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An Evaluation of the Hyperfix Project for the Reconstruction of I-65/70 in Downtown Indianapolis

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16. Abstract

In 2003 the Indiana Department of Transportation executed an ambitious interstate reconstruction project in Indianapolis, named Hyperfix. This project completely closed the I-65/70 section during reconstruction, on which approximately 250,000 vehicles travel daily. Due to the scope and risk involved, an extensive amount of planning, coordination, and cooperation occurred. The main section was rebuilt during the total closure phase, which lasted 55 days. The total closure approach had never been performed before by INDOT on such a high volume artery in a downtown metropolitan area. This present study analyzed the project and its impact on the Indianapolis area. The report includes findings on planning and design issues, contractor and INDOT operations, traffic impact, business impact, the park and ride service implemented, and other issues related to total closure.

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An Evaluation of the Hyperfix Project for the Reconstruction of I-65/70 in Downtown Indianapolis

Introduction

An innovative approach was taken in 2003 by the Indiana Department of Transportation to rebuild the stretch where I-65 and I-70 combine in downtown Indianapolis by totally closing it to traffic. This was the first time this approach had been taken by INDOT on a heavily traveled urban interstate. The project was named "Hyperfix."

Hyperfix required the involvement of numerous organizations, both public and private. The main public organizations were INDOT, the City of Indianapolis, and the Federal Highway Administration, Indianapolis Police, and the Indianapolis area public transportation agency. Other organizations were consultants, contractors, subcontractors, and downtown businesses. The most affected group consisted of road users in the Indianapolis area.

This project studied and analyzed Hyperfix. What made it work, what the impacts were, what was learned, and what could be improved; answers to these and other questions were formed. Collectively, these answers are the Hyperfix analysis results.

Findings

Hyperfix did impact the Indianapolis area. The primary impact was in traffic flow and the shift in traffic volume to local streets and volume added to I-465. Improvements to local streets along with a good public relations campaign and public transportation service helped to minimize congestion. Local businesses were not significantly impacted.

Findings and recommendations are organized into two categories; Management and Engineering Issues. These cover a wide range of issues in planning, design, and construction activities. The results help to document this "total closure" approach and provide the understanding and documentation to use on future "similar" projects.

Implementation

The findings and recommendations reported constitute "a guideline" that can be used to determine if total closure is right for a project. Information provided should be consulted by DOT organizations and thereby learn about this approach and what worked and the timeline to follow to implement "a game plan." Implementation assistance will be available from Purdue University by contacting the JTRP office or Dr. Bob McCullouch (bgm@ecn.purdue.edu, 765-494-0643).

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Chapter 1 – BACKGROUND INFORMATION

Introduction

During the summer of 2003 Indiana Department of Transportation (INDOT) executed a construction project titled "Hyperfix." This project closed down a busy interstate route in downtown Indianapolis, the section where I-65 and I-70 are joined while the reconstruction of the section took place. The Annual Average Daily Traffic (AADT) on this section was about 175,000. The complete closure as opposed to partial closure was undertaken with the expectation that a complete closure would reduce the number of work days and thus reducing traveler inconvenience. The project consisted of the following scope of work.

- 31 bridge decks to overlay – 37000 sys of overlays,
- 2 bridge decks to replace,
- 35 lane miles of pavement to replace or patch and surface – 87,000 sys of new pavement,
- two added merge lanes to enhance capacity, and
- upgrade of traffic control and roadside safety devices.

Figures 1 through 4 show the location of the project, the area at the north split, the area at the south split, and the mainline during closure, respectively.

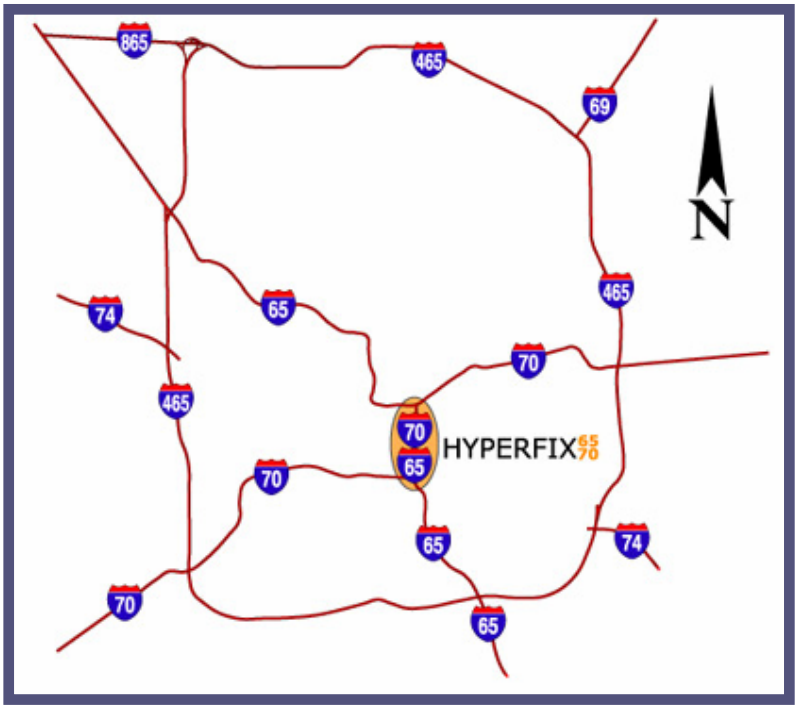


Figure 1 – Project Location

Figure 2 – North Split Looking South

Figure 3 – South Split Looking North

Figure 4 – Main Line During Closure Looking North

An evaluation of the project was performed by Purdue University through the Joint Transportation Research Program. The purpose was to document the consequences of the total closure option and its possible effectiveness. The evaluation involved the following areas of the Hyperfix project:

- Construction Management
- Traffic Management and Impact
- Local Business Impact
- Public Safety Impact

Each of these areas were investigated by collecting field data and from personal interviews and questionnaire surveys. The construction management aspect of the study looked at worker safety, productivity, quality assurance, subcontractor performance and material availability.

Traffic management, and its subsequent travel time and user cost implications, was examined by monitoring the temporal distributions of traffic volumes and travel time profiles. Field data were collected through the use of existing weigh-in-motion and automated traffic recording stations located in the study area. Some of the field data, particularly on adjacent arterials, were supplied by Edwards and Kelcey, traffic consultants for the City of Indianapolis. The Traffic Statistics Section of INDOT's Program Development Division provided traffic data at selected locations on the state highway network within the study area. The level of usage and effectiveness of traffic information on route guidance and dissemination of the information through signing, print media, radio, and the use of the Internet, were identified by questionnaire surveys. Using GPS, travel time profiles were developed on strategic surface arterial routes.

Data on the number of crashes in the study area during the construction were collected from the Indianapolis Police Department. The Internet, electronic and print media were used extensively to disseminate information. The effectiveness of the public relations campaign was evaluated. Issues associated with alternative transportation modes, i.e. Park-and-Ride, were also evaluated. In addition, data on the project impact on downtown businesses during the total closure period were collected through a downtown business survey.

Construction Activities

The construction activities were divided into six phases. Phases 1-3 were classified as prep work to be completed before the total closure phase, which was Phase 4. Phases 5 and 6 followed the

total closure period (Phase 4). The descriptions, timings, and incentives and disincentives are shown below.

Phase Descriptions

Phase 1 – Consisted of temporary widening adjacent to the median and outside pavement lanes of southbound I-65 in the north split.

Phases 2 and 3 – Consisted of bridge repairs to bridges in the north and south split areas.

Phase 4 – Consisted of the complete closure of the mainline I-70 and I-65 roadways between the north and south splits.

Phases 5 and 6 – Involved the pavement construction, shoulder construction and resurfacing of southbound I-65 south of the south spilt.

Phase Timings

- Prep Work Start (Phases 1-3) - March 28, 2003
- Prep Work Completed - May 3, 2003
  - Completed 18 days early
- Total closure (Phase 4) - May 27, 2003
  - Open to Traffic - July 20 , 2003
  - Completed in 55 days, 30 days early
- Phases 5 and 6 – Started July 21, 2003
- Contract Completion - October 11, 2003

Contract Incentives and Disincentives

- Prep & operational fix work - $10,000 / day
- Closure (Phase 4) $100,000/day
- Maximum bonus days on Phase 4 was 30 days
- Total amount paid as incentives - $3.6 million

Design Options for Maintenance of Traffic

Three options were studied for Maintenance of Traffic. They were:

1. Phased Construction
    - 3 lanes traffic maintained each direction
    - 2 lanes I-70 WB on collector-distributor
    - 4 other lanes maintained with phasing and crossovers
    - Expected number of construction days: 180
2. SB Lanes Closed complete/NB Lanes Closed weekends
    - 2 lanes I-65 SB/I-70 WB traffic on collector-distributor
    - I-65 NB/I-70 EB traffic maintained on West Street on weekends
    - Expected number of construction days: 135
3. Complete Closure
    - Traffic maintained on alternate routes
    - Expected number of construction days: 85

INDOT decided to choose Option 3, as it had the highest potential of user cost savings.

Public Relations Campaign

A Public Relations (PR) campaign started almost a year ahead of the construction phase. A local PR consultant firm was hired. One of the first things the consulting firm did was create a name and logo to give the project identity and a label that people could relate to. Another activity was to create a web site to provide information about the project. Extensive community outreach was undertaken through:

- Meetings with Public Officials
- Major Employers (Eli Lilly) / Business Groups (Downtown Business Association)
- Neighborhood Associations
- Special Event Planners (July 4th, Black Expo)

- Emergency Response

Six months in advance of mainline closure, the PR firm used multiple media outlets (radio, television, newspapers) to inform the public in the Indianapolis area. Five thousand map pads containing 250,000 maps of the project location were placed at hotels, public events, and at public locations. Also information was distributed at Interstate Rest Stops near Indianapolis. The PR firm trained INDOT personnel to be a part of the Indianapolis Mayor's Action Center.

Construction Days Saved

The Hyperfix project was completed ahead of schedule with the completion time of 55 days, 30 days ahead of the expected completion date. The number of construction days avoided was then 125 by adopting the complete closure option instead of the phased construction option. This report describes the effects on the Indianapolis area, lessons learned and recommendations for future construction projects.

Chapter 2 - SURVEYS

Introduction

This chapter describes the surveys used in examining the impact of the Hyperfix project. Surveys were developed and executed that targeted different groups affected and impacted by the project. Four surveys were developed for the following groups: general public including commuters, through traffic drivers, downtown businesses, and Park and Ride transit users. Complete survey forms are presented in Appendix A. The public survey was designed to capture the impact of the project on travelers who live in the Indianapolis area; the through traffic survey targeted drivers who traveled through the Indianapolis area during the project; the business survey was conducted to identify the project impact on downtown businesses; and the Park and Ride surveyed the transit riders using this service.

Public Survey

The public survey consisted of an on-site in-person survey and an on-line survey. The same survey form was used in both cases. A copy of the questionnaire is presented in Appendix A1. The on-site survey targeted Indiana Government Center employees that work at the North and South Government Center Buildings in Indianapolis downtown. Employing a 9-member crew of Purdue graduate students, the survey was conducted at the two cafeterias in these buildings on July 9th, 2003. A total of 170 responses were received, out of which 124 responses were considered to be valid.

The on-line survey was for the purpose of collecting general public input on Hyperfix. The website was advertised through media outlets in the Indianapolis area. A total of 180 responses were received during about 4 weeks in June-July 2003, and 143 of them were considered to be valid. Combining both surveys resulted in 267 responses.

The following section summarizes the public survey results. Most of the respondents were commuters. The summary follows the sequence of questions asked in the survey form.

Trip Frequency

Respondents were asked if the Hyperfix project caused them to make fewer trips than they did before Hyperfix. Approximately 11% of respondents indicated any affect of Hyperfix project on travel, while 89% said they were unaffected. About 45%, however, said they made fewer trips in spite of the fact that they were not affected by the Hyperfix project.

Out of 11% that were affected by Hyperfix, Figure 5 summarizes the distribution in terms of number of trips decreased per week. The average number of trips decreased was found to be 2.8 trips per week. It can be seen that approximately half of the respondents who were affected by the project (which only represents approximately 6% of the respondents) made either one or two trips fewer, compared to their trip frequency before the starting of Hyperfix.

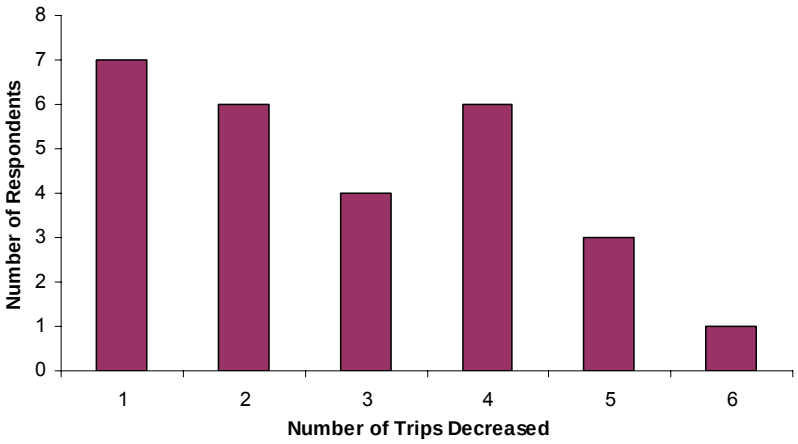


Figure 5 - Distribution of Number of Trips Decreased

Trip Purpose

In response to what type of trip was most affected, respondents selected from a choice set containing work trips, recreational trips, shopping trips, and other trips. Figure 6 presents the distribution of trip types that were affected by the Hyperfix. It was found that work trips, at 79%, were the most affected trip types. Approximately 11% of the total respondents stated that their recreational trips were affected, while only 5% were due to shopping trips.

Figure 6 - Effect on Trip Purpose by Hyperfix

Origin and Destination

Respondents were asked to indicate the origin and destination of their most frequent trip type that was affected by Hyperfix, using zip codes (if known), nearest intersections, or landmarks (for example, Town of Fishers, Government Center, Keystone Crossing). Although the trip origins ranged from the vicinity of the Hyperfix area to locations as far as Fort Wayne and Bloomington, nearly 95% of total respondents had their destinations to downtown Indianapolis. The corresponding zip code was found to be 46204.

Travel Time

Table 1 presents the perceived average travel time in minutes before and during Hyperfix periods. The numbers in parenthesis represent the corresponding standard deviation values. On average, respondents felt that they spent about 7 minutes and 10 minutes longer for the inward leg and return leg, respectively. It should be noted that high standard deviation values are due to a wide variety of origins and destinations, thus resulting in the dispersion of travel time values.

Table 1 - Average Travel Time Before and During Hyperfix Periods

Leg	Travel Time (minutes)	
	Before Hyperfix	During Hyperfix
Inward Leg	33.7 (24.1)	41.0 (26.1)
Return Leg	35.7 (24.3)	45.1 (25.6)

Mode of Transportation

Automobile was found to be the dominant mode of transportation for both before and during Hyperfix. In fact, merely 4 respondents reported using the IndyGo, Indianapolis and Marion County's public bus transportation system as a commuting mode. Only 15 respondents indicated the use of Park and Ride program instead of an automobile during Hyperfix.

Route Change

Approximately 56% of the total respondents indicated that they had to change their travel routes due to Hyperfix, even though most of the respondents (89%) felt there was no effect of Hyperfix on their travel. This may be due to the fact that travel times did not change significantly for most travelers.

Awareness of the Project

In response to the question regarding where they got the information to help make their trips during Hyperfix, respondents selected from a choice set containing TV/radio, websites, brochure/advertising, newspapers, employer announcements, roadside signs, and others. Figure 7 presents the corresponding distribution from the survey. It was found that TV/radio, accounting up to 31%, was the most reported choice of getting Hyperfix information. Other prevalent sources included websites, newspapers, employer announcements, and roadside signs.

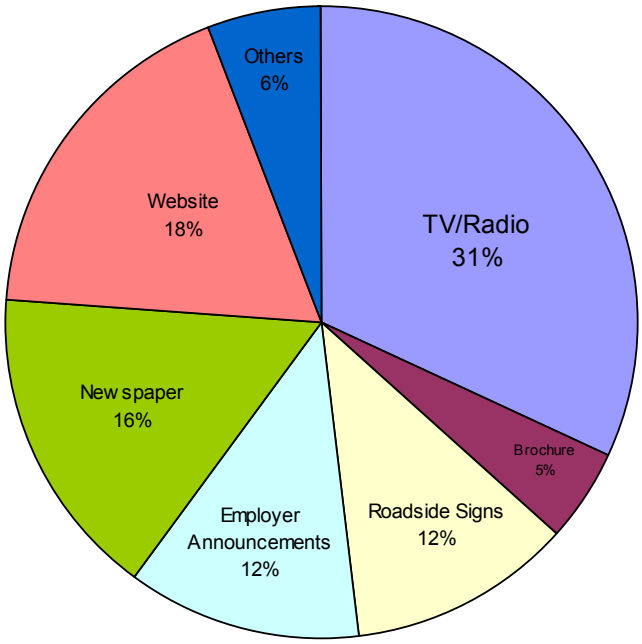


Figure 7 - Sources of Hyperfix Information from Public Survey

Comments

Several voluntary comments were noted in the commuter survey, including compliments, complaints, and suggestions. Most of the respondents reported not having major impacts from the project. The complete survey comments are included in Appendix A2. Examples of the comments are categorized below:

Compliments

- Project showed good planning and communication.
- Project took only one summer.
- Hyperfix should be considered for future road projects.

Complaints

- Freeway traffic congestion, especially on the West and South legs of I-465.
- Arterial traffic congestion on East-West through streets such as 38th Street and Washington Street.
- Lack of Park and Ride program for commuters in west and southwest of Indianapolis.
- Lack of police assistance with significant traffic bottlenecks.
- Possible lack of workmanship.

Suggestions

- The existing variable message signs (VMS) should have been utilized.
- Lane signage should have been improved for exiting I-65 onto Meridian and Pennsylvania Streets South.
- Park and Ride program should be continued and expanded after the project.

Through-Traffic Survey

A through traffic survey was conducted at several Interstate rest areas around Indianapolis on a weekday during the closure period. A copy of this on-site in-person survey is presented in Appendix A1. Respondents consisted of 25 automobile drivers and 44 commercial vehicle drivers. The following section describes the survey results.

Origin and Destination

Tables 2 and 3 summarize the total number of respondents classified by origin and destination for automobiles and commercial vehicles, respectively. About 40% of the total automobile respondents traveled within Indianapolis area while nearly one-third traveled from other states through Indiana with their destination outside Indiana. For commercial vehicle respondents, approximately 60% originated from other states. Nearly 80% of all respondents just traveled through Indianapolis.

Table 2 - Origin and Destination for Automobiles

Origin	Destination		
	Indianapolis Area	Indiana	Out of State
Indianapolis Area	11	2	0
Indiana	3	0	0
Out of State	1	0	8

Table 3 - Origin and Destination for Commercial Vehicles

Origin	Destination		
	Indianapolis Area	Indiana	Out of State
Indianapolis Area	7	2	2
Indiana	2	2	2
Out of State	5	6	16

Trip Frequency

Table 4 presents results from the survey question asking how often the respondents generally traveled through the Indianapolis area. About half of the automobile respondents and over 40% of the commercial vehicle respondents made at least 10 trips per month through Indianapolis. It should be noted that only 18% of commercial vehicle respondents traveled through Indianapolis fewer than 2 trips per month.

Table 4 - Trip Frequency

	Automobiles	Commercial Vehicles
< 2 trips per month	7	8
2 – 10 trips per month	3	17
> 10 trips per month	12	19
Others	3	0
Total Respondents	25	44

Travel Time

In terms of travel time, only one-third of the automobile respondents felt that the Hyperfix project increased their travel time. However, up to two-thirds of the commercial vehicle respondents perceived an increase in travel time. In addition, a quarter of the automobile drivers and approximately 40% of the commercial vehicle drivers reported their travel schedule was changed due to the Hyperfix project.

Awareness of the Project

In response to the question if the travelers were aware of the Hyperfix project prior to starting their trip, about half of the automobile drivers and almost three-quarter of the commercial drivers

answered affirmatively. The major source of Hyperfix information was from news reports. Approximately two-third of automobile drivers and three-quarter of commercial vehicle drivers reported that the signage was satisfactory.

Route Change

According to the survey results, 36% of the automobile respondents changed their routes because of the Hyperfix project. However, route change was found to be more common in commercial vehicles, in which about two-third of the respondents changed their routes due to the project. Specifically, up to 72% and 84% of the total respondents who used automobiles and commercial vehicles, respectively, would have taken the Hyperfix route (I-65/70) if it were open.

Comments

In general, comments were positive. The Hyperfix project was considered to be a desirable and needed project. Some respondents would have liked to be informed when the project would be completed, whereas one respondent complained about the increase in travel time.

Business Survey

A questionnaire survey was mailed to 504 downtown businesses from a list obtained from the Indianapolis Downtown Business Association. The majority of businesses were restaurants, retail stores, entertainment related, and motels and hotels. A total of 123 responses were returned. The survey form, presented in Appendix A, was prepared by adopting questions identified in an earlier INDOT study, "Effects of Road Construction on Adjacent Economic Activities: A Retrospective Study" by J. Palmer, J.P. Cornwell, and W. Black, Indiana University, May 1986. A copy of the questionnaire is included in Appendix A1.

Project Awareness

The first question was how did one learn about the Hyperfix project. As illustrated in Figure 8, the majority of respondents (70%) knew about the project from news reports. The results were

consistent with the public and commuter survey; the brochure was the least popular method of getting information.

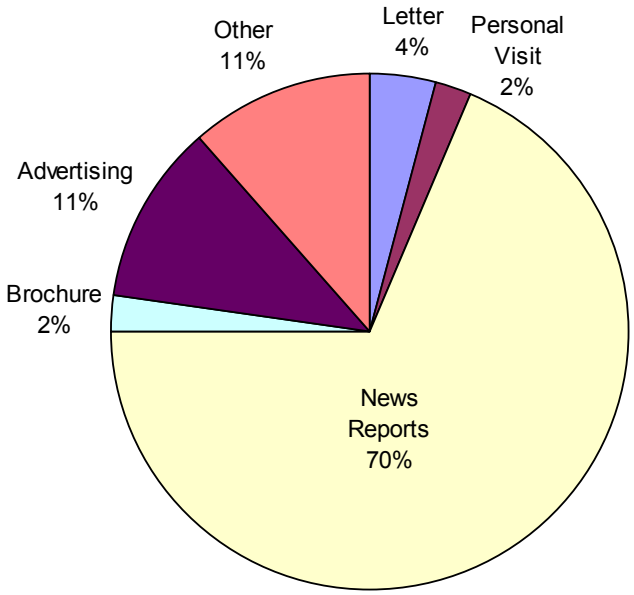


Figure 8 - Sources of Hyperfix Awareness from Business Survey

Public Hearing and Communication

In terms of involvement in public hearing, it was found that only 10% of the total respondents did assign someone from their business to attend a public hearing or meeting conducted by the state before the project began. This may indicate that this method may not be the most effective for getting the word out.

Another question was asked in the survey on how well the respondents kept informed during the Hyperfix project and associated city road projects about what was planned and when it would occur. Responses were collected on a five-point scale basis, where one (1) refers to not informed at all and five (5) refers to fully informed. About 10 percent of total respondents reported that they were not kept informed during the project at all while about 30% of respondents reported that they were kept fully informed, as shown in Figure 9.

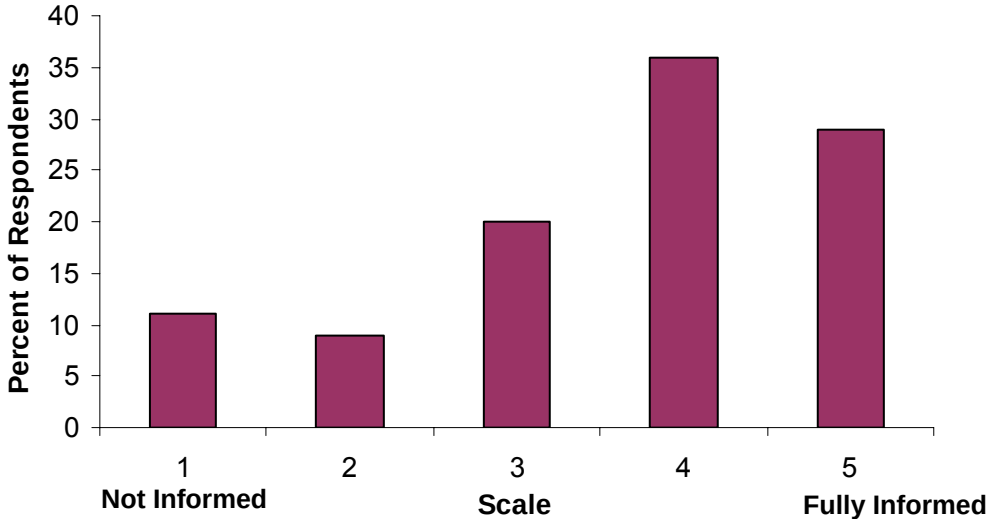


Figure 9 - Distribution of Five-Point Scale on Communication

Business Impacts

To investigate impacts on businesses, a five-point scale question was asked. Figure 10 presents the distribution in terms of percent respondents, where one (1) refers to very significant and five (5) refers to no effect. It was found that nearly 70% of the respondents selected either 4 or 5, signifying that there was no impact or little impact on the respondents' business. Almost 60% further stated that the Hyperfix project did not cause any problems in their businesses. Close to 15% admitted a positive effect on their business during the project.

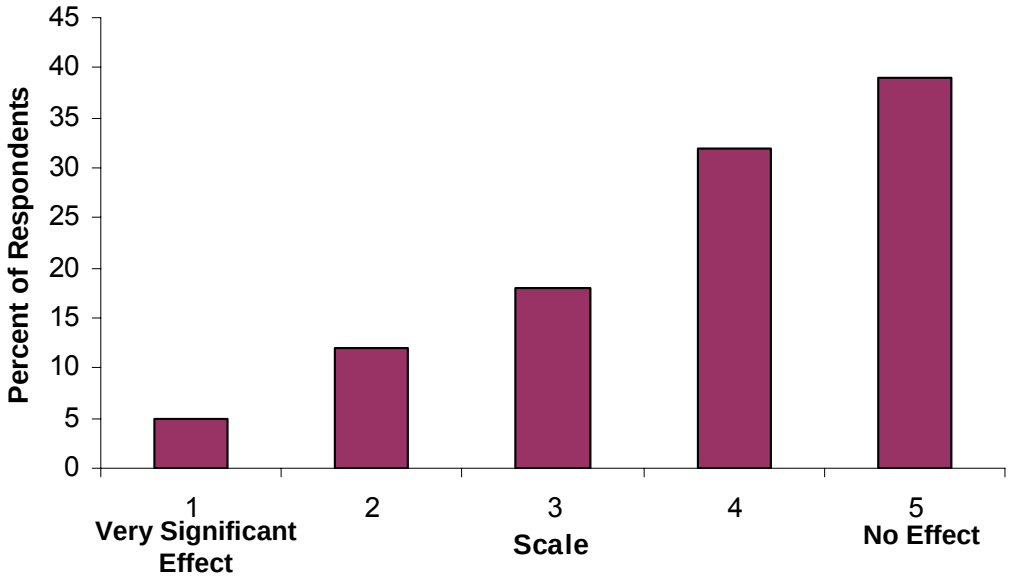


Figure 10 - Distribution of Five-Point Scale on Business Impact

According to the survey, approximately 70% of the total respondents reported no loss of customers during the project. Among the 30% who indicated a loss of customers, the majority reported a loss of fewer than 10%.

Business Operations

The project generally had no impact on downtown businesses. Over 90% of the respondents indicated no reduction in the number of full-time employees. Up to 95% of the total respondents did not alter their hours of operations. Furthermore, none of the respondents had to close the business because of the Hyperfix project.

Comments

Approximately a quarter of the total respondents mentioned that there were several stepts that state and local governments and the contractors could have taken to be more responsive to the needs of the businesses affected by Hyperfix. In addition, since there were still lane closures and minor construction going on the ramps and shoulders after opening the main lanes, the respondents generally felt that the contractor should not receive the early completion bonus because the project was not fully completed.

Park and Ride Survey

A survey of the Park and Ride program undertaken for the Hyperfix project was performed by Hetrick Communications. The program involved express bus service to downtown from a number of outlying locations around Indianapolis. Patrons could park free at the collection points and the l-way fare was $1.00. The INDOT subsidized the operation with a $1 million CMAQ grant from the Federal Highway Administration. Figure 11 shows three collection points. The hours of service were 6:15 AM to 7:00 PM. During 6:15 AM to 8:00 AM, the buses left every 15 minutes. During 8:00 AM to 4:00 PM, depending on location, the service was at 30 – 60 minute intervals. During the afternoon hours of 4:15 to 7:00 PM, the service was at 15 minute intervals from downtown to the three northeast locations.

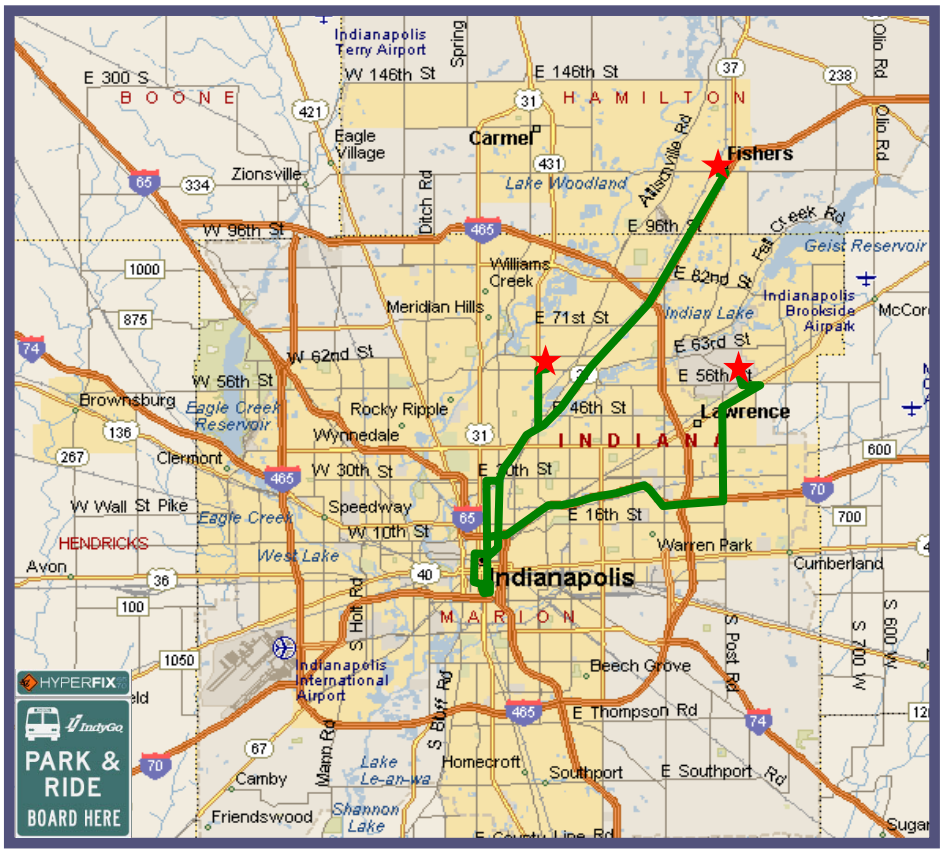


Figure 11 – Park and Ride Collection Points

The service used 16 commuter coaches that provided non-stop service in both directions. The $1 million subsidy allowed for the fare to be $1 each way and free parking was available at the three remote locations.

Ridership Data

Figure 12 shows the daily ridership numbers at the three locations during the closure period. At the start of the program there was a spike in the numbers but that leveled out over the period. The service continued until the end of August in its original form and in a smaller scale until the end of February 2004.

Total closure was for eight weeks, starting May 27 and ending on July 20. Table 5 presents weekly ridership during closure and after opening the closed section and by location. Weeks 1-8 coincided with the period during closure.

Table 5 – Average Weekly Ridership

Fishers Weeks 1-8	468
Fishers Weeks 3-8	480
Glendale Weeks 1-8	136
Glendale Weeks 3-8	135
Lawrence Weeks 4-8	56
Fishers Post HyperFix	342
Glendale Post HyperFix	100
Ft. Harrison Post HyperFix	48

The ridership was consistent throughout closure. There was a drop in ridership at all locations after opening the closed section. However, the post Hyperfix ridership ranged from 70% to 80% depending on the location of origin, indicating very good support for the service.

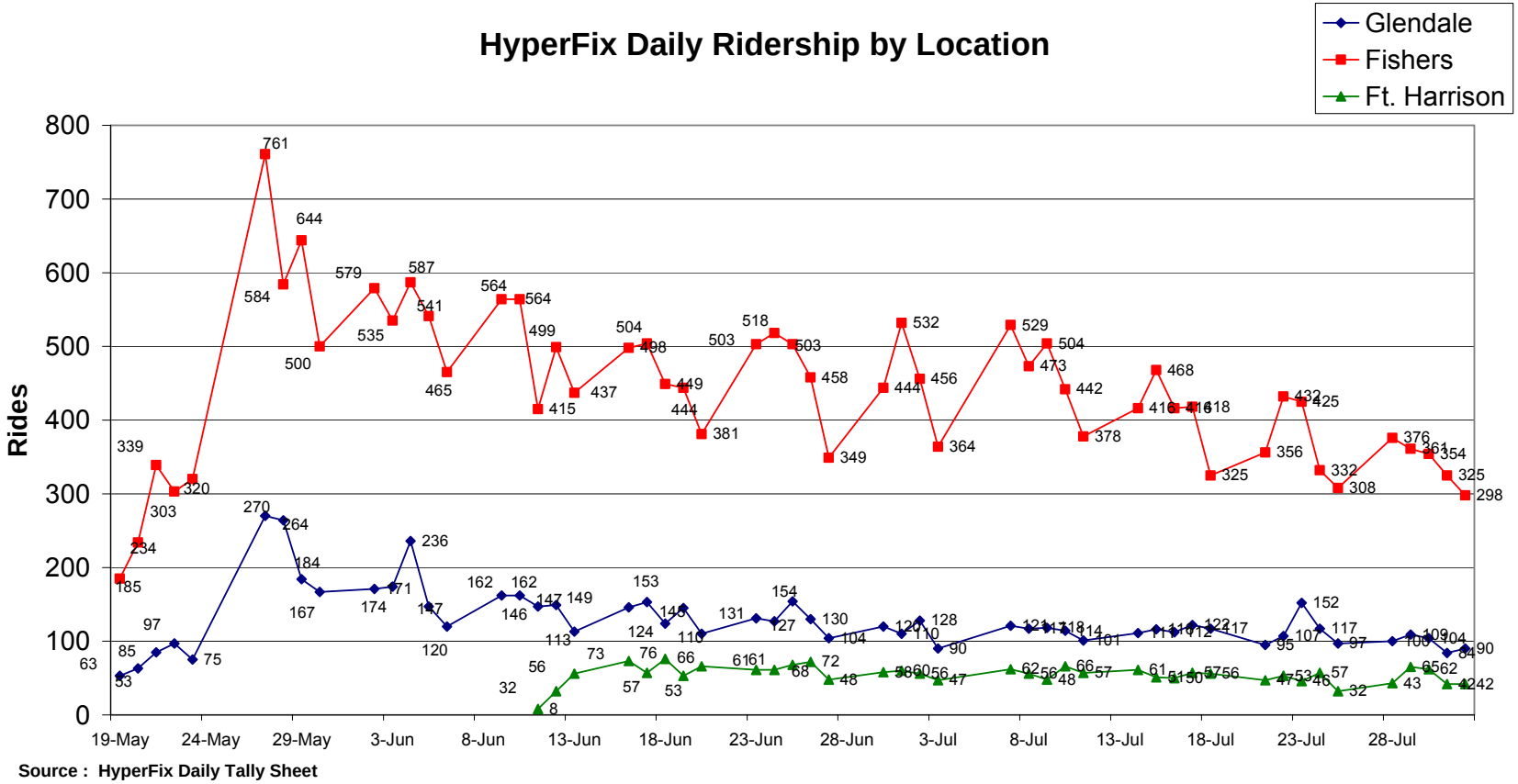


Figure 12 – Park and Ride Daily Ridership

Rating of Park and Ride Service

A summary of the Park and Ride customer survey is presented in the following section. The survey was conducted over a week in June, 2003. The responses are reported by pick-up points. As pick-ups were combined after the morning rush hour, responses from the combined riders are reported separately.

Table 6 – Rating of Hours of Operation and Frequency of Service

Pick-up Location	Average Rating
Fishers	4.8
Glendale	4.82
Ft. Harrison	4.81
Fishers & Glendale	4.83
Glendale & Ft. Harrison	4.6
Unknown	5
Overall	**4.81**

Table 6 presents the ratings (1-poor to 5-excellent) for hours of operation and frequency of service. These ratings indicate a very favorable reception of the Park and Ride operation from the riders.

Table 7 – Rating of the Location of Downtown Pick-up and Drop-off Points

Location	Average Rating
Fishers	4.71
Glendale	4.71
Ft. Harrison	4.76
Fishers & Glendale	5
Glendale & Ft. Harrison	5
Unknown	5
Overall	**4.86**

Table 7 presents the ratings related to downtown pick-up and drop-off points. The riders indicated a high level of satisfaction with the locations of downtown stops.

Frequency of Use and Preferred Commute Time

The frequency of use of the Park and Ride service is indicated in Table 8. Most respondents used the service to commute to work since they used it 4-5 days per week.

Table 8 – Frequency of Use per Week

Location	1	2-3	3-4	4-5
Fishers	6	24	43	161
Glendale	3	11	11	36
Ft. Harrison	2	3	2	21
Fishers & Glendale	0	0	5	1
Glendale & Ft. Harrison	0	0	0	2
Unknown	2	0	1	3
Overall	**13**	**38**	**62**	**224**
Percent	**4%**	**11.2%**	**18.3%**	**66.5%**

.

When asked about the preferred commute time, most respondents indicated 45 min. to be the desirable travel time for the downtown service, as shown in Table 9.

Table 9 – Preferred Commute Time

Location	30 min.	45 min.	60 min.
Fishers	25	138	50
Glendale	25	26	5
Ft. Harrison	6	17	7
Fishers & Glendale	0	0	6
Glendale & Ft. Harrison	0	2	0
Unknown	2	10	12
Overall	**58**	**193**	**80**
Percent	**17.5%**	**58.3%**	**24.2%**

Sources of Information

News reports were the most often reported source of information about the Park and Ride service, as shown in Table 10. It is interesting to note that news reports were also indicated to be the most important source of information about the Hyperfix project for the general public as well as the through traffic.

Table 10 – Sources of Information

Location	News Reports	Employer Announcements	Brochure	Advertising
Fishers	156	37	1	20
Glendale	36	9	1	5
Ft. Harrison	19	2	0	8
Fishers & Glendale	4	1	0	0
Glendale & Ft. Harrison	2	0	0	0
Unknown	10	3	0	0
Overall	**217**	**52**	**2**	**33**
Percent	**71.4%**	**17.1%**	**.7%**	**10.8%**

A marketing program that utilizes mass media therefore appears to be the most effective option for advertising not only this type of service, but also the Hyperfix type of public project.

Use of Businesses at Origination Points

An important incentive for the shopping mall owners at Fishers and Glendale for allowing the use of their parking areas for the Park and Ride service was the expectation that the riders would patronize the businesses at these locations. Overall, 81% of the respondents indicated that they combined shopping at the origin points with travel. The location point in Fishers (Target) was the most popular place for shopping or doing business in combination with the Park and Ride service. About 88% of the respondents originating in Fishers indicated that they patronized businesses at the origination point. This information can be useful to potential hosts in making decisions regarding similar services in the future.

Possible Continuation of the Service

When asked if the riders would like the Park and Ride service to continue after the completion of Hyperfix, all 341 respondents answered affirmatively. This level of popularity of the service indicates latent demand for express public transportation service for commuting in the Indianapolis area.

While all respondents would like to continue the service, the willingness to pay for the service varied. The original service was $1 each way, but this was subsidized to keep the cost down. The willingness to pay responses is presented in Table 11. A fare over $4 will not have much support, as 90% of the respondents were willing to pay $4 or less.

Table 11 – The Willingness to Pay for Park and Ride Service

Location	$5	$4	$3	$2
Fishers	20	75	73	56
Glendale	2	20	14	20
Ft. Harrison	1	9	13	23
Fishers & Glendale	3	2	0	0
Glendale & Ft. Harrison	0	1	1	0
Unknown	1	6	3	4
Overall	**27**	**113**	**104**	**103**
Percent	**7.8%**	**32.5%**	**30%**	**29.7%**

The Role of Express Service and Reasons for Use

The respondents were asked to indicate how important was the express service direct shuttle from the pick-up site to downtown on a scale of 1 to 5 with 1 being not important and 5 being very important. Overall, the average rating was 4.69 indicating the high degree of importance placed on the express or non-stop service between outlying pick-up points and downtown.

Table 12 – Reasons for Using the Service

Location	Saves Time	Saves Fuel cost	Saves Parking	Hassle-free
Fishers	7	41	22	125
Glendale	3	6	18	27
Ft. Harrison	2	2	6	13
Fishers & Glendale	0	0	0	4
Glendale & Ft. Harrison	0	1	0	1
Unknown	0	6	0	3
Overall	**12**	**56**	**46**	**173**
Percent	**4.2%**	**19.5%**	**16%**	**60.3%**

Table 12 presents the reasons for using the service. The reduced stress inherent in the service was the surprising reason for most.

Survey Summary

The four surveys revealed different information representing various impacts of the Hyperfix project. This information is summarized below.

- The commuters felt that the project did not significantly affect travel into the downtown area. Some fewer automobile trips were reported but not a significant percentage. Those impacted perceived the increased travel time was on the average of about 10 minutes. Due to the fact that closure was going to last no more than 85 (55 actual) days, the traveling public was willing to spend this extra time. Because alternate routes were available, the majority of riders took them. Availability of alternate routes was very important to the project's success.

- The most popular sources of information used for Hyperfix were: TV and radio – 31%, websites – 18%, and newspaper – 16%.

- The majority of traffic driving through Indianapolis changed their routes and proper advanced signage was very important to them.

- Downtown businesses were not significantly affected. There was minimum loss of business for most, few layoffs, no closures, and little disruptions in hours of operations.

- The Park and Ride Service was very popular. There is significant interest in seeing it continue but there is a ceiling for the fare. Other areas on Indianapolis would like an express service that was used for the Northeast corridor. Businesses that would allow Park and Ride to use their parking lot would see an increase in business from the riders. Also, this type of service is preferred when the commute time is no less than 30 minutes and no more than 45 minutes. If this type of express service is considered in the future, locations that are within these ride durations would have a high probability of use.

- The Hyperfix project revealed latent demand for express bus service for commuting in the Indianapolis area.

Chapter 3 - INTERVIEWS

Several personal interviews were performed to collect specific information from various parties involved in the Hyperfix project. Interviews were performed with the general contractor, major subcontractors, various INDOT personnel, Federal Highway Administration personnel, and consultants. The interviews are summarized in this chapter.

Construction Contractors and Material Suppliers

In this group the information was collected through a personal interview with a representative of the general contractor, Walsh Construction, and phone interviews with the major subcontractors and material suppliers.

General Contractor

A personal interview was conducted with J.R. Collard, the Project Manager for Walsh Construction on June 23, 2003 and the information is summarized below.

Work Schedule - The work schedule (hours) differed by activities. Some activities were 24/7, while others were only at night or during the day. One of the first activities was bridge demolition, which lasted 2-3 weeks on a 24/7 schedule. After that activity, Walsh went to a 12 hour (6AM-6PM), 7 days a week schedule. One exception was the bridge work; the deck overlay sub and painter used a 24/7 schedule. Some activities are not conducive to night construction. For example, bridge painting productivity is lower at night. Also productivity for some activities are impacted by the 24 hour schedule. On the other hand, total closure really helped the bridge painting activity because it eliminates the need to stage lane closures. Another problem was the 24 hour schedule eliminated competition among subcontractors; some are hesitant about 24 hour operations.

Project Supervision - Project supervision has one day off every week. The laborers do not have a day off, with the money acting as a strong incentive for them to work. Night construction did not work well due to the lack of consistent supervision. That is another reason why the day shift was used.

Job Site Safety - Closing down the work area to traffic significantly improves job site safety and allows for a more productive work environment. It is also a safer option for motorist since they do not have to navigate congestion, lane merges, detours, etc. Also, more space is available for storing materials and staging construction operations. Another advantage is that contractor activities are not affected by Maintenance of Traffic (MOT) plans or phases.

Maintenance of Traffic - Since the project featured total closure the mind set can become that MOT is not an issue. There were construction phases (early and late phases) that required MOT and these plans were insufficient. More time was needed for their development. Also, the impact of MOT on city roads is an important consideration.

INDOT Quick Response - Another item that made the project a success was INDOT's quick response to problems. For example, the incident of the drunk driver coming to the site was dealt by INDOT in a most expeditious way. The INDOT staff was at the site the next day working on a solution. A quick response to problems is very important to the success or failure for this type of accelerated project.

Type of Job - Another reason for success was the type of job. It was a 3R maintenance type job. It consisted of activities that were not affected by utilities or impacted significantly by weather. In other words, there was no excavation work or earthwork that could be impacted significantly by wet weather. Also, site conditions on new construction have a higher level of associated uncertainties. New alignment construction may not work well with this approach.

Advanced Planning - Most contractors within Indiana Constructors Incorporated (ICI) think this is a positive approach to construction. But they believe that it will only work well with good advanced planning and a quick response from INDOT when problems occur.

Project Risk - For contractors, risk to reward was very high on this project. Elevated risk is usually associated with low participation or interest from contractors for the Hyperfix project there were only two bidders. The factors that influenced risk on this project were:

1. The high penalty ($100,000/day)
2. The short construction time, 85 days
3. The size of the project
4. The accelerated activities
5. Night construction

Subcontractors

Subcontractor interviews were done on the phone. A list of the major subcontractors was obtained from Walsh Construction, and those contacted are listed below. Specific comments are summarized in the following sections.

Rebar and Metal Deck Installer – Harman Steel
Asphalt – Shelly and Sands
Bridge Painting – Spanos Painting
Aggregate Supplier – Martin Marietta

Rebar and Metal Deck Installer - Price was higher than usual because of overtime paid. Rebar supplier had no problems in providing materials. However, the work involved 12 hour days, 7 days a week, for 9 weeks.

Asphalt Supplier - Asphalt had to be supplied on a 24 hour schedule. The supplier did not have difficulty in maintaining the schedule, nor were there problems with producing and delivering material. Resources were available. However, wages were higher causing the price to be higher on work. Some problems were experienced with obtaining SMA materials (dust and slag). The supplier felt that it would have been desirable to have more supervision on this project. Weekly schedules were considered good.

Bridge Painting - Like other activities, bridge painting was also relatively expensive due to the compressed schedule. For painting it is difficult to work at night because of the lighting required. The work was completed in 38 days. The subcontractor was able to get adequate resources (labor and material) to perform the job.

Aggregate Supplier - The aggregate supplier experienced no problems on this project. Most of the deliveries were made during normal business hours without encountering any delays from traffic in getting material to the job site.

In summary, the subcontractors and material suppliers did not experience any major problems. This was not much different from other projects for them.

INDOT Personnel

Interviews with INDOT personnel involved two persons from the Greenfield District, one from the project staff, three from the Central Office, and one from the Division of Materials and Tests. A summary of these interviews is presented below.

District Personnel

The district personnel explained how the bonus amount of $100,000 was determined. The amount typically used on Interstate restricted jobs is $50,000. This number was based on past experiences. As the amount for partial restriction was $50,000, the logic was to double that amount for total closure.

The district personnel felt that the total closure was feasible for short periods, say up to 85 days, which was in the contract. Without closure the contract was estimated to take 180 days. So comparing 180 to 85, (the actual duration, however, was 55 days) and with good access and alternate routes around the site, it was decided this project would make an ideal candidate for total closure. Access was good around the project since exit and entrance feeder ramps stayed open.

The district personnel indicated that total closure should not be used if MOT has already been established on a job site. In other words, closure should not be considered for a short period of time on a job where MOT has already been established and implemented. Total closure is always better for contractor activities. The district personnel felt they needed more time for plan review and development.

Project Personnel

Project staff worked 6 days a week with 12 hour days. Engineers were eligible for overtime. Two shifts were operating because of nighttime operations. Personnel from district were asked to staff weekends when employees had their day off.

The project personnel did consider the Hyperfix project to be different from other typical contracts. Day shifts were very similar. It was felt that more personnel was needed to monitor and supervise. Also, coordination for this type of project was much more intense than traditional projects.

Overtime pay helps but time off is important. This type of contract has a limited duration for it to be effective (90-120 days). Any longer, the workers will suffer from burnout.

The number of change orders associated with the Hyperfix project was found to be similar to other contracts.

Central Office

Comments were collected from employees at the Central Office associated with the Hyperfix project and are summarized below.

1. Time was a problem.
    a. Most decisions were made late.

2. A time line for decisions would be helpful for future projects.

a. MOT decision should be made at least 1-1/2 years ahead of letting
b. Park and Ride should be planned at least a year ahead, in order to line up partners, contracts, insurance, and to get a legal review.
c. The lead time for public relations was sufficient.
d. Legal reviews take time and should be promptly pursued.

3. Much effort was made to coordinate activities with the City of Indianapolis and this coordination went well.

4. More should have been done on the west leg of 465 to alleviate congestion.
    a. Temporary improvement to add capacity at the interchanges.
    b. Better by-pass route planning.
    c. Work zone advisory signs should have remained at strategic locations, even after opening.
    d. There was no adequate provision to operate Park and Ride. Target shopping mall at Fishers gave additional six weeks after opening and IndyGo had to look for other locations.

5. Factors that should be considered for total closure.
    a. Availability of alternate routes, particularly other interstates.
    b. Total closure can be used in other situations. For example, it can be useful for demolition activities. A project can go a lot faster when complete closure can be used for short periods, over a weekend or a night.
    c. Availability of construction-free links in the network that can accommodate diverted traffic volume.

6. Effective Use of Variable Message Boards (VBMs)

    a. Had messages about Hyperfix the week before closure and the first week of closure. After that the VBMs went back to blank status. The VBMs are to be used for short term messages and not for long term events.

b. When the restriction was lifted, a message was placed announcing the opening.

7. Intelligent Transportation Systems (ITS)

   a. The ITS group was involved in pre-planning and in the Hoosier Helper operations on I-465 on the south and west sides.
   b. The Marion County Emergency Management Center was opened in the first week of closure to handle any possible emergency due to the closure. As there were no problems during that week, the center was closed.
   c. The following items contributed to the success of the project:
      1. The use of PR consultant.
      2. Improvement of local arterials.
      3. Retiming of signals on West Street.

Materials and Tests

The INDOT Division of Materials and Tests was responsible for monitoring the quality of materials. Results of the monitoring were:

1. Two (2) sublots of intermediate HMA were allowed to be left in place with reduced pay.
2. One (1) sublot of base HMA was allowed to be left in place with reduced pay.
3. Approximately 800 ft of concrete shoulder had to be replaced, due to the original pavement being too thin.
4. One lane of bridge deck overlay had to be replaced, SB 65 to EB 70- bridge over Lewis Street. The INDOT Failed Material Committee decided to remove and replace the deck as the burlap caught fire during the curing period and damaged the deck.

In comparison to the material quality in other jobs, the record of failed materials in the Hyperfix project was above average. INDOT has had many jobs with no failed material items, or at most

only marginal failures and small penalties. Removing and replacing a bridge deck is very unusual.

Can this below average material quality be due to the accelerated schedule of the project? Was the bridge deck fire caused by lack of attention due to time pressures or possibly by a lighted cigarette that was dropped on the burlap? The burlap was supposed to be wet but apparently it was not. Although there were some lapses, no conclusive statements can be made relating poor material quality and the accelerated schedule.

Consultants

There were two major engineering consultants involved in the project, including American Consulting Engineers (ACE) for INDOT, and Edwards and Kelcey for the City of Indianapolis.

State Consultant

The original design specified partial closure with the project being completed in one construction season. ACE estimated that for either option (partial closure vs. total closure) the construction cost would be the same. The only difference would be in the bonus.

Total closure saved a considerable amount of money in the Maintenance of Traffic (MOT). ACE estimated the savings would be close to the bonus amount that was awarded.

Factors to consider for a future total closure decision.

1. Alternate route analysis. I-465 had no restrictions.
2. Origin/Destination Study.
3. Flexibility from alternate routes.
4. Good public relations campaign and communication.
5. Partnering with the local jurisdiction.

Closure should be analyzed by the consultant and come as a recommendation from the consultant. A detailed analysis needs to be performed before a total closure option is chosen. That analysis should be a part of the consultant's scope.

It is important to analyze the impact of the closure on big downtown events, for example, the July 4 celebration and the Black Expo.

Contractor risk needs to be considered to determine how this will affect competition.

