CENTRAL BUSINESS DISTRICT (CBD) TOLLING PROGRAM

Appendix 4B.1, Transportation: Transportation and Traffic Methodology for NEPA Evaluation

August 2022

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Attachments

Acronyms

BPM .... Best Practice Model
BTA .... Balanced Transportation Analyzer
CBD .... Central Business District
CEQR .... City Environmental Quality Review
CFR .... Code of Federal Regulations
EA .... Environmental Assessment
ETC .... Estimated Time of Completion
FDR Drive .... Franklin D. Roosevelt Drive
FHV .... For-Hire Vehicle
FHWA .... Federal Highway Administration
HCM .... Highway Capacity Manual
HCS .... Highway Capacity Software
HOV .... High-Occupancy Vehicles
LOS .... Level of Service
MPO .... Metropolitan Planning Organization
MTA .... Metropolitan Transportation Authority
NEPA .... National Environmental Policy Act
NYCDOT .... New York City Department of Transportation
NYMTC .... New York Metropolitan Transportation Council
NYSDOT .... New York State Department of Transportation
PATH .... Port Authority Trans-Hudson
RFK Bridge .... Robert F. Kennedy Bridge
TAZ .... Transportation Analysis Zone
TBTA .... Triborough Bridge and Tunnel Authority
VMT .... Vehicle-Miles Traveled
VPPP .... Value Pricing Pilot Program

Appendix 4B.1 Transportation and Traffic Methodology for NEPA Evaluation

4B.1-1 OVERVIEW

FHWA in cooperation with the TBTA—an affiliate of the MTA—the NYSDOT, and the NYCDOT (collectively, the Project Sponsors) have prepared this Environmental Assessment (EA) in accordance with the National Environmental Policy Act (NEPA) and the NEPA implementing regulations promulgated by the Council on Environmental Quality (40 CFR Parts 1500–1508) and FHWA (23 CFR Part 771). FHWA is serving as the lead Federal agency for the NEPA review. The EA will analyze the potential effects of implementing a program to reduce congestion in the Manhattan CBD in New York, New York. The Project purpose is to reduce traffic congestion in the Manhattan CBD in a manner that will generate revenue for future transportation improvements, pursuant to acceptance into FHWA's Value Pricing Pilot Program (VPPP).

Appendix 4B.1 provides a summary of the initial transportation and traffic methodology that was shared with FHWA at the onset of their NEPA lead agency responsibility (and as updated based on their review of the initial submission). As such, the appendix has been used to guide and develop the transportation studies and the impact assessment chapters of the EA. Each impact assessment chapter of the EA has refined impact assessment methodologies and assessment results building from this original methodology framework for transportation modeling and traffic impact assessment.

4B.1-2 MODELING APPROACH

The environmental review will establish the No Action Alternative, which will be compared to the CBD Tolling Alternative, which for the EA review comprises multiple tolling scenarios for future analysis years 2023 (estimated time of completion or ETC) and 2045 (horizon year for conformity and indirect and cumulative project effects[1]). The tolling scenarios will include variations in toll pricing as developed in coordination with variations in potential bridge and tunnel crossing credits. As appropriate, detailed impact assessment will be undertaken based on the determination of a specific tolling scenario.

The No Action Alternative and CBD Tolling Alternative will be analyzed for impacts upon regional travel patterns and local traffic conditions resulting from implementation of the Project. To incorporate all of these aspects into the overall modeling effort, the following model will be utilized:

- Best Practice Model (BPM), the regional travel demand forecasting model, developed by the New York Metropolitan Transportation Council (NYMTC), the region's metropolitan planning organization (MPO).

To evaluate local traffic effects, the environmental review will also include a localized traffic assessment of 15 study areas consisting of approximately 102 intersections, including those immediately adjacent to the

1 The CBD Tolling Alternative is required to demonstrate conformity with The New York Metropolitan Transportation Council (NYMTC)'s latest conformity model (2020U) for all analysis years up to the horizon year of 2045.

area of the Manhattan CBD subject to the toll. The review will evaluate 10 key highway corridors, leading to and from bridges or tunnels that connect to the Manhattan CBD or facilities used to bypass the Manhattan CBD entirely, which could experience an increase in traffic due to diversion of traffic in some toll scenarios.

Chapter 4, "Transportation," and associated appendices of the NEPA document will include detailed outputs from the modeling work discussed in this methodology memo.

Setting Toll Rates and Schedules

The toll rate is a key variable in the modeling to determine shifts in travel patterns and among modes. However, the toll rate also changes depending upon whether crossing credits, exemptions or discounts are given to any facilities as ultimately, by statute, the Project must generate sufficient net revenues to fund $15 billion for the MTA 2020–2024 Capital Program. In other words, the more crossing credits, exemptions or discounts, the higher the toll must be.

TBTA, assisted by MTA Planning, will use the Balanced Transportation Analyzer (BTA) initially to determine the toll rates to be used under different credit/exemption/discount tolling scenarios. The toll rates projected by the BTA for each of these tolling scenarios will then be used to model regional transportation effects using BPM.

The NEPA document will include a toll schedule for each tolling scenario, covering all time periods for the day. These rates will be presented in current 2019 dollars and escalated for the 2023 and 2045 CBD Tolling Alternative analysis years.

Regional Traffic Analysis

This analysis is based on a compilation of existing travel characteristics and forecasts of changes in travel demand using the BPM. It is the primary tool used to evaluate the effects of large-scale regional transportation projects included in the New York Regional Transportation Plan. It is adopted by NYMTC's member agencies for use in regional transportation planning analyses and is the Federally recognized transportation forecasting tool for the region.

With the toll schedule generated by the BTA, the environmental review will use the BPM to model changes in regional travel patterns throughout the 28-county BPM study area. The BPM relies on socioeconomic forecasts developed by NYMTC specifically for long-range transportation forecasting and planning for use in the BPM. This forecast includes changes in population, households by income, as well as changes in employment by occupational class, and are provided at the Transportation Analysis Zone (TAZ) level as inputs to the BPM. Growth rates (or declines) between zones drive the overall growth or decline in trip-making behavior in the model.

The NEPA document will provide summaries of NYMTC forecasts at the district and/or county level for a more complete understanding of the key drivers affecting trip-making growth in the region. Districts, such as the Manhattan CBD, will be aggregations of TAZs to better understand travel pattern changes to, from, and within the Manhattan CBD. The document will also summarize how the BPM utilizes the underlying population and employment data combined with all the regional transportation linkages to model route and mode choice.

For each CBD Tolling Alternative scenario, BPM outputs will be screened to identify any highways and roadways in the region with high volume-to-capacity (v/c) ratios and significant percentage changes in traffic volumes during the four time periods of analysis for the BPM (AM, midday [MD], PM, and Late Night[LN]) as shown in **Table 4B.1-1** for each tolling scenario. For the local traffic analysis, because the BPM does not model weekend travel patterns, the environmental review will assume that the traffic changes during the Saturday peak period will be similar to the weekday MD period. This assumption is consistent with data provided by StreetLight Data, Inc. (a third-party traffic data source), which shows similar general traffic conditions for the Saturday peak period and the weekday MD period. Saturday peak-period hours vary by location and will be detailed in the local traffic analysis.

Table 4B.1-1. Best Practice Model Analysis Periods

TIME PERIODS	TIME PERIOD
Weekday Morning Peak (AM)	6 a.m. to 10 a.m.
Weekday Midday (MD)	10 a.m. to 4 p.m.
Weekday Afternoon Peak (PM)	4 p.m. to 8 p.m.
Weekday Late Night (LN)	8 p.m. to 6 a.m.

Source: Best Practice Model, 2022

Specifically, this screening will identify roadway segments with a v/c ratio over 0.90 that experience a 5 percent or more increase in the traffic volume for any period and tolling scenario compared with the No Action Alternative.

Additionally, the screening will also identify changes in roadway volumes along key highways including the Gowanus Expressway, Staten Island Expressway, Brooklyn-Queens Expressway, Long Island Expressway, Trans-Manhattan/Cross Bronx Expressway, Major Deegan Expressway, I-78, NJ-495, Franklin D. Roosevelt Drive (FDR Drive), and West Side Highway/Route 9A.

MEASURES TO ASSESS REGIONAL TRAVEL IMPACT

In addition to identifying significant volume changes on key roadways, the following measures will also be analyzed to assess the effects of the CBD Tolling Alternative scenarios on regional travel patterns.

