

A. INTRODUCTION

This section of the Technical Memorandum presents the findings of detailed station circulation analyses conducted for the proposed Project. Much of the information presented below relies upon new technical analyses completed since the 2006 FEIS. The 2006 FEIS document utilized the findings of prior environmental assessments for previous versions of the Project to reaffirm the findings that new station elements would operate satisfactorily and there were no identified significant adverse impacts on internal station circulation.

With the continued evolution of station planning since 2006 up to the current proposed plan, ESDC/MSDC determined that an update of the circulation analysis is warranted. The update reflects changes to the background condition since 2006, as noted in Section 2, “Analytical Framework” of this Technical Memorandum, and specific design changes resulting from project planning. However, since the analysis is new compared with the 2006 FEIS, this section varies from the format of the other environmental analyses presented in this Technical Memorandum and presents the methodology of the detailed analysis.

B. OVERVIEW

Rail passenger and pedestrian circulation conditions within the Penn Station complex, resulting from construction of the Project, were analyzed and compared with the results of prior analyses of pedestrian circulation conditions contained in the 2006 FEIS and the 1999 EA for the Project as contemplated at those times. The 1999 and 2006 documents determined that the respective designs of Moynihan Station studied in those analyses would not result in any significant adverse impacts to station pedestrian circulation conditions.

Both the 1999 EA and 2006 FEIS determined that the then-proposed Project would not generate significant adverse impacts to passenger circulation within the Penn Station complex. The Project, in both cases, was shown to deliver significant circulation benefits to rail passengers.

There are some differences in the plans for the Farley Complex under the current Project as compared to those on which the 2006 FEIS and 1999 EA were based. The program examined in the 1999 EA was based on Amtrak relocating to the Farley Building—similar to the Amtrak Station Option assessed in this Technical Memorandum. However, the physical configuration of public spaces at Level A and Level B of the proposed Moynihan Station was significantly different in 1999 from the current plans.

The 2006 FEIS analyses assumed that Amtrak would remain at its existing location in Penn Station and that the new passenger facilities at the Farley Complex would be used predominantly by commuters—similar to the Open Station Option assessed in this Technical Memorandum—though the configuration of the Moynihan Station Train Hall, West End Concourse, and interior vertical circulation elements were similar to the 1999 plans. The 2006 FEIS further concluded that the 1999 and 2006 plans were sufficiently similar that the findings of the 1999 EA—in

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terms of the magnitude of transportation benefits for rail passengers and the lack of significant adverse impacts—would apply to the 2006 plan without the need for an independent analysis of interior station pedestrian circulation.

Given the passage of time, the differences in both existing and projected future railroad ridership from conditions examined in the 1999 EA, and the differences in the 2010 Moynihan Station physical plan as compared with previous versions of the plan, ESDC/MSDC determined that this assessment of the current Project should include an updated interior station pedestrian circulation analysis. However, the Project is not expected to significantly alter the patterns of pedestrian flows within the existing Penn Station between Eighth and Seventh Avenues. The number of rail passengers that are projected to be diverted to new Moynihan Station facilities in the Farley Complex is greater than the incremental volume of pedestrian trips that would be generated by development associated with the Project. Therefore, detailed analysis was limited to the portions of the Penn Station complex where new construction is planned—west of Eighth Avenue and in the vicinity of the Eighth Avenue Subway station. The previous data models of station-wide pedestrian circulation were updated to enable comparison of peak conditions at key points in the Penn Station complex for the current plan and projected rail traffic levels, as compared with the results of the previous analyses.

The Project features the reconstruction of the former mail-sorting room of the General Post Office at the Farley Building as a Train Hall for the use of rail passengers. Two options have been developed for the rail occupancy and use of the Moynihan Station Train Hall: the Amtrak Station Option and the Open Station Option. In both cases, the Train Hall would be used by both Amtrak and commuter passengers, though the most prominent use and the nature of associated facilities surrounding the train hall is different in the two options.

AMTRAK STATION OPTION

All Amtrak boarding passengers would be served at the Train Hall, which would include ticketing, seated waiting areas, customer service facilities, comprehensive train information and escalators and elevators that lead directly to the train platforms. Amtrak passengers would board trains using the Train Hall escalators and elevators. The Train Hall would be a public open space; however, its western portion would be used primarily by Amtrak passengers for waiting and queuing, while the eastern portion would be available for commuters to wait for their trains and the posting of train departure information.

A large public space would be located immediately to the west of the Train Hall, containing a secure seated waiting room for Amtrak passengers, the Amtrak ticket office, ticket vending machines, customer service office and baggage check/claim facilities. A two-level corridor flanked by retail stores would lead westward towards Ninth Avenue through the Western Annex along the alignment of West 32nd Street. Amtrak support facilities and back-of-house functions would occupy the remainder of the space within the Western Annex basement, at the Train Hall level.

OPEN STATION OPTION

The configuration of the Train Hall would be the same in this option, though there would be no special facilities provided for Amtrak passengers at Moynihan Station. On the Train Hall level, the public space and retail corridor to the west of the Train Hall would not be provided in this option, although a corridor would be located on the street level above as in the Amtrak Station Option. The Western Annex basement would be configured for the ongoing use of the U.S.

Postal Service, with truck loading and back-of-house functions located at this level to the west of the Train Hall.

The Train Hall would be usable by the passengers of any railroad operating at Penn Station. Train information boards would display comprehensive, up-to-date train information. Commuter and Amtrak tickets would be available from ticket vending machines.

COMMON ELEMENTS

Most elements of the Project would be the same under both options. The Project includes refurbishment of the Diagonal Platform (Platform 12), previously used for mail handling, as a platform to serve Amtrak’s Empire Line to upstate New York and, potentially, future Metro-North Hudson Line service, with direct escalator and elevator connections from the Train Hall. The Project includes the construction of an emergency egress concourse at the far west end of the station; under the Amtrak Station Option, this concourse would be larger to also facilitate baggage handling for Amtrak. The Project also would widen and extend the lower level West End Concourse, so that it runs the entire breadth of the station in the north-south direction and provides stairway access and direct subway connections for commuters using Platforms 3 through 11 (serving Tracks 5 through 21), and for Empire Line passengers using Platform 12. The West End Concourse extension would allow for future construction of pedestrian connections to Platforms 1 and 2 (serving Tracks 1 though 4) that are not contemplated as part of the Project. The 33rd Street mezzanine of the Eighth Avenue Subway 34th Street station would be reconstructed to improve pedestrian flows to and from the subway and to enhance the 33rd Street Connector passageway linking the Train Hall and West End Concourse with the other existing Penn Station concourses located between Eighth and Seventh Avenues.

The Project would provide a major increase in the number of stairs, escalators, and elevators serving the Penn Station platforms and a corresponding increase in the circulation capacity available to move passengers onto and off of the platforms. The Project would bring into balance the vertical circulation capacity at each of the station platforms, specifically addressing existing deficiencies on the western ends of Platforms 3 through 6 (serving Tracks 5 through 12). **Table 13-1** summarizes the extent of these platform access improvements, comparing existing conditions with the proposed facility following completion of the Project.

**Table 13-1
Vertical Circulation and Egress Capacity
Improvements**

	Existing	With the Project
Platform Vertical Circulation – Overall		
Platform Stairs and Escalators to West End Concourse	8	17
Platform Escalators to Farley Train Hall	0	14
Platform Stairs and Escalators, Rest of Station	74	74
Platform Escalators, total	30	44
Platform Stairs, total	52	61
Platform Stairs and Escalators, total	82	105
Emergency Egress Stairs (not included in above)	0	6
Passenger Elevators	17	24
Service Elevators	6	13
Average Egress Capacity per platform, entire station (peds/min)	670	853
Platform Vertical Circulation – Platforms 3-6*		
Platform Stairs and Escalators, Platforms 3-6**	22	38
Average Egress Capacity per platform, Platforms 3-6** (peds/min)	452	832

Table 13-1 (cont'd)
Vertical Circulation and Egress Capacity
Improvements

	Existing	With the Project
Level A-to-Level B Circulation		
No. of escalators	5	9
No. of stairways (6 ft. width equivalent)	11	17
Passenger Elevators	2	4
Vertical circulation capacity (peds/min)	1,530	2,470
Egress Capacity to Street Level		
Number of station street level entrances	7	12
Egress capacity (peds/min)	2,200	3,100
Note: *These are the platforms with the greatest existing deficiencies in platform access. **Platforms 3-6 serve Tracks 5 – 12.		

C. METHODOLOGY AND RAILROAD RIDERSHIP

For this Technical Memorandum, the analysis of pedestrian circulation conditions within the Penn Station complex followed the general methodology and approach used to prepare the 1999 EA.

LEVEL OF SERVICE FOR STATION PEDESTRIAN CIRCULATION

The primary performance measure that was used to determine the adequacy of pedestrian circulation facilities within the station was peak Level of Service (LOS), as defined by Fruin¹, which describes the peak degree of congestion at key locations within the train station. The general characteristics of the six levels of service defined by Fruin for stairways, corridors, and passageways are described below. The difference between each of the six levels is the freedom to choose walking speed, the ability to bypass slower moving pedestrians, and ease of counterflow movements at pedestrian traffic concentrations. Brief descriptions of each LOS are provided below, and the quantitative LOS thresholds are presented in **Table 13-2**:

- At LOS A and B, there is sufficient area to allow pedestrians to freely select walking speed and bypass slower moving pedestrians. When cross flow and reverse flow movement exists, minor conflicts may occur. There are no severe peak concentrations. Volume-to-capacity (V/C) ratios for LOS A range from 0.00 to 0.45, while for LOS B they range from 0.45 to 0.70.
- At LOS C, pedestrian movement is fluid although somewhat restricted. It provides sufficient room for standing without personal contact. Circulation through queuing areas, however, would require adjustment to walking speed. V/C ratios range from 0.70 to 1.00.
- At LOS D, walking speed is restricted and reduced. Reverse flow and cross flow movement is severely restricted due to congestion and difficulty in bypassing slower moving pedestrians. These conditions are common in many Manhattan locations during peak periods and represent somewhat congested conditions with V/C ratios ranging from 1.00 to 1.33.
- LOS E and F represent severe congestion with LOS E V/C ratios ranging from 1.33 to 1.67. Walking speed is restricted and there is insufficient area to bypass others and contraflow movement is difficult. LOS F is “bumper to bumper” pedestrian flow, with forward progress achievable only through shuffling, and with pedestrian queues forming.

¹ John J. Fruin, *Pedestrian Planning and Design*, Revised Edition, Elevator World, Inc., 1987

Section 13: Station Circulation

The flow conditions used to measure level of service differ slightly between the environmental analyses to estimate the extent of any significant adverse impact, and the design analyses that are intended to achieve a desired level of service under estimated future peak conditions. These criteria are summarized in **Table 13-3**. For purposes of this Technical Memorandum, the average condition over the peak 15 minute period within the 8:00 to 9:00 am and 5:00 to 6:00 pm weekday peak hours was used to estimate level of service.

Table 13-4 summarizes the LOS thresholds that will be used to determine the significance of any adverse impacts.

**Table 13-2
Pedestrian Level of Service Standards**

	Flow Rates/ Occupancies	Volume/ Capacity Ratio
Corridors and Ramps		
LOS A (Unrestricted)	≤7 p/m/ft	≤0.47
LOS B (Slightly restricted)	7-10 p/m/ft	0.47 – 0.67
LOS C (Restricted, but fluid)	10-15 p/m/ft	0.67 – 1.00
LOS D (Restricted, necessary to continually alter walking speed)	15-20 p/m/ft	1.00 – 1.33
LOS E (Severely restricted)	20-25 p/m/ft	1.33 – 1.67
LOS F (Forward progress only by shuffling, no reverse movement possible)	≥25 p/m/ft	≥1.67
Stairways		
LOS A (Unrestricted)	≤5 p/m/ft	≤0.50
LOS B (Slightly restricted, no impact on speed)	5-7 p/m/ft	0.50 – 0.70
LOS C (Speeds reduced, difficult to pass)	7-10 p/m/ft	0.70 – 1.00
LOS D (Restricted, reverse flow conflicts)	10-13 p/m/ft	1.00 – 1.30
LOS E (Severely restricted)	13-17 p/m/ft	1.30 – 1.70
LOS F (Many stoppages, no discernable flow)	≥17 p/m/ft	≥1.70
Queuing		
LOS A (Free circulation)	≤8 p/100sf	≤0.57
LOS B (Restricted circulation without affecting queues)	8 - 10 p/100sf	0.57 – 0.70
LOS C (Restricted circulation affecting people in queue)	10 - 14 p/100sf	0.70 – 1.00
LOS D (Severely restricted circulation, no personal contact)	14 - 33 p/100sf	1.00 – 2.36
LOS E (No circulation, personal contact unavoidable)	33 - 50 p/100sf	2.36 – 3.57
LOS F (Close physical contact, unsustainable)	≥50 p/100sf	≥3.57
Note: For purposes of calculating the volume-to-capacity ratio, capacity (V/C=1.0) is defined to be the threshold between Levels of Service C and D; the ratio is calculated by dividing the flow rate or occupancy level by the corresponding Level of Service C/D threshold value.		
Source: John J. Fruin, <i>Pedestrian Planning and Design, Revised Edition</i> , Elevator World, Inc., 1987		

**Table 13-3
Pedestrian Loading Assumptions**

Level of Traffic, AM and PM peak hour – Rail passengers	Existing (2008) and projected 2015 passenger volumes
Level of Traffic, AM and PM peak hour – Other pedestrians within Station	Existing (2008) and projected 2015 traffic, based on site-specific development projections and general background growth assumptions
Peak loading condition	Average over peak 15 minutes, AM and PM weekday peaks
Train operating conditions	Normal operations with trains on or close to schedule*
Note: * With normal operating conditions as defined by the railroads, based on historical Penn Station operating data.	

Table 13-4
Level of Service Standards for Environmental Impact Assessment

	Absolute Condition for No Significant Impact	Build Condition Relative to No Build Condition, if No Build Condition Generates Significant Impact
Corridors, ramps and stairs within station concourse areas, station entrances/exits at street level	LOS C/D ≤ 15.5 p/m/ft.* corridor/ramp ≤ 10.5 p/m/ft.* stair/doorway	No significant impact if LOS remains within same LOS grade (e.g., both No Build and Build are at LOS D)
Train Halls and areas of passenger accumulation Portion used for queuing: (e.g., waiting and boarding zones) Portion used for circulation:	LOS C/D ≥ 6.5 sf/p** for queuing <i>Same as corridor standard</i>	No significant impact if LOS remains within same LOS grade (e.g., both No Build and Build are at LOS D)
Escalators within station concourse areas	Operate during peak 15 minutes without queues (i.e., LOS E or better) ≤ 75 p/m commuter, 70 p/m Amtrak*** <i>2-lane escalator at 90 ft/min.</i>	No significant impact if LOS for Build condition is better than LOS F
Notes:		
* Based on effective width, which is assumed to be equal to actual width, minus the width of any interior obstructions, minus an allowance for edge conditions, which vary depending upon the type and configuration of facility. On corridors/ramps, an edge deduction of one to two feet of effective width typically is taken into account for the propensity of pedestrians to avoid walking adjacent to corridor walls; on stairways, the edge deduction depends upon the number and location of handrails and typically is on the order of one foot.		
** Based on effective area, net of interior obstructions.		
*** Maximum escalator processing rates for the sizes and speeds of escalators at Penn Station as verified by field survey during weekday peak periods.		

When computing the width of a corridor or stairway for purposes of calculating peak level of service, it is necessary to consider the effective width, which is less than the full measured width. Deductions are made for obstructions within the space, such as structural columns, signs or handrails. Additional deductions are made to reflect the observed behavior of pedestrians, who typically leave a buffer between themselves and a wall or obstruction when walking. The effective width of a walkway is based on the narrowest point minus 2 feet, in addition to any deductions for intermediate columns or obstructions. Effective widths of stairwells are assumed to be 1 foot less than the actual width, to account for handrails and similar obstructions.

In addition, the effective widths of circulation elements are adjusted to reflect the reduced capacity available when pedestrians are moving in opposite directions. Counterflow traffic tends to generate pedestrian “friction” within such corridors and on stairways, which can reduce the overall level of service. When one-half to two-thirds of the pedestrian flow is in one direction, capacity is reduced by 10 percent. When more than two-thirds of the pedestrian flow is in one direction, a 20 percent reduction in capacity is assumed. No deduction is made for facilities where flow is entirely in one direction of travel. These friction factors were derived from empirical observations of pedestrian flows in congested transit station environments within New York City and have been adopted by NYC Transit in its station planning guidelines.

PLATFORM VERTICAL CIRCULATION

Platform stairs and escalators are subjected to different loading conditions than stairs and escalators at the concourse levels of the station. Demand occurs in “pulses” as the trains arrive and depart. Immediately following a train arrival or the posting and announcement of a departing train’s track assignment, the stairs and escalators at that platform would operate at their

maximum practical throughput capacity until the queues of passengers dissipate. The durations of these queues—at platform/track level following train arrivals, and at concourse level when the boarding process for trains begins—are the appropriate measure of platform vertical circulation performance. Platform clearance times under a typical peak loading condition (arrival of a full-length, fully-loaded commuter train) were calculated for each station platform for the No Build and Build conditions. The No Build condition would be the same as existing conditions, since no new platform vertical circulation elements are planned by the railroads in the 2015 timeframe aside from those proposed as part of the Project.

While such analyses of rail station platform access are not typically a part of environmental impact assessment documents for transportation terminal projects in New York State and New York City, this Technical Memorandum summarizes platform clearance and access conditions for the Build and No Build conditions, in order to describe the level of improvement that would be realized with the Project.

ENVIRONMENTAL IMPACT ASSESSMENT

Virtually all of the proposed station construction within the Farley Complex would provide new pedestrian circulation facilities—usually in locations and with configurations that are different from existing conditions in Penn Station. Pedestrian circulation analyses were undertaken to confirm that the projected peak level of service within these facilities meets the environmental impact assessment criteria defined in **Table 13-4**, shown above.

Where existing pedestrian circulation elements are retained in the concept plan, including locations where improvements are planned but where space is constrained by property limits or structural impediments, such as the west and east ramps within the 33rd Street Connector, projected peak levels of service are compared between the Build (with the Project) and No Build (without the Project) conditions to determine whether the Project would result in a significant worsening of conditions. These results also were compared with the equivalent results documented in the 2006 FEIS (based on the analysis contained in the 1999 EA), which concluded that the Project, as defined at that time, would not generate significant adverse impacts.

