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EVALUATING ALTERNATIVE TOLL-BASED FINANCING APPROACHES:

A CASE STUDY OF THE BOSTON METROPOLITAN AREA

A Thesis Presented

by

ROSARIA M. BERLINER

Submitted to the Graduate School of the
University of Massachusetts Amherst in partial fulfillment
of the requirements for the degree of

MASTER OF SCIENCE IN CIVIL ENGINEERING

May 2011

Department of Civil and Environmental Engineering
Transportation Engineering

EVALUATING ALTERNATIVE TOLL-BASED FINANCING APPROACHES: A CASE STUDY OF THE BOSTON METROPOLITAN AREA

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Approved as to style and content by:

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John Collura, Chairperson

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Song Gao, Member

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ABSTRACT

EVALUATING ALTERNATIVE TOLL-BASED FINANCING APPROACHES:

A CASE STUDY OF THE BOSTON METROPOLITAN AREA

MAY 2011

ROSARIA M. BERLINER, A.B., MOUNT HOLYOKE COLLEGE

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Directed by: Professor John Collura

The current condition of the nation's transportation system is of great concern to State Departments of Transportation. Currently, funds in many state transportation budgets are depleting. Nowadays, State DOT officials together with researchers are exploring various transportation financing approaches and they are considering the utility, merits, challenges, and impacts of these approaches.

A major financing approach being considered relies on the collection of tolls on existing toll roads and on roads on which tolls are not presently collected. Recent technology advancements in Open Road Tolling and All-Electronic Tolling have provided State DOTs with the opportunity to consider expanding the use of toll revenue to finance transportation investments. These two types of tolling technologies appeal to motorists by allowing them to maintain their current highway speed while going through a toll plaza. In addition, many State DOT officials now view toll based approaches as viable "user fee" based strategies together with other alternative approaches such as the fuel tax and sales tax.

Central to this research is a case study of the Boston Metropolitan area. The case study includes the formulation and preliminary evaluation of toll based financing

approaches potentially suitable for consideration in Massachusetts. The approaches include increases to existing tolls and placing tolls on selected roadways not currently tolled. The evaluation includes estimates of changes in demand and anticipated revenues associated with these toll based approaches. It is expected that the results of this research will be of interest to State DOT officials in Massachusetts and other states.

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CHAPTER 1

INTRODUCTION

The current condition of the nation's transportation system is of great concern to State Departments of Transportation (DOT). Currently, funds in many state transportation budgets are depleting. At the present time, State DOT officials together with researchers are exploring various transportation financing approaches and they are considering the utility, merits, challenges, and impacts of these approaches.

A major financing approach being considered relies on the collection of tolls on existing toll roads and on roads on which tolls are not presently collected. Recent technology advancements in Open Road Tolling and All-Electronic Tolling have provided State DOTs with the opportunity to consider expanding the use of toll revenue to finance transportation investments. These two types of tolling technologies appeal to motorists by allowing them to maintain their current highway speed while going through a toll plaza. In addition, many State DOT officials now view toll based approaches as viable "user fee" based strategies together with other alternative approaches such as the fuel tax and sales tax.

CHAPTER 2

OBJECTIVES OF THE RESEARCH

The objectives of this research are as follows:

- **Review the experiences and lessons learned** with toll based financing approaches to provide revenue to finance toll road improvements and other transportation investments.
- **Identify the financing questions** of interest to State Departments of Transportation with an emphasis on the questions, issues, challenges, merits, and impacts associated with the evaluation and implementation toll based financing approaches as they compare to other alternative approaches. Examples of such questions are:
    - What are the major financing approaches available to State DOTs to support surface transportation investments?
    - Should tolls be considered as a major approach along with other approaches such as the fuel tax and/or a sales tax?
    - Should current toll levels be increased and should innovative pricing strategies be employed?
    - Should tolls be charged on existing roads where tolls are not currently collected such as state borders and at other locations?
    - What level of revenue can be expected from such toll based approaches and strategies as compared to other approaches and what analytical methods might be used to make these revenue estimates?

- What innovative technologies might be used to facilitate the collection of tolls and what are the expected capital and operating costs?

- **Contribute to the state of practice** by improving our understanding of the alternative financing approaches being considered by State DOTs and the relative levels of revenue that might be generated with such financing approaches. More specifically, the results of this research are expected to shed light on the contribution toll based approaches are able to make relative to the fuel tax and a sales tax. Finally, the results of the research are intended to illustrate the application of simplified analytical methods to estimate the level of revenues expected from toll based approaches.

CHAPTER 3

BACKGROUND AND RELATED WORK

As we dive deeper into the economic recession, our nation's roadways continue to deteriorate and transportation funds need to be replenished. In order to restore our nation's roadways to acceptable physical and operating conditions and allow for new transportation projects, various states have invested in researching and developing alternative finance approaches. Oregon, Iowa, Minnesota, New York, along with other states have focused on developing better toll payment systems and other user fee based approaches.

To date, tolls have been considered as appropriate sources of revenue. Initiatives in various forms of tolling have been explored nationally and internationally to fully reap their benefits. A number of states have been at the forefront when it comes to employing innovative toll policies and collection strategies including open-road tolling, cashless tolling, border privatization of toll roads, border tolling and other toll revenue and collection innovations.

What follows is an overview of common financing approaches being used by State DOTs; a more detail description of the innovative toll based approaches being implemented in the U.S.; and a discussion of the issues considered in the design of appropriate financing approaches; and a brief review of the capital and operating costs to implement these toll based approaches.

3.1 Alternative Financing Approaches

As shown in Figure 1, alternative financing approaches for transportation can be broken down into two groups: transportation and non-transportation related. (16)

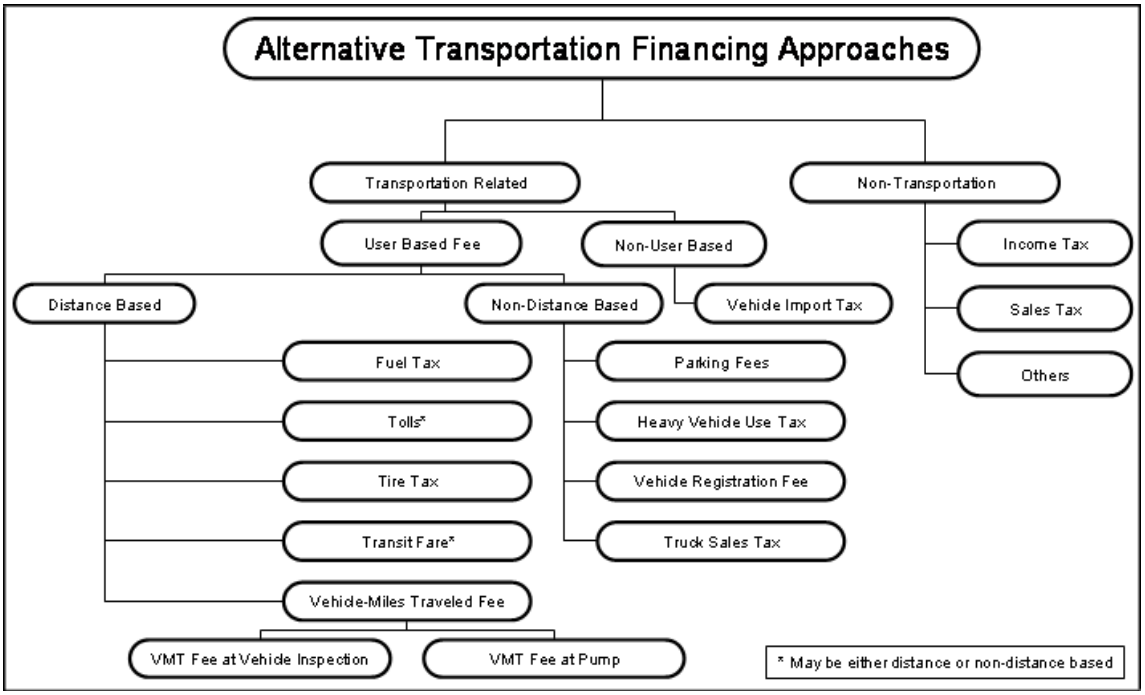
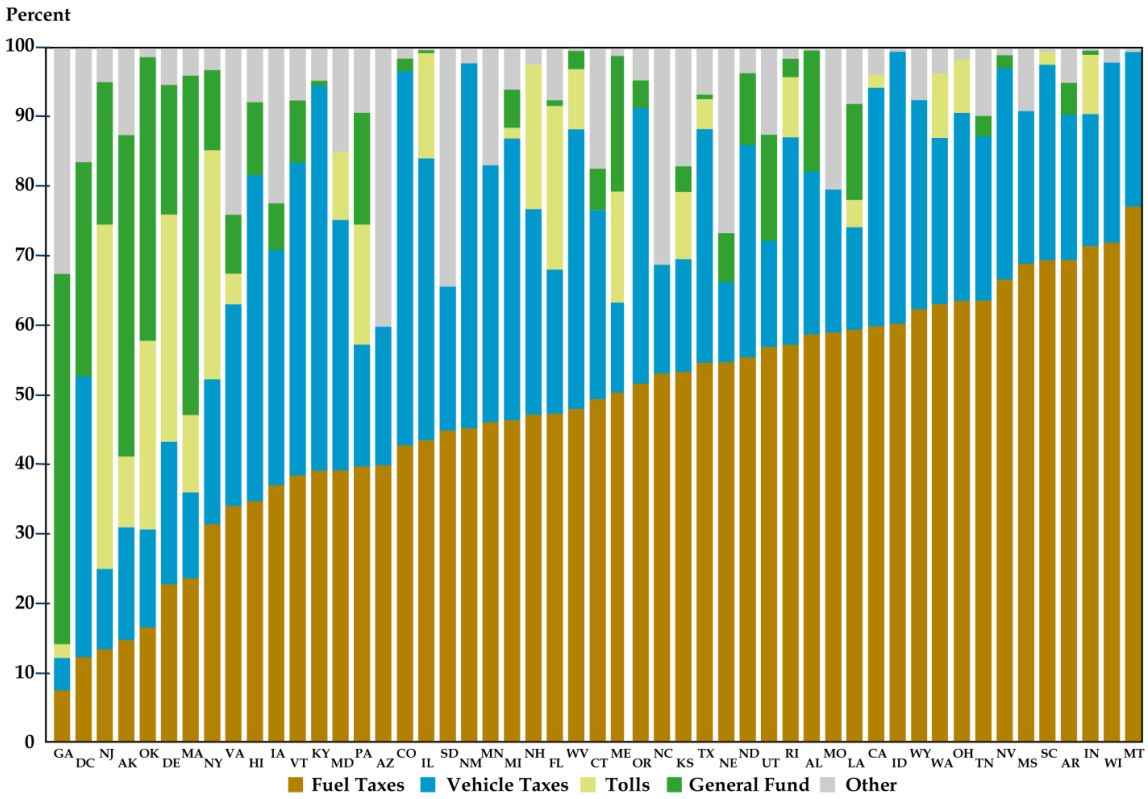


Figure 1. Alternative Transportation Financing Approaches

In the non-transportation group, states have the ability to use the income and sales taxes as a means to finance transportation. It is not uncommon for some states to use a portion of their sales tax to fund public transit. Within the transportation group, state officials will rely on fees including the fuel tax, tolls, tire tax, and in some cases a vehicle-miles traveled fee. Figure 2 shows by state the different financing approaches used in 2004. (15)



Source: 2004 Highway Statistics, Table SF-1

Figure 2. Transportation Revenue Sources, State by State, 2004.

Another financing approach being considered by State DOTs is the so-called vehicle-miles traveled (VMT) fee which could be paid at the pump or at an inspection station. The Oregon Department of Transportation ran a pilot program in 2006 showcasing the possibility of paying a VMT at the pump. (16)

More recently, initiatives in alternative financing approaches undergone by Texas DOT, the New York State Thruway Authority and the New York MTA indicate promise for technological advancement in toll collection throughout the country. These initiatives are reviewed below.

3.2 Toll Based Financing Approaches

3.2.1. ORT

At approximately 5am, Friday, May 14, 2010, the Highway Speed E-ZPass toll lanes at the Woodbury Toll Plaza opened on the New York State Thruway (NY Thruway). It is the first location on the Thruway that bolsters open-road tolling (ORT) for both passenger and commercial vehicles. (1) These lanes allow vehicles to pass through the intersection at the highway speed of 65mph. A similar initiative was undergone in 2007 at the Spring Valley Toll Plaza; however, the toll plaza only serves commercial vehicles. Four highway speed lanes have been added to the toll plaza two in each direction. (2) The $85 million project is envisioned to be successful. Although the Highway Speed E-ZPass lanes have been opened construction was scheduled to be completed in September 2010. (3) More than 42,000 vehicles pass through the toll plaza on an average day and that number rises to 62,000 per day during the summer and holiday weekends. (1, 5, 6) The NY Thruway Authority decided to proceed with the project in this location because of the heavy congestion seen daily at the toll plaza. (2) The new high speed lanes will reduce congestion in the entire toll plaza, increase capacity, and reduce the adverse effects on the environment. New York officials have been very excited about the project stating that it will help in New York's dedication to creating a greener State. (1)

3.2.2 AET

Announced in the Making Every Dollar Count report released by the Metropolitan transportation Authority (MTA) in January 2010, the Henry Hudson Bridge is the MTA's first test location for a non-stop all electronic toll collection site. (7) This is a two phase project. Phase 1 which introduces a gateless tolling scheme, where gates will be removed and cameras will be installed for enforcement barriers will remain intact is scheduled to be completed in mid-January 2011. Phase 2, which will eliminate cash collection completely and the entire toll plaza will turn to all-electronic toll collection, is scheduled to be completed by January 2012. (8) The project is expected to cost about $10 million with phase 1 costing about $4.6 million and phase 2 costing about $5.4 million. (8) The Henry Hudson Bridge toll plaza will be the first AET collection plaza in an urban and densely populated area. (9)

The Henry Hudson Bridge was chosen for the following reasons: there are no nearby entries and exits and thus there are potential savings from not proceeding with an otherwise necessary rebuild of the toll plaza; there is a high out-of-state component to the traffic (NJ, CT, PA drivers) so interstate collection can be tested; the Parkway serves cars-only so there are no vehicle classification complications; and the Parkway is a medium sized facility with 60,000 to 70,000 transactions/day. (8)

During Phase 1 they plan to remove the gate and install cameras. Initially, the cameras will be used to identify violators and later (more likely in Phase 2) to do toll-by-plate of vehicles without a transponder. There is a proposed violation fee of $50 for those who do not have a transponder during Phase 1; however, the fee is anticipated to be revenue neutral the income from the fees are designed to offset the cost of collection and

inescapable toll revenues. (8) Phase 2 will begin around January 2012 when the plaza will go cashless. From this point on and conditions permitting, all traffic will go through the plaza and toll at highway speed. Payment will be accepted through various means: on-line, phone, mail, or payment agencies. (8) MTA Bridges and Tunnels President Jim Ferrara says the new traffic pattern leading into Manhattan will result in a smoother transition for drivers coming onto the Bridge from the two-lane Henry Hudson Parkway. (9)

3.2.3 Texas Tolling

The Central Texas Turnpike System (CTTS), in Texas, opened three turnpikes, SH130 tolls 1-4, SH45 North, and Loop 1 in 1998. Each roadway is equipped with Open Road Tolling (ORT), video tolling, and traditional cash tolling that are used concurrently as means of toll payment. In center lanes, highways are ORT is used in conjunction with video tolling. In order to use the system developed in Texas, users either sign up for a TxTag, a transponder placed inside the vehicle. The TxTag uses a system similar to that of the Fast Lane and EZ-Pass passes in which users create an account from which funds are drawn or to which charges are billed. If the user does not sign up for the TxTag, they are still able to use the highway speed toll lanes and are tolled by video tolling. In CTTS' case, video tolling has progressed beyond violation detection to general toll payment. Any vehicle that passes through the ORT facility that does not have a transponder has their license plate captured on video. This picture is then processed and the registered owner of the vehicle receives a bill in the mail, dubbed "Pay by Mail." Processing and late fees are applied if the bill is not paid on time. Additionally, CTTS has cash toll lanes

on these roadways to allow the user to pay in cash if they so choose. Since its inception, more turnpike sections have been developed. The North Texas Tollway Authority (NTTA) currently operates two toll roads with AET. These roads either use ORT and video tolling or just ORT. In instances where the roadway is only ORT, users have to have a transponder.

Over the two year period, from 2007 to 2008, the CTTS processed about 99 million toll transactions. More than half of these transactions used the ORT/video tolling. In 2009, CTTS had 73 million transactions, generating about $59 million from tolls. The total revenue for 2009 was $61,674,500. About 74% of vehicles used a transponder on the turnpikes. About 17% of the toll transactions used the video tolling system and 9.3% of the transactions used the old cash system. (12)

Since, video tolling costs more than using transponders due to image processing, CTTS charges 25% more for "Pay by Mail" than by transponder, plus a $1.00 processing fee. To encourage users to sign up for a transponder, each "Pay by Mail" bill comes with literature and an application for a transponder. There has been about 20% non-payment of video tolls. Texas does not use refusal of renewal of registration for unpaid tolls so they have to take violators to Justice of the Peace courts—this has made it difficult to for the state to collect toll payments. Unbillable tolls, from poor license plate reads are about 2% of total transactions, 11% of total plate reads. TxDot/CTTS outsources plate readings to a company that uses optical character recognition (OCR). Unbillable tolls were due to poor image quality, obscured plates, US Government plate, non-US plate or no license plate because no address could be found in the DMV vehicle registration database. (13) Factors that affect license plate identification/recognition (LPI/R) readings include, poor

image resolution, blurry images, poor lighting and contrast, obscured plates, out of state or vanity plates, and circumvention techniques.

3.2.4 NCHRP

In 2006, the National Cooperative Highway Research Program (NCHRP) released Synthesis 364: Estimating Toll Road Demand and Revenue. This synthesis gives a detailed analysis of toll road forecasting in terms of demand changes and revenue changes. Through the use of the four-step process NCHRP contributors affirm that changes in demand can be modeled and estimated.

"The demand for travel is a derived demand." (14) There are several factors that need to be considered when deriving demand: human activities, demographic location, socioeconomic issues, as well as land-use. In order to create a successful model, the four-step model is created using a three step process: input, process, and output. The "inputs" are defined to be factors such as zone definition, land-use inputs, transportation network, and observed travel characteristics. Secondly, the process is where the "four-step" process earns its name. The process is comprised of four steps which are trip generation, trip distribution, modal split, and trip assignment. The final part of the four-step process composition is the outputs. The outputs are "volumes by link and ridership numbers." (14) These numbers can be used to identify costs and revenues of a tolled facility.

As previously implied, there is a relationship between demand and revenue forecasts in that "revenue forecasts are **dependent** on travel demand forecasts and the assumptions on which the travel forecasts were based." It is not surprising that there is a proportional relationship between the uncertainty in revenue forecasts and the uncertainty

in travel demand forecasts. Moreover, revenue forecasts are dependent on the tolling technology, fare, and structure (schedule). Tolling schemes sometimes include discounts for electronic tolling, such as the FastLane pass, or multipass users, heavy vehicle fares, and variable tolling practices. "Increases in toll rates can also affect the demand, especially as some authorities have elected to increase toll rates more sharply than projected to quickly generate revenues in the short term." (14)

Calculating estimated toll revenues is similar to peeling an onion: as the tolling scheme becomes more complex, more layers of considerations are made. In general, travel demand forecasts are developed for a weekday peak hour or peak period. In order to apply generalized daily and yearly traffic volumes, conversion factors are used. Furthermore, revenue is then estimated by multiplying the forecast volume by the toll amount taking into account different toll rates, toll evasion, and discounts.

3.2.5 Implementation Costs

Within the context of this research, there are two sets of capital and operating costs that need to be considered: costs for the Massachusetts' Turnpike (an existing toll road) and costs for Interstate 93 (a road on which tolls are not currently collected). Since no construction or structural changes will be made to the Massachusetts' Turnpike estimating those capital and operating costs are relatively simple to determine; whereas with Interstate 93, the literature on Open-Road and video tolling needed to be reviewed to shed light on this project.

Capital cost estimates include items such as transponder costs, processing center, and telecommunication systems. Furthermore the cost of minor items is included in the

contingency component, which is usually about 10% of the total itemized capital costs. Operational cost estimates consider major items: maintenance and salary and benefits associated with toll road personnel.

In 2009, the operating expenses for the western portion of the Massachusetts' Turnpike were $66,696,000 for the fiscal year. (17) Repair and reconstruction costs for the western portion of the Massachusetts' Turnpike in 2007 were $8,000,000. Moreover, for the 2007 fiscal year the operations and policing costs for the Boston Extension was approximately $52,000,000. The repair and reconstruction costs for the Boston Extension were about $12,000,000 for the year 2007. (18) Since there would be no "new" construction for this project, the capital cost to increase the existing tolls on the Massachusetts' Turnpike portions is assumed to be $0.00.

In 2004, the New York State Thruway Authority estimated that they would spend between $30 and $50 million for each highway speed toll plaza installed on the Thruway – 6 years later the actual cost for the new toll plaza that opened in May 2010 was about $75 million. (2, 19) On the other hand, the All-Electronic Tolling project being done on the Henry Hudson toll plaza is contracted for about $10 million. The magnitude of the proposed project for Interstate 93 better aligns with the Henry Hudson toll plaza because each on ramp can be considered a "medium-sized" facility. Since the ownership of transponders for the Boston metropolitan area is unknown, it is assumed that the Commonwealth will spend approximately 10% of the capital costs on this equipment, about $1 million. Therefore, a preliminary order of magnitude estimate of the capital costs for the implementation of tolls on Interstate 93 is $111 million. The capital costs are projected to be $111 million because there are 11 exits that are being considered and it is

estimated that each exit will cost approximately $10 million. Since the Henry Hudson toll plaza is a two level plaza, it is not unreasonable to group the north and southbound exits in to one estimate.

In a side by side comparison of Interstate 93 and the Henry Hudson, it is shown that the average annual daily traffic (AADT) at each exit on Interstate 93 is lower than the Henry Hudson toll plaza. Furthermore, the $75 million used for the Woodbury toll plaza in Upstate New York was used for the construction of the toll plaza as well as additional repairs to the current toll booths and roadway.

The anticipated operating costs on I-93 would include personnel and repairs and maintenance. It was assumed that there would be about 30 personnel hired by MassDOT to manage the AET I-93 project. The average salary of personnel for the Massachusetts Turnpike was assumed to be $70,000 a year. Additionally, it is assumed that the maintenance cost of the Interstate 93 facilities will be about $200,000 annually or 15% of the equipment capital costs and 5% of the processing center costs.

3.3 Designing Appropriate Transportation Financing Approaches

The design of an appropriate financing approach is not a trivial task. As part of the design process, State DOT officials consider a number of questions including:

- What are the major financing approaches available to State DOTs to support surface transportation investments?
- Should tolls be considered as a major approach along with other approaches such as the fuel tax and/or a sales tax?

- Should current toll levels be increased and should innovative pricing strategies be employed?
- Should tolls be charged on existing roads where tolls are not currently collected such as state borders and at other locations?
- What level of revenue can be expected from such toll based approaches and strategies as compared to other approaches and what analytical methods might be used to make these revenue estimates?
- What innovative technologies might be used to facilitate the collection of tolls and what are the expected capital and operating costs?