- **VMT:** The NEPA document will analyze the change in vehicle-miles traveled (VMT) per capita across the tolling scenarios and across time. This analysis will determine whether people would drive less under the tolling scenarios. Less driving could indicate a change to higher capacity modes such as transit, high-occupancy vehicles (HOVs), or trip suppression from people choosing not to travel due to increased costs.

The shift to higher capacity modes could be further analyzed through person-volumes on the region's major corridors indicating a shift toward bus and HOV.

Reductions in VMT and increases in person-volumes on roadways could be leading indicators of improved air quality and greater system efficiency.

Regional Transit Analysis

The BPM is an activity-based model that simulates the number and types of journeys made on an average weekday in the region by each resident. Activity-based models such as the BPM use the concept of journeys. A journey is defined as travel between principal and anchor locations such as home, work, or school but the BPM also predicts related trips linked in with the anchor travel (e.g., intermediate stops such as a day care center or a gym). This makes for a more realistic analysis that is based on the various decisions made by travelers between these locations, such as mode, purpose, destination, frequency, and location of intermediate stops, and time of day. The BPM generates over 28.8 million journeys per average weekday day from the New York City region's 8.2 million households.

The potential for effects from the CBD Tolling Alternative scenarios on the regional transit system will be analyzed using the BPM.

For transit modes, the BPM contains all the routes, stations, service frequencies and fares for transit service throughout the metropolitan region, including the following.

- MTA subway, bus, and commuter rail
- New Jersey Transit Corporation(NJ TRANSIT) commuter rail, light rail, and bus
- Port Authority Trans-Hudson (PATH) trains
- Ferries
- Other public buses such as the Bee-Line in Westchester County and Nassau Inter-County Express (NICE) in Nassau County
- Private transit bus operators

The model generates an estimate of demand by access mode (walk or drive) by two major modes—commuter rail and subway—and all other transit.

Using the BPM, the NEPA document will provide an overarching description of notable transit and travel changes. This will include information on changes in mode share and evaluate factors that inform route choices for trips into and out of the Manhattan CBD, as well as trips within and in the vicinity of the Manhattan CBD. The NEPA document will be written in non-technical language to allow the general public to understand how and why trips change in each tolling scenario.

Local Traffic Analysis

The change in regional travel demand is expected to have localized effects on traffic conditions, particularly in areas where there could be increases in traffic based on diversions or new travel patterns associated with the Project. Therefore, the focus of the traffic analysis will be to analyze the potential traffic effects of the Project by identifying those localized areas most likely to experience meaningful increases in traffic volumes.

IDENTIFICATION OF STUDY AREAS—KEY LOCAL INTERSECTIONS

Localized study areas have been established to evaluate key intersections on either side of bridge and tunnel crossings into Manhattan and other locations where there could be a potential traffic impact. The environmental review will provide a map and detailed inventory of the 102 intersections that comprise the 15 study areas where localized traffic will be evaluated, including:

- East Side around 60th Street, Manhattan
- West Side at 60th Street, Manhattan
- Robert F. Kennedy (RFK) Bridge, the Bronx side
- RFK Bridge, Manhattan side
- Long Island City, Queens including areas around the RFK Bridge and Ed Koch Queensboro Bridge
- Queens-Midtown Tunnel, Queens side
- Queens-Midtown Tunnel, Manhattan side
- Downtown Brooklyn areas around the Brooklyn Bridge and Manhattan Bridge
- Red Hook Brooklyn in the area around the Hugh L. Carey Tunnel
- Downtown Manhattan including the areas around the Hugh L. Carey Tunnel, Brooklyn Bridge, Manhattan Bridge
- West Side Highway/Route 9A (Twelfth Avenue and West 24th Street)
- Midtown Manhattan in the area around the Lincoln Tunnel and Port Authority Bus Terminal
- New Jersey in the area around the Holland Tunnel
- Lower East Side/ China Town/ Two Bridges study area
- Little Dominican Republic study area near George Washington Bridge

Local intersections at the New Jersey approaches to the George Washington Bridge are not included at the intersection level analysis because traffic on the bridge primarily comes from the regional highways instead of the local streets.

IDENTIFICATION OF STUDY AREAS—KEY HIGHWAY SEGMENTS

Based on the initial BPM screening, a traffic count program on key highway segments (e.g., highway crossings into the Manhattan CBD) in both directions will be undertaken, as needed. Current traffic count data from previous studies will be utilized to the maximum extent possible. It is anticipated that the highway segments most likely to be affected would be the approaches to tolled facilities that could experience higher traffic volumes under certain toll credit scenarios. These highway segments are anticipated to include the Gowanus Expressway, Long Island Expressway, the NJ-495 approach to the Lincoln Tunnel, and I-78 approach to the Holland Tunnel. In addition, there may be diversion to the Staten Island Expressway and the Trans-Manhattan/Cross Bronx Expressway because some motorists could take a more circumferential route between Brooklyn/Queens and New Jersey via the Verrazzano-Narrows Bridge or the George Washington Bridge to avoid paying the CBD toll. Following extended examination of the BPM results, additional analyses will be conducted on the FDR Drive, the Bayonne Bridge, the RFK Bridge and a segment of the Eastern Spur in New Jersey, totaling ten highway segments analyzed.

TRAFFIC IMPACT ASSESSMENT

The traffic assessment will be undertaken for the 2023 analysis year to reflect the first year of implementation. For this assessment, existing traffic conditions will first be reviewed and validated reflect existing (2019) conditions. No growth rate will be applied due to the COVID-19 pandemic. Balanced existing traffic flows will be developed where applicable for the weekday AM, MD, PM, and LN peak hours. Synchro networks will be prepared and calibrated to reflect existing (2019) conditions.

To assess the 2023 No Action Alternative and the 2023 CBD Tolling Alternative scenarios, this analysis will first require adjusting BPM results to assign incremental changes in traffic to specific routes and intersections. In lieu of applying a background growth rate to existing volumes to estimate No Action volumes, a No Action increment from the BPM will be added to existing volumes to develop the No Action volumes. For the No Action Alternative and CBD Tolling Alternative scenarios, the BPM results will be adjusted to account for any deviations between calibrated BPM results and hub-bound traffic counts at up to 10 locations (e.g., vicinity of crossings into the Manhattan CBD) during the four time periods of analysis. BPM adjustments include the following:

- Converting peak-period volumes to peak analysis hour volumes
- Applying capacity constraints at the tunnels and bridges crossing into the Manhattan CBD
- Applying a bounce-back adjustment to account for excessive delays due to the diversion of traffic to alternate routes.

A perceived delay adjustment will also be evaluated to reflect a higher cost for time spent in queue conditions. Attachment A summarizes the detailed methodology of applying these adjustment factors to BPM results to determine local traffic volumes.

The future assignments for the CBD Tolling Alternative scenario chosen for analysis will then be added to the existing and No Action volumes and imported into Synchro networks for capacity and delay analysis to determine whether the future CBD Tolling Alternative conditions are likely to cause negative traffic effects. Conceptual traffic mitigation measures will be developed for intersections that may be potentially adversely affected.

A screening assessment will be conducted based on the City Environmental Quality Review (CEQR) screening thresholds for those intersections with a projected net increase of 50 or more vehicles. A secondary screening criterion of an increase of 50 or more vehicles for any movement will also be applied where the net increase in intersection traffic volume is below 50 vehicles.

In addition to the local intersection analysis, the environmental review will also analyze highway corridors most likely to experience the largest increase in traffic volumes under the representative tolling scenario during the four analysis time periods (AM, MD, PM, and LN) described above for the No Action Alternative and CBD Tolling Alternative scenarios. The highway analysis will utilize calibrated Vissim models at the approaches to the Queens-Midtown Tunnel, Hugh L. Carey Tunnel, Holland Tunnel, Lincoln Tunnel, the Verrazzano-Narrows Bridge, and will include merging, diverging, and weaving lane segments as part of the analysis. The FDR Drive and Trans-Manhattan/Cross Bronx Expressway will be analyzed qualitatively due to lack of available data. The Bayonne Bridge, RFK Bridge and New Jersey Turnpike Eastern Spur will be analyzed using Highway Capacity Software (HCS).

MEASURES TO ASSESS TRAFFIC EFFECTS—HIGHWAYS.

