Chapter 2: Description of Phase 2 Modified Design

2.1 INTRODUCTION

This chapter provides an overview of the preliminary engineering design for Phase 2 of the Second Avenue Subway that was evaluated in the Final Environmental Impact Statement (FEIS) published in May 2004, and a description of the proposed design modifications for Phase 2 based on advanced preliminary engineering that has been conducted following completion of Phase 1. The preliminary design evaluated in the 2004 FEIS is referred to in this Supplemental Environmental Assessment (Supplemental EA) as the 2004 FEIS Design. The proposed design for Phase 2 based on the advanced preliminary engineering is referred to throughout this Supplemental EA as the Modified Design.

2.2 OVERVIEW AND DEVELOPMENT OF 2004 FEIS DESIGN

2.2.1 SUBWAY ALIGNMENT

The design for Phase 2 of the Second Avenue Subway that was presented in the 2004 FEIS included a two-track alignment beneath Second Avenue from about 105th Street (where the Phase 1 tracks north of 96th Street Station end) to about 124th Street, where the tracks curved west to continue beneath 125th Street. West of the terminal station at 125th Street, storage tracks (referred to as "tail tracks") extended to about midway between Fifth Avenue and Lenox Avenue (or 525 feet west of Fifth Avenue). An additional option for storage tracks extended north along Second Avenue from about 122nd Street to about 129th Street near the Harlem River.

In the 1970s, two tunnel segments were constructed beneath Second Avenue between 99th Street and 105th Street and between 110th Street and 120th Street in anticipation of the new subway planned at that time. However, construction activities were halted due to financial constraints. The 2004 FEIS Design incorporated these tunnel segments into its tunnel alignment, consistent with design criteria established for the Project during its planning phases (see Section 1.2.3 in Chapter 1, "Project Overview," of this Supplemental EA).

The 2004 FEIS Design included three new stations as part of Phase 2, located at 106th Street, 116th Street, and 125th Street between Lexington and Park Avenues. The 125th Street Station provided direct transfers to the existing Lexington Avenue (4/5/6) subway line and a connection to the existing Metro-North Railroad, which runs above Park Avenue, via a subsurface connection to the Harlem-125th Street Station. Each new station included at least two entrances and two ancillary facilities. Preliminary locations for those station entrances and ancillary facilities were described in the 2004 FEIS.

2.2.2 STATION PLANNING

As described in the 2004 FEIS (see FEIS page 2-17), the 2004 FEIS Design included conceptual designs for each station; detailed designs for the stations were to be developed during future design stages. All stations would accessible in accordance with the Americans with Disabilities Act

(ADA) and all would meet life-safety standards of the National Fire Protection Association (NFPA). As described in the 2004 FEIS, entrances to the new Second Avenue Subway stations would consist of a combination of elevators, escalators, and stairs, with every station served by at least one elevator. In addition, each entrance would be covered; this could consist of locating the entrance in the interior of a building or beneath a canopy. The features of the new stations would vary, depending on the volumes of passengers expected at the station and the number of tracks.

In addition to tracks and stations, the new subway line would also require ancillary facilities, such as ventilation facilities, substations, pump rooms, maintenance rooms, fan plants, and emergency access points. The 2004 FEIS said (see FEIS page 2-22) that at each station, new above-ground structures would house the tunnel and station ventilation functions, including fresh air intake, exhaust, emergency smoke exhaust, and relief of air pressure build-up caused by the movement of trains (the "piston" effect). According to the 2004 FEIS, most ventilation structures would also provide emergency egress from the station below and, in some cases, a station entrance could also be included in the same building.

The 2004 FEIS also described the potential size, shape, and design concepts for new station entrances and ancillary facilities, while noting that the specific design of these features were still being developed and were subject to change. The 2004 FEIS described that the specific location of station entrances would depend on anticipated passenger demand, so that larger entrances could be located where higher ridership demand was expected; proximity to bus transfers; maximizing geographic distribution of station entrances along the alignment; and minimizing environmental impacts related to the station entrances and ancillary facilities.

To accommodate the station entrances, ancillary facilities, and emergency exits, the 2004 FEIS described that easements or property acquisitions would be required at every station. Chapter 8 of the 2004 FEIS presented a preliminary list of the specific properties identified for that purpose and noted that "These locations are not final; it is possible that some will shift during continuing engineering from their currently proposed locations to other similar locations in the same vicinity, and/or that additional, similar properties could be required" (FEIS page 8-8).

Chapter 8 of the 2004 FEIS also described the process MTA used to identify the preliminary locations for station entrances and ancillary facilities for the 2004 FEIS Design (see FEIS page 8-9). That section of the 2004 FEIS stated:

> When entrance and ancillary space can be placed in an existing large building, it would occupy portions of the basement and lower levels. In existing small and/or older buildings, however, use of lower-level space could be impractical without acquisition of the entire building because of structural considerations. Typically, it would be necessary to acquire one or several adjacent small buildings to accommodate the necessary subway functions.
>
> The various entrances and ancillary facilities will each pose unique requirements in terms of their dimensions, quantity, and locations. Moreover, the project must comply with all relevant federal, state, and local codes for both station entrances and emergency egresses, and for the venting facilities and other structures. Therefore, the first steps in identifying locations where acquisitions would be needed were to 1) identify the area and/or volume needed for each required system component; 2) use ridership modeling to determine where the anticipated peak demand would occur; and 3) conduct a

> detailed survey of each station area to identify potential properties for acquisition that would best meet the project needs while minimizing the impact to the surrounding neighborhood.
>
> The selection of individual properties required for either full or partial acquisition seeks to limit the impacts to the community and environment by minimizing the need for residential and business displacement to the extent practicable, and to avoid impacts to such community facilities as schools, parks, houses of worship, or libraries to the extent practicable.

Chapter 8 of the 2004 FEIS described the specific site selection process used to identify possible locations for station entrances, ancillary facilities, and emergency exits. That information is presented below.

2.2.2.1 SITE SELECTION PROCESS FOR STATION ENTRANCES

Station entrances would be provided at locations where the largest numbers of passengers are expected, based on ridership modeling information; at or close to major cross streets and destinations; and to facilitate transfers to other subway lines and bus routes. The 2004 FEIS identified preliminary locations for station entrances for the full Project, based on ridership projections and other information available at that time. As part of the 2004 FEIS and preliminary engineering process, for each station entrance location, surveys were conducted to identify any plazas, arcades, vacant properties, and underdeveloped sites that might be appropriate for a new entrance location. Locational constraints were also identified, such as major utilities that might interfere with station elements, and vertical and horizontal alignment constraints governing the location of the station. Existing, pending, and possible future Special Transit Land Use District (STLUD) zoning easements were used wherever they met the Project's needs in terms of volume and location.

The STLUD was established in 1974 along Second Avenue to support construction of the Second Avenue Subway as proposed at that time. The district was mapped on Second Avenue where the future Second Avenue Subway stations were to be located in the 1970s. By encouraging transit entrances off of the sidewalk, it was intended to ease pedestrian flows, provide light and air to underground transit facilities, encourage development that promotes needed pedestrian amenities, coordinate present and future relationship of land uses within the district, and conserve the value of land and buildings. At locations in the mapped special district, developers of new buildings must coordinate with the New York City Department of City Planning and MTA to determine whether MTA wishes to obtain a transit easement, and if so, the developer must provide that easement. MTA has obtained several easements in buildings that were developed after the special district was mapped. However, the 2004 FEIS Design was not the same as the previous, 1970s plan for the new subway, so the STLUD areas were not consistently located in appropriate places for the new subway's stations.

Based on surveys and identified constraints, a preliminary list of possible entrance locations was prepared for the 2004 FEIS Design, with possible locations ranked in descending order of priority as follows:

- Existing STLUD easements (if available);
- Pending and future STLUD easements;
- Vacant lots and buildings;

- Plazas and arcades;
- Possibilities for joint developments (i.e., new construction accommodating an entrance within a larger building being developed for some non-transit use); and
- Open spaces such as parks, where no other feasible and prudent alternative is available, and using all practicable measures to minimize harm to the open spaces.

Where no such sites were available, the use of portions of existing structures with street-level retail facilities was next considered. Any such properties were examined to determine whether portions of the retail spaces could be used without requiring relocation of the entire business. If the dimensions of the space were such that the entire use, and potentially any uses above the retail space, would have to be displaced (typically in older, less structurally solid buildings), acquisition of the entire building and relocation of its occupants was assumed. Acquisition and relocation of buildings containing residential occupants was only considered after all other possibilities were exhausted. Use of historic resources, public open spaces, or community resources was avoided unless no feasible or prudent alternatives were available. To the extent that such properties were considered, additional alternatives analyses were conducted, and a preliminary assessment of impacts was conducted.

During this process, when acquisition of residential or commercial properties would be required because of the absence of other suitable sites, MTA generally sought first to identify large, modern buildings where construction could occur in the buildings' lobbies, basements, or storefronts without requiring displacement of the residents or workers above. If such structures were not available, the smallest buildings (typically 5 stories or smaller) were then identified. Because of the smaller lot size (typically 25 feet wide), age, and structural condition of these buildings, generally it is not possible to use only a portion of the structure while leaving other existing uses in place. Therefore, when sites on small lots were identified, the entire building was identified for acquisition.

2.2.2.2 SITE SELECTION PROCESS FOR ANCILLARY FACILITIES

While locating suitable properties for ancillary facilities allows for more flexibility than station entrances, there are still a number of constraints regarding their siting. For example, the tunnel ventilation facilities must be located within a certain limited distance from each end of the station platform. As part of the 2004 FEIS and preliminary engineering process, the preliminary selection of properties for the Project's ancillary facilities was made to account for these constraints.

As with station entrances and emergency egress facilities, site selection for ancillary facilities consisted first of conducting site surveys within the various station areas. According to New York City's Zoning Resolution at that time, the easement volumes provided under the STLUD could be used only for station access and pedestrian circulation purposes. Therefore, STLUD easements were not considered for ancillary facilities that did not provide a pedestrian amenity. Generally, the site selection process for ancillary facilities considered use of the following types of properties in descending order of priority:

- Vacant lots;
- Vacant or deteriorated building sites;
- Open spaces (non-parkland);
- Plazas and arcades;

- Retail or commercial properties; and
- Residential properties or community resources.

As with station entrances, use of historic resources, parkland, religious institutions, and other community facilities was avoided unless no feasible or prudent alternatives were available. An effort was also made to minimize residential displacements within the locational constraints of siting these ancillary facilities. Consideration was also given to whether the site could be redeveloped after construction of the ancillary facility space for residential, commercial, or some other use in addition to the transit use.

2.2.2.3 SITE SELECTION PROCESS FOR EMERGENCY EGRESS

In addition to regular station entrances, the 2004 FEIS noted that emergency staircases would be provided for evacuation of stations and tunnels and to allow access by emergency services personnel in emergency situations. The number and location of emergency egress facilities is largely governed by federal, state, and city codes. Generally, site selection for emergency egress facilities included considering use of the following types of properties in descending order of priority:

- Pending and future STLUD easements, or existing STLUD easements that have agreements allowing such use;
- Incorporation in property acquired for entrances or ancillary facilities; and
- Plazas and arcades.

2.2.3 CONSTRUCTION METHODS AND ACTIVITIES

2.2.3.1 OVERVIEW

The 2004 FEIS described the activities associated with construction of the new subway through a variety of geological conditions. As described in Chapter 3 of the 2004 FEIS ("Description of Construction Methods and Activities"), the primary activities would be a combination of tunneling with Tunnel Boring Machines (TBMs), mining underground, and cut-and-cover excavation from the surface.

2.2.3.1.1 Excavation with TBM

Where possible, the new subway would be conducted using underground methods, primarily through the use of TBMs to drill the new tunnel through Manhattan's hard bedrock. The use of TBMs for tunnel excavation would greatly reduce the amount of construction activity at the surface in comparison to an open excavation. For this type of tunnel, a large shaft would be excavated and the TBM (or TBMs) would be assembled in the shaft. From that point, the TBM would tunnel forward through rock, with the excavated material being removed behind the machine through the shaft. The TBM shaft site would serve as a major construction support site during the tunneling activity, with excavated materials (referred to as spoils) being removed from the tunnel, workers entering and exiting the tunnel, and construction materials being delivered to the tunnel at that location.

2.2.3.1.2 Mining

In some locations, excavation would occur underground through mining rather than by using a TBM. For example, mining would be used to excavate rock to create some station areas. It could

also occur for short tunnel segments, where use of a TBM is not economical. Mining can include hard rock mining using controlled drill and blast methods and soft ground mining with ground improvement:

- Hard rock mining usually involves the use of controlled drilling and blasting, in which a grid of small holes is drilled and explosives are inserted and then detonated sequentially. After each blast, the fragmented rock is removed and the perimeter walls may be supported by a combination of rock bolts, welded wire fabric, steel, and/or sprayed shotcrete (a type of concrete).
- Soft ground mining typically involves the use of mechanical excavators rather than drilling and blasting. Generally, the soil is first hardened, typically through the injection of grout or through temporary freezing, to maintain its stability during excavation. This process of hardening the soil is often referred to as "ground improvement."

2.2.3.1.3 Cut-and-Cover Excavation

In some locations where the tunnel would not be in bedrock, cut-and-cover construction would be used to excavate the subway tunnel or stations. This type of construction involves excavating from the surface, with a temporary deck above the excavation area to allow the affected area of roadway or sidewalk to continue to be used while work is under way below ground. Once the tunnel is complete, the area above would be permanently backfilled, and the road and sidewalk restored to their permanent condition.

For areas that are excavated in soil, support walls would be constructed along the edges of the excavation. Typically, these would be either slurry walls or walls constructed of secant piles:

- Slurry walls are reinforced concrete walls constructed using a slurry (wet mix) of bentonite, a natural, clay-like liquid material. This involves excavating a trench where the wall will be, filling it with slurry, lowering a large cage of reinforcing steel into the slurry-filled trench, and then piping concrete into the trench that displaces the slurry. Construction of slurry walls requires a slurry plant near the construction site where the bentonite is mixed, pumped, stored, and cleaned for reuse.
- Secant pile walls are constructed by drilling piles that interlock to form a continuous wall. This process also involves the use of steel reinforcing cages and concrete as the wall is constructed.

Cut-and-cover construction involves establishing a construction zone over and around the excavation area, with workers and materials accessing the excavation from the surface in that zone. The decking placed above the excavation can be moved to create a larger open area, when needed, and then replaced. The 2004 FEIS noted (FEIS page 3-10), "Because of the disruption that cut-and-cover construction can cause, it would only be used in areas where this is inadequate cover [i.e., soil above the tunnel] to allow safe and stable underground mining."

2.2.3.1.4 Utility Relocation

For areas that are excavated from the surface rather than mined, construction would begin with relocation of utilities. Buried utilities within the excavation zone would either be supported in place or moved to an area outside the excavation area. This would require excavation of trenches within the street and sidewalk to allow connection to existing utilities and laying of new pipes, cables, etc.

2.2.3.1.5 Stations

At all new subway stations for the Second Avenue Subway, including those that are mined and those that are excavated using cut-and-cover construction, construction activities would occur at the surface to create openings for the new entrances, and to construct station entrance buildings and ancillary buildings. At station construction sites, construction zones would be established where workers would move into and out of the station, deliveries would be made, and excavated materials would be removed. In addition, existing buildings adjacent to excavated areas may need to be supported while construction is occurring nearby (see FEIS page 3-16).