Figure 3 presents a framework that suggests that there are four major elements that need to be considered in the design and evaluation of a transportation financing approach including establishing policy objectives; determining revenue sources; identifying short and long term implications; and assessing impacts. (16)

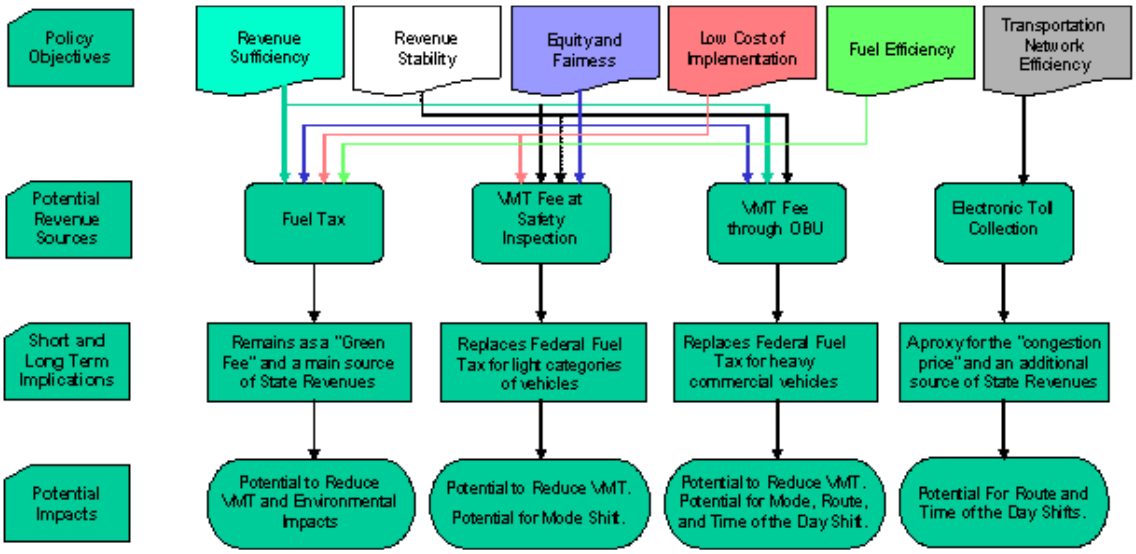


Figure 3. Alternative Finance Approaches Framework.

As depicted in Figure 3, the Fuel Tax, VMT Fee at Safety Inspection, and VMT through OBU (On-Board Unit), all have implications within revenue sufficiency, revenue

stability, equity, and low cost implications. It is important to note in light of the objectives of this research that all electronic toll (AET) collection has proven in certain cases to be successful in the collection of an adequate, stable, equitable, and fuel efficient source of revenue. Furthermore, in cases where the route is heavily traveled (such as Interstates 90 and 93) there is an expectation of revenue stability, because the demand for toll road service has been shown historically on existing toll roads to be inelastic with respect to changes in toll levels. Moreover, implementing tolls on roadways that are not currently tolled, as is the case with North South Interstate 93, has the potential to satisfy equity concerns vis a vis those who pay tolls on the East West Mass Turnpike. In addition, implementing a congestion pricing scheme on Interstate 93 may reduce travel time for those traveling during the peak hours.

CHAPTER IV

RESEARCH METHODOLOGY

4.1 Research Objectives

As presented in section 2, the research objectives are as follows:

- **Review the experiences and lessons learned** with toll based financing approaches to provide revenue to finance toll road improvements and other transportation investments.
- **Identify the financing questions** of interest to State Departments of Transportation with an emphasis on the questions, issues, challenges, merits, and impacts associated with the evaluation and implementation toll based financing approaches as compared to other alternative approaches. Examples of such questions are:
    - What are the major financing approaches available to State DOTs to support surface transportation investments?
    - Should tolls be considered as a major approach along with other approaches such as the fuel tax and/or a sales tax?
    - Should current toll levels be increased and should innovative pricing strategies be employed?
    - Should tolls be charged on existing roads where tolls are not currently collected such as state borders and at other locations?
    - What level of revenue can be expected from such toll based approaches and strategies as compared to other approaches and what analytical methods might be used to make these revenue estimates?

- What innovative technologies might be used to facilitate the collection of tolls and what are the expected capital and operating costs?

- **Contribute to the state of practice** by improving our understanding of the alternative financing approaches being considered by State DOTs and the relative levels of revenue that might be generated with such financing approaches. More specifically, the results of this research are expected to shed light on the contribution toll based approaches are able to make relative to the fuel tax and a sales tax. Finally, the results of the research will illustrate the application of simplified analytical methods to estimate the level of revenues expected from toll based approaches.

4.2 Tasks

In order to achieve the research objectives, the following tasks should be accomplished:

Task 1: Review literature signifying the importance of alternative finance approaches in transportation.

Task 2: Describe the toll approaches to be evaluated and their intended policy objectives.

Task 3: Conduct a case study by formulating toll based approaches and estimating changes in demand and expected revenues using elasticity methods.

A description of each task is provided below.

4.2.1 Task 1: Carry out Literature Review

Task 1 will consist of a literature review on the subject of transportation financing. Literature will be drawn from government reports, scholarly journal articles, university research reports, and other sources. An emphasis will be placed on reviewing

ongoing toll road projects in Texas, New York, and other states in which innovative toll strategies and technologies are being considered. In addition, widely used analytical methods for estimating toll revenues will be described. Finally, the issues, questions, and concerns of interest to State DOT officials as they consider alternative financing approaches regarding will also be discussed. These questions will be used as a basis in the in the formulation of the alternative financing approaches formulated in Task 2 and in conduct of the case study in Task 3.

4.2.2 Task 2: Formulate Alternative Financing Approaches

There are three toll based financing approaches that will be evaluated as part of this research. These three approaches are:

1. Increase tolls on Interstate 90 by 10% each year and impose no tolls on Interstate 93
2. Increase tolls on Interstate 90 for one year and impose a flat rate toll of $1.00 on Interstate 93
3. Increase tolls on Interstate 90 for one year and impose a $1.00 toll on Interstate-93 as well as a congestion toll of an additional $0.50 during the peak travel periods.

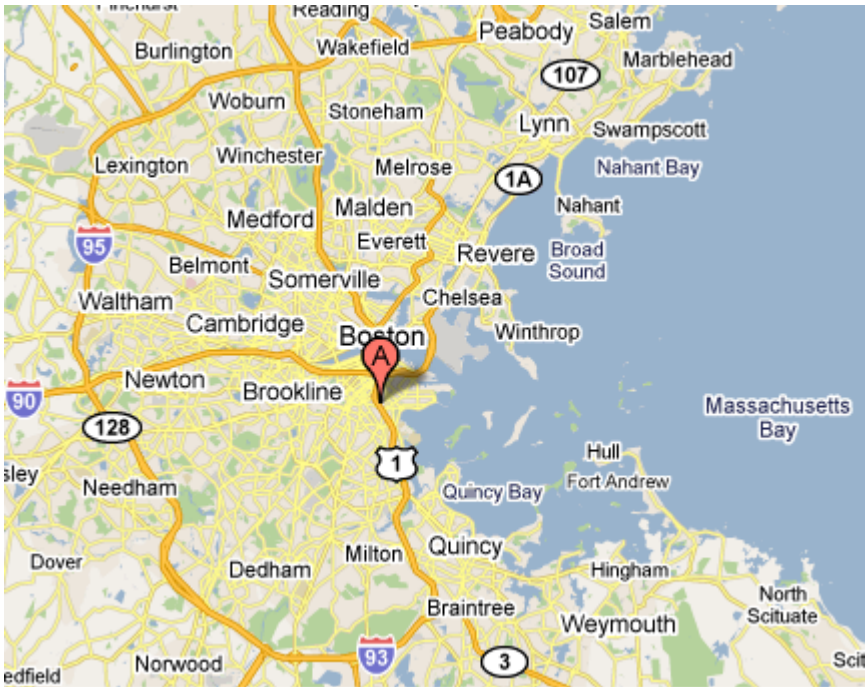


Figure 4. Boston Metropolitan Area Map

Figure 4 depicts the Boston metropolitan area. To the left of the "A" marker, lies Interstate 90 (also known as the Massachusetts Turnpike). North and south of the marker from Braintree to Woburn lies Interstate 93– the highway on which toll implementation is being considered.

The expectation is that raising tolls (including congestion pricing strategies) on the currently tolled Interstate 90 and imposing similar toll strategies on Interstate 93 will generate additional revenue for future transportation investments and possibly reduce peak period congestion.

4.2.3 Task 3

Based on current revenue and demand data and other information compiled by the Central Transportation Planning Staff (CTPS) and others on the East-West Interstate 90 (also referred to as the MassPike) and the North-South Interstate 93, changes in demand and expected revenue along both roadways will be examined for three proposed toll

based approaches using empirically derived toll elasticity values in conjunction with sensitivity analyses.

As stated in Task 2, there are three toll based financing approaches that will be evaluated. These three approaches are:

1. Increase tolls on Interstate-90 by 10% each year and impose no tolls on Interstate-93
2. Increase tolls on Interstate-90 for one year and impose a flat rate toll of $1.00 on Interstate-93
3. Increase tolls on Interstate-90 for one year, impose a $1.00 toll on Interstate-93 as well as a congestion toll of an additional $0.50 during the peak travel periods.

The data supplied by CTPS will allow for the generation of a model for the North-South roadways surrounding the Boston metropolitan area that are not tolled. Using the data, estimates will be developed that map the change in demand experienced when tolls are installed on these roadways on which tolls are not presently collected. This change in demand will then be used to estimate revenue for the new tolls. On Interstate 93 changes in demand and revenue for a $1 and $1.50 toll as well as a incorporating a congestion pricing scheme will be evaluated. For Interstate 93, open-road tolling technology as well as all-electronic payment technology would be the only toll collection option considered, in order to maintain the current flow of traffic.

CTPS data also will be used to further analyze changes in demand and revenue when the toll fares on Interstate 90 are increased. Using this data, changes in demand based on increased toll fares are estimated. Furthermore, after having calculated the demand change, the change in revenue can also be calculated.

CHAPTER V

RESEARCH ANALYSIS AND RESULTS

5.1 Demand and Revenues

Demand and revenue forecasting is never a simple task. Multiple variables need to be considered when approximating changes in demand. The sections below thoroughly outline and describe analytical methods used to estimate changes in demand on roadways when; a) tolls are increased on roadways that currently have tolls; b. tolls are implemented on roadways that are not currently tolled. Two methods of analysis were used: point elasticity and iterative arc elasticity.

5.1.1 Mass Turnpike: The Boston Extension

In January 2010, Cambridge Systematics (CS) prepared a report for the Massachusetts' Department of Transportation that focused on traffic and revenue in the Commonwealth of Massachusetts. This report details the toll transactions, toll revenues, and average toll on the Boston Extension of the Massachusetts' Turnpike. The Boston Extension includes exits 15 to 26 on the Massachusetts' Turnpike. Geographically users who travel on the Boston Extension can travel between Newton, Massachusetts and Logan International Airport. Using this data, an approximated yearly revenue was generated using an elasticity based method for a proposed 10% increase on all tolls on the Turnpike Extension. Furthermore, a sensitivity analysis was conducted to show the impacts of a various elasticity assumptions on revenues.

First and foremost, the data extracted from Table 1 supplied the "original" demand, revenue, and toll prices.

Table 2.8 2009 versus 2008 Toll Transactions and Toll Revenue by Month

	Toll Transactions			Toll Revenue			Average Toll		
Month	2008	2009	Percent Change	2008 (Dollars)	2009 (Dollars)	Percent Change	2008 (Dollars)	2009 (Dollars)	Percent Change
Boston Extension									
January	5,519,797	5,012,039	-9.2%	6,333,613	5,701,418	-10.0%	1.15	1.14	-0.9%
February	5,268,526	4,904,223	-6.9%	6,040,721	5,557,837	-8.0%	1.15	1.13	-1.2%
March	5,830,713	5,512,302	-5.5%	6,674,466	6,230,412	-6.7%	1.14	1.13	-1.3%
April	5,903,935	5,650,435	-4.3%	6,779,977	6,395,176	-5.7%	1.15	1.13	-1.4%
May	6,044,486	5,804,814	-4.0%	6,960,449	6,574,404	-5.5%	1.15	1.13	-1.6%
June	5,798,167	5,738,387	-1.0%	6,680,633	6,496,568	-2.8%	1.15	1.13	-1.7%
July	5,634,641	5,655,532	0.4%	6,512,707	6,417,071	-1.5%	1.16	1.13	-1.8%
August	5,550,527	5,553,963	0.1%	6,425,689	6,313,145	-1.8%	1.16	1.14	-1.8%
September	5,689,641	5,628,847	-1.1%	6,545,288	6,361,542	-2.8%	1.15	1.13	-1.8%
October	6,018,436	5,948,223	-1.2%	6,910,569	6,707,969	-2.9%	1.15	1.13	-1.8%
November	5,344,727	5,443,998	1.9%	6,100,426	6,120,794	0.3%	1.14	1.12	-1.5%
December	5,157,398	5,373,289	4.2%	5,875,509	6,042,163	2.8%	1.14	1.12	-1.3%
Total	**67,760,994**	**66,226,052**	**-2.3%**	**77,840,046**	**74,918,499**	**-3.8%**	**1.15**	**1.13**	**-1.5%**
Tunnels									
January	1,571,531	1,437,340	-8.5%	5,552,556	4,978,964	-10.3%	3.53	3.46	-2.0%
February	1,522,647	1,389,852	-8.7%	5,406,472	4,800,820	-11.2%	3.55	3.45	-2.7%
March	1,721,301	1,613,355	-6.3%	6,133,669	5,603,123	-8.6%	3.56	3.47	-2.5%
April	1,723,964	1,620,336	-6.0%	6,151,708	5,607,243	-8.9%	3.57	3.46	-3.0%
May	1,799,635	1,721,400	-4.3%	6,420,781	5,962,077	-7.1%	3.57	3.46	-2.9%
June	1,784,140	1,724,016	-3.4%	6,384,447	5,973,071	-6.4%	3.58	3.46	-3.2%
July	1,759,165	1,774,237	0.9%	6,233,407	6,129,171	-1.7%	3.54	3.45	-2.5%
August	1,757,576	1,775,579	1.0%	6,221,428	6,138,253	-1.3%	3.54	3.46	-2.3%
September	1,648,027	1,685,177	2.3%	5,857,393	5,861,652	0.1%	3.55	3.48	-2.1%
October	1,739,321	1,785,208	2.6%	6,177,475	6,245,454	1.1%	3.55	3.50	-1.5%
November	1,543,909	1,626,422	5.3%	5,401,681	5,630,699	4.2%	3.50	3.46	-1.0%
December	1,531,920	1,620,728	5.8%	5,324,455	5,543,142	4.1%	3.48	3.42	-1.6%
Total	**20,103,136**	**19,773,650**	**-1.6%**	**71,265,471**	**68,473,669**	**-3.9%**	**3.54**	**3.46**	**-2.3%**

Source: MassDOT.

Table 1. Toll Transactions and Toll Revenue by Month

More specifically, the 2008 data provided an original demand of 67,760,994 toll transactions, a base revenue of $77,840,046 for the year 2008, and an average toll of $1.15. Moreover, the new toll was set to be $1.27 or 10% higher than the 2008 average toll. It should be further noted that although the 2009 data was available, the data used for the I-93 analysis was from 2007 and it was used to maintain consistency.

Mathematically, the equation is: $\varepsilon = \frac{\frac{Old\ Demand - New\ Demand}{Old\ Demand}}{\frac{Old\ Price - New\ Price}{Old\ Price}}$. Substituting constant numbers, the equation is: $\varepsilon = \frac{\frac{67{,}760{,}994 - New\ Demand}{67{,}760{,}994}}{\frac{1.15 - 1.27}{1.15}}$. In order to demonstrate the impact of a varying elasticity, new demands were calculated for each elasticity value of -0.05 to -0.2 with increments of 0.05. Below are the calculated demands with the appropriate ε.

$\varepsilon = -0.05$

$$-0.05 = \frac{\frac{67{,}760{,}994 - New\ Demand}{67{,}760{,}994}}{\frac{1.15 - 1.27}{1.15}}$$

$$New\ Demand = 67{,}407{,}458\ toll\ transactions$$

$$New\ Revenue = \$1.27 * 67407458 = \$85{,}607{,}471/year$$

$\varepsilon = -0.10$

$$-0.10 = \frac{\frac{67{,}760{,}994 - New\ Demand}{67{,}760{,}994}}{\frac{1.15 - 1.27}{1.15}}$$

$$New\ Demand = 67{,}053{,}900\ toll\ transactions$$

$$New\ Revenue = \$1.27 * 67053900 = \$85{,}158{,}453/year$$

$\varepsilon = -0.15$

$$-0.15 = \frac{\frac{67{,}760{,}994 - New\ Demand}{67{,}760{,}994}}{\frac{1.15 - 1.27}{1.15}}$$

$$New\ Demand = 66{,}700{,}387\ toll\ transactions$$

$$New\ Revenue = \$1.27 * 66700387 = \$84{,}709{,}491/year$$

$\varepsilon = -0.20$

$$-0.20 = \frac{\frac{67{,}760{,}994 - New\ Demand}{67{,}760{,}994}}{\frac{1.15 - 1.27}{1.15}}$$

$$New\ Demand = 66{,}346{,}851\ toll\ transactions$$

$$New\ Revenue = \$1.27 * 66346851 = \$84{,}260{,}500/year$$

Given a varying elasticity from -0.05 to -0.2, the revenue fluctuates from approximately $85.6 million to $84.2 million. Since Cambridge Systematics calculated an elasticity of -0.06, it would be appropriate to consider the second elasticity of -0.1 in order to conservatively estimate revenue.

Elasticity	ε = -0.05		ε = -0.10	
	Base	Forecasted	Base	Forecasted
Demand	67,760,994	67,407,458	67,760,994	67,053,900
Revenue	$77,925,143	$85,607,471	$77,925,143	$85,158,453

Elasticity	ε = -0.15		ε = -0.20	
	Base	Forecasted	Base	Forecasted
Demand	67,760,994	66,700,387	67,760,994	66,346,851
Revenue	$77,925,143	$84,709,491	$77,925,143	$84,260,500

Table 2. Demand and Revenue for the Boston Extension

5.1.2 Mass Turnpike: Western Portion

The Central Transportation Planning Staff provided corridor counts for all major highways surrounding the Boston metropolitan area. These corridor counts include a portion of the tolled Massachusetts' Turnpike (Interstate 90 or I90) as well the untolled Interstate 93 (or I93). Since all the toll based approach alternatives examined include I90, our primary focus was to create an appropriate method to estimate revenues based on the data provided. Since I90's tolling scheme is based primarily on distance, Origin-Destination (O-D) tables were needed to generate accurate estimates of revenue; however, CTPS provided volume counts rather than the coveted O-D tables. In order to circumvent the lack of O-D tables, the toll level from exits 11 to 14 was used as an "average" toll. Therefore, the revenues estimated below for the Massachusetts' Turnpike (Eastbound), should be considered to be *very* conservative values.

In order to more accurately approximate revenues, the analysis of the Turnpike was split into the eastbound and westbound directions.

5.1.2.1 Eastbound Direction

First, the eastbound direction was considered. Since the volume on the Turnpike increased as motorists traveled towards Boston, the only exit volume data considered was at exit 14 (the last exit before the start of the Boston Extension, which was analyzed separately above). In this instance, it was assumed that the old price of the exit toll was $1.10 and that a 10% increase in that price would be $1.21. Furthermore, in order to showcase the impacts of a varying elasticity, several elasticity values were used in order to generate new demands as well as revenues. The average volume (per day) on I90 eastbound at exit 14 was 46,233 vehicles. The demand calculations for different elasticities are shown below.

In this analysis, epsilon, $\varepsilon = \frac{\frac{46233-x}{46233}}{\frac{1.10-1.21}{1.10}}$, where x represents the New Demand. Elasticity values of -0.05, -0.10, -0.15, and -0.20 were used to calculate different x's.

$\varepsilon = -0.05$

$$-0.05 = \frac{\frac{46233 - x}{46233}}{\frac{1.10 - 1.21}{1.10}}$$

$$New\ Demand = 46002$$

$$Average\ Daily\ Revenue = \$55{,}662/day$$

$\varepsilon = -0.10$

$$-0.10 = \frac{\frac{46233 - x}{46233}}{\frac{1.10 - 1.21}{1.10}}$$

$$New\ Demand = 45771$$

$$Average\ Daily\ Revenue = \$55{,}383/day$$

$\varepsilon = -0.15$

$$-0.15 = \frac{\frac{46233 - x}{46233}}{\frac{1.10 - 1.21}{1.10}}$$

$$New\ Demand = 45540$$

$$Average\ Daily\ Revenue = \$55{,}103/day$$

$\varepsilon = -0.20$

$$-0.20 = \frac{\frac{46233 - x}{46233}}{\frac{1.10 - 1.21}{1.10}}$$

$$New\ Demand = 45308$$

$$Average\ Daily\ Revenue = \$54{,}823/day$$

To show that the above values were considered liberal, a link-by-link analysis of the eastbound segment was done. In a link-by-link analysis, it was considered that each segment of roadway has a toll level – in this case the toll is the original toll that is charged if a motorist were to enter and exit the turnpike at each entry and exit point (respectively). Tables 3 through 6 summarize this analysis.

Exit 11 to Exit 11a:

Original Demand: 33219
Original Price: $0.45
New Price: $0.50

Elasticity Value	ε = -0.05	ε = -0.10	ε = -0.15	ε = -0.20
New Demand	33035	32850	32665	32481
Estimated Revenue/ day	$16352	$16261	$16169	$16078

Table 3. Demand and Revenue Values for I-90E Exit 11 to 11a

Exit 11a to Exit 12:

Original Demand: 36027
Original Price: $0.25
New Price: $0.28

Elasticity Value	ε = -0.05	ε = -0.10	ε = -0.15	ε = -0.20
New Demand	35811	35595	35379	35162
Estimated Revenue/ day	$9848	$9789	$9729	$9670

Table 4. Demand and Revenue Values for I-90E Exit 11a to 12

Exit 12 to Exit 13:

Original Demand: 40000
Original Price: $0.30
New Price: $0.33

Elasticity Value	ε = -0.05	ε = -0.10	ε = -0.15	ε = -0.20
New Demand	39800	39600	39400	39200
Estimated Revenue/ day	$13134	$13068	$13002	$12936

Table 5. Demand and Revenue Values for I-90E Exit 12 to 13

Exit 13 to Exit 14:

Original Demand: 46233
Original Price: $0.30
New Price: $0.33

Elasticity Value	ε = -0.05	ε = -0.10	ε = -0.15	ε = -0.20
New Demand	46002	45771	45540	45308
Estimated Revenue/ day	$15181	$15104	$15028	$14952

Table 6. Demand and Revenue Values for I-90E Exit 13 to 14

It can then be assumed that the average daily revenue for this portion of the Massachusetts' Turnpike using a link-by-link analysis would be $54,515 for an elasticity value of -0.05, $54,222 for an elasticity value of -0.1, $53,929 for an elasticity value of -

0.15, and $53,635 for an elasticity value of -0.2. In the link-by-link analysis, the average daily revenue was smaller than the aggregate data used above. Table 7 summarizes this analysis.

Elasticity Value	ε = -0.05	ε = -0.10	ε = -0.15	ε = -0.20
Aggregate Revenue	$55,662	$55,383	$55,103	$54,823
Link-by-link Revenue	$54,515	$54,222	$53,929	$53,635

Table 7. Side by Side Revenue Analysis

In order to make a comparison between the current toll prices and the proposed toll prices, current revenues for Exit 11 to Exit 14 were approximated. In order to estimate these toll revenues, the link volume was multiplied by the toll price. Table 8 gives a summary of the original revenue values.

Original Values - I90E			
Eastbound	Volume	Toll Price	Revenue
Exit 11 to 11a	33219	$0.45	14949
Exit 11a to 12	36027	$0.25	9007
Exit 12 to 13	40000	$0.30	12000
Exit 13 to 14	46233	$0.30	13870
Total Revenue			$49,825

Table 8. Original Revenue I-90E

As shown in the analysis, the proposed increase in tolls would result in an increase of $4,000 per day or approximately $1 million per year for eastbound weekday toll transactions.

5.1.2.2 Westbound Direction

On the Massachusetts' Turnpike Westbound, the similar calculations were done. In this case, as motorists headed west towards the New York state border, they exited the turnpike, which allowed for a higher understanding of the data. Below is the general formula of the calculations done for a portion of the Massachusetts' Turnpike westbound.

Like the analysis done for the eastbound direction of the turnpike and the Boston Extension, several elasticity values were used to calculate approximates for the New Demand. As before, epsilon, ε, was set equal to the percent change in demand over the percent change in price. The equation was written as $\varepsilon = \frac{\frac{Old\ Demand - New\ Demand}{Old\ Demand}}{\frac{Old\ Price - New\ Price}{Old\ Price}}$. From there, constant values were substituted which yielded a more condensed equation. The revenues calculated below provide a conservative estimate of potential revenue if the toll price along the turnpike were to increase by 10%.

