Penn Station Master Plan

Alternatives Report

Final — April 2022









Alternatives Report

Final — April 2022

Note:
This Master Plan study presents design concepts that do not constitute actual, completed designs. Architectural renderings presented in this report are provided only to illustrate how the concepts might be implemented.

Revisions

Date	Version	Comments
August 15, 2020	**1**	
October 21, 2020	**2**	▪ Incorporated all comments received from first draft. Added Existing Conditions chapter and Introduction to Alternatives section. Updated all drawings and added new sections and renderings. Completed Emergency Building Egress Assessment. ▪ Further evaluation of passenger operations and refinement of evaluation criteria in progress.
November 23, 2020	**3**	▪ Updated for public review.
February 14, 2021	**4**	▪ Updated with latest renderings and analysis. ▪ Updated project and station naming.
March 26, 2021	**5**	▪ Updated with latest renderings.
April 19, 2021	**6**	▪ Updated with latest renderings and plans.
March 30, 2022	**7**	▪ Updated with selected alternative.

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Acronyms and Abbreviations

2PP	Two Penn Plaza
AHU	Air Handling Unit
AOR	As-of-Right
BOH	Back-of-House
fc	Foot-Candles
GPP	General Project Plan
HVAC	Heating, ventilation, and air conditioning
IEBC	International Existing Building Code
LIRR	Long Island Rail Road
LOS	Level of Service
MEPS	Mechanical, electrical, plumbing, and sprinkler systems
MNR	Metro-North Railroad
MSG	Madison Square Garden
MTA	Metropolitan Transportation Authority
NFPA	National Fire Protection Association
NJT	NJ TRANSIT
NYCT	New York City Transit
NYS	New York State
NYSBC	New York State Building Code
PSF	Points per Square Foot
PSMP	Penn Station Master Plan
ROW	Right-of-Way
SF	Square Footage
V.I.F.	Verify in Field
VCE	Vertical Circulation Element

1

Executive Summary

Penn Station Master Plan

The Metropolitan Transportation Authority (MTA), Amtrak, and NJ TRANSIT (NJT) together commissioned the development of a new Master Plan for NY Penn Station. The Master Plan comprises two major elements: the full reconstruction of the existing Penn Station (Penn Station) and the expansion of Penn Station (Penn Station Expansion) to add eight or nine new tracks to increase capacity. With the assistance of the FXC WSP USA Architecture and Engineering JV team, the Master Plan aims to transform Penn Station to improve customer experience, increase passenger handling capacity, address substandard conditions, and restore the status of Penn Station as a world-class transportation facility. The Master Plan also seeks to create a unified vision of the larger transportation complex created by the renovation of Penn Station, the new Moynihan Train Hall, and the future Penn Station Expansion—collectively called the Penn Station Complex.

Over the course of 12 months of study, the project team evaluated dozens of different ideas and permutations on how to improve Penn Station. Biweekly design oversight meetings provided a forum for sharing the evolution of the design ideas and receiving feedback from project stakeholders. The team held 17 workshops to take a deep dive into specific areas of study and to understand best practices and lessons learned from other projects nationally and internationally. The team also spent significant time reviewing past redevelopment plans, including the Penn Station Visioning Study from 2013, as well as gathering comprehensive existing conditions information.

This Alternatives Report is the product of these efforts and presents four distinct alternatives for consideration. **Figure 1-1** shows a summary of the four alternatives, and **Section 4** of this report provides complete details of these alternatives.

Alternative 1 leverages much of the station's current configuration, including boarding on two levels, but it also adds significant additional passenger circulation space on the east side of the lower level, straightens and widens the east-west spine of the circulation spaces on both levels, and creates some double-height openings between the two levels.

Alternative 2 builds on the improvements in Alternative 1 by adding a grand new entrance on 8th Avenue facing the Moynihan Train Hall, in the space currently occupied by Madison Square Garden's (MSG's) Hulu Theater.

Alternative 3 takes a whole new approach to station operations and moves all passenger circulation to a single level with double-height ceilings throughout, relocating most back-of-house (BOH) operations to the upper level.

Alternative 4 builds on Alternative 3 by adding an aboveground, glass-enclosed mid-block train hall in the space between MSG's arena and Two Penn Plaza on the east side of Penn Station.

Penn Station Expansion, a separate, though related study by Amtrak, NJ TRANSIT and MTA to add more tracks and platforms to Penn Station, is preparing to begin environmental study under federal environmental regulations. Although the preferred alternative configuration for the Expansion has not been finalized, preliminary analysis suggests that it will be immediately south of the existing station. That potential configuration has been adopted for the purpose of considering how the reconstructed station and the expansion can be integrated. The southern configuration of the Expansion could work with all four alternatives with the 8th Avenue, Central, and 7th Avenue Concourses extending south under 31st Street into Penn Station Expansion (see **Section 6.1**). In addition, the Master Plan proposes a series of underground connections within the Penn Station Complex and heading eastward toward Herald Square to improve passenger circulation in the area (see **Section 6.2**). All four alternatives would have improved entrances at grade and a redeveloped shared street on 33rd Street (see **Section 6.3**). As this is a high-level Master Plan study, the materials presented for each alternative are conceptual in nature and do not constitute actual, completed designs. Layouts and architectural renderings for each alternative are provided only to illustrate how they might be implemented.

The project team used 16 criteria representing the goals and objectives of the Master Plan to assess each alternative in detail (see **Section 5**). The criteria in the Passenger Movement category, including Passenger Access and Circulation, Emergency Platform and Building Access, and Accessibility, were considered the most important. The team placed particular attention on ensuring that all four alternatives performed at least satisfactorily, if not better, on these criteria. With this threshold objective met, the differences between the alternatives become clearer.

At the direction of the Master Plan Steering Committee, the alternatives presented herein were evaluated and discussed over a period of time until a version of Alternative 4 was selected as the preferred alternative (see **Section 7**). MTA, Amtrak and NJT can now advance to the next stage of design and engineering for the reconstruction of Penn Station.

The project team is confident that the effort to transform Penn Station and the entire Penn Station Complex will succeed in creating a superior travelling experience for the hundreds of thousands of passengers who traverse the station now and in the future.

Aspirations

1. **Relieve overcrowding and improve passenger flow and orientation**
2. **Improve platform and station egress and accessibility**
3. **Optimize station functionality and operation**
4. **Improve or eliminate the cramped, disjointed circulation areas on the Lower Level**
5. **Create a clear street presence that integrates with the surrounding context**
6. **Introduce daylighting**
7. **Optimize retail and other revenue generation to support the station**
8. **Integrate Penn Station with Penn Station Expansion**
9. **Create a superior passenger experience**

Figure 1-1

Summary of Alternatives

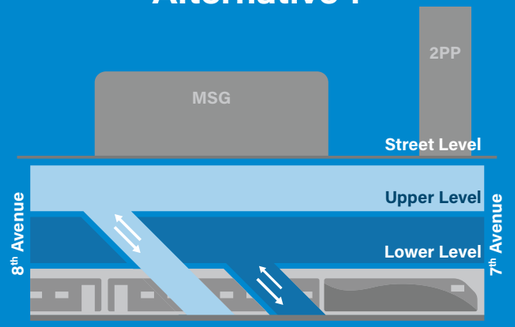
Aspiration: Optimize station functionality and operation

Aspiration: Create a clear street presence

Leverage Existing Two-Level Configuration

Stay Mostly Within Existing Building

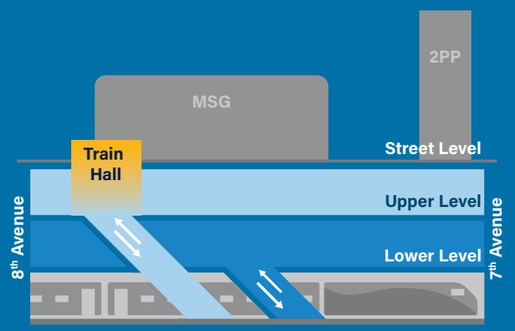
Alternative 1



- Retains two levels for boarding and alighting
- Introduces an east-west spine on both levels
- Straightens and widens all circulation spaces
- Creates central atria between levels with double-height spaces
- Improves all existing entrances

Add New Above Ground Elements

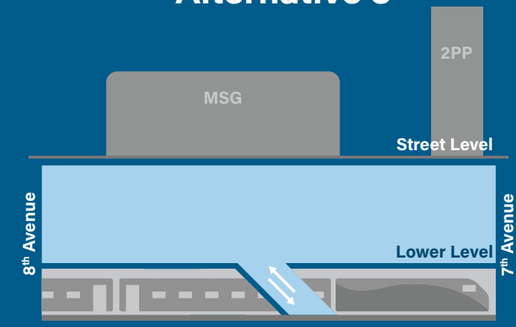
Alternative 2



- Same general configuration as Alternative 1
- Adds a grand 8th Avenue entrance and a spacious, light-filled West Train Hall on the Upper Level by purchasing and removing the Hulu Theater

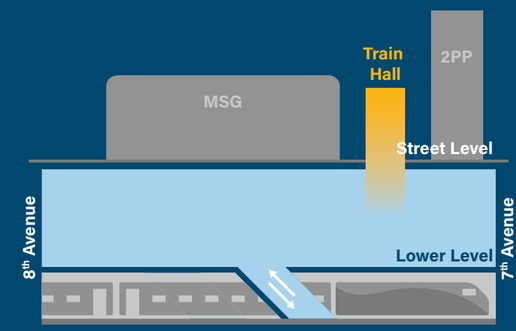
Transform to Single-Level Commuter Operations

Alternative 3



- Creates one unified boarding and alighting level with double-height ceilings throughout
- Simplifies wayfinding
- Primarily locates BOH station operations on Upper Level
- Improves all existing entrances

Alternative 4



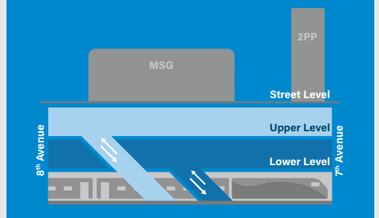
- Same general configuration as Alternative 3
- Adds a soaring, light-filled Mid-block Train Hall on the Lower Level between MSG and Two Penn Plaza, with new entrances from 33rd and 31st Streets

Rough-Order-of-Magnitude Cost Comparison

Note:
All cost estimates are high-level conceptual cost projections.

Penn Station

Alternative 1



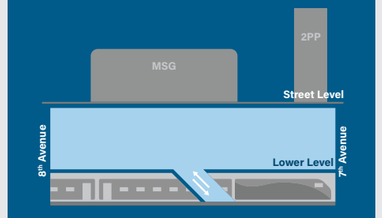
$4.9 billion

Alternative 2



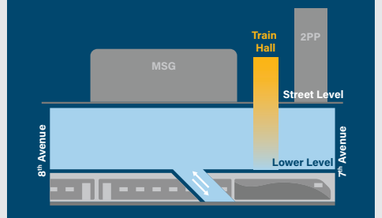
$6.5 billion

Alternative 3



$5.0 billion

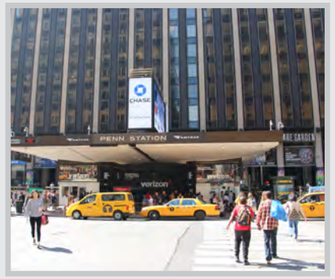
Alternative 4



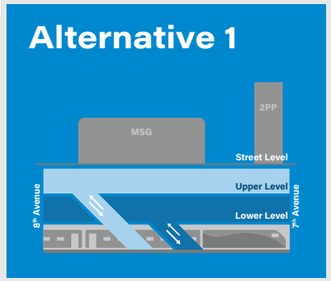
$6.4 billion

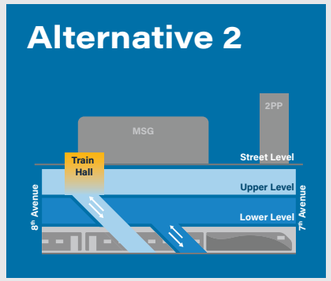
In Station Building Program Comparison

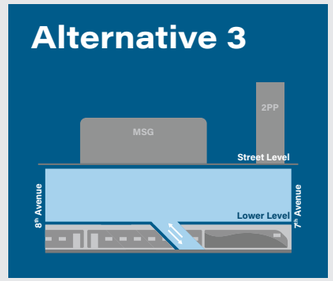
Existing

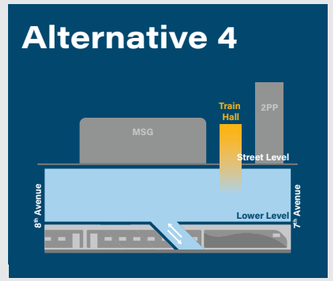


Penn Station







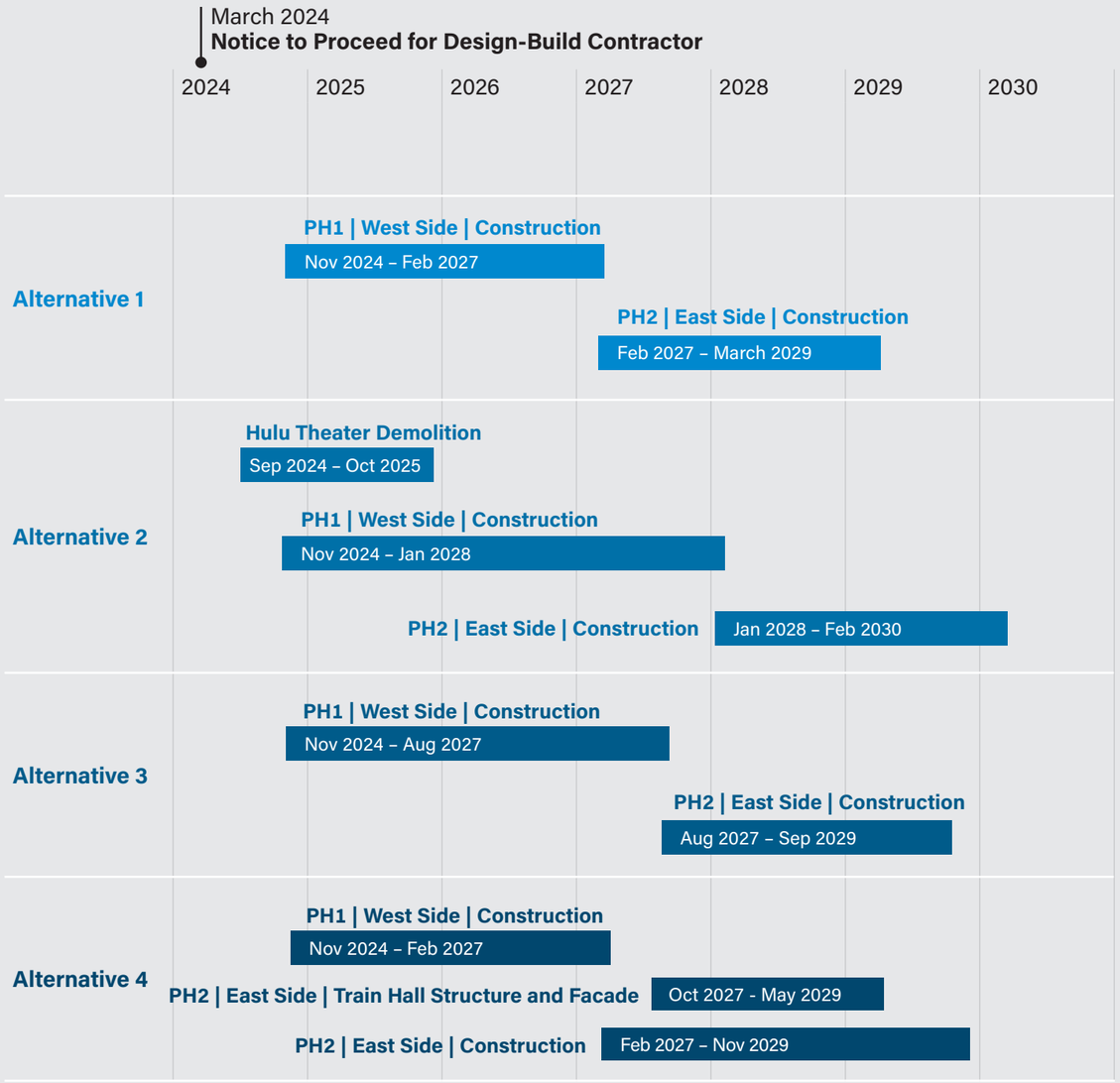


Retail	82,211 SF	103,900 SF	100,800 SF	101,600 SF	101,100 SF
Customer-Facing Station Operations	62,972 SF	57,800 SF	58,500 SF	45,200 SF	49,500 SF
MEP In Station	94,160 SF	55,300 SF	58,000 SF	55,300 SF	55,600 SF
BOH Station Operations	226,557 SF	219,100 SF	218,000 SF	198,200 SF	205,100 SF
Total	**465,900 SF**	**453,500 SF**	**452,700 SF**	**417,700 SF**	**443,000 SF**
Public Circulation	248,600 SF	364,700 SF	386,100 SF	286,800 SF	267,300 SF
Grand Total	**714,500 SF**	**818,200 SF**	**838,800 SF**	**704,500 SF**	**710,300 SF**
Customer-Facing	**55%**	**67%**	**68%**	**64%**	**63%**
Station Operations	**45%**	**33%**	**32%**	**36%**	**37%**

Notes

- Space lost to walls & structure distributed proportionally through existing program area categories
- Does not include the West End Concourse or Moynihan Train Hall
- Does not include existing LIRR area in One Penn Plaza (14,400 SF)
- Existing area includes Amtrak Customer Service scheduled to move to MTH (Club Acela, Package Express)
- 63,000 SF of area created by removing BOH Ramp, Intermediate Level, and filling in other slab areas at Lower Level
- Retail for Alternative 2 includes some Street Level retail
- Existing retail is 52,800 SF of Amtrak retail and 16,000 SF of LIRR retail
- Public circulation includes some Street Level circulation

Rough-Order-of-Magnitude Schedules



Key Takeaways

1. Alternatives 2 and 4 create new, aboveground spaces that allow for daylight into the station and create more of a station identity at street level.

2. The single-level passenger circulation in Alternatives 3 and 4 provides for better intuitive wayfinding but makes the BOH programming more complex.

3. None of the alternatives can provide sufficient space to meet all the BOH requests from the railroads, since customer-facing needs, particularly circulation space, must be prioritized. Additional studies optimized the BOH space needs through more comprehensive co-location and consolidation of station operation functions and leveraging new ticketing and customer service technologies to reduce space needs. Some functions that do not have to be in the station could be relocated outside the station.

4. All the alternatives meet the goal of 100,000 to 125,000 square feet (SF) of retail space, determined by the team's retail consultant to be the optimal amount for Penn Station. Alternatives 1 and 2 could accommodate more retail square footage than recommended by the team's retail consultant, while Alternatives 3 and 4 would create the most favorable layout and environment for retail as well as the best layout in terms of traveler convenience.

5. The construction schedule duration of the four alternatives varies: Alternative 1 is the shortest and Alternative 2 is the longest. The alternatives with major aboveground elements (Alternatives 2 and 4) are over 30% more expensive than the alternatives that stay within the existing building footprint (Alternatives 1 and 3).

2

Background and Purpose

This Alternatives Report is a progress report and summation of the first 12 months of the Master Plan project. This report presents four alternative concept plans for the station that are the result of consultation and coordination with the railroads and other stakeholders. The evaluation of the alternatives contained herein provides the basis for moving forward to refine these concepts into a single preferred plan.

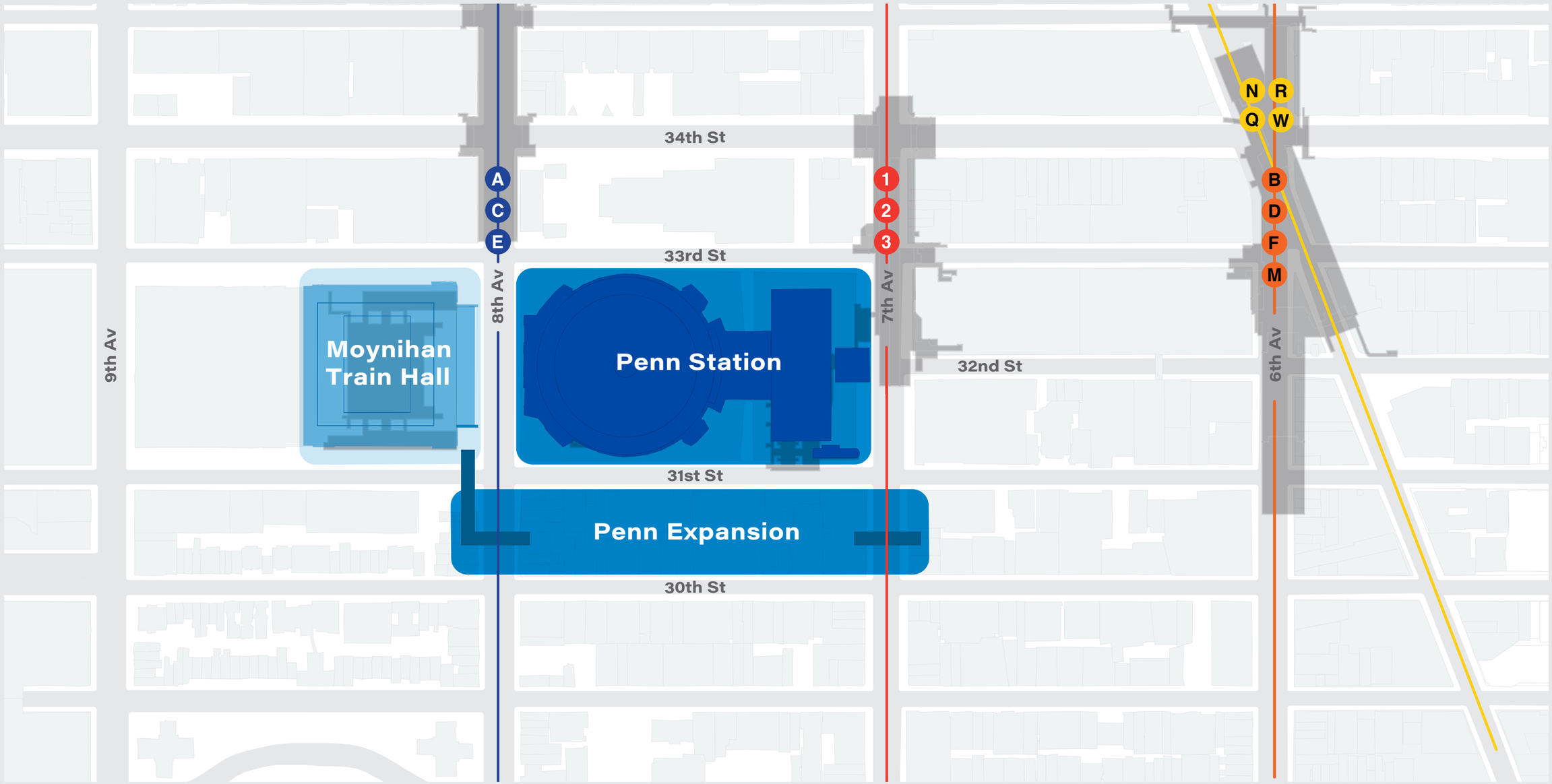
This report marks the conclusion of the first stage of a year-long collaborative and interdisciplinary design process to create a Master Plan for the reconstruction and expansion of Penn Station. Penn Station is owned by Amtrak and used by Amtrak, the Long Island Rail Road (LIRR), and NJT, with direct connections to New York City Transit (NYCT) subway lines, and plans to include Metro-North Railroad (MNR) (see **Figure 2-1** schematic of the Master Plan Area on the following page). It is the busiest station in North America, serving an estimated 600,000 passenger trips daily. Since the demolition of the original Penn Station in 1963, the station has existed as two basement levels below MSG and the Two Penn Plaza office building. A long series of piecemeal renovations and balkanized improvements, combined with a substantial increase in passengers, has left the station in substandard condition, known as a place to avoid, and a far cry from the quality merited by its significant role in New York City, New York State, and the region. Re-envisioning this important nexus to expand and improve rail transportation in the region is an important goal of both the city and the state. When the Master Plan process began, a number of other projects were already underway or being planned that impact the Master Plan. The Master Plan is tasked with incorporating and unifying these other projects as part of the plan. They include:

- The transformation of the Farley Post Office Building into the Moynihan Train Hall, a new facility connected to Penn Station, and serving Amtrak and LIRR.
- The renovation and expansion of the LIRR Concourse under 33rd Street, including the creation of a new entrance at 33rd Street and 7th Avenue.
  - Project improves system-wide reliability and provides for increased reverse commute service from NYC to Long Island, which includes additional LIRR trains departing Penn Station during the AM peak and arriving at Penn Station during the PM peak.
- The upgrade of NYCT subway entrances at the 7th and 8th Avenue ends of the LIRR Concourse.
- Penn Station Access, a plan to bring MNR service to Penn Station via the Hell Gate Line with new stations in the Bronx.
- East Side Access, which will create a new terminal beneath Grand Central Terminal for LIRR service.
- NJT Central Concourse, expanding and extending the concourse with a new entrance on 31st Street.
- Additional MNR service directly down the Hudson Line into Penn Station.
- Additional NYCT upgrades to the subways and subway concourses, including a below-grade link to Herald Square Station.
- Penn Expansion and Hudson Tunnel Project, providing for an expansion of NJT service into Penn Station.

Simultaneous to and in coordination with this Master Plan, New York State Empire State Development Corporation has undertaken an analysis of the area surrounding the station as the basis for a General Project Plan (GPP) that will further transform the surrounding neighborhood and capture value from the redevelopment of the district to help fund the Penn Station and Penn Station Expansion projects.

Figure 2-1

Master Plan Area



Transit-Oriented Development in the Penn Station District

In January 2020, New York State announced that, in addition to the project by the three railroads to reconstruct and expand Penn Station, the Empire State Development Corporation would manage a General Project Plan (GPP), a State land use action to revitalize the district and foster transit-oriented development around the busiest transit hub in the nation. The goal of the GPP is to catalyze a modern, thriving and dynamic commercial district around the Penn Station Complex.

The Penn Station Area Civic and Land Use Improvement Project currently under review would result in new commercial buildings on eight development sites in the Project Area. These new buildings would incorporate new onsite entrances and access ways to Penn Station and public transit. Importantly, such redevelopment would also generate essential revenue for substantial passenger rail and transit improvements at Penn Station and area subway stations.

The new development is anticipated to result in approximately 20 million gross square feet of primarily Class A commercial office, retail, and hotel space on the eight development sites within the Project Area. More than 10 million gross square feet of development is already permitted, so the net additional square footage is fewer than 10 million gross square feet.

The proposed project's improvements range from reconstructed subway entrances and platform widenings, to new stairways and a new below-grade east-west corridor from Penn Station to the Herald Square subway station.

Empire State Development Corporation (ESD) is collaborating with MTA, Amtrak, and NJT on a network of public transportation improvements that would be required as part of the Penn Station Complex and would align with the Railroads' plans for improvements to passenger rail facilities at Penn Station as well as the potential expansion south. The Penn Station Complex would also introduce much-needed public realm improvements to address pedestrian, bicycle, and vehicular circulation and enhance the surrounding streetscape, including through public plazas, shared streets, sidewalk widening, and new bike lanes. ESD is working closely with the City of New York to accomplish the Penn Station Complex's development goals and the implementation of the public realm and public transportation improvements for the area.

For planning purposes, it is assumed that all components of the Penn Station Complex would be completed and fully operational by 2038. Note that Sites 1, 2 and 3 shown in the illustration would only be included if the southern option for Penn Expansion is selected (see **Section 6.1** on Penn Expansion).

Illustrative Massings: 2038 Analysis Year

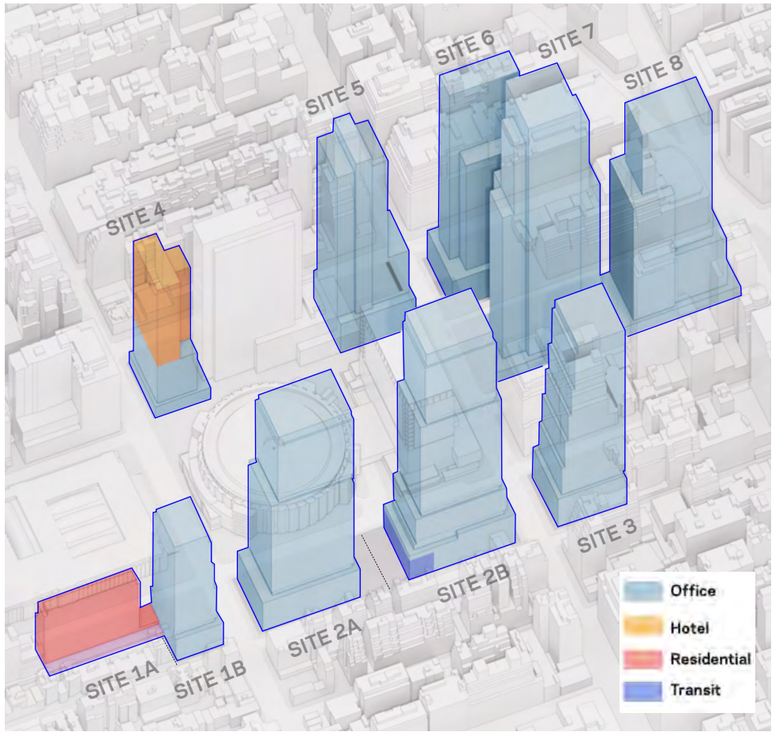
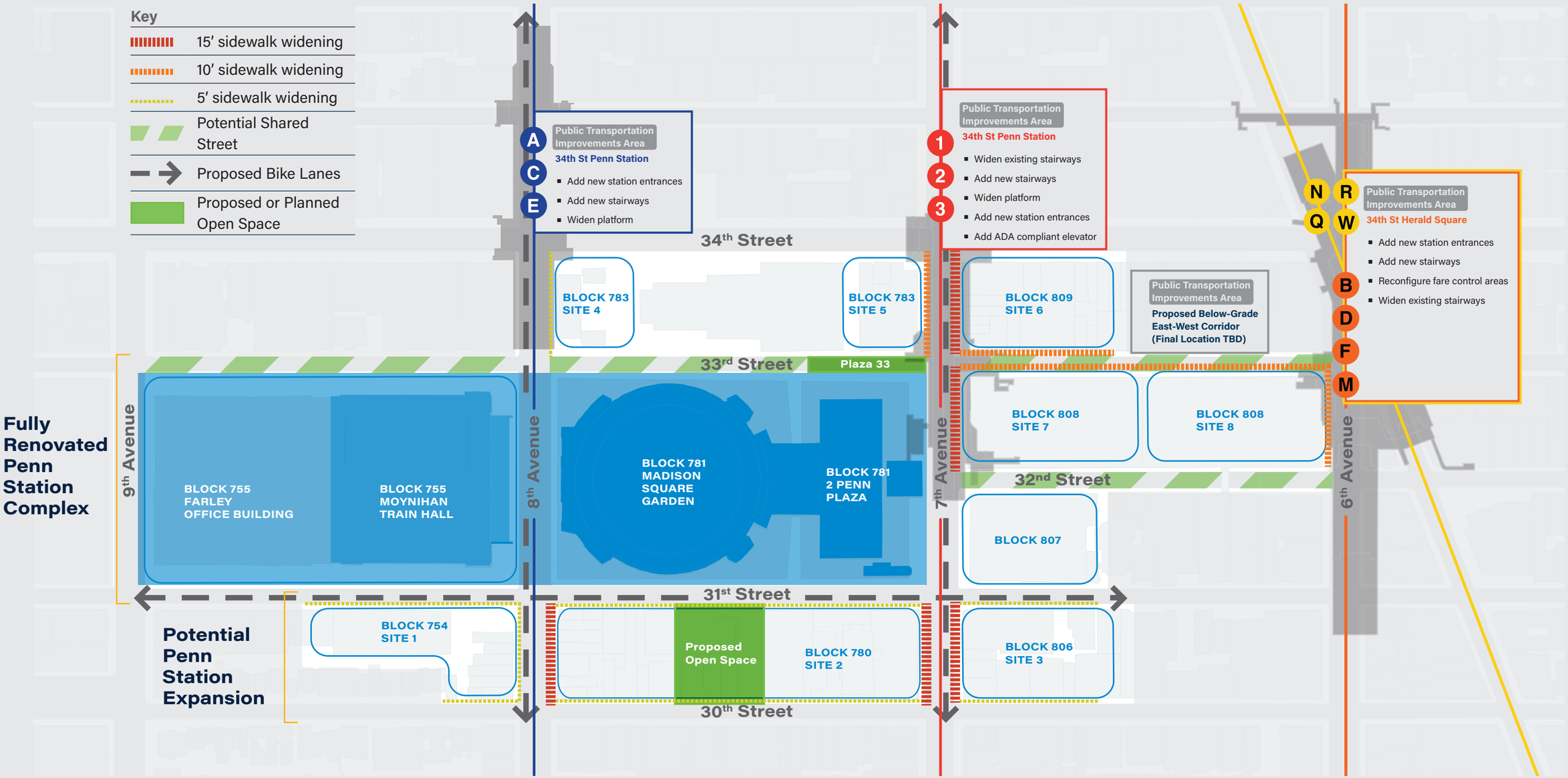


Figure 2-2

ESD Area



3

Existing Conditions

Station Facilities

Penn Station was originally built by the prosperous Pennsylvania Railroad in 1910 as a grand, spacious, daylit train hall to accommodate the then-dominant mode of intercity travel. With the subsequent rise of auto, air, and commuter rail travel and corresponding decline in inter-city train travel, the cash-strapped Pennsylvania Railroad was forced in the 1960s to reconfigure the station as two basement levels to allow it to lease space above for MSG and Two Penn Plaza as it tried unsuccessfully to stave off insolvency. The reconfigured station was designed to handle 200,000 daily passenger trips on a typical day.

The combination of the low-cost reconstruction in the 1960s and the chronic financial straits of its successor owner, Amtrak, has led to inadequate investment in the station over time, and the steady rise in ridership has strained the station's infrastructure and systems. Almost 60 years later, Penn Station is outdated; poorly configured; worn; and badly in need of major investment to maintain operations, renew its infrastructure, improve its revenue stream to support itself, re-establish itself as the premier rail transportation center in the Metropolitan region and, along with the recently completed Moynihan Train Hall and Farley Office Building across 8th Avenue, anchor the economic revival of the surrounding, underutilized district.

The station operates 24 hours a day, 365 days per year, and the "train shed" covers four full city blocks. The station platforms are accessed directly either from the Lower Level (one story above, also called Level A) or the Upper Level (two stories above, also called Level B). Subway connections to the station are at the Avenues, on the Lower Level, while street-level access varies depending on area of the station. The station configuration and its existing pedestrian performance are described further in the following sections.

Passenger Experience

The street presence of Penn Station is lacking and the few station signs that exist compete with advertisements and retail signage as well as the signage for MSG. Entrances lack the station name altogether or fail to identify all the railroads, and there is inconsistent naming of the station (e.g., Penn Station vs. Pennsylvania Station). The basement existing concourse levels combined with the disparate distribution of station functions (see **Figures 3-1 – 3-3**) and amenities create a rabbit warren maze that is often disorienting for all but the seasoned commuter (see **Figures 3-5 – 3-13**).

Daylighting is almost non-existent in the current Penn Station. Because most of the station is located below-grade, the mass of MSG sitting on top of the station allows little opportunity for natural light to filter into the space. Existing ceiling heights are constrained by the minimal floor-to-floor heights and existing structural elements. Ceiling heights throughout Penn Station vary not only between the levels, but also throughout a single level, contributing to the lack of continuity throughout the station (see **Figure 3-4**). Ceiling heights on the Lower Level are particularly low, ranging from 8.5 to 9.5 feet in height in the Exit and Central Concourses.

Architectural elements and finishes vary widely throughout the station, and the general aesthetic is a mismatch of spaces and finishes left over from various eras and renovations. The interior finishes throughout Penn Station are industrial and durable. The design of the space lacks continuity, however, and each railroad is responsible for its own portion of the station. Throughout the station, one can find remnants of the original 1910 building, original elements from the 1968 reconstruction, and disconnected renovations from the last 50 years.

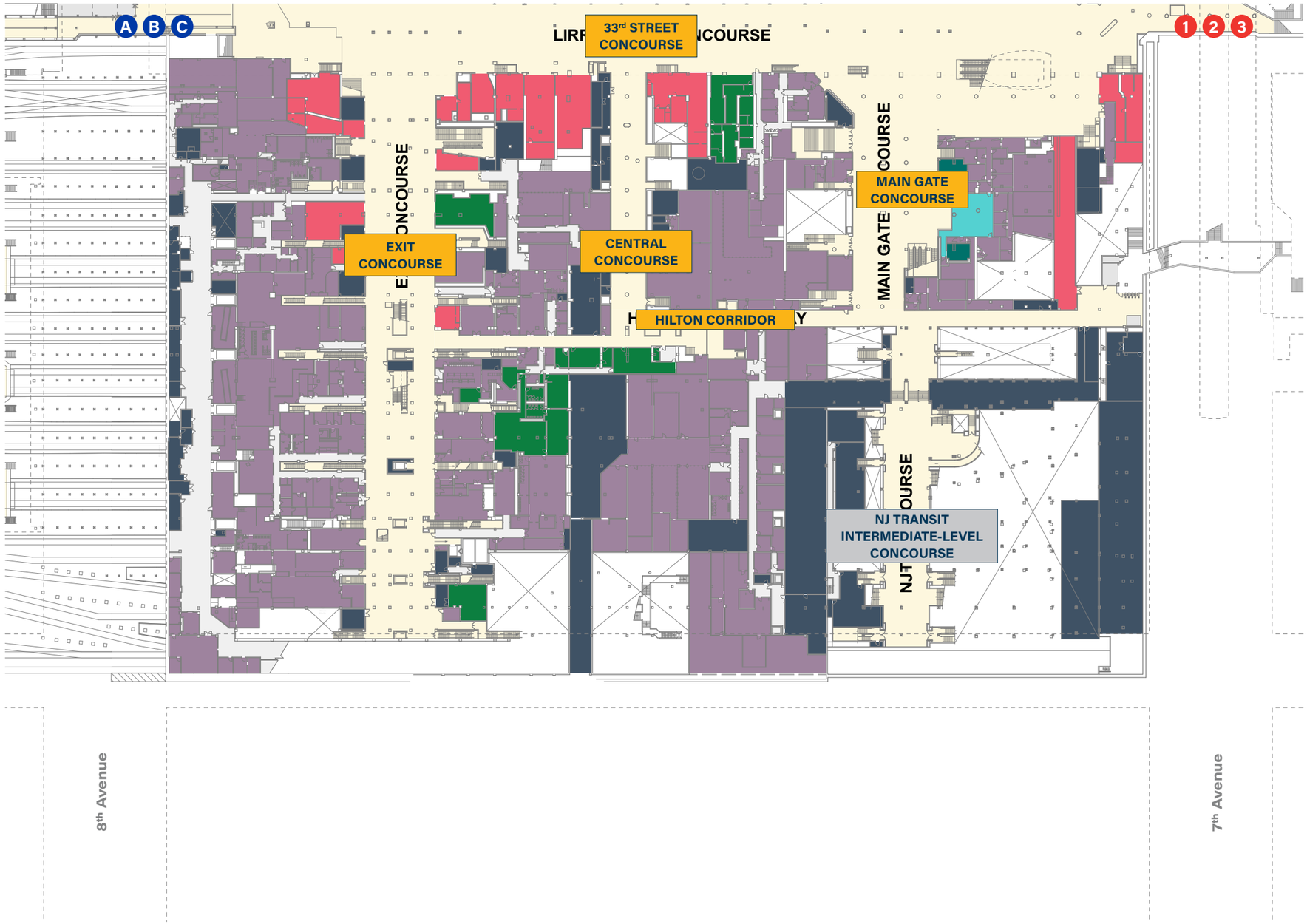
Three distinctive railroad services — LIRR, Amtrak, and NJT — operate under one roof, along with NYCT. Although each railroad is in a partially dedicated service area, Penn Station can easily be confusing for users unfamiliar with the station. Each railroad has a branding standard, including a signage component, implemented in its own service area. However, in some circulation paths and connecting corridors, the division between different railroads is unclear.

There are many retail shops in Penn Station, most of which have storage scattered throughout the facility and inefficient methods to transfer goods from storage spaces to retail spaces. Currently, the only route to transfer goods is through passenger corridors.

There are three sets of public restrooms in Penn Station, one in each railroad's area. Each rail line is responsible for maintaining its own facilities. The total number of fixtures available to the public is less than 100. While technically compliant, this quantity of restroom facilities results in long lines at peak times. There are no gender-neutral, family restrooms or lactation rooms in Penn Station. Note: There is a lactation pod in the LIRR area.

Figure 3-1

Existing Lower Level

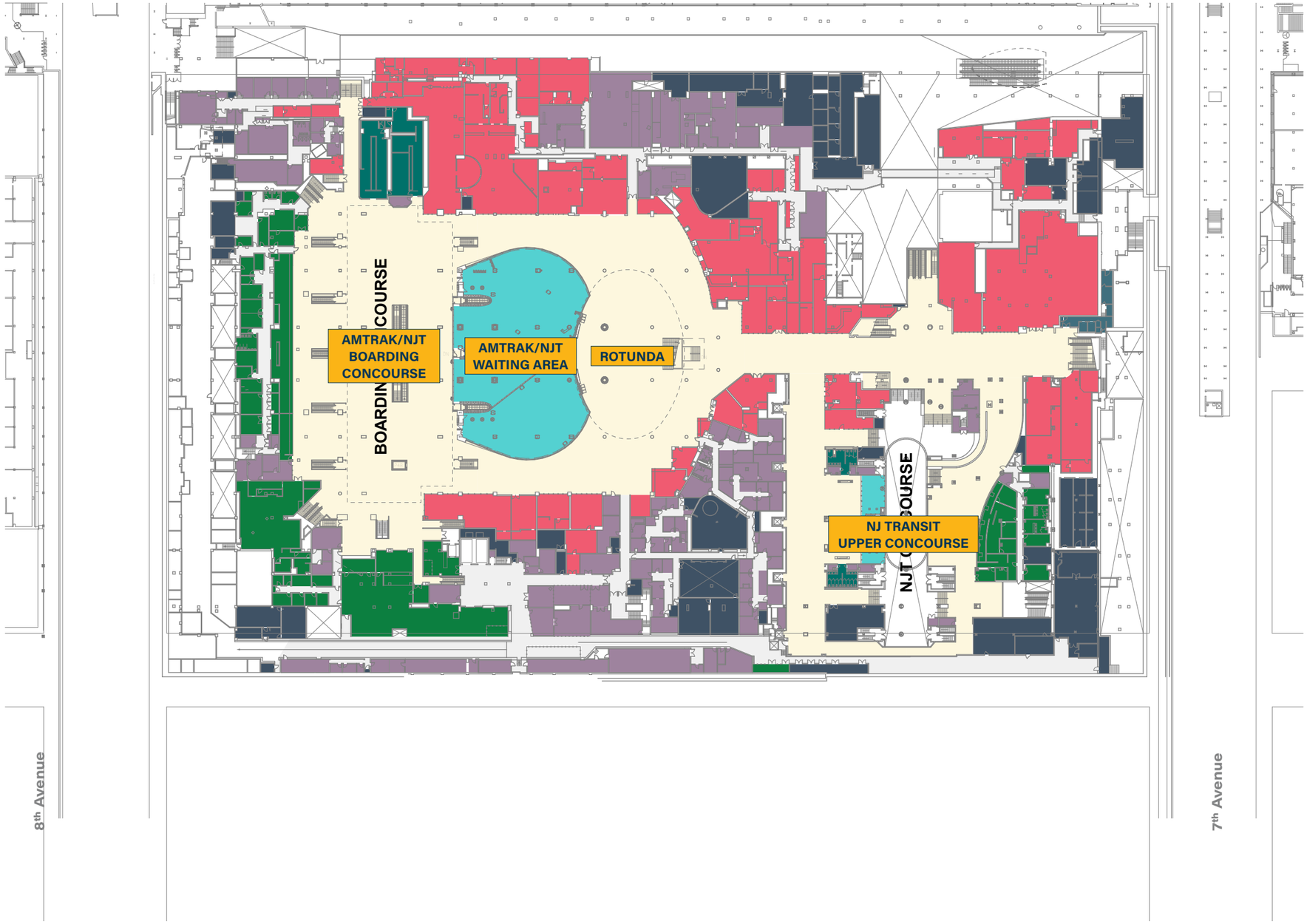


Key

- BOH
- MEP
- Retail
- Ticketing/ Customer Service
- Waiting
- Restrooms
- One Penn Plaza Retail

Figure 3-2

Existing Upper Level



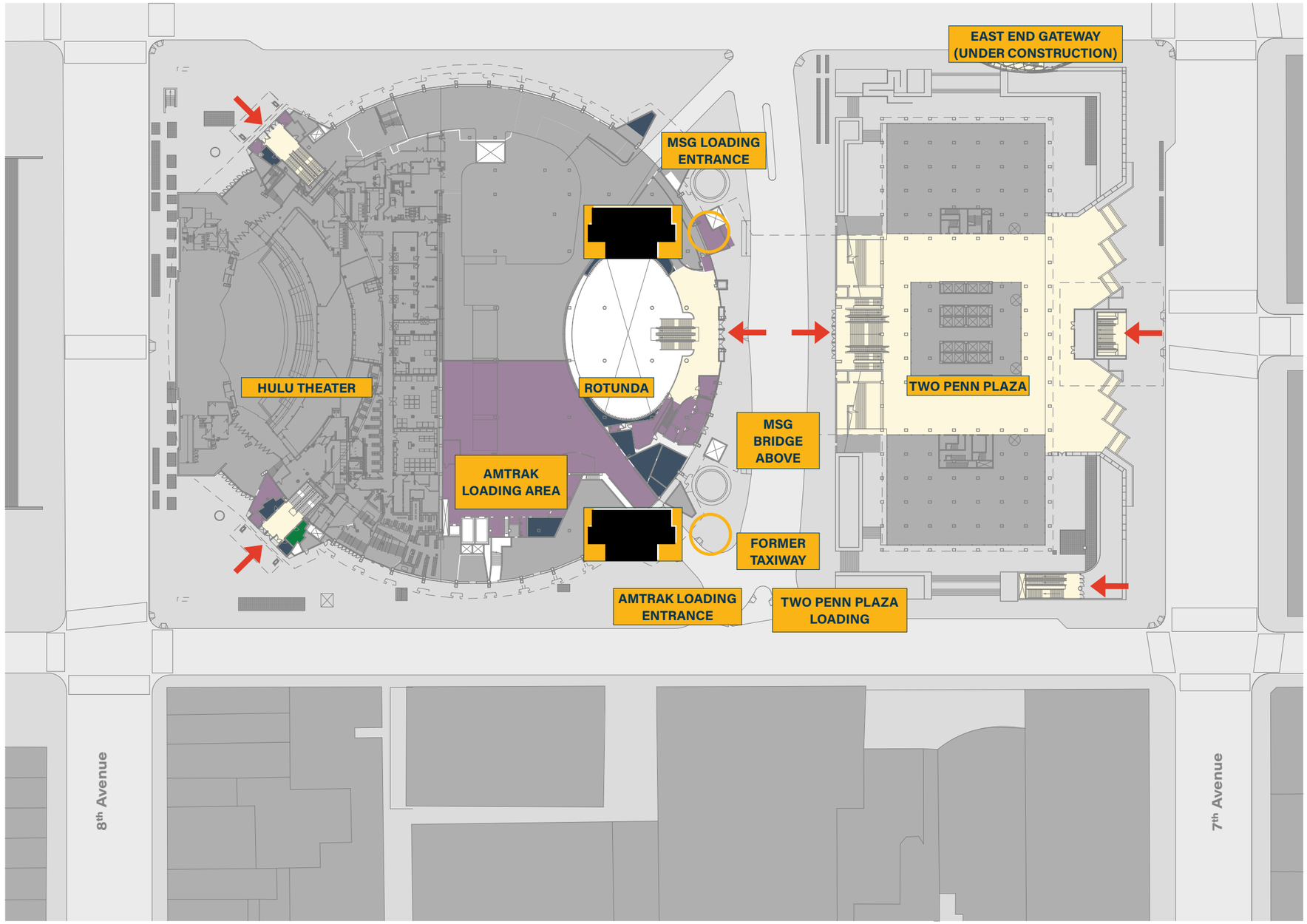
Key

- BOH
- MEP
- Retail
- Ticketing/ Customer Service
- Waiting
- Restrooms
- One Penn Plaza Retail

Lower Level | Upper Level | **Street Level** | Roof

Figure 3-3

Existing Street Level



Key

- BOH
- MEP
- Retail
- Ticketing/ Customer Service
- Waiting
- Restrooms
- One Penn Plaza Retail

Existing Program Areas

Department	Lower Level (SF)	NJT Intermediate Level (SF)	Upper Level and Roof (SF)	Street Level (SF)	Total Program (SF)
Retail	18,400 SF	–	64,800 SF	-	83,200 SF
Customer-Facing Station Operations	13,300 SF	–	50,200 SF	200 SF	63,700 SF
BOH Station Operations	145,600 SF	–	77,200 SF	3,900 SF	226,700 SF
Loading Dock	-	–	-	17,200 SF	17,200 SF
MEP in Station	60,500 SF	0 SF	37,400 SF	-	97,900 SF
MEP at/above Grade	-	–	-	4,200 SF	4,200 SF
Total	**237,800 SF**	**–**	**229,600 SF**	**25,500 SF**	**492,900 SF**
Public Circulation	123,300 SF	33,000 SF	81,400 SF	10,900 SF	248,600 SF
Grand Total	**361,100 SF**	**33,000 SF**	**311,000 SF**	**36,400 SF**	**741,500 SF**

Station Operations and BOH Breakdowns

	Lower Level	Upper Level	Street Level
Cleaning/Janitorial	3,240 SF	940 SF	280 SF
Police Office + Lockers	7,030 SF	5,110 SF	530 SF
Incident Command	0 SF	0 SF	380 SF
Engineering + Engineering Lockers	53,300 SF	23,110 SF	1,940 SF
Crew Base	20,740 SF	0 SF	0 SF
Commissary	7,490 SF	0 SF	0 SF
On Board Services	790 SF	0 SF	0 SF
Operations	5,420 SF	4,240 SF	0 SF
Joint Concourse Management Center	-	-	-
Joint Security Operations Center	-	-	-
Under Construction	7,090 SF	0 SF	0 SF
BOH Circulatoin	21,630 SF	29,530 SF	320 SF

Figure 3-4

Existing East-West Section at Center of Station

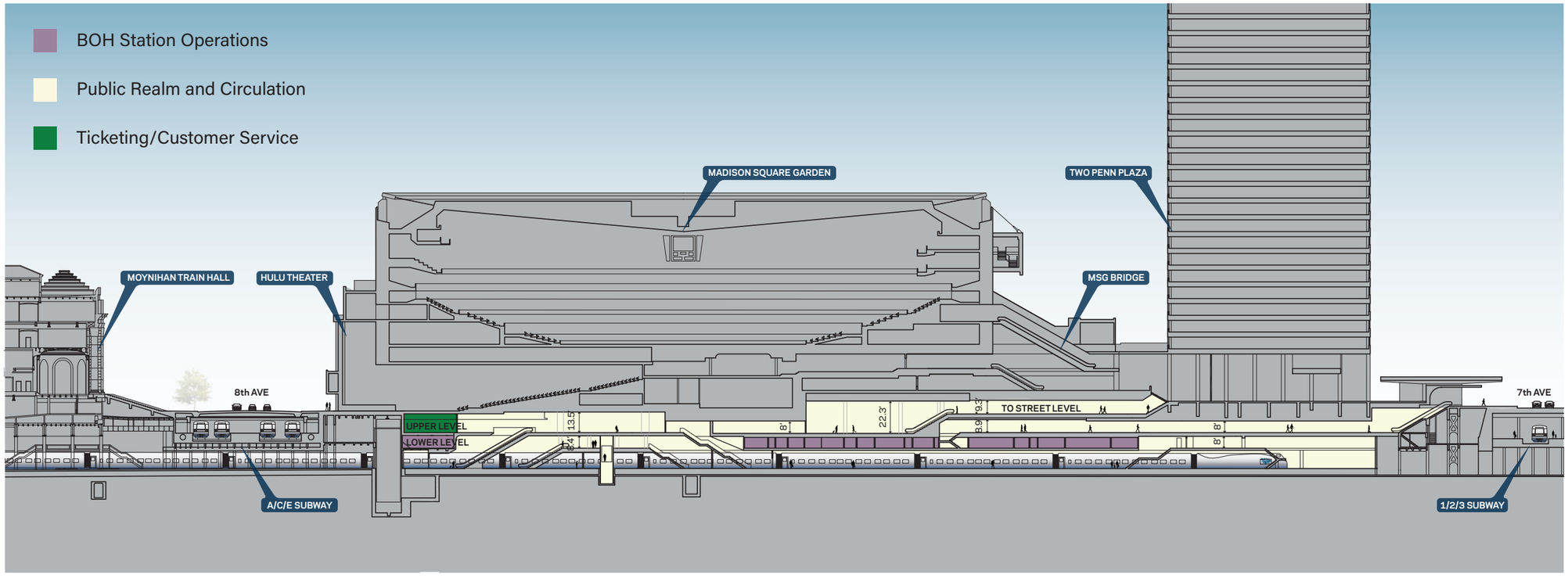
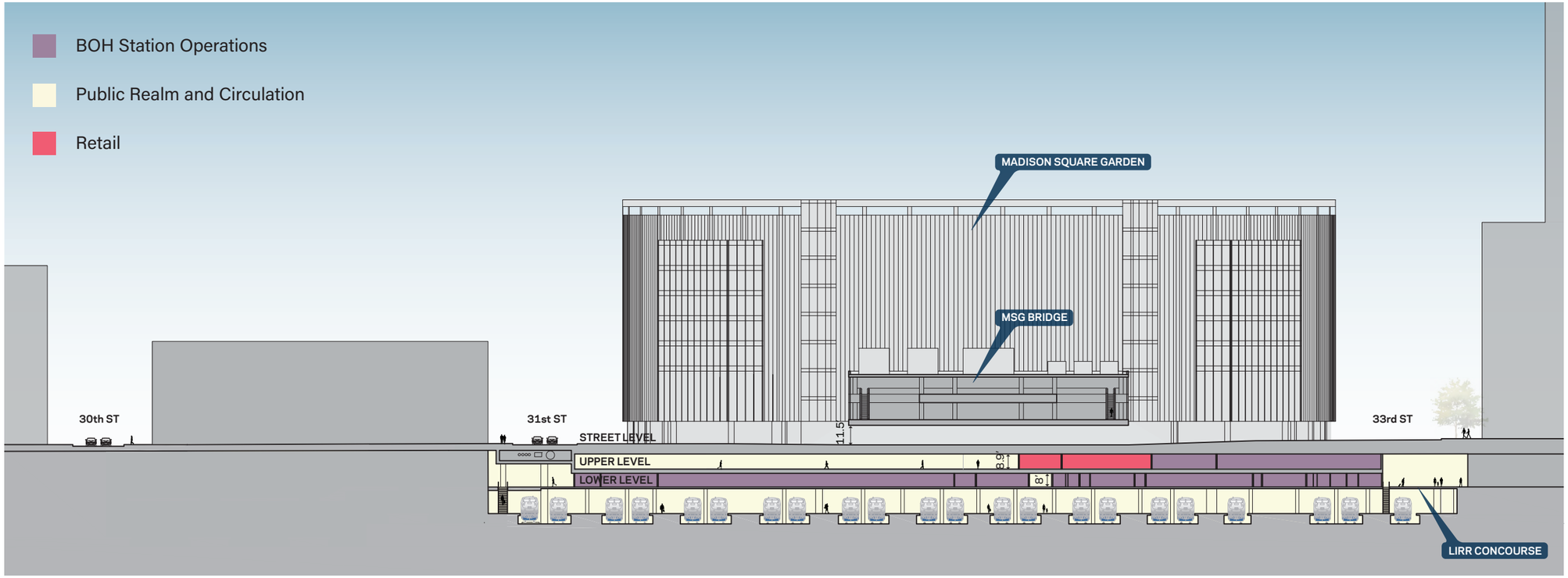


Figure 3-5

Existing North-South Section at Taxiway



Figures 3-6 – 3-13

Existing Conditions Photos



Figure 3-6 Lower Level — Main Gate Concourse



Figure 3-7 NJT Intermediate-Level Concourse



Figure 3-8 Upper Level Amtrak/NJT Boarding Concourse



Figure 3-9 Upper Level Looking North into Rotunda



Figure 3-10 North End of Exit Concourse Looking South



Figure 3-11 Hilton Passageway



Figure 3-12 Exit Concourse Overcrowding



Figure 3-13 Exit Concourse and Stairs/Escalator to Upper Level Amtrak/NJT Boarding Area

Station Operations

The station operation side of Penn Station impacts not only the passengers but also those who work in the station. The three railroads operating at Penn Station, LIRR, Amtrak, and NJT, follow their own operating methods. Station operation is everything outside of actual train function. Station operation includes the various services that the station depends on to function such as escalators/elevators, station cleaning, retail support, restrooms, and overall maintenance of the facility.

Each of the three railroads in Penn Station maintains its own BOH functions and spaces; however, these boundaries have blended over time based on changing needs, space alterations, and functional changes.

There is very little overlap or sharing of space between the railroads, which leads to the duplication of functions. Space allocations vary widely from one support space to another, based upon space available at the time of construction. Similar uses are scattered throughout the station, rather than consolidated.

Currently, all the railroads manage their own designated spaces for cleaning and maintenance support. Although the station has enough janitors' closets, because they are for the different railroads, they are dispersed and fragmented throughout the station.

Amtrak loading occurs either at curbside or within the Amtrak interior loading dock. Height clearance at the entrance to the loading dock from 31st Street is constricted because the size of a typical truck has increased since Penn Station was constructed. Some loading activities occur within the street. 31st Street is also congested in the area of the loading access as a result of back-in parking by the various police vehicles. This condition occurs on the north side of 31st Street from a point near 7th Avenue right up to the driveway that provides access to the loading area. This limits the ability of delivery vehicles for Amtrak and Two Penn/ Vornado to queue or unload curbside.

Building Systems

The existing Mechanical, Electrical, Plumbing (MEP) and Fire Protection Systems are fragmented and dispersed throughout the station, installed where space was available when systems were updated. The age and condition of the systems vary; most are under capacity and inefficient. The existing electrical services are not adequate for existing loads especially when considering possible sustained higher peak demands and system faults. Lighting fixtures throughout the BOH are of older technologies (fluorescent, high-intensity discharge, etc.) that do not meet current energy efficiency requirements. The standpipe system for Penn Station is a manual wet system. There is currently no backup water supply to the system if the main is compromised.

Penn Station building systems are supported by the Service Building (see **Section 6.1** for a description of the existing Service Building).

Figures 3-14 - 3-16 show the existing dispersed distribution of the MEP functions throughout Penn Station. Select critical infrastructure such as ventilation fans, transformers and traction power substations have been identified to remain in place as these are critical to the functioning of the station (see **Figures 3-14 – 3-16**).

Figure 3-14

Lower Level



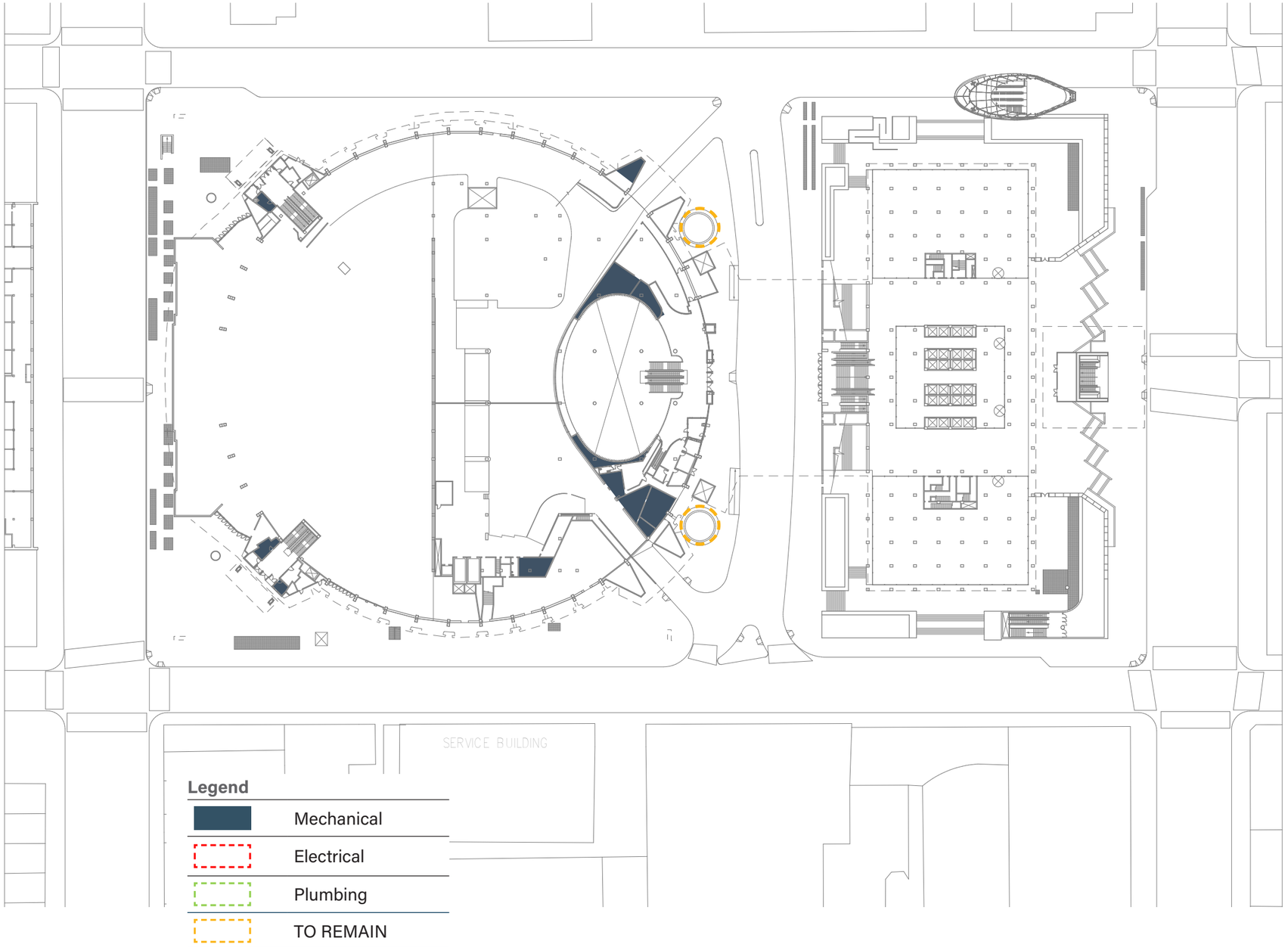
Figure 3-15

Upper Level



Figure 3-16

Street Level



Ridership

Penn Station is the most heavily used and most crowded rail passenger station in the U.S., handling 455,000 weekday rail passenger trips. The station complex, including the 7th and 8th Avenue subway stations, serves an estimated 600,000 daily pedestrian trips, including subway users, office building workers, MSG patrons, and other pedestrians who are not railroad riders. The station serves as both New York's intercity rail terminal for Amtrak and the sole Manhattan rail terminal for NJT and the LIRR. The bulk of the riders on the latter two carriers are commuters from the suburbs to workplaces in the Manhattan central business district (although ridership from area airports has steadily increased). Because of this, usage of the station is heavily peaked in the early morning and early evening hours.

The existing level of ridership in the fall of 2019 was determined from data obtained from the three railroads. A summary of daily ridership for a typical fall weekday is shown in **Figure 3-17**. The peak hourly volumes by railroad operator are shown in **Figure 3-18**.

The locations of the street level entrances to Penn Station are shown in **Figure 3-19**. AM and PM peak hour pedestrian volumes at these street entrances, as well as below-grade subway entrances, are presented in **Figure 3-20**.

Approximately 70% of current passengers exit through the east side entrances during the AM peak and enter the station through these same entrances in the PM peak. This translates to higher congestion in the concourses on the east side of Penn Station. The predominance of travelers coming from the eastern side of Penn Station is expected to continue to grow in the future.

Figure 3-17

Fall 2019 Average Weekday Ridership at Penn Station

	Alighting	Boarding	Total
Amtrak	17,000	17,000	**34,000**
LIRR	119,000	118,000	**237,000**
NJT	95,000	92,000	**187,000**
Total	**231,000**	**227,000**	**458,000**

Note:
Counting NYCT 1/2/3 and A/C/E riders transitioning through Penn Station, the combined Average Daily Total is roughly 600,000.

Figure 3-18

Existing Peak Hour Ridership at Penn Station

	AM Peak Hour			PM Peak Hour		
	Alighting	Boarding	Total	Alighting	Boarding	Total
Amtrak	1,143	1,107	**2,250**	1,347	915	2,262
LIRR	33,750	1,720	**35,470**	3,730	27,630	31,360
NJT	25,927	1,783	**27,710**	4,302	23,179	27,481
Total	**60,820**	**4,610**	**65,430**	**9,379**	**51,724**	**61,103**

Figure 3-19

Existing Penn Station Street Level Entrances

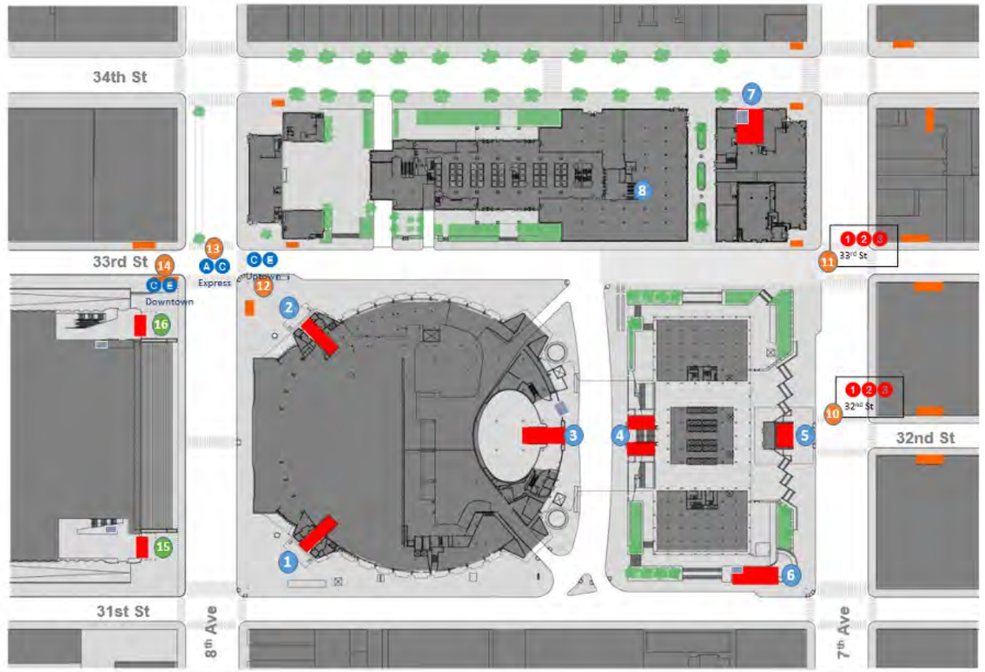


Figure 3-19

Existing Peak Hour Entry and Exit Point Pedestrian Volumes

Entrances	Fall 2019 AM Peak Hour Volume				Fall 2019 PM Peak Hour Volume			
	Enter	%	Exit	%	Enter	%	Exit	%
1 **8th Ave & 31st Street East**	245	2.8%	983	1.5%	1,227	2.1%	277	1.9%
2 **8th Ave & 33rd Street East**	493	5.6%	3,345	5.1%	3,294	5.8%	1,093	7.4%
3 **West Taxiway – Rotunda**	420	4.7%	2,767	4.3%	1,841	3.2%	359	2.4%
4 **East Taxiway – 2 Penn Stairs**	211	2.3%	1,813	2.8%	1,252	2.2%	290	2.0%
5 **7th Avenue & 32nd Street West**	1,655	18.7%	9,862	15.2%	8,185	14.3%	1,319	8.9%
6 **7th Avenue & 31st Street West**	421	4.8%	2,873	4.4%	3,652	6.4%	700	4.7%
7 **7th Avenue & 34th Street South**	1,261	14.2%	8,709	13.4%	7,578	13.3%	1,261	8.5%
8 **1 Penn Plaza East**	98	1.1%	1,577	2.4%	803	1.4%	119	0.8%
9 **1 Penn Plaza West** (closed for construction)								
10 **1/2/3 32nd Subway Cordon**	445	5.0%	4,000	6.1%	3,600	6.3%	700	4.7%
11 **1/2/3 33rd Subway Cordon**	994	11.2%	11,096	17.1%	9,986	17.5%	4,100	27.6%
12 **C/E Stair Uptown**	343	3.9%	6,882	10.6%	6,194	10.8%	1,600	10.8%
13 **A/C Express**	1,498	16.9%	4,300	6.6%	3,870	6.8%	2,000	13.5%
14 **C/E Stair Downtown**	397	4.5%	3,948	6.1%	3,536	6.2%	513	3.5%
15 **8th Ave & 33rd Street West**	297	3.4%	2,282	3.5%	1,548	2.7%	361	2.4%
16 **8th Ave & 31st Street West**	83	0.9%	634	1.0%	615	1.1%	144	1.0%
Total	**8,861**	**100%**	**65,071**	**100%**	**57,181**	**100%**	**14,836**	**100%**

Level of Service

The primary performance measure that is used to determine the adequacy of pedestrian circulation facilities within the station is peak Level of Service (LOS), as defined by Fruin,[1] which describes the peak degree of congestion at key locations within the train station. There are six LOS classifications, indicated by the letters A through F, ranging from free-flowing (A) to severely restricted and packed with people (F). 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:

- 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.
- 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.
- 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.
- **LOS E** and **F** represent severe congestion. 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.

LOS is calculated slightly differently for pedestrian flows along a walkway or on stairways (pedestrians per minute per effective width of walkway) and for pedestrians waiting or queuing (i.e., occupancy) within a space (square feet per person).

Concourse Level Circulation and Occupancy

The focus of the preliminary analysis of alternative master plan concepts is on occupancy LOS during the weekday PM peak, which is when the Penn Station concourses are most crowded. Levels of peak occupancy, measured as the average condition over the peak five-minute period, are estimated for the zones at concourse level where access to the platforms is provided. These are the locations where passengers currently wait for trains and where queues form when train boarding announcements are made. The estimates include allowances for passengers waiting within these spaces and circulating through the spaces.

Figure 3-21 shows existing PM peak hour boarding passenger volumes and occupancy LOS within the Penn Station concourse waiting areas. These estimates are based on modeled operations, not passenger counts. The concourse assignments were informed by the 2009 Moynihan Station Environmental Assessment and the 2019 33rd St. East End Gateway project design analysis.

The north/south concourses on the Lower Level show passenger flow rates within LOS A–D in the PM peak periods. The central corridor has the best LOS but the least usage, because it only serves LIRR trains directly and offers less vertical circulation to and from the platforms compared with the other concourses for LIRR passengers. The 8th Avenue Concourse shows more variation with modest congestion in the vicinity of the Connecting Concourse, and free flow to the south of the Hilton Corridor in the AM, while it becomes increasingly congested in the PM peak, as passengers wait for their train departure announcements (LOS C). The 7th Avenue concourses (LIRR Main Gate Area and NJT 7th Avenue Concourse) have areas of congestion (C/D) focused on the vertical circulation and cross flows (at the Connecting Concourse or 32nd Street Spine) during the AM while they are largely flowing, but become significantly more congested during the PM peak, when substantial volumes of passengers are waiting in these areas for train departures. The NJT 7th Avenue Concourse is particularly prone to high congestion in the PM peak, due to the limitations of vertical circulation elements (VCEs) to platforms and its configuration (LOS D/E).

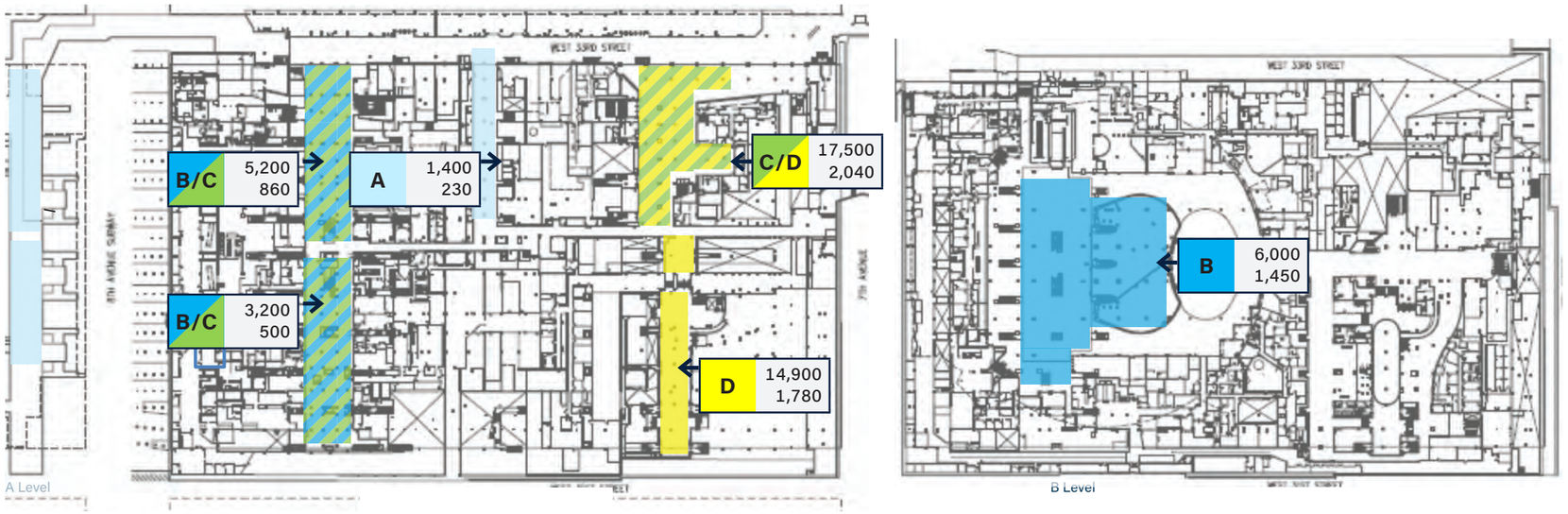
The east-west Connecting Concourse generally functions at LOS C/D, depending on location and time of day. Although fairly wide overall, the Concourse carries great volumes of passengers en route to the subways and exits. At the far east of the Concourse, the crossflow of passengers heading to the 1/2/3 7th Avenue Subway, heading to/coming from the 34th Street Entrance, and waiting in the Man Gate Area make for large pockets of congested conditions at LOS D.