2.2.3.1.6 Construction Zones

As described in the 2004 FEIS (see FEIS page 3-22), construction zones would be established at each station and around shaft sites where the TBMs would be inserted and removed. At the staging areas, construction machinery and other equipment and materials would be delivered, stored, and operated. At each staging area, conveyors, trucks, substations, exhaust fans, sidewalk sheds, construction fencing, traffic lane closures, and other similar equipment are likely to result in noise, air emissions, traffic, and aesthetic effects on their surroundings.

Where construction is occurring beneath the street, the construction zone would be located across half the width of the street, and would extend for a block past the station's limits on either end. The 2004 FEIS noted that if off-street areas can be identified for staging areas, it is possible that less space on the street would be required (see FEIS page 3-25). In addition, the 2004 FEIS noted (FEIS page 3-12) that during construction it might be necessary to close off portions of side streets to through traffic adjacent to the station construction zones. This would accommodate limited construction on these side streets for retaining walls, and would allow portions of these streets to be used if needed to store construction materials that are trucked to the site, accommodate worker support areas, accommodate utility diversions, and other similar activities. On all side streets adjacent to station construction, areas of up to 100 feet in length could be required for staging and construction activities. On streets where entrances would be constructed, the 2004 FEIS said that this construction zone might extend farther, typically up to 200 feet.

In the construction zones, sidewalk widths on each side of the street would also typically be reduced, but pedestrian circulation would be maintained and temporary signage highlighting entrances to stores, businesses, or other activities would be provided.

At all construction locations for the Second Avenue Subway, a Maintenance and Protection of Traffic (MPT) Plan would be developed in coordination with the New York City Department of Transportation (NYCDOT) to maintain traffic flow near the construction zones and to ensure that a seven-foot sidewalk is maintained at all times. The MPT Plans may entail the use of parking lanes, and potentially the use of portions of the sidewalk for moving traffic, so as to allow traffic to be rerouted around the construction zone.

The 2004 FEIS and Record of Decision set forth noise mitigation requirements that construction contractors would be required to meet. As stated in the 2004 FEIS (FEIS page 12-51), techniques that may be implemented to meet these requirements may include enclosing areas where spoils from tunnel operations would be loaded into trucks, or at station locations where spoils removal would take place for long durations during the daytime or at night; and placing some equipment or operations below grade in shielded locations.

2.2.3.1.7 Schedule

Total construction duration for the Project was estimated at 16 years. It was anticipated that construction of each phase could overlap with the previous phase(s), depending on the availability of funding. Phase 1 was estimated at seven years, Phase 2 at seven years, Phase 3 at nine years, and Phase 4 at seven years. At each new station, construction was estimated to affect a three- to five-block area for three to five years.

2.2.3.2 EAST HARLEM ALIGNMENT

The 2004 FEIS Design involved construction of the new Second Avenue Subway alignment from the end of the tunnels constructed in Phase 1 under Second Avenue at approximately 105th Street to a new terminus under 125th Street approximately 525 feet west of Fifth Avenue. The new alignment under Second Avenue in East Harlem would make use of the existing tunnel segments built in the 1970s, which are located between 99th and 105th Streets and between 110th and 120th Streets. The segment between 99th and 105th Streets was completed with tracks as part of Phase 1 and is currently being used for train storage north of the 96th Street Station.

From 105th Street to about 122nd Street, the new tunnel in the 2004 FEIS Design would have been constructed by cut-and-cover construction, using the existing 1970s tunnel segment where possible. This would involve excavation of the 106th Street station area and adjacent tunnel from 105th to 110th Street, reuse of the existing tunnel from 110th to 115th Street, construction of the new 116th Street Station from 115th to 119th Street within the existing tunnel segment (including demolition and reconstruction of the existing tunnel structure), and cut-and-cover excavation north of the 116th Street Station from 120th to 122nd Street. The existing tunnel segment is not deep enough to make use of a TBM feasible for the new tunnel sections in this area.

In the 2004 FEIS Design, the curve between Second Avenue and 125th Street (referred to as the 125th Street curve) would have been constructed by a TBM operating beneath the existing buildings that were at the southwest corner of the Second Avenue and 125th Street. As described in the 2004 FEIS (see FEIS page 3-35), the TBM would have been inserted through a shaft within 125th Street at about Third Avenue and removed from the cut-and-cover excavation area in Second Avenue generally located between 120th Street and midway between 121st and 122nd Street. Spoils would have been removed from the tunnel via the Third Avenue shaft. Because the 125th Street curve was to be in soil beneath existing structures, protective measures, such as ground improvement by injection of grouting, was anticipated in this area to increase the strength and decrease the permeability of the soil.

On 125th Street from Third Avenue (where the 125th Street curve ended) to just west of Fifth Avenue, the 2004 FEIS Design would have involved use of a TBM to excavate the tunnel, in combination with cut-and-cover construction for the 125th Street Station itself (from Third Avenue to Park Avenue). This combination was proposed to reduce the amount of cut-and-cover construction required on 125th Street (see FEIS page 3-35). This TBM would have been removed from a shaft in 125th Street at the end of the storage tracks, approximately 525 feet west of Fifth Avenue.

The 2004 FEIS Design involved constructing the new 125th Street Station using cut-and-cover techniques beneath and beside the existing Lexington Avenue line 125th Street station. The new station would be perpendicular to the existing station, with a new mezzanine level and new platform and track level beneath the existing station. The 2004 FEIS stated that this work would

be done using a combination of cut-and-cover and traditional mining techniques. Escalators and stairs were to be constructed from the new mezzanine up through the lower level Lexington Avenue line station platforms, and escalators were also to be built from the new mezzanine to the upper level of the Lexington Avenue line station. As much of this construction was going to occur immediately under existing, active tracks, the 2004 FEIS stated that subway service disruptions would occur, including track outages (i.e., track closures where subway service would not operate) and limited platform area closures. The 2004 FEIS stated that construction work for the new 125th Street Station would affect service on the Lexington Avenue line on selected nights and weekends for approximately two years.

In addition, the cut-and-cover construction activity for the new 125th Street Station in the 2004 FEIS Design would have involved underpinning the Park Avenue viaduct structure at the Metro-North Harlem-125th Street Station. This might have required speed reductions for Metro-North commuter rail service.

The 2004 FEIS Design also included possible storage tracks (tail tracks) under Second Avenue from about 125th Street to 129th Street. If these were included, they would have been constructed using cut-and-cover methods.

2.3 MODIFIED DESIGN FOR PHASE 2

In 2017, Phase 1 of the Second Avenue Subway opened and MTA began to advance the design for Phase 2 beyond the preliminary design completed for the 2004 FEIS. As discussed in Chapter 1 (see Section 1.4), MTA followed its planning and design process for capital projects to review and update the design. The design process for Phase 2 of the Second Avenue Subway was established to advance the original preliminary engineering design that was developed for the 2004 FEIS and update it by incorporating changes in background conditions, advanced preliminary engineering design, and updated construction methods.

As a result, MTA is now proposing some modifications to the Phase 2 design from what was presented in the 2004 FEIS. This modified design for Phase 2, referred to throughout this Supplemental EA as the Modified Design, is described below. **Table 2-1** at the end of this chapter provides a summary of Phase 2 design modifications.

This section of the Supplemental EA describes the reasons for the design refinements (Section 2.3.1), and the design refinements proposed for the overall Phase 2 alignment of the 2004 FEIS Design as part of the Modified Design, beginning at the south (Section 2.3.2). Following this section, Section 2.3.3 describes design refinements to ancillary facilities and station entrances, also beginning at the south (106th Street Station). Finally, Section 2.3.4 describes changes in construction methods proposed for the Modified Design.

2.3.1 REASONS FOR PROPOSED DESIGN CHANGES

Based on the design and planning process described in Chapter 1, the preliminary design of Phase 2 of the Second Avenue Subway that was presented in the 2004 FEIS (the 2004 FEIS Design) has been refined. There were three primary reasons for modifications to the preliminary engineering:

- **Changes in Background Conditions:** Since the 2004 FEIS and Record of Decision were completed, some background conditions have changed. Following Hurricane Sandy in 2012, NYCT flood protection design standards were updated and now require critical transit-related

equipment to be located at higher elevations;[1] some sites previously identified for entrances and ancillary facilities have been or are planned to be developed with new, larger buildings, which would result in more displacements and complexities in demolition than the previous design anticipated; a rezoning of the 125th Street corridor went into effect in 2008, which encouraged and resulted in large commercial development; an area-wide rezoning of East Harlem was approved in November 2017; and the New York State Office of Parks, Recreation and Historic Preservation has identified a new East Harlem Historic District, centered along East 116th Street from Park Avenue to the FDR Drive, as eligible for listing on the State and National Register of Historic Places (S/NR). These changes in background conditions are described in the subsequent environmental chapters of this Supplemental EA.

- **Advanced Preliminary Engineering:** Subsequent to the 2004 FEIS, site-specific reconnaissance, further engineering, and advanced operations planning (including updated ridership modeling and pedestrian flow studies) have been conducted for Phase 2. The advanced preliminary engineering also incorporates experience gained from other NYCT major capital projects, including construction of Phase 1 of the Second Avenue Subway, the South Ferry terminal station on the No. 1 subway line, and extension of the No. 7 train to the new 34th Street–Hudson Yards Station. These projects have provided valuable experience for continually improving efficiency and cost-effectiveness of construction means and methods, and for informing design of the subway alignment and its ancillary components.
- **Updated Construction Methods:** During the advanced preliminary engineering, and building on the experience developed during construction of Phase 1, MTA has identified modifications to the Phase 2 design to reduce the Project's impacts during construction. This is consistent with the overall goal of minimizing community disruption during construction and with the design criterion of minimizing community and environmental impacts (see Chapter 1, Section 1.2.3). During development of the 2004 FEIS Design, MTA's design engineers sought to reduce the amount of cut-and-cover construction along 125th Street to reduce construction impacts (see FEIS page 3-35) and therefore proposed TBM construction of the tunnel beneath 125th Street in combination with the cut-and-cover excavation for the new station. The Modified Design includes design refinements to further reduce surface construction activity on 125th Street, which is a growing retail and office corridor for East Harlem, Harlem, and Morningside Heights that has been the focus of several New York City initiatives intended to spur commercial growth (see discussion in Chapter 4, "Social and Economic Conditions," Section 4.3). It is also an important crosstown (east-west) traffic route that connects to the RFK Bridge and Henry Hudson Parkway. This wide, two-way street is used by many NYCT bus routes (M100, M101, M103, Bx15, and the M60 Select Bus Service). Recognizing that the 2004 FEIS Design's cut-and-cover construction for the 125th Street Station would have had substantial impacts, MTA explored alternative construction means and methods that could avoid it. As design has advanced, the engineering team has further attempted to avoid or minimize cut-and-cover construction and has made refinements that would allow for mining for the full 125th Street corridor (except for above-ground elements, such as entrances and ancillary facilities) (see Section 2.3.4, "Changes in Construction Methods and Activities," of this chapter for more information).

[1] NYCT Flood Resiliency Design Guidelines (DG312), Issue 7, was most recently updated in July 2017.

2.3.2 OVERVIEW OF CHANGES IN THE PHASE 2 ALIGNMENT

The overall Phase 2 alignment in the Modified Design is generally consistent with the 2004 FEIS Design. As with the 2004 FEIS Design, the Modified Design would include two tracks beneath Second Avenue that would extend from the existing Phase 1 tail tracks at about 105th Street and continue to about 120th Street, where the alignment would curve west to 125th Street. The alignment would continue beneath 125th Street and would have tail tracks extending past the terminal station from about Park Avenue to near Lenox Avenue (see **Figure 1-2** in Chapter 1, "Project Overview"). The exact terminus of the tail tracks depends on design options for storage and operational needs, as discussed in Section 2.3.2.5, "125th Street Tail Tracks," of this chapter.

Like the 2004 FEIS Design, the Modified Design would have three new stations: at 106th Street and Second Avenue, 116th Street and Second Avenue, and 125th Street between Lexington and Park Avenues. The 125th Street Station would provide direct transfers to the existing Lexington Avenue (4/5/6) subway line and provide connections to Metro-North Railroad at the Metro-North Harlem-125th Street Station at Park Avenue. All three new stations would be accessible in compliance with the Americans with Disabilities Act (ADA).

Each alignment segment is illustrated in **Figures 2-1a through 2-5a** and corresponding **Figures 2-1b through 2-5b** provide photographs of entrance and ancillary facility locations that support the discussions in later sections.

2.3.2.1 106TH STREET STATION

As in the 2004 FEIS Design, the Modified Design for the 106th Street Station would include a two-track island platform with a mezzanine level above the track level. The platform and mezzanine level would be located north of 106th Street to avoid major utility lines that run beneath 106th Street. The Modified Design includes the following refinements from the 2004 FEIS Design:

- The proposed island platform has been shifted approximately five to six feet east of the Second Avenue centerline as a result of updated construction methods to reduce impacts to the existing Empire City Subway duct bank (utility line) that runs along the west side of Second Avenue.
- The station has been shifted approximately 50 feet south to accommodate modified station entrances and connections to ancillary buildings, discussed in Section 2.3.3 (see **Figure 2-1a**).
- Station entrances are larger, and ancillary facilities have been shifted and are larger (see Section 2.3.3).

2.3.2.2 116TH STREET STATION

Consistent with the 2004 FEIS Design, the running tracks and the 116th Street Station in the Modified Design would use an existing tunnel box segment—referred to as "Section 13"—which was constructed in the 1970s as part of an earlier plan for a Second Avenue Subway that was subsequently halted as a result of financial constraints. The existing Section 13 tunnel box is located under Second Avenue between 110th and 120th Streets. It includes space for three tracks, originally providing for a storage and inspection track as well as a northbound and southbound track. The 1970s plan for the Second Avenue Subway did not include a 116th Street Station, however, so this track section was not constructed to accommodate a station. Consistent with the 2004 FEIS Design, this space will now be used for the 116th Street Station with a two-track island platform. Therefore, a portion of the existing Section 13 tunnel segment would be demolished and