Tolling scenarios with the largest increase in local traffic volumes will be analyzed using microsimulation software, the HCS where speeds are 40 mph or greater,[2] or a qualitative and analytic method depending on the availability of micro-simulation models, pre-COVID-19 pandemic traffic data, existing speeds, and the level of congestion. TBTA, in consultation with NYCDOT and NYSDOT, adopted a preliminary evaluation criteria for determining potential adverse traffic effects along highways as follows:

- At speeds below 20 mph, an increase in traffic volumes of up to 5 percent would not be considered significant.
- At speeds of 20 mph or above, an increase in traffic volumes of up to 10 percent would not be considered significant and thus is appropriate for determining the significance of traffic effects along highways potentially affected by the Project.

Where a detailed traffic analysis is performed using the Vissim model or HCS an additional State Environmental Quality Review Act (SEQRA) criterion will be applied to determine adverse highway effects that relies on an increase in delay of 2.5 minutes or greater. This criterion is derived from an examination of average weekday travel times to the Manhattan CBD from the outer boroughs based on for-hire vehicle (FHV) recorded travel time and distance between passenger pickups and drop-offs prior to the COVID-19 pandemic and during spring 2022 when average travel times rebounded to pre-pandemic levels.

Average travel times to the Manhattan CBD from the outer boroughs during the weekday between 6:00 a.m. and 8:00 p.m. vary from about 35 minutes from Brooklyn, 45 minutes from the Bronx, 45 minutes from Queens, and about 58 minutes from Staten Island. A 2.5-minute increase in travel time under the SEQRA threshold would represent about a 5 percent increase in total travel time, depending on the trip origin, with shorter trips experiencing a higher percentage change and longer trips experiencing a smaller percentage change in travel time. See **Appendix 4B.7, "Transportation: Average Weekday Travel Times to the Manhattan CBD**."

Because up to a 2.5-minute increase in travel time would not be noticeable to most drivers over the length of the average trip, it is an appropriate threshold for determining adverse traffic effects. This threshold was applied at all locations where a detailed traffic analysis was performed. Where a detailed traffic analysis will not be performed due to the lack of availability of a calibrated Vissim model, or where reliable pre-COVID-19 traffic data are not available, the following SEQRA criteria will be used to determine adverse effects: an increase in traffic volumes greater than 5 percent at speeds of less than 20 mph, or an increase in traffic volumes greater than 10 percent at speeds of 20 mph or higher.

Measures to Assess Traffic Effects—Intersections. Intersection level of service (LOS) is typically based on the average delay per vehicle, either for the intersection as a whole or for specific lane groups (e.g.,

2 The Highway Capacity Software (HCS) is a macroscopic traffic simulation software that implements the methodology in the Highway Capacity Manual (HCM) 6th Edition. This tool is useful when speeds are generally 40 mph or higher. It provides level of service (LOS), speed, and density as measures of performance. At LOS F, this software does not provide useful output and, therefore, cannot be used effectively under congested conditions.

westbound left-turn lane). The analysis methodology and impact threshold guidance will be based on the SEQRA standards. In accordance with the SEQRA guidelines adopted by TBTA for the determination of adverse traffic effects at signalized intersections, an increase in delay for any intersection during the peak hour of greater than 5 seconds at LOS E or F is considered an adverse traffic effect requiring mitigation.

These traffic analyses will be conducted using Synchro and all Synchro inputs and outputs will be shared with NYCDOT technical reviewers and will be included in the environmental document. All traffic intersection analyses will be evaluated for the incremental change in volume and LOS between the No Action Alternative and CBD Tolling Alternative conditions consistent with the applicable SEQRA guidance.

PARKING ANALYSES

The enabling legislation requires NYCDOT to prepare a parking study 18 months after implementation of the program.

The BPM has shown an overall reduction in vehicle trips to the Manhattan CBD as a result of the CBD Tolling Alternative in all tolling scenarios. The decrease in vehicle trips would also result in a decrease in parking demand in the Manhattan CBD. Consequently, the CBD Tolling Alternative would not create a parking shortfall in the Manhattan CBD, and a detailed assessment of the effects of the CBD Tolling Alternative on parking supply and demand in the Manhattan CBD is not necessary.

With the CBD Tolling Alternative, the number of commuters and visitors to the Manhattan CBD who would use transit for their trip would increase. Some of these commuters and visitors would drive to commuter rail and subway stations outside the Manhattan CBD to access transit to complete their trip. Consequently, the CBD Tolling Alternative would increase the number of drivers who would seek parking near commuter rail and subway stations outside the Manhattan CBD. These commuters and visitors would create demand for on- and off-street parking near the commuter rail and subway stations they use for their trip to the Manhattan CBD.

The NEPA document will assess the future effects of the Project on parking in the outer boroughs. The proposed methodology will determine baseline supply and utilization in areas up to 1/4-mile from the subway stations or transit hubs where “park & ride” auto to transit demand resulting from toll avoidance is expected to be the greatest. Based upon results from the model, the incremental parking demand will be added to the future baseline (No Action Alternative) levels to determine whether the shift in travel patterns would result in the potential for parking shortfalls within the outer borough study area.

This assessment of parking conditions outside the Manhattan CBD relies upon estimates of transit usage produced by the BPM for the Project.

The parking assessment is being conducted using the methodologies outlined in the City of New York’s 2020 *City Environmental Quality Review (CEQR Technical Manual)*, which recommends a screening procedure to determine whether quantified analyses of transportation conditions are warranted.[3] Using that screening approach, if a project would result in 50 or more peak-hour vehicle trips at an intersection, then further analyses might be warranted to assess the potential for adverse effects on parking. For locations that would experience an increase of fewer than 50 peak-hour vehicle trips due to a project, further analysis of parking is typically not warranted.

The socioeconomic section of the NEPA document will qualitatively examine broader effects of the shifts in parking demand including changes to the demand for off-street parking. It will also look at the potential for new cost differentials to emerge such as increases or decreases in parking costs based on changes to demand.

DATA COLLECTED AS PART OF THE NEPA ANALYSIS

The NEPA transportation and traffic analyses are built on an extensive baseline of data collected in June 2019, with additional data collection that occurred in fall 2019. The combination of assembled existing data obtained from NYCDOT and available public documents with the newly collected data ensures that the analyses are built on a well-supported existing conditions baseline. The data collection, calibration and balancing of intersection traffic and pedestrian volumes was done in coordination with NYCDOT and is consistent with the *CEQR Technical Manual* guidance. For broader calibration of BPM volumes and traffic count data for Manhattan CBD crossings, the collected and modeled data was correlated with the NYMTC *Hub Bound Travel Data Report 2019*. The NEPA document will summarize the data collection effort (location, dates, time periods collected) and the original data collection will be shared with NYCDOT and other agencies as part of the environmental record.

THIRD-PARTY DATA SOURCES

The transportation and traffic analysis will utilize third-party data provided by StreetLight Data, Inc. These data are being used to further define trip origin and destination to inform how to assign traffic on the local road network. The data provided by StreetLight Data, Inc. does not require further calibration with existing traffic counts. The NEPA document will include details about the source material and describe its use as part of the traffic assessment.

[3] While the MTA Reform and Traffic Mobility Act exempts the Project from the environmental review procedures of CEQR, the methodology of the *CEQR Technical Manual* was used for this analysis because it provides a widely accepted methodology for conducting a parking assessment in New York City.

Attachment A. Methodology to Develop Local Traffic Volumes

A.1. HOURLY FACILITY TRAFFIC VOLUMES

This section describes the method used to develop hourly traffic volumes for existing, 2023 No Action Alternative, and 2023 CBD Tolling Alternative conditions.

A.1.1. Existing Traffic Volumes

Existing hourly facility traffic volumes are available for all Manhattan CBD crossings based on transaction data at TBTA tolled facilities for the Hugh L. Carey Tunnel, the Queens–Midtown Tunnel, and the RFK Bridge. Port Authority of New York and New Jersey trans-Hudson transaction data are available for 2018 inbound (to Manhattan) traffic and 2017 outbound (exiting Manhattan) traffic. NYCDOT toll-free bridge counts are available in the *Hub Bound Travel Data Report 2019*. Counts were recently taken in June 2019 at the 60th Street exit from the Manhattan CBD. A 0.5 percent annual background growth rate was applied to the pre-2019 traffic data to estimate the existing 2019 traffic volumes. This growth rate is twice the growth rate suggested in the *CEQR Technical Manual* to account for some additional traffic generated by local development projects.