Note that the LOS shown are for the normal operating conditions. In the case of delays in train service, the LOS for concourses can decline upwards of a full level. The NJT 7th Avenue Concourse (also referred to later as the Intermediate Level) is especially prone to this, as it has relatively limited space availability compared to its awaiting passenger load.

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

Figure 3-21

PM Peak Hour Passenger Volumes, Concourse Occupancy, and Level of Service on a Typical Fall Weekday in 2019, with On-Time Train Departures



Level of Service (LOS) Ratings Key

LOS Rating	Peak Hr. Boardings / Peak Occupancy
LOS A	
LOS B	
LOS B/C	
LOS C	
LOS C/D	
LOS D	
LOS D/E	
LOS E	
LOS F	

4

Description of Alternatives

From a much larger field of design opportunities and alternatives, the project team selected four options as preferred alternatives. These alternatives represent the most viable options of the many studied, as well as a range of approaches to reconfigure the station. The alternatives are ordered roughly by the magnitude of the level of intervention to the existing station. In addition to these major moves, a host of other secondary and tertiary differences, most of which are consequences of the major moves, further define and delineate the alternatives.

Alternative 1



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Alternative 2



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Alternative 3



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Alternative 4



Page 132

Renderings are for illustrative purposes only.

Introduction

The Gold Standard: Grand Central Terminal

Opened in 1913, Grand Central Terminal has functioned exceptionally well as both an intercity terminal for the New York Central Railroad and a commuter terminal for Metro-North Railroad, through good and bad times. It was the third iteration of a terminal on this site, so the designers took on board many lessons learned from the earlier and generally unsuccessful predecessor stations. With access to greater financial resources than its crosstown rival the Pennsylvania Railroad, the Vanderbilt-owned New York Central could invest in a larger and more gracious facility, with 56 tracks on two track levels, unobstructed sight lines to the tracks, and wide ramps for vertical circulation. It also has the advantage of being a terminal, allowing all the stub tracks to be accessed at their head ends directly from their respective boarding concourses via platform-width ramps, an exceptional circulation scheme not available at the more space-constrained Penn Station. Overall, Grand Central Terminal set a number of best practices in design of railroad stations.

Despite these and other important differences, Penn Station would greatly benefit from implementing, to the extent possible, the best practices pioneered by Grand Central in this proposed reconstruction.

Best practices pioneered by Grand Central Terminal

Unified Station Operations

Although several railroads initially used the terminal, and commuter lines used the lower "Suburban Level", station operations were unified. These legacy railroads now form three major Metro-North lines, and station operations are still unified.

Lots of Exits in All Directions

The terminal's most outstanding feature is its 22 exits in various directions to different streets, which knits it to the surrounding district, makes entry and egress easy, and provides for rapid evacuation of the terminal in an emergency.

Excellent Visibility to the Tracks

The sight lines from the upper and lower boarding concourses to their respective tracks are clear and easy to understand.

Intuitive Wayfinding

Passengers do not have difficulty finding their tracks due to the simple, direct spatial relationship between the tracks and their respective boarding concourses. While Grand Central is a sprawling, two-level complex that now accommodates many non-transportation functions, there are generally clear transitions between zones, and the architecture provides navigation cues that work very successfully with signage to guide users to their destinations.

Ample Vertical Circulation

The many ramps and wide stairs easily accommodate the large concentration of passengers during peak hours. Navigating between levels rarely feels constrained or crowded.

Prominent Street Presence

Although well integrated with the surrounding district, the terminal has an unmistakable street presence. Even users unfamiliar with the terminal do not have trouble finding it.

Penn Station Lessons Learned

The history of Penn Station provides several lessons regarding understanding its traveler profile and the development and legacy of the station configuration. Understanding how we got here informs where we go from here.

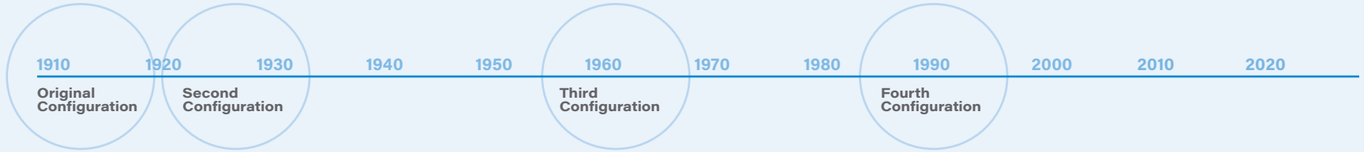
Planning Penn Station

When Penn Station was opened in 1910, rail was the dominant mode of travel between cities, and all the great railroads of North America and Europe built grand stations in their major cities that reflected the importance and profitability of intercity rail travel, including here in NYC. When the station was being planned at the turn of the 20th century, the designers were focused on providing a station that complemented the prestige and glamor of intercity rail travel. This is obvious in the ambitious, Greek- and Roman-inspired architecture of the building, which had as much street presence and grandeur as its crosstown rival.

What the planners did not anticipate was the rapid growth of commuting and intercity auto and air travel encouraged by generous federal and state subsidies. When the station opened in 1910, in addition to the intercity service provided by Pennsylvania Railroad, the Long Island, Pennsylvania, New Haven, and Lehigh Valley railroads also ran commuter service to Penn Station. By 1920, two-thirds of the 25 million annual passengers using Penn Station were commuters. The station was designed for a traveler profile that was out-of-date within a decade of its construction.

Station Configuration

Penn Station has had four variations of a multi-level configuration over its 110-year-life.



Original Configuration

The railroad was anticipating considerable growth in passenger traffic over time, with contemporary articles in Scientific American and other journals reporting that the rail network was designed for up to 100 million annual passengers. The designer's approach to managing the high anticipated passenger volumes was to physically separate arriving and departing passengers on two levels, making Penn Station one of the first transportation facilities to adopt this model, which was subsequently adopted by airports around the world.

The departure level comprised the spacious, light-filled departure concourse (Figure 4-1), a vast, ornate waiting room with a 130-foot-high ceiling (Figure 4-2), separate seated waiting rooms for men and women, a formal dining room serving the same fare as provided on intercity trains, and an informal counter-style lunch room. The level stretched from 31st to 33rd Street and occupied roughly one-half of the footprint of the station east-to-west. Pennsylvania Railroad passengers boarded from the upper departure concourse, which was in the western third of the station, with two stairs down to each of the 11 platforms.

Pennsylvania Railroad owned a controlling Interest in Long Island Railroad, but commuter service was a loss leader, as it was for all the major railroads. Focused on their profitable



Figure 4-1
Departure Concourse



Figure 4-2
Departure Waiting Hall

intercity service, they relegated Long Island Railroad to second-class citizenship on the smaller, unimaginative lower level. LIRR had a separate entrance on 7th Avenue near 33rd Street and an underground connector to another entrance on 34th Street, space on the lower level for ticketing and waiting, and boarded from the arrival concourse and from some additional stairs to their platforms near the 7th Avenue end of the lower level.

The rail track profile, which had to pass below the North and East Rivers on each side of Manhattan and remain below the City's planned subway lines, set the tracks 40 feet below street level, too great an elevation change for continuous stair runs. The designers' solution was to place the departure level one story down from street level, to reduce the length of the stair runs down to the platforms. They squeezed a smaller lower level, including an arrival concourse, LIRR facilities and various station operations functions like baggage handling and mechanical systems between the departure concourse and the platform level. This decision burdened the lower level with very low ceilings, a legacy from which the station suffers to this day.

The lower- level arrival concourse, directly below and smaller than the departure concourse, also had two stairs to each platform. There was also a waiting room for people to meet arriving intercity passengers, and a departure waiting room for LIRR. Arriving intercity passengers used any of three stairs that went from the arrival concourse directly to street level at the west end of the station to exit the building. While the departure level sported world-class architecture, the arrivals level resembled a subway station, with white tile walls and the structure supporting the upper level above exposed.

See **Figure 4-3.1 — 4-3.3** for diagrams of the original station.

Note that the 7th Avenue subway line was already in development and partially opened when Penn Station opened. The subway line was completed shortly thereafter in 1918.

Figure 4-3.1
Original Configuration

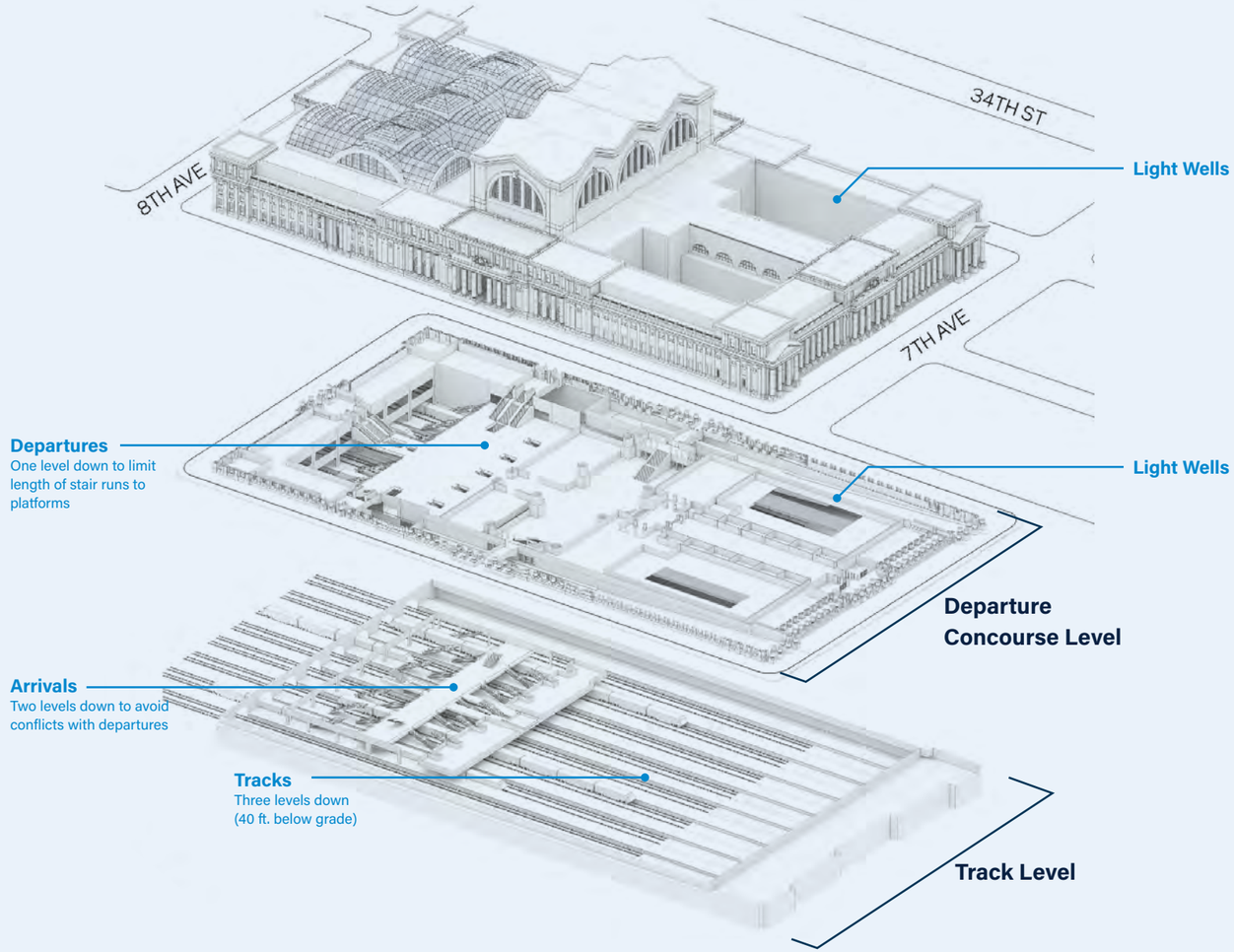


Figure 4-3.2
Departure Configuration

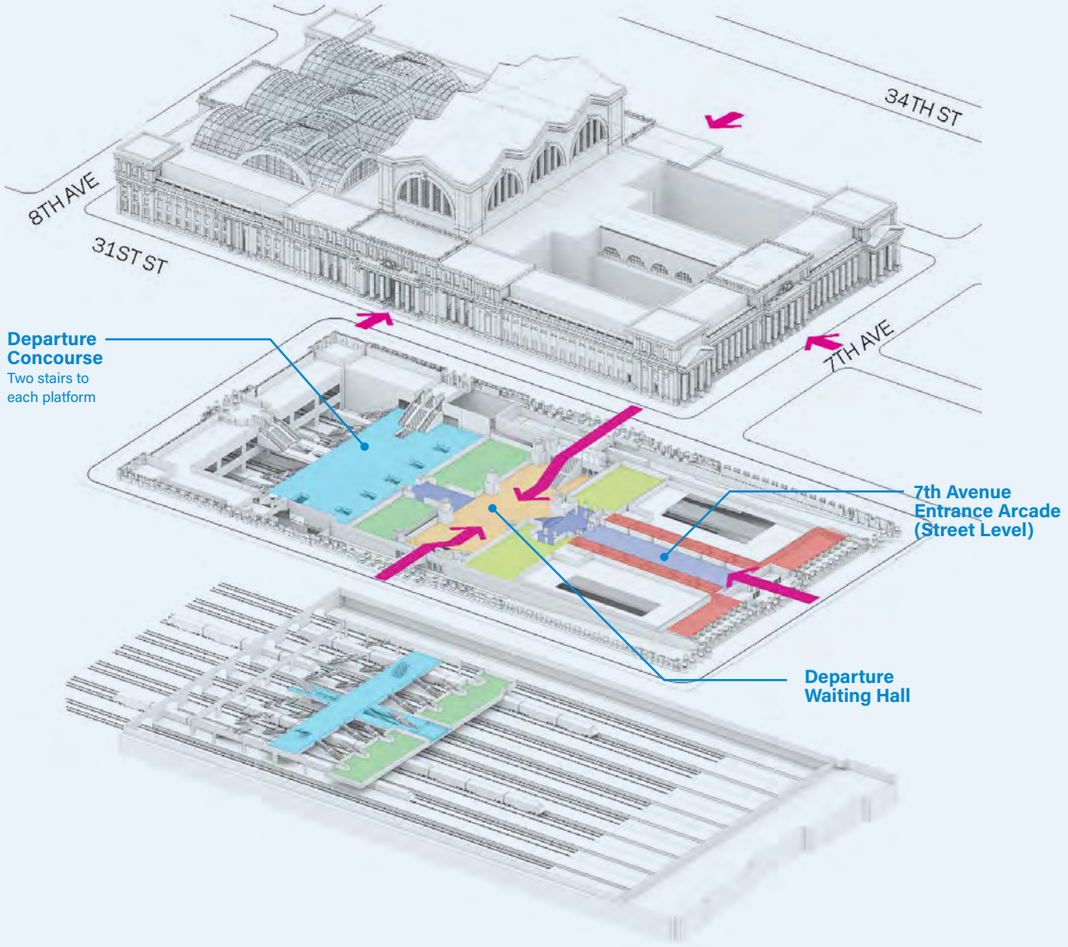
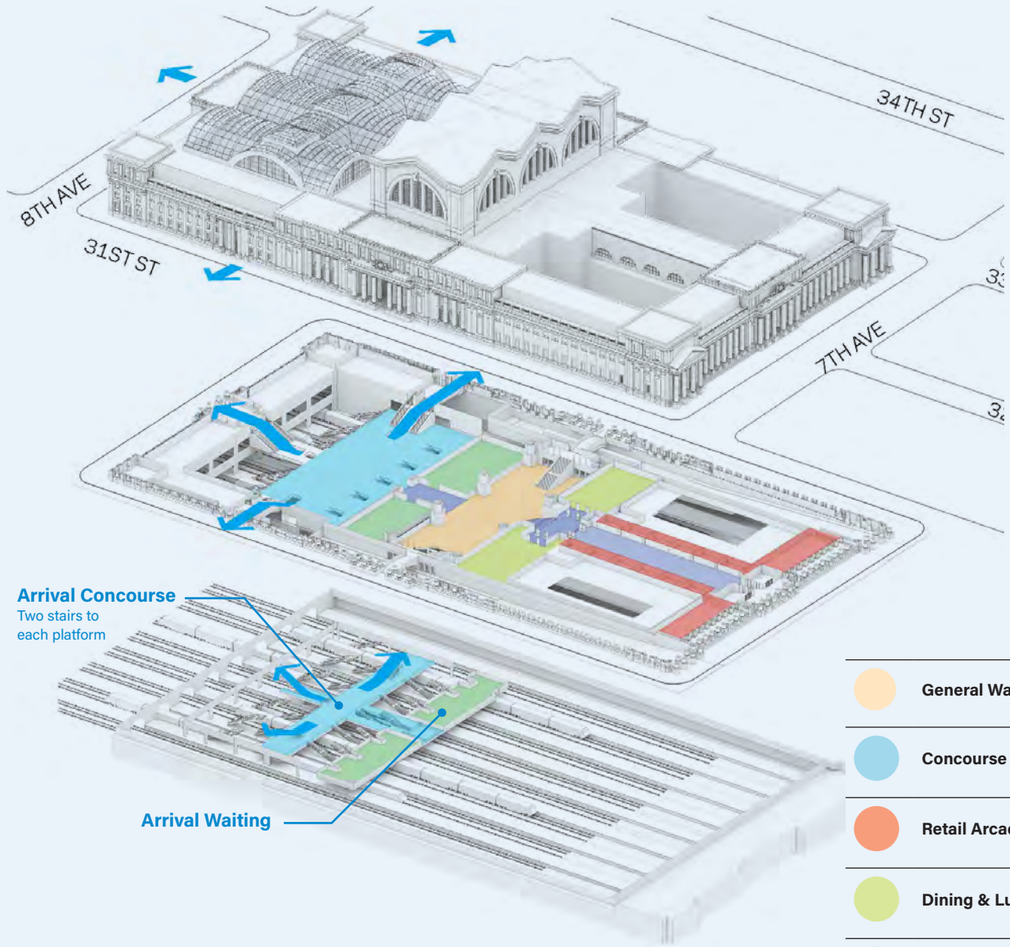


Figure 4-3.3
Arrival Configuration

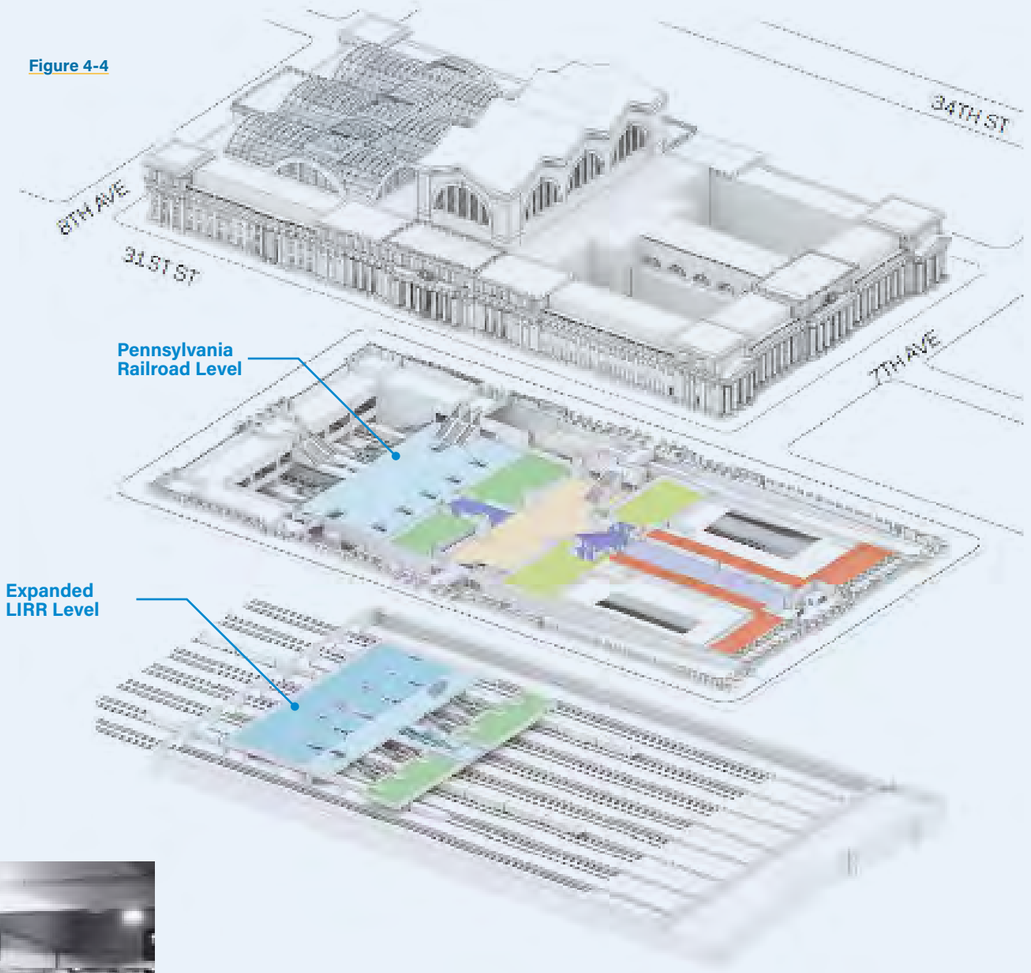


- General Waiting
- Concourse
- Retail Arcade & Shops
- Dining & Lunch
- Waiting Rooms
- General Circulation

Second Configuration

A number of expansions and improvements to the lower level were made in the 1920s and 1930s to accommodate LIRR's rapidly-growing ridership. The lower-level concourse was expanded to the west into the west atrium space, but left open to the atrium, with additional LIRR seating; the LIRR ticketing area was expanded and modernized; and other unidentified modifications are referred to in contemporary articles (see **Figure 4-4**). Arriving passengers were also routed up directly to the departure concourse as well as to the arrival concourse, presumably to speed-up clearing the platforms after trains arrived. The 8th Avenue subway line also opened during this period. While these Improvements no doubt helped, they also introduced confusion, since taking different stairs from the platforms took passengers to different levels with different exit pathways. Overall, passenger circulation in the station was confusing and frustrating.

Figure 4-4





Expanded LIRR Level



LIRR Boarding Concourse



Figure 4-5



Figure 4-6.1



Figure 4-6.2

Third Configuration

Annual passenger volume in the station rose to a peak of 100 million in 1945. However, this figure disguises the financial decline of the Pennsylvania Railroad. The actual demand for intercity rail travel was already declining significantly, but was greatly inflated by the number of World War II military personnel being moved around the country by the War Department without payment to the railroads (all railroads were taken over by the federal government on an emergency basis during the war). The Pennsylvania Railroad posted its first annual loss in 1947, and by 1953 it sought to stave off impending bankruptcy by optioning the air rights over the station to a developer. By the mid-1960s, the iconic station above street level was demolished and first MSG and then the Two Penn Plaza office building were constructed in the air rights. The station was reconfigured as two basement levels below these new buildings, with both levels filled-in to cover the full footprint of the two-square-block station. This was a minimum-cost effort due to the precarious finances of the Pennsylvania Railroad.

The stairs from the upper-level west boarding area (the former departure concourse) to the center 6 platforms were replaced with escalators, but most of the stairs to the outer platforms were removed, markedly reducing the functionality of the upper level. The rest of the upper level comprised circulation, waiting, retail, and station operations (BOH) space for the Pennsylvania Railroad. The architecture, benches, and finishes of the new upper level were like those in other major Pennsylvania Railroad stations, serviceable but certainly not grand (**Figure 4-5**).

The original arrival concourse on the west end of the lower level remained (now called the Exit Concourse). New ticketing and waiting areas and a partial north-south concourse with stairs to the LIRR platforms were added on the east end of the lower level (the Main Gate Area). An expanded east-west concourse below 33rd Street connected the two lower boarding concourses with each other and with the 7th and 8th Avenue subway stations (the 33rd Street Connecting Concourse), with retail shops on both sides. New stairs were added to connect the upper and lower levels, and the remainder of the lower level (the majority of its floor area) became station operations (BOH) space for both railroads. Headroom remained low, as little as 6 ft. – 8 in. in places, though some areas had greater headroom. There was no attempt at improving the architecture and finishes, so the entire lower level resembled a nondescript subway station (**Figure 4-6.1 – 4-6.2**).

A major loss of functionality stems from the Pennsylvania Railroad acceding to a development plan that left Penn Station with no meaningful presence in the surrounding streetscape and scattered, uncoordinated entrances (see Figure 4-7). The busiest train station in North America is virtually hidden from the public. If we compare this configuration to the best practices implemented in Grand Central, it becomes painfully obvious that none of the redeeming characteristics of the original station survived the 1960s deconstruction.

At the time of the third configuration, intercity travel was still declining, but commuter traffic was still increasing. Contemporary articles report that the new station configuration was designed for 200,000 daily passenger trips, reflecting lower ridership expectations.

Figure 4-7
Uncoordinated Entrances



Fourth Configuration

In the 1990s, NJT constructed a ticketing and waiting area in the southeast quadrant of the upper level in a former storage area with an intermediate-level boarding concourse, to support its new Midtown Direct service to Penn Station. The design, with warm-colored stone finishes and a mix of modern and retro details, made Its best effort to fit its many new riders into an awkward legacy configuration. NJT passengers can board trains from the upper-level west boarding area as well, but most of their passengers use the newer intermediate-level concourse.

LIRR also did renovations to their lower-level space in the 1980s and 1990s, including: constructing the West End concourse; adding a new entrance and underground connector to 34th Street; lengthening their platforms to accommodate 12 car train sets; adding air conditioning to the lower level; and adding new elevators and escalators, making their part of the station Americans with Disabilities Act (ADA) accessible.

Moynihan Train Hall was opened in January 2020, and is now Amtrak's main ticketing, waiting and boarding facility. While some of their passengers continue to board and alight their trains in Penn Station, the station Is now almost entirely a commuter facility (save for two Amtrak trains each night that will still use Penn Station when Moynihan Station is closed overnight), a vastly different reality from what it was originally designed for in 1910 (see **Figure 4-8**).

Legacy

The station has had four configurations, none of which appears to have functioned very well. The overall result of this history is a legacy station configuration that is poorly matched to its current usage and ridership, and which has lost its rightful place in the fabric of midtown. The current configuration is balkanized, inefficient, and inequitable, and still reflects the priorities and prejudices of a long-gone era, minus the grand street presence. Both levels have large public areas with low ceiling heights, and the lack of direct access to street level and the uneven distribution of retail and station BOH functions between the two levels keeps the lower level second-class. Penn Station simply does not function well because the original design flaws and profound changes in use and ridership patterns over 120 years have never been addressed comprehensively, despite a number of thoughtful but incremental and piecemeal renovations and improvements.

Improving how Penn Station functions on a very basic level is the key to providing a superior travel experience for riders, and is the heart of the Master Plan.

Aspirations

1. **Relieve overcrowding and improve passenger flow and orientation**
2. **Improve platform and station egress and accessibility**
3. **Optimize station functionality and operation**
4. **Improve or eliminate the cramped, disjointed circulation on the Lower Level**
5. **Create a clear street presence that integrates with the surrounding context**
6. **Introduce daylighting**
7. **Optimize retail and other revenue generation to support the station**
8. **Integrate Penn Station with the Penn Station Expansion**
9. **Create a superior passenger experience**

Aspirations for the Future Penn Station

We adopted the at left nine general and specific aspirations at right as guides for our early design studies.

All the alternatives meet the objectives of Aspirations 1, 2, and 8 regarding improving circulation, platform access, and integration with Penn Station Expansion. The alternatives meet aspirations 3 (optimize station operations) and 5 (create street presence) in divergent ways based on:

1. Whether the scheme retains the Upper Level of the existing station for passenger circulation and platform access/boarding.

2. Whether the scheme creates a Mid-block Train Hall in the area of the former taxiway running between MSG and Two Penn Plaza.

3. Whether the scheme removes the Hulu Theater to create a large Entry Hall space on the 8th Avenue perimeter of the station.

These options then affect the performance of the alternatives against the remaining aspirations of 4, 6, 7, and 9.

Some of the details and options shown in the various alternatives can be added to other alternatives, to further improve the selected alternative. The team looks forward to incorporating this feedback in order to continue to refine the preferred alternative. The new entrance on 8th Avenue replacing the Hulu Theater is shown in Alternative 2 where it functions well as an entrance to the west boarding gates on the Upper Level. This entrance could also be added to the single-level boarding in Alternatives 3 and 4, although the implications of the added expense would have to be considered.

The Mid-block Train Hall is currently shown in Alternative 4 where it provides access to the 7th Avenue boarding concourse below. The utility of the Mid-Block Train Hall above Alternative 1 or 2 which retain the Upper Level would be limited since the east side of the Upper Level does not provide boarding access.

Early Design Studies

Based on the work of previous studies, an understanding of the existing conditions, and the Master Plan aspirations, the design team generated a wide array of design strategies at different scales. Some of the strategies focused on major spaces and circulation patterns while others focused on specific issues such as entries or connections to the 780 block. Some of the key strategies included in these early explorations are shown in **Figure 4-8**.

The strategies were sorted, grouped, and tested. Some strategies quickly proved non-viable, while others could be applied to any and all alternatives. For example, reconfiguring of the Amtrak loading proved largely unachievable, and enclosing a full block of 31st Street proved impractical.

Among the elements that proved preferable for any alternative were creating strong connections to Penn Station Expansion and Moynihan, and a grid-like system of north-south and east-west concourses. As the VCEs must align with the track-level platforms, and distributing passengers among these platforms is the chief function of the circulation space, a grid system was the most efficient and effective organization. Several major drivers helped shape this circulation grid:

- The extension of the Central Concourse which is one of the only ways to provide additional platform access and egress.
- The geometry established by the LIRR concourse axis. The ongoing renovation of this area made it a "fixed element."
- The widening of the east-west Hilton Corridor connecting to the 7th Avenue entrances to the north-south concourses which is essential for passenger distribution, especially with the 32nd Street entrance being the station's most heavily trafficked.
- As the pedestrian flow analysis was developed, the importance of a wide concourse on the east side of the station, where the greatest pedestrian flows are, became apparent.

Through the process of testing and combining strategies, several key factors emerged as more significant drivers and differentiators between potential alternatives. These include:

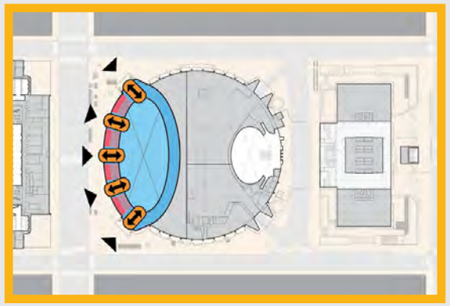
- The location, configuration, and size for a major gathering space. The leading opportunities were a train hall on the east side if the Hulu Theater is removed from MSG, and a mid-block train hall in the former taxiway.
- Having public circulation on both Upper and Lower Levels, maintain lower ceiling heights, or on Upper Level only with higher ceiling heights.
- The degree of street presence, based on the ability to rework the existing entrances or add new entrances.
- The extent of daylight penetration into the station, based on the addition of a west or east train hall or modification of existing entrances.

The final alternatives differ primarily in these ways, and the design strategies have been aligned to form two fundamental approaches to the problem of remaking the station.

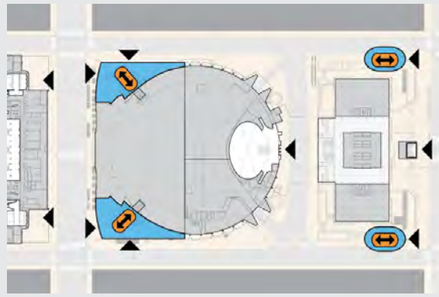
Figure 4-8

Design Strategies A Starting Point for Investigation

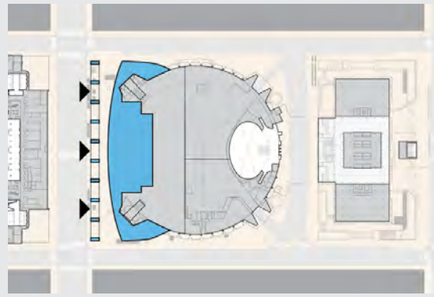
Strategies highlighted in yellow boxes were identified as strategies including spatial drivers with the greatest impact



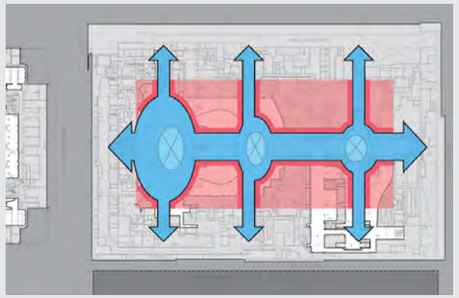
01: Hulu Theater Removed
Removal of the Hulu Theater to create a grand entry hall on 8th Avenue.



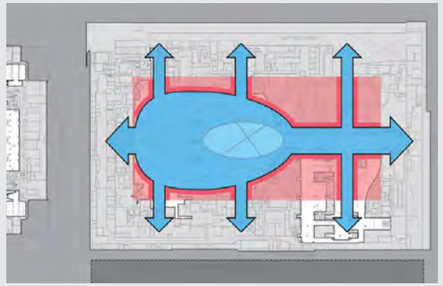
02: Enhance Corner Entries
Expansion of the corner entries on 8th Avenue.



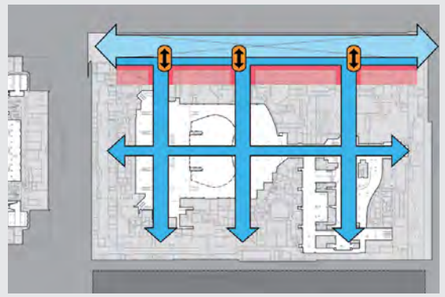
03: Street Presence
A recladding of the 8th Avenue façade incorporating new corner entrances.



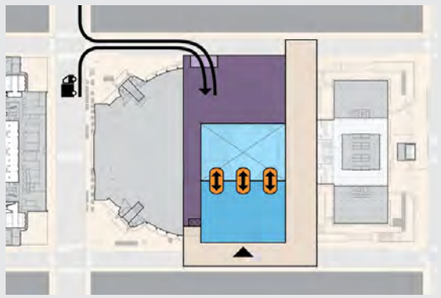
08: Multiple Nodes
The creation of multiple key nodes or gathering spaces along a central east-west corridor.



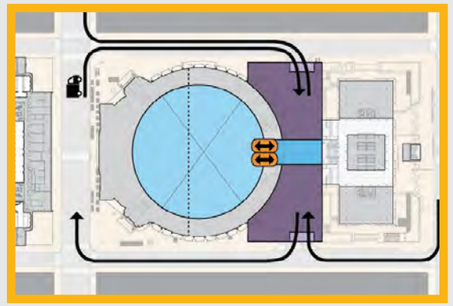
09: Large Central Node
Creating a large open area dominating most of the station footprint.



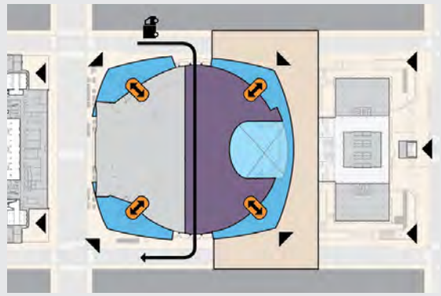
10: LIRR Corridor as Primary Axis
Treating the LIRR concourse as the station's main spine.



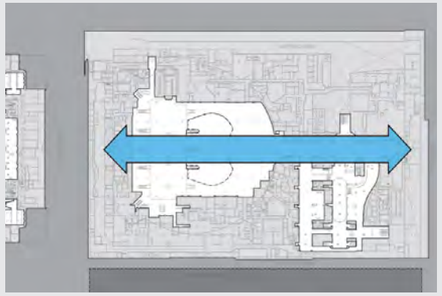
15: Consolidate Loading
Consolidating Amtrak and MSG loading on 33rd Street.



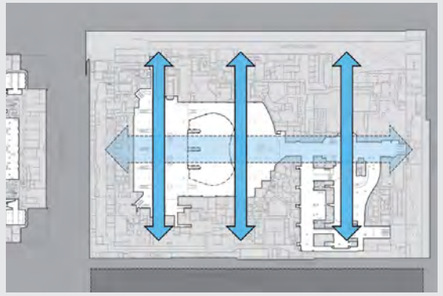
16: Relocate Loading
Relocating loading to enclosed space in the taxiway.



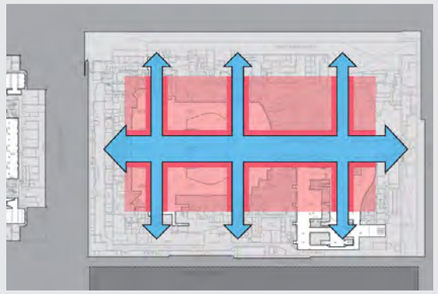
17: 4 Corner Entries
Creating matching entrances at all four corners of the MSG block.



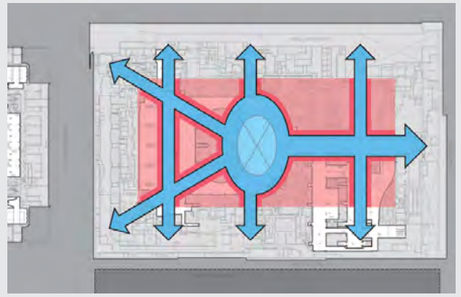
04: Central E/W Axis
A central East-West one- or two-level concourse.



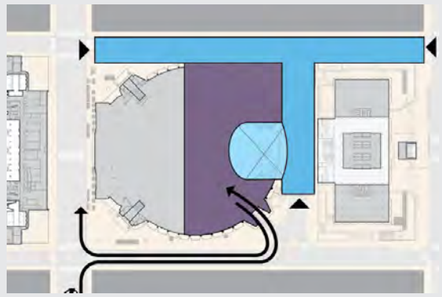
05: Create N/S Axes
Creation of three parallel north-south concourses, including the extension of the Central Concourse.



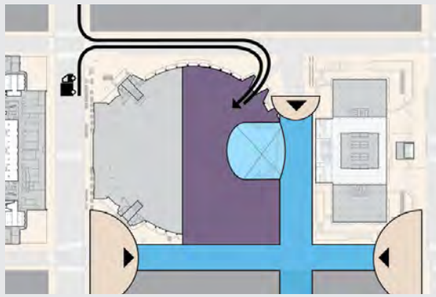
06: Retail on B Extends to Axes
Focusing retail on the Upper Level along a central concourse.



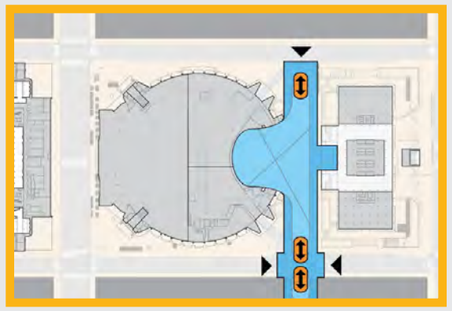
07: Central Node
The creation of a centralized hall or gathering space.



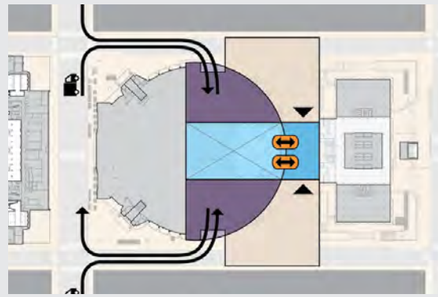
11: Train Hall on 33rd Street
Creating a mid-block train hall accessed from 31st Street.



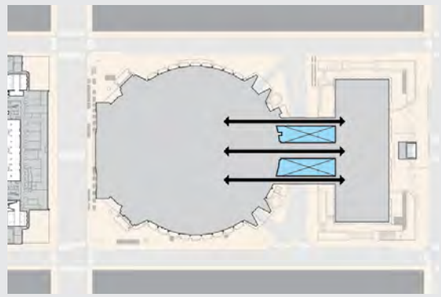
12: Train Hall on 31st Street
Enclosing 31st Street as a main east-west train hall.



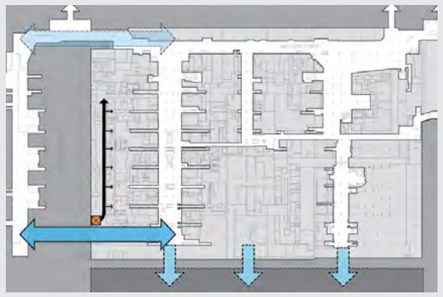
13: Mid-Block Train Hall
Enclosing 31st Street as a main east-west train hall.



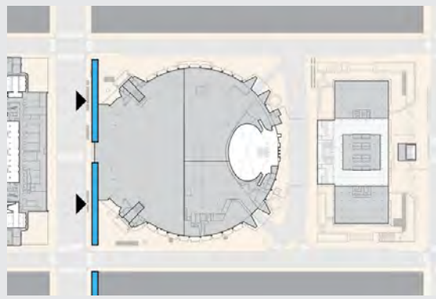
14: Carve Out Loading
Carving out the existing loading dock to create a central hall space



18: Bridge Narrowed
Narrowing or opening up the MSG bridge to bring light below.



19: Connection Across 8th Ave
Extending concourses across 8th Avenue and 31st Street to better connect Moynihan and Penn Station Expansion.



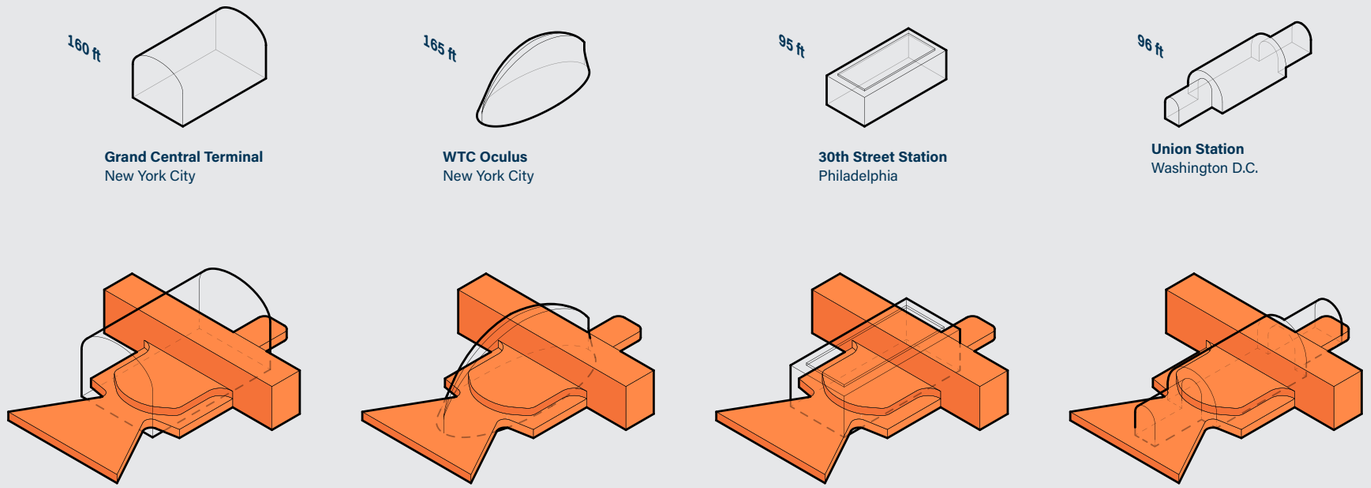
20: Street Presence W/780 Block
Creating a three-block-long coordinated façade from 30th to 33rd Street on 8th Avenue.

Spatial Precedent Comparison

Through the course of developing studies, the volume of the primary circulation space was compared to known precedents for major public station spaces, including Grand Central Station and the Oculus at the World Trade Center (Figure 4-9). These comparisons confirm the importance of both height and the ratio of height-to-width in creating a civic-feeling space. The comparisons underscore the challenge of creating such spaces at Penn Station, with very limited opportunity for vertical expansion. Only the 8th Avenue Grand Entrance and the Mid-block Train Hall can achieve an appropriate level of vertical space to achieve this effect. In addition, the study impacted the proposed width of concourses. Even where additional ceiling height could be gained, making a concourse too wide would make it feel proportionally compressed, and in several alternatives the main east-west concourse was narrowed from earlier iterations to achieve a better spatial proportion.

Figure 4-9

Station Axon Comparisons



Fundamental Approaches to Reconstruction

From the early design studies, two fundamental approaches to improving how Penn Station functions emerged:

1. Improve and rationalize the current station configuration, on the logic that leveraging the existing configuration to the greatest extent possible should produce the best compromise between improved functionality, minimizing disruption during construction, and cost. Central to this approach is retaining the current two-level configuration of the station, with boarding, alighting, and customer-facing functions on both levels. Achieving this compromise would still entail a major reconstruction effort and cost.

2. Reconfigure the station for single-level operation, driven by two considerations. First, it is best suited to meet the needs of a commuter station — it gets riders to their platforms and exits by the shortest and smoothest routes. We have not found any examples of commuter stations in which all trains arrive on a single level, but passengers board and alight on two levels. Second, we can best maximize functionality and create a superior passenger experience by comprehensively addressing the outdated, inequitable, and inefficient configuration that is the legacy of the station's history, to the greatest extent possible. All boarding, alighting, and customer-facing functions would be on the Lower Level with no public access to those portions of the Upper Level that would be retained.

Both approaches could be limited to within the footprint of the existing station, providing the basis for two alternatives, or could expand the station to provide visibility to the public at street level and better integrate the station into the streetscape of the surrounding district, adding a major interior public space at the same time.

The two options identified for such a space in our early design studies are:

- A grand entrance on 8th Avenue (Alternative 2) leading to a spacious West Train Hall, made possible by purchasing and removing the Hulu Theater; and
- A Mid-block Train Hall (Alternative 4) in the former taxiway between MSG and Two Penn Plaza.

The West Train Hall could extend down to the Upper Level, or all the way down to the Lower Level. However, the increment of additional cost required to extend it down to the Lower Level would make this option unreasonably expensive, especially since only roughly 30% of passengers currently board from the west end of the station, so this option fails a cost/benefit analysis. Therefore, the West Train Hall is paired only with the two-level approach.

The MSG bridge that crosses over the former taxiway would pass through a Mid-block Train Hall. In a single-level configuration, there would not be sufficient height between the floor of the Upper Level and the underside of the bridge to make the train hall a spacious and gracefully proportioned great room. Further, its utility would be limited since the east side of the Upper Level does not provide escalator or stair access to the platforms, and adding those elements would significantly reduce circulation space on the Lower Level in the busiest location. Therefore, the Mid-block Train Hall is paired only with the single-level approach.

Through this logic, we arrived at a matrix of four alternatives. We have striven to make each alternative what it should be so as not to prejudice any one alternative. The four alternatives are presented in **Figure 4-10**.

The four alternatives differ most in how they meet Aspirations 3, 4, and 5. They meet Aspirations 1, 2, and 8 equally well. There are incremental differences in how well they meet Aspirations 6 and 7. Aspiration 9 is the most subjective one, so it is left to the reader to assess this for themselves.

Figure 4-10

Summary of Alternatives

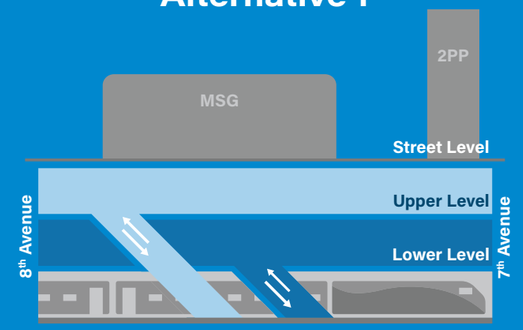
Aspiration: Optimize station functionality and operation

Aspiration: Create a clear street presence

Leverage Existing Configuration with Two Levels

Stay Mostly Within Existing Building

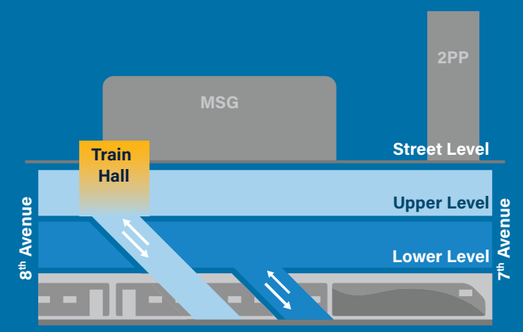
Alternative 1



- Retains two levels for boarding and alighting
- Introduces an east-west spine on both levels
- Straightens and widens all circulation spaces
- Creates central atria between levels with double-height spaces
- Improves all existing entrances

Add New Above Ground Elements

Alternative 2



- Same general configuration as Alternative 1
- Adds a grand 8th Avenue entrance and a spacious, light-filled West Train Hall on the Upper Level by purchasing and removing the Hulu Theater

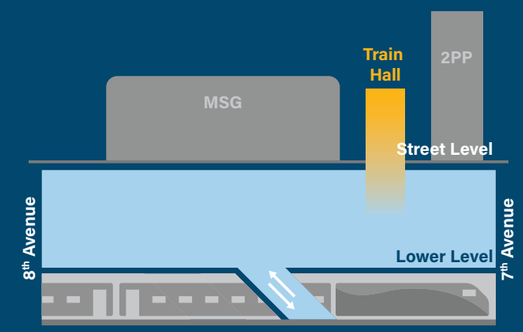
Transform for Commuter Operations with One Level

Alternative 3



- Creates one unified boarding and alighting level with double-height ceilings throughout
- Simplifies wayfinding
- Primarily locates BOH station operations on upper level
- Improves all existing entrances

Alternative 4



- Same general configuration as Alternative 3
- Adds a soaring, light-filled Mid-block Train Hall on the Lower Level between MSG and Two Penn Plaza, with new entrances from 33rd and 31st Streets

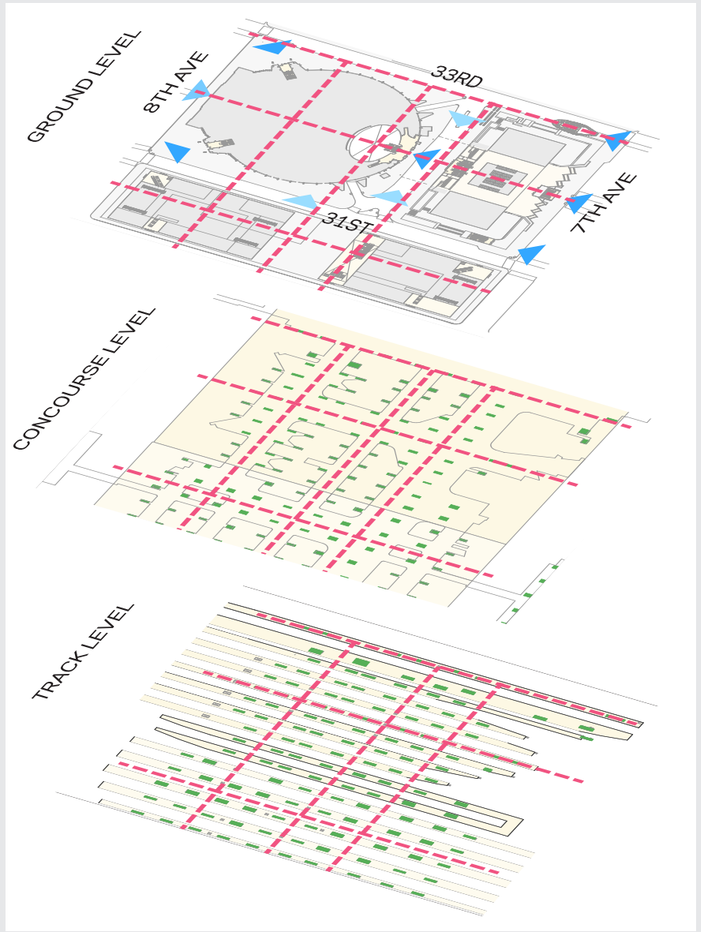
Common to All Alternatives

One of the fundamental challenges presented by Penn Station is the sheer area it covers. The platforms and associated tracks extend over an area of more than 12.5 acres. Station concourses must connect to 116 different VCEs from the platforms within the main station and link them to nine different street entrances and the two subway stations that sit at opposite ends of the station. Connections to Moynihan Train Hall and Empire Penn Expansion further extend the required reach of the station concourses, and add an additional 134 VCEs from train platforms that must be served. This expanse is functionally necessitated for Penn Station's concourse system, and far exceeds that of terminal stations, such as Grand Central Station or Washington's Union Station, as well as most through-running stations like Philadelphia's 30th Street Station. This constraint makes a central train hall that provides visible access to all the platforms nearly impossible, especially when the vertical height of any such space would be limited by MSG and Two Penn Plaza structures above.

A grid system of east-west and north-south concourses provides the most efficient access to the platforms from the entrances, and aligns with the east-west orientation of the platform stairs and escalators. Within this basic grid orientation, there are three opportunities to achieve the greater ceiling heights that create the expansive feel of a transportation hub, and help to orient passengers. The former taxiway provides the greatest opportunity for height, especially at its north and south ends where there is nothing overhead. If the Hulu Theater is removed, that creates an opportunity for taller ceiling heights along 8th Avenue. Both of these opportunities have a generally north-south orientation. The area of the current rotunda offers an opportunity for greater ceiling height in an east-west orientation, although less tall than either of the other options. These three axes, together with the LIRR 33rd Street Concourse, provide the foundation for a grid network of concourses that can connect the station entrances with platform access, as well as Moynihan Train Hall and Penn Station Expansion. Thus, all four alternatives rely on a similar grid-based network of concourses to achieve the optimal functional distribution of passengers.

In addition, the four alternatives all address the fundamental needs of the station to increase the passenger handling capacity to remedy existing peak period overcrowding at congested locations and allow for anticipated future growth in rail passenger travel demand. The alternatives all assume the completion of the Moynihan Train Hall construction and the shifting of most Amtrak passenger boarding from the existing station to Moynihan. All alternatives widen and extend the Central Concourse to the south, serving all of Penn Station's platforms and filling the largest existing gap in platform vertical circulation within the station. All alternatives take some or all of the taxiway between MSG and Two Penn to improve the entrances, create higher ceiling areas, and introduce more daylight in the station. All alternatives remove the Intermediate Level in the NJT Concourse area and assume an off-site Service Building (**see Section 6**). The alternatives are consistent in the level of retail space allocated and the attempts to rationalize and consolidate BOH space. Finally, all the alternatives include similar connections to Penn Station Expansion to the south. Penn Station Expansion and future underground connections to the east of Penn Station are covered in **Section 6**.

Figure 4-11



Future Ridership

Future passenger flow in Penn Station was estimated in order to ensure that the Master Plan allowed for sufficient circulation capacity for future foot traffic. Several different future scenarios were developed, based on the potential completion date of various projects affecting the capacity and train volumes through Penn Station. The passenger circulation analysis shown for each alternative in this report focuses on the estimated ridership approximately 20 years into the future under the Proposed Action scenario. In this scenario, the full Gateway Program has been built and is operational; the Penn Station Complex GPP District has been fully developed; Penn Station Access has been completed providing Metro-North Access to Penn Station; and ridership growth has continued on Amtrak, LIRR, MNR, NJT, and the subways. The 2038[1] Proposed Action scenario (Figure 4-12) shows the ridership in Penn Station almost doubling when compared to Figure 3-18 in the Existing Conditions Section.

An estimate of the future usage of station entrances and exits was made, assuming the increase in NJT passengers using the Penn Station Expansion platforms and concourses and making generic assumptions about the changes in the location and configuration of station entrances in the Master Plan. There is an observed southward shift in pedestrian activity resulting from the major addition of New Jersey commuter trips at Penn Station Expansion. In addition, the majority of riders (around 70%) continue to enter and exit the station from the east side entries, implying that the Master Plan must pay particular attention to the circulation space on the east side of Penn Station.

[1] The year 2038 is used to align with the EIS horizon years. The diagrams shown in the alternatives are based on estimates generated for the year 2042, but the findings are essentially the same as year 2038.

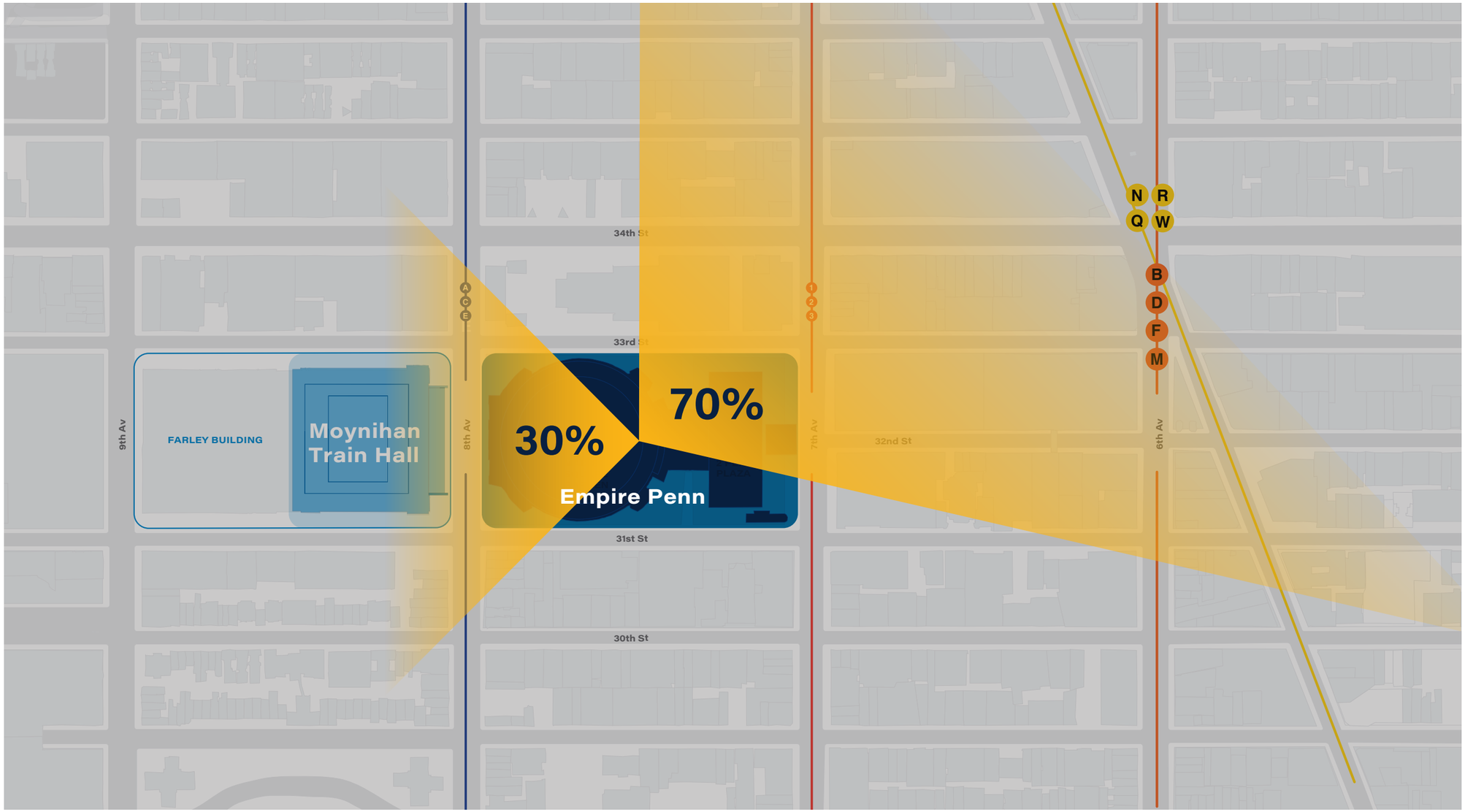
Figure 4-12

2038 Proposed Action Scenario Peak Ridership Estimates at Penn Station

	AM Peak Hour			PM Peak Hour		
	Alighting	Boarding	Total	Alighting	Boarding	Total
Amtrak	4,500	4,000	**8,500**	4,800	4,000	**8,800**
LIRR	39,000	3,790	**42,790**	5,690	33,500	**39,180**
NJT	55,000	7,500	**62,500**	11,600	48,900	**60,500**
MNR – New Haven	4,900	810	**5,710**	1,210	4,200	**5,410**
Total	**103,400**	**16,100**	**119,500**	**23,300**	**90,600**	**113,900**

Figure 4-13

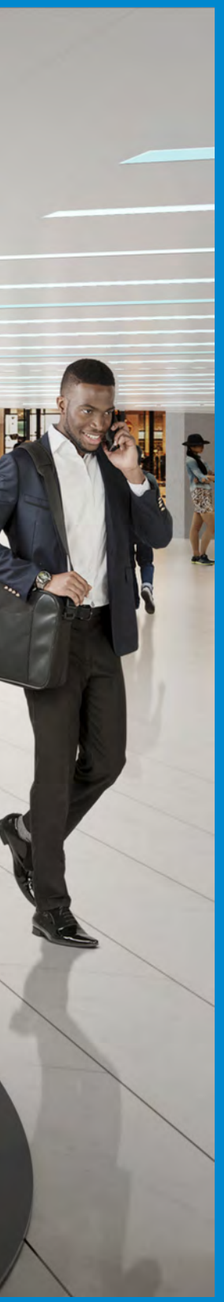
Future Expected Entry and Exit Distribution

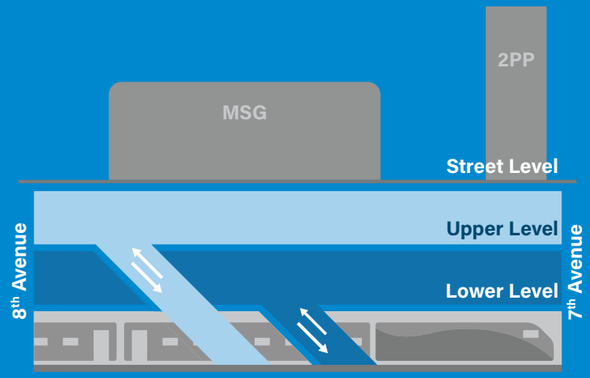


Alternative 1



East-West Axis looking East. Renderings are for illustrative purposes only.





Leverage Existing Two-Level Configuration with Incremental Improvements

Of the alternatives, Alternative 1 retains the largest amount of the existing station's structure and builds the least amount of new structure. However, it is still a major reconstruction, with internal spaces and programs substantially reconfigured.

→ **Alternative 1 leverages the existing station layout and retains boarding and alighting from both the Lower Level and Upper Level.** At the Lower Level, the Hilton Corridor is expanded and straightened, and all north-south concourses connect south toward Penn Station Expansion across 31st Street. Openings in the Upper Level slab along the Central Concourse and above the Hilton Corridor create double-height and triple-height spaces, although other ceiling heights particularly in the west boarding area remain as they are today. The half level in the NJT Concourse area is removed, and slabs for the Lower and Upper Levels are filled in to provide continuous concourses on the east side.

Primary entrances to the station remain at the four corners of the block and mid-block on 32nd Street and 7th Avenue. A new street level entrance is added at the south end of the Central Concourse, on the north side of 31st Street. Secondary entrances will be off the Central Concourse and from the former taxiway. The existing entries at the 8th Avenue corners and immediately north and south of the MSG bridge are expanded to allow a small amount of largely indirect daylight into the station.

The Lower Level program is focused largely on BOH programs and support space for rail operations and MEP space, with some retail along the LIRR concourse. The Upper Level program has more retail than the Lower Level, as well as additional MEP and BOH space. Passenger-facing program elements such as waiting rooms, ticketing, customer service, and restrooms are located on both levels.

Some passenger platform access from the Upper Level is provided along the west end boarding area, but the majority is from the Lower Level. The Street Level program is limited to the entrances, the loading dock, and MEP spaces. Platforms built above the taxiway provide sheltered service areas and new roof space for MEP equipment.

→ **Alternative 1 has two primary objectives related to passenger circulation:**

- Expand waiting and boarding queuing and circulation space at the east end of the station on the Lower Level. This addresses current overcrowding and makes room for future growth in pedestrian traffic. This is the most heavily utilized portion of the station.

- Encourage passengers, especially those departing the station, to utilize the existing Upper Level concourse for waiting and train boarding, thereby making maximum use of the concourse space vacated by Amtrak now that Moynihan Train Hall has opened.

On the 8th Avenue side of the station, improvements are made to the Upper Level concourse. Enlarged public spaces are provided along the 32nd Street and 33rd Street spines of the station. These spaces are not as convenient as the north-south concourses for passenger waiting, but they provide reservoir space that is available for waiting passengers to use in the event of train delays. These reservoir spaces are more useful on the Lower Level, relatively close to the boarding gates, than on the current Upper Level concourse. This alternative seeks to attract commuter rail patrons to the Upper Level concourse for waiting, customer service, and retail amenities — accomplished primarily through architectural design and improved wayfinding.

8th Avenue Looking North

Renderings are for illustrative purposes only.



Exterior on 8th Avenue Looking East

Renderings are for illustrative purposes only.

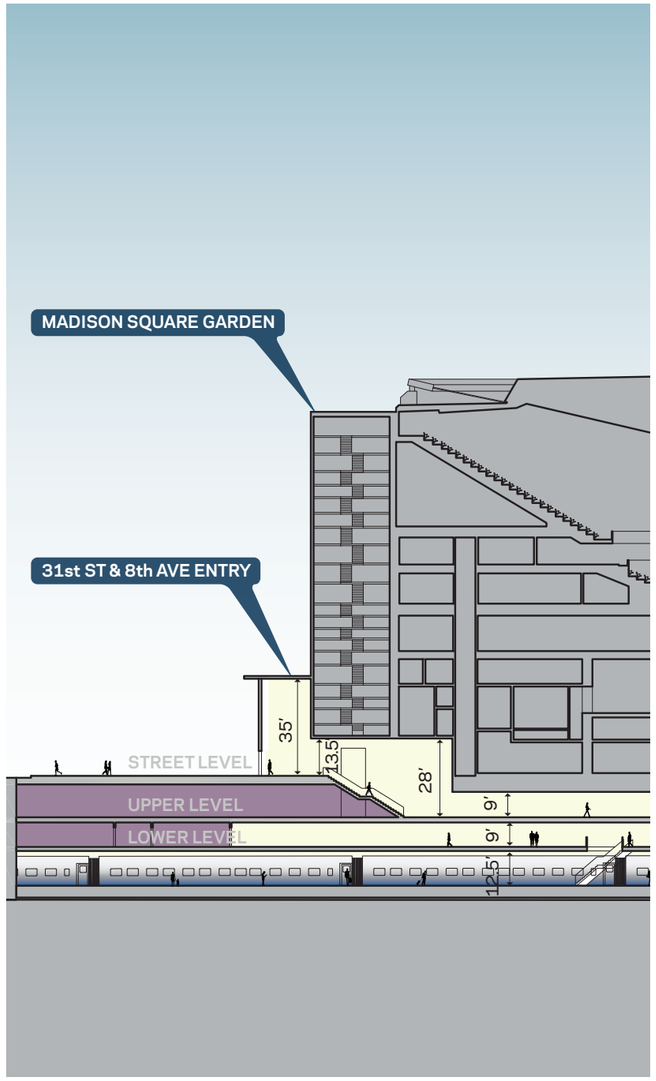


East-West Spine Looking Southwest

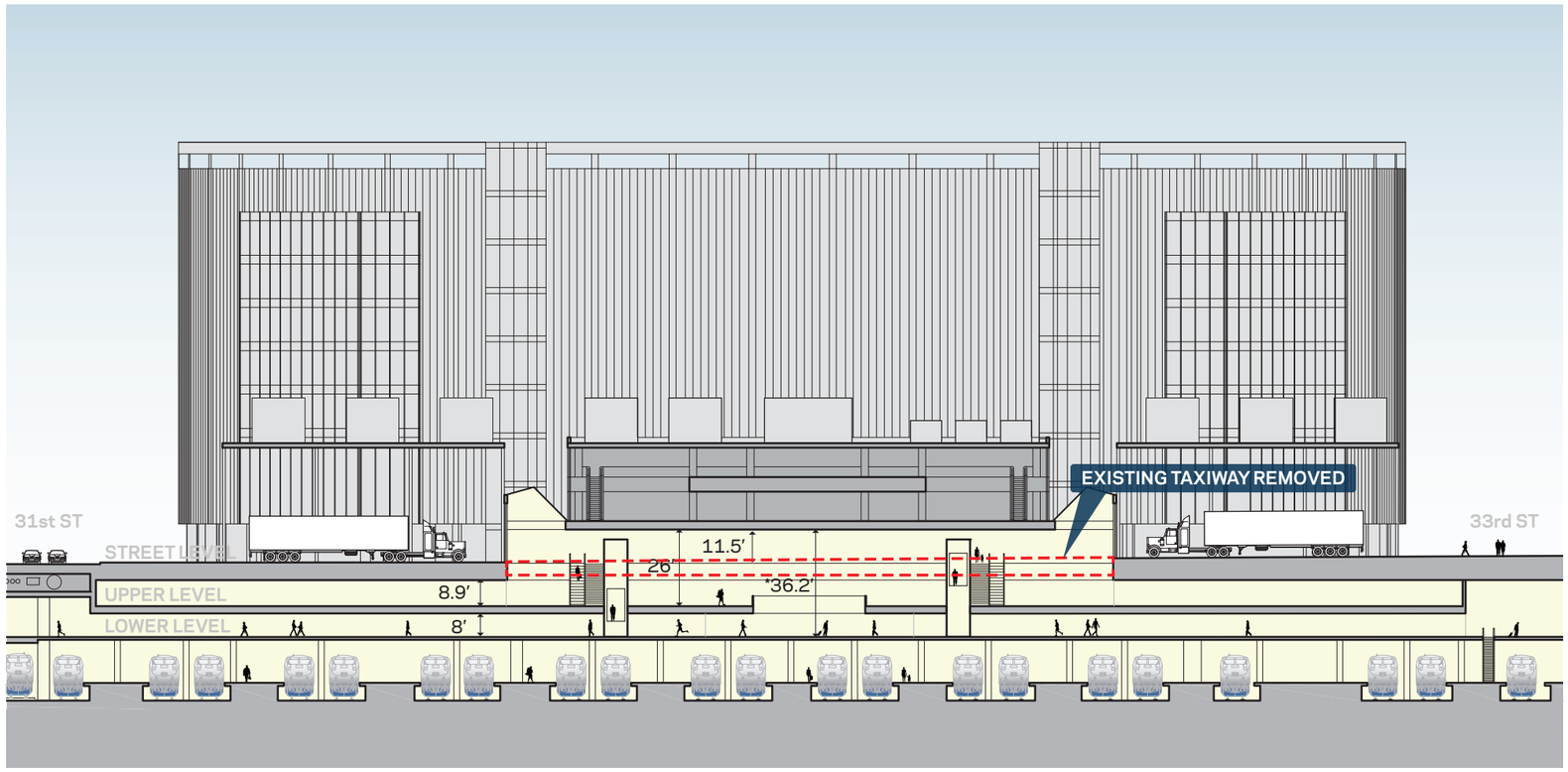
Renderings are for illustrative purposes only.