RAILROAD RIDERSHIP

Estimates of existing (2008) and projected future (2015 No Build) ridership at Penn Station on the three railroads serving the station—Amtrak, LIRR, and NJT—are presented in **Table 13-5a**. Separate estimates of Amtrak’s year 2015 ridership at the station are prepared for the 2015 Build condition for each of the two occupancy options—with and without Amtrak relocating its primary passenger-handling functions to the Farley Complex. These two estimates, presented in **Table 13-5b**, provide the basis for calculating peak levels of service and determining whether any significant adverse impacts are generated by the Project. The differences between the two Amtrak ridership estimates are explained below. These 2015 Build year estimates show continuing growth in rail passenger traffic on all three railroads. While these increases may continue for a few years beyond 2015, the opening of the LIRR East Side Access Project and the NJT ARC project in the period between 2015 and 2020 will create new rail terminal capacity in Manhattan that will absorb future growth and take the pressure off of the capacity-constrained facilities at Penn Station. Long-range regional travel demand forecasts show that rail passenger demand at Penn Station is projected to climb back to levels at or above the 2015 estimates by 2035.

Table 13-5a
Existing And Projected 2015 No Build Railroad Ridership At Penn Station New York

	EXISTING (2008)							NO BUILD (2015) [1]						
	Amtrak Acela	Amtrak Regional*	Amtrak Empire**	Amtrak Total	LIRR	NJT	Total	Amtrak Acela	Amtrak Regional*	Amtrak Empire**	Amtrak Total	LIRR	NJT	Total
Annual	2,259,692	4,865,418	1,387,623	8,512,733	66,274,000	47,641,000	122,427,733	2,924,000	6,262,000	1,782,000	10,968,000	83,496,000	54,268,000	148,732,000
Daily to Annual Factor	248	289	292	277	284	284	284	248	289	292	277	284	284	283
Daily, Both Directions	9,120	16,860	4,750	30,730	233,360	167,750	431,840	11,800	21,700	6,100	39,600	294,000	191,083	524,683
Morning Peak Period														
Inbound (Alighting)														
Peak Period 6-10 AM	1,010	1,395	600	3,005	86,980	56,697	146,682	1,420	1,960	840	4,220	109,400	72,500	186,120
Peak Hour	420	815	260	1,495	35,710	24,182	61,387	630	1,230	390	2,250	45,900	32,800	80,950
Peak 15 Minutes				780	10,410	7,074	18,264				1,120	13,380	9,630	24,130
Outbound (Boarding's)														
Peak Period 6-10 AM	1,090	1,440	480	3,010	5,040	7,597	15,647	1,530	2,030	680	4,240	8,090	12,200	24,530
Peak Hour	390	410	280	1,080	2,320	2,425	5,825	590	620	420	1,630	3,730	3,890	9,250
Peak 15 Minutes				440	740	999	2,179				630	1,190	1,600	3,420
Total, Both Directions														
Peak Period 6-10 AM	2,100	2,835	1,080	6,015	92,020	64,294	162,329	2,950	3,990	1,520	8,460	117,490	84,700	210,650
Peak Hour	810	1,225	540	2,575	38,030	26,607	67,212	1,220	1,850	810	3,880	49,630	36,690	90,200
Peak 15 Minutes				1,220	11,150	8,073	20,443				1,750	14,570	11,230	27,550
Evening Peak Period														
Inbound (Alighting)														
Peak Period 4-8 PM	1,160	1,760	510	3,430	9,110	11,175	23,715	1,630	2,480	720	4,830	14,630	17,940	37,400
Peak Hour	350	780	330	1,460	3,380	3,567	8,407	530	1,170	500	2,200	5,430	5,730	13,360
Peak 15 Minutes				610	1,190	1,676	3,476				880	1,910	2,690	5,480
Outbound (Boarding's)														
Peak Period 4-8 PM	1,260	2,550	720	4,530	73,520	46,901	124,951	1,770	3,590	1,010	6,370	92,500	63,800	162,670
Peak Hour	450	1,000	240	1,690	29,710	20,484	51,884	680	1,500	360	2,540	38,200	28,000	68,740
Peak 15 Minutes				710	8,260	6,016	14,986				1,020	10,600	8,220	19,840
Total, Both Directions														
Peak Period 4-8 PM	2,420	4,310	1,230	7,960	82,630	58,076	148,666	3,400	6,070	1,730	11,200	107,130	81,740	200,070
Peak Hour	800	1,780	570	3,150	33,090	24,051	60,291	1,210	2,670	860	4,740	43,630	33,730	82,100
Peak 15 Minutes				1,320	9,450	7,692	18,462				1,900	12,510	10,910	25,320

Notes:
 * Regional category includes Keystone corridor and long-distance intercity trains on the NEC spine.
 ** Empire category includes Adirondack, Maple Leaf and Lake Shore Limited passengers.
 [1] Baseline growth in Amtrak daily ridership assumed to be approximately 3.7% per year over seven years (2008-2015); peak period ridership growth at 5.0% per year; peak hour ridership growth at 6.0% per year.

**Table 13-5b
Projected 2015 Railroad Ridership At Penn Station New York With the Project**

	2015 PROJECTED -- WITH THE PROJECT (BUILD) AMTRAK STATION OPTION							2015 PROJECTED -- WITH THE PROJECT (BUILD) OPEN STATION OPTION						
	Amtrak Acela [2]	Amtrak Regional* [2]	Amtrak Empire** [2] [3]	Amtrak Total	LIRR [4]	NJT [4]	Total	Amtrak Acela *	Amtrak Regional *	Amtrak Empire** [3]	Amtrak Total	LIRR [4]	NJT [4]	Total
Annual	3,072,000	6,580,000	2,921,000	12,573,000	83,496,000	54,268,000	150,337,000	2,924,000	6,262,000	2,782,000	11,968,000	83,496,000	54,268,000	149,732,000
Daily to Annual Factor	248	289	292	278	284	284	284	248	289	292	278	284	284	284
Daily, Both Directions	12,400	22,800	10,000	45,200	294,000	191,083	530,283	11,800	21,700	9,500	43,000	294,000	191,083	528,083
Morning Peak Period														
Inbound (Alighting)														
Peak Period 6-10 AM	1,500	2,100	1,400	5,000	109,400	72,500	186,900	1,420	1,960	1,300	4,680	109,400	72,500	186,580
Peak Hour	660	1,300	600	2,560	45,900	32,800	81,260	630	1,230	600	2,460	45,900	32,800	81,160
Peak 15 Minutes				2,220	13,380	9,630	25,230				2,130	13,380	9,630	25,140
Outbound (Boarding's)														
Peak Period 6-10 AM	1,600	2,900	1,100	5,600	8,090	12,200	25,890	1,530	2,030	1,050	4,610	8,090	12,200	24,900
Peak Hour	620	1,100	700	2,420	3,730	3,890	10,040	590	620	660	1,870	3,730	3,890	9,490
Peak 15 Minutes				1,250	1,190	1,600	4,040				970	1,190	1,600	3,760
Total, Both Directions														
Peak Period 6-10 AM	3,100	5,000	2,500	10,600	117,490	84,700	212,790	2,950	3,990	2,350	9,290	117,490	84,700	211,480
Peak Hour	1,280	2,400	1,300	4,980	49,630	36,690	91,300	1,220	1,850	1,260	4,330	49,630	36,690	90,650
Peak 15 Minutes				3,470	14,570	11,230	29,270				3,100	14,570	11,230	28,900
Evening Peak Period														
Inbound (Alighting)														
Peak Period 4-8 PM	1,710	2,940	1,200	5,850	14,630	17,940	38,420	1,630	2,480	1,130	5,240	14,630	17,940	37,810
Peak Hour	560	1,560	800	2,920	5,430	5,730	14,080	530	1,170	780	2,480	5,430	5,730	13,640
Peak 15 Minutes				1,740	1,910	2,690	6,340				1,480	1,910	2,690	6,080
Outbound (Boarding's)														
Peak Period 4-8 PM	1,860	3,770	1,700	7,330	92,500	63,800	163,630	1,770	3,590	1,600	6,960	92,500	63,800	163,260
Peak Hour	710	1,580	600	2,890	38,200	28,000	69,090	680	1,500	560	2,740	38,200	28,000	68,940
Peak 15 Minutes				2,030	10,600	8,220	20,850				1,920	10,600	8,220	20,740
Total, Both Directions														
Peak Period 4-8 PM	3,570	6,710	2,900	13,180	107,130	81,740	202,050	3,400	6,070	2,730	12,200	107,130	81,740	201,070
Peak Hour	1,270	3,140	1,400	5,810	43,630	33,730	83,170	1,210	2,670	1,340	5,220	43,630	33,730	82,580
Peak 15 Minutes				3,770	12,510	10,910	27,190				3,400	12,510	10,910	26,820

Notes:

* Regional category includes Keystone corridor and long-distance intercity trains on the NEC spine.

** Empire category includes Adirondack, Maple Leaf and Lake Shore Limited passengers.

[2] Effect of Project improvements on Amtrak Acela, Regional and Empire ridership assumed to be 5% over and above baseline (No Build) ridership level.

[3] Additional effect of implementing NYS HSR plan, increasing service to 18 daily frequencies (enabled by Project), assumed to be 56.3% per NYS Senate HSR Task Force Action Program (2004).

[4] Commuter rail (LIRR and NJT) passenger volumes assumed to be the same in the No Build and Build conditions (i.e., no significant induced demand effects associated with the Project).

EXISTING PASSENGER TRAFFIC

Existing daily, peak period and peak hour railroad ridership data were obtained from LIRR, NJT and Amtrak. LIRR provided typical Spring and Fall 2008 train counts and Penn Station boarding and alighting volumes in 15-minute intervals. Amtrak furnished FY2008 annual boarding and alighting volumes by train at Penn Station, along with aggregated seasonal and day-of-week peaking data that provided the basis for an estimate of Amtrak daily, peak period and peak hour ridership on a typical busy day. NJT provided a count-based estimate of 2008 morning peak period ridership at Penn Station, which enabled prior 2006 count data to be factored to approximate 2008 conditions.

For each of the railroads, estimates of existing weekday morning and evening peak volumes and levels of service within the station concourses and adjacent subway stations were prepared based on the 2008 count-based data furnished by the railroads, adjusted as necessary by peaking and directional factors developed from previous count surveys. As in the earlier environmental assessments at Penn Station, the “design day” is considered to be a typical Fall or Spring weekday, with the peak periods occurring in the morning between 6:00 am and 10:00 am and again in the evening between 4:00 pm and 8:00 pm. Tests for significant environmental impacts are based on average conditions within the peak 15 minute period, which falls roughly in the middle of these four-hour peak periods.

The 2008 existing condition volumes within the 33rd Street Connector were developed from an extensive count program within the Eighth Avenue subway station conducted during continued Project planning subsequent to completion of the 2006 FEIS. These 2006 and 2007 volumes were increased to 2008 levels based on subway station turnstile counts.

PROJECTED FUTURE PASSENGER TRAFFIC

Year 2015 projections of future railroad weekday ridership at Penn Station (daily, AM/PM peak period, AM/PM peak hour boarding and alighting volumes) were obtained from LIRR and were derived for Amtrak and NJT based on scaling and interpolating previous projections. The near-term pace of ridership growth is assumed to be slower than recent historical experience and slower than previously forecast, as a result of the current economic downturn, the slowed pace of residential and commercial development in the Manhattan central business district and commuter suburbs, and the longer anticipated timeframe for implementing planned major capital investments in rail system fleet and facilities. However, the estimates still incorporate significant growth over and above 2008 levels, so that the environmental analysis remains sufficiently conservative and represents reasonable worst case conditions (in terms of station pedestrian congestion) for the Build year of 2015.

ADDITIONAL RAILROAD RIDERSHIP GENERATED BY THE PROJECT

Commuter Rail—LIRR and NJT

The level of commuter ridership at Penn Station is not expected to be as sensitive to the quality of the station environment as it is to the quantity of rail service provided. The Project would not directly affect the level of commuter rail service at the station in the 2015 Build year, and more than three-quarters of Penn Station’s commuters would continue to use the existing Penn Station concourses and facilities. Therefore, there is no difference in the estimated levels of commuter ridership between the 2015 No Build and Build conditions. The non-station development that is part of the Project will generate a small number of incremental trips on the commuter railroads (less than 100 in each direction in the 2015 evening peak hour, as documented in Section 14). When distributed among the multiple railroads, concourses and walking paths that will exist within

the Penn Station complex in the Build condition, this increase is too small to generate significant incremental impacts on pedestrian flow and does not warrant an adjustment to the 2015 Build projections for LIRR and NJT.

Amtrak Intercity

The Project would significantly improve conditions within the station for Amtrak passengers. Therefore, estimated Amtrak ridership has been increased for the 2015 Build condition, compared with the 2015 No Build condition, to reflect the boost in ridership that is anticipated to occur as a result of improved station facilities.

The incremental Amtrak ridership in the 2015 Build condition has two components, which get applied differently for each of the two occupancy options:

- Additional Amtrak Empire Line ridership resulting from improvements to the frequency, reliability and speed of Empire Corridor service that would be enabled by the activation of Platform 12 (applied to both the Amtrak Station and Open Station Options). Platform 12 may also potentially be used for future Metro-North Hudson Line service.

For the Empire Service, a ridership increment was estimated to reflect the effects of service improvements in the corridor that would be enabled by the rehabilitation of Platform 12 which would be accessed from the Farley Building and the street west of Eighth Avenue, and which could be dedicated for use exclusively by Empire Service trains and passengers.

A 2004 study by the New York State Senate High-Speed Rail Task Force evaluated a range of service and investment options in the Empire corridor. This study indicated that an increase in service on the Empire Line from 13 to 18 daily round trips, coupled with incrementally better run times and improved reliability, would result in a 56.3 percent gain in ridership over and above the existing service baseline.

The 2015 Build projections for Amtrak Empire service therefore apply an additional 56.3 percent increase in ridership in addition to the estimated 5 percent ridership increase attributable to an upgraded station environment. Such an improvement in service within the 2015 timeframe is a conservative assumption, considering that other significant capital investment would be needed over and above the Project for rolling stock and rail infrastructure. However, it represents an appropriately conservative assumption for purposes of examining the potential for significant environmental impacts of the Project, including the activation of Platform 12.

- New Amtrak passenger trips generated by having larger and better facilities for all intercity passengers at the Moynihan Station Train Hall (applied only to the Amtrak Station Option).

The 1999 EA included an incremental ridership gain of 5 percent for Amtrak intercity service at Penn Station associated with developing substantially improved passenger facilities at the Farley Building. This analysis uses the same assumption for the Amtrak Station Option that builds similar new facilities for Amtrak at the Farley Complex. The five percent increment is not added in the case of the Open Station Option, since Amtrak's primary passenger-handling functions would be retained at the existing Penn Station main concourse.

NON-RAILROAD PEDESTRIAN TRAFFIC WITHIN THE PENN STATION COMPLEX

Existing Conditions

The majority of pedestrians within the Penn Station complex at any given time are passengers of the three railroads that operate at the station. A portion of the total foot traffic, however,

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comprises pedestrians who are not rail passengers, including local workers and residents who take subways or buses to get to and from the Farley Complex or to pass through the station complex, patrons of retail and food service establishments within the station complex, and pedestrians walking between Eighth and Ninth Avenues or between West 33rd and West 31st Streets who prefer to walk indoors through the station concourses. Based on historical count data, these trips account for 10 to 15 percent of all pedestrian traffic in corridors that directly serve the subway stations (e.g., Locations #7 and #8 on **Figure 13-1**), and a lower percentage within the interior of the train station.

Additional Non-Railroad Pedestrian Trips Generated by the Project

The Project would directly affect employment levels and retail activity and, consequently, the level of pedestrian trip-making at Penn Station. The magnitude of this traffic would be small relative to the volume of rail passenger traffic at the Penn Station complex, but assumptions have been made in this Technical Memorandum about the magnitude of these trips within the morning and evening peak hours at locations within the Penn Station complex. These trip generation and mode split assumptions are documented in Section 14: "Traffic and Parking."

USPS employment at the Farley Complex has been reduced since the 2006 FEIS as a result of consolidation of mail sorting operations at the Morgan Annex. USPS operations are expected to remain at the current levels for the foreseeable future. The space vacated by USPS would be replaced under the Project by railroad, retail and other commercial development in the Farley Complex. In addition, the Project includes the redevelopment of the Development Transfer Site, which would generate additional pedestrian trips at the Penn Station complex.

This analysis also assesses trips that would pass through the Eighth Avenue Subway station, which would be affected by the expansion of the 33rd Street Connector that is proposed as part of the Project, the existing Penn Station 33rd Street Connecting Concourse, and the proposed Moynihan Station concourses. On average, these additional Project-generated trips would represent less than ten percent of the total peak volume within corridors and on stairways within the Penn Station complex.

Projected Growth in Other Non-Railroad Passenger Traffic

Independently of the proposed Project, background growth in non-railroad pedestrian traffic is assumed to occur at a rate of 0.5 percent per year in the period between 2008 and 2015 and is included within the 2015 No Build pedestrian traffic estimates. This growth is attributable to the general long-term trend of gradual increasing population and employment within the Manhattan central business district. An additional increment of pedestrian traffic can be attributed to specific major development projects (not related to the Project) that are projected to be completed between 2008 and 2015 in the immediate vicinity of the Penn Station complex. Some of these new commuters will be railroad riders and are included within the projected increases in railroad ridership tabulated above. Others will walk through portions of the Penn Station complex on their way to and from the subways; an allowance for these additional pedestrian trips is included within the 2015 No Build estimates.

D. EXISTING CONDITIONS

Penn Station is the most heavily used and most crowded rail passenger station in the U.S., handling on the order of 430,000 daily rail passenger trips, in addition to approximately 100,000 daily pedestrian trips by subway users, office building workers, Madison Square Garden patrons

and other pedestrians who are not railroad riders. The station serves as both New York's intercity rail terminal for Amtrak and the only Manhattan rail terminal for NJT and LIRR. The bulk of the riders on the latter two carriers are commuters from the suburbs to workplaces in the Manhattan central business district. As a result, usage of the station is heavily peaked in the early morning and late afternoon hours. During the commuter peak periods, commuter volumes exceed those of Amtrak intercity riders by more than a factor of 10. The station operates 24 hours a day, 365 days per year. The "train shed" at track level covers four full city blocks, from West 31st Street to West 33rd Street and Seventh Avenue to Ninth Avenue. The train platforms have various lengths but generally extend from Seventh Avenue to a point between Eighth and Ninth Avenues. The three platforms in the center of the station stretch almost all the way to Ninth Avenue. Nevertheless, the existing concourses, subway connections and street level station entrances are skewed towards the eastern ends of the platforms, located exclusively between Seventh Avenue and the western edge of Eighth Avenue.