A.1.2. 2023 No Action Alternative Traffic Volumes

The 2023 No Action Alternative increment traffic volumes were derived by distributing the adjusted peak-period increment traffic volumes from the No Action Alternative BPM facilities to each hour of the day. The No Action Alternative BPM increment is the difference between and the 2023 No Action Alternative BPM and the calibrated existing conditions BPM. The peak-period traffic volumes were distributed to individual hours using the same temporal distribution as the existing facility counts. The No Action Alternative BPM reflects roadway network changes expected to be in place by 2023 including the Brooklyn Bridge bike lanes, Queensboro Bridge bike lanes, and Brooklyn-Queens Expressway lane reduction. No additional background growth rates were applied since the existing volumes and BPM baseline represent pre-pandemic volumes that are not yet fully recovered and are expected to remain flat within the framework of the 2023 No Action Alternative analysis year.[4]

A.1.3. 2023 CBD Tolling Alternative Increment Hourly Traffic Volumes

The 2023 CBD Tolling Alternative increment traffic volumes were derived by distributing the adjusted peak-period increment traffic volumes from the CBD Tolling Alternative BPM facilities to each hour of the day. The 2023 CBD Tolling Alternative increment is the difference between the 2023 CBD Tolling Alternative BPM and the 2023 No Action Alternative BPM. The peak-period traffic volumes were distributed to individual hours using the same temporal distribution as the existing facility counts.

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4 Traffic counts on local streets and NYCDOT bridges in the Manhattan CBD in May 2021 and May 2022 indicate that traffic volumes are at 85 percent to 90 percent of pre-COVID-19 pandemic traffic levels, although traffic volumes on TBTA and PANYNJ facilities have nearly recovered to pre-pandemic levels.

A.1.4. 2023 CBD Tolling Alternative Total Hourly Traffic Volumes

Both the 2023 No Action Alternative and CBD Tolling Alternative hourly traffic volumes were derived by adding the appropriate hourly increment to the preceding analysis (No Action Alternative is added to existing conditions, CBD Tolling Alternative is added to the No Action Alternative) hourly volumes and then subtracting or adding the hourly "bounce-back" traffic volumes. A facility that is projected to have a large incremental increase could see the increment decrease slightly due to volume (traffic) diverting to a facility with more available capacity, which would result in a smaller positive increment. A facility that is projected to have a large incremental decrease could see the increment increase slightly due to volume diverting from a facility with less available capacity, resulting in a smaller negative increment. The bounce-back methodology is further detailed in the section below.

A.2. ADJUSTMENT OF PROJECTED CHANGES IN BPM PERIOD FACILITY VOLUMES

Figure A-1 presents a flow chart describing the adjustment of projected changes in peak-period facility volumes as projected by the BPM. These steps are summarized below. This process is followed when establishing both the No Action Alternative and CBD Tolling Alternative increments, with the only differences between the following:

- The No Action Alternative calibration factor is based on the difference between the *Hub Bound Travel Data Report 2019* and the existing BPM, while the CBD Tolling Alternative calibration factor is based on the difference between the *Hub Bound Travel Data Report 2019* and the No Action Alternative BPM.
- The No Action Alternative increment is based on the initial difference between the existing and No Action Alternative BPM results, while the CBD Tolling Alternative increment is based on the initial difference between the No Action Alternative and CBD Tolling Alternative BPM results.

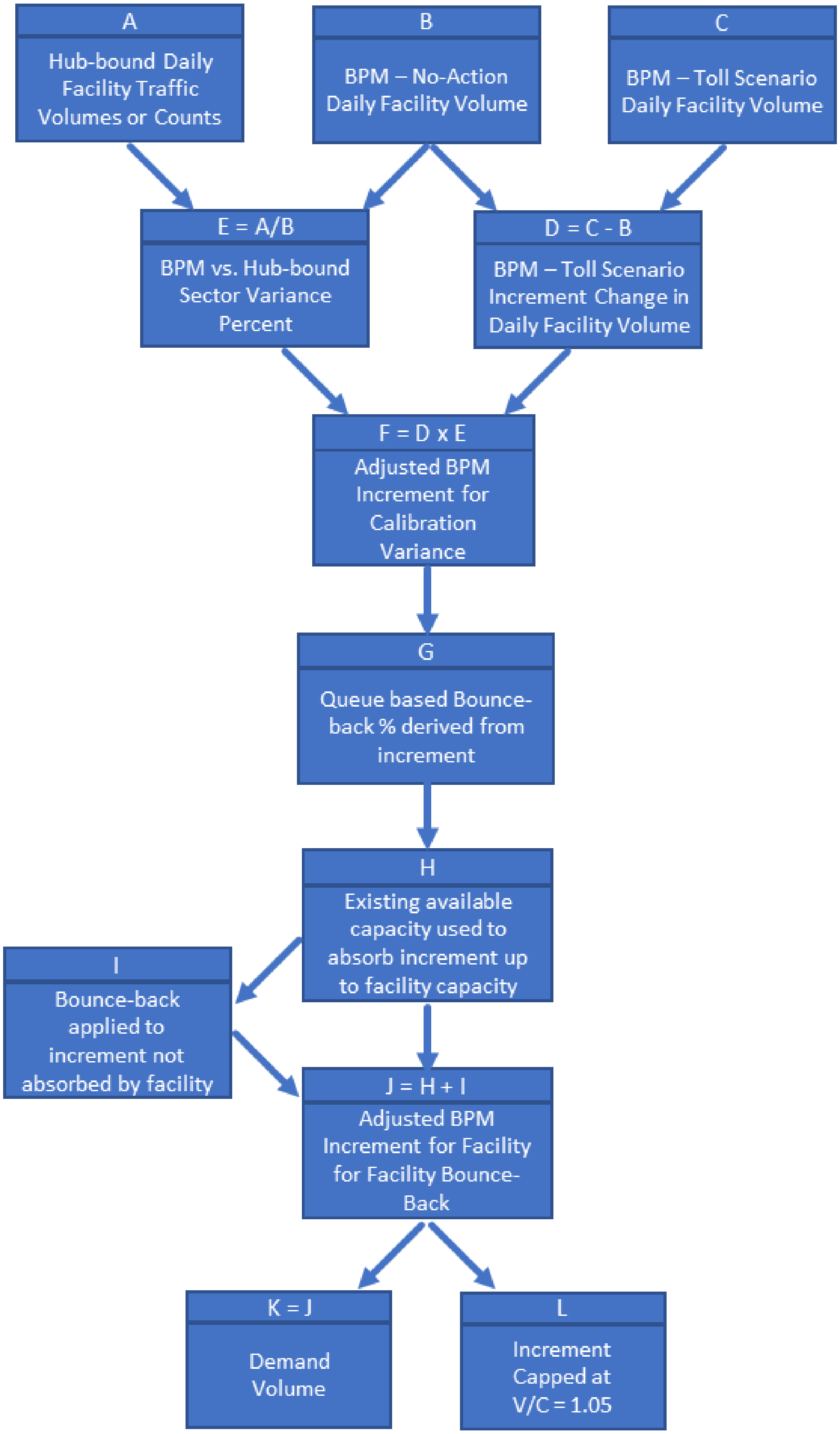
A.2.1. Adjustment for Calibration Variance at Each Facility

The period increment between the modeled BPM facility volume and the hub-bound[5] or count volume represents an under or over assignment of facility traffic. This over-under assignment of facility volumes needs to be accounted for and an adjustment needs to be made to the initial changes in facility volumes projected by the BPM. The proposed increment, whether positive or negative has an impact on the necessary adjustment. There are four possible scenarios based on these relationships of the BPM assignment and the proposed BPM increment. The table below breaks down each possible scenario.

Scenarios	A BPM Percent Difference (Over/Under Assigned)	B BPM Increment (Positive/Negative)	C Adjusted BPM Increment	Reason
Scenario 1	Over Assigned (+)	Positive (+)	**Positive (+) [Absolute Increase]**	The real facility has less traffic (**more available capacity**) than it does in the BPM, so it **could attract more** trips.
Scenario 2	Over Assigned (+)	Negative (-)	**Negative (-) [Absolute Decrease]**	The real facility **has less traffic** than it does in the BPM. There is less traffic to lose so it **could lose fewer** trips.
Scenario 3	Under Assigned (-)	Positive (+)	**Positive (+) [Absolute Decrease]**	The real facility has more traffic (**less available capacity**) than it does in the BPM, so it could **attract fewer** trips.
Scenario 4	Under Assigned (-)	Negative (-)	**Negative (-) [Absolute Increase]**	The real facility **has more traffic** than it does in the BPM. There is more traffic to lose so it could **lose more** trips.