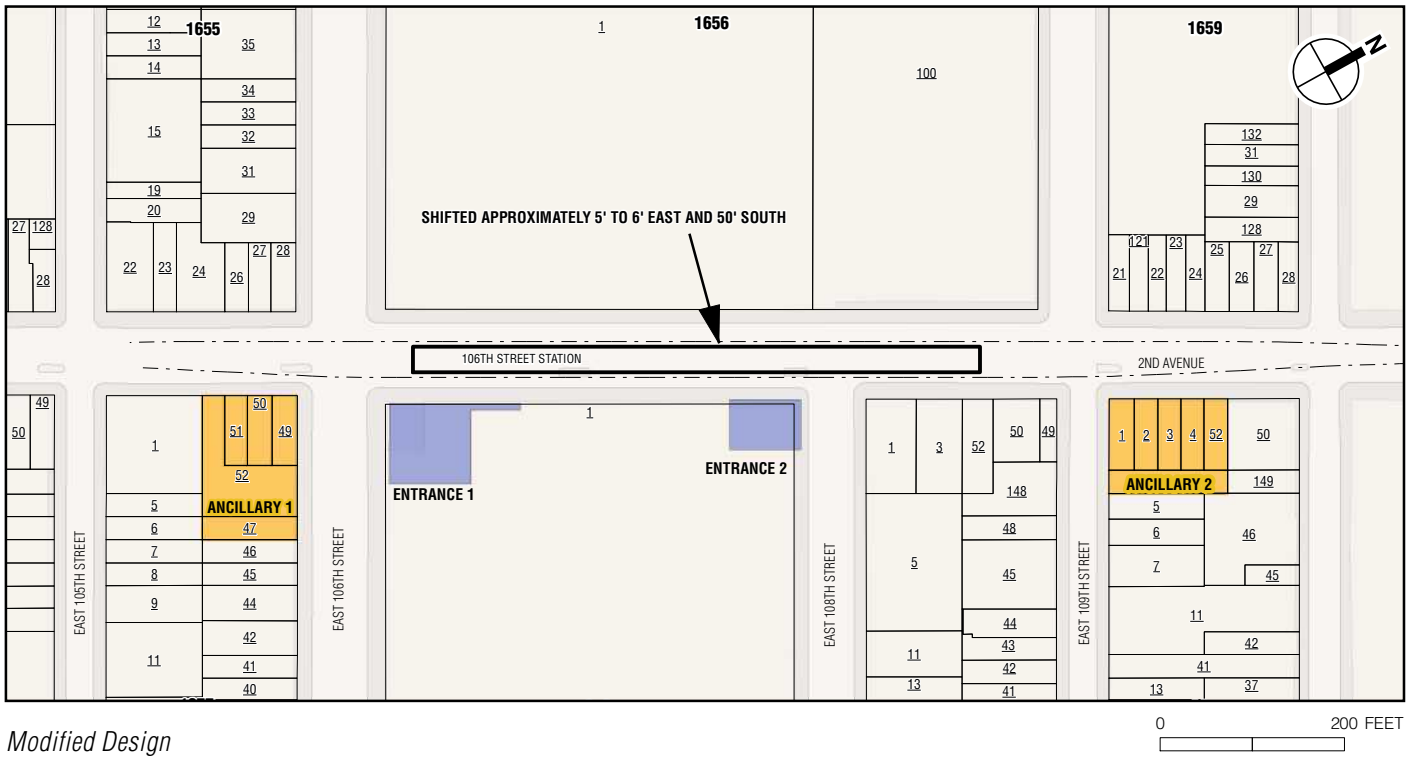
6/20/2018

2004 FEIS Design

Entrance

Ancillary

Station Platform



Modified Design

Entrance

Ancillary

Station Platform

Comparison of 2004 FEIS Design and Modified Design
106th Street Station
Figure 2-1a

SECOND AVENUE SUBWAY PHASE 2

3.19.18

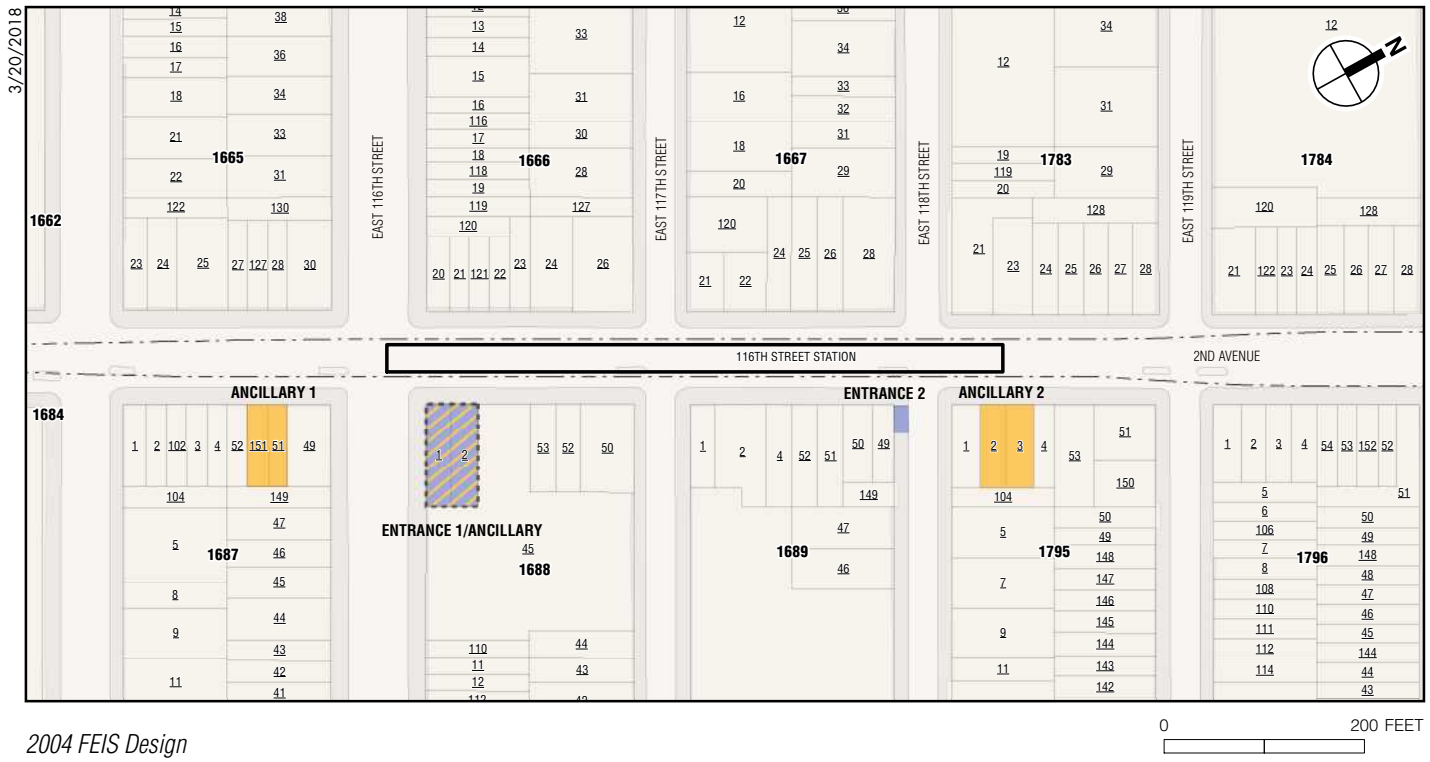
Ancillary Facility 1

Ancillary Facility 2

Entrance 1

Entrance 2

106th Street Station
Entrance and Ancillary Facility Sites
Figure 2-1b



2004 FEIS Design

Ancillary

Entrance/Ancillary

Station Platform

Modified Design

Entrance

Ancillary

Station Platform

Comparison of 2004 FEIS Design and Modified Design
116th Street Station

SECOND AVENUE SUBWAY PHASE 2

Figure 2-2a

3.19.18

Ancillary Facility 1

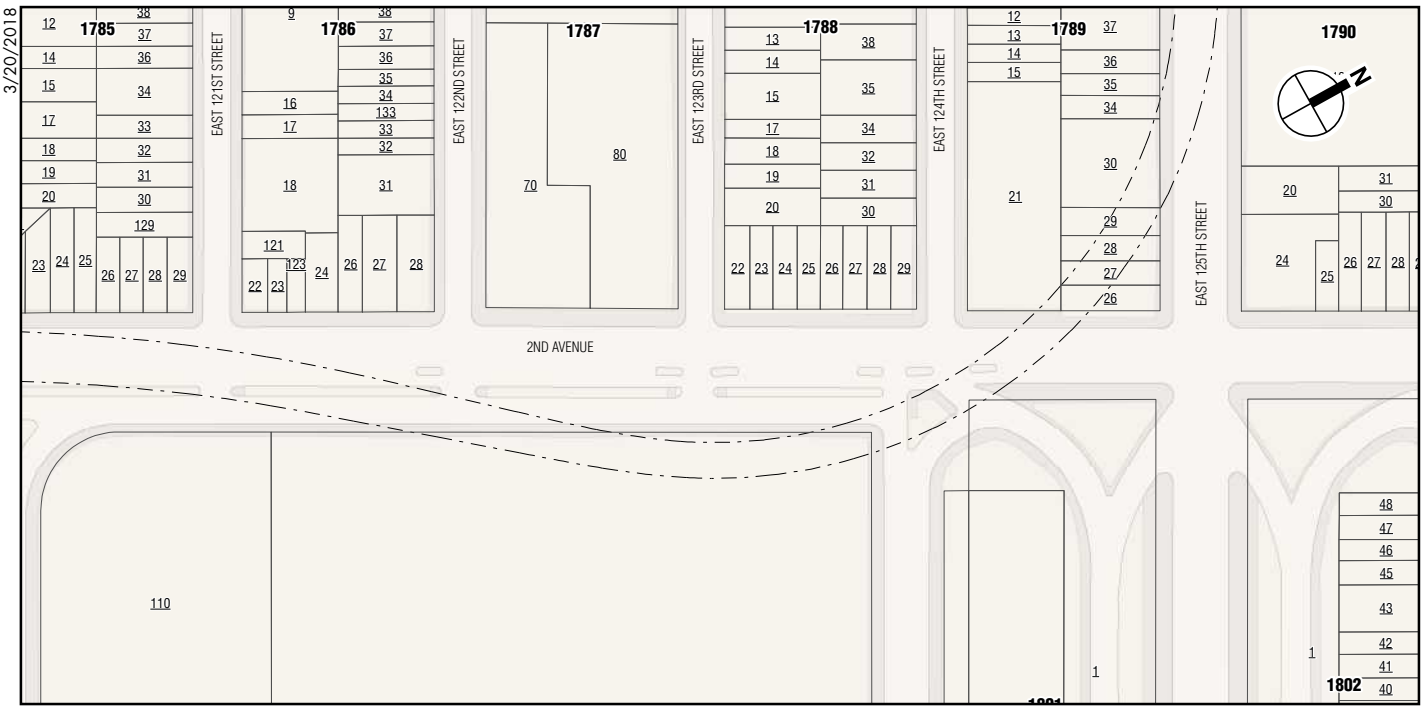
Ancillary Facility 2

Entrance 1

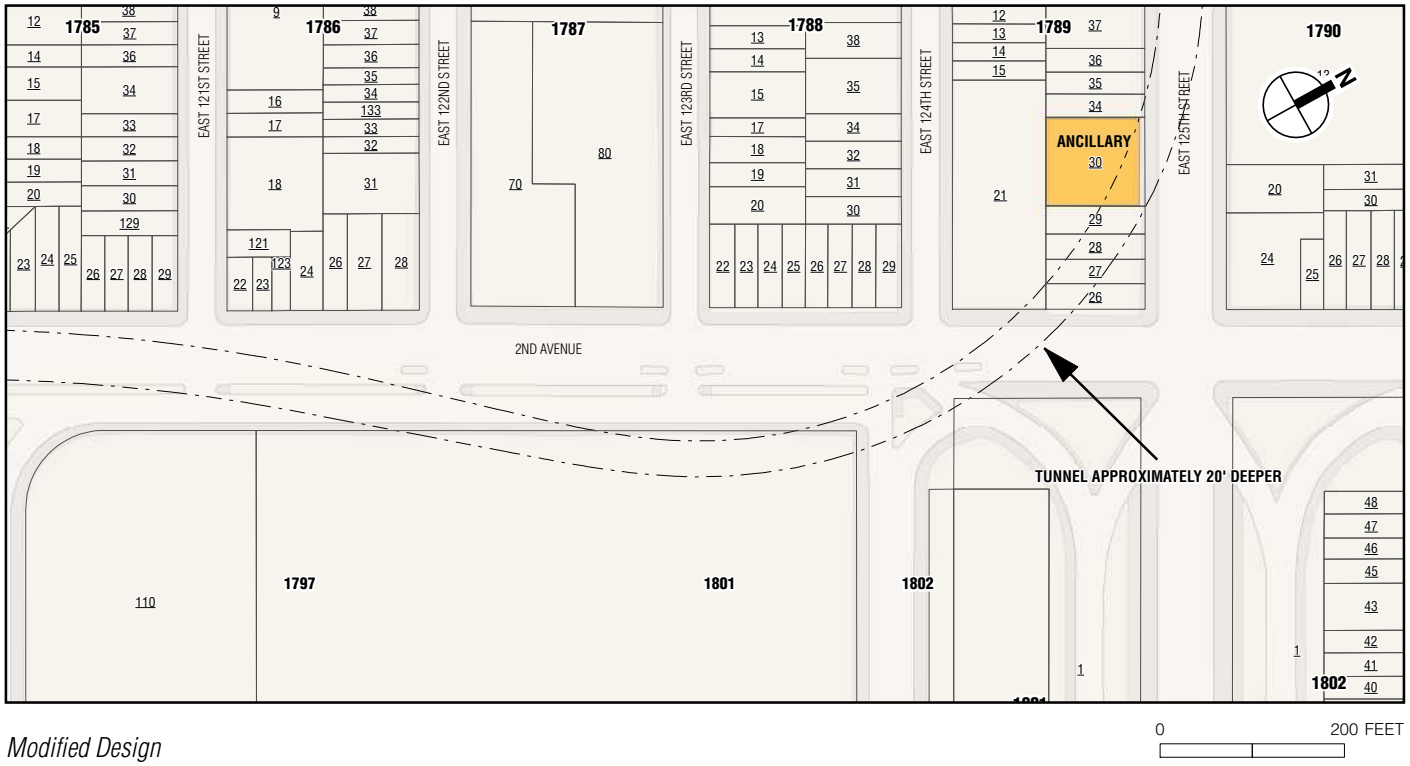
Entrance 2

116th Street Station
Entrance and Ancillary Facility Sites
Figure 2-2b

3/20/2018



2004 FEIS Design



Modified Design

Ancillary

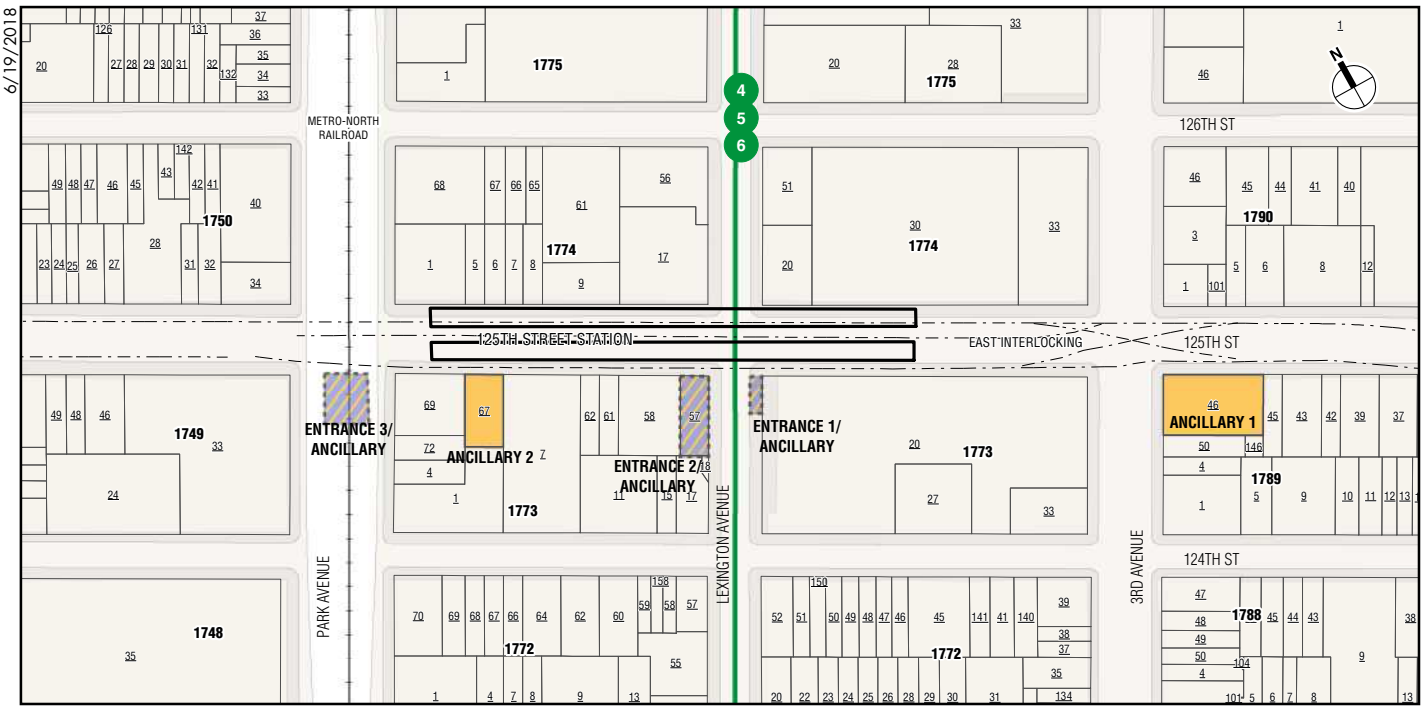
Comparison of 2004 FEIS Design and Modified Design
125th Street Curve