PHYSICAL CONFIGURATION AND USAGE

PLATFORM LEVEL

On the lowest level of Penn Station are 11 platforms of various lengths serving 21 tracks, both numbered from south to north. Tracks 1 through 4 (accessed via Platforms 1 and 2) on the south side of the station are stub-ended on the east end of the station at Seventh Avenue so they provide service only to and from New Jersey to the west. The remaining tracks 5 through 21 are "through tracks" with connections at both ends.

Track usage by the three rail operators is influenced by the configuration of tracks and tunnels leading to the station and is divided according to agreements between the two commuter railroads and Amtrak. NJT uses tracks 1 through 4 exclusively. Tracks 5 through 12 are used by both Amtrak and NJT. Amtrak, NJT and LIRR all share tracks 13 through 16, with usage varying by time of day (LIRR uses these tracks during weekday morning and evening peak periods, while all three railroads use them at other times). The LIRR has exclusive use of tracks 17 through 21. All tracks are equipped with AC overhead catenary power, the system used by Amtrak Northeast Corridor and NJT trains. Tracks 5 through 21 are also equipped with DC third rail to accommodate the overriding third-rail contact shoes used by LIRR and Amtrak Empire Service trains. Train dispatching at Penn Station is performed by Penn Station Central Control, a joint venture owned and operated by Amtrak and the LIRR.

Passengers arriving or departing on any of the station's 11 platforms (and 21 associated tracks) can use multiple stairs or escalators to and from the Level A concourse, located one level above the platforms. In addition, there are direct stairs and/or escalators between Platforms 2 through 9 (serving Tracks 3 through 17) and the Main Concourse on the upper level (Level B). Platforms 1 and 2 (serving Tracks 1 through 4) have a set of stairs that leads to a connecting passageway on Level B (midway between Seventh and Eighth Avenues next to 31st Street). These stairs are only available during weekday peak periods as the connecting passageway runs through Amtrak back-of-house operations. Platforms 10 and 11 (serving Tracks 18 and 19, and 20 and 21, respectively) are accessible only from Level A.

LEVEL A

The first Level above the platforms, designated Level A, includes the primary access to LIRR trains and NJT's Seventh Avenue Concourse. Level A also provides direct underground

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connections to adjacent subway stations on the Eighth Avenue (A, C & E) and Seventh Avenue (1, 2 & 3) NYC Transit subway lines. The general layout of Level A is shown in **Figure 13-1**. The LIRR ticket office, LIRR waiting room, retail shopping, and various crew quarters and support facilities for the three railroads are all located on Level A.

A series of interconnected concourses and corridors span the entire station at Level A. Arriving passengers on all three railroads can ascend to any of five concourse areas on Level A, all of which are oriented in a north-south direction:

- the LIRR West End Concourse (west of Eighth Avenue, serving Tracks 13-21);
- the “Exit Concourse” (east of Eighth Avenue, serving all 21 station tracks, its name derives from that fact that this was originally the arrivals area for the Pennsylvania Railroad when Penn Station first opened in 1910, but it is now used for commuter departures as well as Amtrak and commuter arrivals);
- the LIRR Central Concourse (serving Tracks 13-21);
- the LIRR Main Gate Area (near Seventh Avenue, serving Tracks 13-21); and
- NJT’s Seventh Avenue Concourse, which is split between Levels A and B (serving Tracks 1-12).

Linking these four north/south passages is the Connecting Concourse, which is located directly beneath West 33rd Street. It connects the northern ends of the four north-south passages and connects to both the Eighth Avenue (A, C, and E) and Seventh Avenue (1, 2, and 3) subway stations. An additional east west passageway, the Hilton Passageway, connects the Exit Concourse, Central Corridor, and Seventh Avenue concourses. The Hilton Passageway is located roughly in the middle of the station and provides an additional connection to the Seventh Avenue subway in the vicinity of West 32nd Street.

Various retail establishments are located along the Connecting Concourse, primarily on the north side of the concourse within the basement of the One Penn Plaza building. The Connecting Concourse also provides a connection to the LIRR’s 34th Street entrance via a side corridor and two connections to the One Penn Plaza building. The Hilton Corridor and the West End Concourse are narrower than the other concourses and corridors.

The quantity and configuration of platform access varies among the five Level A concourses: Escalators situated between Level A and the platform typically operate in the peak direction of travel (up in the AM and down in the PM) to carry peak loads.

- West End Concourse—double stairs to Platforms 7 and 9 (serving Tracks 13 and 14, and 17, respectively), stair and escalator to Platform 8 (serving Tracks 15 and 16), single stairs to Platforms 10 and 11 (serving Tracks 18 and 19, and 20 and 21, respectively);
- Exit Concourse—typically an escalator on the west side and a stair on the east side of the concourse, with exceptions at Platforms 1-2 (Tracks 1-4) and Platforms 9-11 (Tracks 17-21), plus ADA-compliant elevators to Platforms 1-6 (Tracks 1-12);
- Central Concourse—ADA-compliant elevators on the west side and stairs on the east side to Platforms 7-11 (Tracks 13-21);
- LIRR Main Gate Area—Stairs on the west side of the concourse to Platforms 7-11 (Tracks 13-21), plus escalators to Platforms 7, 8 and 11 (Tracks 13/14, Tracks 15/16, and Tracks 20/21, respectively), plus additional stairs to Platform 10 (Tracks 18 and 19) and Platform 11 (Tracks 20 and 21) on the east side of the concourse; and

- NJT Seventh Avenue Concourse—two stairs and two escalators to Platforms 1-2 (Tracks 1-4), single stair to Platform 3 (Tracks 5 and 6), single escalator to Platform 4 (Tracks 7 and 8), stair plus escalator to Platforms 5-6 (Tracks 9-12).

LEVEL B

Above Level A is Level B, which was the main level of the original Pennsylvania Station and was designed primarily to accommodate the needs of departing intercity rail passengers on the Pennsylvania Railroad. Situated one level below the street, Level B includes the Main Concourse at the Eighth Avenue end of the station, NJT concourse facilities at the Seventh Avenue end, a corridor on axis with 32nd Street, referred to as the 32nd Street Spine, and the “Rotunda,” a relatively underutilized high-ceiling space along the 32nd Street Spine that contains the Amtrak information booth. **Figure 13-2** shows the configuration of public spaces on Level B.

The Main Concourse has escalators and stairs that provide direct access to platforms 2 through 9 for Amtrak and NJT, as well as ticket offices for both railroads. The Main Concourse also houses Amtrak’s primary passenger service and operational facilities, including the main train information display board, the ClubAcela lounge for first class passengers, and the baggage-handling facilities.

NJT facilities on Level B at the Seventh Avenue end of the station include a seated waiting room, ticket office, and direct elevator access to Platforms 1-5 (Tracks 1-10).

Except for the LIRR’s 34th Street entrance, the station’s main entrances all connect to this level. Two Eighth Avenue entrances are at the western corners of Level B and lead to the east side of Eighth Avenue, while the 32nd Street entrance and the entrances from the midblock driveway are along the 32nd Street Spine.

There are four clusters of vertical circulation elements connecting Levels A and B:

- Between Level B Main Concourse and Level A Exit Concourse;
- Between Level B Main Concourse and Level A Connecting Concourse;
- Between Level B Rotunda and Level A Hilton Passageway; and
- Between 32nd Street Spine and Level A LIRR Main Gate Area and NJT Seventh Avenue Concourse.

Within the Main Concourse are two rows of escalators and stairs providing direct platform access. Those on the west side of the concourse provide access to Platforms 3-9 (Tracks 5-17), while those on the east side serve Platforms 2-8 (Tracks 3-16). Virtually all Amtrak departing passengers use these stairs and escalators for boarding. NJT passengers can either board directly from the Main Concourse or board from the concourses on Level A. There are no direct connections from the Main Concourse to Tracks 18 through 21, which are used only by LIRR trains, so LIRR passengers entering through this area descend via Level A to access their trains.

NJT also has constructed a set of stairs providing access from the central portion of Platforms 1 and 2 (Tracks 1-4) directly up to the B Level, where passengers can walk via a back-of-house corridor to the Rotunda. This facility was envisioned as a temporary installation, to be replaced ultimately by an extension of the Central Concourse on Level A, and is only open during weekday peak periods.

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LEVEL C (STREET LEVEL) AND STATION ENTRANCES/EXITS

The railroads generate the bulk of the total pedestrian activity within the Penn Station complex. At street level, rail passenger traffic mixes with other pedestrian traffic associated with area office buildings, retail establishments, the General Post Office and Madison Square Garden.

As described previously, most of the elements of Penn Station lie below street level. There is no significant station-related public circulation space at the street level. The surface above Penn Station is occupied by the Madison Square Garden arena and Two Penn Plaza office building between Seventh and Eighth Avenues and by the Farley Complex west of Eighth Avenue. Street-level entrances to the station are located around and within these buildings, with stairs and escalators descending to the station concourses. The locations of the major street-level station entrances are shown in **Figure 13-3**. Primary street-level entrances and exits, and the station level to which they connect, are as follows:

- At the northeast corner of Eighth Avenue and West 31st Street (to Level B);
- At the southeast corner of Eighth Avenue and West 33rd Street (to Level B);
- On the south side of West 34th Street west of Seventh Avenue (to Level A);
- On the West side of Seventh Avenue at West 32nd Street (to Level B);
- On the east and west sides of a driveway located between Seventh and Eighth Avenues (to Level B); and
- On the northwest corner of West 31st Street and Seventh Avenue (to Level B), which opened in the summer of 2009.

Each of these entrances is served by stairs and one or more escalators. ADA-compliant elevators are provided at only two locations: the 34th Street entrance (to Level A) and on the west side of the midblock driveway (to Levels A and B). Additional minor street access is available via some stairways of adjacent subway stations that provide access to the Penn Station concourses as well. These are located as follows:

- On all four corners of the intersection of Eighth Avenue and West 33rd Street (to Level A); and
- On the northeast, northwest and southeast corners of Seventh Avenue and West 33rd Street (to Level A).

In addition to the above street entrances and exits, there are two direct pedestrian connections between Level A of the station and the adjacent One Penn Plaza office building, one at the Eighth Avenue end of the Connecting Concourse and the other near the 34th Street entrance. These building entrances are open only on weekdays from approximately 7:00 AM to 6:30 PM. A new station entrance at Seventh Avenue and West 31st Street was under construction during 2008, and opened in the summer of 2009, by NJT and therefore is not reflected in the 2008 baseline station usage patterns.

HISTORICAL CAPITAL INVESTMENT

Over the past 20 years, through a series of capital projects, the railroads have reduced congestion bottlenecks, expanded the passenger circulation capacity of the station, and improved the quality of the pedestrian environment.

The LIRR portion of Penn Station is served by four concourse areas that each have escalator and/or stair access to the five LIRR platforms. From east to west, these include the Main Gate Area, Central

Concourse, Exit Concourse (lower level of the main Eighth Avenue concourse) and West End Concourse. Vertical circulation to and from the platforms used by the LIRR is distributed along the length of most platforms. Each of the LIRR platforms has in the range of seven to nine points of egress from the platforms, spread from the Seventh Avenue ends of the platforms to west of Eighth Avenue (at the West End Concourse). On Platforms 7 and 8 (Tracks 13-16), which are used by LIRR during the weekday peak periods, approximately one-third of the length of a full 12-car train is positioned to the west of the westernmost vertical circulation at the West End Concourse.

NJT constructed a new Seventh Avenue Concourse and added platform vertical circulation at the eastern ends of Platforms 1 through 6 (Tracks 1-12). Platforms 1 and 2 (Tracks 1-4) have access points that are well distributed along the length of these relatively short platforms. However, some gaps still remain on Platforms 3 through 6 (Tracks 5-12). NJT also opened in the summer of 2009 a new street entrance at the northwest corner of West 31st Street and Seventh Avenue.

MORNING AND EVENING PEAK FLOWS

An analysis of pedestrian flows and levels of service within the existing station was undertaken in the Fall of 2006. Though railroad ridership during the morning and evening peak hours has increased by approximately seven percent since then, those 2006 counts represent a reasonable yardstick for measuring future peak conditions against current conditions and have been used for this Technical Memorandum as the basis for calibrating the Penn Station pedestrian circulation model that was used to analyze peak congestion within Penn Station.

At concourse Levels A and B, **Table 13-6** shows morning peak volumes and levels of service at selected locations, as identified in **Figures 13-1** through **13-4**. The principal station concourses and vertical circulation elements operate at LOS C/D or better during the 15-minute peak. Evening peak queuing conditions at the concourses are indicated in **Table 13-7**. Levels of service in the B and C range prevail, with some queues reaching LOS C for short periods of time. The existing facilities are relatively balanced in terms of their loading and congestion. Amtrak and NJT boarding passengers typically wait at concourse level until track assignments are posted and announced, since assigned tracks vary on a daily basis. On the other hand, significant numbers of LIRR boarding passengers descend to platform level in advance of the boarding period, to position themselves to obtain seats on their train, and because LIRR trains typically operate on regularly scheduled tracks. This anticipatory movement of people to the platforms helps compensate for the higher volumes of LIRR passengers and permits the concourse spaces to function at an acceptable level of service.

Table 13-6
Weekday Morning Peak Pedestrian Flow Levels of Service
at Selected Penn Station Locations—Existing (2008)

	Location	Circulation Element Type	Peak Hour Volume	Peak 15 Min. Volume	Effective Width (ft.)	Peak Flow Rate (p/m/ft)	Level of Service
1	Main Entrance, 7th & 32nd	Stair + 2 Escs	11,881	4,158	16.5	15.4	E
2	LIRR Entrance, 7th & 34th	Stair + 3 Escs	9,246	3,236	13.5	14.9	E
3	NJT Entrance, 7th & 31st	Stair + 2 Escs			(Facility under construction during 2008)		
4	33rd St Connecting Concourse West of LIRR Main Gate Area	Corridor	10,279	3,598	20.0	13.2	C
5	33rd St Connecting Concourse East of Exit Concourse	Corridor	11,005	3,852	19.0	14.9	C/D

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Table 13-6 (cont'd)
Weekday Morning Peak Pedestrian Flow Levels of Service
at Selected Penn Station Locations—Existing (2008)

	Location	Circulation Element Type	Peak Hour Volume	Peak 15 Min. Volume	Effective Width (ft.)	Peak Flow Rate (p/m/ft)	Level of Service
6	33rd St Connecting Concourse East of 8th Ave Subway	Corridor	11,859	4,151	26.0	11.7	C
7	Hilton Passageway, East End	Corridor	6,322	2,213	12.0	13.5	C
8	33rd Street Connector East Ramp	Corridor	6,985	2,445	14.0	12.8	C
9	33rd Street Connector West Ramp	Corridor	6,258	2,190	11.0	14.6	C/D
10	West End Concourse North End	Corridor	6,208	2,173	13.0	12.3	C
11	8th Ave Subway Downtown Local Stair to West End Concourse	Stair	2,304	806	7.0	8.4	C
12	8th Ave Subway Downtown Local Stair to Subway Mezzanine	Stair	2,197	769	8.2	6.9	B/C
13a	8th Ave Subway Uptown Local Stair to Penn Station Connecting Concourse	Stair G1	5,020	1,757	16.0	9.4	C
14a	8th Ave Subway Express Platform Stair - North	Stair M21/22	1,150	403	7.0	4.6	B
15a	8th Ave Subway Express Platform Stair - South	Stair M23/24	2,160	755	7.0	8.6	C

Note: See Figures 13-1 through 13-4.

Table 13-7
Weekday Evening Peak Pedestrian Flow Levels of Service
at Selected Penn Station Locations—Existing (2008)

	Location	Circulation Element Type	Peak Hour Volume	Peak 15 Min. Volume	Effective Width (ft.)	Peak Flow Rate (p/m/ft)	Level of Service
1	Main Entrance, 7th & 32nd	Stair +2 Escs	10,160	3,556	16.5	11.8	D
2	LIRR Entrance, 7th & 34th	Stair +3 Escs	7,668	2,684	13.5	11.3	D
3	NJT Entrance, 7th & 31st	Stair +2 Escs			(Facility under construction during 2008)		
4	33rd St Connecting Concourse West of LIRR Main Gate Area	Corridor	8,430	2,951	20.0	10.8	C
5	33rd St Connecting Concourse East of Exit Concourse	Corridor	8,484	2,969	19.0	11.5	C
6	33rd St Connecting Concourse East of 8th Ave Subway	Corridor	13,633	4,772	26.0	13.5	C
7	Hilton Passageway, East End	Corridor	5,328	1,865	12.0	11.4	C
8	33rd Street Connector East Ramp	Corridor	8,781	3,073	14.0	16.1	D
9	33rd Street Connector West Ramp	Corridor	6,753	2,364	11.0	15.8	D
10	West End Concourse North End	Corridor	5,014	1,755	13.0	9.0	B
11	8th Ave Subway Downtown Local Stair to West End Concourse	Stair	2,745	961	7.0	10.1	C/D
12	8th Ave Subway Downtown Local Stair to Subway Mezzanine	Stair	3,315	1,160	8.2	10.4	C/D
13a	8th Ave Subway Uptown Local Stair to Penn Station Connecting Concourse	Stair G1	2,940	1,030	16.0	5.1	B
14a	8th Ave Subway Express Platform Stair - North	Stair M21/22	1,320	461	7.0	5.3	B
15a	8th Ave Subway Express Platform Stair - South	Stair M23/24	1,840	643	7.0	6.8	B

Note: See Figures 13-1 through 13-4.

The north/south corridors on Level A (the Central Concourse, Exit Concourse, and Seventh Avenue Concourse) show flow rates within LOS A-C in the AM and PM peak 15-minute periods. The volume of passengers in the Central Corridor are relatively low, because it only serves LIRR trains and offers a more circuitous route to and from the platforms compared with the other concourses. The Exit Concourse shows slightly more variation with modest congestion in the vicinity of the Connecting Concourse, and free flow to the south of the Hilton Corridor. As will be discussed further below, the primary access to both subway stations is via the Connecting Concourse, which accounts for the increased volume as one travels through the concourse from south to north. The Seventh Avenue concourses (LIRR Main Gate Area and NJT Seventh Avenue Concourse) are busy but relatively free-flowing in the morning peak. They become significantly more congested during the evening peak, when substantial volumes of passengers are waiting in these areas for train departures.

