



FINAL ENVIRONMENTAL IMPACT STATEMENT AND FINAL SECTION 4(f) EVALUATION

APPENDIX 3

Construction Methods and Activities

3-1: Options for Spoils Removal and Materials Deliveries at the Hoboken Staging Area



FINAL ENVIRONMENTAL IMPACT STATEMENT AND FINAL SECTION 4(f) EVALUATION

APPENDIX 3-1

Options for Spoils Removal and Materials Deliveries at the Hoboken Staging Area

Options for Spoils Removal and Materials Deliveries at the Hoboken Staging Area¹

Appendix 3-1

A.3-1.1 INTRODUCTION

The new Hudson River Tunnel would consist of two separate tunnels (referred to as tubes) that would extend from a portal in the western slope of the Palisades landform in North Bergen, New Jersey, to a portal near Tenth Avenue in Manhattan (New York). For purposes of describing tunnel construction activities, the tunnel is divided into two different lateral segments: (1) the Palisades tunnel, an approximately 5,000-foot-long segment through the hard rock of the Palisades landform, extending from the portal in North Bergen, New Jersey, near Tonnelle Avenue to an intermediate ventilation shaft in Hoboken, New Jersey; and (2) the river tunnel, an approximately 7,000-foot-long segment in rock and soft soil extending from the Hoboken shaft, under the Hudson River, and on to an intermediate ventilation shaft in Manhattan near Twelfth Avenue. The two tubes of the Palisades tunnel and river tunnel segments would each be constructed by a tunnel boring machine (TBM) operating eastward from New Jersey to New York. Construction of both of these segments would be staged from New Jersey.

In the conceptual construction approach presented in the Draft Environmental Impact Statement (DEIS) in Chapter 3, "Construction Methods and Activities," the two tubes of the tunnel would be constructed simultaneously by two TBMs working in parallel, with start times staggered by approximately two months to allow information about ground conditions gained from operation of the first TBM to be applied during operation of the second TBM. To achieve expedited completion of the Project, the construction schedule presented in the DEIS also assumed that tunneling for the Palisades tunnel segment would occur at the same time as construction of the river tunnel segment. In that scenario, TBMs would bore from a staging area at Tonnelle Avenue eastward to the Hoboken shaft at the same time that TBMs would bore from the Hoboken shaft eastward toward New York. Staging areas near both tunnel starting points would provide access to the tunnel for workers and deliveries and would receive excavated materials from the tunneling activity that each respective staging area was supporting. For the Palisades tunnel segment, a staging area would be on both sides of Tonnelle Avenue near the new portal. For the river tunnel segment, a staging area would be at the Hoboken ventilation shaft site. At both staging areas, excavated material (i.e., spoils) removed from the tunnel segments during construction would be brought to the surface and removed by trucks for delivery to approved disposal sites. When construction of the new Hudson River Tunnel is complete, rehabilitation of the North River Tunnel would begin, staged only from the Tonnelle Avenue staging area.

During public review of the DEIS in summer 2017, residents and elected officials in Weehawken, which is adjacent to the Hoboken staging area, and surrounding communities, raised concerns about the potential volume of construction trucks traveling to and from the Hoboken staging area on local streets in Weehawken. To address those concerns, the Federal Railroad Administration (FRA), the New Jersey Transit Corporation (NJ TRANSIT), and the other Project Partners² sought to identify feasible and reasonable modifications to the Project's construction methodology that

¹ This appendix is new for the FEIS.

² NJ TRANSIT, the National Railroad Passenger Corporation (Amtrak), and the Port Authority of New York and New Jersey (PANYNJ), who are working together to advance the Hudson Tunnel Project, are referred to in this FEIS as the Project Partners.



would reduce truck trips in Weehawken, so as to reduce the construction impacts of the Hudson Tunnel Project in Weehawken without either substantially increasing impacts to other communities and resources or affecting the Project's effectiveness in meeting its purpose and need. This appendix describes the options considered, the criteria used to evaluate them, and the results of the evaluation.

A.3-1.2 APPROACH FOR EVALUATION

In the construction approach presented in the DEIS, the Hoboken staging area would be used for three different phases of construction activity: (1) construction of a vertical shaft from the surface to the depth of the tunnel, which would serve as one of the ventilation shafts and emergency access points for the new Hudson River Tunnel; (2) as an access point for deliveries of tunnel construction materials and for removal of tunnel spoils during construction of the river tunnel segment; and (3) construction of a ventilation fan plant that would provide ventilation for the train tunnel below for use when the tunnel is complete and in operation. In each of these three phases, trucks would bring deliveries to the site. In the first and second phase, trucks would also remove spoils from the site—from excavation of the vertical shaft in the first phase and from excavation of the river tunnel in the second phase.