Ancillary Facility

125th Street Curve - Ancillary Facility Site

Figure 2-3b

6/19/2018



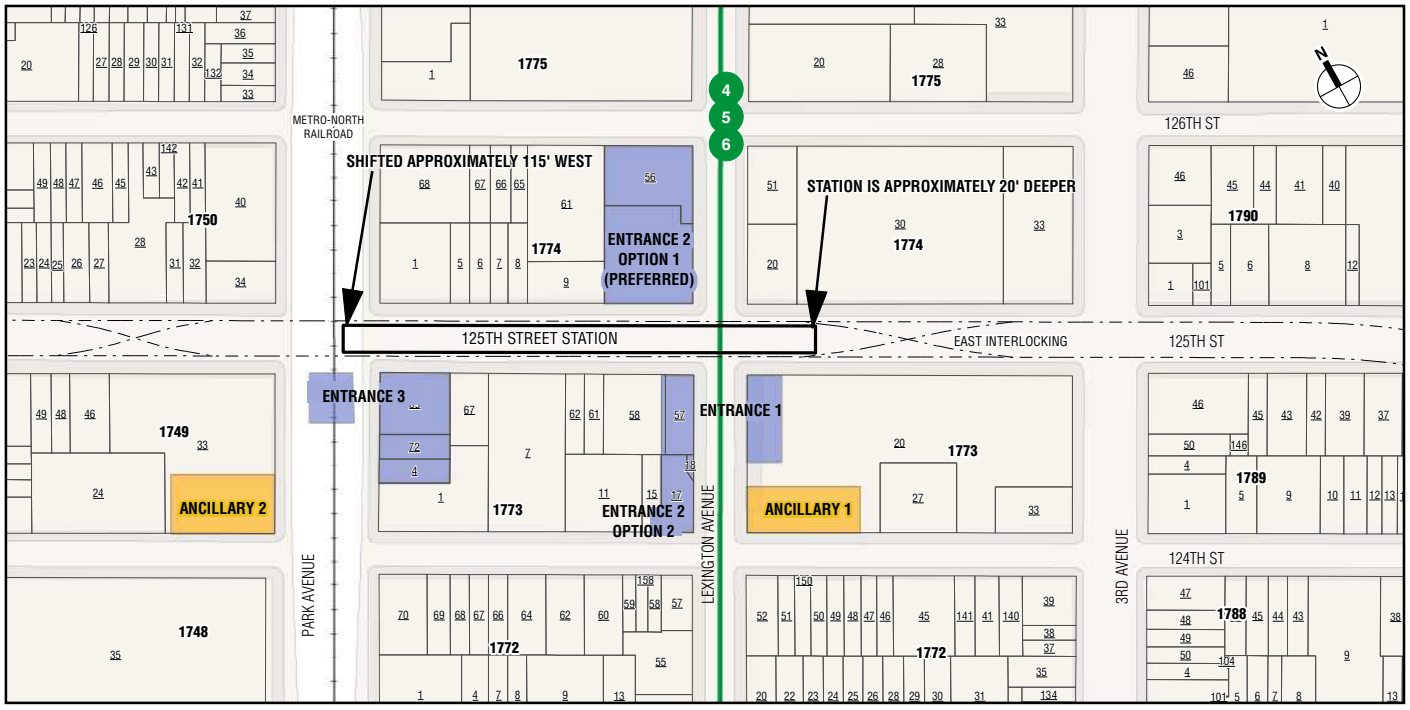
2004 FEIS Design

0 200 FEET

Ancillary

Entrance/Ancillary

Station Platform



Modified Design

0 200 FEET

Entrance

Ancillary

Station Platform

Comparison of 2004 FEIS Design and Modified Design
125th Street Station

SECOND AVENUE SUBWAY PHASE 2

Figure 2-4a

6.19.18

Ancillary Facility 1

Ancillary Facility 2

Entrance 1

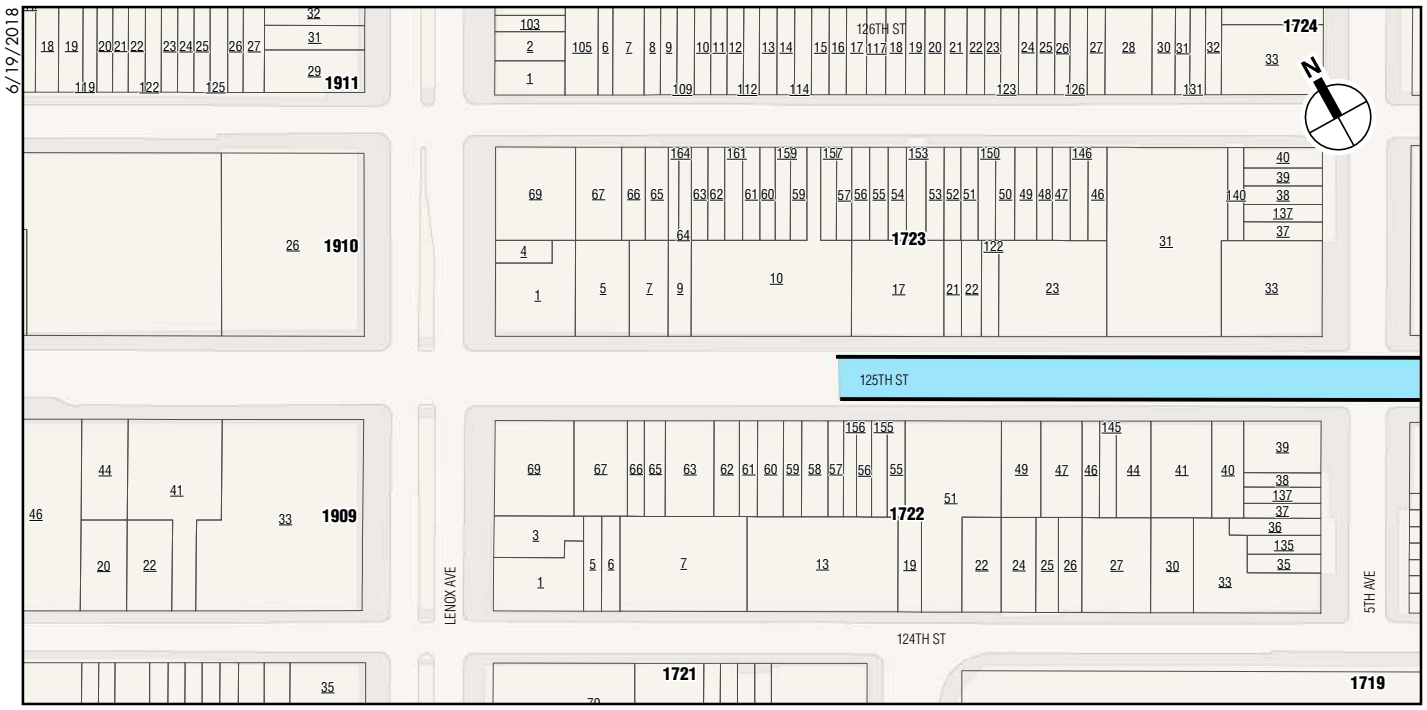
Entrance 2 Option 1 (Preferred)

Entrance 2 Option 2

Entrance 3

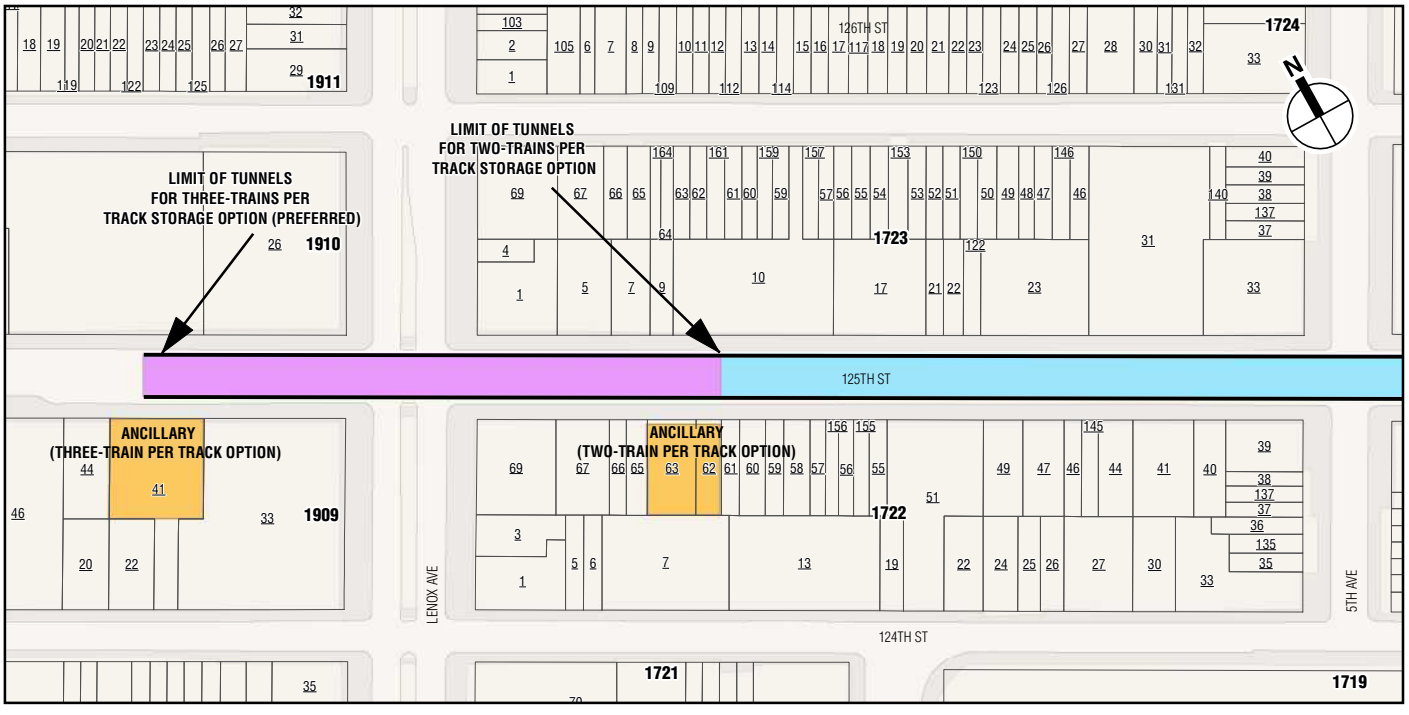
Entrance 3

125th Street Station
Entrance and Ancillary Facility Sites
Figure 2-4b



2004 FEIS Design

Note: The 2004 FEIS also included potential storage tracks along Second Avenue from 122nd Street to 129th Street



Modified Design

Entrance

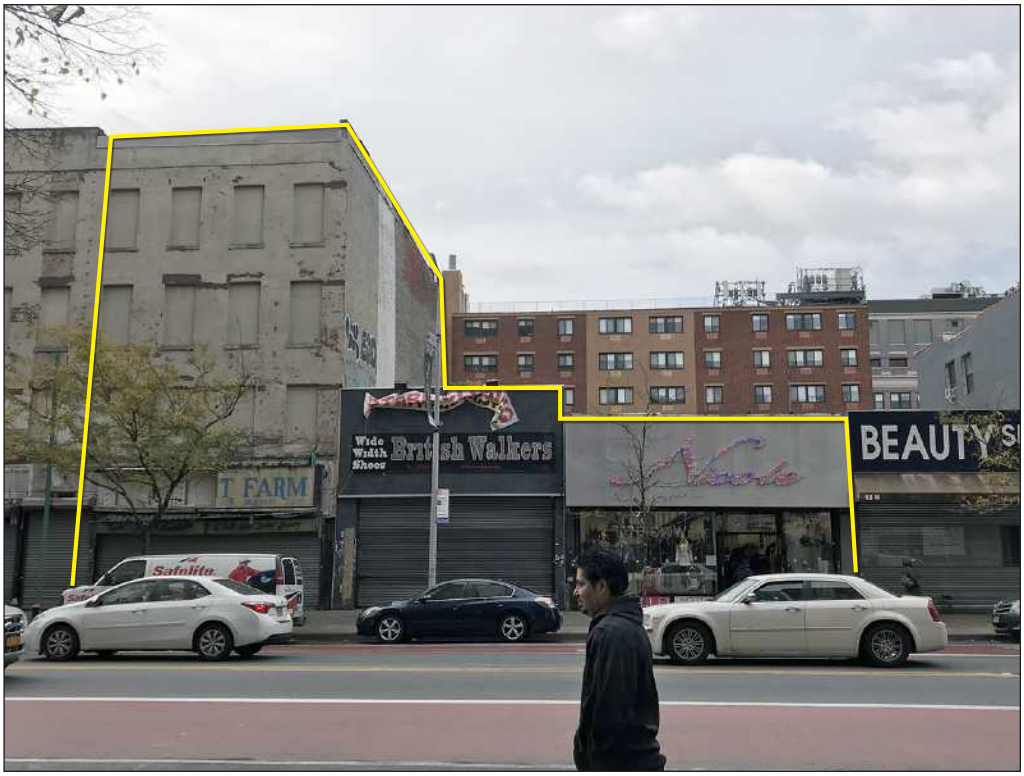
Ancillary

Note: The potential storage tracks along Second Avenue to 129th Street have been eliminated with the Modified Design

Comparison of 2004 FEIS Design and Modified Design
125th Street Tail Tracks

SECOND AVENUE SUBWAY PHASE 2

Figure 2-5a



Two-Train per Track Option

Three -Train per Track Option (Preferred)

125th Street Tail Tracks
Figure 2-5b

the subway structure would be reconstructed to accommodate a full station, including a mezzanine level. The Modified Design includes the following refinement from the 2004 FEIS Design:

- The platform has been shifted about 30 feet north from the 2004 FEIS Design as preliminary engineering has advanced, to accommodate revised horizontal and vertical alignments (see **Figure 2-2a**).The revised platform location eliminates the need for a curve at the south end of the platform, which might have created compliance issues with ADA requirements. Eliminating the curve would also retain more of the existing 1970s tunnel structure on the south end of the station.
- Station entrances are larger, Entrance 2 has been shifted, and ancillary facilities are larger and have been shifted (see Section 2.3.3).