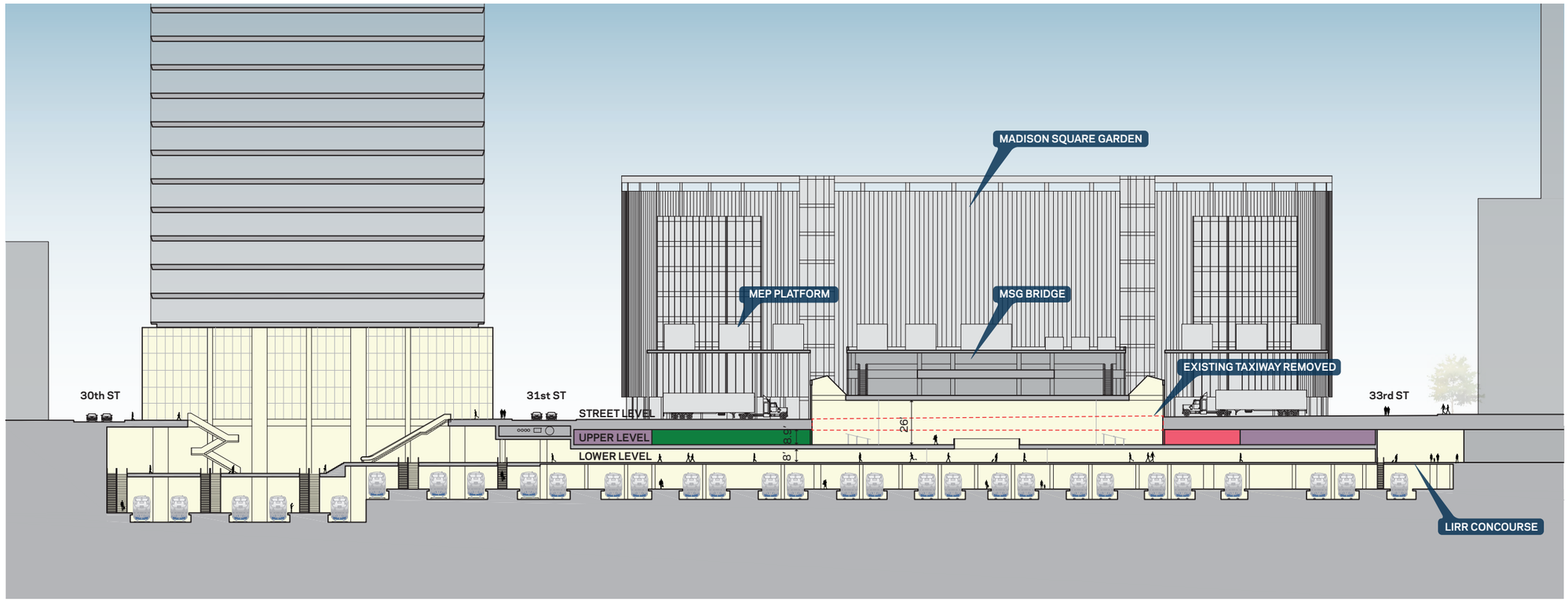
Southwest Section



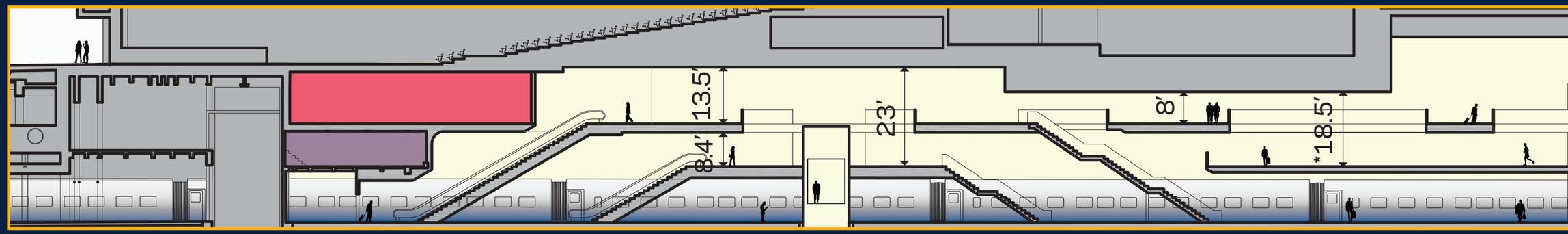
Taxiway Section



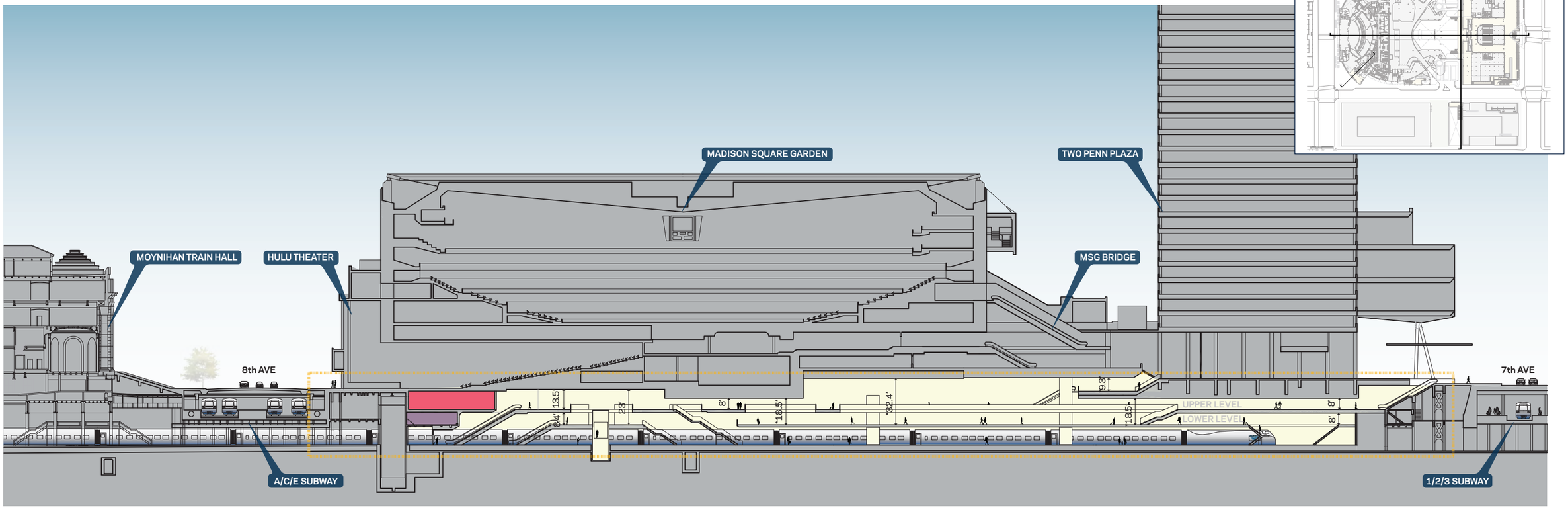
North-South Section

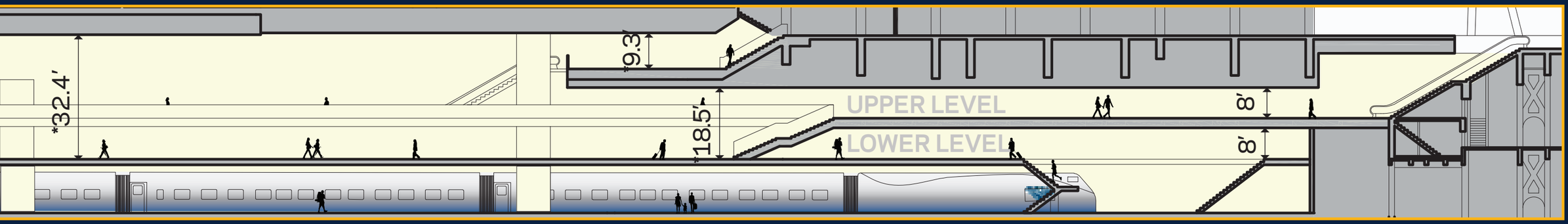


Note
Penn Station Expansion track configuration is conceptual.



East-West Section



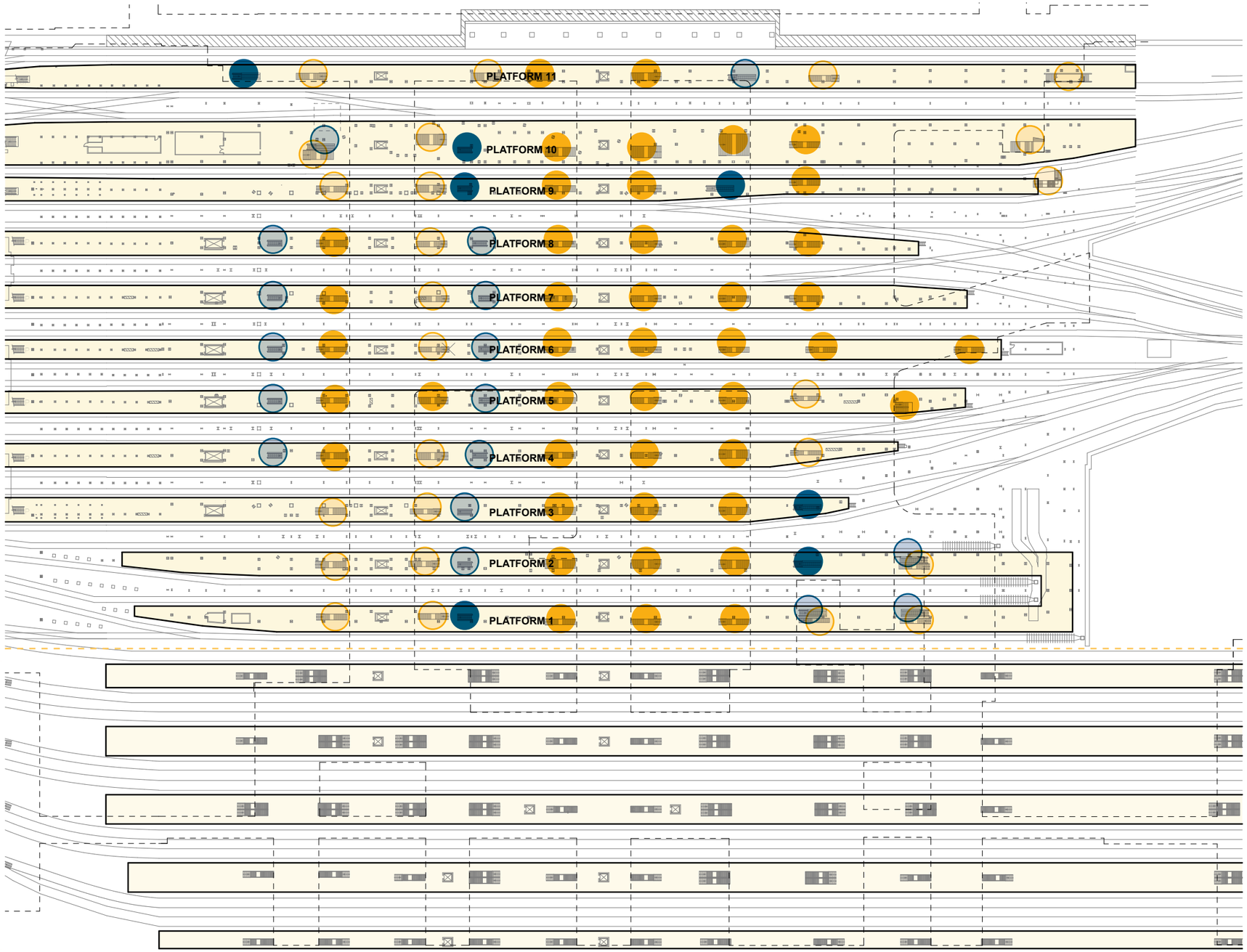


Platform

PENN RECONSTRUCTION

POTENTIAL Penn Station EXPANSION

Note
Penn Station Expansion track configuration is conceptual.



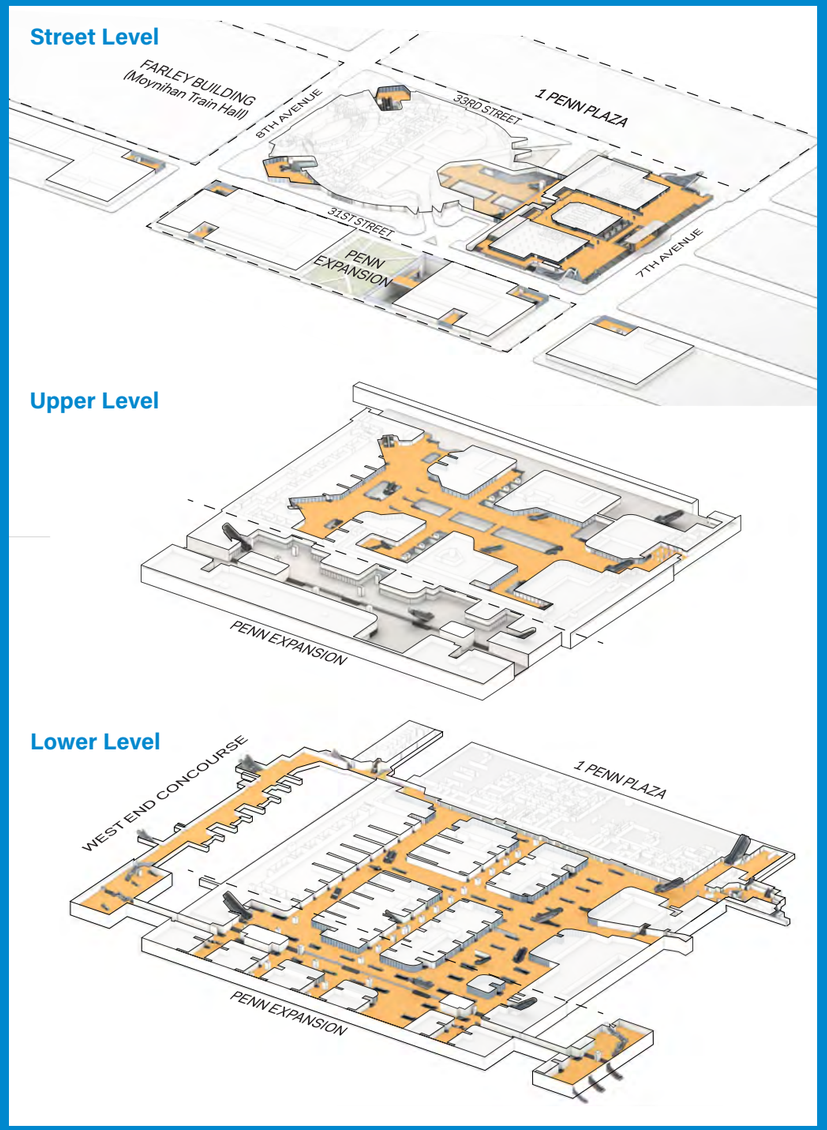
Stair Widths (Inches)

	Vertical Circulation Element (VCE)										Total Number of VCEs	Total Width of VCEs (in)	Existing Number of VCEs
Platform	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**			
11	**38**	64	78	78	**78**	34	60	73	73		**9**	**542**	7
10	38	92	108	**34**	**90**	**118**	**222**	60	108		**9**	**836**	8
9	60	72	**34**	**62**	**62**	**32**	60	68			**8**	**418**	7
8	34	**66**	58	34	**60**	**60**	**60**	**60**			**8**	**432**	7
7	34	**57**	58	34	**60**	**60**	**60**	**60**			**8**	**423**	7
6	34	**49**	50	34	**54**	**54**	**54**	**54**	**54**		**9**	**437**	7
5	34	**54**	**64**	34	**60**	**60**	**60**	**44**	**44**		**9**	**454**	6
4	34	**64**	72	34	**60**	**60**	**86**	**44**			**8**	**454**	5
3	69	52	34	**75**	**75**	**75**	**32**				**8**	**378**	6
2	64	57	34	**88**	**88**	**86**	**40**	46	52		**9**	**521**	8
1	60	58	**40**	**57**	**57**	**57**	46	44	46	52	**10**	**477**	8

Key

New Escalator	
Existing Escalator	
New Stair	
Existing Stair	

Axonometric View of Alternative 1

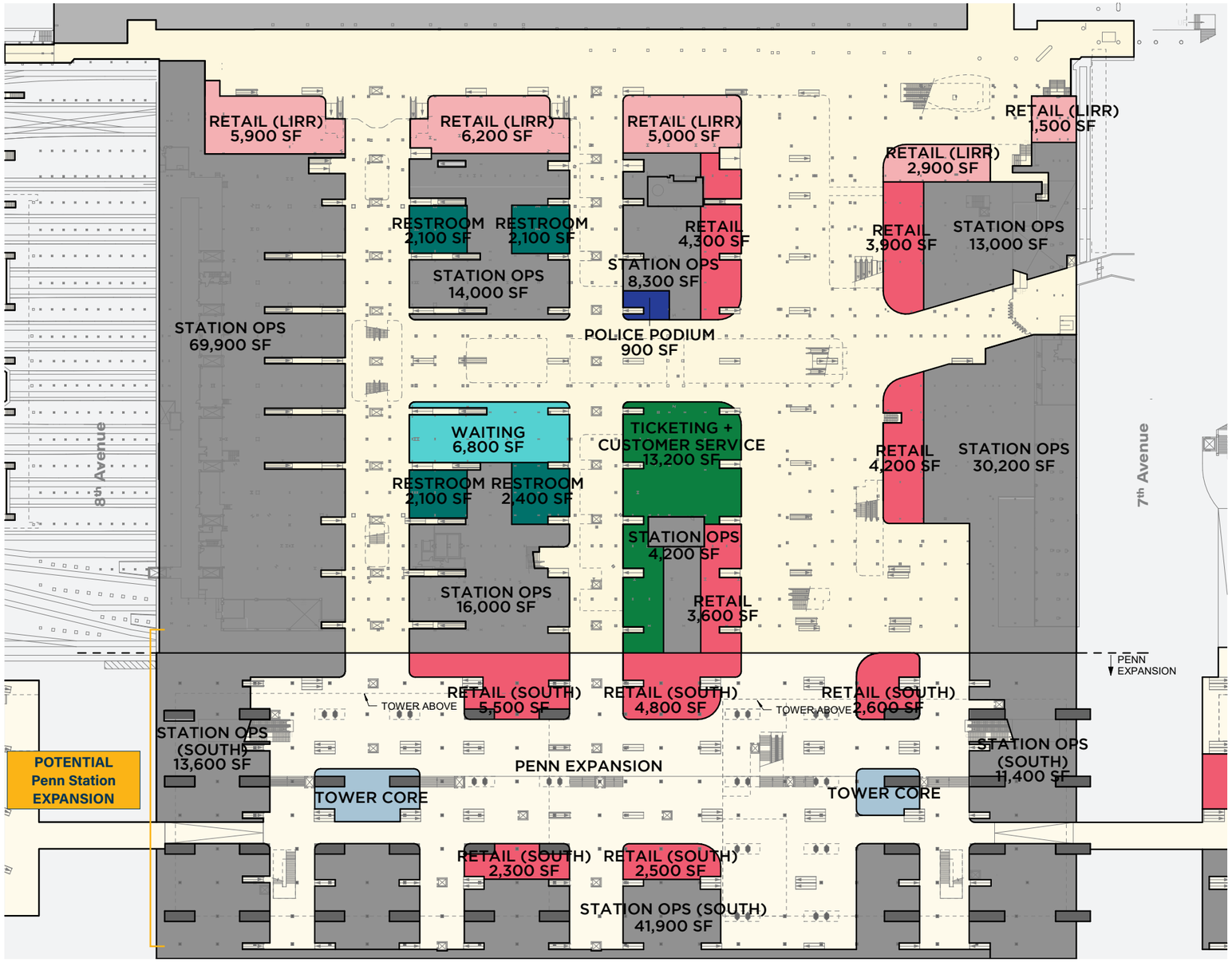


Lower Level

Alternative 1 makes three significant changes to the circulation space on the Lower Level. The first is to extend the Central Concourse southward to serve all tracks and eventually feed directly into the Penn Station Expansion. Second, it widens and straightens the Hilton Corridor and creates a double- and triple-height central atrium with vertical circulation up to the Upper Level at each end. Third, Alternative 1 significantly widens the east end of the station by expanding the LIRR Main Gate Concourse area and extends it southward to the NJT Concourse area to serve all tracks and relieve congestion at the east end of the station. The east end becomes all one continuous concourse due to the removal of the elevated half level in the NJT area.

The retail lining the LIRR Concourse remains, and additional retail space is added on the east side of the Lower Level, conveniently where most passengers congregate to wait for trains. Similar to the Upper Level, waiting and ticketing/ customer service are centrally located around the central atrium, with restrooms on either end of the Central Concourse.

Nearly 70% of the available program space on the Lower Level is reserved for BOH and MEP, much of which is consistent with how those areas are currently used.



Note: Retail (LIRR) denotes Retail under LIRR control.

Lower Level Concourse Width Comparison

Existing



Proposed



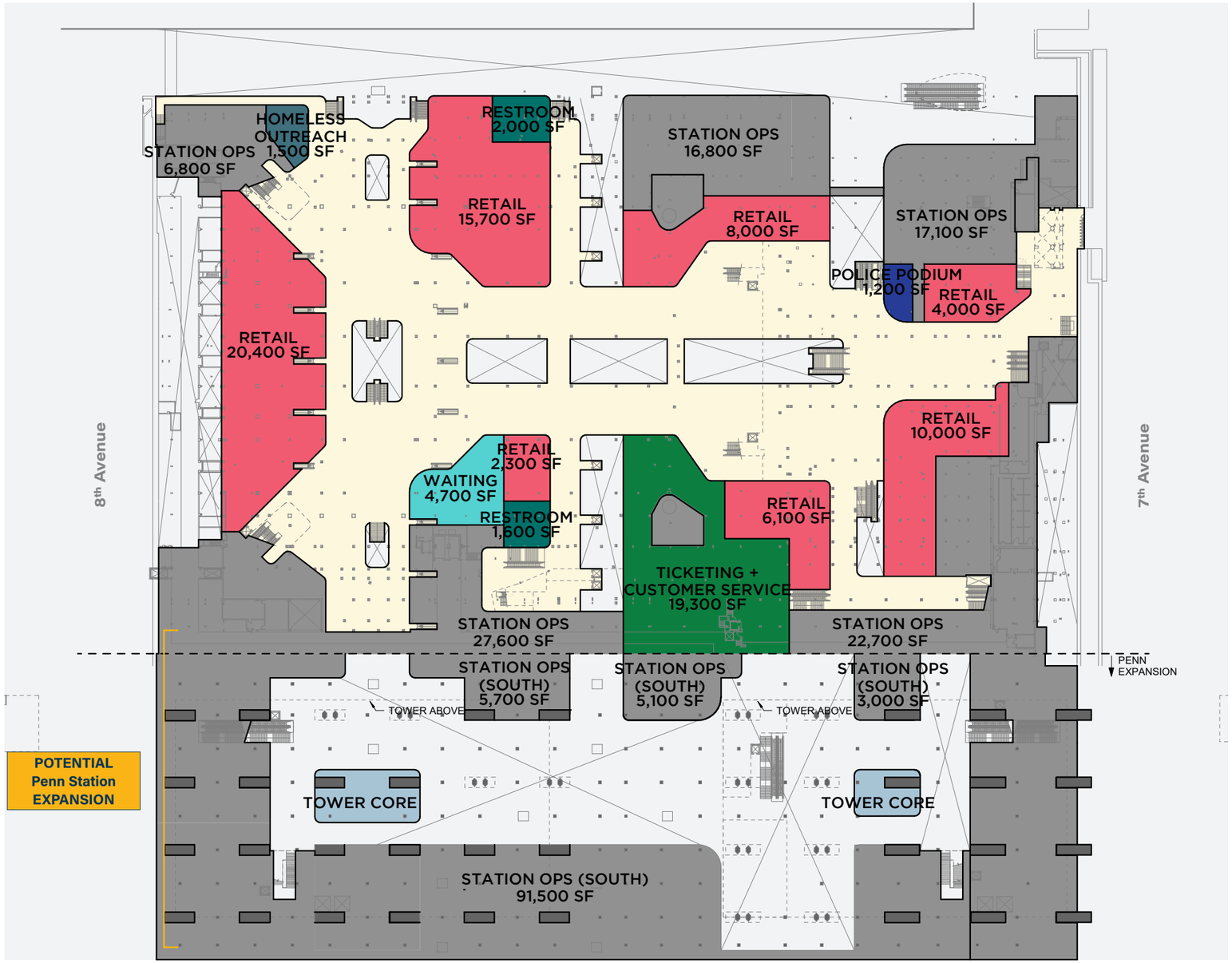
Upper Level

The Upper Level of Alternative 1 introduces an east-west spine from the renovated 7th Avenue and 32nd Street entrance to the west boarding area, removing the existing enclosed waiting area and incorporating the existing Rotunda. Increased ceiling height and volume are made possible by removing the central third of the taxiway above the eastern end of the east-west spine. Openings down to the Lower Level introduce a new atrium in the center of the east-west spine.

Retail surrounds the east-west spine for maximum retail value, with the exception of the south side of the east-west spine which is reserved for a waiting area and ticketing/ customer service. Locating these program areas centrally will make it easier for passengers to get assistance and wait conveniently to board their train. Restrooms are located next to the waiting area and on the north side of the Upper Level.

All the existing VCEs on the Upper Level remain, except for one escalator from the Upper Level to Platform 3 that is removed to accommodate the new location of the 8th Avenue and 31st Street entrance. VCEs from the north end of the Upper Level west boarding area are reconfigured down to the Lower Level west boarding area (Exit Concourse). Stairs are also added at the atrium openings from the Upper Level to the Lower Level. Single escalators from the Upper Level directly to the tracks are added at Platforms 9 and 10.

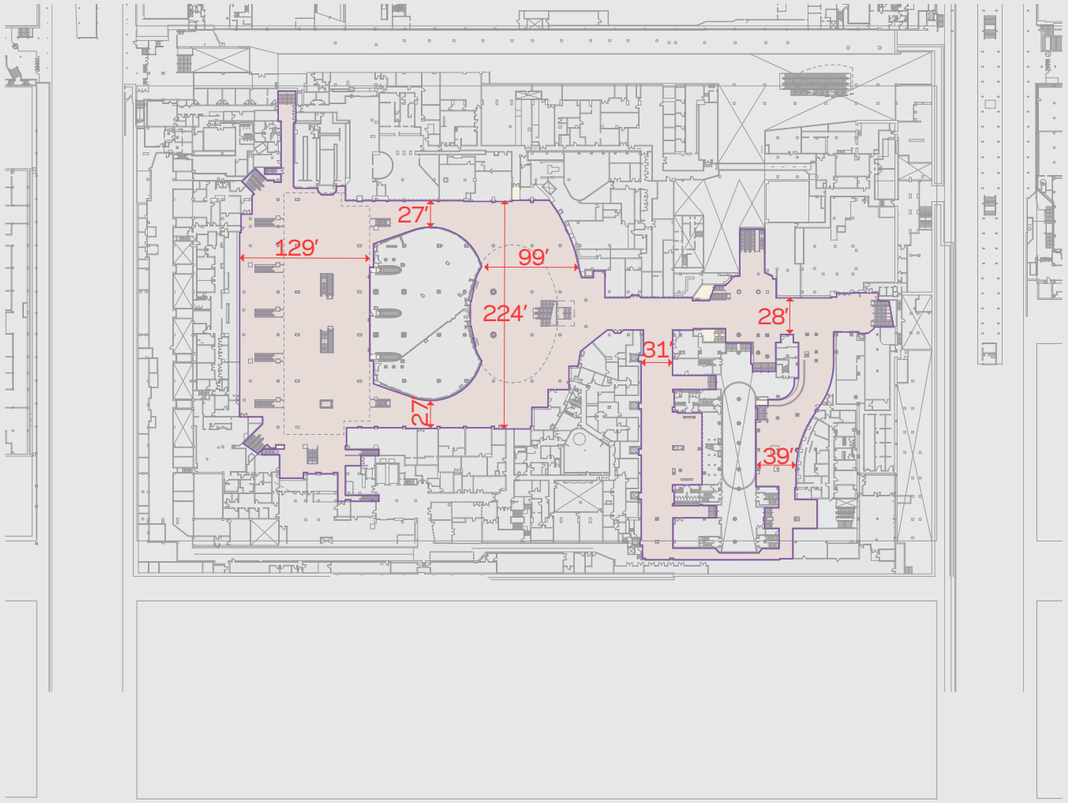
Alternative 1 arranges BOH spaces around the periphery of the Upper Level, behind customer-facing areas. Certain MEP areas throughout the Upper Level remain in place. A new service elevator is added between the Lower Level and the Upper Level to eliminate the existing ramp, because the ramp would interfere with the connection to Penn Station Expansion. The homeless outreach space is located in the northwest corner of the Upper Level, near an exit to grade, per recommendations.



Note: Retail (LIRR) denotes Retail under LIRR control.

Upper Level Concourse Width Comparison

Existing



Proposed

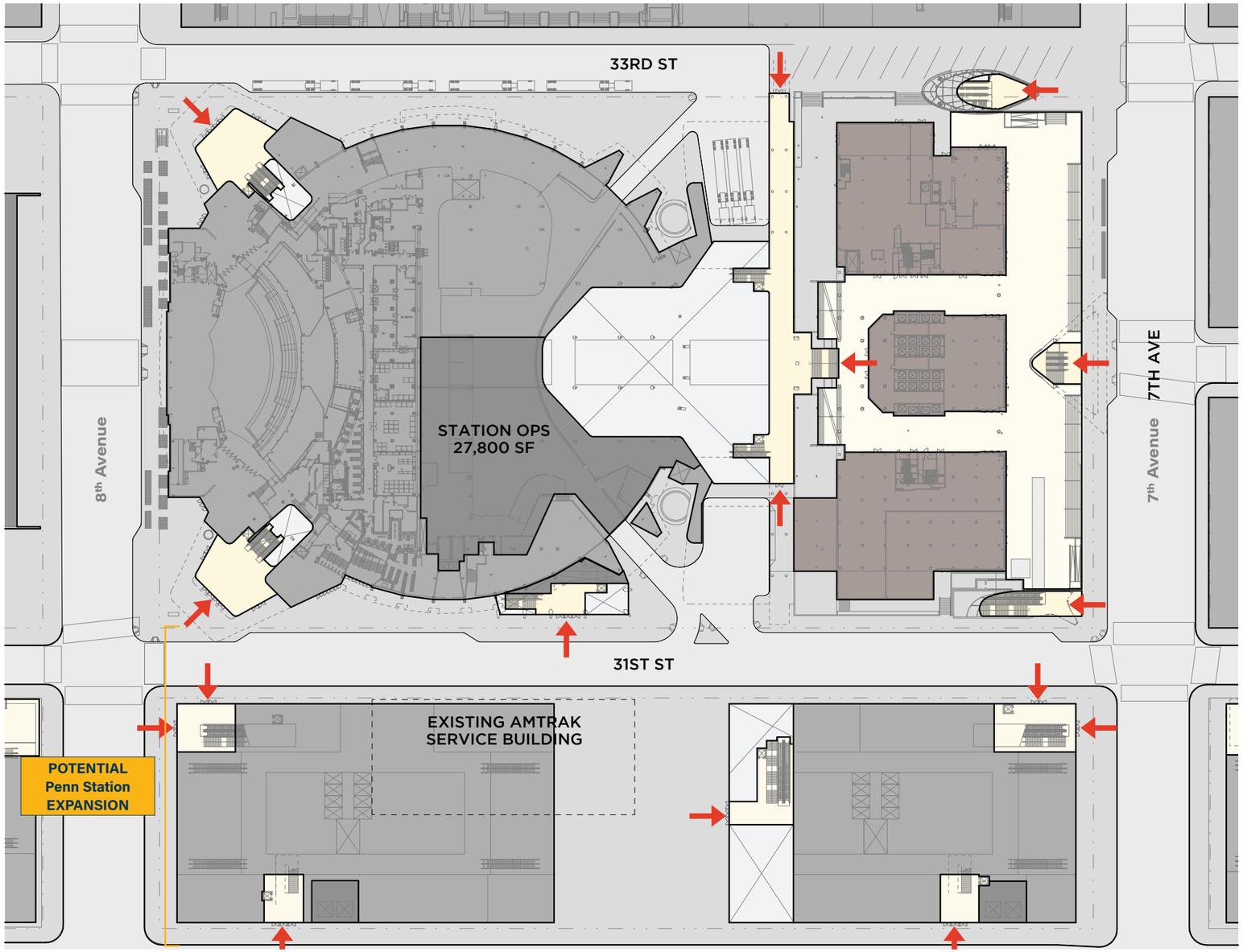


Street Level

Alternative 1 moves the entrances at 33rd and 31st Streets and 8th Avenue out toward the avenue and enlarges them to allow for some daylighting (although limited) down to the Upper Level. The new entrances will also be more visible, creating more street presence and identity for Penn Station on 8th Avenue (see **Section 6.5** on Entrances).

Alternative 1 also reconfigures and improves the entrances on 7th Avenue at 32nd and 31st Streets, with the intent of coordinating with the style of the new entrance on 33rd Street and 7th Avenue. This alternative adds a new entrance mid-block on 31st Street providing entry to the Upper Level and then down to the NJT central concourse area. New light-filled entrances from the taxiway are created by removing the roadway slab beneath the MSG bridge, and opening to the Upper Level. The area beneath the bridge, and extending slightly to the north and south beyond it, is enclosed to create sky-lit entry areas with vertical circulation to levels below. The new entry areas will be accessed from both 31st and 33rd Streets.

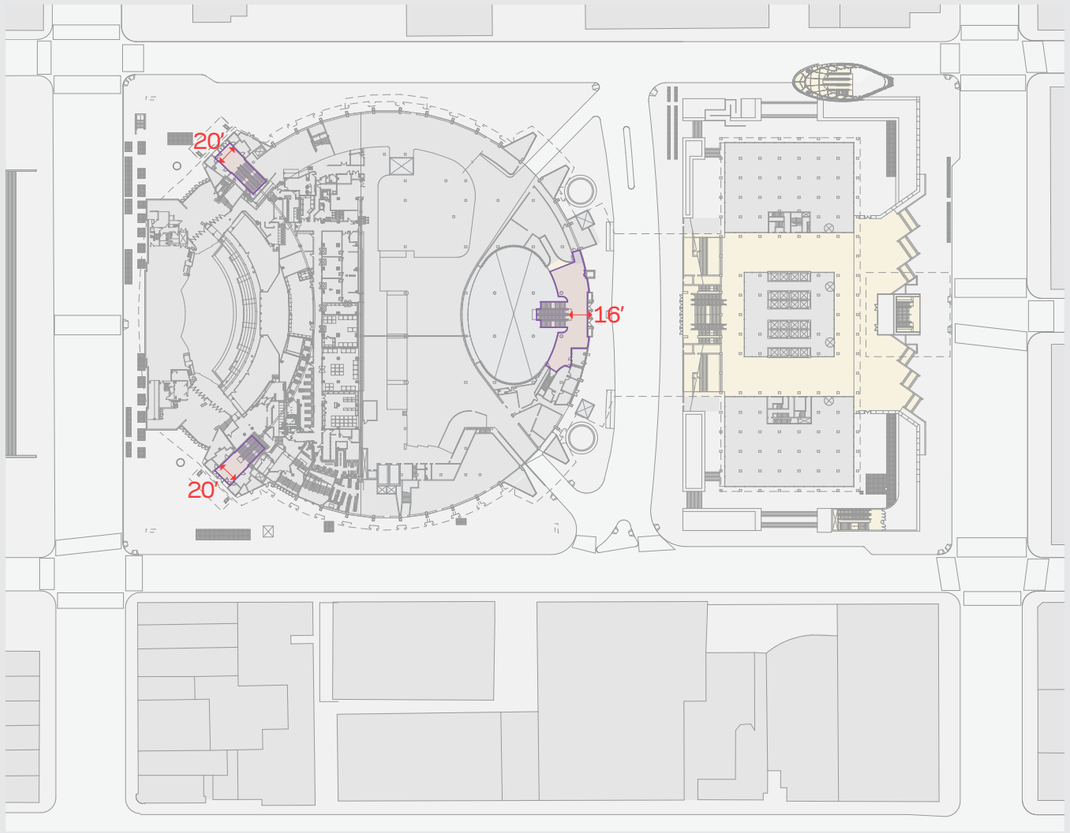
Finally, the Street Level continues to allow space for Penn Station loading in the same existing area, with some MEP space adjacent. Alternative 1 also adds three MEP platforms roughly at the height of the roof of the MSG bridge for MEP equipment, needed primarily for the Air Handling Units (AHUs).



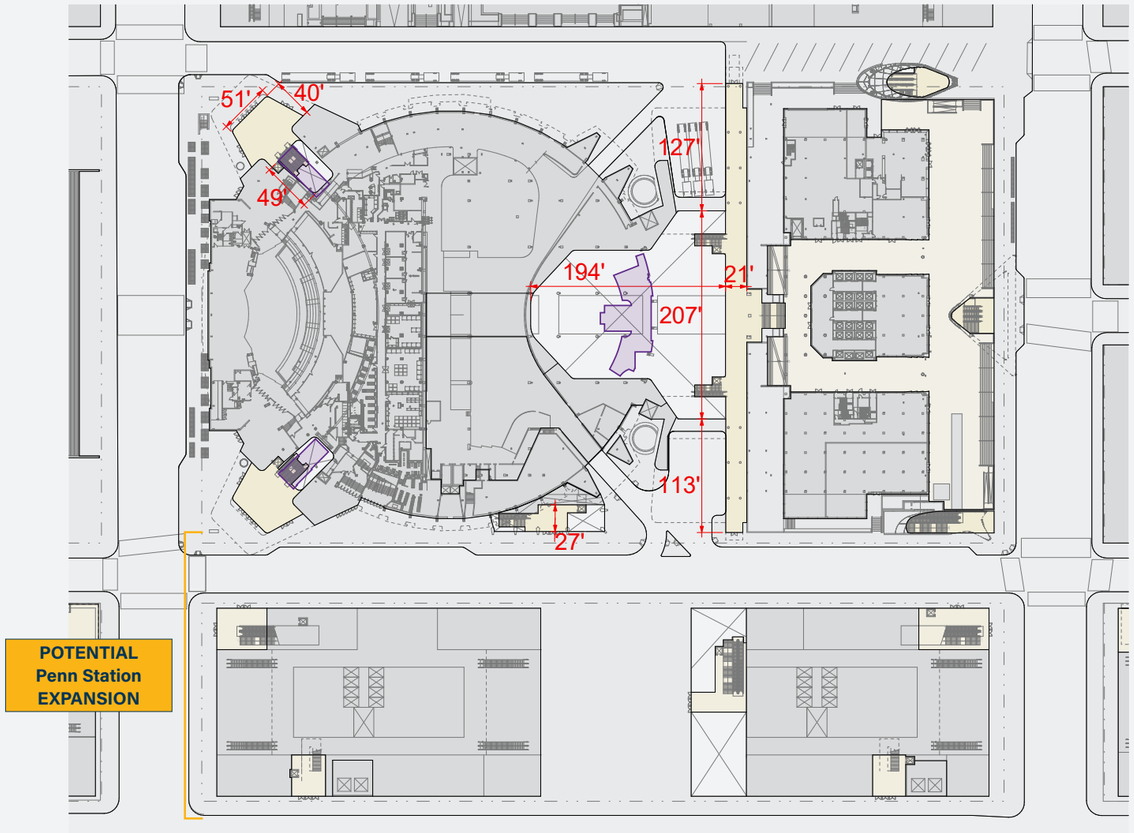
Note: Retail (LIRR) denotes Retail under LIRR control.

Street Level Concourse Width Comparison

Existing



Proposed



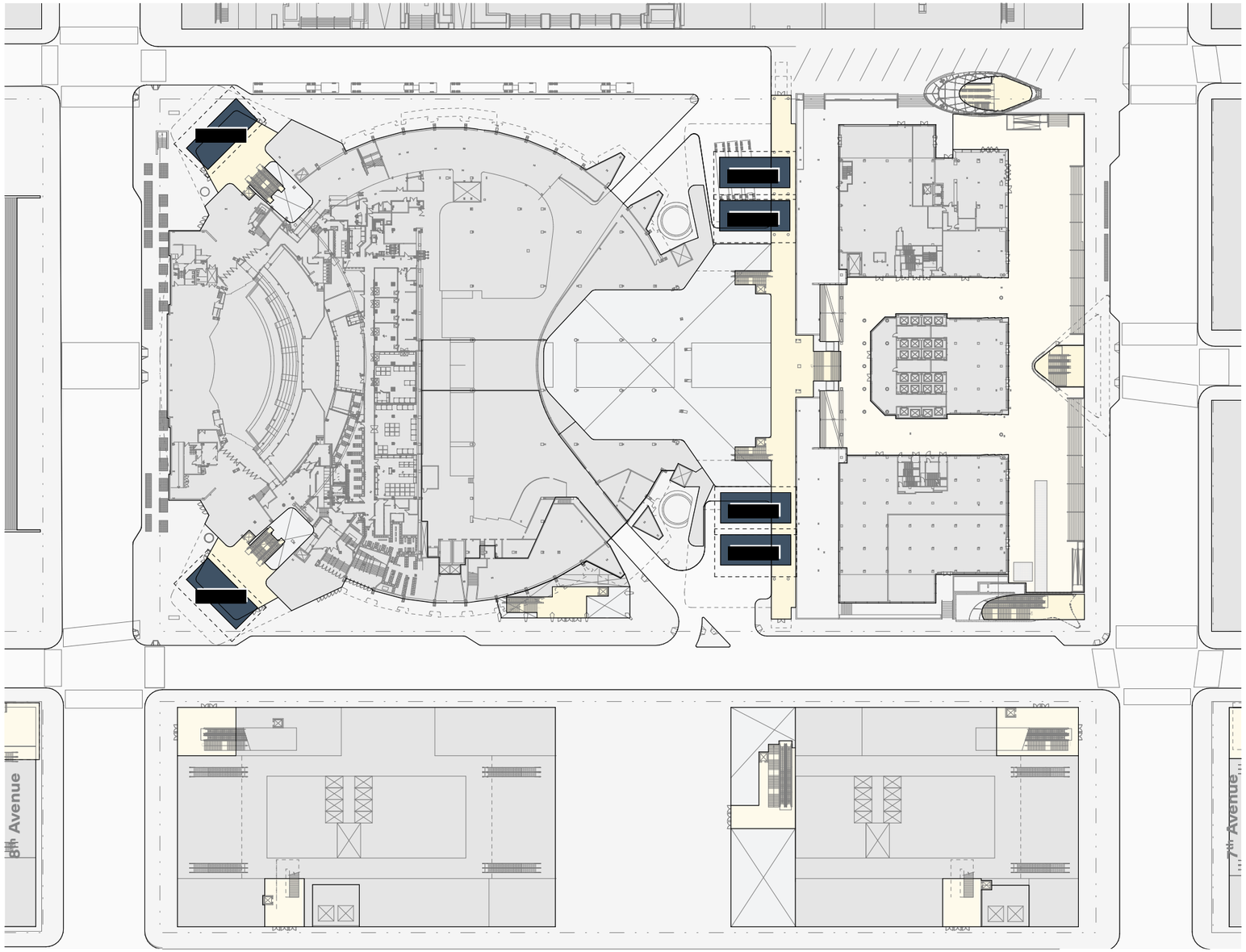
MEP

The large, custom-built AHUs that deliver cooled or heated outdoor air to all areas of Penn Station are located on two elevated outdoor platforms above the taxiway for this alternative. In addition, AHUs are housed above the new corner entrances on 8th Avenue. This distributed configuration of AHUs facilitates ducting to all areas of the station. By installing the AHUs outdoors, the large intake and exhaust louvers on the building façade that would be needed for AHUs located indoors are not required.

The AHU ductwork will be routed from the outdoor platforms to various areas in Penn Station via BOH spaces and avoid infringing on vertical clearance requirements in the loading dock and truck parking spaces below. The limited height in circulation areas on the Lower Level will pose difficulties fitting overhead ductwork and may tend to trap heat coming through stairs and escalators from the platform below, making the Lower Level more difficult to cool. In addition, the limited ceiling heights and the large amount of ductwork necessary will cause some loss of floor space on both levels.

As for each of the other alternatives, the underground tunnel pathway beneath 7th Avenue may require reconfiguration of the Amtrak Traction Power Substation located near the corner of 7th Avenue and 31st Street.

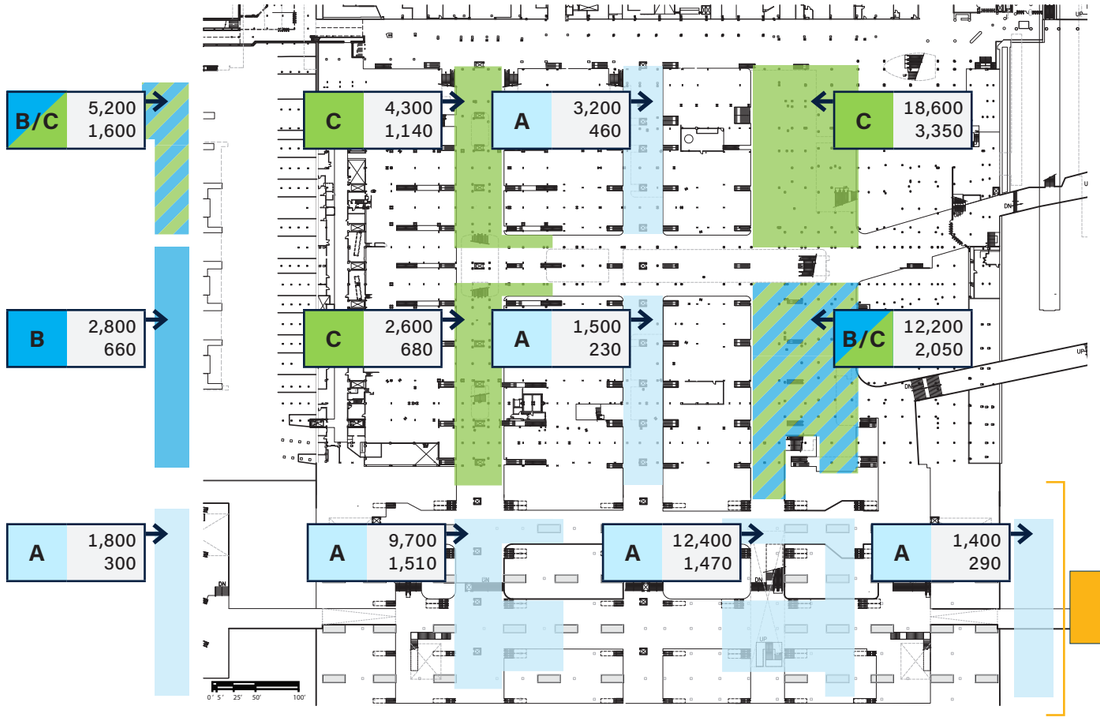
The building will be fully sprinklered, equipped throughout with an emergency voice/alarm communication system and a smoke control system in accordance with Section 909. These systems are necessary to justify the application of the smoke-protected assembly seating provisions for emergency building egress. The smoke control system will be designed to be a combined system with the building's air handling systems.



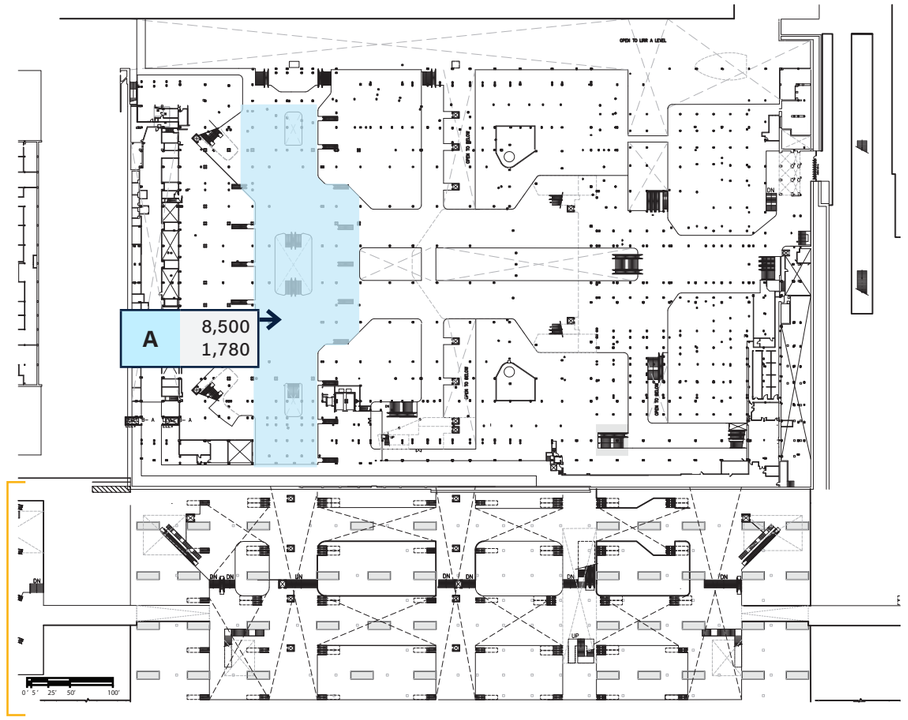
Level of Service

2038 Proposed Action On-Time Operations

PM Peak Hour Volumes, Concourse Occupancy, and Level of Service



Lower Level



Upper Level

Level of Service (LOS) Ratings Key

LOS Rating	Peak Hr. Boardings / Peak Occupancy
LOS A	
LOS B	
LOS B/C	
LOS C	
LOS C/D	
LOS D	
LOS D/E	
LOS E	
LOS F	

Program Area

Department	Lower Level SF	Upper Level SF	Street Level SF	Total Program SF
Retail	37,500 SF	66,400 SF	—	103,900 SF
Customer-Facing Station Operations	28,700 SF	29,100 SF	—	57,800 SF
BOH Station Operations	133,800 SF	81,000 SF	4,300 SF	219,100 SF
Loading Dock	—	—	17,400 SF	17,400 SF
MEP (Total)	22,500 SF	11,600 SF	21,200 SF	55,300 SF
Total	**222,500 SF**	**188,100 SF**	**42,900 SF**	**453,500 SF**
Public Circulation	210,000 SF	130,300 SF	24,400 SF	364,700 SF
Grand Total	**432,500 SF**	**318,400 SF**	**67,300 SF**	**818,200 SF**

BOH% Occupancy Breakdowns

Ticketing + Customer Service

Conference & Meeting	3%
Locker & Break Rooms	13%
Office & Administration	35%
Storage	17%
Customer Facing Includes Ticket Counters and Customer Service functions	32%

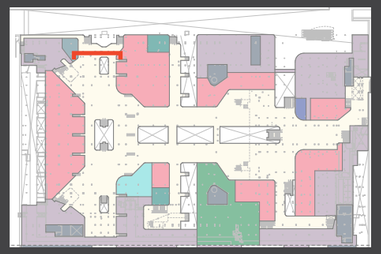
BOH Program

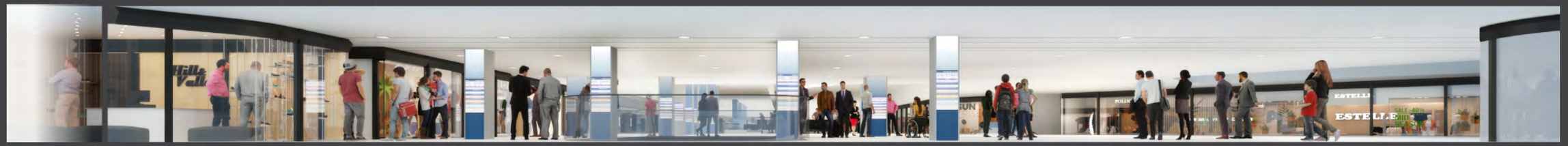
Conference & Meeting	4%
Locker & Break Rooms	34%
Office & Administration	30%
Storage	18%
Support Support functions include Engineering Shops, Commissary Food Prep, Police Holding Cells, Print/Copy Rooms, and other specialized functions	15%

Section A: Exit Concourse Looking South

Renderings are for illustrative purposes only.







Upper Level



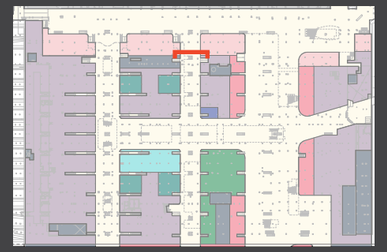
Lower Level

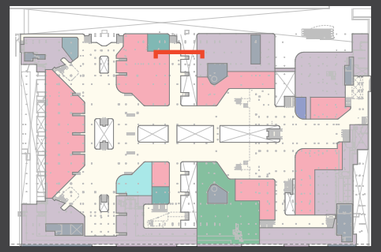


Platform Level

Section B: Central Concourse Looking South

Renderings are for illustrative purposes only.





Upper Level



Lower Level



Platform Level

Section C: East-West Spine Looking West

Renderings are for illustrative purposes only.







Upper Level

Lower Level

Platform Level

Section D: Exit Concourse Looking South

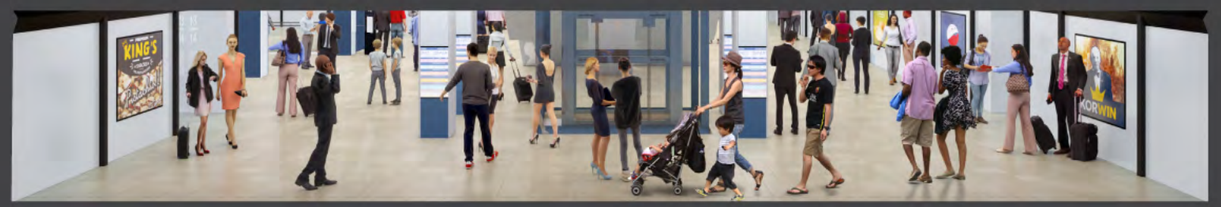
Renderings are for illustrative purposes only.







Upper Level



Lower Level



Platform Level

Section E: Exit Concourse Looking South

Renderings are for illustrative purposes only.







Upper Level



Lower Level



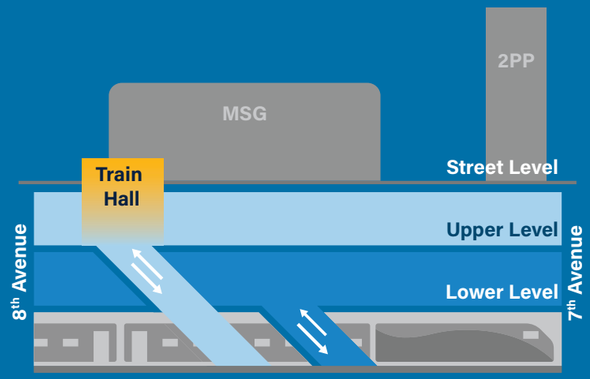
Platform Level

Alternative 2



Interior of West Train Hall Looking West. Renderings are for illustrative purposes only.





Leverage Existing Two-Level Configuration with New 8th Avenue Entrance and West Train Hall

Alternative 2 removes the Hulu Theater to create a large Train Hall space along 8th Avenue on the west side of the station. This alternative retains both the Upper and Lower Levels for passenger circulation and platform access. The program distribution of this alternative is very similar to Alternative 1, with most BOH space on the Lower Level and most retail on the Upper Level and, in this alternative, the Street Level as well.

→**The Lower Level plan for this alternative is similar to Alternative 1 with concourses regularized and expanded in some areas.** The Hilton Corridor is expanded and straightened, and all north-south concourses connect south toward Penn Station Expansion across 31st Street. As in Alternative 1, the Central Concourse has a new street level entrance at 31st Street. Openings in the Upper Level slab occur at the north and south ends of the north-south concourses creating double-height extensions of the Concourses below. At the north, the Upper Level balconies provide views of the LIRR Concourse. As with Alternative 1, the Lower Level program is focused on BOH programs and support space for rail operations and MEP space, with some retail along the LIRR and NJT Concourses, a waiting area, restrooms, and a customer service area. Ceiling heights are approximately 28 feet where the Hulu Theater is removed, and a gracious central stair provides entry from 8th Avenue to the Upper Level. A wide concourse running east toward 7th Avenue with higher ceiling heights creates a central spine connecting to the former Rotunda area and taxiway exits.

This concourse is lined with retail and will get daylight at its western end. It is directly accessed by stairs from the 31st and 33rd Street corner entrances along 8th Avenue. Secondary entrances are from 31st Street to the Central Concourse and from the former taxiway. Entrances at 33rd, 32nd, and 31st Streets along 7th Avenue provide access for the east side of the station. The Upper Level program focuses on customer-facing elements including retail, ticketing, customer service, and a waiting room, but also includes some BOH functions. The wide east-west concourse allows the possibility of a waiting area (open or enclosed) in the center of the concourse.

The street level of Alternative 2 offers the opportunity for retail that can serve the new 8th Avenue entrance hall and open onto 31st and 33rd Streets.

→**Similar to Alternative 1, Alternative 2 tackles the following two primary objectives related to passenger circulation and improves upon them with the removal of the Hulu Theater and the opening of the Upper Level to 8th Avenue:**

- Expand waiting and boarding queuing and circulation space at the east end of the station on the Lower Level. This addresses current overcrowding and makes room for future growth in pedestrian traffic. This is the most heavily used portion of the station.
- Encourage passengers, especially those departing the station, to utilize the existing Upper Level concourse for waiting and train boarding, thereby making maximum use of the concourse space vacated by Amtrak now that Moynihan Train Hall has opened..

Similar to Alternative 1, enlarged public spaces are provided along the 32nd Street and 33rd Street spines of the station. These spaces, while not as convenient as the north-south concourses for passenger waiting, provide reservoir space that is available for waiting passengers to use in the event of train delays. These reservoir spaces are more useful on the Lower Level, closer to the boarding gates, than on the current Upper Level concourse.

The removal of the Hulu Theater opens the Upper Level concourse to 8th Avenue and provides clear and direct circulation from the Lower Level to the Upper Level. This will attract commuter rail patrons to the Upper Level concourse for waiting, customer service, and retail amenities. Alternative 2 is expected to be more successful than Alternative 1 at attracting commuter rail passengers to the Upper Level and reducing peak crowding on the western side of the Lower Level.

8th Avenue Entrance From Moynihan Trail Hall Steps

Renderings are for illustrative purposes only.



8th Avenue Entrance From Corner of 33rd Street

Renderings are for illustrative purposes only.



8th Avenue Entrance From Sidewalk Looking North

Renderings are for illustrative purposes only.



Interior of West Train Hall Looking Northeast

Renderings are for illustrative purposes only.

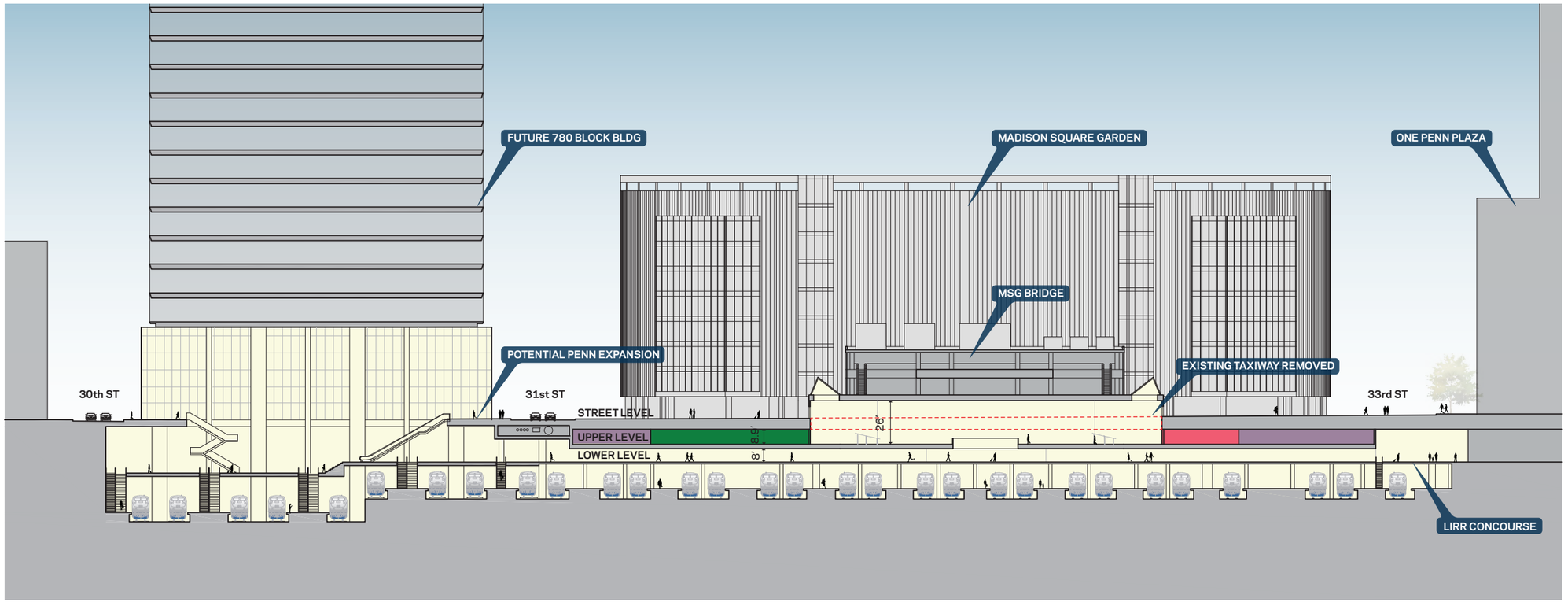


Interior of West Train Hall Looking West

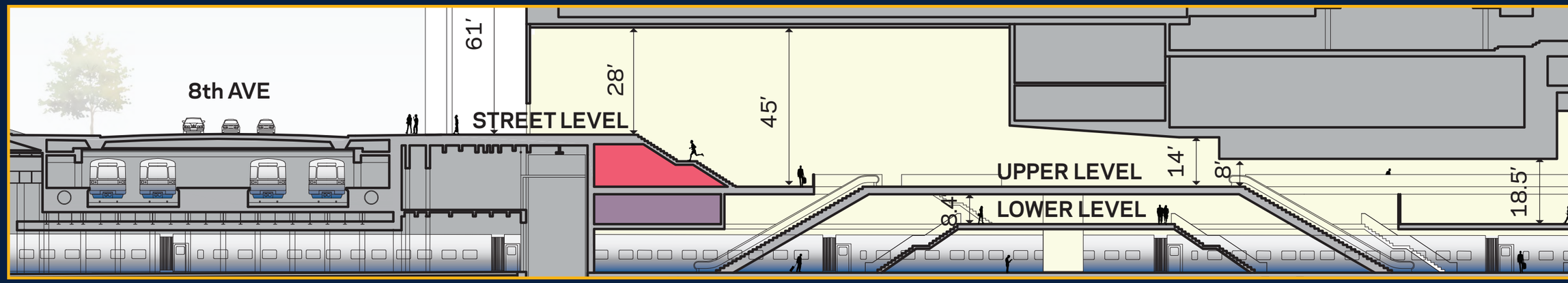
Renderings are for illustrative purposes only.



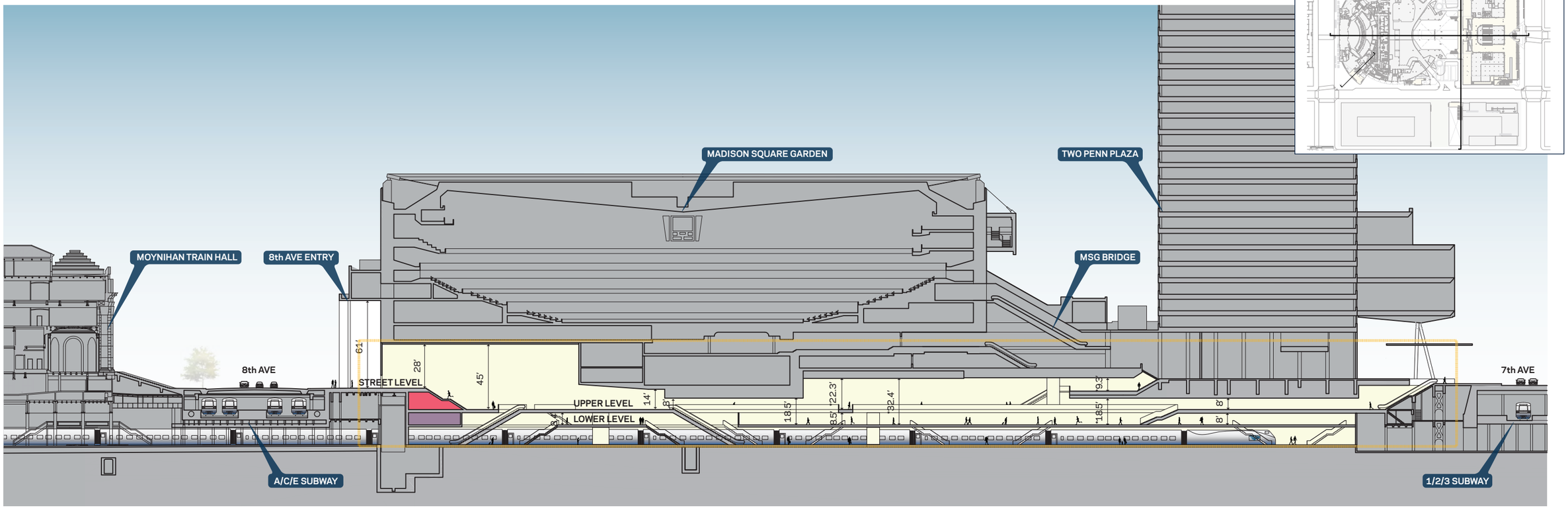
North-South Section

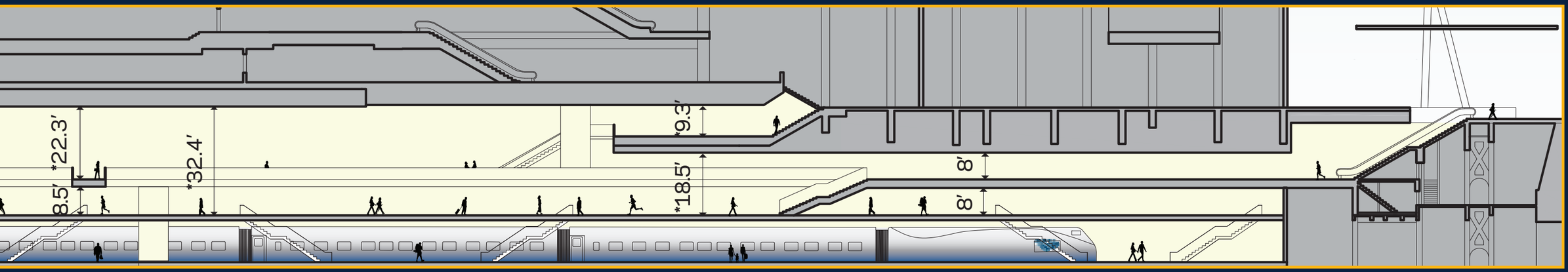


Note
Penn Station Expansion track configuration is conceptual.



East-West Section



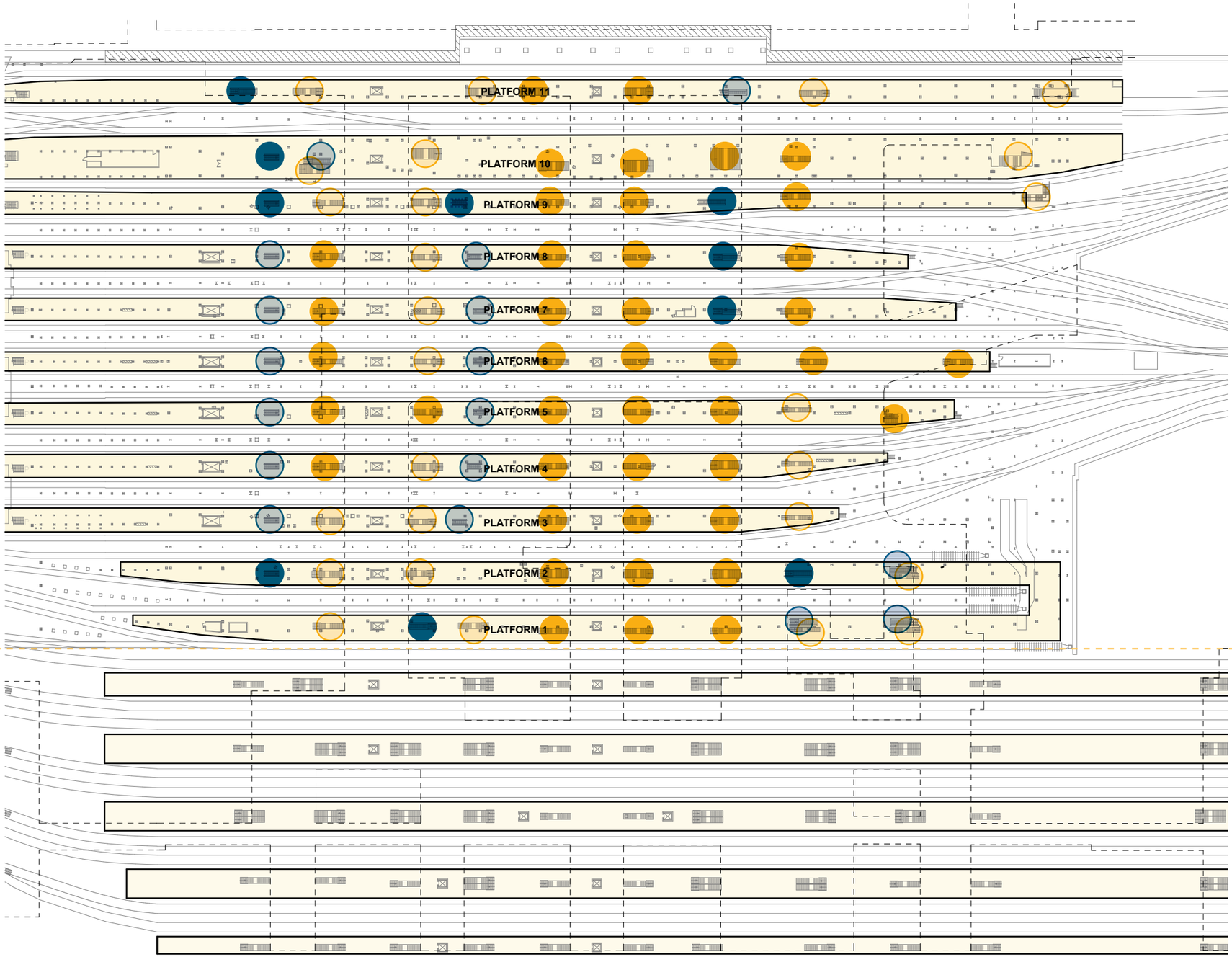


Platform

PENN RECONSTRUCTION

POTENTIAL PENN STATION EXPANSION

Note
Penn Station Expansion track configuration is conceptual.



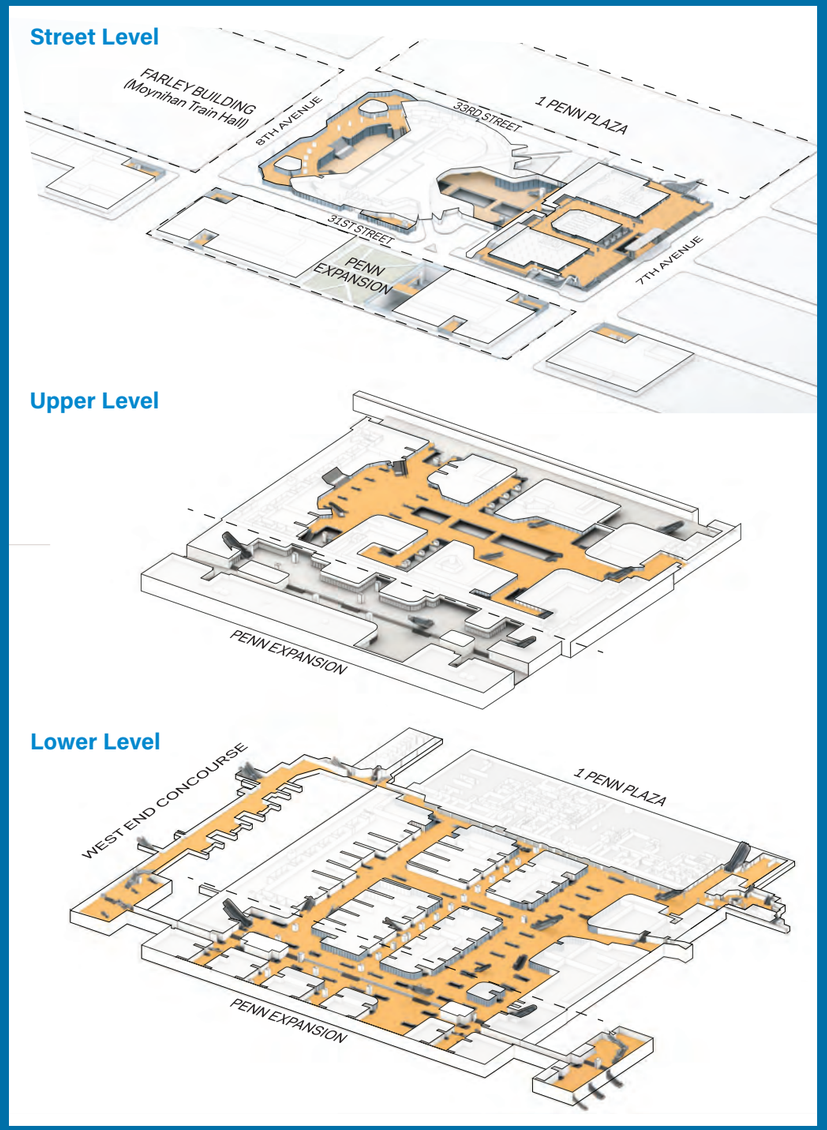
Stair Widths (Inches)

	Vertical Circulation Element (VCE)												
Platform	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Total Number of VCEs**	**Total Width of VCEs (in)**	**Existing Number of VCEs**
11	**38**	64	78	**78**	**78**	34	60	73	73		**9**	**542**	**7**
10	38	92	108	**34**	**90**	**118**	**222**	**60**	108		**9**	**836**	**8**
9	60	72	**34**	**62**	**62**	**32**	**60**	68			**8**	**416**	**7**
8	34	**66**	58	34	**60**	**60**	**60**	**60**			**8**	**432**	**7**
7	34	**57**	58	34	**60**	**60**	**60**	**60**			**8**	**423**	**7**
6	34	**49**	50	34	**54**	**54**	**54**	**54**	**54**		**9**	**437**	**7**
5	34	**54**	**64**	34	**60**	**60**	**60**	**44**	**44**		**9**	**454**	**6**
4	34	**64**	72	34	**60**	**60**	**86**	**44**			**8**	**454**	**5**
3	34	69	52	34	**75**	**75**	**75**	**44**			**8**	**389**	**5**
2	**34**	64	57	**88**	**88**	**86**	**40**	46	52		**9**	**498**	**8**
1	60	**40**	58	**57**	**57**	**57**	46	**57**	46	52	**10**	**490**	**8**

Key

- **New Escalator**
- Existing Escalator
- **New Stair**
- Existing Stair

Axonometric View of Alternative 2



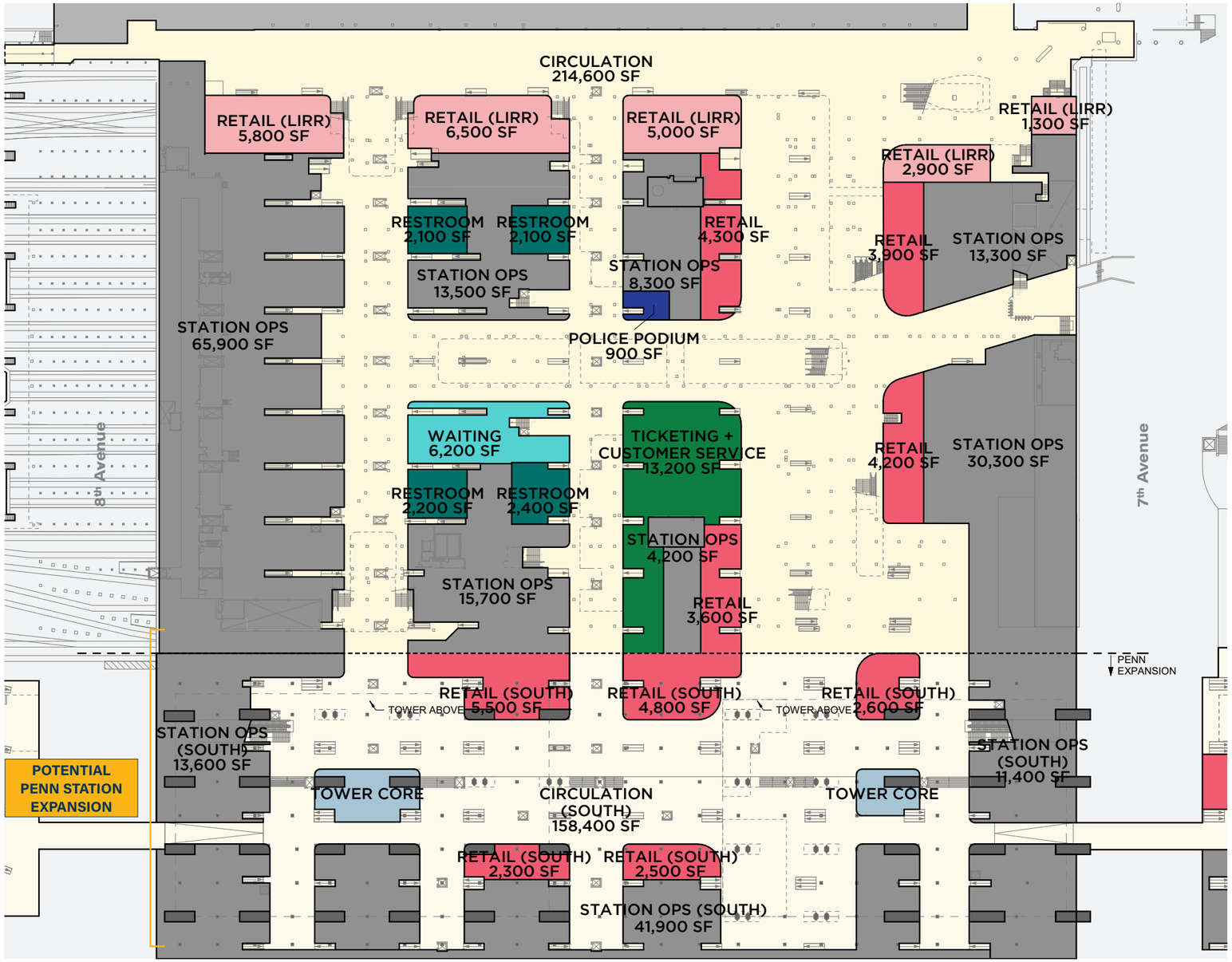
Lower Level

Although the Lower Level will overall still have low ceiling heights, Alternative 2 significantly improves the space through widening of corridors and the introduction of a cut-out to above. The LIRR Main Gate Concourse is widened and extended southward to all tracks to relieve congestion at the east end of the station. The NJT Intermediate Level area is removed and filled in at the Lower and Upper Levels to facilitate continuous flow for passengers. The alternative extends the Central Concourse southward to all tracks and widens the Hilton Corridor, with a double- and triple-height central atrium with VCEs to the Upper Level.