The east-west Connecting Concourse currently functions at LOS C to C/D, depending on location and time of day. Although fairly wide overall, the Concourse carries great volumes of passengers *en route* to the subways and exits and is punctuated by stairways and an escalator to Platform 11 (Tracks 20 and 21) along its south side. During the AM peak 15 minute period, the volume of people in the western portion of the Connecting Concourse generates relatively congested conditions at LOS D. Moving eastward down the corridor, peak conditions are in the LOS C range. In the PM peak, the Connecting Concourse exhibits a more spread peak than in the morning and operates at LOS C, but this does not reflect the effects of passengers waiting in the Corridor for trains to be announced.

VERTICAL CIRCULATION ELEMENTS

The majority of vertical circulation elements for Penn Station appear to operate at either LOS A or B (16 of 20 locations) in both the AM and PM peak periods with four notable exceptions:

- The main stair and escalator bank leading to Seventh Avenue at 32nd Street operates at LOS E in the AM peak 15-minute period and at LOS D in the PM peak, as it is the primary NJT and Amtrak entrance;
- The stair and escalator bank leading to 34th Street west of Seventh Avenue operates at LOS E in the AM and D in the PM peak 15 minutes as it is the primary LIRR entrance;
- The stair and escalator bank leading to the 32nd Street Spine from the LIRR main gate area operates at LOS C in the AM and LOS D in the PM peak as it is the main connection for LIRR passengers to and from the 32nd Street entrance; and
- The stairway leading to the Eighth Avenue subway downtown local platform from the West End Concourse operates at LOS C in the AM peak and LOS C/D in the PM peak 15-minute period as many LIRR passengers arrive/depart directly via the Eighth Avenue subway. This stair also leads to street stairways on the west side of Eighth Avenue, currently offering the most westerly entrance and exit to Penn Station.

These relatively congested existing levels of service demonstrate the heavy utilization of Penn Station's public spaces and concourses by rail passengers and other commuters during the weekday peak periods.

EVENING PEAK ACCUMULATIONS

Space utilization varies significantly throughout the station, with some areas much more heavily used by people either waiting or walking than other areas. Nonetheless, the total area available

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for passengers provides a useful measure and a point of comparison with proposed improvements that are part of the Project. **Table 13-8** presents a breakdown of space available to the public in various areas on Levels A and B.

**Table 13-8
Public Spaces for Passengers Within Penn Station—Existing (2008)**

Location		Open Waiting & Queuing	Seated Waiting	Ticketing Queues	General Circulation	Total Area (gsf)
Level A	NJT Seventh Ave. Concourse	8,025				8,025
	NJT Seventh Ave Con. Lower North End	2,060				2,060
	Hilton Corridor				9,353	9,353
	LIRR Main gate & Ticketing Area	12,515		3,760	1,623	17,898
	LIRR Waiting Room		1,586			1,586
	33rd Street Connecting Concourse	4,900			17,325	22,225
	LIRR 34th Street Entrance Hall				6,189	6,189
	Seventh Ave. Subway Free Area				5,310	5,310
	Central Corridor	4,987			554	5,541
	Exit Concourse -- North End	9,167			3,929	13,095
	Exit Concourse -- South End	6,219			5,088	11,307
LIRR West End Concourse	3,946			438	4,384	
Eighth Avenue Subway Free Area				5,413	5,413	
Level B	Amtrak/NJT Main Concourse	21,318		6,983	4,971	33,272
	Amtrak/Acela/NJT Waiting Rooms		14,722			14,722
	Rotunda and Links to Main Concourse				29,075	29,075
	32nd Street Spine				11,980	11,980
	NJT Seventh Ave. West Balcony				7,779	7,779
	NJT Seventh Ave. Waiting Room		2,666			2,666
	NJT Seventh Ave. East Balcony				8,273	8,273
NJT Seventh Ave. South Walkway				800	800	
TOTAL		73,136	18,974	10,743	118,100	220,953

Peak passenger accumulations within each of the existing station concourses during the evening peak period are presented in **Table 13-9**. By comparing these figures with the estimated effective concourse area for passenger waiting and queuing, netting out space occupied by columns and obstructions as well as space that is dedicated to passenger circulation, an estimate of the relative level of crowding is obtained by using Fruin’s measures of queuing level of service. Waiting space is limited and significant crowding regularly occurs in the LIRR Main Gate Area, the NJT Seventh Avenue concourse, the Level A Exit Concourse, and, when moderate LIRR train delays occur, at the existing West End Concourse.

**Table 13-9
Weekday Evening Peak Passenger Accumulations Within Boarding Concourses—Existing (2008)**

EXISTING (2008)		West End Concourse North	Level B Main Concourse	Exit Concourse North	Exit Concourse South	Central Concourse	LIRR Main Gate Area	NJT Seventh Avenue Concourse
PM Peak Hour Boardings	Amtrak		2,011					
	LIRR	3,387		8,316		1,547	16,460	
	NJT		4,662		4,385			11,376
	Total	3,387	6,673	8,316	4,385	1,547	16,460	11,376
Peak Occupancy	Amtrak		523					
	LIRR	373		915		170	1,811	
	NJT		513		482			1,251
	Total	373	1,036	915	482	170	1,811	1,251
Effective Queuing Area (sf)		4,000	21,000	10,000	6,000	5,000	17,000	10,000
Queue Density (sf/p)		10.72	20.27	10.93	12.45	29.41	9.39	7.99
Level of Service (LOS)		B/C	A	B/C	B/C	A	C/D	C/D

Note: This analysis assumes normal operating conditions with trains running on or close to schedule; passengers wait at concourse level for track assignment information.

PLATFORM CLEARANCE

Passenger queuing occurs at the platforms following morning peak train arrivals. Immediately following train arrivals, exit stairs and escalators operate at their capacity (LOS E) for several minutes until the queue dissipates, then remain empty until the next train arrival. Queuing conditions are considered unacceptable if queues extend beyond approximately six minutes, increasing the likelihood that a following train would arrive before the passengers from a prior train have been cleared from the platform. In general, the LIRR platforms, with their multiple exit points, operate acceptably.

A lack of vertical circulation capacity and the uneven spreading of that capacity along the length of certain platforms results in inordinately long times to clear platforms of passengers when trains arrive with a full load, most often during the morning peak. This condition is most prevalent on platforms 3 through 6 (serving Tracks 5-12), which lack access at their western ends (the LIRR West End Concourse provides such access to Platforms 7 through 11, which serve Tracks 13-21), and which also lack access in their central portions (the LIRR Central Concourse provides such access to Platforms 7 through 11 [for Tracks 13-21], while the interim Level B stairs provide such access at Platforms 1 and 2, which serve Tracks 1-4). Queues at Platforms 3 through 6 (Tracks 5-12) can exceed the six minute goal for heavily-loaded NJT trains. The platform clearance times for the existing station are summarized in **Table 13-10**.

Table 13-10
Existing Station Configuration—Platform Clearance Times
Following Arrival of Fully Loaded Train

Platform	Tracks	Length (ft.)	No. of Cars	Railroad	Seats / Car	Passenger Load	No. of Escs.	No. of Stairs	Total Vertical Circulation Elements	Total Egress Capacity (ped / min)	Platform Clearance Time	
											Minimum (min)	Expected (min)
11	20, 21	1,007	12	LIRR	115	1,380	1	7	8	741	1.96	2.29
10	18, 19	1,022	12	LIRR	115	1,380	2	7	9	1201	1.21	1.83
9	17	916	10	LIRR	115	1,150	1	8	9	713	2.03	3.66
8	15, 16	1,185	12	LIRR	115	1,380	4	5	9	779	1.86	2.86
7	13, 14	1,483	12	LIRR	115	1,380	4	5	9	699	2.07	3.03
6	11, 12	1,464	12	NJT	135	1,620	4	2	6	494	3.44	5.37
5	9, 10	1,463	12	NJT	135	1,620	4	2	6	440	3.87	5.60
4	7, 8	1,149	12	NJT	135	1,620	3	2	5	437	3.89	5.60
3	5, 6	934	10	NJT	135	1,350	2	3	5	437	2.76	5.47
2	3, 4	842	8	NJT	135	1,080	3	5	8	703	1.61	1.92
1	1, 2	842	8	NJT	135	1,080	2	6	8	722	1.57	1.86

Notes:
 Minimum clearance time assumes passengers are distributed among egress points in proportion to egress capacity.
 Expected clearance time assumes passengers are distributed according to location on platform and desired point of egress, based on historical surveys.
 Expected clearance times also assume that passengers choose the nearest egress point once queues dissipate.

E. FUTURE WITHOUT THE PROJECT

This case analyzes rail passenger traffic growth and West Side development that is projected to occur between now and 2015, if the Project and related actions were not to proceed. ESDC has purchased the Farley Complex from the USPS, and, absent the proposed Project, USPS would continue to occupy space within the Farley Complex for its operations. The No Build condition for the Project differs in some respects from the No Build condition analyzed in the 2006 FEIS. ESDC would redevelop portions of the Farley Complex with commercial uses. The existing

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Penn Station configuration, including the existing West End Concourse beneath would be retained in their existing configurations.

This No Build condition assumes that no new passenger circulation facilities would be constructed west of Eighth Avenue within the limits of the Farley Complex, and no modifications would be made to either the Eighth Avenue subway station or the existing LIRR West End Concourse.

PHYSICAL IMPROVEMENTS FOR PEDESTRIAN CIRCULATION

The analysis of projected future conditions without the Project, i.e., the No Build condition, includes projected growth in rail passenger traffic to the year 2015 and assumes completion of programmed station and rail system capacity improvement projects by the railroads. Within the Penn Station complex, the most significant current project is the construction of a new station entrance by NJT at the northwest corner of Seventh Avenue and 31st Street, providing a direct pedestrian pathway between the NJT Seventh Avenue Concourse and the street. This improvement, completed in the summer of 2009, provides a more direct and less crowded walking route for many NJT passengers and is intended to relieve congested conditions at the main station entrance at Seventh Avenue and West 32nd Street. This project, however, is expected to have little effect on passenger circulation conditions at the Eighth Avenue end of the station.

No other significant circulation improvements are planned for the station within the 2015 timeframe by any of the three operating railroads. The western portions of the station, including the Eighth Avenue Subway station and West End Concourse, are assumed to remain the same in the 2015 No Build condition as in the 2008 existing condition.

MORNING AND EVENING PEAK FLOWS

The increase in commuter rail traffic projected by the year 2015 would result in congested conditions at certain locations within Penn Station in the morning peak, as **Table 13-11** shows. In the No Build condition, the only significant change to the physical configuration of the station in 2015 is the opening of a new street entrance/exit for the NJT Seventh Avenue Concourse at Seventh Avenue and 31st Street (Location #3 on **Figures 13-2** and **13-3**). This improvement siphons some NJT passengers from the overcrowded main stair/escalator bank at Seventh Avenue and West 32nd Street (Location #1 on **Figures 13-2** and **13-3**) and, in turn, would enable some LIRR passengers to shift their access route from the LIRR 34th Street entrance (Location #2 on **Figures 13-1** and **13-3**) to the Seventh Avenue and 32nd Street entrance (Location #1 on **Figures 13-2** and **13-3**). This projected shifting of pedestrian routes would allow the existing two main pedestrian entrances (Seventh Avenue and West 32nd Street and Seventh Avenue and West 34th Street) to continue to operate in the LOS E range during the morning and evening peak 15 minute periods—close to capacity but not generating gridlocked conditions.

Otherwise, peak pedestrian traffic within the station is estimated to grow proportionally with the projected increase in overall peak hour ridership between 2008 and 2015. Peak levels of service are projected to reach the D range at the following locations:

- Connecting Concourse;
- LIRR 34th Street Entrance;
- Eighth Avenue Subway mezzanine ramps; and
- Seventh Avenue Subway entrances at 33rd Street and 32nd Street.

Table 13-11
Weekday Morning Peak Pedestrian Flow Levels of Service
at Selected Penn Station Locations—2015 No Build

	Location	Circulation Element Type	Peak Hour Volume	Peak 15 Min. Volume	Effective Width (ft.)	Peak Flow Rate (p/m/ft)	Level of Service
1	Main Entrance, 7th & 32nd	Stair + 2 Escs	12,161	4,256	16.5	15.6	E
2	LIRR Entrance, 7th & 34th	Stair + 3 Escs	10,423	3,648	13.5	16.5	E
3	NJT Entrance, 7th & 31st	Stair + 2 Escs	5,952	2,083	12.5	9.8	C/D
4	33rd St Connecting Concourse West of LIRR Main Gate Area	Corridor	12,747	4,461	20.0	16.4	D
5	33rd St Connecting Concourse East of Exit Concourse	Corridor	13,936	4,878	19.0	18.8	D
6	33rd St Connecting Concourse East of 8th Ave Subway	Corridor	15,532	5,436	26.0	15.3	C/D
7	Hilton Passageway, East End	Corridor	8,639	3,024	12.0	18.5	D
8	33rd Street Connector East Ramp	Corridor	9,117	3,191	14.0	16.7	D
9	33rd Street Connector West Ramp	Corridor	8,160	2,856	11.0	19.0	D
10	West End Concourse North End	Corridor	8,093	2,833	13.0	14.5	C/D
11	8th Ave Subway Downtown Local Stair to West End Concourse	Stair	3,019	1,057	7.0	11.1	D
12	8th Ave Subway Downtown Local Stair to Subway Mezzanine	Stair	2,867	1,003	8.2	9.0	C
13a	8th Ave Subway Uptown Local Stair to Penn Station Connecting Concourse	Stair G1	7,610	2,663	16.0	13.4	E
14a	8th Ave Subway Express Platform Stair - North	Stair M21/22	1,270	444	7.0	5.1	B
15a	8th Ave Subway Express Platform Stair - South	Stair M23/24	2,850	999	7.0	11.5	D

Note: See Figures 13-1 through 13-4.

Peak flow rates at most locations within the station are lower during the evening peak, compared with the morning peak, which tends to be more concentrated. Resulting peak levels of service, shown in **Table 13-12**, generally are as good or better in the evening peak, compared with the morning. When compared to existing conditions, the No Build levels of service would be expected to significantly worsen by 2015, due to the significant projected increase in peak hour rail passenger traffic.

Table 13-12
Weekday Evening Peak Pedestrian Flow Levels of Service
at Selected Penn Station Locations—2015 No Build

	Location	Circulation Element Type	Peak Hour Volume	Peak 15 Min. Volume	Effective Width (ft.)	Peak Flow Rate (p/m/ft)	Level of Service
1	Main Entrance, 7th & 32nd	Stair + 2 Escs	10,648	3,727	16.5	12.2	D
2	LIRR Entrance, 7th & 34th	Stair + 3 Escs	9,342	3,270	13.5	13.7	E
3	NJT Entrance, 7th & 31st	Stair + 2 Escs	5,775	2,021	12.5	8.8	C
4	33rd St Connecting Concourse West of LIRR Main Gate Area	Corridor	10,536	3,688	20.0	13.5	C
5	33rd St Connecting Concourse East of Exit Concourse	Corridor	10,659	3,731	19.0	14.4	C
6	33rd St Connecting Concourse East of 8th Ave Subway	Corridor	16,911	5,919	26.0	16.7	D
7	Hilton Passageway, East End	Corridor	7,342	2,570	12.0	15.7	D
8	33rd Street Connector East Ramp	Corridor	10,550	3,693	14.0	19.3	D
9	33rd Street Connector West Ramp	Corridor	8,117	2,841	11.0	18.9	D

Table 13-12 (cont'd)
Weekday Evening Peak Pedestrian Flow Levels of Service
at Selected Penn Station Locations—2015 No Build

Location		Circulation Element Type	Peak Hour Volume	Peak 15 Min. Volume	Effective Width (ft.)	Peak Flow Rate (p/m/ft)	Level of Service
10	West End Concourse North End	Corridor	6,625	2,319	13.0	11.9	C
11	8th Ave Subway Downtown Local Stair to West End Concourse	Stair	3,646	1,276	7.0	13.4	D/E
12	8th Ave Subway Downtown Local Stair to Subway Mezzanine	Stair	3,925	1,374	8.2	12.3	D
13a	8th Ave Subway Uptown Local Stair to Penn Station Connecting Concourse	Stair G1	3,920	1,372	16.0	6.3	B
14a	8th Ave Subway Express Platform Stair - North	Stair M21/22	1,750	612	7.0	7.0	C
15a	8th Ave Subway Express Platform Stair - South	Stair M23/24	2,500	875	7.0	9.1	C

Note: See Figures 13-1 through 13-4.

EVENING PEAK ACCUMULATIONS

In the year 2015 No Build condition, LIRR peak hour traffic is projected to grow, but the patterns of pedestrian movement, queuing and accumulation would remain the same as at present. About 40 percent of LIRR departing passengers would use the Main Gate Area, where most of the LIRR's support and customer service facilities are located. Smaller percentages would use the Central Concourse, Exit Concourse and West End Concourse. Between 2008 and 2015, NJT traffic is projected to continue growing, which would put additional stress on each of the concourse facilities used by NJT passengers for boarding trains in the evening peak—the Seventh Avenue Concourse, the south end of the Exit Concourse, and the Main Concourse on Level B (shared with Amtrak passengers).

In the No Build condition, Amtrak would continue to have its main departure facilities—including ticketing, train information, baggage handling and seated waiting areas—at the Main Concourse on Level B of the existing station. The projected increase in Amtrak evening peak hour boardings of approximately 44 percent between 2008 and 2015 would strain the capacity of the existing facilities. Although the overall level of service for queuing in the Main Concourse would be in the C range—this level of service, while generally acceptable for commuters used to crowded conditions at major terminals, is not desirable for Amtrak intercity rail customers and will constrain Amtrak's ability to build ridership growth to and from New York.

Table 13-13 presents the projected volumes, queues and levels of service during the year 2015 evening peak at each of the principal Penn Station concourses.