City Consultant

The City of Indianapolis made $2.8 million of improvements to increase capacity on local routes. This amount came from INDOT as a part of the total INDOT Hyperfix project cost. Two streets, West and Fall Creek/Binford, had the major improvements. Approximately $1,000,000 was spent on Fall Creek/Binford and $900,000 spent on West Street. On West Street an additional lane was added by making the lane widths 9-10 ft. The curb line was moved at the north end to accommodate the increase in lane width. A detailed breakdown on the estimated costs is shown below:

$ 400,000 Planning /design / inspection services
$ 1,253,780 Intersection and street improvements
$ 173,320 Opticom technology for bus priority
$ 100,000 Indianapolis Police Department
$ 800,000 IndyGo Park and Ride bus service
$ 120,000 Other (Binford, mobilization, demobilization)
$ 2,847,100 Total

The major intersection and street improvements are shown in Figure 13.

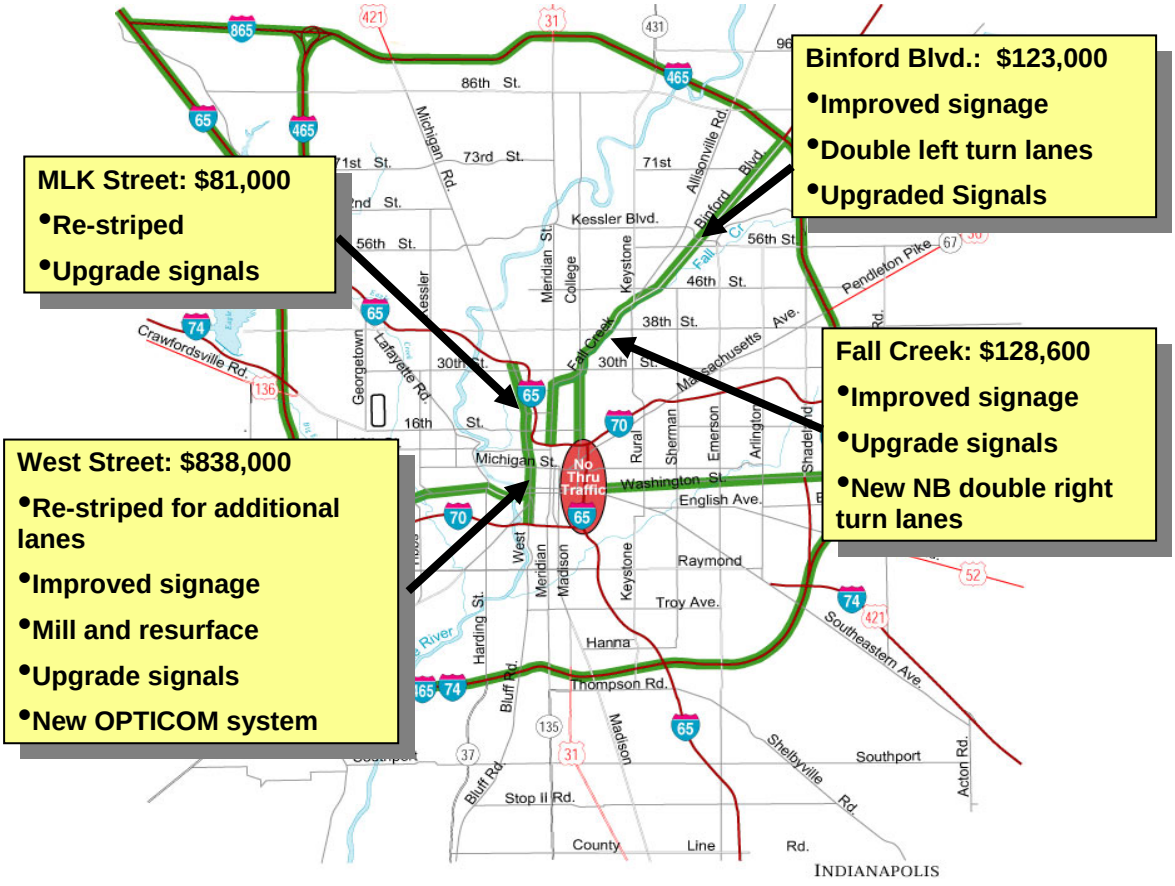


Figure 13 - Major Local Improvements

A time line for city activities is shown below:

06/01/02 City is informed of INDOT plans;

09/01/02 City engages Edwards & Kelcey to determine mitigation;

07/16/02 – 06/01/03 Analysis / strategies / meetings;

12/01/02 City engages Edwards & Kelcey to prepare construction documents;

03/10/03 City awards construction contracts.

Based on the project experience Edwards and Kelcey developed the following list of lessons learned.

Lessons Learned

1. Additional lead time would have been useful for design and construction. Local improvement construction should have been performed in Fall 2002.
2. Persons representing various parties at coordinating meetings must be empowered to make decisions.
3. Information should be shared openly and inquiries from concerned parties should be answered promptly.
4. The city should have been brought into the early discussions on closure.
5. FHWA involvement was important because they could act as an arbitrator and mediator.
6. Cooperative attitudes are important.
7. Park and Ride capabilities are important.
8. Alternate routes analysis must be done properly.
9. Public relations are very important.
10. Financial arrangements are very important. Since INDOT paid for most costs, funding was not a problem for the city. But at other locations, where there are regional transportation organizations with their own funding, this may be an issue.
11. City noise ordinance was an issue for the deck replacement jobs. Variance was not allowed. As hydro-demolition is a very loud operation, it was performed only during the day to comply with the ordinance. Overlays were done at night.
12. No lane closure should be allowed after opening the project for traffic.
13. INDOT did a great job with up-front planning and this contributed to the project's success.

Interview Summary

The various interviews captured the different perspectives of the main participants. This section reported the main points gathered from the nineteen in-person and phone interviews.

Chapter 4 - TRAVEL TIME STUDY

Shortly after the Hyperfix project was initiated, the research team met with several individuals from INDOT and their consultants who were involved in developing plans to mitigate the impact of diverted traffic on alternative routes. During those discussions, it was determined that a series of travel time studies would be conducted to directly measure the impact of Hyperfix on alternative routes.

In consultation with INDOT and their consultants, it was decided that no travel time studies would be performed on I-465. This was primarily a time/resource decision since the Hyperfix project was already underway and there was an extremely short period of time to collect data "during" the Hyperfix project. Also, since the Hyperfix project was already underway, it was not possible to collect "before" data. Consequently, "after" data was collected to provide a basis for estimating the additional travel time on alternative routes that was caused by the Hyperfix project.

Travel Time Study Corridors

In consultation with Ron Griewe of Edwards & Kelcey several corridors were identified for inclusion in the study. These corridors were selected based upon assessments made by Edwards & Kelcey of where traffic would likely divert. These corridors are shown in Table 13. Figures 14 and 15 show maps of the area where these routes are located.

Table 13 - Hyperfix Travel Time Study Corridors

Corridor	AM Peak Direction	PM Peak Direction
1. Fall Creek Pkwy/Binford Blvd Meridian to 75th St.	SB	NB
2. E. Washington St. College Ave to Kitley	WB	EB
3. West St. I-70 to I-65	NB/SB	NB/SB
4. Pennsylvania St./Delaware St. Washington to Fall Creek Pkwy	Penn (in)	Del (out)
5. East St./ College Ave Washington to 10th St.	NB/SB	NB/SB
6. Rural St. Washington St. to I-70	NB	NB
7. Emerson Av. Washington St. to I-70	NB	NB
8. MLKing 16th St. to I-65	SB	
9. W. Washington St. West St. to Holt Rd.	EB	WB
10. East St./ Madison Ave I-465 to Delaware St.	NB	SB
11. New York/Michigan St. University Blvd. to Pine St.	EB/WB	EB/WB

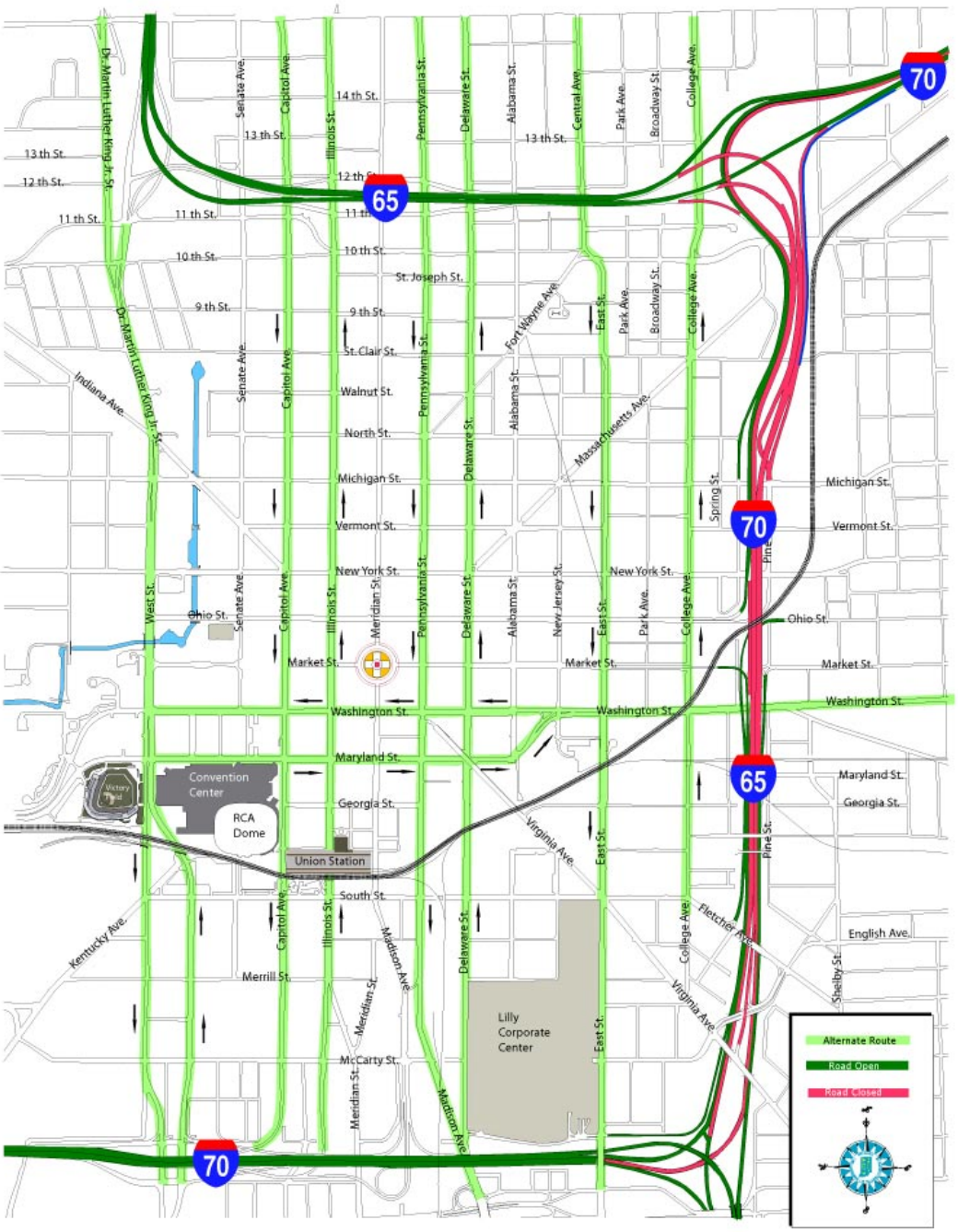


Figure 14 - Travel Time Study Corridors in Downtown Indianapolis, IN

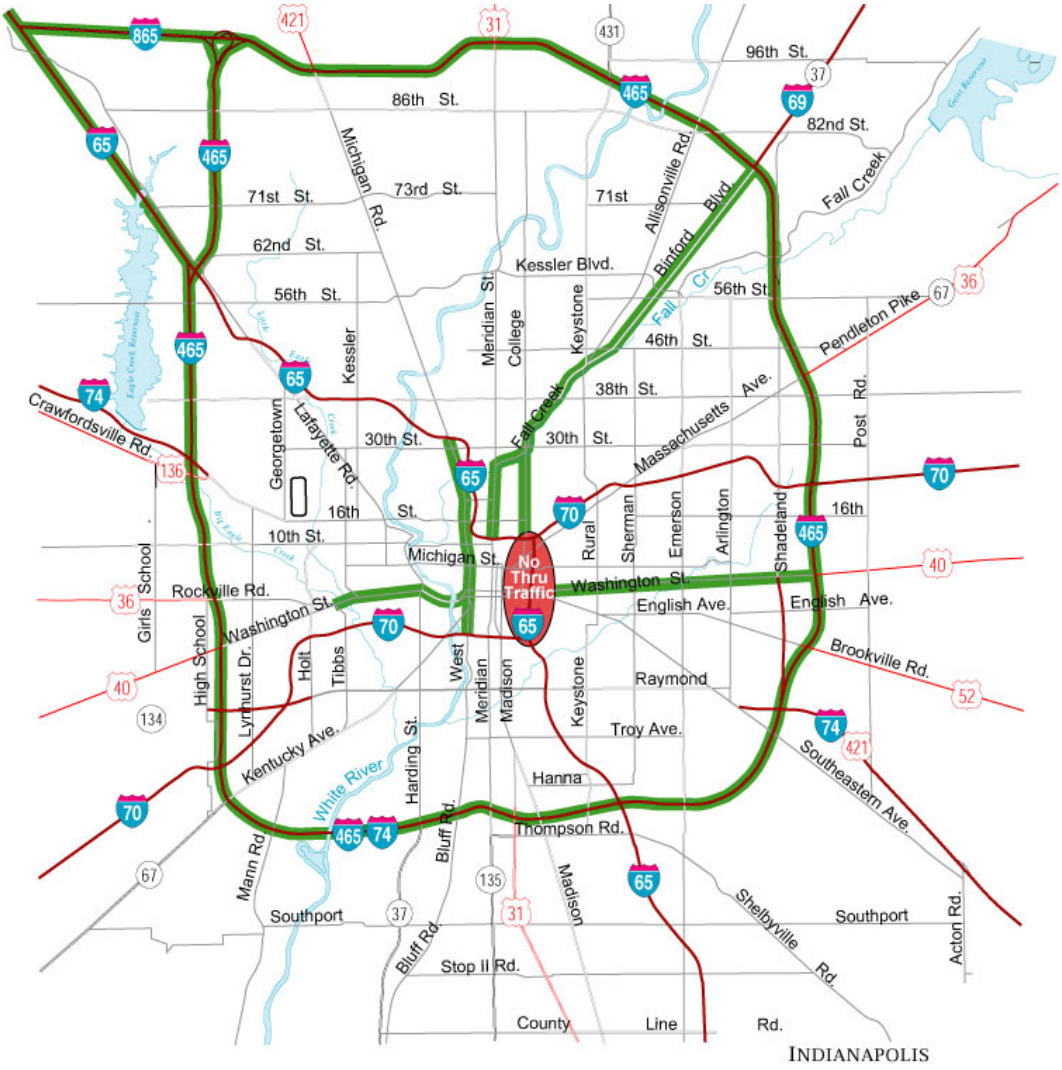


Figure 15 - Travel Time Study Corridors Leading to Downtown Indianapolis, IN

Data Collection

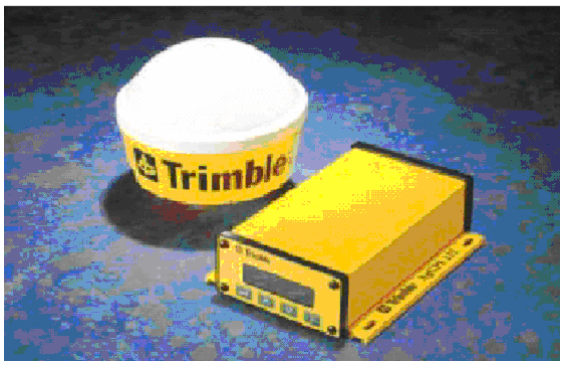
Scheduling was a significant challenge in the travel time study. Data had to be collected during the Hyperfix project on all eleven corridors in two weeks. Therefore, corridors were combined in such a way that multiple corridors could be traveled at least three times each during an approximately two hour period that was centered on the morning and afternoon peak hours. The routes and dates traveled are shown in Tables 14 and 15. Data was collected using GPS-Trek Data Collection Program which records the GPS location from AgGPS 132. The GPS equipment and software shown in Figure 16 was used to collect location data at 1-second intervals.

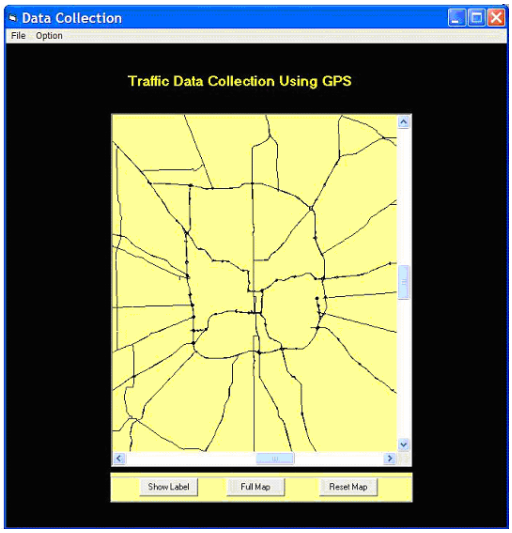
Table 14 - Data Collection Schedule During Construction

Day/Date			Location
T	7/8/2003		W. Washington & East/Madison Ave.
W	7/9/2003		Rural St. & Emerson Ave.
R	7/10/2003		East/College Ave. & Michigan/New York St.
F	7/11/2003		W. Washington & East/Madison Ave.
M	7/14/2003		Binford Blvd./Fall Creek
T	7/15/2003		MLK & West St. & Pennsylvania/Delaware St.
W	7/16/2003		E. Washington
R	7/17/2003		MLK & West St.
F	7/18/2003		Pennsylvania/Delaware St.

Table 15 - Data Collection Schedule After Construction

Day/ Date			Location
W	8/13/03		Binford Blvd/Fall Creek Parkway
W	9/3/2003		W. Washington & East/Madison Ave.
R	9/4/2003		Rural St. & Emerson Ave.
T	9/9/2003		East/College Ave. & Michigan/New York St.
W	9/10/2003		East/Madison Ave. & Pennsylvania/Delaware St.
W	9/10/2203		MLK & West St.
R	9/11/2003		MLK & West St.
R	9/11/2003		Pennsylvania/Delaware St.
R	9/18/2003		East/College Ave. & Michigan/New York St.





a) GPS Receiver b) Example Maps for Data Collection

Figure 16 - GPS Data Collection Equipment

Detailed strip maps (Appendix B, Tables B-1 to B-11) were generated that showed the travel time and speed of individual segments down to the block level. This data was also used to plot travel time graphs (Appendix C, Figures C-1 to C-21) and Average Speed graphs (Appendix D, Figures D-1 to D-21). Tables 16 and 17 summarize the data.

Table 16 - AM Peak Cumulative Travel Time Differences between Post Construction and During Construction

Route	Direction	Post Construction Ave. Travel Time (s)	During Construction Ave. Travel Time (s)	% Change of Travel Time during Hyperfix
1. Fall Creek Pkwy/Binford Blvd	NB			
Meridian to 75th St.	SB	727	752	3
2. E. Washington St.	EB			
College Ave to Kitley	WB	544	541	-1
3. West St.	NB	301	396	32
I-70 to I-65	SB	247	274	11
4. Pennsylvania St./Delaware St.	NB			
Washington to Fall Creek Pkwy	SB	370	386	4
5. East St./ College Ave	NB	184	211	15
Washington to 10th St.	SB	180	220	22
6. Rural St.	NB	325	349	7
Washington St. to I-70				
7. Emerson Av.	NB	354	366	3
Washington St. to I-70				
8. MLKing	SB	187	181	-3
16th St. to I-65				
9. W. Washington St.	EB	365	364	0
West St. to Holt Rd.	WB			
10. East St./ Madison Ave	NB	367	375	2
I-465 to Delaware St.	SB			
11. New York/Michigan St.	EB	287	291	1
University Blvd. to Pine St.	WB	311	349	12

Table 17 - PM Peak Cumulative Travel Time Differences between Post Construction and During Construction

Route	Direction	Post Construction Ave. Travel Time (s)	During Construction Ave. Travel Time (s)	% Change of Travel Time during Hyperfix
1. Fall Creek Pkwy/Binford Blvd	NB	984	940	-4
Meridian to 75th St.	SB			
2. E. Washington St.	EB	576	600	4
College Ave to Kitley	WB			
3. West St.	NB	298	387	30
I-70 to I-65	SB	302	350	16
4. Pennsylvania St./Delaware St.	NB	320	515	61
Washington to Fall Creek Pkwy	SB			
5. East St./ College Ave	NB	201	256	27
Washington to 10th St.	SB	156	235	51
6. Rural St.	NB	292	397	36
Washington St. to I-70				
7. Emerson Av.	NB	318	411	29
Washington St. to I-70				
8. MLKing	SB			
16th St. to I-65				
9. W. Washington St.	EB			
West St. to Holt Rd.	WB	434	467	8
10. East St./ Madison Ave	NB			
I-465 to Delaware St.	SB	373	467	25
11. New York/Michigan St.	EB	359	331	-8
University Blvd. to Pine St.	WB	435	298	-31

Limitations of Data Collection

The GPS data collection procedure produces self document data files that eliminate most sources of data that were traditional encountered with distance measuring instrument (DMI) or stop watch based procedures. However, this technology is subject to what is known as "Urban Canyons." Once such "Urban Canyon" was an approximate two block section of the Pennsylvania/Delaware St. route where the GPS signal was routinely lost and had to be interpolated. Also, as with any travel time study, there is some inconsistency among drivers in moderate traffic conditions as to whether they are driving at "free flow speed" or the posted speed limit. Although important to note, these issues have only a very minor influence on the data.

From a strategic perspective, the routes selected did not include ramps from say I-65, I-70, or I-465 that may have experienced congestion as motorists were departing those facilities for alternative routes. Also, the data collected "during" the Hyperfix construction was performed during the summer when schools were not in session. The schools were in session when the data was collected "after" the Hyperfix project. There were several routes where school zone speed limits were encountered. Also heavy pedestrian/vehicle movement was experienced around facilities such as IUPUI.

Finally, because of imminent construction, "after" data was collected along Binford Blvd/Fall Creek Parkway in August during the State Fair.

Travel Time Impact Summary

In general, the morning travel time was higher on all routes during construction as opposed to post-construction, with the exception of the East Washington and Martin Luther King corridors (Table 16). On those corridors, travel time decreased a relatively modest 3 seconds and 6 seconds, respectively. The increase in travel time along other corridors in the morning ranged from 4 seconds (New York/Michigan St.) to 95 seconds (West Street). Based upon this data, the impact along the studied arterial corridors was observed to be relatively minor, increasing

corridor travel time by a maximum of approximately 1.5 minutes. However, as we noted above this travel time study did not consider the Interstate or Interstate ramp travel times.

In the afternoon, travel time during construction in general was higher than after construction along all corridors, with the exception of Fall Creek/Binford Blvd, New York/Michigan St., and University Blvd (Table 17). On those corridors, travel time decreased 44 seconds, 28 seconds and 137 seconds, respectively. The increase in travel time along other corridors in the afternoon ranged from 24 seconds (East Washington St.) to 195 seconds (Pennsylvania St./Delaware St.). Based upon this data, impact along the studied corridors was deemed to be relatively minor also in the afternoon. However, as with the morning data, no travel time information was available for the Interstate or Interstate ramps.

Chapter 5 – ESTIMATION OF TRAFFIC IMPACTS

Overview

Information on traffic impact came from three sources. The Department of Metropolitan Development (DMD) of the City of Indianapolis provided travel simulation model results for the metropolitan Indianapolis network under various scenarios of I-65/70 closure. These results were considered to assess areawide traffic impact on an aggregated basis. The second source of data was the ground counts from the permanent traffic count stations maintained by the Indiana Department of Transportation. These ground counts represent the time periods before and during the Hyperfix project and the data was used to examine the traffic impact on major state highway links around Indianapolis. The third set of data came from the consultants (Edwards & Kelcey) working for the City of Indianapolis and this information represented ground counts from surface arterial links in downtown Indianapolis. The counts were taken before and during the Hyperfix project.

While the questionnaire surveys, discussed in Chapter 2, provided information on travel impacts as perceived by commuter and other road users, the travel simulation and ground counts were used to establish quantitative traffic impacts. In the following sections, the analysis of data obtained from travel simulation model runs and ground counts are discussed.

Regional Travel Demand Model

Travel demand models can (in theory) be helpful in the analysis of alternative road closure strategies such as those considered for the reconstruction of I-65/70 in Indianapolis in 2003.

1. Estimate the traffic patterns that will result from proposed network changes, identifying locations where excessive delay may occur.
2. Estimate network totals for vehicle-miles traveled (VHT) and vehicle-hours traveled (VHT).

A standard “partial closure” traffic control strategy is to close one direction of traffic and use the lanes in the opposite direction for both directions of traffic. Instead, a “full closure” strategy was

used. The mainline lanes along the Hyperfix project section were closed and specified arterial corridors adjacent to the construction site had their signal timings adjusted for the expected diverted traffic. The travel demand model that has been developed for the Indianapolis region was used to assess the travel impact due to the Hyperfix project.

Overall Impacts

The Indianapolis Department of Metropolitan Development (DMD) provided the model results for the following four scenarios:

A. The base case without any lane closures on I-65/70.
B. The Hyperfix case.
C. Closing all NB lanes in the I-65/70 construction zone and keeping SB traffic flowing on the SB lanes.
D. Closing all SB lanes in the I-65/70 construction zone and keeping NB traffic flowing on the NB lanes.

The summary results of the four model runs for the entire Indianapolis region are summarized in Table 18.

Table 18 – VMT/VHT Results from the Model

	Alt. A	Alt. B	Alt. C	Alt. D
	Base	Hyperfix	NB Closed	SB Closed
VMT	42,801,800	42,779,300	42,805,100	42,805,100
VHT	1,214,900	1,209,200	1,215,100	1,215,100
Trips	4,442,600	4,442,600	4,442,600	4,442,600

As expected, Runs C and D produced identical results, while Run B showed a drop in VMT and VHT, compared to the Base Case A. The simulation runs indicated that although the Hyperfix project involved the closing of the most heavily traveled section in the freeway network, the overall travel impact, as represented by VMT and VHT, would not be significant in the regionwide context. That means the increase in trip lengths and travel times resulting from the trips diverted from the Hyperfix section onto the slower surface arterial streets or the more circuitous I-465 would be negligible.

Link Loadings

To investigate the results further, changes in individual link loadings were examined. A summary of the link volume changes expected from Hyperfix and partial closure with respect to the Base Case, given in Figure 17, seems reasonable. A few interstate links in and near the Hyperfix project site lose large volumes, as shown in Figure 18. A larger number of links realize only modest gains, represented by dark links in Figure 18. It can be seen that the dark links include substantial portions of I-465, numerous links in downtown Indianapolis, and some links to the north and east of downtown. These results are also as expected.

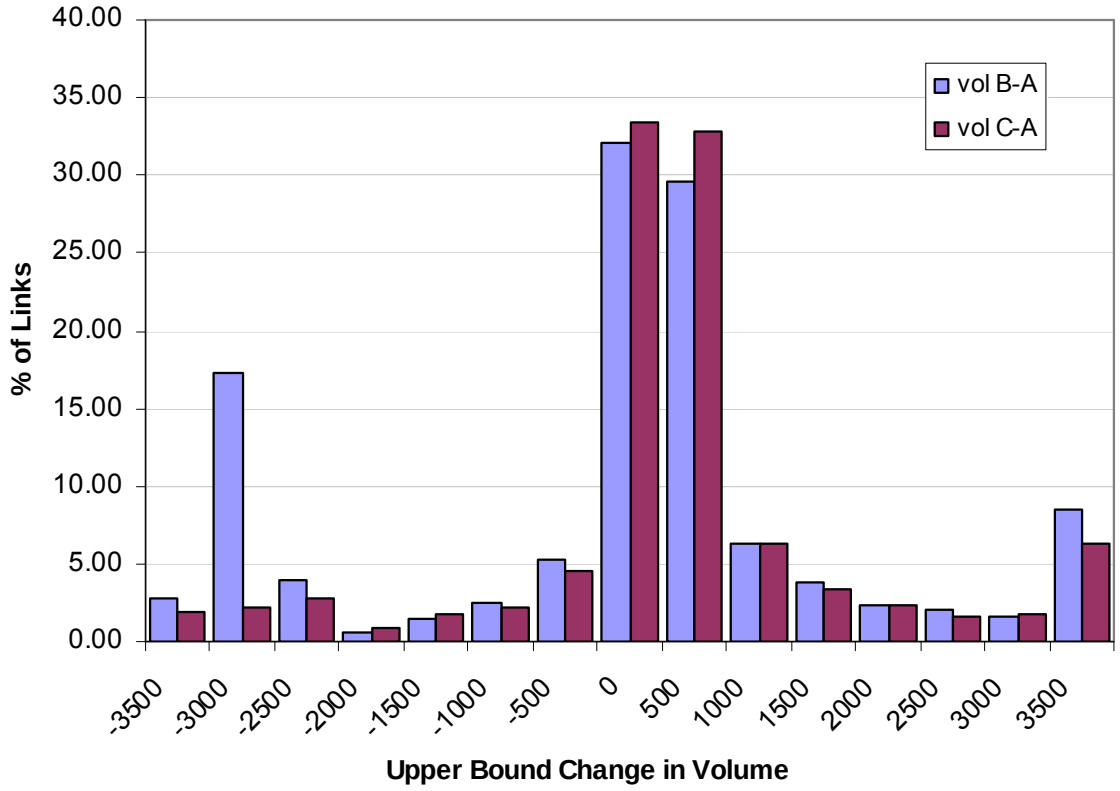


Figure 17 - Percent of Links by Change in Volume

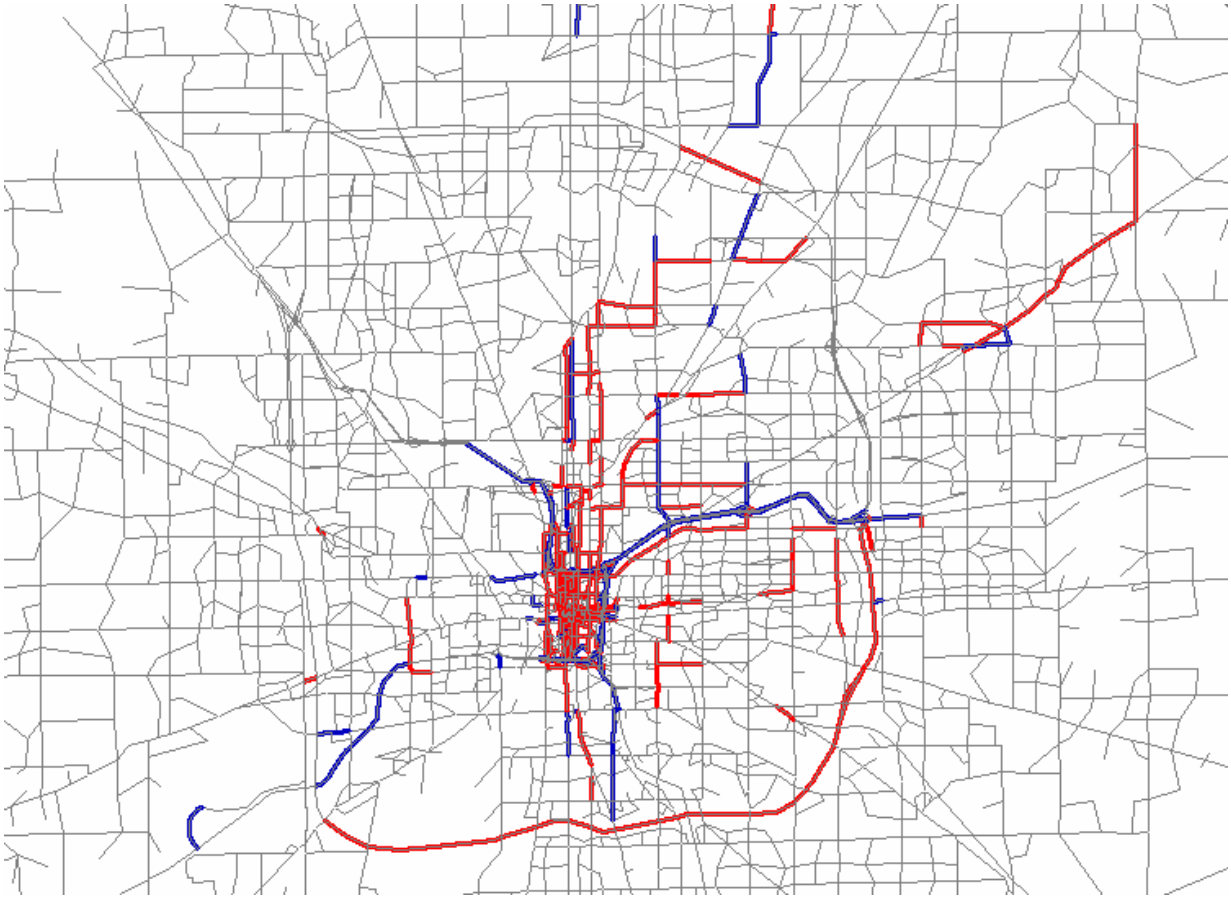


Figure 18 - Links with Estimated Change ≥ 3000 vpd (dark) and with Change ≤ -3000 vpd (light) for Scenario B

I-465 Ring, US Highways, and State Roads: Observed Impacts from Ground Counts

The changes in traffic volumes before and during the Hyperfix project, recorded at INDOT count stations on I-465, US Highways and State Roads are shown in Figure 19 and Table 19. Traffic volumes for the 'Before' scenario were obtained from average ground counts during April 2003, before the Hyperfix construction began. Traffic volume for the 'During' scenario was obtained from ground counts on a typical travel day (Wednesday) averaged over the weeks during which construction was ongoing (05/18/03 to 08/09/03). Both 'Before' and 'During' traffic volumes were factored using INDOT seasonal adjustment factors for the respective months during which they were obtained.

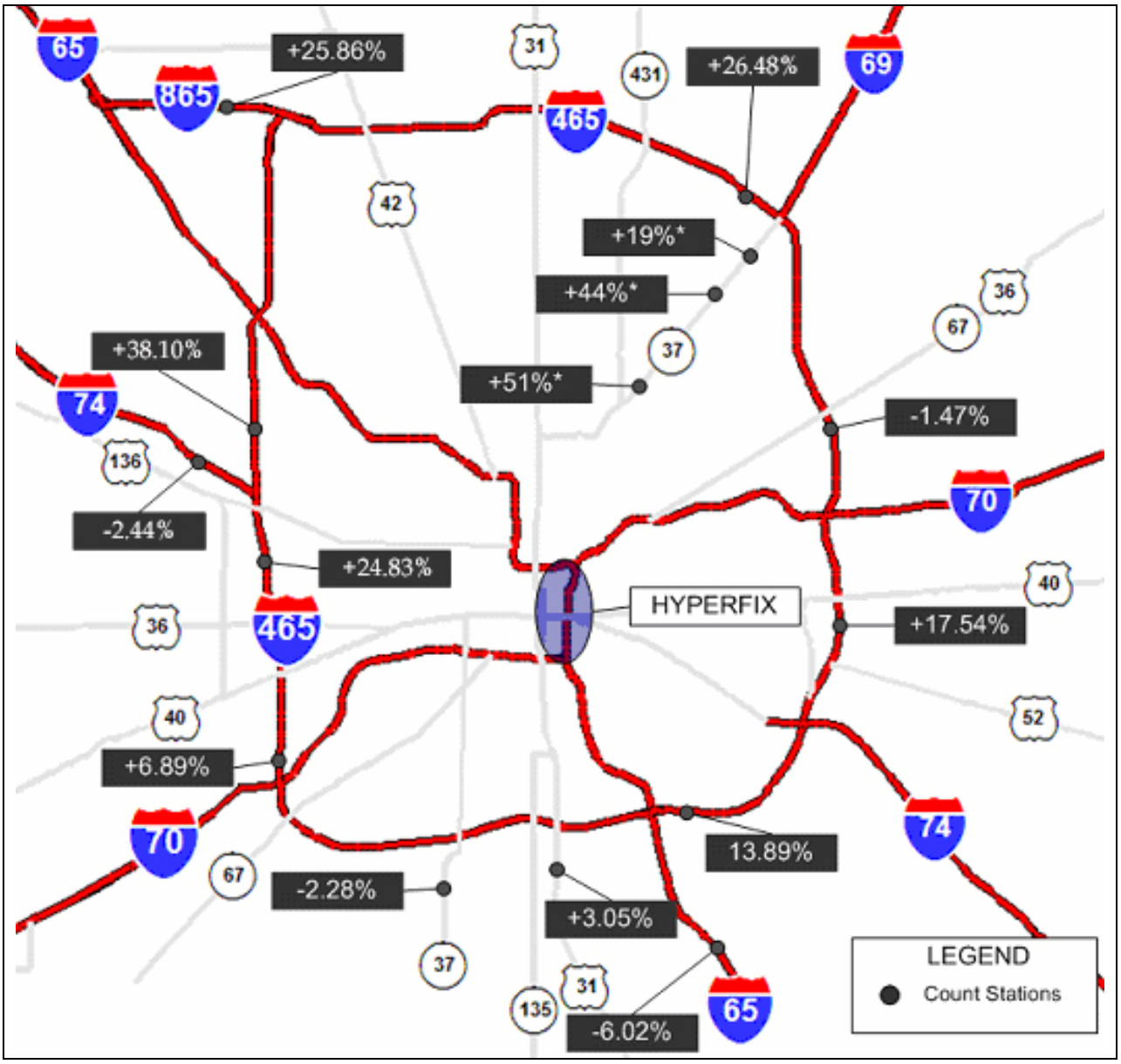


Figure 19 - Observed Percent Changes in Average Daily Traffic Due to Hyperfix on I-465, US Highways and State Roads

Table 19 - Observed Average Daily Traffic Before and During Hyperfix for Interstates, US Highways and State Roads

		ADT		
	Location	Before	During	% Change
I-465 at:	16.4 MM N of I-74/ Crawfordsville Rd	103,220	142,544	38.10
	13.4 MM N of US 36/ Rockville Rd	124,050	154,855	24.83
	0.72 Mi W of I-69	118,868	150,348	26.48
	0.60 Mi S of US 40 E	102,057	119,955	17.54
	0.85 Mi E of I-65	117,635	133,975	13.89
	0.70 Mi N of I-70 W	114,320	122,199	6.89
	0.097 Mi S of US 36 E/ SR 67	147,053	144,891	-1.47
I-65 at:	0.65 Mi S of Southport Rd	97,029	91,184	-6.02
I-74 at:	1.54 Mi W of I-465	35,400	34,538	-2.44
I-865 at:	4 Mi E of I-65	20,030	26,417	31.89
SR 37:	at 1.59 Mi S of S Jct of I-465	35,696	34,883	-2.28
	between 46th St and 56th St*	20,346	30,791	51.34
	between 62th St and 65th St*	30,225	43,551	44.09
	between 71th St and 75th St*	35,189	41,815	18.83
US 31 at:	1.16 Mi S of Jct I-465	42,760	44,064	3.05

The recorded ground counts indicated that on the whole, the traffic volume increased on I-465, US Highways and State Roads leading to the I-65/ I-70 link under construction. Significant increases (+19% to +51%) were observed on the northern links of SR 37 which provides an alternate route through downtown Indianapolis. The western and southeastern legs of the I-465 ring also had significant increase (+14% to +38%) as traffic was diverted away from the I-65 and I-70 links within the ring.

I-65 and I-70 within I-465: Simulated Impacts

The changes in traffic volumes along I-65 and I-70 within the I-465 ring, before and during construction, are shown in Figure 20 and Table 20. Traffic volumes for the 'Before' and 'During' scenarios were both obtained from the DMD travel simulation model outputs. The results are as expected. The Hyperfix project diverted a good portion of I-65/70 traffic around I-465 and onto surface arterials.

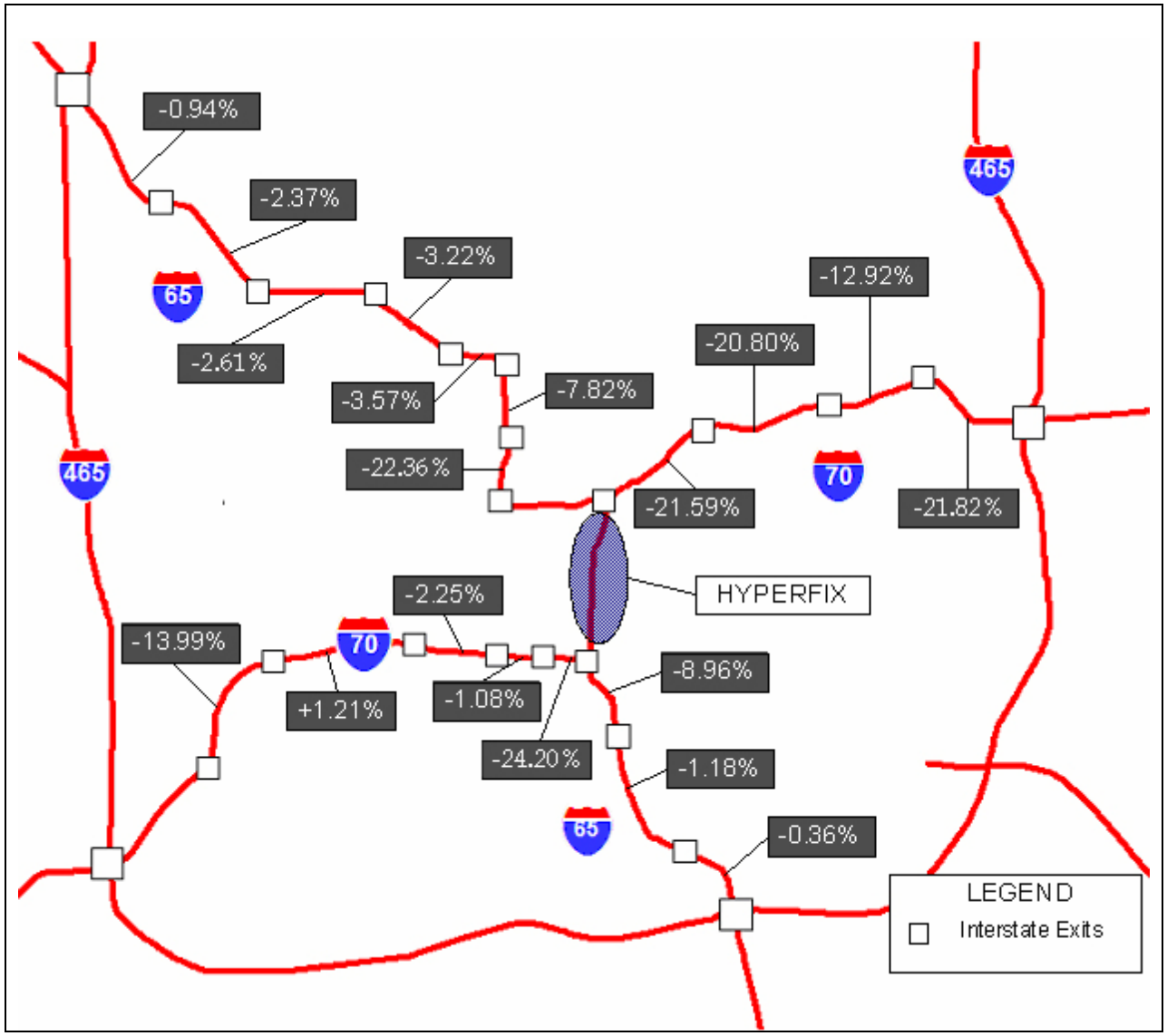


Figure 20 - Simulated Percent Changes in Average Daily Traffic Due to Hyperfix on I-65 and I-70 within the I-465 Ring

Table 20 – Simulated Change in Average Daily Traffic Before and During Hyperfix from DMD Model Outputs

Location		AADT	Change	% Change
I-65 between Exits:	123 and 121	46,520	-439	-0.94
	121 and 119 W	67,810	-1,609	-2.37
	119 W and 119 E	61,799	-1,615	-2.61
	119 E and 117	105,500	-3,395	-3.22
	117 and 116	76,930	-2,749	-3.57
	116 and 115	112,780	-8,825	-7.82
	114 and 112	132,610	-29,650	-22.36
	110 and 109	86,900	-7,782	-8.96
	109 and 107	75,860	-897	-1.18
	107 and 106	69,910	-254	-0.36
I-70 between Exits:	75 and 77	51,280	-7,172	-13.99
	77 and 78	77,250	938	1.21
	78 and 79	89,410	-2,011	-2.25
	79 and 80	97,780	-1,060	-1.08
	80 and 110	97,190	-23,519	-24.20
	112 and 85	167,330	-36,127	-21.59
	85 and 87	155,900	-32,425	-20.80
	87 and 89	127,720	-16,497	-12.92
	89 and 90	79,390	-17,322	-21.82

Change in Directional Traffic: Ground Counts

The impact of the Hyperfix project on the directional changes in traffic volumes could be determined only at the INDOT count stations as shown in Figure 21, and Tables 21 and 22. Similar to the data presented in Figure 19 and Table 19, traffic volumes for the 'Before' and 'During' scenarios were obtained from ground counts before and during construction, corrected for seasonal adjustments.

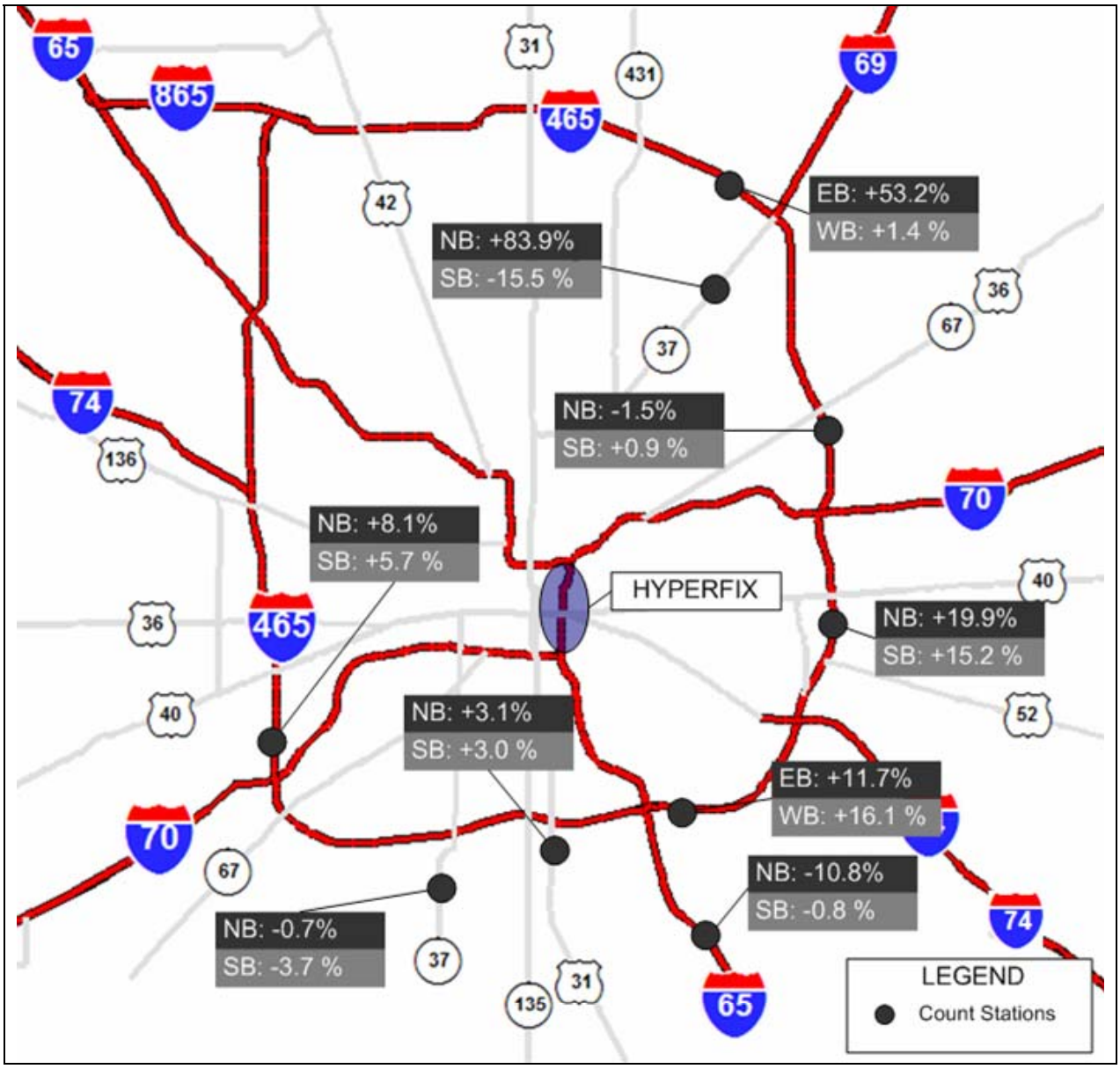


Figure 21 – Observed Percent Changes in Average Daily Traffic by Direction of Travel Due to Hyperfix on Interstates, US Highways and State Roads

Table 21 – Observed Change in Northbound or Eastbound Average Daily Traffic Before and During Hyperfix

		Northbound or Eastbound ADT		
	Location	Before	During	% Change
I-465 at:	0.72 Mi W of I-69	57,557	88,154	53.16
	0.60 Mi S of US 40 E	50,717	60,821	19.92
	0.85 Mi E of I-65	58,787	65,664	11.70
	0.70 Mi N of I-70 W	57,461	62,086	8.05
	0.097 Mi S of US 36 E/ SR 67	73,312	74,882	2.14
I-65 at:	0.65 Mi S of Southport Rd	50,635	45,178	-10.78
SR 37 at:	1.96 Mi S of Jct I-465 and I-69	11,242	20,678	83.94
	1.59 Mi S of S Jct of I-465	16,998	16,884	-0.67
US 31 at:	1.16 Mi S of Jct I-465	21,201	21,849	3.06

Table 22 – Observed Change in Southbound or Westbound Average Daily Traffic Before and During Hyperfix

		Southbound or Westbound ADT		
	Location	Before	During	% Change
I-465 at:	0.72 Mi W of I-69	61,311	62,194	1.44
	0.60 Mi S of US 40 E	51,339	59,134	15.18
	0.85 Mi E of I-65	58,849	68,311	16.08
	0.70 Mi N of I-70 W	56,859	60,113	5.72
	0.097 Mi S of US 36 E/ SR 67	73,741	73,066	-0.92
I-65 at:	0.65 Mi S of Southport Rd	46,394	46,006	-0.84
SR 37 at:	1.96 Mi S of Jct I-465 and I-69	25,323	21,391	-15.53
	1.59 Mi S of S Jct of I-465	18,698	17,999	-3.74
US 31 at:	1.16 Mi S of Jct I-465	21,560	22,215	3.04

On the whole, there were only small discrepancies between directional traffic volumes on the same roadway sections, except for SR 37 and the junction of I-465 and I-69. On SR 37, northbound traffic had an 84% increase while southbound traffic had a 16% decrease in traffic volumes. At the junction of I-465 and I-69, eastbound traffic experienced an increase of 53% while westbound traffic experienced an increase of only 1.4%. In addition, on I-65 south of I-465, the drop in northbound traffic was many times more than the drop in southbound traffic.

Downtown Indianapolis: Ground Counts

Traffic volumes before and during the Hyperfix project for road sections in downtown Indianapolis were obtained from the consulting firm Edwards and Kelcey. The changes for road sections around downtown are shown in Figure 22, while the changes for road sections in the downtown area are given in Figure 23. The before and during volume data is presented in Table 23. The data reported was based upon average weekday ground counts taken before and during construction.

All roadway sections studied in downtown Indianapolis experienced a high average overall increase of 51% in traffic volumes. Major arterials through downtown, running parallel to the link under construction, such as Pennsylvania Street, West Street and Delaware Street experienced significant increases since traffic from SR 37, SR 135, SR 431 and US 31 all merge into these arterials.