The Lower Level maintains substantially the same existing area of retail space, along the 33rd Street corridor and adds new retail along the 7th Avenue corridor. Waiting and customer service areas are conveniently located in the central circulation area, with restrooms at either end of the Central Concourse.

The bulk of BOH remains at the Lower Level, particularly in the west and south areas.

The 8th Avenue, Central, and 7th Avenue Concourses all extend directly through Penn Station Expansion.



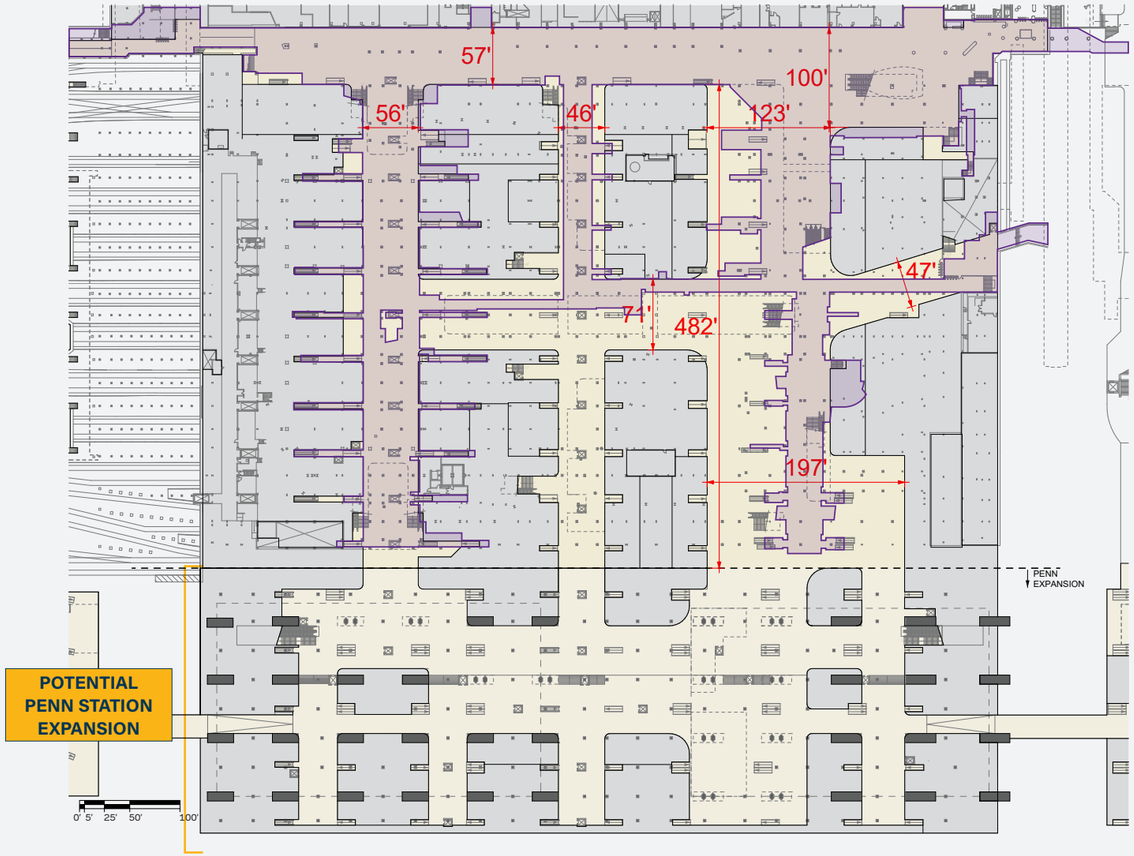
Note: Retail (LIRR) denotes Retail under LIRR control.

Lower Level Concourse Width Comparison

Existing



Proposed



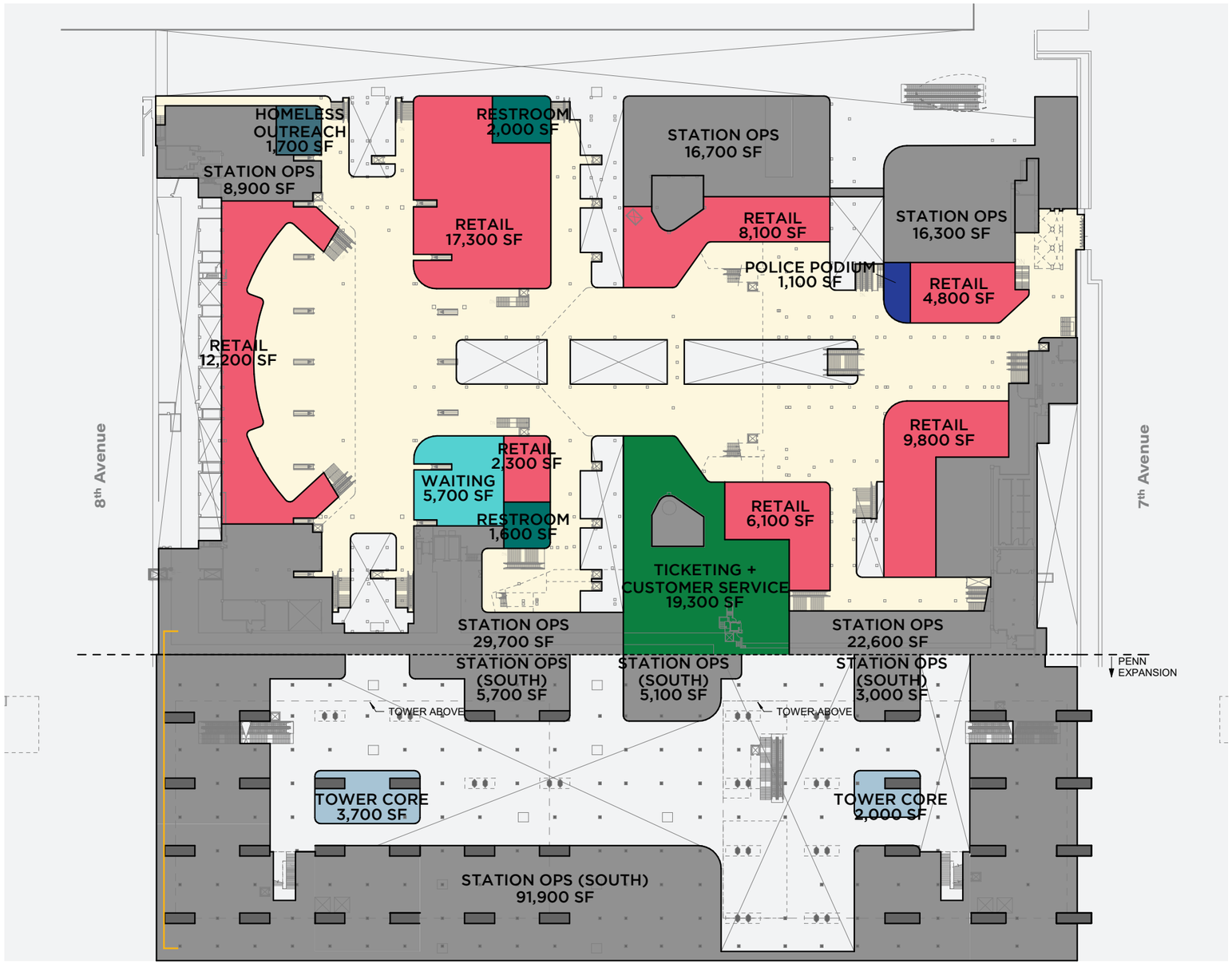
Upper Level

In Alternative 2, boarding continues to occur on the west end of the Upper Level, with significant retail around a large central circulation area. This alternative replaces the existing Rotunda with an east-west spine from the 7th Avenue and 32nd Street entrance to the west boarding area, removing the existing enclosed waiting area. The central east-west spine incorporates the increased height and volume made possible by removing the central third of the taxiway above and introduces a new atrium to the Lower Level in the center of the east-west spine. Additional openings down to the Lower Level occur in the west boarding area as well as at the north and south ends over the 8th Avenue, Central, and 7th Avenue Concourses. The area above the former NJT half-level is partially filled in to unify the circulation space on the Upper Level.

Retail is located along both sides of the east-west spine for maximum retail value, with waiting and customer service along the south side of the spine. Restrooms are located on the north and south sides of the Upper Level, included adjacent to the waiting area.

Vertical circulation is reconfigured throughout between the Upper and Lower Levels, including along the west boarding area and around the central atrium. This alternative retains all the existing VCEs from the Upper Level to Platforms 3 through 8, as well as adding a pair of escalators from the Upper Level to Platform 9 and a single escalator to Platform 10. The single escalator from the Upper Level to Platform 2 is moved to the west, and the existing VCEs up to the taxiway are shifted to the east.

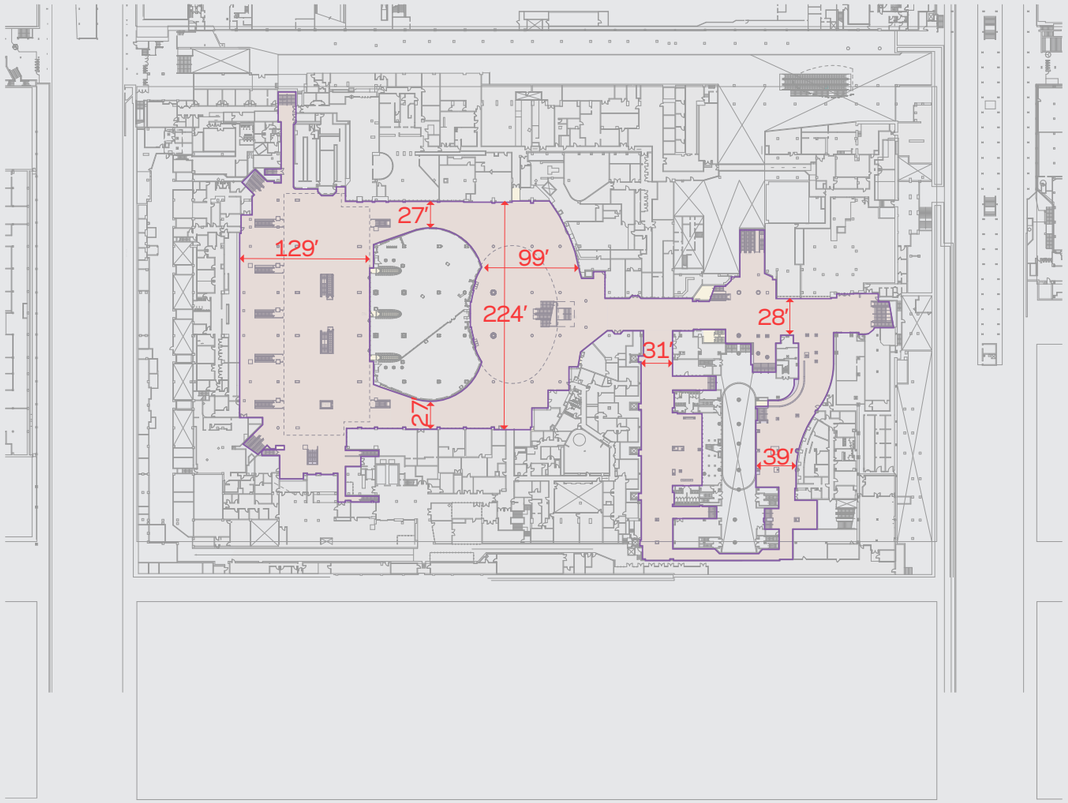
BOH space is arranged around the periphery of the Upper Level, and new service elevators are added between the Upper and Lower Levels to eliminate the existing ramp, which interferes with the connection to Penn Station Expansion. The homeless outreach space is located in the northwest corner of the Upper Level, near an exit to grade, per recommendations.



Note: Retail (LIRR) denotes Retail under LIRR control.

Upper Level Concourse Width Comparison

Existing



Proposed

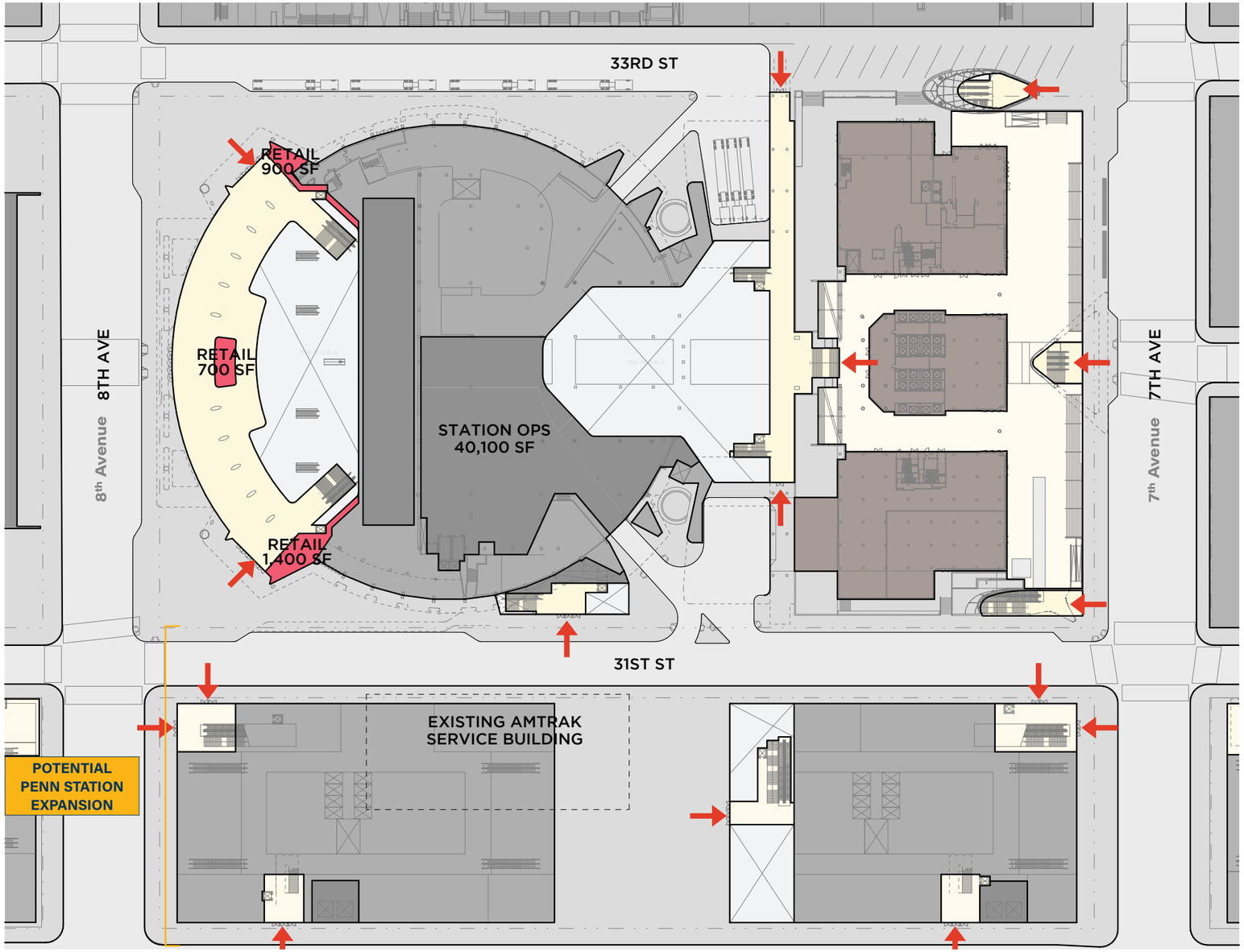


Street Level

The main element of the Street Level in Alternative 2 is the new grand entrance on 8th Avenue facing the Moynihan Train Hall, in the space now occupied by the Hulu Theater. This new entrance allows the addition of retail space on Street Level, which will contribute to the street presence and retail appeal of the station. Alternative 2 retains the corner entrances on 8th Avenue at 33rd and 31st Streets in addition to the new larger entrance in order to maximize egress routes, distribute passengers across multiple stairways down into the station, and maximize flow around the retail locations.

This alternative also includes improving the entrances on 7th Avenue at 32nd and 31st Streets, while also adding a new entrance mid-block on 31st Street providing access to the Upper Level and then down to the Central Concourse extension. New light-filled entrances from the taxiway are created by removing the roadway slab beneath the bridge, and opening it to the Upper Level. The area beneath the bridge, and extending slightly to the north and south beyond it, is enclosed to create sky-lit entry areas with vertical circulation to levels below. The new entry areas will be accessed from both 31st and 33rd Streets.

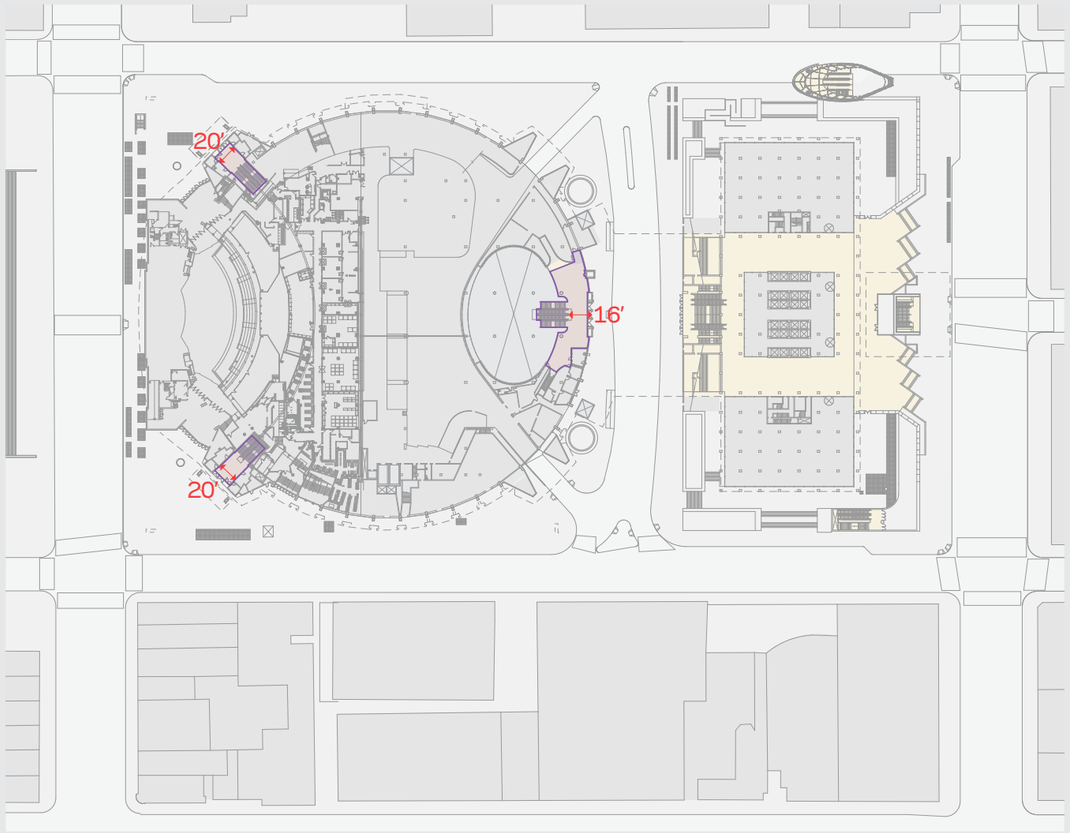
AHUs will be housed on two new MEP platforms roughly at the height of the roof of the MSG bridge. Additional MEP space is also provided adjacent to the Penn Station loading area, which remains in its current location.



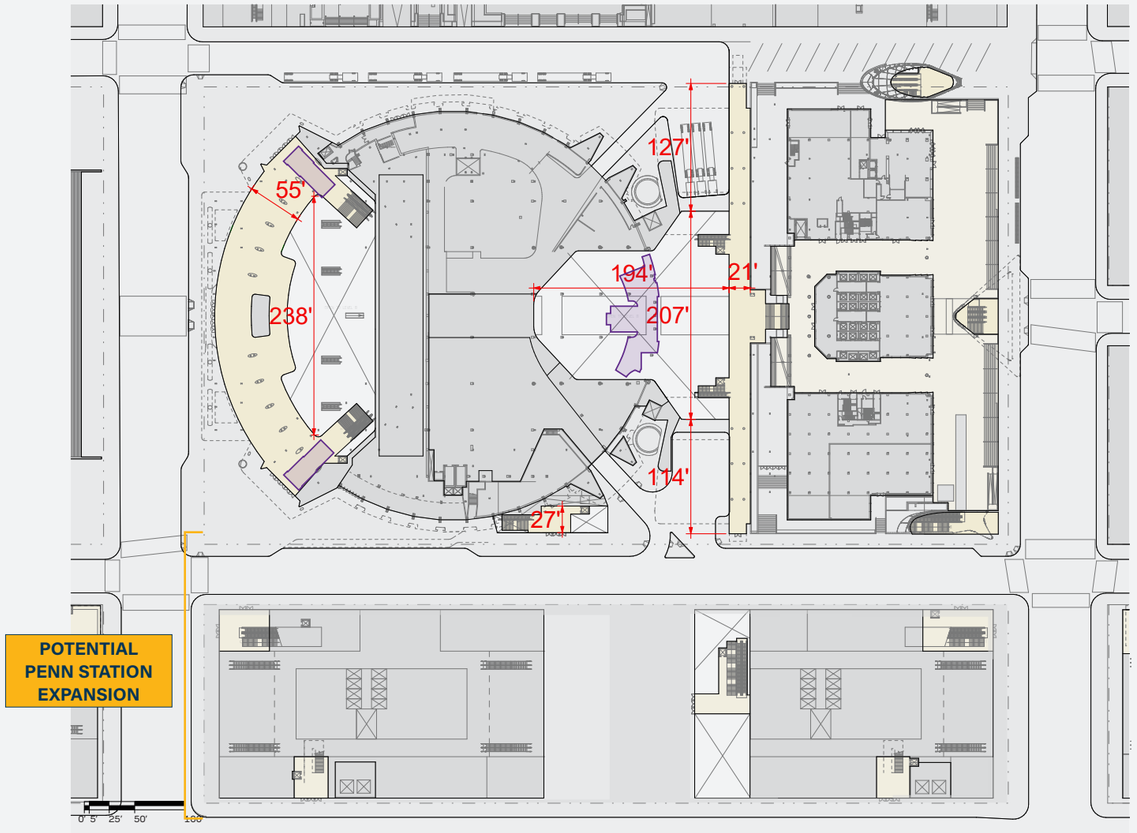
Note: Retail (LIRR) denotes Retail under LIRR control.

Street Level Concourse Width Comparison

Existing



Proposed



MEP

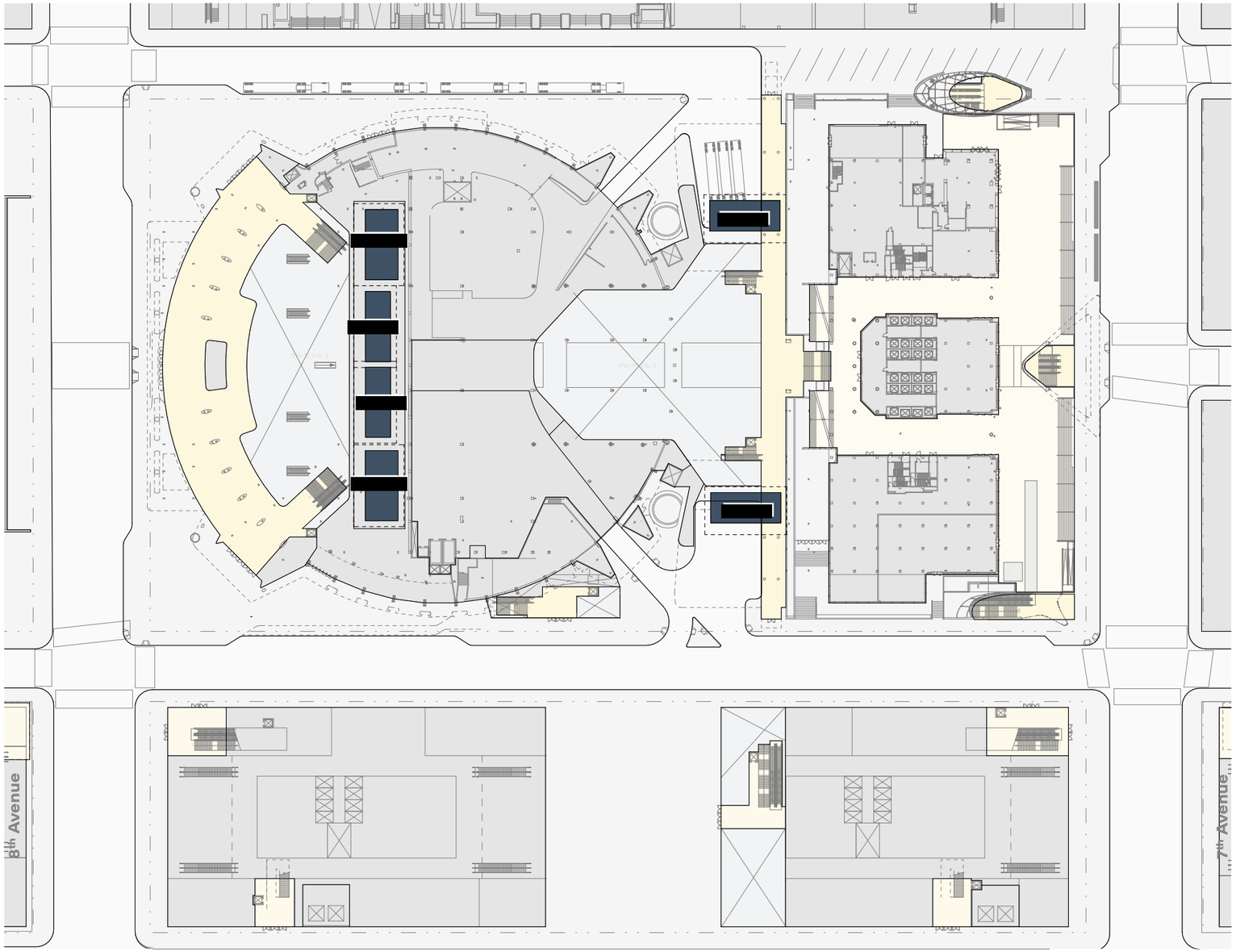
The large custom-built AHUs that deliver cooled or heated outdoor air to all areas of Penn Station are located on two elevated outdoor platforms above the taxiway for this alternative. AHUs are also located in part of the interior space vacated by the Hulu Theater removal. These AHUs will require large intake and exhaust louvers on the building façade (see next page).

The AHU ductwork is routed from the outdoor platforms to various areas in Penn Station via BOH spaces and must avoid infringing on vertical clearance requirements in the loading dock and truck parking spaces below. Like Alternative 1, the limited height on the Lower Level in circulation areas will pose difficulties fitting overhead ductwork and may tend to trap heat coming through stairs and escalators from the platform below, making the Lower Level more difficult to cool. The limited ceiling heights and the large amount of ductwork necessary will cause some loss of floor space on both levels. In addition, the high ceiling from the Hulu Theater removal area to below the MSG bridge entry creates some airflow distribution difficulties.

The discharge for the local sewage ejector pumps for the existing MSG drains at the ceiling of the Hulu Theater will need to be pumped through new force mains to the existing east side sanitary discharge lines in MSG. In addition, catwalks coordinated with the architectural design will be required to access the underside of the Hulu Theater sump locations and HVAC condensate lines serving MSG.

Construction of this alternative requires complicated coordination with the MSG 8th Avenue Con Edison Vault, and Primary and Secondary Service feeders. This alternative requires reconfiguration of the MSG 8th Avenue Medium Voltage incoming service and Fire Command Center.

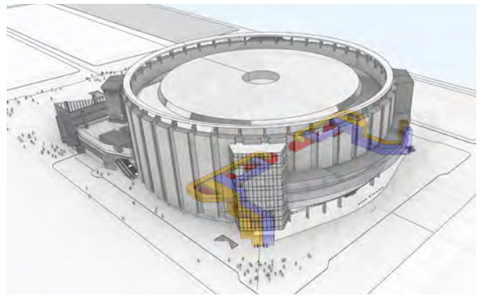
The building will be fully sprinklered, equipped throughout with an emergency voice/alarm communication system and a smoke control system in accordance with Section 909. These systems are necessary to justify the application of the smoke-protected assembly seating provisions for emergency building egress. The smoke control system will be designed to be a combined system with the building's air handling systems.



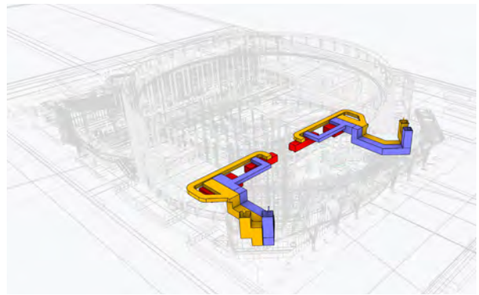
Air Handling Units

Alternative 2 places four large AHUs in the rear of the space that is today seating for Hulu Theater. The advantage of this location is that it facilitates distribution of tempered air to the station and avoids the need for exterior locations for the large AHUs on the west side of the station. The complication from this location is that the units need access to outside air, and routing the large supply and return ducts to the exterior is a complex task. The ducts also need large louvered areas on the exterior of the building.

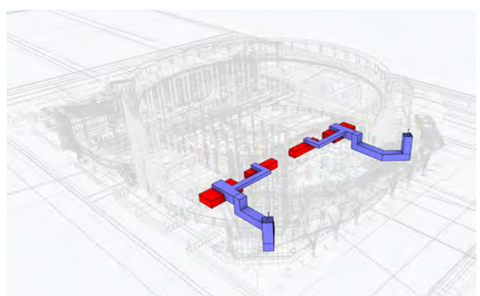
Several options were evaluated. The option shown below runs the supply and return duct work underneath and through the stairwell towers, but the low clearance that results requires moving the entrances away from the base of the towers toward the center of the block. This option has complex routing for the ductwork but has less impact to public spaces than other options studied and creates a more integrated entrance along the length of 8th Avenue.



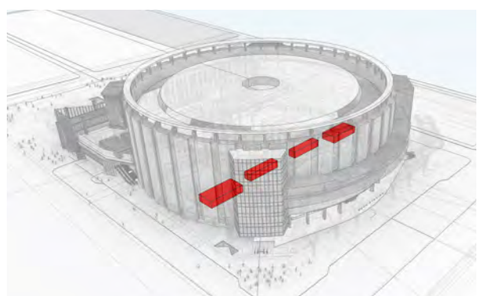
Compiled



Supply and Return



Supply

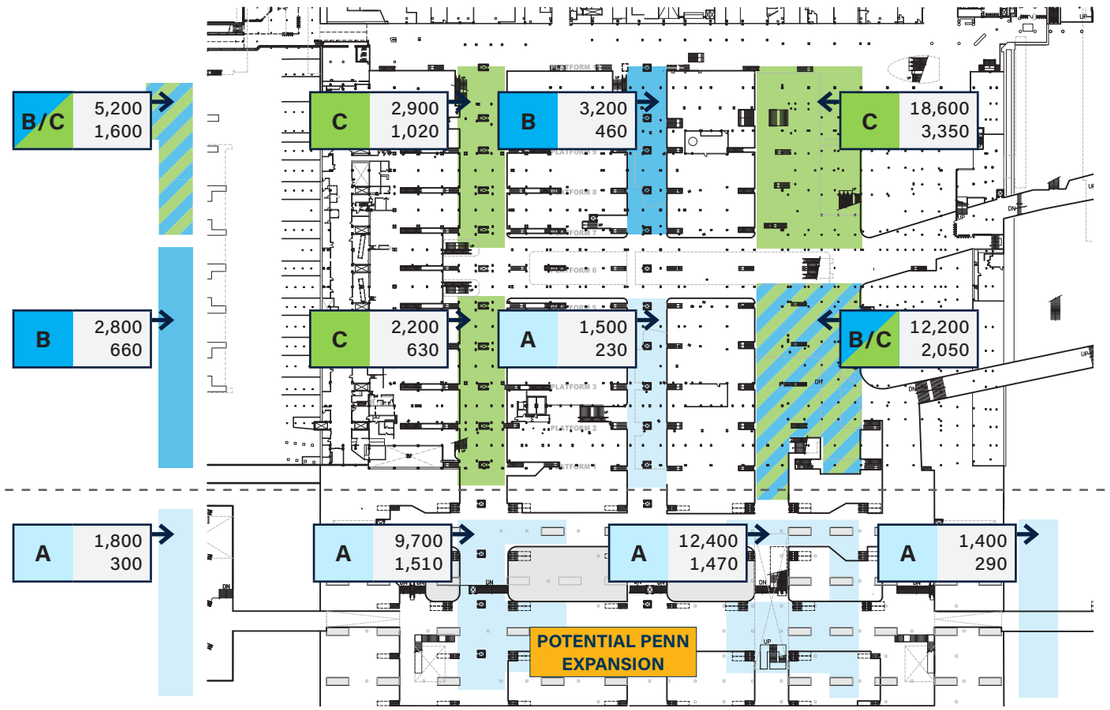


Units

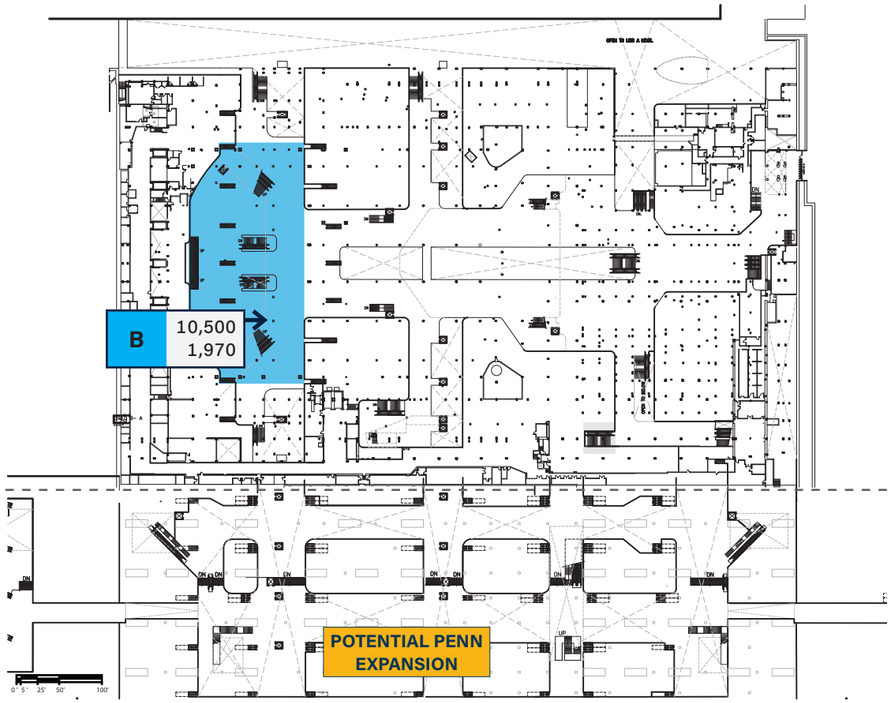
Level of Service

2038 Proposed Action On-Time Operations

PM Peak Hour Volumes, Concourse Occupancy, and Level of Service



A Level



B Level

Level of Service (LOS) Ratings Key

LOS Rating	Peak Hr. Boardings Peak Occupancy

LOS A | LOS B | LOS B/C | LOS C | LOS C/D | LOS D | LOS D/E | LOS E | LOS F

Program Area

Department	Lower Level SF	Upper Level SF	Street Level SF	Total Program SF
Retail	37,500 SF	60,300 SF	3,000 SF	100,800 SF
Customer-Facing Station Operations	28,200 SF	30,300 SF	—	58,500 SF
BOH Station Operations	129,600 SF	84,100 SF	4,300 SF	218,000 SF
Loading Dock	—	—	17,400 SF	17,400 SF
MEP (Total)	22,500 SF	11,600 SF	23,900 SF	58,000 SF
Total	**217,800 SF**	**186,300 SF**	**48,600 SF**	**452,700 SF**
Public Circulation	214,600 SF	130,300 SF	41,200 SF	386,100 SF
Grand Total	**432,400 SF**	**316,600 SF**	**89,800 SF**	**838,800 SF**

BOH% Occupancy Breakdowns

Ticketing + Customer Service	
Conference & Meeting	3%
Locker & Break Rooms	13%
Office & Administration	35%
Storage	17%
Customer Facing Includes Ticket Counters and Customer Service functions	32%

BOH Program	
Conference & Meeting	4%
Locker & Break Rooms	34%
Office & Administration	30%
Storage	18%
Support Support functions include Engineering Shops, Commissary Food Prep, Police Holding Cells, Print/Copy Rooms, and other specialized functions	15%

Section A: Exit Concourse Looking South

Renderings are for illustrative purposes only.



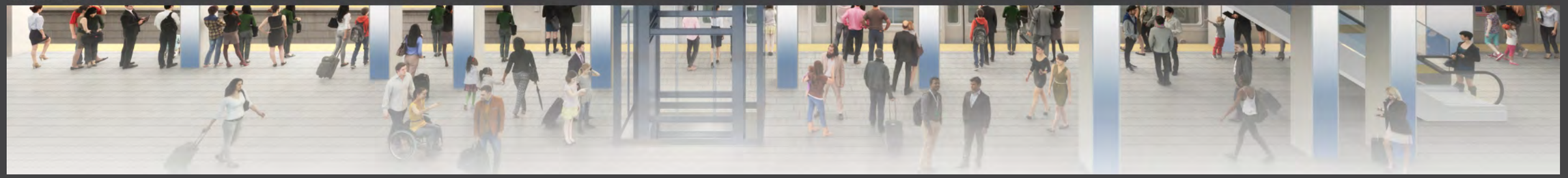




Upper Level



Lower Level



Platform Level

Section B: Central Concourse Looking South

Renderings are for illustrative purposes only.

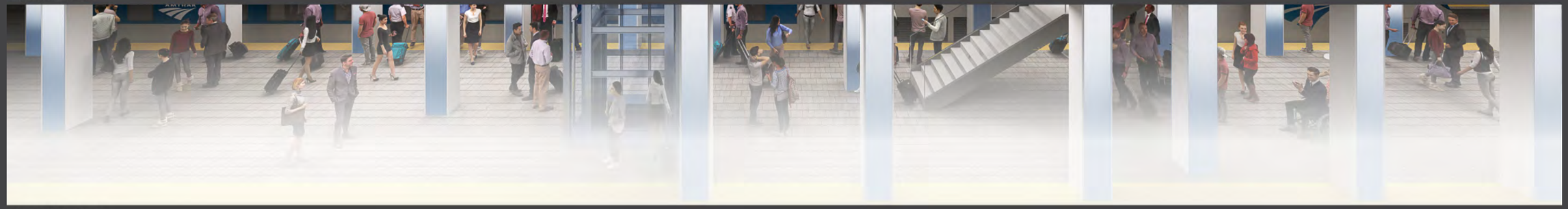




Upper Level



Lower Level



Platform Level

Section C: East-West Spine Looking West

Renderings are for illustrative purposes only.







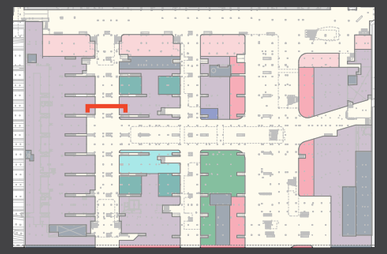
Upper Level

Lower Level

Platform Level

Section D: Exit Concourse Looking South

Renderings are for illustrative purposes only.



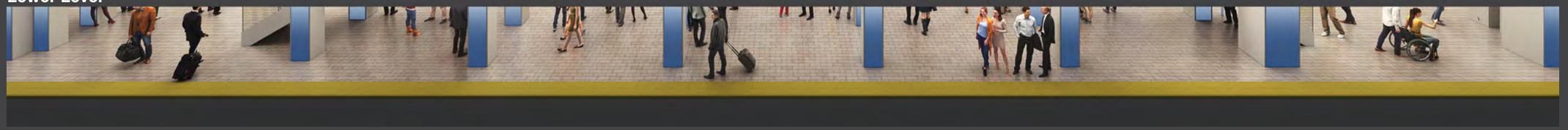




Upper Level



Lower Level



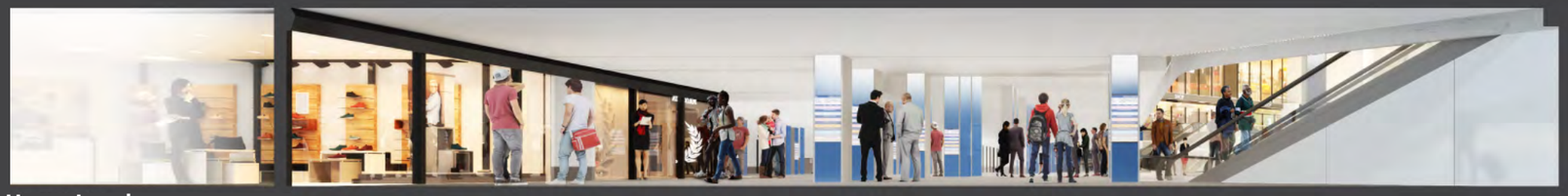
Platform Level

Section E: Exit Concourse Looking South

Renderings are for illustrative purposes only.







Upper Level



Lower Level



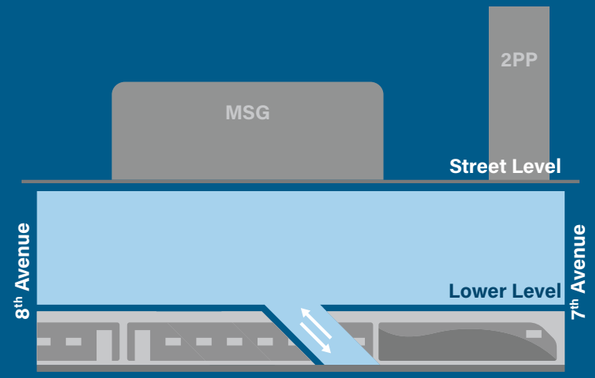
Platform Level

Alternative 3



7th Avenue Concourse Under the Taxiway Looking Southwest. Renderings are for illustrative purposes only.





Transform to Single-Level Operations

Alternative 3 fundamentally changes the station's operations by moving all passenger circulation to the Lower Level to provide more direct travel paths between the platforms and exits for commuters. This alternative creates double-height ceilings in all public circulation spaces by removing the Upper Level above the reconfigured Lower Level public circulation spaces (roughly 40% of the Upper Level).

→ **The focus of Alternative 3 is on the Lower Level.** There are no major aboveground alterations made in Alternative 3, with the exception of the renovations of the existing entrances at 32nd and 31st Streets and 7th Avenue and 33rd and 31st Streets and 8th Avenue. A new entrance is added mid-block on 31st Street.

Alternative 3's Lower Level creates widened and regularized concourses, including a central east-west concourse that replaces the Hilton Corridor and a new north-south circulation concourse on the east side. All north-south concourses connect southward toward Penn Station Expansion under 31st Street.

The Lower Level program is focused on customer-facing functions, including waiting, retail, ticketing, and customer service. The east-west concourse and the open area where it merges with the 7th Avenue Concourse and the east-west concourse is lined with retail uses. BOH areas occupy areas behind the retail primarily in the western portions of the station.

The Upper Level is almost exclusively for BOH and MEP, except for the substantial retail and customer service areas on the Upper Level Mezzanine on the west end of the station.

→ **Alternative 3 takes a different approach to passenger circulation within the existing station by providing virtually all horizontal circulation on a single level, the Lower Level.**

This single-level approach creates a less-complicated pedestrian network with double-height spaces expected to significantly improve passenger orientation and wayfinding. This alternative compensates for the loss of public space on the Upper Level with the provision of substantially more public space on the Lower Level. The provided public space on the Lower Level is located in greater proximity to the platform boarding gates and, therefore, is more useful for meeting rail passengers' needs.

The north-south concourse at the 7th Avenue end of the Lower Level is substantially enlarged and integrated into a single expansive public space with double-height ceilings. The expanded concourse provides increased platform access and significantly more space for passenger waiting, boarding queuing, and circulation. The high ceilings on the Lower Level will help the space function as a single, integrated concourse.

The north-south concourse on the Lower Level at the 8th Avenue end of the station is widened significantly in Alternative 3, providing multiple access points to each platform and providing more space for passenger waiting in and around the boarding gates. Boarding queues are expected to be more evenly distributed among the Lower Level gates in this single-level scheme than in the concepts that split boarding between the Lower Level and the Upper Level.

The primary passenger waiting areas will be in the north-south concourses, within sight of and a relatively short walking distance from the boarding gates. The substantially widened east-west concourses along the 32nd and 33rd Street axes provide reservoir space that will be usable by waiting passengers when train delays occur, functionally replacing the reservoir space that currently exists on the Upper Level of the station.

8th Avenue Looking North

Renderings are for illustrative purposes only.



8th Avenue Looking East From Moynihan Train Hall

Renderings are for illustrative purposes only.



7th Avenue Concourse Looking South

Renderings are for illustrative purposes only.

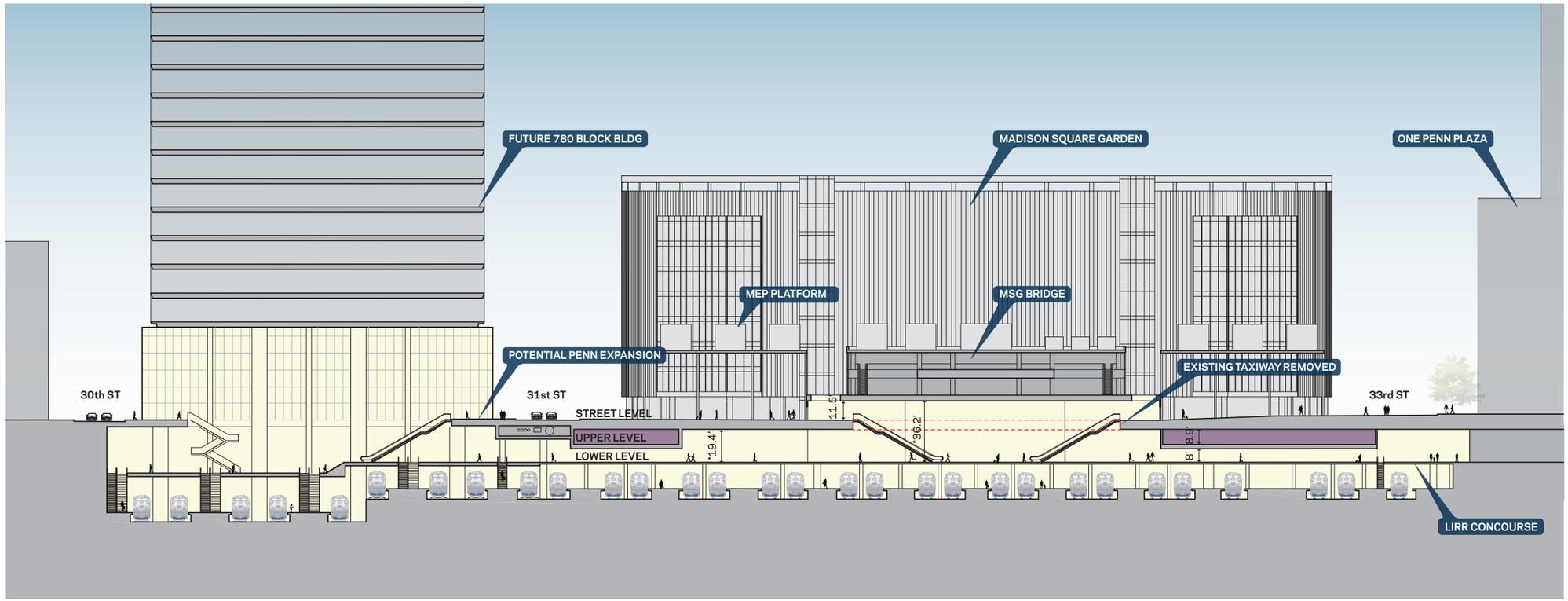


7th Avenue Concourse Looking Southwest

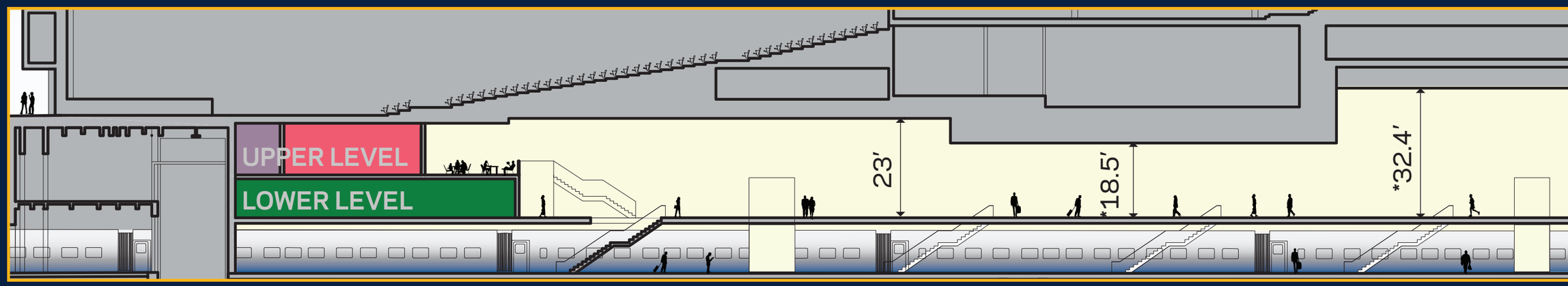
Renderings are for illustrative purposes only.



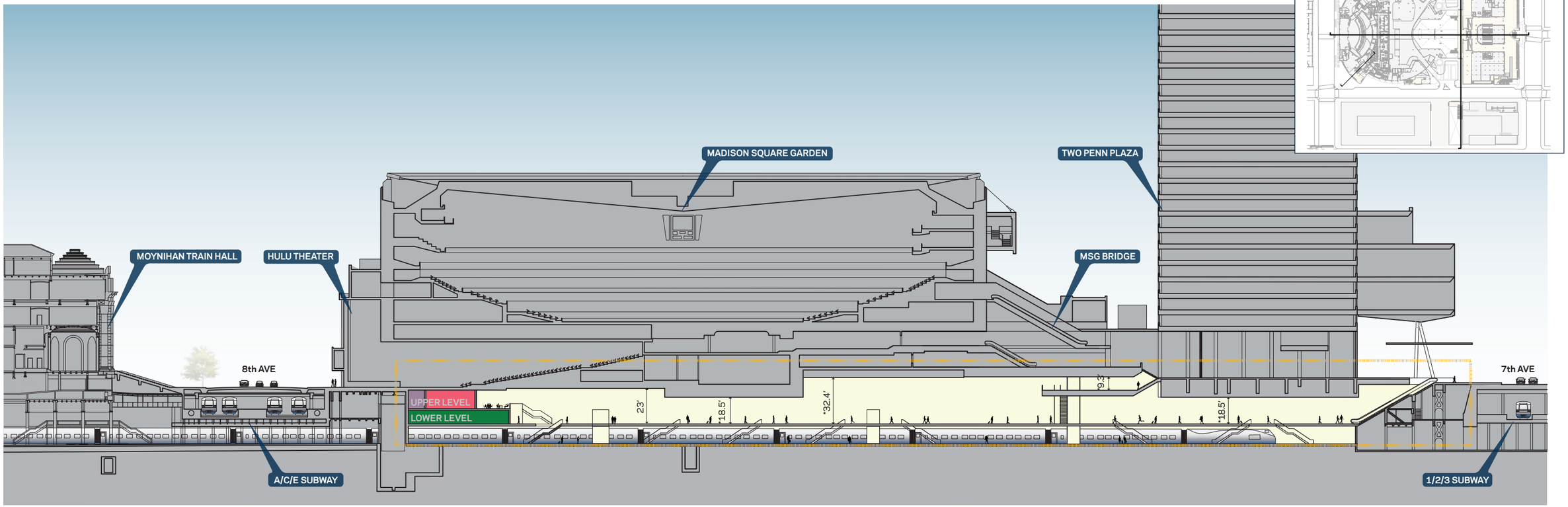
North-South Section at Taxiway

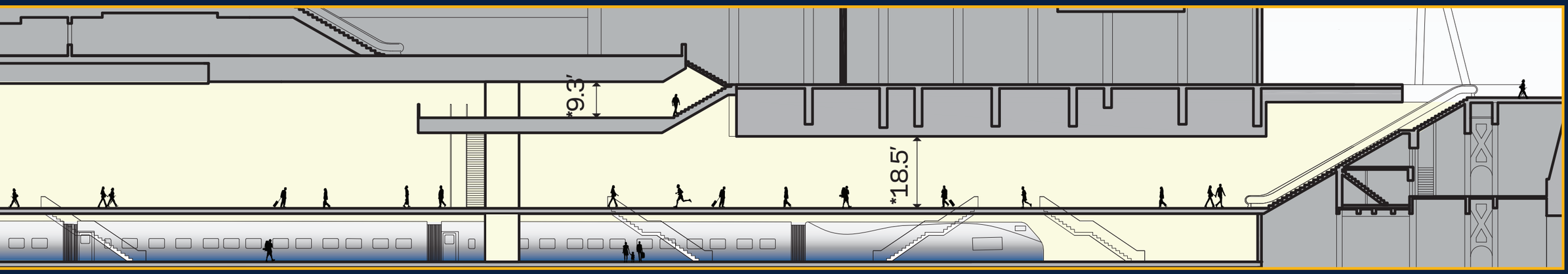


Note
Penn Station Expansion track configuration is conceptual.



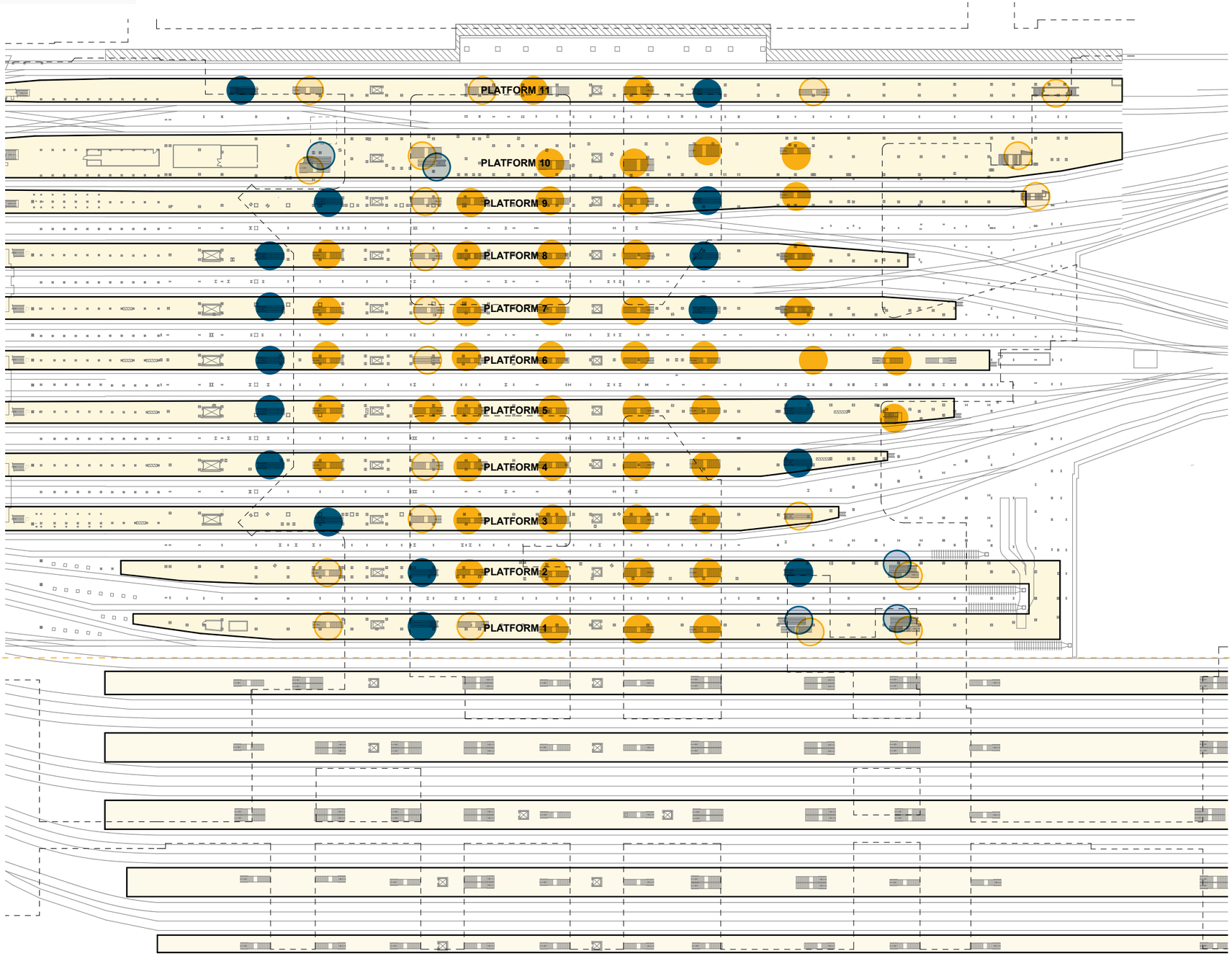
East-West Section at Center of Station





Platform

PENN RECONSTRUCTION



POTENTIAL PENN STATION EXPANSION

Note
Penn Station Expansion track configuration is conceptual.

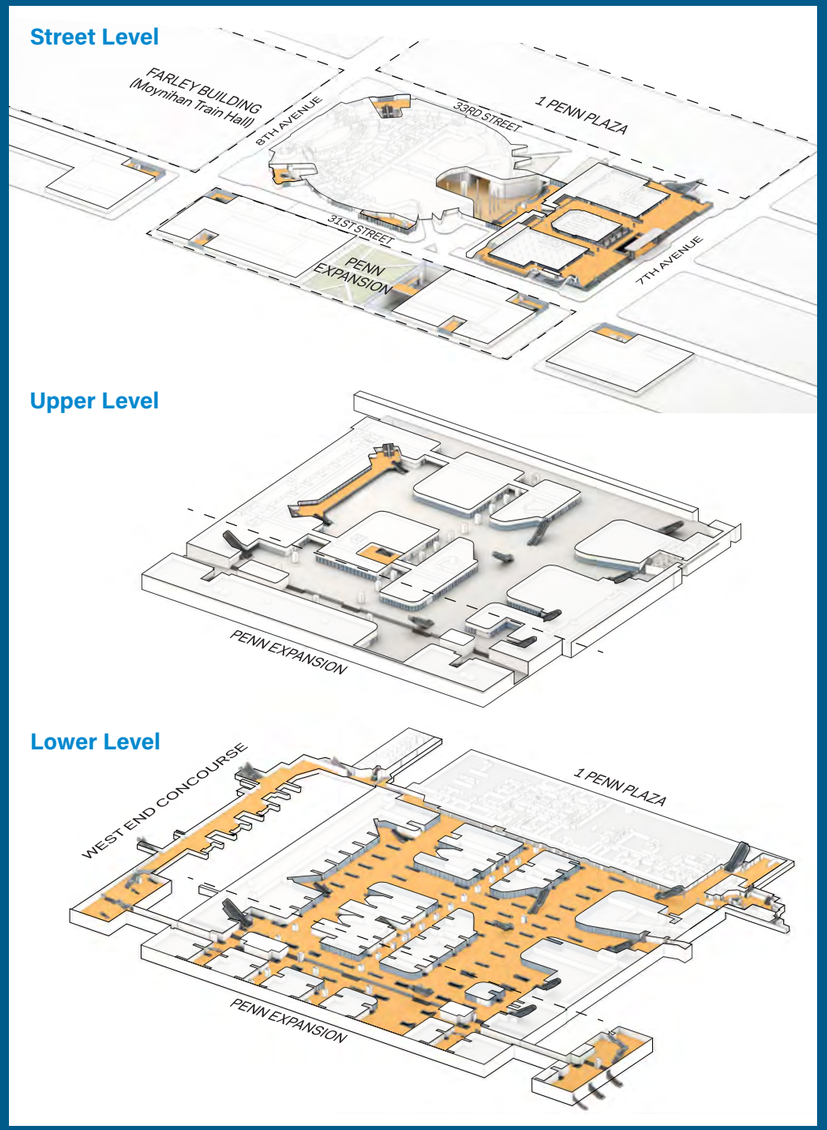
Stair Widths (Inches)

	Vertical Circulation Element (VCE)												
Platform	1	2	3	4	5	6	7	8	9	10	Total Number of VCEs	Total Width of VCEs (in)	Existing Number of VCEs
11	**38**	64	78	**78**	**78**	34	60	73	73		9	542	7
10	38	92	108	**34**	**90**	**118**	**120**	**60**	108		9	734	8
9	**40**	66	72	**62**	**62**	**32**	**60**	68			8	430	7
8	**40**	**66**	58	**58**	**60**	**60**	**40**	**60**			8	442	7
7	**40**	**57**	58	**58**	**60**	**60**	**40**	**60**			8	433	7
6	**40**	**54**	**40**	**54**	**54**	**54**	**54**	**54**	**54**		9	458	7
5	**40**	**54**	**64**	**64**	**60**	**60**	**60**	**40**	**44**		9	486	6
4	**40**	**64**	72	**72**	**60**	**60**	**86**	**40**			8	494	5
3	**40**	68	**52**	**75**	**75**	**75**	**32**				7	385	5
2	**64**	**40**	**57**	**60**	**88**	**86**	**40**	46	52		9	493	8
1	60	**40**	58	**57**	**57**	**57**	46	**57**	46	52	10	490	8

Key

New Escalator	
Existing Escalator	
New Stair	
Existing Stair	

Axonometric View of Alternative 3



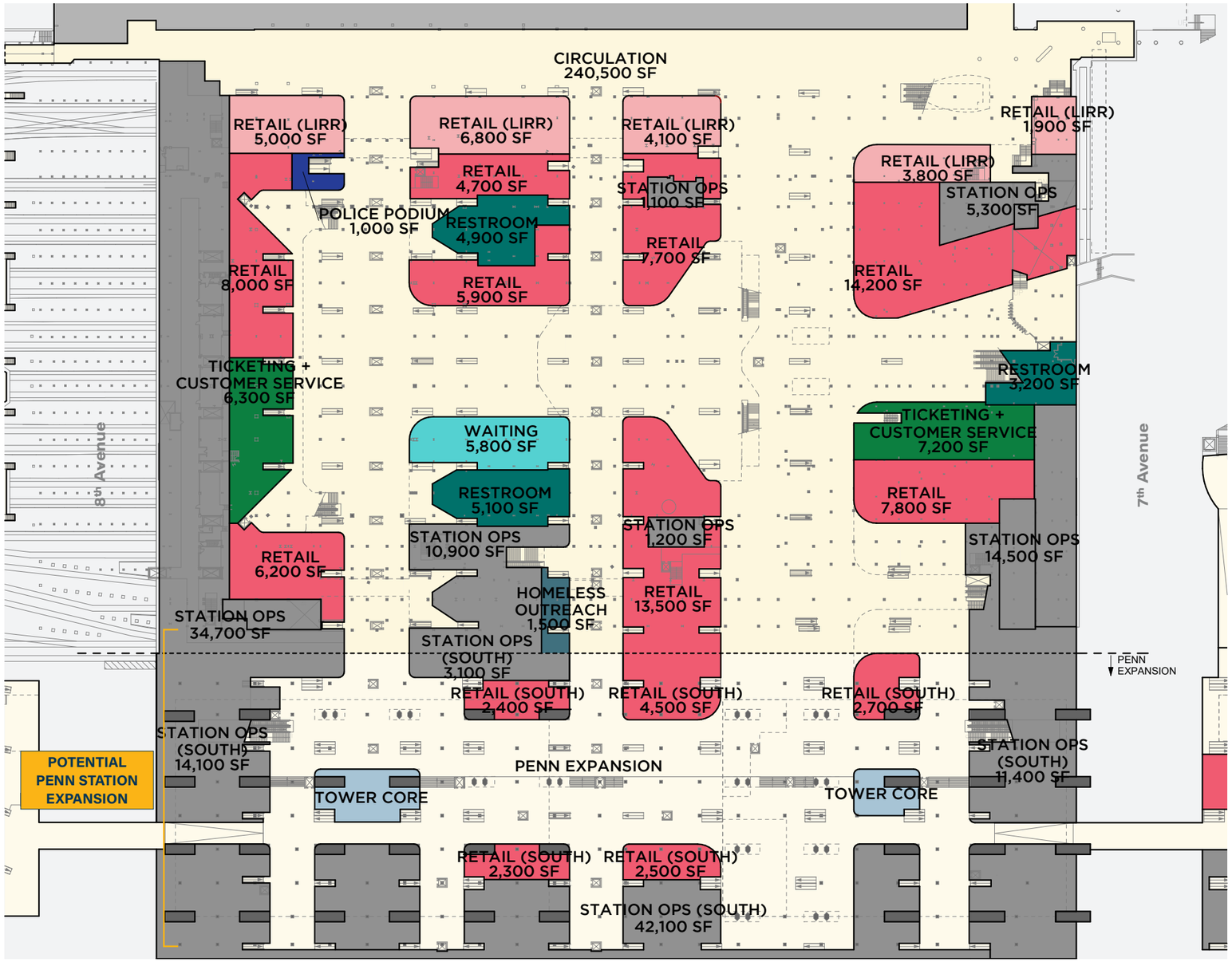
Lower Level

Alternative 3 significantly improves the Lower Level by widening corridors and eliminating all low ceiling height areas. The 7th Avenue Concourse is substantially widened and extends from the LIRR Main Gate straight down to the NJT area where the half-level has been removed and Lower Level slab filled in. The Central Concourse is extended southward to all tracks, and the 8th Avenue Concourse is widened in the center. The Hilton Corridor is straightened and widened creating a wide east-west central corridor. All public concourses end up with a ceiling height of at least 18 feet by opening them up to the Upper Level.

Retail in this alternative continues to line the 33rd Street Concourse while also being added to the north, east, and south sides of the main, east-west central corridor. Waiting is visibly located at the west end of the central area, with easy access to all tracks and proximity to restrooms and customer service. Customer service is located next to the waiting area on the west end as well as on the east end, near where people enter from the 32nd Street and 7th Avenue entrance. Restrooms are located at both ends of the 8th Avenue Concourse.

The 8th Avenue, Central, and 7th Avenue Concourses all extend directly to the Penn Station Expansion. In addition, a fourth passageway east of the 7th Avenue Concourse provides a convenient way for passengers at Penn Station Expansion to access the proposed underground connection in the southeast corner of the station (see **Section 6.2** on Underground Connnections), without having to cross through the congested NJT Concourse area.

BOH and MEP space is present along the west and south sides of the station. The homeless outreach space is located in the northwest corner of the Lower Level.



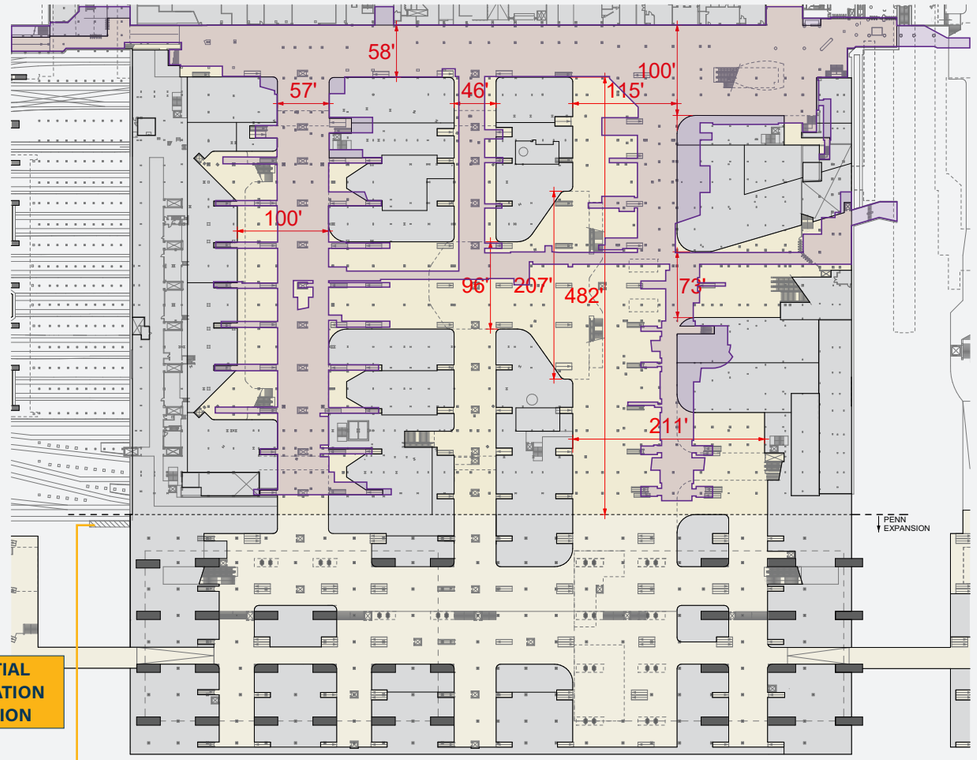
Note: Retail (LIRR) denotes Retail under LIRR control.