Table 13-13

**Weekday Evening Peak Passenger Accumulations Within Boarding
Concourses—2015 No Build**

2015 No Build								
		West End Concse North	Level B Main Concse	Exit Concse North	Exit Concse South	Central Concse	LIRR Main Gate Area	NJT Seventh Avenue Concse
PM Peak Hour Boardings	Amtrak		3,023					
	LIRR	4,355		10,693		1,989	21,164	
	NJT		6,373		5,994			15,550
	Total	4,355	9,396	10,693	5,994	1,989	21,164	15,550
Peak Occupancy	Amtrak		786					
	LIRR	479		1,176		219	2,328	
	NJT		701		659			1,710
	Total	479	1,487	1,176	659	219	2,328	1,710
Effective Queuing Area (sf)		4,000	21,000	10,000	6,000	5,000	17,000	10,000
Queue Density (sf/p)		8.35	14.12	8.50	9.10	22.83	7.30	5.85
Level of Service (LOS)		C/D	A/B	C/D	C/D	A	D	D/E
Note: This analysis assumes normal operating conditions with trains running on or close to schedule; passengers wait at concourse level for track assignment information.								

F. PROBABLE IMPACTS OF THE PROPOSED PROJECT

Future pedestrian circulation conditions within the train station were analyzed for 2015 Build year rail passenger traffic for the proposed Project—with proposed train station and pedestrian station circulation improvements included in the Project assumed to be in place, and with the new non-station development proposed for the Farley Complex and Development Transfer Site. This is defined as the Build condition, and station pedestrian circulation levels of service were compared for the Build and No Build conditions to determine whether or not the Project would generate any significant adverse impacts on pedestrian circulation within the station.

PHYSICAL IMPROVEMENTS FOR PEDESTRIAN CIRCULATION

The Build condition incorporates and builds upon the programmed station improvements that are included in the No Build condition. The Project would result in extensive capital investments in train station facilities within the Farley Complex on the west side of Eighth Avenue and would not involve any modifications to rail passenger facilities and public circulation at the existing Penn Station concourses between Eighth and Seventh Avenues.

The Project would construct a total of 36 stairways, escalators and passenger elevators down to the platforms west of Eighth Avenue, greatly improving passenger access to and from the platforms in this zone of the station. Of these, 21 platform escalators and elevators would be provided at a new public Train Hall within the former mail-handling atrium of the Farley Building. The remaining stairways and escalators would be added to the West End Concourse—an existing passenger concourse that would be widened and extended to provide access to additional station platforms.

One new platform would be opened up for use by Amtrak Empire Service passengers. The existing Diagonal Platform (Platform 12), formerly used for handling mail, would be refurbished and the adjoining tracks reconfigured to connect with the existing tunnel leading to Amtrak's

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Empire Line. This platform would be accessed directly from the Moynihan Station Train Hall as well as from the south end of the extended West End Concourse.

The Project also includes reconfiguration of the 33rd Street passageway within NYC Transit property beneath the Eighth Avenue Subway, providing a more prominent, higher-capacity and ADA-compliant connector between the Farley Complex and the existing Penn Station concourses and subway stations.

Two station options are being considered, primarily affecting the configuration and usage of Moynihan Station within the Farley Complex.

AMTRAK STATION OPTION

In this option, the Project would relocate most of Amtrak's Penn Station operations to the Farley Complex. All of the passenger-handling functions and activities now located at the Main Concourse on Level B of the existing station, beneath Madison Square Garden, would be relocated. The new facilities for Amtrak within Moynihan Station would be larger than those at the existing station—allowing Amtrak ridership to and from New York to approximately triple over the next 20 years. These facilities would be better configured and more attractive than the existing Penn Station facilities.

The new train station facilities west of Eighth Avenue also would be used by commuters. The existing West End Concourse would be widened and lengthened, expanding its access to additional platforms and making it usable by NJT passengers in addition to LIRR riders. Commuter passengers would be able to wait and obtain train information at the Moynihan Station Train Hall as well as within the West End Concourse. The facilities would allow the Train Hall to better accommodate Amtrak and commuter passengers simultaneously in the same space, avoiding the cramped and crowded conditions that typically prevail in the evening peak period in the existing Penn Station Main Concourse.

Train Hall

The configuration of the Train Hall on Level B of Moynihan Station remains similar to the 2006 plan and is shown on **Figure 13-5**. The major difference from the 2006 plan is the relocation of most of Amtrak's station operations and passenger-handling activities from Penn Station to Moynihan Station.

The central atrium of the Farley Building would become a large public concourse for rail passengers, providing a passenger elevator and two direct escalators to seven station platforms—Platforms 3 through 8 (Tracks 5-16) plus the Diagonal Platform. These are the platforms used by Amtrak, and these vertical circulation elements would be the way that departing Amtrak passengers board their trains.

Station-related retail would line the northern, eastern and southern edges of the Train Hall, which, along with the sky-lit atrium, would make this an attractive location for Amtrak passengers to wait for trains, as well as for commuter passengers arriving on foot from the West Side of Midtown Manhattan.

The central and western portions of the Train Hall would be occupied primarily by Amtrak passengers either waiting or queuing at the escalators prior to boarding. The eastern side of the Train Hall would be used by commuter passengers as a waiting zone, with LIRR passengers congregating towards the northeast corner of the Train Hall, and, to a lesser extent, NJT passengers using the southeastern portion of the Train Hall.

Large train information boards would be mounted on the east wall of the Train Hall, providing up-to-the-minute train information. A staffed information booth also would be provided within the Train Hall.

When not in use for passenger boarding, the platform escalators and elevators would be available for use by arriving Amtrak, LIRR and NJT passengers exiting the platforms.

The western edge of the Train Hall would contain all of Amtrak's passenger-handling and service functions, including the ticket office, ticket vending machines, baggage check and claim facilities, seated waiting areas, customer service office, and ClubAcela lounge for first class passengers and frequent travelers. A public corridor (Location #15 on **Figures 13-5** and **13-6**) would head west along the alignment of West 32nd Street from the Train Hall, lined on both sides with retail stores, providing pedestrian access to Ninth Avenue.

Intermodal Hall and Circulation

The configuration of the Amtrak Station Option at street level (Level C) is shown on **Figure 13-6**. A prominent bank of escalators and stairs would lead upwards from the west side of the Train Hall on Level B to another significant public space at street level—the Intermodal Hall (Location #16 on Level C, shown on **Figures 13-5** and **13-6**). This upper level public hall would provide access to the primary street entrances at the West 33rd Street midblock and at Ninth Avenue, as well as to a secondary entrance at the West 31st Street midblock. The Intermodal Hall would have a sky-lit roof and would provide access to the street, destination retail stores and other development in the Western Annex of the Farley Complex. Pedestrians would be able to walk along a balcony overlooking the north side of the Train Hall to reach the Post Office facility at the Eighth Avenue end of the Farley Building and the grand Eighth Avenue stairs. The upper level public spaces also would provide important reservoir space that could be occupied by rail passengers in the event of significant train delay conditions, where they would obtain up-to-date information on the status of train departures while relieving the intense overcrowding that typically occurs within the existing station when such delays occur.

OPEN STATION OPTION

In this option, the configuration of public spaces within the Farley Building would be similar to the Amtrak Station option, with the major difference being that Amtrak's station facilities and passenger-handling activities would remain in their existing locations within Penn Station, and Amtrak passengers would board intercity trains from the existing main concourse instead of from the Moynihan Station Train Hall.

In this option, the Train Hall and West End Concourse would be usable by rail passengers of any of the railroads operating at Penn Station—Amtrak, LIRR, NJT and, in the future, Metro-North. Train departure information for each of the railroads would be displayed in the Train Hall, and ticket vending machines for each railroad would be provided. As a practical matter, the Train Hall and West End Concourse likely would be most heavily utilized by LIRR passengers, because access to all of the LIRR's platforms would be relatively convenient. Amtrak departing passengers would likely continue to use the existing Main Concourse for train boarding. Commuters from New Jersey arriving on the western ends of NJT commuter trains would find it convenient to use the new station facilities west of Eighth Avenue; however, the Train Hall and West End Concourse would be of limited utility to NJT departing passengers because direct access would be not be provided to all of the station platforms used by NJT. In the future, if

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direct access is provided to Platforms 1 and 2 (serving Tracks 1-4) independently of the Project, the Train Hall could become a full-service concourse for NJT.

Train Hall

The configuration of the Train Hall atrium would be similar to the Amtrak Station Option, with a large public concourse beneath a sky-lit roof, punctuated by the escalators and elevators leading directly down to the platforms, as shown on **Figure 13-7**. Access to the Train Hall from the street would be the same in both options. Vertical circulation down to the West End Concourse level would be exactly the same as in the Amtrak Station Option.

The western edge of the Train Hall would be configured differently in the Open Station Option. The horseshoe-shaped Amtrak ticketing and waiting zone would not be constructed, and the public retail corridor at the Train Hall level heading westward towards Ninth Avenue would not be built (although the corridor would be constructed one level up on Level C as under the Amtrak Station Option). Instead, the west side of the Train Hall would be occupied by retail space and potential railroad back-of-house functions, and the Western Annex basement would contain loading and support space for the U.S. Postal Service.

Intermodal Hall and Circulation

As in the Amtrak Station Option, a large stair/escalator bank would lead upward to the west from the Train Hall on Level B to the Intermodal Hall at street level (Level C). The general configuration of public corridors and entranceways on Level C would be similar between the two schemes, as shown on **Figure 13-8**, as would the types of retail uses envisioned for the Western Annex.

The major difference between the two options would be that the Intermodal Hall and the West 32nd Street pedestrian corridor would have a large, continuous floor in the Open Station Option, without an opening to the level below, providing a larger quantity of public space that would serve the portion of the site devoted to retail and provide a reservoir of space that could be occupied by rail passengers in the event of train delays. The Intermodal Hall level is shown on **Figure 13-8**.

Public corridors along the north and south balconies of the Train Hall would connect the midblock Intermodal Hall to the existing Post Office lobby at Eighth Avenue, which would remain as a public Post Office.

ELEMENTS COMMON TO BOTH OPTIONS

West End Concourse Extension

The Project would both widen and lengthen the existing West End Concourse. The concourse would be approximately doubled in width, from 17 to 38 feet, providing increased space for both passenger waiting and circulation. The existing concourse serves only those platforms used by the LIRR, Platforms 7 through 11 (Tracks 13-21). The West End Concourse would be extended all the way to the south station retaining wall, as shown on **Figure 13-9**. This extension would provide new stairways down to Platforms 3 through 6 (Tracks 5-12), enable future stair connections to Platforms 1 and 2 (Tracks 1-4) when these platforms are extended westward (which is not part of the Project), and allow for a future connecting passageway to the existing Penn Station concourses in the vicinity of 31st Street (also not part of the Project). Instead of serving only LIRR passengers, the enlarged concourse would be used by passengers arriving on

LIRR, NJT and Amtrak trains. Arriving passengers would be able to ascend from the platforms to the West End Concourse and then proceed either directly to the 33rd Street Connector (providing access to the Eighth Avenue Subway, Seventh Avenue Subway, and the existing Penn Station concourses) or up one additional level to the Train Hall and the exits to street level.

The northern end of the West End Concourse would continue to be used by LIRR passengers, particularly as a route for those passengers transferring to and from the Eighth Avenue Subway, and as a place for departing passengers to obtain train information, wait, and then proceed to platform level when track assignments are posted.

The extended West End Concourse also potentially would be used by some NJT passengers to board their trains during the evening peak, but the inability to provide universal access from the concourse to all station platforms used by NJT would limit its usefulness for departing NJT passengers. Since the track assignments for NJT commuter trains can vary from day to day, and since a significant percentage of trains depart from Platforms 1 and 2 (Tracks 1-4), most NJT passengers would choose to wait and obtain train information at concourse locations within the existing station with direct access to all platforms.

For purposes of this Technical Memorandum, the conservative assumption has been made that up to five percent of NJT departing passengers would board trains from the extended West End Concourse. Until Platforms 1 and 2 (Tracks 1-4) are extended independently of the Project, the actual usage of the West End Concourse by NJT passengers is expected to be less.

At the southern end of the extended West End Concourse, a stairway would be provided down to the east end of the Diagonal Platform. This stair would provide a direct walking route for Empire Service passengers between the platform and the subways,

Platform Access

The Project would add vertical circulation capacity to and from Platforms 3 through 8 (serving Tracks 5-16) in Penn Station—all of it west of Eighth Avenue. No changes would be made to vertical circulation on Platforms 1, 2, 10 and 11 (which serve Tracks 1/2, 3/4, 18/19, and 20/21, respectively). As part of the West End Concourse widening, one existing escalator and four existing stairways would be removed and replaced with new stairways on Platforms 7, 8 and 9, (serving Tracks 13/14, 15/16, and 17, respectively), with the replacement stair capacity equaling or exceeding the existing vertical circulation capacity at each of these platforms. On Platforms 3 through 6 (Tracks 5-12), all existing vertical circulation would be retained, and new capacity would be created west of Eighth Avenue. The proposed platform access improvements include:

- Platform 3 (Tracks 5/6)
 - 2 new escalators (Train Hall), 2 new stairs (West End Concourse)
 - 1 new elevator
- Platforms 4, 5 & 6 (Tracks 7-12)
 - 2 new escalators (Train Hall), 2 new stairs (West End Concourse)
 - 1 new passenger elevator, 1 new service elevator, 1 new emergency stair
- Platforms 7 & 8 (Tracks 13-16)
 - 2 new escalators (Train Hall), 2 new stairs replacing existing stairs and escalator (West End Concourse), 1 new passenger elevator, 1 new service elevator, 1 new emergency stair

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- Platform 9 (Track 17)
 - 2 new stairs, replacing the existing stairs (West End Concourse)
- Diagonal Platform (Platform 12)
 - 2 new escalators (Train Hall), 1 new stair (West End Concourse), 1 new passenger elevator, 2 new service elevators.

A pair of escalators would be provided from the center of the Train Hall directly to each of Platforms 3 through 8 (Tracks 5-16). New ADA-compliant passenger elevators would be provided at the Train Hall, serving Platforms 3 through 8 (Tracks 5-16). The elevators to Platforms 4 through 8 (Tracks 7-16) would be located on the west side of the Train Hall. The elevator to Platform 3, serving Tracks 5 and 6 (which does not extend as far west as the other platforms) would be located on the south side of the concourse.

At the lower concourse level (Level A), the Project would retain the existing stairs down to Platforms 9, 10 and 11 (serving Tracks 17-21). New stairway access would be provided from the east side of the widened and lengthened West End Concourse down to Platforms 3 through 8 (Tracks 5-16). A pair of new stairways, nominally 6 feet wide, would be provided to each of these platforms. One stair would point towards the west end of the platform; the other would point eastward. Both stairs would turn 90 degrees and have a common landing. The stairs would rise to a landing area at the West End Concourse level shared with one adjacent platform. This would create three groups of two platforms each (i.e., Platforms 3 & 4, 5 & 6, and 7 & 8—serving Tracks 5-16), each sharing a common landing area. This configuration would minimize the quantity of passenger queuing occurring within the West End Concourse itself at the tops of the stairways. All platform access would occur on the east side of the concourse; waiting, train information and access up to the Train Hall would occur on the west side of the concourse.

A pair of escalators and a passenger elevator would be constructed at the south side of the Train Hall to the Diagonal Platform, which is expected to become the primary platform used by all Amtrak Empire Line trains providing service within New York State.

Emergency exit stairways would be provided toward the western ends of Platforms 4 through 8 (Tracks 7-16) to supplement the station's egress capacity and eliminate an existing *cul-de-sac* condition that exists at the west ends of these platforms. An emergency exit towards the western end of the Diagonal Platform also would be provided.

Level A to B Vertical Circulation—North Side (Location #17)

At the Train Hall level (Level B), in the vicinity of the ramp along the north edge of the Farley Building, a vertical circulation element would descend from the Train Hall level down to the north end of the West End Concourse (Location #17 on **Figures 13-5, 13-7, and 13-9**). Escalators could be provided at this location, which lies above the western end of Platform 10 (Tracks 18 and 19). The ramp (Location #21 on **Figures 13-5 and 13-7**) would be approximately 19 feet wide and would occupy the southern half of the space, while the escalators and/or stair would occupy the northern half of the space along the outside wall of the Farley Building. The pedestrian circulation capacity of the ramp is greater than the capacity of the doorways leading out to Eighth Avenue; therefore, the ramp as shown would not constrain the flow of pedestrians moving into and out of the Farley Building at this location.

Level A to B Vertical Circulation—South Side (Location #18)

This vertical circulation element (Location #18 on **Figures 13-5, 13-7, and 13-9**) toward the southern edge of the Farley Building corresponds to the vertical circulation element described above (Location #17), providing access between the Train Hall and extended West End Concourse on the West 31st Street side of the building. A stairway would be provided at this location, since escalator pits would conflict with the catenary structure and dynamic envelope of the trains on the tracks immediately below. This south side stairway would not be as heavily used as the vertical circulation on the north side. The ramp zone (Location #22 on **Figures 13-5 and 13-7**) would have ample space to accommodate projected pedestrian flows on both a stair and a ramp at an uncongested level of service.

33rd Street Connector and Eighth Avenue Subway Station Modifications

The indoor pedestrian route through the Eighth Avenue Subway station that links the West End Concourse with the other Penn Station concourses would be enlarged and improved. This 33rd Street Connector would become one of the major pedestrian access routes to the new station facilities west of Eighth Avenue. The Project would widen the existing east and west ramps and modify the N67 mezzanine level subway turnstile array to create as wide a public walkway as is physically possible within the limits of the trainshed structure and the property line. The connector would provide a direct, indoor walking route between the existing Penn Station concourses and Moynihan Station. Though the space within and adjacent to the Eighth Avenue Subway station would have relatively low ceiling heights (underneath the Eighth Avenue Subway), the Project would significantly improve and widen the existing public circulation spaces.

Both the west ramp leading to the Train Hall and West End Concourse (Location #9 on **Figures 13-1, 13-4, 13-9, and 13-10**) and the east ramp leading to the existing Penn Station (Location #8 on **Figures 13-1, 13-4, 13-9, and 13-10**) would be widened and made compliant with ADA requirements for ramp grades, landings and handrails. This would entail relocating existing stairwells and extending the ramps. On both sides, there would be a single ramp with the same profile, although some intermediate columns would be necessary to support the subway structure and existing utilities. To replace the stairways that would be eliminated, a new double stairway system would be constructed serving the downtown local platform level of the Eighth Avenue Subway. One side of the stairway would aim towards the west ramp (Location #12 on **Figures 13-1, 13-4, 13-9, and 13-10**), providing a logical but somewhat lengthy path for downtown local subway passengers going to the existing Penn Station concourses. The other half of the stair would turn 90 degrees and aim directly towards the West End Concourse and the stair/escalator bank leading up to the Train Hall (Location #11 on **Figures 13-1, 13-4, 13-9, and 13-10**).