2.3.2.3 125TH STREET CURVE

The 2004 FEIS Design alignment curved from Second Avenue to 125th Street at about Third Avenue, with two possible scenarios for the tunnel alignment. One scenario included a bellmouth (a widened tunnel area) from about 120th Street to 122nd Street to remove the TBM used for the curved tunnel and to allow for a potential future extension to the Bronx.[2] A second scenario also involved removing the TBM near 122nd Street and included potential storage tracks extending north beneath Second Avenue from about 122nd Street to 129th Street at the Harlem River Drive, which could also facilitate a future extension to the Bronx. The Modified Design includes the following modifications from the 2004 FEIS Design:

- The potential storage tracks beneath Second Avenue to 129th Street have been eliminated, as well as an associated ancillary facility that was proposed along Second Avenue near 127th Street. Updated operations analysis conducted during advanced preliminary engineering has concluded that the location of these storage tracks is not compatible with the efficient dispatching of trains from storage into revenue service and, therefore, these tracks are not needed.
- The bellmouth structure where the 125th Street curve would terminate at Second Avenue has been shifted south from the original location at 120th-122nd Streets to 118th-120th Streets, connecting with the existing bulkhead of the Section 13 tunnel box and the north end of the 116th Street Station structure. This revised bellmouth structure would be more compact (i.e., narrower), which would reduce the amount of surface construction, and its new location would eliminate about two blocks of cut-and-cover construction for the new tunnel. The bellmouth would still allow for a future extension to the Bronx, with space for two outer tracks that would continue to the 125th Street Station and two inner tracks that would allow for the extension. This revised alignment and track configuration is a result of updated design and proposed construction methods.
- The vertical alignment (i.e., depth) of the tunnel at the curve has been lowered approximately 20 feet as a result of updated design and proposed construction methods to reduce the amount of cut-and-cover construction along 125th Street in comparison to the 2004 FEIS Design by (1) allowing the tunnel to be deep enough to be located in bedrock at the 125th Street Station location; (2) providing greater separation from foundations of buildings above the tunnel in

[2] Bellmouths are often constructed at the terminus of a tunnel to allow for future extensions from that point.

the 125th Street curve portion of the alignment; and (3) achieving the first two items while maintaining the required track operational grades, avoiding steep ascents/descents (see **Figure 2-3a**). Reduced surface-level construction impacts are discussed in Section 2.3.4, "Changes in Construction Methods and Activities."

- An ancillary facility has been added at the curve at a previously (and still) proposed construction staging site (see Section 2.3.3).

2.3.2.4 125TH STREET STATION

Consistent with the 2004 FEIS Design, the Modified Design would include a new 125th Street Station between Lexington and Park Avenues. This station would provide direct transfers to the existing Lexington Avenue (4/5/6) line subway station and provide connection to the Metro-North Harlem-125th Street Station. The 2004 FEIS Design included a three-track configuration with an island platform and a side platform at the 125th Street Station with an interlocking east of the station. The Modified Design includes the following modifications from the 2004 FEIS Design:

- The station would be shifted approximately 115 feet west and would be about 20 feet deeper as a result of updated design and construction methods, so that it would be located in bedrock rather than soil (see **Figure 2-4a**). This would allow for mining construction techniques, which would substantially reduce surface-level disruption along 125th Street and reduce construction disruption to the Lexington Avenue line (see Section 2.3.4, "Changes in Construction Methods and Activities").
- The connections between the new 125th Street Station on the Second Avenue line and the existing 125th Street station on the Lexington Avenue line would be reconfigured from what was proposed in the 2004 FEIS Design. The Modified Design has been developed to provide for additional transfer capacity and also optimized to better distribute those transfers along both the Second Avenue Subway mezzanine and the Lexington Avenue line platforms.
- The track configuration has been changed from a three-track configuration to a two-track, center island platform as a result of advanced preliminary engineering. At the time of the 2004 FEIS, NYCT generally considered three-track configurations to be preferable for new terminal stations, to provide expanded rail storage capacity and operational flexibility, and to facilitate schedule recovery. However, as several capital projects progressed since 2004 (e.g., the new South Ferry Station on the No. 1 subway line and extension of the No. 7 subway line to a new terminus), these terminal stations were revised to two-track configurations to reduce costs and to reduce impacts (i.e., constructability impacts to Battery Park for South Ferry Station and construction risks associated with an unprecedented 100-foot-wide rock cavern for the No. 7 subway station). During design development for those stations, MTA used train simulations to conclude that a two-track configuration would provide acceptable levels of service.

  Based on that advanced operations analysis, MTA determined that a two-track configuration at the 125th Street terminal station for the Second Avenue Subway would be adequate. With a narrower cavern than a three-track station (and a deeper vertical alignment, as noted above), a two-track station would be suitable for construction via mining and tunnel boring rather than cut-and-cover construction. This would meet one of the Project objectives of minimizing construction impacts (discussed in Section 2.3.4, "Changes in Construction Methods and Activities"). Additionally, the two-track configuration would provide an operational advantage by allowing a double crossover interlocking system on the east and west end of the station that would give greater flexibility for moving trains in and out of the storage tracks.

- Station entrances are larger and an additional option for Entrance 2 has been added. Ancillary facilities are larger and have been shifted (see Section 2.3.3).

2.3.2.5 125TH STREET TAIL TRACKS

The 2004 FEIS Design included two storage tracks extending west of the 125th Street Station to about midway between Fifth and Lenox Avenues (525 feet west of Fifth Avenue), accommodating two trains each. Storage for an additional (fifth) train during off-peak hours was provided on a third track at the 125th Street Station. As discussed above, additional potential storage tracks were considered in the 2004 FEIS beneath Second Avenue from about 122nd Street to 129th Street. The Modified Design includes the following modifications from the 2004 FEIS Design:

- The third storage track at the 125th Street Station has been eliminated (as noted above).
- The storage tracks beneath Second Avenue from about 122nd Street to 129th Street have been eliminated.
- Two tail tracks are still included west of the station, but two options are now being considered, pending further operations and planning analysis (see **Figure 2-5a**):
  - One option would accommodate two trains per track (four trains total), with tail tracks that would extend to between Fifth and Lenox Avenues (about 325 feet east of Lenox Avenue), or about 100 feet west of the 2004 FEIS Design's terminus. This storage option would reduce the amount of storage space by one train compared to the 2004 FEIS Design, since the 125th Street Station would be shifted westward relative to the 2004 FEIS Design alignment.
  - The second option would accommodate three trains per track (six trains total), with tail tracks that extend to about 275 feet west of Lenox Avenue, approximately 730 feet farther west than in the 2004 FEIS Design. This option would incorporate storage space for one additional train compared to the 2004 FEIS Design, which would introduce additional flexibility for train operations.

  With both options, the new tunnels would be built using mined construction rather than cut-and-cover construction, the same construction methodology as in the 2004 FEIS Design. This would help meet one of the Project's objective of minimizing construction impacts (discussed in Section 2.3.4, "Changes in Construction Methods and Activities"). An off-street TBM retrieval site would be located at the end of the tail tracks.
- An ancillary facility has been added for the tail tracks, which would use the same site as would be used for the TBM retrieval and be located just west or just east of Lenox Avenue, depending on the design option (see Section 2.3.3).

2.3.2.6 PROTECTION FROM FLOODING

In 2012, Hurricane Sandy caused extreme flooding and damage throughout New York City, including in East Harlem. As a result, NYCT has updated its flood protection design standards.[3] The design standards set the specific flood elevation that must be used for design purposes for all transit infrastructure located in a flood zone; they also identify other guidelines for critical infrastructure to protect it from flooding.

[3] NYCT Flood Resiliency Design Guidelines (DG312), Issue 7, was most recently updated in July 2017.

The 106th Street Station would be located in the 100-year floodplain mapped by the Federal Emergency Management Agency (FEMA) and the 116th Street Station would be within FEMA's mapped 500-year floodplain (for more information, see Chapter 14, "Natural Resources"). Both stations would be designed to be consistent with NYCT's updated flood design standards. Most importantly, critical electrical and ventilation equipment will be located above the design flood elevation. In addition, the Modified Design will include providing watertight structures around elevator headhouses and canopy entrances to stations, watertight equipment hatches and manholes, and flood gates or deployable barriers for station entrances. The sidewalk gratings present in Second Avenue above the tunnel built in the 1970s will be eliminated and no new sidewalk gratings will be installed.

2.3.3 CHANGES IN ANCILLARY FACILITIES AND STATION ENTRANCES

Consistent with the 2004 FEIS Design, each new station would include at least two entrances and two ancillary facilities to house ventilation, electrical, and mechanical equipment. However, based on design development and assessment of changes in background conditions, engineering standards, and constructability considerations identified during construction of Phase 1, the ancillary facilities and entrances proposed under Phase 2 would be larger than those shown in the 2004 FEIS Design. In addition, some proposed ancillary facilities and entrances would also be on different sites than the preliminary sites shown in the 2004 FEIS, because the previous sites are no longer appropriate, due to constructability considerations related to the advanced design or because the sites are now occupied by new, larger private development that was not present when the 2004 FEIS was completed.

2.3.3.1 DESIGN OF ANCILLARY FACILITIES

Each subway station would include two ancillary buildings, one at each end of the station. As described in the 2004 FEIS (see FEIS page 2-21), many subway support functions, such as ventilation facilities, substations, pump rooms, maintenance rooms, and fan plants, would be within the envelope of the new stations, but certain facilities would have to be located away from the station shells above street level. The 2004 FEIS said that ongoing engineering would focus on how to provide ventilation, climate control, and emergency egress for the new stations and tunnels, and, where practicable, these three functions would be housed in shared structures.

Specific dimensions and appearance of ancillary facilities were not known at the time of the 2004 FEIS, but a general massing and scale was provided and the 2004 FEIS stated that the ancillary would be designed to blend with the urban fabric of the surrounding neighborhood. According to the 2004 FEIS, ancillary facilities were anticipated to be similar in size to a typical rowhouse, ranging from about 25 to 40 feet wide (depending on whether the facility is combined with an entrance), 75 feet deep, and up to about 75 feet tall (7 to 8 stories). The 2004 FEIS stated that this general sizing assumed that most operation and maintenance "back-of-house" needs could be accommodated within the station shells. This general sizing was used for purposes of analysis in the 2004 FEIS for the full-length Second Avenue Subway, as design for each Project phase was not yet advanced and site-specific requirements were not yet known.

However, based on more advanced design for Phase 2, more space would be required for the ancillary facilities. For the three stations in Phase 2, the ancillary buildings would house electrical distribution equipment, station cooling equipment, emergency egress, which must be provided with separate corridors from other room access corridors to meet code requirements, and vertical

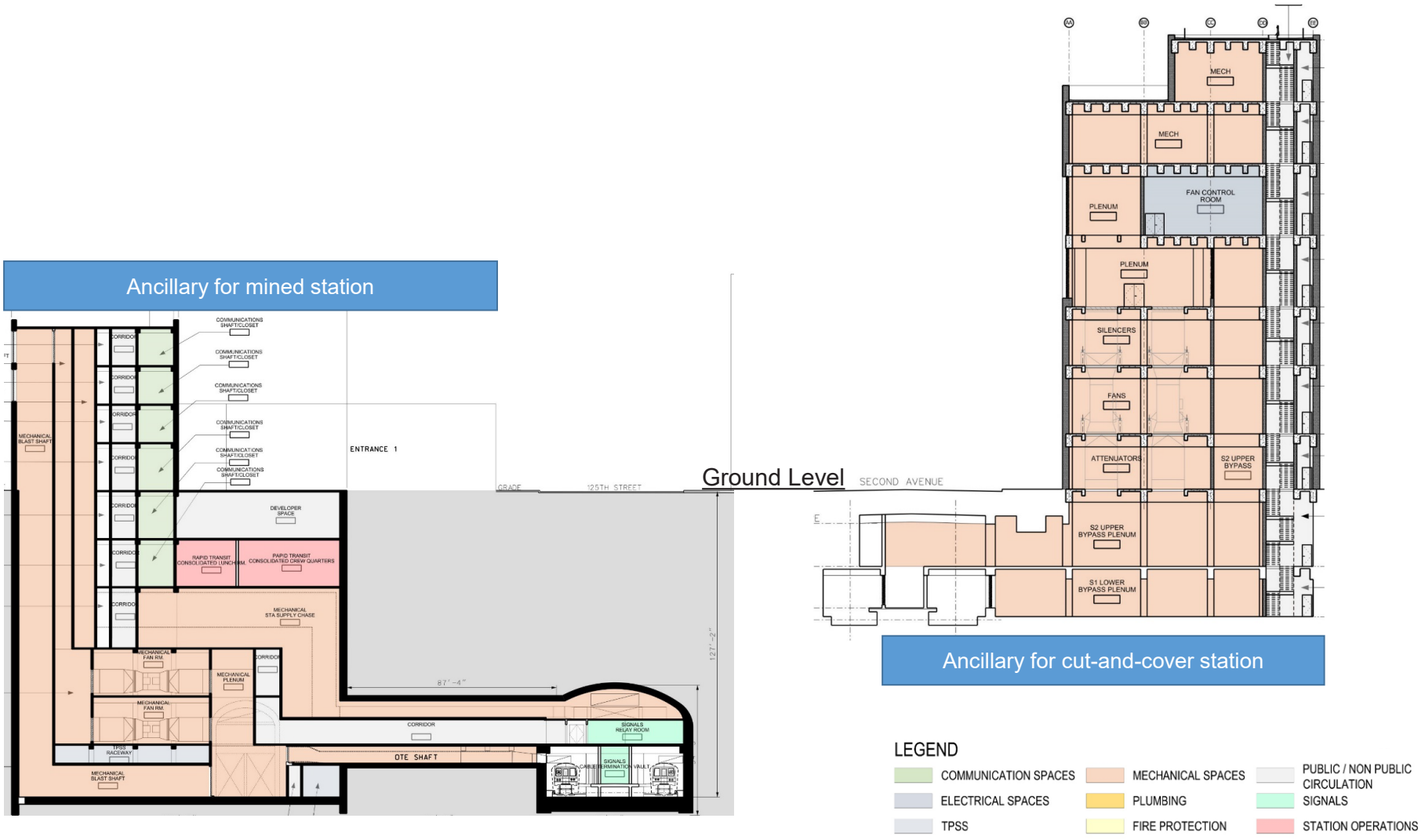
fans for emergency smoke management, which should be above the electrical distribution equipment. In addition, for Phase 2, ground-level retail space is proposed for the ancillary structures to enliven the streetscape and maintain the existing neighborhood context.

Construction of Phase 1 of the Second Avenue Subway provided valuable experience for construction of this large and complex capital project. For example, during design of Phase 1, some ancillary facilities needed to be relocated or enlarged from the 2004 FEIS Design to accommodate features such as additional maintenance spaces and meet specific NYCT design requirements. As preliminary engineering has advanced, measures based on this experience have been incorporated into the Modified Design to improve efficiency and cost-effectiveness of construction for Phase 2. This is reflected in the design for the ancillary facilities in Phase 2.

Based on advanced preliminary engineering, the proposed ancillary facilities in the Modified Design would be approximately 80 to 100 feet wide, 80 to 110 feet deep, and would range in height depending on location. In and around 125th Street, where the station would be farther below the street, the above-grade portion of the ancillary facilities would range in height from between 45 and 75 feet (equivalent to 5 to 8 stories). Along Second Avenue, where the stations would be relatively shallow beneath the street, the above-grade portion of the ancillary buildings would range from 90 to 140 feet tall (equivalent to 9 to 14 stories). **Figure 2-6** provides an illustration of typical ancillary facilities for the two shallow stations (106th Street and 116th Street Stations) and the deep station at 125th Street.