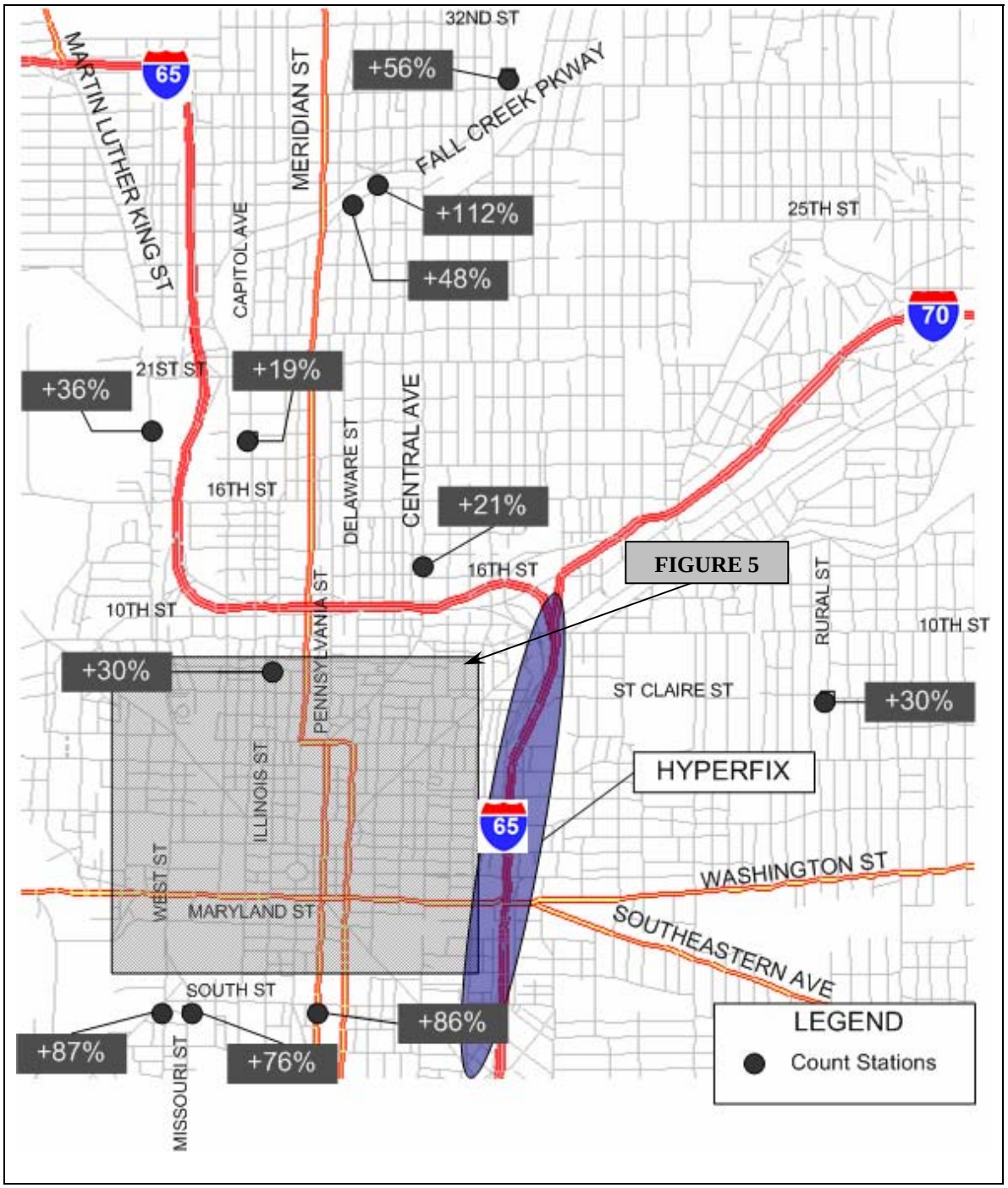


Figure 22 - Percent Changes in Average Daily Traffic for Road Sections Around Downtown Indianapolis due to Hyperfix

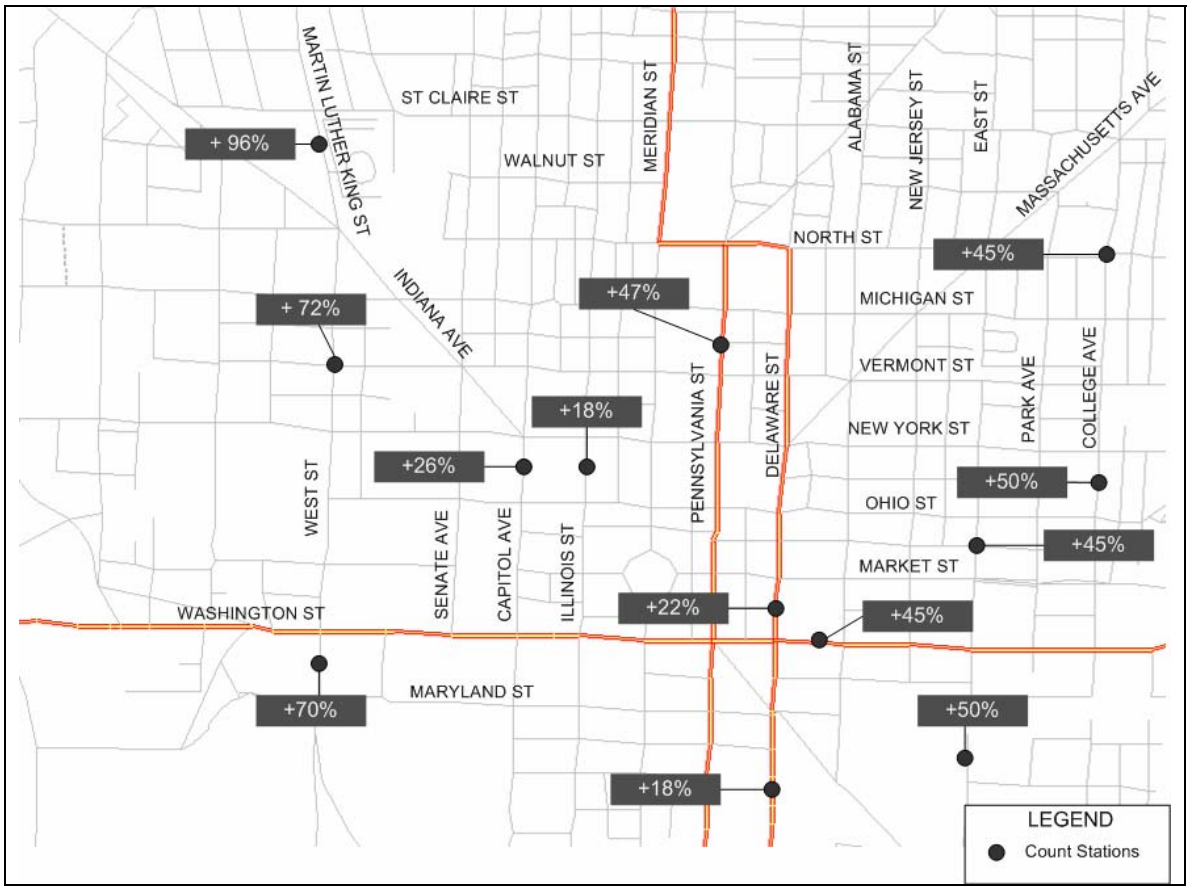


Figure 23 - Percent Changes in Average Daily Traffic for Road Sections in Downtown Indianapolis due to Hyperfix

Table 23 - Change in Average Daily Traffic for Road Sections Around and in Downtown Indianapolis

Location		Traffic Count		
		Before	During	% Change
West St between:	New York and Michigan	29,448	50,786	72.46
	South St and Maryland	28,831	48,985	69.90
	Indiana and St. Clair	23,655	46,412	96.20
	South of South St	11,829	22,167	87.40
Missouri St between:	South of South St	12,413	21,866	76.15
Capitol Ave between:	16th and 21st	15,277	18,117	18.59
	New York and Ohio	17,269	21,770	26.06
Illinois St between:	Ohio and New York	21,469	25,324	17.96
	St. Clair and 10th	12,237	15,865	29.65
Pennsylvania Ave between:	Vermont St. and Michigan	13,957	20,451	46.53
	South of South St	11,256	20,885	85.55
Delaware St between:	South St and Maryland	12,863	15,192	18.11
	Washington and South St	18,638	22,806	22.36
	South of Fall Creek Pkwy	7,908	16,795	112.38
Central Ave between:	10th and 16th	9,062	10,927	20.58
East St between:	Market and Ohio	13,705	23,592	72.14
	Washington and South	10,316	15,435	49.62
College Ave between:	Ohio and New York	9,335	13,947	49.41
	Michigan and Massachusetts	8,967	13,017	45.17
Dr. ML King between:	16th and 21st	14,021	19,094	36.18
Rural St between:	Michigan and 10th	12,237	15,865	29.65
Washington St between:	Ritter and Arlington	24,069	36,034	49.71
	Alabama and Delaware	12,894	18,752	45.43
Fall Creek Road Pkwy	College and 30th St	30,457	47,656	56.47
	Meridian and Delaware	19,210	27,822	44.83

Comparing Impacts on Vehicle Hours of Travel (VHT)

The need for pavement patching, shoulder reconstruction and ramp resurfacing of northbound and southbound mainline I-70 and I-65 between the "north and south splits" brought about consideration of alternative lane closure strategies. The traditional strategy would be to close northbound lanes while the southbound lanes were being worked on, and vice versa. The strategy that became known as "Hyperfix" involved closing both directions of the mainline, accommodating the diverted traffic on other roads and on other modes, thereby reducing the duration of the project. This analysis estimates the travel time -- measured in vehicle hours traveled (VHT) – that occurred (or would have occurred) under the various alternative scenarios.

Data for the scenarios analyzed were obtained from the sources shown in Table 24.

Table 24 - Data Sources for VHT Analysis

	Description	Sources
Scenario A	Base Case	Data collected: Traffic counts and peak hour travel time Model outputs: Average volume and speed
Scenario B	Hyperfix Case	Data collected: Traffic counts and peak hour travel time Model outputs: Average volume and speed
Scenario C/D	Partial Closure Cases	Model outputs: Average volume and speed

VHT values were determined using the average of traffic counts that were taken at various count stations along the arterial sections selected for analysis. DMD model outputs for average daily traffic flow were used in the few cases where counts were not available along roadway sections of interest. To obtain the proportion of traffic during an average peak hour shown in Table 25, average daily traffic volumes were modified using a k-factor of 0.093, the recommended HCM value for urbanized areas.

Table 25 - Traffic Volumes Along Selected Arterial Sections

	Sections	Volume (vpd)		Peak Vol (vph)	
		Before	During	Before	During
1	Fall Creek Pkwy/ Binford Blvd from Illinois St to 56th St	28587	38719	2659	3601
2	E. Washington St. from College Ave. to Kitley	30189	36034	2808	3351
3	West St from I-70 to I-65	27311	48728	2540	4532
4	Pennsylvania St from Washington St to Fall Creek Pkwy (SB)	13975	20451	1300	1902
5	Delaware St. from Washington to Fall Creek Pkwy (NB)	7908	16795	735	1562
6	East St from Washington St to 10th St (SB)	13705	23592	1275	2194
7	College Ave from Washington St to 10th St (NB)	9151	26964	851	2508
8	Rural St from Washington St to I-70	12237	15865	1138	1475
9	Emerson Ave from Washington St to I-70*	19814	22791	1843	2120
10	ML King from 16th St to I-65	14021	19094	1304	1776
11	West Washington St from West St to Holt St*	31042	30500	2887	2837
12	New York St from University Blvd to Pine St (EB)*	22405	22971	2084	2136
12	Michigan St from University Blvd to Pine St (WB)*	18117	19094	1685	1776

* Indicates no traffic counts available; travel model output used instead.

For the purpose of this analysis, the average values of AM and PM peak period travel times collected in the present study were used in the Base and Hyperfix Cases. Table 26 shows the VHT values for the selected arterial sections. It can be seen that most of the sections experienced a large increase in VHT. Total VHT increased by 42 percent (2594 to 3691) from the Base to Hyperfix case.

Table 26 - VHT Values for Selected Arterial Sections Before and During Hyperfix

	Sections	VHT per peak hr Base	Hyperfix	ΔVHT	ΔVHT
1	Fall Creek Pkwy/ Binford Blvd from Illinois St to 56th St	632	846	214	33.9
2	E. Washington St. from College Ave. to Kitley	437	531	94	21.6
3	West St from I-70 to I-65	202	443	240	118.7
4	Pennsylvania St from Washington St to Fall Creek Pkwy (SB)	134	204	70	52.7
5	Delaware St. from. Washington to Fall Creek Pkwy (NB)	65	223	158	241.8
6	East St from Washington St to 10th St (SB)	59	139	79	133.1
7	College Ave from.Washington St to 10th St (NB)	46	163	117	257.4
8	Rural St from Washington St to I-70	98	153	55	56.8
9	Emerson Ave from Washington St to I-70*	172	229	57	33.0
10	ML King from 16th St to I-65	68	89	22	31.8
11	West Washington St from West St to Holt St*	320	327	7.0	2.2
12	New York St from University Blvd to Pine St (EB)*	187	185	-2.4	-1.3
12	Michigan St from University Blvd to Pine St (WB)*	175	160	-15	-9
	TOTAL	2594	3691		

Because counts were not available for the hypothetical case of partial closure on I-65/ I-70 link, DMD model outputs were used instead. To determine total travel times, the speeds along the selected sections were averaged. Volumes and travel times for all three cases -- the base, Hyperfix and partial closure on I-65/ I-70 -- are shown in Table 27.

Table 27 - VHT Values from DMD Model for Selected Arterial Sections

		Volume (vpd)			Avg Travel Time (s)		
		Base	Hyperfix	Partial	Base	Hyperfix	Partial
1	Fall Creek Pkwy/ Binford Blvd between Illinois St to 56th St	53616	55034	54440	831	874	855
2	E. Washington St. between College Ave. to Kitley	22419	24644	24556	521	547	545
3	West St between I-70 to I-65	35814	48845	42504	181	241	203
4	Pennsylvania St between Washington St to Fall Creek Pkwy (SB)	23551	27856	25473	285	313	295
5	Delaware St. between Washington to Fall Creek Pkwy (NB)	33041	41541	39382	391	678	579
6	East St between Washington St to 10th St (SB)	20844	26931	24319	116	139	126
7	College Ave between Washington St to 10th St (NB)	13140	19997	19840	107	113	113
8	Rural St between Washington St to I-70	8323	9923	9323	309	309	309
9	Emerson Ave between Washington St to I-70*	19814	22791	23304	306	325	329
10	ML King between 16th St to I-65	19650	22641	19671	137	140	137
11	West Washington St between West St to Holt St*	31042	30500	31926	407	400	420
12	New York St from University Blvd to Pine St (EB)*	22405	22971	22516	226	229	226
12	Michigan St from University Blvd to Pine St (WB)*	18117	19095	19799	203	205	207

Partial Closure vs. Complete Closure

For the purpose of comparing VHT for the various scenarios, data from the DMD Model was used to allow a common basis of comparison. As can be seen in Table 28, the I-65/ I-70 section experienced no traffic during the Hyperfix scenario. VHT decreases by 31 percent during a partial closure because of the decrease in capacity. The overall change in VHT for the selected sections with respect to the base scenario was lower for the partial closure scenario compared to the Hyperfix scenario on a daily basis. However, when the duration of the construction period was taken into account – 55 days for Hyperfix and 180 days for the partial closure scenario – the total VHT from the partial closure scenario are more than double that of the Hyperfix strategy.

Table 28 - Analysis of Change in Peak Hour VHT using DMD Model Outputs

	Base	Hyperfix	Partial
VHT per peak hr on I-65/ I-70 section	111	0	77
VHT per peak hr on 12 arterial sections	3069	3907	3619
Total Peak Hr VHT	3181	3907	3696
Δ Peak hr VHT with respect to Base scenario		727	516
Δ Peak hr VHT for Partial Closure scenario / Δ Peak hr VHT for Hyperfix scenario			0.71
Total peak hr VHT during construction period		39972	92841
Δ VHT Partial Closure scenario / Δ VHT Hyperfix scenario			2.32

Based on this analysis, if a project using the partial closure alternative will last more than 40 percent longer than a project using the full closure Hyperfix strategy, the full closure strategy will lead to lower total VHT during the life of the project. As the Hyperfix project was completed in 55 days, the breakeven project duration for the partial closure alternative would have been 77 days. In other words, as the partial closure alternative was estimated to require 180 days, the breakeven time for the complete closure alternative would be 128 days. The user cost savings in terms of only travel time have more than justified the added expenditure due to the complete closure.

Traffic Safety

In order to assess possible impact of the Hyperfix project on traffic safety in the Indianapolis area, the crash data during the months of April-September for the years 2002 and 2003 was obtained from the City of Indianapolis Police Department, as shown in Figure 24. It can be seen that the number of crashes during the Hyperfix months in 2003 was higher than the adjacent months in the same year. No conclusive result can be drawn from the data. Both years had a one-month blip in crash numbers. The spokesman at the Indianapolis Police Department indicated that weather may have affected the crash data since there was above average rainfall during the Hyperfix period. Even though the data shows an increase, it is difficult to say that Hyperfix was the cause.

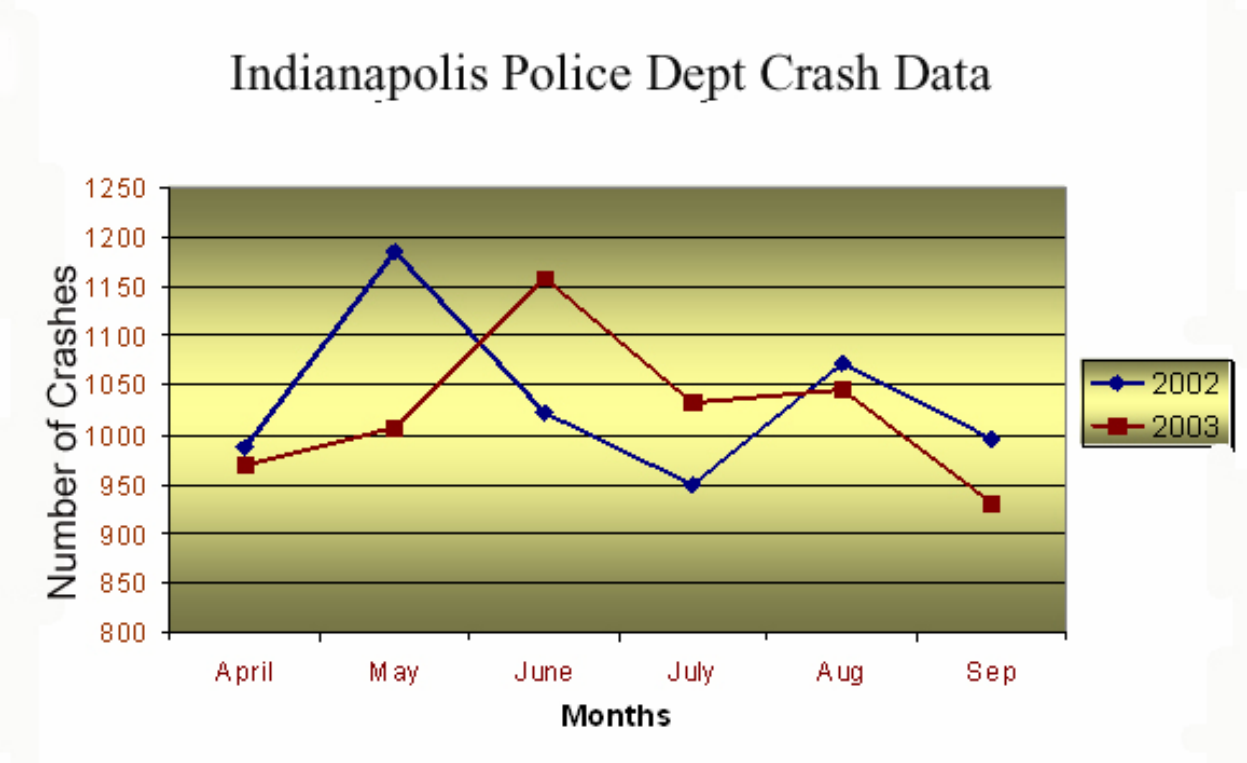


Figure 24 – Crash Data

Cost Effectiveness Evaluation

The additional cost for selecting the total closure option instead of the partial closure option included the following items.

Local road and transit improvements including city police and Park and Ride services		$2,847,100
Public relations campaign for Hyperfix and Park and Ride service		172,000
Total bonus paid for all phases		3,550,000
	Total	$6,569,100

The consultant for the state, American Consulting Engineers, estimated that the cost savings in maintenance of traffic (MOT) by selecting the total closure option was $3,000,000. The net additional cost associated with the Hyperfix project was then $3,569,100.

From Table 28 the peak hour travel time associated with only the I-65/70 section and 12 arterial sections for the partial closure option was estimated as 3,619 hours, while the corresponding figure for the full closure option was 3,907 hours. The estimated duration for the partial closure option was 180 days and the actual duration with the full closure option came to be 55 days. Therefore, if one considers only travel time during 3 hours of peak each day and only for the I-65/70 section and a selected set of arterial sections, the time saving due to Hyperfix would be 1,351,185 hours.

The break-even travel time value for the Hyperfix project to be cost-effective would then be $2.64 per vehicle per hour. As the actual travel time value can be as high as $15-$20 per vehicle per hour, the Hyperfix project has proved to be highly cost-effective. In fact, even if the cost saving due to MOT is not considered, the full closure option would still be highly cost-effective.

Chapter 6 – SUMMARY AND RECOMMENDATIONS

Hyperfix did impact the Indianapolis area. The biggest impact was in traffic flow and the shift in traffic volume to local streets and volume added to I-465. Local businesses were only minimally affected. In terms of travel time savings, the full closure option of Hyperfix turned out to be highly cost-effective. Based on the data collected and analyses performed in the study, this chapter summarizes the findings to make a set of recommendations.

Summary

Four surveys were performed: one for the general public; a through traffic survey; a downtown business survey; and a Park and Ride survey. Survey results revealed:

- Commuters felt that the project did not significantly affect travel into the downtown area. Because alternate routes were available, the majority of riders took them. Availability of alternate routes was very important to the project's success.

- The most popular sources of information used for Hyperfix were: TV and radio – 31%, websites – 18%, and newspaper – 16%.

- The majority of travelers driving through Indianapolis changed their routes and proper advanced signage was very important to them.

- Downtown businesses were not significantly affected.

- The Park and Ride transit service was very popular. There was significant interest in seeing it continue but the riders indicated a ceiling for the fare.

Nineteen interviews were performed with the construction contractor, major subcontractors, INDOT personnel, FHWA personnel, and consultants. Information collected in these interviews is incorporated in the recommendations.

A travel time study was performed during and after the construction phase. The methodology used is explained in Chapter 4. In general, the morning travel time was higher on all the study routes during construction as opposed to post-construction, with the exception of the East Washington and Martin Luther King corridors. On those corridors, travel time decreased a relatively modest 3 seconds and 6 seconds, respectively. The increase in travel time along other corridors in the morning ranged from 4 seconds (New York/Michigan St.) to 95 seconds (West Street). Based upon this data, the impact along the studied arterial corridors was observed to be relatively minor, increasing corridor travel time by a maximum of approximately 1.5 minutes.

In the afternoon, travel time during construction in general was higher than after construction along all corridors, with the exception of Fall Creek/Binford Blvd, New York/Michigan St., and University Blvd (Table 17). On those corridors, travel time decreased 44 seconds, 28 seconds and 137 seconds, respectively. The increase in travel time along other corridors in the afternoon ranged from 24 seconds (East Washington St.) to 195 seconds (Pennsylvania St./Delaware St.). Based upon this data, impact along the studied corridors was deemed to be relatively minor also in the afternoon. Travel time study was performed only for local streets.

The Hyperfix project diverted a good portion of I-65/70 traffic around I-465 and onto surface arterials. The recorded ground counts indicated that on the whole, the traffic volume increased on I-465, US Highways and State Roads leading to the I-65/ I-70 link under construction. Significant increases (+19% to +51%) were observed on the northern links of SR 37 which provides an alternate route through downtown Indianapolis. The western and southeastern legs of the I-465 ring also had significant increase (+14% to +38%) as traffic was diverted away from the I-65 and I-70 links within the ring.

All roadway sections studied in downtown Indianapolis experienced a high average overall increase of 51% in traffic volumes. Major arterials through downtown, running parallel to the

link under construction, such as Pennsylvania Street, West Street and Delaware Street experienced significant increases since traffic from SR 37, SR 135, SR 431 and US 31 all merge into these arterials.

When the duration of the construction period was taken into account – 55 days for Hyperfix and 180 days for the partial closure scenario – the total vehicle hours of travel from the partial closure scenario would have been more than double that of the Hyperfix strategy.

If one considers only travel time during 3 hours of peak each day and only for the I-65/70 section and a selected set of arterial sections, the time saving due to Hyperfix would be 1,351,185 hours. The break even travel time value for the Hyperfix projectwould then be $2.64 per vehicle hour. The actual travel time value can be as high as $15-$20 per vehicle per hour, the Hyperfix project has proved to be highly cost-effective.

Recommendations

Recommendations based on the study findings are summarized into two categories, Management and Engineering Issues, as presented in the following sections.

Management Issues

1. INDOT Quick Response Mechanism

For a fast paced job like Hyperfix, a quick response mechanism that deals with project problems by the INDOT is very important. This mechanism is organizational in nature. This is no more than taking the current chain of responsibility matrix and making it responsive to project needs and problems.

2. Effective Coordination and Empowerment

For Hyperfix there were many involved agencies. In addition to INDOT, there was the City of Indianapolis , IndyGo, engineering consultants, law enforcement agencies and emergency response services, and the public relations consultant. There were many planning meetings involving some or all of the above organizations. In order to keep the process moving the representatives at these meetings must be empowered to make decisions. This makes the meetings important which will provide a strong incentive for attendance and minimizes delays that can be caused by decision making. A cooperative attitude must permeate these meetings and be a part of the project philosophy. When differences occur they must be resolved in a timely manner.

3. Project Planning Timeline

One standard principle in construction projects is that careful advance planning will payoff in project execution. Since the Hyperfix project involves multiple organizations, a time line for project planning with these agencies is needed. The experience of the Hyperfix project provides valuable information to develop a possible time line for future total closure projects. The activities involved in project planning and estimated time line are shown in Figure 25.

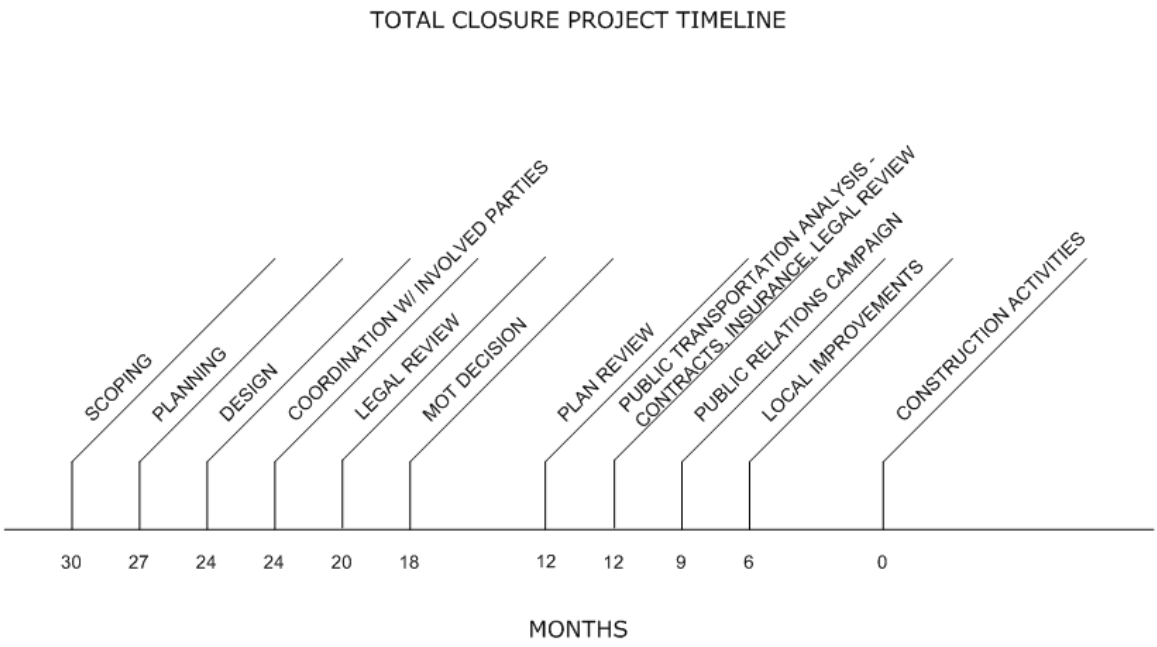


Figure 25 - Project Planning Timeline

4. Funding Agency

For this type of accelerated project, only one funding agency is preferred. If multiple funding sources are used, then requesting and disbursing payment can slow and impact project activities. If a number of funding sources are involved, then an oversight organization should be put in place to act as a central funding authority.

5. Local Road Improvement

The Hyperfix project involved a significant amount of improvement of city streets in order to accommodate increased traffic on these streets due to the complete closure of the I-65/70 link. Local street improvement and its timing is critical in the success of a project of this type. However, an effective coordination is necessary to make sure that possible alternative local streets are kept free of construction zones during the complete closure.

6. Availability of Public Transit

Park and Ride capabilities are important. Public transportation in this case was very successful. Existing capabilities were analyzed and new options added to the system to mitigate some of the traffic concerns. Obtaining insurance and a legal review is needed and time needs to be built into this activity.

7. Public Relations

Public relations (PR) are very important. The public campaign should start six months ahead of construction. This means a contract should be awarded to a PR firm one year ahead of construction.

8. Federal-State-City Partnership

An important element is effective intergovernmental partnership. In that partnership FHWA plays an important role as an arbitrator and mediator.

Engineering Issues

A number of engineering issues emerged during the course of the Hyperfix project and they should be considered in any future project of this type.

1. Night Operations

It is necessary to analyze project activities to determine if a project would benefit from night operations. Safety and quality should be assessed in comparison with time savings.

2. Contractor Risk Factors

Contractor risk factors should be identified and analyzed in order to determine how to package the project that encourages potential bidders to respond.

3. Total Closure Option Analysis

Closure should be analyzed by the consultant and come as a recommendation from the consultant. A detailed analysis needs to be performed before a total closure is chosen. That should be a part of the scoping report. A major component of the scoping should involve a detailed travel impact analysis under various possible options. A review of metropolitan travel model results used by the INDOT and the City of Indianapolis in making closure decisions indicated lack of sensitivity to network changes. Greater effort should be made to determine if the model is capable of such sensitivity.

4. Analysis of Alternate Routes

A careful analysis of alternate routes can result only from the use of a well organized metropolitan travel demand modeling process. Alternate routes should not have restrictions during total closure. Also, the modeling process should be able to investigate the impact of various options of freeway traffic management on the quality of traffic flow on local roads.

5. Local Ordinances

Some local areas can have restrictions regarding noise and other aspects of construction activities, particularly local ordinances and their impact on construction activities should be identified during the planning process.

These recommendations would provide guidelines to evaluate a total closure option. A well planned, timely evaluation is necessary for any organization considering the option taken in Hyperfix. This report summarized the lessons learned and can be used as a plan for future projects.

Appendix A1 – Survey Questionnaires

On-Line Survey

When completed, the ongoing Hyperfix project (the closing of I65/I70 in the downtown area) will provide Indianapolis with a first class highway that is expected to reduce travel time, and enhance traveler convenience, comfort and safety.

To speed up the project, it has been necessary to close the section under construction to traffic. In order to make recommendations toward reducing any inconvenience caused to travelers during the project, we are soliciting your perspectives on the Hyperfix impacts on your trip characteristics and welfare in general.

1. Has the Hyperfix project caused you to make fewer trips than you did before Hyperfix?

   Yes No

   If yes, how many fewer trip(s) per week? _____

2. What type of trips has been most affected?

   - O Work Trips
   - O Recreational Trips
   - O Shopping Trips
   - O Other, Please Specify _____

3. Please indicate the origin and destination of your most frequent trip type in that has been affected by Hyperfix. Use zip code (if known), nearest intersection, or landmarks (for example, Town of Fishers, Government Center, Keystone Crossing).

   Origin_____

   Destination_____

4. For the trip type chosen in Question 2,

   iii What was the typical time for starting this trip? (Example: 8:00 AM)

   Before Hyperfix _____ After Hyperfix _____

   b) What was the typical travel time (in minutes)?

   Before Hyperfix _____ After Hyperfix _____

5. For the return leg of the trip taken in Question 4,

   iii What was the typical time for starting this trip? (Example: 4:00 PM)

   Before Hyperfix _____ After Hyperfix _____

b) What was the typical travel time (in minutes)?

Before Hyperfix _____ After Hyperfix _____

6. What mode of transportation do you typically use for this trip type?

BEFORE Hyperfix	**DURING** Hyperfix
__ Car/Van/Pickup/Motorcycle	__Car/Van/Pickup/Motorcycle
__ IndyGo Local Bus	__ IndyGo Local Bus
__ Walk	__ Hyperfix Park and Ride
__ Bike	__ Walk
__ Other, Please Specify	__ Bike
_____	__ Other, Please Specify
	_____

7. Has Hyperfix changed your car travel routes?

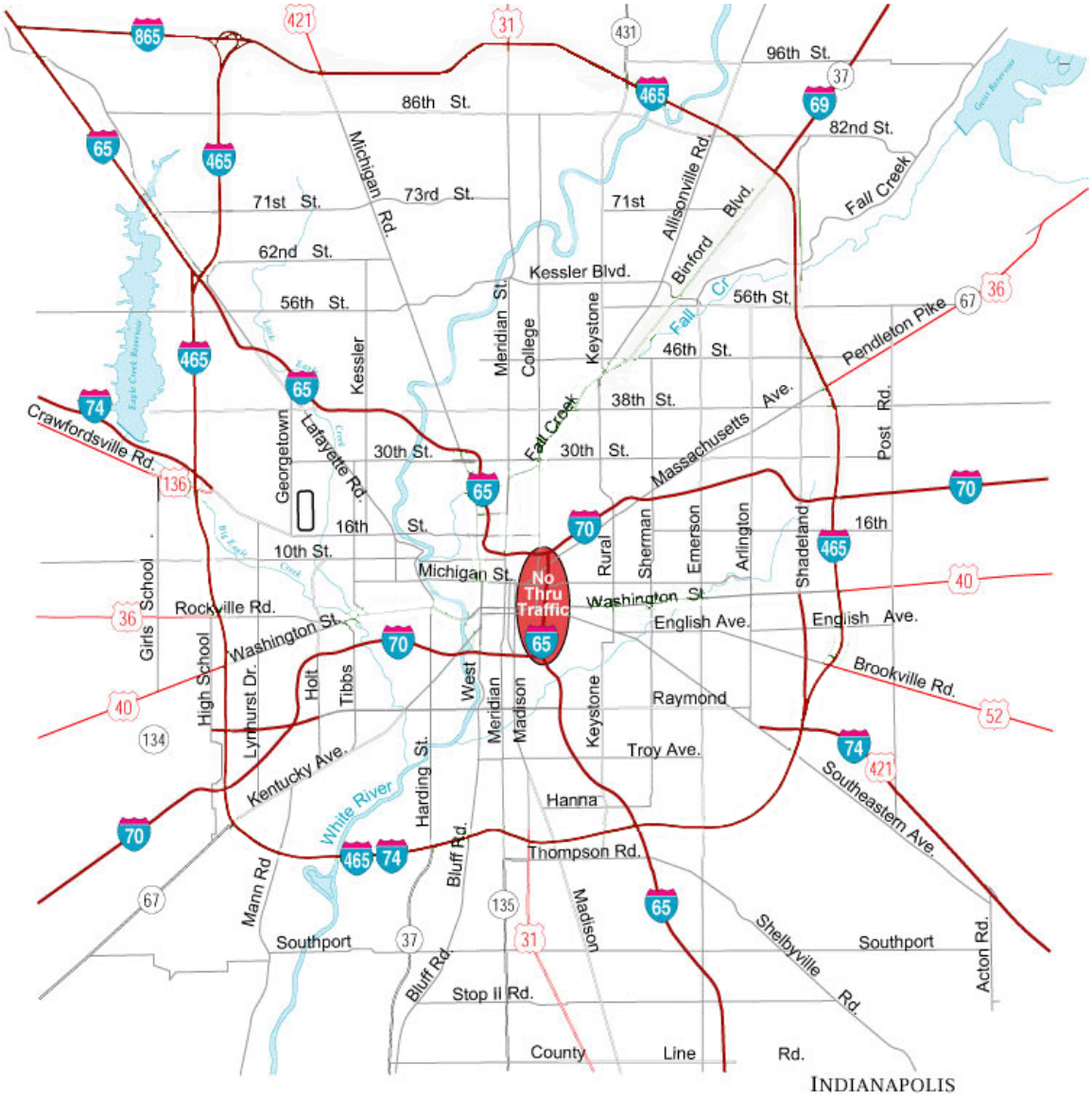
Yes No

8. Choose the route you used for your most frequent trip type (see Question 2) **BEFORE** Hyperfix.

ML King Jr St.
Fall Creek PKWY/Binford BLVD
Washington St. from the east
Madison Ave. /East St.
Washington St. from the west
I70 from the east
Meridian St. /College Ave.
Massachusetts Ave.
I65 from the north west
I65 from the south
Other: Please indicate

If you chose “Other”, please enter in the box below a list of the streets inside I465 that you used to reach destination stated in Question 3.

A map is provided below for your use.



9. Where did you get the information to help make your trips during Hyperfix? Check all that applied:

_____ TV / Radio
_____ Websites
_____ Brochure / Advertising
_____ Newspaper
_____ Employer Announcements
_____ Roadside Signs
_____ Other _____

10. Please indicate if you have any other comments on Hyperfix impacts.

THROUGH TRAFFIC SURVEY

When completed, the ongoing Hyperfix project (the closing of I65/I70 in the downtown area) will provide Indianapolis with a first class highway. To speed up the project, it has been necessary to close the section under construction to traffic. In order to make recommendations we are soliciting your perspectives on the Hyperfix impacts on your trip characteristics and welfare in general.

1. Which vehicle are you currently driving?
   - o Private Vehicle
   - o Commercial Vehicle
   - o Bus

2. Are you an instate commuter or out of state commuter? _____

3. Before you started your trip through Indianapolis were you aware about the Hyperfix project?

   Yes No

   If you were aware, how did you learn about the project?
   - o News Reports
   - o Brochure
   - o Advertising
   - o Other, Please Specify _____

4. Was the signage appropriate throughout your travel?

   Yes No

5. Did Hyperfix add to your travel time?

   Yes No

6. Has the Hyperfix affected your schedule/plans?

   Yes No

7. Are there any other major impacts of Hyperfix you can think of?

BUSINESS SURVEY

The completed Hyperfix project (the closing of I65/I70 in the downtown area) and the associated city road projects such as West Street improvements, etc. will provide Indianapolis with a first class road system. In order to make recommendations for similar future projects we are soliciting your perspectives on what impact hyperfix had on your business.

1. How did you learn about the Hyperfix project and associated city road projects?

   __ Letter
   __ Personal Visit
   __ News Reports
   __ Brochure
   __ Advertising
   __ Other, Please Specify _____

2. Did anyone from your business attend a public hearing or meeting conducted by the state before the Hyperfix project and associated city road projects began?

   ___ Yes ___ No

3. How well were you kept informed during the Hyperfix project and associated city road projects about what was planned and when it would occur? On a scale from 1 to 5, with 1=not informed at all and 5=fully informed, how well were you kept informed? (circle one)

   1 2 3 4 5

4. Was your business affected financially during the Hyperfix project and associated city road projects? On a scale from 1 to 5, with 1=very significant effect and 5=no effect, how was your business affected? (circle one)

   1 2 3 4 5

5. Did the Hyperfix project and associated city road projects cause any problems for your business?
   ___ Yes ____No

   If yes, what were the problems?
   (i)
   (ii)
   (iii)

6. Were there any positive effects on your business during the Hyperfix project and associated city road projects? __ Yes ___ No

   If yes, what were the benefits?
   (i)
   (ii)
   (iii)

7. Did you lose customers during the Hyperfix project and associated city road projects?

__ Yes ___ No

If yes, approximately what percentage of your customers did you lose? _____

8. Did you reduce the number of full-time or part-time employees because of the Hyperfix project and associated city road projects?

__ Yes ___ No

9. Were your hours of operation affected by the Hyperfix project and associated city road projects?
__ Yes ___ No

If yes, how were the hours affected? _____

10. Did you close the business because of the Hyperfix project and associated city road projects?

__ Yes ___ No

If yes, how long did you close? _____

11. Is there anything that the state and local governments and the contractors could have done to be more responsive to the needs of the businesses affected by Hyperfix and associated city road projects?

__ Yes ___ No

What do you recommend?

12. Please indicate below any other comments you may have about the Hyperfix project and associated city road projects.

Appendix A2 - Survey Comments

Compliments

- I have been very impressed with this project. At the beginning of the project, I braced for the worst and I have been pleasantly surprised at how little I am inconvenienced. This project shows what good planning and communication can accomplish.
- One summer is better than two!
- My trip to work every morning has been much easier since Hyperfix started. It has removed much of the traffic from north-bound I65 into downtown. Hyperfix was a blessing in disguise!
- The communication about Hyperfix has been fantastic.
- The planning seemed to be excellent and the public education was also precise and plentiful.

Complaints

- Hyperfix is placing a strain on I-465. The afternoons are the worst. The I-65 and I-465 intersection on the south side backs up to the US 31 exit. Many drivers get on I-465 at I-65 and exit at Emerson, add in the combination of more trucks it makes this stretch of I-465 a mess.
- I hope this project solves the daily traffic jams that occurred on NB 65 at the north split. If not, the project was a waste.
- The stupid move is that on the East side of 465, they are doing construction around Pendelton Pike?
- I would have liked more consideration given to the Southside drivers.
- What about the folks who live on the west side of the city who sit in traffic an additional 15 - 20 minutes each way to work? What thoughts were given or plans made for those folks? I live in Plainfield and work at 86th & Zionsville Rd. What used to be an easy 30 minute drive in the morning has turned into carefully timed operation. If I don't leave my house by 6:45 a.m., I can guarantee that I still won't be at work 50 minutes later. That's not even talking about how awful it is during the afternoon drive home.
- The real problems have been on the West and South legs of I465 -- especially from I70 on the West to I65 on the South. It has been very common for all Eastbound lanes of I465 to come to a near standstill just from the volume of traffic jumbling to reach the single-lane ramp for I65 South.
- Just do the math: I465 - 3 lanes; I74 - 2 lanes; I65 - 3 lanes; I70 - 3 lanes totaling 11 lanes all trying to travel via I465's 3 lanes equals one big mess. Was I the only one who foresaw this? Mike Morey mikemorey@sbcglobal.net.
- There has been a HUGE impact on I-465 on the West side. The evening commute has become incredibly aggravating and dangerous. Some drivers are dangerous for their highway maneuvers and aggressiveness, while other drivers are dangerous from their lack of attention to the road. I have seen people reading books, eating dinner, applying make-up and distracted beyond compare as they sit, parked, inching up in line every few minutes. Other routes are equally congested, and don't reduce my commute time. I'm using more fuel, wasting precious personal time. It's very aggravating.

- Northside rich people get good buses and my bus is till old and not comfortable, they even have TV and Restrooms

- I haven't had to change my route because of Hyperfix, but I have been impacted due to the people who have had to change their routes. In the afternoon, it seems that no matter what time I leave work, it is stop and go on I-465 on the Westside because of the volume of drivers that have been forced to take drive this road as well. I have had to make a few trips downtown for errands, and it seems that every time that I get downtown on I-65, and have to get off where they are doing the construction, there are either no workers or the workers are all standing around with their hands in their pockets. I thought that this was supposed to be a 24/7 job. When I pass the construction, I don't see many workers working in a "hyper" fashion. I think that if you are going to shut down an huge chunk of interstate that you had better have your workers working as efficiently as possible so that everything can get back to normal. When I hit traffic, it isn't because of an accident, it is because there are not-so-smart drivers on the interstate who think that they should go about 45 mph on the INTERSTATE!!!!! All it takes is one person to hit their brakes and a few miles back, everyone is going to have to slow down. There are just way to many people traveling on I-465 because of the Hyperfix troubles. Whoever thought that it was a good idea to try and do it all at once through the hot summer when people are so anxious to get home from work so that they can enjoy summer activities must have had their head lodged in their rear end.

Public Transportation

- No park and ride option was given to residents originating from Brownsburg/Avon areas to Downtown Indy. Although it would be great to see mass-transit options such as rail (active rail lines from Downtown Indy run through Avon and Brownsburg), my travel time by car hasn't been greatly impacted by this project.

- I wish, however, that there was additional bus service offered from the East Side to downtown to parallel the additional service ($1.00 fee-per-ride) bus that was provided to the Northeast side.

- I am really hoping that Park and Ride will continue. Many people in the northeast side of town are really using it and enjoying.

- The Hyperfix shuttle was perfect!! Always on time, always courteous drivers, the right price, the right stops and starts....this city needs fast, affordable, mass transportation from the suburbs to the city; to cut down on parking spots needed, exhaust, etc.

- Insulted at the lack of consideration for the west and southwest side commuters. Interesting that Hamilton County residents received options of commuter services while Morgan, Hendricks and Johnson county residents were left to fend from themselves. Especially, since the largest area impacted as been the west side.

- I think the Hyperfix Park & Ride Shuttles should be continued and expanded. Please continue the park and ride program. This is a real good think for people and environment to minimize the personal car trips.

Suggestions

- Existing Variable Message Signs (VMS) already installed on Indianapolis area Interstate highways would have been a great source of up to the minute information, but I never saw them utilized in conjunction with Hyperfix.

- You added an extra right-turn lane at the intersection of Delaware and Fall Creek. It's great. However, I almost got killed by an idiot who turned right from Delaware onto Fall Creek assuming he had 3 lanes, and came right onto me as I was coming from Fall Creek ready to turn left onto Delaware. Also, despite the new signs, it seems that many people can't read signs (even the lit ones!) and it's confusing to turn onto Washington Blvd from Delaware. Now, how about considering adding an extra right-turn lane from College onto Fall Creek. Since it's a 2-way street in that area, how about making one lane both straight/right turn. That would alleviate heavy flow from College onto Fall Creek. Now, thanks for the lighted signs along Fall Creek. The entrance/exit to the State Fair grounds during rush hour is still a nuisance. Also, I preferred the one side at a time light sequence at the intersection of Keystone and Fall Creeek, instead of the left turn both sides, then straight ahead both sides. Besides, you could make those lights longer from North to Downtown in the AM and reverse it in the PM. With the left turn arrow as it is now, this is not possible. Thank you for fixing the light at the intersection of College, St Clair and Mass. It's a real mess in the PM, and most traffic comes from Northbound College, with Mass. onto College second. It's nice to have more time on the College side. (I've clocked that light and it varied between 15 to 20 seconds, hence about 4 rows of cars at a time, 5 if we are lucky and drivers are alert!)Last but not least, Indianapolis has a real problem with intersections. In San Francisco, there is a heavy fine for blocking intersections. But most importantly, the ordinance is INFORCED! So, drivers don't block intersections. If Indy had such an INFORCED ordinance, Castleton corner would be a breeze! Finally, what will it take to have the lights on Ohio synchronized? We're in the 21 st century, yet some of those street lights could go back into the beginning of electricity. And it would be nice for this city/metropolitan area to have a mass transit system that works :-)

Miscellaneous

- I think the phone number and address of that moron who set back the project by driving through the barricades should be released to the public

Appendix B – Detailed Strip Maps

Table B-1

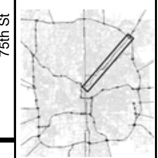
Indianapolis, IN — Route No.1 Fall Creek Pkwy/Binford Blvd — July, 2003

AM PEAK

Avg.Travel Spd/Posted Spd	0.4	0.86	0.97	0.91	0.97	0.91	0.65	0.68	0.83	0.98	1.05	1.05	1.1	1.1	1.05	1	0.8	0.88	1.08	0.93	0.84	0.4	1	1.1	0.98	0.84	1.1	1.2	1.18	1.18	1.2	1.16	1	0.8	1.04	1.1	1.16	1.18	1.16	1	0.82	1.1	1.12	1.06	0.89	0.95	0.87	0.76	0.75	0.64	0.95	0.91	0.51
Ave.Travel Speed (mph)	14	30	34	32	34	32	26	27	33	39	42	42	44	44	42	40	32	35	43	42	38	18	45	55	49	42	55	60	59	59	60	58	50	40	52	55	58	59	58	50	41	55	56	53	49	52	48	42	41	35	52	50	28
Cumulative Travel Time (s)	752	731	713	699	684	668	659	631	613	599	582	567	564	551	537	524	510	492	469	454	440	425	387	377	369	356	329	316	306	294	284	275	265	254	236	227	215	204	194	182	169	152	141	130	118	107	96	85	75	66	47	35	22
Posted Speed (MPH)	35	35	35	35	35	35	40	40	40	40	40	40	40	40	40	40	40	40	40	45	45	45	45	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	55	55	55	55	55	55	55	55	55
Segment length (miles)	0.1	0.14	0.13	0.14	0.15	0.08	0.15	0.13	0.13	0.18	0.17	0.14	0.17	0.17	0.14	0.16	0.17	0.18	0.18	0.16	0.16	0.18	0.12	0.12	0.17	0.19	0.19	0.19	0.19	0.16	0.16	0.16	0.16	0.13	0.13	0.18	0.18	0.18	0.18	0.18	0.17	0.17	0.17	0.17	0.15	0.15	0.15	0.11	0.11	0.17	0.17	0.17	0.17
Segment ID	1253	1252	1251	1250	1249	1248	1247	1246	1245	1244	1243	1242	1241	1240	1239	1238	1237	1236	1235	1234	1233	1232	1231	1230	1229	1228	1227	1226	1225	1224	1223	1222	1221	1220	1219	1218	1217	1216	1215	1214	1213	1212	1211	1210	1209	1208	1207	1206	1205	1204	1203	1202	1201

← SB

Meridian St, Pennsylvania St, Delaware St, New Jersey St, Ruckle St, Broadway St, College Ave, 30th St, 32nd St, Guilford Ave, 34th St, Birchwood Ave, Evergreen Ave, Coliseum Ave, Woodland Ave, 38th St, 39th St, Evanston Ave, Keystone Ave, Fall Creek Pky North, 45th St, 46th St, Delmar Rd, 56th st, Kessler Blvd East, 62nd St, Rucker Rd, 65th St, Graham Rd, 71st St, 75th St



NB →

Segment ID	1101	1102	1103	1104	1105	1106	1107	1108	1109	1110	1111	1112	1113	1114	1115	1116	1117	1118	1119	1120	1121	1122	1123	1124	1125	1126	1127	1128	1129	1130	1131	1132	1133	1134	1135	1136	1137	1138	1139	1140	1141	1142	1143	1144	1145	1146	1147	1148	1149	1150	1151	1152	1153
Segment length (miles)	0.1	0.14	0.13	0.14	0.15	0.08	0.15	0.13	0.13	0.18	0.17	0.14	0.17	0.17	0.14	0.16	0.17	0.18	0.18	0.16	0.16	0.18	0.12	0.12	0.17	0.19	0.19	0.19	0.19	0.16	0.16	0.16	0.16	0.13	0.13	0.18	0.18	0.18	0.18	0.18	0.17	0.17	0.17	0.17	0.15	0.15	0.15	0.11	0.11	0.17	0.17	0.17	0.17
Posted Speed (MPH)	35	35	35	35	35	35	40	40	40	40	40	40	40	40	40	40	40	40	40	45	45	45	45	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	55	55	55	55	55	55	55	55	55

PM PEAK

Avg.Travel Spd/Posted Spd	0.77	0.4	0.6	0.97	1	0.97	0.78	0.9	1	1	1.08	1.05	1.05	1.1	1.05	0.4	0.95	1.1	1.03	0.87	0.71	0.98	1.16	1.08	1.02	1	1	1.08	1.08	1.12	0.84	0.54	0.56	0.56	0.64	0.96	1.08	1.08	1.06	0.92	1.04	1	1.02	1.06	0.96	0.8	0.69	0.56	0.75	0.91	0.84	0.55	0.11
Ave.Travel Speed (mph)	27	14	21	34	35	34	31	36	40	40	43	42	42	44	42	16	38	44	41	39	32	44	52	54	51	50	50	54	54	56	42	27	28	28	32	48	54	54	53	46	52	50	51	53	53	44	38	31	41	50	46	30	6
Cumulative Travel Time (s)	13	58	83	98	113	122	144	158	170	186	200	204	218	232	244	303	319	334	350	366	385	400	409	416	429	443	456	468	481	492	510	550	586	607	639	652	664	676	688	703	715	728	740	752	762	776	799	815	825	837	851	876	940