5 Hub-bound refers to travel to the Manhattan CBD tolling area and is a term used by NYMTC. The geographic coverage of the Hub and the Manhattan CBD tolling area are the same.

Figure A-1 Adjustment of Period Best Practice Model Changes in Facility Volumes[6]



A.2.2. Adjustment for Sector Calibration Variance

The period BPM sector volumes are generally consistent with the hub-bound sector volumes; however, there is a need to adjust for some over or under assignment of traffic. Sectors are defined regions within BPM, generally broken down by New York City borough. For instance, if the BPM period sector traffic volume is over-assigned by 5 percent, then it is assumed that the diverted traffic would also be about 5 percent too high. Therefore, in Step 2, a 5 percent reduction is applied to the Step 1 adjusted increase in BPM facility volume to account for the over assignment in period BPM sector volumes. Similarly, if the assigned sector volumes are 5 percent too low, then the Step 1 adjusted BPM change in facility volumes must be increased to account for the under assignment of sector traffic volumes.

A.2.3. Bounce-back Hourly Facility Traffic Volumes

Unlike a network simulation model, the BPM as a travel demand model relies on a conventional static assignment method in TransCAD for the loading of origin-destination demand to the links of the highway network. While it does consider capacity constraints at the Manhattan CBD crossings and all links in the network, over congestion is expressed as simple link-level v/c ratios, which are used to calculate travel time delays on each link. Therefore, post assignment analysis of the hourly traffic volumes can yield more realistic estimates of traffic flow characteristics particularly on the arterial system and at intersections. For specific segments and links utilized in the traffic study the distribution of adjusted period BPM flow increments may result in traffic volumes that cannot be accommodated resulting in excessive delays which may result in a bounce-back of traffic from the alternate facility to the original facility. The premise of this portion of the methodology is to determine how a system equilibrium would look following the implementation of any of the CBD Tolling Alternative scenarios.

The No Action Alternative delay and the CBD Tolling Alternative delay are calculated based on estimated queue length. Estimated queue length is determined by converting the additional volume from the No Action Alternative to CBD Tolling Alternative scenarios into a queue length by assuming 20 feet per vehicle. The additional queue is only considered if the v/c ratio is greater than 1.0. Based on the estimated increase in queue, a delay function, using a congested speed of about 6.5 mph, calculates a projected delay for each vehicle. This delay value is then multiplied by a perceived delay factor of 1.5 which is used to reflect a higher perceived cost for time spent in queue conditions. This factor is supported via several studies that detail how a traveler perceives delay as taking longer than it may take realistically. A delay cost is calculated by multiplying the new delay factor by a $35 per hour value of time. Based on the delay cost, using the bounce-back curve shown in **Figure A-2**, the percent bounce-back is determined for the hourly increment. Any additional increment over the capacity of the facility is subject to this bounce-back percentage. The volume that is "bounced" returns to the facility it was likely to have originally used under existing conditions. **Table A-1** and **Table A-2** show the method of calculating the hourly bounce-back traffic volumes.

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[6] Variance adjustments are based on the ratio of Hub-bound volumes vs. BPM assigned volumes and were applied by four sectors as described below: New Jersey sector for the George Washington Bridge, Lincoln Tunnel, and Holland Tunnel; Brooklyn sector for Hugh L. Carey T, Brooklyn Bridge, and Manhattan Bridge; Queens sector for Williamsburg Bridge, Queens Midtown Tunnel, Queensboro Bridge, and RFK Bridge; 60th Street Sector for Route 9A, west side avenues, east side avenues, and the FDR Drive

Table A-1. Hourly Existing, No Action Alternative and CBD Tolling Alternative Facility Volumes (Hugh L. Carey Tunnel Manhattan-bound Example)

Hour Starting	Existing Inbound - May 2019					No Action Inbound - May 2023					2023 Base Action Increment				
	Cars		Trucks		Total	Cars		Trucks		Total	Cars		Trucks		Total
	TBM	E-ZPass	TBM	E-ZPass		TBM	E-ZPass	TBM	E-ZPass		TBM	E-ZPass	TBM	E-ZPass	
12:00 AM	6	108	0	15	129	6	113	0	16	135	7	120	0	17	144
1:00 AM	3	55	0	7	65	3	58	0	7	68	3	61	0	8	72
2:00 AM	2	33	0	6	41	2	35	0	6	43	2	37	0	7	46
3:00 AM	1	38	0	6	45	1	40	0	6	47	1	42	0	7	50
4:00 AM	3	116	0	18	137	3	121	0	19	143	3	129	0	20	152
5:00 AM	17	785	2	97	901	18	821	2	101	942	19	874	2	108	1,003
6:00 AM	40	1,722	4	191	1,957	46	1,960	5	217	2,228	13	575	1	64	653
7:00 AM	37	1,919	2	235	2,193	40	2,117	2	256	2,416	12	621	1	75	708
8:00 AM	37	1,735	2	201	1,975	42	1,983	2	229	2,256	12	582	1	67	662
9:00 AM	35	1,612	2	142	1,791	40	1,835	2	162	2,039	12	538	1	47	598
10:00 AM	48	1,812	4	126	1,990	56	2,115	5	147	2,322	18	684	2	48	751
11:00 AM	46	1,538	3	104	1,691	56	1,861	4	126	2,046	18	602	1	41	662
12:00 PM	43	1,431	2	93	1,569	52	1,731	2	113	1,898	17	560	1	36	614
1:00 PM	45	1,351	2	108	1,506	54	1,634	2	131	1,822	18	528	1	42	589
2:00 PM	49	1,388	2	121	1,560	59	1,679	2	146	1,887	19	543	1	47	610
3:00 PM	53	1,408	2	132	1,595	64	1,703	2	160	1,930	21	551	1	52	624
4:00 PM	40	1,137	1	152	1,330	42	1,201	1	161	1,405	43	1,217	1	163	1,424
5:00 PM	32	1,023	1	144	1,200	35	1,104	1	155	1,295	35	1,118	1	157	1,312
6:00 PM	30	1,043	1	134	1,208	32	1,126	1	145	1,304	33	1,141	1	147	1,321
7:00 PM	40	1,112	1	76	1,229	43	1,208	1	83	1,335	44	1,224	1	84	1,353
8:00 PM	30	783	0	40	853	31	819	0	42	892	33	871	0	45	949
9:00 PM	32	702	0	36	770	34	734	0	38	805	36	781	0	40	857
10:00 PM	26	626	0	31	683	27	655	0	32	714	29	697	0	35	760
11:00 PM	16	348	0	21	385	17	364	0	22	403	18	387	0	23	429
AM Peak TOTAL	**149**	**6,989**	**10**	**769**	**7,916**	**168**	**7,895**	**11**	**864**	**8,938**	**49**	**2,315**	**3**	**253**	**2,621**
PM Peak TOTAL	**142**	**4,315**	**4**	**506**	**4,967**	**153**	**4,639**	**4**	**543**	**5,339**	**155**	**4,700**	**4**	**550**	**5,409**
Off-Peak TOTAL	**420**	**12,522**	**17**	**961**	**13,920**	**484**	**14,482**	**20**	**1,112**	**16,097**	**262**	**7,467**	**8**	**574**	**8,311**
Daily TOTAL	**711**	**23,826**	**31**	**2,236**	**26,803**	**804**	**27,015**	**36**	**2,519**	**30,374**	**465**	**14,482**	**16**	**1,378**	**16,341**
Vehicle TOTAL	**24,537**		**2,266**		**26,803**	**27,819**		**2,554**		**30,374**	**14,948**		**1,394**		**16,341**
Facility TOTAL	**26,803**					**30,374**					**16,341**				