Lower Level Concourse Width Comparison

Existing



Proposed

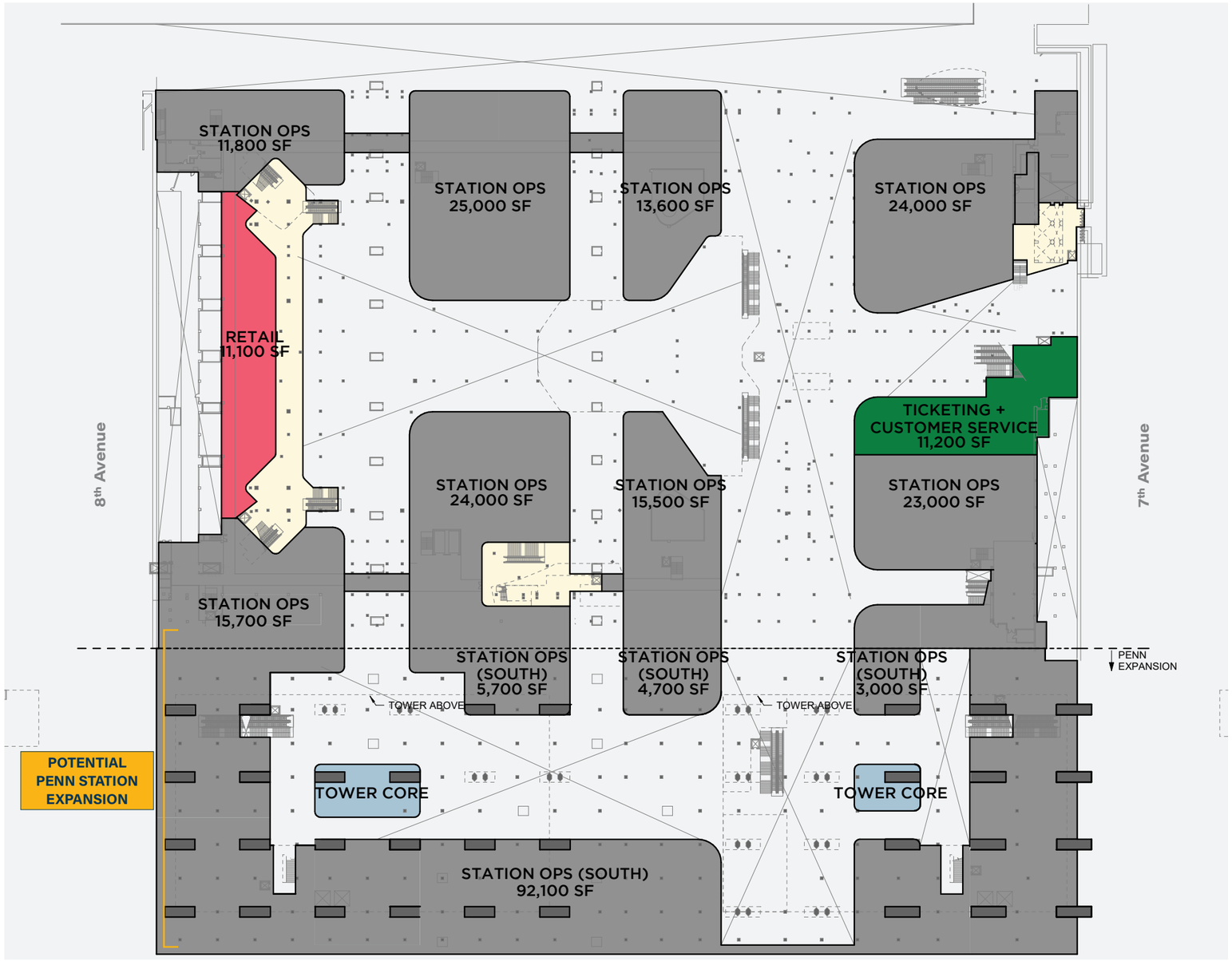


POTENTIAL PENN STATION EXPANSION

Upper Level

From the west side, Alternative 3 provides two new VCEs from Street Level to the Upper Level and from the Upper Level to the Lower Level's widened 8th Avenue Concourse. The Upper Level mezzanine area on the west will have retail spaces with a balcony looking down into the station. There is a large customer service area in the northwest corner of the Upper Level.

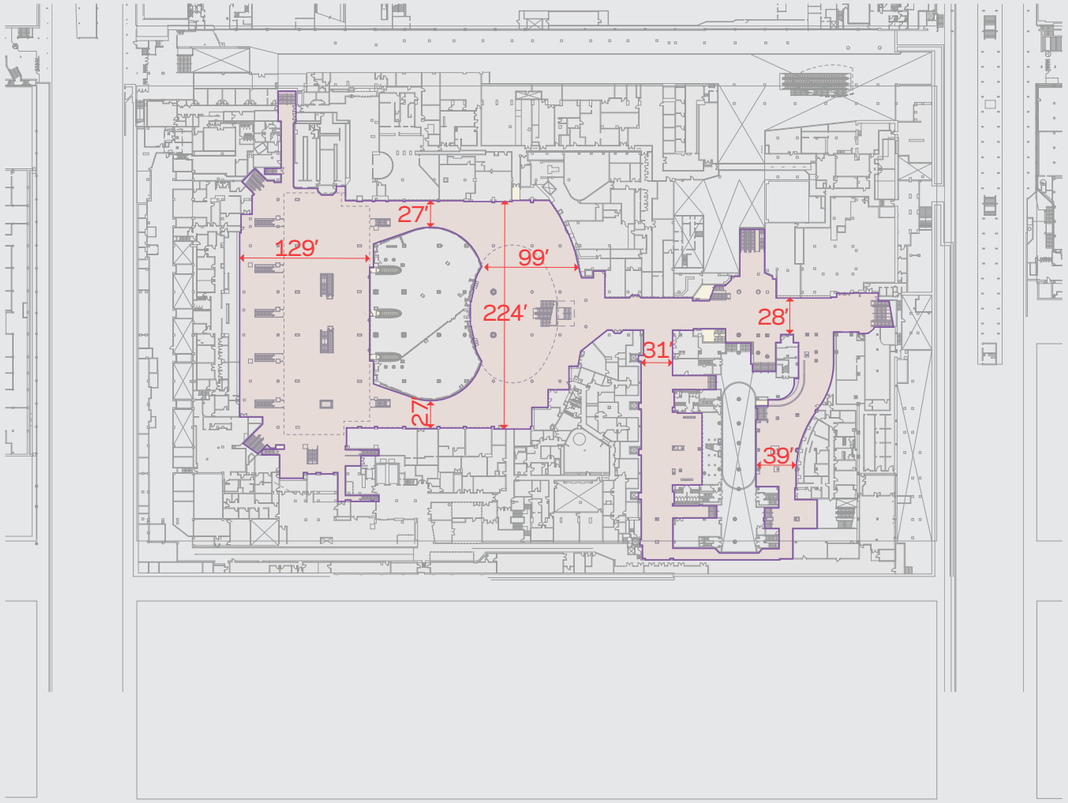
The removal of all of the Upper Level slab above the Lower Level circulation spaces creates throughout the remainder of the Upper Level MEP and BOH "islands" housing most of these functions for the station, connected by hallways running along the north and south of the station. Each "island" will have a vertical circulation core from the Lower Level below. New service elevators between the Upper and Lower Levels are added to eliminate the existing ramp, which interferes with the connection to the Penn Station Expansion.



Note: Retail (LIRR) denotes Retail under LIRR control.

Upper Level Concourse Width Comparison

Existing



Proposed

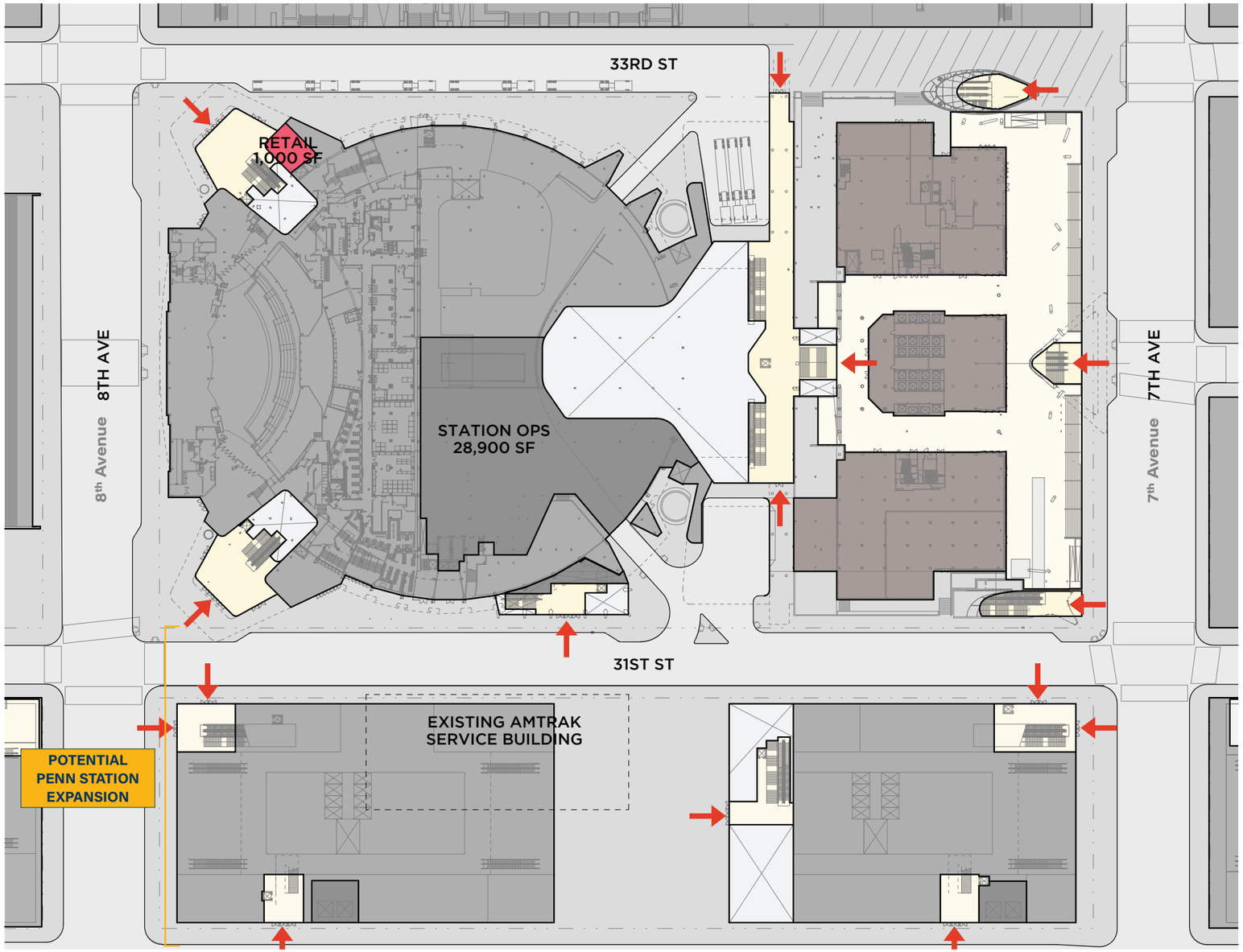


Street Level

In this alternative, the entrances at 32nd and 31st Streets and 7th Avenue and 33rd and 31st Streets and 8th Avenue are all renovated. The 8th Avenue entrances in particular are pulled out to get some daylight into the station at the entrances. The alternative also adds an entrance mid-block on 31st Street.

New light-filled entrances from the taxiway are created by removing the roadway slab beneath the bridge, and opening to the Lower Level. The area beneath the bridge, and extending slightly to the north and south beyond it, is enclosed to create sky-lit entry areas with vertical circulation to levels below. The new entry areas will be accessed from both 31st and 33rd Streets.

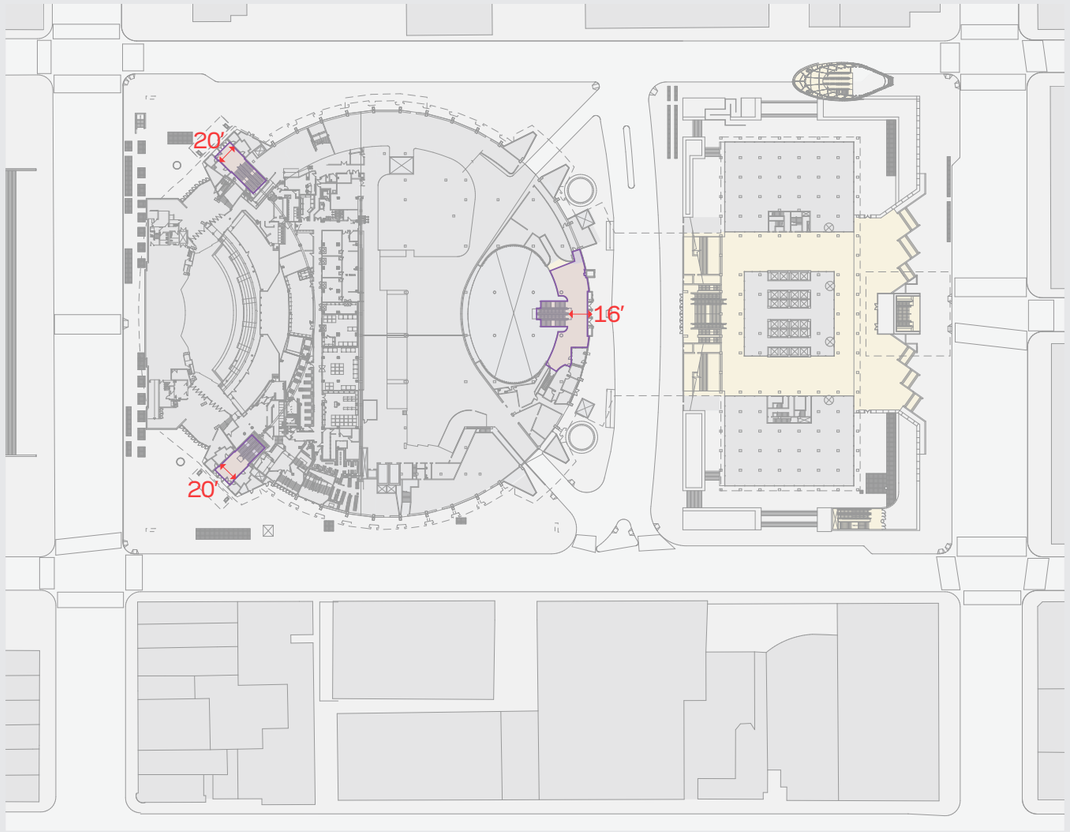
The Street Level continues to have Penn Station loading in the same existing area, with some MEP space adjacent. Alternative 3 also adds two MEP platforms roughly at the height of the roof of the MSG bridge for MEP equipment, needed primarily for the AHUs.



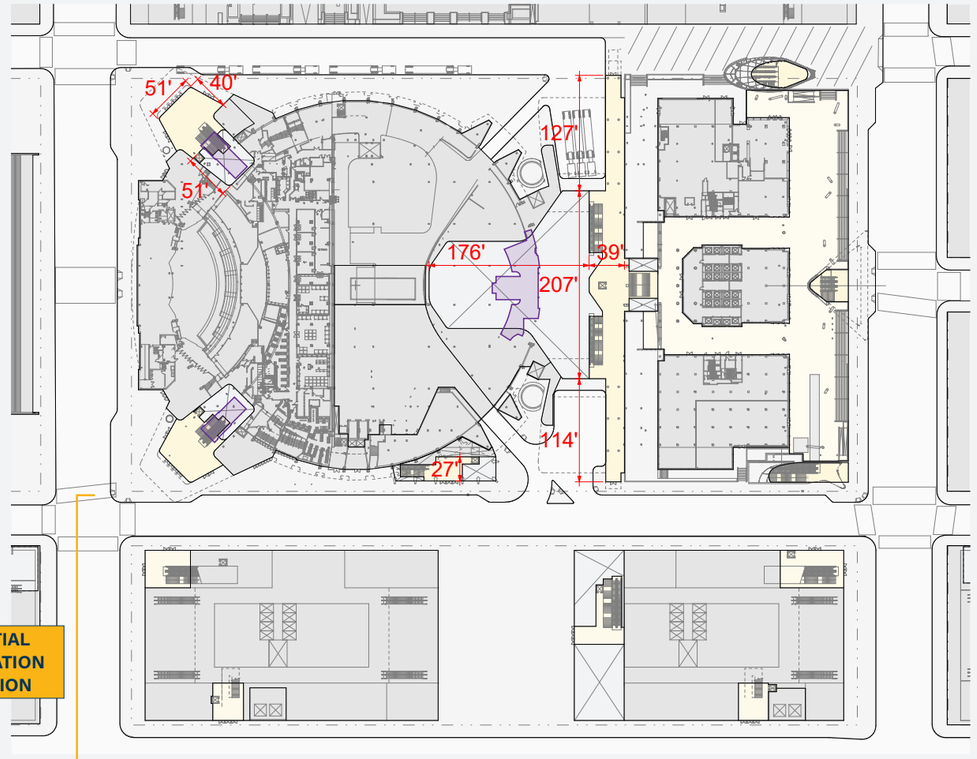
Note: Retail (LIRR) denotes Retail under LIRR control.

Street Level Concourse Width Comparison

Existing



Proposed

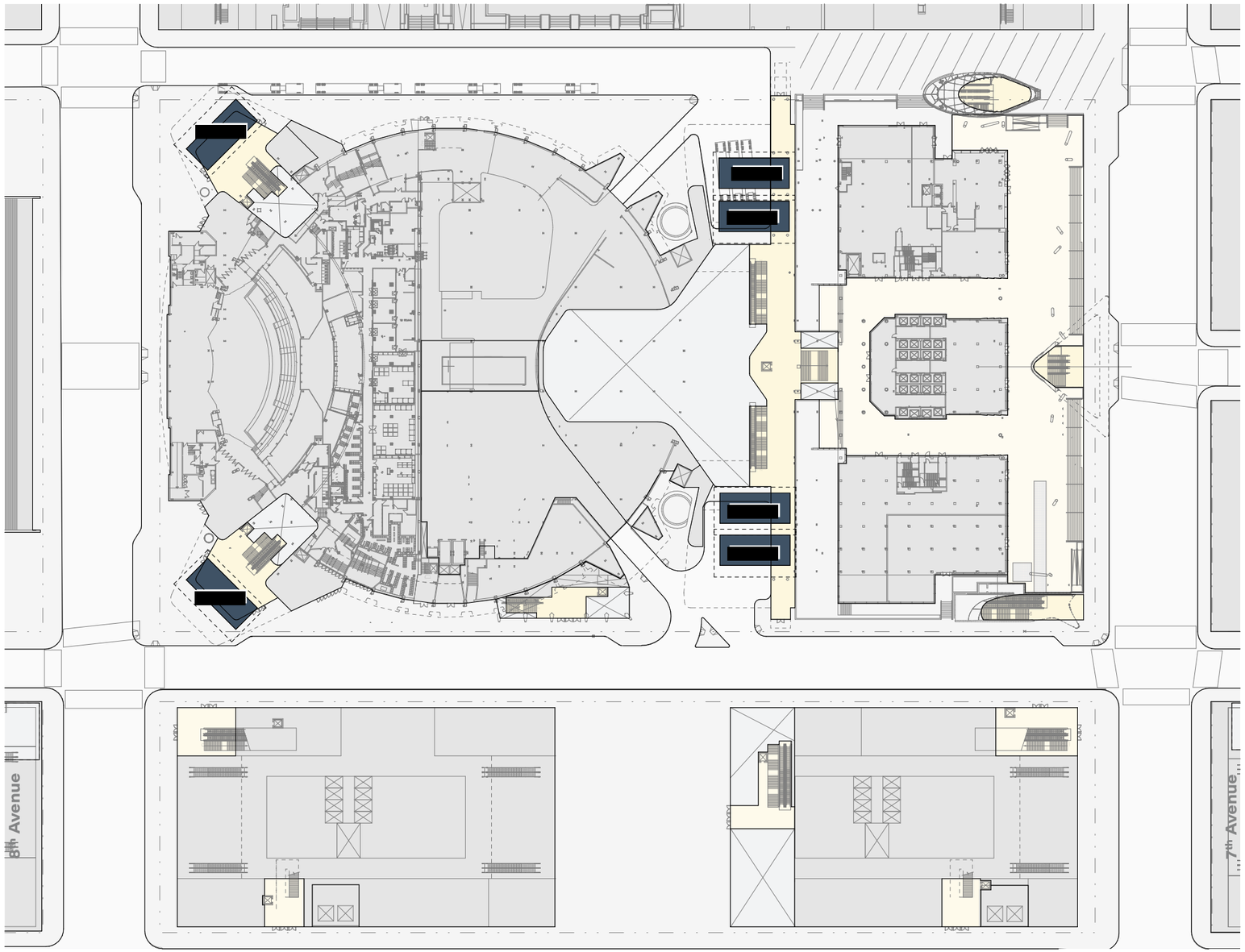


MEP

The large custom-built AHUs that deliver cooled or heated outdoor air to all areas of Penn Station are located on two elevated outdoor platforms above the taxiway area for this alternative. In addition, AHUs are housed above the new corner entrances on 8th Avenue. This distributed configuration of AHUs facilitates ducting to all areas of the station. AHU ductwork routed from the outdoor platforms to various areas in Penn Station via BOH spaces must avoid infringing on vertical clearance requirements in the loading dock and truck parking spaces below. Main air supply ductwork will run above the main circulation areas and distribute to the program areas on the Upper and Lower Levels.

The building will be fully sprinklered, equipped throughout with an emergency voice/alarm communication system and a smoke control system in accordance with Section 909. These systems are necessary to justify the application of the smoke-protected assembly seating provisions for emergency building egress. The smoke control system will be designed to be a combined system with the building's air handling systems.

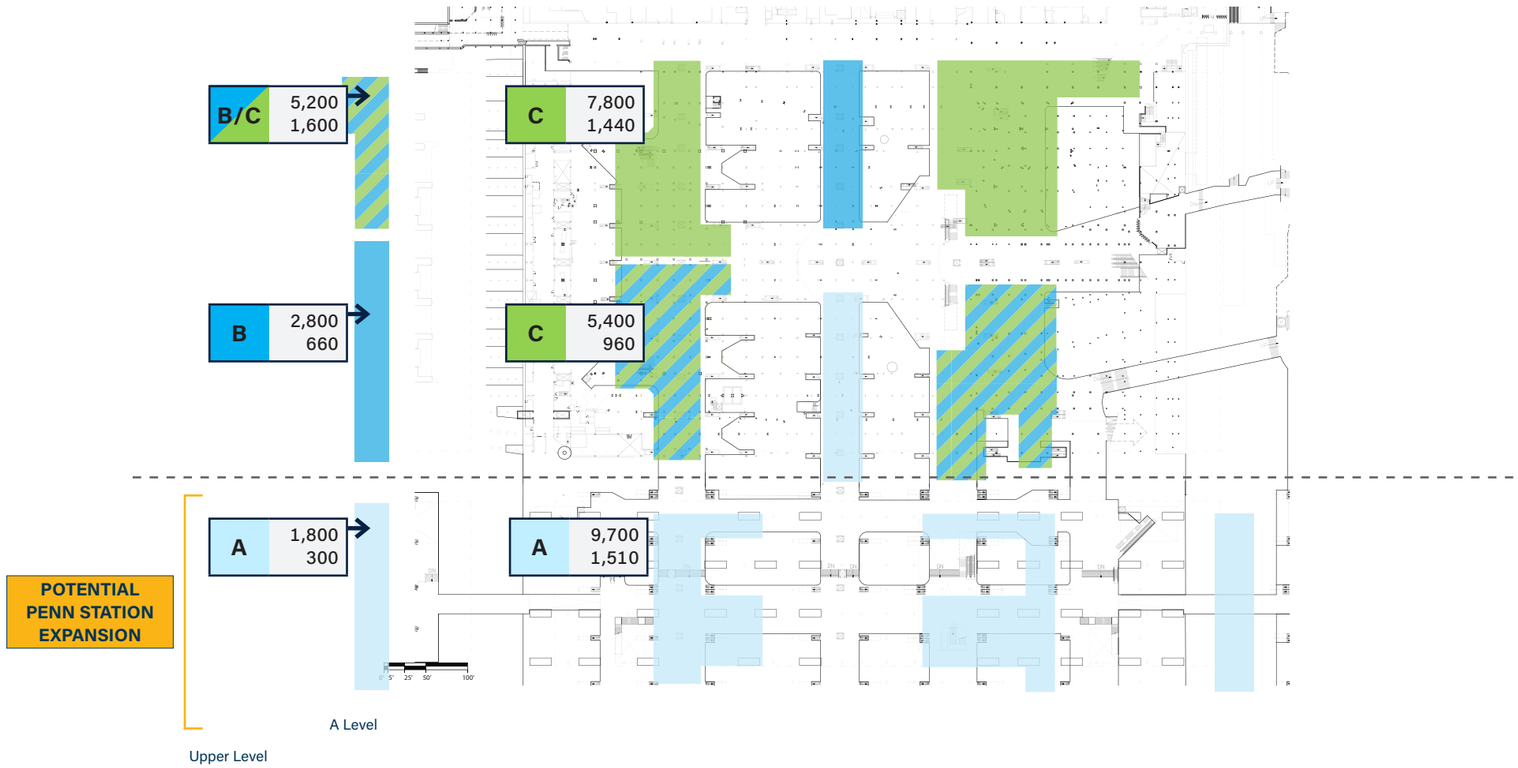
In this alternative, the MSG Con Edison vault currently on the Upper Level is relocated to the Street Level next to the MSG loading area.



Level of Service

2038 Proposed Action On-Time Operations

PM Peak Hour Volumes, Concourse Occupancy, and Level of Service



Level of Service (LOS) Ratings Key

LOS Rating	Peak Hr. Boardings / Peak Occupancy
LOS A	
LOS B	
LOS B/C	
LOS C	
LOS C/D	
LOS D	
LOS D/E	
LOS E	
LOS F	

Program Area

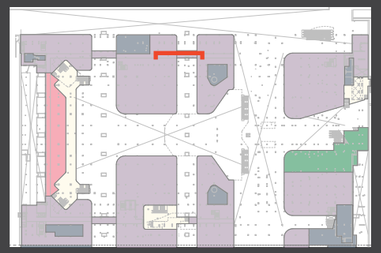
Department	Lower Level SF	Upper Level SF	Street Level SF	Total Program SF
Retail	89,500 SF	11,100 SF	1,000 SF	101,600 SF
Customer-Facing Station Operations	34,000 SF	11,200 SF	—	45,200 SF
BOH Station Operations	52,700 SF	139,400 SF	6,100 SF	198,200 SF
Loading Dock	—	—	17,400 SF	17,400 SF
MEP (Total)	15,900 SF	16,800 SF	22,600 SF	55,300 SF
Total	**192,100 SF**	**178,500 SF**	**47,100 SF**	**417,700 SF**
Public Circulation	240,500 SF	19,300 SF	27,000 SF	286,800 SF
Grand Total	**432,600 SF**	**197,800 SF**	**74,100 SF**	**704,500 SF**

BOH% Occupancy Breakdowns

Ticketing + Customer Service	
Conference & Meeting	3%
Locker & Break Rooms	13%
Office & Administration	35%
Storage	17%
Customer Facing Includes Ticket Counters and Customer Service functions	32%

BOH Program	
Conference & Meeting	4%
Locker & Break Rooms	34%
Office & Administration	30%
Storage	18%
Support Support functions include Engineering Shops, Commissary Food Prep, Police Holding Cells, Print/Copy Rooms, and other specialized functions	15%





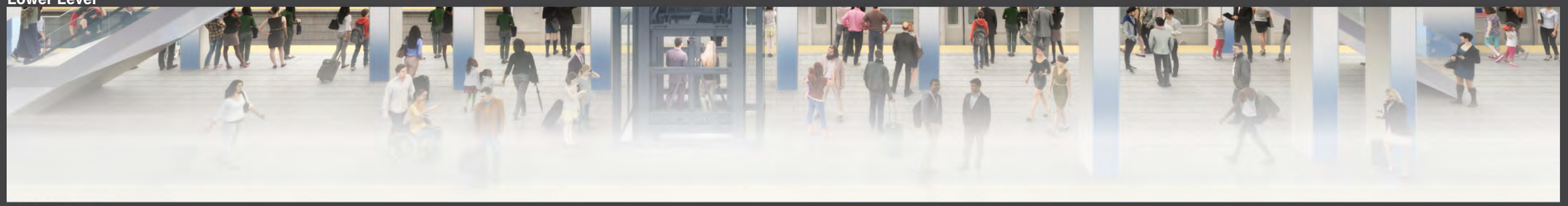
Section A: Exit Concourse Looking South

Renderings are for illustrative purposes only.

Upper Level



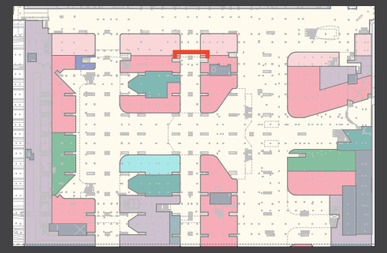
Lower Level

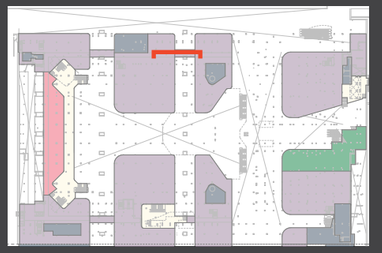


Platform Level

Section B: Central Concourse Looking South

Renderings are for illustrative purposes only.

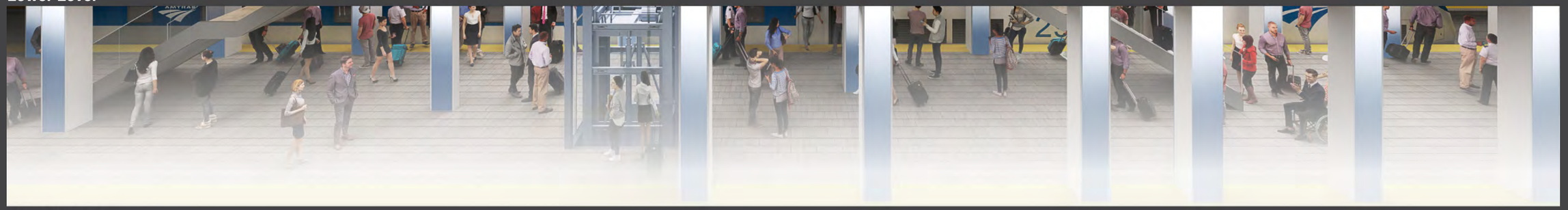




Upper Level



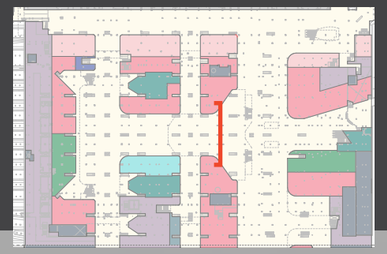
Lower Level

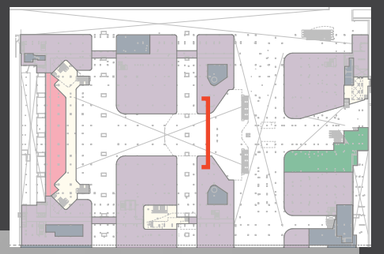


Platform Level

Section C: East-West Spine Looking West

Renderings are for illustrative purposes only.







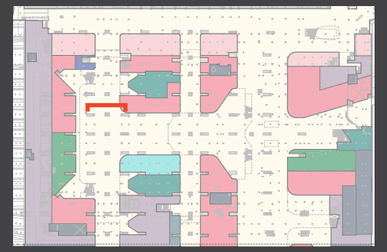
Upper Level

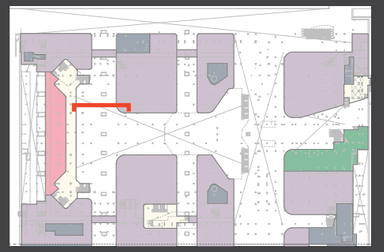
Lower Level

Platform Level

Section D: Exit Concourse Looking South

Renderings are for illustrative purposes only.





Upper Level





Lower Level

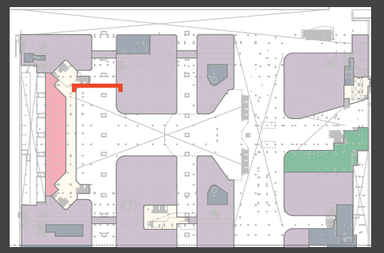


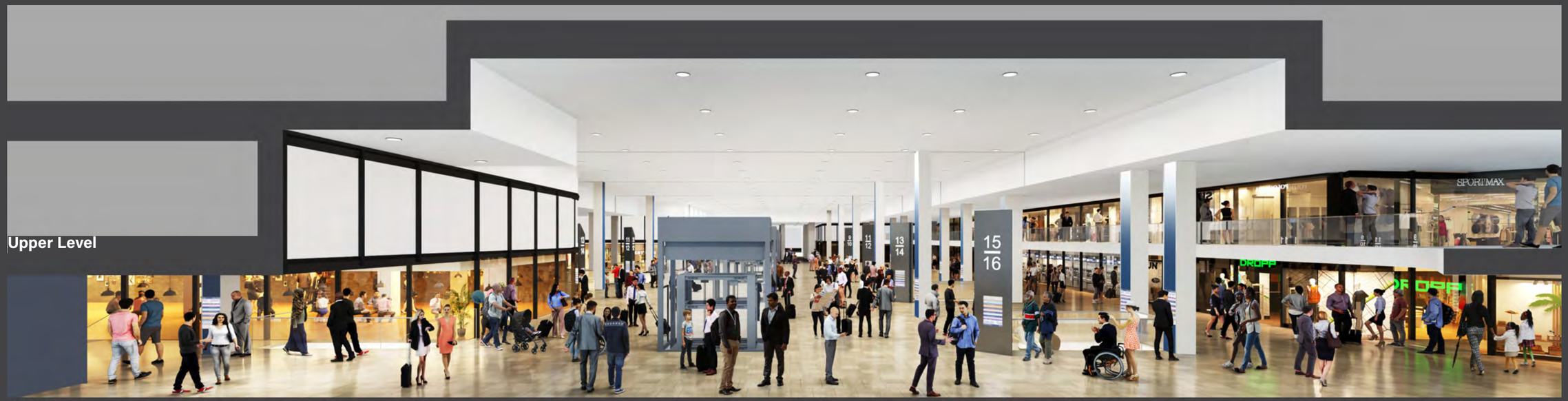
Platform Level

Section E: Exit Concourse Looking South

Renderings are for illustrative purposes only.







Upper Level

Lower Level



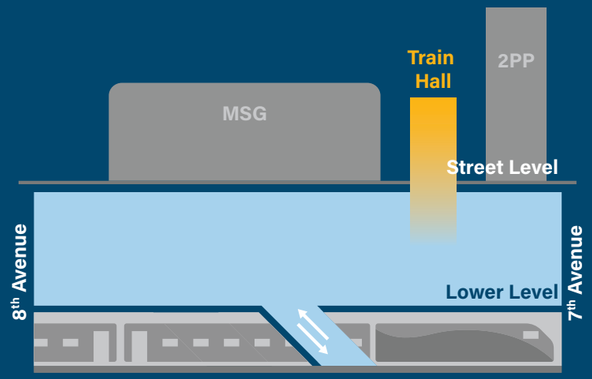
Platform Level

Alternative 4



Interior Train Hall Looking South. Renderings are for illustrative purposes only.





Transform to Single-Level Operation with New Mid-block Train Hall

Alternative 4 represents the most extensive changes to the station by adding a glass-enclosed Mid-block Train Hall and moving all passenger circulation to the Lower Level. The Mid-block Train Hall brings daylight into the east side of the station and adds street presence to Penn Station. This alternative creates the largest amount of high-ceiling space, because of the removal of substantial portions of the Upper Level and the vaulted spaces in the Train Hall.

→ **Alternative 4's focus on a single, Lower Level with the addition of a Mid-block Train Hall creates widened and regularized concourses, including new north-south circulation boarding space below the new Mid-block Train Hall at the former taxiway as well as a central east-west concourse that replaces the Hilton Corridor.** The Mid-block Train Hall's circulation concourse merges with the 7th Avenue Concourse and the east-west concourse to create a large, open area on the east side of the station with daylight from the Mid-block Train Hall above. All north-south concourses connect southward toward Penn Station Expansion under 31st Street.

The Lower Level program focuses on customer-facing functions, including retail, waiting, ticketing, and customer service. The main east-west and north-south concourse are lined with retail uses. Lower Level BOH areas occupy areas behind the retail in the western and southeastern portions of the station.

The Mid-block Train Hall ceiling is roughly 94 feet above the Lower Level floor and 69 feet above Street Level. The Mid-block Train Hall is built around the MSG bridge which appears to penetrate through the Mid-block Train Hall offering passengers at either end of the Mid-block Train Hall views of activity on the bridge and vice versa. The Mid-block Train Hall adds entrances on 33rd and 31st Streets and has the potential to connect across 31st Street to the aboveground developments above Penn Station Expansion.

To accommodate the Mid-block Train Hall's aboveground structure, Alternative 4 reconfigures the loading for MSG. Trucks will pull off 33rd Street, unload under the MSG bridge at three elevated loading bays with direct access to MSG's internal loading ramp, and exit to 31st Street. To provide clearance for trucks under the MSG bridge, an area of the Lower Level immediately west of the Mid-block Train Hall will have ceiling heights of only about 14.5 feet where the loading ramp is lowered.

→ **The passenger circulation concept for Alternative 4 closely mirrors that of Alternative 3, with all horizontal passenger circulation on a single level, the Lower Level.** This creates a simple pedestrian network with double-height spaces expected to significantly improve passenger orientation and wayfinding. This alternative compensates for the loss of public space on the Upper Level with the provision of substantially more public space on the Lower Level. The provided public space on the Lower Level is located in greater proximity to the platform boarding gates and, therefore, is more useful for meeting rail passengers' needs.

The Mid-block Train Hall, the primary differentiator for Alternative 4, opens the station to light and air from above at the expanded north-south 7th Avenue concourse. Alternative 4 also provides additional direct escalator, elevator, and stair access between the Lower Level and Street Level within the Train Hall, increasing the capacity of the station's entrances and exits at its most heavily utilized location.

The north-south concourse on the Lower Level at the 8th Avenue end of the station is widened significantly in Alternative 4, providing either multiple access points to each platform and more space for passenger waiting in and around the boarding gates. Boarding queues are expected to be more evenly distributed among the Lower Level gates in this single-level scheme than in the concepts that split boarding between the Lower and Upper Levels.

The primary passenger waiting areas will be in the north-south concourses, within sight of and a relatively short walking distance from the boarding gates. The substantially widened east-west concourses along the 32nd and 33rd Street axes provide reservoir space that will be usable by waiting passengers when train delays occur, functionally replacing the reservoir space that currently exists on the Upper Level of the station.

Exterior of Train Hall Looking Southwest

Renderings are for illustrative purposes only.



Lower Level of Train Hall Looking South

Renderings are for illustrative purposes only.

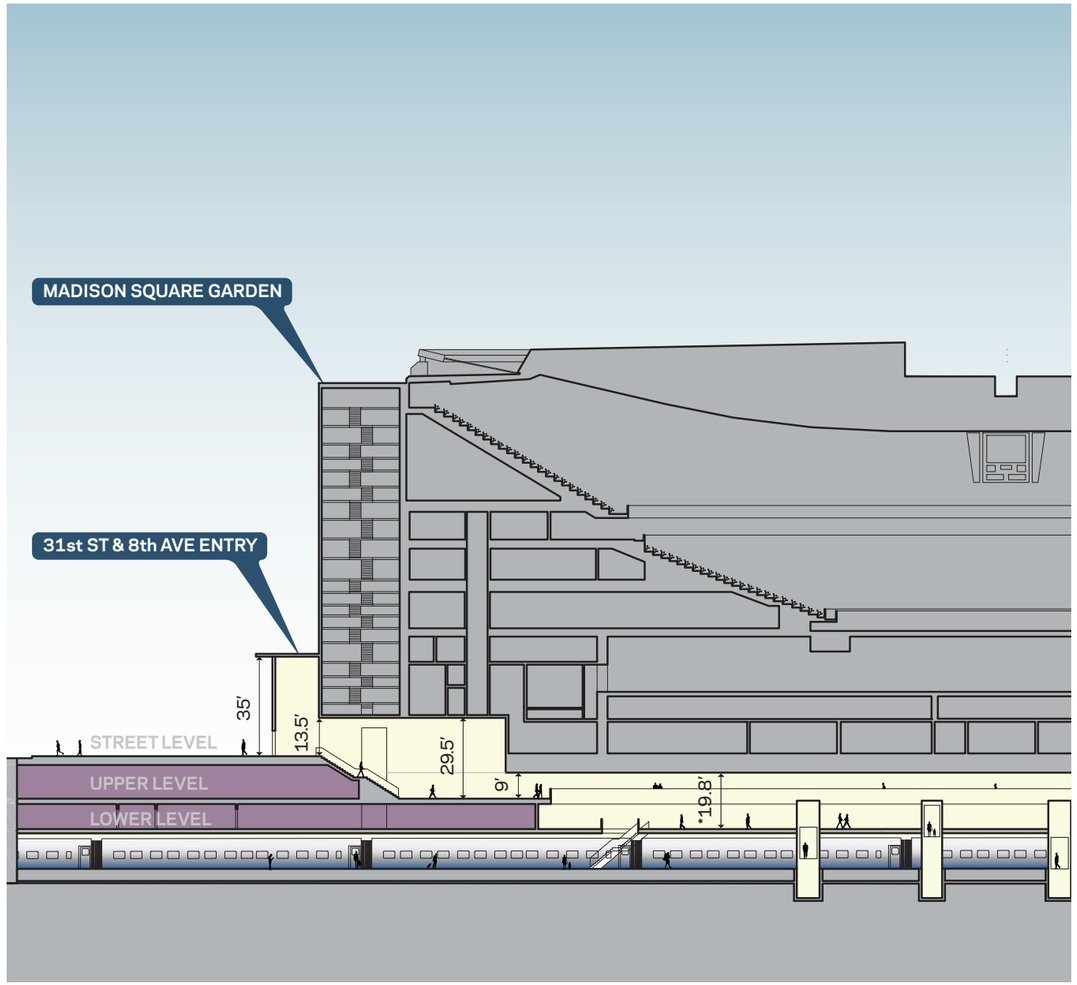


Lower Level of Train Hall looking southwest

Renderings are for illustrative purposes only.

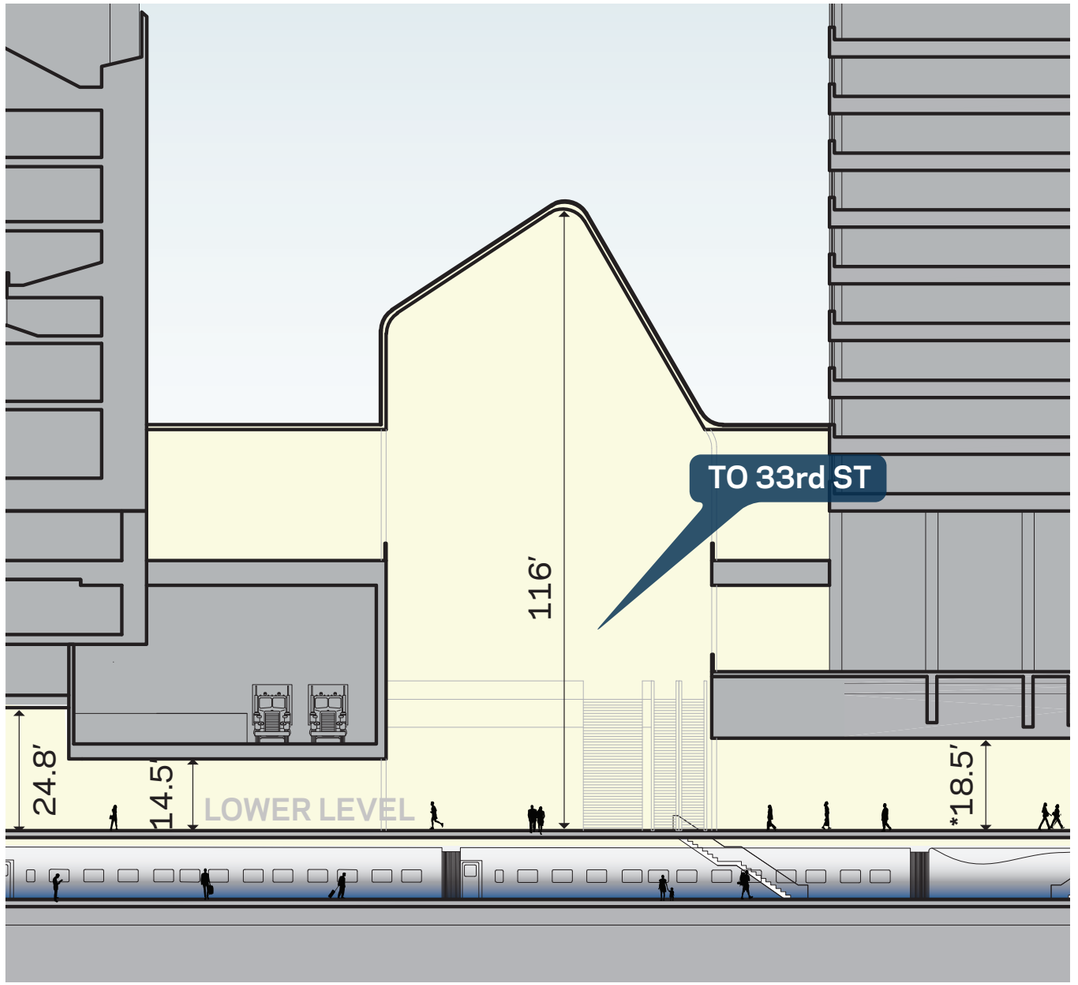


Southwest Section



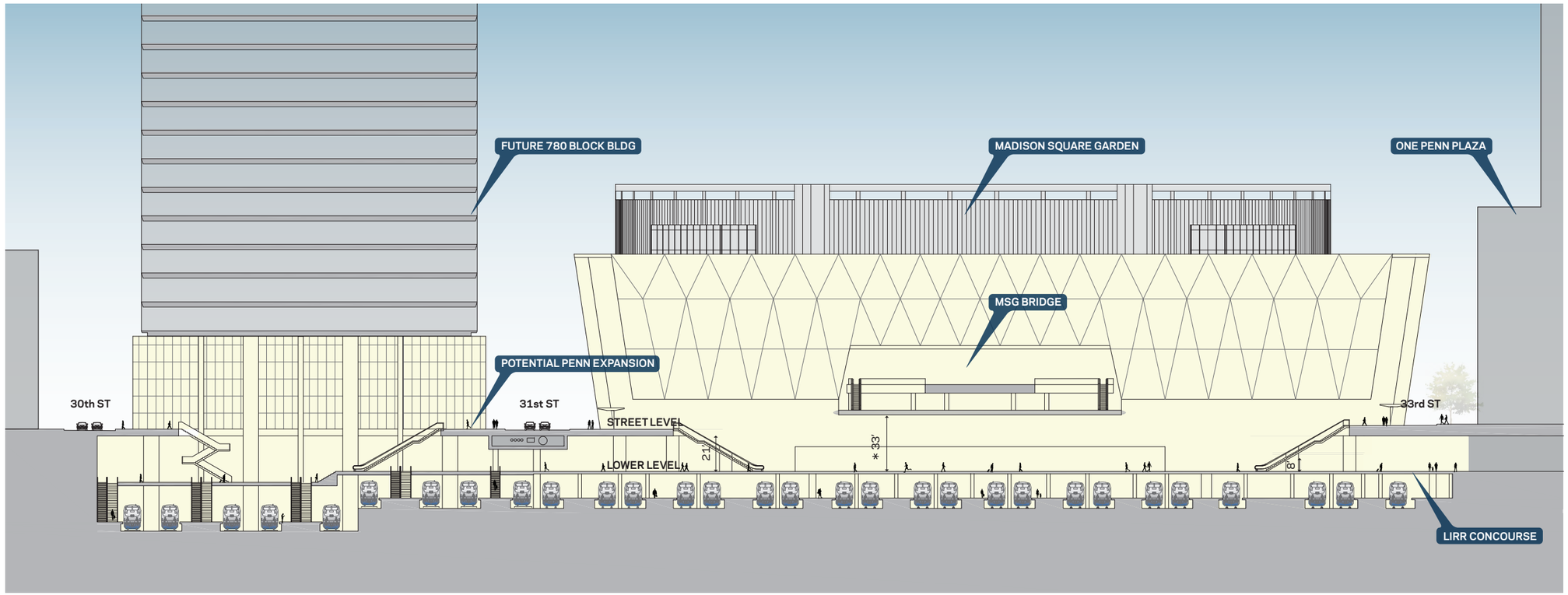


Mid-block Section

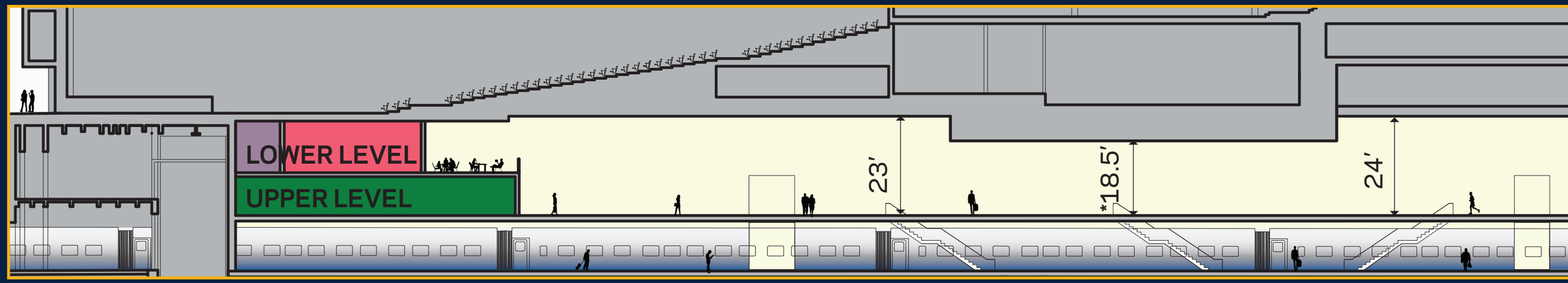




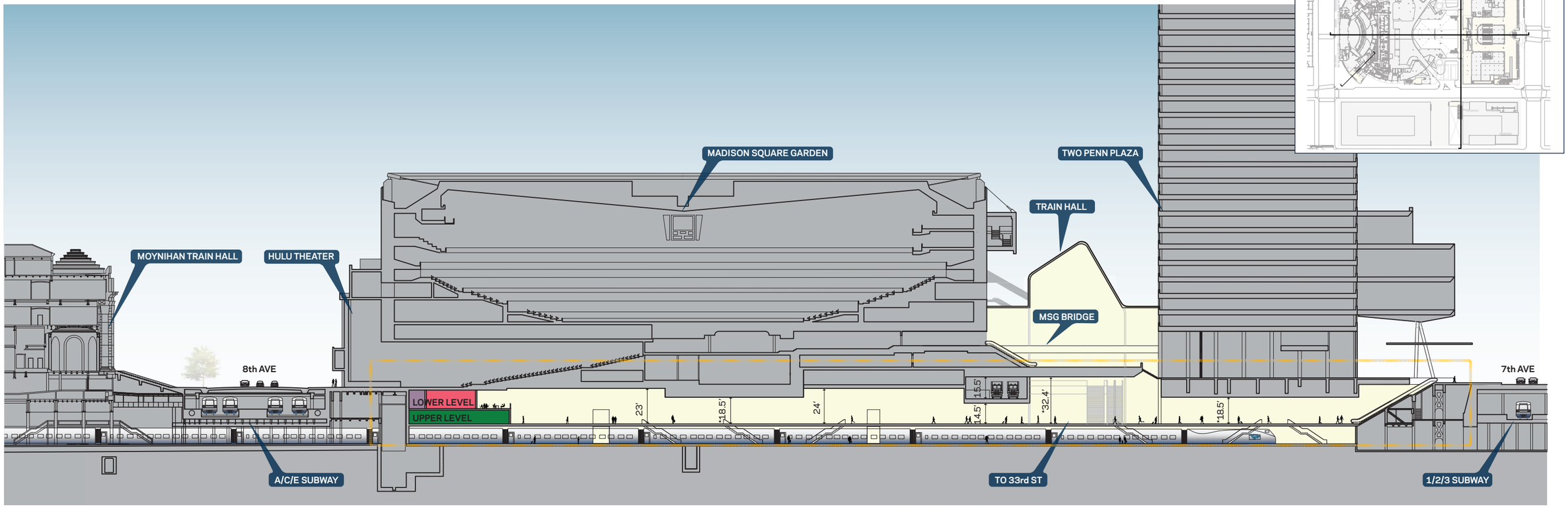
North-South Section at Mid-Block Train Hall

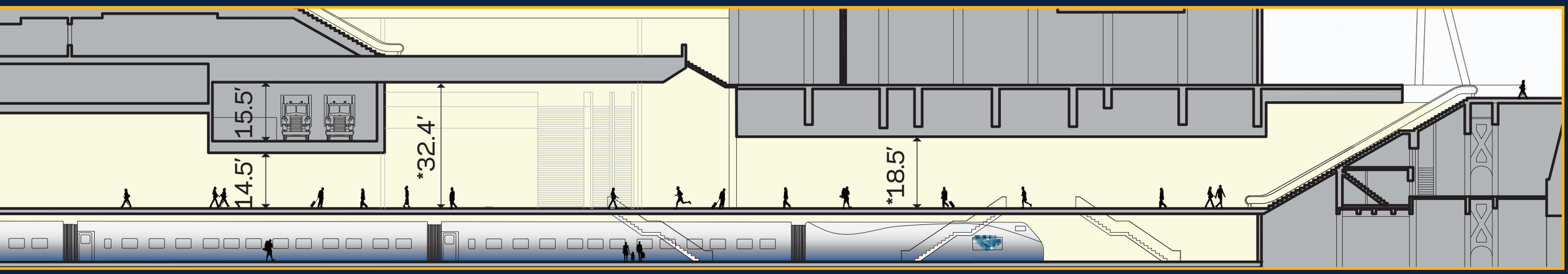


Note
Penn Station Expansion track configuration is conceptual.



East-West Section



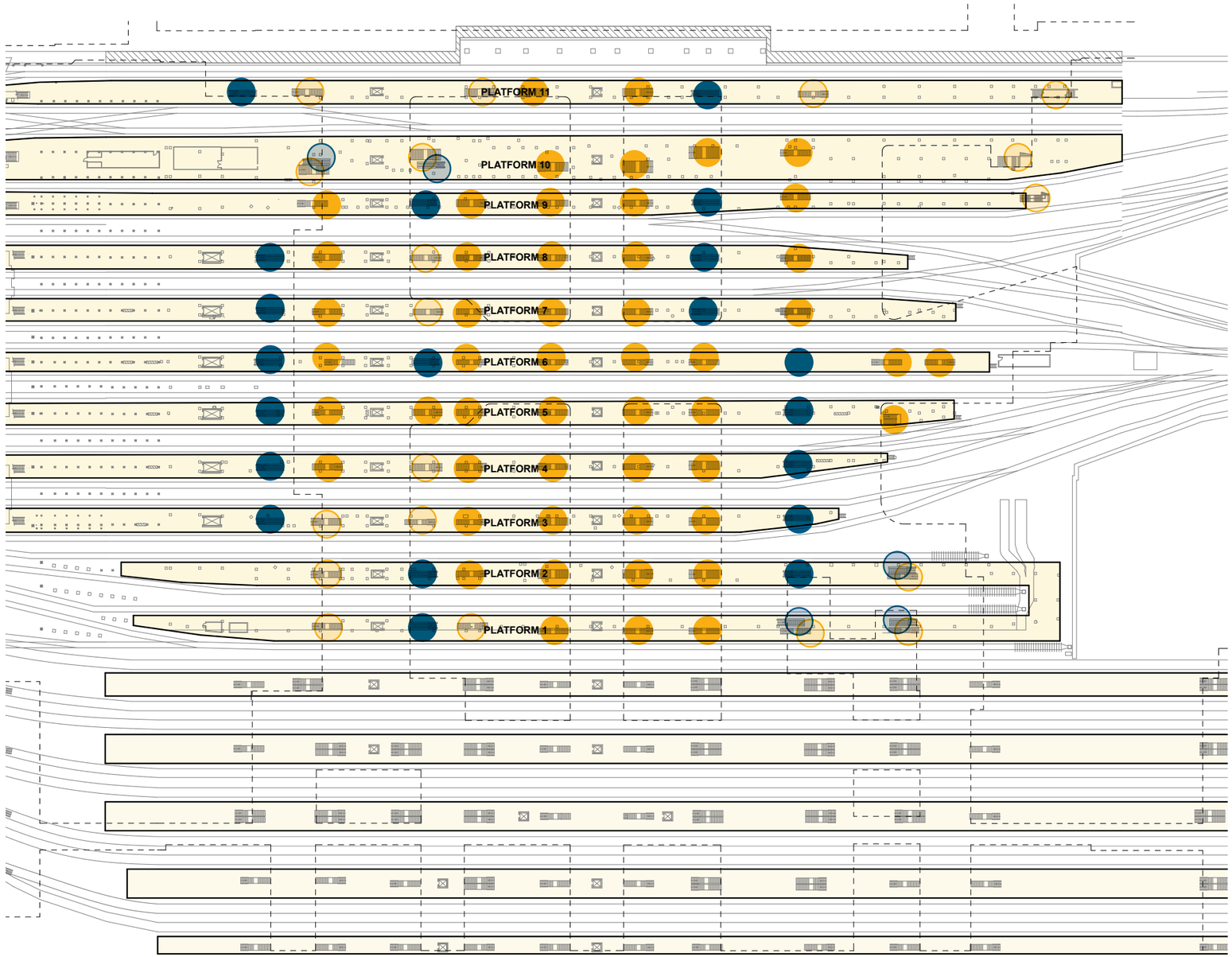


Platform

PENN RECONSTRUCTION

POTENTIAL PENN STATION EXPANSION

Note
Penn Station Expansion track configuration is conceptual.



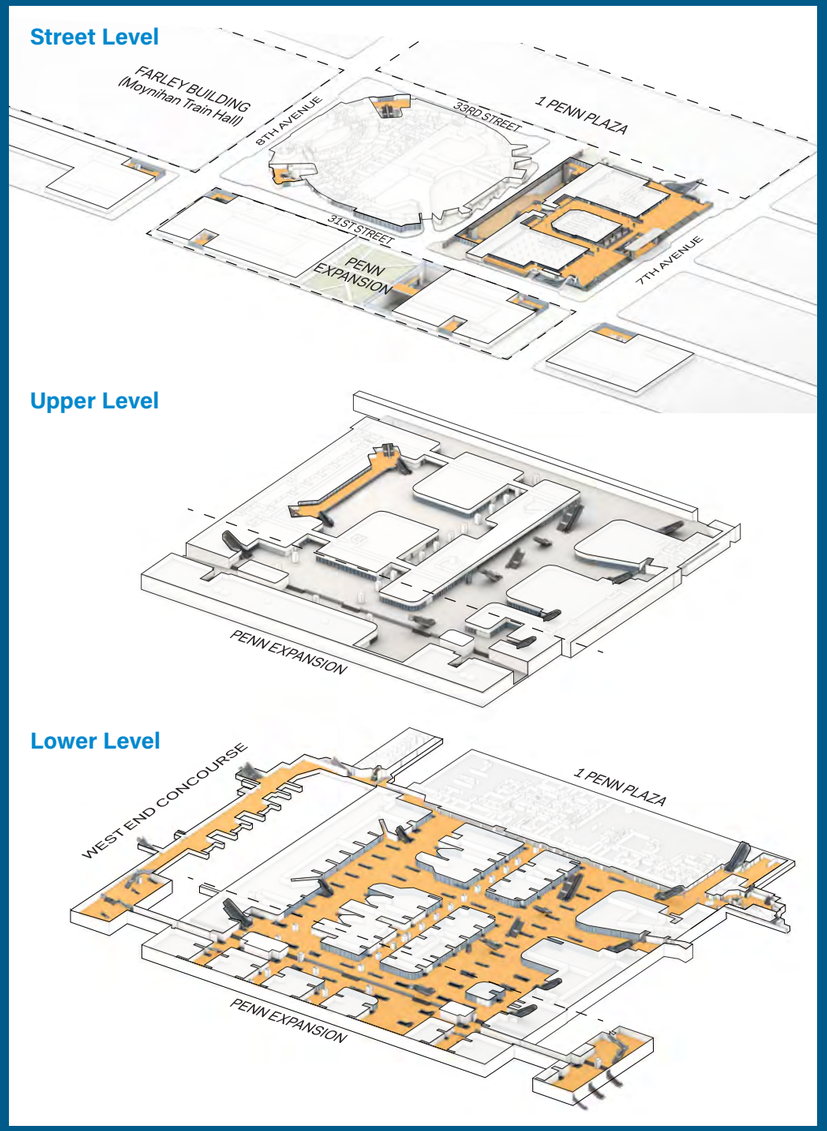
Stair Widths (Inches)

	Vertical Circulation Element (VCE)												
Platform	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Total Number of VCEs**	**Total Width of VCEs (in)**	**Existing Number of VCEs**
11	**38**	64	78	**78**	**78**	34	60	73	73		**9**	**542**	**7**
10	38	92	108	34	**90**	**118**	**120**	**60**	108		**9**	**734**	**8**
9	**40**	66	72	**62**	**62**	**32**	**60**	68			**8**	**430**	**7**
8	**40**	**66**	58	**58**	**60**	**60**	**40**	**60**			**8**	**442**	**7**
7	**40**	**57**	58	**58**	**60**	**60**	**40**	**60**			**8**	**433**	**7**
6	**40**	**54**	**40**	**54**	**54**	**54**	**54**	**54**	**54**		**9**	**458**	**7**
5	**40**	**54**	**64**	**64**	**60**	**60**	**60**	**40**	**44**		**9**	**486**	**6**
4	**40**	**64**	72	**72**	**60**	**60**	**86**	**40**			**8**	**494**	**5**
3	**40**	68	**52**	**75**	**75**	**75**	**32**				**7**	**385**	**5**
2	64	**40**	**57**	**60**	**88**	**86**	**40**	46	52		**9**	**493**	**8**
1	60	**40**	58	**57**	**57**	**57**	46	**57**	46	52	**10**	**490**	**8**

Key

- **New Escalator**
- Existing Escalator
- **New Stair**
- Existing Stair

Axonometric View of Alternative 4



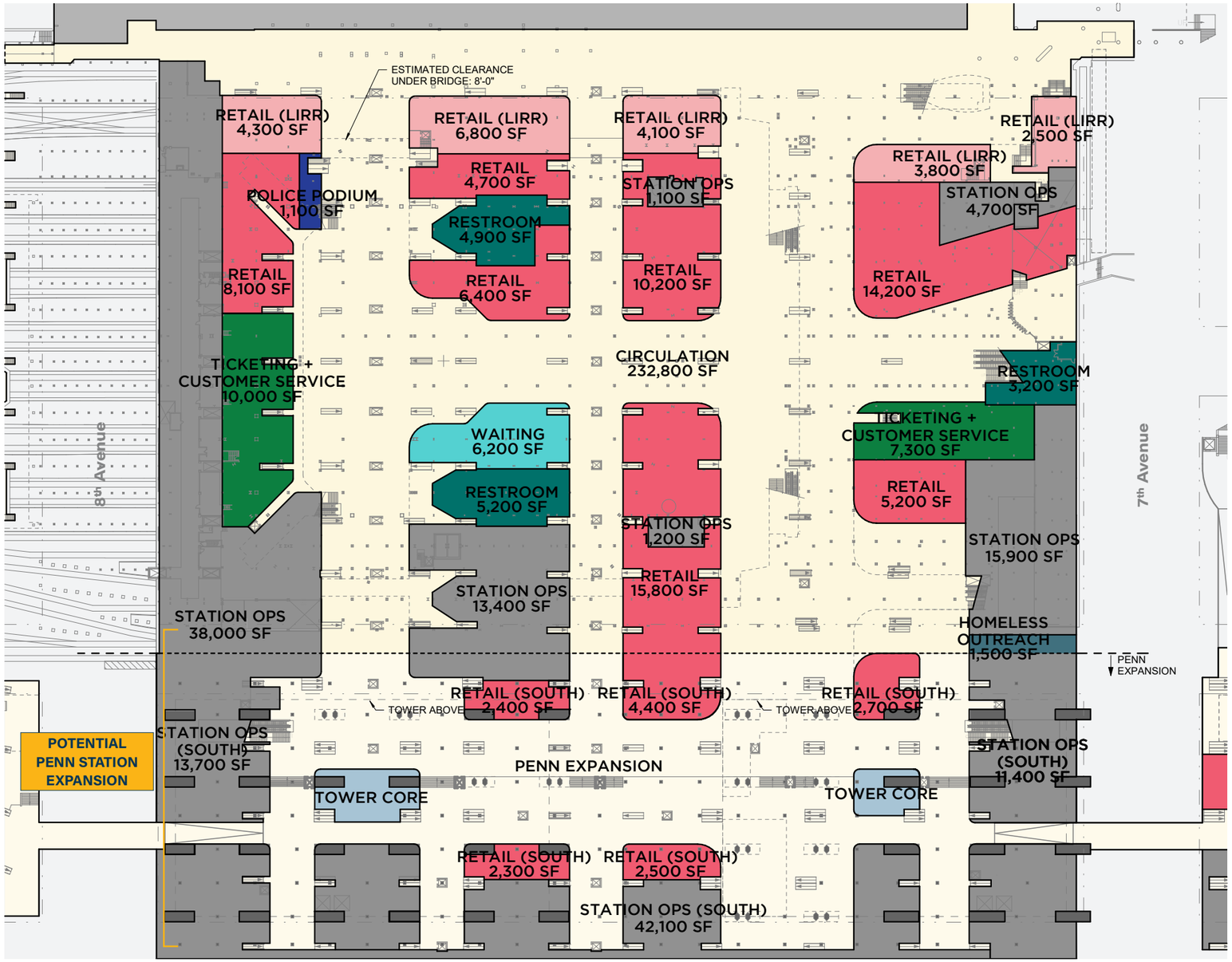
Lower Level

Alternative 4 significantly improves the Lower Level by widening corridors and eliminating all low ceiling height areas. The 7th Avenue Concourse is substantially widened and extends from the LIRR Main Gate straight down to the NJT area where the half-level has been removed and Lower Level slab filled in. The Central Concourse is extended southward to all tracks, and the 8th Avenue Concourse is widened in the center. The Hilton Corridor is straightened and widened creating a wide, east-west central corridor. All public concourses end up with a ceiling height of at least 18 feet by opening them up to the Upper Level.

Retail in this alternative continues to line the 33rd Street Concourse while also being added to the north and south sides of the main, east-west central corridor. Waiting is visibly located in the central area, with easy access to all tracks and proximity to restrooms and customer service. Customer service is located on the west and east ends, near where people enter from the 8th Avenue and 7th Avenue entrances. Restrooms are located at both ends of the 8th Avenue Concourse.

The 8th Avenue, Central, and 7th Avenue Concourses all extend directly to the Penn Station Expansion. In addition, a fourth passageway east of the 7th Avenue Concourse provides a convenient way for passengers at the Penn Station Expansion to access the proposed underground connection in the southeast corner of the station (see **Section 6.2** in Underground Connections), without having to cross through the congested NJT Concourse area.

BOH and MEP space is present along the west and south sides of the station. The homeless outreach space is located in the southeast corner of the Lower Level, near the police podium.



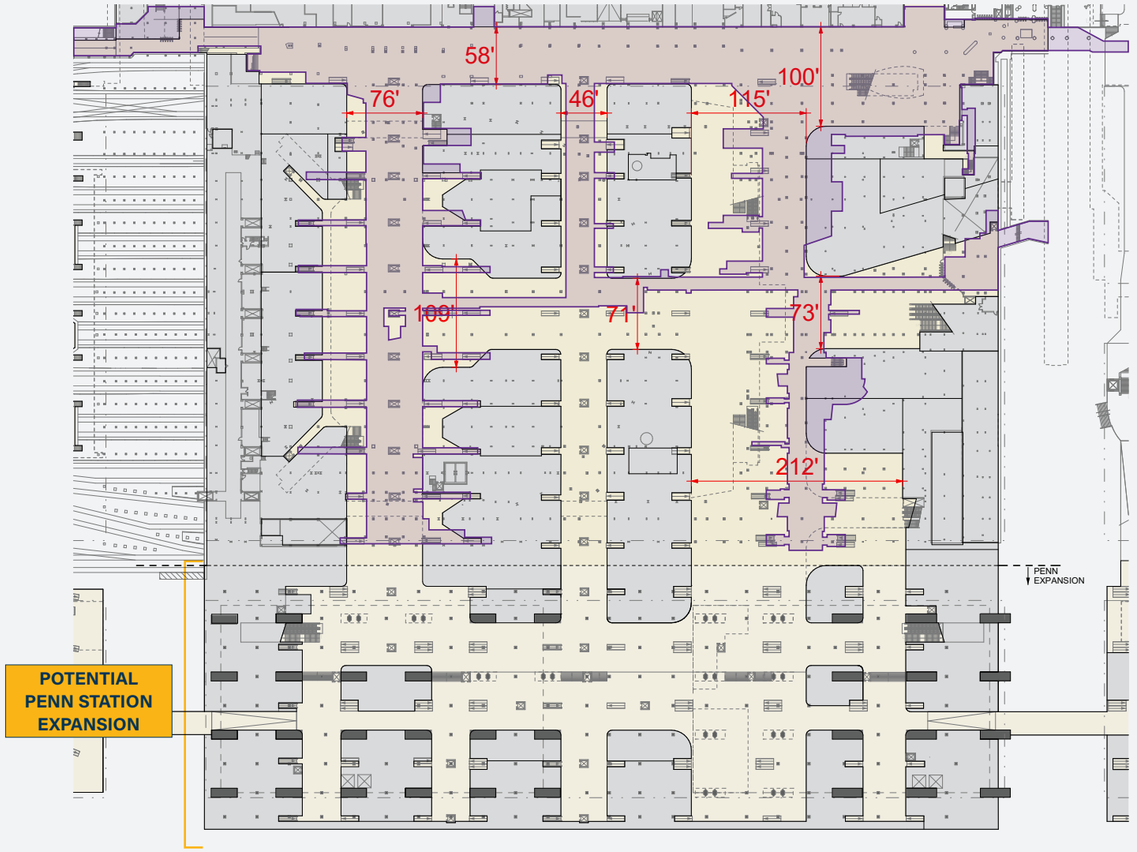
Note: Retail (LIRR) denotes Retail under LIRR control.

Lower Level Concourse Width Comparison

Existing



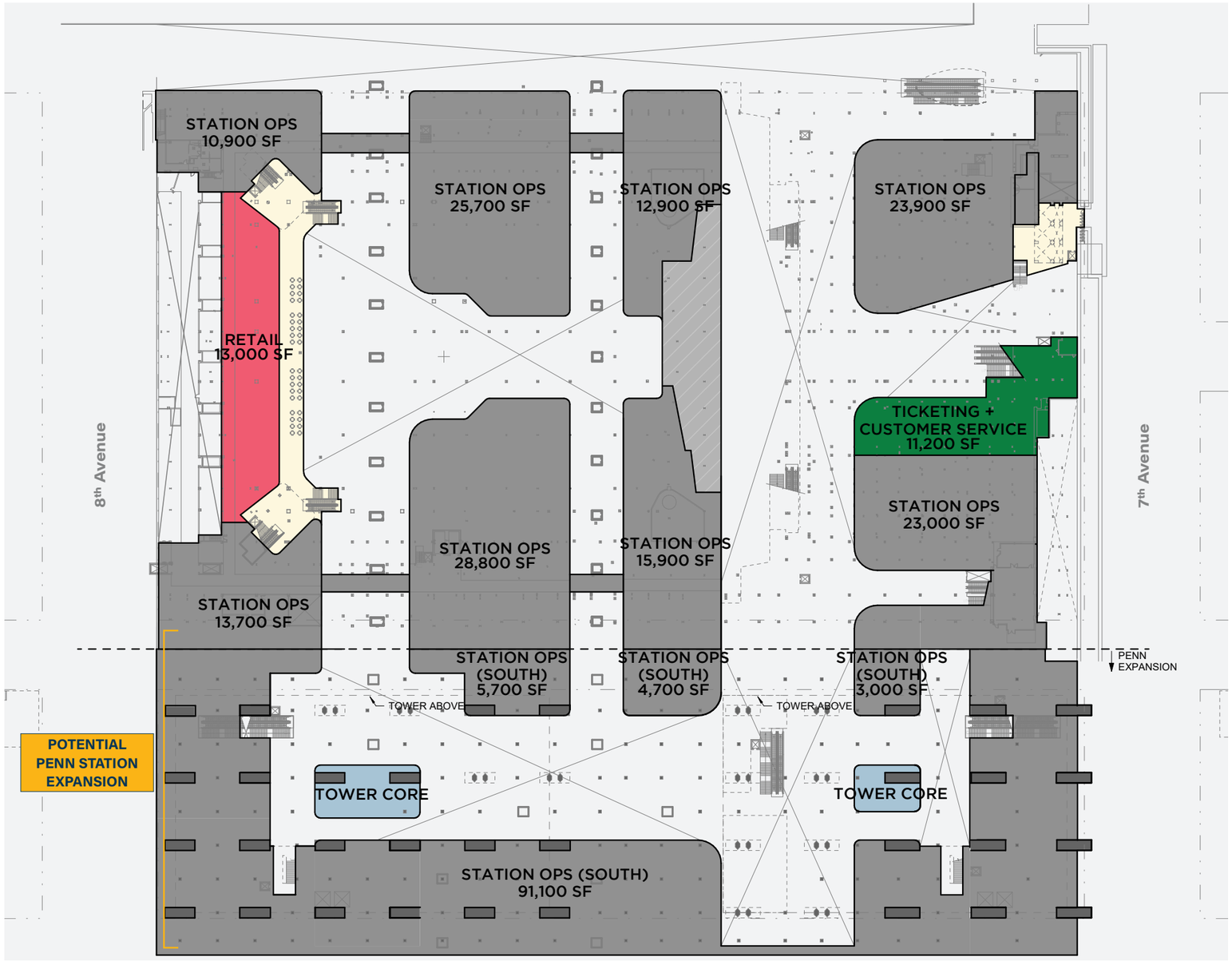
Proposed



Upper Level

From the west side, Alternative 4 provides two new VCEs from the Street Level to the Upper Level and from the Upper Level to the Lower Level to the 8th Avenue Concourse. The Upper Level mezzanine area on the west has retail spaces with a balcony looking down into the station. There is a large customer service area in the northwest corner of the Upper Level.