Table B-2

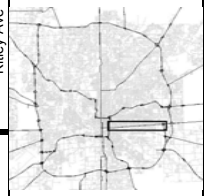
Indianapolis,IN														Route No.2 E.Washington Street																			July, 2003
																																	AM PEAK
	0.54	0.86	0.74	1.06	1.03	1.03	1.03	1	0.89	0.97	0.94	0.97	1.11	1.14	1.06	1.09	1	1.06	1.09	1.06	1.03	1.09	1.03	1.03	0.91	0.66	0.97	1.03	0.69	1.09	0.97	1.09	Avg.Travel Spd/Posted Spd
	19	30	26	37	36	36	36	35	31	34	33	34	39	40	37	38	35	37	38	37	36	38	36	36	32	23	34	36	24	38	34	38	Ave.Travel Speed (mph)
	541	522	508	476	462	452	437	420	402	380	369	354	336	318	302	296	282	262	243	225	212	196	182	166	152	129	100	81	65	38	24	8	Cumulative Travel Time (S)
	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	Posted Speed (MPH)
	0.08	0.12	0.2	0.14	0.1	0.15	0.17	0.17	0.18	0.11	0.13	0.17	0.2	0.17	0.06	0.15	0.19	0.19	0.19	0.14	0.15	0.15	0.16	0.15	0.2	0.18	0.17	0.16	0.15	0.14	0.14	0.08	Segment length (miles)
	2432	2431	2430	2429	2428	2427	2426	2425	2424	2423	2422	2421	2420	2419	2418	2417	2416	2415	2414	2413	2412	2411	2410	2409	2408	2407	2406	2405	2404	2403	2402	2401	Segment ID
																	← WB																
	College Ave	Davidson St	Southeastern Ave	Highland Ave	Oriental St	Arsenal Ave	State Ave	Parkview Ave	Jefferson Ave	Forest Ave	Temple Ave	Rural St	Oakland Ave	LaSalle St	Gale St	Ewing St	Sherman St	Chester St	Colorado Ave	Drexel Ave	Wallace Ave	Riley Ave	Emerson Ave	Butler Ave	Downey Ave	Ritter Ave	Audubon Ave	Bolton Ave	Arlington Ave	Catherwood Ave	Kenmore Rd	Kenyon St	Kitley Ave	
																	EB →																
	2302	2302	2303	2304	2305	2306	2307	2308	2309	2310	2311	2312	2313	2314	2315	2316	2317	2318	2319	2320	2321	2322	2323	2324	2325	2326	2327	2328	2329	2330	2331	2332	Segment ID
	0.08	0.12	0.2	0.14	0.1	0.15	0.17	0.17	0.18	0.11	0.13	0.17	0.2	0.17	0.06	0.15	0.19	0.19	0.19	0.14	0.15	0.15	0.16	0.15	0.2	0.18	0.17	0.16	0.15	0.14	0.14	0.08	Segment length (miles)
	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	Posted Speed (MPH)
																																	PM PEAK
	9	24	44	63	75	95	113	130	149	160	188	206	228	245	252	306	327	344	362	375	389	439	456	471	490	510	526	545	562	576	590	600	Cumulative Travel Time (s)
	32	31	36	32	32	29	36	36	35	36	23	35	32	38	36	11	34	39	38	40	40	16	34	36	36	34	37	30	34	37	34	30	Ave.Travel Speed (mph)
	0.91	0.89	1.03	0.91	0.91	0.83	1.03	1.03	1	1.03	0.66	1	0.91	1.09	1.03	0.31	0.97	1.11	1.09	1.14	1.14	0.46	0.97	1.03	1.03	0.97	1.06	0.86	0.97	1.06	0.97	0.86	Avg.Travel Spd/Posted Spd

Table B-3

Indianapolis, IN			Route No.3 West Street							July, 2003
										PM PEAK
0.857143	0.771429	0.942857	0.428571	0.857143	0.285714	0.514286	0.628571	0.685714	0.628571	Avg.Travel Spd/Posted Spd
30	27	33	15	30	10	18	22	24	22	Ave.Travel Speed (mph)
350	347	324	306	243	219	136	93	61	30	Cumulative Travel Time (S)
										AM PEAK
0.942857	0.971429	0.857143	0.714286	0.914286	0.485714	0.8	0.628571	0.542857	0.771429	Avg.Travel Spd/Posted Spd
33	34	30	25	32	17	28	22	19	27	Ave.Travel Speed (mph)
25	65	97	123	166	188	229	252	269	274	Cumulative Travel Time (S)
35	35	35	35	35	35	35	35	35	35	Posted Speed (MPH)
0.18	0.19	0.19	0.19	0.2	0.19	0.19	0.17	0.17	0.17	Segment length (miles)
3210	3209	3208	3207	3206	3205	3204	3203	3202	3201	Segment ID
			← SB							
I-70	McCarty St	Merrill St	Kentucky Ave	US 40	Ohio St	Vermont St	Indiana Ave	St Clair St	10th St	
			NB →							
3101	3102	3103	3104	3105	3106	3107	3108	3109	3110	Segment ID
0.18	0.19	0.19	0.19	0.2	0.19	0.19	0.17	0.17	0.17	Segment length (miles)
35	35	35	35	35	35	35	35	35	35	Posted Speed (MPH)
										AM PEAK
0.571429	0.771429	0.714286	0.657143	0.428571	0.628571	0.485714	0.6	0.942857	0.942857	Avg.Travel Spd/Posted Spd
20	27	25	23	15	22	17	21	33	33	Ave.Travel Speed (mph)
43	68	94	126	193	232	276	310	330	350	Cumulative Travel Time (s)
										PM PEAK
1.085714	1.028571	0.657143	0.714286	0.314286	0.742857	0.657143	0.457143	0.828571	0.571429	Avg.Travel Spd/Posted Spd
38	36	23	25	11	26	23	16	29	20	Ave.Travel Speed (mph)
16	33	63	93	158	186	222	268	295	340	Cumulative Travel Time (s)

Table B-4

Indianapolis,IN			Route No.4 Pennsylvania St/Delaware St																			July, 2003
																						AM PEAK
			1	0.88	1.12	1	0.48	0.49	0.86	0.86	0.71	0.89	1.03	0.69	0.94	1.03	1.03	0.86	0.69	0.94	0.83	Avg.Travel Spd/Posted Spd
			25	22	28	25	12	17	30	30	25	31	36	24	33	36	36	30	24	33	29	Ave.Travel Speed (mph)
			383	354	340	326	313	274	230	215	202	190	173	162	130	111	99	82	62	39	24	Cumulative Travel Time (S)
			25	25	25	25	25	35	35	35	35	35	35	35	35	35	35	35	35	35	35	Posted Speed (MPH)
			0.2	0.1	0.1	0.09	0.1	0.18	0.12	0.1	0.08	0.15	0.11	0.17	0.16	0.12	0.17	0.16	0.13	0.13	0.2	Segment length (miles)
			4219	4218	4217	4216	4215	4214	4213	4212	4211	4210	4209	4208	4207	4206	4205	4204	4203	4202	4201	Segment ID
			← SB (Pennsylvania St)																			
			Washington St	Ohio St	New York St	Vermont St	Michigan St	North St	St Clair St	Sahm St	10th St	11th St	13th St	14th St	16th St	17th St	19th St	21st St	22nd St	23rd St	24th St	Fall Creek Pkwy S	
Washington St	Ohio St	New York St	Vermont St	Michigan St	North St	St Clair St	Sahm St	10th St	11th St	13th St	14th St	16th St	18th St	19th St	20th St	21st St	22nd St	23rd St	24th St	25th St	Fall Creek Pkwy S	
			NB(Delaware St) →																			
	4101	4102	4103	4104	4105	4106	4107	4108	4109	4110	4111	4112	4113	4114	4115	4116	4117	4118	4119	4120	4121	Segment ID
	0.19	0.1	0.1	0.09	0.09	0.18	0.11	0.11	0.08	0.14	0.11	0.17	0.12	0.17	0.08	0.13	0.11	0.13	0.13	0.13	0.14	Segment length (miles)
	25	25	25	25	25	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	Posted Speed (MPH)
																						PM PEAK
	54	69	95	132	191	252	266	304	329	351	362	380	394	411	419	431	443	480	482	495	502	Cumulative Travel Time (s)
	12	21	16	14	11	14	29	17	19	25	38	34	30	36	41	37	35	24	39	37	34	Ave.Travel Speed (mph)
	0.48	0.84	0.64	0.56	0.44	0.4	0.83	0.49	0.54	0.71	1.09	0.97	0.86	1.03	1.17	1.06	1	0.69	1.11	1.06	0.97	Avg.Travel Spd/Posted Spd

Table B-5

Indianapolis,IN			Route No.5 East St/College Ave						July, 2003
									PM PEAK
0.266667	0.5	0.666667	0.733333	0.966667	0.9	0.7	1.2	0.9	Avg.Travel Spd/Posted Spd
8	15	20	22	29	27	21	36	27	Ave.Travel Speed (mph)
234	176	145	116	99	87	73	24	13	Cumulative Travel Time (S)
									AM PEAK
0.4	0.633333	0.533333	0.633333	1	0.833333	0.8	1.066667	0.633333	Avg.Travel Spd/Posted Spd
12	19	16	19	30	25	24	32	19	Ave.Travel Speed (mph)
221	170	151	118	88	77	62	36	23	Cumulative Travel Time (S)
30	30	30	30	30	30	30	30	30	Posted Speed (MPH)
0.1	0.09	0.1	0.1	0.09	0.09	0.18	0.11	0.1	Segment length (miles)
5209	5208	5207	5206	5205	5204	5203	5202	5201	Segment ID
			← SB(East St)						
Washington St	Market St	Ohio St	New York St	Vermont St	Michigan St	North St	St.Clair St	9th St	10th St
Washington St	Market St	Ohio St	New York St	Vermont St	Michigan St	North St	St.Clair St	9th St	10th St
				NB(College Ave) →					
5101	5102	5103	5104	5105	5106	5107	5108	5109	Segment ID
0.1	0.09	0.1	0.1	0.1	0.09	0.18	0.14	0.07	Segment length (miles)
30	30	30	30	30	30	30	30	30	Posted Speed (MPH)
									AM PEAK
0.466667	0.333333	0.8	0.866667	0.433333	0.933333	0.633333	0.933333	1	Avg.Travel Spd/Posted Spd
14	10	24	26	13	28	19	28	30	Ave.Travel Speed (mph)
28	66	82	96	137	148	185	202	211	Cumulative Travel Time (s)
									PM PEAK
0.6	0.166667	0.866667	1.066667	1	1.133333	0.266667	0.8	0.666667	Avg.Travel Spd/Posted Spd
18	5	26	32	30	34	8	24	20	Ave.Travel Speed (mph)
20	87	100	110	122	132	223	244	256	Cumulative Travel Time (s)

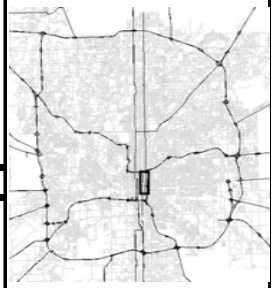


Table B-6

Indianapolis, IN				Route No. 6 Rural Street									July, 2003			
																PM PEAK
	0.8857	0.6	0.5143	0.9429	0.9429	0.7429	0.5143	0.8333	0.5	0.8333	1	0.5333	0.5667	0.5333	0.7333	Avg.Travel Spd/Posted Spd
	31	21	18	33	33	26	18	25	15	25	30	16	17	16	22	Ave.Travel Speed (mph)
	397	389	372	327	316	298	266	232	206	162	139	126	97	58	21	Cumulative Travel Time (seconds)
																AM PEAK
	1	0.8	0.8286	0.9429	0.8857	0.9143	0.5429	0.8667	0.2	0.7667	0.8667	0.4667	0.7333	0.8	0.8333	Avg.Travel Spd/Posted Spd
	35	28	29	33	31	32	19	26	6	23	26	14	22	24	25	Ave.Travel Speed (mph)
	349	352	330	307	296	278	264	238	216	140	115	100	28	38	17	Cumulative Travel Time (seconds)
	35	35	35	35	35	35	35	30	30	30	30	30	30	30	30	Posted Speed (MPH)
	0.07	0.09	0.19	0.1	0.16	0.12	0.13	0.16	0.12	0.12	0.11	0.12	0.18	0.12	0.12	Segment length (miles)
	6115	6114	6113	6112	6111	6110	6109	6108	6107	6106	6105	6104	6103	6102	6101	Segment ID

← NB

I-70 Ramp	Roosevelt Ave	Massachusetts Ave	18th St.	17th St.	Brookside Pky N Dr	Brookside Pky S Dr	12th St.	10th St.Brookside Pky S Dr	9th St.	St. Clair St.	North St.	Michigan St.	New York St.	Washington St.

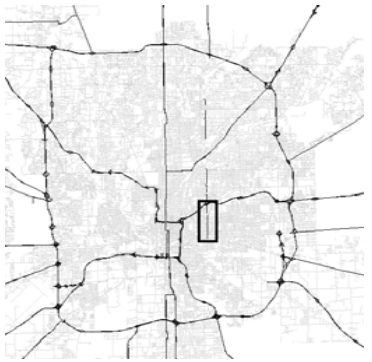


Table B-7

Indianapolis,IN				Route No.7 Emerson Ave											July, 2003
															PM PEAK
0.775	0.525	0.45	0.825	0.825	0.65	0.514	0.714	0.429	0.714	0.857	0.457	0.486	0.457	0.629	Avg.Travel Spd/Posted Spd
31	21	18	33	33	26	18	25	15	25	30	16	17	16	22	Ave.Travel Speed (mph)
397	389	372	327	316	298	266	232	206	162	139	126	97	58	21	Cumulative Travel Time (seconds)
															AM PEAK
0.925	0.825	0.4	1	1	0.925	0.743	1.086	1.029	0.771	0.229	0.914	0.8	0.486	0.457	Avg.Travel Spd/Posted Spd
37	33	16	40	40	37	26	38	36	27	8	32	28	17	16	Ave.Travel Speed (mph)
366	358	345	310	300	289	276	243	230	216	207	112	94	78	36	Cumulative Travel Time (seconds)
40	40	40	40	40	40	35	35	35	35	35	35	35	35	35	Posted Speed (MPH)
0.08	0.12	0.15	0.11	0.12	0.12	0.16	0.13	0.14	0.07	0.18	0.15	0.13	0.18	0.15	Segment length (miles)
7115	7114	7113	7112	7111	7110	7109	7108	7107	7106	7105	7104	7103	7102	7101	Segment ID

← NB

I-70 Ramp | Railroad | 21st St | 20th St | 19th St | 16th St | Nowland Ave | 13th St | 11th St | 10th St | 9th St | Walnut St | Michigan St | New York St | Washington St

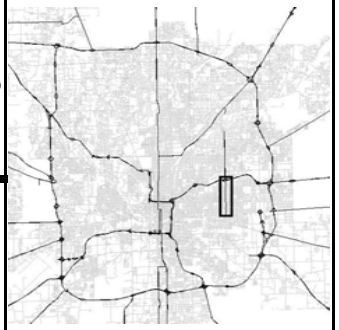


Table B-8

Indianapolis, IN			Route No. 8 MLK							July, 2003
										AM PEAK
0.68571	1.02857	0.94286	0.94286	1.05714	1.08571	1.08571	1.02857	1.02857	0.88571	0.74286	Avg.Travel Spd/Posted Spd
24	36	33	33	37	38	38	36	36	31	26	Ave.Travel Speed (mph)
181	156	140	124	115	103	92	81	62	48	22	Cumulative Travel Time (S)
35	35	35	35	35	35	35	35	35	35	35	Posted Speed (MPH)
0.16	0.15	0.15	0.08	0.12	0.11	0.12	0.19	0.14	0.2	0.13	Segment length (miles)
8211	8210	8209	8208	8207	8206	8205	8204	8203	8202	8201	Segment ID
					← SB						
16th St	18th St	21st St	Langsdale Ave	Fall Creek Pkwy N	23rd St	24th St	26th St	27th St	29th St	30th St	

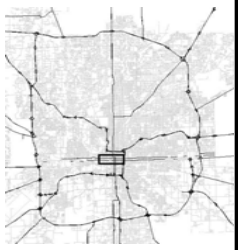
Table B-9

Indianapolis, IN					Route No.9 W.Washington St.																	July, 2003
																						PM PEAK
	0.86	0.91	0.51	1.06	1	0.89	1.06	0.83	0.94	1.06	1.03	1.06	1	0.66	0.63	1	0.98	1.03	0.94	0.46	0.31	Avg.Travel Spd/Posted Spd
	30	32	18	37	35	31	37	29	33	37	36	37	35	23	22	35	39	41	33	16	11	Ave.Travel Speed (mph)
	467	445	435	397	382	365	349	334	307	287	273	254	237	222	205	171	146	125	112	95	42	Cumulative Travel Time (S)
	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	40	40	35	35	35	Posted Speed (MPH)
	0.2	0.09	0.18	0.16	0.16	0.12	0.15	0.2	0.18	0.14	0.19	0.17	0.15	0.11	0.2	0.2	0.2	0.15	0.15	0.15	0.07	Segment length (miles)
	9421	9420	9419	9418	9417	9416	9415	9414	9413	9412	9411	9410	9409	9408	9407	9406	9405	9404	9403	9402	9401	Segment ID
											← WB											
	Holt Rd	Somerset Rd	S Tibbs Ave	Alton Ave	N Tibbs Ave	Hancock Ave	Warman Ave	Belleview Pl	Pershing Ave	Belmont Ave	Neal Ave	Richland St	Harding St	N White River Pkwy	S White River Pkwy	California St	West St					
		Holt Rd	Somerset Rd	S Tibbs Ave	Alton Ave	N Tibbs Ave	Hancock Ave	Warman Ave	Belleview Pl	Pershing Ave	Belmont Ave	Neal Ave	Richland St	Harding St	N White River Pkwy	S White River Pkwy	West St					
											EB →											
		9301	9302	9303	9304	9305	9306	9307	9308	9309	9310	9311	9312	9313	9314	9315	9316	9317	9318	9319	9320	Segment ID
		0.2	0.09	0.18	0.16	0.16	0.12	0.15	0.2	0.18	0.14	0.19	0.17	0.15	0.11	0.2	0.2	0.2	0.14	0.14	0.19	Segment length (miles)
		35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	40	40	35	35	Posted Speed (MPH)
																						AM PEAK
		21	31	48	62	76	86	107	130	147	162	181	198	224	250	271	296	314	328	344	364	Cumulative Travel Time (s)
		33	34	39	41	41	42	29	32	39	35	38	37	28	17	33	30	39	41	34	24	Ave.Travel Speed (mph)
		0.94	0.97	1.11	1.17	1.17	1.2	0.83	0.91	1.11	1	1.09	1.06	0.8	0.49	0.94	0.86	0.98	1.03	0.97	0.69	Avg.Travel Spd/Posted Spd

Table B-10

Indianapolis,IN						Route No.10 East St/Madison Ave																			July, 2003
																									PM PEAK
	0.775	0.225	0.525	0.5	1	0.1	1.05	1.025	1.05	1.057	0.343	0.914	1.114	1.114	1.086	1.2	1.029	1.543	1.156	1.111	1	0.689	0.956	1.229	Avg.Travel Spd/Posted Spd
	31	9	21	20	40	4	42	41	42	37	12	32	39	39	38	42	36	54	52	50	45	31	43	43	Ave.Travel Speed (mph)
	467	446	374	351	307	296	286	275	269	251	238	192	172	162	149	138	121	92	79	66	53	38	21	6	Cumulative Travel Time (S)
	40	40	40	40	40	40	40	40	40	35	35	35	35	35	35	35	35	35	35	45	45	45	45	35	Posted Speed (MPH)
	0.19	0.18	0.09	0.17	0.13	0.12	0.13	0.07	0.2	0.13	0.13	0.17	0.1	0.14	0.11	0.2	0.2	0.19	0.19	0.19	0.18	0.12	0.18	0.08	Segment length (miles)
	10224	10223	10222	10221	10220	10219	10218	10217	10216	10215	10214	10213	10212	10211	10210	10209	10208	10207	10206	10205	10204	10203	10202	10201	Segment ID
															← SB										
	Lawrence Ave	Edwards Ave	Hanna Ave	Pacific St	National Ave	Norton Ave	Summer Ave	Werges Ave	Murry St	Bacon St	Troy Ave	Berwyn St	Yoke St	Nelson Ave	Southern Ave	Hoffgen St	Pleasant Run Pkwy N Dr	Raymond St		Lincoln St	Terrace Ave	Orange St	Prospect St	Delaware St		
															NB →										
	10101	10102	10103	10104	10105	10106	10107	10108	10109	10110	10111	10112	10113	10114	10115	10116	10117	10118	10119	10120	10121	10122	10123	10124	Segment ID
	0.19	0.18	0.09	0.17	0.13	0.12	0.13	0.07	0.2	0.13	0.13	0.17	0.1	0.14	0.11	0.2	0.2	0.19	0.19	0.19	0.18	0.12	0.18	0.08	Segment length (miles)
	40	40	40	40	40	40	40	40	40	35	35	35	35	35	35	35	35	35	35	45	45	45	45	35	Posted Speed (MPH)
																									AM PEAK
	15	43	52	80	92	102	111	116	132	145	164	181	191	204	222	246	277	292	306	320	332	345	366	373	Cumulative Travel Time (s)
	44	29	38	30	42	45	48	47	45	38	29	37	39	38	32	33	28	44	49	50	49	38	35	40	Ave.Travel Speed (mph)
	1.1	0.725	0.95	0.75	1.05	1.125	1.2	1.175	1.125	1.086	0.829	1.057	1.114	1.086	0.914	0.943	0.8	1.257	1.089	1.111	1.089	0.844	0.778	1.143	Avg.Travel Spd/Posted Spd

Table B-11

Indianapolis,IN				Route No.11 New York St/Michigan St								July, 2003
												PM PEAK
8.51429	8	7.42857	7.14286	9.56	7.16	6.24	4.68	3.92	3.28	2.32	1.52	Avg.Travel Spd/Posted Spd
16	34	30	29	12	30	22	28	34	30	28	12	Ave.Travel Speed (mph)
298	280	260	250	239	179	156	117	98	82	58	38	Cumulative Travel Time (S)
												AM PEAK
0.4	0.97143	0.82857	0.82857	0.72	0.76	1.04	0.96	0.56	1.04	1.2	0.56	Avg.Travel Spd/Posted Spd
14	34	29	29	18	19	26	24	14	26	30	14	Ave.Travel Speed (mph)
349	326	307	297	286	227	179	152	129	75	47	25	Cumulative Travel Time (S)
35	35	35	35	25	25	25	25	25	25	25	25	Posted Speed (MPH)
0.12	0.18	0.08	0.09	0.19	0.19	0.19	0.15	0.15	0.19	0.16	0.12	Segment length (miles)
11412	11411	11410	11409	11408	11407	11406	11405	11404	11403	11402	11401	Segment ID
							← WB(Michigan)					
University Blvd	Blake St	Blackford St	California St	West St	Senate Ave	Illinois St	US 31	Hudson St	New Jersey St	Park Ave	Fulton St	Pine St	
University Blvd	Blake St	Blackford St	California St	West St	Senate Ave	Illinois St	US 31	Hudson St	New Jersey St	Park Ave	Fulton St	Pine St	
							EB(New York) →					
11301	11302	11303	11304	11305	11306	11307	11308	11309	11310	11311	11312	Segment ID
0.12	0.18	0.08	0.09	0.19	0.19	0.19	0.14	0.15	0.19	0.15	0.11	Segment length (miles)
35	35	35	35	25	25	25	25	25	25	25	25	Posted Speed (MPH)
												AM PEAK
0.74286	0.6	0.74286	0.4	0.72	0.96	1.16	0.8	1.12	1.28	1.36	1.32	Avg.Travel Spd/Posted Spd
26	21	26	14	18	24	29	20	28	32	34	33	Ave.Travel Speed (mph)
16	46	56	91	133	162	185	227	247	268	284	291	Cumulative Travel Time (s)
												PM PEAK
0.82857	0.74286	0.82857	0.34286	0.96	0.64	1.04	0.52	1.04	1.24	1.04	1.2	Avg.Travel Spd/Posted Spd
29	26	29	12	24	16	26	13	26	31	26	30	Ave.Travel Speed (mph)
14	40	50	85	116	169	197	252	272	295	322	331	Cumulative Travel Time (s)

Appendix C – Travel Time Graphs

Figure C-1

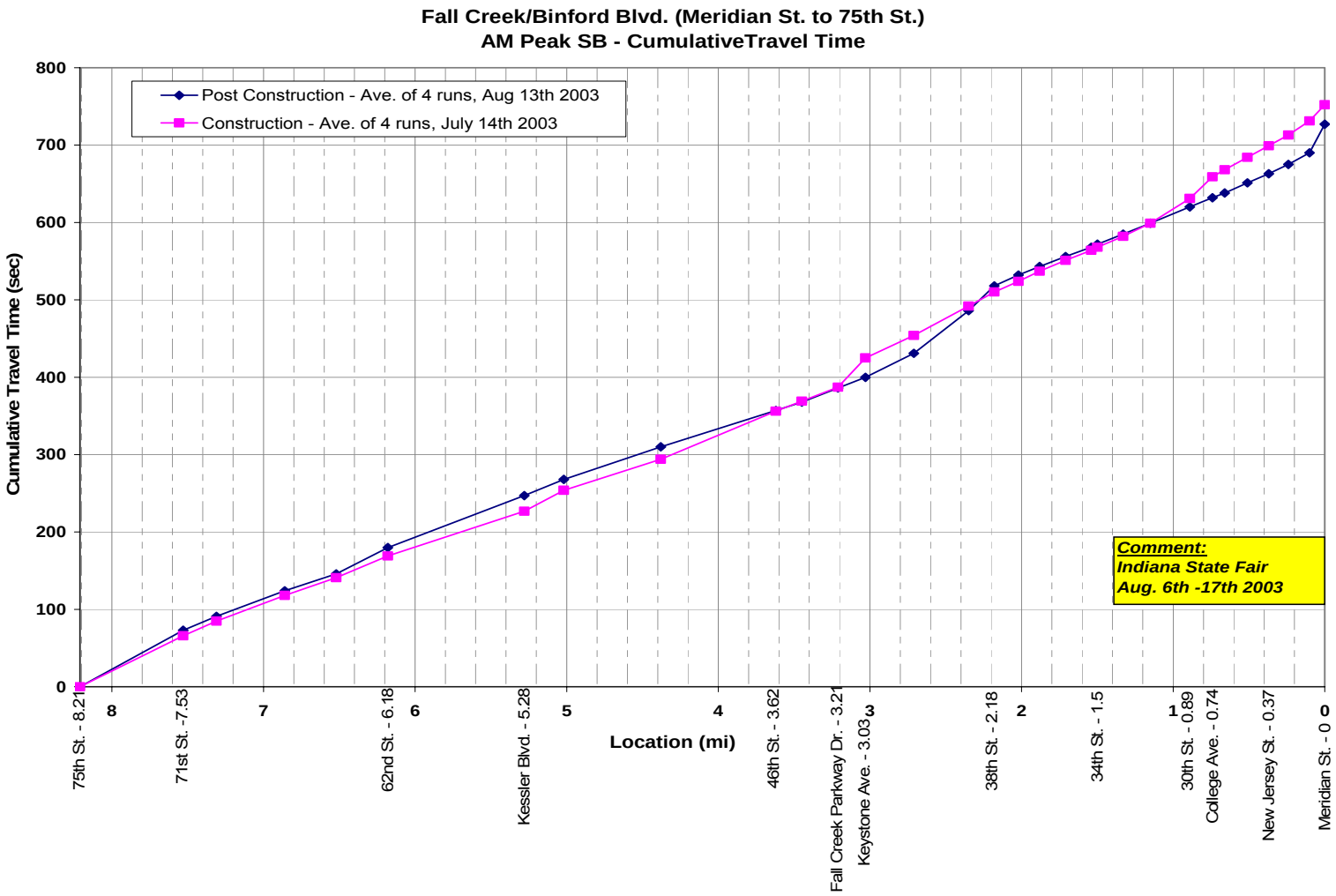

Fall Creek/Binford Blvd. (Meridian St. to 75th St.)
AM Peak SB - CumulativeTravel Time
Post Construction - Ave. of 4 runs, Aug 13th 2003
Construction - Ave. of 4 runs, July 14th 2003
Cumulative Travel Time (sec)
800
700
600
500
400
300
200
100
0
Comment:
Indiana State Fair
Aug. 6th -17th 2003
Location (mi)
8
7
6
5
4
3
2
1
0
75th St. - 8.21
71st St. -7.53
62nd St. - 6.18
Kessler Blvd. - 5.28
46th St. - 3.62
Fall Creek Parkway Dr. - 3.21
Keystone Ave. - 3.03
38th St. - 2.18
34th St. - 1.5
30th St. - 0.89
College Ave. - 0.74
New Jersey St. - 0.37
Meridian St. - 0

Figure C-2

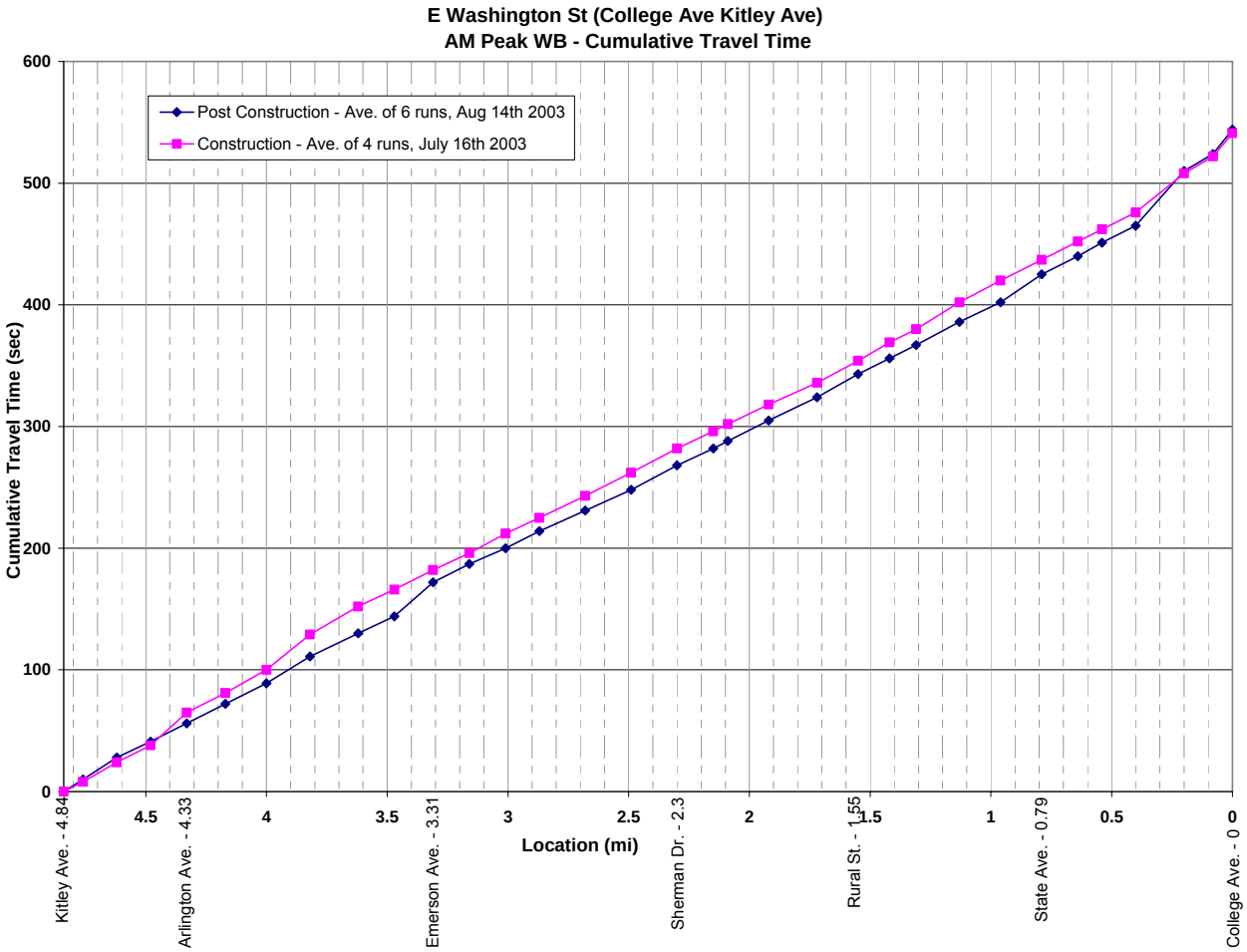

E Washington St (College Ave Kitley Ave)
AM Peak WB - Cumulative Travel Time
Post Construction - Ave. of 6 runs, Aug 14th 2003
Construction - Ave. of 4 runs, July 16th 2003
Cumulative Travel Time (sec)
600
500
400
300
200
100
0
Location (mi)
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
Kitley Ave. - 4.84
Arlington Ave. - 4.33
Emerson Ave. - 3.31
Sherman Dr. - 2.3
Rural St. - 1.55
State Ave. - 0.79
College Ave. - 0

Figure C- 3a

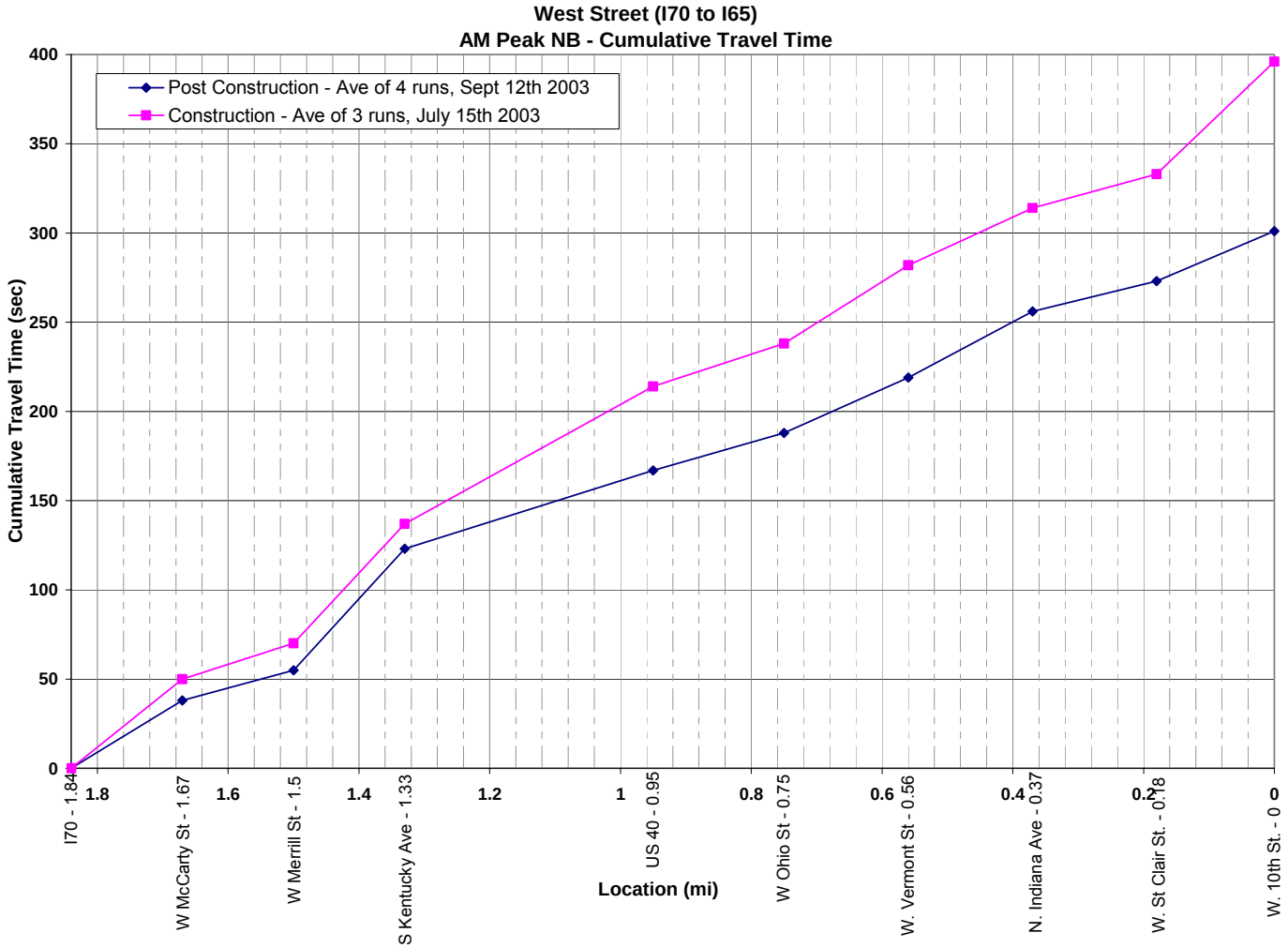

West Street (I70 to I65)
AM Peak NB - Cumulative Travel Time
Post Construction - Ave of 4 runs, Sept 12th 2003
Construction - Ave of 3 runs, July 15th 2003
Cumulative Travel Time (sec)
400
350
300
250
200
150
100
50
0
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
I70 - 1.84
W McCarty St - 1.67
W Merrill St - 1.5
S Kentucky Ave - 1.33
US 40 - 0.95
W Ohio St - 0.75
W. Vermont St - 0.56
N. Indiana Ave - 0.37
W. St Clair St. - 0.18
W. 10th St. - 0
Location (mi)

Figure C- 3b

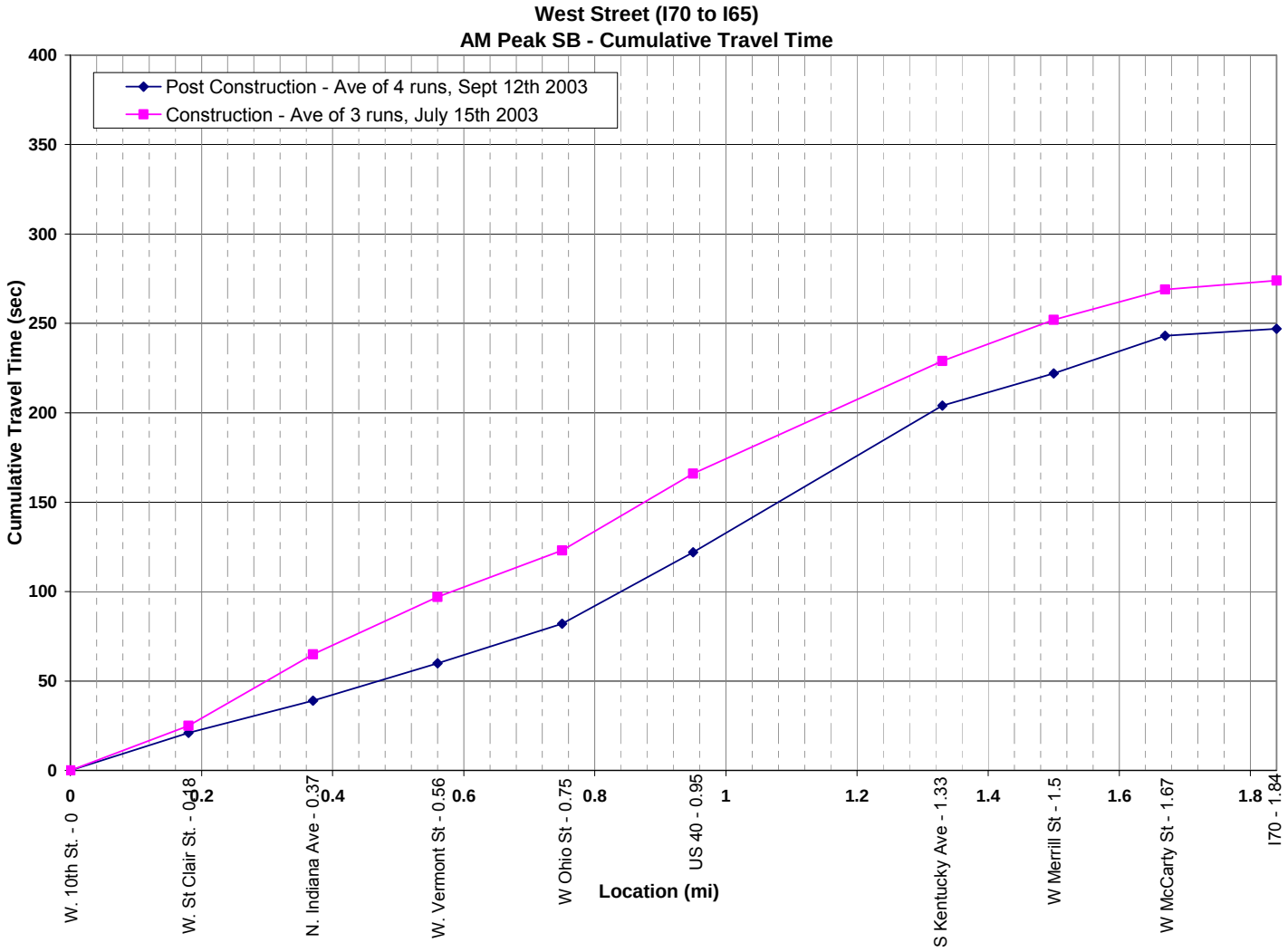

West Street (I70 to I65)
AM Peak SB - Cumulative Travel Time
Post Construction - Ave of 4 runs, Sept 12th 2003
Construction - Ave of 3 runs, July 15th 2003
Cumulative Travel Time (sec)
400
350
300
250
200
150
100
50
0
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
Location (mi)
W. 10th St. - 0
W. St Clair St. - 0.18
N. Indiana Ave - 0.37
W. Vermont St - 0.56
W Ohio St - 0.75
US 40 - 0.95
S Kentucky Ave - 1.33
W Merrill St - 1.5
W McCarty St - 1.67
I70 - 1.84

Figure C- 4

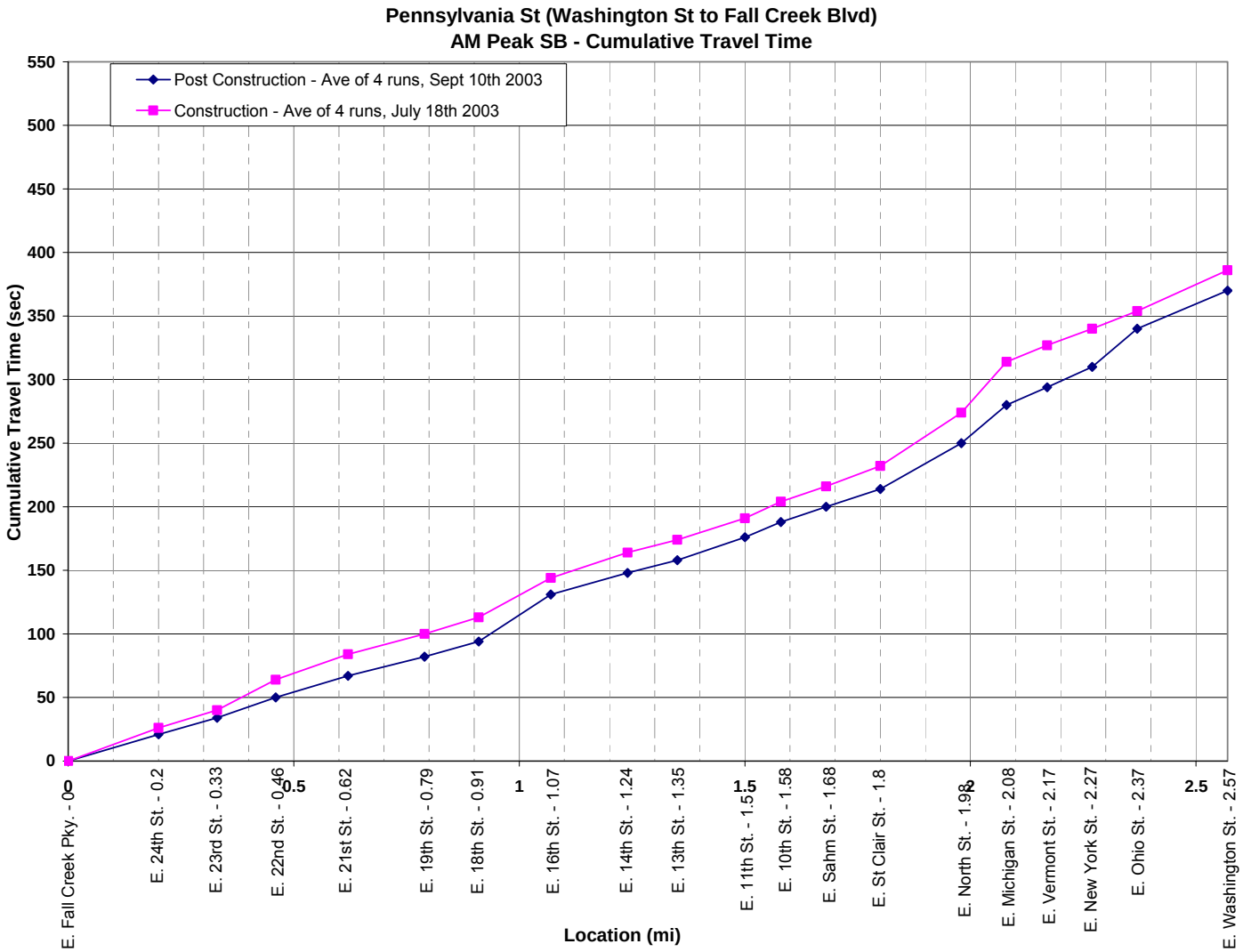

Pennsylvania St (Washington St to Fall Creek Blvd)
AM Peak SB - Cumulative Travel Time
Post Construction - Ave of 4 runs, Sept 10th 2003
Construction - Ave of 4 runs, July 18th 2003
Cumulative Travel Time (sec)
550
500
450
400
350
300
250
200
150
100
50
0
0
0.5
1
1.5
2
2.5
Location (mi)
E. Fall Creek Pky. - 0
E. 24th St. - 0.2
E. 23rd St. - 0.33
E. 22nd St. - 0.46
E. 21st St. - 0.62
E. 19th St. - 0.79
E. 18th St. - 0.91
E. 16th St. - 1.07
E. 14th St. - 1.24
E. 13th St. - 1.35
E. 11th St. - 1.55
E. 10th St. - 1.58
E. Sahm St. - 1.68
E. St Clair St. - 1.8
E. North St. - 1.98
E. Michigan St. - 2.08
E. Vermont St. - 2.17
E. New York St. - 2.27
E. Ohio St. - 2.37
E. Washington St. - 2.57

Figure C- 5a

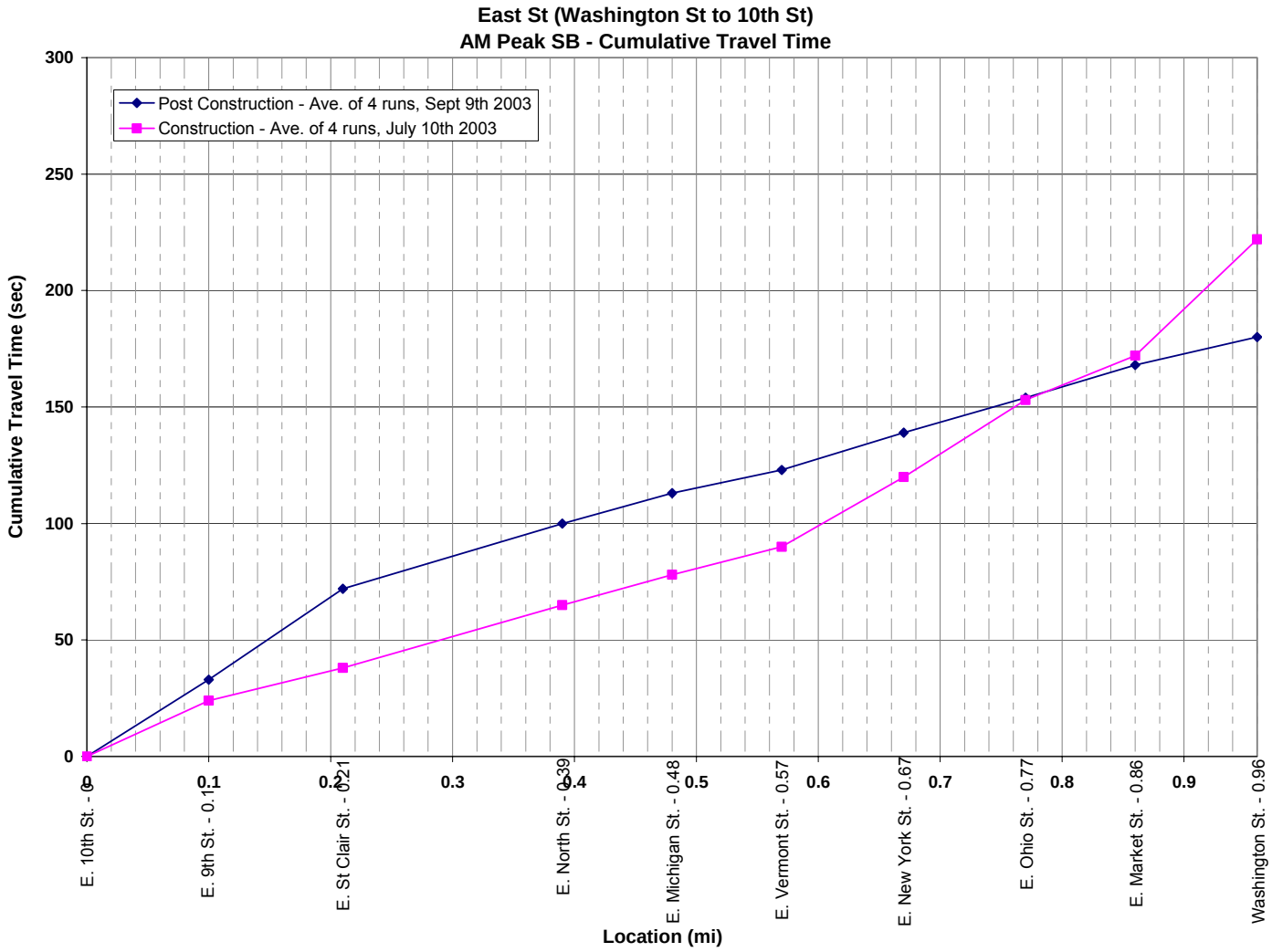

East St (Washington St to 10th St)
AM Peak SB - Cumulative Travel Time
Post Construction - Ave. of 4 runs, Sept 9th 2003
Construction - Ave. of 4 runs, July 10th 2003
Cumulative Travel Time (sec)
300
250
200
150
100
50
0
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
E. 10th St. - 0
E. 9th St. - 0.1
E. St Clair St. - 0.21
E. North St. - 0.39
E. Michigan St. - 0.48
E. Vermont St. - 0.57
E. New York St. - 0.67
E. Ohio St. - 0.77
E. Market St. - 0.86
Washington St. - 0.96
Location (mi)

Figure C-5b

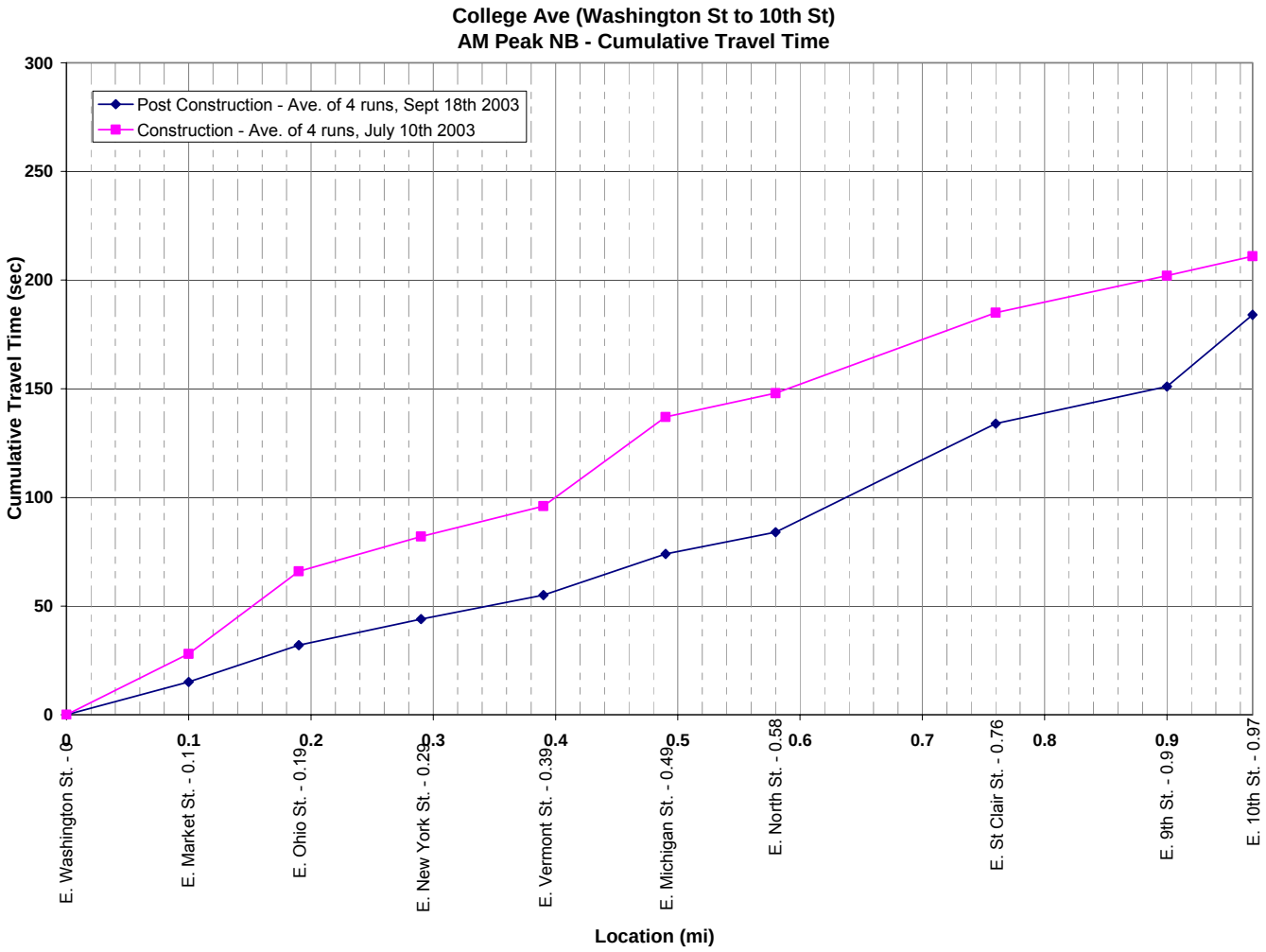

College Ave (Washington St to 10th St)
AM Peak NB - Cumulative Travel Time
Post Construction - Ave. of 4 runs, Sept 18th 2003
Construction - Ave. of 4 runs, July 10th 2003
Cumulative Travel Time (sec)
300
250
200
150
100
50
0
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
E. Washington St. - 0
E. Market St. - 0.1
E. Ohio St. - 0.19
E. New York St. - 0.29
E. Vermont St. - 0.39
E. Michigan St. - 0.49
E. North St. - 0.58
E. St Clair St. - 0.76
E. 9th St. - 0.9
E. 10th St. - 0.97
Location (mi)