Below, Tables 9 through 12 summarize the estimated revenues and new demand for each exit.

Exit 14 to Exit 13:
Original Demand: 48356
Original Price: $0.30
New Price: $0.33

Elasticity Value	ε = -0.05	ε = -0.10	ε = -0.15	ε = -0.20
New Demand	48114	47872	47631	47389
Estimated Revenue/ day	$15878	$15798	$15718	$15638

Table 9. Demand and Revenue Values for I-90W Exit 14 to 13

Exit 13 to Exit 12:
Original Demand: 41027
Original Price: $0.30
New Price: $0.33

Elasticity Value	ε = -0.05	ε = -0.10	ε = -0.15	ε = -0.20
New Demand	40822	40617	40412	40207

Estimated Revenue/ day	$13471	$13404	$13336	$13268

Table 10. Demand and Revenue Values for I-90W Exit 13 to 12

Exit 12 to Exit 11:

Original Demand: 35822
Original Price: $0.25
New Price: $0.28

Elasticity Value	ε = -0.05	ε = -0.10	ε = -0.15	ε = -0.20
New Demand	35607	35392	35177	34962
Estimated Revenue/ day	$9792	$9733	$9674	$9615

Table 11. Demand and Revenue Values for I-90W Exit 12 to 11

Exit 11 to Exit 11A:

Original Demand: 33219
Original Price: $0.45
New Price: $0.50

Elasticity Value	ε = -0.05	ε = -0.10	ε = -0.15	ε = -0.20
New Demand	33035	32850	32665	32481
Estimated Revenue/ day	$16352	$16261	$16169	$16078

Table 12. Demand and Revenue Values for I-90W Exit 11 to 11a

It can then be assumed that the average daily revenue for this portion of the Massachusetts' Turnpike would be $55,493 for an elasticity value of -0.05, $55,195 for an elasticity value of -0.1, $54,897 for an elasticity value of -0.15, and $54,599 for an elasticity value of -0.2. Table 13 summarizes these findings.

Elasticity Value	ε = -0.05	ε = -0.10	ε = -0.15	ε = -0.20
Estimated Revenue/ day	$55,493	$55,195	$54,897	$54,599

Table 13. Total (Western Portion) Estimated Revenue for I-90W

As before, in order to effectively analyze the positive outcome of increasing the tolls on the Massachusetts' Turnpike by 10%, the original revenue needed to be

calculated. Table 14 provides a summary of the link revenues as well as the total estimated revenue for Exit 11 through Exit 14.

Original Values – I90W			
Westbound	Volume	Toll Price	Revenue
Exit 11 to 11a	33219	$0.45	14949
Exit 11a to 12	35822	$0.25	8956
Exit 12 to 13	41027	$0.30	12308
Exit 13 to 14	48356	$0.30	14507
Total Revenue			$50,719

Table 14. Current Volume and Revenues for I-90W

As shown in the analysis, the proposed increase in tolls would result in an increase of $4,000 per day or approximately $1 million per year for westbound weekday toll transactions.

5.1.2.3 Comparison

The revenues and volumes presented above can be converted into daily averages or yearly averages, without becoming too uncertain. The yearly estimates are more accurate because they were converted by Cambridge Systematics, a company which has access to better and more accurate data. Converting daily averages to yearly averages would be a little more complex because it cannot be assumed that the roadway volume on a weekday is comparable to the roadway volume on a weekend or holiday.

The Westbound and Eastbound average revenues appear to be comparable. The average daily revenue for each direction falls between $54,000 and $56,000 per day. On March 29, 2010, the Massachusetts' Turnpike Authority released, "Western Turnpike

Revenue Bonds" which is a document that reported the annual revenue generated by the Massachusetts' Turnpike for the fiscal year that ended on June 30, 2009. The report stated that for Exit 1 to Exit 15 on the Turnpike about $110,773,000 was generated in 2008-2009. The gap between the revenues estimated in this research and the revenues reported by the Turnpike cannot be directly compared because the revenues reported by the Turnpike account for Exit 1 through Exit 15, whereas this research only considers Exit 11 through Exit 14.

5.1.3 Interstate 93

In order to estimate the anticipated revenues on Interstate 93, a freeway that runs North/South through the Boston Metropolitan area, the adjusted 2007 corridor counts provided by the Central Transportation Planning Staff (CTPS) were used. Since the data from CTPS was based on a 250 day year (including only "work" days), the data needed to be adjusted to include 365 days (a full non-leap year). In order to appropriately adjust the data, the individual corridor count sections were multiplied (i.e. North of route 129, North of Exit 16, etc.) by 250 and then divided that number by 365. More explicitly, the equation below was used:

$$\frac{y_i \times 250}{365}$$

Where y_i is the corridor count on section of road under consideration. Moreover, due to the fact that it is being suggested that collection ramps be installed at each exit north of Route 3 and south of Route 28, the exit ramp demand was calculated using the adjusted CTPS data. More specifically, if traffic was moving Northbound towards Route 28, the calculations started with the corridor count from the Braintree Split and subtracted

the following exit from the previous exit (i.e. The corridor count of exit 15 was subtracted from exit 14), in most cases this yielded a positive number. A positive number indicated an increase in volume; a negative number indicated a decrease in volume. It should be noted that negative numbers were discarded and not used in any revenue summations.

Using the adjusted corridor counts provided by CTPS and approximated elasticities, the demand changes on Interstate 93 were estimated for when a toll is collected. Since Interstate 93 is not currently tolled, an arc elasticity was used rather than a standard elasticity calculation. In using an arc elasticity, the nontrivial issue of dividing by 0 was circumvented. The equations for a standard elasticity (the one used for the Massachusetts' Turnpike analysis) and an arc elasticity are shown below:

$$\varepsilon_{standard} = \frac{\dfrac{Old\ Demand - New\ Demand}{Old\ Demand}}{\dfrac{Old\ Price - New\ Price}{Old\ Price}}$$

$$\varepsilon_{arc_{i+1}} = \frac{\dfrac{(New\ Demand)_{i+1} - (Old\ Demand)_i}{(New\ Demand)_{i+1}}}{\dfrac{(New\ Price)_{i+1} - (Old\ Price)_i}{(New\ Price)_{i+1}}}$$

As you can see from $\varepsilon_{standard}$the "Old Price" divides the difference of the "New Price" but in this situation the "Old Price" is zero. In order to best approximate the change in demand an iterative method was needed.

Statement of Method:

Step 1: Let $i = 0$

Step 2: Find $ND_i = f(OP_i, NP_i, OD_i)$

Step 3: $OD_{i+1} = ND_i$

Step 4: $i = i + 1$

Step 5 (if necessary): Go to Step 1

To better illustrate this approach, an epsilon, $\varepsilon = -0.05$ and the values in Table 15 were considered.

i	OP_i Old Price	NP_i New Price	OD_i Old Demand	ND_i New Demand
0	\$0.00	\$0.01	10000	ND_0 $(= OD_1)$
1	\$0.01	\$0.02	OD_1	ND_1

Table 15. Calculation Analysis, Step 1

Solve for ND_0:

$$-0.05 = \frac{\frac{ND_0 - 10000}{ND_0}}{\frac{\$0.01 - \$0.00}{\$0.01}}$$

Therefore:

$$ND_0 \approx 9524$$

It then follows that Table 15 (now Table 16) can be filled in as such:

i	Old Price	New Price	Old Demand	New Demand
0	\$0.00	\$0.01	10000	9524
1	\$0.01	\$0.02	9524	ND_1

Table 16. Calculation Analysis, Step 2

Solve for

$$-0.05 = \frac{\frac{ND_1 - 9524}{ND_1}}{\frac{\$0.02 - \$0.01}{\$0.02}}$$

Like before, it can be seen:

$$ND_1 \approx 9292$$

From there the calculations are completed and compiled into Table 17:

i	Old Price	New Price	Old Demand	New Demand
0	$0.00	$0.01	10000	9524
1	$0.01	$0.02	9524	9292

Table 17. Calculation Analysis, Final

Prior to the research, it was expected that implementing tolls on Interstate 93 would significantly reduce demand – the analysis supports our original hypothesis. The manner in which the data was originally presented was disjoint. CTPS looked at link volumes for Interstate 93 (in the north and south direction) north and south of Boston. Since it was proposed that users entering or leaving Boston would have to pay a $1.00 toll, which means that for each Table 18 through 25 a user is expected to pay the toll, regardless if they were already counted in a previous table in which the roadway was going the same direction. Additionally, unlike the analysis done for the Massachusetts' Turnpike, after the first link, the difference in volume (among the following) was only considered, to avoid double counting.

The same method of analysis (as shown above) was applied to the Interstate 93 data for multiple elasticity values and exits. The appendix includes a detailed summary of the iterative analysis done for Interstate 93. Additionally in Tables 21 through 25, the effects of congestion pricing during the AM Peak hour was analyzed. A summary of all the data analysis for I-93 is presented in Tables 18 through 25. It should be noted that all values are considered to be daily estimates.

First, Interstate 93 Northbound, both north and south of Boston were analyzed. Then, Interstate 93 Southbound, both north and south of Boston were analyzed. After that analysis was done, the morning peak volumes were analyzed to measure the effects of congestion pricing during that peak period. The original demand for each link is in parenthesis next to the link location. It was found that there was a huge reduction in

demand as the absolute value of the elasticity increased. In the calculations, to avoid double and triple counting vehicles, it was necessary to use the link volume from the first link and subtracted it from the total volume on the second link – this method was continued until the last link in the chain was reached. Therefore, in the revenue analysis negative demand values were not considered because it meant that more vehicles were exiting the facility than entering them and unfortunately there was no way to extract that information from the data provided.

I93N (South of Boston)				
Location	**Elasticity value**			
	-0.05	**-0.1**	**-0.15**	**-0.2**
SE Expwy @ Braintree Split (67041)	51854	40260	31370	24525
north of Route 28 (4158)	3216	2497	1946	1521
SE Expwy n. of Exit 14 (719)	556	432	336	263
SE Expwy n. of Exit 15 (6603)	5107	3965	3090	2416
SE Expwy n. of Exit 16 (-5233)	-4048	-3143	-2449	-1914
Total	$60733	$47154	$36742	$28725

Table 18. New Demand for I-93N (South of Boston)

I93N (North of Boston)				
Location	**Elasticity value**			
	-0.05	**-0.1**	**-0.15**	**-0.2**
South of Exit 30 (53236)	41176	31970	24911	19475
South of Exit 32 (11428)	8839	6863	5347	4181
South of Exit 33 (979)	757	588	458	358
Stoneham TL (1295)	1002	778	606	474
South of Exit 36 (3134)	2424	1882	1466	1146
South of Rt 129 (-10284)	-7954	-6176	-4812	-3762
Total	$54198	$42081	$32788	$25634

Table 19. New Demand for I-93N (North of Boston)

I93S (South of Boston)				
Location	**Elasticity value**			
	-0.05	**-0.1**	**-0.15**	**-0.2**
SE Expwy n. of Exit 16 (63014)	48739	37842	29486	23052
SE Expwy n. of Exit 15 (15315)	11846	9197	7166	5603
SE Expwy n. of Exit 14 (-2291)	-1772	-1376	-1072	-838
north of Route 28 (-4435)	-3430	-2663	-2075	-1622
SE Expwy @ Braintree Split (-740)	-572	-444	-346	-271
Total	$60585	$47039	$36652	$28655

Table 20. New Demand for I-93S (South of Boston)

I93S (North of Boston)				
Location	**elasticity value**			
	-0.05	**-0.1**	**-0.15**	**-0.2**
South of Rt 129 (60801)	47027	36513	28450	22242
South of Exit 36 (9312)	7203	5592	4357	3407
Stoneham TL (-3216)	-2487	-1931	-1505	-1176
South of Exit 33 (-1476)	-1142	-886	-691	-540
South of Exit 32 (-3366)	-2603	-2021	-1575	-1231
South of Exit 30 (-9353)	-7234	-5617	-4377	-3422
Total	$54230	$42105	$32807	$25649

Table 21. New Demand for I-93S (North of Boston)

I93S (North of Boston) – Congestion				
Location	**Elasticity value**			
	-0.05	**-0.1**	**-0.15**	**-0.2**
South of Rt 129 (15305)	11599	8825	6738	5161
South of Exit 36 (-1747)	-1324	-1007	-769	-589
Stoneham TL (-935)	-709	-539	-412	-315
South of Exit 33 (226)	171	130	99	76
South of Exit 32 (-630)	-477	-363	-277	-212
South of Exit 30	-1171	-891	-680	-521

(-1545)				
I93S (North of Boston) – Congestion				
Location	**Revenues (in dollars)**			
	-0.05	**-0.1**	**-0.15**	**-0.2**
South of Rt 129	17399	13237	10106	7742
South of Exit 36	-1986	-1511	-1154	-884
Stoneham TL	-1063	-809	-617	-473
South of Exit 33	257	195	149	114
South of Exit 32	-716	-545	-416	-319
South of Exit 30	-1756	-1336	-1020	-782
Total	17656	13432	10256	7856

Table 22. New Demand and Revenue during the AM Peak for I-93S (North of Boston)

I93N (North of Boston) -- Congestion				
Location	**Elasticity value**			
	-0.05	**-0.1**	**-0.15**	**-0.2**
South of Rt 129 (7171)	-1988	-1512	-1155	-885
South of Exit 36 (2507)	1168	889	678	520
Stoneham TL (247)	1015	772	589	452
South of Exit 33 (1339)	187	142	109	83
South of Exit 32 (1541)	1900	1445	1104	845
South of Exit 30 (-2623)	5435	4135	3157	2418
I93N (North of Boston) -- Congestion				
Location	**Revenues (in dollars)**			
	-0.05	**-0.1**	**-0.15**	**-0.2**
South of Rt 129	-2982	-2269	-1732	-1327
South of Exit 36	1752	1333	1018	780
Stoneham TL	1522	1158	884	677
South of Exit 33	281	214	163	125
South of Exit 32	2850	2168	1655	1268
South of Exit 30	8152	6202	4735	3627
Total	14557	11075	8456	6477

Table 23. New Demand and Revenue during the AM Peak for I-93N (North of Boston)

I93S (South of Boston) -- Congestion				
Location	**Elasticity value**			
	-0.05	**-0.1**	**-0.15**	**-0.2**
SE Expwy @ Braintree Split (9589)	7267	5529	4221	3234

north of Route 28 (1969)	1492	1135	867	664
SE Expwy n. of Exit 14 (-1120)	-849	-646	-493	-378
SE Expwy n. of Exit 15 (2853)	2162	1645	1256	962
SE Expwy n. of Exit 16 (-3103)	-2352	-1789	-1366	-1046
I93S (South of Boston) -- Congestion				
Location	**Revenues (in dollars)**			
	-0.05	**-0.1**	**-0.15**	**-0.2**
SE Expwy @ Braintree Split	10901	8293	6332	4851
north of Route 28	2238	1703	1300	996
SE Expwy n. of Exit 14	-1273	-969	-740	-567
SE Expwy n. of Exit 15	3243	2467	1884	1443
SE Expwy n. of Exit 16	-3528	-2684	-2049	-1570
Total	16383	12464	9516	7290

Table 24. New Demand and Revenue during the AM Peak for I-93S (South of Boston)

I93N (South of Boston) -- Congestion				
Location	**Elasticity value**			
	-0.05	**-0.1**	**-0.15**	**-0.2**
SE Expwy @ Braintree Split (13483)	10219	7774	5936	4547
north of Route 28 (634)	480	366	279	214
SE Expwy n. of Exit 14 (589)	446	340	259	199
SE Expwy n. of Exit 15 (1373)	1041	792	604	463
SE Expwy n. of Exit 16 (-17)	-13	-10	-7	-6
I93N (South of Boston) -- Congestion				
Location	**Revenues (in dollars)**			
	-0.05	**-0.1**	**-0.15**	**-0.2**
SE Expwy @ Braintree Split	15328	548	419	321
north of Route 28	721	548	419	321
SE Expwy n. of Exit 14	670	509	389	298
SE Expwy n. of Exit 15	1561	1187	907	695
SE Expwy n. of Exit 16	-19	-15	-11	-9
Total	18279	2794	2133	1634

Table 25. New Demand and Revenue during the AM Peak for I-93N (South of Boston)

5.1.4 Turnpike Application

In order to test the veracity of the method proposed above, the same iterative method was applied to an exit on the Massachusetts' Turnpike. For the analysis, Exit 11

to 11a on the Massachusetts' Turnpike (in the eastbound direction) was used. All parameters and base numbers used previously were once again used.

As depicted in Table 26, below, the new and original methods were compared. The new method yielded a higher value for new demand for all values of ε; however, the percent difference between the two methods at its highest is only 1.5% — relatively small when other factors are taken into consideration. This comparison supports the notion that the iterative calculations using the arc elasticity and the corresponding results may be considered to be reasonable.

It should be noted that one of the main differences between the analysis for this exit on the Massachusetts' Turnpike and the analysis done for Interstate 93 is that the first "Old Price" in the iterative method was $0.45, rather than $0.00 (the value that had been used for Interstate 93). If the "Old Price" had been set to $0.00, as it was in previous calculations, the demand decrease would have been significant. Furthermore, since the original and new methods yield almost the same demand values, using $0.45 as the original "Old Price" it can be concluded that the calculations in both cases for Interstate 90 and 93 were done in a reasonable manner and that the higher decrease in demand estimated for Interstate 93 may be reasonable.

Exit 11 to Exit 11a:

Original Demand: 33219
Original Price: $0.45
New Price: $0.50

	Elasticity Value			
	ε = -0.05	ε = -0.10	ε = -0.15	ε = -0.20
Original Method	33035	32850	32665	32481
New Method	33079	33046	33012	32979

Difference	44	196	347	498
Percent Diff.	0.13%	0.59%	1.07%	1.53%

Table 26. Side by Side Comparison of the Two Methods

5.2 Contributions of the Research

The results of the research will better serve state DOT officials in understanding how tolls can be used as a tool in transportation finance. Toll roads have been used as a source of transportation finance for more than 50 years, but still there are states in the continental U.S. that do not have any tolled roadways. Literature shows that in locations where tolls are currently used, users are looking for better technology and faster collection. In locations where toll roads are non-existent, high speed toll roads and all electronic toll payment systems are being considered as an alternative transportation finance approach.

It should be noted that installing toll roads on roadways that are not currently tolled can have mixed effects. For example, in some instances the roadway users will accept that they need to pay the toll and demand will not change. On the other hand, many roadways users may switch to other roadways where tolls are not charged and demand on these other roads may decrease significantly. Furthermore, as roadway users switch to an alternate route, the roadways in which they choose to relocate are usually not designed to handle increased demand. What may happen is that users would initially switch routes, but the increase in travel time as well as inconvenience would direct them back to the newly tolled highway. As such, demand on the newly tolled highway may not significantly decrease as time went on. It goes without saying that revenue will increase because there was no generated revenue in the first place.

More specifically, on Interstate 93, it was believed that users will use alternative routes to reach their destination. As such, their new route choice could be examined to see if: a) they are in fact switching routes; b) choosing to commute at off-peak times (in the case where congestion pricing is implemented); and finally c) carpooling with co-workers and acquaintances to reduce traveling expenses. Gathering political support and public acceptance to implement tolls on a roadway such as Interstate 93 is expected to be a challenge for State DOT officials because the notion of installing tolls on roads that are not currently tolled may raise a lot of questions.

In raising toll prices on Interstate 90, revenue would also be expected to increase. As shown in the literature, the roads that typically demonstrate a severe decrease in demand when tolls are raised are roads that were not previously tolled. Although demand may fluctuate on Interstate 90, revenue on the roadway is expected to increase which is supported with CTPS data for the MassPike. Moreover, many users who choose to utilize a different facility in response to the toll increase on the MassPike may revert back to the MassPike due to convenience and faster travel times.

CHAPTER VI

CONCLUSIONS AND RECOMMENDATIONS

The current economic climate serves as an open forum to consider alternative financing approaches for surface transportation. As discussed in the literature, tolling is a major finance approach available to State DOTs to support surface transportation investments. Present trends indicate that toll roads are sustainable financing approaches. Although not referenced in this paper, a vehicle-miles traveled fee or a VMT fee has been suggested as a viable substitute to the gas tax. The current gas tax has been recognized by many researchers and economists as a financing method that is losing its purchasing power -- as the number of hybrid cars increases, the gas tax becomes more ineffective. Another alternative used to support surface transportation investments has been the sales tax (in some states). Using the sales tax to fund surface transportation investments is a complicated issue because people want their taxes to be used in investments that relate to them – not everyone drives. Additionally, other sources imply that a financing approach including many different innovative financing schemes should be considered.

Not only should current toll levels be increased, to remain on par with inflation, but innovative pricing strategies should be employed to reduce congestion during peak hours as well as create a greener transportation system. In employing effective and innovative pricing strategies, congestion on roadways such as Interstate 93, previously discussed, would create a more enjoyable travel experience for the user, generate revenue for the state, and reduce idle time for users (i.e. reducing CO2 emissions).

In employing innovative technologies, toll collection strategies needed to be considered. In this day and age, the literature suggests and later proves that all-electronic

tolling and “cashless” tolling are strategies being considered by many toll road agencies. Roadway users have two goals: they want to get to their destination without incident and they want to do that quickly -- all-electronic tolling better allows users to achieve their goals.

Massachusetts, like most states, is in the middle of an economic decline – especially when it comes to financing transportation while at the same time the State DOT is looking for ways to generate additional revenue for transportation investments. Increasing the tolls on the Massachusetts’ Turnpike and implementing tolls on Interstate 93 are viable alternatives to pave way for improvements and new development to transportation infrastructure in the commonwealth. In a place where snow falls can accumulate to more than 40 inches in one month, there needs to money to offset the damaging effects of the weather – implementing the alternatives proposed above can help remedy these hardships. The analysis done on Interstate 93 will allow state department of transportation officials a foundation in which they can use to seek clarity when deciding to implement tolls on a roadway that is not currently tolled. Using an iterative arc elasticity, rather than the standard arc elasticity is believed to yield a more accurate approximation when it comes to forecasting new demand on roadways that were not previously tolled. Furthermore, state officials should know that using the point elasticity method (such as the one used for the Massachusetts’ Turnpike) is not a viable option because it leaves the researcher to divide by zero – undefined in mathematics. Furthermore, reflecting on the project demand decrease on Interstate 93, it is expected that a route shift will occur; however, due to the limitations of the data, the alternative routes chosen could not be determined.

Since, the Massachusetts' Turnpike already has tolls and transportation demand is relatively inelastic, increasing the tolls on this roadway, as shown above, would minimally reduce demand while at the same time increase revenue. Most users expect that as inflation increases the cost of living increases as well – they see it everywhere. With the rising cost of oil, produce, taxes, and rent, it is only natural to expect a rise in transportation costs. Looking at the analysis of the Boston Extension, just by increasing the average toll price by 10%, revenues are projected to increase by at least $6 million for the year AND there will be a reduction in congestion on the heavily traveled Boston Extension. Furthermore, looking at the western/central portion of the Turnpike, revenues are projected to increase as well.

Unlike the Boston Extension, current revenue data for the western portion of Turnpike was not made available so it had to be estimated in a manner similar to that of the analysis. For both the eastbound and westbound directions of the Massachusetts' Turnpike, increasing tolls by 10% could yield at least an increase of approximately $8,000 per weekday in revenues or approximately $2,000,000 annually for weekday traffic. If Origin-Destination (OD) tables were available for the entire Western portion of the Turnpike, a more accurate analysis could have been performed. With OD tables, the exact toll price for users would be known and as such be able to better calculate projected revenues.