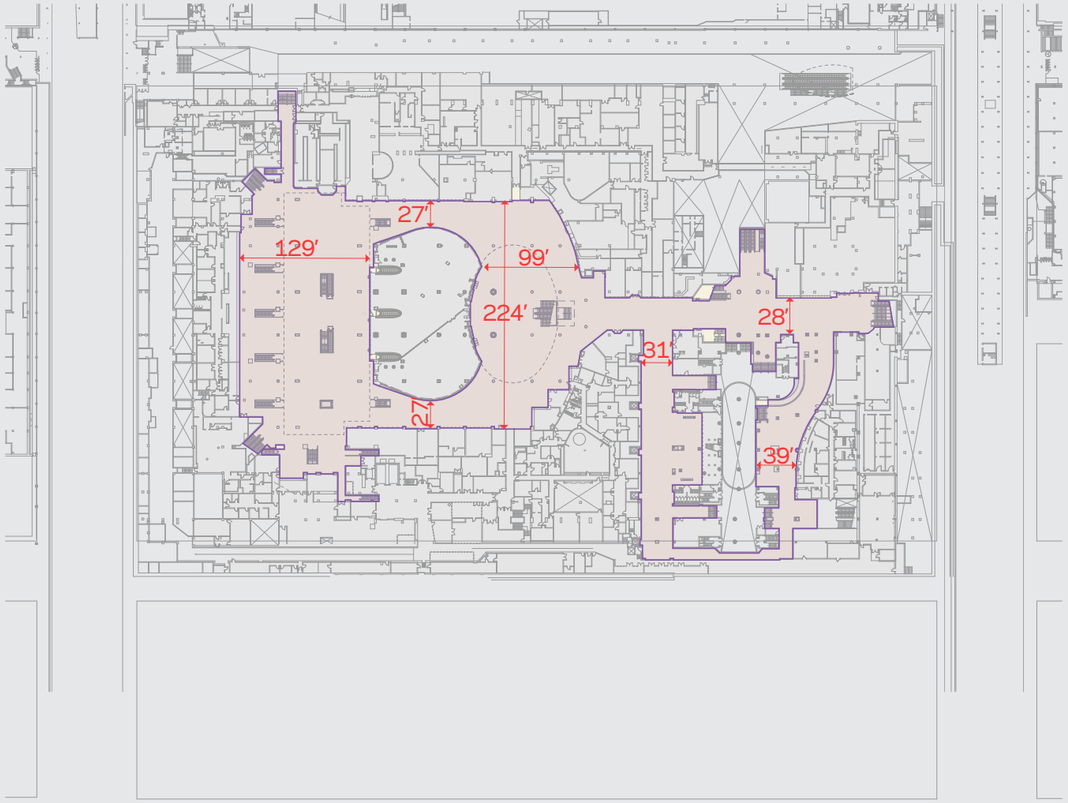
The removal of all the Upper Level slab above Lower Street circulation spaces creates throughout the remainder of the Upper Level MEP and BOH "islands" housing most of these functions for the station, connected by hallways running along the north and south of the station. Each "island" will have a vertical circulation core from the Lower Level below. New service elevators between the Lower Level and the Upper Level eliminate the existing service ramp, which interferes with the connection to the Penn Station Expansion.



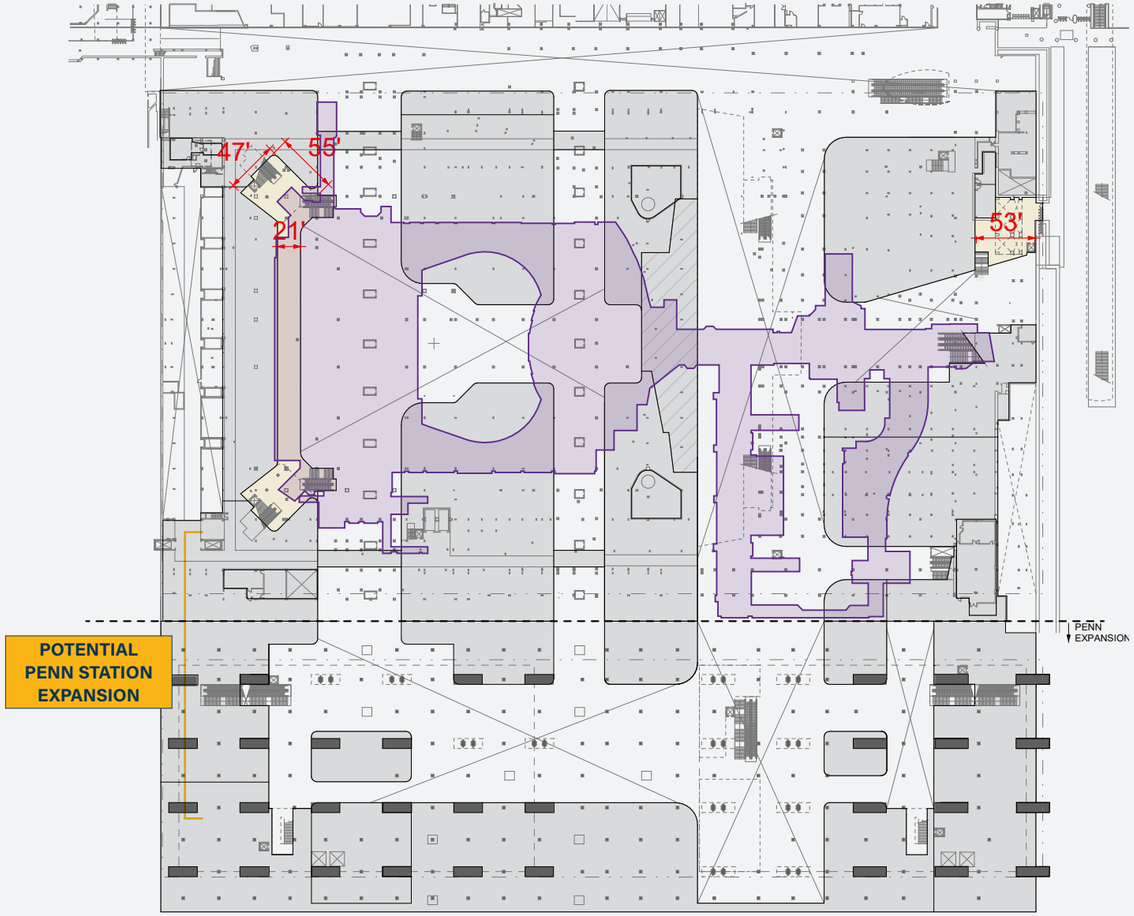
Note: Retail (LIRR) denotes Retail under LIRR control.

Upper Level Concourse Width Comparison

Existing



Proposed



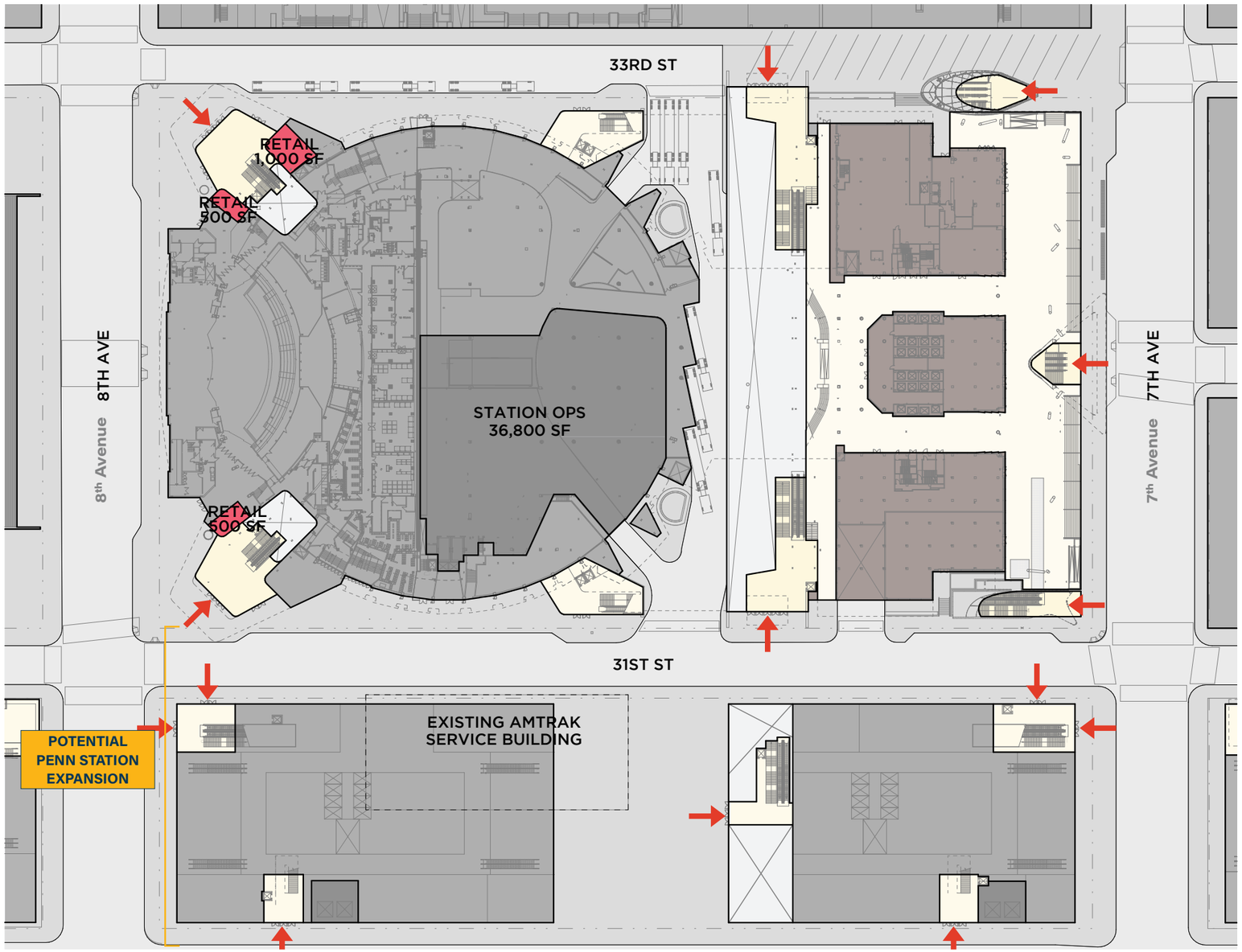
Street Level

The distinguishing element of this alternative at Street Level is the new Mid-Block Train Hall that will add entrances at 33rd and 31st Streets and street presence to the station. The train hall will include circulation space at Street Level and vertical circulation packages down to the Lower Level. The entrances at 32nd and 31st Streets and 7th Avenue are also renovated.

Alternative 4 also includes Street Level retail on 33rd and 31st streets, as well as smaller retail locations within the expanded corner entrances on 8th Avenue.

The MSG loading is reconfigured to accommodate the Mid-block Train Hall. Trucks will now pass through the loading area from 33rd to 31st Streets using three new elevated loading docks below the MSG bridge.

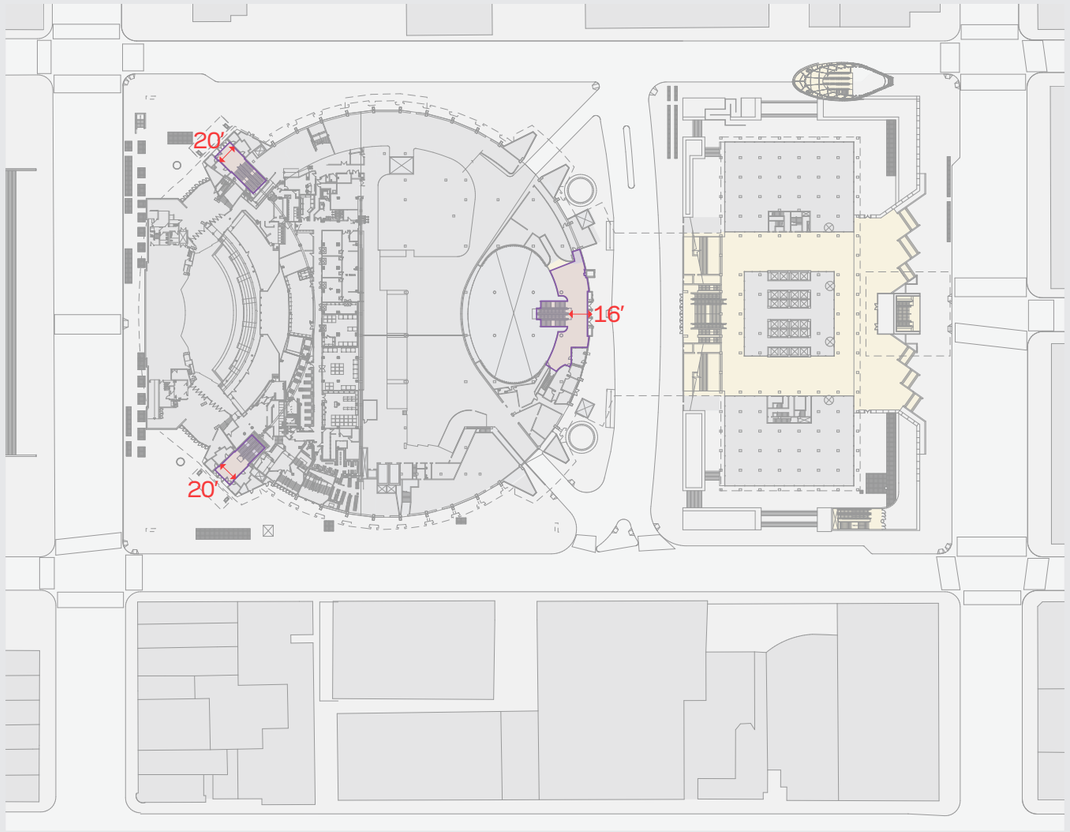
Finally, the Street Level continues to have Penn Station loading in the same existing area, with some MEP space adjacent. Alternative 4 also adds two MEP platforms roughly at the height of the roof of the MSG bridge for MEP equipment, needed primarily for the AHUs.



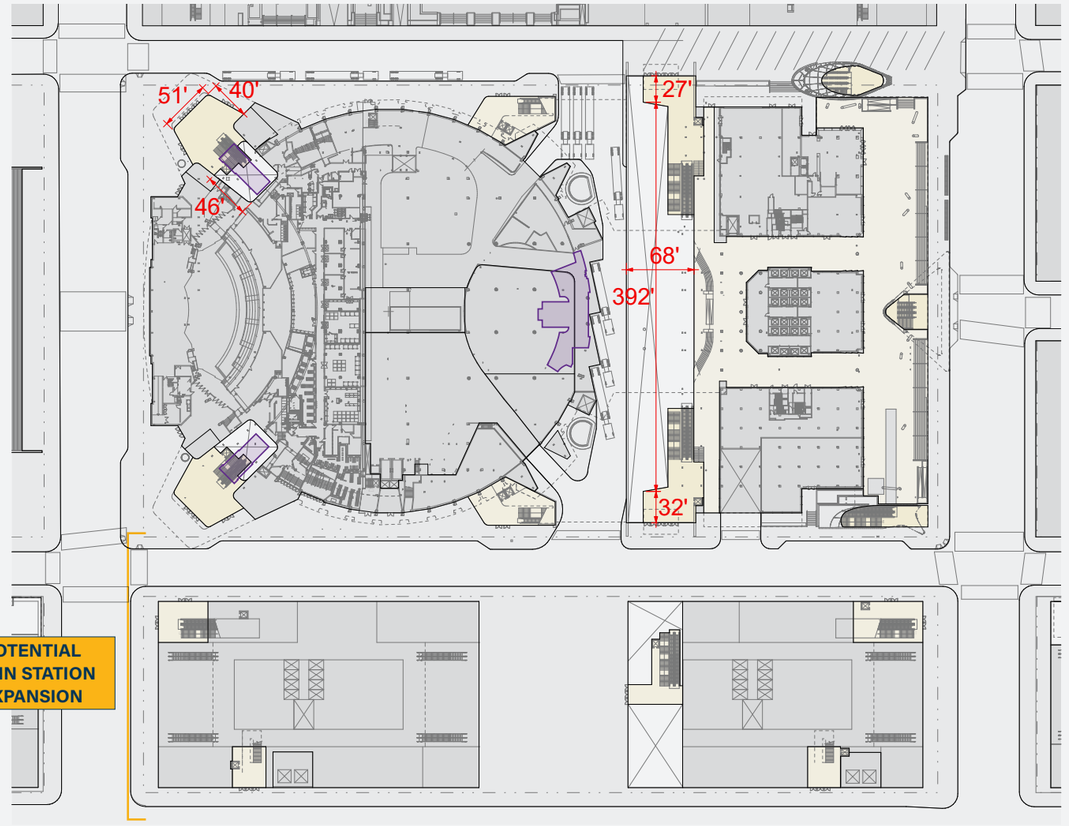
Note: Retail (LIRR) denotes Retail under LIRR control.

Street Level Concourse Width Comparison

Existing



Proposed

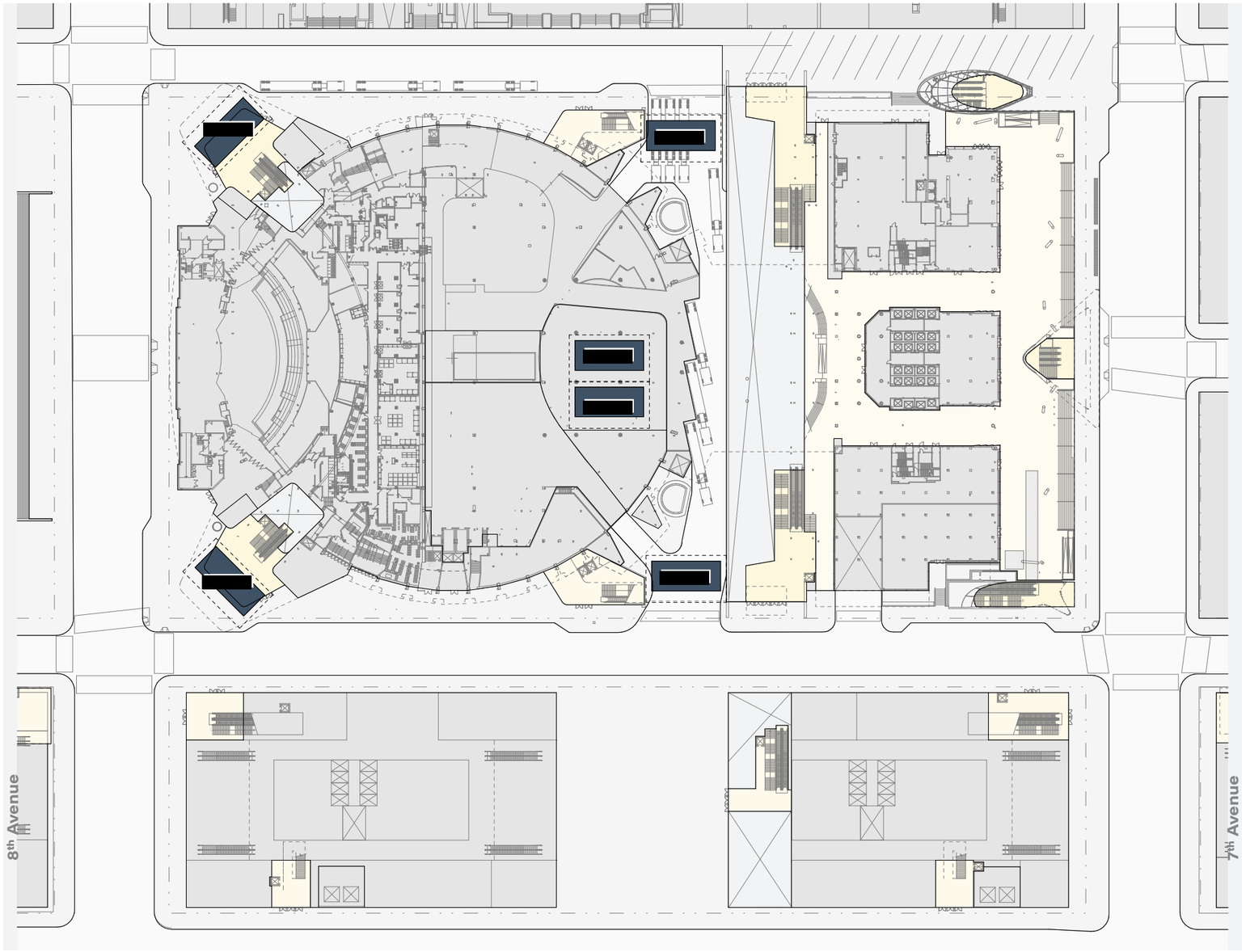


MEP

The large custom-built AHUs that deliver cooled or heated outdoor air to all areas of Penn Station are located on one elevated outdoor platform and above the new corner entrances on 8th Avenue. This distributed configuration of AHUs facilitates ducting to all areas of the station. AHU ductwork routed from the outdoor platforms to various areas in Penn Station via BOH spaces must avoid infringing on vertical clearance requirements in the loading dock and truck parking spaces below, and minimize blocking of incoming natural light at the west side of the train hall. Main air supply ductwork will run above the main circulation areas and distribute to the program areas on the Upper and Lower Levels.

The building will be fully sprinklered, equipped throughout with an emergency voice/alarm communication system and a smoke control system in accordance with Section 909. These systems are necessary to justify the application of the smoke-protected assembly seating provisions for emergency building egress. The smoke control system will be designed to be a combined system with the building's air handling systems.

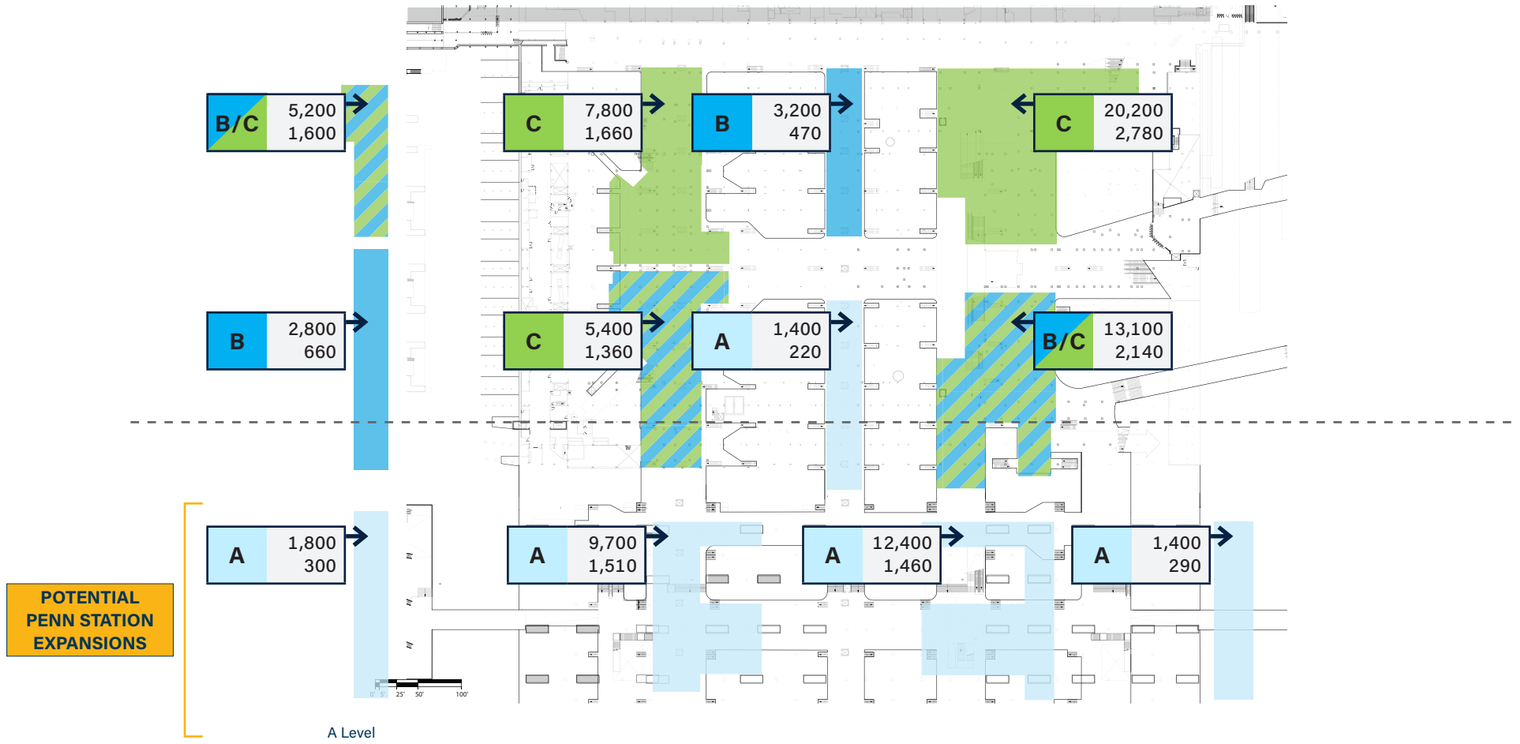
In this alternative, the MSG Con Edison vault currently on the Upper Level is relocated to the Street Level next to the MSG loading area.



Level of Service

2038 Proposed Action On-Time Operations

PM Peak Hour Volumes, Concourse Occupancy, and Level of Service



Level of Service (LOS) Ratings Key

LOS Rating	Peak Hr. Boardings / Peak Occupancy	LOS A	LOS B	LOS B/C	LOS C	LOS C/D	LOS D	LOS D/E	LOS E	LOS F

Program Area

Department	Lower Level SF	Upper Level SF	Street Level SF	Total Program SF
Retail	86,200 SF	13,000 SF	1,900 SF	101,100 SF
Customer-Facing Station Operations	38,300 SF	11,200 SF	—	49,500 SF
BOH Station Operations	59,500 SF	142,000 SF	3,600 SF	205,100 SF
Loading Dock	—	—	17,400 SF	17,400 SF
MEP (Total)	15,900 SF	16,800 SF	22,900 SF	55,600 SF
Total	**214,200 SF**	**183,000 SF**	**45,800 SF**	**443,000 SF**
Public Circulation	232,800 SF	13,200 SF	21,300 SF	267,300 SF
Grand Total	**432,700 SF**	**196,200 SF**	**67,100 SF**	**710,300 SF**

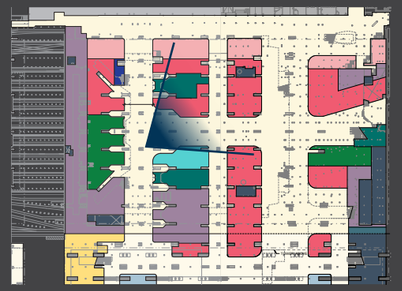
BOH% Occupancy Breakdowns

Ticketing + Customer Service	
Conference & Meeting	3%
Locker & Break Rooms	13%
Office & Administration	35%
Storage	17%
Customer Facing Includes Ticket Counters and Customer Service functions	32%

BOH Program	
Conference & Meeting	4%
Locker & Break Rooms	34%
Office & Administration	30%
Storage	18%
Support Support functions include Engineering Shops, Commissary Food Prep, Police Holding Cells, Print/Copy Rooms, and other specialized functions	15%

View Looking East Along Central Spine

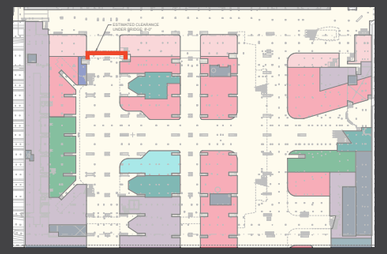
Renderings are for illustrative purposes only.

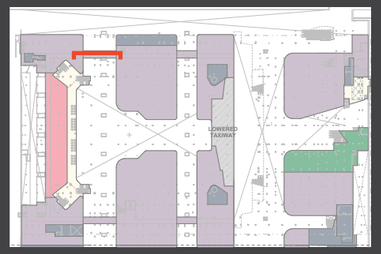




Section A: Exit Concourse Looking South

Renderings are for illustrative purposes only.

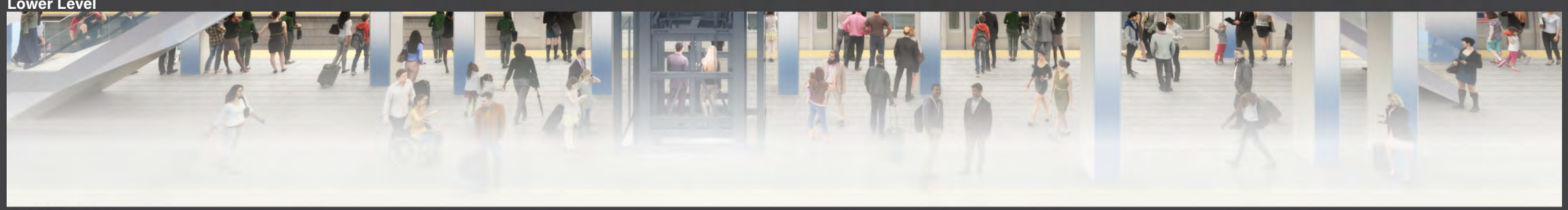




Upper Level



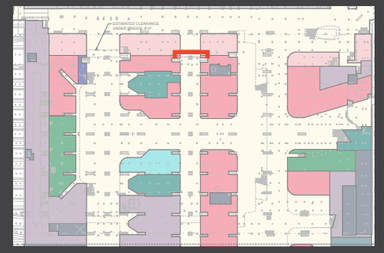
Lower Level

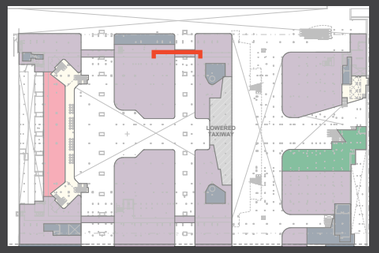


Platform Level

Section B: Central Concourse Looking South

Renderings are for illustrative purposes only.

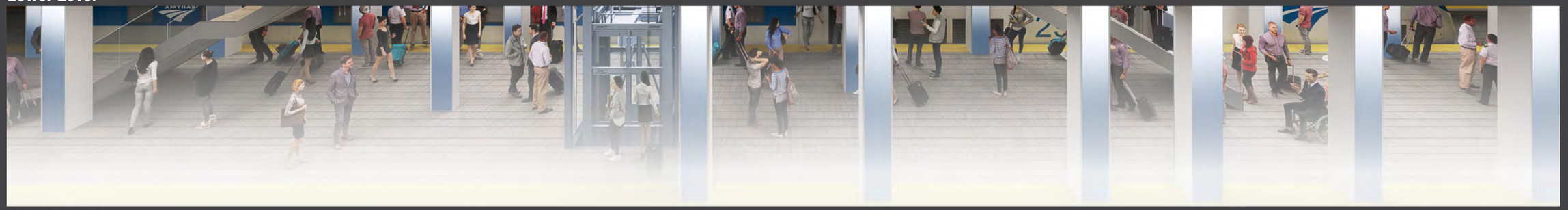




Upper Level



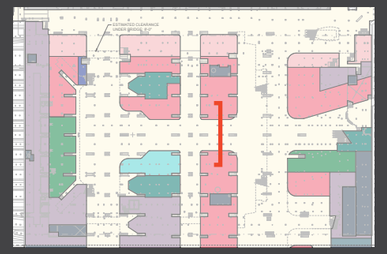
Lower Level

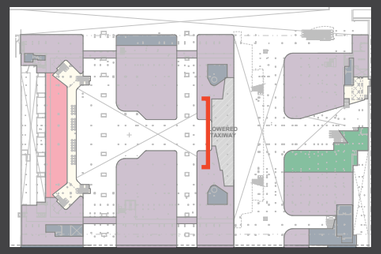


Platform Level

Section C: East-West Spine Looking West

Renderings are for illustrative purposes only.





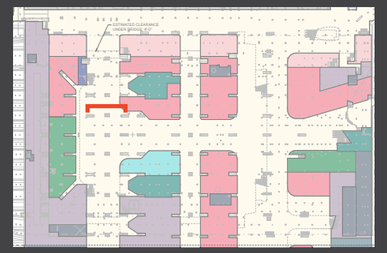
Upper Level

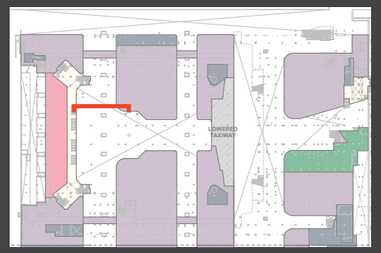
Lower Level

Platform Level

Section D: Exit Concourse Looking South

Renderings are for illustrative purposes only.





Upper Level



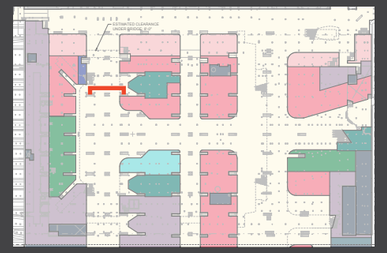
Lower Level

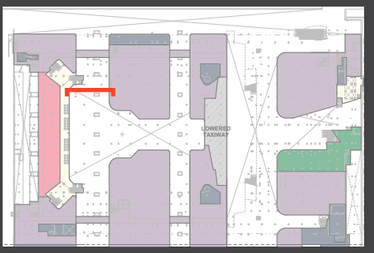


Platform Level

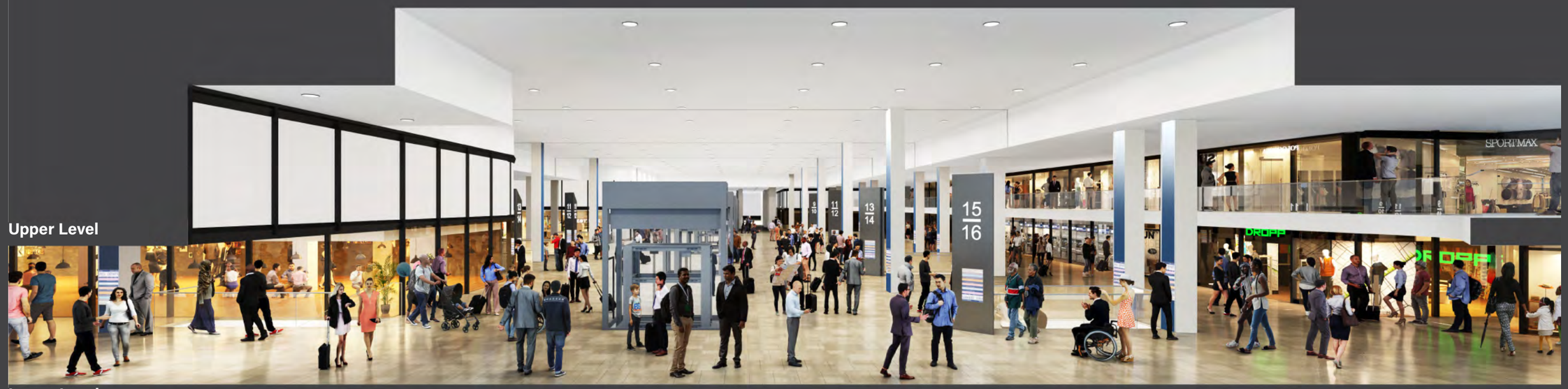
Section E: Exit Concourse Looking South

Renderings are for illustrative purposes only.

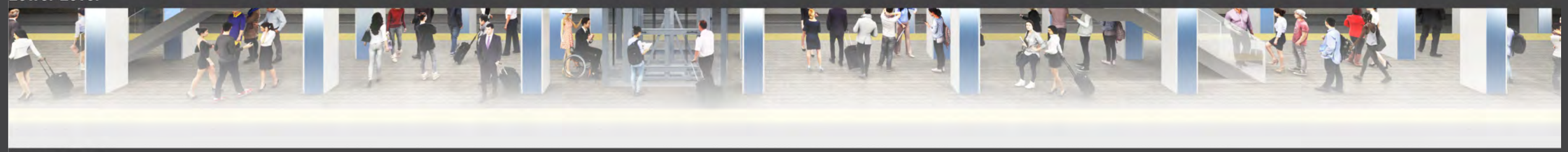




Upper Level



Lower Level



Platform Level

Aerial View of Train Hall looking South

Renderings are for illustrative purposes only.

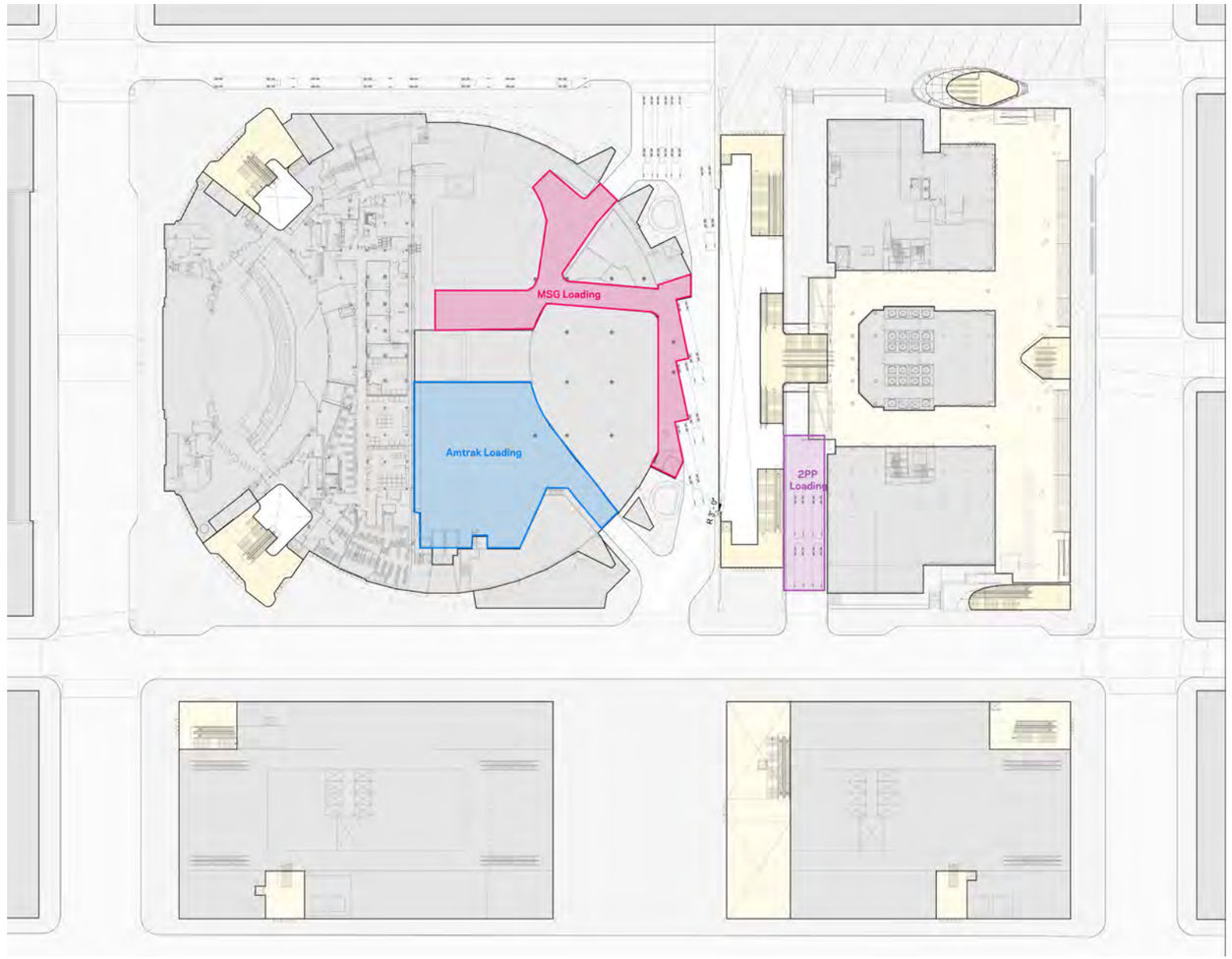


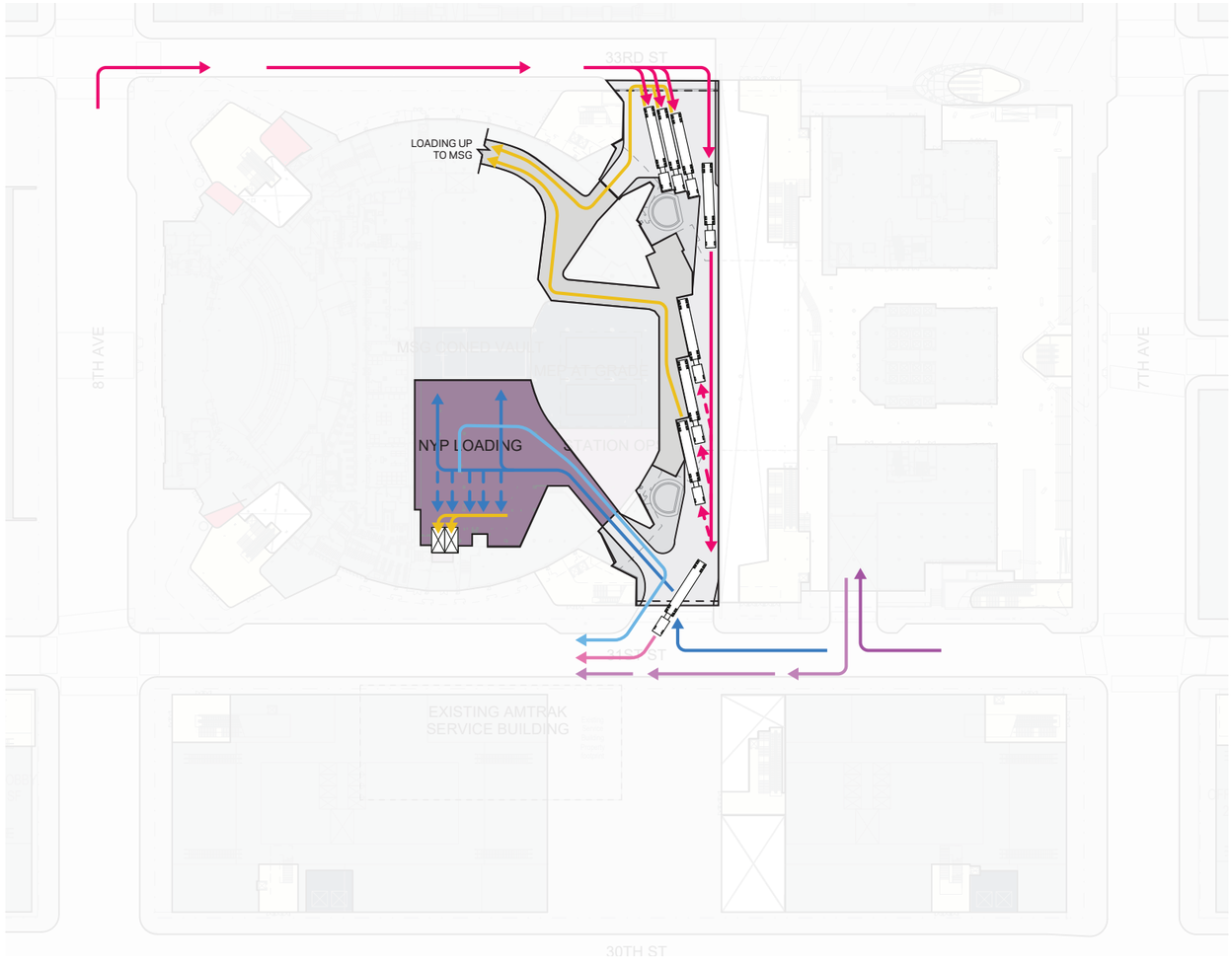
Truck Loading

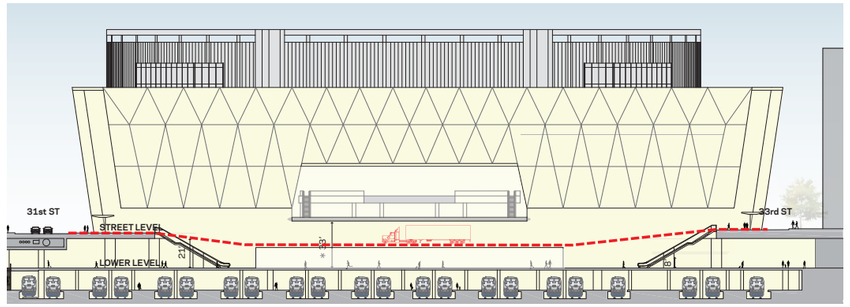
For Alternative 4, the Mid-block Train Hall occupies the former taxiway area, including some of the area MSG currently uses to load and unload. MSG's current configuration has three loading slots, with a bypass lane, and space for two broadcast trucks. Trucks pull in and are unloaded onto forklifts which take loads into the building. When finished, the trucks must back out, do a series of turning maneuvers to face westward, and drive out to 8th Avenue.

Alternative 4 replicates the three exterior loading slots and the broadcast truck spaces just to the west of their current location. In addition, the Alternative provides three raised-dock berths under the MSG bridge. This allows trucks to pull in, unload, and then continue forward and pull out onto 31st Street running west. From the raised loading dock area, loads can be taken by forklift directly to the same ramp they access today that leads to the arena floor. The arrangement allows for 6 trucks to be unloaded simultaneously instead of the current 3, or to be staged and then unloaded. The elevated dock also makes for faster and easier loading.

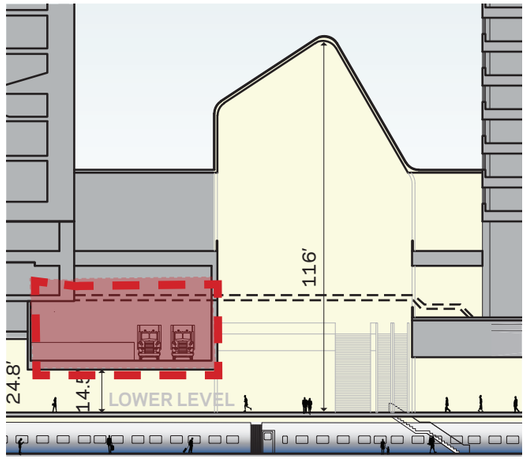
To allow trucks to pass beneath the MSG bridge, which today has insufficient clearance, a portion of the removed taxiway would be rebuilt at a lower elevation that provides enough clearance. This lowered roadway does create a small band of lower ceiling heights at the Lower Level concourse in the station, although still taller than they are today. This zone would act as a kind of threshold as passengers move from the concourse east into the high ceiling space of the Train Hall.







North - South Section Looking West



East - West Section Looking North

MSG Loading Key

- **Arrival** Forward Movement
- **Arrival** Reverse Movement
- **Departure** Forward Movement
- **Departure** Reverse Movement

2PP Loading Key

- **Arrival** Forward Movement
- **Arrival** Reverse Movement
- **Departure** Forward Movement
- **Departure** Reverse Movement

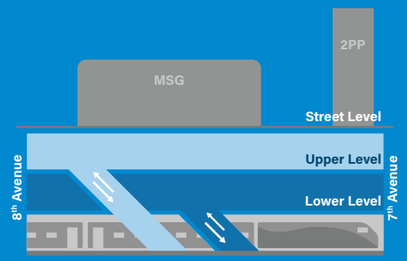
AMTRAK Loading Key

- **Arrival** Forward Movement
- **Arrival** Reverse Movement
- **Departure** Forward Movement
- **Departure** Reverse Movement

- Loading Movements

Summary

Alternative 1



Leverage Existing Two-Level Configuration with Incremental Improvements

- **Retains two levels for boarding and alighting**
- **Introduces an east-west spine on both levels**
- **Straightens and widens all circulation spaces**
- **Creates central atria between levels with double-height spaces**
- **Improves all existing entrances**

Lower Level

- Removes the NJT Intermediate Level
- Extends the Central Concourse southward to all tracks
- Widens the Main Gate Concourse and extends it southward to all tracks to relieve congestion at the east end of the station
- Widens the Hilton Corridor, with a double- and triple-height central atrium with VCEs to Upper Level at each end
- Maintains substantially the same area of retail space as existing, but somewhat reconfigured
- BOH occupies the bulk of the Level
- Concourses extend through to Penn Station Expansion
- Locates waiting, and adjacent restrooms, on the south side of the central atrium
- Locates secondary restrooms on the north side of the Lower Level
- Locates ticketing and customer service on the south side of the central atrium

Upper Level

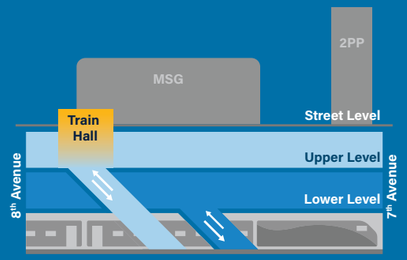
- Introduces east-west spine from the 7th Avenue and 32nd Street entrance to the West Boarding Area, removing the existing enclosed waiting area
- Reconfigures and improves the 7th Avenue entrances at 32nd and 31st Streets
- Incorporates the existing Rotunda into the east-west spine
- Incorporates the increased height and volume made possible by removing the central third of the taxiway into the east-west spine
- Introduces a new atrium to the Lower Level in the center of the east-west spine
- Locates retail along both sides of the east-west spine for maximum retail value
- Locates waiting, with adjacent restrooms, on south side of spine
- Locates secondary restrooms on north side of the Upper Level
- Removes one stairway from the Upper Level to Platform 3 to accommodate new location of the 8th Avenue and 31st Street entrance
- Reconfigures VCEs from the Upper Level West Boarding Area to the Lower Level Exit Concourse
- Retains the remainder of the existing VCEs from the Upper Level to Platforms 3 through 8
- Adds single escalators from the Upper Level to Platforms 9 and 10
- Improves the VCE connecting the Upper Level and the Lower Level adjacent to 33rd Street and 8th Avenue entrance
- Shifts the existing VCEs up to the taxiway to the east
- Arranges BOH around the periphery of the Upper Level
- Adds new service elevators between the Upper Level and the Lower Level to eliminate the existing ramp, because the ramp would interfere with the connection to Penn Station Expansion
- Locates a homeless outreach space in the northwest corner of the Upper Level
- Removes structural trusses within public space

Street Level

- Moves the entrances at 33rd and 31st Street and 8th Avenue out toward the avenue and enlarges them to allow for some daylighting (though limited)
- Reconfigures and improves the entrances on 7th Avenue at 32nd and 31st Streets
- Adds a new entrance mid-block on 31st Street to the Upper Level and then down to the NJT central concourse
- Adds three MEP platforms roughly at the height of the roof of the MSG bridge
- Removes the central third of the taxiway to open up the Upper Level adjacent to the Rotunda below

Summary

Alternative 2



Leverage Existing Two-Level Configuration with new 8th Avenue Entrance and West Train Hall

- **Adds large 8th Avenue entrance and widened West Train Hall by removing Hulu Theater**
- **Retains two levels for boarding and alighting**
- **Introduces an east-west spine on both levels**
- **Straightens and widens all circulation spaces**
- **Creates central atria between levels with double-height spaces**

Lower Level

- Removes the NJT Intermediate Level
- Widens the Main Gate Concourse and extends it southward to all tracks to relieve congestion at the east end of the station
- Extends the Central Concourse southward to all tracks
- Widens the Hilton Corridor, with a double- and triple-height central atrium with VCEs to the Upper Level at each end
- Maintains substantially the same area of retail space as existing, but somewhat reconfigured
- BOH occupies the bulk of the Lower Level
- Concourses extend through to Penn Station Expansion

Upper Level

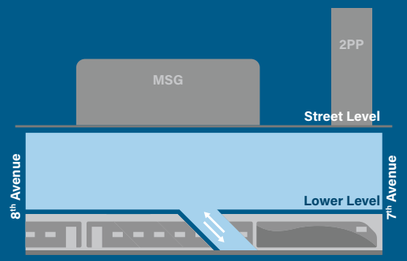
- Introduces east-west spine from the 7th Avenue and 32nd Street entrance to the West Boarding Area, removing the existing enclosed waiting area
- Incorporates the existing Rotunda into the east-west spine
- Incorporates the increased height and volume made possible by removing the central third of the taxiway into the east-west spine
- Introduces a new atrium to the Lower Level in the center of the east-west spine
- Locates retail along both sides of the east-west spine for maximum retail value
- Locates waiting, with adjacent restrooms, on south side of spine
- Locates secondary restrooms on north side of the Upper Level
- Reconfigures VCEs from the Upper Level West Train Hall to Lower Level Exit Concourse
- Retains the existing VCEs from the Upper Level to Platforms 3 through 8
- Adds pair of escalators from the Upper Level to Platform 9 and single escalator to Platform 10
- Moves single escalator from the Upper Level to Platform 2 to the west
- Improves the VCE connecting the Upper and Lower Levels adjacent to 33rd Street and 8th Avenue entrance
- Shifts the existing VCEs up to the taxiway to the east
- Arranges BOH around the periphery of the Upper Level
- Adds new service elevators between the Upper and Lower Levels to eliminate the existing ramp, because the ramp would interfere with the connection to Penn Station Expansion
- Locates a homeless outreach space in the northwest corner of the Upper Level
- Removes structural trusses within public space

Street Level

- Adds retail to Street Level in the West Train Hall
- Reconfigures and improves the entrances on 7th Avenue at 32nd and 31st Streets
- Adds new entrance mid-block on 31st Street to Upper Level and then down to the NJT Central Concourse extension
- Adds three MEP platforms roughly at the height of the roof of the MSG bridge
- Removes the central third of the taxiway to open up the Upper Level adjacent to the Rotunda below

Summary

Alternative 3



Transform to Single-Level Operations

- **Creates one unified boarding and alighting level with double-height ceilings throughout**
- **Provides more intuitive wayfinding**
- **Primarily locates BOH station operations on upper level**
- **Improves all existing entrances**

Lower Level

- Removes the NJT Intermediate Level
- Widens the Main Gate Concourse and extends it southward to all tracks to relieve congestion at the east end of the station
- Extends the Central Concourse southward to all tracks
- Widens the Hilton Corridor
- Widens the 8th Avenue Concourse in the middle
- Increases the height of all public concourses to at least 18 feet by opening them up to Upper Level
- Maintains substantially the same area of retail space as existing, but somewhat reconfigured to line the east-west spine
- Locates the restrooms on the north and south halves of the Lower Level, one adjacent to the waiting area
- Positions Customer Service/Ticketing on either end of the station, with the Waiting Area prominently positioned near the western boarding gates
- Concourses extend through to Penn Station Expansion, including an additional opening all the way to the east to allow passengers coming from the south to easily access the underground connection under 7th Avenue
- Removes structural trusses within public Concourses
- Locates a homeless outreach space in the northwest corner, near the Police Podium

Upper Level

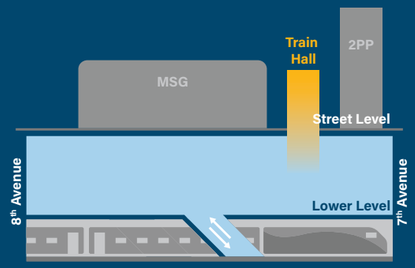
- Provides 2 VCEs from street to Upper Level and from Upper Level to Lower Level along 8th Avenue Concourse
- Removes all of the Upper Level slab above Lower Level circulation spaces, creating MEP and BOH “islands” housing most of these functions for the station
- Adds retail on Upper Level in a mezzanine overlooking the 8th Avenue Concourse
- Adds a Ticketing/Customer Service space on Upper Level
- Removes the NJT Intermediate Level
- Adds new service elevators between the Upper and Lower Levels to eliminate the existing ramp, because the ramp would interfere with the connection to Penn Station Expansion

Street Level

- Moves the entrances at 33rd and 31st Street and 8th Avenue out toward the avenue and enlarges them to allow for some daylighting (though limited)
- Reconfigures and improves the entrances on 7th Avenue at 32nd and 31st Streets
- Adds new entrance mid-block on 31st Street to the Upper Level and then down to the NJT Central Concourse extension
- Adds three MEP rooms or platforms on Street Level

Summary

Alternative 4



Transform to Single-Level Operation with New Mid-block Train Hall

- **Adds glass-enclosed Mid-block Train Hall between MSG and Two Penn**
- **Creates one unified boarding and alighting level with double-height ceilings throughout**
- **Provides more intuitive wayfinding**
- **Primarily locates BOH station operations on upper level**
- **Improves all existing entrances**

Lower Level

- Removes the NJT Intermediate Level
- Widens the Main Gate Concourse and extends it southward to all tracks to relieve congestion at the east end of the station
- Extends the Central Concourse southward to all tracks
- Widens the Hilton Corridor
- Widens the 8th Avenue Concourse
- Increases the height of all public concourses to at least 18 feet by opening them up to Upper Level
- Maintains substantially the same area of retail space as existing, but somewhat reconfigured to line the east-west spine
- Locates the restrooms on the north and south halves of Lower Level, one adjacent to the waiting area
- Positions Customer Service/Ticketing on either end of the station, with the Waiting Area prominently positioned near the western boarding gates
- Concourses extend through to Penn Station Expansion, including an additional opening all the way to the east to allow passengers coming from the south to easily access the underground connection under 7th Avenue
- Removes structural trusses within public Concourses
- Locates a homeless outreach space in the northwest corner, near the Police Podium

Upper Level

- Provides 2 VCEs from street to Upper Level and from Upper Level to Lower Level along 8th Avenue Concourse
- Removes all of the Upper Level slab above Lower Level circulation spaces, creating MEP and BOH “islands” housing most of these functions for the station
- Adds retail on Upper Level in a mezzanine overlooking the 8th Avenue Concourse
- Adds a Ticketing/Customer Service space on Upper Level
- Removes the NJT Intermediate Level
- Adds new service elevators between Levels B and A to eliminate the existing ramp, because the ramp would interfere with the connection to Penn Station Expansion

Street Level

- Creates new aboveground Mid-block Train Hall between MSG and Two Penn, providing high ceilings and daylight
- Moves the entrances at 33rd and 31st Street and 8th Avenue out toward the avenue and enlarges them to allow for some daylighting (though limited)
- Adds retail on Street Level adjacent to corner entrance on 8th Avenue and mid-block on 31st Street
- Reconfigures and improves the entrances on 7th Avenue at 32nd and 31st Streets
- Adds 3 loading docks for MSG below the MSG bridge
- Adds two MEP rooms or platforms on Street Level

5

Summary of Criteria and Assessments

The project team identified 16 criteria for evaluating the alternatives, grouped into five key categories. The purpose of these criteria is to assess the performance of each alternative against the goals and priorities for the redevelopment of Penn Station. Of primary importance is the category of **Passenger Movement**, which evaluates the core functionality, safety, and accessibility of the station for the traveling public. **Customer Experience** evaluates the station's ease of use and pleasantness; **Station Operations** governs the behind-the-scenes aspects of the station's functionality; **Integration with the Urban Setting** judges how well the updated station fits into the surrounding landscape; and, finally, **Delivery** evaluates the estimated time and money needed to perform the work.

Criteria		Definition	Key Takeways
Passenger Movement	**Passenger Access and Circulation Plan**	The level of congestion that is estimated; the clarity, logic, and consistency of pedestrian circulation pathways; the ease of movement and choice of alternative pathways; and the quality of the experience of moving through the station.	▪ All alternatives provide significantly more circulation space than existing ▪ All alternatives achieve similar levels of service under peak conditions
	Emergency Platform Egress	Evaluated using the 2010 Edition of National Fire Protection Association (NFPA) 130, Standard for Fixed Guideway and Transit Passenger Rail Systems. Evacuate the platform in 4 minutes or less and reach a point of safety within 6 minutes or less.	▪ All alternatives can meet egress code standards
	Emergency Building Egress	Evaluated for egress of the Lower and Upper Levels using the 2020 New York State (NYS) Construction Codes. Chapter 10 of the Building Code.	▪ All alternatives can meet egress code standards
	Accessibility	Evaluated using the 2020 NYSBC and 2010 ADA Standards for compliance of accessible entrances and accessible routes throughout public levels.	▪ All alternatives exceed accessibility standards into and around the station
Customer Experience	**Daylighting**	The potential to introduce daylight — both direct and indirect — into the passenger spaces.	▪ Alternatives 2 & 4 provide greater daylight into the station
	Retail	Ability to accommodate 100,000 to 125,000 SF of retail space, based on study of optimal retail demand. The productivity of retail will be determined by proximity and visibility to the consumer, sense of place, and uniqueness and quality of the retail tenant mix.	▪ All alternatives provide retail quantities in the range suggested by the experts ▪ Retail in Alternatives 3 & 4 create a greater revenue value
	Intuitive Wayfinding	Evaluates how the customer navigates to, from, and through the station; how they orient themselves within the station and its connecting buildings; and how they identify and locate key services and amenities along their way.	▪ Alternatives 3 & 4 create a simpler intuitive navigational experience
	Customer Service	Facilitates customer service through two core station aspects: ticketing/customer service areas and waiting areas.	▪ All alternatives can provide sufficient customer service amenities for passengers
	Lower Level Environment	Substantially improve or eliminate the cramped, disjointed circulation areas on the Lower Level. Improve ceiling height and widen passageways and thereby improve intuitive wayfinding on the Lower Level.	▪ Alternatives 3 & 4 remove the cramped Lower Level circulation spaces

Assessment varies across alternatives

Criteria		Definition	Key Takeways
Station Operations	**Building Program**	Evaluate success in efficiently meeting goals for both the station operations program areas and passenger circulation spaces.	▪ All of the alternatives meet the program needs, but some relocation off-site of BOH program is needed
	Sustainable Design Principles	Provide opportunities to reduce carbon emissions and provide a healthier and smarter customer experience, in line with project's strategic sustainable design goals.	▪ At this early stage, all alternatives have similar potential relative to sustainability ▪ Alternatives 2 & 4 have a slight advantage due to increased daylight
Integration with Urban Setting	**Street Level Pedestrian Experience**	Create a pedestrian environment that feels gracious, even when crowded; easy to navigate, with clear design clues for orientation; inclusive to accommodate a wide range of users; flexible; and with a touch of civic grandeur.	▪ Alternatives 2 and 4 create a better Street Level pedestrian experience
	Station Identity	Create a clear, recognizable, legible, and imageable station identity. Provide recognizable entrances that reflect the locations and volumes of traffic, respond to the surrounding architecture, and are of a stature appropriate to Penn Station.	▪ Alternatives 2 and 4 create a better Street Level station identity
Delivery	**Schedule**	Estimated length of time needed to reconstruct Penn Station. Preliminary assessment based on current level of Master Plan.	▪ Alternative 1 has the shortest duration with Alternative 3 taking half a year longer ▪ Alternative 2 has the longest duration, with Alternative 4 close behind it
	Constructability	Assess the ease or difficulty of reconstructing Penn Station while still in operation. Evaluates the phasing, meaning the order in which the work will be undertaken, and its impact on passenger circulation and station operations.	▪ Alternative 1 is slightly easier to build since it makes the fewest changes ▪ All alternatives will require complex phasing to build while in operation
	Cost	Rough order of magnitude cost estimate to reconstruct Penn Station. Preliminary assessment based on current level of Master Plan. Property acquisition allowances included. **Note:** All cost estimates are high-level conceptual cost projections.	**Alternative 1** $4.9 billion **Alternative 2** $6.5 billion **Alternative 3** $5.0 billion **Alternative 4** $6.4 billion

Assessment varies across alternatives

6

Specific Study Areas

6.1 **Penn Station Expansion** 166

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6.3 **33rd Shared Street** 179

6.1
Penn Station Expansion

A key component of the long-term vision for the Penn Station Complex and the Gateway program is Penn Expansion.

The track and station configuration of Penn Station Expansion is still under study by Amtrak, NJT and MTA at the time of this writing, and the three agencies are preparing to begin the environmental review required under the National Environmental Policy Act (NEPA). An Environmental Impact Statement (EIS) and preliminary design will be done under separate contracts. The environmental review will consider alternatives to expanding the station, such as converting the station to all through-running to increase capacity and expanding other modes of travel. It will also consider locating the expansion to the north of the station under 34th Street, under the existing station, and to the south of the existing station (as was envisioned originally in the Gateway program). While early studies favor the southern expansion option, these options are still subject to feasibility studies and an EIS before a decision is confirmed. Several design options for expanding the station to the south and connecting it to the new Hudson Tunnel are being studied. The Master Plan is tasked with testing the feasibility of the Expansion with respect to the GPP overbuild and integrating it with the overall station design. Thus the Master Plan studied how the overbuild would be handled on the southern expansion alternative, but this study will be moot if a different expansion alternative is selected. One of the design options for expanding to the south being studied was selected for the following proof-of-concept study.

This nine-track alternative proposes a single, split track level, with the four northern stub tracks set at the same elevation as the track level in Penn Station. The five southern tracks would be set eight feet lower than the four northern stub tracks, to allow those tracks to extend east to Sunnyside Yard in Queens, below the eight subway lines along Sixth Avenue, to support a future conversion to through-running. The five lower platforms will be wide enough to accommodate simultaneous boarding and alighting of passengers to facilitate potential future through-running operations. The western end of the platforms would begin under the block west of 8th Avenue and south of 31st Street, known as Block 754; continue through the block south of 31st Street between 7th and 8th Avenues, known as Block 780; and have its eastern end in the block south of 31st Street and east of 7th Avenue, known as Block 806. Most of Penn Station Expansion facilities and program would lie below Block 780.

The single concourse level would be split to mirror the track level, with the elevation of the northern half at the same elevation as the Lower Level in Penn Station, connecting directly to it. The connections to Penn Station would be extensions of the main north-south-running concourses, so that the Lower Level concourses run continuously from 33rd to 30th Street. A fourth north-south concourse is added in Penn Station Expansion at the eastern side of Block 780 that connects to NJT's 31st Street and 7th Avenue entrance. There would be no Upper Level in Penn Station Expansion, to allow for more generous ceiling heights.

A grand east-west running concourse, roughly 100 feet wide, connects the four main east-west concourses just south of 31st Street. The concourse is initially 25 feet tall and then becomes approximately 32 feet tall farther south, when the concourse drops with the tracks, keeping stair and escalator lengths between platform and concourse to a manageable length.

At either end of the main Penn Station Expansion Concourse, ramps connect to passages underneath the 7th and 8th Avenue subway lines to station concourses in Blocks 806 and 754, respectively. A north-south passageway from Block 754 under 31st Street would connect to the Moynihan Train Hall. Passengers can currently cross underground between Moynihan Train Hall and Penn Station at 33rd Street. Another underground connection at 31st Street would help promote the perception for travelers of one transportation complex, which would be particularly beneficial to Amtrak passengers, who are looking to make intermodal connections in Penn Station.

A second north-south passageway could be added from Block 806 below 31st Street to connect to the potential network of Underground Concourses running north to 34th Street and east to Herald Square (see **Section 6.2**).

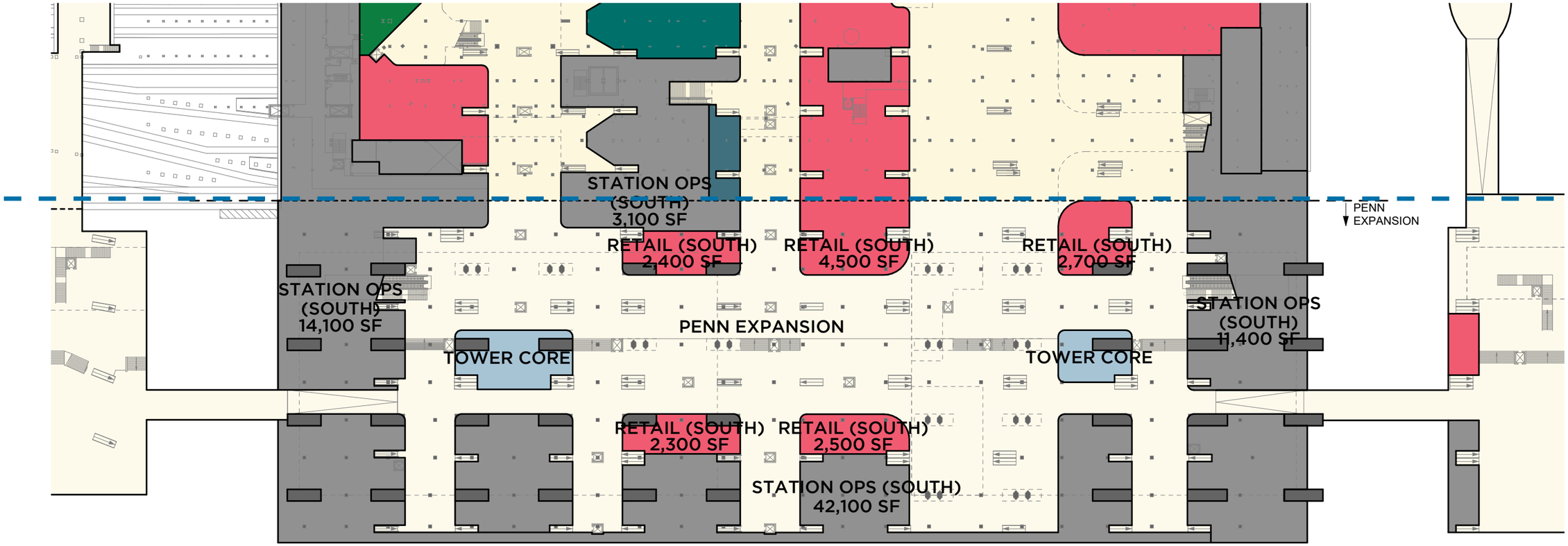
Large new buildings will be constructed above the station on all three blocks as part of the GPP in preparation by ESD. There will be two large office building on Block 780, separated by a public open space. The buildings above the station in Blocks 754 and 806 would be smaller in size. The foundations and structure to support these buildings must be integrated into Penn Station Expansion, with foundation elements and columns set between tracks and/or on platforms. One of the main design challenges is allowing for the structure of the overbuild towers to pass though the station without negatively affecting the station's functioning, nor the value of the overbuild. The value captured from this overbuild will help to pay for Penn Station Expansion project.

Mega-columns, which accept and transfer the load of the overbuild towers, measure approximately 9-feet wide × 26-feet long, and are spread throughout Penn Station Expansion concourses. Their locations as shown here are indicative of the general spacing and quantity, but greater design specificity will need to be developed in conjunction with further development of the overbuild and Expansion designs. These test layouts serve as proof-of-concept.

At street level, the primary entrances to Penn Station Expansion are at the 31st Street corners. Stairs and escalators run diagonally to direct passengers toward the Main Concourse. These corner entrances also bring daylight down to the concourse level. A larger opening for daylight is envisioned above the extension of the widened Eastern Concourse from Penn Station. The alignment of this opening coincides with the Mid-Block Train Hall in Alternative 4, and above grade could take on some of the characteristics of a train hall, acting as a direct extension of the station. This opening provides access to 31st and 30th Streets and could also relate to the planned mid-block open space. Additional entrances from 30th Street are placed somewhat toward the middle of the block from the avenue corners, in order to allow for retail functions at those corners, and because pedestrian traffic to and from the south is anticipated to be relatively low. These entrances lead directly to the Main Concourse.

Although a detailed program for Penn Station Expansion has not been developed, this test fit exercise estimates approximately 120,000 SF of circulation space, and 100,000 SF of other space to be programmed with retail and station operation functions.

The Penn Station Expansion will enable the Penn Station Complex to realize its full potential and meet future demand. In conjunction with selecting a preferred alternative, Penn Station Expansion's design will be developed further and integrated into the Master Plan.