Figure C-6

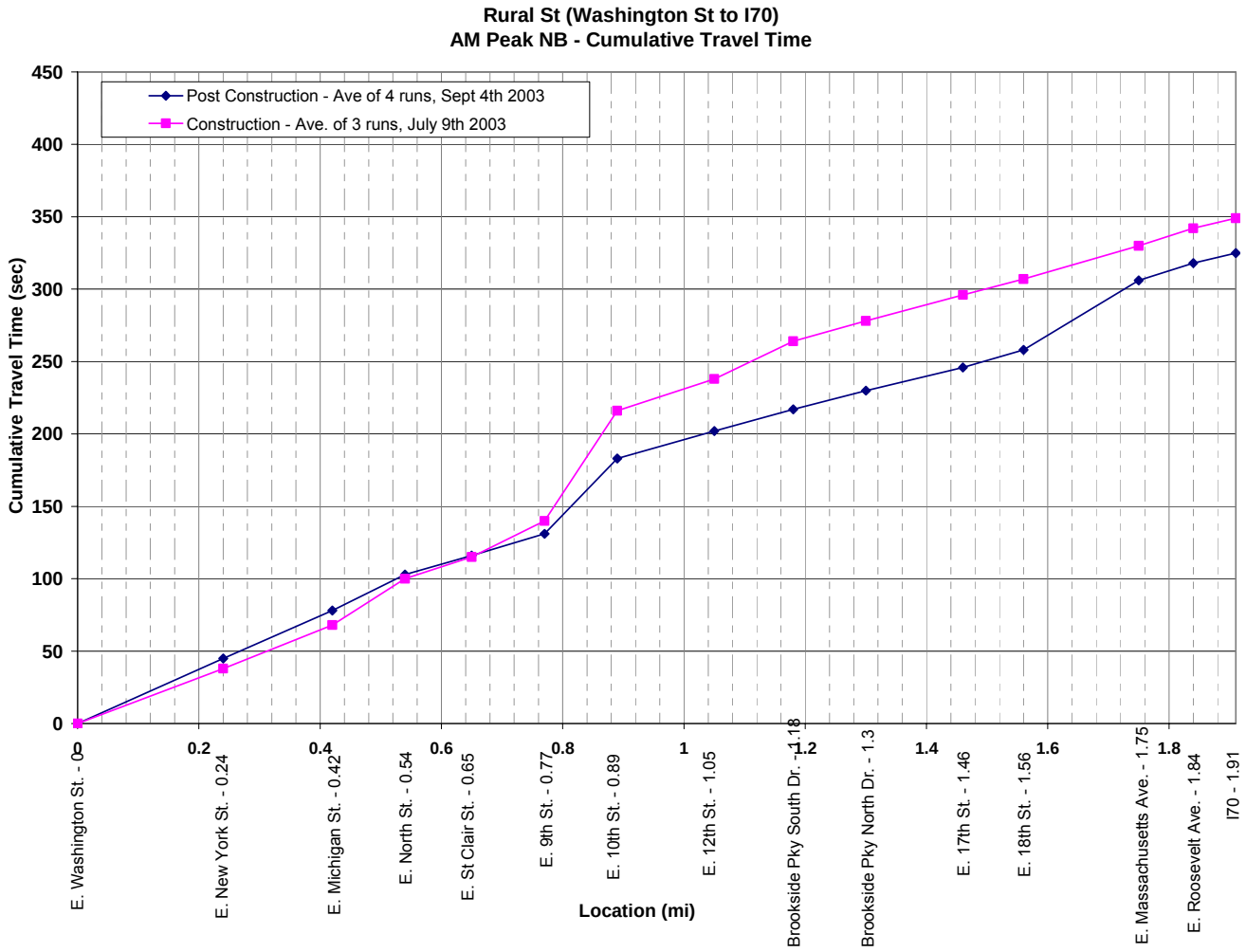

Rural St (Washington St to I70)
AM Peak NB - Cumulative Travel Time
Post Construction - Ave of 4 runs, Sept 4th 2003
Construction - Ave. of 3 runs, July 9th 2003
Cumulative Travel Time (sec)
450
400
350
300
250
200
150
100
50
0
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
Location (mi)
E. Washington St. - 0
E. New York St. - 0.24
E. Michigan St. - 0.42
E. North St. - 0.54
E. St Clair St. - 0.65
E. 9th St. - 0.77
E. 10th St. - 0.89
E. 12th St. - 1.05
Brookside Pky South Dr. - 1.18
Brookside Pky North Dr. - 1.3
E. 17th St. - 1.46
E. 18th St. - 1.56
E. Massachusetts Ave. - 1.75
E. Roosevelt Ave. - 1.84
I70 - 1.91

Figure C-7

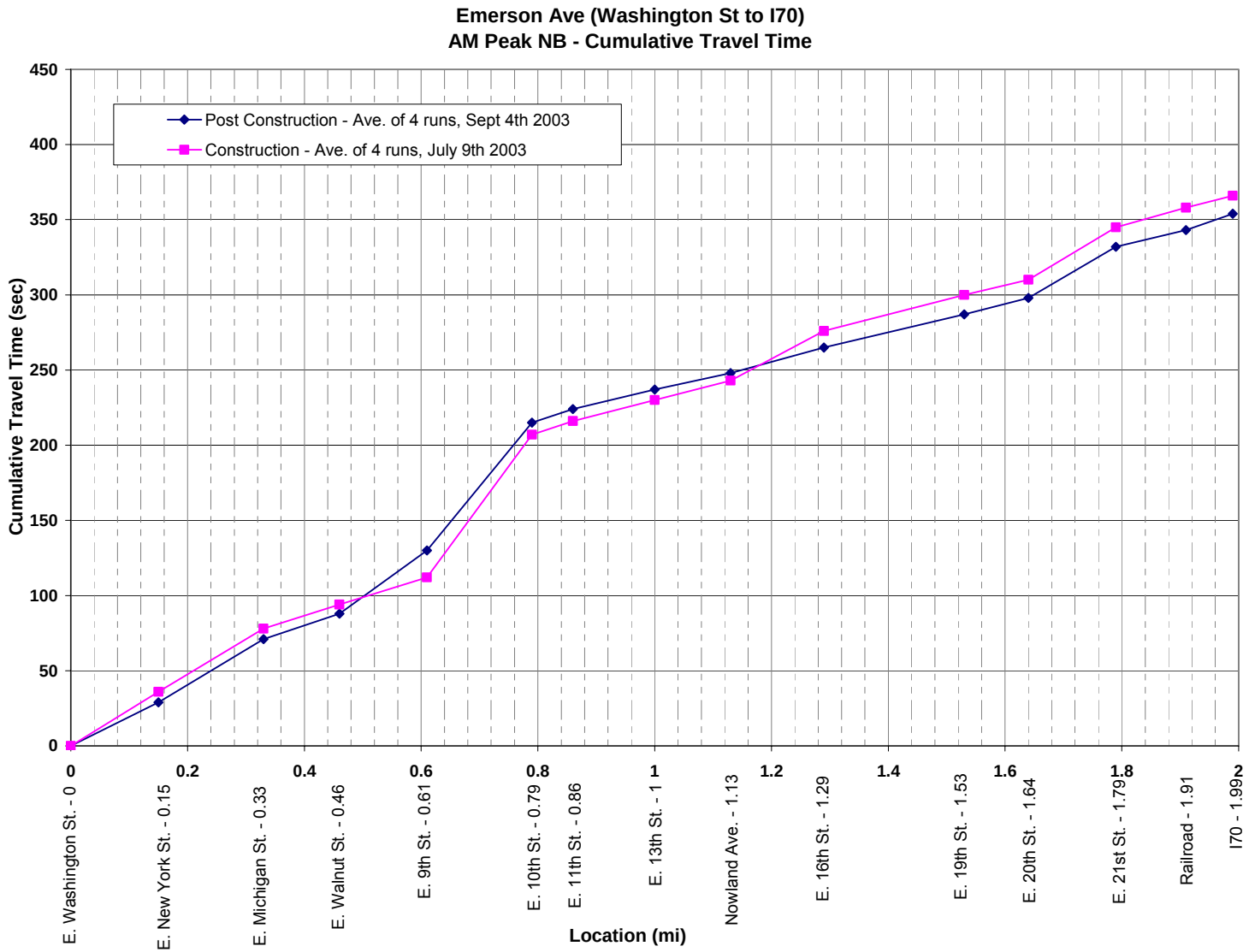

Emerson Ave (Washington St to I70)
AM Peak NB - Cumulative Travel Time
Post Construction - Ave. of 4 runs, Sept 4th 2003
Construction - Ave. of 4 runs, July 9th 2003
Cumulative Travel Time (sec)
450
400
350
300
250
200
150
100
50
0
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
E. Washington St. - 0
E. New York St. - 0.15
E. Michigan St. - 0.33
E. Walnut St. - 0.46
E. 9th St. - 0.61
E. 10th St. - 0.79
E. 11th St. - 0.86
E. 13th St. - 1
Nowland Ave. - 1.13
E. 16th St. - 1.29
E. 19th St. - 1.53
E. 20th St. - 1.64
E. 21st St. - 1.79
Railroad - 1.91
I70 - 1.99
Location (mi)

Figure C-8

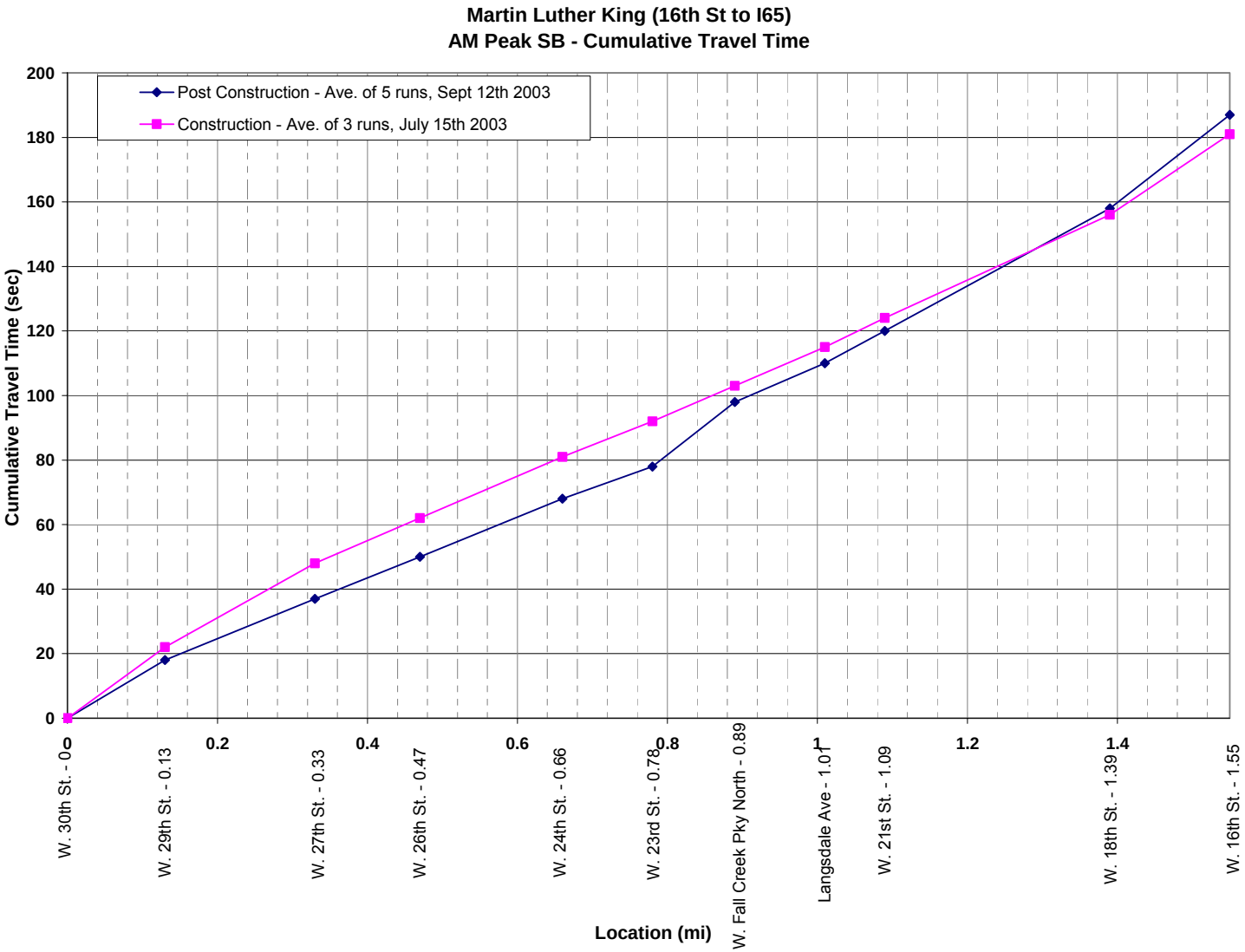

Martin Luther King (16th St to I65)
AM Peak SB - Cumulative Travel Time
Post Construction - Ave. of 5 runs, Sept 12th 2003
Construction - Ave. of 3 runs, July 15th 2003
Cumulative Travel Time (sec)
0
20
40
60
80
100
120
140
160
180
200
0
0.2
0.4
0.6
0.8
1
1.2
1.4
W. 30th St. - 0
W. 29th St. - 0.13
W. 27th St. - 0.33
W. 26th St. - 0.47
W. 24th St. - 0.66
W. 23rd St. - 0.78
W. Fall Creek Pky North - 0.89
Langsdale Ave - 1.01
W. 21st St. - 1.09
W. 18th St. - 1.39
W. 16th St. - 1.55
Location (mi)

Figure C-9

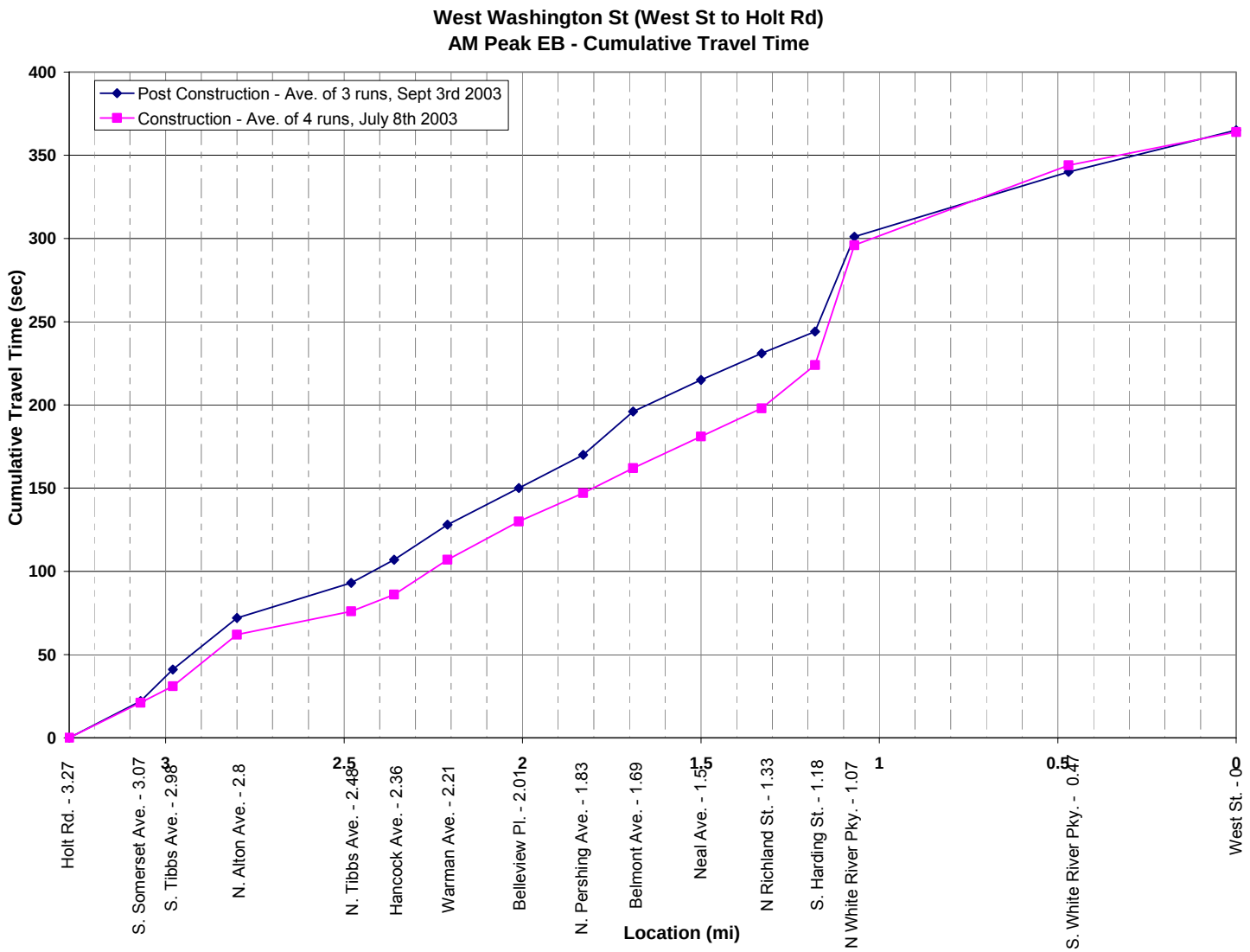

West Washington St (West St to Holt Rd)
AM Peak EB - Cumulative Travel Time
Post Construction - Ave. of 3 runs, Sept 3rd 2003
Construction - Ave. of 4 runs, July 8th 2003
Cumulative Travel Time (sec)
400
350
300
250
200
150
100
50
0
Holt Rd. - 3.27
S. Somerset Ave. - 3.07
S. Tibbs Ave. - 2.98
N. Alton Ave. - 2.8
N. Tibbs Ave. - 2.48
Hancock Ave. - 2.36
Warman Ave. - 2.21
Belleview Pl. - 2.01
N. Pershing Ave. - 1.83
Belmont Ave. - 1.69
Neal Ave. - 1.55
N Richland St. - 1.33
S. Harding St. - 1.18
N White River Pky. - 1.07
S. White River Pky. - 0.47
West St. - 0
3
2.5
2
1.5
1
0.5
0
Location (mi)

Figure C-10

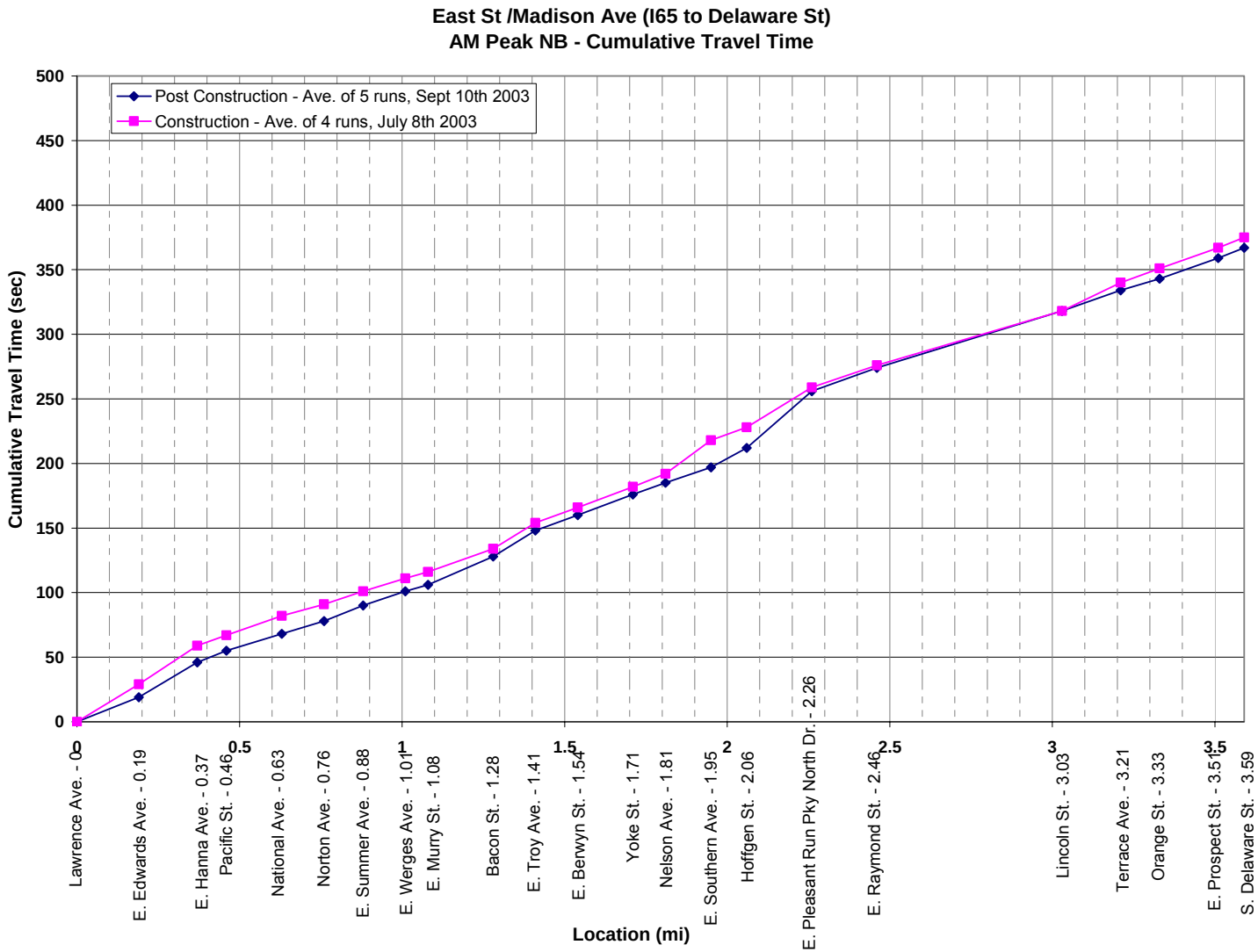

East St /Madison Ave (I65 to Delaware St)
AM Peak NB - Cumulative Travel Time
Post Construction - Ave. of 5 runs, Sept 10th 2003
Construction - Ave. of 4 runs, July 8th 2003
Cumulative Travel Time (sec)
500
450
400
350
300
250
200
150
100
50
0
0
0.5
1
1.5
2
2.5
3
3.5
Location (mi)
Lawrence Ave. - 0
E. Edwards Ave. - 0.19
E. Hanna Ave. - 0.37
Pacific St. - 0.46
National Ave. - 0.63
Norton Ave. - 0.76
E. Summer Ave. - 0.88
E. Werges Ave. - 1.01
E. Murry St. - 1.08
Bacon St. - 1.28
E. Troy Ave. - 1.41
E. Berwyn St. - 1.54
Yoke St. - 1.71
Nelson Ave. - 1.81
E. Southern Ave. - 1.95
Hoffgen St. - 2.06
E. Pleasant Run Pky North Dr. - 2.26
E. Raymond St. - 2.46
Lincoln St. - 3.03
Terrace Ave. - 3.21
Orange St. - 3.33
E. Prospect St. - 3.51
S. Delaware St. - 3.59

Figure C-11a

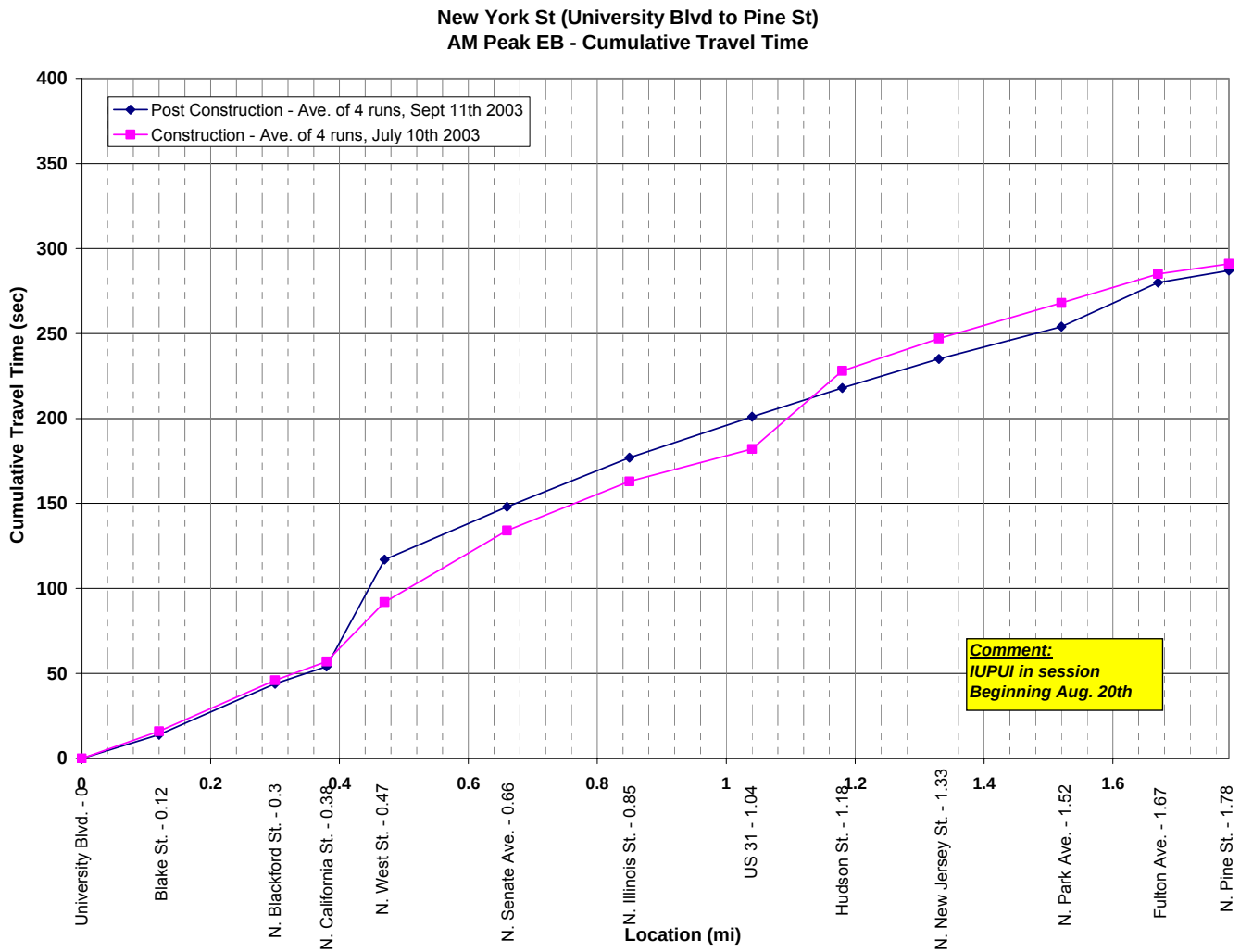

New York St (University Blvd to Pine St)
AM Peak EB - Cumulative Travel Time
Post Construction - Ave. of 4 runs, Sept 11th 2003
Construction - Ave. of 4 runs, July 10th 2003
Cumulative Travel Time (sec)
400
350
300
250
200
150
100
50
0
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
Location (mi)
University Blvd. - 0
Blake St. - 0.12
N. Blackford St. - 0.3
N. California St. - 0.38
N. West St. - 0.47
N. Senate Ave. - 0.66
N. Illinois St. - 0.85
US 31 - 1.04
Hudson St. - 1.18
N. New Jersey St. - 1.33
N. Park Ave. - 1.52
Fulton Ave. - 1.67
N. Pine St. - 1.78
Comment:
IUPUI in session
Beginning Aug. 20th

Figure C- 11b

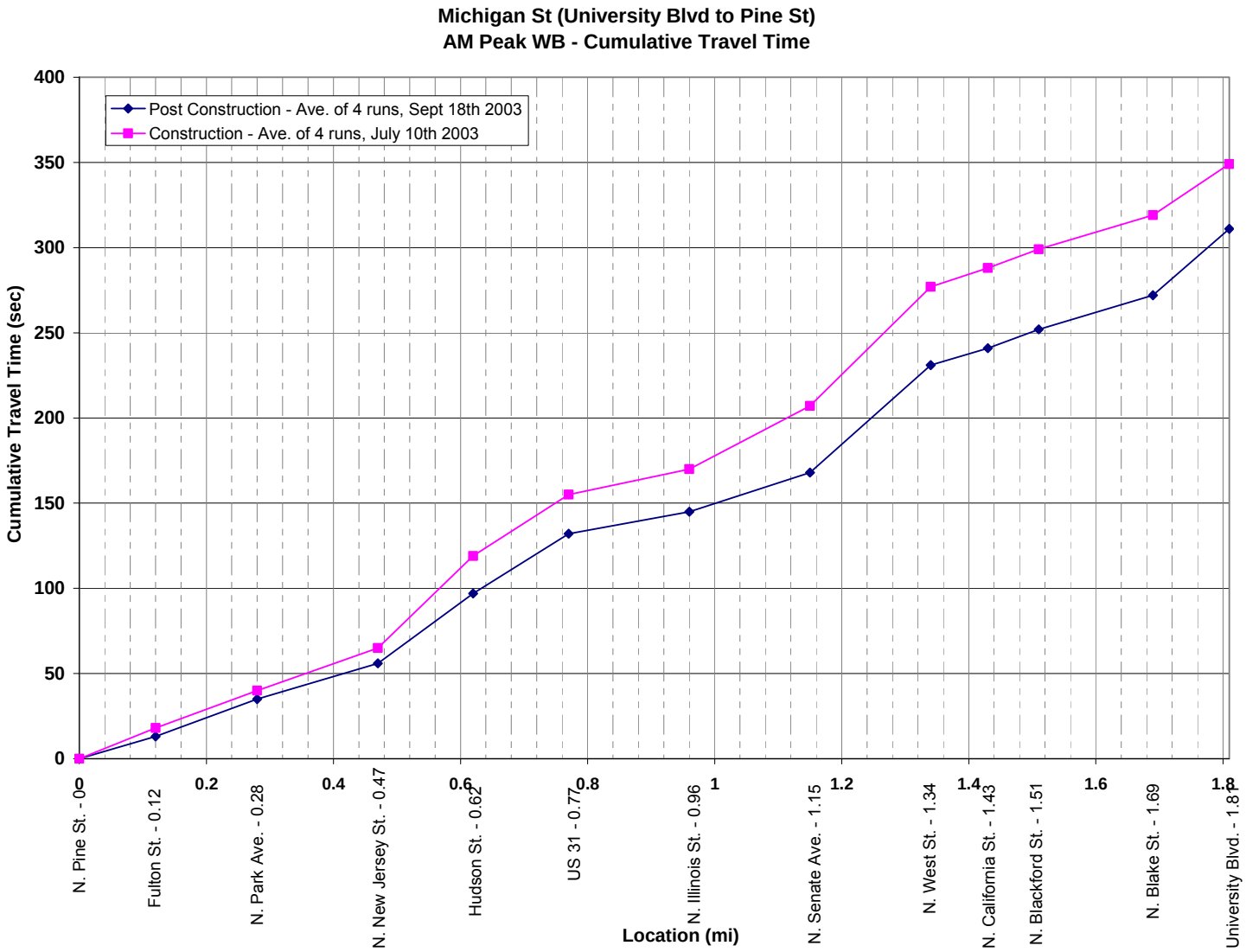

Michigan St (University Blvd to Pine St)
AM Peak WB - Cumulative Travel Time
Post Construction - Ave. of 4 runs, Sept 18th 2003
Construction - Ave. of 4 runs, July 10th 2003
Cumulative Travel Time (sec)
400
350
300
250
200
150
100
50
0
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
Location (mi)
N. Pine St. - 0
Fulton St. - 0.12
N. Park Ave. - 0.28
N. New Jersey St. - 0.47
Hudson St. - 0.62
US 31 - 0.77
N. Illinois St. - 0.96
N. Senate Ave. - 1.15
N. West St. - 1.34
N. California St. - 1.43
N. Blackford St. - 1.51
N. Blake St. - 1.69
University Blvd. - 1.81

Figure C-12

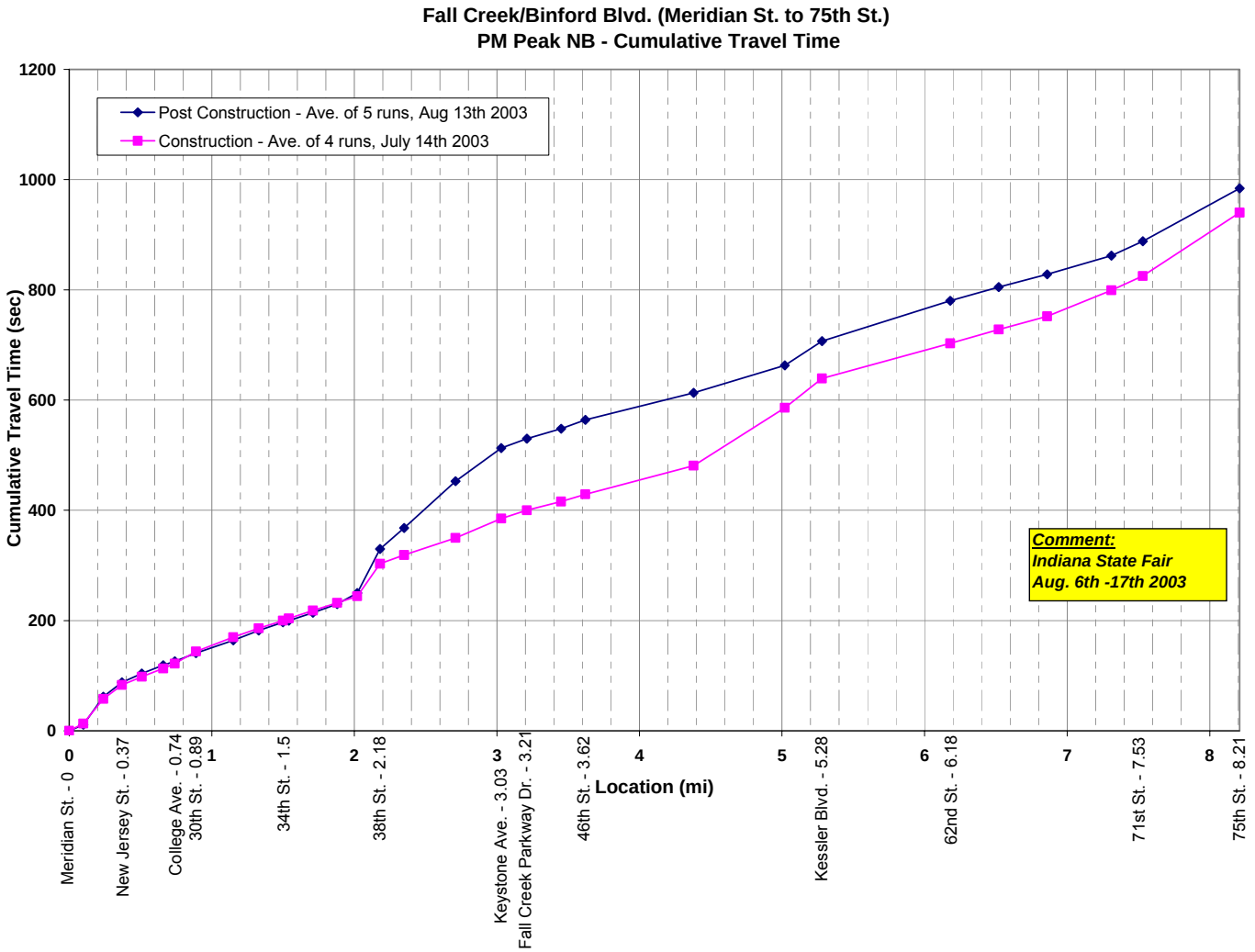

Fall Creek/Binford Blvd. (Meridian St. to 75th St.)
PM Peak NB - Cumulative Travel Time
Post Construction - Ave. of 5 runs, Aug 13th 2003
Construction - Ave. of 4 runs, July 14th 2003
Cumulative Travel Time (sec)
1200
1000
800
600
400
200
0
Comment:
Indiana State Fair
Aug. 6th -17th 2003
0
1
2
3
4
5
6
7
8
Location (mi)
Meridian St. - 0
New Jersey St. - 0.37
College Ave. - 0.74
30th St. - 0.89
34th St. - 1.5
38th St. - 2.18
Keystone Ave. - 3.03
Fall Creek Parkway Dr. - 3.21
46th St. - 3.62
Kessler Blvd. - 5.28
62nd St. - 6.18
71st St. - 7.53
75th St. - 8.21

Figure C-13

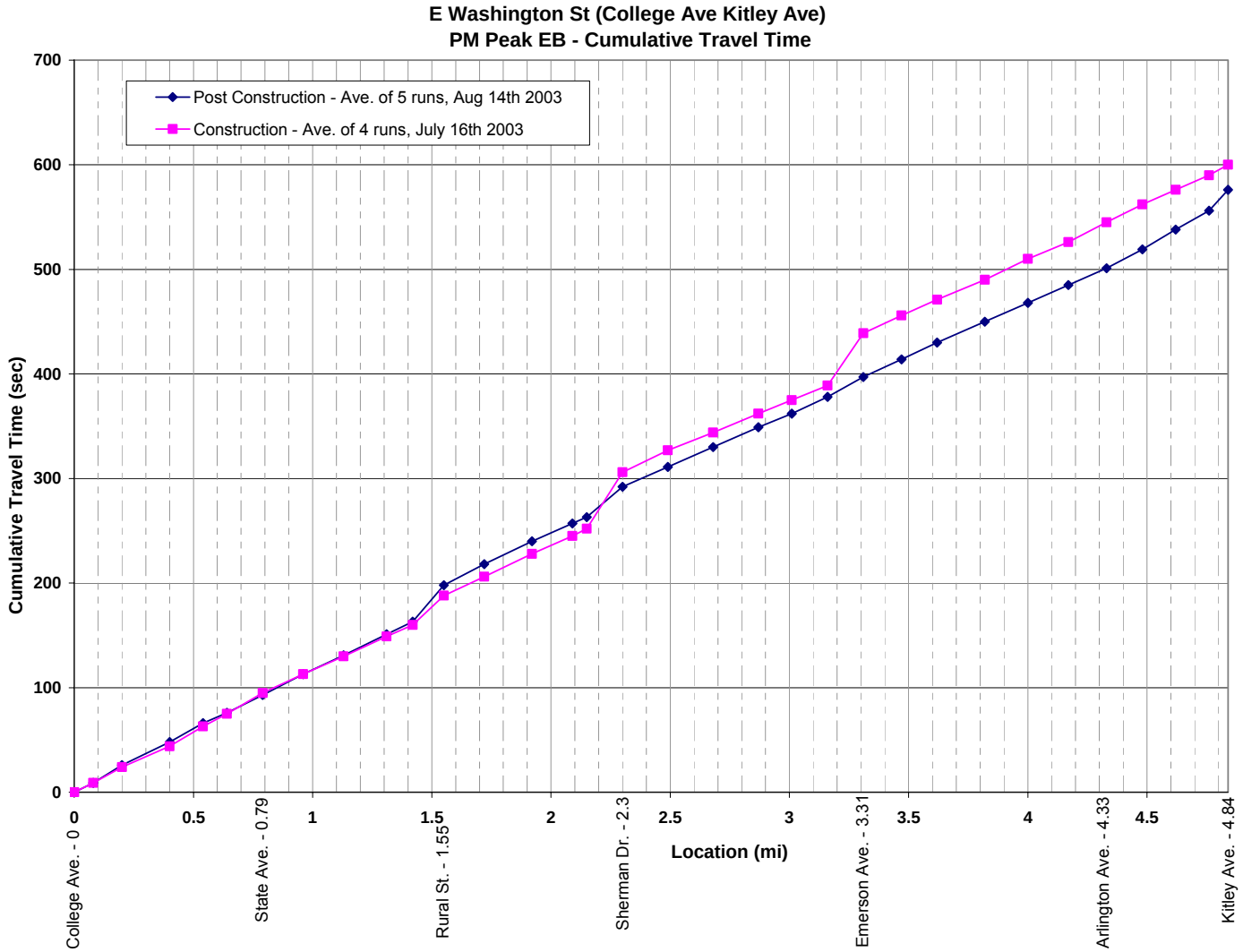

E Washington St (College Ave Kitley Ave)
PM Peak EB - Cumulative Travel Time
Post Construction - Ave. of 5 runs, Aug 14th 2003
Construction - Ave. of 4 runs, July 16th 2003
Cumulative Travel Time (sec)
700
600
500
400
300
200
100
0
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
Location (mi)
College Ave. - 0
State Ave. - 0.79
Rural St. - 1.55
Sherman Dr. - 2.3
Emerson Ave. - 3.31
Arlington Ave. - 4.33
Kitley Ave. - 4.84

Figure C-14a

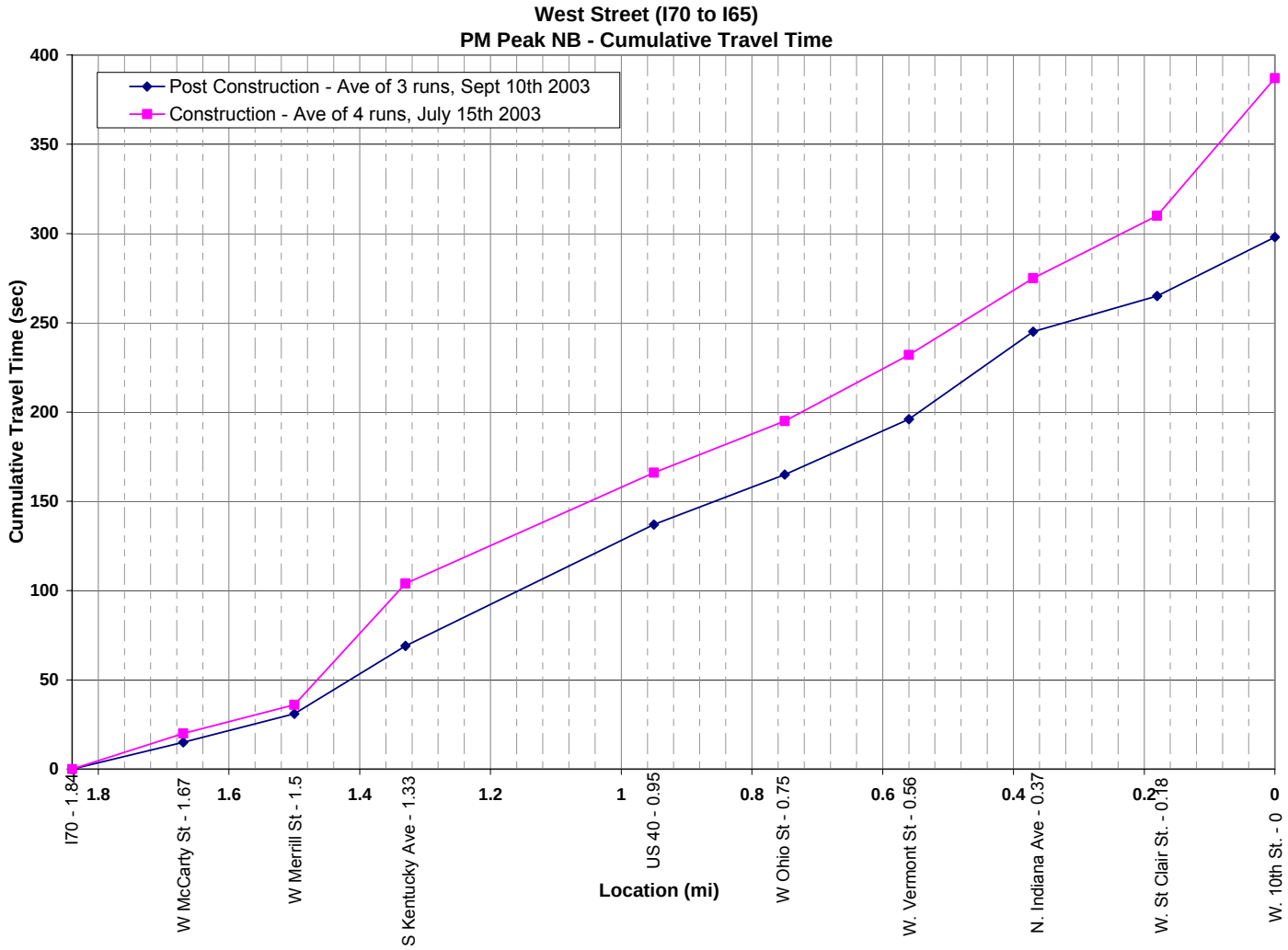

West Street (I70 to I65)
PM Peak NB - Cumulative Travel Time
Post Construction - Ave of 3 runs, Sept 10th 2003
Construction - Ave of 4 runs, July 15th 2003
Cumulative Travel Time (sec)
400
350
300
250
200
150
100
50
0
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
I70 - 1.84
W McCarty St - 1.67
W Merrill St - 1.5
S Kentucky Ave - 1.33
US 40 - 0.95
W Ohio St - 0.75
W. Vermont St - 0.56
N. Indiana Ave - 0.37
W. St Clair St. - 0.18
W. 10th St. - 0
Location (mi)

Figure C-14b

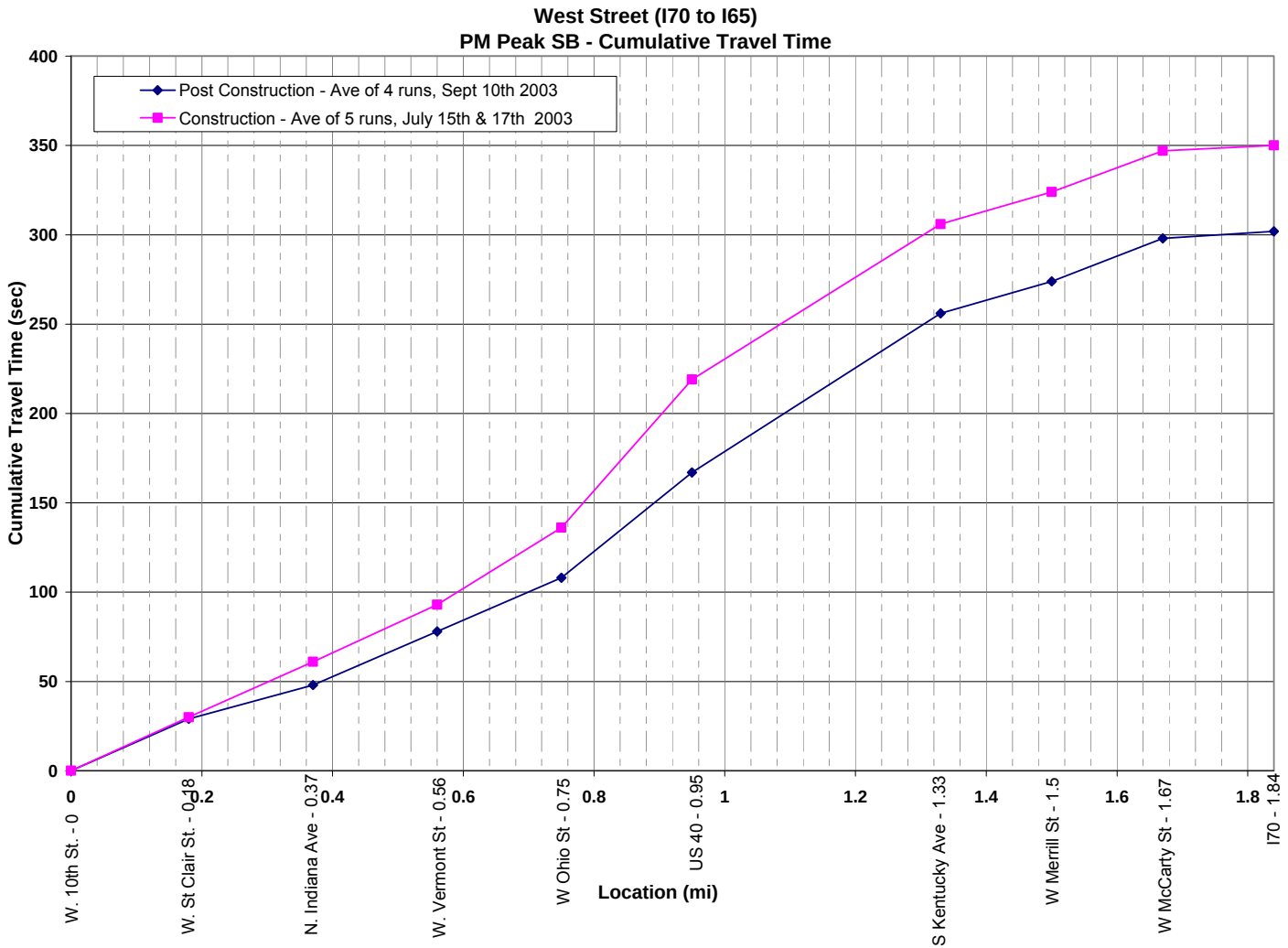

West Street (I70 to I65)
PM Peak SB - Cumulative Travel Time
Post Construction - Ave of 4 runs, Sept 10th 2003
Construction - Ave of 5 runs, July 15th & 17th 2003
Cumulative Travel Time (sec)
400
350
300
250
200
150
100
50
0
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
Location (mi)
W. 10th St. - 0
W. St Clair St. - 0.18
N. Indiana Ave - 0.37
W. Vermont St - 0.56
W Ohio St - 0.75
US 40 - 0.95
S Kentucky Ave - 1.33
W Merrill St - 1.5
W McCarty St - 1.67
I70 - 1.84

Figure C-15

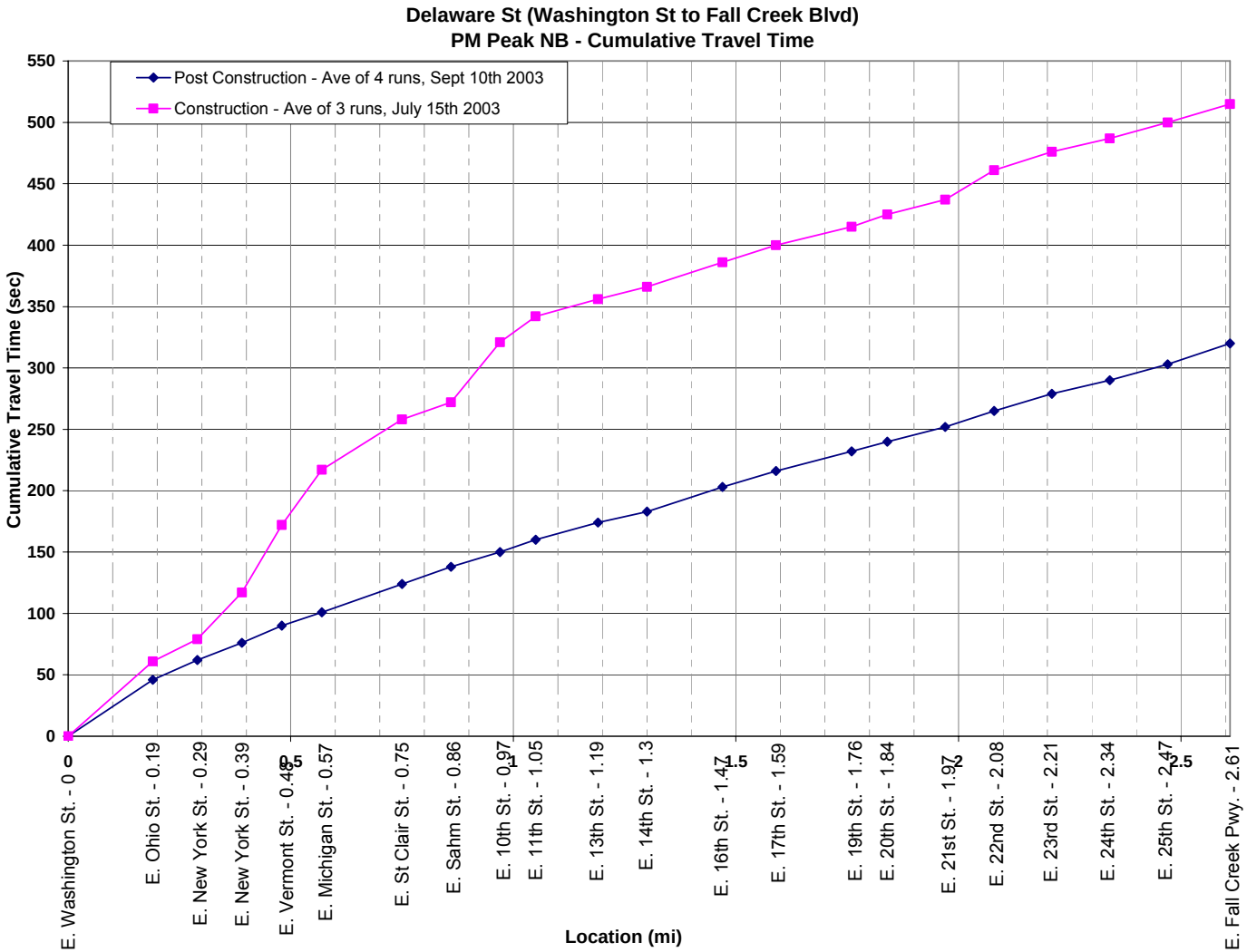

Delaware St (Washington St to Fall Creek Blvd)
PM Peak NB - Cumulative Travel Time
Post Construction - Ave of 4 runs, Sept 10th 2003
Construction - Ave of 3 runs, July 15th 2003
Cumulative Travel Time (sec)
550
500
450
400
350
300
250
200
150
100
50
0
0
0.5
1
1.5
2
2.5
E. Washington St. - 0
E. Ohio St. - 0.19
E. New York St. - 0.29
E. New York St. - 0.39
E. Vermont St. - 0.48
E. Michigan St. - 0.57
E. St Clair St. - 0.75
E. Sahm St. - 0.86
E. 10th St. - 0.97
E. 11th St. - 1.05
E. 13th St. - 1.19
E. 14th St. - 1.3
E. 16th St. - 1.47
E. 17th St. - 1.59
E. 19th St. - 1.76
E. 20th St. - 1.84
E. 21st St. - 1.97
E. 22nd St. - 2.08
E. 23rd St. - 2.21
E. 24th St. - 2.34
E. 25th St. - 2.47
E. Fall Creek Pwy. - 2.61
Location (mi)