In response to comments made on the DEIS during the public comment period in summer 2017, FRA, NJ TRANSIT, and the Project Partners developed and evaluated a wide range of different options for removal of spoils and delivery of supplies to support construction activities proposed in the DEIS to occur at the Hoboken staging area. Including the original options examined in the DEIS, FRA, NJ TRANSIT and the Project Partners identified and evaluated a total of eight spoils removal and materials delivery options (see Section A.3-1.3 for the list and description of options).

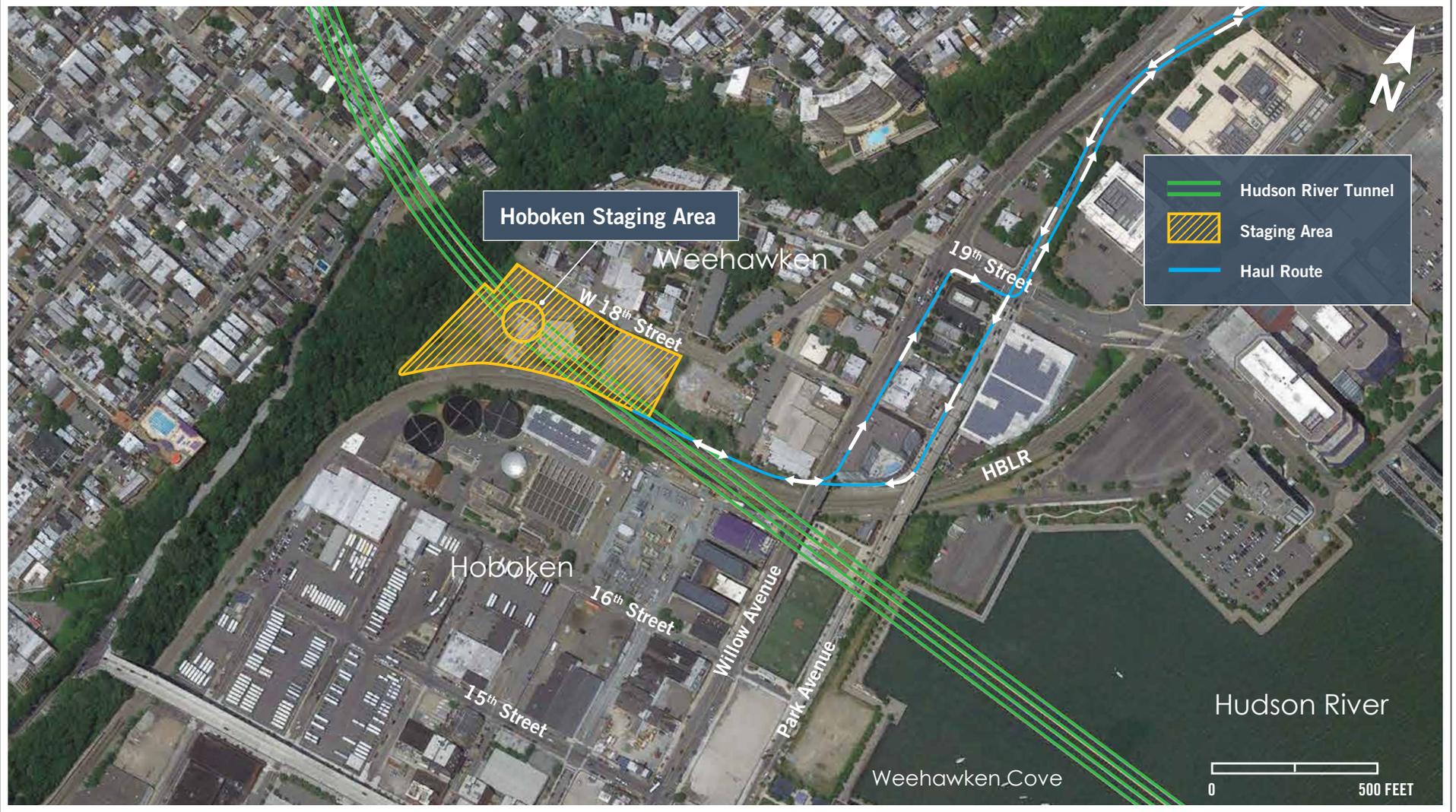
Each option was evaluated for its potential effects in the following areas:

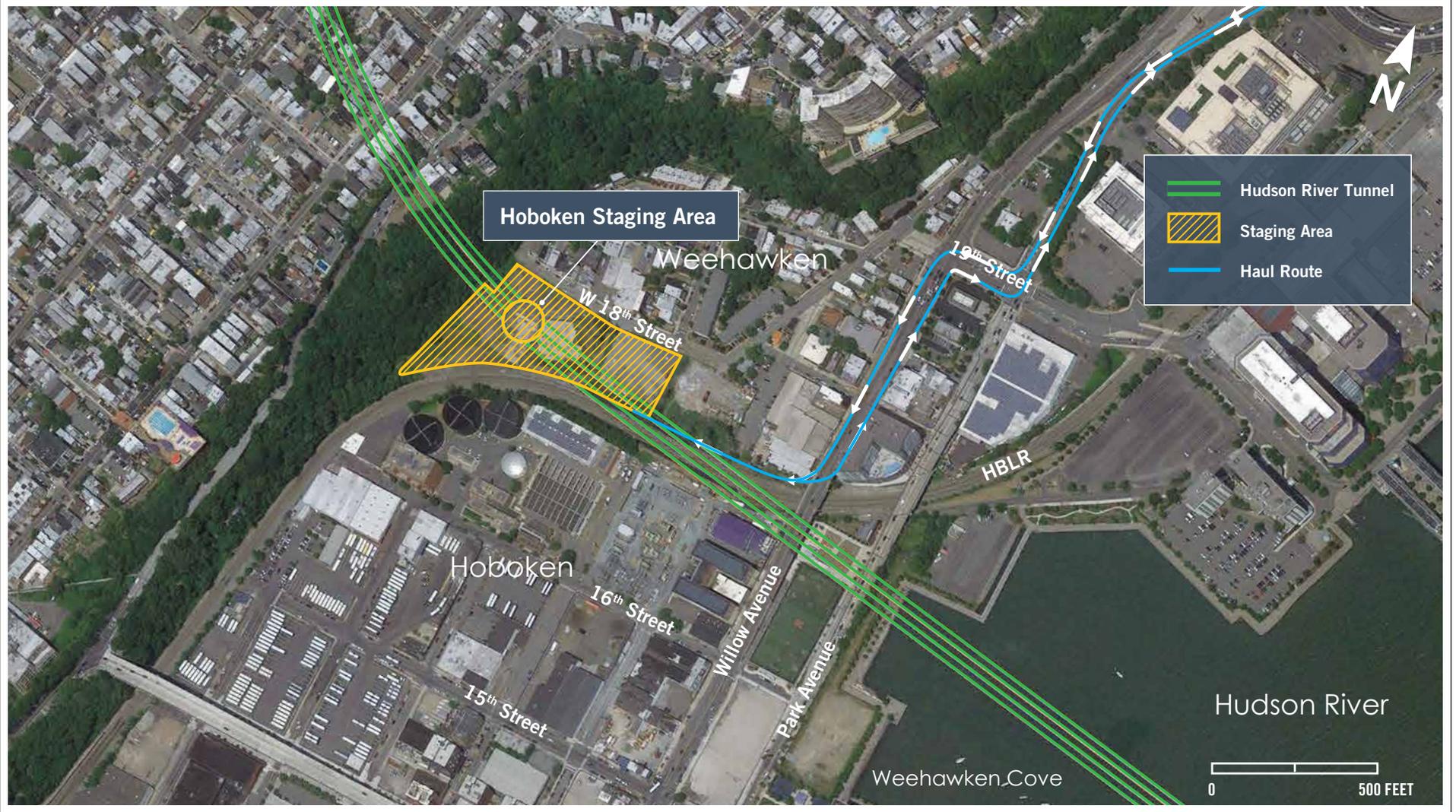
- **Feasibility and Reasonability:** This factor considered whether the option was feasible to implement (i.e., whether the option can feasibly be implemented given engineering and constructability considerations) and whether use of this option introduced new or substantial concerns so that it is not reasonable (i.e., an alternative may not be reasonable if it would have a likelihood for substantial impacts, a protracted construction time, an unacceptably high cost or great environmental impact relative to other alternatives, or operational characteristics that are unacceptable).
- **Effects on Project Schedule:** Expedient completion of the Hudson Tunnel Project is a key goal for the Project. Therefore, each option was evaluated in terms of its overall impact on the Project construction schedule.
- **Constructability and Construction Risk:** Options that introduce construction difficulties, even if feasible to build and operate, may increase risks associated with construction, which may also result in delays in Project completion or the potential for substantial additional cost.
- **Ability to Reduce Community Impacts:** The purpose of the evaluation was to identify methods to reduce community impacts on residential areas of Weehawken and Hoboken that are adjacent to the Hoboken staging area, so this criterion considered how well the option achieved that purpose. At the same time, options should not result in substantial new impacts to residential communities, either in Weehawken or elsewhere, which would also be counter to the basic purpose of the evaluation.