The ancillary facilities would be larger than in the 2004 FEIS Design for the following reasons:

- The 106th and 116th Street Stations would be relatively shallow to align with the existing tunnel segments that were constructed during the 1970s. The station shells would also be limited in height because of the many utilities located within Second Avenue above the tunnel depth. This would limit the amount of underground space at the stations that can be used for equipment related to operations and maintenance. While the 2004 FEIS Design provided one potential set of dimensions for all the ancillary facilities along the 8.5-mile-long alignment, the 106th and 116th Street Stations would not have the same amount of underground space as other, deeper stations along the alignment, and therefore more ancillary space would have to be outside the station shell and above grade.
- The 106th and 116th Street Stations would both be in or near FEMA-designated flood zones (see Chapter 14, "Natural Resources"), and therefore they must comply with NYCT's flood protection requirements, which have been updated since Hurricane Sandy in 2012. To meet these requirements, more of the equipment in the ancillary facilities must be above grade, which would protect it from flooding. This includes electrical and ventilation equipment.
- The 125th Street Station would require additional ancillary space to support functions of a terminal station. The station would be deeper than the 106th and 116th Street Stations and is not located within a flood zone, so unlike the 106th Street and 116th Street Stations, some of the ancillary functions at the 125th Street Station could be accommodated below ground. However, with the mined station now proposed to reduce construction impacts (discussed in Section 2.3.4, "Changes in Construction Methods and Activities"), the station shell for the 125th Street Station would be smaller in overall volume than in the 2004 FEIS Design. This would limit the available space for ancillary functions. Overall, therefore, the above-ground structures for the ancillary facilities at the 125th Street Station would larger than in the 2004 FEIS Design.



General Profile of Ancillary Facilities for Phase 2

Figure 2-6

- The Modified Design includes a different cooling system for the stations than was envisioned for the 2004 FEIS Design or was constructed in Phase 1. The 2004 FEIS Design incorporated station cooling using chilled water, with cooling towers on the roofs of the station ancillary buildings. The Modified Design would use an updated system, to reduce the operations and maintenance demands of the system, as well as the noise attenuation requirements for the cooling towers. With the new system, dry coolers would be used. These would not have rooftop cooling towers, but would have more equipment indoors instead.
- To meet the Project objectives of maintaining neighborhood character and creating transit facilities that are aesthetically pleasing and compatible with neighborhood character, the proposed ancillary facilities in the Modified Design would accommodate ground floor-retail spaces. Retail uses in these buildings would result in street-level activity and visual interest, but require additional space not originally contemplated in the 2004 FEIS Design.
- During construction of Phase 1, the limited sizes of staging areas led to construction difficulties. The limited off-street space for storing materials and equipment and coordinating construction activities required staging areas to be located within the street. As construction progressed along the alignment, these on-street staging areas required multiple lengthy and costly relocations and remobilizations of construction activities, whereas a larger off-street staging area would provide a longer-term designated space for delivery of equipment, storing of materials, and labor for the stations and systems work.

  In addition, during construction of Phase 1, working within small staging sites to limit the acquisition of private property also posed high construction risks because of the close proximity to adjacent buildings. The proximity of construction sites for ancillary buildings to adjacent buildings led to the need for extensive efforts to rehabilitate, underpin, support, stabilize, and structurally strengthen adjacent buildings. Based on this experience, the advanced preliminary engineering for the Modified Design proposes larger areas for ancillary facilities to save substantial costs and avoid unnecessarily prolonged construction activities and impacts to adjacent buildings.

As design proceeds from advanced preliminary engineering to final design, opportunities to reduce property acquisitions will be identified, if practicable. In the event that property required for construction staging is no longer needed for permanent Project operation, excess property would be used or disposed of in accordance with MTA real estate procedures and will adhere to all pertinent federal regulations. Property that is sold would be subject to underlying zoning regulations.

In addition, there may be an opportunity to include other development in combination with some ancillaries and/or entrances, within the envelope permitted by the zoning. No such overbuild or other development projects are being proposed at this time. However, it should be noted that, in conformance with FTA joint development guidelines, ancillary and entrance sites may be considered for private co-development as the Phase 2 advances. Any such development or overbuild proposal(s) would be subject to additional NEPA re-evaluation(s).

2.3.3.2 DESIGN OF STATION ENTRANCES

The Modified Design includes revisions to the station entrances from those shown in the 2004 FEIS Design. The 2004 FEIS Design generally included stations with primary entrances supported by smaller secondary entrances on properties near street corners or within sidewalk spaces at street

corners. For the 106th Street and 116th Street Station entrances, the Modified Design includes the following changes to the station entrances:

- To correspond with modifications to the alignment and location of station platforms, the station entrances were shifted so that connections could still be made to the shifted station mezzanines.
- The philosophy for station entrances has been modified to better balance passenger flows. Rather than having a large primary entrance and a smaller secondary entrance, the entrances would be similar in size.
- To comply with the ADA requirement that at least 60 percent of the station entrances be ADA accessible, the Modified Design would include elevators at each end of the 106th and 116th Street Stations.
- Entrances have been designed for greater visibility and access along Second Avenue, rather than side streets.
- In the Modified Design, the entrances would serve a larger portion of emergency egress passenger loads, so that NYCT code requirements are met without the need to provide additional emergency access points that might require additional property at other locations near the station.
- Similar to the ancillary facilities, the sites for some proposed entrances have been expanded to provide sufficient space to build the entrances while minimizing impacts to and structural reinforcement needs for adjacent buildings.

For the 125th Street Station, modifications were made to station entrances to enhance connectivity for transfers to the Lexington Avenue (4/5/6) subway line and Metro-North Railroad, as follows:

- Similar to the 2004 FEIS Design, the Modified Design includes two entrances at 125th Street and Lexington Avenue—one at the southeast corner of the intersection and one on the west side of Lexington Avenue, at either the northwest or southwest corner. For the entrance on the west side of Lexington Avenue, the 2004 FEIS Design included an entrance at the southwest corner. The Modified Design includes a new entrance option at the northwest corner that would provide better transfer connections between the Lexington Avenue (4/5/6) subway line and the Second Avenue platforms, eliminating a chokepoint that would exist in the 2004 FEIS Design. Constructability, cost, and environmental considerations are being evaluated to determine the final location for this entrance. In the Modified Design, both entrance options (the southwest and northwest corner) would provide additional capacity than was accounted for in the 2004 FEIS Design; this additional capacity was added to meet NYCT level of service criteria for passenger loads that were implemented after the 2004 FEIS Design.
- Similar to the 2004 FEIS Design, the Modified Design includes access to the Second Avenue Subway at 125th Street and Park Avenue, adjacent to the Metro-North Harlem-125th Street Station. In the Modified Design, the entrance that was originally planned in the Park Avenue median under the Metro-North Railroad viaduct would be expanded to incorporate the property at the southeast corner of 125th Street and Park Avenue. This change was made to address passenger load demands and constructability considerations related to the foundations of the viaduct and the historic Comfort Station building located nearby (as discussed in Section 2.3.3.4.4, “125th Street Station”). As design advances, additional evaluation of the viaduct structure may result in the need to place the entrance entirely on the southeast corner of 125th Street and Park Avenue.

2.3.3.3 LOCATIONS OF ANCILLARY FACILITIES AND STATION ENTRANCES

In addition to modifications in their design, with the Modified Design some ancillary facilities and station entrances have been relocated because the original site is not large enough to accommodate the larger facility now needed, because of the shifts in the station platform locations, or because the sites originally proposed for these facilities in the 2004 FEIS Design are no longer appropriate (for example, because they are now developed with new, larger buildings than were present in 2004). In seeking new locations for the ancillary facilities, MTA sought to minimize acquisitions and displacements while also minimizing constructability risk related to adjacent buildings, providing sufficient construction staging space, and allowing flexibility in the final configuration of the ancillary buildings as design advances.

MTA is using the site selection criteria outlined in the 2004 FEIS for identifying new sites when ancillary facilities and station entrances must be relocated. Those criteria are described in Section 2.2.2 of this chapter. As noted there, sites for station entrances and ancillary facilities are selected to limit the need for displacement of residents or businesses where possible. This is accomplished by choosing potential easements in existing or planned buildings, vacant lots and buildings, plazas and arcades, and open areas before occupied buildings.

As noted in Section 2.2.2, the site selection process described in the 2004 FEIS prioritized the use of easements obtained through the Special Transit Land Use District (STLUD) established by New York City zoning, where possible. Prior to completion of the 2004 FEIS, MTA had obtained several easements in buildings that were developed after the special district was mapped. However, the 2004 FEIS Design did not include station entrances in entirely the same locations as the previous, 1970s plan for the new subway, so the STLUD areas were not consistently located in appropriate places for the new subway. As part of the recently enacted East Harlem Rezoning, the New York City Department of City Planning coordinated with MTA to revise the STLUDs mapped along Second Avenue to align with current plans for the Second Avenue Subway. STLUD overlays are now mapped in the locations of the 106th Street, 116th Street, and 125th Street Stations. In addition, the text of the New York City Zoning Resolution was revised as relates to the STLUD so that (1) floor area provided for any subway transit-related uses such as subway entrances and ancillary facilities is not considered to be zoning floor area, and therefore is not counted against the total amount of development allowed on a site; and (2) greater flexibility is available in transit easement volumes to accommodate entrances and/or ancillary facilities that meet ADA requirements, ventilation and access requirements. The STLUD text also allows MTA to obtain transit easements on vacant lots that are needed for development of the subway.

Changes in the ancillary facility and entrance locations for each new station are described below and are shown on **Figures 2-1a through 2-5a**. Photos of the planned entrance and ancillary facility sites are shown on **Figures 2-1b through 2-5b**. The required property acquisitions are discussed in Chapter 6, "Displacement and Relocation."

2.3.3.4 PROPOSED MODIFICATIONS

2.3.3.4.1 106th Street Station

Figure 2-1a provides a comparison of the entrance and ancillary facility locations proposed for the 106th Street Station in the 2004 FEIS Design and in the Modified Design. These include the following:

- **Entrance 1**: There would be no change in location, but as a result of advanced preliminary engineering, the footprint would be expanded to better accommodate passenger demand and emergency egress. The entrance would remain within a street corner sidewalk plaza that was provided by New York City zoning requirements to accommodate the future subway entrance (see **Figure 2-1b**).
- **Entrance 2**: Entrance 2 would remain in the same general location, but to address changes in background conditions, it would be shifted slightly north, closer to the corner of 108th Street to avoid the recently constructed utility connections for the Franklin Plaza Apartments. In addition, to address advanced preliminary engineering considerations (see Section 2.3.3.2), Entrance 2 would be expanded from a small sidewalk entrance with only a stair to a larger entrance with escalators and an elevator to provide a greater level of service for the projected passenger demand and better accessibility for the station. The area of Entrance 2 is currently part of a parking lot for the Franklin Plaza Apartments, with approximately 14 spaces within the entrance footprint (see **Figure 2-1b**).
- **Ancillary 1**: The original location identified in the 2004 FEIS was vacant when the 2004 FEIS was completed, but is now the site of a new six-story school building. Therefore, using this site for Ancillary 1 would result in displacement of this school, as well as complicated demolition and additional project costs. As a result of this change in background conditions, Ancillary 1 would be relocated to the northern end of the same block, where several two- and four-story mixed commercial and residential buildings (partially vacant) are located (see **Figure 2-1b**). Several lots have been identified for acquisition because they are occupied by a single business.

  The new location of Ancillary 1 would also allow for improved connection to the south end of the station box and more efficient ventilation functions because of its location closer to the proposed platform. The revised location of the ancillary facility, immediately south of 106th Street, would provide direct back-of-house connections within the station structure.

  The site of Ancillary 1 would be used for construction staging before the ancillary facility is built. To minimize occupation of the Second Avenue right-of-way and limit the level of costly remobilization efforts, this site would be used to consolidate construction activities, and likely be used for a slurry plant to install the support walls for the excavation; storage space for excavated soils (referred to as muck); laydown of construction materials; contractor operations; and other related activities.
- **Ancillary 2**: The location identified for Ancillary 2 in the 2004 FEIS was occupied by a one-story commercial building at that time, but this site has since been redeveloped with a seven-story residential building with ground-floor retail space. Therefore, using this site for Ancillary 2 would involve substantial displacements, complicated demolition, and additional project costs. Consequently, Ancillary 2 would be shifted south on the same block, where several smaller four-story mixed commercial and residential buildings are located (see **Figure 2-1b**).

  The new location would also result in a better ventilation connection with the subway structure by being closer to the end of the platform. This site would also allow the ancillary building to have two exterior, exposed facades, providing an efficient separation between emergency exhaust louvers and fresh air intake louvers. This would prevent short circuiting of exhaust gases and smoke being drawn back into the station or ancillary rooms during an emergency event. Having two street facades would also provide separation between the exhaust louvers

and adjacent buildings, thereby minimizing restrictions on operable windows at those locations.

The site of Ancillary 2 would be used for construction staging prior to construction of the new building, but with more limited activity than Ancillary 1.

2.3.3.4.2 116th Street Station

Figure 2-2a provides a comparison of the entrance and ancillary facility locations proposed for the 116th Street Station in the 2004 FEIS Design and in the Modified Design. These include the following:

- **Entrance 1**: There would be no change in location, but the footprint would be expanded to better accommodate passenger demand and emergency egress. Entrance 1 was originally combined with ancillary functions in addition to a separate ancillary facility. With the Modified Design ancillary functions would be shifted from this entrance and consolidated into one ancillary facility (Ancillary 1, described below).
- **Entrance 2**: The original planned entrance was a small secondary sidewalk entrance. In the Modified Design, this entrance would be expanded to provide greater capacity and balance passenger loadings, and to provide an elevator for station access. Entrance 2 would be relocated from the southeast corner to the northeast corner of Second Avenue and 118th Street to better align with the end of the platform. A portion of this location was previously planned for an ancillary facility, but the ancillary would be relocated (see Ancillary 2, below).
- **Ancillary 1**: Ancillary 1 would be shifted south on the same block to provide a better ventilation connection with the subway structure by being closer to the end of the station box and to avoid potential construction risks to the Banca Commerciale Italiana building (Block 1687, Lot 49), a newly designated historic structure adjacent to the previous location. The site of Ancillary 1 would be used for construction staging prior to construction of the new building, but for more limited activity than Ancillary 2 (described below).
- **Ancillary 2**: Ancillary 2 would be relocated about one block north of the original location on Second Avenue to provide a better ventilation connection to the station box and tunnel section. This site, on the west side of Second Avenue between 119th and 120th Streets, would also provide a staging area for the TBM operation. This new site includes multiple vacant structures (see **Figure 2-2b**).

  In the Modified Design, the site of Ancillary 2 would be used for a number of construction staging activities, including construction of the 116th Station structure, the bellmouth structure at the end of the tunnel, and the TBM operations that would continue northward from the end of this station. This area would require a large footprint to handle excavated materials from both the station and the two bored tunnels (that would serve the two subway tracks), which would require cranes, conveyors, and space to route and stage trucking. The two bored tunnels would be permanently lined with precast concrete segments, which would be installed as the tunnel excavation proceeds. Therefore, the precast segments would need to be located near the TBM launch point. (The subway tunnels constructed in Phase 1 did not include precast concrete segments, because of the tunnels' location in hard rock).

  To accommodate this staging activity, a site suitable for this activity was selected. All of the buildings on this site are in common ownership and appear vacant. It is not anticipated that all the lots identified on **Figure 2-2a** would be required for the footprint of the ancillary facility; instead, they are conservatively incorporated to allow flexibility in the design. As design

advances, opportunities will be investigated to reduce property acquisitions, if practicable. In the event that property required for construction staging is no longer needed for permanent project operation, excess property would be used or disposed of in accordance with MTA real estate procedures and will adhere to all pertinent federal regulations. Property that is sold would be subject to underlying zoning regulations.

2.3.3.4.3 125th Street Curve

The 2004 FEIS Design did not include any ancillary facilities or station entrances at the 125th Street curve but included two prospective construction staging sites (Block 1789, Lots 25 and 30—Lot 25 is now merged with Lot 21) and demolition of the building on Lot 30. The Modified Design would still incorporate Lot 30 as a potential staging site but would now also include an ancillary facility at that location (see **Figures 2-3a and 2-3b**). This facility would serve as an intermediate tunnel ventilation and emergency egress point. As a staging site, it would provide a location to service and support the tunneling operations, as well as an access point for workers to perform ground stabilization measures (see Section 2.3.4, "Changes in Construction Methods and Activities").