APPENDIX

93 DATA ANALYSIS

		I93S (south of boston)																			
		ND (1)				**ND (2)**				**ND (3)**				**ND (4)**				**ND (5)**			
OP	NP	**-0.05**	**-0.1**	**-0.15**	**-0.2**	**-0.05**	**-0.1**	**-0.15**	**-0.2**	**-0.05**	**-0.1**	**-0.15**	**-0.2**	**-0.05**	**-0.1**	**-0.15**	**-0.2**	**-0.05**	**-0.1**	**-0.15**	**-0.2**
0.0	0.0	6301	6301	6301	6301	1531	1531	1531	1531	-	-	-	-	-	-	-	-		-		-
0	1	4	4	4	4	5	5	5	5	2291	2291	2291	2291	4435	4435	4435	4435	-740	740	-740	740
0.0	**0.0**	6001	5728	5479	5251	1458	1392	1331	1276	-	-	-	-	-	-	-	-		-		-
1	**2**	3	5	5	2	6	3	7	3	2182	2083	1992	1909	4224	4032	3857	3696	-705	673	-643	617
0.0	0.0	5855	5455	5097	4773	1423	1326	1238	1160	-	-	-	-	-	-	-	-		-		-
2	3	0	8	2	8	0	0	8	2	2129	1984	1853	1736	4121	3840	3587	3360	-688	641	-599	561
0.0	0.0	5759	5279	4854	4475	1399	1283	1179	1087	-	-	-	-	-	-	-	-		-		-
3	4	0	8	5	4	7	2	8	7	2094	1920	1765	1627	4053	3716	3417	3150	-676	620	-570	526
0.0	**0.0**	5687	5151	4679	4262	1382	1251	1137	1035	-	-	-	-	-	-	-	-		-		-
4	**5**	9	0	0	3	4	9	2	9	2068	1873	1701	1550	4003	3625	3293	3000	-668	605	-549	501
0.0	0.0	5631	5050	4542	4098	1368	1227	1104		-	-	-	-	-	-	-	-		-		-
5	6	6	0	7	4	7	4	1	9961	2047	1836	1652	1490	3964	3554	3197	2884	-661	593	-533	481
0.0	0.0	5585	4967	4431	3966	1357	1207	1077		-	-	-	-	-	-	-	-		-		-
6	7	0	2	9	2	4	2	1	9639	2031	1806	1611	1442	3931	3496	3119	2791	-656	583	-520	466
0.0	**0.0**	5545	4897	4338	3856	1347	1190	1054		-	-	-	-	-	-	-	-		-		-
7	**8**	4	2	9	0	8	2	5	9372	2016	1780	1578	1402	3903	3447	3054	2714	-651	575	-510	453
0.0	0.0	5511	4836	4259	3761	1339	1175	1035		-	-	-	-	-	-	-	-		-		-
8	9	0	8	1	9	4	5	1	9143	2004	1759	1548	1368	3879	3404	2998	2648	-647	568	-500	442
0.0	0.1	5480	4783	4189	3680	1332	1162	1018		-	-	-	-	-	-	-	-		-		-
9	0	5	6	3	2	0	6	2	8944	1993	1739	1523	1338	3857	3367	2948	2590	-644	562	-492	432
0.1	**0.1**	5453	4736	4127	3608	1325	1151	1003		-	-	-	-	-	-	-	-		-		-
0	**1**	3	3	4	0	4	1	1	8769	1983	1722	1501	1312	3838	3333	2905	2539	-640	556	-485	424
0.1	0.1	5428	4693	4071	3543	1319	1140			-	-	-	-	-	-	-	-		-		-
1	2	6	6	8	6	4	7	9896	8612	1974	1706	1480	1288	3821	3303	2866	2494	-638	551	-478	416
0.1	0.1	5406	4654	4021	3485	1313	1131			-	-	-	-	-	-	-	-		-		-
2	3	1	8	6	5	9	3	9774	8471	1965	1692	1462	1267	3805	3276	2830	2453	-635	547	-472	409
0.1	**0.1**	5385	4619	3975	3432	1308	1122			-	-	-	-	-	-	-	-		-		-
3	**4**	3	3	7	7	9	7	9663	8343	1958	1679	1445	1248	3790	3251	2798	2416	-632	542	-467	403
0.1	0.1	5366	4586	3933	3384	1304	1114			-	-	-	-	-	-	-	-		-		-
4	5	2	5	5	3	2	7	9560	8225	1951	1668	1430	1230	3777	3228	2768	2382	-630	539	-462	397
0.1	0.1	5348	4556	3894	3339	1299	1107			-	-	-	-	-	-	-	-		-		-
5	6	3	1	6	8	9	3	9465	8117	1944	1656	1416	1214	3764	3207	2741	2351	-628	535	-457	392
0.1	**0.1**	5331	4527	3858	3298	1295	1100			-	-	-	-	-	-	-	-		-		-
6	**7**	7	8	4	6	8	5	9378	8017	1938	1646	1403	1199	3753	3187	2716	2322	-626	532	-453	387
0.1	0.1	5316	4501	3824	3260	1292	1094			-	-	-	-	-	-	-	-		-		-
7	8	1	4	7	2	0	0	9296	7924	1933	1637	1391	1185	3741	3168	2692	2295	-624	529	-449	383
0.1	0.1	5301	4476	3793	3224	1288	1088			-	-	-	-	-	-	-	-		-		-
8	9	3	5	1	4	4	0	9219	7837	1927	1628	1379	1172	3731	3151	2670	2269	-623	526	-445	379
0.1	**0.2**	5287	4453	3763	3190	1285	1082			-	-	-	-	-	-	-	-		-		-
9	**0**	4	1	4	8	1	3	9147	7755	1922	1619	1368	1160	3721	3134	2649	2246	-621	523	-442	375

	0.2	5274	4430	3735	3159	1281	1076			-	-	-	-	-	-	-	-		-		-
0.2	1	2	9	3	2	9	9	9078	7678	1918	1611	1358	1149	3712	3119	2629	2223	-619	520	-439	371
0.2	0.2	5261	4409	3708	3129	1278	1071			-	-	-	-	-	-	-	-		-		-
1	2	7	9	9	4	8	8	9014	7606	1913	1603	1348	1138	3703	3104	2610	2203	-618	518	-436	367
0.2	**0.2**	5249	4389	3683	3101	1275	1066			-	-	-	-	-	-	-	-		-		-
2	**3**	8	9	7	2	9	9	8953	7537	1909	1596	1339	1128	3695	3090	2593	2183	-617	516	-433	364
0.2	0.2	5238	4370	3659	3074	1273	1062			-	-	-	-	-	-	-	-		-		-
3	4	4	9	9	5	1	3	8895	7472	1905	1589	1331	1118	3687	3076	2576	2164	-615	513	-430	361
0.2	0.2	5227	4352	3637	3049	1270	1057			-	-	-	-	-	-	-	-		-		-
4	5	5	8	1	1	5	9	8840	7410	1901	1583	1322	1109	3679	3064	2560	2146	-614	511	-427	358
0.2	**0.2**	5217	4335	3615	3024	1268	1053			-	-	-	-	-	-	-	-		-		-
5	**6**	1	5	4	9	0	7	8787	7352	1897	1576	1314	1100	3672	3051	2545	2129	-613	509	-425	355
0.2	0.2	5207	4318	3594	3001	1265	1049			-	-	-	-	-	-	-	-		-		-
6	7	0	9	7	8	5	7	8737	7296	1893	1570	1307	1091	3665	3040	2530	2113	-611	507	-422	353
0.2	0.2	5197	4302	3574	2979	1263	1045			-	-	-	-	-	-	-	-		-		-
7	8	4	9	8	7	2	8	8688	7242	1890	1564	1300	1083	3658	3028	2516	2097	-610	505	-420	350
0.2	**0.2**	5188	4287	3555	2958	1260	1042			-	-	-	-	-	-	-	-		-		-
8	**9**	1	6	8	6	9	1	8642	7191	1886	1559	1293	1076	3651	3018	2503	2082	-609	504	-418	347
0.2		5179	4272	3537	2938	1258	1038			-	-	-	-	-	-	-	-		-		-
9	0.3	2	9	5	3	8	5	8598	7141	1883	1553	1286	1068	3645	3007	2490	2068	-608	502	-415	345
0.3	0.3	5170	4258	3519	2918	1256	1035			-	-	-	-	-	-	-	-		-		-
0	1	6	7	9	8	7	0	8555	7094	1880	1548	1280	1061	3639	2997	2477	2054	-607	500	-413	343
0.3	**0.3**	5162	4245	3502	2900	1254	1031			-	-	-	-	-	-	-	-		-		-
1	**2**	3	0	9	1	6	7	8514	7049	1877	1543	1274	1054	3633	2988	2465	2041	-606	499	-411	341
0.3	0.3	5154	4231	3486	2882	1252	1028			-	-	-	-	-	-	-	-		-		-
2	3	2	8	6	1	7	5	8474	7005	1874	1539	1268	1048	3628	2978	2454	2028	-605	497	-409	338
0.3	0.3	5146	4219	3470	2864	1250	1025			-	-	-	-	-	-	-	-		-		-
3	4	4	0	8	8	8	4	8436	6963	1871	1534	1262	1042	3622	2969	2443	2016	-604	495	-408	336
0.3	**0.3**	5138	4206	3455	2848	1249	1022			-	-	-	-	-	-	-	-		-		-
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0.3	**0.3**	5117	4171	3412	2801	1243	1013			-	-	-	-	-	-	-	-		-		-
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0.4	0.4	5085	4119	3349	2732	1236	1001			-	-	-		-	-	-	-		-		-
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6	**7**	8	1	6	4	5	9924	8031	6522												
0.4	0.4	5057	4074	3294	2672	1229				-1839	-1481	-1198	-971	-3559	-2868	-2318	-1881	-594	-478	-387	-314
7	8	4	4	0	0	2	9902	8006	6494												
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9	**0**	0	6	8	1	6	9862	7957	6441												
	0.5	5042	4049	3264	2639	1225				-1833	-1472	-1187	-960	-3549	-2850	-2297	-1858	-592	-476	-383	-310
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3	4	4	3	9	3	9	9785	7865	6342												
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5	**6**	2	5	1	3	6	9750	7821	6295												
0.5	0.5	5013	4004	3209	2581	1218				-1823	-1456	-1167	-938	-3529	-2818	-2259	-1817	-589	-470	-377	-303
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7	8	4	4	1	0	5	9715	7780	6251												
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8	**9**	0	5	9	2	4	9698	7760	6230												
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1	**2**	5	6	0	7	4	9650	7702	6168												
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2	3	5	2	4	6	4	9635	7683	6148												
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3	4	6	9	9	5	5	9619	7665	6128												
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4	**5**	7	7	5	7	5	9604	7647	6109												
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5	6	8	7	3	0	6	9590	7630	6091												
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6	7	1	7	1	4	7	9575	7612	6072												
0.6	**0.6**	4969	3933	3125	2491	1207				-1807	-1430	-1136	-906	-3498	-2769	-2200	-1753	-584	-462	-367	-293
7	**8**	4	8	1	0	8	9561	7595	6054												
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8	9	7	0	3	7	9	9547	7579	6036												
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9	0	1	4	5	5	0	9533	7562	6019												

0.70	**0.71**	4958	3916	3104	2469	1205				-1803	-1424	-1129	-898	-3490	-2757	-2185	-1738	-582	-460	-365	-290
0.71	0.72	4955	3911	3098	2462	1204	9519	7546	6002	-1802	-1422	-1126	-895	-3487	-2753	-2181	-1733	-582	-459	-364	-289
0.72	0.73	4951	3905	3091	2455	1203	9506	7530	5985	-1800	-1420	-1124	-893	-3485	-2749	-2176	-1728	-581	-459	-363	-288
0.73	**0.74**	4948	3900	3085	2449	1202	9493	7514	5968	-1799	-1418	-1122	-890	-3483	-2745	-2172	-1724	-581	-458	-362	-288
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0.75	0.76	4941	3890	3073	2435	1201	9467	7484	5936	-1797	-1414	-1117	-886	-3478	-2738	-2163	-1714	-580	-457	-361	-286
0.76	**0.77**	4938	3884	3067	2429	1200	9454	7469	5920	-1795	-1412	-1115	-883	-3476	-2734	-2159	-1710	-580	-456	-360	-285
0.77	0.78	4935	3879	3061	2423	1199	9442	7454	5905	-1794	-1411	-1113	-881	-3473	-2731	-2154	-1705	-580	-456	-359	-285
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0.79	**0.80**	4928	3870	3049	2410	1197	9418	7425	5874	-1792	-1407	-1109	-877	-3469	-2724	-2146	-1697	-579	-454	-358	-283
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0.82	**0.83**	4919	3855	3032	2393	1195	9382	7384	5830	-1789	-1402	-1103	-870	-3463	-2714	-2134	-1684	-578	-453	-356	-281
0.83	0.84	4916	3851	3027	2387	1195	9371	7370	5816	-1788	-1400	-1101	-868	-3461	-2710	-2131	-1680	-577	-452	-355	-280
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0.85	**0.86**	4911	3842	3016	2376	1193	9349	7344	5788	-1785	-1397	-1097	-864	-3456	-2704	-2123	-1672	-577	-451	-354	-279
0.86	0.87	4908	3837	3011	2370	1192	9338	7331	5775	-1784	-1395	-1095	-862	-3454	-2701	-2119	-1668	-576	-451	-354	-278
0.87	0.88	4905	3833	3005	2365	1192	9327	7318	5761	-1783	-1394	-1093	-860	-3452	-2698	-2116	-1665	-576	-450	-353	-278
0.88	**0.89**	4902	3828	3000	2359	1191	9316	7306	5748	-1782	-1392	-1091	-858	-3450	-2695	-2112	-1661	-576	-450	-352	-277
0.89	0.90	4899	3824	2995	2354	1190	9305	7293	5735	-1781	-1390	-1089	-856	-3449	-2692	-2108	-1657	-575	-449	-352	-276
0.90	0.91	4897	3820	2990	2349	1190	9295	7281	5722	-1780	-1389	-1087	-854	-3447	-2689	-2105	-1653	-575	-449	-351	-276
0.91	**0.92**	4894	3816	2985	2344	1189	9285	7269	5710	-1779	-1387	-1086	-852	-3445	-2686	-2101	-1650	-575	-448	-351	-275
0.92	0.93	4891	3811	2981	2339	1188	9275	7257	5697	-1778	-1386	-1084	-850	-3443	-2683	-2098	-1646	-574	-448	-350	-275
0.93	0.94	4889	3807	2976	2334	1188	9264	7245	5685	-1778	-1384	-1082	-849	-3441	-2680	-2095	-1643	-574	-447	-350	-274
0.94	**0.95**	4886	3803	2971	2329	1187	9255	7233	5673	-1777	-1383	-1080	-847	-3439	-2677	-2091	-1639	-574	-447	-349	-274
		5	7	5	1	6	9245	7222	5661												

0.9	0.9	4883	3799	2966	2324	1187				-	-	-		-	-	-	-		-		-
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0.9	0.9	4881	3795	2962	2319	1186				-	-	-		-	-	-	-		-		-
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0.9	**0.9**	4878	3791	2957	2314	1185				-	-	-		-	-	-	-		-		-
7	**8**	9	9	6	6	8	9216	7188	5625	1774	1379	1075	-842	3434	2669	2082	1629	-573	445	-347	272
0.9	0.9	4876	3788	2953	2309	1185				-	-	-		-	-	-	-		-		-
8	9	4	0	1	9	2	9206	7177	5614	1773	1377	1074	-840	3432	2666	2078	1626	-573	445	-347	271
0.9	**1.0**	**4873**	**3784**	**2948**	**2305**	**1184**				**-**	**-**	**-**		**-**	**-**	**-**	**-**		**-**		**-**
9	**0**	**9**	**2**	**6**	**2**	**6**	**9197**	**7166**	**5603**	**1772**	**1376**	**1072**	**-838**	**3430**	**2663**	**2075**	**1622**	**-572**	**444**	**-346**	**271**

I93N (south of Boston)

		ND (1)				**ND (2)**				**ND (3)**				**ND (4)**				**ND (5)**			
OP	NP	**-0.05**	**-0.1**	**-0.15**	**-0.2**	**-0.05**	**-0.1**	**-0.15**	**-0.2**	**-0.05**	**-0.1**	**-0.15**	**-0.2**	**-0.05**	**-0.1**	**-0.15**	**-0.2**	**-0.05**	**-0.1**	**-0.15**	**-0.2**
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0.01	**0.02**	63849	60946	58297	55868	3960	3780	3616	3465	685	654	625	599	6289	6003	5742	5503	-4984	-4757	-4550	-4361
0.02	0.03	62291	58044	54229	50789	3863	3600	3363	3150	668	623	582	545	6135	5717	5341	5002	-4862	-4531	-4233	-3964
0.03	0.04	61270	56172	51647	47614	3800	3484	3203	2953	657	602	554	511	6035	5532	5087	4690	-4783	-4385	-4031	-3717
0.04	**0.05**	60514	54802	49780	45347	3753	3399	3087	2813	649	588	534	486	5960	5398	4903	4466	-4724	-4278	-3886	-3540
0.05	0.06	59915	53727	48330	43603	3716	3332	2998	2704	643	576	518	468	5901	5292	4760	4295	-4677	-4194	-3773	-3403
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0.07	**0.08**	58998	52102	46162	41024	3659	3231	2863	2544	633	559	495	440	5811	5132	4547	4041	-4605	-4067	-3603	-3202
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0.09	0.10	58308	50893	44570	39154	3616	3156	2764	2428	625	546	478	420	5743	5013	4390	3856	-4551	-3973	-3479	-3056
0.10	**0.11**	58018	50389	43911	38386	3598	3125	2723	2381	622	540	471	412	5714	4963	4325	3781	-4529	-3933	-3428	-2996
0.11	0.12	57755	49936	43320	37700	3582	3097	2687	2338	619	536	465	404	5688	4918	4267	3713	-4508	-3898	-3381	-2943
0.12	0.13	57515	49523	42786	37082	3567	3071	2654	2300	617	531	459	398	5665	4878	4214	3652	-4489	-3866	-3340	-2895
0.13	**0.14**	57295	49145	42298	36520	3554	3048	2623	2265	614	527	454	392	5643	4840	4166	3597	-4472	-3836	-3302	-2851
0.14	0.15	57091	48796	41849	36006	3541	3026	2596	2233	612	523	449	386	5623	4806	4122	3546	-4456	-3809	-3267	-2811
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0.16	**0.17**	56724	48172	41050	35094	3518	2988	2546	2177	608	517	440	376	5587	4745	4043	3456	-4428	-3760	-3204	-2739
0.17	0.18	56558	47890	40691	34686	3508	2970	2524	2151	607	514	436	372	5570	4717	4008	3416	-4415	-3738	-3176	-2707
0.18	0.19	56401	47626	40355	34304	3498	2954	2503	2128	605	511	433	368	5555	4691	3975	3379	-4402	-3718	-3150	-2678
0.19	**0.20**	56253	47376	40039	33947	3489	2938	2483	2105	603	508	429	364	5540	4666	3943	3344	-4391	-3698	-3125	-2650
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0.22	**0.23**	55853	46705	39191	32994	3464	2897	2431	2046	599	501	420	354	5501	4600	3860	3250	-4360	-3646	-3059	-2575

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0.24	0.25	55616	46310	38696	32439	3449	2872	2400	2012	596	497	415	348	5478	4561	3811	3195	-4341	-3615	-3020	-2532
0.25	**0.26**	55505	46125	38465	32182	3442	2861	2386	1996	595	495	413	345	5467	4543	3788	3170	-4333	-3600	-3002	-2512
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0.40	**0.41**	54236	44043	35892	29346	3364	2732	2226	1820	582	472	385	315	5342	4338	3535	2890	-4234	-3438	-2802	-2291
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0.79	**0.80**	52439	41173	32443	25650	3252	2554	2012	1591	562	442	348	275	5165	4055	3195	2526	-4093	-3214	-2532	-2002
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0.88	**0.89**	52158	40734	31926	25106	3235	2526	1980	1557	559	437	342	269	5137	4012	3144	2473	-4071	-3180	-2492	-1960
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0.91	**0.92**	52072	40599	31767	24939	3230	2518	1970	1547	558	435	341	267	5129	3999	3129	2456	-4065	-3169	-2480	-1947
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0.94	**0.95**	51988	40468	31614	24779	3224	2510	1961	1537	558	434	339	266	5120	3986	3114	2441	-4058	-3159	-2468	-1934

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0.96	0.97	51933	40384	31515	24676	3221	2505	1955	1530	557	433	338	265	5115	3977	3104	2430	-4054	-3152	-2460	-1926
0.97	**0.98**	51907	40342	31466	24625	3219	2502	1952	1527	557	433	337	264	5112	3973	3099	2425	-4052	-3149	-2456	-1922
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I93N (north of Boston)

		ND (1)				**ND (2)**				**ND (3)**				**ND (4)**				**ND (5)**				**ND (6)**			
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0.07	**0.08**	46849	41373	36577	32377	10057	8881	7853	6943	862	6741	5960	5269	11140	10006	8892	7902	2758	2436	2158	1918	-9050	-7992	-7081	-6293
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0.13	**0.14**	45497	39025	33525	28800	9767	8347	7170	6157	837	6183	5298	4554	10625	9378	8117	7080	2678	2297	1991	1707	-8789	-7539	-6488	-5602
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6	**7**	44	52	97	67	9	2	8	2		3		2	6	1		8	2	52	9	41	8701	7390	6297	5383
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5	**6**	75	27	44	55	1	3	7	6	811	4	562	0	2	1	743	2	5	56	8	04	8514	7076	5900	4937
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6	7	91	87	69	60	3	3	9	4	809	1	558	6	0	8	739	7	0	48	8	93	8498	7048	5867	4899
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0.2	**0.2**	438	362	300	249	940	777	644	536		66		46	106	88		60	258	21	176	14	-	-	-	-
8	**9**	31	23	40	95	9	6	9	6	806	6	552	0	6	1	731	8	0	32	8	71	8467	6997	5803	4828
0.2		437	360	298	248	939	774	641	532		66		45	106	87		60	257	21	175	14	-	-	-	-
9	0.3	56	98	86	24	3	9	5	9	805	4	550	7	4	8	727	4	6	25	9	61	8453	6973	5773	4795
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0.3	**0.3**	436	358	295	245	936	769	635	526		66		45	106	87		59	256	21	174	14	-	-	-	-
1	**2**	12	63	94	01	2	9	3	0	802	0	544	1	1	2	720	6	7	11	2	42	8425	6928	5717	4733
0.3	0.3	435	357	294	243	934	767	632	522		65		44	105	87		59	256	21	173	14	-	-	-	-
2	3	44	51	56	49	8	5	3	7	801	7	542	8	9	0	717	2	3	05	4	33	8412	6906	5690	4704
0.3	0.3	434	356	293	242	933	765	629	519		65		44	105	86		58	256	20	172	14	-	-	-	-
3	4	78	43	23	02	3	1	5	5	800	5	539	5	8	7	713	9	0	98	6	25	8399	6885	5664	4675
0.3	**0.3**	434	355	291	240	932	762	626	516		65		44	105	86		58	255	20	171	14	-	-	-	-
4	**5**	15	39	94	61	0	9	7	5	798	4	537	2	6	4	710	5	6	92	9	16	8387	6865	5640	4648
0.3	0.3	433	354	290	239	930	760	624	513		65		44	105	86		58	255	20	171	14	-	-	-	-
5	6	53	37	69	24	6	7	0	6	797	2	535	0	5	2	707	2	2	86	1	08	8375	6846	5616	4622
0.3	0.3	432	353	289	237	929	758	621	510		65		43	105	86		57	254	20	170	14	-	-	-	-
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0.3	**0.3**	432	352	288	236	928	756	618	508		64		43	105	85		57	254	20	169	13	-	-	-	-
7	**8**	34	44	32	64	1	6	9	0	795	8	530	5	2	7	701	6	5	75	7	93	8352	6808	5570	4571
0.3	0.3	431	351	287	235	926	754	616	505		64		43	105	85		57	254	20	169	13	-	-	-	-
8	9	77	51	18	40	9	6	5	3	794	6	528	3	0	5	699	3	2	69	1	86	8341	6790	5548	4547
0.3	0.4	431	350	286	234	925	752	614	502		64		43	104	85		57	253	20	168	13	-	-	-	-
9	0	22	61	08	20	7	7	1	7	793	5	526	1	9	3	696	0	9	64	4	79	8330	6773	5526	4524
0.4	**0.4**	430	349	285	233	924	750	611	500		64		42	104	85		56	253	20	167	13	-	-	-	-
0	**1**	68	74	01	03	5	8	8	2	792	3	524	9	8	1	693	7	5	59	8	72	8320	6756	5506	4502
0.4	0.4	430	348	283	231	923	748	609	497	791	64	522	42	104	84	691	56	253	20	167	13	-	-	-	-