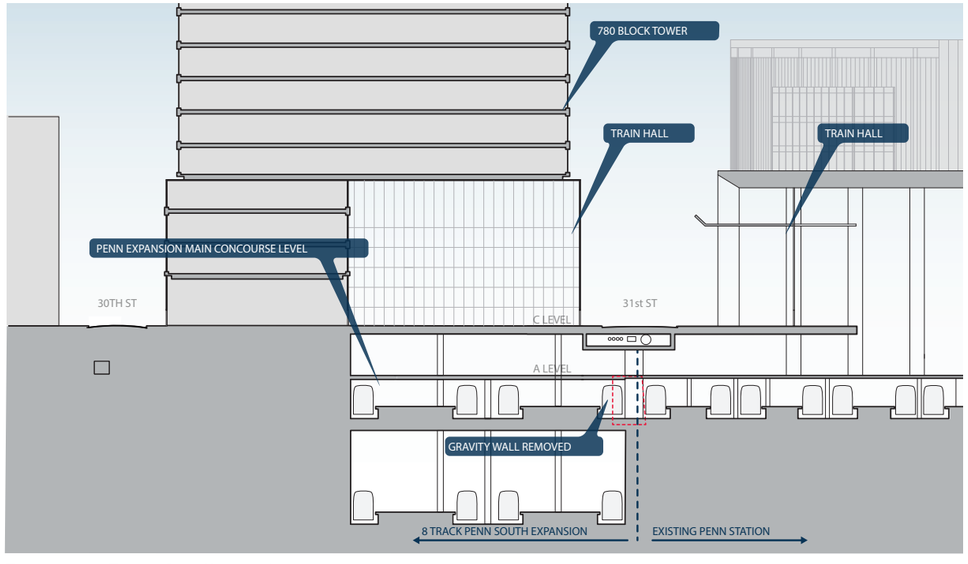


Penn Station Expansion concourse connects directly to Penn Station

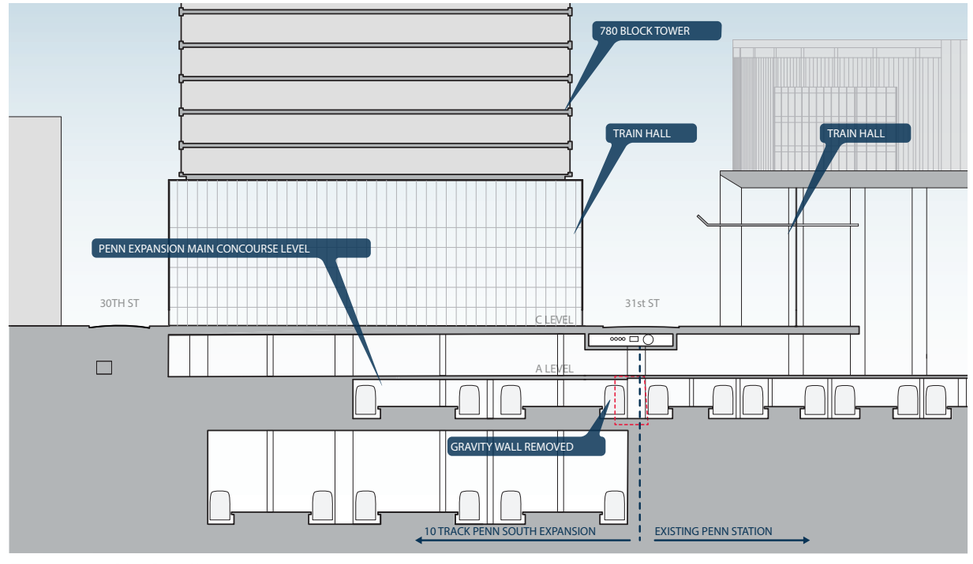
Note
Penn Station Expansion track configuration is conceptual.

Possible Station Configurations

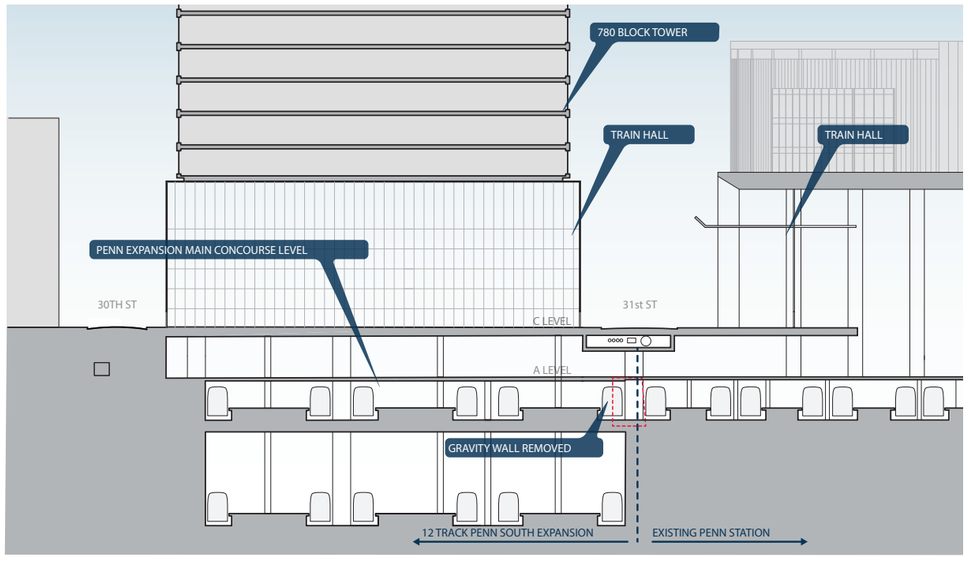
Note
Penn Station Expansion track configurations are conceptual.



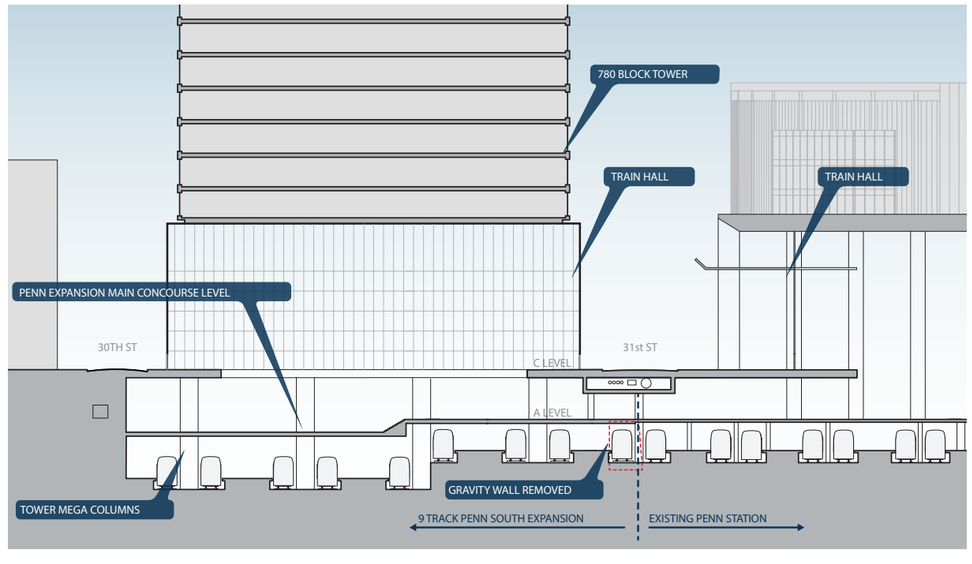
Four over Four Configuration



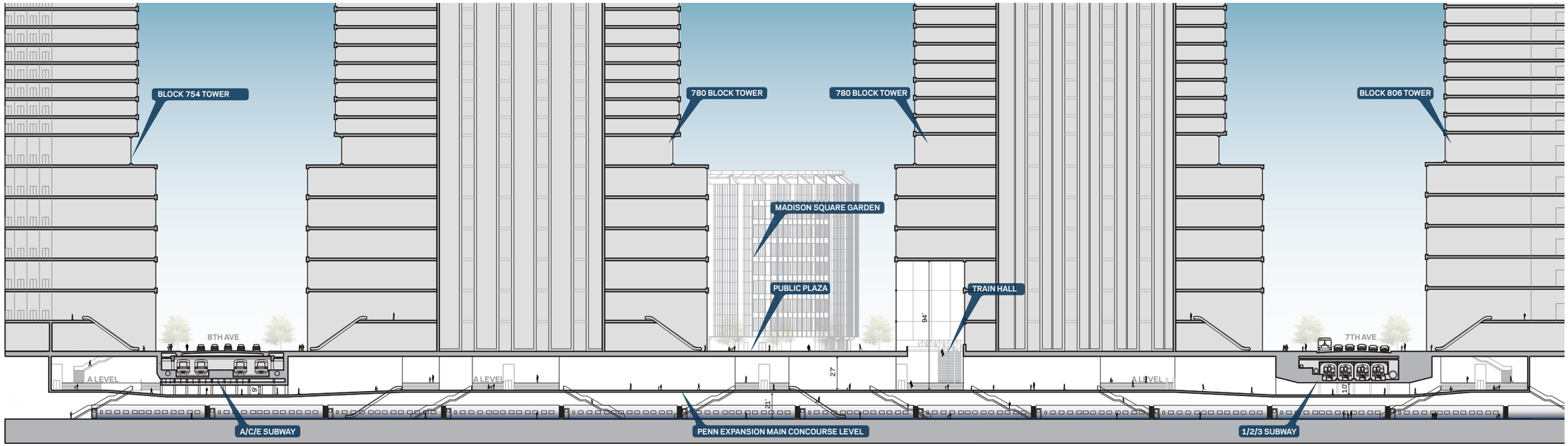
Four over Six Configuration



Six over Six Configuration



Single Level Configuration



East-West Section

Note
Penn Station Expansion track configuration is conceptual.

Service Building

A central Service Building is a critical element to rationalizing the operations and functionality of future Penn Station and Penn Station Expansion. If the southern Penn Expansion option is selected, it is anticipated that the existing eight-level Service Building on the south side of 31st Street will be removed for the future development on Block 780 and Penn Station Expansion. The reallocation of building systems from the Service Building into the renovated Penn Station and Penn Station Expansion would require 77,000 SF and 26,000 SF of floor space, respectively. The scale of this space poses a challenge for transforming Penn Station into a world-class transit facility. The potential construction of a new off-site Service Building merited special study in order to: free up space in Penn Station, increase efficiency and constructability and increase revenue generation in Penn Station.

The project team evaluated four potential locations for a new Service Building. After extensive evaluation, the recommendation is to build the new Service Building into the podium of the new tower to be built on the west side of Block 780 (along 8th Avenue between 31st and 30th Street).

This location allows the Service Building to leverage the existing MEP connections points in the basement of the actual Service Building and leading to tunnels under the existing Penn Station tracks and platforms.

The proposed new Service Building is one-phased solution that depends on the concurrent development of Block 780 and the GPP. The mechanical equipment for the new Service Building is located on levels 3 through 8 of the proposed tower. The floor plate and the super structure are designed and constructed to accommodate the service core and the super structure required for future tower development.

Phasing and Constructability

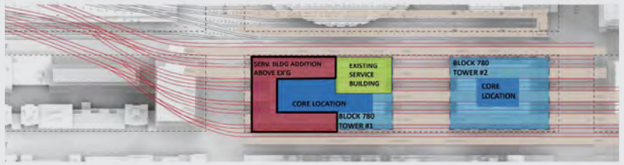
1. Demolition and excavation of the west end of Block 780 between 8th Avenue and the existing Service Building
2. Construction of new mega columns and shear walls to grade under extent of the new Service Building and construction of slab at grade
3. Construct the Service Building including transfer super structure
4. Swing over of utilities to the new Service Building

Schedule	Complete
Service Building	June 2027
Penn Station Expansion	April 2029

*Developer contribution is estimated based on the approximate cost the future developer would pay for the construction of their foundations in this footprint if Penn Station Expansion and the Service Building did not exist and had not already built the foundations for them.

Figure 6.1-1

Option Three
Integral with Proposed Tower On Block 780



Note:
Empire South Track configuration is conceptual

Figure 6.1-2

Existing Electrical Connection Points

Future Penn Station Expansion plans in the background

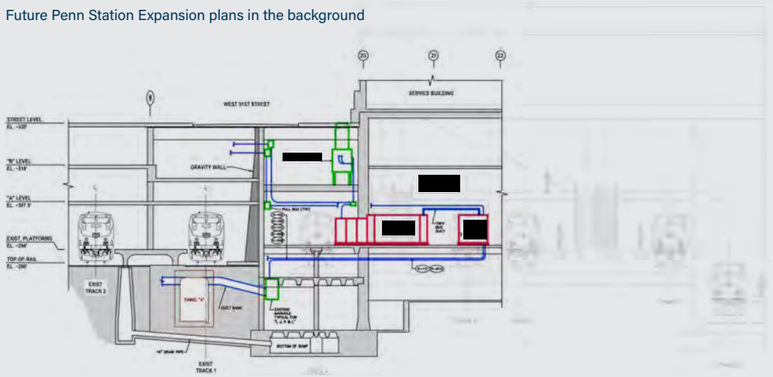
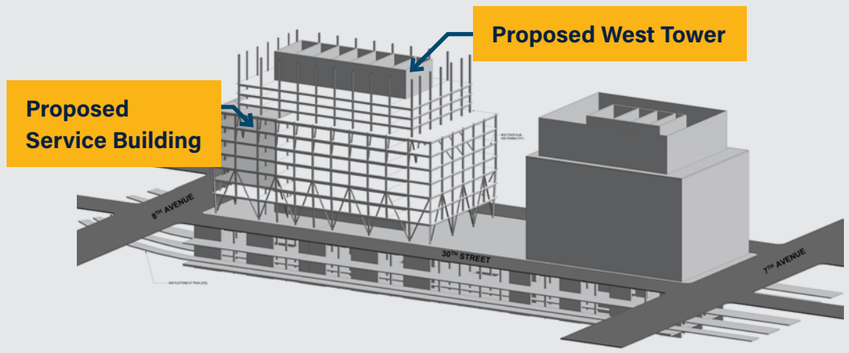


Figure 6.1-3

Proposed Build out of Block 780 looking North from 31st Street



6.2
Underground Connections

The underground connections that provide access to and from Penn Station are an important part of the pedestrian transportation network surrounding the station. The potential expansion of this network merited special study in order to:

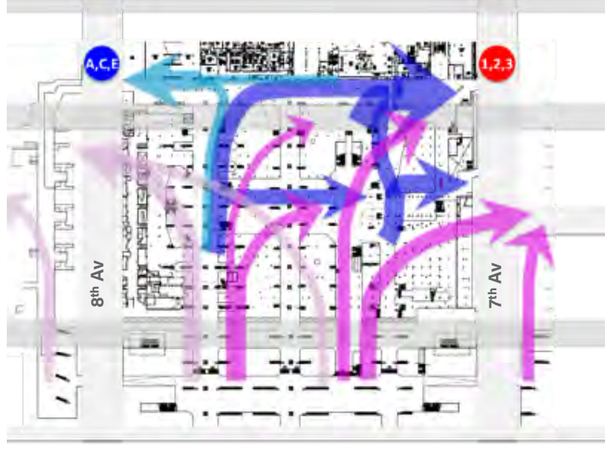
Alleviate Crosswalk and Sidewalk Congestion
The at-grade pedestrian areas around Penn Station, particularly along 7th Avenue, already suffer from significant congestion, despite NYCDOT's efforts to widen the sidewalks. The crosswalks have insufficient 'storage space' for people that pile up waiting for the 'walk cycle.' With almost 60% of morning peak hour, Penn Station arrivals walking to non-subway destinations, the volume of pedestrian traffic will only increase as the future ridership of Penn Station rises. An underground alternative route would remove a portion of these pedestrians from the at-grade flow, improving the safety for all pedestrians, and provide a favorable customer experience during inclement weather.

Move People Efficiently in the Predominant Directions
Over 60% of passengers arriving to Penn Station leave the station in the east direction to arrive at their destination (see Figure 6.2-1). The same pattern repeats in the afternoon peak periods, with over 60% arriving from the east direction. As a result, the congestion within Penn Station is disproportionately on the east side of the station, notably in the LIRR and NJT connection areas. Underground connections provide an important mechanism for relieving this overcrowding by moving people out of the station as soon as possible from getting off a train. Commuters tend towards the most efficient path and will be drawn to an alternative that moves them more quickly in the direction that they want to go.

Encourage Redistribution of Subway Moves to Herald Square
A projected 48% of Penn Station morning peak hour arrivals are intermodal transfers to the subways. The 7th Avenue 1,2,3 line is the closest option for many of these passengers, but it already suffers from high levels of overcrowding, which will only increase with the expanded ridership at Penn Station. The 8th Avenue A,C,E line is the next closest but is also crowded and requires walking in the west direction, which is the wrong direction for many travelers. If access to Herald Square was more convenient and pleasant, the less crowded eight subway lines and PATH trains at Herald Square could provide a promising alternative for passengers. ***Even diverting 10% of subway transfers towards Herald Square would have a meaningful effect on the LOS on the 7th Avenue 1,2,3 line***. The ESD EIS for the Penn Station District includes re-opening the old Gimbel's passageway to Herald Square. The alternative underground connection proposed here just south of the Gimbel's passageway has the potential to be more effective in mitigating pedestrian impacts at street level and in the 34th Street 1/2/3 subway stop. Being outside the footprint of Penn Station, it has been referred to ESD to consider for incorporating into the EIS and GPP. MTA is working with ESD to assess its feasibility.

Provide Alternate Routes to the 7th Avenue Subway
With the potential expansion of Penn Station tracks, platforms, and concourses into the blocks south of 31st Street and new Hudson River tunnel capacity, substantial additional volumes of NJT commuters will alight and board at the new concourses, with almost half of those passengers using the subways to get to and from the station. The primary walking route for those passengers will be through the existing Lower Level of Penn Station, adding to the crowding within the concourses. Providing passageways beneath 7th Avenue would provide an alternate walking route to the subway, particularly to the uptown local platform of the 7th Avenue subway, and divert some passengers away from the existing Penn Station concourses.

Figure 6.2-1
2042 AM Peak Hour Predominant Desire Lines



Future pedestrian flow estimates indicate that well over 60,000 people will be entering and exiting from the entrances along 7th Avenue during the AM peak hour in 2042, half of them coming from the 7th Avenue subway. An effective underground concourse system on the east side of Penn Station could enable the Herald Square subways to serve up to 10% of subway trips from LIRR and MNR at Penn Station, and 20% of subway trips from NJT, resulting in up to 8,000 AM peak hour pedestrian trips. In addition, a share of Penn Station rail passengers walking to points east of the station and to the uptown local platform of the 7th Avenue subway would use the system of new passageways, with a total AM peak hour volume in the range of 12,000 to 17,000 pedestrian trips — most of which would be diverted from the heavily used Lower Level concourses on the east side of Penn Station.

Underground Connection Options

Understanding the goals for additional underground connections is clear, but options for actually adding underground connections is decidedly more complex. The area of 7th and 8th Avenues includes layers of conflicts — the train shed below the subways below utilities, not to mention the retaining walls and tunnel throats heading East.

After careful study, the project team identified the following route components of the concourse system (see **Figure 6.2-2**).

Penn Station to 11 Penn to 33rd Street and to Herald Square

Between 7th Avenue and Herald Square there are two options: the former Gimbels Passage along 33rd Street or a parallel route along 32nd Street.

- Build the underground connection from the southeast corner of Penn Station under 7th Avenue to mid-block under 11 Penn with vertical circulation up to proposed north-south passage.
- Build the North-South Connection from mid-block north, through the basement of 11 Penn to connect to existing free zone connection at 32nd Street entrance to 34th Street Station and north through basement of 15 Penn to existing free zone connection at 33rd Street entrance to 34th Street Station.
- Build the East-West connection either A) reusing, widening, and upgrading the former Gimbels Passage running along the south side of 33rd St. with a mid-block and 6th avenue exit or B) below the north sidewalk of 32nd Street and partially within the property of Site 7 (15 Penn) and Site 8 (the Manhattan Mall) with an exit at 6th Avenue. Both options connect directly to the subway station and Path station at Harold Square.

North-South Connection Extension to Penn Station Expansion

- Build the North-South Connection from the Penn Station Connection mid-block under 11 Penn running south through the basement of 11 Penn up to connect to Penn Station Expansion.

One Penn to North-South Connection to 34th Street

- Build the North-South Connection from north side of 34th Street Station through the basement of Block 809 to 33rd Street Entrance of 34th Street Station.
- Build the underground connection beneath 7th Avenue connecting One Penn to the North-South Connection in the basement of the Block 809 development.

Drivers for Phasing of the Underground Connection System

The sequence of the construction of the underground connection system considers the following factors:

- Reconstruction of Penn Station
- Construction of Penn Station Expansion
- NYCT work at existing 32nd, 33rd, and 34th Street entrances to the 34th Street Subway Station
- Development timeline of Block 809, 15 Penn, and Block 806

The team also assessed options to expand the existing connections at 7th Avenue and 33rd Street, 8th Avenue and 33rd Street, and 7th Avenue and 32nd Street in detail but found them to be either not possible or exceedingly complex for a minor capacity improvement.

Figure 6.2-2

Gimbels Passageway Option

Figure 6.2-2

32nd Street Option

Note:
More detailed information can be found in Appendix A, Transit Mitigation.

Entrances and Canopies

The above connections would require new exterior entrances and associated canopies at the following locations:

- 32nd Street & 7th Avenue
- 33rd Street & 7th Avenue
- 34th Street & 7th Avenue

Constructability

Connections under 7th and 8th Avenues

The connections proposed under 7th and 8th Avenues run beneath the existing subways, and minimizing impact to subway operations is a priority. Two piles per existing column will be drilled adjacent to columns either from above the street or from track level. The team anticipates closure of one track at a time within NYCT's blackout constraints. Driving piles from above the street requires coordination with and possible relocation of complex utilities under both 7th and 8th Avenues. Once piles are installed, temporary framing must be put in place below the subway tracks and platforms, and excavation will occur based on site availability. Shoring will be installed, if required, to support the slab above during excavation. Tunneling through rock below will be done using hydraulic or chemical splitting methods. Rock anchors will be installed as required for tunnel stability and with shotcrete on the face of rock for added stability. The permanent structural framing system will then be installed.

As much of the construction for the underground connections is below the street and/or sidewalks, the project team conducted a comprehensive inventory of utilities below grade (see the Existing Conditions Report for details). The most impactful conditions are:

- The sewer culvert integral to northbound subway platforms at 7th Avenue must be supported and maintained during excavation below for East-West Connection north of 33rd Street.

- Piles driven from above 7th Avenue or 8th Avenue will require coordination with and possible temporary relocation of major utility infrastructure in the roadbed.

- The East-West Connection on the north side of 32nd Street will require relocation of the steam pipe at the intersection with 7th Avenue and the relocation of all utilities to the south half of 32nd Street from 7th Avenue to 6th Avenue. This potentially includes a 12-inch water main, a 12-inch gas line, electrical ducts, and a 38-inch sewer.

Much of the North-South Connection will be constructed through the built-out basements of proposed developments at Block 809, 15 Penn, and Block 806 and through the existing basement at 11 Penn.

Cost and Schedule

The construction cost estimate and schedule assume a construction start of January 2024. Segments can be constructed concurrently or in sequence.

Developer Participation

As part of the special permit to develop the 15 Penn property on the east side of 7th Avenue between 32nd and 33rd Streets, Vornado Realty Trust agreed to reconstruct and re-open the Gimbel's passageway as a public-realm improvement. Both this option and the 32nd Street option are being considered as part of the Penn Station District Plan and the preferred option will be determined in coordination with the Empire State Development Corporation and Vornado. The financing structure is anticipated to be implemented across the development of the Penn Station District. Developers within the Penn Station Development will contribute funding to mitigate the impact of above-grade pedestrian activity as defined by the GPP EIS. A decision on implementing each segment of the Underground Concourse will not be made until developer impacts and their contributions to mitigating their impacts are decided.

	Rough Order of Magnitude Cost	Construction Duration
Penn Station to 11 Penn to 33rd Street and East-West Connection to Herald Square	$514 million	25 months
Penn Station Expansion to North-South Connection	$30 million	8 months
North-South to 34th Street and under 7th Avenue to 1 Penn	$385 million	23 months

Note:

- All cost estimates are high-level conceptual cost projections.
- Owner soft costs and force account work are included in these numbers.
- All segments assume co-development of connections with overlapping projects.
- Costs do not include NYCT upgrades, except where elements had to be relocated for the construction of the connections.
- Costs for East-West Connection consider possibility of running connection within Manhattan Mall rather than under sidewalk.

- Costs for East-West Connection consider possibility of running connection within Manhattan Mall rather than under sidewalk.

6.3
33rd Shared Street

33rd Street Shared Street Looking from 8th Avenue

Renderings are for illustrative purposes only.



The Challenge

All four of the streets immediately surrounding Penn Station play an important role in the functioning and urban presence of the station. While all the streets must balance competing demands for space, 33rd Street between 7th and 8th Avenues must resolve particularly acute competition for space. Particular challenges this block of 33rd Street faces include:

- The closure of the eastern third of the street to vehicular traffic and the creation of Plaza 33 already in progress (see **Figure 6.3-1**).
- The new station entrance being constructed at 33rd Street and 7th Avenue, expected to have a large volume of pedestrian traffic.
- Loading for MSG, which can take over the entire western portion of the street with truck staging and unloading or loading. Large shows can require over 20 tractor-trailer trucks. Truck are unloaded outside the building, and a fleet of forklifts ferries materials into the building (see **Figure 6.3-2**).
- Loading and parking entrances for One Penn Plaza as well as loading for the future One Penn East and One Penn West developments. The new developments are expected to roughly double the square footage of the block, and presumably more than double the loading requirements. The other frontages of the block are not available for loading access.
- The relocation of the main entrance of Two Penn Plaza from 7th Avenue to 33rd Street.
- The aspiration of the City's Department of Transportation and Department of City Planning to make the street pedestrian-only.
- Pedestrian connectivity between Herald Square and Hudson Yards. The street offers one of the few through streets for pedestrians between these locations (see **Figure 6.3-3**).
- Security requirements for both MSG and Penn Station, as well as One Penn Plaza, to protect from potential terrorist attack.
- Emergency vehicle access and marshaling areas.
- Below-grade utilities and vaults, including a water main along the length of the block on the north side of the ROW and sewer lines at either end of the block. These utility lines will be relocated as part of Phase II of the LIRR Concourse renovation.
- Existing subway entrances and new subway and station entrances planned for the north side of the street.
- The desire for retail frontage to activate the street, as well as retail service access.
- General traffic, congestion, and service volume. New development on the blocks immediately surrounding Penn Station is expected to generate 5,000 to 6,000 new deliveries daily. Increased competition for the same amount of street space in the surrounding block puts added pressure on 33rd Street (see **Figure 6.3-4**).

In addition to these constraints and demands, the inclusion of the Mid-block Train Hall in Alternative 4 further complicates things. The train hall reduces the area along 33rd Street that MSG uses for security checks and loading, moving some loading to underneath the bridge between MSG and Two Penn Plaza. This alternative does permit trucks to exit to 31st Street, which would reduce the two-way traffic on 33rd Street. The Mid-block Train Hall also likely adds additional pedestrian traffic to 33rd Street.

Because the Mid-block Train Hall adds complexity and constraints to 33rd Street, it is used as the base case for all the studies of the street. It represents the worst-case scenario condition. Other alternatives would only ease the constraints on the street, but the suggested strategies would not be altered.

Figure 6.3-1
Existing Conditions

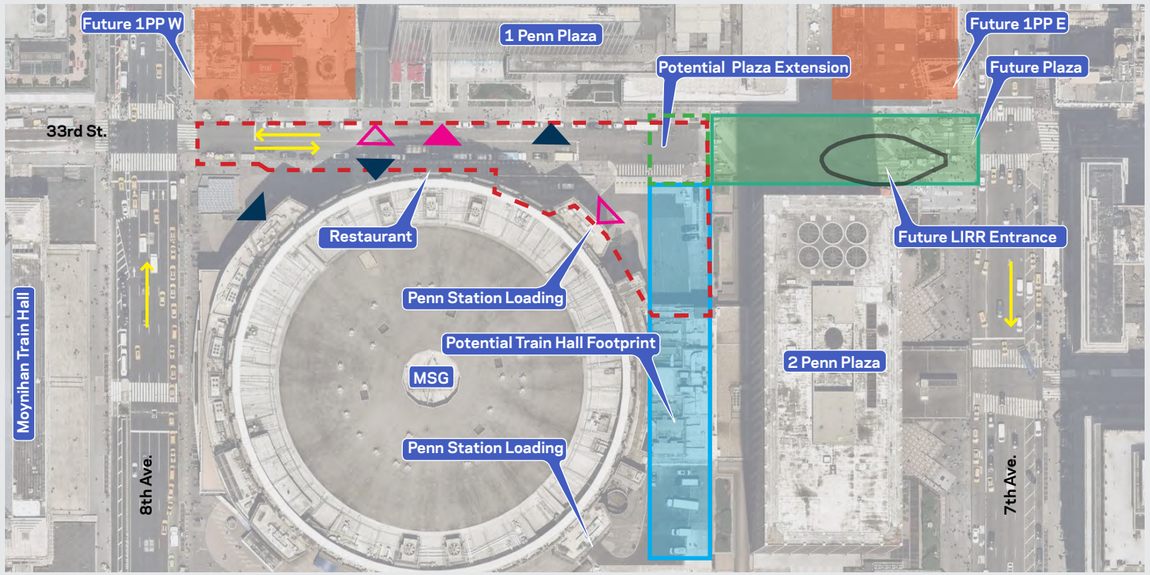


Figure 6.3-2
Madison Square Garden Concert Loading Photo



Figure 6.3-3
Primary East-West Axis

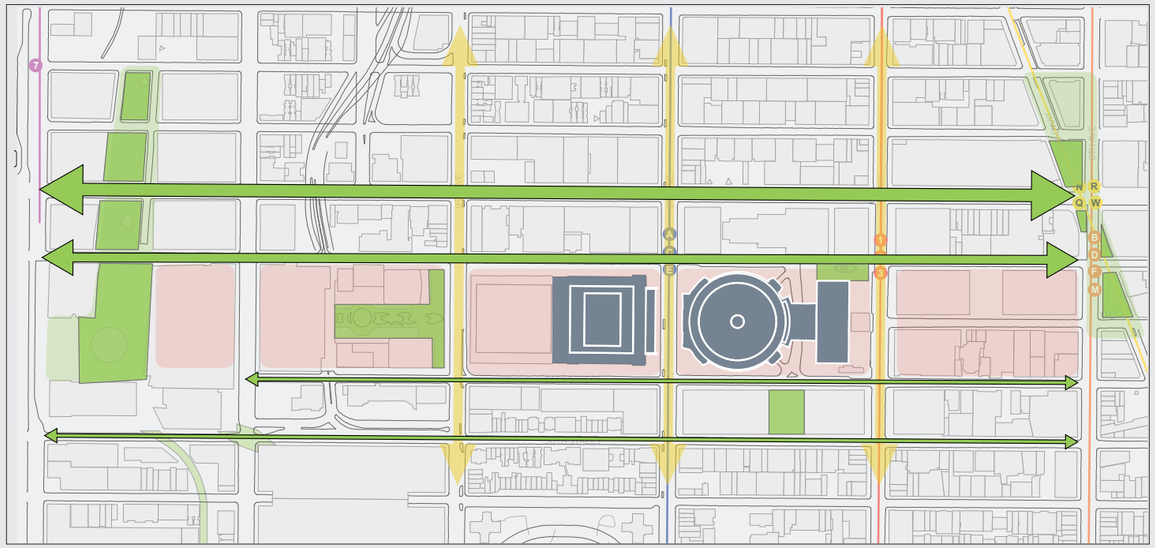
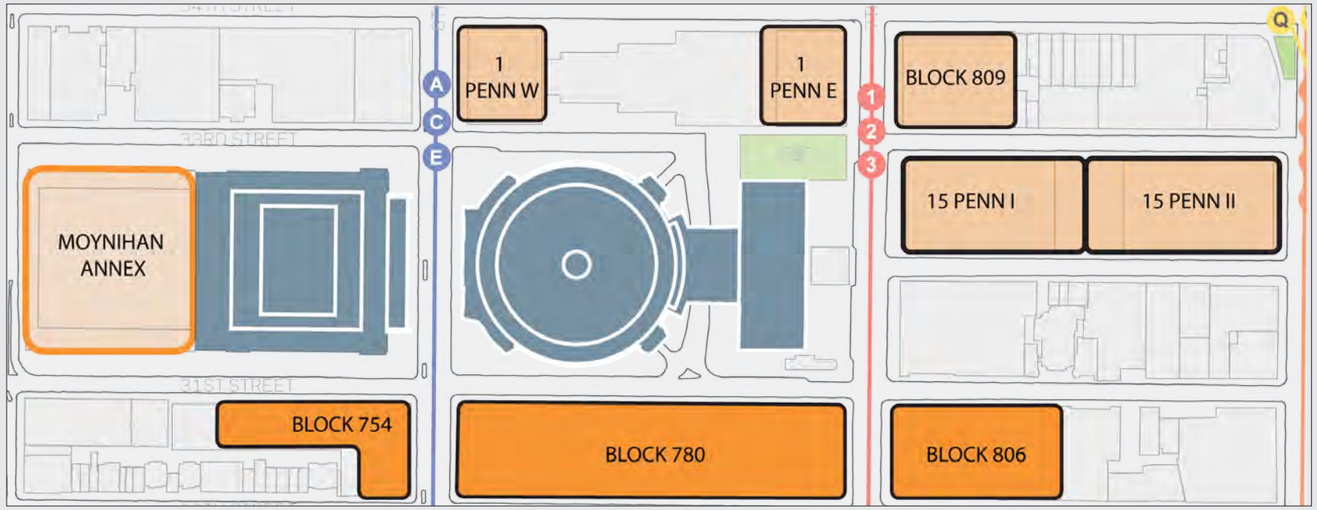
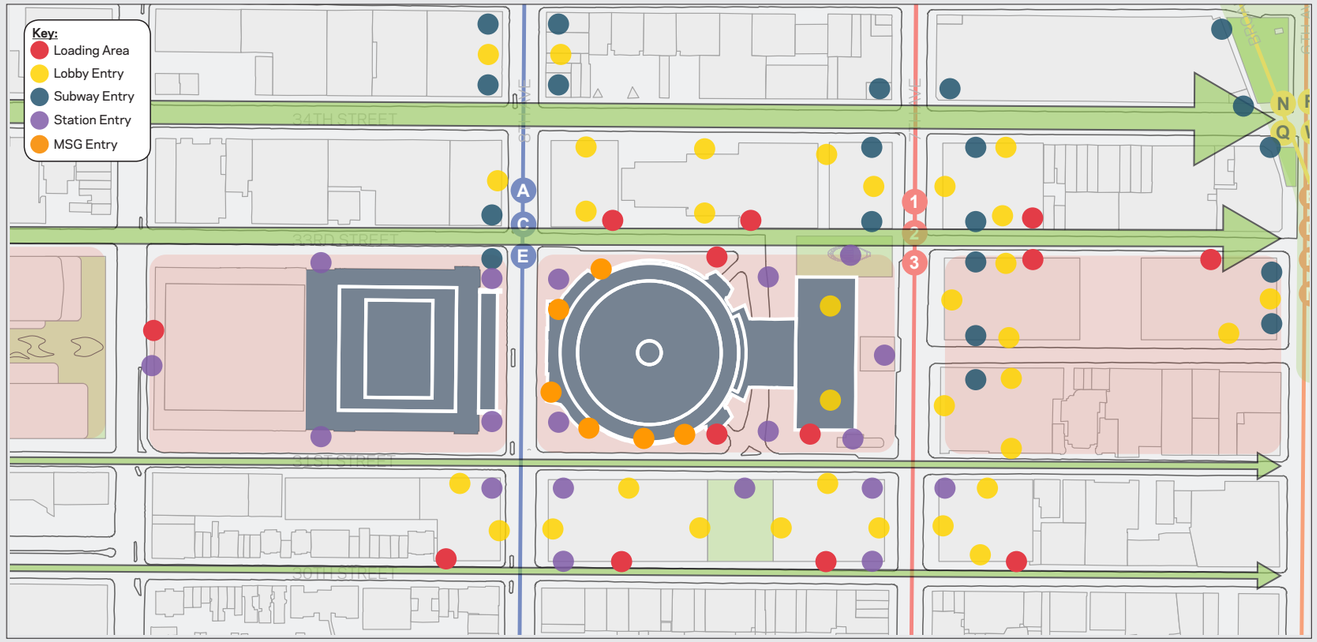


Figure 6.3-4
District Plan (above) and Competing Interests (below)





Delivery Estimates

Development Sites	Daily Delivery Estimate (10% error margin)
Block 780	1,172–1,432
Block 754	242–296
Block 754 Alt.	226–276
Block 806	330–404
15 Penn W Phase 1	483–591
15 Penn W Phase 2	485–593
One Penn East	348–426
One Penn West (Office + Hotel)	224–274
One Penn West (Hotel + Residential)	143–175
One Penn Plaza (existing)	932–1,139
11 Penn Plaza (existing)	379–463
Total	**4,963–6,069**

Strategies and Tools

The term "shared street" usually refers to a particular set of design standards that allow overlap between pedestrian and vehicular space. In fact, nearly every street in the City is shared by cars and people, with greater or lesser degree of overlap or physical separation. The separation of cars and people exists on a spectrum. The design tools and strategies developed for 33rd Street reflect a spectrum of shared vs. separated approaches. The project team generated a series of options for 33rd Street that are largely independent of the design alternatives. As the alternatives are developed and winnowed down, solutions for 33rd Street will be refined in a parallel process that will engage the City and other property owners and stakeholders on the street.

Key strategies and tools include:

- **Curb Management.** For any design, a program for curb management must be established. This includes designating certain areas of the street for certain uses that may vary by time through the course of the day and the week. There may also be more active curb management that could employ digital signs that can be programmed to respond to particular events. Access or parking regulations might be temporarily changed to allow for MSG to load-in a large show, for example (see **Figure 6.3-5**).

- **Live Management.** To ensure smooth operation of the street and orchestrate its many uses, on-site staff may be required. This staff could direct truck traffic and deliveries and help ensure that posted regulations are followed. This could potentially be combined with security.

- **Segregated and Secure Zones.** It may be desirable to designate certain portions of the street as secure, allowing only vehicles that have been cleared to access those areas. A shared security checkpoint at the entrance to the street could facilitate this, which would provide security for MSG, Penn Station, and Vornado properties on the north side. Amtrak and MSG already share a security operation at Penn Station, so this could be an expansion of that arrangement. This could even be taken a step further by having off-site security for screening vehicles, as is done for the World Trade Center, World Financial Center, and other secure zones (see **Figure 6.3-6**).

- **Curb-less Streets and Chicaning.** These are among the tools commonly used for shared streets, where curbs are removed but drive aisles are indicated with changes in paving material, planters, seating, flexible bollards, or other design elements. Chicaning snakes the vehicular area back and forth, which creates pockets for pedestrian uses and areas for loading, and tends to slow vehicular speeds making the streets safer.

- **Bollards.** Although some bollards will be required for security purposes, others may be desired for pedestrian safety. Security bollards are rated depending on the level of protection they provide (see **Figure 6.3-7**). For example, bollards running across the street, where a potential threat vehicle could approach a target with greater speed, require a higher security rating than those along the street edges. Bollards can also be retractable, for use at security checkpoints or for emergency vehicle access (see **Figure 6.3-8**). Bollards may also be integrated into planters, seating, or take on a more sculptural form so that they become part of a pedestrian-friendly environment that feels less like a security zone (see **Figure 6.3-9**).

- **Moveable Furniture.** Lightweight movable chairs and tables have been instrumental in creating pedestrian-friendly plazas throughout the City. Because these are designed to be moved by the users, as well as taken in and set-up again on a daily basis, such furniture requires active management.

Figure 6.3-5
Time Specific Signage



Figure 6.3-6
Pearl Street (above) and Boston Street (below)





Figure 6.3-7
Bollard Rating

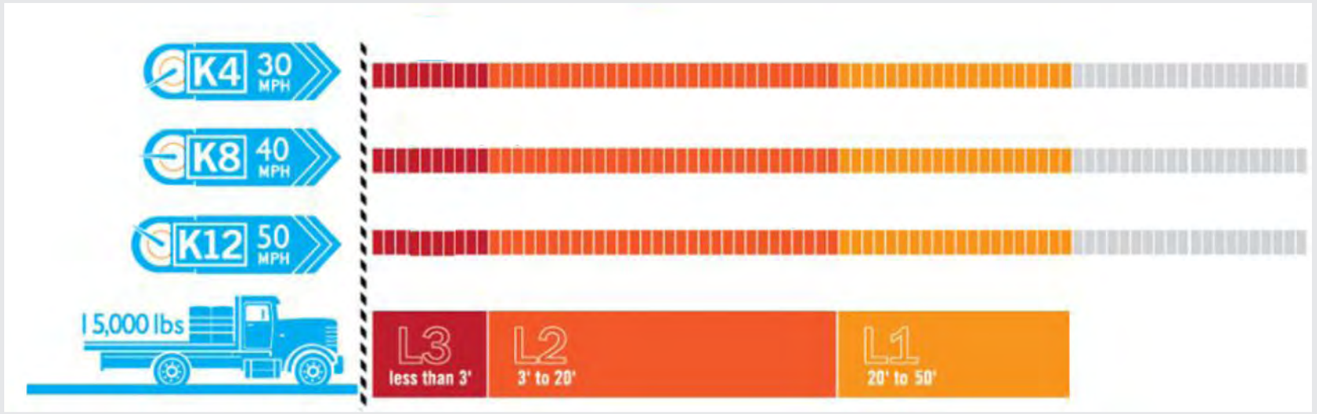


Figure 6.3-8
World Trade Center Barrier





Figure 6.3-9
Disguised Bollards





Options

Based on these strategies and tools, the project team developed four options that cover a range of degrees of pedestrian and vehicular separation. The options are design explorations, not complete proposals, for the street. A final version will be developed based on feedback and coordinated with the further development of the alternatives. These options can work with any of the alternatives.

Option 1
Curbed Separation

In this option, the street operates much as it does today, with curbs separating the north and south sidewalks from the vehicular area. Sidewalk space shifts slightly from the south sidewalk to the northern one, to favor the north as the preferred pedestrian through route. Additional sidewalk space is created at the corner of 8th Avenue with "bulb-outs" to accommodate the large volume of pedestrians from the Penn Station and subway exits. The Mid-block Train Hall in Alternative 4 would shift MSG screening and loading slightly west from where it is today. This option also explored the potential for increased retail space along the southern edge of the street, but technical and cost issues are likely to make this impossible.

This option represents a minimal level of upgrade to the street and comes closest to the current condition and operation pattern (see **Figure 6.3-10**).

Figure 6.3-10
Diagram

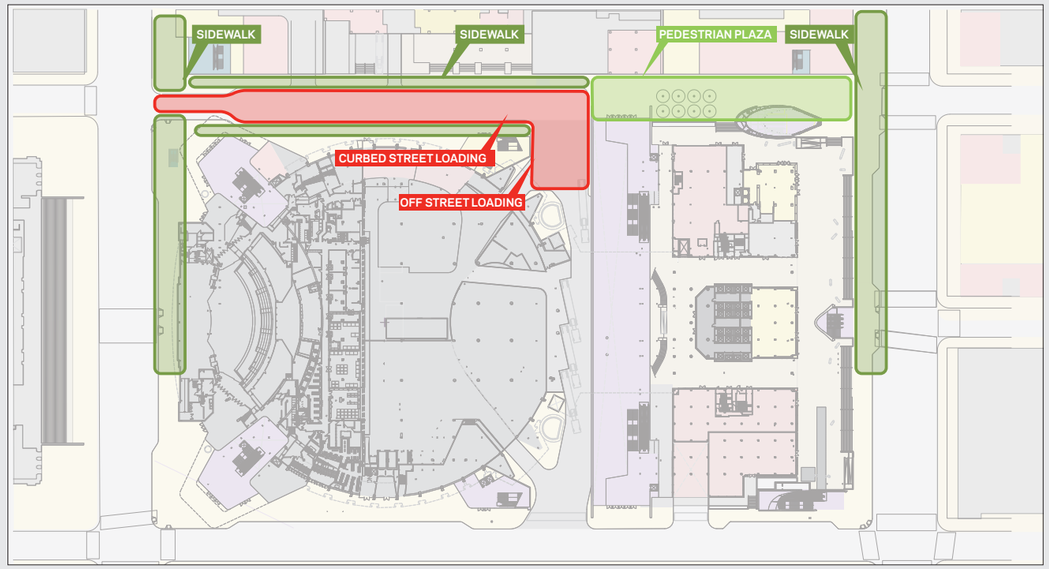


Figure 6.3-10
Base

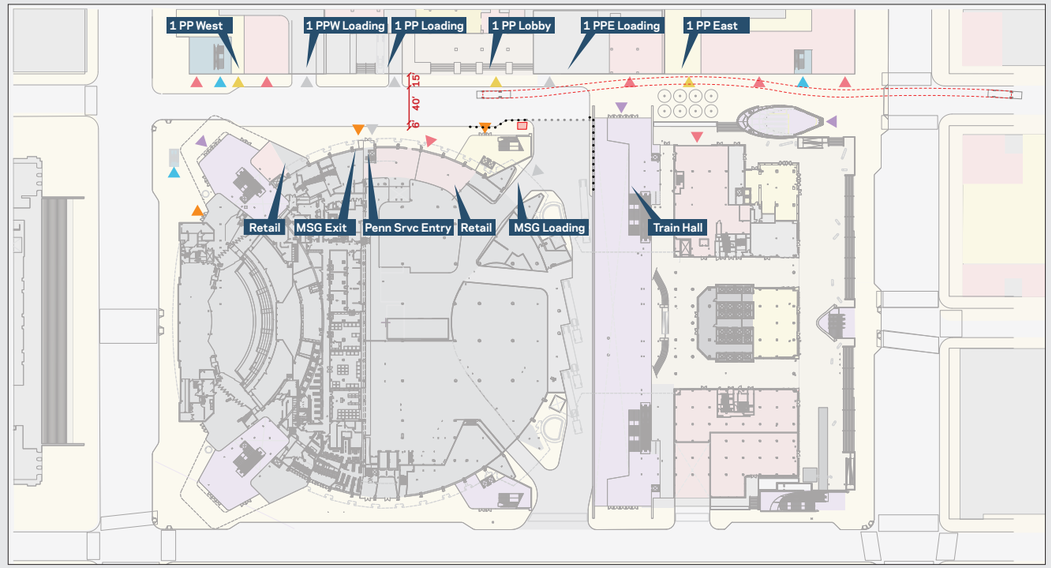
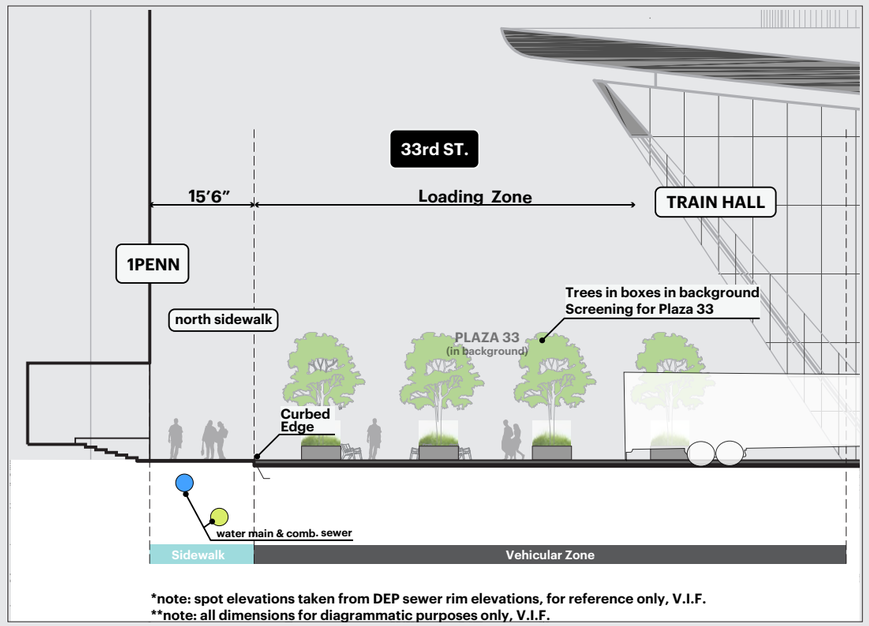


Figure 6.3-10
Section



*note: spot elevations taken from DEP sewer rim elevations, for reference only, V.I.F.
**note: all dimensions for diagrammatic purposes only, V.I.F.

Option 2
Segregated Zones

This option creates a largely pedestrian area on the west side of the street, that, along with Plaza 33 on the east end of the street, bookends the street with plazas. The zone between is dedicated to loading vehicles with the pedestrian route limited to the northern sidewalk. The plaza on the west side of the street, at sidewalk level, doubles as a shared security checkpoint. The vehicular space of the street is considered a secure zone. Part of the security area perimeter is formed by planters with integrated bollards (see Figure 6.3-11).

Figure 6.3-11
Diagram

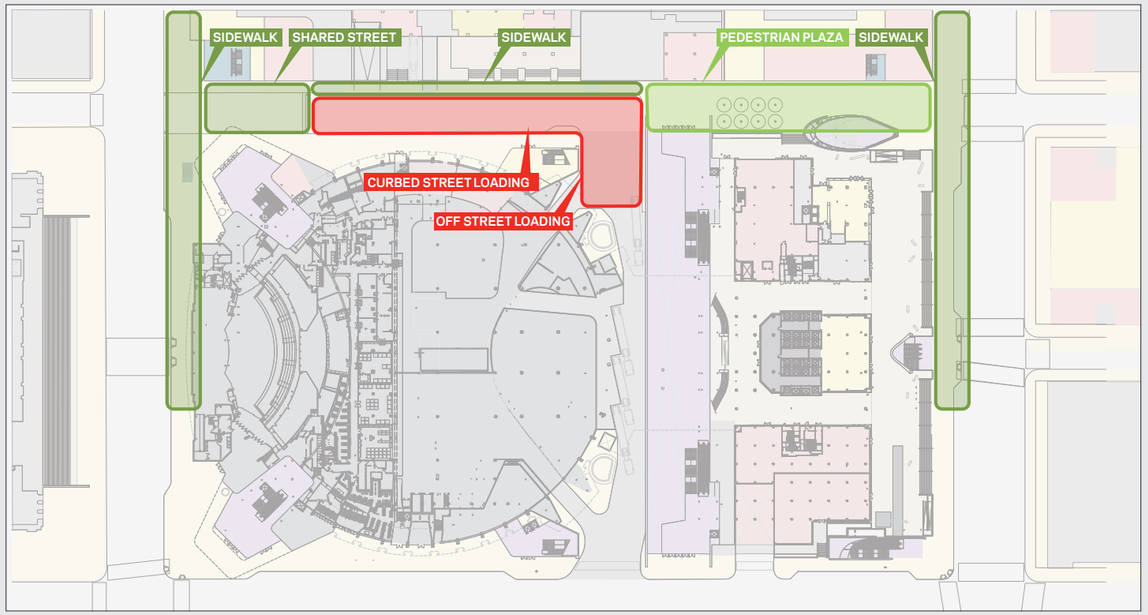


Figure 6.3-11
Base

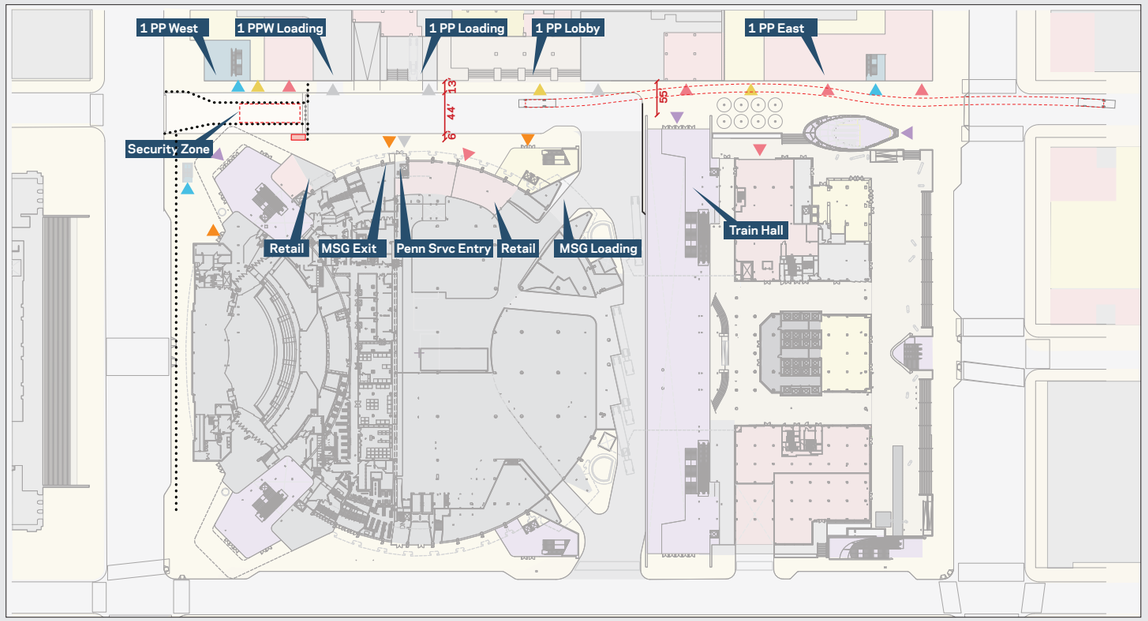
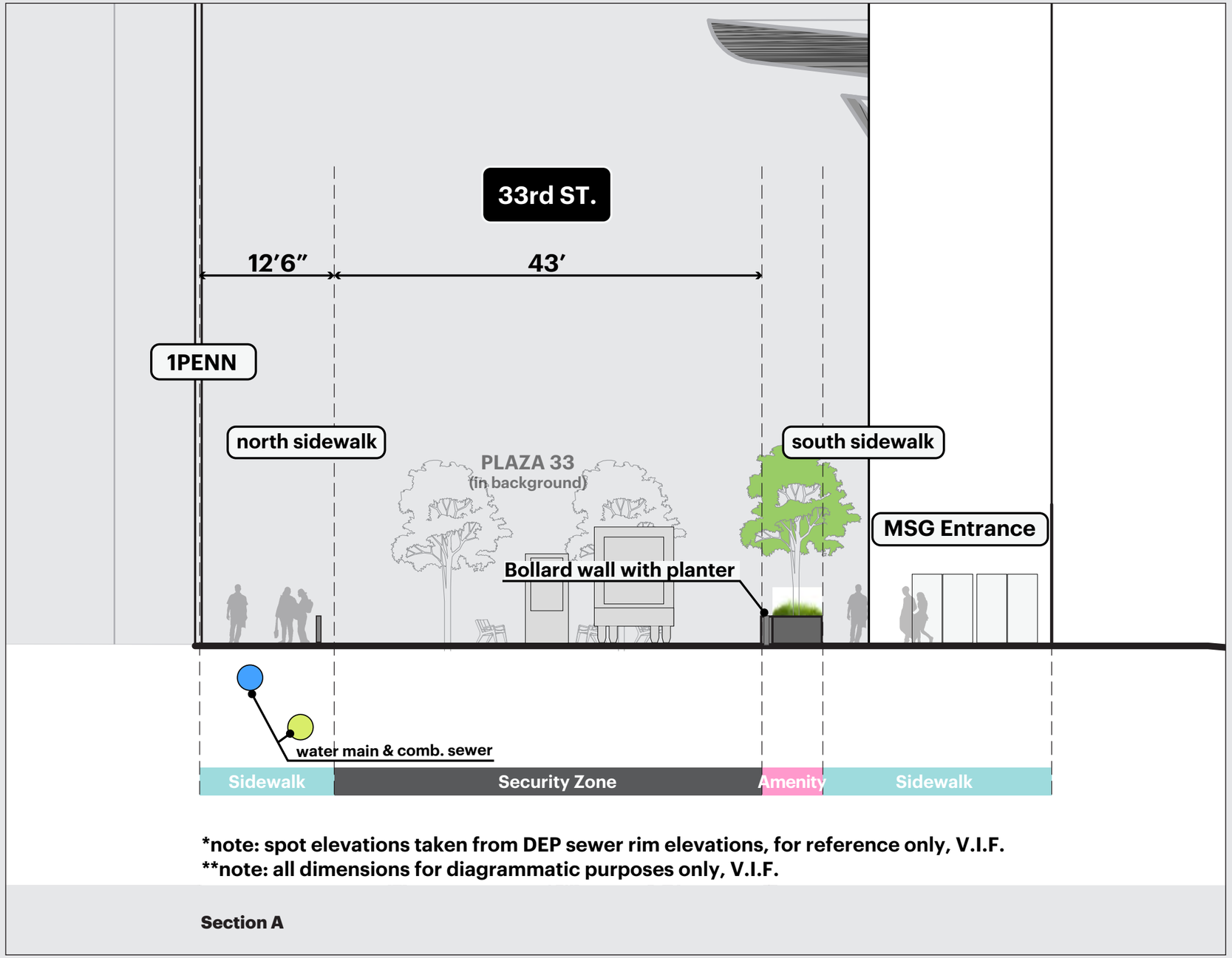


Figure 6.3-11
West Plaza Section



*note: spot elevations taken from DEP sewer rim elevations, for reference only, V.I.F.
**note: all dimensions for diagrammatic purposes only, V.I.F.

Section A

Option 3
Shared Street

The third option creates a more truly shared street condition. All areas of the street are open to pedestrians, although certain of those areas are also shared with vehicles. The shared portion of the street is demarcated by changes in paving material, planters, fixed seating, bollards, and other such elements, but there are no curbs. The team is still developing the details of the placement and types of bollards required.

An analysis of the turning movements required to access the various loading areas revealed portions of the street that could be added to the pedestrian-only zone, increasing the purely pedestrian area. Adding these areas also creates a chicaning of the street, which is desirable for shared streets. These areas create opportunities for planters, seating, and other pedestrian amenities. The vehicular-only part of the street is entered through a shared security checkpoint on the west end of the street, similar to Option 2 (see **Figure 6.3-12**).

Figure 6.3-12
Diagram

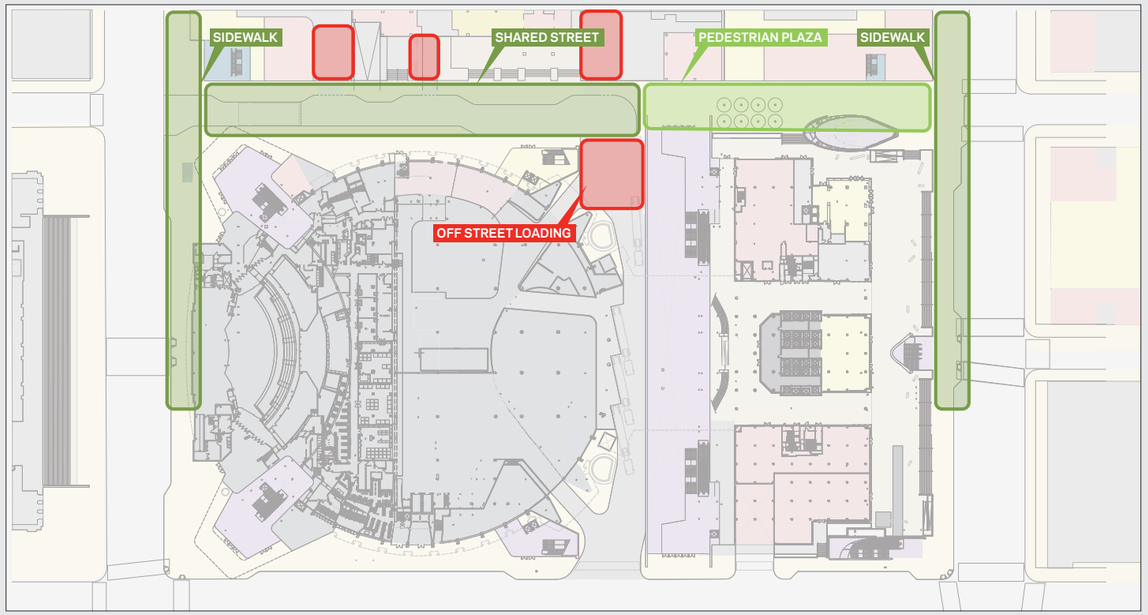


Figure 6.3-12
Base

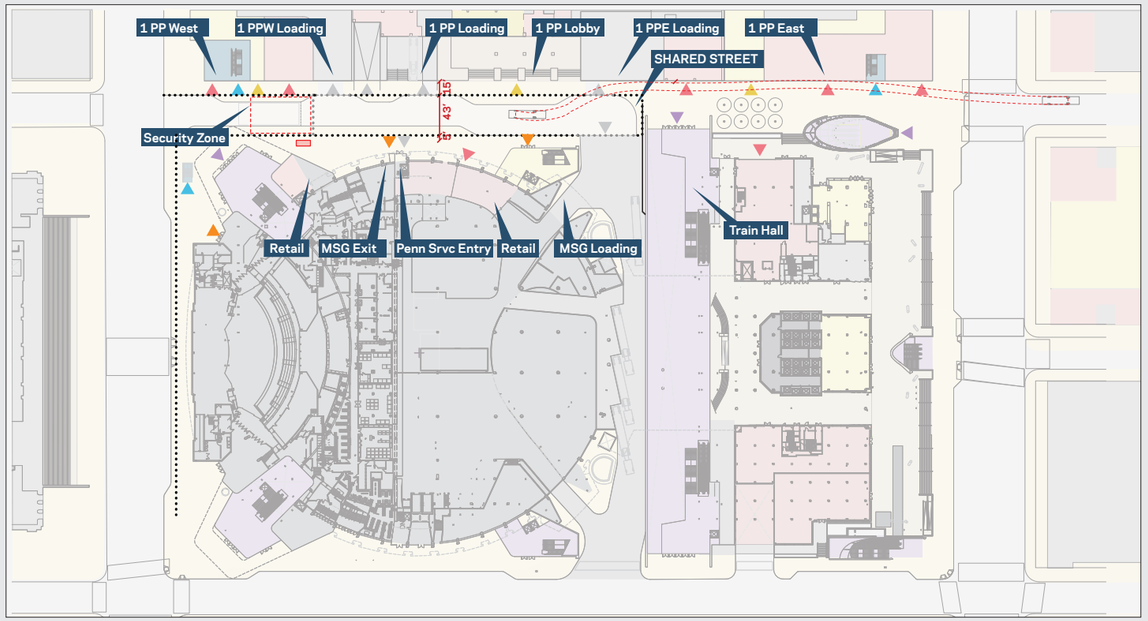


Figure 6.3-12
Truck Turning

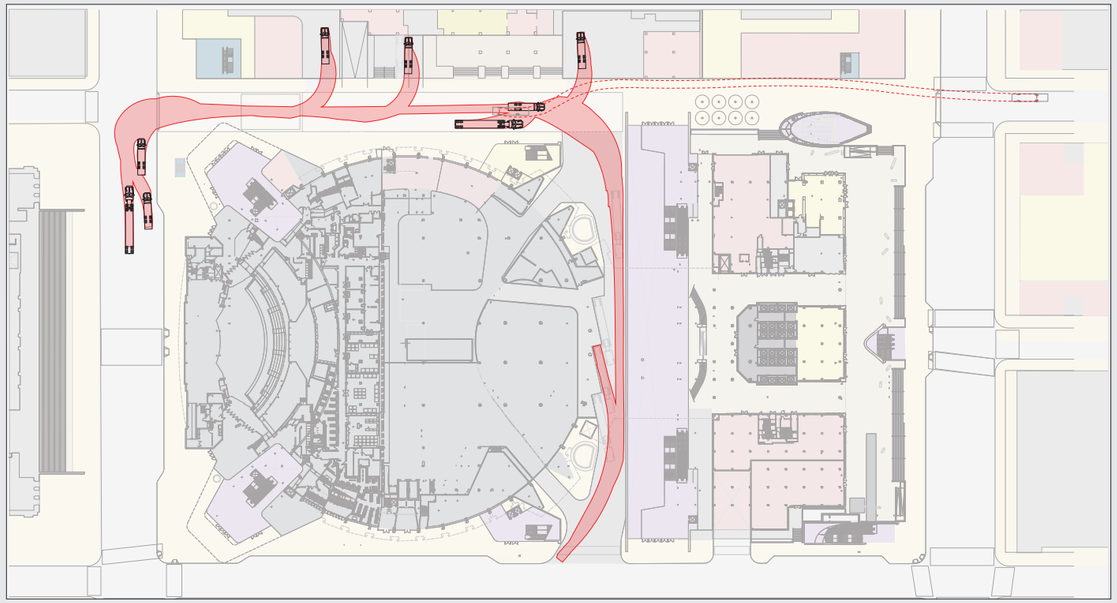


Figure 6.3-12
Shared Geometry

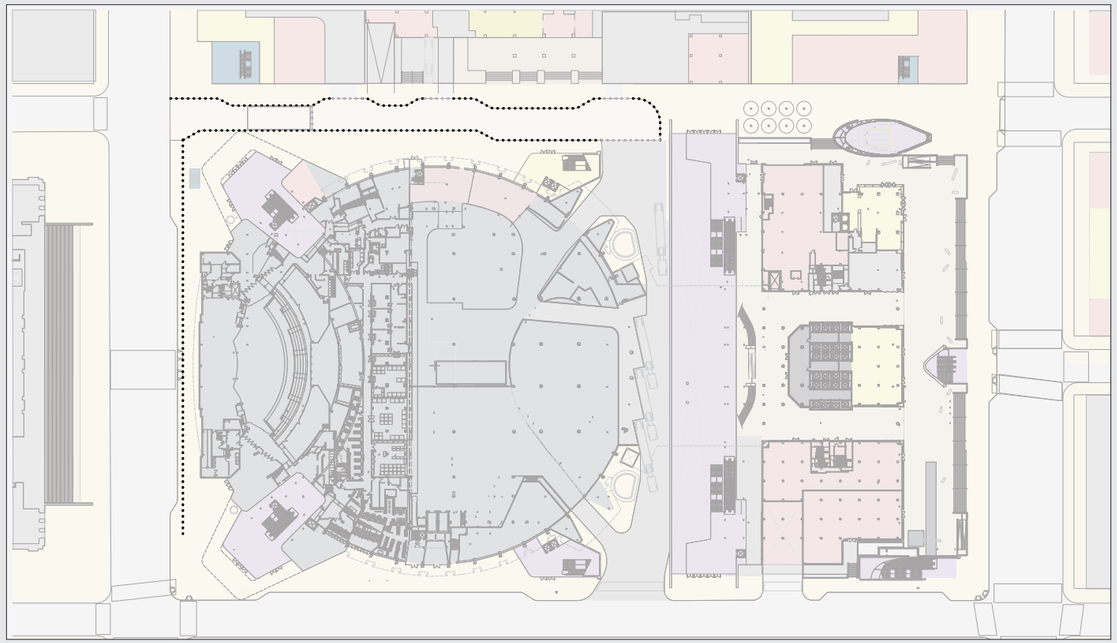


Figure 6.3-12
Shared Zones

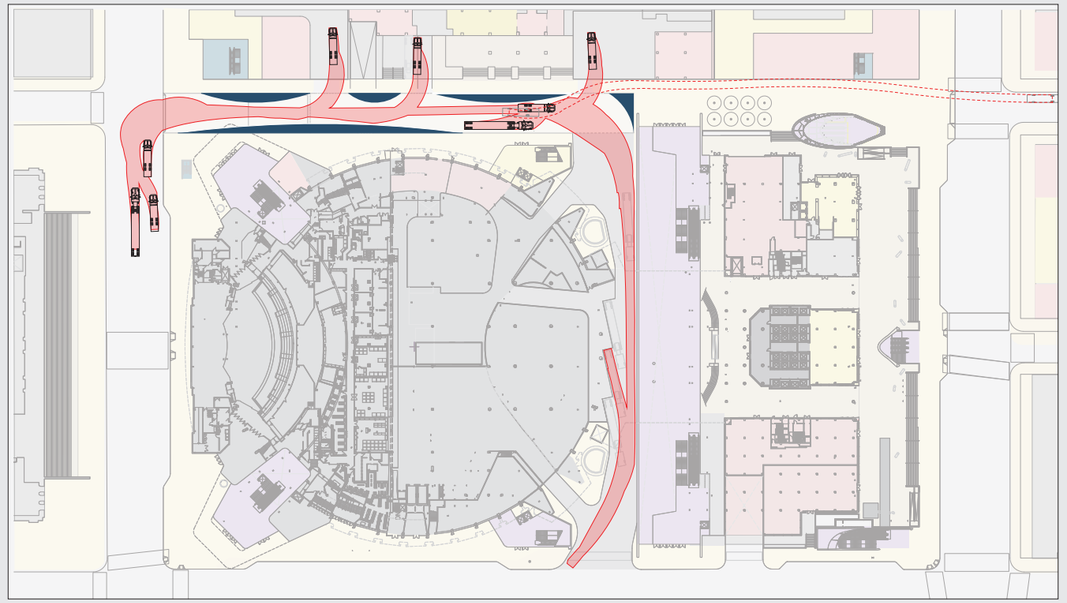


Figure 6.3-12
Landscape Plan

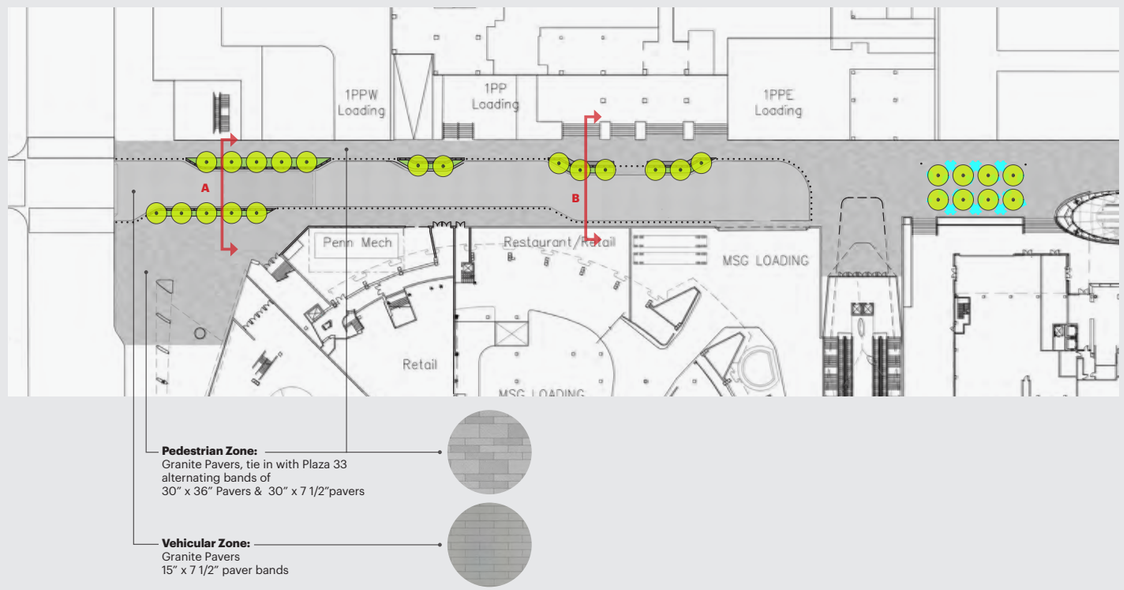
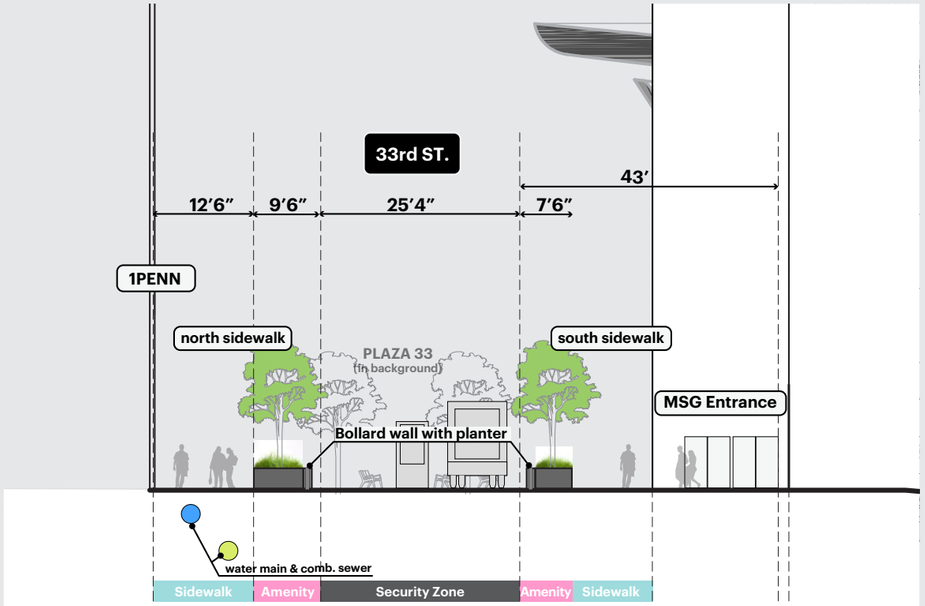
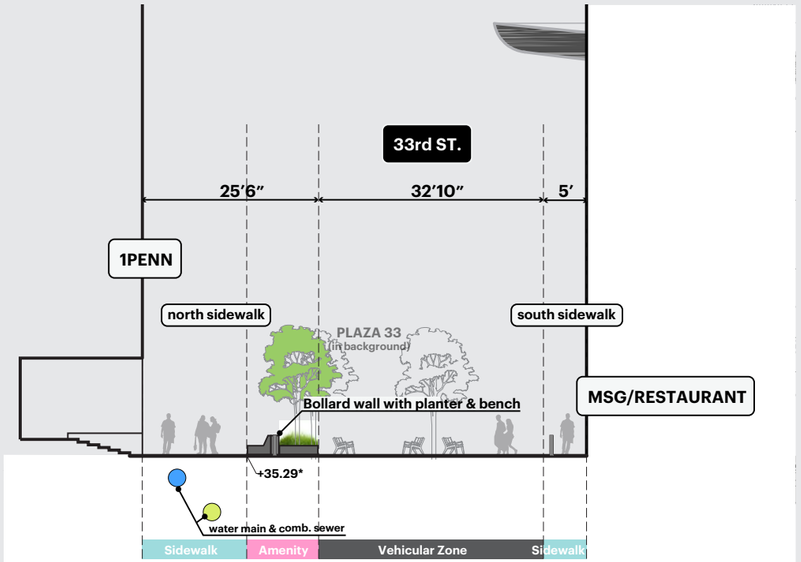


Figure 6.3-12
Sections



*note: spot elevations taken from DEP sewer rim elevations, for reference only, V.I.F.
**note: all dimensions for diagrammatic purposes only, V.I.F.



*note: spot elevations taken from DEP sewer rim elevations, for reference only, V.I.F.
**note: all dimensions for diagrammatic purposes only, V.I.F.

Option 4
Street Loading

Option 4 considers a scenario where it is not possible for MSG to unload beneath the bridge between Two Penn Plaza and MSG. In this case, MSG trucks unload from an area that uses some of the road bed and turn around and exit to the west from 33rd Street. A series of three sawtooth loading bays is added, partially on the skirt of MSG and partially in the roadway. Trucks use the MSG "driveway" for turning, before they back into the load bays. Similar to Option 2, pedestrian movement is primarily along the northern sidewalk. To allow for two-way traffic and turns from 8th Avenue, the sidewalks are not expanded at 8th Avenue.