Hour Starting	Bounceback					Adjusted Increment w/Bounceback					TOTAL 2023 Action Inbound Traffic Volume				
	Cars		Trucks		Total	Cars		Trucks		Total	Cars		Trucks		Total
	TBM	E-ZPass	TBM	E-ZPass		TBM	E-ZPass	TBM	E-ZPass		TBM	E-ZPass	TBM	E-ZPass	
12:00 AM	0	0	0	0	0	7	120	0	17	144	13	233	0	32	279
1:00 AM	0	0	0	0	0	3	61	0	8	72	6	119	0	15	140
2:00 AM	0	0	0	0	0	2	37	0	7	46	4	71	0	13	89
3:00 AM	0	0	0	0	0	1	42	0	7	50	2	82	0	13	97
4:00 AM	0	0	0	0	0	3	129	0	20	152	6	250	0	39	296
5:00 AM	0	0	0	0	0	19	874	2	108	1,003	37	1,695	4	209	1,945
6:00 AM	-11	-488	-1	-54	-555	2	87	0	10	99	48	2,047	5	227	2,326
7:00 AM	-11	-596	-1	-72	-680	0	25	0	3	28	41	2,142	2	259	2,444
8:00 AM	-11	-519	-1	-60	-591	1	62	0	7	71	43	2,045	2	236	2,327
9:00 AM	-6	-291	0	-26	-324	5	247	0	22	274	45	2,081	3	183	2,313
10:00 AM	-17	-657	-1	-46	-721	1	27	0	2	30	57	2,142	5	149	2,352
11:00 AM	-11	-357	-1	-24	-393	7	245	0	17	269	63	2,105	4	142	2,315
12:00 PM	-6	-186	0	-12	-204	11	374	1	24	410	63	2,105	3	137	2,308
1:00 PM	-3	-96	0	-8	-107	14	432	1	35	482	69	2,067	3	165	2,304
2:00 PM	-6	-169	0	-15	-190	13	374	1	33	420	73	2,053	3	179	2,307
3:00 PM	-8	-216	0	-20	-244	13	335	0	31	379	77	2,038	3	191	2,309
4:00 PM	-41	-1,173	-1	-157	-1,372	2	44	0	6	51	44	1,245	1	166	1,456
5:00 PM	-34	-1,078	-1	-152	-1,265	1	40	0	6	47	36	1,144	1	161	1,342
6:00 PM	-32	-1,100	-1	-141	-1,274	1	41	0	5	47	34	1,167	1	150	1,351
7:00 PM	-42	-1,180	-1	-81	-1,304	2	44	0	3	49	45	1,252	1	86	1,384
8:00 PM	0	0	0	0	0	33	871	0	45	949	65	1,690	0	86	1,841
9:00 PM	0	0	0	0	0	36	781	0	40	857	69	1,515	0	78	1,662
10:00 PM	0	0	0	0	0	29	697	0	35	760	56	1,352	0	67	1,475
11:00 PM	0	0	0	0	0	18	387	0	23	429	35	751	0	45	831
AM Peak TOTAL	**-40**	**-1,895**	**-3**	**-212**	**-2,149**	**9**	**421**	**1**	**42**	**472**	**177**	**8,315**	**12**	**905**	**9,410**
PM Peak TOTAL	**-149**	**-4,531**	**-4**	**-530**	**-5,215**	**6**	**169**	**0**	**20**	**195**	**158**	**4,808**	**4**	**563**	**5,533**
Off-Peak TOTAL	**-51**	**-1,681**	**-3**	**-125**	**-1,859**	**211**	**5,786**	**5**	**449**	**6,451**	**694**	**20,268**	**25**	**1,561**	**22,549**
Daily TOTAL	**-240**	**-8,106**	**-10**	**-867**	**-9,223**	**225**	**6,376**	**6**	**511**	**7,118**	**1,030**	**33,391**	**41**	**3,030**	**37,492**
Vehicle TOTAL	**-8,346**		**-877**		**-9,223**	**6,601**		**517**		**7,118**	**34,421**		**3,071**		**37,492**
Facility TOTAL	**-9,223**					**7,118**					**37,492**				

Table A-2. Percentage Bounce-Back by Hour—(Hugh L. Carey Tunnel Manhattan-bound Example)

Capacity Per GP Lane	Approach Lanes	Congested Speed	Uncongested Speed	VOT/Min	Excessive Delay Multiplier
1,150	2	8.82 9.4	51.45	$ 0.58	1.50

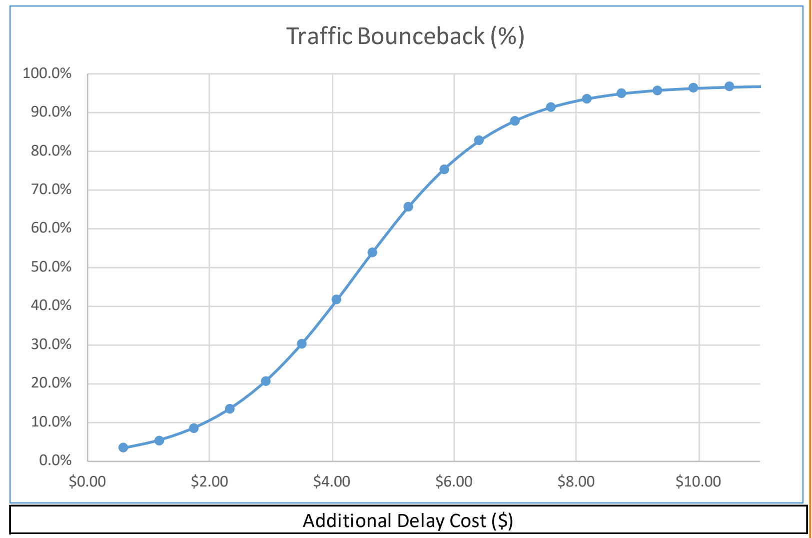
Hour Starting	Number of GP Lanes	Capacity Per GP Lane	HOV Volume Removed	Total Vehicular Capacity in GP	Existing Volume (PCE)	No Action Volume (PCE)	Action Volume (PCE)	Delta Volume	No Action V/C	Action V/C w/o Bounce-Back	No Action Queue	Action Queue w/o Bounce-Back	Net Queue w/o Bounce-Back (ft)	Estimated Delay (min)	Perceived Delay	Delay Cost	Bounce-Back (percent)*	Capped Bounce Back (percent)*
12:00 AM	2	1,150		2,300	144	151	311	160	0.065	0.135	0	0	0	0	0.0	$ -	2.54%	0.0%
1:00 AM	2	1,150		2,300	72	75	155	80	0.033	0.068	0	0	0	0	0.0	$ -	2.54%	0.0%
2:00 AM	2	1,150		2,300	47	49	102	52	0.021	0.044	0	0	0	0	0.0	$ -	2.54%	0.0%
3:00 AM	2	1,150		2,300	51	53	110	57	0.023	0.048	0	0	0	0	0.0	$ -	2.54%	0.0%
4:00 AM	2	1,150		2,300	155	162	334	172	0.070	0.145	0	0	0	0	0.0	$ -	2.54%	0.0%
5:00 AM	2	1,150		2,300	1,000	1046	2159	1113	0.455	0.938	0	0	0	0	0.0	$ -	2.54%	0.0%
6:00 AM	2	1,150	751	2,300	2,151	2450	3168	718	1.065	1.377	2981	10164	7183	11	16.9	$ 9.84	95.51%	95.5%
7:00 AM	2	1,150	913	2,300	2,430	2674	3458	784	1.163	1.503	2436	10277	7841	12	18.4	$ 10.74	95.98%	96.0%
8:00 AM	2	1,150	985	2,300	2,178	2487	3217	729	1.081	1.399	3095	10389	7294	11	17.1	$ 9.99	95.62%	95.6%
9:00 AM	2	1,150	859	2,300	1,935	2202	2848	646	0.958	1.238	0	9134	9134	14	21.5	$ 12.51	96.30%	96.3%
10:00 AM	2	1,150		2,300	2,120	2474	3274	800	1.076	1.423	3540	11538	7998	13	18.8	$ 10.96	96.05%	96.0%
11:00 AM	2	1,150		2,300	1,798	2175	2879	703	0.946	1.252	0	10806	10806	17	25.4	$ 14.80	96.38%	96.4%
12:00 PM	2	1,150		2,300	1,664	2013	2664	651	0.875	1.158	0	9999	9999	16	23.5	$ 13.70	96.36%	96.4%
1:00 PM	2	1,150		2,300	1,616	1955	2587	632	0.850	1.125	0	9712	9712	15	22.8	$ 13.31	96.35%	96.3%
2:00 PM	2	1,150		2,300	1,683	2036	2694	658	0.885	1.171	0	10114	10114	16	23.8	$ 13.86	96.37%	96.4%
3:00 PM	2	1,150		2,300	1,729	2092	2768	676	0.909	1.203	0	10389	10389	16	24.4	$ 14.23	96.38%	96.4%
4:00 PM	1	1,150		1,150	1,483	1566	3154	1587	1.362	2.742	835	16708	15873	25	37.3	$ 21.75	96.40%	96.4%
5:00 PM	1	1,150		1,150	1,345	1451	2921	1470	1.262	2.540	1061	15764	14703	23	34.5	$ 20.14	96.40%	96.4%
6:00 PM	1	1,150		1,150	1,343	1449	2918	1469	1.260	2.537	1065	15751	14686	23	34.5	$ 20.12	96.40%	96.4%
7:00 PM	1	1,150		1,150	1,306	1419	2857	1438	1.234	2.484	1130	15508	14378	23	33.8	$ 19.70	96.40%	96.4%
8:00 PM	2	1,150		2,300	893	934	1928	994	0.406	0.838	0	0	0	0	0.0	$ -	2.54%	0.0%
9:00 PM	2	1,150		2,300	806	843	1740	897	0.366	0.756	0	0	0	0	0.0	$ -	2.54%	0.0%
10:00 PM	2	1,150		2,300	714	747	1541	795	0.325	0.670	0	0	0	0	0.0	$ -	2.54%	0.0%
11:00 PM	2	1,150		2,300	406	425	877	452	0.185	0.381	0	0	0	0	0.0	$ -	2.54%	0.0%
Facility TOTAL				PCE	29,069	32,928	50,663							*Bounce-back is only applied after a facility is over capacity				

