHOD INPUT			METHOD 1		METHOD 2		METHOD 3		METHOD 4	
		method title	10-12PM							
DISTANCE AND SPEED		(mi) (mph)	distance	speed	distance	speed	distance	speed	distance	speed
work zone		method travel	0.5	see delay		see delay		see delay		see delay
		normal travel	0.5	70.0						
diversion		method travel								
		normal travel								
SPEED DELAY			threshold	range	threshold	range	threshold	range	threshold	range
capacity for speed delay (V/period)			800							
speed (when D~0) (mph)			39							
speed (when D=C) (mph)			5							
DECREASE TO DEMAND			threshold	range	threshold	range	threshold	range	threshold	range
capacity for decreases to design demand (V/period)			800							
canceled cars (with no delay) (%)			1.0%							
canceled trucks (with no delay) (%)										
canceled cars (with delay) (%/min)			1.0%							
canceled trucks (with delay) (%/min)										
diverted cars (with no delay) (%)										
diverted trucks (with no delay) (%)										
diverted cars (with delay) (%/min)										
diverted trucks (with delay) (%/min)										
OTHER USER COST INPUT			cars	trucks	cars	trucks	cars	trucks	cars	trucks
other user cost per actual demand ($/V)			$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
user cost per diversion ($/V)			$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

PERIOD INPUT			backup at start (V)		0	0	0	0	0	0	0	0
direction:	NB		NB		NB							
period	historical demand		design demand		capacity		capacity		capacity		capacity	
(hr)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)
12 A	119		119	0	800							
1 A	72		72	0	800							
2 A	75		75	0	800							
3 A	78		78	0	800							
4 A	104		104	0	800							
5 A	333		333	0	800							
6 A	993		993	0	800							
7 A	942		942	0	800							
8 A	800		800	0	800							
9 A	713		713	0	800							
10 A	682		682	0	800							
11 A	700		700	0	800							
12 P	655		655	0	800							
1 P	683		683	0	800							
2 P	885		885	0	800							
3 P	941		941	0	800							
4 P	648		648	0	800							
5 P	1012		1012	0	800							
6 P	654		654	0	800							
7 P	433		433	0	800							
8 P	374		374	0	800							
9 P	441		441	0	800							
10 P	321		321	0	800							
11 P	185		185	0	800							
Total		0	12843	0	19200	0	0	0	0	0	0	0

SUMMARY OUTPUT	METHOD 1		METHOD 2		METHOD 3		METHOD 4	
traffic method	24 hr							
direction	NB		NB		NB		NB	
total user cost	$15,271	$0	$0	$0	$0	$0	$0	$0
user cost of delays	$14,518	$0	$0	$0	$0	$0	$0	$0
user cost of decreases	$753	$0	$0	$0	$0	$0	$0	$0
maximum backup (V)	141	0	0	0	0	0	0	0
maximum backup length (lane mi)	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
maximum delay (min.)	16.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
average delay, except diversions (min)	6.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total delay, except diversions (V hr)	1346	0	0	0	0	0	0	0
total vehicles canceled(V)	753	0	0	0	0	0	0	0
total vehicles diverted (V)	0	0	0	0	0	0	0	0
total decrease in demand (V)	753	0	0	0	0	0	0	0
% decrease in demand	5.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
delay per diverted vehicle (min)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total diversion delay (V hr)	0	0	0	0	0	0	0	0
average delay, including diversions (min)	6.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total delay, including diversions (V hr)	1346	0	0	0	0	0	0	0
user cost / design demand	$1.19	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
delay cost / actual demand	$1.20	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Grid: ON Print: ON Now: OK validity of output	VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID

SummaryView

period length (min)	60	
annual traffic growth (%)	5.00%	
years of growth	0	
VEHICLE INPUT	cars	trucks
design demand (%)	75.0%	25.0%
user cost per hour ($/V hr)	$10.79	$10.79
user cost per mile, ($/V mi)	$0.30	$1.00
user cost per cancellation, ($/V)	$1.00	$2.00