1	2	16	89	97	90	4	9	6	8		2		6	6	9		4	2	54	2	65	8310	6740	5486	4480
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2	3	65	06	96	80	3	2	4	5	790	0	520	4	5	7	688	1	9	49	6	59	8300	6724	5466	4459
0.4	**0.4**	429	347	281	229	921	745	605	493		63		42	104	84		55	252	20	166	13	-	-	-	-
3	**4**	15	25	98	74	2	4	3	2	789	9	519	2	4	5	686	9	6	44	0	52	8290	6708	5447	4438
0.4	0.4	428	346	281	228	920	743	603	490		63		42	104	84		55	252	20	165	13	-	-	-	-
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0.4	0.4	428	345	280	227	919	742	601	488		63		41	104	84		55	252	20	164	13	-	-	-	-
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0.4	**0.4**	427	344	279	226	918	740	599	486		63		41	104	83		55	251	20	164	13	-	-	-	-
6	**7**	72	95	18	70	2	5	3	6	787	4	513	7	0	9	679	1	8	31	4	35	8263	6664	5393	4379
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7	8	26	22	29	74	2	9	4	6	786	3	512	5	9	7	677	9	5	26	8	29	8254	6649	5376	4361
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8	9	82	50	42	80	2	4	5	6	785	2	510	3	8	6	675	7	3	22	3	23	8245	6636	5359	4343
0.4	**0.5**	426	342	276	223	915	735	593	480		63		41	103	83		54	251	20	162	13	-	-	-	-
9	**0**	38	80	58	89	3	9	7	6	784	0	509	2	7	4	673	5	0	18	8	18	8237	6622	5343	4325
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2	**3**	13	79	15	27	6	6	5	0	782	7	504	7	4	9	667	8	3	06	4	03	8213	6583	5296	4275
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0.5	**0.5**	423	338	271	218	910	727	583	469		62		40	103	82		53	249	19	160	12	-	-	-	-
5	**6**	95	90	88	83	1	5	6	8	780	3	500	2	1	4	661	2	6	95	1	88	8190	6547	5252	4227
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8	**9**	84	13	74	54	7	7	0	8	778	0	496	8	9	0	656	7	9	85	8	75	8168	6513	5211	4183
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7	**8**	83	34	02	44	2	4	8	8	772	1	486	7	1	8	642	2	2	56	4	39	8110	6420	5100	4065
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3	**4**	04	52	67	90	4	4	6	1	769	6	479	0	7	2	634	3	1	40	5	18	8076	6366	5036	3997
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6	**7**	21	21	12	25	6	6	2	6	767	4	477	7	5	8	630	9	6	32	5	08	8060	6340	5006	3965
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2	**3**	64	74	20	18	2	3	0	0	764	9	471	2	1	2	623	2	7	18	8	90	8029	6293	4949	3906
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4	5	14	96	28	21	2	6	0	9	763	8	469	0	0	0	621	9	4	13	3	85	8020	6278	4931	3887
0.8	**0.8**	414	324	254	200	890	696	547	430		59		36	100	79		48	244	19	150	11	-	-	-	-
5	**6**	90	58	83	74	6	8	0	9	763	7	469	9	9	0	620	8	2	11	0	82	8015	6270	4923	3878
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8	**9**	18	46	52	36	1	4	2	0	762	5	466	7	8	7	617	5	8	04	2	74	8001	6249	4897	3851
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1	**2**	49	39	25	04	6	1	5	1		3		4	6	4		2	4	98	5	66	7988	6228	4873	3826
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4	**5**	82	35	04	77	2	8	9	4	759	1	462	2	4	2	611	9	0	92	8	58	7975	6208	4849	3801
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0.9	**0.9**	412	320	249	195	884	687	536	419		58		36	100	77		47	242	18	147	11	-	-	-	-
7	**8**	18	35	86	54	8	7	4	8	758	9	459	0	3	9	608	6	7	86	1	51	7962	6188	4827	3777
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8	9	97	02	48	14	4	0	6	9	758	9	459	9	2	8	607	5	5	84	9	49	7958	6182	4819	3770
0.9	1.0	**411**	**319**	**249**	**194**	**883**	**686**	**534**	**418**		**58**		**35**	**100**	**77**		**47**	**242**	**18**	**146**	**11**	**-**	**-**	**-**	**-**
9	0	**76**	**70**	**11**	**75**	**9**	**3**	**7**	**1**	**757**	**8**	**458**	**8**	**2**	**8**	**606**	**4**	**4**	**82**	**6**	**46**	**7954**	**6176**	**4812**	**3762**

I93S (north of Boston)

		ND (1)				**ND (2)**				**ND (3)**				**ND (4)**				**ND (5)**				**ND (6)**			
O P	N P	**-0.05**	**-0.1**	**-0.15**	**-0.2**	**-0.05**	**-0.1**	**-0.15**	**-0.2**	**-0.05**	**-0.1**	**-0.15**	**-0.2**	**-0.05**	**-0.1**	**-0.15**	**-0.2**	**-0.05**	**-0.1**	**-0.15**	**-0.2**	**-0.05**	**-0.1**	**-0.15**	**-0.2**
0. 00	0.0 1	608 01	608 01	608 01	608 01	93 12	93 12	93 12	93 12	-3216	-3216	-3216	-3216	-1476	-1476	-1476	-1476	-3366	-3366	-3366	-3366	-9353	-9353	-9353	-9353
0. 01	**0.0 2**	579 06	552 74	528 70	506 68	88 69	84 65	80 97	77 60	-3063	-2924	-2797	-2680	-1406	-1342	-1283	-1230	-3206	-3060	-2927	-2805	-8908	-8503	-8133	-7794
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0. 04	**0.0 5**	548 81	497 01	451 47	411 26	84 05	76 12	69 14	62 99	-2903	-2629	-2388	-2175	-1332	-1207	-1096	-998	-3038	-2751	-2499	-2277	-8442	-7645	-6945	-6326
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0. 07	**0.0 8**	535 07	472 53	418 66	372 06	81 95	72 37	64 12	56 98	-2837	-2491	-2212	-1966	-1296	-1141	-1018	-903	-2963	-2613	-2317	-2066	-8230	-7267	-6444	-5727

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24	5	39	99	94	20	25	32	75	06	2668	2222	1856	1556	1224	1020	852	714	2792	2325	1943	1629	7759	6461	5399	4526
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0.75	0.76	47681	37534	29652	23503	7303	5749	4541	3600	-2522	-1985	-1568	-1243	-1157	-911	-720	-571	-2640	-2078	-1642	-1301	-7335	-5774	-4561	-3616
0.76	**0.77**	47649	37485	29594	23442	7298	5741	4532	3590	-2520	-1983	-1565	-1240	-1157	-910	-718	-569	-2638	-2075	-1638	-1298	-7330	-5766	-4552	-3606
0.77	0.78	47619	37436	29536	23381	7293	5734	4524	3581	-2519	-1980	-1562	-1237	-1156	-909	-717	-568	-2636	-2073	-1635	-1294	-7325	-5759	-4544	-3597
0.78	0.79	47588	37388	29479	23321	7288	5726	4515	3572	-2517	-1978	-1559	-1234	-1155	-908	-716	-566	-2635	-2070	-1632	-1291	-7320	-5751	-4535	-3587
0.79	**0.80**	47558	37341	29424	23262	7284	5719	4506	3563	-2516	-1975	-1556	-1230	-1155	-906	-714	-565	-2633	-2067	-1629	-1288	-7316	-5744	-4526	-3578
0.8	0.81	47528	37294	29368	23204	7279	5712	4498	3554	-2514	-1973	-1553	-1227	-1154	-905	-713	-563	-2631	-2065	-1626	-1285	-7311	-5737	-4518	-3569
0.81	0.82	47499	37248	29314	23147	7275	5705	4490	3545	-2512	-1970	-1551	-1224	-1153	-904	-712	-562	-2630	-2062	-1623	-1281	-7307	-5730	-4509	-3561
0.82	**0.83**	47470	37203	29261	23091	7270	5698	4481	3536	-2511	-1968	-1548	-1221	-1152	-903	-710	-561	-2628	-2060	-1620	-1278	-7302	-5723	-4501	-3552
0.83	0.84	47441	37158	29208	23035	7266	5691	4473	3528	-2509	-1965	-1545	-1218	-1152	-902	-709	-559	-2626	-2057	-1617	-1275	-7298	-5716	-4493	-3543
0.84	0.85	47413	37114	29156	22980	7262	5684	4465	3520	-2508	-1963	-1542	-1216	-1151	-901	-708	-558	-2625	-2055	-1614	-1272	-7294	-5709	-4485	-3535
0.85	**0.86**	47385	37071	29104	22927	7257	5678	4457	3511	-2506	-1961	-1539	-1213	-1150	-900	-707	-557	-2623	-2052	-1611	-1269	-7289	-5703	-4477	-3527
0.86	0.87	47358	37028	29054	22873	7253	5671	4450	3503	-2505	-1959	-1537	-1210	-1150	-899	-705	-555	-2622	-2050	-1608	-1266	-7285	-5696	-4469	-3519
0.87	0.88	47331	36985	29004	22821	7249	5664	4442	3495	-2503	-1956	-1534	-1207	-1149	-898	-704	-554	-2620	-2048	-1606	-1263	-7281	-5689	-4462	-3511
0.88	**0.89**	47304	36943	28954	22769	7245	5658	4435	3487	-2502	-1954	-1532	-1204	-1148	-897	-703	-553	-2619	-2045	-1603	-1261	-7277	-5683	-4454	-3503
0.89	0.9	47277	36902	28906	22718	7241	5652	4427	3479	-2501	-1952	-1529	-1202	-1148	-896	-702	-552	-2617	-2043	-1600	-1258	-7273	-5677	-4447	-3495
0.90	0.91	47251	36861	28858	22668	7237	5645	4420	3472	-2499	-1950	-1526	-1199	-1147	-895	-701	-550	-2616	-2041	-1598	-1255	-7269	-5670	-4439	-3487

0.91	**0.92**	472 25	368 20	288 10	226 18	72 33	56 39	44 12	34 64	-2498	-1948	-1524	-1196	-1146	-894	-699	-549	-2614	-2038	-1595	-1252	-7265	-5664	-4432	-3479
0.92	0.93	471 99	367 80	287 63	225 69	72 29	56 33	44 05	34 57	-2497	-1945	-1521	-1194	-1146	-893	-698	-548	-2613	-2036	-1592	-1249	-7261	-5658	-4425	-3472
0.93	0.94	471 74	367 41	287 17	225 20	72 25	56 27	43 98	34 49	-2495	-1943	-1519	-1191	-1145	-892	-697	-547	-2612	-2034	-1590	-1247	-7257	-5652	-4418	-3464
0.94	**0.95**	471 49	367 02	286 71	224 73	72 21	56 21	43 91	34 42	-2494	-1941	-1517	-1189	-1145	-891	-696	-546	-2610	-2032	-1587	-1244	-7253	-5646	-4410	-3457
0.95	0.96	471 24	366 63	286 26	224 25	72 17	56 15	43 84	34 35	-2493	-1939	-1514	-1186	-1144	-890	-695	-544	-2609	-2030	-1585	-1241	-7249	-5640	-4404	-3450
0.96	0.97	471 00	366 25	285 81	223 79	72 14	56 09	43 77	34 27	-2491	-1937	-1512	-1184	-1144	-889	-694	-543	-2607	-2028	-1582	-1239	-7245	-5634	-4397	-3443
0.97	**0.98**	470 75	365 87	285 37	223 33	72 10	56 04	43 71	34 20	-2490	-1935	-1509	-1181	-1144	-888	-693	-542	-2606	-2025	-1580	-1236	-7242	-5628	-4390	-3435
0.98	0.99	470 51	365 50	284 94	222 87	72 06	55 98	43 64	34 13	-2489	-1933	-1507	-1179	-1142	-887	-692	-541	-2605	-2023	-1577	-1234	-7238	-5622	-4383	-3428
0.99	**1.00**	**470 27**	**365 13**	**284 50**	**222 42**	**72 03**	**55 92**	**43 57**	**34 07**	**-2487**	**-1931**	**-1505**	**-1176**	**-1142**	**-886**	**-691**	**-540**	**-2603**	**-2021**	**-1575**	**-1231**	**-7234**	**-5617**	**-4377**	**-3422**

I93S (North of Boston) -- Congestion

		ND (1)				ND (2)				ND (3)				ND (4)				ND (5)				ND (6)			
OP	NP	**-0.05**	**-0.1**	**-0.15**	**-0.2**	**-0.05**	**-0.15**	**-0.1**	**-0.2**	**-0.05**	**-0.1**	**-0.15**	**-0.2**	**-0.05**	**-0.1**	**-0.15**	**-0.2**	**-0.05**	**-0.1**	**-0.15**	**-0.2**	**-0.05**	**-0.1**	**-0.15**	**-0.2**
0.00	0.01	15305	15305	15305	15305	-1747	-1747	-1747	-1747	-935	-935	-935	-935	226	226	226	226	-630	-630	-630	-630	-1545	-1545	-1545	-1545
0.01	**0.02**	14576	13914	13309	12754	-1664	-1588	-1519	-1456	-890	-850	-813	-779	215	205	197	188	-600	-573	-548	-525	-1471	-1405	-1343	-1288
0.02	0.03	14221	13251	12380	11595	-1623	-1513	-1413	-1323	-869	-810	-756	-708	210	196	183	171	-585	-545	-510	-477	-1436	-1338	-1250	-1170
0.03	0.04	13988	12844	11791	10870	-1597	-1464	-1346	-1241	-855	-783	-720	-664	207	189	174	161	-576	-528	-485	-447	-1412	-1295	-1190	-1097
0.04	**0.05**	13815	12511	11364	10352	-1577	-1428	-1297	-1182	-844	-764	-694	-632	204	185	168	153	-569	-515	-468	-426	-1395	-1263	-1147	-1045

0.05	0.06	13678	12266	11033	9954	-1561	-1400	-1259	-1136	-836	-749	-674	-608	202	181	163	147	-563	-505	-454	-410	-1381	-1238	-1114	-1005
0.06	0.07	13565	12064	10764	9633	-1548	-1377	-1229	-1100	-829	-737	-658	-588	200	178	159	142	-558	-497	-443	-397	-1369	-1218	-1087	-972
0.07	**0.08**	13469	11895	10539	9366	-1537	-1358	-1203	-1069	-823	-727	-644	-572	199	176	156	138	-554	-490	-434	-386	-1360	-1201	-1064	-945
0.08	0.09	13385	11748	10345	9137	-1528	-1341	-1181	-1043	-818	-718	-632	-558	198	173	153	135	-551	-484	-426	-376	-1351	-1186	-1044	-922
0.09	0.10	13311	11619	10175	8938	-1519	-1326	-1161	-1020	-813	-710	-622	-546	197	172	150	132	-548	-478	-419	-368	-1344	-1173	-1027	-902
0.10	**0.11**	13245	11504	10025	8763	-1512	-1313	-1144	-1000	-809	-703	-612	-535	196	170	148	129	-545	-474	-413	-361	-1337	-1161	-1012	-885
0.11	0.12	13185	11400	9890	8607	-1505	-1301	-1129	-982	-805	-696	-604	-526	195	168	146	127	-543	-469	-407	-354	-1331	-1151	-998	-869
0.12	0.13	13130	11306	9768	8466	-1499	-1290	-1115	-966	-802	-691	-597	-517	194	167	144	125	-540	-465	-402	-348	-1325	-1141	-986	-855
0.13	**0.14**	13080	11219	9656	8337	-1493	-1281	-1102	-952	-799	-685	-590	-509	193	166	143	123	-538	-462	-397	-343	-1320	-1133	-975	-842
0.14	0.15	13034	11140	9554	8220	-1488	-1272	-1091	-938	-796	-681	-584	-502	192	164	141	121	-536	-459	-393	-338	-1316	-1125	-964	-830
0.15	0.16	12990	11066	9459	8112	-1483	-1263	-1080	-926	-794	-676	-578	-496	192	163	140	120	-535	-456	-389	-334	-1311	-1117	-955	-819
0.16	**0.17**	12950	10997	9371	8012	-1478	-1255	-1070	-914	-791	-672	-573	-489	191	162	138	118	-533	-453	-386	-330	-1307	-1110	-946	-809
0.17	0.18	12912	10933	9289	7918	-1474	-1248	-1060	-904	-789	-668	-568	-484	191	161	137	117	-531	-450	-382	-326	-1303	-1104	-938	-799
0.18	0.19	12876	10873	9213	7831	-1470	-1241	-1052	-894	-787	-664	-563	-478	190	161	136	116	-530	-448	-379	-322	-1300	-1098	-930	-791
0.19	**0.20**	12842	10816	9141	7750	-1466	-1235	-1043	-885	-785	-661	-558	-473	190	160	135	114	-529	-445	-376	-319	-1296	-1092	-923	-782
0.20	0.21	12810	10762	9072	7673	-1462	-1228	-1036	-876	-783	-657	-554	-469	189	159	134	113	-527	-443	-373	-316	-1293	-1086	-916	-775
0.21	0.22	12780	10711	9008	7601	-1459	-122	-102	-868	-781	-65	-550	-46	189	158	133	112	-526	-44	-371	-31	-129	-108	-909	-767

							3	8			4		4						1		3	0	1		
0.2	**0.3**	127	1066			-	-121	-102	-	-	-65	-	-46		15		11	-	-43	-	-31	-128	-107	-	-
2		51	2	8947	7532	1455	7	1	860	779	1	547	0	188	7	132	1	525	9	368	0	7	6	903	760
0.2	0.2	127	1061			-	-121	-101	-	-	-64	-	-45		15		11	-	-43	-	-30	-128	-107	-	-
3	4	23	6	8889	7467	1452	2	5	852	777	9	543	6	188	7	131	0	524	7	366	7	4	2	897	754
0.2	0.2	126	1057			-	-120	-100	-	-	-64	-	-45		15		10	-	-43	-	-30	-128	-106	-	-
4	5	97	2	8834	7406	1449	7	8	845	776	6	540	2	187	6	130	9	523	5	364	5	2	7	892	748
0.2	**0.2**	126	1053			-	-120	-100	-	-	-64	-	-44		15		10	-	-43	-	-30	-127	-106	-	-
5	**6**	71	0	8781	7347	1446	2	2	839	774	3	536	9	187	5	130	8	522	3	361	2	9	3	886	742
0.2	0.2	126	1049			-	-119	-	-	-	-64	-	-44		15		10	-	-43	-	-30	-127	-105	-	-
6	7	47	0	8731	7291	1444	7	997	832	773	1	533	5	187	5	129	8	521	2	359	0	7	9	881	736
0.2	0.2	126	1045			-	-119	-	-	-	-63	-	-44		15		10	-	-43	-	-29	-127	-105	-	-
7	8	24	1	8683	7237	1441	3	991	826	771	8	530	2	186	4	128	7	520	0	357	8	4	5	876	731
0.2	**0.2**	126	1041			-	-118	-	-	-	-63	-	-43		15		10	-	-42	-	-29	-127	-105	-	-
8	**9**	01	4	8636	7186	1438	9	986	820	770	6	528	9	186	4	128	6	519	9	356	6	2	1	872	725
0.2		125	1037			-	-118	-	-	-	-63	-	-43		15		10	-	-42	-	-29	-127	-104	-	-
9	0.3	79	8	8592	7137	1436	5	981	815	768	4	525	6	186	3	127	5	518	7	354	4	0	8	867	720
	0.3	125	1034			-	-118	-	-	-	-63	-	-43		15		10	-	-42	-	-29	-126	-104	-	-
0.3	1	58	4	8549	7089	1433	1	976	809	767	2	522	3	185	3	126	5	517	6	352	2	8	4	863	716
0.3	**0.3**	125	1031			-	-117	-	-	-	-63	-	-43		15		10	-	-42	-	-29	-126	-104	-	-
1	**2**	38	0	8508	7044	1431	7	971	804	766	0	520	0	185	2	126	4	516	4	350	0	6	1	859	711
0.3	0.3	125	1027			-	-117	-	-	-	-62	-	-42		15		10	-	-42	-	-28	-126	-103	-	-
2	3	19	8	8468	7000	1429	3	967	799	765	8	517	8	185	2	125	3	515	3	349	8	4	8	855	707
0.3	0.3	125	1024			-	-117	-	-	-	-62	-	-42		15		10	-	-42	-	-28	-126	-103	-	-
3	4	00	7	8430	6958	1427	0	962	794	764	6	515	5	185	1	124	3	515	2	347	6	2	4	851	702
0.3	**0.3**	124	1021			-	-116	-	-	-	-62	-	-42		15		10	-	-42	-	-28	-126	-103	-	-
4	**5**	81	7	8393	6917	1425	6	958	790	763	4	513	3	184	1	124	2	514	1	345	5	0	1	847	698
0.3	0.3	124	1018			-	-116	-	-	-	-62	-	-42		15		10	-	-41	-	-28	-125	-102	-	-
5	6	64	8	8357	6878	1423	3	954	785	761	2	511	0	184	0	123	2	513	9	344	3	8	8	844	694
0.3	0.3	124	1016			-	-116	-	-	-	-62	-	-41		15		10	-	-41	-	-28	-125	-102	-	-
6	7	46	0	8323	6840	1421	0	950	781	760	1	508	8	184	0	123	1	512	8	343	2	6	6	840	690
0.3	**0.3**	124	1013			-	-115	-	-	-	-61	-	-41		15		10	-	-41	-	-28	-125	-102	-	-
7	**8**	30	2	8289	6803	1419	7	946	777	759	9	506	6	184	0	122	0	512	7	341	0	5	3	837	687
0.3	0.3	124	1010	8256	6768	-	-	-	-	-	-	-	-	183	14	122	10	-	-	-	-	-	-	-	-

8	9	13	6			1417	1154	942	772	758	617	504	413		9		0	511	416	340	279	1253	1020	833	683
0.39	0.40	12397	10080	8225	6733	-1415	-1151	-939	-769	-757	-616	-502	-411	183	149	121	99	-510	-415	-339	-277	-1251	-1018	-830	-680
0.4	**0.41**	12382	10055	8194	6700	-1413	-1148	-935	-765	-756	-614	-501	-409	183	148	121	99	-510	-414	-337	-276	-1250	-1015	-827	-676
0.41	0.42	12367	10030	8164	6667	-1412	-1145	-932	-761	-755	-613	-499	-407	183	148	121	98	-509	-413	-336	-274	-1248	-1013	-824	-673
0.42	0.43	12352	10007	8135	6635	-1410	-1142	-929	-757	-755	-611	-497	-405	182	148	120	98	-508	-412	-335	-273	-1247	-1010	-821	-670
0.43	**0.44**	12338	9983	8107	6605	-1408	-1140	-925	-754	-754	-610	-495	-403	182	147	120	98	-508	-411	-334	-272	-1245	-1008	-818	-667
0.44	0.45	12324	9961	8079	6575	-1407	-1137	-922	-750	-753	-609	-494	-402	182	147	119	97	-507	-410	-333	-271	-1244	-1006	-816	-664
0.45	0.46	12310	9939	8052	6546	-1405	-1134	-919	-747	-752	-607	-492	-400	182	147	119	97	-507	-409	-331	-269	-1243	-1003	-813	-661
0.46	**0.47**	12297	9917	8026	6517	-1404	-1132	-916	-744	-751	-606	-490	-398	182	146	119	96	-506	-408	-330	-268	-1241	-1001	-810	-658
0.47	0.48	12284	9896	8001	6490	-1402	-1130	-913	-741	-750	-605	-489	-396	181	146	118	96	-506	-407	-329	-267	-1240	-999	-808	-655
0.48	0.49	12271	9875	7976	6463	-1401	-1127	-910	-738	-750	-603	-487	-395	181	146	118	95	-505	-407	-328	-266	-1239	-997	-805	-652
0.49	**0.50**	12258	9855	7951	6437	-1399	-1125	-908	-735	-749	-602	-486	-393	181	146	117	95	-505	-406	-327	-265	-1237	-995	-803	-650
0.50	0.51	12246	9836	7928	6411	-1398	-1123	-905	-732	-748	-601	-484	-392	181	145	117	95	-504	-405	-326	-264	-1236	-993	-800	-647
0.51	0.52	12234	9816	7904	6386	-1396	-1120	-902	-729	-747	-600	-483	-390	181	145	117	94	-504	-404	-325	-263	-1235	-991	-798	-645
0.52	**0.53**	12222	9798	7882	6361	-1395	-1118	-900	-726	-747	-599	-481	-389	180	145	116	94	-503	-403	-324	-262	-1234	-989	-796	-642
0.53	0.54	12211	9779	7859	6338	-1394	-1116	-897	-723	-746	-597	-480	-387	180	144	116	94	-503	-403	-324	-261	-1233	-987	-793	-640
0.54	0.55	12199	9761	7838	6314	-1393	-1114	-895	-721	-745	-596	-479	-386	180	144	116	93	-502	-402	-323	-260	-1232	-985	-791	-637