Figure C-16a

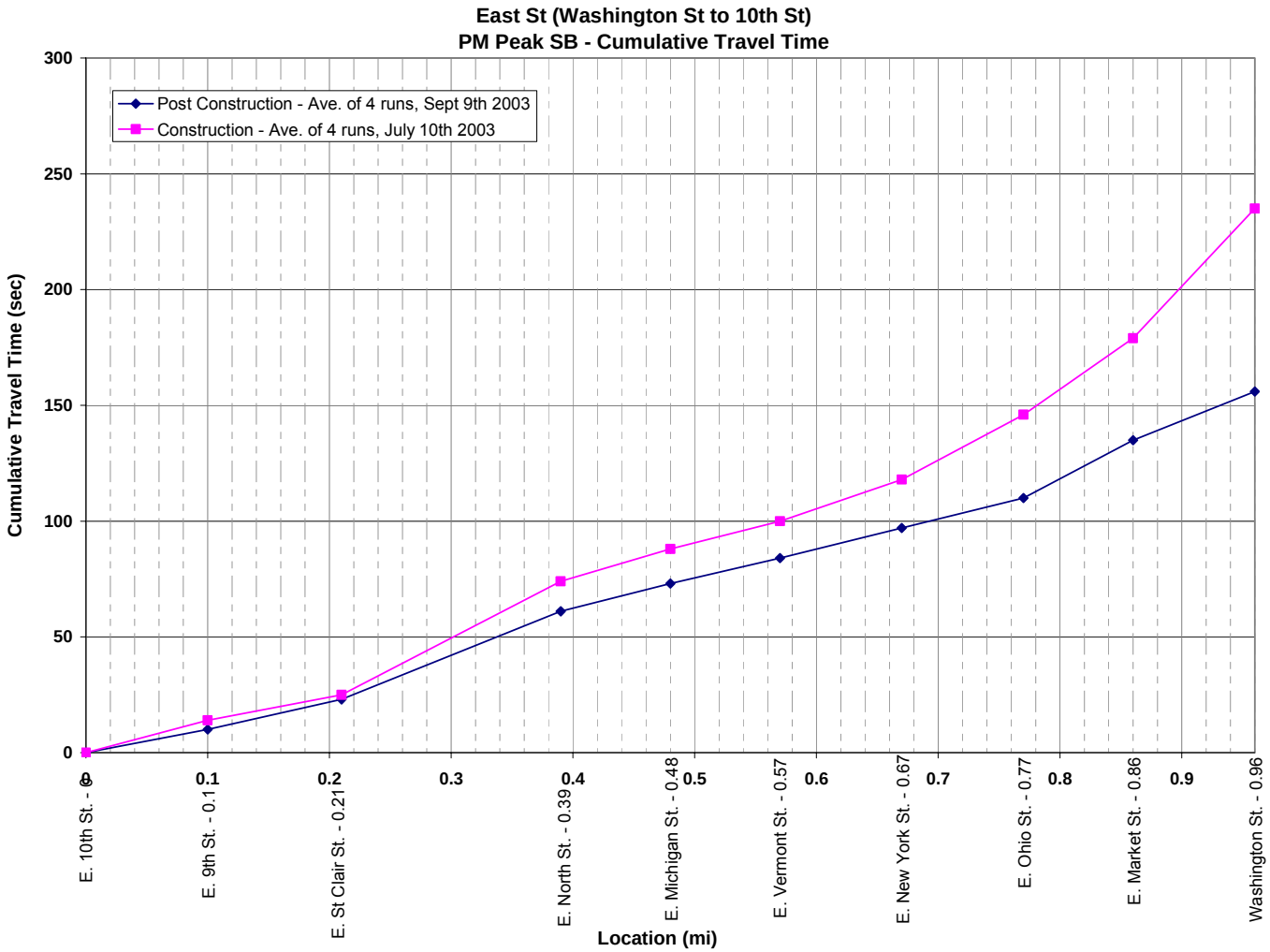

East St (Washington St to 10th St)
PM Peak SB - Cumulative Travel Time
Post Construction - Ave. of 4 runs, Sept 9th 2003
Construction - Ave. of 4 runs, July 10th 2003
Cumulative Travel Time (sec)
300
250
200
150
100
50
0
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
E. 10th St. - 0
E. 9th St. - 0.1
E. St Clair St. - 0.21
E. North St. - 0.39
E. Michigan St. - 0.48
E. Vermont St. - 0.57
E. New York St. - 0.67
E. Ohio St. - 0.77
E. Market St. - 0.86
Washington St. - 0.96
Location (mi)

Figure C- 16b

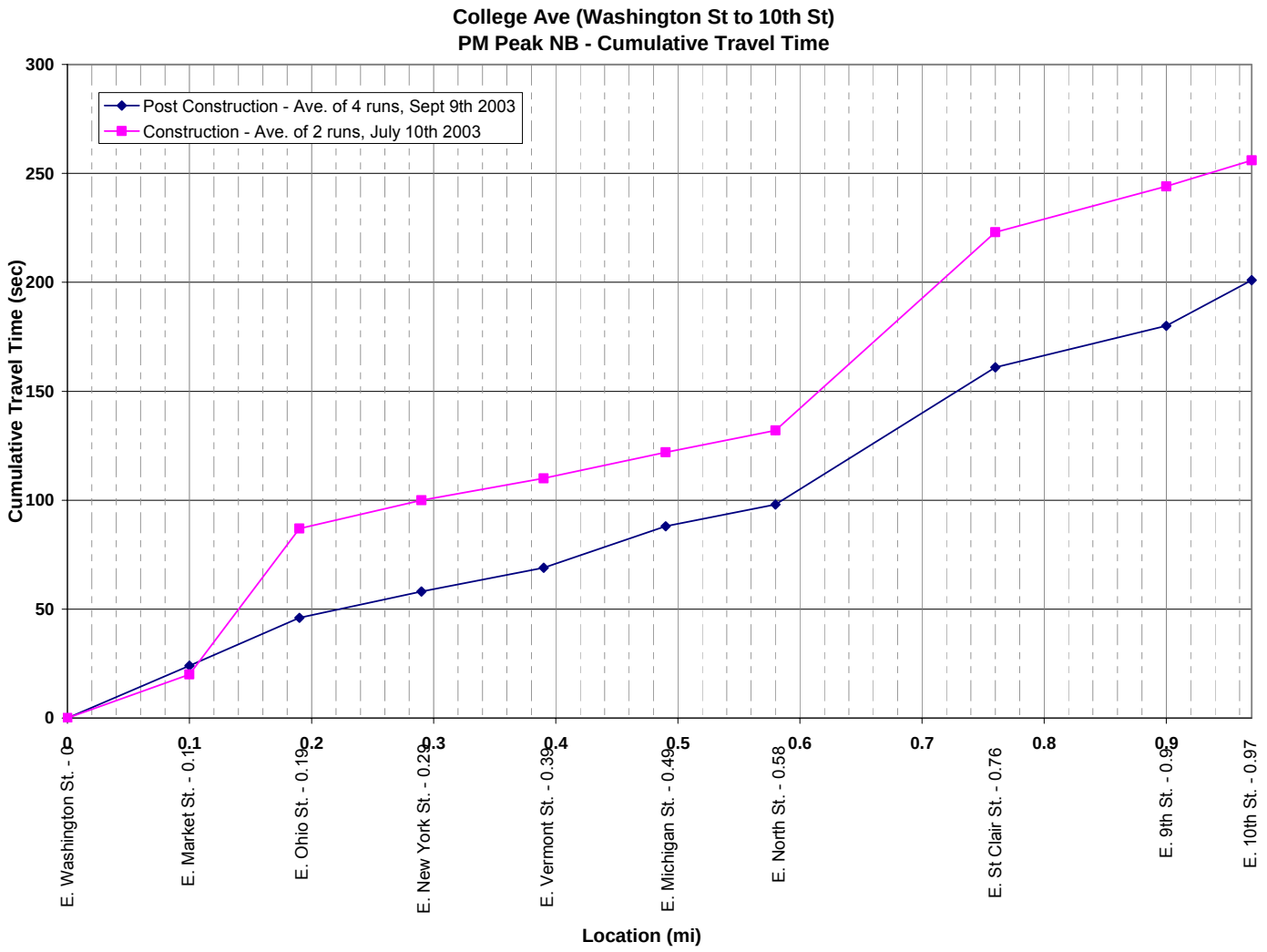

College Ave (Washington St to 10th St)
PM Peak NB - Cumulative Travel Time
Post Construction - Ave. of 4 runs, Sept 9th 2003
Construction - Ave. of 2 runs, July 10th 2003
Cumulative Travel Time (sec)
300
250
200
150
100
50
0
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
E. Washington St. - 0
E. Market St. - 0.1
E. Ohio St. - 0.19
E. New York St. - 0.29
E. Vermont St. - 0.39
E. Michigan St. - 0.49
E. North St. - 0.58
E. St Clair St. - 0.76
E. 9th St. - 0.9
E. 10th St. - 0.97
Location (mi)

Figure C-17

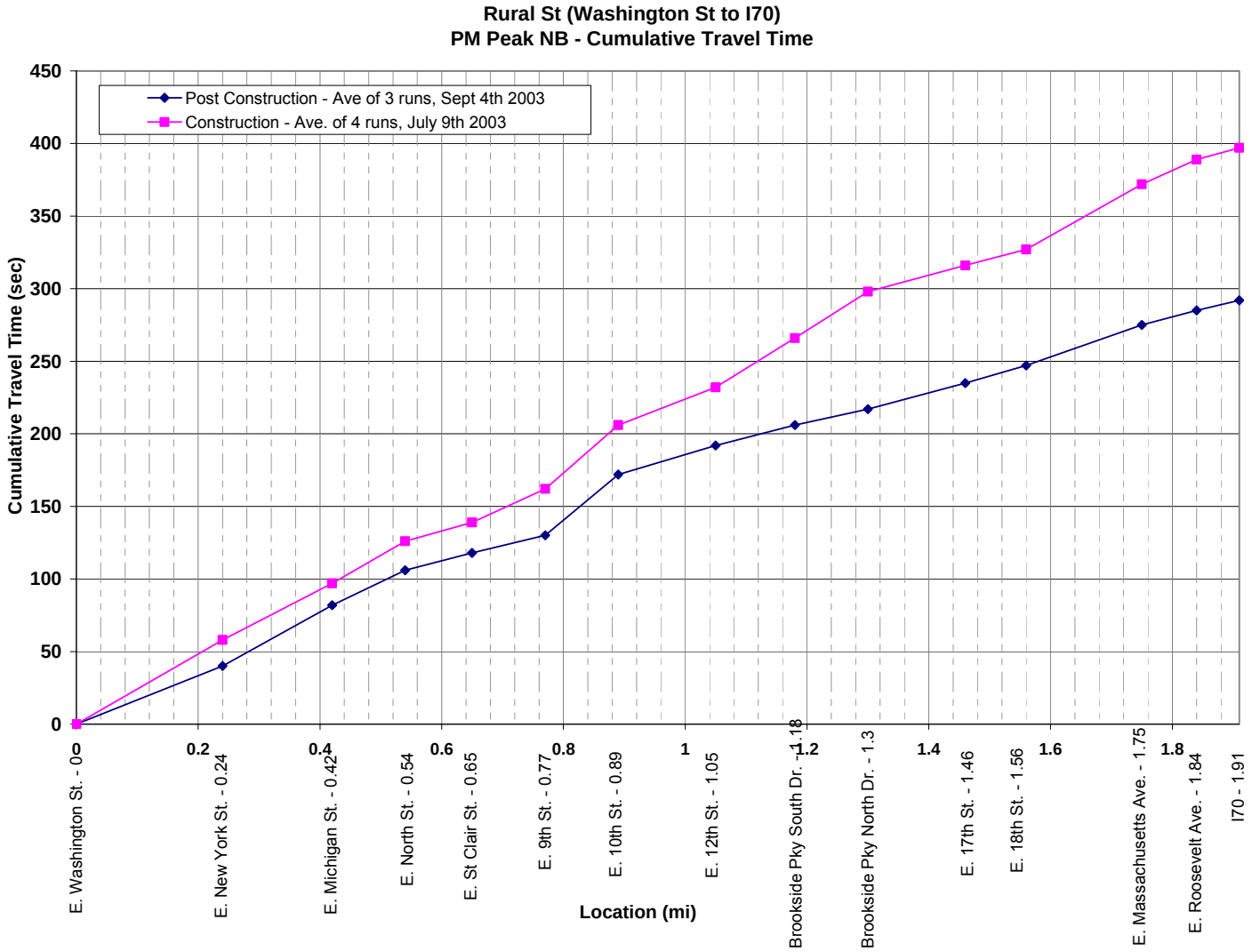

Rural St (Washington St to I70)
PM Peak NB - Cumulative Travel Time
Post Construction - Ave of 3 runs, Sept 4th 2003
Construction - Ave. of 4 runs, July 9th 2003
Cumulative Travel Time (sec)
450
400
350
300
250
200
150
100
50
0
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
Location (mi)
E. Washington St. - 0
E. New York St. - 0.24
E. Michigan St. - 0.42
E. North St. - 0.54
E. St Clair St. - 0.65
E. 9th St. - 0.77
E. 10th St. - 0.89
E. 12th St. - 1.05
Brookside Pky South Dr. - 1.18
Brookside Pky North Dr. - 1.3
E. 17th St. - 1.46
E. 18th St. - 1.56
E. Massachusetts Ave. - 1.75
E. Roosevelt Ave. - 1.84
I70 - 1.91

Figure C-18

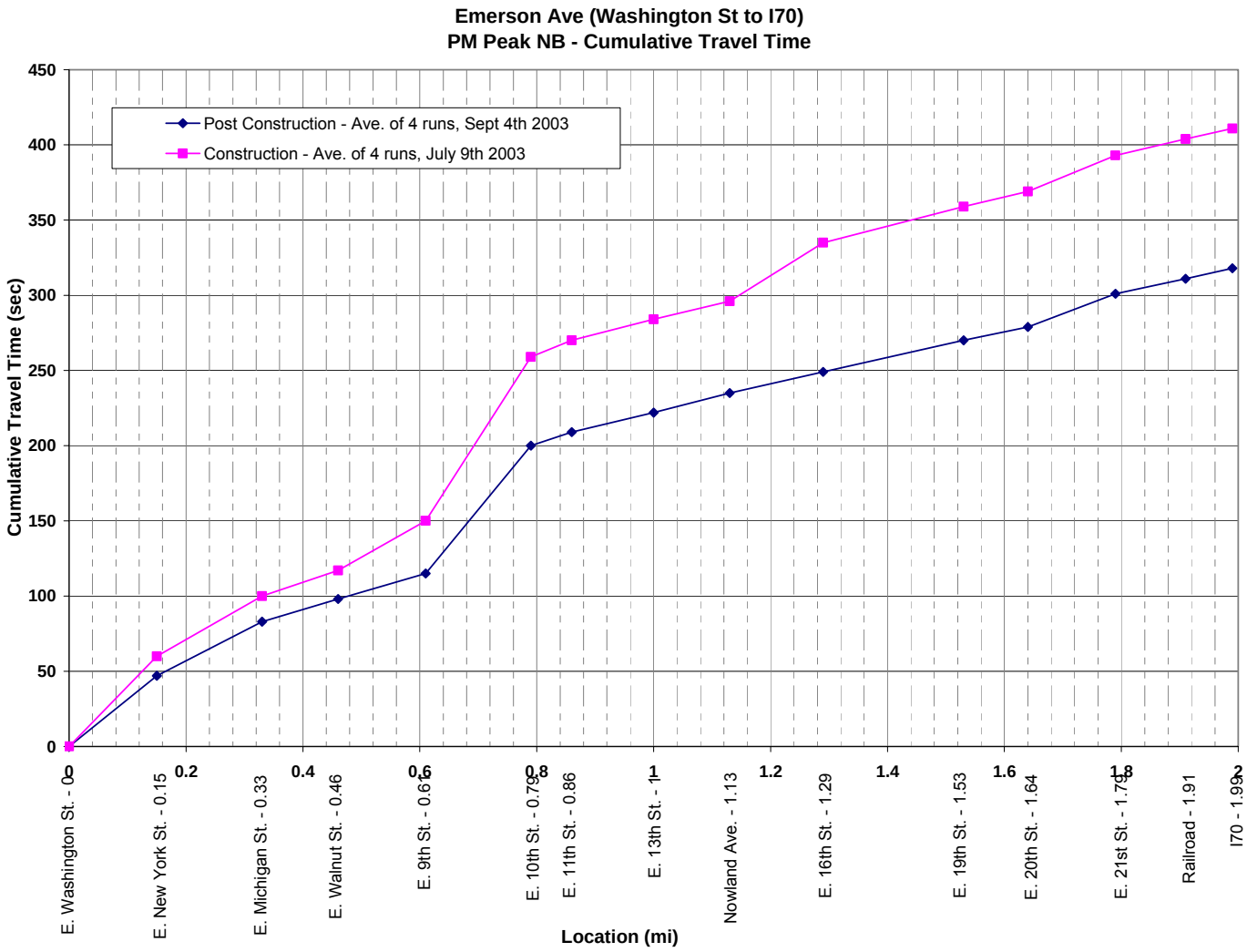

Emerson Ave (Washington St to I70)
PM Peak NB - Cumulative Travel Time
Post Construction - Ave. of 4 runs, Sept 4th 2003
Construction - Ave. of 4 runs, July 9th 2003
Cumulative Travel Time (sec)
450
400
350
300
250
200
150
100
50
0
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
E. Washington St. - 0
E. New York St. - 0.15
E. Michigan St. - 0.33
E. Walnut St. - 0.46
E. 9th St. - 0.61
E. 10th St. - 0.79
E. 11th St. - 0.86
E. 13th St. - 1
Nowland Ave. - 1.13
E. 16th St. - 1.29
E. 19th St. - 1.53
E. 20th St. - 1.64
E. 21st St. - 1.79
Railroad - 1.91
I70 - 1.99
Location (mi)

Figure C-19

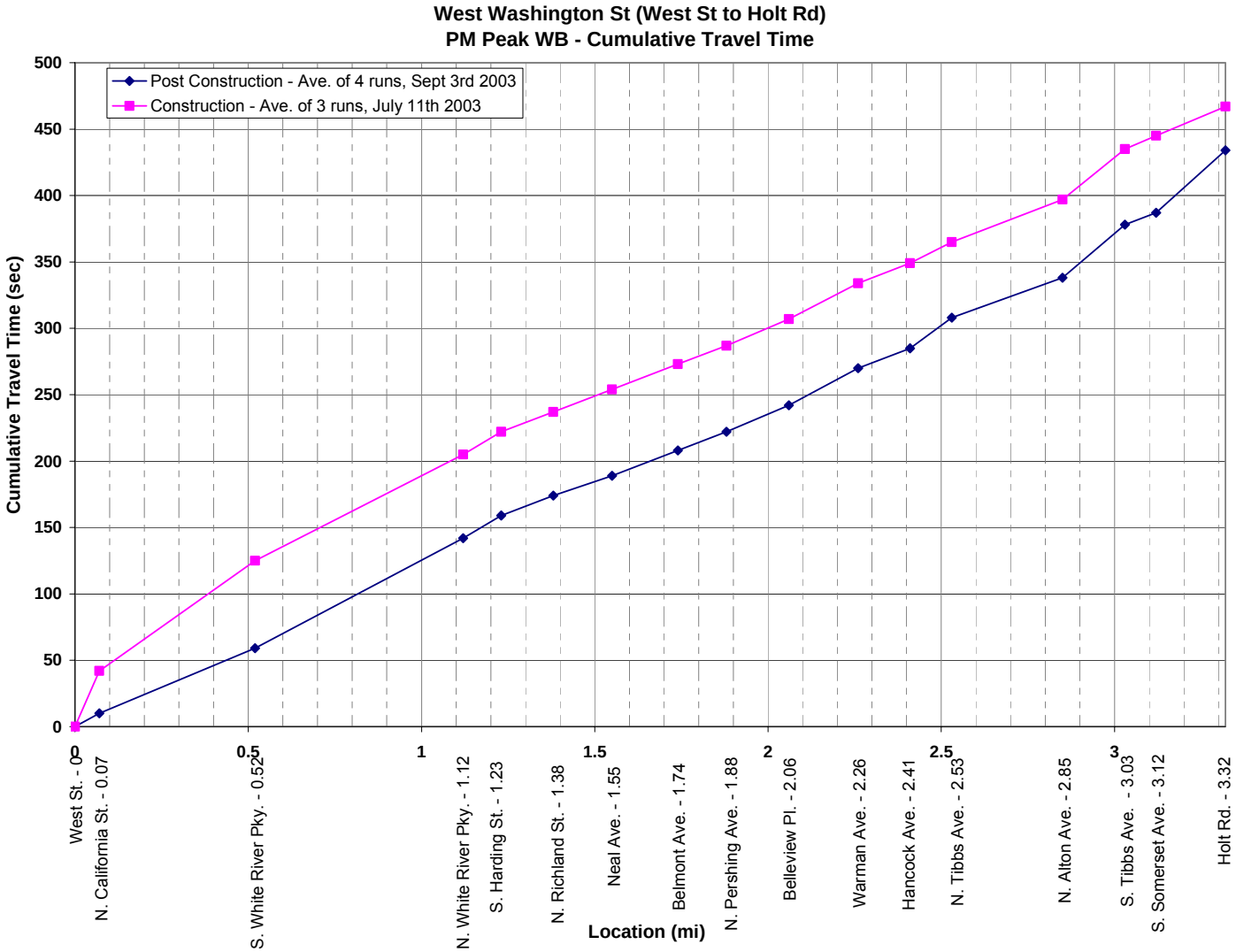

West Washington St (West St to Holt Rd)
PM Peak WB - Cumulative Travel Time
Post Construction - Ave. of 4 runs, Sept 3rd 2003
Construction - Ave. of 3 runs, July 11th 2003
Cumulative Travel Time (sec)
500
450
400
350
300
250
200
150
100
50
0
0
0.5
1
1.5
2
2.5
3
Location (mi)
West St. - 0
N. California St. - 0.07
S. White River Pky. - 0.52
N. White River Pky. - 1.12
S. Harding St. - 1.23
N. Richland St. - 1.38
Neal Ave. - 1.55
Belmont Ave. - 1.74
N. Pershing Ave. - 1.88
Belleview Pl. - 2.06
Warman Ave. - 2.26
Hancock Ave. - 2.41
N. Tibbs Ave. - 2.53
N. Alton Ave. - 2.85
S. Tibbs Ave. - 3.03
S. Somerset Ave. - 3.12
Holt Rd. - 3.32

Figure C-20

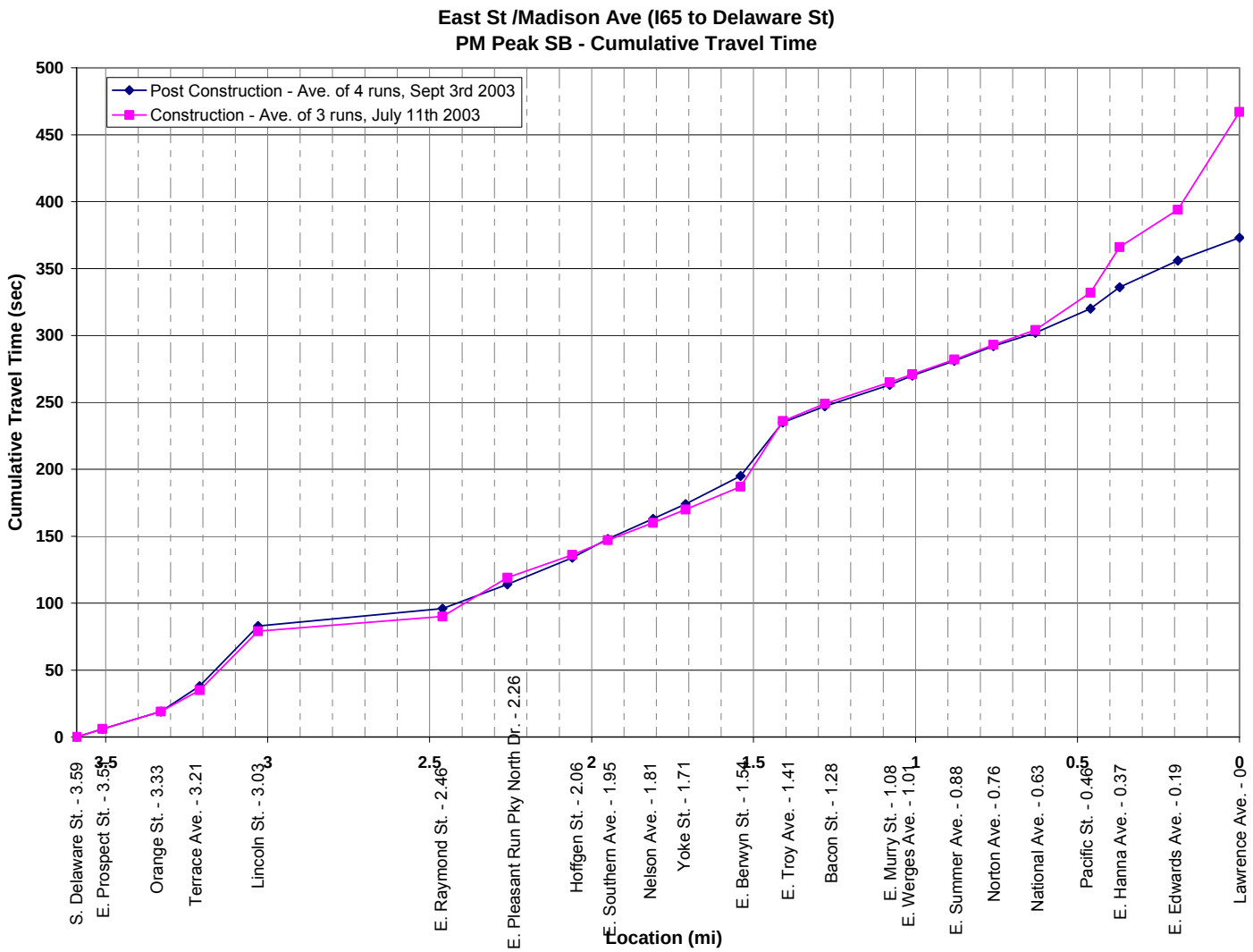

East St /Madison Ave (I65 to Delaware St)
PM Peak SB - Cumulative Travel Time
Post Construction - Ave. of 4 runs, Sept 3rd 2003
Construction - Ave. of 3 runs, July 11th 2003
Cumulative Travel Time (sec)
500
450
400
350
300
250
200
150
100
50
0
3.5
3
2.5
2
1.5
1
0.5
0
S. Delaware St. - 3.59
E. Prospect St. - 3.55
Orange St. - 3.33
Terrace Ave. - 3.21
Lincoln St. - 3.03
E. Raymond St. - 2.46
E. Pleasant Run Pky North Dr. - 2.26
Hoffgen St. - 2.06
E. Southern Ave. - 1.95
Nelson Ave. - 1.81
Yoke St. - 1.71
E. Berwyn St. - 1.54
E. Troy Ave. - 1.41
Bacon St. - 1.28
E. Murry St. - 1.08
E. Werges Ave. - 1.01
E. Summer Ave. - 0.88
Norton Ave. - 0.76
National Ave. - 0.63
Pacific St. - 0.46
E. Hanna Ave. - 0.37
E. Edwards Ave. - 0.19
Lawrence Ave. - 0
Location (mi)

Figure C-21a

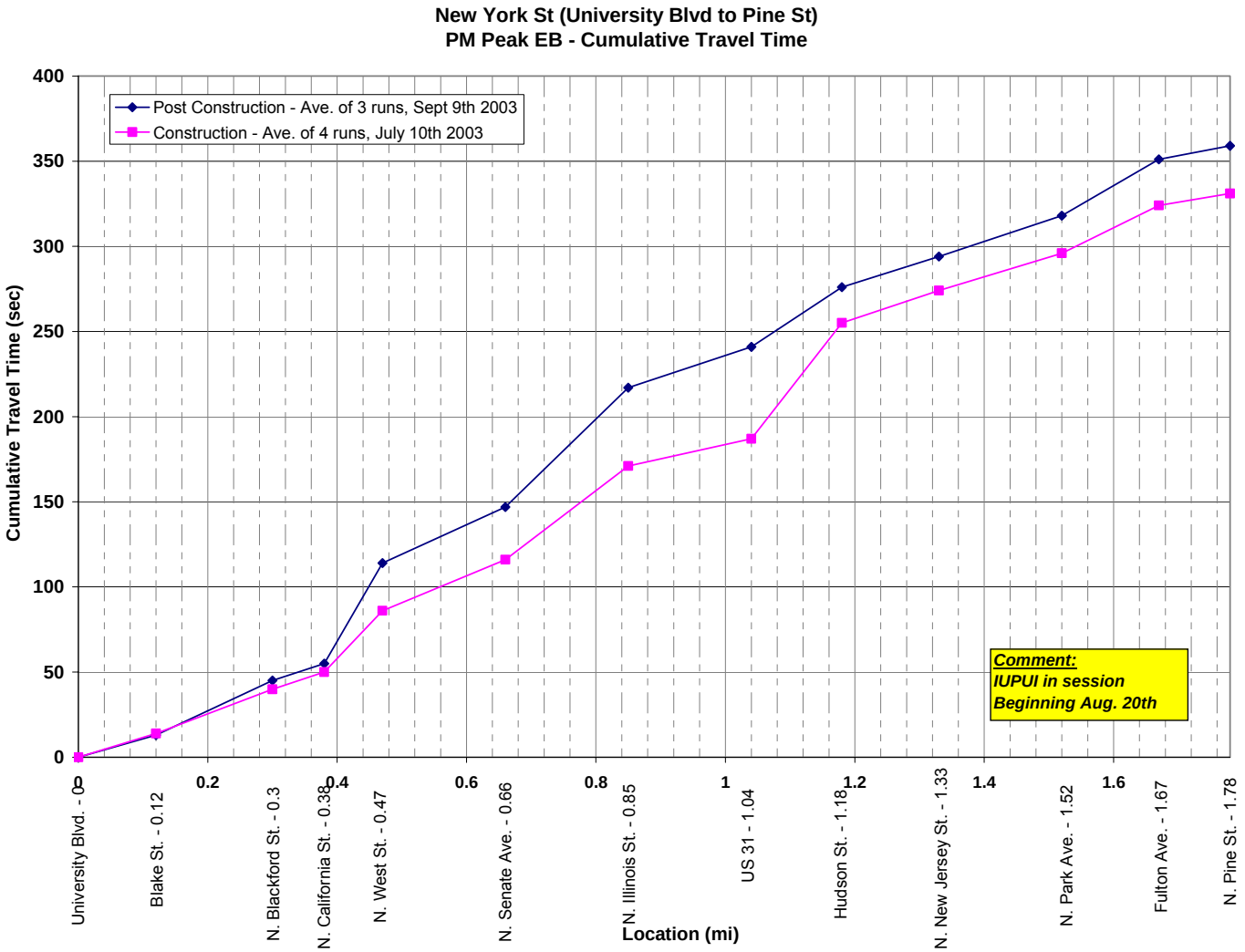
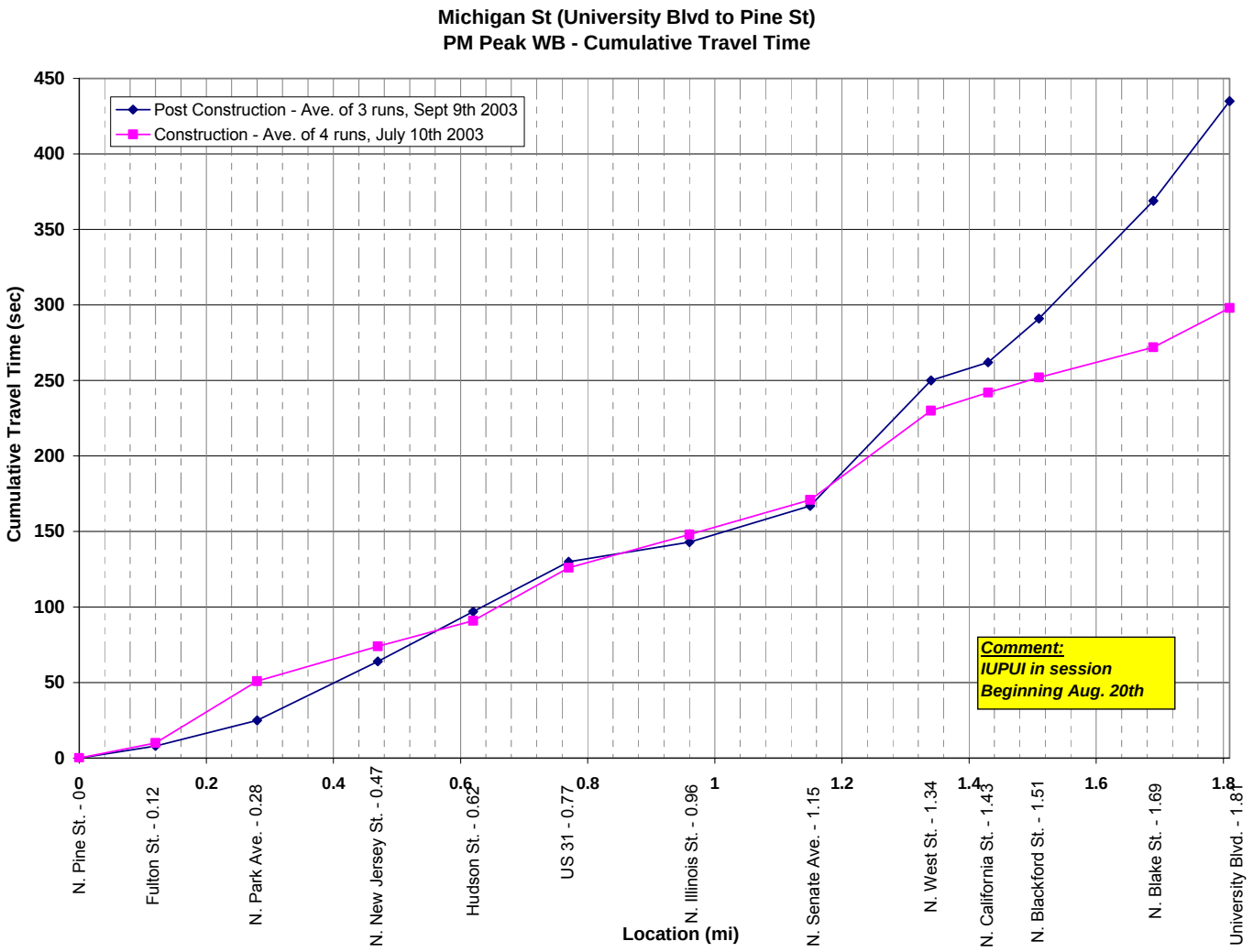

New York St (University Blvd to Pine St)
PM Peak EB - Cumulative Travel Time
Post Construction - Ave. of 3 runs, Sept 9th 2003
Construction - Ave. of 4 runs, July 10th 2003
Cumulative Travel Time (sec)
400
350
300
250
200
150
100
50
0
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
Location (mi)
University Blvd. - 0
Blake St. - 0.12
N. Blackford St. - 0.3
N. California St. - 0.38
N. West St. - 0.47
N. Senate Ave. - 0.66
N. Illinois St. - 0.85
US 31 - 1.04
Hudson St. - 1.18
N. New Jersey St. - 1.33
N. Park Ave. - 1.52
Fulton Ave. - 1.67
N. Pine St. - 1.78
Comment:
IUPUI in session
Beginning Aug. 20th

Figure C-21b


Michigan St (University Blvd to Pine St)
PM Peak WB - Cumulative Travel Time
Post Construction - Ave. of 3 runs, Sept 9th 2003
Construction - Ave. of 4 runs, July 10th 2003
Cumulative Travel Time (sec)
450
400
350
300
250
200
150
100
50
0
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
Location (mi)
N. Pine St. - 0
Fulton St. - 0.12
N. Park Ave. - 0.28
N. New Jersey St. - 0.47
Hudson St. - 0.62
US 31 - 0.77
N. Illinois St. - 0.96
N. Senate Ave. - 1.15
N. West St. - 1.34
N. California St. - 1.43
N. Blackford St. - 1.51
N. Blake St. - 1.69
University Blvd. - 1.81
Comment:
IUPUI in session
Beginning Aug. 20th

Appendix D – Average Speed Graphs

Figure D-1

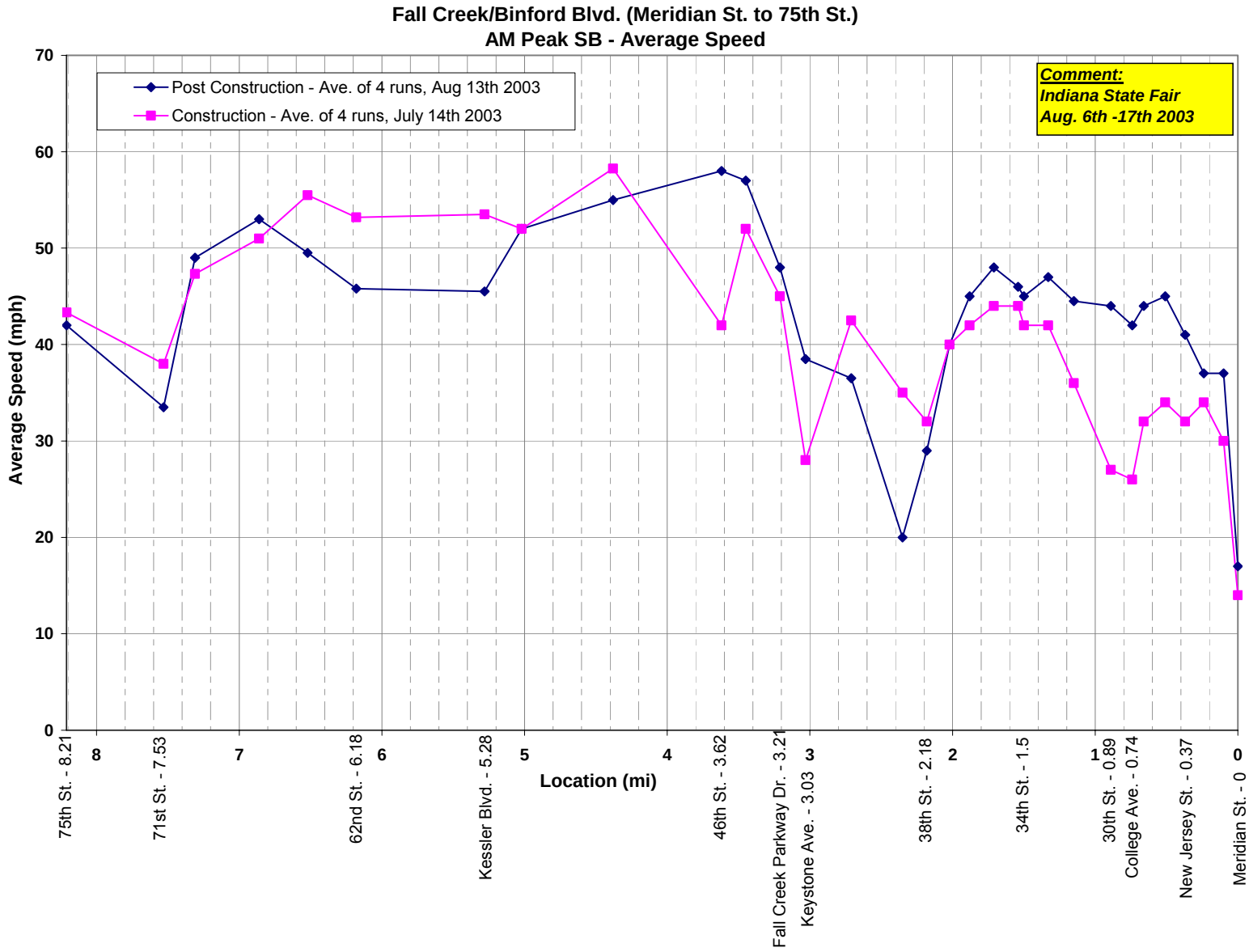

Fall Creek/Binford Blvd. (Meridian St. to 75th St.)
AM Peak SB - Average Speed
Post Construction - Ave. of 4 runs, Aug 13th 2003
Construction - Ave. of 4 runs, July 14th 2003
Comment:
Indiana State Fair
Aug. 6th -17th 2003
Average Speed (mph)
70
60
50
40
30
20
10
0
Location (mi)
8
7
6
5
4
3
2
1
0
75th St. - 8.21
71st St. - 7.53
62nd St. - 6.18
Kessler Blvd. - 5.28
46th St. - 3.62
Fall Creek Parkway Dr. - 3.21
Keystone Ave. - 3.03
38th St. - 2.18
34th St. - 1.5
30th St. - 0.89
College Ave. - 0.74
New Jersey St. - 0.37
Meridian St. - 0

Figure D-2

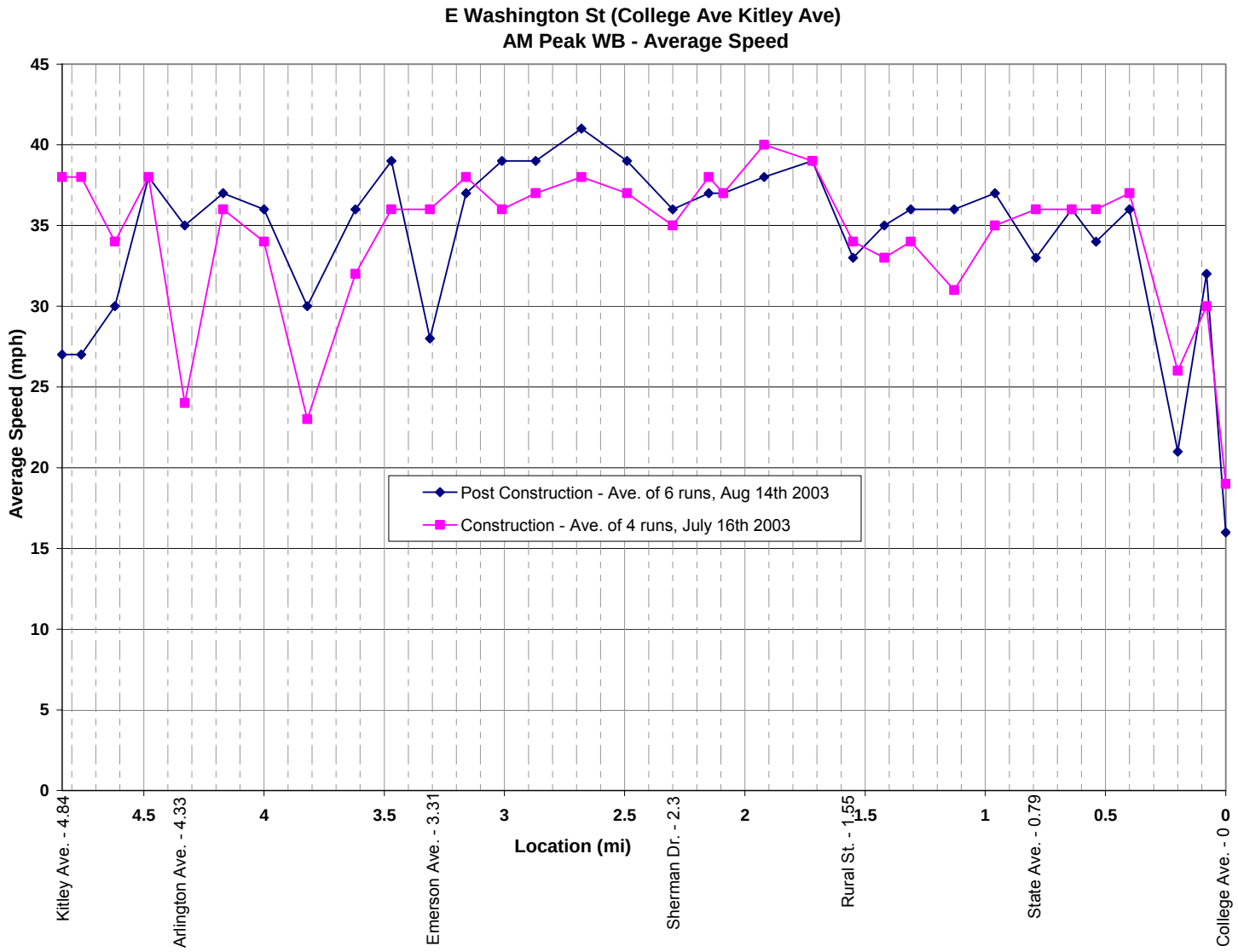

E Washington St (College Ave Kitley Ave)
AM Peak WB - Average Speed
Average Speed (mph)
45
40
35
30
25
20
15
10
5
0
Post Construction - Ave. of 6 runs, Aug 14th 2003
Construction - Ave. of 4 runs, July 16th 2003
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
Location (mi)
Kitley Ave. - 4.84
Arlington Ave. - 4.33
Emerson Ave. - 3.31
Sherman Dr. - 2.3
Rural St. - 1.55
State Ave. - 0.79
College Ave. - 0

Figure D-3a

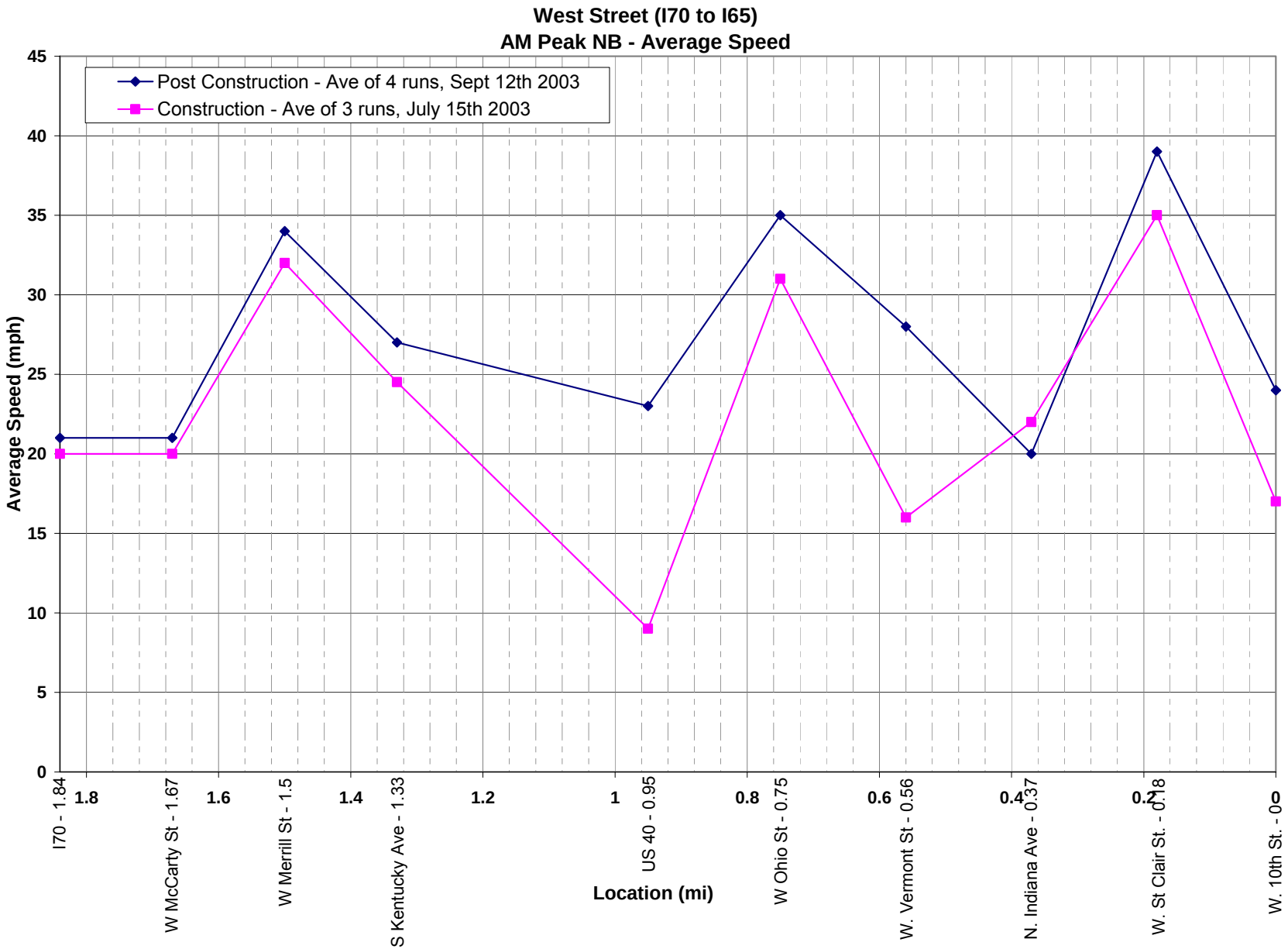

West Street (I70 to I65)
AM Peak NB - Average Speed
Post Construction - Ave of 4 runs, Sept 12th 2003
Construction - Ave of 3 runs, July 15th 2003
Average Speed (mph)
45
40
35
30
25
20
15
10
5
0
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
I70 - 1.84
W McCarty St - 1.67
W Merrill St - 1.5
S Kentucky Ave - 1.33
US 40 - 0.95
W Ohio St - 0.75
W. Vermont St - 0.56
N. Indiana Ave - 0.37
W. St Clair St. - 0.18
W. 10th St. - 0
Location (mi)