Figure A-2 Bounce-Back Curve (Percentage Bounce-Back versus Anticipated Cost of Delay)

		Xo	Midpoint	4.412203965
VOT/Hour	$35.00	L	Max Value	0.971291382
VOT/Min	$0.58	K	Growth Rate	0.875596649
		e	Exponential value	2.718281828

Perceived Delay Factor: 1

Delay (min)	Perceived Delay (min)	Delay Cost	Target Bounceback	Bounceback Curve	Variance
1	1.00	$0.58	3.0%	3.3%	0.28%
2	2.00	$1.17	5.0%	5.4%	0.35%
3	3.00	$1.75	8.0%	8.6%	0.60%
4	4.00	$2.33	10.0%	13.5%	3.54%
5	5.00	$2.92	20.0%	20.6%	0.65%
6	6.00	$3.50	30.0%	30.1%	0.14%
7	7.00	$4.08	40.0%	41.6%	1.62%
8	8.00	$4.67	50.0%	54.0%	3.95%
9	9.00	$5.25	70.0%	65.6%	-4.38%
10	10.00	$5.83	75.0%	75.4%	0.40%
11	11.00	$6.42	85.0%	82.8%	-2.19%
12	12.00	$7.00	88.0%	88.0%	0.00%
13	13.00	$7.58	90.0%	91.4%	1.44%
14	14.00	$8.17	94.0%	93.6%	-0.37%
15	15.00	$8.75	95.0%	95.0%	0.00%
16	16.00	$9.33	96.0%	95.8%	-0.16%
17	17.00	$9.92	97.0%	96.4%	-0.65%
18	18.00	$10.50	97.0%	96.7%	-0.34%
19	19.00	$11.08	97.0%	96.8%	-0.15%
20	20.00	$11.67	98.0%	97.0%	-1.04%
21	21.00	$12.25	98.0%	97.0%	-0.97%
22	22.00	$12.83	98.0%	97.1%	-0.93%
23	23.00	$13.42	98.0%	97.1%	-0.91%
24	24.00	$14.00	98.0%	97.1%	-0.89%



A.2.4. Capping Processed Traffic Volumes

The final step of the adjustment process deals with capping the processed increment based upon the capacity of the facility. The final incremental demand is split into two categories: demand volume and processed (capped) volume. The demand volume is the total number of vehicles that are committed to using a facility. Based on the magnitude of this volume, it is possible that the entire demand cannot be processed by the facility. As a result, a lower processed volume will emerge downstream of the facility. The processing ability of a facility is set to 105 percent of the facility capacity, a standard value used in traffic analysis. This demand volume is used in analysis of locations upstream of, or before entering, a facility. The processed volume is used in analysis of locations downstream of, or after exiting, a facility. **Table A-3** details the entire adjustment process that the period increment undergoes, prior to any capping.

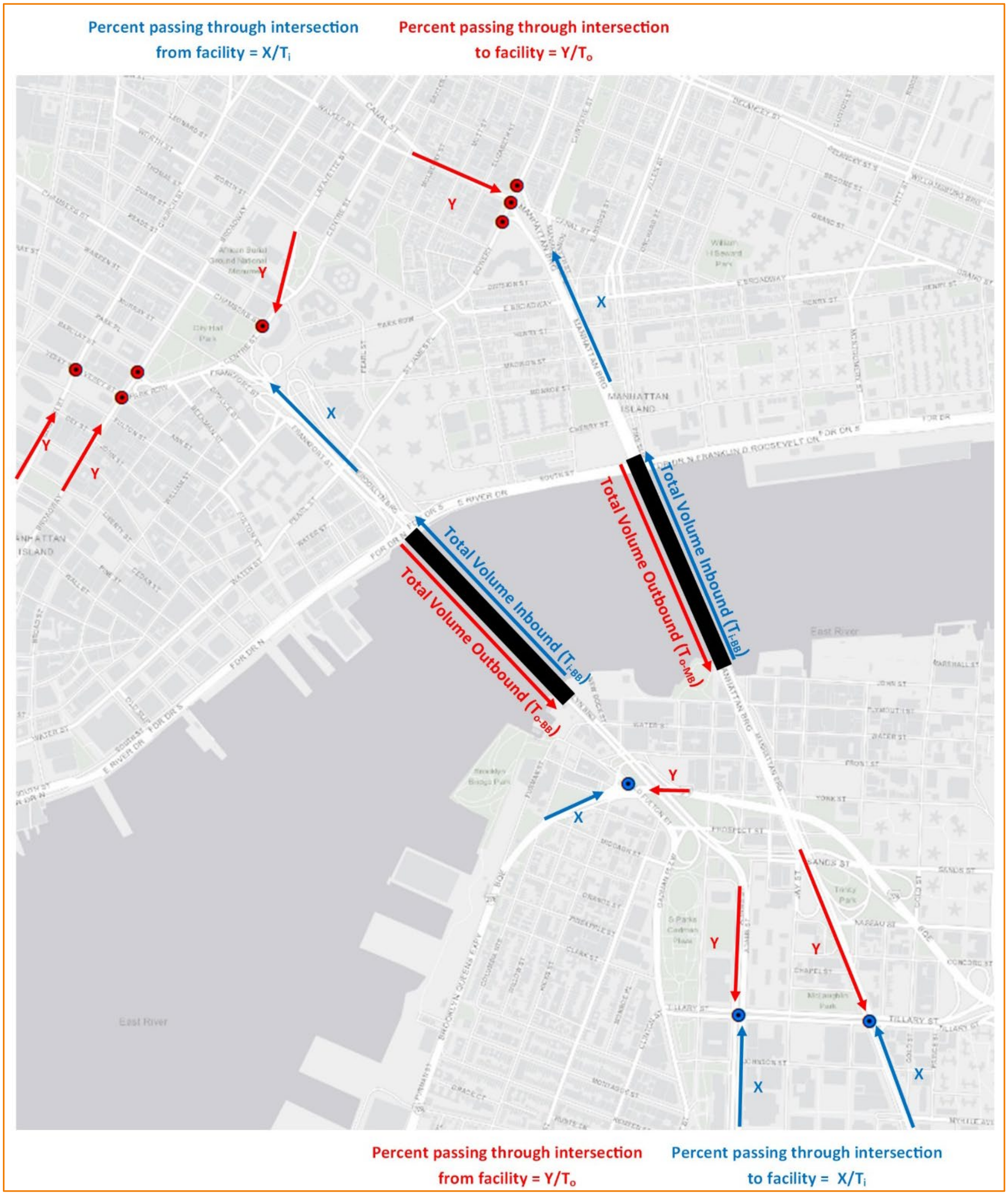
Table A-3 Inbound Adjustment of Projected Best Practice Model AM Period Changes in Facility Volumes