PROJECT INFORMATION	
PROJECT TITLE	WZ DELAY
C.S.	
JOB #	
START DATE	
NOTES:	US-127NB@I-96

REPORT INFORMATION	
REPORT TITLE	DETAILED USER COST REPORT SUMMARY SHEET
DIVISION	
REPORT BY	
REPORT DATE	

METHOD INPUT		METHOD 1		METHOD 2		METHOD 3		METHOD 4	
	method title	10-12PM							
DISTANCE AND SPEED	(mi) (mph)	distance	speed	distance	speed	distance	speed	distance	speed
work zone	method travel	0.5	~~see delay~~		~~see delay~~		~~see delay~~		~~see delay~~
	normal travel	0.5	70.0						
diversion	method travel								
	normal travel								
SPEED DELAY		threshold	range	threshold	range	threshold	range	threshold	range
capacity for speed delay (V/period)		800							
speed (when D~0) (mph)		34							
speed (when D=C) (mph)		15							
DECREASE TO DEMAND		threshold	range	threshold	range	threshold	range	threshold	range
capacity for decreases to design demand (V/period)		800							
canceled cars (with no delay) (%)		1.0%							
canceled trucks (with no delay) (%)									
canceled cars (with delay) (%/min)		1.0%							
canceled trucks (with delay) (%/min)									
diverted cars (with no delay) (%)									
diverted trucks (with no delay) (%)									
diverted cars (with delay) (%/min)									
diverted trucks (with delay) (%/min)									
OTHER USER COST INPUT		cars	trucks	cars	trucks	cars	trucks	cars	trucks
other user cost per actual demand ($/V)		$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
user cost per diversion ($/V)		$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

PERIOD INPUT			backup at start (V)		0	0	0	0	0	0	0	0
direction:	NB		NB		NB							
period	historical demand		design demand		capacity		capacity		capacity		capacity	
(hr)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)
12 A	119		119	0	800							
1 A	72		72	0	800							
2 A	75		75	0	800							
3 A	78		78	0	800							
4 A	104		104	0	800							
5 A	333		333	0	800							
6 A	993		993	0	800							
7 A	942		942	0	800							
8 A	800		800	0	800							
9 A	713		713	0	800							
10 A	682		682	0	800							
11 A	700		700	0	800							
12 P	655		655	0	800							
1 P	683		683	0	800							
2 P	885		885	0	800							
3 P	941		941	0	800							
4 P	648		648	0	800							
5 P	1012		1012	0	800							
6 P	654		654	0	800							
7 P	433		433	0	800							
8 P	374		374	0	800							
9 P	441		441	0	800							
10 P	321		321	0	800							
11 P	185		185	0	800							
Total		0	12843	0	19200	0	0	0	0	0	0	0

SUMMARY OUTPUT								
traffic method	24 hr							
direction	NB		NB		NB		NB	
total user cost	$11,051	$0	$0	$0	$0	$0	$0	$0
user cost of delays	$10,484	$0	$0	$0	$0	$0	$0	$0
user cost of decreases	$566	$0	$0	$0	$0	$0	$0	$0
maximum backup (V)	177	0	0	0	0	0	0	0
maximum backup length (lane mi)	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
maximum delay (min.)	14.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
average delay, except diversions (min)	4.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total delay, except diversions (V hr)	972	0	0	0	0	0	0	0
total vehicles canceled(V)	566	0	0	0	0	0	0	0
total vehicles diverted (V)	0	0	0	0	0	0	0	0
total decrease in demand (V)	566	0	0	0	0	0	0	0
% decrease in demand	4.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
delay per diverted vehicle (min)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total diversion delay (V hr)	0	0	0	0	0	0	0	0
average delay, including diversions (min)	4.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total delay, including diversions (V hr)	972	0	0	0	0	0	0	0
user cost / design demand	$0.86	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
delay cost / actual demand	$0.85	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Calc: ON Print: ON Now: OK validity of output	VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID

SummaryView

period length (min)		60
annual traffic growth (%)		5.00%
years of growth		0
VEHICLE INPUT	cars	trucks
design demand (%)	75.0%	25.0%
user cost per hour ($/V hr)	$10.79	$10.79
user cost per mile, ($/V mi)	$0.30	$1.00
user cost per cancellation, ($/V)	$1.00	$2.00