Figure D-3b

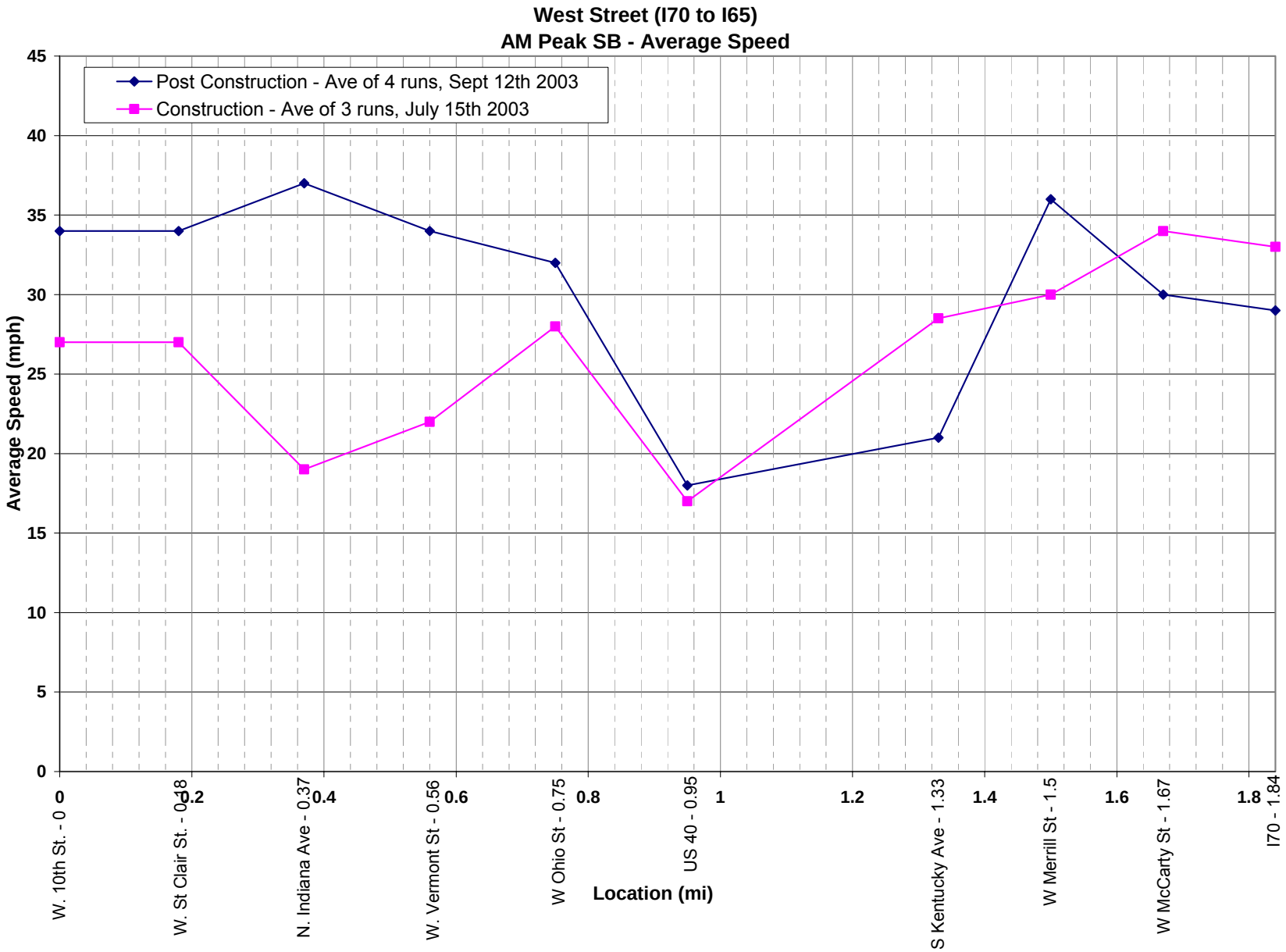

West Street (I70 to I65)
AM Peak SB - Average Speed
Post Construction - Ave of 4 runs, Sept 12th 2003
Construction - Ave of 3 runs, July 15th 2003
Average Speed (mph)
45
40
35
30
25
20
15
10
5
0
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
W. 10th St. - 0
W. St Clair St. - 0.18
N. Indiana Ave - 0.37
W. Vermont St - 0.56
W Ohio St - 0.75
US 40 - 0.95
S Kentucky Ave - 1.33
W Merrill St - 1.5
W McCarty St - 1.67
I70 - 1.84
Location (mi)

Figure D- 4

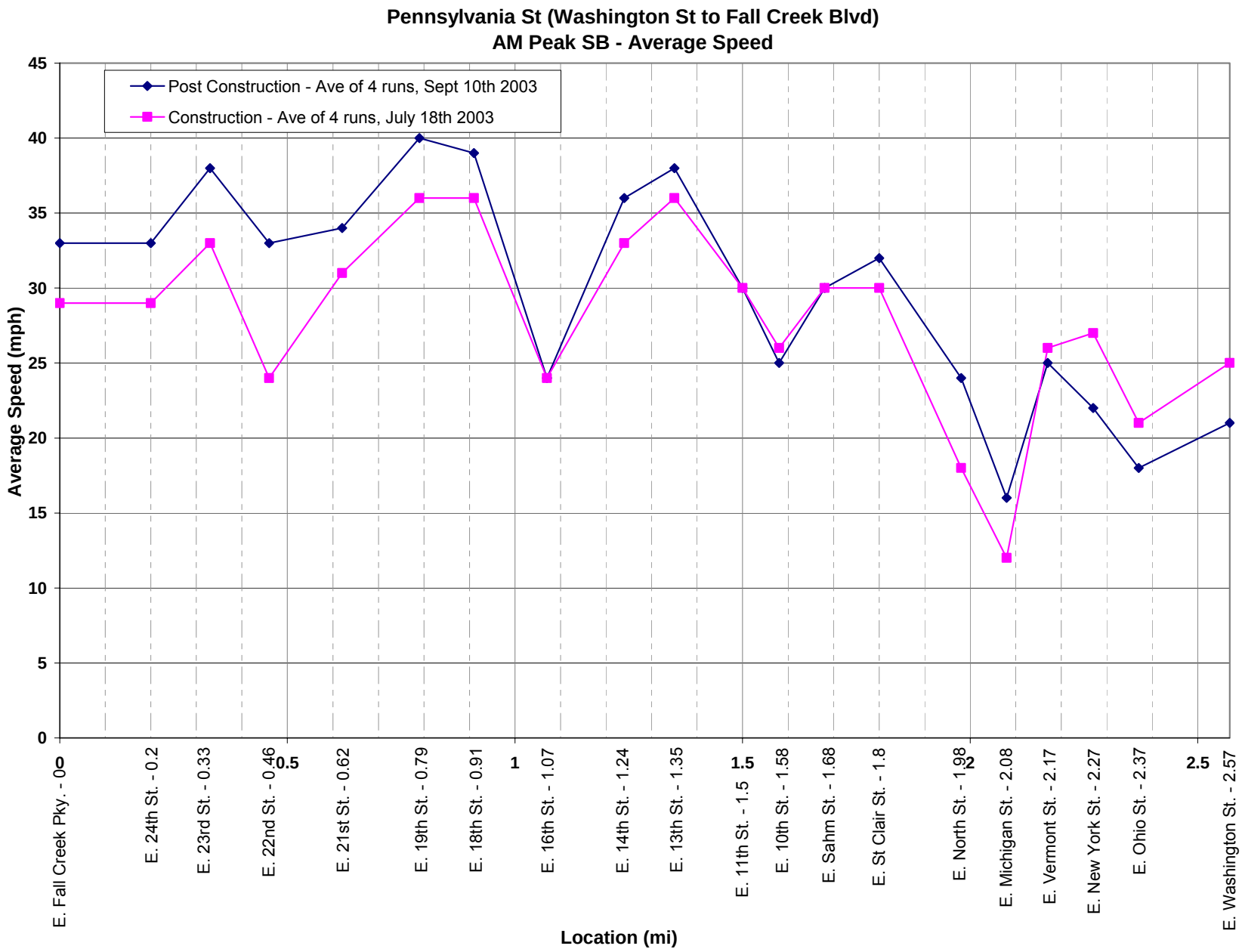

Pennsylvania St (Washington St to Fall Creek Blvd)
AM Peak SB - Average Speed
Post Construction - Ave of 4 runs, Sept 10th 2003
Construction - Ave of 4 runs, July 18th 2003
Average Speed (mph)
45
40
35
30
25
20
15
10
5
0
0
0.5
1
1.5
2
2.5
E. Fall Creek Pky. - 0
E. 24th St. - 0.2
E. 23rd St. - 0.33
E. 22nd St. - 0.46
E. 21st St. - 0.62
E. 19th St. - 0.79
E. 18th St. - 0.91
E. 16th St. - 1.07
E. 14th St. - 1.24
E. 13th St. - 1.35
E. 11th St. - 1.5
E. 10th St. - 1.58
E. Sahm St. - 1.68
E. St Clair St. - 1.8
E. North St. - 1.98
E. Michigan St. - 2.08
E. Vermont St. - 2.17
E. New York St. - 2.27
E. Ohio St. - 2.37
E. Washington St. - 2.57
Location (mi)

Figure D- 5a

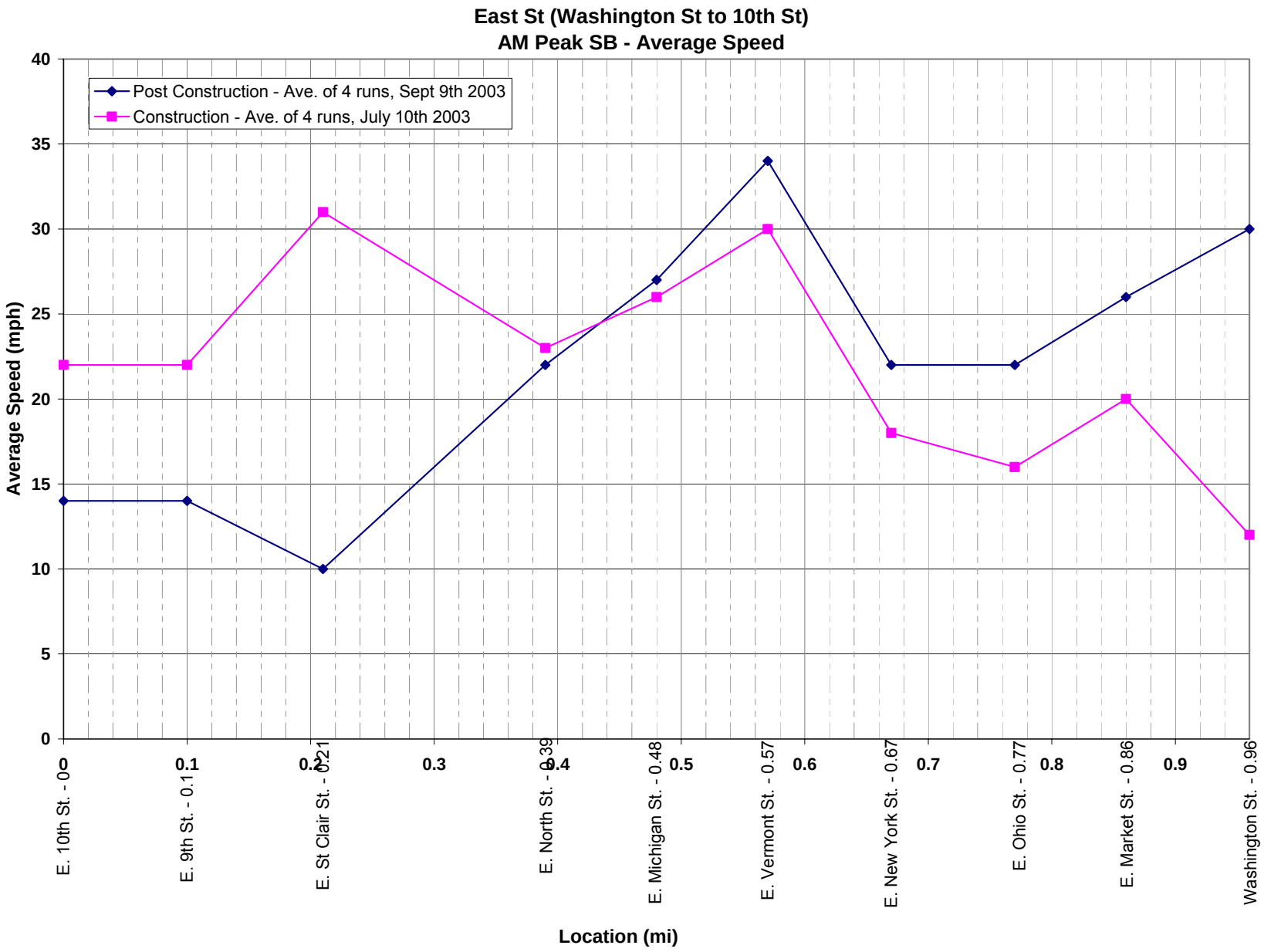

East St (Washington St to 10th St)
AM Peak SB - Average Speed
Post Construction - Ave. of 4 runs, Sept 9th 2003
Construction - Ave. of 4 runs, July 10th 2003
Average Speed (mph)
40
35
30
25
20
15
10
5
0
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
E. 10th St. - 0
E. 9th St. - 0.1
E. St Clair St. - 0.21
E. North St. - 0.39
E. Michigan St. - 0.48
E. Vermont St. - 0.57
E. New York St. - 0.67
E. Ohio St. - 0.77
E. Market St. - 0.86
Washington St. - 0.96
Location (mi)

Figure D- 5b

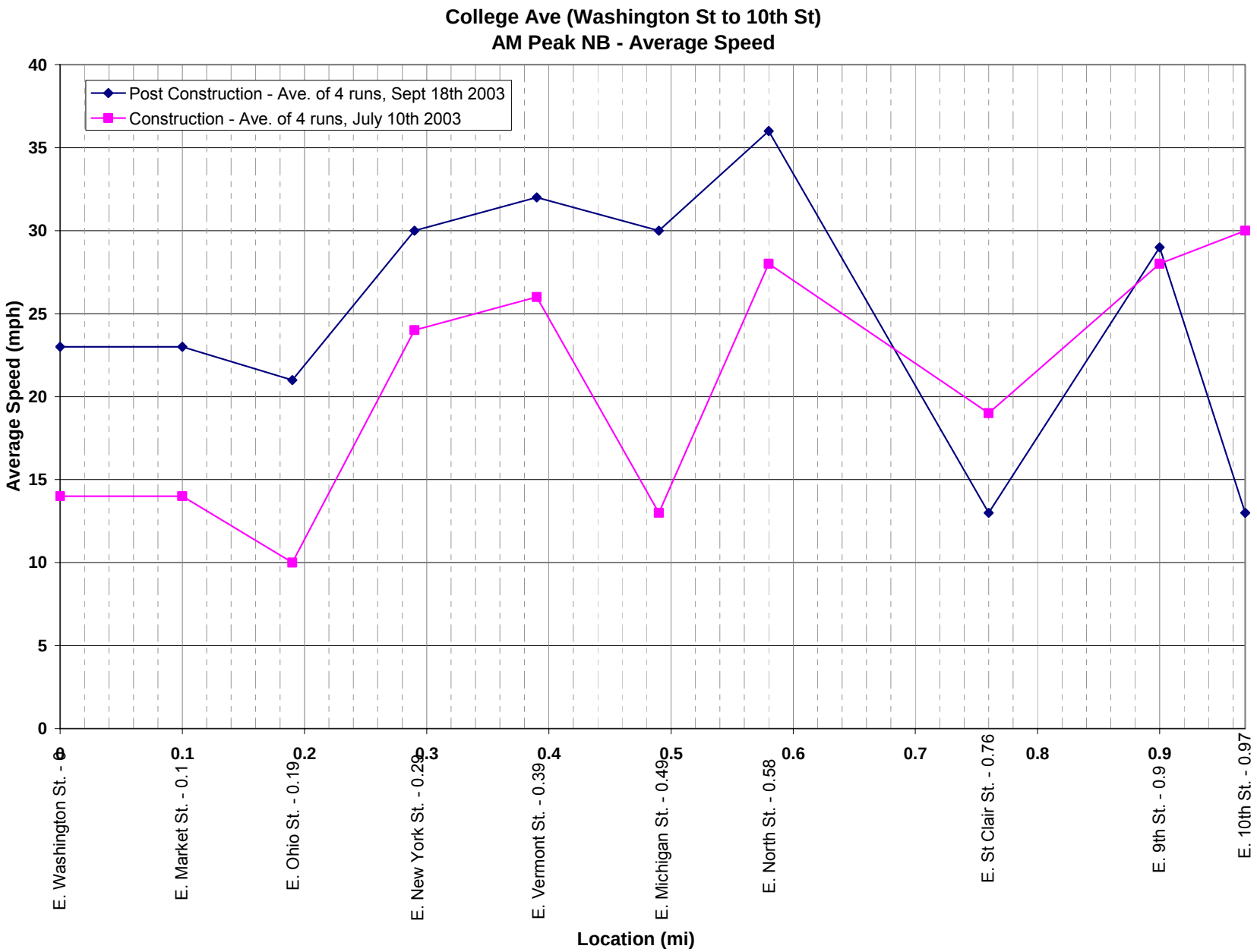

College Ave (Washington St to 10th St)
AM Peak NB - Average Speed
Post Construction - Ave. of 4 runs, Sept 18th 2003
Construction - Ave. of 4 runs, July 10th 2003
Average Speed (mph)
40
35
30
25
20
15
10
5
0
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
E. Washington St. - 0
E. Market St. - 0.1
E. Ohio St. - 0.19
E. New York St. - 0.29
E. Vermont St. - 0.39
E. Michigan St. - 0.49
E. North St. - 0.58
E. St Clair St. - 0.76
E. 9th St. - 0.9
E. 10th St. - 0.97
Location (mi)

Figure D- 6

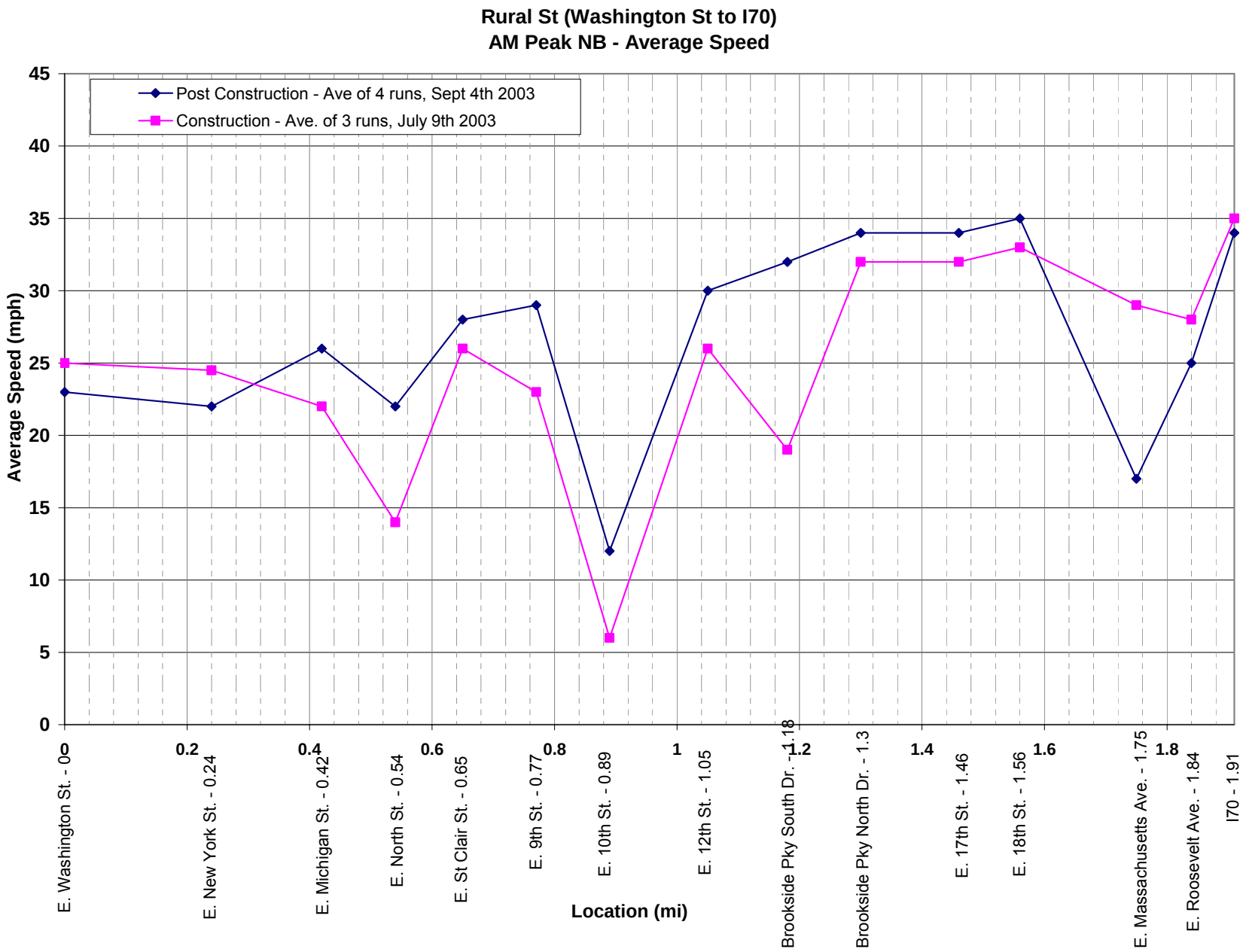

Rural St (Washington St to I70)
AM Peak NB - Average Speed
Post Construction - Ave of 4 runs, Sept 4th 2003
Construction - Ave. of 3 runs, July 9th 2003
Average Speed (mph)
45
40
35
30
25
20
15
10
5
0
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
Location (mi)
E. Washington St. - 0
E. New York St. - 0.24
E. Michigan St. - 0.42
E. North St. - 0.54
E. St Clair St. - 0.65
E. 9th St. - 0.77
E. 10th St. - 0.89
E. 12th St. - 1.05
Brookside Pky South Dr. - 1.18
Brookside Pky North Dr. - 1.3
E. 17th St. - 1.46
E. 18th St. - 1.56
E. Massachusetts Ave. - 1.75
E. Roosevelt Ave. - 1.84
I70 - 1.91

Figure D- 7

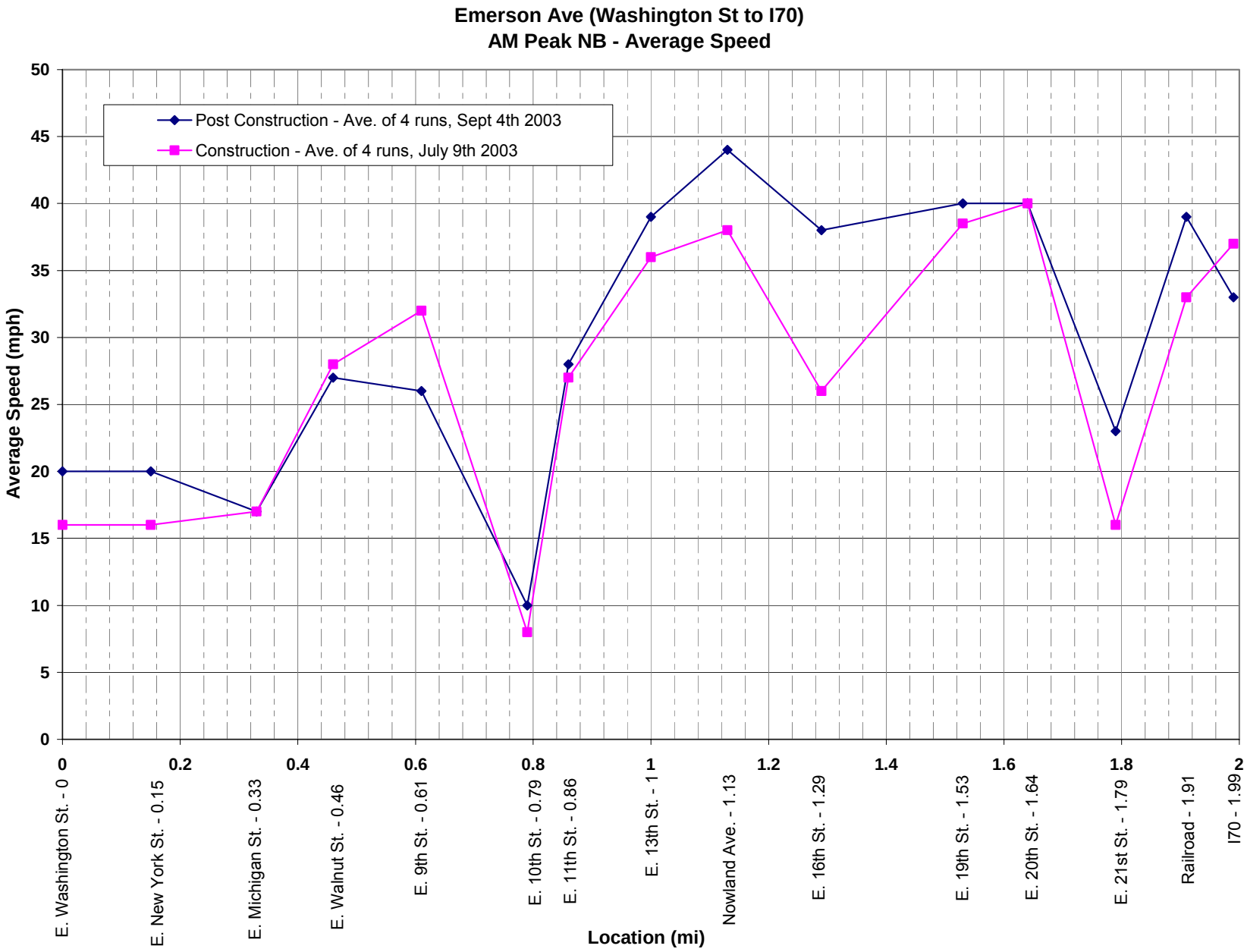

Emerson Ave (Washington St to I70)
AM Peak NB - Average Speed
Post Construction - Ave. of 4 runs, Sept 4th 2003
Construction - Ave. of 4 runs, July 9th 2003
Average Speed (mph)
50
45
40
35
30
25
20
15
10
5
0
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
E. Washington St. - 0
E. New York St. - 0.15
E. Michigan St. - 0.33
E. Walnut St. - 0.46
E. 9th St. - 0.61
E. 10th St. - 0.79
E. 11th St. - 0.86
E. 13th St. - 1
Nowland Ave. - 1.13
E. 16th St. - 1.29
E. 19th St. - 1.53
E. 20th St. - 1.64
E. 21st St. - 1.79
Railroad - 1.91
I70 - 1.99
Location (mi)

Figure D- 8

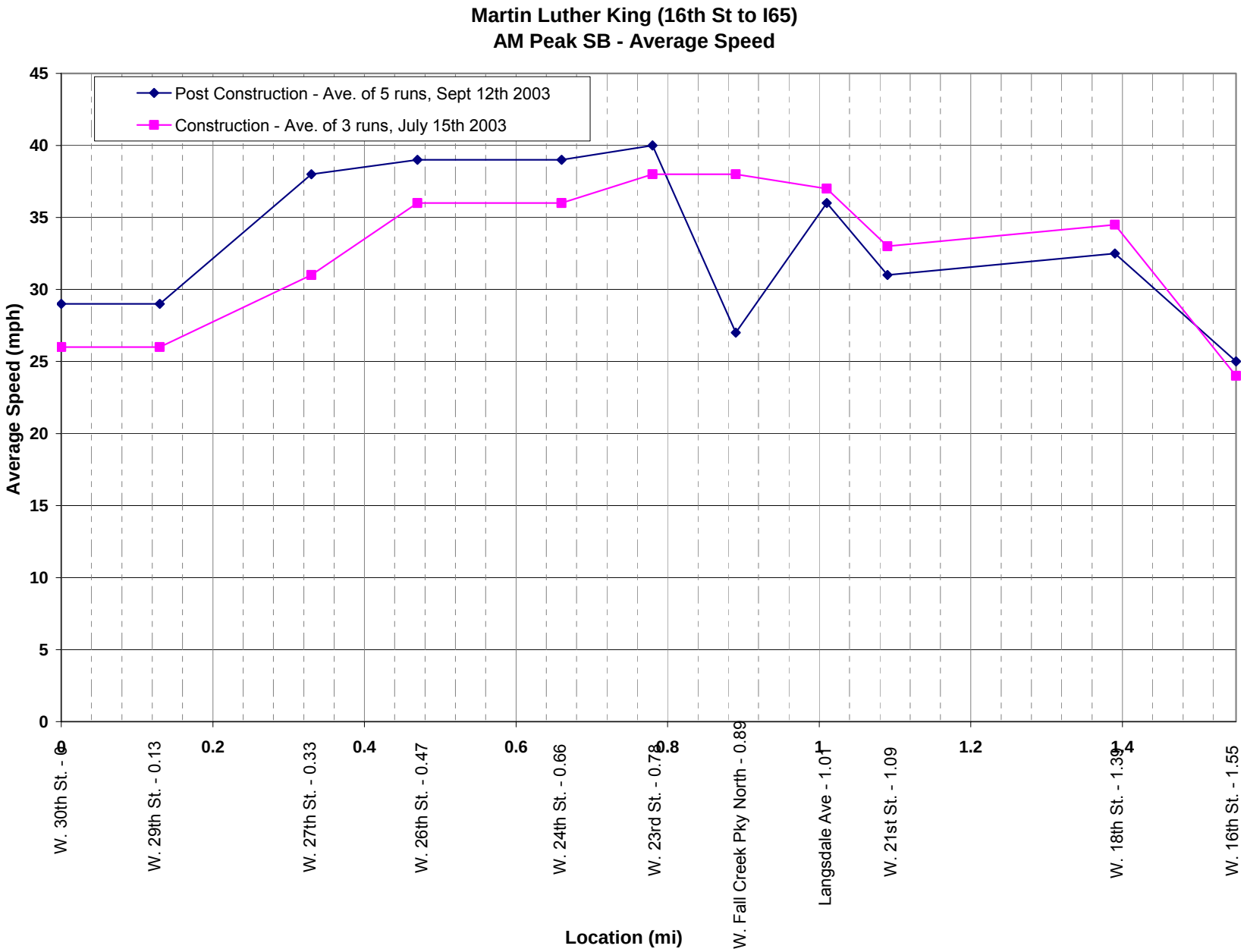

Martin Luther King (16th St to I65)
AM Peak SB - Average Speed
Post Construction - Ave. of 5 runs, Sept 12th 2003
Construction - Ave. of 3 runs, July 15th 2003
Average Speed (mph)
45
40
35
30
25
20
15
10
5
0
0
0.2
0.4
0.6
0.8
1
1.2
1.4
W. 30th St. - 0
W. 29th St. - 0.13
W. 27th St. - 0.33
W. 26th St. - 0.47
W. 24th St. - 0.66
W. 23rd St. - 0.78
W. Fall Creek Pky North - 0.89
Langsdale Ave - 1.01
W. 21st St. - 1.09
W. 18th St. - 1.39
W. 16th St. - 1.55
Location (mi)

Figure D- 9

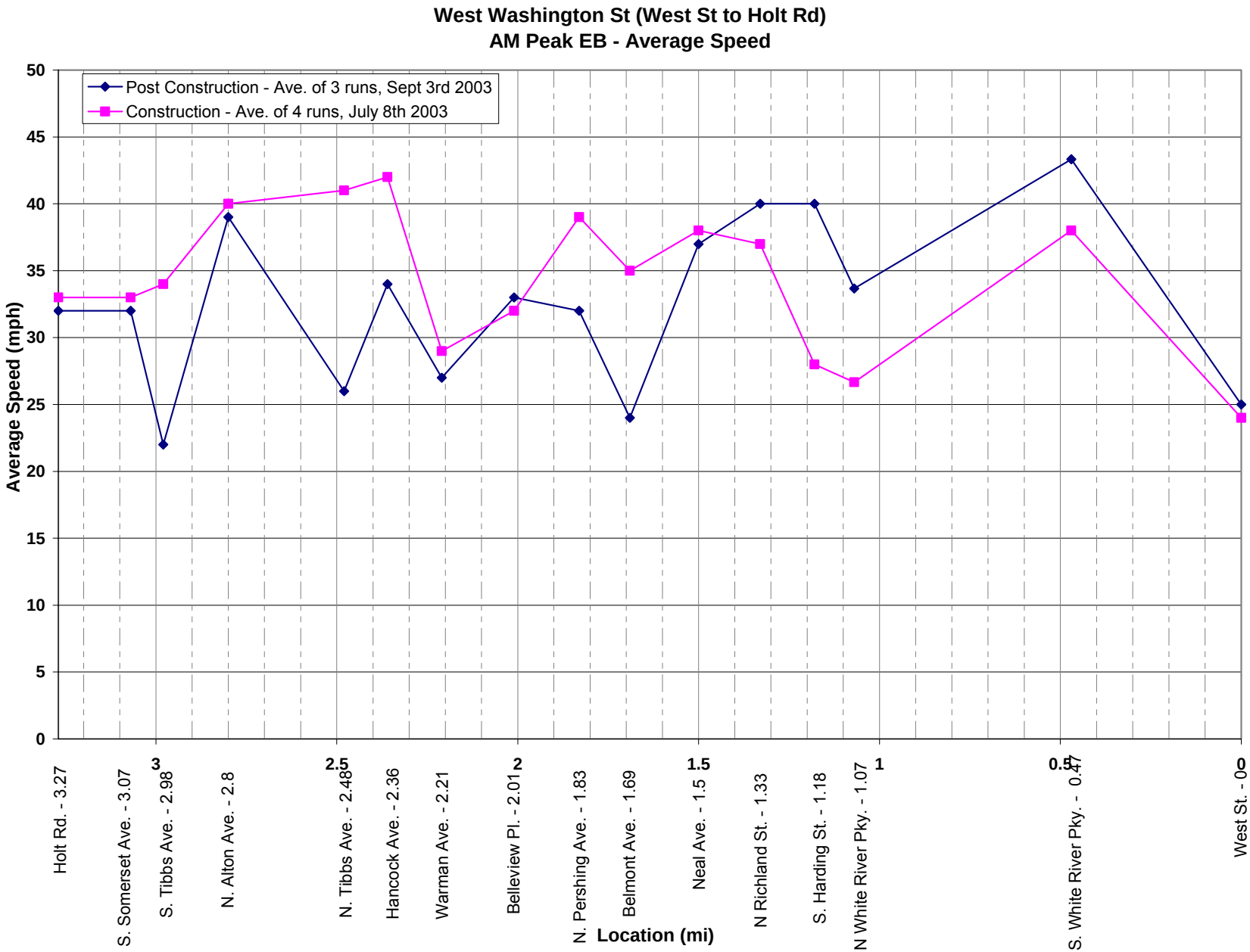

West Washington St (West St to Holt Rd)
AM Peak EB - Average Speed
Post Construction - Ave. of 3 runs, Sept 3rd 2003
Construction - Ave. of 4 runs, July 8th 2003
Average Speed (mph)
50
45
40
35
30
25
20
15
10
5
0
Holt Rd. - 3.27
S. Somerset Ave. - 3.07
S. Tibbs Ave. - 2.98
N. Alton Ave. - 2.8
N. Tibbs Ave. - 2.48
Hancock Ave. - 2.36
Warman Ave. - 2.21
Belleview Pl. - 2.01
N. Pershing Ave. - 1.83
Belmont Ave. - 1.69
Neal Ave. - 1.5
N Richland St. - 1.33
S. Harding St. - 1.18
N White River Pky. - 1.07
S. White River Pky. - 0.47
West St. - 0
3
2.5
2
1.5
1
0.5
0
Location (mi)

Figure D- 10

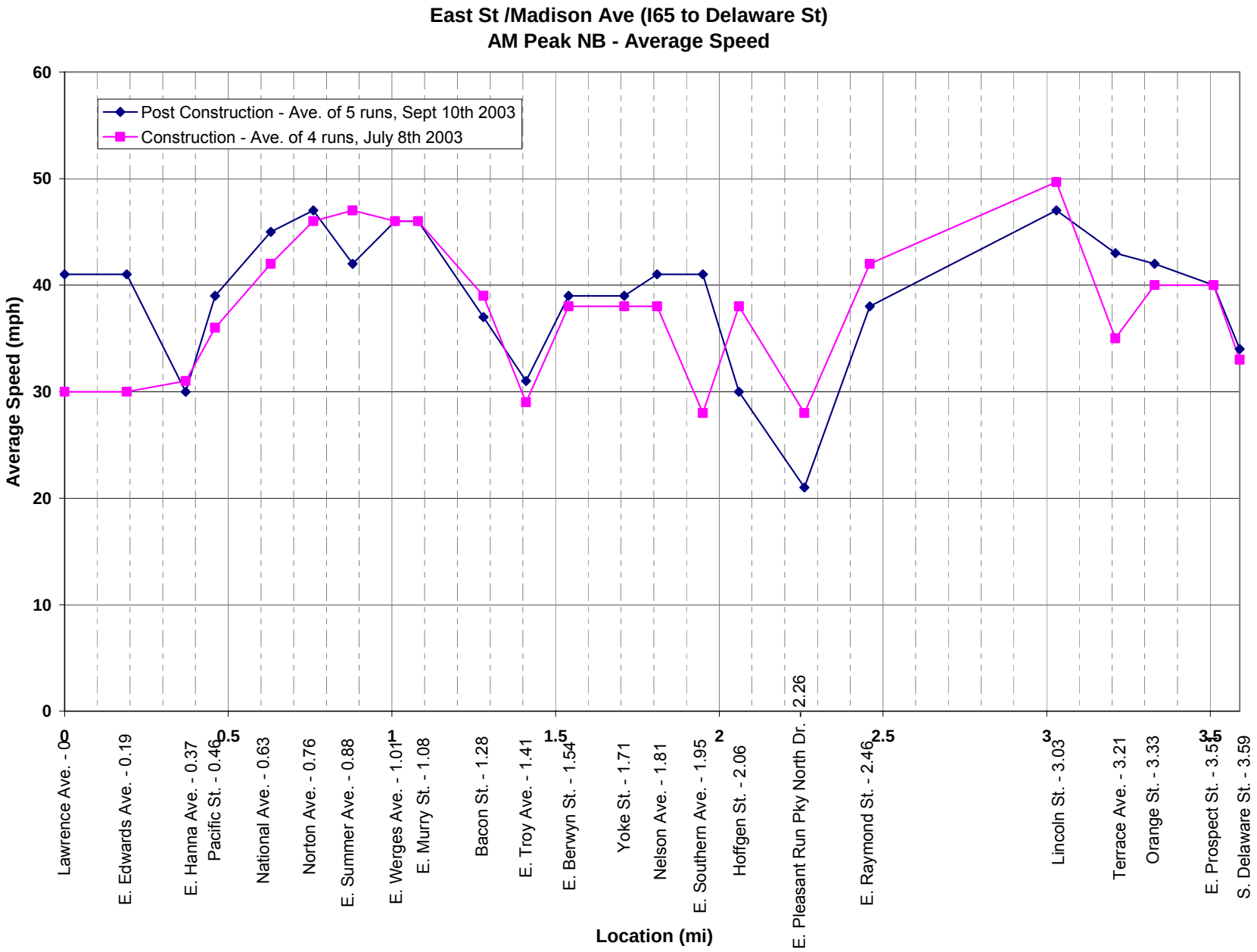

East St /Madison Ave (I65 to Delaware St)
AM Peak NB - Average Speed
Post Construction - Ave. of 5 runs, Sept 10th 2003
Construction - Ave. of 4 runs, July 8th 2003
Average Speed (mph)
60
50
40
30
20
10
0
0
0.5
1
1.5
2
2.5
3
3.5
Location (mi)
Lawrence Ave. - 0
E. Edwards Ave. - 0.19
E. Hanna Ave. - 0.37
Pacific St. - 0.46
National Ave. - 0.63
Norton Ave. - 0.76
E. Summer Ave. - 0.88
E. Werges Ave. - 1.01
E. Murry St. - 1.08
Bacon St. - 1.28
E. Troy Ave. - 1.41
E. Berwyn St. - 1.54
Yoke St. - 1.71
Nelson Ave. - 1.81
E. Southern Ave. - 1.95
Hoffgen St. - 2.06
E. Pleasant Run Pky North Dr. - 2.26
E. Raymond St. - 2.46
Lincoln St. - 3.03
Terrace Ave. - 3.21
Orange St. - 3.33
E. Prospect St. - 3.55
S. Delaware St. - 3.59

Figure D- 11a

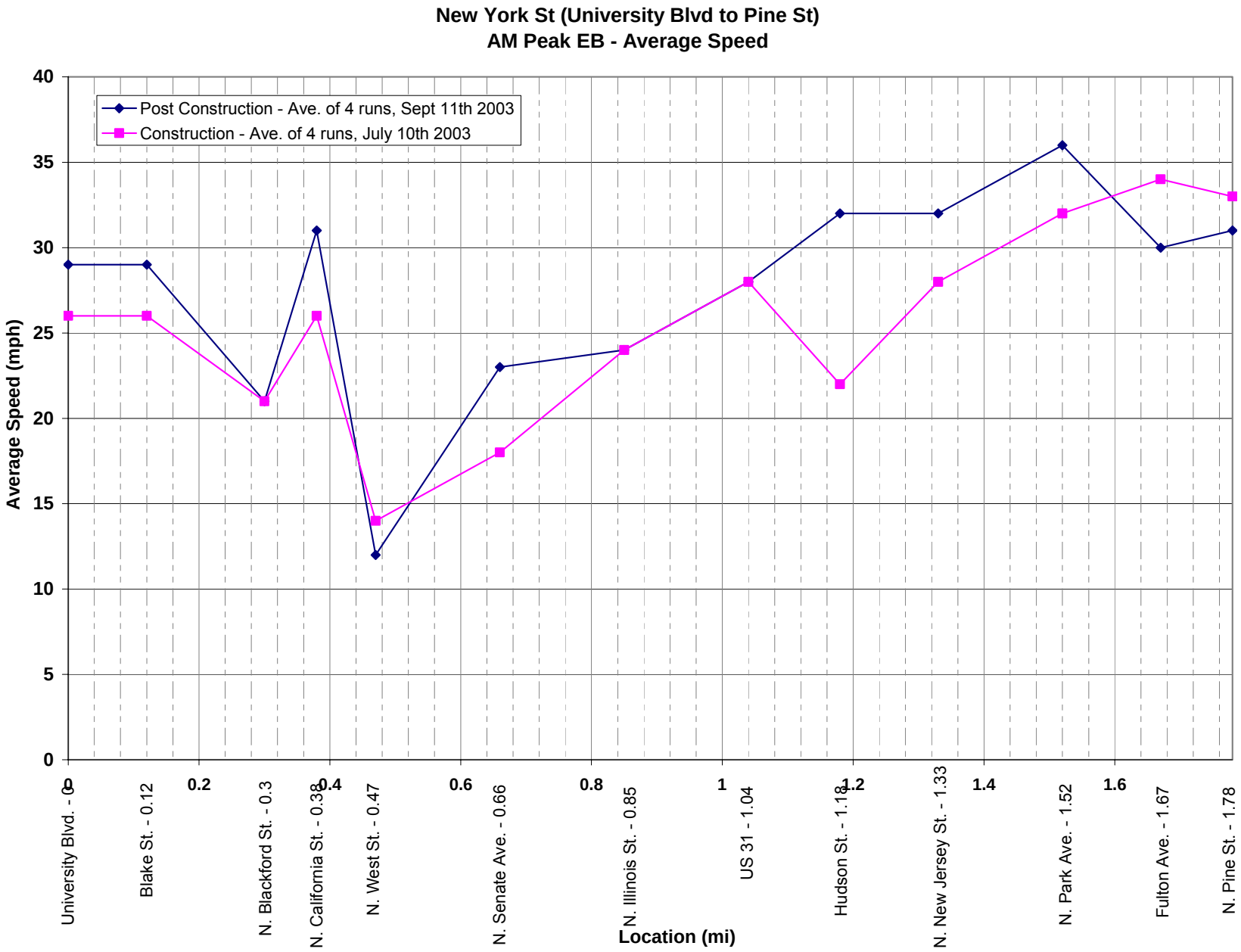

New York St (University Blvd to Pine St)
AM Peak EB - Average Speed
Post Construction - Ave. of 4 runs, Sept 11th 2003
Construction - Ave. of 4 runs, July 10th 2003
Average Speed (mph)
40
35
30
25
20
15
10
5
0
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
University Blvd. - 0
Blake St. - 0.12
N. Blackford St. - 0.3
N. California St. - 0.38
N. West St. - 0.47
N. Senate Ave. - 0.66
N. Illinois St. - 0.85
US 31 - 1.04
Hudson St. - 1.18
N. New Jersey St. - 1.33
N. Park Ave. - 1.52
Fulton Ave. - 1.67
N. Pine St. - 1.78
Location (mi)

Figure D- 11b

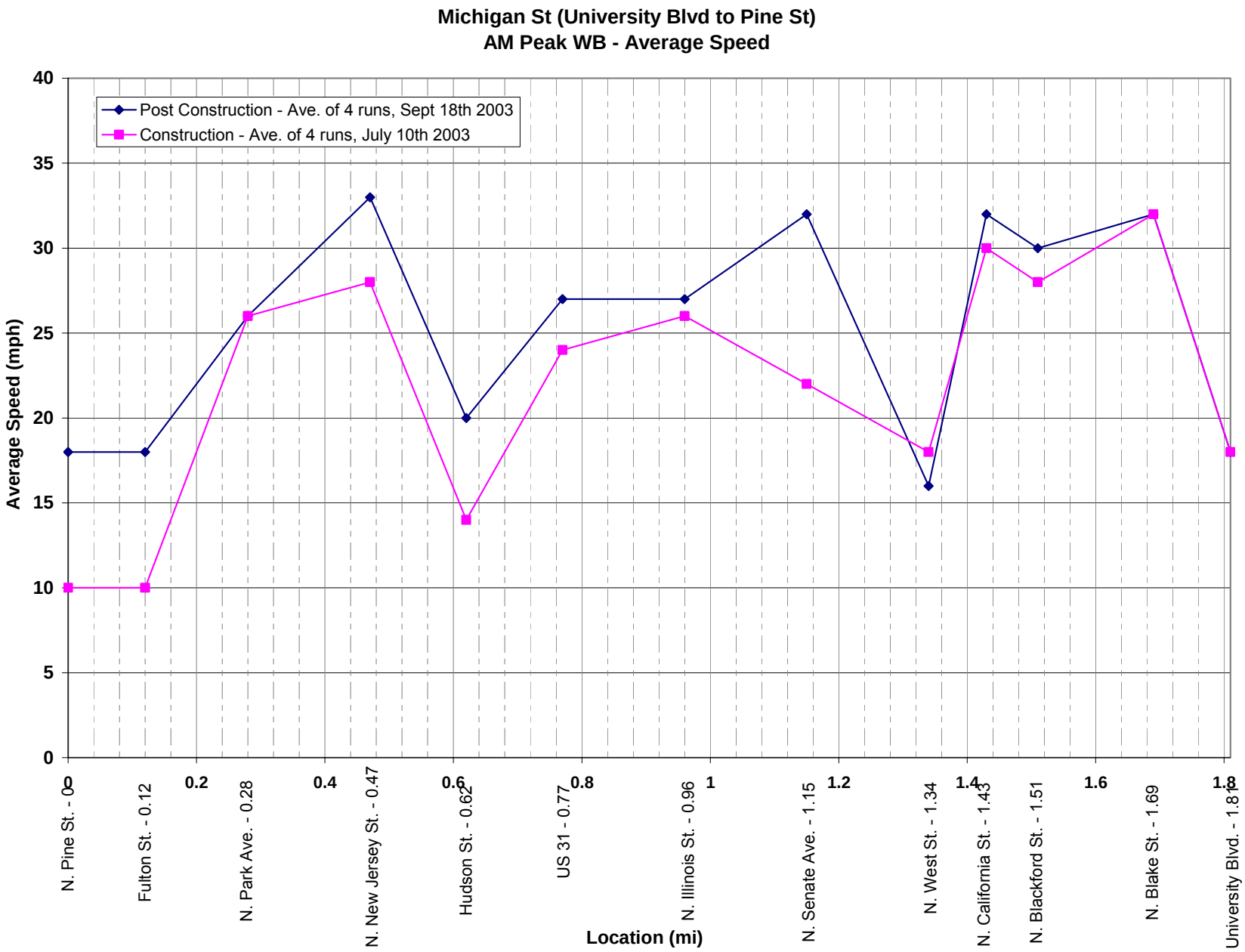

Michigan St (University Blvd to Pine St)
AM Peak WB - Average Speed
Post Construction - Ave. of 4 runs, Sept 18th 2003
Construction - Ave. of 4 runs, July 10th 2003
Average Speed (mph)
40
35
30
25
20
15
10
5
0
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
Location (mi)
N. Pine St. - 0
Fulton St. - 0.12
N. Park Ave. - 0.28
N. New Jersey St. - 0.47
Hudson St. - 0.62
US 31 - 0.77
N. Illinois St. - 0.96
N. Senate Ave. - 1.15
N. West St. - 1.34
N. California St. - 1.43
N. Blackford St. - 1.51
N. Blake St. - 1.69
University Blvd. - 1.81

Figure D- 12

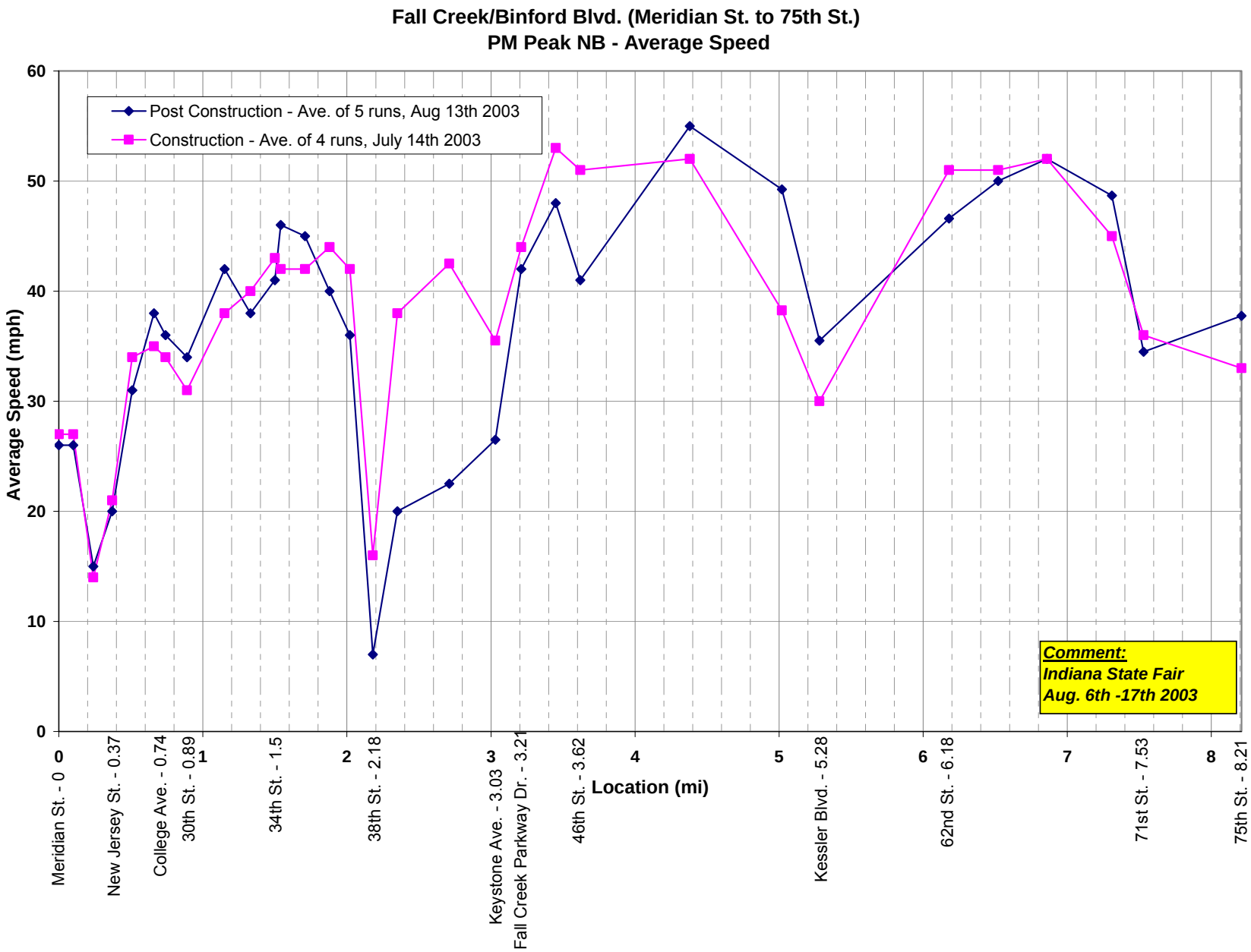

Fall Creek/Binford Blvd. (Meridian St. to 75th St.)
PM Peak NB - Average Speed
Post Construction - Ave. of 5 runs, Aug 13th 2003
Construction - Ave. of 4 runs, July 14th 2003
Average Speed (mph)
60
50
40
30
20
10
0
Comment:
Indiana State Fair
Aug. 6th -17th 2003
0
1
2
3
4
5
6
7
8
Location (mi)
Meridian St. - 0
New Jersey St. - 0.37
College Ave. - 0.74
30th St. - 0.89
34th St. - 1.5
38th St. - 2.18
Keystone Ave. - 3.03
Fall Creek Parkway Dr. - 3.21
46th St. - 3.62
Kessler Blvd. - 5.28
62nd St. - 6.18
71st St. - 7.53
75th St. - 8.21