Within the mezzanine level of the Eighth Avenue Subway station at the West 33rd Street end, the configuration of the subway turnstiles would be modified to increase the width of the east-west through passageway and to provide zones outside of the main passageway where subway patrons could queue to enter the turnstiles or purchase MetroCards from vending machines or the customer service booth (see **Figure 13-10**).

Additional queuing space on the western side of the mezzanine would be created by relocating existing NYCT back-of-house facilities, including employee lockers and showers, to other locations within the subway station. The existing pair of stairways up to the express subway platform would be retained, as would the existing service booth on the east side of the mezzanine. A new bank of six turnstiles would be installed on the western side of the turnstile array. This bank of turnstiles would be placed at a 45-degree angle to provide a direct access

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path from Moynihan Station and the West End Concourse and to enable turnstile queues to form outside of the main east-west flow passageway. The existing pair of high entry-exit turnstiles (HEETs) would be shifted to the west side of the turnstile array to make room for additional turnstiles on the east side. (These HEET units could be converted to standard turnstiles should NYCT determine that HEETs are not required at this location.)

On the eastern side of the mezzanine, a set of three turnstiles, also angled at 45 degrees, would be placed at the southeast corner of the array aimed at the east ramp at the 33rd Street Connector leading to the existing Penn Station concourses. In addition, two additional banks of four turnstiles each would be located on the eastern side of the turnstile array. The total number of turnstile units would be increased from 13 to 17.

Street Entrances

There would be five separate entrances to the new station facilities and public spaces in the Farley Complex. These entrances would be in addition to the existing stairs on Eighth Avenue that lead up to the existing Post Office retail lobby.

New doorways would be provided at the northeast (Location #27) and southeast (Location #28) corners of the Farley Building to provide pedestrian access from Eighth Avenue directly into the Train Hall. (Locations #27 and #28 are shown on **Figures 13-5** and **13-7**.) Rail passengers would be able to walk into the building at street level from Eighth Avenue, descend down short ramps along the north and south edges of the building, and then directly enter the Train Hall on the north or south side.

Additional station entrances would be provided at the West 33rd Street and West 31st Street midblocks (Locations #29 and #30, respectively, shown on **Figures 13-6** and **13-8**), and at Ninth Avenue (Location #31 on **Figures 13-6** and **13-8**). Since West 31st and West 33rd Streets rise in grade from east to west adjacent to the Farley Complex, these three entrances would lead to the Intermodal Hall, from which passengers would then descend via the main escalator/stair bank into the Train Hall.

The West 33rd Street midblock entrance would be the primary entrance to the Moynihan Station facilities at the Farley Complex. A taxi stand would be located at this entrance, and a widened sidewalk would lead towards Ninth Avenue and the West Side, where extensive new development is planned in the future without the Project.

At Level C, a retail-lined corridor along the alignment of West 32nd Street would provide a direct pedestrian connection between the Intermodal Hall and the Ninth Avenue entrance to Moynihan Station. This corridor would be part of a multi-level retail complex but would also serve as one of the important routes to and from the station for west side residents and workers and those who may be arriving via taxi at Ninth Avenue.

The West 31st Street midblock entrance would be somewhat smaller, reflecting the lower estimated volume of pedestrians walking along this street, as well as physical constraints imposed by the existing Farley Complex.

Cumulatively, these five new station entrances would increase the number of major station entrances from 7 to 12 and increase the overall emergency egress capacity of the station by 40 percent.

USAGE OF STATION FACILITIES BY RAIL PASSENGERS

Amtrak peak hour ridership is projected to increase as a result of the improved quality of service offered to Amtrak passengers by the Project and improved Empire Line service enabled by the conversion of the Diagonal Platform for use by Empire Line passengers. LIRR and NJT rail commuter traffic levels in the year 2015 are assumed to be the same in the Build and No Build conditions. The incremental passenger-handling capacity provided by the Project far exceeds the increase in railroad ridership that would be generated by the Project. In total, therefore, the Project would improve the average level of service throughout the station. Because Project improvements are focused on the western side of the station, with no construction proposed for the existing Penn Station between Eighth and Seventh Avenues, Project benefits would accrue primarily, but not exclusively, to passengers using station facilities west of Eighth Avenue. Nonetheless, these directly benefited passengers would number in the range of 20 to 25 percent of the station total.

In addition to increasing pedestrian circulation capacity, the proposed improvements would tend to redistribute passenger traffic somewhat within the station, moving the station's center of gravity westward with the development of the new Moynihan Station facilities west of Eighth Avenue. The increase in overall circulation and egress capacity would spread the peak volumes over a larger area and a greater number of facilities, which would lessen the utilization and peak congestion levels at many existing locations in the station. As demonstrated in **Tables 13-14** and **13-15**, many locations in the existing station would be improved by the Project in comparison with the No Build condition. However, not all locations within the existing station would improve, and the magnitude of improvement would be tempered by the continued attractiveness of the existing station concourses for pedestrian trips to and from the Seventh Avenue Subway and the street level east of the station. Although the Project would produce a westward shift of passenger traffic to and from the rail platforms, the predominant origins and destinations of trips to and from Penn Station are expected to continue to lie to the east of the station.

MORNING AND EVENING PEAK FLOWS

Estimated pedestrian flow volumes and levels of service in the morning peak hour at selected locations within the existing Penn Station complex are presented in **Table 13-14** for existing conditions and for the year 2015 No Build and Build¹ conditions. The equivalent volumes and levels of service are shown for the evening peak hour in **Table 13-15**. In general, peak pedestrian flow rates with the implementation of the Project would be at or below the levels projected for the 2015 No Build condition. At most locations, peak flows would be lower in the evening peak than in the morning peak, and passengers would be able to circulate through the station facilities within the Farley Complex and 33rd Street Connector at acceptable levels of service.

Projected morning peak pedestrian flow volumes and levels of service in the year 2015 within the Farley Complex, including the West End Concourse, are presented in **Table 13-16a** for the Amtrak Station Option and **Table 13-16b** for the Open Station Option. Projected evening peak volumes and levels of service are presented in **Table 13-17a** for the Amtrak Station Option and **Table 13-17b** for the Open Station Option.

¹ Conditions within the existing station were analyzed for one of the two Moynihan Station rail occupancy options: the Amtrak Station Option, which is considered representative of projected future conditions within the overall Penn Station complex.

Table 13-14
Comparison of Weekday Morning Peak Pedestrian Flow Levels of
Service at Selected Penn Station Locations

Location		Circulation Element Type	Existing, No Build, and Build Condition	Peak Hour Volume	Peak 15 Min. Volume	Effective Width (ft.)	Peak Flow Rate (p/m/ft)	Level of Service
1	Main Entrance, 7th & 32nd	Stair + 2 Escs	Existing (2008)	11,881	4,158	16.5	15.4	E
			2015 No Build	12,161	4,256	16.5	15.6	E
			2015 Build	10,978	3,842	16.5	14.1	E
2	LIRR Entrance, 7th & 34th	Stair + 3 Escs	Existing (2008)	9,246	3,236	13.5	14.9	E
			2015 No Build	10,423	3,648	13.5	16.5	E
			2015 Build	10,232	3,581	13.5	16.3	E
3	NJT Entrance, 7th & 31st	Stair + 2 Escs	Existing (2008)	--	--	--	--	--
			2015 No Build	5,952	2,083	12.5	9.8	C/D
			2015 Build	4,704	1,646	12.5	7.8	C
4	33rd St Connecting Concourse West of LIRR Main Gate Area	Corridor	Existing (2008)	10,279	3,598	20.0	13.2	C
			2015 No Build	12,747	4,461	20.0	16.4	D
			2015 Build	13,377	4,682	20.0	17.2	D
5	33rd St Connecting Concourse East of Exit Concourse	Corridor	Existing (2008)	11,005	3,852	19.0	14.9	C/D
			2015 No Build	13,936	4,878	19.0	18.8	D
			2015 Build	13,541	4,739	19.0	18.3	D
6	33rd St Connecting Concourse East of 8th Ave Subway	Corridor	Existing (2008)	11,859	4,151	26.0	11.7	C
			2015 No Build	15,532	5,436	26.0	15.3	C/D
			2015 Build	14,795	5,178	26.0	14.6	C/D
7	Hilton Passageway, East End	Corridor	Existing (2008)	6,322	2,213	12.0	13.5	C
			2015 No Build	8,639	3,024	12.0	18.5	D
			2015 Build	7,462	2,612	12.0	16.0	D
8	33rd Street Connector East Ramp	Corridor	Existing (2008)	6,950	2,432	14.0	12.7	C
			2015 No Build	8,270	2,896	14.0	15.2	D
			2015 Build	10,900	3,800	18.5	15.0	D
9	33rd Street Connector West Ramp	Corridor	Existing (2008)	3,220	1,125	11.0	8.2	B
			2015 No Build	4,090	1,430	11.0	10.4	C
			2015 Build	10,290	3,602	19.5	14.8	C/D
10	West End Concourse North End	Corridor	Existing (2008)	6,208	2,173	13.0	12.3	C
			2015 No Build	8,093	2,833	13.0	14.5	C/D
			2015 Build	10,159	3,556	25.0	9.5	B
11	8th Ave Subway Downtown Local Stair to West End Concourse	Stair	Existing (2008)	1,980	694	7.0	7.9	C
			2015 No Build	2,830	990	7.0	11.3	D
			2015 Build	2,069	724	10.0	5.8	B
12	8th Ave Subway Downtown Local Stair to Subway Mezzanine	Stair	Existing (2008)	1,830	642	8.2	6.3	B
			2015 No Build	1,980	693	8.2	6.7	C
			2015 Build	2,270	794	10.0	6.4	B
13a	8th Ave Subway Uptown Local Stair to Penn Station Connecting Conc	Stair G1	Existing (2008)	5,020	1,757	16.0	9.4	C
			2015 No Build	7,610	2,663	16.0	13.4	E
			2015 Build	7,170	2,511	16.0	12.5	D
14a	8th Ave Subway Express Stair North	Stair M21/22	Existing (2008)	1,150	403	7.0	4.6	B
			2015 No Build	1,270	444	7.0	5.1	B
			2015 Build	2,590	907	7.0	9.4	C
15a	8th Ave Subway Express Stair South	Stair M23/24	Existing (2008)	2,160	755	7.0	8.6	C
			2015 No Build	2,850	999	7.0	11.5	D
			2015 Build	2,390	834	7.0	9.6	C
16a	8th Ave Subway N67 Mezzanine Turnstiles	Turnstiles	Existing (2008)	5,760	2,016	13 units	12.0	B
			2015 No Build	7,230	2,531	13 units	15.1	C
			2015 Build	8,760	3,068	17 units	14.1	C

Note: See Figures 13-1 through 13-10.

Table 13-15
Comparison of Weekday Evening Peak Pedestrian Flow Levels of Service
at Selected Penn Station Locations

Location	Circulation Element Type	Existing, No Build, and Build Condition	Peak Hour Volume	Peak 15 Min. Volume	Effective Width (ft.)	Peak Flow Rate (p/m/ft)	Level of Service
1	Main Entrance, 7th & 32nd Stair + 2 Escs	Existing (2008)	10,160	3,556	16.5	11.8	D
		2015 No Build	10,648	3,727	16.5	12.2	D
		2015 Build	9,731	3,406	16.5	11.2	D
2	LIRR Entrance, 7th & 34th Stair +3 Escs	Existing (2008)	7,668	2,684	13.5	11.3	D
		2015 No Build	9,342	3,270	13.5	13.7	E
		2015 Build	8,819	3,087	13.5	12.8	D/E
3	NJT Entrance, 7th & 31st Stair + 2 Escs	Existing (2008)	--	--	--	--	--
		2015 No Build	5,775	2,021	12.5	8.8	C
		2015 Build	4,578	1,602	12.5	6.9	B/C
4	33rd St Connecting Concourse West of LIRR Main Gate Area Corridor	Existing (2008)	8,430	2,951	20.0	10.8	C
		2015 No Build	10,536	3,688	20.0	13.5	C
		2015 Build	11,172	3,910	20.0	14.3	C
5	33rd St Connecting Concourse East of Exit Concourse Corridor	Existing (2008)	8,484	2,969	19.0	11.5	C
		2015 No Build	10,659	3,731	19.0	14.4	C
		2015 Build	11,290	3,952	19.0	15.3	C/D
6	33rd St Connecting Concourse East of 8th Ave Subway Corridor	Existing (2008)	13,633	4,772	26.0	13.5	C
		2015 No Build	16,911	5,919	26.0	16.7	D
		2015 Build	16,325	5,714	26.0	16.1	D
7	Hilton Passageway, East End Corridor	Existing (2008)	5,328	1,865	12.0	11.4	C
		2015 No Build	7,342	2,570	12.0	15.7	D
		2015 Build	6,145	2,151	12.0	13.1	C
8	33rd Street Connector East Ramp Corridor	Existing (2008)	7,870	2,754	14.0	15.8	D
		2015 No Build	10,720	3,753	14.0	21.4	E
		2015 Build	12,300	4,308	18.5	18.6	D
9	33rd Street Connector West Ramp Corridor	Existing (2008)	1,720	603	11.0	4.0	A
		2015 No Build	2,490	871	11.0	5.8	A
		2015 Build	7,350	2,571	19.5	10.5	C
10	West End Concourse North End Corridor	Existing (2008)	5,014	1,755	13.0	9.0	B
		2015 No Build	6,625	2,319	13.0	11.9	C
		2015 Build	8,641	3,024	25.0	8.1	B
11	8th Ave Subway Downtown Local Stair to West End Concourse Stair	Existing (2008)	2,745	961	7.0	10.1	C/D
		2015 No Build	3,646	1,276	7.0	13.4	D/E
		2015 Build	3,555	1,244	10.0	8.3	C
12	8th Ave Subway Downtown Local Stair to Subway Mezzanine Stair	Existing (2008)	3,315	1,160	8.2	10.4	C/D
		2015 No Build	3,925	1,374	8.2	12.3	D
		2015 Build	3,868	1,354	10.0	9.0	C
13a	8th Ave Subway Uptown Local Stair to Penn Station Connecting Conc Stair G1	Existing (2008)	2,940	1,030	15.0	5.1	B
		2015 No Build	3,920	1,372	15.0	6.3	B
		2015 Build	3,880	1,359	15.0	6.3	B
14a	8th Ave Subway Express Stair North Stair M21/22	Existing (2008)	1,320	461	7.0	5.3	B
		2015 No Build	1,750	612	7.0	7.0	C
		2015 Build	2,080	726	7.0	8.2	C
15a	8th Ave Subway Express Stair South Stair M23/24	Existing (2008)	1,840	643	7.0	6.8	B
		2015 No Build	2,500	875	7.0	9.1	C
		2015 Build	2,550	893	7.0	9.4	C
16a	8th Ave Subway N67 Mezzanine Turnstiles Turnstiles	Existing (2008)	6,450	2,257	13 units	13.0	C
		2015 No Build	8,680	3,039	13 units	17.8	C
		2015 Build	9,050	3,166	17 units	13.0	C

Note: See Figures 13-1 through 13-10.

Table 13-16a
Weekday Morning Peak Pedestrian Flow Levels of Service within Farley Complex
Amtrak Station Option—2015 Build

	Location	Circulation Element Type	Peak Hour Volume	Peak 15 Min. Volume	Effective Width (ft.)	Peak Flow Rate (p/m/ft)	Level of Service
13	Train Hall North Side	Corridor	6,837	2,392	47.0	3.7	A
14	Train Hall South Side	Corridor	2,826	989	33.0	2.2	A
15	Train Hall West Retail Corridor	Corridor	1,286	450	17.0	1.9	A
16	Train Hall Grand Stair/Escalator - Up	2 escalators plus 2 stairs	4,438	1,553	22.0	5.0	A/B
	Train Hall Grand Stair/Escalator - Down	2 escalators plus 2 stairs	2,152	753	22.0	2.4	A
17	North Edge Vertical Circulation - Up	1 escalator plus stair	2,203	771	8.5	6.3	B
	North Edge Vertical Circulation - Down	1 escalator	1,479	518	4.5	8.2	C
18	South Edge Vertical Circulation	Stair	420	147	7.5	1.5	A
19	Train Hall Vertical Circulation to West End Concourse -- Northeast Corner - Up	1 escalator	970	340	4.5	5.4	A/B
	Train Hall Vertical Circulation to West End Concourse -- Northeast Corner - Down	Stair	563	197	11.0	1.2	A
20	Train Hall Vertical Circulation to West End Concourse -- Southeast Corner - Up	1 escalator	817	202	4.5	3.0	A
	Train Hall Vertical Circulation to West End Concourse -- Southeast Corner - Down	Stair	239	84	11.0	0.6	A
21	North Ramp	Corridor	4,594	1,608	17.0	6.9	A/B
22	South Ramp	Corridor	2,388	836	17.0	3.6	A
23	West End Concourse - North Cordon	Corridor	5,948	2,082	19.0	8.0	B
24	West End Concourse - North Central Cordon	Corridor	5,977	2,092	19.0	8.0	B
25	West End Concourse - South Central Cordon	Corridor	2,915	1,020	19.0	3.9	A
26	West End Concourse - South Cordon	Corridor	1,482	519	19.0	2.0	A
27	Farley Eighth Ave Entrance at 33rd Street	Doorway	3,993	1,397	6 units	17.1	B
28	Farley Eighth Ave Entrance at 31st Street	Doorway	2,187	766	6 units	9.4	A
29	Farley 33rd Street Midblock Entrance	Doorway	4,282	1,499	12 units	9.2	A
30	Farley 31st Street Midblock Entrance	Doorway	930	326	6 units	4.0	A
31	Farley Ninth Avenue Entrance	Doorway	936	328	12 units	2.0	A

Note: See Figures 13-5 through 13-10.