0.5	**0.5**	121				-1391	-111	-892	-718	-745	-595	-478	-384	180	144	115	93	-502	-401	-322	-259	-1230	-984	-789	-635
0.5	0.5	121				-1390	-110	-890	-716	744	-594	476	-383	180	144	115	93	-501	-400	-321	-258	-1229	-982	787	-633
0.5	0.5	121				-1389	-1108	-887	713	743	-593	475	-382	180	143	115	92	-501	-400	-320	-257	-1228	-980	785	-631
0.5	**0.5**	121				-1388	-1106	-885	711	743	-592	474	-380	180	143	115	92	-500	-399	-319	-256	-1227	-978	783	-628
0.5	0.6	121				-1386	-1104	-883	708	742	-591	473	-379	179	143	114	92	-500	-398	-318	-255	-1226	-977	781	-626
0.6	0.6	121				-1385	-1103	-881	706	741	-590	471	-378	179	143	114	91	-500	-398	-318	-255	-1225	-975	779	-624
0.6	**0.6**	121				-1384	-1101	-879	704	741	-589	470	-377	179	142	114	91	-499	-397	-317	-254	-1224	-974	777	-622
0.6	0.6	121				-1383	-1099	-876	701	740	-588	469	-375	179	142	113	91	-499	-396	-316	-253	-1223	-972	775	-620
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8	**9**	07				1359	1061	832	654	727	568	445	350		7			490	383	300	236	1202	939	736	579
0.89	0.9	11901	9289	7276	5719	-1358	-1060	-831	-653	-727	-567	-445	-349	176	137	107	84	-490	-382	-300	-235	-1201	-938	-735	-577
0.9	0.91	11894	9279	7264	5706	-1358	-1059	-829	-651	-727	-567	-444	-349	176	137	107	84	-490	-382	-299	-235	-1201	-937	-733	-576
0.91	**0.92**	11888	9268	7252	5693	-1357	-1058	-828	-650	726	-566	-443	-348	176	137	107	84	-489	-382	-299	-234	-1200	-936	-732	-575
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0.93	0.94	11875	9248	7229	5669	-1355	-1056	-825	-647	725	-565	-442	-346	175	137	107	84	-489	-381	-298	-233	-1199	-934	-730	-572
0.94	**0.95**	11868	9239	7217	5657	-1355	-1055	-824	-646	725	-564	-441	-346	175	136	107	84	-489	-380	-297	-233	-1198	-933	-729	-571
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0.96	0.97	11856	9219	7195	5633	-1353	-1052	-821	-643	724	-563	-440	-344	175	136	106	83	-488	-379	-296	-232	-1197	-931	-726	-569
0.97	**0.98**	11850	9210	7183	5622	-1353	-1051	-820	-642	724	-563	-439	-343	175	136	106	83	-488	-379	-296	-231	-1196	-930	-725	-567
0.98	0.99	11844	9200	7172	5610	-1352	-1050	-819	-640	724	-562	-438	-343	175	136	106	83	-488	-379	-295	-231	-1196	-929	-724	-566
0.99	1.00	11838	9191	7162	5599	-1351	-1049	-817	-639	723	-561	-438	-342	175	136	106	83	-487	-378	-295	-230	-1195	-928	-723	-565
1	**1.01**	11832	9182	7151	5588	-1351	-1048	-816	-638	723	-561	-437	-341	175	136	106	83	-487	-378	-294	-230	-1194	-927	-722	-564
1.01	1.02	11826	9173	7140	5577	-1350	-1047	-815	-637	722	-560	-436	-341	175	135	105	82	-487	-378	-294	-230	-1194	-926	-721	-563
1.02	1.03	11820	9164	7130	5566	-1349	-1046	-814	-635	722	-560	-436	-340	175	135	105	82	-487	-377	-293	-229	-1193	-925	-720	-562
1.03	**1.04**	11815	9155	7119	5555	-1349	-1045	-813	-634	722	-559	-435	-339	174	135	105	82	-486	-377	-293	-229	-1193	-924	-719	-561
1.04	1.05	11809	9146	7109	5544	-1348	-1044	-811	-633	721	-559	-434	-339	174	135	105	82	-486	-376	-293	-228	-1192	-923	-718	-560

1.05	1.06	11803	9138	7099	5534	-1347	-1043	-810	-632	-721	-558	-434	-338	174	135	105	82	-486	-376	-292	-228	-1192	-922	-717	-559
1.06	**1.07**	11798	9129	7089	5523	-1347	-1042	-809	-630	-721	-558	-433	-337	174	135	105	82	-486	-376	-292	-227	-1191	-922	-716	-558
1.07	1.08	11792	9120	7079	5513	-1346	-1041	-808	-629	-720	-557	-432	-337	174	135	105	81	-485	-375	-291	-227	-1190	-921	-715	-557
1.08	1.09	11787	9112	7069	5503	-1345	-1040	-807	-628	-720	-557	-432	-336	174	135	104	81	-485	-375	-291	-227	-1190	-920	-714	-556
1.09	**1.10**	11781	9104	7060	5493	-1345	-1039	-806	-627	-720	-556	-431	-336	174	134	104	81	-485	-375	-291	-226	-1189	-919	-713	-554
1.10	1.11	11776	9095	7050	5483	-1344	-1038	-805	-626	-719	-556	-431	-335	174	134	104	81	-485	-374	-290	-226	-1189	-918	-712	-553
1.11	1.12	11771	9087	7040	5473	-1344	-1037	-804	-625	-719	-555	-430	-334	174	134	104	81	-485	-374	-290	-225	-1188	-917	-711	-552
1.12	**1.13**	11765	9079	7031	5463	-1343	-1036	-803	-624	-719	-555	-430	-334	174	134	104	81	-484	-374	-289	-225	-1188	-917	-710	-551
1.13	1.14	11760	9071	7022	5454	-1342	-1035	-801	-623	-718	-554	-429	-333	174	134	104	81	-484	-373	-289	-224	-1187	-916	-709	-551
1.14	1.15	11755	9063	7012	5444	-1342	-1035	-800	-621	-718	-554	-428	-333	174	134	104	80	-484	-373	-289	-224	-1187	-915	-708	-550
1.15	**1.16**	11750	9055	7003	5435	-1341	-1034	-799	-620	-718	-553	-428	-332	174	134	103	80	-484	-373	-288	-224	-1186	-914	-707	-549
1.16	1.17	11745	9047	6994	5425	-1341	-1033	-798	-619	-718	-553	-427	-331	173	134	103	80	-483	-372	-288	-223	-1186	-913	-706	-548
1.17	1.18	11740	9040	6985	5416	-1340	-1032	-797	-618	-717	-552	-427	-331	173	133	103	80	-483	-372	-288	-223	-1185	-913	-705	-547
1.18	**1.19**	11735	9032	6976	5407	-1339	-1031	-796	-617	-717	-552	-426	-330	173	133	103	80	-483	-372	-287	-223	-1185	-912	-704	-546
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1.21	**1.22**	11720	9009	6950	5380	-1338	-102	-793	-614	-716	-55	-425	-32	173	133	103	79	-482	-37	-286	-22	-118	-909	-702	-543

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1.2	1.2	117				-	-102	-	-	-	-550	-	-328		13			-	-371	-	-221	-1183	-	-	-
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1.2	1.2	117				-	-102	-	-	-	-550	-	-328		13			-	-370	-	-221	-1182	-	-	-
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1.2	**1.2**	117				-	-102	-	-	-	-549	-	-327		13			-	-370	-	-220	-1182	-	-	-
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1.2	1.2	117				-	-102	-	-	-	-549	-	-327		13			-	-370	-	-220	-1181	-	-	-
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7	**8**	92	8966	6900	5328	1335	3	788	608	714	8	422	6	173	2	102	79	481	9	284	9	0	905	697	538
1.2	1.2	116				-	-102	-	-	-	-547	-	-325		13			-	-369	-	-219	-1180	-	-	-
8	9	88	8959	6892	5320	1334	3	787	607	714	7	421	5	173	2	102	79	481	9	284	9	0	904	696	537
1.2	1.3	116				-	-102	-	-	-	-547	-	-324		13			-	-368	-	-219	-1179	-	-	-
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3	**4**	65	8925	6853	5280	1332	9	782	603	713	5	419	3	172	2	101	78	480	7	282	7	8	901	692	533
1.3	1.3	116				-	-101	-	-	-	-545	-	-322		13			-	-367	-	-217	-1177	-	-	-
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1.3	**1.3**	116				-	-101	-	-	-	-544	-	-321		13			-	-367	-	-216	-1176	-	-	-
6	**7**	52	8905	6830	5256	1330	6	780	600	712	4	417	1	172	1	101	78	480	7	281	6	6	899	689	531
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1.3	1.3	116	8892	6815	5241	-	-	-	-	-	-	-	-	172	13	101	77	-	-	-	-	-	-	-	-

8	9	44				1329	1015	778	598	711	543	416	320		1			479	366	281	216	1175	898	688	529
1.39	**1.40**	11640	8886	6808	5233	-1329	-1014	-777	-597	-711	-543	-416	-320	172	131	101	77	-479	-366	-280	-215	-1175	-897	-687	-528
1.40	1.41	11635	8880	6801	5226	-1328	-1014	-776	-597	-711	-542	-415	-319	172	131	100	77	-479	-366	-280	-215	-1175	-896	-687	-528
1.41	1.42	11631	8873	6793	5218	-1328	-1013	-775	-596	-711	-542	-415	-319	172	131	100	77	-479	-365	-280	-215	-1174	-896	-686	-527
1.42	**1.43**	11627	8867	6786	5211	-1327	-1012	-775	-595	-710	-542	-415	-318	172	131	100	77	-479	-365	-279	-215	-1174	-895	-685	-526
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1.44	1.45	11619	8855	6772	5197	-1326	-1011	-773	-593	-710	-541	-414	-317	172	131	100	77	-478	-364	-279	-214	-1173	-894	-684	-525
1.45	**1.46**	11615	8849	6765	5189	-1326	-1010	-772	-592	-710	-541	-413	-317	172	131	100	77	-478	-364	-278	-214	-1173	-893	-683	-524
1.46	1.47	11611	8843	6758	5182	-1325	-1009	-771	-592	-709	-540	-413	-317	171	131	100	77	-478	-364	-278	-213	-1172	-893	-682	-523
1.47	1.48	11607	8836	6751	5175	-1325	-1009	-771	-591	-709	-540	-412	-316	171	130	100	76	-478	-364	-278	-213	-1172	-892	-682	-522
1.48	**1.49**	11603	8831	6744	5168	-1324	-1008	-770	-590	-709	-539	-412	-316	171	130	100	76	-478	-363	-278	-213	-1171	-891	-681	-522
1.49	**1.50**	**11599**	**8825**	**6738**	**5161**	**-1324**	**-1007**	**-769**	**-589**	**-709**	**-539**	**-412**	**-315**	**171**	**130**	**99**	**76**	**-477**	**-363**	**-277**	**-212**	**-1171**	**-891**	**-680**	**-521**

I93N (North of Boston) -- Congestion

		ND (1)				ND (2)				ND (3)				ND (4)				ND (5)				ND (6)			
OP	NP	**-0.05**	**-0.1**	**-0.15**	**-0.2**	**-0.05**	**-0.1**	**-0.15**	**-0.2**	**-0.05**	**-0.1**	**-0.15**	**-0.2**	**-0.05**	**-0.1**	**-0.15**	**-0.2**	**-0.05**	**-0.1**	**-0.15**	**-0.2**	**-0.05**	**-0.1**	**-0.15**	**-0.2**
0.00	0.01	7171	7171	7171	7171	2507	2507	2507	2507	2477	2477	2477	2477	1339	1339	1339	1339	1541	1541	1541	1541	-2623	-2623	-2623	-2623
0.01	**0.02**	6830	6519	6236	5976	2388	2279	2180	2089	2355	2245	2156	2066	1275	1217	1164	1116	1468	1401	1340	1284	-2498	-2385	-2281	-2186
0.0	0.0	666	6209	5801	5433	2329	21	202	18	230	21	200	18	124	11	108	10	143	13	124	11	-	-	-	-

2	3	3					71	8	99		4		7	4	59	3	14	2	34	7	67	2437	2271	2122	1987
0.03	**0.04**	6554	6008	5524	5093	2291	2101	1931	1781	226	207	190	175	1224	1122	1032	951	1408	1291	1187	1094	-2397	-2198	-2021	-1863
0.04	0.05	6473	5862	5325	4851	2263	2049	1862	1696	223	202	183	167	1209	1095	994	906	1391	1260	1144	1042	-2368	-2144	-1948	-1774
0.05	**0.06**	6409	5747	5170	4664	2241	2009	1807	1631	221	198	178	161	1197	1073	965	871	1377	1235	1111	1002	-2344	-2102	-1891	-1706
0.06	0.07	6356	5653	5044	4514	2222	1976	1763	1578	219	195	174	155	1187	1055	942	843	1366	1215	1084	970	-2325	-2068	-1845	-1651
0.07	**0.08**	6311	5573	4938	4388	2206	1948	1726	1534	217	192	170	151	1178	1041	922	819	1356	1198	1061	943	-2308	-2039	-1806	-1605
0.08	0.09	6271	5504	4847	4281	2193	1924	1694	1497	216	190	167	147	1171	1028	905	799	1348	1183	1042	920	-2294	-2013	-1773	-1566
0.09	**0.10**	6237	5444	4767	4188	2180	1903	1667	1464	215	188	164	144	1165	1016	890	782	1340	1170	1024	900	-2281	-1991	-1744	-1532
0.10	0.11	6206	5390	4697	4106	2170	1884	1642	1435	214	186	162	141	1159	1006	877	767	1334	1158	1009	882	-2270	-1972	-1718	-1502
0.11	**0.12**	6178	5341	4634	4033	2160	1867	1620	1410	213	184	160	139	1154	997	865	753	1328	1148	996	867	-2260	-1954	-1695	-1475
0.12	0.13	6152	5297	4577	3966	2151	1852	1600	1387	212	182	158	137	1149	989	855	741	1322	1138	983	852	-2250	-1938	-1674	-1451
0.13	**0.14**	6129	5257	4524	3906	2143	1838	1582	1366	211	181	156	135	1144	982	845	729	1317	1130	972	839	-2242	-1923	-1655	-1429
0.14	0.15	6107	5219	4476	3851	2135	1825	1565	1346	210	180	154	133	1140	975	836	719	1312	1122	962	828	-2234	-1909	-1637	-1409
0.15	**0.16**	6086	5185	4432	3801	2128	1813	1549	1329	210	179	153	131	1136	968	828	710	1308	1114	952	817	-2226	-1897	-1621	-1390
0.16	0.17	6067	5153	4391	3754	2121	1801	1535	1312	209	177	151	129	1133	962	820	701	1304	1107	944	807	-2219	-1885	-1606	-1373
0.17	**0.18**	6050	5123	4352	3710	2115	1791	1522	1297	208	176	150	128	1130	957	813	693	1300	1101	935	797	-2213	-1874	-1592	-1357
0.18	0.19	6033	5094	4317	3669	2109	1781	1509	1283	208	175	149	126	1126	951	806	685	1296	1095	928	789	-2207	-1863	-1579	-1342

0.19	**0.20**	6017	5068	4283	3631	2104	1772	1497	1269	207	175	148	125	1124	946	800	678	1293	1089	920	780	-2201	-1854	-1567	-1328
0.20	0.21	6002	5042	4251	3595	2098	1763	1486	1257	207	174	146	124	1121	942	794	671	1290	1084	913	773	-2195	-1844	-1555	-1315
0.21	**0.22**	5988	5018	4221	3561	2093	1754	1476	1245	206	173	145	123	1118	937	788	665	1287	1078	907	765	-2190	-1836	-1544	-1303
0.22	0.23	5974	4996	4192	3529	2089	1747	1466	1234	206	172	144	122	1116	933	783	659	1284	1074	901	758	-2185	-1827	-1533	-1291
0.23	**0.24**	5961	4974	4165	3499	2084	1739	1456	1223	205	171	143	121	1113	929	778	653	1281	1069	895	752	-2181	-1819	-1523	-1280
0.24	0.25	5949	4954	4139	3470	2080	1732	1447	1213	205	171	143	120	1111	925	773	648	1278	1064	889	746	-2176	-1812	-1514	-1269
0.25	**0.26**	5937	4934	4114	3442	2076	1725	1438	1203	204	170	142	119	1109	921	768	643	1276	1060	884	740	-2172	-1805	-1505	-1259
0.26	0.27	5926	4915	4091	3416	2072	1718	1430	1194	204	169	141	118	1106	918	764	638	1273	1056	879	734	-2167	-1798	-1496	-1250
0.27	**0.28**	5915	4897	4068	3391	2068	1712	1422	1185	204	169	140	117	1104	914	760	633	1271	1052	874	729	-2163	-1791	-1488	-1240
0.28	0.29	5904	4879	4046	3367	2064	1706	1415	1177	203	168	139	116	1102	911	756	629	1269	1049	870	724	-2160	-1785	-1480	-1232
0.29	**0.30**	5894	4863	4026	3344	2061	1700	1407	1169	203	167	139	115	1101	908	752	624	1267	1045	865	719	-2156	-1779	-1473	-1223
0.30	0.31	5884	4846	4006	3322	2057	1694	1400	1161	203	167	138	114	1099	905	748	620	1264	1041	861	714	-2152	-1773	-1465	-1215
0.31	**0.32**	5875	4831	3986	3300	2054	1689	1394	1154	202	166	137	114	1097	902	744	616	1262	1038	857	709	-2149	-1767	-1458	-1207
0.32	0.33	5866	4816	3968	3280	2051	1684	1387	1147	202	166	137	113	1095	899	741	612	1260	1035	853	705	-2145	-1761	-1451	-1200
0.33	**0.34**	5857	4801	3950	3260	2047	1679	1381	1140	202	165	136	112	1094	897	738	609	1259	1032	849	701	-2142	-1756	-1445	-1192
0.34	0.35	5848	4787	3932	3241	2044	1674	1375	1133	201	165	135	112	1092	894	734	605	1257	1029	845	696	-2139	-1751	-1438	-1186
0.35	**0.36**	5840	4773	3916	3223	2042	1669	1369	1127	201	164	135	111	1090	891	731	602	1255	1026	841	693	-2136	-1747	-1432	-1179

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0.36	0.37	5832	4760	3899	3205	2039	1664	1363	1120	201	164	134	110	1089	889	728	598	1253	1023	838	689	-2133	-1741	-1426	-1172
0.37	**0.38**	5824	4747	3884	3188	2036	1660	1358	1114	201	164	134	110	1087	886	725	595	1251	1020	835	685	-2130	-1737	-1421	-1166
0.38	0.39	5816	4735	3868	3171	2033	1655	1352	1109	200	163	133	109	1086	884	722	592	1250	1018	831	681	-2127	-1732	-1415	-1160
0.39	**0.40**	5809	4723	3854	3155	2031	1651	1347	1103	200	163	133	109	1085	882	720	589	1248	1015	828	678	-2125	-1728	-1410	-1154
0.40	0.41	5801	4711	3839	3139	2028	1647	1342	1097	200	162	132	108	1083	880	717	586	1247	1012	825	675	-2122	-1723	-1404	-1148
0.41	**0.42**	5794	4700	3825	3124	2026	1643	1337	1092	200	162	132	108	1082	878	714	583	1245	1010	822	671	-2119	-1719	-1399	-1143
0.42	0.43	5787	4688	3812	3109	2023	1639	1333	1087	199	161	131	107	1081	875	712	581	1244	1008	819	668	-2117	-1715	-1394	-1137
0.43	**0.44**	5781	4678	3798	3095	2021	1635	1328	1082	199	161	131	107	1079	873	709	578	1242	1005	816	665	-2114	-1711	-1389	-1132
0.44	0.45	5774	4667	3785	3081	2019	1632	1323	1077	199	161	130	106	1078	871	707	575	1241	1003	813	662	-2112	-1707	-1385	-1127
0.45	**0.46**	5768	4657	3773	3067	2016	1628	1319	1072	199	160	130	106	1077	870	704	573	1239	1001	811	659	-2110	-1703	-1380	-1122
0.46	0.47	5761	4647	3761	3054	2014	1624	1315	1068	198	160	130	105	1076	868	702	570	1238	999	808	656	-2107	-1700	-1376	-1117
0.47	**0.48**	5755	4637	3749	3041	2012	1621	1311	1063	198	160	129	105	1075	866	700	568	1237	996	806	653	-2105	-1696	-1371	-1112
0.48	0.49	5749	4627	3737	3028	2010	1618	1306	1059	198	159	129	104	1074	864	698	565	1235	994	803	651	-2103	-1692	-1367	-1108
0.49	**0.50**	5743	4618	3726	3016	2008	1614	1302	1054	198	159	128	104	1072	862	696	563	1234	992	801	648	-2101	-1689	-1363	-1103
0.50	0.51	5738	4608	3714	3004	2006	1611	1299	1050	198	159	128	103	1071	860	694	561	1233	990	798	645	-2099	-1686	-1359	-1099
0.51	**0.52**	5732	4599	3704	2992	2004	1608	1295	1046	197	158	128	103	1070	859	692	559	1232	988	796	643	-2097	-1682	-1355	-1094
0.50	0.50	572	4591	3693	2981	2002	16	129	10	197	15	127	10	106	85	690	55	123	98	794	64	-	-	-	-

2	3	7					05	1	42		8		3	9	7		7	1	6		1	2095	1679	1351	1090
0.53	**0.54**	5721	4582	3682	2969	2000	1602	1287	1038	197	158	127	102	1068	856	688	554	1229	985	791	638	-2093	-1676	-1347	-1086
0.54	0.55	5716	4573	3672	2958	1998	1599	1284	1034	197	158	126	102	1067	854	686	552	1228	983	789	636	-2091	-1673	-1343	-1082
0.55	**0.56**	5711	4565	3662	2948	1996	1596	1280	1031	197	157	126	102	1066	852	684	550	1227	981	787	633	-2089	-1670	-1340	-1078
0.56	0.57	5706	4557	3652	2937	1995	1593	1277	1027	197	157	126	101	1065	851	682	548	1226	979	785	631	-2087	-1667	-1336	-1074
0.57	**0.58**	5701	4549	3643	2927	1993	1590	1274	1023	196	157	125	101	1064	849	680	547	1225	978	783	629	-2085	-1664	-1332	-1071
0.58	0.59	5696	4541	3633	2917	1991	1588	1270	1020	196	156	125	100	1064	848	678	545	1224	976	781	627	-2083	-1661	-1329	-1067
0.59	**0.60**	5691	4533	3624	2907	1990	1585	1267	1016	196	156	125	100	1063	847	677	543	1223	974	779	625	-2082	-1658	-1326	-1063
0.60	0.61	5686	4526	3615	2897	1988	1582	1264	1013	196	156	125	100	1062	845	675	541	1222	973	777	623	-2080	-1655	-1322	-1060
0.61	**0.62**	5682	4519	3606	2888	1986	1580	1261	1010	196	156	124	99	1061	844	673	539	1221	971	775	621	-2078	-1653	-1319	-1056
0.62	0.63	5677	4511	3598	2879	1985	1577	1258	1006	196	155	124	99	1060	842	672	538	1220	969	773	619	-2077	-1650	-1316	-1053
0.63	**0.64**	5672	4504	3589	2870	1983	1575	1255	1003	195	155	124	99	1059	841	670	536	1219	968	771	617	-2075	-1648	-1313	-1050
0.64	0.65	5668	4497	3581	2861	1982	1572	1252	1000	195	155	123	99	1058	840	669	534	1218	966	769	615	-2073	-1645	-1310	-1046
0.65	**0.66**	5664	4490	3572	2852	1980	1570	1249	997	195	155	123	98	1058	838	667	533	1217	965	768	613	-2072	-1642	-1307	-1043
0.66	0.67	5659	4483	3564	2843	1979	1567	1246	994	195	154	123	98	1057	837	666	531	1216	963	766	611	-2070	-1640	-1304	-1040
0.67	**0.68**	5655	4477	3556	2835	1977	1565	1243	991	195	154	122	98	1056	836	664	529	1215	962	764	609	-2069	-1637	-1301	-1037
0.68	0.69	5651	4470	3549	2826	1976	1563	1241	988	195	154	122	97	1055	835	663	528	1214	961	763	607	-2067	-1635	-1298	-1034