FACILITY	Δ	A	B	C=B*(1-A) or C=B*(1+A)	D	E	F = C x D x E	G	H		I = F + G + H
	BPM Nobuild - Existing Counts	Percent Difference	BPM Scenario Increment	Adjusted BPM Increment	Sector Adjustment	Value of Time Adjustment	Adjusted 6AM - 10AM	Bounceback Loss	Bounceback Gain	Bounce-Back To	**Total Facility Increment**
Queensboro Bridge (Lower)	4,584	75%	(3,922)	(985)	0.826	1.000	(814)	0	1,115	50% QMT and 50% RFK	**301**
Queensboro Bridge (Upper NR)	1,082	16%	(2,562)	(2,140)	0.826	1.000	(1,767)	0	0	100% RFKM	**(1,767)**
Queensboro Bridge (Upper SR)	797	(2%)	(2,058)	(2,101)	0.826	1.000	(1,735)	0	710	100% RFKM	**(1,025)**
Queens-Midtown Tunnel	337	3%	4,146	4,253	0.826	1.000	3,512	(2,787)	0	QBB LL, 15% WBB, 10% BB, 10% MB, 25% Q	**725**
Hugh L. Carey Tunnel	1,484	13%	2,598	2,944	0.890	1.000	2,621	(2,149)	0	20% WBB, 60% MB, and 20% BB	**472**
Holland Tunnel	606	6%	(356)	(336)	0.960	1.000	(323)	0	0	50% VNB and 50% GWB	**(322)**
Lincoln Tunnel	521	3%	(383)	(371)	0.960	1.000	(356)	0	0	100% LT	**(356)**
RFK Bridge - Manhattan	(2,184)	(19%)	961	777	0.642	1.000	499	(21)	0	60% QBB UL, 40% RFKM	**477**
Williamsburg Bridge	280	3%	(1,597)	(1,552)	0.890	1.000	(1,382)	0	848	35% QMT, 50% BB and 15% MB	**(534)**
Manhattan Bridge	6,311	59%	(10,331)	(4,281)	0.890	1.000	(3,812)	0	1,568	20% HCT, 40% WBB and 40% BB	**(2,244)**
Brooklyn Bridge	(2,320)	(16%)	(1,294)	(1,496)	0.890	1.000	(1,332)	0	709	20% HCT, 40% MB and 40% WB	**(624)**
George Washington Bridge	7,865	21%	(665)	(526)	0.960	1.000	(505)	0	0	50% HT and 50% LT	**(505)**
Henry Hudson Bridge	5,184	118%	(448)	81	0.458	1.000	37	0	0	100% RFKM	**37**
Verrazzano-Narrows Bridge	20,993	135%	(224)	80	0.425	1.000	34	(0)	0	50% HT and 50% LT	**33**
60th St Crossings	5,579	9%	(13,532)	(12,358)	0.920	1.000	(11,371)	0	9	-	**(11,363)**

A.3. INTERSECTION ASSIGNMENT

After the BPM results are normalized at each crossing facility, the hourly increment between the No Action Alternative and CBD Tolling Alternative facility volumes were distributed to the study locations for each analysis hour based on StreetLight Data, Inc. GPS travel data. The distribution was performed separately for inbound traffic (entering Manhattan), outbound traffic (exiting Manhattan), non-Manhattan locations, and Manhattan locations. These distributions were then combined to calculate the total traffic increment at each study location. The process is described below and illustrated in **Figure A-3**.

Figure A-3 Traffic Assignment to Specific Intersections



A.3.1. Inbound Assignment

NON-MANHATTAN

The percentage of facility trips that pass through each non-Manhattan intersection destined to a facility crossing during each peak period is calculated from data provided by StreetLight Data, Inc.. This percentage is applied to the facility Action increment to calculate the inbound increment by facility for each intersection. After the facility increments are calculated they were added together to derive the total inbound increment for each non-Manhattan intersection location.

MANHATTAN CBD

The percentage of facility trips that pass through each Manhattan intersection originating at a facility crossing during each peak period was calculated from data provided by StreetLight Data, Inc.. This percentage was applied to the facility Action increment to calculate the inbound increment by facility for each location. After the facility increments were calculated they were added together to derive the total inbound increment for each Manhattan intersection location.

A.3.2. Outbound Assignment

MANHATTAN CBD

The percentage of facility trips that pass through each Manhattan intersection destined to a facility crossing during each peak period was calculated from data provided by StreetLight Data, Inc.. This percentage was applied to the facility Action increment to calculate the outbound increment by facility for each intersection. After the facility increments were calculated they were added together to derive the total outbound increment for each Manhattan location.

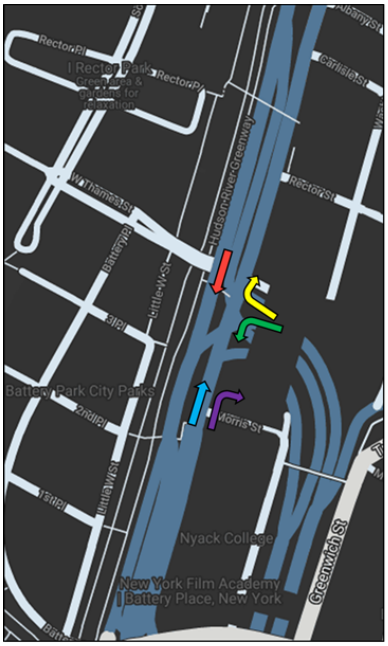
NON-MANHATTAN

The percentage of facility trips that pass through each non-Manhattan intersection originating at a facility crossing during each peak period was calculated from data provided by StreetLight Data, Inc.. This percentage was applied to the facility Action increment to calculate the outbound increment by facility for each location. After the facility increments were calculated they were added together to derive the total outbound increment for each non-Manhattan intersection location.

A.3.3. Northern Manhattan (Non-Manhattan CBD) Assignment

The normalized volume entering the Manhattan CBD at 60th Street was assigned as southbound traffic at Manhattan intersection locations in the Upper East and Upper West study areas while the normalized volume exiting the Manhattan CBD at 60th Street were assigned as northbound traffic at Manhattan intersection locations in the Upper East and Upper West study areas.

Figure A-4 Example of Traffic Assignment Methodology



Facility Source	Outbound (Away from CBD) % of Increment	Outbound Total Increment	Outbound Assigned Increment	Assigned to? NBT	NBR	SBT	WBL	WBR	Inbound (Towards CBD) % of Increment	Inbound Total Increment	Inbound Assigned Increment	Assigned to? NBT	NBR	SBT	WBL	WBR
George Washington Bridge	0.1%	342	1						1.9%	-115	(2)			■		
Holland Tunnel	7.5%	-294	(22)	■					12.1%	-85	(10)			■		
Lincoln Tunnel	0.8%	-171	(1)						3.3%	-120	(4)			■		
Verrazzano-Narrows Bridge	54.3%	5	2						-	-	0					
Brooklyn Bridge	8.8%	196	17			■	■		1.5%	-356	(5)	■	■			
Hugh L. Carey Tunnel	97.6%	187	182		■				87.4%	324	283				■	■
Manhattan Bridge	0.9%	-201	(2)						0.4%	-897	(3)			■		
Queensboro (59th Street) Bridge - Upper Level	0.0%	0	0						1.1%	4	0	■	■			
Queensboro (59th Street) Bridge - Lower Level	0.1%	-499	(0)						1.1%	50	1	■	■			
Queens Midtown Tunnel	0.5%	3	0						2.8%	106	3	■	■			
Robert F. Kennedy (Triborough) Bridge	0.5%	474	2						2.0%	0	0	■	■			
Williamsburg Bridge	1.0%	-172	(2)						0.7%	12	0			■		
11th Ave	7.9%	-70	(6)	■					7.9%	-120	(9)			■		
10th Ave	2.6%	-200	(5)	■					-	-	0			■		
9th Ave	-	-	0						5.1%	-208	(11)			■		
Broadway	1.1%	0	0	■					1.1%	-157	(2)			■		
Queensboro Bridge Exit	3.1%	-161	(5)			■	■		-	-	0			■		
3rd Ave	0.4%	-252	(1)						-	-	0			■		
York Ave	5.9%	0	0			■	■		5.9%	-98	(6)			■		
2nd Ave	-	-	0						0.5%	-218	(1)			■		
1st Ave	3.3%	-283	(9)			■	■		-	-	0			■		
Lexington Ave	-	-	0						0.7%	-208	(1)			■		
Park Ave	0.4%	-161	(1)						0.4%	0	0			■		
Madison Ave	0.9%	-159	(1)						-	-	0			■		
5th Ave	-	-	0						0.5%	-174	(1)			■		
West Side Highway	0.1%	-503	(1)						1.9%	-836	(16)			■		
FDR Drive	0.5%	-770	(4)						2.0%	-972	(19)	■	■			
Sum (If Assigned)			152								195					