2.3.3.4.4 125th Street Station

Figure 2-4a provides a comparison of the entrance and ancillary facility locations proposed for the 125th Street Station in the 2004 FEIS Design and in the Modified Design. These include the following:

- **Entrance 1**: Entrance 1 on the southeast corner of 125th Street and Lexington Avenue would be expanded from a small sidewalk entrance to a larger entrance (with escalators) and would include a portion of an adjacent property. This site is part of a former Pathmark superstore (see **Figures 2-4a and 2-4b**), which was in operation at the time of the 2004 FEIS but is now vacant and the subject of a private development interest. MTA will coordinate with the developer as design advances so that this entrance can be incorporated within the new building.
- **Entrance 2**: MTA is evaluating two entrance options for Entrance 2 on the west side of Lexington Avenue. Option 1, the preferred option for Entrance 2, is being evaluated on the northwest corner of 125th Street at Lexington Avenue (see **Figure 2-4a**). Option 2 is the 2004 FEIS Design's entrance location at the southwest corner of 125th Street and Lexington Avenue, which would be expanded in the Modified Design to accommodate escalators and other vertical circulation elements that are required for the transfer connections between the Second Avenue Subway and existing Lexington Avenue (4/5/6) subway line.

  To accommodate anticipated passenger demand, MTA anticipates a need for at least three escalators at Entrance 2, two for the peak direction and one for the opposing direction. Option 1 on the northwest corner would adequately accommodate these escalators. Option 2 on the southwest corner is not large enough to accommodate the escalator core for three escalators to serve this deep station, and expanding into the adjacent property to the west could result in impacts to a historic bank on that site that is listed on the State and National Register of Historic Places. Therefore, an entrance at the southwest corner (Option 2) could accommodate only two escalators.

  In addition, Option 1 could potentially provide a higher capacity transfer connection between the Second Avenue Subway and Lexington Avenue (4/5/6) subway line. Option 1 would provide a transfer point at the northern end of the Lexington Avenue (4/5/6) subway platform

in addition to the transfer point at the southern end of the platform provided by Entrance 1. This would allow greater distribution of passengers for the expected heavy use of this station. Conversely, with Option 2, the transfer point would be only at the southern end of the platform, thereby concentrating passenger movements in a smaller area. These two options are being evaluated to determine optimal connectivity and distribution of transfer passengers, and the final option will be selected as design advances.

- **Entrance 3**: The 2004 FEIS Design included an entrance to the subway within the Park Avenue median under the Metro-North Railroad viaduct, but as a result of updated passenger estimates and advanced design that identified greater spatial needs to accommodate passenger demand and vertical circulation elements, the entrance has been expanded to include the property at the southeast corner of 125th Street and Park Avenue. In addition, the area within the Park Avenue median is constrained by the foundations and superstructure of the railroad viaduct, as well as a Comfort Station (currently unused) building that is a historic structure as a contributing element of the historic Metro-North Harlem-125th Street Station. Therefore, Entrance 3 would have a shallow street-level entrance within the Park Avenue median, with deeper vertical circulation elements to the mezzanine and platform levels constructed below the southeast corner of 125th Street and Park Avenue. While these elements would be below grade, they would require the demolition of the existing building (partially vacant) on this corner to avoid challenges with maintaining its structural integrity, as was encountered during the construction of Phase 1. As design advances, additional evaluation of the viaduct structure may result in the need to place the entrance entirely on the southeast corner of 125th Street and Park Avenue rather than in the Park Avenue median.
- **Ancillary 1**: The 2004 FEIS Design included an ancillary facility at 125th Street and Third Avenue. However, with the Modified Design, the 125th Street Station cavern is shifted farther west to allow it to be mined in bedrock, and this shift requires relocation of the ancillary facility farther west as well. With the Modified Design, Ancillary 1 would use a portion of the same lot as Entrance 1, thereby consolidating subway facilities, and similarly potentially integrating with a proposed private development, pending coordination with the developer. Ancillary 1 would be sited along 124th Street rather than 125th Street, which would preserve the street frontage on 125th Street, where the City of New York seeks to encourage a retail and commercial corridor. The shift to 124th Street would also allow some construction traffic to be routed on 124th Street, which would reduce construction impacts on the heavily traveled 125th Street.

  The site shown on **Figure 2-4a** that comprises Ancillary 1, Entrance 1, and an associated area of permanent subsurface easement would be used for station cavern excavation and structural lining. These operations require multiple large work areas to provide contractor access into the cavern, storage of muck, routing of trucks, storage of construction materials, and concrete operations. Following construction, the area shown as permanent subsurface easement would no longer be needed for the project at the ground level. The subsurface easement would be associated with subsurface corridors connecting Ancillary 1 to the station.
- **Ancillary 2**: The 2004 FEIS Design included an ancillary facility on 125th Street just east of Park Avenue. Similar to Ancillary 1, with the Modified Design, Ancillary 2 would be shifted farther west to better align with the station that would also be shifted west, and it would be sited along 124th Street to reduce construction impacts on 125th Street, similar to Ancillary 1. The new site of Ancillary 2 is currently vacant. Like the site of Ancillary 1 and Entrance 1,

this site has been the subject of a private development interest, and MTA will coordinate with the prospective developer, as needed, as design advances.

The site of Ancillary 2 would function similarly to the site of Ancillary 1 during construction, providing an area for contractor access into the cavern, storage of muck, routing of trucks, storage of construction materials, and concrete operations. Following construction, the area shown in **Figure 2-4a** as permanent subsurface easement would no longer be needed for the project at the ground level. The subsurface easement would be associated with subsurface corridors connecting Ancillary 2 to the station.

2.3.3.4.5 125th Street Tail Tracks

Like the 2004 FEIS Design, the Modified Design includes tail tracks extending west from the 125th Street Station. The 2004 FEIS Design did not include an ancillary facility for the proposed tail tracks west of the 125th Street Station. The Modified Design, however, extends the tail tracks farther west to provide greater storage capacity and as a result, an ancillary facility would be required to provide emergency ventilation and emergency egress for the longer tail tracks. The ancillary facility location would also be used as the location where the TBM used to construct the tunnel beneath 125th Street is retrieved. The two possible tail track options in the Modified Design (discussed in Section 2.3.2, "Overview of Changes in the Phase 2 Alignment") would each include an ancillary facility, as follows (and shown on **Figure 2-5a**):

- For the two-train per tail track storage option, an ancillary facility would be located on the south side of 125th Street, about 325 feet east of Lenox Avenue.
- For the three-train per tail track option, an ancillary facility would be located on the south side of 125th Street about 275 feet west of Lenox Avenue.

The buildings currently on the two sites are shown on **Figure 2-5b**. The tail track ancillary facility would likely be smaller than the ancillary facilities at the stations.

2.3.4 CHANGES IN CONSTRUCTION METHODS AND ACTIVITIES

For Phase 2, the 2004 FEIS Design anticipated a seven-year construction period and included a combination of cut-and-cover construction and mining, as discussed in Section 2.2.3. The Modified Design remains largely consistent with the construction techniques proposed for the 2004 FEIS Design. This includes:

- Use of the existing, already constructed tunnel box between 110th and 120th Streets for the new tunnel.
- Cut-and-cover construction of the 106th Street Station. At this station, off-street staging areas would be created on the sites of the future ancillary buildings, to reduce disturbance within Second Avenue.
- Cut-and-cover construction of the 116th Street Station, with demolition and reconstruction of the existing tunnel box there. At this station, off-street staging areas would be created on the sites of the future ancillary buildings, to reduce disturbance within Second Avenue.
- Mining of the 125th Street curve using a TBM. With the Modified Design, this TBM would be launched from a staging area along Second Avenue rather than from Third Avenue at 125th Street as in the 2004 FEIS Design.
- Mining of the 125th Street tunnel and tail tracks with a TBM. This would be the same TBM as used for the 125th Street curve, rather than a separate TBM run launched from Third

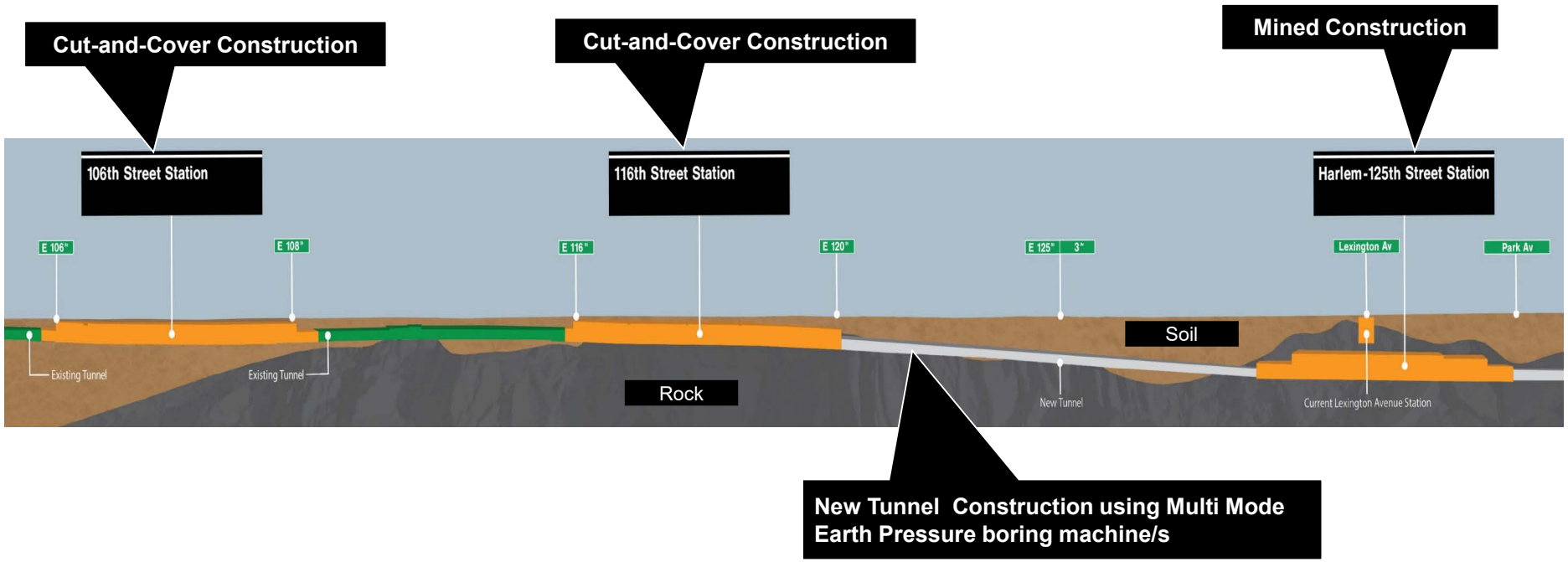
Avenue as in the 2004 FEIS Design. The TBM would be retrieved at a shaft beside 125th Street at the end of the tail tracks; whereas with 2004 FEIS Design it would have been retrieved from a shaft within the street.

However, as a result of updated design and proposed construction methods to help meet one of the Project's objectives of minimizing construction impacts, the Modified Design would reduce construction impacts where possible, particularly at the 125th Street curve and 125th Street Station. **Figure 2-7** illustrates the overall construction methods for the Modified Design, and these modifications are discussed below.

With the Modified Design, the construction period is estimated at nine years, including utility relocation in advance of the rest of the construction activities. Based on the current schedule, assuming a construction start in mid-2019, Phase 2 construction would be complete in 2029.

Modifications to construction methods with the Modified Design include the following:

- The potential **storage tracks under Second Avenue** from about 122nd Street to 129th Street that were included in the 2004 FEIS Design are no longer proposed. This eliminates the need for cut-and-cover construction in this area and the need for an ancillary facility along Second Avenue at approximately 127th Street.
- To expedite construction, based on experience gained during construction of Phase 1 and other major transit projects, MTA intends to implement an early utility relocation program to address a portion of the utility relocation work needed to prepare for the upcoming heavy construction. By performing some major utility relocations along Second Avenue in advance of the underground station shells and tunnel construction, unanticipated complications can be resolved in advance, thereby reducing the risk of construction delays in the follow-on contracts.
- To reduce impacts to the neighborhood associated with lane and sidewalk closures and to limit the need for costly remobilization of staging sites, the sites of ancillary facilities at the 106th and 116th Street Stations would be used as off-street staging areas before the ancillary structures are built. This would shift construction activity from the street to off-street sites.
- The **bellmouth structure under Second Avenue** near the 125th Street curve has been shifted south (from 120th-122nd Streets to 118th-120th Streets) and therefore the area to be excavated there would be reduced. With the 2004 FEIS Design, the cut-and-cover construction for the 116th Street Station would have been extended northward to about 122nd Street to incorporate a shaft where the TBM could be removed. With the Modified Design, the limit of cut-and-cover excavation for TBM activities would be about a block south, near 120th Street. At the off-street staging area developed on the future site of Ancillary 2, the TBM for the tunnels at the 125th Street curve and beneath 125th Street would be launched and excavated materials would be removed from behind the TBM. The 2004 FEIS Design included only a short TBM segment here for the 125th Street curve, and it assumed that the TBM would be launched from a staging site on the south side of 125th Street close to Third Avenue and would finish tunneling and be removed from the ground at an excavated area on Second Avenue near 121st Street. Shifting this excavated area a block south for the Modified Design introduces tunnel construction activity, including removal of tunnel spoils, to this site and removes that activity from the site at Third Avenue and 125th Street. In addition, this change requires portions of the existing Section 13 tunnel and bulkhead to be demolished, which was not the case with the 2004 FEIS Design. However, these modifications combine the construction of the 116th Street



Construction Overview
Figure 2-7

Station, bellmouth structure, and TBM launch site into one continuous structure, and allow for a more compact track design for the bellmouth. As a result, the overall amount of cut-and-cover construction is reduced. These modifications also optimize the TBM construction for the tunnel.

- At the **125th Street tunnel curve**, risk to buildings above the curve would be reduced. The deeper profile of the tunnel would provide greater separation from building foundations. In addition, modified ground stabilization techniques are being investigated that would reduce or avoid potential temporary displacements at properties above the tunnel curve identified in the 2004 FEIS during construction (see Chapter 6, "Displacement and Relocation"). These measures include conducting ground improvement activities (e.g., injection of grout to harden and stabilize the soil) from the proposed construction staging site at the curve, which would potentially avoid the need to access the tunnel from building basements (to be determined during final design).
- For the **tunnel under 125th Street**, including at the 125th Street curve and at the 125th Street Station, excavation would be accomplished by mining with a TBM rather than mining for the tunnel in combination with cut-and-cover construction for the station in the 2004 FEIS Design. In the Modified Design, this tunnel segment would have a deeper alignment so that construction could occur within bedrock in this area rather than soil. This change in construction methods would substantially reduce surface-level impacts. The 2004 FEIS Design included cut-and-cover construction for the length of the station box (from about Third Avenue to Park Avenue) and for track crossover areas, which would have resulted in substantial surface disruption.
- The **125th Street Station** would be deeper than in the 2004 FEIS Design and would be mined rather than excavated through cut-and-cover construction. Cut-and-cover construction would be limited primarily to the station entrances and ancillary building connection locations. The Modified Design would reduce the construction-period impacts to the Lexington Avenue line at the 125th Street Station in comparison to the 2004 FEIS Design, because the Modified Design would involve mining the new tunnel and station farther below the existing station rather than excavating from the surface to build a new station directly beneath and around the existing station, as was proposed for the 2004 FEIS Design. Construction-related risk and the potential need for track outages would be greatly reduced. With the Modified Design, construction impacts to the Lexington Avenue line would be limited to the areas where the new connections are made. These would be at the two new entrances on Lexington Avenue, the two new transfer stairs to the lower platform level, and stair modifications between the lower and upper platform levels. The work would involve structural modifications to provide for new openings into the subway station structure, underpinning of the existing lower level columns where the new transfer stairs are located, and structural reframing for the stair modifications. The modification from a three-track, cut-and-cover station to a two-track, mined station would reduce excavation at the new 125th Street Station by approximately 315,000 cubic yards of spoils—from approximately 465,000 cubic yards of spoils to about 150,000 cubic yards of spoils. This would substantially reduce the above-ground construction activity, including truck traffic, for the new station.