This option is the least desirable option, but may be necessary, depending on how MSG loading is resolved (see Figure 6.3-13).

Figure 6.3-13
Diagram

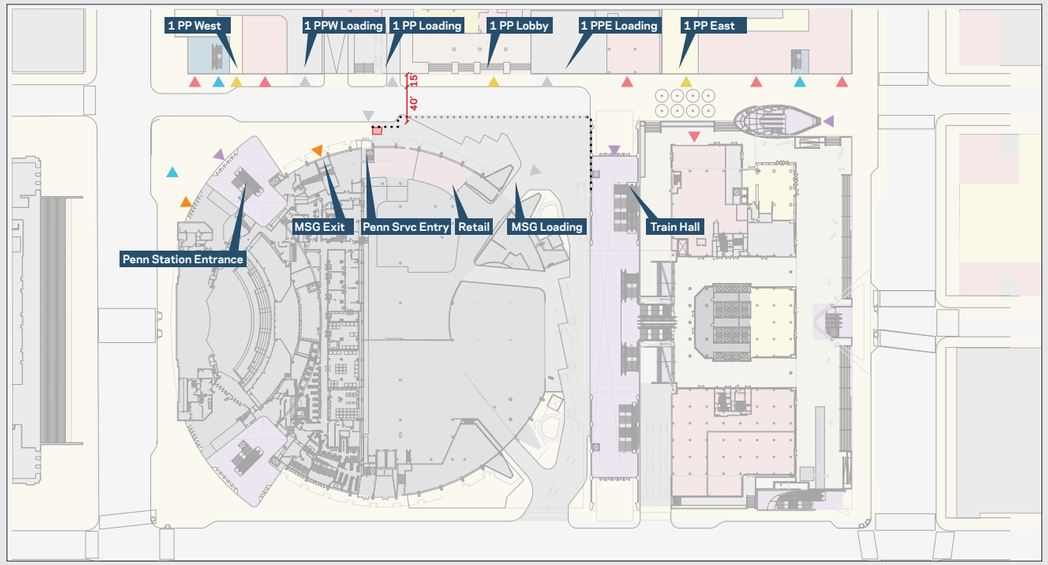


Figure 6.3-13
Loading Base

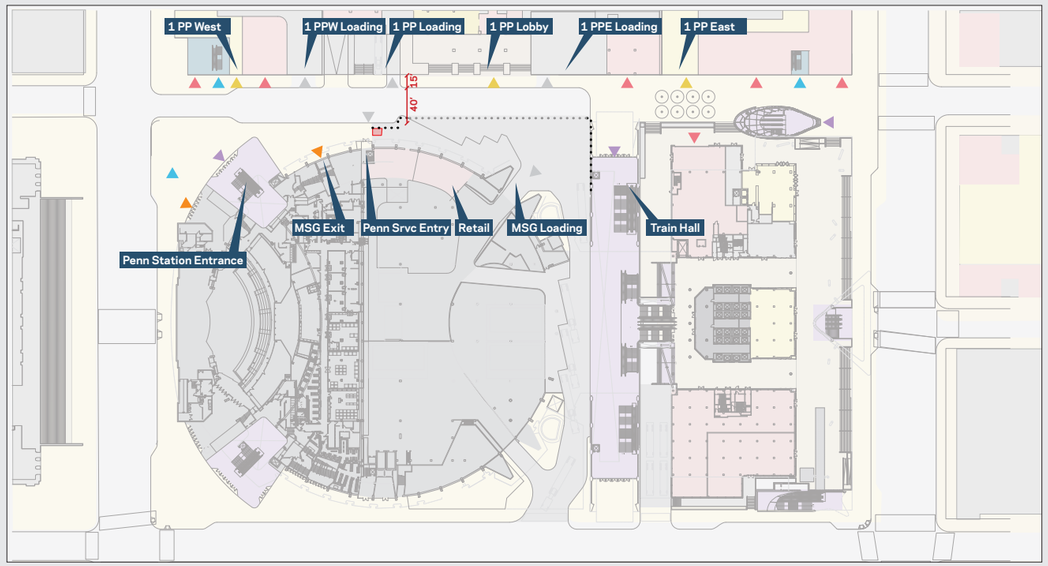
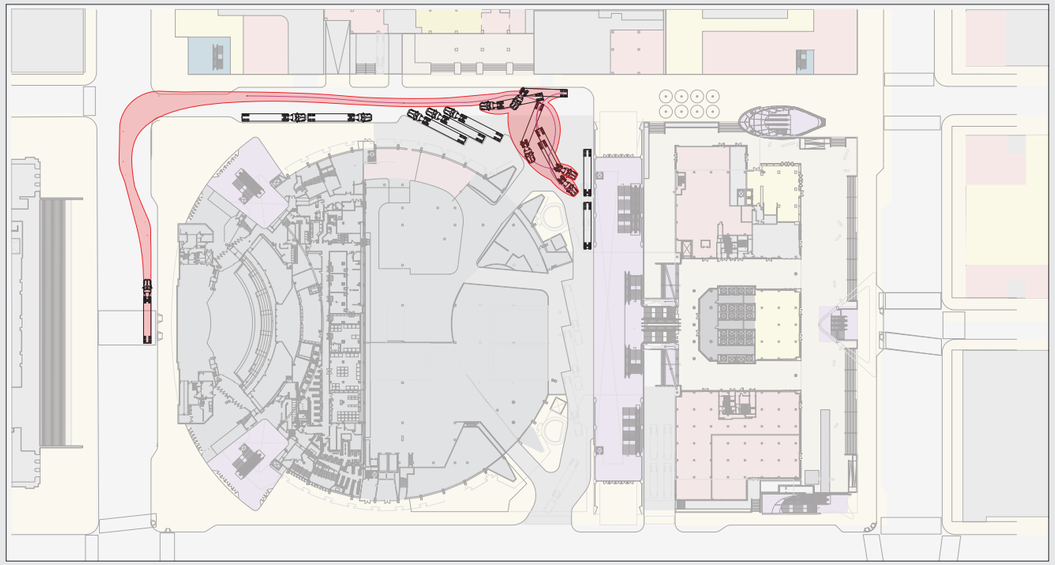


Figure 6.3-13
Truck Turning



Conclusion

These options for 33rd Street provide the basic materials and approaches with which to begin the conversations with a range of stakeholders, including:

- Vornado
- MSG
- NYC DOT
- NYC DCP
- NYC FDNY
- NYC Police Department
- DHS

The final version for the Master Plan will depend on feedback from these and other stakeholders. It will likely incorporate elements from more than one of these options. In addition, it will need to be coordinated with the preferred alternative for the station.

7

Next Steps

The railroads have selected Alternative 4 as the preferred alternative with the following modifications and additional items of study to be considered and developed during the next phase of design:

1. Concepts for retail/waiting mezzanines on the Upper Level at both the east and west ends of the station (see **Figure 7-1, 7-5, 7-6** and reference Page 140).

2. An improved underground connection from the LIRR 33rd Street Concourse to the West End Concourse and Moynihan Train Hall (see **Figure 7-2, 7-3, 7-4**).

3. Additional seated and enclosed waiting areas.

4. Improved entrances at 8th Avenue and 33rd and 31st Streets to greatly increase the street presence of the station, integrated with the adjacent MSG entrances, providing direct access to the Lower Level and secondary access to a retail/waiting mezzanine referenced in Item 1 above (see **Figure 7-7, 7-8**).

5. Concepts for highly visible street-level connections between Penn Station and Moynihan across 8th Avenue.

Figure 7-1

Upper Level

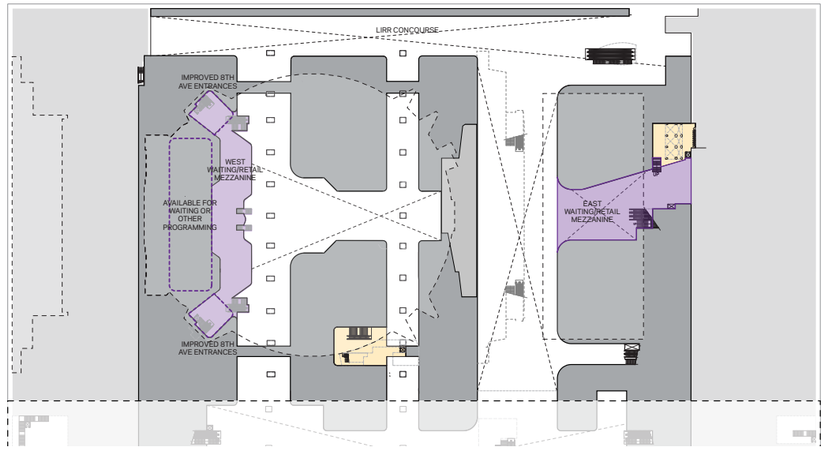


Figure 7-2

Lower Level

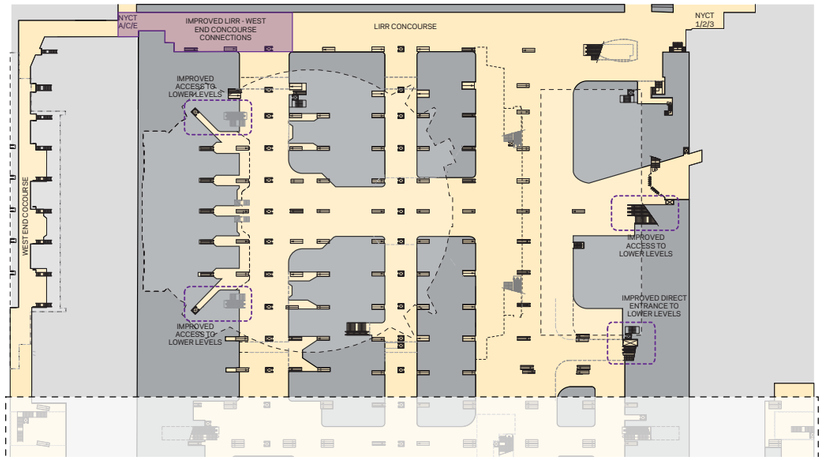
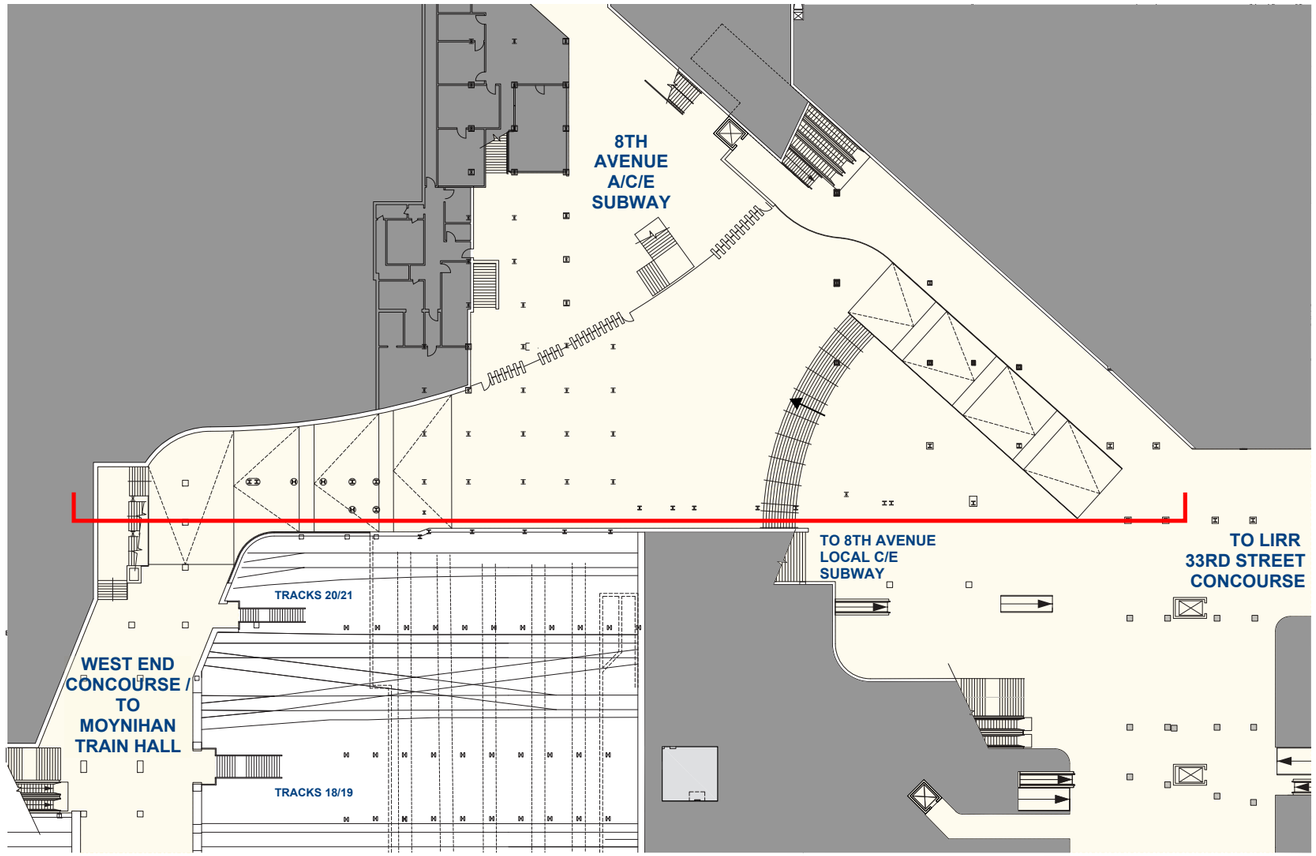


Figure 7-3

Improved connection between LIRR 33rd Street Concourse, 8th Avenue Subway Station, and Moynihan Train Hall.



A reconfiguration of the connection between the LIRR 33rd Street Concourse, the 8th Avenue Subway Station, and Moynihan Train Hall would take advantage of a new building at the northeast corner of 33rd Street and 8th Avenue to create a more gracious and welcoming space. The design lowers the connection area to create additional clear height and opens to the north east to create a street level entrance from 34th Street. The design retains ramped connections while adding a grand stair on the east side. Further study of this configuration will be required.

Figure 7-4

Section looking North through improved connection between LIRR 33rd Street Concourse, 8th Avenue Subway Station, and Moynihan Train Hall.

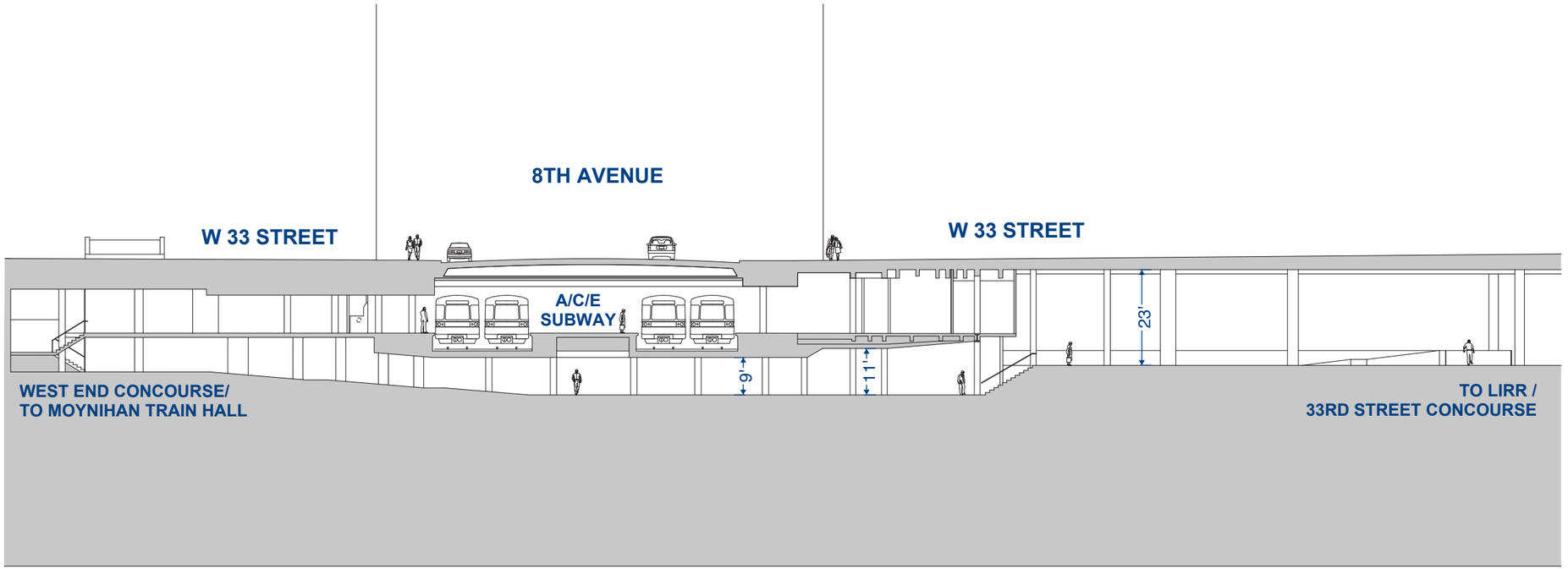


Figure 7-5

View of looking south along the Exit Concourse showing a retail and waiting mezzanine.







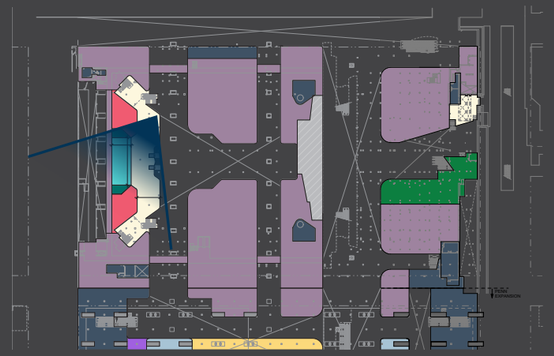


Figure 7-6
View looking south along exit concourse at mezzanine level.



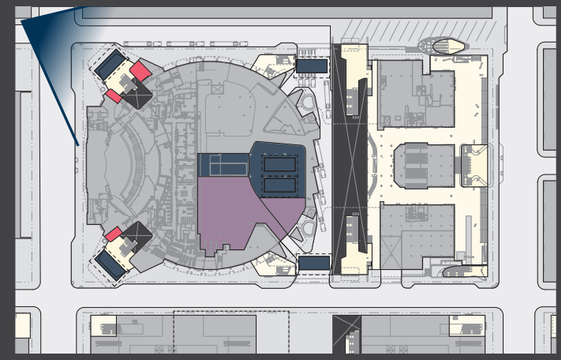


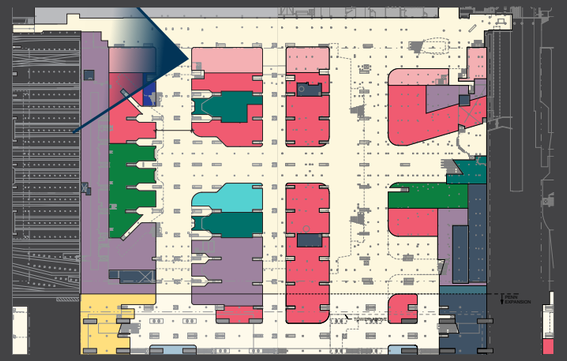
Figure 7-7

View looking east along 33rd Street at 8th Avenue showing integrated MSG entrances and a re-clad Hulu Theater.

Figure 7-8

View from the west end of the LIRR 33rd Street concourse looking west and showing daylighting opportunities from the entrance at 33rd and 8th Avenue.





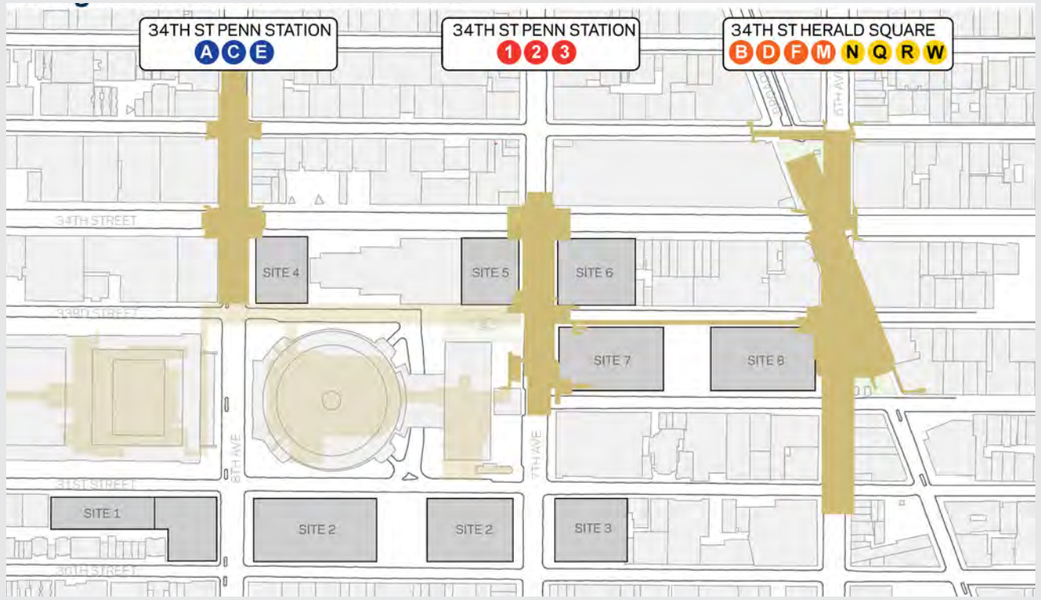
8

Appendices

A **Transit Mitigation** 197

A.
Transit Mitigation

District Transit Stations

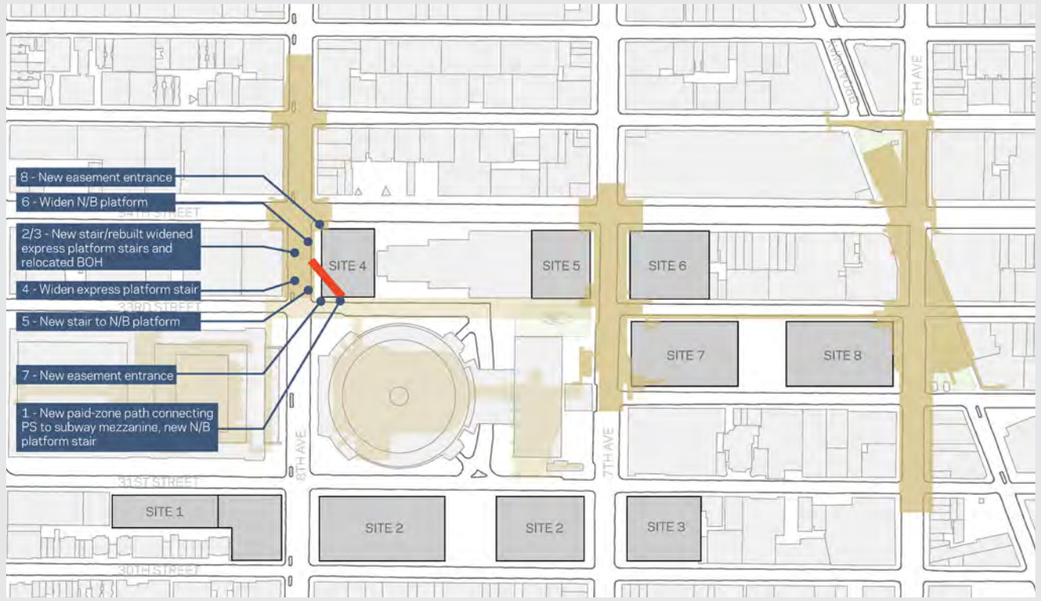


District Wide Mitigations



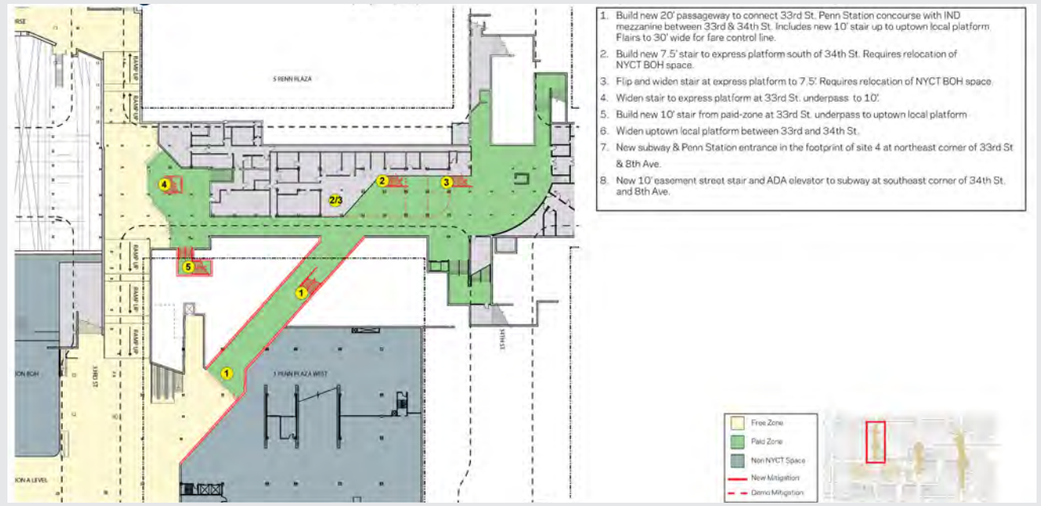
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Overview

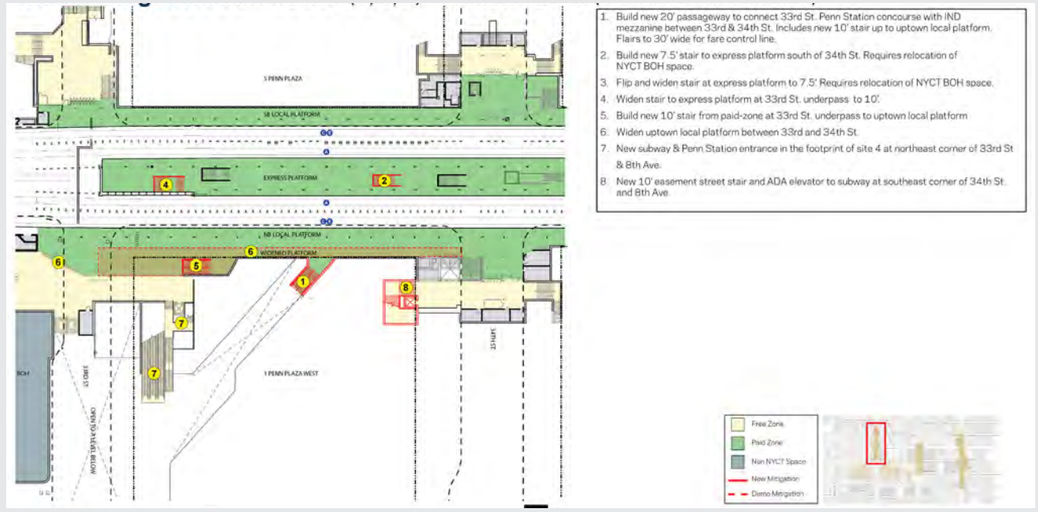


8th Ave IND (A/C/E)

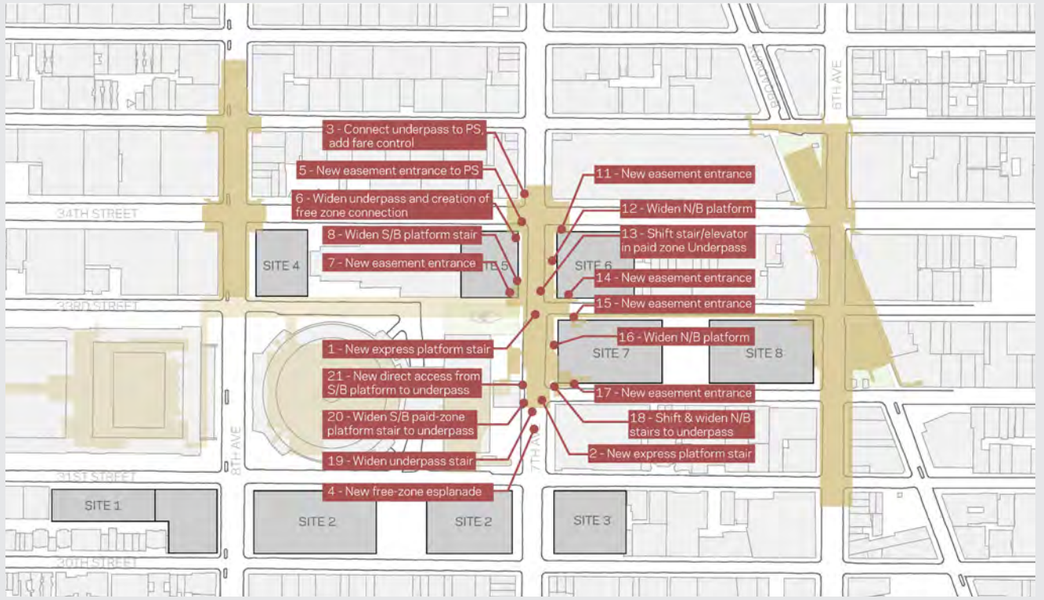
Mezzanine Level (A Level Penn Station)



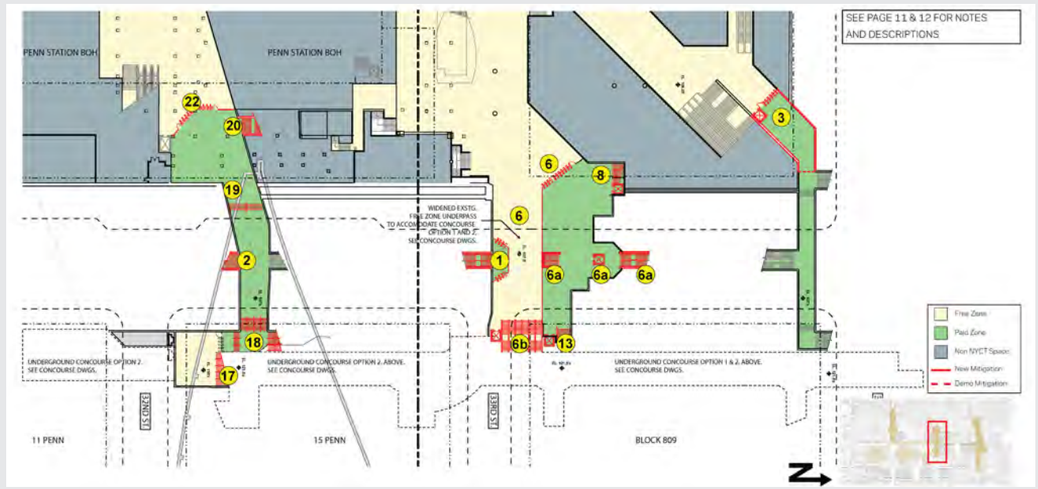
8th Ave IND (A/C/E)
Platform Level (B Level Penn Station)



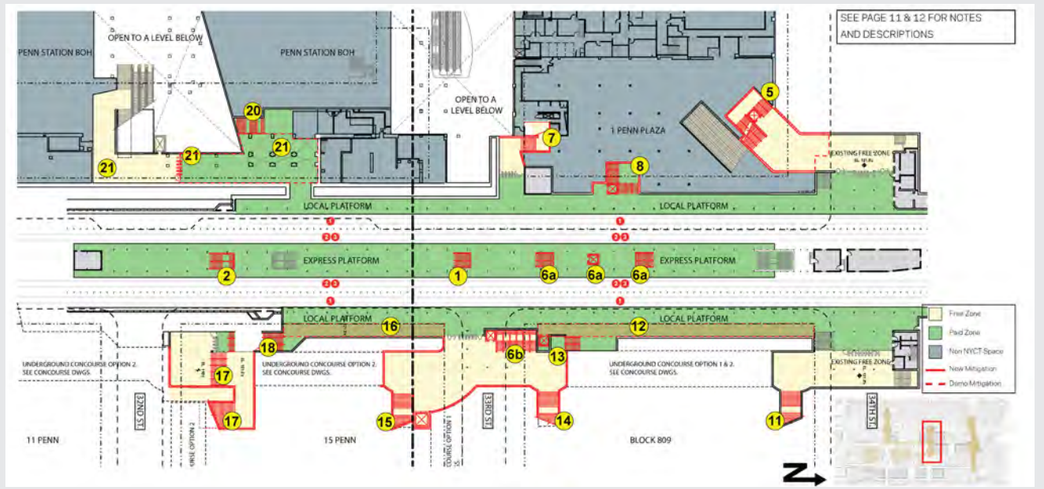
7th Ave IRT (1/2/3)
Overview



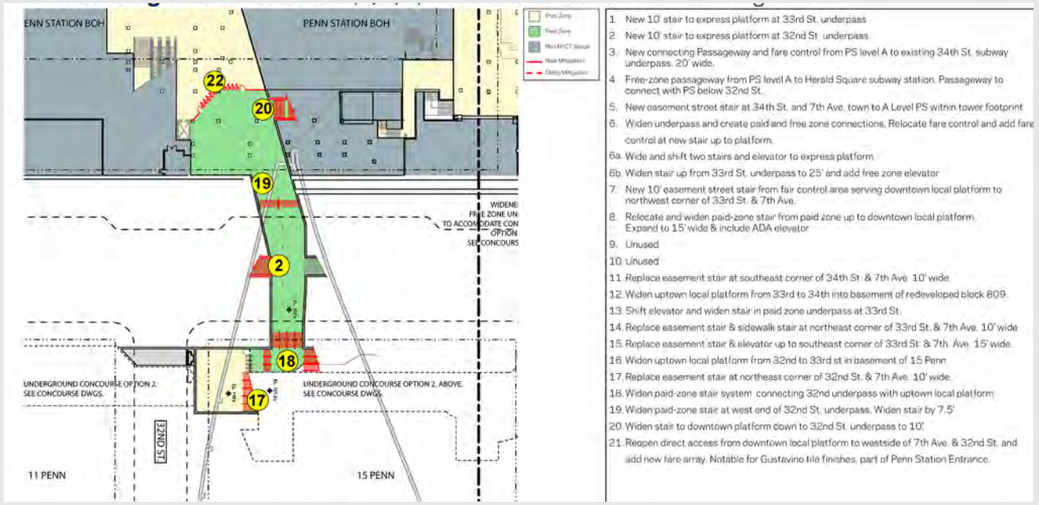
7th Ave IRT (1/2/3)
Mezzanine Level (A Level Penn Station)—Overall View



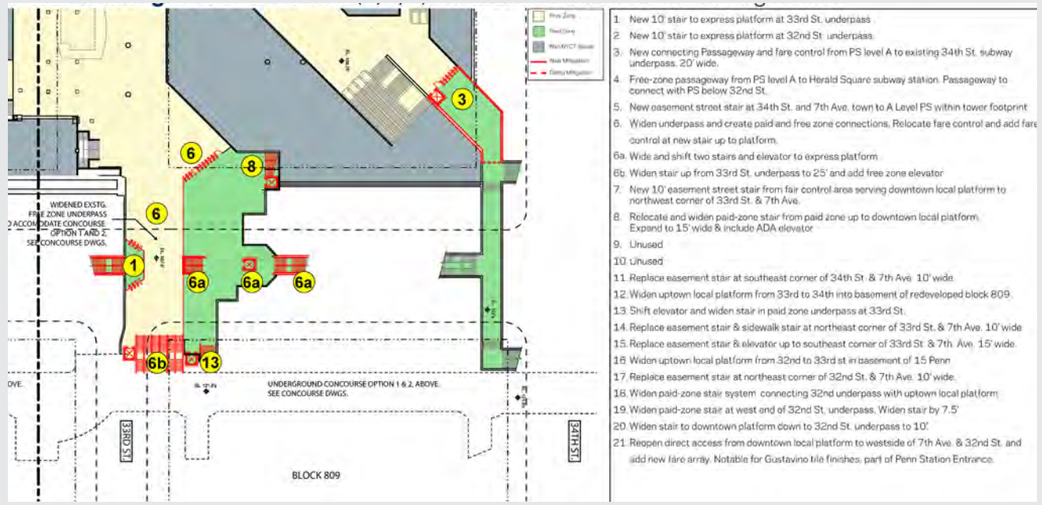
7th Ave IRT (1/2/3)
Mezzanine Level (B Level Penn Station)—Overall View



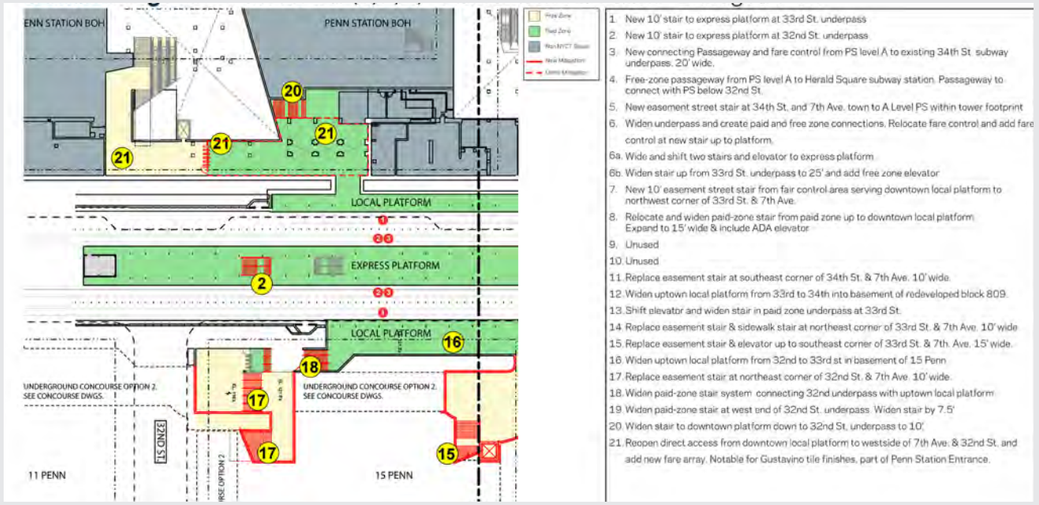
7th Ave IRT (1/2/3)
Mezzanine Level South—Enlarged View



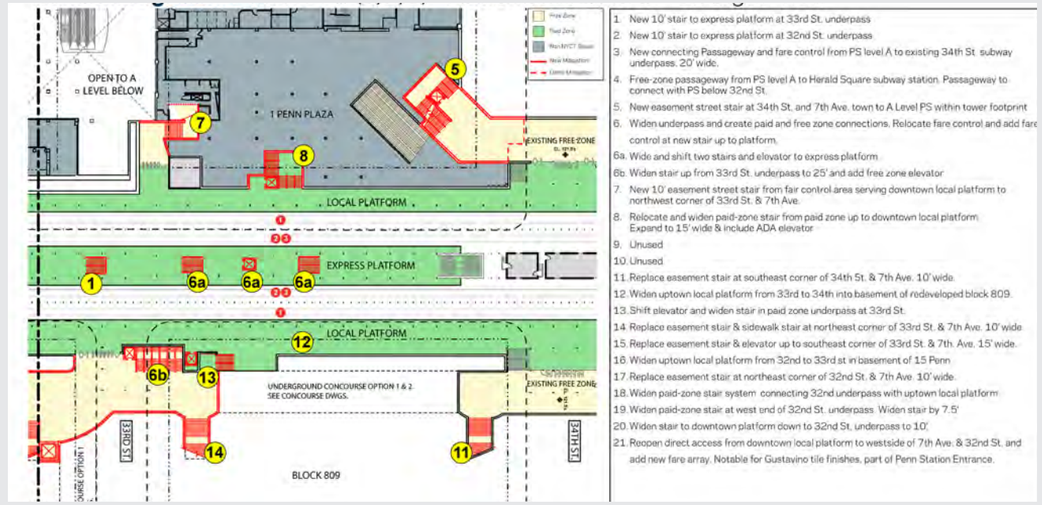
7th Ave IRT (1/2/3)
Mezzanine Level North—Enlarged View



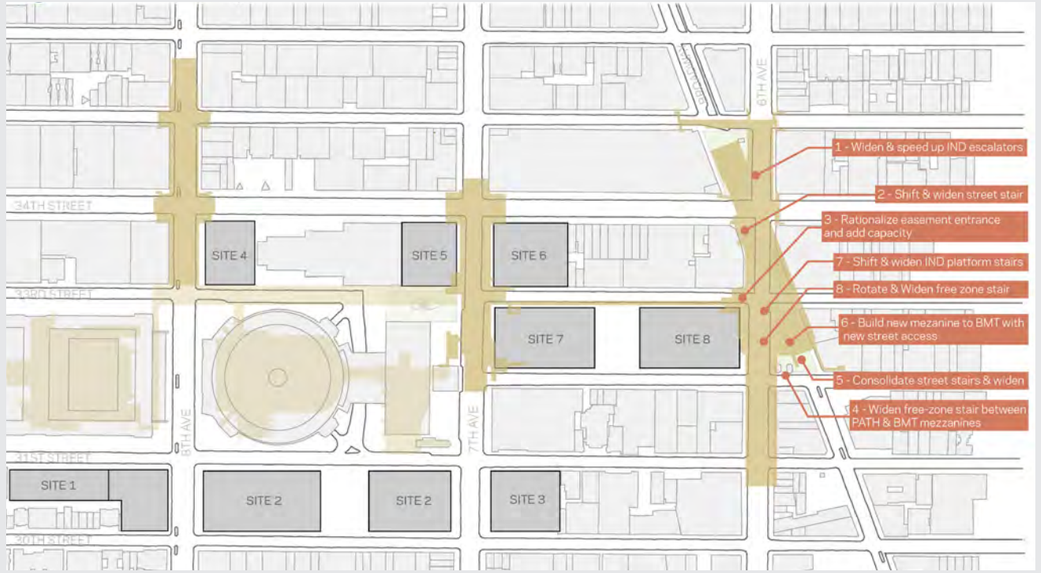
7th Ave IRT (1/2/3)
Platform Level South—Enlarged View



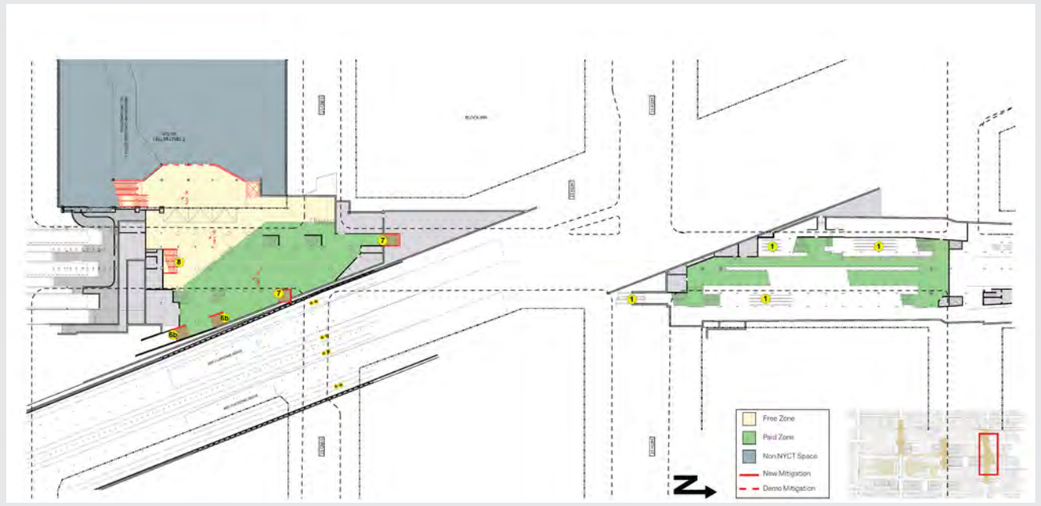
7th Ave IRT (1/2/3)
Platform Level North—Enlarged View



Herald Square (B/D/F/M and N/Q/R/W)
Overview



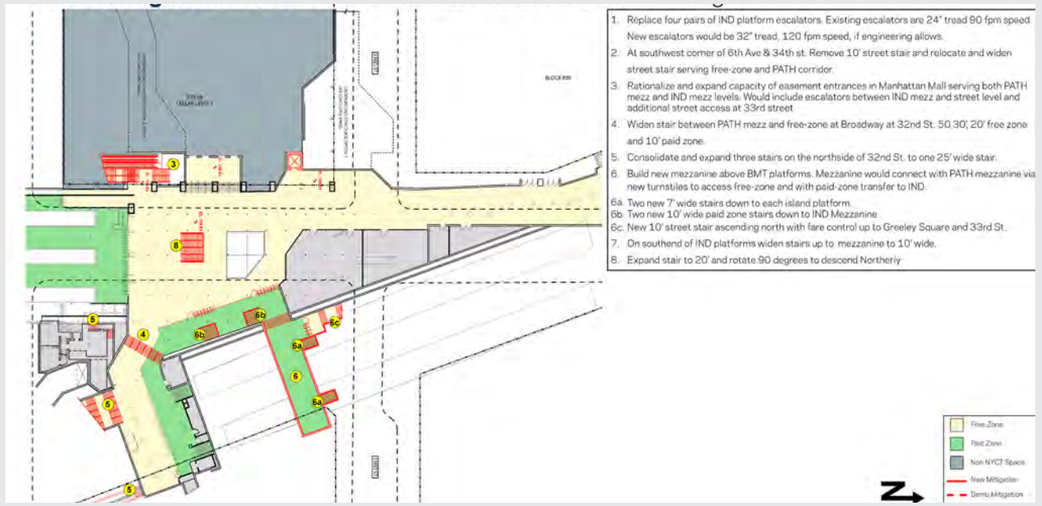
Herald Square (B/D/F/M and N/Q/R/W)
IND Mezzanine Level—Overview



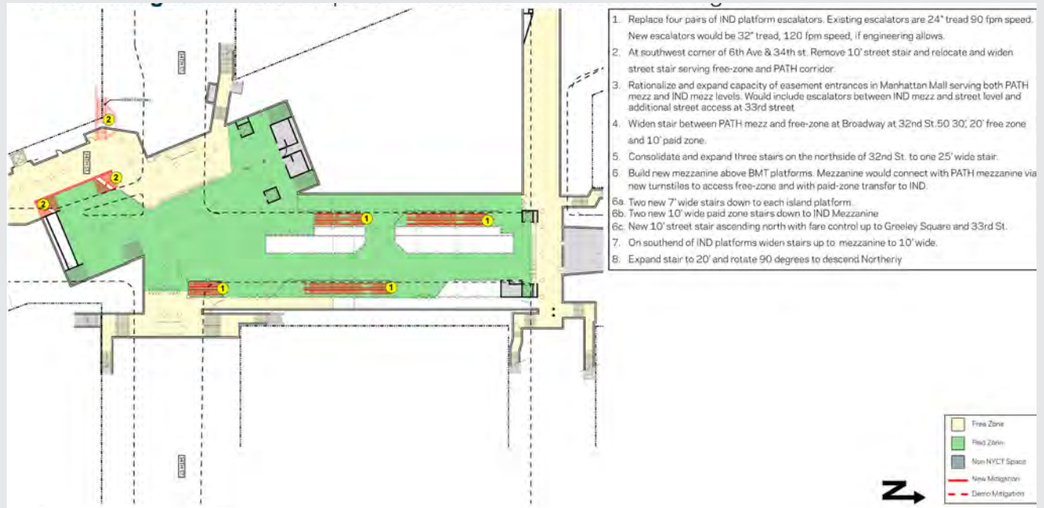
Herald Square (B/D/F/M and N/Q/R/W)
Mezzanine Level—Overview



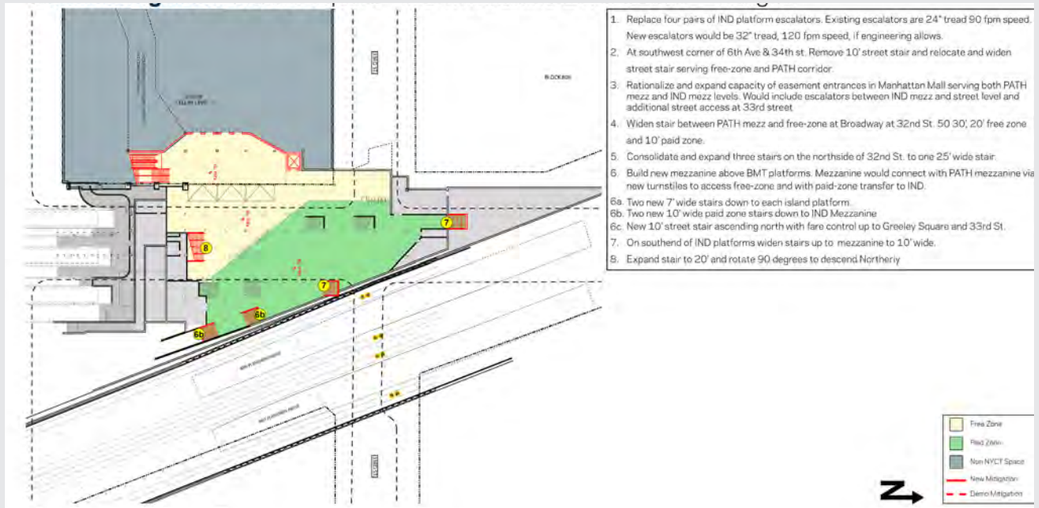
Herald Square (B/D/F/M and N/Q/R/W)
Mezzanine Level South—Enlarged



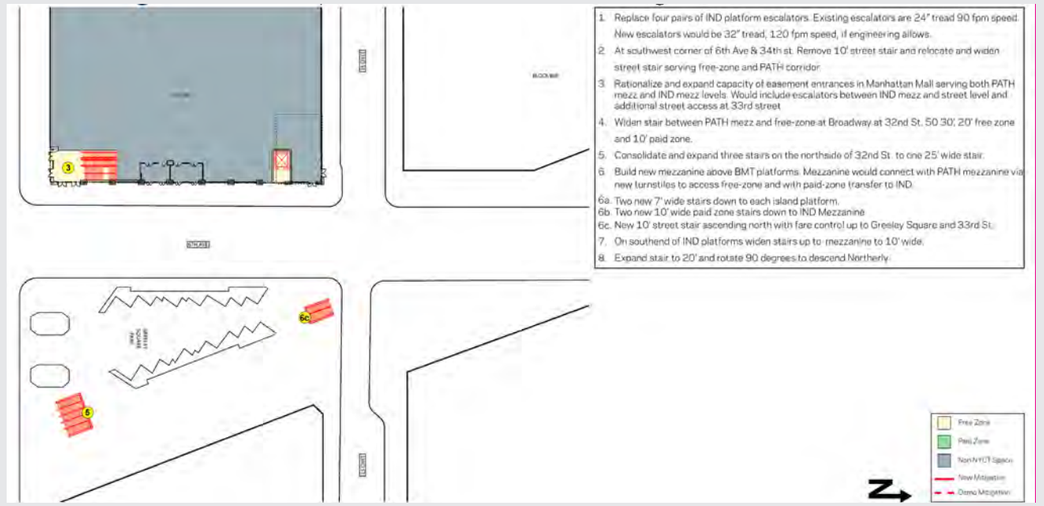
Herald Square (B/D/F/M and N/Q/R/W)
Mezzanine Level North—Enlarged



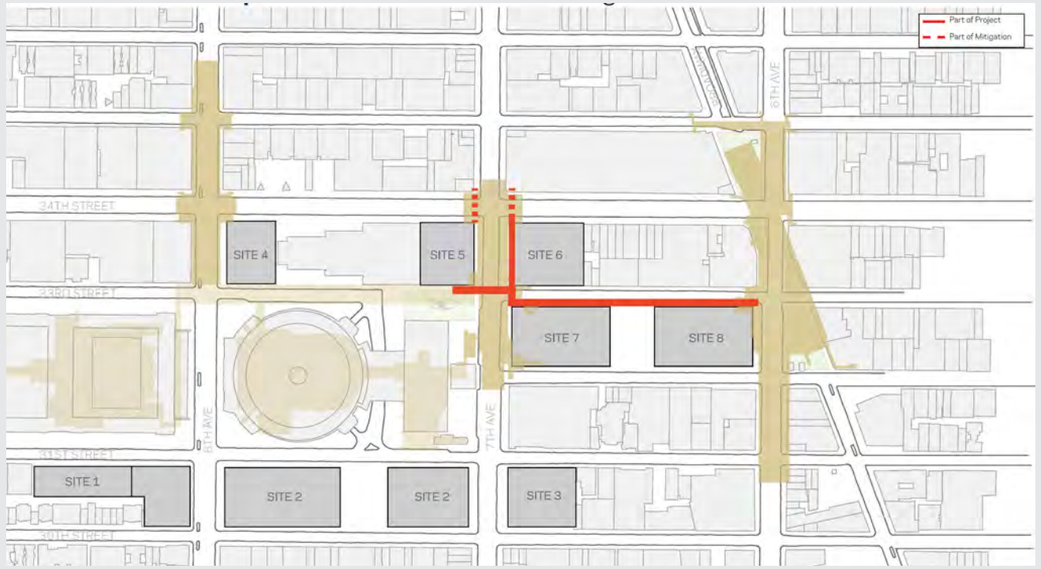
Herald Square (B/D/F/M and N/Q/R/W)
IND Mezzanine Level South—Enlarged



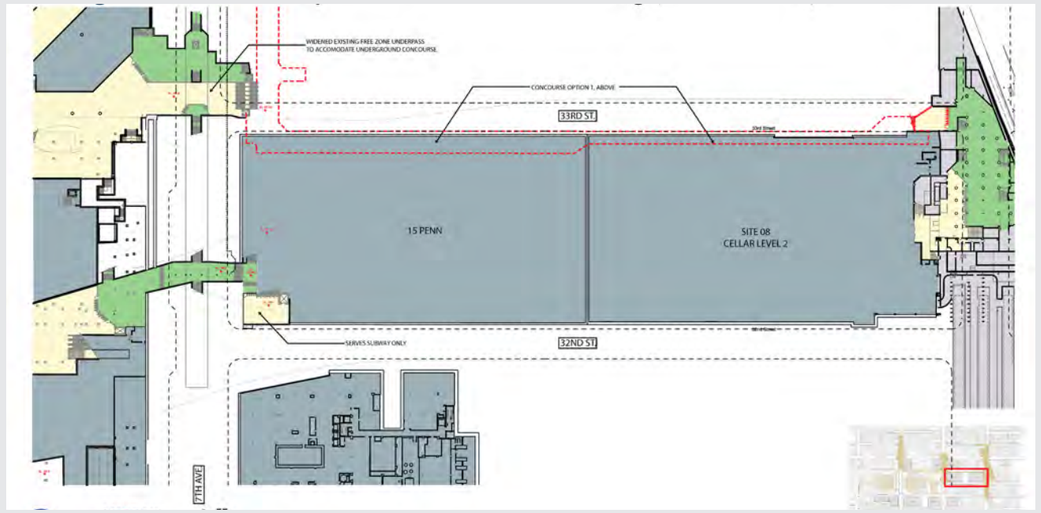
Herald Square (B/D/F/M and N/Q/R/W)
Street Level South—Enlarged



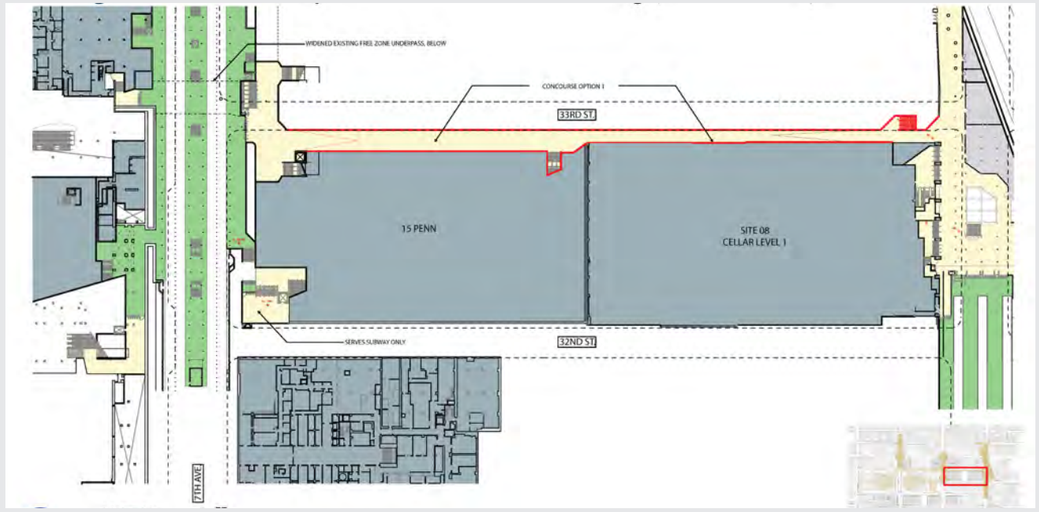
Underground Concourse Option 1
Rebuilt Gimbels Passage



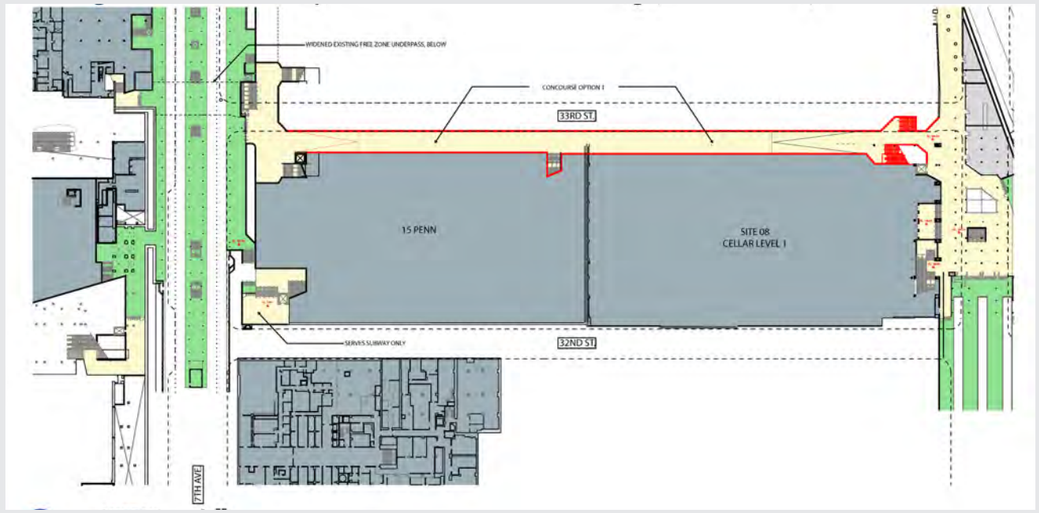
Underground Concourse Option 1
Rebuilt Gimbels Passage, Cellar Level 2, Phase 1



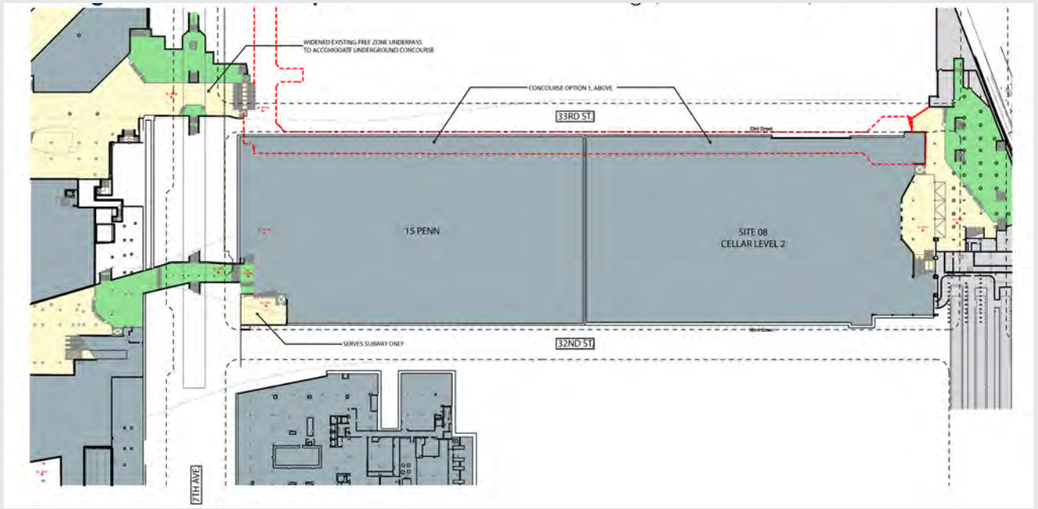
Underground Concourse Option 1
Rebuilt Gimbels Passage, Cellar Level 1, Phase 1



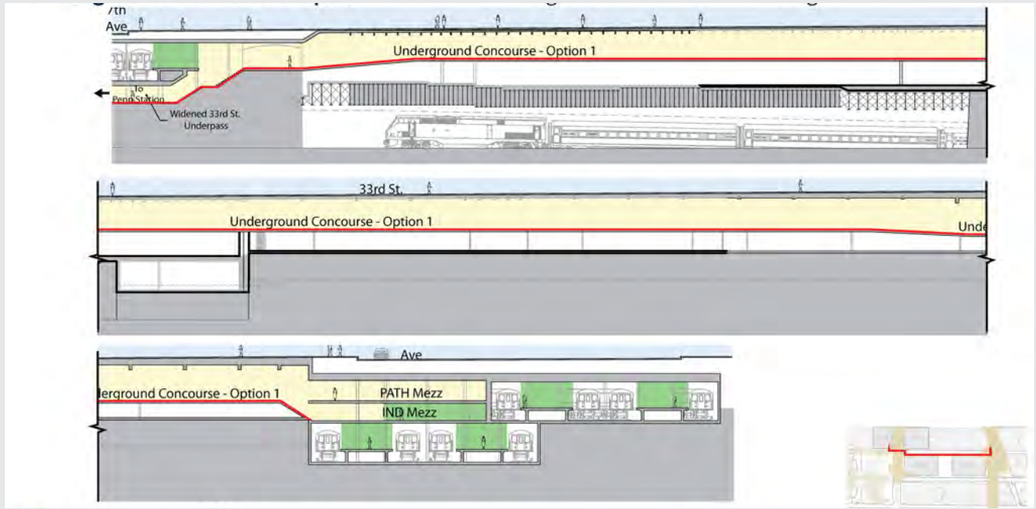
Underground Concourse Option 1
Rebuilt Gimbels Passage, Cellar Level 1, Phase 2



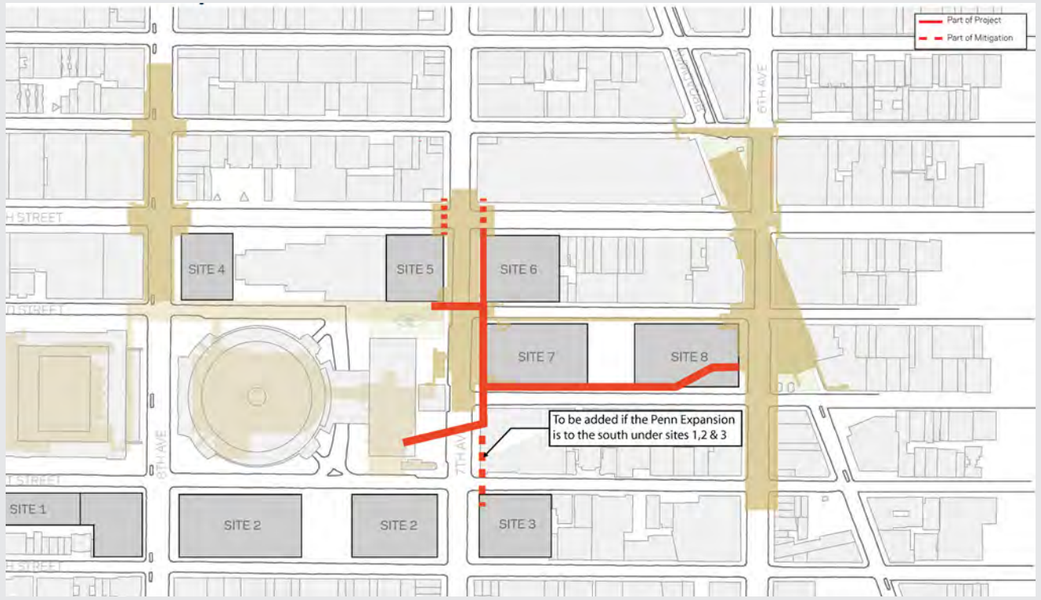
Underground Concourse Option 1
Rebuilt Gimbels Passage, Cellar Level 2, Phase 2



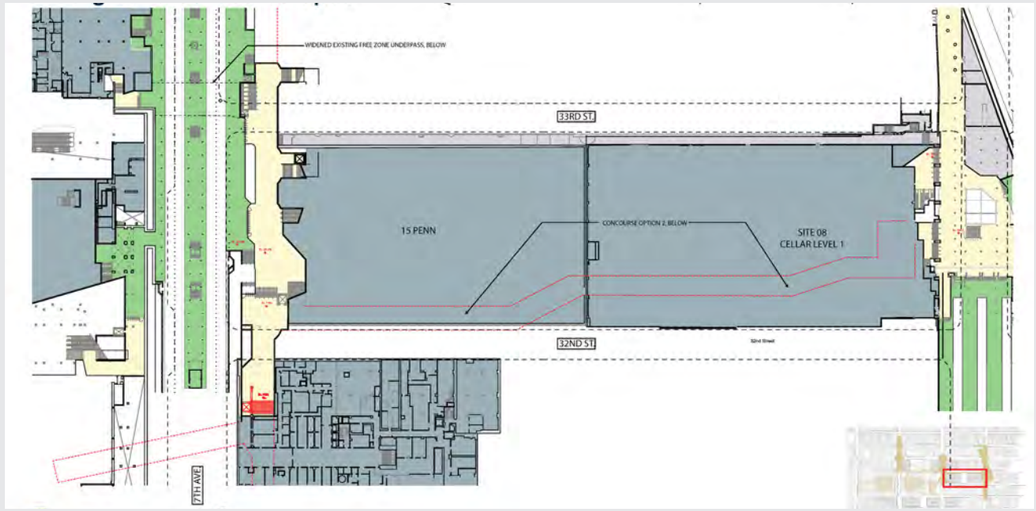
Underground Concourse Option 1
Section Through Rebuilt Gimbels Passage



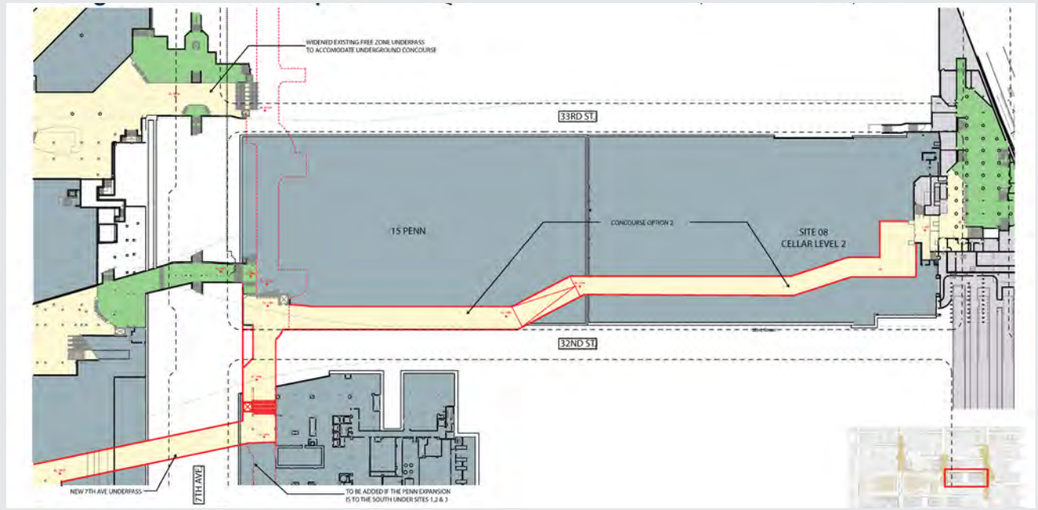
Underground Concourse Option 2
Connector at 32nd Street



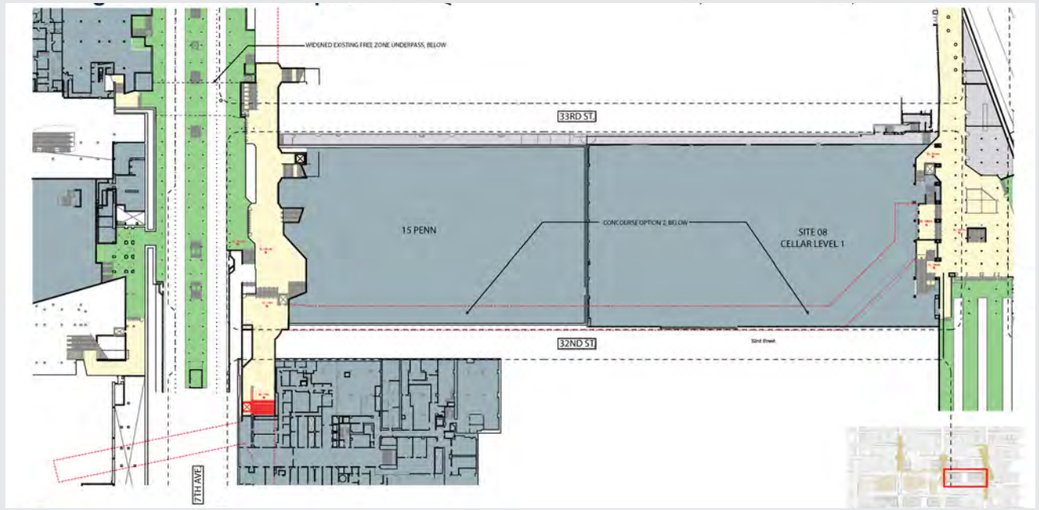
Underground Concourse Option 2
HSQ Connection at 32nd Street, Cellar Level 1, Phase 1



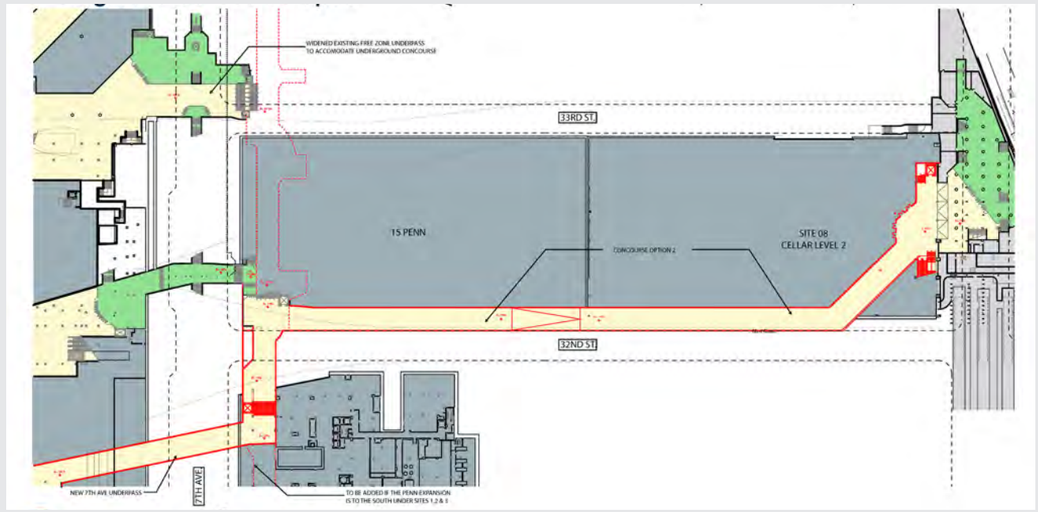
Underground Concourse Option 2
HSQ Connection at 32nd Street, Cellar Level 2, Phase 1



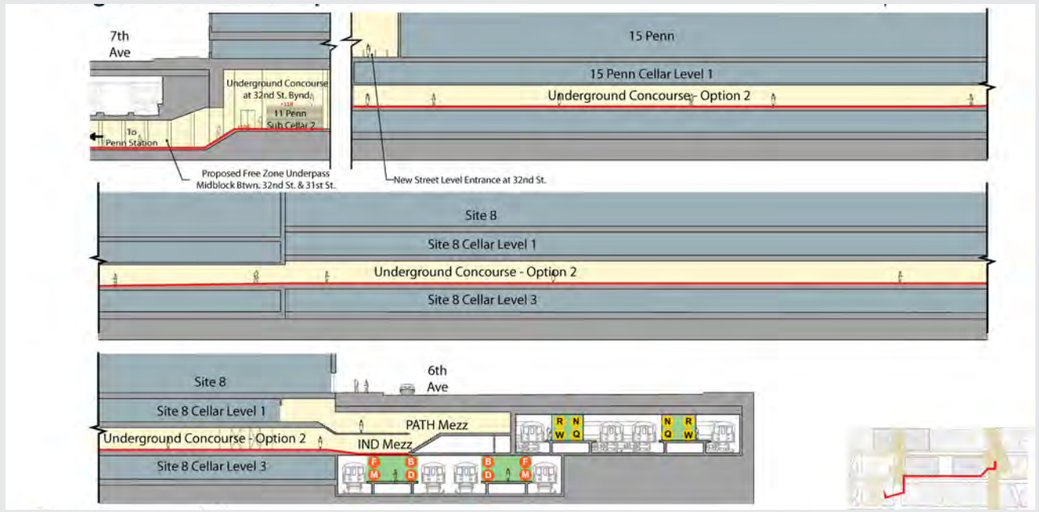
Underground Concourse Option 2
HSQ Connection at 32nd Street, Cellar Level 1, Phase 2



Underground Concourse Option 2
HSQ Connection at 32nd Street, Cellar Level 2, Phase 1



Underground Concourse Option 2
Section of Concourse Through New 7th Ave Underpass



Penn Station Master Plan

Alternatives Report

FINAL — APRIL 2022