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Table 13-16b
Weekday Morning Peak Pedestrian Flow Levels of Service within Farley Complex
Open Station Option—2015 Build

	Location	Circulation Element Type	Peak Hour Volume	Peak 15 Min. Volume	Effective Width (ft.)	Peak Flow Rate (p/m/ft)	Level of Service
13	Train Hall North Side	Corridor	5,440	1,904	47.0	3.0	A
14	Train Hall South Side	Corridor	2,513	879	33.0	2.0	A
15	Train Hall West Retail Corridor	Corridor	n.a.	n.a.	n.a.	n.a.	n.a.
16	Train Hall Grand Stair/Escalator - Up	2 escalators plus 2 stairs	3,949	1,382	22.0	4.4	A
	Train Hall Grand Stair/Escalator - Down	2 escalators plus 2 stairs	1,183	414	22.0	1.3	A
17	North Edge Vertical Circulation - Up	1 escalator plus stair	1,587	555	8.5	4.6	A/B
	North Edge Vertical Circulation - Down	1 escalator	1,379	483	4.5	7.5	B/C
18	South Edge Vertical Circulation	Stair	410	144	7.5	1.5	A
19	Train Hall Vertical Circulation to West End Concourse -- Northeast Corner - Up	1 escalator	892	312	4.5	4.9	A/B
	Train Hall Vertical Circulation to West End Concourse -- Northeast Corner - Down	Stair	407	143	11.0	1.0	A
20	Train Hall Vertical Circulation to West End Concourse -- Southeast Corner - Up	1 escalator	716	196	4.5	3.0	A
	Train Hall Vertical Circulation to West End Concourse -- Southeast Corner - Down	Stair	157	55	11.0	0.4	A
21	North Ramp	Corridor	3,936	1,377	17.0	6.0	A
22	South Ramp	Corridor	2,078	727	17.0	3.1	A
23	West End Concourse - North Cordon	Corridor	5,683	1,989	19.0	7.7	B
24	West End Concourse - North Central Cordon	Corridor	5,784	2,025	19.0	7.8	B
25	West End Concourse - South Central Cordon	Corridor	2,785	975	19.0	3.8	A
26	West End Concourse - South Cordon	Corridor	1,446	506	19.0	2.0	A
27	Farley Eighth Ave Entrance at 33rd Street	Doorway	3,704	1,296	6 units	15.8	B
28	Farley Eighth Ave Entrance at 31st Street	Doorway	2,067	724	6 units	8.8	A
29	Farley 33rd Street Midblock Entrance	Doorway	3,719	1,302	12 units	8.0	A
30	Farley 31st Street Midblock Entrance	Doorway	921	323	6 units	4.0	A
31	Farley Ninth Avenue Entrance	Doorway	930	326	12 units	2.0	A

Note: See Figures 13-5 through 13-10.

Table 13-17a
Weekday Evening Peak Pedestrian Flow Levels of Service within Farley Complex
Amtrak Station Option—2015 Build

	Location	Circulation Element Type	Peak Hour Volume	Peak 15 Min. Volume	Effective Width (ft.)	Peak Flow Rate (p/m/ft)	Level of Service
13	Train Hall North Side	Corridor	5,426	1,899	47.0	3.0	A
14	Train Hall South Side	Corridor	1,711	599	33.0	1.3	A
15	Train Hall West Retail Corridor	Corridor	1,335	468	17.0	2.0	A
16	Train Hall Grand Stair/Escalator - Up	2 escalators plus 2 stairs	1,808	633	22.0	2.0	A
	Train Hall Grand Stair/Escalator - Down	2 escalators plus 2 stairs	6,230	2,181	22.0	6.9	B/C
17	North Edge Vertical Circulation - Up	1 escalator plus stair	1,906	667	4.5	10.3	C/D
	North Edge Vertical Circulation - Down	1 escalator	3,361	1,176	8.5	9.6	C/D
18	South Edge Vertical Circulation	Stair	208	73	7.5	0.7	A
19	Train Hall Vertical Circulation to West End Concourse -- Northeast Corner -- Up	1 escalator	344	120	4.5	1.9	A
	Train Hall Vertical Circulation to West End Concourse -- Northeast Corner -- Down	Stair	3,721	1,302	11.0	8.3	C
20	Train Hall Vertical Circulation to West End Concourse -- Southeast Corner -- Up	1 escalator	180	63	4.5	0.9	A
	Train Hall Vertical Circulation to West End Concourse -- Southeast Corner -- Down	Stair	860	301	11.0	1.9	A
21	North Ramp	Corridor	3,380	1,183	17.0	5.1	A
22	South Ramp	Corridor	1,304	457	17.0	1.9	A
23	West End Concourse - North Cordon	Corridor	3,509	1,228	19.0	4.7	A
24	West End Concourse - North Central Cordon	Corridor	3,387	1,186	19.0	4.6	A
25	West End Concourse - South Central Cordon	Corridor	1,226	429	19.0	1.7	A
26	West End Concourse - South Cordon	Corridor	804	282	19.0	1.1	A
27	Farley Eighth Ave Entrance at 33rd Street	Doorway	2,779	973	6 units	11.9	A
28	Farley Eighth Ave Entrance at 31st Street	Doorway	1,105	387	6 units	4.8	A
29	Farley 33rd Street Midblock Entrance	Doorway	5,953	2,083	12 units	12.7	A
30	Farley 31st Street Midblock Entrance	Doorway	739	259	6 units	3.1	A
31	Farley Ninth Avenue Entrance	Doorway	734	257	12 units	1.6	A

Note: See Figures 13-5 through 13-10.

Table 13-17b

**Weekday Evening Peak Pedestrian Flow Levels of Service within Farley Complex
Open Station Option—2015 Build**

	Location	Circulation Element Type	Peak Hour Volume	Peak 15 Min. Volume	Effective Width (ft.)	Peak Flow Rate (p/m/ft)	Level of Service
13	Train Hall North Side	Corridor	4,111	1,439	47.0	2.2	A
14	Train Hall South Side	Corridor	1,363	478	33.0	1.1	A
15	Train Hall West Retail Corridor	Corridor	n.a.	n.a.	n.a.	n.a.	n.a.
16	Train Hall Grand Stair/Escalator - Up	2 escalators plus 2 stairs	1,425	499	22.0	1.6	A
	Train Hall Grand Stair/Escalator - Down	2 escalators plus 2 stairs	5,614	1,965	22.0	6.3	B
17	North Edge Vertical Circulation - Up	1 escalator plus stair	1,438	503	4.5	7.9	C
	North Edge Vertical Circulation - Down	1 escalator	3,048	1,067	8.5	8.8	C
18	South Edge Vertical Circulation	Stair	189	66	7.5	0.6	A
19	Train Hall Vertical Circulation to West End Concourse -- Northeast Corner -- Up	1 escalator	276	97	4.5	1.4	A
	Train Hall Vertical Circulation to West End Concourse -- Northeast Corner -- Down	Stair	2,255	789	11.0	5.1	A/B
20	Train Hall Vertical Circulation to West End Concourse -- Southeast Corner -- Up	1 escalator	159	56	4.5	0.9	A
	Train Hall Vertical Circulation to West End Concourse -- Southeast Corner -- Down	Stair	456	160	11.0	1.1	A
21	North Ramp	Corridor	2,650	927	17.0	4.0	A
22	South Ramp	Corridor	957	336	17.0	1.4	A
23	West End Concourse - North Cordon	Corridor	3,126	1,094	19.0	4.2	A
24	West End Concourse - North Central Cordon	Corridor	3,058	1,071	19.0	4.1	A
25	West End Concourse - South Central Cordon	Corridor	1,060	371	19.0	1.4	A
26	West End Concourse - South Cordon	Corridor	745	261	19.0	1.0	A
27	Farley Eighth Ave Entrance at 33rd Street	Doorway	2,450	858	6 units	10.5	A
28	Farley Eighth Ave Entrance at 31st Street	Doorway	965	338	6 units	4.2	A
29	Farley 33rd Street Midblock Entrance	Doorway	5,310	1,858	12 units	11.4	A
30	Farley 31st Street Midblock Entrance	Doorway	728	255	6 units	3.1	A
31	Farley Ninth Avenue Entrance	Doorway	727	254	12 units	1.6	A

Note: See Figures 13-5 through 13-10.

EXISTING PENN STATION COMPLEX

In general, the Project would create new train station facilities west of Eighth Avenue that would divert rail passengers from the congested concourses, entrances and vertical circulation elements in the existing station. At most locations in the station, the diversion of rail passengers away from these facilities would offset the small increase in Amtrak rail passenger traffic that would be attributable to the Project and which would mostly flow through the Farley Complex under the Amtrak Station Option. At one location on the West 33rd Street Connecting Concourse—to the

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west of the LIRR Main Gate Area—the morning peak No Build condition would be at a congested LOS D and the peak pedestrian flow rate would increase for the Build condition, from 16.4 to 17.2 pedestrians per minute per foot of effective corridor width. The Project would not generate a significant adverse impact, however, since peak conditions would remain at LOS D.

In the West 33rd Street Connecting Concourse on Level A, peak flow conditions would remain in the LOS C/D to D range, but the density of peak flows in the Build condition would be slightly lower than for the No Build condition at all locations except the portion of the concourse immediately west of the LIRR Main Gate Area, which would see a slight rise in flow rate during the morning peak but would remain within the LOS D range. Similarly, the three main station entrances at the Seventh Avenue end of the station would see slight reductions in traffic in the Build condition compared to the No Build condition. The main station entrance at Seventh Avenue and 32nd Street (Location #1 on **Figures 13-2 and 13-3**) would remain at LOS E in the morning peak and LOS D in the evening, with flow densities that are slightly improved in the Build condition over the No Build condition. The main LIRR 34th Street entrance (Location #2 on **Figures 13-1 and 13-3**) also would remain at LOS E in the morning and improve from LOS E to LOS D/E in the evening peak. Peak flows at the new NJT West 31st Street entrance (Location #3 on **Figures 13-2 and 13-3**) also would improve slightly—from LOS C/D to LOS C in the morning peak, and from LOS C to LOS B/C in the evening peak.

Within the Eighth Avenue Subway station, the Project would reconstruct and widen the two stairs leading down from the downtown local platform to the level of the West End Concourse and 33rd Street Connector (Locations #11 and #12 on **Figures 13-1, 13-4, 13-9, and 13-10**). Though subway passenger traffic on these stairs would increase in the Build condition, the number of rail passengers and other pedestrians using these stairs as a shortcut route to the street would decline, since the Project would provide alternative pedestrian paths to street level within the Farley Complex. Overall, the level of service on these stairways would improve between the No Build and Build conditions.

MOYNIHAN STATION TRAIN HALL

The proposed Project would bring rail passengers and other pedestrians into areas of the Farley Complex that heretofore have been restricted to Postal Service employees. Major changes to the pedestrian circulation system within the Farley Complex are designed to accommodate this pedestrian traffic. The Train Hall would be a large, open public space punctuated by the escalators that provide direct access to the platforms. Rail passengers and the general public would be able to circulate freely through the Train Hall during the weekday peak periods, with peak Levels of Service projected in the A to B range—for the Amtrak Station and Open Station Options. Estimated peak pedestrian volumes within the Train Hall in the year 2015 would be significantly lower for the Open Station Option than the Amtrak Station Option, since Amtrak departing passengers would not be present within the Train Hall. The availability of waiting area within the Train Hall would be expected to attract a slightly higher proportion of LIRR passengers, but the overall levels of passenger traffic would be similar for the two station options.

When trains are boarding at a particular escalator, passenger queues would temporarily block through-circulation. During these times, pedestrians would still be able to circulate around the edges of the Train Hall, which would have sufficient width to accommodate circulation needs at LOS B or better. The passageways leading into the Train Hall from the north and south (Locations #13 and #14 on **Figures 13-5 and 13-7**) would operate at a free-flowing LOS A, as would the corridor leading westward through the retail zone (Location #15). The main bank of

stairs and escalators leading from the Train Hall to the Intermodal Hall (Location #16 on **Figures 13-5, 13-6, 13-7, and 13-8**) would be free-flowing at all times, reaching LOS B conditions in the peak direction of flow (up in the morning, down in the evening).

Pedestrian flows within the Intermodal Hall and connecting passageways are projected to be at LOS A during the morning and evening peaks.

MOYNIHAN STATION ENTRANCES

The new street entrances at the northeast and southeast corners of the Farley Building to the concourse would each have at least three sets of double doors. The northeast entrance (Location #27 on **Figures 13-5 and 13-7**)—closest to the core of Midtown Manhattan—is expected to receive the highest use of the two Eighth Avenue entrances, with a pedestrian volume of approximately 4,000 in the 2015 morning peak hour and 2,800 in the evening peak hour, in the Amtrak Station Option. Estimated 2015 volumes would be 3,700 in the morning peak hour and 2,450 in the evening peak hour, for the Open Station Option. Pedestrian traffic for both rail occupancy options is projected to be in the range of LOS A during the morning and evening peak periods. The southeast entrance (Location #28 on **Figures 13-5 and 13-7**) would have lower usage than the northeast entrance and would also function at LOS A.

The primary entrance and exit for rail passengers with origins or destinations on the far west side of Manhattan, and for taxi passengers, is expected to be the midblock entrance at West 33rd Street (Location #29 on **Figures 13-6 and 13-8**). This entrance would be most heavily used in the evening peak, with almost 6,000 pedestrians using it during the 2015 PM peak hour. With twelve door openings, this entrance would operate at LOS A during the 2015 peaks.

The station and retail entrance at Ninth Avenue (Location #31 on **Figures 13-6 and 13-8**), and the West 31st Street midblock entrance (Location #30 on **Figures 13-6 and 13-8**), are expected to have pedestrian volumes of between 900 and 1,000 during the morning peak hour and between 700 and 800 in the evening peak hour—both providing LOS A.

WEST END CONCOURSE—SOUTH END

The southern portion of the West End Concourse would be used by some arriving NJT and Amtrak passengers, who would ascend the stairs from Platforms 3 through 8 (Tracks 5-16) and then proceed to either the subways or up to the Train Hall and the street. The level of service at the south end of the West End Concourse in the morning peak would be comfortably in the LOS A range, for both the Amtrak Station and Open Station Options. Volumes would be extremely light in the evening peak, since only a limited number of NJT passengers are assumed to board trains from this location (because of the lack of direct access to Platforms 1 and 2 [Tracks 1-4]).

The southern portion of the West End Concourse (Locations #25 and #26 on **Figure 13-9**) would be designed to be larger than needed for 2015 peak flows, allowing for future use of the concourse by boarding NJT passengers and allowing for a potential future West 31st Street Connector beneath Eighth Avenue (that is not part of the Project) as a second route for accessing the existing Penn Station concourses.

WEST END CONCOURSE—NORTH END

The West End Concourse would be more heavily used at its northern end (Locations #23 and #24 on **Figure 13-9**) because of the 33rd Street Connector to the subways and existing Penn Station concourses. Doubling the width of the existing West End Concourse would enable the

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northern portion of the concourse to handle projected ridership growth and serve Amtrak and NJT passengers as well as those of the LIRR—at acceptable peak levels of service for pedestrian flows. For the Amtrak Station Option, the portion of the concourse in the vicinity of Platforms 8 and 9 (Location #23) would have approximately 6,000 passengers per hour in the morning peak and 3,500 passengers per hour in the evening peak circulating along the concourse in the north-south direction—in addition to those passengers who may wait within the concourse for information about departing trains. This would result in flow conditions at LOS B in the morning and LOS A in the evening, assuming that departing commuters waiting at this level for information on boarding track assignments occupy spaces away from the main flow corridors—which would be the case under normal railroad operating conditions.

The Open Station Option would generate slightly lower levels of pedestrian activity at this location than the Amtrak Station Option—5,800 pedestrian trips in the 2015 morning peak hour and 3,100 trips in the evening peak hour. Significant numbers of departing Amtrak passengers coming from the subways would walk through the north end of the West End Concourse in the Amtrak Station Option, but they would tend to remain within the existing portions of Penn Station in the Open Station Option. The peak level of service for pedestrian flows within the northern portion of the West End Concourse would be the same in both options—LOS B in the morning peak and LOS A in the evening peak.

The configuration of the West End Concourse platform stairs would affect the location where commuter passengers would wait to receive train information. Waiting passengers would occupy the spaces along the west wall of the concourse. These are the locations where train information displays would be positioned. The east side of the concourse would be primarily for north-south pedestrian circulation.

33RD STREET CONNECTOR

The existing connector, which was initially constructed as the 33rd Street mezzanine of the Eighth Avenue Subway and later modified to provide access to the LIRR West End Concourse, is used largely by subway patrons and LIRR riders, with some additional pedestrians using the ramps and stairs as a walking route to the far West Side from the existing Penn Station concourses. No Build conditions in 2015 are projected to reach a congested LOS D during both the morning and evening peak hours (Locations #8 and #9 on **Figures 13-1, 13-4, 13-9, and 13-10**).

The Project would increase the number of pedestrians moving through the 33rd Street Connector compared with the No Build condition. Amtrak boarding passengers coming from the subways would use the Connector to access Amtrak’s facilities at the Moynihan Station Train Hall. A limited number of NJT boarding passengers, and significant numbers of arriving NJT and Amtrak passengers also would use the Connector, as would non-railroad passengers going to and from locations on the far West Side and the destination retail proposed for the Farley Complex.

The Project also would widen the east and west ramps and modify the subway turnstile array to create as wide a public walkway as possible within the physical constraints of the space, and would improve ADA compliance. Peak hour flows in the year 2015 on the east ramp (Location #8) are projected to increase from 8,300 to 10,900 in the morning and from 10,700 to 12,300 in the evening. Evening flows are heavier in this area because of the relatively high number of railroad commuters who transfer from the downtown local C and E lines of the Eighth Avenue Subway and head towards the existing Penn Station concourses in the evening. The morning peak movement in the opposite direction does not utilize the 33rd Street Connector. With the widening of the east ramp, which would increase its effective width from 14 to 18.5 feet, the

morning peak level of service would remain within the LOS D range, but the density of traffic and level of crowding, measured in pedestrian per minute per foot of effective width (p/m/ft), would be reduced slightly to 15.0 p/m/ft compared to the No Build condition of 15.2 p/m/ft. In the evening peak, the level of service on the east ramp would improve from LOS E (21.4 p/m/ft) in the No Build condition to LOS D (18.6 p/m/ft) in the Build condition.