Figure D-13

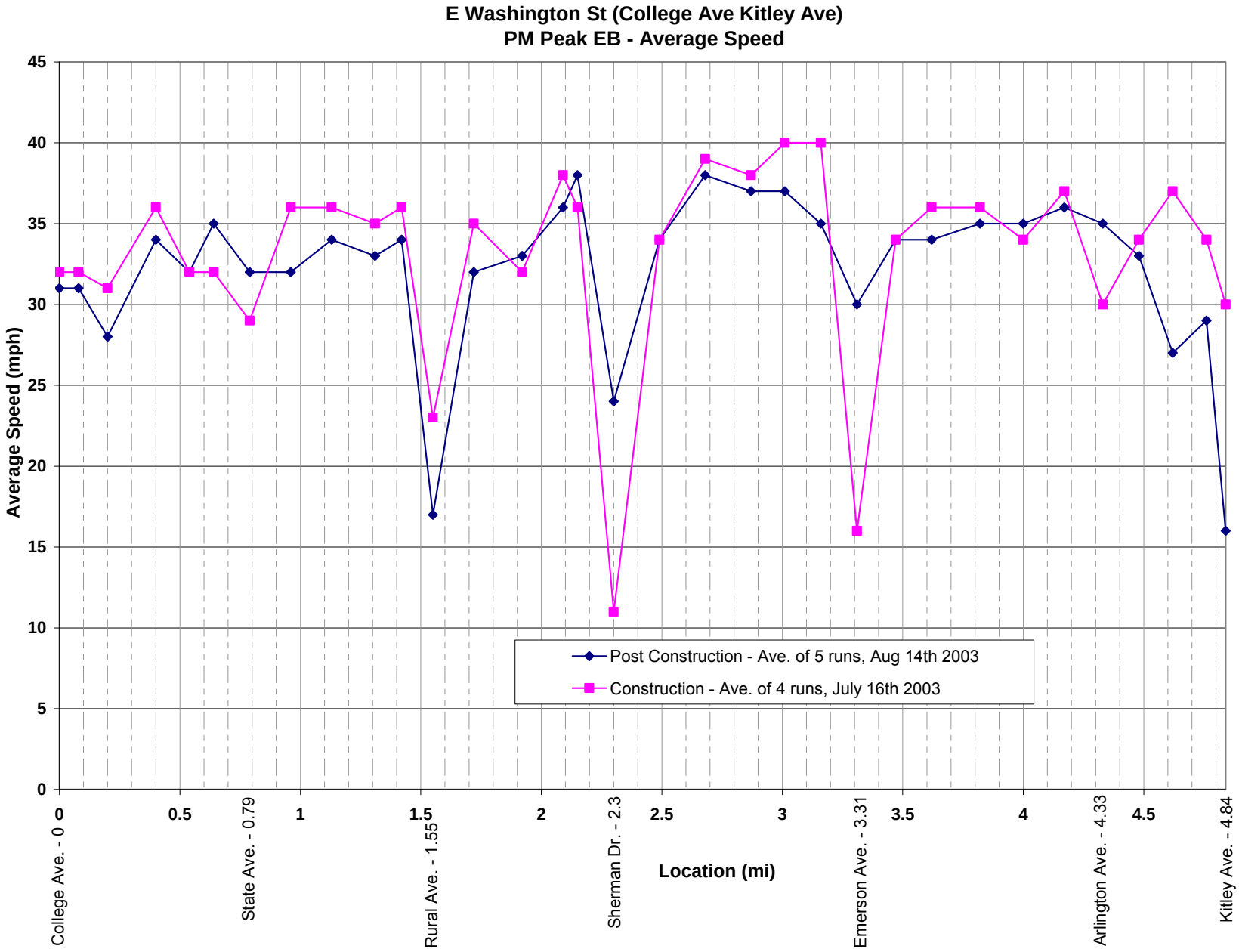

E Washington St (College Ave Kitley Ave)
PM Peak EB - Average Speed
Average Speed (mph)
45
40
35
30
25
20
15
10
5
0
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
College Ave. - 0
State Ave. - 0.79
Rural Ave. - 1.55
Sherman Dr. - 2.3
Emerson Ave. - 3.31
Arlington Ave. - 4.33
Kitley Ave. - 4.84
Location (mi)
Post Construction - Ave. of 5 runs, Aug 14th 2003
Construction - Ave. of 4 runs, July 16th 2003

Figure D- 14a

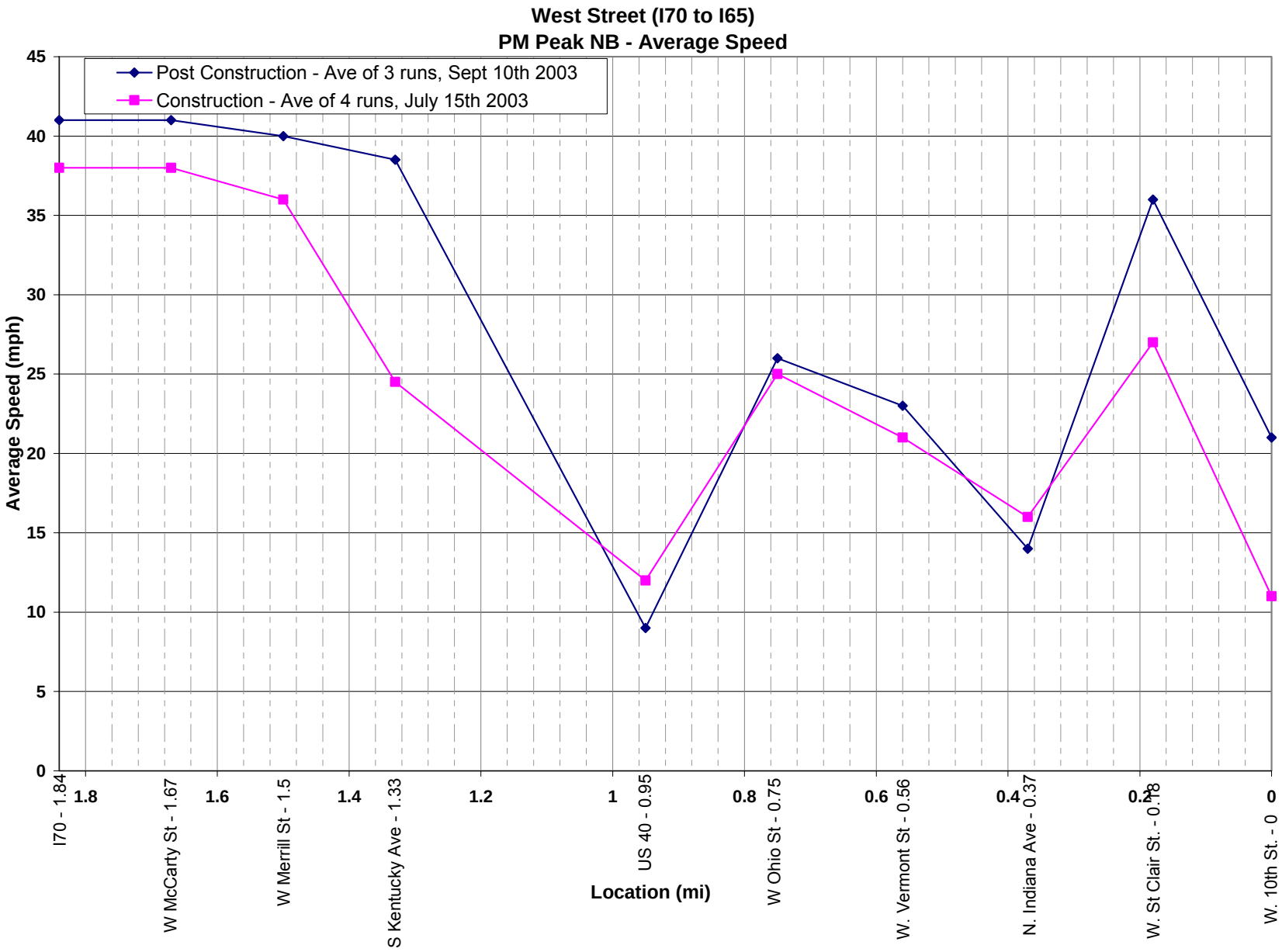

West Street (I70 to I65)
PM Peak NB - Average Speed
Post Construction - Ave of 3 runs, Sept 10th 2003
Construction - Ave of 4 runs, July 15th 2003
Average Speed (mph)
45
40
35
30
25
20
15
10
5
0
1.84
1.8
1.67
1.6
1.5
1.4
1.33
1.2
1
0.95
0.8
0.75
0.6
0.56
0.4
0.37
0.2
0.18
0
I70 - 1.84
W McCarty St - 1.67
W Merrill St - 1.5
S Kentucky Ave - 1.33
US 40 - 0.95
W Ohio St - 0.75
W. Vermont St - 0.56
N. Indiana Ave - 0.37
W. St Clair St. - 0.18
W. 10th St. - 0
Location (mi)

Figure D-14b

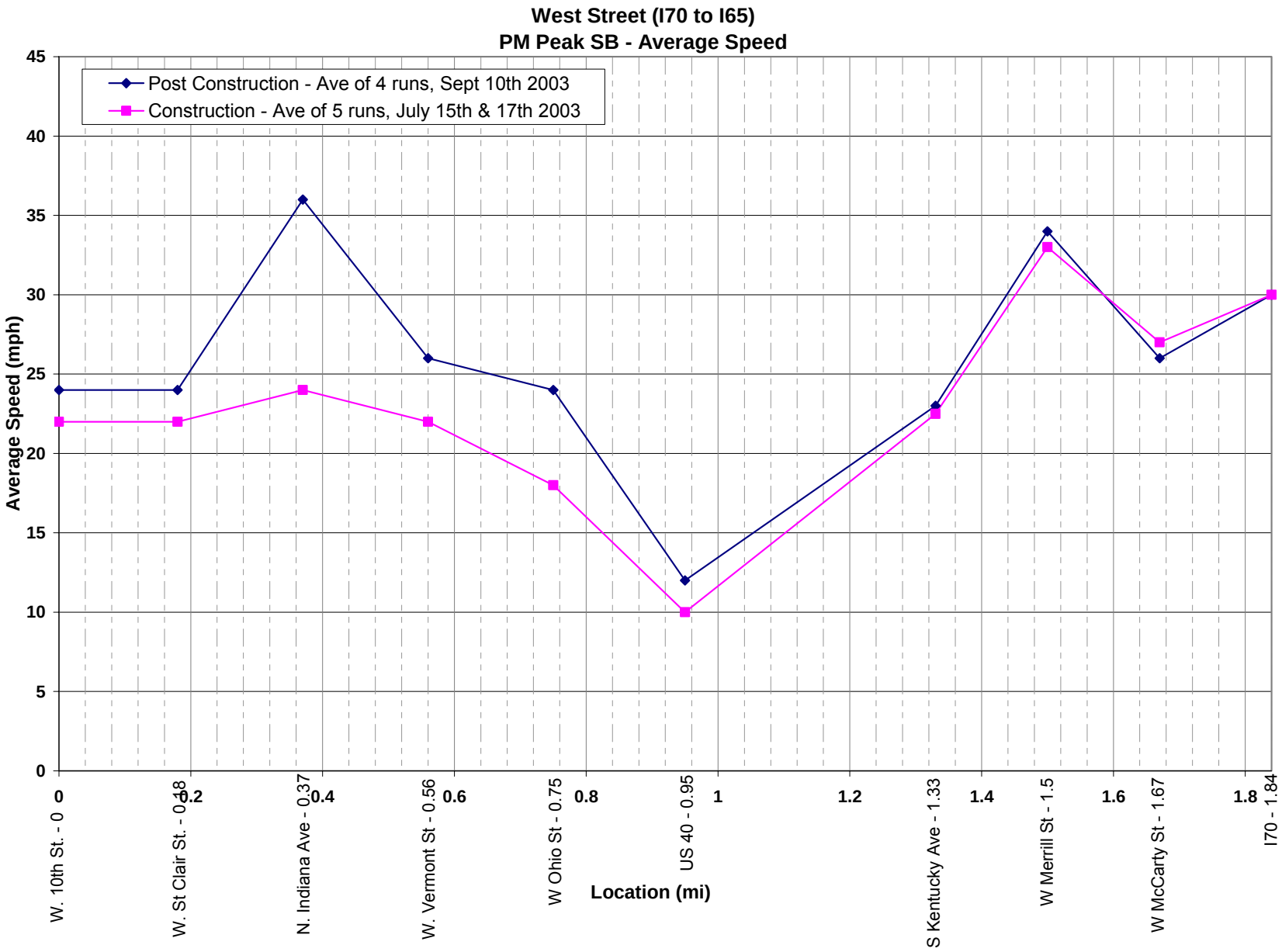

West Street (I70 to I65)
PM Peak SB - Average Speed
Post Construction - Ave of 4 runs, Sept 10th 2003
Construction - Ave of 5 runs, July 15th & 17th 2003
Average Speed (mph)
45
40
35
30
25
20
15
10
5
0
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
Location (mi)
W. 10th St. - 0
W. St Clair St. - 0.18
N. Indiana Ave - 0.37
W. Vermont St - 0.56
W Ohio St - 0.75
US 40 - 0.95
S Kentucky Ave - 1.33
W Merrill St - 1.5
W McCarty St - 1.67
I70 - 1.84

Figure D- 15

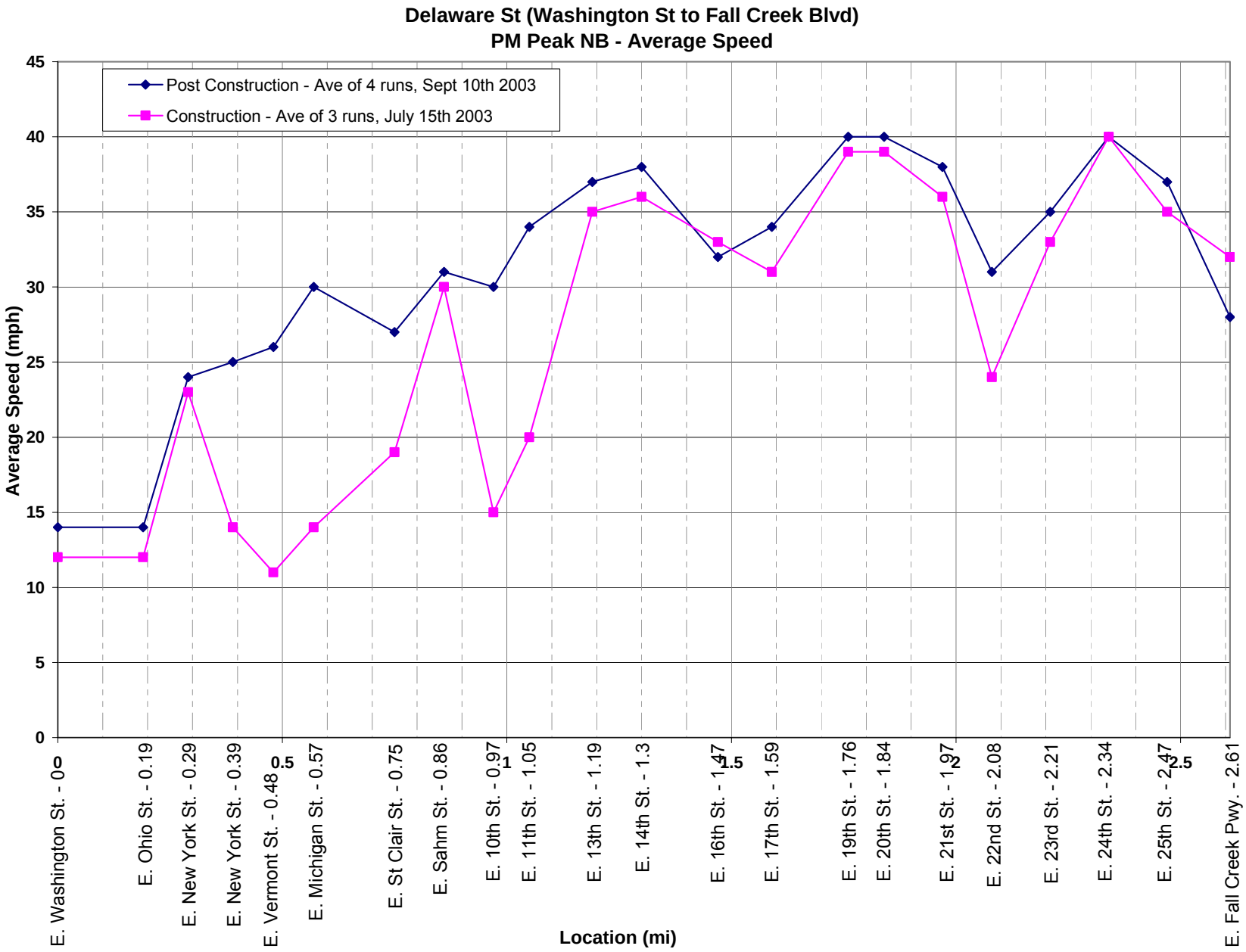

Delaware St (Washington St to Fall Creek Blvd)
PM Peak NB - Average Speed
Post Construction - Ave of 4 runs, Sept 10th 2003
Construction - Ave of 3 runs, July 15th 2003
Average Speed (mph)
45
40
35
30
25
20
15
10
5
0
E. Washington St. - 0
E. Ohio St. - 0.19
E. New York St. - 0.29
E. New York St. - 0.39
E. Vermont St. - 0.48
E. Michigan St. - 0.57
E. St Clair St. - 0.75
E. Sahm St. - 0.86
E. 10th St. - 0.97
E. 11th St. - 1.05
E. 13th St. - 1.19
E. 14th St. - 1.3
E. 16th St. - 1.47
E. 17th St. - 1.59
E. 19th St. - 1.76
E. 20th St. - 1.84
E. 21st St. - 1.97
E. 22nd St. - 2.08
E. 23rd St. - 2.21
E. 24th St. - 2.34
E. 25th St. - 2.47
E. Fall Creek Pwy. - 2.61
0
0.5
1
1.5
2
2.5
Location (mi)

Figure D-16a

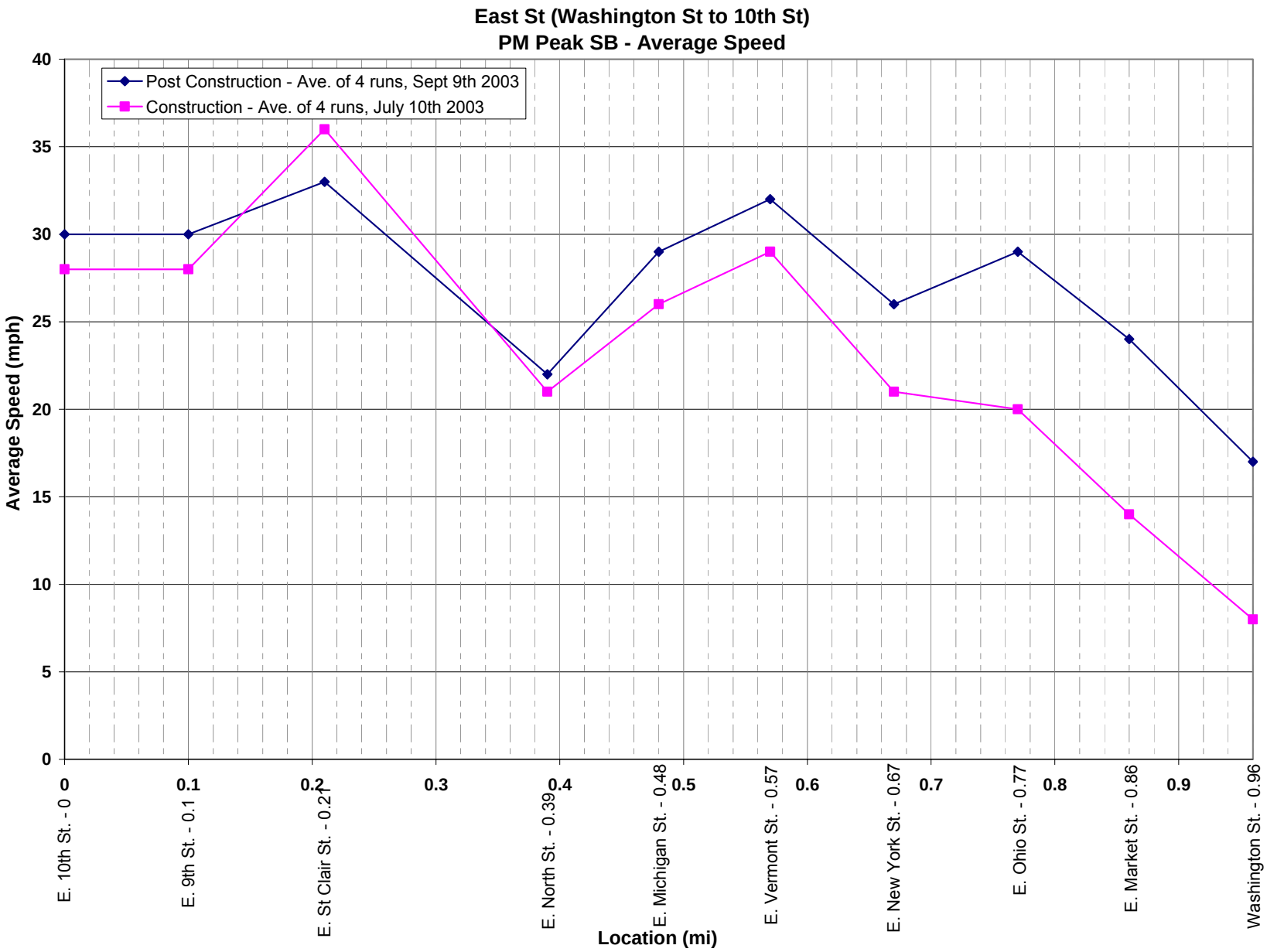

East St (Washington St to 10th St)
PM Peak SB - Average Speed
Post Construction - Ave. of 4 runs, Sept 9th 2003
Construction - Ave. of 4 runs, July 10th 2003
Average Speed (mph)
40
35
30
25
20
15
10
5
0
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
E. 10th St. - 0
E. 9th St. - 0.1
E. St Clair St. - 0.21
E. North St. - 0.39
E. Michigan St. - 0.48
E. Vermont St. - 0.57
E. New York St. - 0.67
E. Ohio St. - 0.77
E. Market St. - 0.86
Washington St. - 0.96
Location (mi)

Figure D- 16b

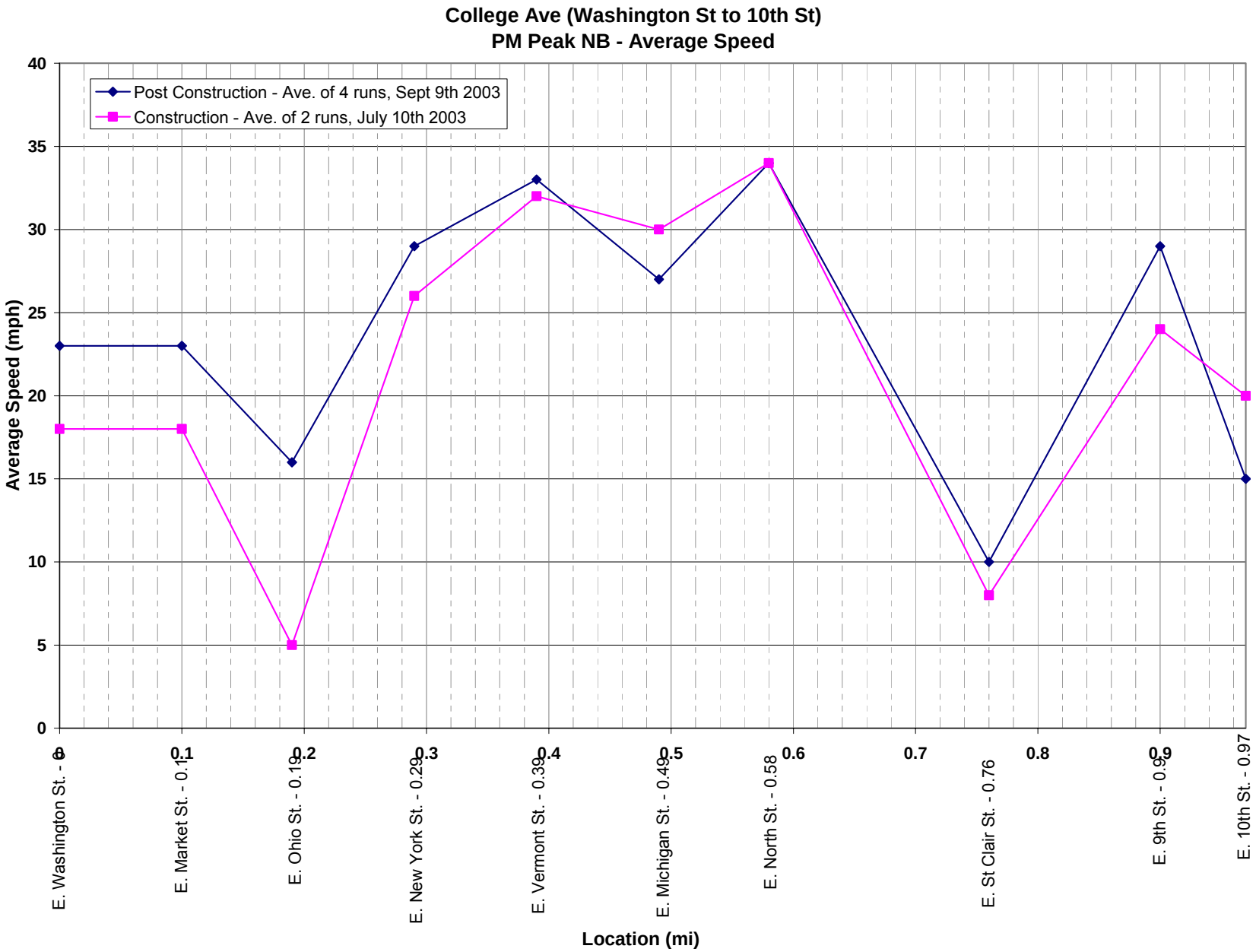

College Ave (Washington St to 10th St)
PM Peak NB - Average Speed
Post Construction - Ave. of 4 runs, Sept 9th 2003
Construction - Ave. of 2 runs, July 10th 2003
Average Speed (mph)
40
35
30
25
20
15
10
5
0
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
E. Washington St. - 0
E. Market St. - 0.1
E. Ohio St. - 0.19
E. New York St. - 0.29
E. Vermont St. - 0.39
E. Michigan St. - 0.49
E. North St. - 0.58
E. St Clair St. - 0.76
E. 9th St. - 0.9
E. 10th St. - 0.97
Location (mi)

Figure D-17

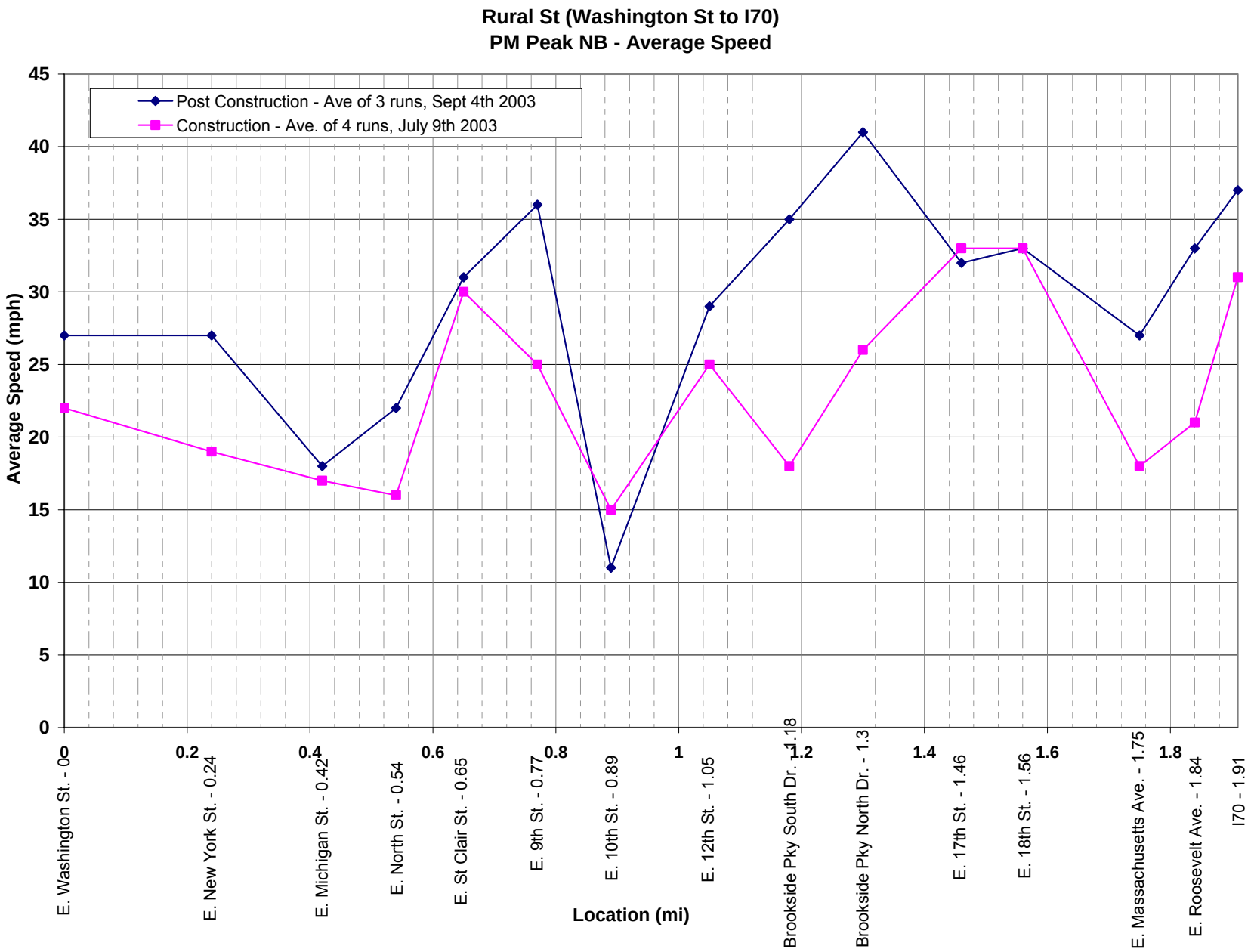

Rural St (Washington St to I70)
PM Peak NB - Average Speed
Post Construction - Ave of 3 runs, Sept 4th 2003
Construction - Ave. of 4 runs, July 9th 2003
Average Speed (mph)
45
40
35
30
25
20
15
10
5
0
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
Location (mi)
E. Washington St. - 0
E. New York St. - 0.24
E. Michigan St. - 0.42
E. North St. - 0.54
E. St Clair St. - 0.65
E. 9th St. - 0.77
E. 10th St. - 0.89
E. 12th St. - 1.05
Brookside Pky South Dr. - 1.18
Brookside Pky North Dr. - 1.3
E. 17th St. - 1.46
E. 18th St. - 1.56
E. Massachusetts Ave. - 1.75
E. Roosevelt Ave. - 1.84
I70 - 1.91

Figure D- 18

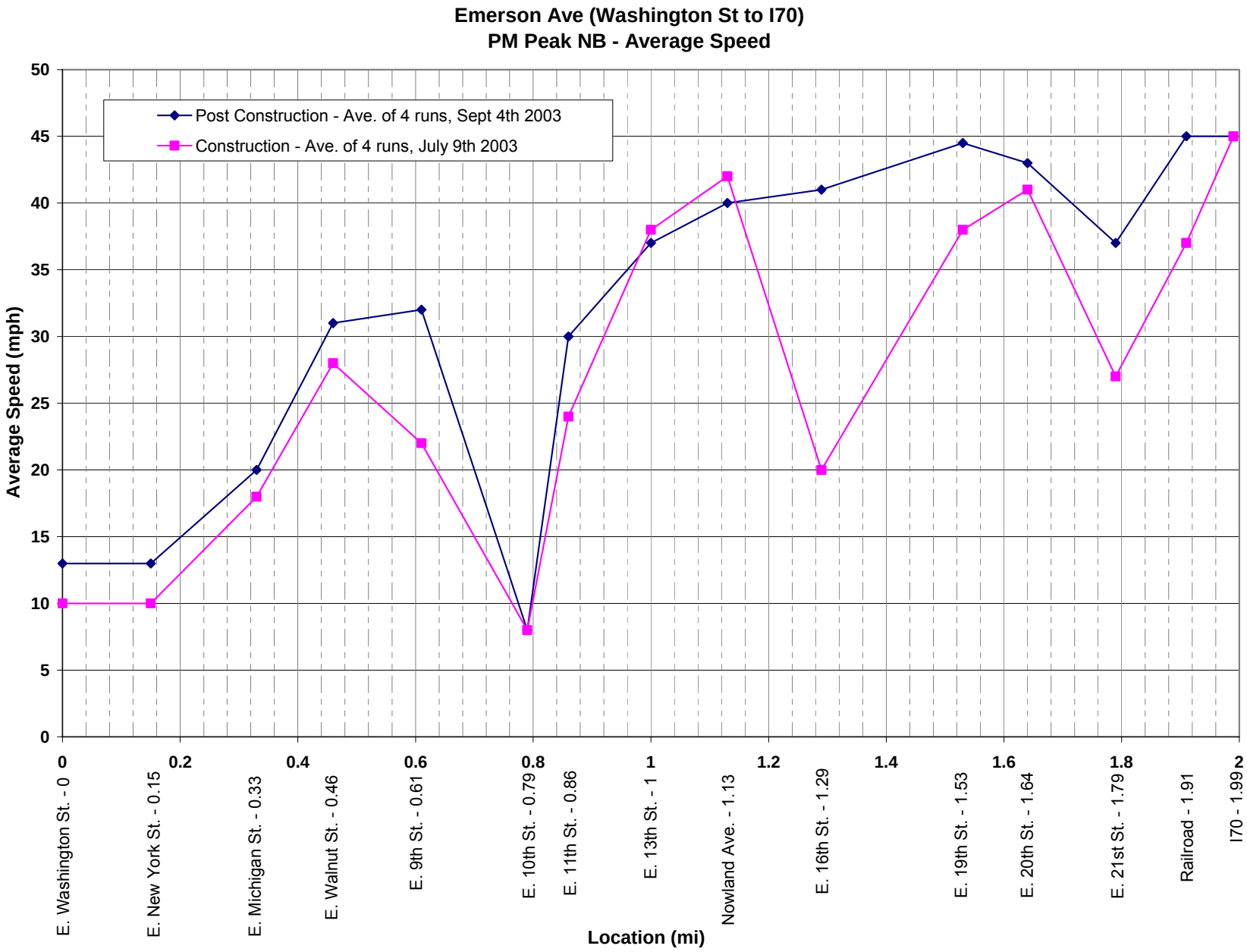

Emerson Ave (Washington St to I70)
PM Peak NB - Average Speed
Post Construction - Ave. of 4 runs, Sept 4th 2003
Construction - Ave. of 4 runs, July 9th 2003
Average Speed (mph)
50
45
40
35
30
25
20
15
10
5
0
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
E. Washington St. - 0
E. New York St. - 0.15
E. Michigan St. - 0.33
E. Walnut St. - 0.46
E. 9th St. - 0.61
E. 10th St. - 0.79
E. 11th St. - 0.86
E. 13th St. - 1
Nowland Ave. - 1.13
E. 16th St. - 1.29
E. 19th St. - 1.53
E. 20th St. - 1.64
E. 21st St. - 1.79
Railroad - 1.91
I70 - 1.99
Location (mi)

Figure D- 19

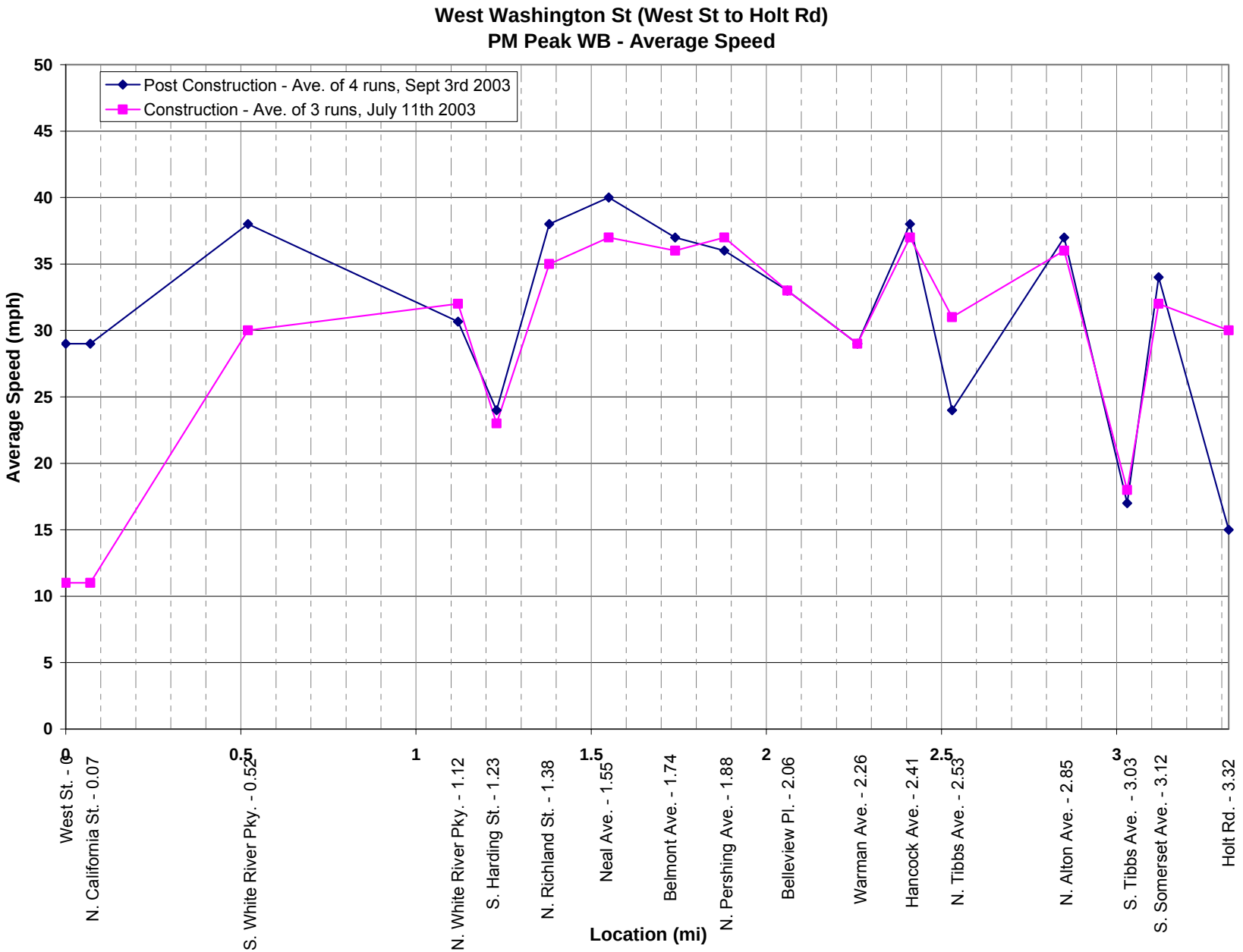

West Washington St (West St to Holt Rd)
PM Peak WB - Average Speed
Post Construction - Ave. of 4 runs, Sept 3rd 2003
Construction - Ave. of 3 runs, July 11th 2003
Average Speed (mph)
50
45
40
35
30
25
20
15
10
5
0
0
0.5
1
1.5
2
2.5
3
West St. - 0
N. California St. - 0.07
S. White River Pky. - 0.52
N. White River Pky. - 1.12
S. Harding St. - 1.23
N. Richland St. - 1.38
Neal Ave. - 1.55
Belmont Ave. - 1.74
N. Pershing Ave. - 1.88
Belleview Pl. - 2.06
Warman Ave. - 2.26
Hancock Ave. - 2.41
N. Tibbs Ave. - 2.53
N. Alton Ave. - 2.85
S. Tibbs Ave. - 3.03
S. Somerset Ave. - 3.12
Holt Rd. - 3.32
Location (mi)

Figure D-20

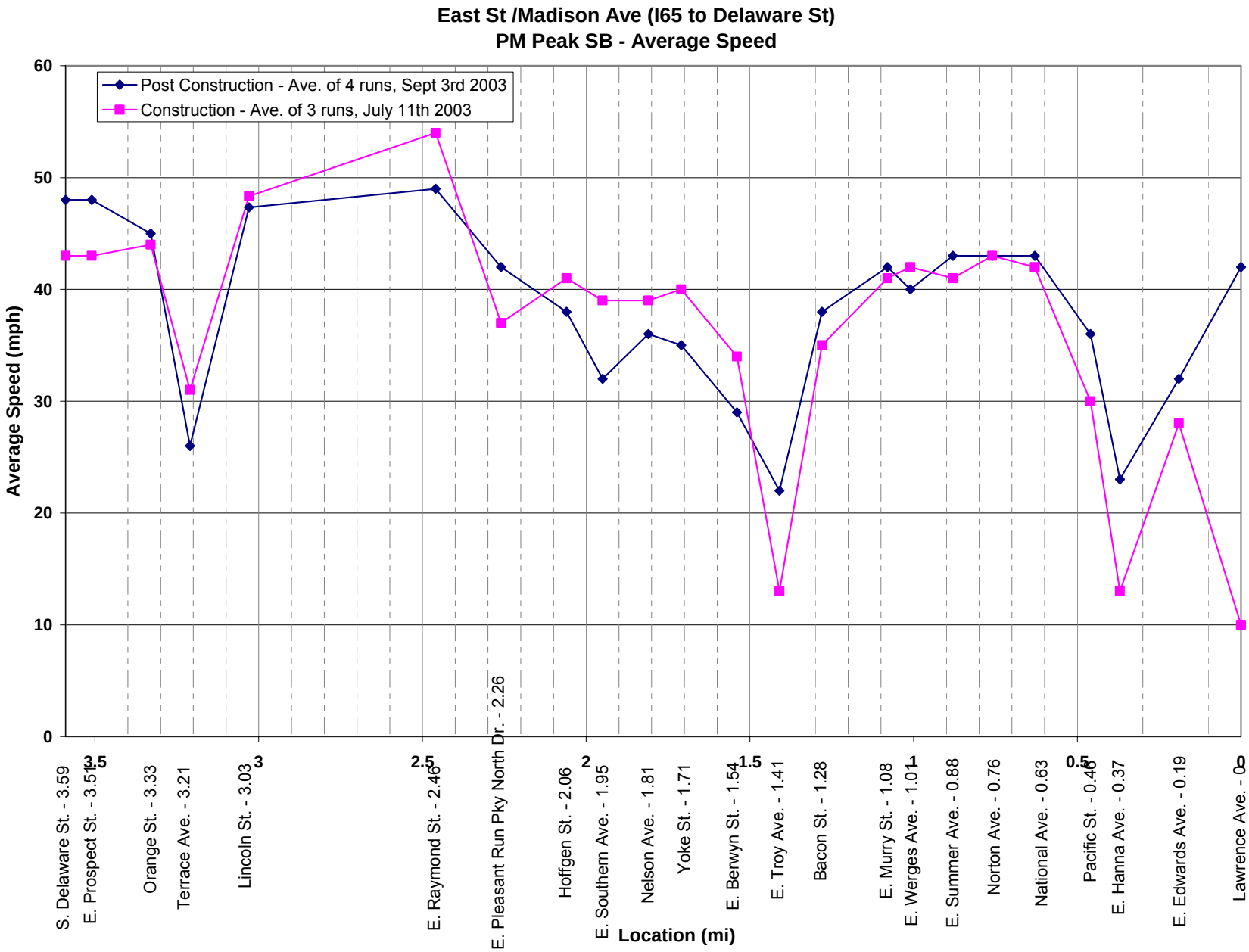

East St /Madison Ave (I65 to Delaware St)
PM Peak SB - Average Speed
Post Construction - Ave. of 4 runs, Sept 3rd 2003
Construction - Ave. of 3 runs, July 11th 2003
Average Speed (mph)
60
50
40
30
20
10
0
3.5
3
2.5
2
1.5
1
0.5
0
S. Delaware St. - 3.59
E. Prospect St. - 3.51
Orange St. - 3.33
Terrace Ave. - 3.21
Lincoln St. - 3.03
E. Raymond St. - 2.46
E. Pleasant Run Pky North Dr. - 2.26
Hoffgen St. - 2.06
E. Southern Ave. - 1.95
Nelson Ave. - 1.81
Yoke St. - 1.71
E. Berwyn St. - 1.54
E. Troy Ave. - 1.41
Bacon St. - 1.28
E. Murry St. - 1.08
E. Werges Ave. - 1.01
E. Summer Ave. - 0.88
Norton Ave. - 0.76
National Ave. - 0.63
Pacific St. - 0.48
E. Hanna Ave. - 0.37
E. Edwards Ave. - 0.19
Lawrence Ave. - 0
Location (mi)

Figure D- 21a

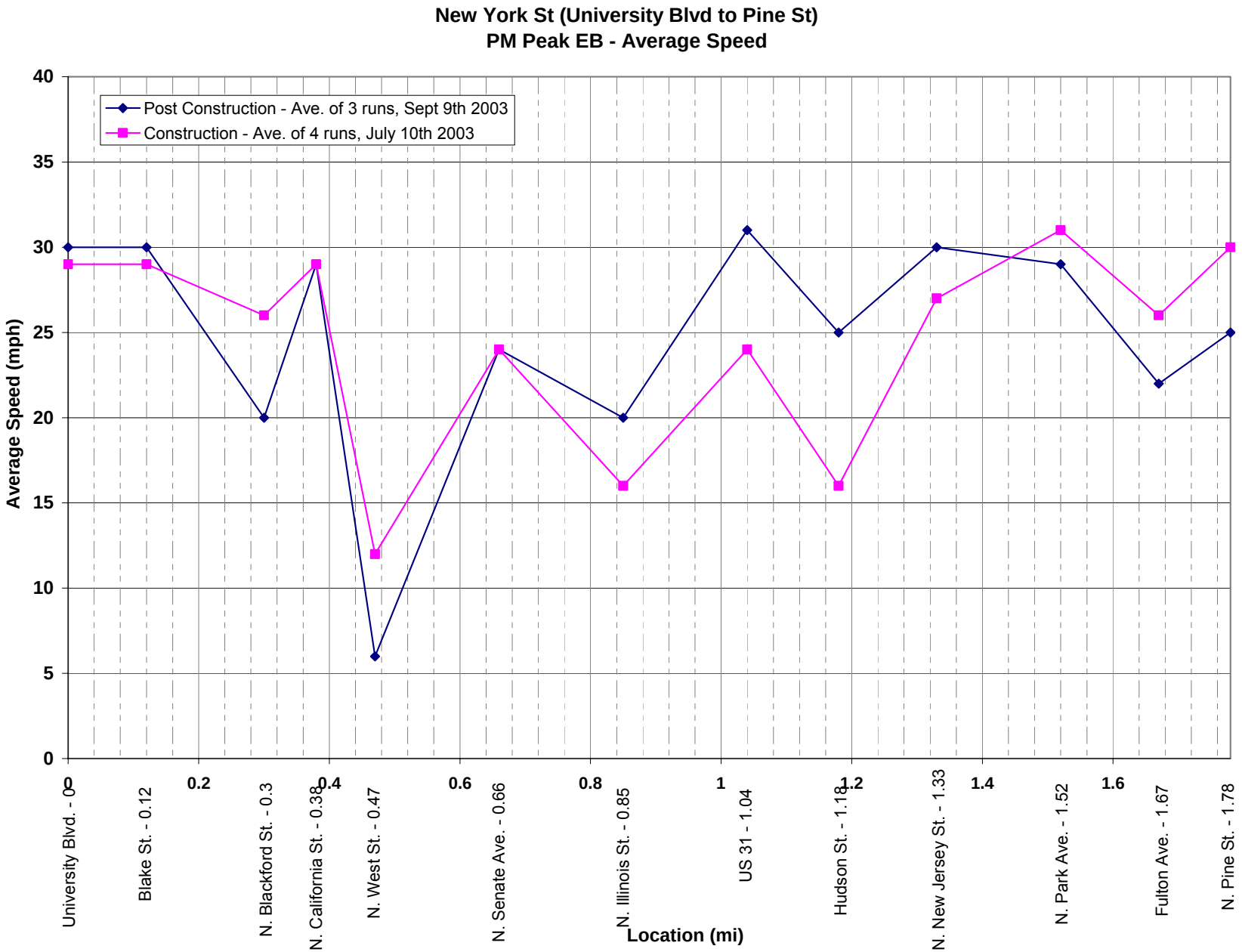
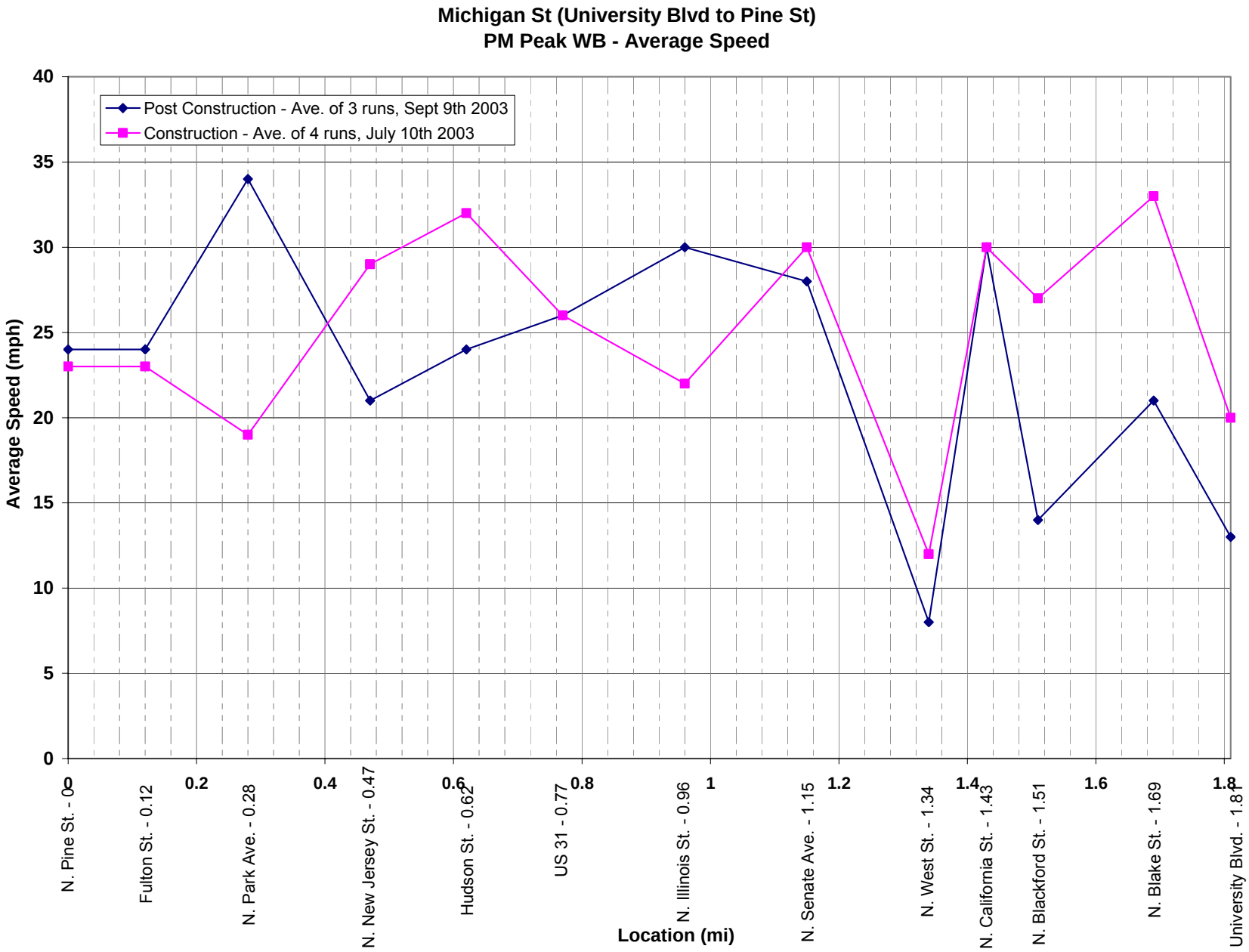

New York St (University Blvd to Pine St)
PM Peak EB - Average Speed
Post Construction - Ave. of 3 runs, Sept 9th 2003
Construction - Ave. of 4 runs, July 10th 2003
Average Speed (mph)
40
35
30
25
20
15
10
5
0
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
Location (mi)
University Blvd. - 0
Blake St. - 0.12
N. Blackford St. - 0.3
N. California St. - 0.38
N. West St. - 0.47
N. Senate Ave. - 0.66
N. Illinois St. - 0.85
US 31 - 1.04
Hudson St. - 1.18
N. New Jersey St. - 1.33
N. Park Ave. - 1.52
Fulton Ave. - 1.67
N. Pine St. - 1.78

Figure D- 21b


Michigan St (University Blvd to Pine St)
PM Peak WB - Average Speed
Post Construction - Ave. of 3 runs, Sept 9th 2003
Construction - Ave. of 4 runs, July 10th 2003
Average Speed (mph)
40
35
30
25
20
15
10
5
0
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
Location (mi)
N. Pine St. - 0
Fulton St. - 0.12
N. Park Ave. - 0.28
N. New Jersey St. - 0.47
Hudson St. - 0.62
US 31 - 0.77
N. Illinois St. - 0.96
N. Senate Ave. - 1.15
N. West St. - 1.34
N. California St. - 1.43
N. Blackford St. - 1.51
N. Blake St. - 1.69
University Blvd. - 1.81