- The **125th Street tail tracks** would involve tunnel construction continuing farther west than in the 2004 FEIS Design. However, similar to the 2004 FEIS Design, mining of the tail tracks would involve minimal surface disruption. With the Modified Design, an off-street shaft site would be used to retrieve the TBM and would then be used as the site of an ancillary facility. The 2004 FEIS Design included retrieval of the TBM from a cut within 125th Street and did not include an end-of-track ancillary facility.

For the Modified Design, as for the 2004 FEIS Design and for Phase 1, the construction contractor will be required to comply with the noise mitigation requirements outlined in the 2004 FEIS and Record of Decision. As stated in the 2004 FEIS, this may include enclosing areas where spoils from tunnel operations would be loaded into trucks, or at station locations where spoils removal would take place for long durations during the daytime or at night; placing some equipment or operations below grade in shielded locations; changing construction sequencing to reduce noise impacts by combining noisy operations to occur in the same time period or by spreading them out; avoiding nighttime activities; prohibiting blasting after 8 PM or on holidays; and using alternative construction methods, such as avoiding impact pile installation in sensitive areas, using special low noise emission level equipment, and selecting and specifying quieter demolition methods. If the construction contractor encloses areas where spoils are removed to reduce impacts to nearby areas, similar to what was done at certain locations for Phase 1, these enclosures would remain in place for the duration of the spoils removal operation.

2.4 SUMMARY OF THE MODIFIED DESIGN

The design modifications described in this chapter are summarized in **Table 2-1**. The primary reason for each design modification is indicated by an asterisk (*).

Table 2-1
Summary of Phase 2 Design Modifications

Phase 2 Component	Description of Change(s)	Primary Reasons for Design Changes		
		Changes in Background Conditions[1]	**Advanced Preliminary Engineering[2]**	**Updated Construction Methods[3]**
106th Street Station (See Figure 2-1a)				
Station/ Platform	Shifted about 5-6 feet east	N/A	N/A	*Shifted east to reduce impacts to Empire City Subway duct bank utility line along west side of Second Avenue.
	Shifted about 50 feet south	N/A	*Shifted south to accommodate modified station entrances and connections to ancillary facilities.	N/A
Entrance 1	Larger	N/A	*Larger entrance required to provide acceptable passenger level of service and emergency egress based on updated ridership estimates.	N/A
Entrance 2	Larger	N/A	*Larger entrance required to provide an elevator and acceptable passenger level of service and emergency egress based on updated ridership estimates.	N/A
	Shifted slightly	N/A	N/A	*Shifted closer to street corner to avoid recent utility connections for adjacent residences.
Ancillary 1	Relocated	*Relocated to avoid displacement of new six-story school on previous site.	Relocated to better meet ventilation needs by being closer to the proposed platform.	
	Larger	*Larger to accommodate more functions above-ground as updated flood protection standards (largely as a result of Hurricane Sandy in 2012) require more critical equipment to be at higher elevations.	Larger above-ground facility to account for shallow tunnel alignment, which limits space in the station box. Modified Design includes dry-cooler system within the building interior, rather than rooftop cooling towers. Dry coolers provide less maintenance, reduce noise, and eliminate rooftop equipment. Modified Design incorporates ground floor retail space to enhance integration with surrounding neighborhood. Larger to accommodate construction staging to consolidate construction activities, limit work area within Second Avenue right-of-way, limit costly and timely remobilization activities, and limit risk to adjacent buildings.	N/A

Table 2-1 (Cont'd)
Summary of Phase 2 Design Modifications

Phase 2 Component	Description of Change(s)	Primary Reasons for Design Changes		
		Changes in Background Conditions[1]	Advanced Preliminary Engineering[2]	Updated Construction Methods[3]
106th Street Station (See Figure 2-1a)- Cont'd				
Ancillary 2	Relocated	*Relocated to avoid new seven-story residential and commercial development on previous site.	Relocated to better meet ventilation needs of subway structure by providing a more direct connection to the relocated station box.	N/A
	Larger	*Larger to accommodate more functions above-ground as updated flood protection standards (largely as a result of Hurricane Sandy in 2012) require more critical equipment to be at higher elevations.	Larger above-ground facility to account for shallow tunnel alignment, which limits space in the station box. Modified Design includes dry-cooler system within the building interior, rather than rooftop cooling towers. Dry coolers provide less maintenance, reduce noise, and eliminate rooftop equipment. Modified Design incorporates ground floor retail space to enhance integration with surrounding neighborhood. Larger to accommodate construction staging to consolidate construction activities, limit work area within Second Avenue right-of-way, limit costly and timely remobilization activities, and limit risk to adjacent buildings.	N/A
116th Street Station (See Figure 2-2a)				
Station/ Platform	Shifted about 30 feet north	N/A	*Shifted to meet revised alignment geometry and location of bellmouth structure.	N/A
Entrance 1	Larger	N/A	*Larger entrance required to provide acceptable passenger level of service and emergency egress based on updated ridership estimates.	N/A
Entrance 2	Larger	N/A	*Larger entrance required to provide an elevator and acceptable passenger level of service and emergency egress based on updated ridership estimates.	N/A
	Relocated	N/A	Relocated to better align with the end of the platform.	N/A
Ancillary 1	Relocated	*Relocated to avoid newly designated historic structure (Banca Italiana Commerciale) adjacent to previous site.	Relocated to better meet ventilation needs of the subway structure by providing a more direct connection to the station box.	N/A

Table 2-1 (Cont'd)
Summary of Phase 2 Design Modifications

Phase 2 Component	Description of Change(s)	Primary Reasons for Design Changes		
		Changes in Background Conditions[1]	Advanced Preliminary Engineering[2]	Updated Construction Methods[3]
116th Street Station (See Figure 2-2a)- Cont'd				
Ancillary 1 (Cont'd)	Larger	*Larger to accommodate more functions above-ground such as updated flood protection standards that (largely as a result of Hurricane Sandy in 2012) require more critical equipment to be at higher elevations.	Larger above-ground facility to account for shallow tunnel alignment, which limits space in the station box. Modified Design includes dry-cooler system within the building interior, rather than rooftop cooling towers. Dry coolers provide lower maintenance, reduce noise, and eliminate rooftop equipment Modified Design incorporates ground floor retail space to enhance integration with surrounding neighborhood. Larger to accommodate construction staging to consolidate construction activities, limit work area within Second Avenue right-of-way, limit costly and timely remobilization activities, and limit risk to adjacent buildings.	N/A
Ancillary 2	Relocated	N/A	*Relocated to better meet ventilation needs of the subway structure by providing a more direct connection to the station box. New location provides a staging area for the tunnel boring machines (TBMs) operations.	N/A
	Larger	*Larger to accommodate more functions above-ground such as updated flood protection standards that (largely as a result of Hurricane Sandy in 2012) require more critical equipment to be at higher elevations.	Larger above-ground facility to account for shallow tunnel alignment, which limits space in the station box. Modified Design includes dry-cooler system within the building interior, rather than rooftop cooling towers. Dry coolers provide lower maintenance, reduce noise, and eliminate rooftop equipment Modified Design incorporates ground floor retail space to enhance integration with surrounding neighborhood. Larger to accommodate construction staging for station, bellmouth, and tunnel boring machine (TBM), and would consolidate construction activities, limit work area within Second Avenue, limit costly and timely remobilization activities, limit risk to adjacent buildings, and allow space to support TBM operations.	N/A

Table 2-1 (Cont'd)
Summary of Phase 2 Design Modifications

Phase 2 Component	Description of Change(s)	Primary Reasons for Design Changes		
		Changes in Background Conditions[1]	Advanced Preliminary Engineering[2]	Updated Construction Methods[3]
125th Street Curve (See Figure 2-3a)				
Bellmouth Structure and TBM Launch Box	Shifted from original location at 120th-122nd Street to new location at 118th-120th Street	N/A	N/A	*Shifted to reduce surface construction impacts by allowing bellmouth structure to be connected with 116th Street Station structure, which also allows for a more compact (i.e., narrower) structure, further reducing cut-and-cover construction needs.
Ancillary	New to project	N/A	*Added to provide intermediate ventilation and emergency egress point, if required. Located on site already identified as construction staging site.	N/A
Tunnel	Modified ground stabilization techniques – use of grouting rather than underpinning	N/A	N/A	*To reduce surface construction impacts and potentially reduce or avoid temporary displacements by conducting ground stabilization from the construction staging site.
	Lowered about 20 feet	N/A	Lowered to connect with lowered 125th Street Station (discussed below) with appropriate track grades.	*Lowered to reduce substantial construction impacts associated with excavation along 125th Street, a heavily traveled commercial corridor, by allowing mined construction instead of cut-and-cover.
Optional Storage Tracks Beneath Second Avenue to 129th Street	Removed from project	N/A	*****Removed optional storage tracks that were considered in 2004 FEIS since advanced operations analysis concluded that the location of these storage tracks is not compatible with the efficient dispatching of trains from storage into revenue service and, therefore is not needed.	N/A
125th Street Station (See Figure 2-4a)				
Station Tunnel Alignment	Lowered 20 feet and shifted 115 feet west	N/A	N/A	*Lowered and shifted west to allow mined construction in bedrock to substantially reduce disruptive cut-and-cover construction impacts otherwise associated with excavation along 125th Street and to reduce impacts with intersection of existing Lexington Avenue (4/5/6) subway line.
Track Configuration	Modified from 3-track to 2-track station	N/A	Modified to facilitate double crossover interlocking system on both sides of station for greater operational flexibility.	*Modified to reduce excavation needs and reduce surface construction impacts along 125th Street.

Table 2-1 (Cont'd)
Summary of Phase 2 Design Modifications

Phase 2 Component	Description of Change(s)	Primary Reasons for Design Changes		
		Changes in Background Conditions[1]	Advanced Preliminary Engineering[2]	Updated Construction Methods[3]
125th Street Station (See Figure 2-4a) – Cont'd				
Entrance 1	Larger	N/A	*Larger entrance required to provide acceptable passenger level of based on updated ridership and transfer estimates.	N/A
Entrance 2 – Option 1 *(preferred)*	New to project	N/A	*Could provide higher capacity transfer connection between new subway and existing Lexington Avenue (4/5/6) line. Final option will be selected as design advances.	N/A
Entrance 2 – Option 2 *(Original 2004 Location)*	Larger	N/A	*Larger entrance required to provide acceptable passenger level of based on updated ridership and transfer estimates. Larger to accommodate vertical circulation elements required to access deeper station and for transfers between the new subway and existing Lexington Avenue (4/5/6) line.	N/A
Entrance 3	Larger	N/A	*Larger entrance required to provide acceptable passenger level of based on updated ridership and transfer estimates. Expanded station to accommodate vertical circulation elements for deeper station and to avoid conflicts with the existing Metro-North Railroad viaduct structure and a Comfort Station, which is a contributing element of the historic Metro-North Harlem-125th Street Station.	N/A
Ancillary 1	Relocated	N/A	N/A	*Relocated west to align with shifted station box. Relocated from 125th Street to 124th Street to shift construction impacts away from busy commercial corridor.

Table 2-1 (Cont'd)
Summary of Phase 2 Design Modifications

Phase 2 Component	Description of Change(s)	Primary Reasons for Design Changes		
		Changes in Background Conditions[1]	Advanced Preliminary Engineering[2]	Updated Construction Methods[3]
125th Street Station (See Figure 2-4a) – Cont'd				
Ancillary 1 (Cont'd)	Larger	N/A	*Mined station box reduces excavation but provides less volume for ancillary functions. Modified Design includes dry-cooler system within the building interior, rather than rooftop cooling towers. Dry coolers provide less maintenance, reduce noise, and eliminate rooftop equipment Modified Design incorporates ground floor retail space to enhance integration with surrounding neighborhood. Larger to accommodate construction staging to facilitate station cavern excavation and structural lining, which require multiple, large work areas to provide contractor access into the cavern, storage of muck, routing of trucks, storage of construction materials, and concrete operations.	N/A
Ancillary 2	Relocated	N/A	N/A	*Relocated west to align with the shifted station box. Relocated from 125th Street to 124th Street to shift construction impacts away from busy commercial corridor.
	Larger	N/A	*Mined station box reduces excavation but provides less volume for ancillary functions. Modified Design includes dry-cooler system within the building interior, rather than rooftop cooling towers. Dry coolers provide less maintenance, reduce noise, and eliminate rooftop equipment Modified Design incorporates ground floor retail space to enhance integration with surrounding neighborhood. Larger to accommodate construction staging to facilitate station cavern excavation and structural lining, which require multiple, large work areas to provide contractor access into the cavern, storage of muck, routing of trucks, storage of construction materials, and concrete operations.	N/A

Table 2-1 (Cont'd)
Summary of Phase 2 Design Modifications

Phase 2 Component	Description of Change(s)	Primary Reasons for Design Changes		
		Changes in Background Conditions[1]	Advanced Preliminary Engineering[2]	Updated Construction Methods[3]
125th Street Tail Tracks (See Figure 2-5a)				
Alignment	Two options now considered	N/A	Two options are being considered, pending further operations and planning analysis: - Option 1: two-train per track storage (four trains total) - Option 2 *(preferred)*: three-train per track storage (six trains total)	N/A
	Both options extend farther west to just east or west of Lenox Avenue	N/A	*Extended farther west as a result of advanced operations planning for rail storage needs and to accommodate shift west of 125th Street Station and reconfiguration of station from 3-track to 2-track.	N/A
Ancillary	New to project	N/A	*Extension of tail tracks farther west require an ancillary facility for emergency ventilation and egress, whereas tail tracks under the 2004 FEIS Design were anticipated to be served by ancillary facilities at the 125th Street Station.	N/A

Notes:

1 **Changes in Background Conditions:** Includes changes in updated flood protection standards that require electrical and other critical equipment to be at higher elevations. Includes changes in site conditions where previously identified real estate is no longer suitable or available (i.e., new developments are typically larger and deconstruction would result in increased displacements and additional project costs). Includes consideration of the East Harlem Historic District centered along 116th Street that was designated in 2017.

2 **Advanced Preliminary Engineering:** Subsequent to the 2004 FEIS, site-specific reconnaissance, further engineering, and advanced operations planning, including new ridership modeling and pedestrian flow studies, have been conducted for Phase 2, which resulted in some refinements to the preliminary engineering design. In addition, experience gained from previous NYCT major capital projects have been incorporated into the design and construction methods.

3 **Updated Construction Methods:** To further support one of the Project's goals and objectives to "Minimize community disruption during construction," as stated in the 2004 FEIS, efforts have been undertaken to reduce surface construction impacts, particularly along 125th Street, which is a major commercial center for the area and has seen extensive development in the past decade. The 2004 FEIS Design proposed cut-and-cover construction along much of this corridor, which would have required substantial surface disruption, whereas the Modified Design proposes primarily mined construction within bedrock, thus minimizing surface construction impacts.

*** Indicates primary reason for the change.**

✷