The west ramp (Location #9) would see an even heavier increase in pedestrian activity, increasing from 4,100 to 10,300 pedestrians per hour in the morning peak hour and from 2,500 to 7,350 pedestrians per hour in the evening peak hour. This increase would be attributable to the increased rail passenger and pedestrian traffic that would be generated by the proposed Moynihan Station facilities west of Eighth Avenue, as well as the westward shift of the downtown local subway stairways (Locations #11 and #12 on **Figures 13-1, 13-4, 13-9, and 13-10**), which would increase the number of subway riders using the west ramp. The ramp would be widened, increasing its effective width from 11 to 19.5 feet. During the morning peak, the west ramp would operate at LOS C during the morning peak. With the wider ramp and increased traffic in the Build condition, the traffic density on the ramp would increase from 10.4 to 14.8 p/m/ft but would still remain within the acceptable LOS C/D threshold of 15.0 p/m/ft. Evening peak conditions on the west ramp would be at LOS C (10.5 p/m/ft).

The Project would increase the volume of pedestrian traffic at the Eighth Avenue Subway mezzanine turnstiles within the 33rd Street Connector (known as Control Area N67 on subway station drawings). In the morning peak, the predominant flow is inbound to the subway. The flows are heavier in the evening, with the predominant flow in the outbound direction but with more balance between inbound and outbound flows. In the 2015 morning peak hour, flows through the turnstiles are projected to increase from 7,230 (with 5,350 in the inbound direction) in the No Build condition to 8,760 (with 6,590 in the inbound direction) in the Build condition. With the increase in the number of turnstiles from 13 to 17, the peak level of service would remain at LOS C.

In the 2015 evening peak hour, turnstile volumes would increase from 8,680 (5,890 outbound) in the No Build condition to 9,050 (6,070 outbound) in the Build condition. As in the morning, the peak level of service at the turnstile array would remain at LOS C.

The volume of pedestrian traffic on the two subway express platform stairways would also increase as a result of the Project. The distribution of traffic between these two stairs would be a function of the position of the stairs relative to the location of the trains at the platform level, and the location and orientation of the turnstiles at the mezzanine level. The northernmost stair (Location #14a, M21/M22, on **Figures 13-4 and 13-10**) is the more heavily used for passengers descending from platform level. The current turnstile arrangement favors the use of the southernmost stair (Location #15a, M23/M24, on **Figures 13-4 and 13-10**) for passengers entering the subway through the turnstiles and ascending to platform level. In the 2015 No Build condition, the southerly stair would be more heavily utilized. The shift in the turnstile configuration that is proposed as part of the Project would provide additional turnstiles that have a clear pathway to the northerly stair, which would result in somewhat higher utilization of the northerly stair. This would tend to better balance the peak flows between the two stairways and enable the increased volumes in the Build condition to be accommodated at an acceptable level of service.

Morning peak volumes on the southerly stair (Location #15a) in the No Build condition will be 2,850 (2,450 up, 400 down) and in the Build condition would be 2,390 (1,920 up, 470 down). The level of service would improve from LOS D to LOS C in the Build condition. Evening peak volumes on this stair in the No Build condition will be 2,500 (1,370 up, 1,130 down) and in the

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Build condition would be 2,550 (1,380 up, 1,170 down). The peak level of service in both cases would be LOS C.

At the northerly stair (Location #14a), the morning peak No Build volume will be 1,270 (320 up, 950 down) at LOS B, and the corresponding Build volume would be 2,590 (1,500 up, 1,090 down), at LOS C. Evening peak volumes on this stair in the No Build condition will be 1,750 (140 up, 1,610 down) and in the Build condition would be 2,080 (420 up, 1,660 down). The peak level of service in both conditions would be LOS C.

The existing stairway to the uptown local subway platform from the Penn Station 33rd Street Connecting Concourse (Location #13a, NYCT designation G1, on **Figures 13-4** and **13-10**) is 17 feet wide and provides the primary route from Penn Station to the uptown local subway services—a heavy volume of flow in the morning peak period. Morning peak No Build conditions in 2015 are projected to reach LOS E, with 7,610 peak hour trips (7,140 in the up direction), producing a flow density of 13.4 p/m/ft. With the proposed Project, an increased number of rail passengers would arrive via the West End Concourse and Moynihan Station, and a share of these passengers would get to the Eighth Avenue uptown local via the mezzanine turnstiles and the paid corridor leading to the 34th Street mezzanine. This would reduce the morning peak hour volume of pedestrians on Stair 13a to 7,170 (6,620 in the up direction), improving the level of service to LOS D, at 12.5 p/m/ft. Evening peak conditions at this location would be in the LOS B range in both cases.

Overall, peak conditions in the year 2015 within the 33rd Street Connector and at the 33rd Street mezzanine of the Eighth Avenue Subway would either be at an acceptable level of service (LOS C or better) or would be improved over No Build conditions in locations where peak conditions are projected to be congested (LOS D or E). Therefore, the Project would not generate adverse impacts on pedestrian flows in this area of the station complex.

VERTICAL CIRCULATION

The Project would construct four Level A-to-Level B vertical circulation elements between the West End Concourse and the Train Hall. The northernmost location, along the north edge of the Farley Building (Location #17 on **Figures 13-5**, **13-7**, and **13-9**), would be the primary walking route between the Train Hall and the West 33rd Street Connector. It would carry Amtrak boarding passengers between the subways and the Train Hall and would also be used heavily by commuter passengers and non-railroad pedestrians. These non-railroad pedestrians would include commuters walking between the subway stations and workplaces situated to the west of Penn Station, patrons of the proposed retail development in the Farley Complex, and people using the available indoor route to walk to and from locations on the far west side of Manhattan. Flows would be relatively heavy in both directions during the peak periods, but volumes would be more heavily upward in the morning peak and downward in the evening peak. In the Amtrak Station Option, two escalators and a stair would be required to handle the projected flows at an acceptable level of service. (LOS B and C in the morning peak and LOS C/D in the evening peak). Volumes on these vertical circulation elements would be slightly lower in the Open Station Option, with morning peak levels of service in the A/B to B/C range and evening peak conditions at LOS C.

The southernmost vertical circulation element (Location #18 on **Figures 13-5**, **13-7**, and **13-9**) also would have two possible variations. Projected usage of this vertical circulation element would be substantially lower than on the north side of the building, because of the relatively low level of NJT boarding activity at the south end of the West End Concourse. This stair or

stair/escalator combination would operate at LOS A at all times in the 2015 Build condition, for both Moynihan Station rail occupancy options. This location would become more important and carry heavier volumes if pedestrian access to Platforms 1 and 2 (Tracks 1-4), and/or a 31st Street Connector passageway, were provided at some point in the future.¹

The other two A-to-B vertical circulation elements would be located along the eastern wall of the Train Hall. Upward running escalators at these locations would serve passengers arriving at the West End Concourse on any of the three railroads who wish to ascend to the Train Hall and then out to the street west of Eighth Avenue. The element at the northeast corner of the Train Hall (Location #19 on **Figures 13-5, 13-7, and 13-9**), situated approximately above Platform 8 (Tracks 15 and 16), also would serve as the primary platform access point for LIRR passengers who choose to wait for train information within the Train Hall. The escalator would accommodate 100 percent of the upward flows at this location during both the morning and evening peaks, at LOS A/B and LOS A, respectively. The adjoining stairway would need to be a minimum of 12 feet wide to accommodate projected evening peak downward flows of boarding LIRR passengers at LOS C. The stair would operate at LOS A during the morning peak.

The vertical circulation element at the southeastern corner of the Train Hall (Location #20 on **Figures 13-5, 13-7, and 13-9**), approximately above Platform 4 (Tracks 7 and 8), would correspond to the vertical circulation element at the northeast corner (Location #19). In the morning peak, it would be used mostly by arriving rail passengers ascending from the West End Concourse to street level. In the evening, it would primarily serve NJT boarding passengers. Because only a small number of these passengers are projected to use the Train Hall in 2015, since there would be no direct access to NJT trains using Platforms 1 and 2 (Tracks 1-4), the pedestrian flows at this element would be substantially less than at the element at the northeast corner of the Train Hall, and LOS A would prevail throughout the day.

EVENING PEAK ACCUMULATIONS

Table 13-18 compares estimated peak occupancies of the various concourses and waiting areas by rail passengers during normal operating conditions, with minor train delays that result in variations to the normal track assignments for boarding trains. These conditions occur periodically within the station for any of a number of reasons—but not frequently enough to be appropriate as a test for environmental impact significance. However, this comparative analysis serves to illustrate one of the significant benefits of the Project, compared with the No Build condition, where the ability to spread boarding passengers around a greater number of concourses and waiting areas in the evening peak provides a greater reservoir of public space for accommodating large volumes of passengers. **Table 13-8** compares the existing, 2015 No Build, and 2015 Build conditions, including both the Amtrak Station and Open Station Options. The projected evening peak occupancy of the Moynihan Station Train Hall would be lower in the Open Station Option than the Amtrak Station Option, since Amtrak boarding passengers would not be present in large numbers.

¹ These potential improvements are not part of the Project.

Table 13-18
Comparison of Weekday Evening Peak Passenger Accumulations
Within Boarding Concourses

		Moynihan Station Train Hall	West End Concourse North	West End Concourse Central/S	Level B Main Concourse	Exit Concourse North	Exit Concourse South	Central Concourse	LIRR Main Gate Area	NJT Seventh Avenue Concourse
EXISTING (2008)										
PM Peak Hour Boardings	Amtrak				2,011					
	LIRR		3,387			8,316		1,547	16,460	
	NJT				4,662		4,385			11,376
	Total		3,387		6,673	8,316	4,385	1,547	16,460	11,376
Peak Occupancy	Amtrak				523					
	LIRR		373			915		170	1,811	
	NJT				513		482			1,251
	Total		373		1,036	915	482	170	1,811	1,251
Effective Queuing Area (sf)		4,000		21,000	9,000	6,000	5,000	17,000	10,000	
Queue Density (sf/p)		10.72		20.27	9.84	12.45	29.41	9.39	7.99	
Level of Service (LOS)			B/C		A	C	B/C	A	C/D	C/D
2015 NO BUILD										
PM Peak Hour Boardings	Amtrak				3,023					
	LIRR		4,355			10,693		1,989	21,164	
	NJT				6,373		5,994			15,550
	Total		4,355		9,396	10,693	5,994	1,989	21,164	15,550
Peak Occupancy	Amtrak				786					
	LIRR		479			1,176		219	2,328	
	NJT				701		659			1,710
	Total		479		1,487	1,176	659	219	2,328	1,710
Effective Queuing Area (sf)		4,000		21,000	9,000	6,000	5,000	17,000	10,000	
Queue Density (sf/p)		8.35		14.12	7.65	9.10	22.83	7.30	5.85	
Level of Service (LOS)			C/D		A/B	C/D	C/D	A	D	D/E
2015 BUILD – AMTRAK STATION OPTION										
PM Peak Hour Boardings	Amtrak	1,056			2,011					
	LIRR	3,102	4,989			9,396		1,428	18,943	
	NJT	832		877	9,921		6,511			9,860
	Total	4,990	4,989	877	11,932	9,396	6,511	1,428	18,943	9,860
Peak Occupancy	Amtrak	275			523					
	LIRR	341	549			1,034		157	2,084	
	NJT	92		96	1,091		716			1,085
	Total	708	549	96	1,614	1,034	716	157	2,084	1,085
Effective Queuing Area (sf)	25,000	7,000	4,000	21,000	9,000	6,000	5,000	17,000	10,000	
Queue Density (sf/p)	35.31	12.75	41.67	13.01	8.70	8.38	31.85	8.16	9.22	
Level of Service (LOS)	A	B	A	B	C/D	C/D	A	C/D	C/D	
2015 BUILD – OPEN STATION OPTION										
PM Peak Hour Boardings	Amtrak				2,640					
	LIRR	3,613	4,474			9,737		1,469	18,905	
	NJT	693		671	10,005		5,909			10,720
	Total	4,306	4,474	671	12,645	9,737	5,909	1,469	18,905	10,720
Peak Occupancy	Amtrak				686					
	LIRR	397	492			1,071		162	2,080	
	NJT	76		74	1,101		650			1,179
	Total	473	492	74	1,787	1,071	650	162	2,080	1,179
Effective Queuing Area (sf)	25,000	7,000	4,000	21,000	10,700	6,000	6,300	20,700	10,085	
Queue Density (sf/p)	52.85	14.23	54.05	11.75	9.99	9.23	38.89	9.95	8.55	
Level of Service (LOS)	A	A/B	A	B/C	C	C/D	A	C	C/D	

Note: This analysis assumes normal operating conditions with trains running on or close to schedule; passengers wait at concourse level for track assignment information.

In the Build condition, for the evening peak scenario that was analyzed, conditions within the Train Hall and at the southern end of the West End Concourse would remain at LOS A. At the north end of the West End Concourse, the analysis assumed that 7,000 square feet of space would be available for LIRR passenger waiting and queuing outside of the main flow corridor, which would generate LOS B conditions in this area, permitting other pedestrians to walk comfortably through the space. The configuration of the north end of the West End Concourse and associated vertical circulation elements would be determined during the final design process, taking into account structural constraints, requirements for platform ventilation systems and other utilities, and pedestrian space needs.

With Amtrak shifted to Moynihan Station, and with commuter passengers able to utilize the new concourses at the Farley Building, as well as the existing main concourse of Level B, occupancies within the existing Penn Station concourses would be reduced, and queuing levels of service would improve (e.g., from LOS D to LOS C/D in the LIRR Main Gate Area and from LOS D/E to LOS C/D in the NJT Seventh Avenue Concourse).

PLATFORM CLEARANCE

The Project would increase the number of platform escalators from 30 to 44, the number of platform stairways from 52 to 61, and the number of passenger elevators from 17 to 24. The increased capacity would be focused on Platforms 3 through 8 (Tracks 5-16), with the largest increases on Platforms 3 through 6 (Tracks 5-12), which are the platforms with the least current egress capacity. **Table 13-19** compares the time required to clear the platforms of a full trainload of passengers for the 2008 existing and 2015 Build conditions. No new platform access points currently are planned by the railroads, so the 2015 No Build condition would be the same as the existing condition. On platforms 3 through 6 (Tracks 5-12), the time required to clear the platform of a full trainload of passengers would decrease from approximately 5.5 minutes to between 3.7 and 4.8 minutes. In addition, the platforms would be made safer for passengers by distributing vertical circulation elements more evenly along the lengths of the platforms.

CONCLUSIONS

The Project would increase the quantity of public circulation space in the Penn Station complex, increase platform vertical circulation capacity, with particularly significant improvements at Platforms 3 through 6 (serving Tracks 5 through 12), increase total vertical circulation capacity between Levels A and B of the station, and increase the number and capacity of station street level entrances.

The new pedestrian circulation facilities within the Farley Complex, including the Train Hall, Intermodal Hall, street entrances and connecting corridors and passageways, can be designed to carry the projected 2015 pedestrian volumes at an appropriately high level of service without creating significant congestion impacts during the weekday peak periods. No locations were identified within the station complex where significant adverse impacts would be generated or existing peak conditions significantly worsened by the proposed Project. Overall, the Project would provide time savings and congestion relief benefits for all passengers using Penn Station, improve pedestrian circulation by providing a more balanced arrangement of facilities within the station complex, and create a significantly more attractive and convenient station environment for passengers using the new facilities within the Farley Complex.

Table 13-19
Comparison of Platform Clearance Times
Following Arrival of Fully Loaded Train

Platform	Tracks	Length (ft.)	No. of Cars	Railroad	Seats / Passenger Car	Passenger Load	Case	No. of Escs.	No. of Stairs	Total Vertical Circulation Elements	Total Egress Capacity (ped / min)	Platform Clearance Time		Percent Improvement Over No Build
												Minimum (min)	Expected (min)	
11	20, 21	1,007	12	LIRR	115	1,380	Ex, NB, B	1	7	8	741	1.96	2.29	N/C
10	18, 19	1,022	12	LIRR	115	1,380	Ex, NB, B	2	7	9	1201	1.21	1.83	N/C
9	17	916	10	LIRR	115	1,150	Ex, NB, B	1	8	9	713	2.03	3.66	N/C
8	15, 16	1,185	12	LIRR	115	1,380	Ex & NB	4	5	9	779	1.86	2.86	25.8%
							B	5	6	11	1037	1.40	2.12	
7	13, 14	1,483	12	LIRR	115	1,380	Ex & NB	4	5	9	699	2.07	3.03	17.5%
							B	6	5	11	940	1.54	2.50	
6	11, 12	1,464	12	NJT	135	1,620	Ex & NB	4	2	6	494	3.44	5.37	31.5%
							B	6	4	10	923	1.84	3.68	
5	9, 10	1,463	12	NJT	135	1,620	Ex & NB	4	2	6	440	3.87	5.60	21.4%
							B	6	4	10	843	2.02	4.40	
4	7, 8	1,149	12	NJT	135	1,620	Ex & NB	3	2	5	437	3.89	5.60	13.7%
							B	5	4	9	840	2.02	4.83	
3	5, 6	934	10	NJT	135	1,350	Ex & NB	2	3	5	437	2.76	5.47	30.3%
							B	4	5	9	723	1.67	3.81	
2	3,4	842	8	NJT	135	1,080	Ex, NB, B	3	5	8	703	1.61	1.92	N/C
1	1,2	842	8	NJT	135	1,080	Ex, NB, B	2	6	8	722	1.57	1.86	N/C
12	A,B	500	5	Amtrak	70	350	B	2	1	3	191	1.83	2.25	New

Notes:
N/C: No Change.
The Project would make no significant changes to platform access at Platforms 1, 2, 9, 10 and 11. Minimum clearance time assumes passengers are distributed among egress points in proportion to egress capacity. Expected clearance time assumes passengers are distributed according to location on platform and desired point of egress, based on historical surveys. Expected clearance times also assume that passengers choose the nearest egress point once queues dissipate.
Ex = Existing; NB = No Build; B = Build

The projected increase in 2015 rail passenger traffic generated by the Project would be offset by the diversion of Amtrak and commuter passengers to the new Moynihan Station facilities west of Eighth Avenue and the expanded ability of commuters to make use of the Main Concourse space vacated by Amtrak, resulting in peak levels of service within the existing station that are comparable to or better than those indicated for the 2015 No Build condition.

The analyses that have been undertaken of the proposed Project confirm the conclusion reached in the 1999 EA (and later seconded in the 2006 FEIS) that there would be no significant impacts to pedestrian circulation within the station, and:

“The net result of the Project would be a transportation facility that would provide dramatically improved service to all its customers—intercity rail passengers, rail commuters, subway riders, area employers, and retail patrons.”¹

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¹ Penn Station Redevelopment Corporation, Pennsylvania Station Redevelopment Project, Environmental Assessment, Appendix 7, “Transit and Indoor Pedestrian Circulation,” AKRF, Inc., 1999, p. A.7-25.