0.69	**0.70**	5647	4464	3541	2818	1974	1561	1238	985	195	154	122	97	1054	833	661	526	1213	959	761	606	-2066	-1633	-1295	-1031
0.70	0.71	5643	4457	3533	2810	1973	1558	1235	982	194	154	122	97	1054	832	660	525	1213	958	759	604	-2064	-1630	-1292	-1028
0.71	**0.72**	5639	4451	3526	2802	1971	1556	1233	980	194	153	121	97	1053	831	658	523	1212	956	758	602	-2063	-1628	-1290	-1025
0.72	0.73	5635	4445	3519	2795	1970	1554	1230	977	194	153	121	96	1052	830	657	522	1211	955	756	601	-2061	-1626	-1287	-1022
0.73	**0.74**	5631	4439	3511	2787	1969	1552	1228	974	194	153	121	96	1051	829	656	520	1210	954	755	599	-2060	-1624	-1284	-1019
0.74	0.75	5627	4433	3504	2779	1967	1550	1225	972	194	153	121	96	1051	828	654	519	1209	953	753	597	-2058	-1621	-1282	-1017
0.75	**0.76**	5624	4427	3497	2772	1966	1548	1223	969	194	152	120	95	1050	827	653	518	1208	951	752	596	-2057	-1619	-1279	-1014
0.76	0.77	5620	4421	3490	2765	1965	1546	1220	967	194	152	120	95	1049	826	652	516	1208	950	750	594	-2056	-1617	-1277	-1011
0.77	**0.78**	5616	4415	3484	2758	1963	1544	1218	964	193	152	120	95	1049	824	650	515	1207	949	749	593	-2054	-1615	-1274	-1009
0.78	0.79	5613	4410	3477	2751	1962	1542	1216	962	193	152	120	95	1048	823	649	514	1206	948	747	591	-2053	-1613	-1272	-1006
0.79	**0.80**	5609	4404	3470	2744	1961	1540	1213	959	193	152	120	95	1047	822	648	512	1205	946	746	590	-2052	-1611	-1269	-1004
0.80	0.81	5606	4399	3464	2737	1960	1538	1211	957	193	152	119	94	1047	821	647	511	1205	945	744	588	-2050	-1609	-1267	-1001
0.81	**0.82**	5602	4393	3457	2730	1959	1536	1209	954	193	151	119	94	1046	820	646	510	1204	944	743	587	-2049	-1607	-1265	-999
0.82	0.83	5599	4388	3451	2723	1957	1534	1207	952	193	151	119	94	1045	819	644	509	1203	943	742	585	-2048	-1605	-1262	-996
0.83	**0.84**	5595	4383	3445	2717	1956	1532	1204	950	193	151	119	94	1045	818	643	507	1202	942	740	584	-2047	-1603	-1260	-994
0.84	0.85	5592	4377	3439	2710	1955	1530	1202	948	193	151	118	93	1044	817	642	506	1202	941	739	582	-2045	-1601	-1258	-991
0.85	**0.86**	5589	4372	3433	2704	1954	1529	1200	945	192	151	118	93	1044	816	641	505	1201	940	738	581	-2044	-1599	-1255	-989

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0.86	0.87	5585	4367	3427	2698	1953	1527	1198	943	192	150	118	93	1043	815	640	504	1200	938	736	580	-2043	-1597	-1253	-987
0.87	**0.88**	5582	4362	3421	2692	1952	1525	1196	941	192	150	118	93	1042	815	639	503	1200	937	735	578	-2042	-1596	-1251	-985
0.88	0.89	5579	4357	3415	2685	1950	1523	1194	939	192	150	118	92	1042	814	638	501	1199	936	734	577	-2041	-1594	-1249	-982
0.89	**0.90**	5576	4352	3409	2679	1949	1522	1192	937	192	150	117	92	1041	813	637	500	1198	935	733	576	-2040	-1592	-1247	-980
0.90	0.91	5573	4347	3404	2673	1948	1520	1190	935	192	150	117	92	1041	812	636	499	1198	934	731	575	-2038	-1590	-1245	-978
0.91	**0.92**	5570	4343	3398	2668	1947	1518	1188	933	192	150	117	92	1040	811	634	498	1197	933	730	573	-2037	-1588	-1243	-976
0.92	0.93	5567	4338	3392	2662	1946	1517	1186	931	192	149	117	92	1039	810	633	497	1196	932	729	572	-2036	-1587	-1241	-974
0.93	**0.94**	5564	4333	3387	2656	1945	1515	1184	929	192	149	117	91	1039	809	632	496	1196	931	728	571	-2035	-1585	-1239	-972
0.94	0.95	5561	4329	3382	2650	1944	1513	1182	927	192	149	116	91	1038	808	631	495	1195	930	727	570	-2034	-1583	-1237	-969
0.95	**0.96**	5558	4324	3376	2645	1943	1512	1180	925	191	149	116	91	1038	807	630	494	1194	929	726	568	-2033	-1582	-1235	-967
0.96	0.97	5555	4320	3371	2639	1942	1510	1178	923	191	149	116	91	1037	807	629	493	1194	928	724	567	-2032	-1580	-1233	-965
0.97	**0.98**	5552	4315	3366	2634	1941	1509	1177	921	191	149	116	91	1037	806	628	492	1193	927	723	566	-2031	-1578	-1231	-963
0.98	0.99	5549	4311	3361	2629	1940	1507	1175	919	191	148	116	91	1036	805	628	491	1193	926	722	565	-2030	-1577	-1229	-961
0.99	**1.00**	5547	4306	3356	2623	1939	1506	1173	917	191	148	116	90	1036	804	627	490	1192	925	721	564	-2029	-1575	-1227	-960
1.00	1.01	5544	4302	3350	2618	1938	1504	1171	915	191	148	115	90	1035	803	626	489	1191	924	720	563	-2028	-1574	-1226	-958
1.01	**1.02**	5541	4298	3346	2613	1937	1503	1170	913	191	148	115	90	1035	803	625	488	1191	924	719	561	-2027	-1572	-1224	-956
1.0	1.0	553	4294	3341	2608	1936	15	116	91	191	14	115	90	103	80	624	48	119	92	718	56	-	-	-	-

2	3	8					01	8	2		8			4	2		7	0	3		0	2026	1571	1222	954
1.03	**1.04**	5536	4289	3336	2603	1935	1500	1166	910	191	148	115	90	1034	801	623	486	1190	922	717	559	-2025	-1569	-1220	-952
1.04	1.05	5533	4285	3331	2598	1934	1498	1165	908	191	148	115	89	1033	800	622	485	1189	921	716	558	-2024	-1567	-1218	-950
1.05	**1.06**	5530	4281	3326	2593	1933	1497	1163	906	190	147	115	89	1033	799	621	484	1188	920	715	557	-2023	-1566	-1217	-948
1.06	1.07	5528	4277	3321	2588	1933	1495	1161	905	190	147	114	89	1032	799	620	483	1188	919	714	556	-2022	-1565	-1215	-947
1.07	**1.08**	5525	4273	3317	2583	1932	1494	1160	903	190	147	114	89	1032	798	619	482	1187	918	713	555	-2021	-1563	-1213	-945
1.08	1.09	5523	4269	3312	2578	1931	1493	1158	901	190	147	114	89	1031	797	618	481	1187	917	712	554	-2020	-1562	-1212	-943
1.09	**1.10**	5520	4265	3308	2574	1930	1491	1156	900	190	147	114	89	1031	796	618	481	1186	917	711	553	-2019	-1560	-1210	-941
1.10	1.11	5518	4262	3303	2569	1929	1490	1155	898	190	147	114	88	1030	796	617	480	1186	916	710	552	-2018	-1559	-1208	-940
1.11	**1.12**	5515	4258	3299	2564	1928	1488	1153	896	190	147	114	88	1030	795	616	479	1185	915	709	551	-2017	-1557	-1207	-938
1.12	1.13	5513	4254	3294	2560	1927	1487	1152	895	190	147	113	88	1029	794	615	478	1185	914	708	550	-2016	-1556	-1205	-936
1.13	**1.14**	5510	4250	3290	2555	1926	1486	1150	893	190	146	113	88	1029	794	614	477	1184	913	707	549	-2015	-1555	-1203	-935
1.14	1.15	5508	4246	3286	2551	1926	1485	1149	892	190	146	113	88	1028	793	614	476	1184	913	706	548	-2015	-1553	-1202	-933
1.15	**1.16**	5505	4243	3281	2546	1925	1483	1147	890	190	146	113	88	1028	792	613	475	1183	912	705	547	-2014	-1552	-1200	-931
1.16	1.17	5503	4239	3277	2542	1924	1482	1146	889	190	146	113	88	1028	792	612	475	1183	911	704	546	-2013	-1551	-1199	-930
1.17	**1.18**	5501	4235	3273	2538	1923	1481	1144	887	189	146	113	87	1027	791	611	474	1182	910	703	545	-2012	-1549	-1197	-928
1.18	1.19	5498	4232	3269	2533	1922	1479	1143	886	189	146	113	87	1027	790	610	473	1182	909	702	544	-2011	-1548	-1196	-927

1.19	**1.20**	5496	4228	3265	2529	1921	1478	1141	884	189	146	112	87	1026	790	610	472	1181	909	702	543	-2010	-1547	-1194	-925
1.20	1.21	5494	4225	3261	2525	1921	1477	1140	883	189	146	112	87	1026	789	609	471	1181	908	701	543	-2009	-1545	-1193	-924
1.21	**1.22**	5491	4221	3257	2521	1920	1476	1138	881	189	145	112	87	1025	788	608	471	1180	907	700	542	-2009	-1544	-1191	-922
1.22	1.23	5489	4218	3253	2517	1919	1475	1137	880	189	145	112	87	1025	788	607	470	1180	906	699	541	-2008	-1543	-1190	-920
1.23	**1.24**	5487	4214	3249	2512	1918	1473	1136	878	189	145	112	87	1025	787	607	469	1179	906	698	540	-2007	-1542	-1188	-919
1.24	1.25	5485	4211	3245	2508	1917	1472	1134	877	189	145	112	86	1024	786	606	468	1179	905	697	539	-2006	-1540	-1187	-918
1.25	**1.26**	5483	4208	3241	2504	1917	1471	1133	876	189	145	112	86	1024	786	605	468	1178	904	696	538	-2005	-1539	-1185	-916
1.26	1.27	5480	4204	3237	2500	1916	1470	1132	874	189	145	111	86	1023	785	604	467	1178	903	696	537	-2005	-1538	-1184	-915
1.27	**1.28**	5478	4201	3233	2497	1915	1469	1130	873	189	145	111	86	1023	784	604	466	1177	903	695	536	-2004	-1537	-1183	-913
1.28	1.29	5476	4198	3229	2493	1914	1468	1129	871	189	145	111	86	1023	784	603	465	1177	902	694	536	-2003	-1535	-1181	-912
1.29	**1.30**	5474	4194	3226	2489	1914	1466	1128	870	189	144	111	86	1022	783	602	465	1176	901	693	535	-2002	-1534	-1180	-910
1.30	1.31	5472	4191	3222	2485	1913	1465	1126	869	188	144	111	86	1022	783	602	464	1176	901	692	534	-2001	-1533	-1178	-909
1.31	**1.32**	5470	4188	3218	2481	1912	1464	1125	867	188	144	111	85	1021	782	601	463	1175	900	692	533	-2001	-1532	-1177	-908
1.32	1.33	5468	4185	3214	2477	1912	1463	1124	866	188	144	111	85	1021	781	600	463	1175	899	691	532	-2000	-1531	-1176	-906
1.33	**1.34**	5466	4182	3211	2474	1911	1462	1123	865	188	144	111	85	1021	781	600	462	1175	899	690	532	-1999	-1530	-1174	-905
1.34	1.35	5464	4179	3207	2470	1910	1461	1121	864	188	144	110	85	1020	780	599	461	1174	898	689	531	-1998	-1528	-1173	-903
1.35	**1.36**	5462	4176	3204	2466	1909	1460	1120	862	188	144	110	85	1020	780	598	461	1174	897	688	530	-1999	-1527	-1172	-902

																						8	7	2	
1.36	1.37	5460	4172	3200	2463	1909	1459	1119	861	188	144	110	85	1019	779	598	460	1173	897	688	529	-1997	-1526	-1171	-901
1.37	**1.38**	5458	4169	3197	2459	1908	1458	1118	860	188	144	110	85	1019	779	597	459	1173	896	687	528	-1996	-1525	-1169	-899
1.38	1.39	5456	4166	3193	2456	1907	1457	1116	858	188	144	110	85	1019	778	596	459	1172	895	686	528	-1996	-1524	-1168	-898
1.39	**1.40**	5454	4163	3190	2452	1907	1456	1115	857	188	143	110	84	1018	777	596	458	1172	895	685	527	-1995	-1523	-1167	-897
1.40	1.41	5452	4160	3186	2449	1906	1454	1114	856	188	143	110	84	1018	777	595	457	1172	894	685	526	-1994	-1522	-1166	-896
1.41	**1.42**	5450	4157	3183	2445	1905	1453	1113	855	188	143	110	84	1018	776	594	457	1171	893	684	525	-1993	-1521	-1164	-894
1.42	1.43	5448	4155	3180	2442	1905	1452	1112	854	188	143	110	84	1017	776	594	456	1171	893	683	525	-1993	-1520	-1163	-893
1.43	**1.44**	5446	4152	3176	2438	1904	1451	1110	852	188	143	109	84	1017	775	593	455	1170	892	683	524	-1992	-1519	-1162	-892
1.44	1.45	5444	4149	3173	2435	1903	1450	1109	851	188	143	109	84	1017	775	592	455	1170	892	682	523	-1991	-1518	-1161	-891
1.45	**1.46**	5442	4146	3170	2431	1903	1449	1108	850	187	143	109	84	1016	774	592	454	1169	891	681	523	-1991	-1516	-1159	-889
1.46	1.47	5440	4143	3166	2428	1902	1448	1107	849	187	143	109	84	1016	774	591	453	1169	890	680	522	-1990	-1515	-1158	-888
1.47	**1.48**	5438	4140	3163	2425	1901	1447	1106	848	187	143	109	84	1015	773	591	453	1169	890	680	521	-1989	-1514	-1157	-887
1.48	1.49	5437	4137	3160	2422	1901	1446	1105	847	187	143	109	83	1015	773	590	452	1168	889	679	520	-1989	-1513	-1156	-886
1.49	**1.50**	**5435**	**4135**	**3157**	**2418**	**1900**	**1445**	**1104**	**845**	**187**	**142**	**109**	**83**	**1015**	**772**	**589**	**452**	**1168**	**889**	**678**	**520**	**-1988**	**-1512**	**-1155**	**-885**

I93N (South of Boston) -- Congestion

		ND (1)				ND (2)				ND (3)				ND (4)				ND (5)			
OP	NP	**-0.05**	**-0.1**	**-0.15**	**-0.2**	**-0.05**	**-0.1**	**-0.15**	**-0.2**	**-0.05**	**-0.1**	**-0.15**	**-0.2**	**-0.05**	**-0.1**	**-0.15**	**-0.2**	**-0.05**	**-0.1**	**-0.15**	**-0.2**

0.0	0.0	958	958					196	196	-	-	-	-	285	285	285	285	-	-	-	-
0	1	9	9	9589	9589	1969	1969	9	9	1120	1120	1120	1120	3	3	3	3	3103	3103	3103	3103
0.0	**0.0**	913	871					171	164	-	-			271	259	248	237	-	-	-	-
1	**2**	2	7	8338	7991	1875	1790	2	1	1067	1018	-974	-933	7	4	1	8	2955	2821	2698	2586
0.0	0.0	891	830					159	149	-				265	247	230	216	-	-	-	-
2	3	0	2	7757	7264	1830	1705	3	2	1041	-970	-906	-848	1	0	8	1	2883	2687	2510	2351
0.0	**0.0**	876	803					151	139	-				260	239	219	202	-	-	-	-
3	**4**	4	4	7387	6810	1800	1650	7	8	1024	-938	-863	-795	7	0	8	6	2836	2600	2390	2204
0.0	0.0	865	783					146	133	-				257	233	211	193	-	-	-	-
4	5	5	8	7120	6486	1777	1610	2	2	1011	-916	-832	-758	5	2	8	0	2801	2537	2304	2099
0.0	**0.0**	857	768					141	128	-				255	228	205	185	-	-	-	-
5	**6**	0	5	6913	6237	1760	1578	9	1	1001	-898	-807	-728	0	6	7	6	2773	2487	2237	2018
0.0	0.0	849	755					138	123					252	224	200	179	-	-	-	-
6	7	9	9	6744	6035	1745	1552	5	9	-993	-883	-788	-705	9	9	7	6	2750	2446	2182	1953
0.0	0.0	843	745					135	120					251	221	196	174	-	-	-	-
7	8	9	2	6603	5868	1733	1530	6	5	-986	-870	-771	-685	1	7	4	6	2731	2412	2137	1899
0.0	**0.0**	838	736					133	117					249	219	192	170	-	-	-	-
8	**9**	6	0	6481	5725	1722	1511	1	5	-980	-860	-757	-669	5	0	8	3	2714	2382	2097	1852
0.0	0.1	834	727					130	115					248	216	189	166	-	-	-	-
9	0	0	9	6375	5600	1712	1495	9	0	-974	-850	-745	-654	1	6	7	6	2699	2356	2063	1812
0.1	**0.1**	829	720					129	112					246	214	186	163	-	-	-	-
0	**1**	8	7	6281	5490	1704	1480	0	7	-969	-842	-734	-641	9	4	9	4	2685	2332	2032	1777
0.1	0.1	826	714					127	110					245	212	184	160	-	-	-	-
1	2	1	2	6196	5392	1696	1467	2	7	-965	-834	-724	-630	8	5	4	4	2673	2311	2005	1745
0.1	**0.1**	822	708					125	108					244	210	182	157	-	-	-	-
2	**3**	7	3	6120	5304	1689	1454	7	9	-961	-827	-715	-620	8	7	1	8	2662	2292	1980	1716
0.1	0.1	819	702					124	107					243	209	180	155	-	-	-	-
3	4	5	9	6050	5224	1683	1443	2	3	-957	-821	-707	-610	8	1	0	4	2652	2275	1958	1690
0.1	0.1	816	697					122	105					243	207	178	153	-	-	-	-
4	5	6	9	5986	5150	1677	1433	9	8	-954	-815	-699	-602	0	7	1	2	2642	2259	1937	1667
0.1	**0.1**	813	693					121	104					242	206	176	151	-	-	-	-
5	**6**	9	3	5927	5082	1671	1424	7	4	-951	-810	-692	-594	1	3	3	2	2634	2244	1918	1645
0.1	0.1	811	689					120	103					241	205	174	149	-	-	-	-
6	7	3	0	5871	5020	1666	1415	6	1	-948	-805	-686	-586	4	0	7	3	2625	2230	1900	1624
0.1	**0.1**	809	685					119	101					240	203	173	147	-	-	-	-
7	**8**	0	0	5820	4961	1661	1407	5	9	-945	-800	-680	-579	7	8	2	6	2618	2217	1883	1605
0.1	0.1	806	681					118	100					240	202	171	146	-	-	-	-
8	9	7	2	5772	4907	1657	1399	5	8	-942	-796	-674	-573	0	7	7	0	2611	2204	1868	1588
0.1	**0.2**	804	677					117						239	201	170	144	-	-	-	-
9	**0**	6	6	5727	4856	1652	1391	6	997	-940	-791	-669	-567	4	6	4	5	2604	2193	1853	1571
0.2	0.2	802	674					116						238	200	169	143	-	-	-	-
0	1	6	3	5684	4807	1648	1385	7	987	-937	-788	-664	-562	8	6	1	0	2597	2182	1839	1556
0.2	0.2	800	671					115						238	199	167	141	-	-	-	-
1	2	7	1	5644	4762	1644	1378	9	978	-935	-784	-659	-556	2	7	9	7	2591	2172	1826	1541
0.2	**0.2**	798	668					115						237	198	166	140	-	-	-	-
2	**3**	9	0	5606	4719	1640	1372	1	969	-933	-780	-655	-551	7	8	8	4	2585	2162	1814	1527
0.2	0.2	797	665					114						237	197	165	139	-	-	-	-
3	4	1	1	5569	4679	1637	1366	4	961	-931	-777	-650	-546	2	9	7	2	2580	2152	1802	1514
0.2	**0.2**	795	662					113						236	197	164	138	-	-	-	-
4	**5**	5	4	5535	4640	1633	1360	6	953	-929	-774	-646	-542	7	1	7	0	2574	2143	1791	1501

0.2	0.2	793	659					113						236	196	163	137	-	-	-	-
5	6	9	7	5502	4603	1630	1355	0	945	-927	-771	-643	-538	2	3	7	0	2569	2135	1780	1490
0.2	**0.2**	792	657					112						235	195	162	135	-	-	-	-
6	**7**	4	2	5470	4568	1627	1350	3	938	-925	-768	-639	-534	8	5	8	9	2564	2127	1770	1478
0.2	0.2	790	654					111						235	194	161	134	-	-	-	-
7	8	9	8	5440	4534	1624	1345	7	931	-924	-765	-635	-530	3	8	9	9	2559	2119	1760	1467
0.2	0.2	789	652					111						234	194	161	134	-	-	-	-
8	9	5	5	5411	4502	1621	1340	1	924	-922	-762	-632	-526	9	1	0	0	2555	2111	1751	1457
0.2	**0.3**	788	650					110						234	193	160	133	-	-	-	-
9	**0**	1	2	5383	4471	1618	1335	5	918	-921	-759	-629	-522	5	5	2	0	2550	2104	1742	1447
0.3	0.3	786	648					110						234	192	159	132	-	-	-	-
0	1	8	1	5356	4442	1616	1331	0	912	-919	-757	-626	-519	1	8	4	2	2546	2097	1733	1437
0.3	**0.3**	785	646					109						233	192	158	131	-	-	-	-
1	**2**	6	0	5331	4413	1613	1326	5	906	-918	-754	-623	-515	7	2	6	3	2542	2090	1725	1428
0.3	0.3	784	644					108						233	191	157	130	-	-	-	-
2	3	3	0	5306	4386	1611	1322	9	901	-916	-752	-620	-512	4	6	9	5	2538	2084	1717	1419
0.3	**0.3**	783	642					108						233	191	157	129	-	-	-	-
3	**4**	1	0	5282	4359	1608	1318	5	895	-915	-750	-617	-509	0	0	1	7	2534	2078	1709	1411
0.3	0.3	782	640					108						232	190	156	128	-	-	-	-
4	5	0	1	5258	4334	1606	1314	0	890	-913	-748	-614	-506	7	5	5	9	2531	2071	1702	1402
0.3	0.3	780	638					107						232	189	155	128	-	-	-	-
5	6	9	3	5236	4309	1603	1311	5	885	-912	-746	-612	-503	3	9	8	2	2527	2066	1694	1394
0.3	**0.3**	779	636					107						232	189	155	127	-	-	-	-
6	**7**	8	5	5214	4285	1601	1307	1	880	-911	-743	-609	-501	0	4	1	5	2523	2060	1687	1387
0.3	0.3	778	634					106						231	188	154	126	-	-	-	-
7	8	7	8	5193	4262	1599	1304	6	875	-910	-741	-607	-498	7	9	5	8	2520	2054	1681	1379
0.3	**0.3**	777	633					106						231	188	153	126	-	-	-	-
8	**9**	7	2	5173	4240	1597	1300	2	871	-908	-740	-604	-495	4	4	9	2	2517	2049	1674	1372
0.3	0.4	776	631					105						231	187	153	125	-	-	-	-
9	0	7	5	5153	4218	1595	1297	8	866	-907	-738	-602	-493	1	9	3	5	2513	2044	1668	1365
0.4	**0.4**	775	630					105						230	187	152	124	-	-	-	-
0	**1**	8	0	5134	4197	1593	1294	4	862	-906	-736	-600	-490	8	4	7	9	2510	2039	1661	1358
0.4	0.4	774	628					105						230	187	152	124	-	-	-	-
1	2	8	4	5115	4177	1591	1290	0	858	-905	-734	-597	-488	5	0	2	3	2507	2034	1655	1352
0.4	0.4	773	626					104						230	186	151	123	-	-	-	-
2	3	9	9	5097	4157	1589	1287	7	854	-904	-732	-595	-486	3	5	6	7	2504	2029	1649	1345
0.4	**0.4**	773	625					104						230	186	151	123	-	-	-	-
3	**4**	0	5	5079	4138	1587	1284	3	850	-903	-731	-593	-483	0	1	1	1	2501	2024	1644	1339
0.4	0.4	772	624					103						229	185	150	122	-	-	-	-
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0.50	**0.51**	767	6162	4967	4017	1575	1265	1020	825	-896	-720	-580	-469	2283	1833	1478	1195	-2483	-1994	-1607	-1300
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1.4	**1.4**	727	553											216	164	125		-	-	-	-
8	**9**	0	3	4226	3238	1493	1136	868	665	-849	-646	-494	-378	3	6	7	963	2352	1790	1367	1048
1.4	**1.5**	**726**	**552**											**216**	**164**	**125**		**-**	**-**	**-**	**-**
9	**0**	**7**	**9**	**4221**	**3234**	**1492**	**1135**	**867**	**664**	**-849**	**-646**	**-493**	**-378**	**2**	**5**	**6**	**962**	**2352**	**1789**	**1366**	**1046**