PROJECT INFORMATION		REPORT INFORMATION	
PROJECT TITLE	WZ DELAY	REPORT TITLE	DETAILED USER COST REPORT SUMMARY SHEET
C.S.		DIVISION	
JOB #		REPORT BY	
START DATE		REPORT DATE	

NOTES: US-127NB@I-96

METHOD INPUT	METHOD 1		METHOD 2		METHOD 3		METHOD 4	
method title	10-12PM							
DISTANCE AND SPEED (mi) (mph)	distance	speed	distance	speed	distance	speed	distance	speed
work zone — method travel	0.5	see delay		see delay		see delay		see delay
work zone — normal travel	0.5	70.0						
diversion — method travel								
diversion — normal travel								
SPEED DELAY	threshold	range	threshold	range	threshold	range	threshold	range
capacity for speed delay (V/period)	800							
speed (when D~0) (mph)	34							
speed (when D=C) (mph)	10							
DECREASE TO DEMAND	threshold	range	threshold	range	threshold	range	threshold	range
capacity for decreases to design demand (V/period)	800							
canceled cars (with no delay) (%)	1.0%							
canceled trucks (with no delay) (%)								
canceled cars (with delay) (%/min)	1.0%							
canceled trucks (with delay) (%/min)								
diverted cars (with no delay) (%)								
diverted trucks (with no delay) (%)								
diverted cars (with delay) (%/min)								
diverted trucks (with delay) (%/min)								

OTHER USER COST INPUT	cars	trucks	cars	trucks	cars	trucks	cars	trucks
other user cost per actual demand ($/V)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
user cost per diversion ($/V)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

PERIOD INPUT				backup at start (V)	0	0	0	0	0	0	0	0
direction:	NB		NB		NB							
period	historical demand		design demand		capacity		capacity		capacity		capacity	
(hr)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)
12 A	119		119	0	800							
1 A	72		72	0	800							
2 A	75		75	0	800							
3 A	78		78	0	800							
4 A	104		104	0	800							
5 A	333		333	0	800							
6 A	993		993	0	800							
7 A	942		942	0	800							
8 A	800		800	0	800							
9 A	713		713	0	800							
10 A	682		682	0	800							
11 A	700		700	0	800							
12 P	655		655	0	800							
1 P	683		683	0	800							
2 P	885		885	0	800							
3 P	941		941	0	800							
4 P	648		648	0	800							
5 P	1012		1012	0	800							
6 P	654		654	0	800							
7 P	433		433	0	800							
8 P	374		374	0	800							
9 P	441		441	0	800							
10 P	321		321	0	800							
11 P	185		185	0	800							
Total		0	12843	0	19200	0	0	0	0	0	0	0

SUMMARY OUTPUT								
traffic method	24 hr							
direction	NB		NB		NB		NB	
total user cost	$12,147	$0	$0	$0	$0	$0	$0	$0
user cost of delays	$11,533	$0	$0	$0	$0	$0	$0	$0
user cost of decreases	$614	$0	$0	$0	$0	$0	$0	$0
maximum backup (V)	168	0	0	0	0	0	0	0
maximum backup length (lane mi)	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
maximum delay (min.)	15.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
average delay, except diversions (min)	5.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total delay, except diversions (V hr)	1069	0	0	0	0	0	0	0
total vehicles canceled(V)	614	0	0	0	0	0	0	0
total vehicles diverted (V)	0	0	0	0	0	0	0	0
total decrease in demand (V)	614	0	0	0	0	0	0	0
% decrease in demand	4.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
delay per diverted vehicle (min)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total diversion delay (V hr)	0	0	0	0	0	0	0	0
average delay, including diversions (min)	5.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total delay, including diversions (V hr)	1069	0	0	0	0	0	0	0
user cost / design demand	$0.95	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
delay cost / actual demand	$0.94	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Auto: ON · Print: ON · Now: OK · validity of output	VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID

SummaryView

	cars	trucks
period length (min)	60	
annual traffic growth (%)	5.00%	
years of growth	0	
VEHICLE INPUT	cars	trucks
design demand (%)	75.0%	25.0%
user cost per hour ($/V hr)	$10.79	$10.79
user cost per mile, ($/V mi)	$0.30	$1.00
user cost per cancellation, ($/V)	$1.00	$2.00

PROJECT INFORMATION	
PROJECT TITLE	WZ DELAY
C.S.	
JOB #	
START DATE	

REPORT INFORMATION	
REPORT TITLE	DETAILED USER COST REPORT SUMMARY SHEET
DIVISION	
REPORT BY	
REPORT DATE	

NOTES: US-127NB@I-96

METHOD INPUT		METHOD 1		METHOD 2		METHOD 3		METHOD 4	
method title		10-12PM							
DISTANCE AND SPEED	(mi) (mph)	distance	speed	distance	speed	distance	speed	distance	speed
work zone	method travel	0.5	see delay		see delay		see delay		see delay
	normal travel	0.5	70.0						
diversion	method travel								
	normal travel								
SPEED DELAY		threshold	range	threshold	range	threshold	range	threshold	range
capacity for speed delay (V/period)		800							
speed (when D~0) (mph)		34							
speed (when D=C) (mph)		5							
DECREASE TO DEMAND		threshold	range	threshold	range	threshold	range	threshold	range
capacity for decreases to design demand (V/period)		800							
canceled cars (with no delay) (%)		1.0%							
canceled trucks (with no delay) (%)									
canceled cars (with delay) (%/min)		1.0%							
canceled trucks (with delay) (%/min)									
diverted cars (with no delay) (%)									
diverted trucks (with no delay) (%)									
diverted cars (with delay) (%/min)									
diverted trucks (with delay) (%/min)									

OTHER USER COST INPUT	cars	trucks	cars	trucks	cars	trucks	cars	trucks
other user cost per actual demand ($/V)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
user cost per diversion ($/V)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

PERIOD INPUT			backup at start (V)		0	0	0	0	0	0	0	0
direction:	NB		NB		NB							
period	historical demand		design demand		capacity		capacity		capacity		capacity	
(hr)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)	(V/period)
12 A	119		119	0	800							
1 A	72		72	0	800							
2 A	75		75	0	800							
3 A	78		78	0	800							
4 A	104		104	0	800							
5 A	333		333	0	800							
6 A	993		993	0	800							
7 A	942		942	0	800							
8 A	800		800	0	800							
9 A	713		713	0	800							
10 A	682		682	0	800							
11 A	700		700	0	800							
12 P	655		655	0	800							
1 P	683		683	0	800							
2 P	885		885	0	800							
3 P	941		941	0	800							
4 P	648		648	0	800							
5 P	1012		1012	0	800							
6 P	654		654	0	800							
7 P	433		433	0	800							
8 P	374		374	0	800							
9 P	441		441	0	800							
10 P	321		321	0	800							
11 P	185		185	0	800							
Total		0	12843	0	19200	0	0	0	0	0	0	0

SUMMARY OUTPUT								
traffic method	24 hr							
direction	NB		NB		NB		NB	
total user cost	$15,337	$0	$0	$0	$0	$0	$0	$0
user cost of delays	$14,580	$0	$0	$0	$0	$0	$0	$0
user cost of decreases	$756	$0	$0	$0	$0	$0	$0	$0
maximum backup (V)	141	0	0	0	0	0	0	0
maximum backup length (lane mi)	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
maximum delay (min.)	16.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
average delay, except diversions (min)	6.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total delay, except diversions (V hr)	1351	0	0	0	0	0	0	0
total vehicles canceled(V)	756	0	0	0	0	0	0	0
total vehicles diverted (V)	0	0	0	0	0	0	0	0
total decrease in demand (V)	756	0	0	0	0	0	0	0
% decrease in demand	5.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
delay per diverted vehicle (min)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total diversion delay (V hr)	0	0	0	0	0	0	0	0
average delay, including diversions (min)	6.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total delay, including diversions (V hr)	1351	0	0	0	0	0	0	0
user cost / design demand	$1.19	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
delay cost / actual demand	$1.21	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Calc: ON / Print: ON / Now: OK — validity of output	VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID	NOT VALID