I93N (South of Boston) -- Congestion

		ND (1)				ND (2)				ND (3)				ND (4)				ND (5)			
OP	NP	**-0.05**	**-0.1**	**-0.15**	**-0.2**	**-0.05**	**-0.1**	**-0.15**	**-0.2**	**-0.05**	**-0.1**	**-0.15**	**-0.2**	**-0.05**	**-0.1**	**-0.15**	**-0.2**	**-0.05**	**-0.1**	**-0.15**	**-0.2**
0.00	0.01	13483	13483	13483	13483	634	634	634	634	589	589	589	589	1373	1373	1373	1373	-17	-17	-17	-17
0.01	**0.02**	12841	12257	11724	11236	604	576	551	528	561	535	512	491	1308	1248	1194	1144	-16	-15	-15	-14
0.02	0.03	12528	11674	10906	10214	589	549	513	480	547	510	476	446	1276	1189	1111	1040	-16	-15	-14	-13
0.03	**0.04**	12322	11297	10387	9576	579	531	488	450	538	494	454	418	1255	1150	1058	975	-16	-14	-13	-12
0.04	0.05	12170	11021	10012	9120	572	518	471	429	532	481	437	398	1239	1122	1019	929	-15	-14	-13	-11
0.05	**0.06**	12050	10805	9720	8769	567	508	457	412	526	472	425	383	1227	1100	990	893	-15	-14	-12	-11
0.06	0.07	11950	10628	9483	8486	562	500	446	399	522	464	414	371	1217	1082	966	864	-15	-13	-12	-11
0.07	**0.08**	11865	10479	9284	8251	558	493	437	388	518	458	406	360	1208	1067	945	840	-15	-13	-12	-10
0.08	0.09	11792	10349	9113	8049	554	487	429	378	515	452	398	352	1201	1054	928	820	-15	-13	-11	-10
0.09	**0.10**	11727	10235	8964	7874	551	481	421	370	512	447	392	344	1194	1042	913	802	-15	-13	-11	-10
0.10	0.11	11668	10134	8831	7720	549	477	415	363	510	443	386	337	1188	1032	899	786	-15	-13	-11	-10
0.11	**0.12**	11615	10043	8712	7582	546	472	410	357	507	439	381	331	1183	1023	887	772	-15	-13	-11	-10
0.12	0.13	11567	9960	8605	7458	544	468	405	351	505	435	376	326	1178	1014	876	759	-15	-13	-11	-9
0.13	**0.14**	11523	9884	8507	7345	542	465	400	345	503	432	372	321	1173	1006	866	748	-15	-12	-11	-9
0.14	0.15	11482	9814	8417	7241	540	461	396	341	502	429	368	316	1169	999	857	737	-14	-12	-11	-9
0.15	**0.16**	11444	9749	8333	7146	538	458	392	336	500	426	364	312	1165	993	849	728	-14	-12	-11	-9
0.16	0.17	11408	9688	8256	7058	536	456	388	332	498	423	361	308	1162	987	841	719	-14	-12	-10	-9
0.17	**0.18**	11375	9631	8184	6976	535	453	385	328	497	421	357	305	1158	981	833	710	-14	-12	-10	-9
0.18	0.19	11343	9578	8116	6899	533	450	382	324	496	418	355	301	1155	975	826	703	-14	-12	-10	-9
0.19	**0.20**	11313	9528	8052	6827	532	448	379	321	494	416	352	298	1152	970	820	695	-14	-12	-10	-9
0.20	0.21	11285	9481	7992	6760	531	446	376	318	493	414	349	295	1149	965	814	688	-14	-12	-10	-9
0.21	**0.22**	11258	9436	7936	6696	529	444	373	315	492	412	347	293	1146	961	808	682	-14	-12	-10	-8
0.22	0.23	11233	9393	7882	6636	528	442	371	312	491	410	344	290	1144	957	803	676	-14	-12	-10	-8
0.23	**0.24**	11208	9352	7831	6578	527	440	368	309	490	409	342	287	1141	952	797	670	-14	-12	-10	-8
0.24	0.25	11185	9314	7782	6524	526	438	366	307	489	407	340	285	1139	948	792	664	-14	-12	-10	-8
0.25	**0.26**	11163	9277	7736	6472	525	436	364	304	488	405	338	283	1137	945	788	659	-14	-12	-10	-8
0.26	0.27	11141	9241	7692	6423	524	435	362	302	487	404	336	281	1135	941	783	654	-14	-12	-10	-8
0.27	**0.28**	11121	9207	7649	6376	523	433	360	300	486	402	334	279	1132	938	779	649	-14	-12	-10	-8
0.28	0.29	11101	9174	7608	6330	522	431	358	298	485	401	332	277	1130	934	775	645	-14	-12	-10	-8
0.29	**0.30**	11082	9143	7569	6287	521	430	356	296	484	399	331	275	1128	931	771	640	-14	-12	-10	-8
0.30	0.31	11063	9112	7531	6245	520	428	354	294	483	398	329	273	1127	928	767	636	-14	-11	-9	-8
0.31	**0.32**	11046	9083	7495	6205	519	427	352	292	483	397	327	271	1125	925	763	632	-14	-11	-9	-8

0.32	0.33	11028	9055	7460	6167	519	426	351	290	482	396	326	269	1123	922	760	628	-14	-11	-9	-8
0.33	**0.34**	11012	9027	7426	6130	518	424	349	288	481	394	324	268	1121	919	756	624	-14	-11	-9	-8
0.34	0.35	10996	9001	7394	6094	517	423	348	287	480	393	323	266	1120	917	753	621	-14	-11	-9	-8
0.35	**0.36**	10980	8975	7362	6059	516	422	346	285	480	392	322	265	1118	914	750	617	-14	-11	-9	-8
0.36	0.37	10965	8950	7332	6026	516	421	345	283	479	391	320	263	1117	911	747	614	-14	-11	-9	-8
0.37	**0.38**	10950	8926	7302	5993	515	420	343	282	478	390	319	262	1115	909	744	610	-14	-11	-9	-8
0.38	0.39	10935	8903	7273	5962	514	419	342	280	478	389	318	260	1114	907	741	607	-14	-11	-9	-8
0.39	**0.40**	10921	8880	7246	5932	514	418	341	279	477	388	317	259	1112	904	738	604	-14	-11	-9	-7
0.40	0.41	10908	8858	7218	5902	513	417	339	278	477	387	315	258	1111	902	735	601	-14	-11	-9	-7
0.41	**0.42**	10895	8836	7192	5873	512	416	338	276	476	386	314	257	1109	900	732	598	-14	-11	-9	-7
0.42	0.43	10882	8815	7167	5846	512	415	337	275	475	385	313	255	1108	898	730	595	-14	-11	-9	-7
0.43	**0.44**	10869	8795	7142	5818	511	414	336	274	475	384	312	254	1107	896	727	593	-14	-11	-9	-7
0.44	0.45	10857	8775	7117	5792	511	413	335	272	474	383	311	253	1106	894	725	590	-14	-11	-9	-7
0.45	**0.46**	10845	8755	7094	5767	510	412	334	271	474	382	310	252	1104	892	722	587	-14	-11	-9	-7
0.46	0.47	10833	8736	7071	5742	509	411	332	270	473	382	309	251	1103	890	720	585	-14	-11	-9	-7
0.47	**0.48**	10821	8718	7048	5717	509	410	331	269	473	381	308	250	1102	888	718	582	-14	-11	-9	-7
0.48	0.49	10810	8700	7026	5694	508	409	330	268	472	380	307	249	1101	886	715	580	-14	-11	-9	-7
0.49	**0.50**	10799	8682	7005	5670	508	408	329	267	472	379	306	248	1100	884	713	577	-14	-11	-9	-7
0.50	0.51	10788	8665	6984	5648	507	407	328	266	471	379	305	247	1099	882	711	575	-14	-11	-9	-7
0.51	**0.52**	10778	8648	6963	5626	507	407	327	265	471	378	304	246	1098	881	709	573	-14	-11	-9	-7
0.52	0.53	10767	8631	6943	5604	506	406	326	264	470	377	303	245	1096	879	707	571	-14	-11	-9	-7
0.53	**0.54**	10757	8615	6924	5583	506	405	326	263	470	376	302	244	1095	877	705	569	-14	-11	-9	-7
0.54	0.55	10747	8599	6905	5562	505	404	325	262	469	376	302	243	1094	876	703	566	-14	-11	-9	-7
0.55	**0.56**	10737	8583	6886	5542	505	404	324	261	469	375	301	242	1093	874	701	564	-14	-11	-9	-7
0.56	0.57	10728	8568	6867	5523	504	403	323	260	469	374	300	241	1092	873	699	562	-14	-11	-9	-7
0.57	**0.58**	10718	8553	6849	5503	504	402	322	259	468	374	299	240	1091	871	697	560	-14	-11	-9	-7
0.58	0.59	10709	8538	6832	5484	504	401	321	258	468	373	298	240	1091	869	696	558	-14	-11	-9	-7
0.59	**0.60**	10700	8524	6814	5466	503	401	320	257	467	372	298	239	1090	868	694	557	-13	-11	-9	-7
0.60	0.61	10691	8510	6797	5448	503	400	320	256	467	372	297	238	1089	867	692	555	-13	-11	-9	-7
0.61	**0.62**	10682	8496	6781	5430	502	399	319	255	467	371	296	237	1088	865	690	553	-13	-11	-9	-7
0.62	0.63	10674	8482	6764	5412	502	399	318	255	466	371	295	236	1087	864	689	551	-13	-11	-9	-7
0.63	**0.64**	10665	8469	6748	5395	502	398	317	254	466	370	295	236	1086	862	687	549	-13	-11	-9	-7
0.64	0.65	10657	8455	6733	5379	501	398	317	253	466	369	294	235	1085	861	686	548	-13	-11	-8	-7
0.65	**0.66**	10649	8442	6717	5362	501	397	316	252	465	369	293	234	1084	860	684	546	-13	-11	-8	-7
0.66	0.67	10641	8430	6702	5346	500	396	315	251	465	368	293	234	1084	858	682	544	-13	-11	-8	-7
0.67	**0.68**	10633	8417	6687	5330	500	396	314	251	464	368	292	233	1083	857	681	543	-13	-11	-8	-7

0.68	0.69	10625	8405	6672	5314	500	395	314	250	464	367	291	232	1082	856	679	541	-13	-11	-8	-7
0.69	**0.70**	10617	8393	6658	5299	499	395	313	249	464	367	291	231	1081	855	678	540	-13	-11	-8	-7
0.70	0.71	10610	8381	6643	5284	499	394	312	248	463	366	290	231	1080	853	677	538	-13	-11	-8	-7
0.71	**0.72**	10602	8369	6629	5269	499	394	312	248	463	366	290	230	1080	852	675	537	-13	-11	-8	-7
0.72	0.73	10595	8357	6616	5254	498	393	311	247	463	365	289	230	1079	851	674	535	-13	-11	-8	-7
0.73	**0.74**	10588	8346	6602	5240	498	392	310	246	463	365	288	229	1078	850	672	534	-13	-11	-8	-7
0.74	0.75	10581	8335	6589	5226	498	392	310	246	462	364	288	228	1077	849	671	532	-13	-11	-8	-7
0.75	**0.76**	10574	8323	6576	5212	497	391	309	245	462	364	287	228	1077	848	670	531	-13	-10	-8	-7
0.76	0.77	10567	8313	6563	5198	497	391	309	244	462	363	287	227	1076	846	668	529	-13	-10	-8	-7
0.77	**0.78**	10560	8302	6550	5185	497	390	308	244	461	363	286	226	1075	845	667	528	-13	-10	-8	-7
0.78	0.79	10553	8291	6537	5172	496	390	307	243	461	362	286	226	1075	844	666	527	-13	-10	-8	-7
0.79	**0.80**	10546	8281	6525	5159	496	389	307	243	461	362	285	225	1074	843	664	525	-13	-10	-8	-7
0.80	0.81	10540	8270	6513	5146	496	389	306	242	460	361	285	225	1073	842	663	524	-13	-10	-8	-6
0.81	**0.82**	10533	8260	6501	5133	495	388	306	241	460	361	284	224	1073	841	662	523	-13	-10	-8	-6
0.82	0.83	10527	8250	6489	5121	495	388	305	241	460	360	283	224	1072	840	661	521	-13	-10	-8	-6
0.83	**0.84**	10520	8240	6477	5108	495	387	305	240	460	360	283	223	1071	839	660	520	-13	-10	-8	-6
0.84	0.85	10514	8230	6465	5096	494	387	304	240	459	360	282	223	1071	838	658	519	-13	-10	-8	-6
0.85	**0.86**	10508	8221	6454	5084	494	387	303	239	459	359	282	222	1070	837	657	518	-13	-10	-8	-6
0.86	0.87	10502	8211	6443	5072	494	386	303	239	459	359	281	222	1069	836	656	517	-13	-10	-8	-6
0.87	**0.88**	10496	8202	6432	5061	494	386	302	238	459	358	281	221	1069	835	655	515	-13	-10	-8	-6
0.88	0.89	10490	8192	6421	5049	493	385	302	237	458	358	280	221	1068	834	654	514	-13	-10	-8	-6
0.89	**0.90**	10484	8183	6410	5038	493	385	301	237	458	357	280	220	1068	833	653	513	-13	-10	-8	-6
0.90	0.91	10478	8174	6399	5027	493	384	301	236	458	357	280	220	1067	832	652	512	-13	-10	-8	-6
0.91	**0.92**	10472	8165	6389	5016	492	384	300	236	457	357	279	219	1066	831	651	511	-13	-10	-8	-6
0.92	0.93	10467	8156	6378	5005	492	384	300	235	457	356	279	219	1066	831	650	510	-13	-10	-8	-6
0.93	**0.94**	10461	8147	6368	4994	492	383	299	235	457	356	278	218	1065	830	648	509	-13	-10	-8	-6
0.94	0.95	10456	8139	6358	4983	492	383	299	234	457	356	278	218	1065	829	647	507	-13	-10	-8	-6
0.95	**0.96**	10450	8130	6348	4973	491	382	298	234	457	355	277	217	1064	828	646	506	-13	-10	-8	-6
0.96	0.97	10445	8122	6338	4963	491	382	298	233	456	355	277	217	1064	827	645	505	-13	-10	-8	-6
0.97	**0.98**	10439	8113	6328	4952	491	382	298	233	456	354	276	216	1063	826	644	504	-13	-10	-8	-6
0.98	0.99	10434	8105	6319	4942	491	381	297	232	456	354	276	216	1063	825	643	503	-13	-10	-8	-6
0.99	**1.00**	10429	8097	6309	4932	490	381	297	232	456	354	276	215	1062	825	642	502	-13	-10	-8	-6
1.00	1.01	10423	8089	6300	4923	490	380	296	231	455	353	275	215	1061	824	642	501	-13	-10	-8	-6
1.01	**1.02**	10418	8081	6290	4913	490	380	296	231	455	353	275	215	1061	823	641	500	-13	-10	-8	-6
1.02	1.03	10413	8073	6281	4903	490	380	295	231	455	353	274	214	1060	822	640	499	-13	-10	-8	-6
1.03	**1.04**	10408	8065	6272	4894	489	379	295	230	455	352	274	214	1060	821	639	498	-13	-10	-8	-6

1.04	1.05	10403	8057	6263	4884	489	379	294	230	454	352	274	213	1059	821	638	497	-13	-10	-8	-6
1.05	**1.06**	10398	8050	6254	4875	489	379	294	229	454	352	273	213	1059	820	637	496	-13	-10	-8	-6
1.06	1.07	10393	8042	6245	4866	489	378	294	229	454	351	273	213	1058	819	636	495	-13	-10	-8	-6
1.07	**1.08**	10388	8035	6236	4857	488	378	293	228	454	351	272	212	1058	818	635	495	-13	-10	-8	-6
1.08	1.09	10384	8027	6228	4848	488	377	293	228	454	351	272	212	1057	817	634	494	-13	-10	-8	-6
1.09	**1.10**	10379	8020	6219	4839	488	377	292	228	453	350	272	211	1057	817	633	493	-13	-10	-8	-6
1.10	1.11	10374	8013	6211	4830	488	377	292	227	453	350	271	211	1056	816	632	492	-13	-10	-8	-6
1.11	**1.12**	10369	8005	6202	4821	488	376	292	227	453	350	271	211	1056	815	632	491	-13	-10	-8	-6
1.12	1.13	10365	7998	6194	4813	487	376	291	226	453	349	271	210	1055	814	631	490	-13	-10	-8	-6
1.13	**1.14**	10360	7991	6186	4804	487	376	291	226	453	349	270	210	1055	814	630	489	-13	-10	-8	-6
1.14	1.15	10356	7984	6178	4796	487	375	290	226	452	349	270	210	1055	813	629	488	-13	-10	-8	-6
1.15	**1.16**	10351	7977	6170	4788	487	375	290	225	452	348	270	209	1054	812	628	488	-13	-10	-8	-6
1.16	1.17	10347	7970	6162	4779	487	375	290	225	452	348	269	209	1054	812	627	487	-13	-10	-8	-6
1.17	**1.18**	10342	7964	6154	4771	486	374	289	224	452	348	269	208	1053	811	627	486	-13	-10	-8	-6
1.18	1.19	10338	7957	6146	4763	486	374	289	224	452	348	268	208	1053	810	626	485	-13	-10	-8	-6
1.19	**1.20**	10334	7950	6138	4755	486	374	289	224	451	347	268	208	1052	810	625	484	-13	-10	-8	-6
1.20	1.21	10329	7943	6131	4747	486	374	288	223	451	347	268	207	1052	809	624	483	-13	-10	-8	-6
1.21	**1.22**	10325	7937	6123	4739	486	373	288	223	451	347	267	207	1051	808	624	483	-13	-10	-8	-6
1.22	1.23	10321	7930	6115	4732	485	373	288	222	451	346	267	207	1051	808	623	482	-13	-10	-8	-6
1.23	**1.24**	10317	7924	6108	4724	485	373	287	222	451	346	267	206	1051	807	622	481	-13	-10	-8	-6
1.24	1.25	10312	7918	6101	4716	485	372	287	222	450	346	267	206	1050	806	621	480	-13	-10	-8	-6
1.25	**1.26**	10308	7911	6093	4709	485	372	287	221	450	346	266	206	1050	806	620	480	-13	-10	-8	-6
1.26	1.27	10304	7905	6086	4701	485	372	286	221	450	345	266	205	1049	805	620	479	-13	-10	-8	-6
1.27	**1.28**	10300	7899	6079	4694	484	371	286	221	450	345	266	205	1049	804	619	478	-13	-10	-8	-6
1.28	1.29	10296	7893	6072	4687	484	371	286	220	450	345	265	205	1048	804	618	477	-13	-10	-8	-6
1.29	**1.30**	10292	7886	6065	4679	484	371	285	220	450	345	265	204	1048	803	618	477	-13	-10	-8	-6
1.30	1.31	10288	7880	6058	4672	484	371	285	220	449	344	265	204	1048	802	617	476	-13	-10	-8	-6
1.31	**1.32**	10284	7874	6051	4665	484	370	285	219	449	344	264	204	1047	802	616	475	-13	-10	-8	-6
1.32	1.33	10280	7868	6044	4658	483	370	284	219	449	344	264	203	1047	801	615	474	-13	-10	-8	-6
1.33	**1.34**	10277	7863	6037	4651	483	370	284	219	449	343	264	203	1046	801	615	474	-13	-10	-8	-6
1.34	1.35	10273	7857	6030	4644	483	369	284	218	449	343	263	203	1046	800	614	473	-13	-10	-8	-6
1.35	**1.36**	10269	7851	6024	4637	483	369	283	218	449	343	263	203	1046	799	613	472	-13	-10	-8	-6
1.36	1.37	10265	7845	6017	4630	483	369	283	218	448	343	263	202	1045	799	613	472	-13	-10	-8	-6
1.37	**1.38**	10261	7839	6010	4624	483	369	283	217	448	342	263	202	1045	798	612	471	-13	-10	-8	-6
1.38	1.39	10258	7834	6004	4617	482	368	282	217	448	342	262	202	1045	798	611	470	-13	-10	-8	-6
1.39	**1.40**	10254	7828	5997	4610	482	368	282	217	448	342	262	201	1044	797	611	469	-13	-10	-8	-6

1.40	1.41	10250	7822	5991	4604	482	368	282	216	448	342	262	201	1044	797	610	469	-13	-10	-8	-6
1.41	**1.42**	10247	7817	5985	4597	482	368	281	216	448	341	261	201	1043	796	609	468	-13	-10	-8	-6
1.42	1.43	10243	7811	5978	4591	482	367	281	216	447	341	261	201	1043	795	609	467	-13	-10	-8	-6
1.43	**1.44**	10239	7806	5972	4584	481	367	281	216	447	341	261	200	1043	795	608	467	-13	-10	-8	-6
1.44	1.45	10236	7801	5966	4578	481	367	281	215	447	341	261	200	1042	794	608	466	-13	-10	-8	-6
1.45	**1.46**	10232	7795	5960	4572	481	367	280	215	447	341	260	200	1042	794	607	466	-13	-10	-8	-6
1.46	1.47	10229	7790	5954	4565	481	366	280	215	447	340	260	199	1042	793	606	465	-13	-10	-8	-6
1.47	**1.48**	10225	7785	5948	4559	481	366	280	214	447	340	260	199	1041	793	606	464	-13	-10	-7	-6
1.48	1.49	10222	7779	5941	4553	481	366	279	214	447	340	260	199	1041	792	605	464	-13	-10	-7	-6
1.49	**1.50**	**10219**	**7774**	**5936**	**4547**	**480**	**366**	**279**	**214**	**446**	**340**	**259**	**199**	**1041**	**792**	**604**	**463**	**-13**	**-10**	**-7**	**-6**

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