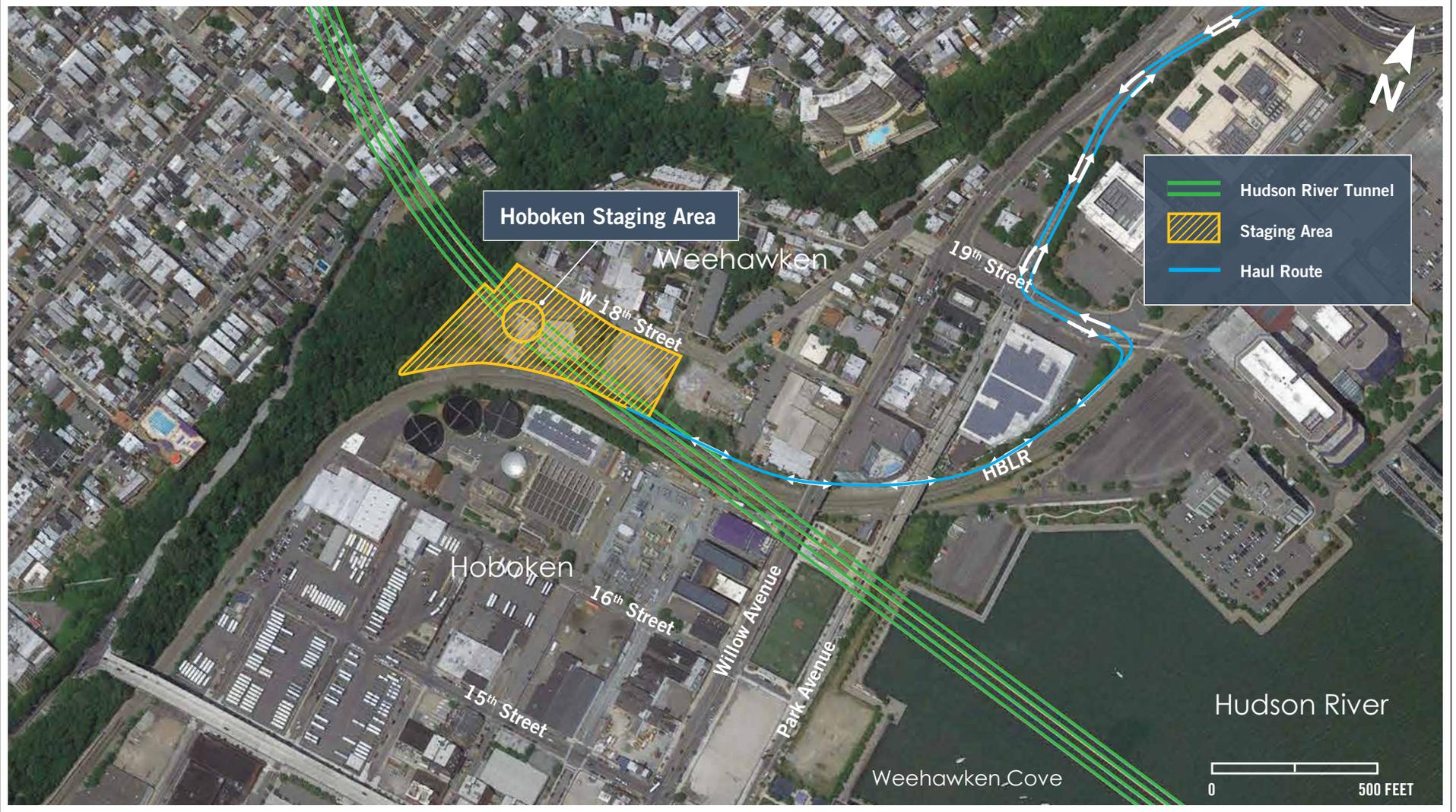
A.3-1.3 EVALUATION OF SPOILS REMOVAL AND MATERIALS DELIVERY OPTIONS

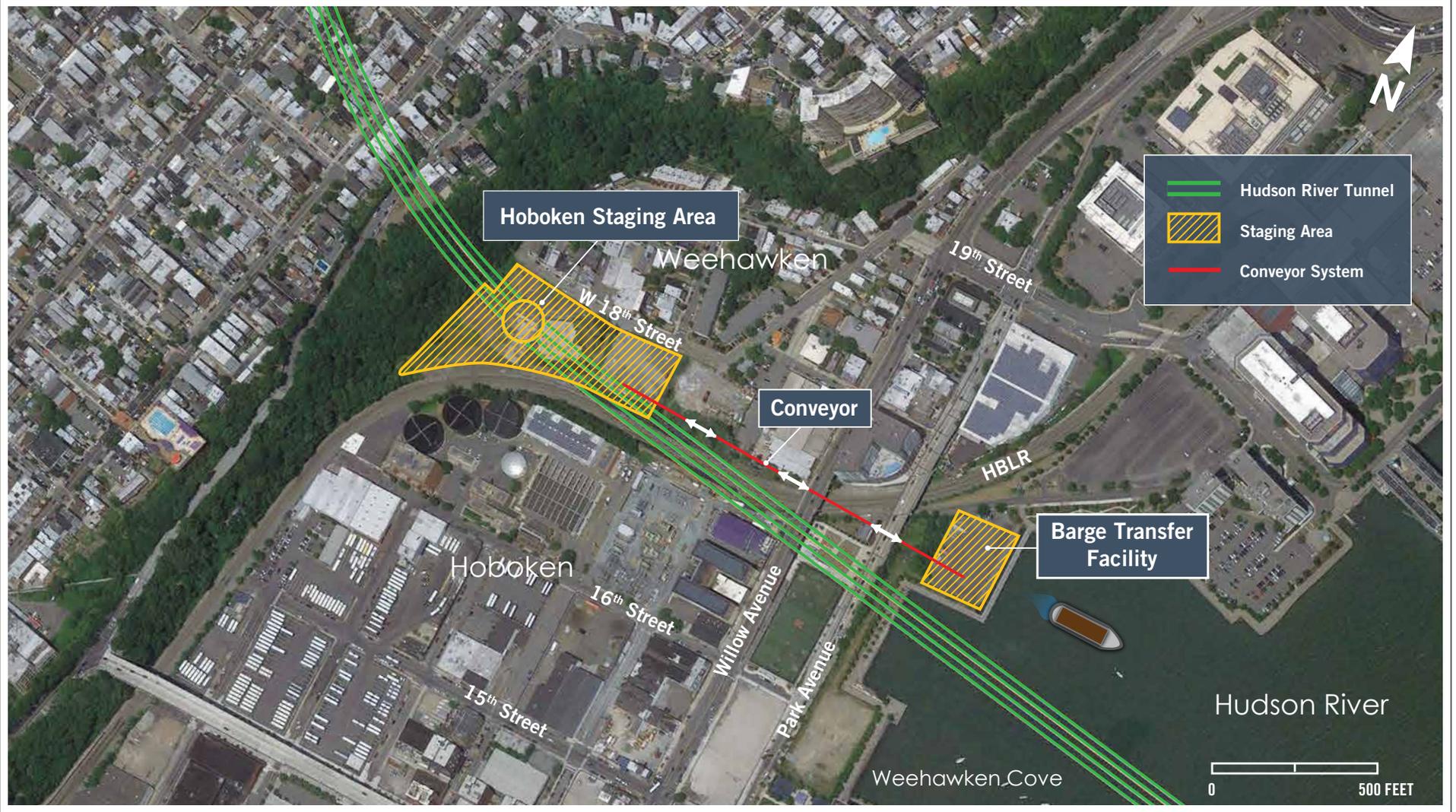
FRA, NJ TRANSIT, and the Project Partners considered the following eight spoils removal and materials delivery options in this evaluation. Analysis of Options 1 and 2 was presented in the DEIS; Options 3 through 8 were developed for analysis after completion of the DEIS.

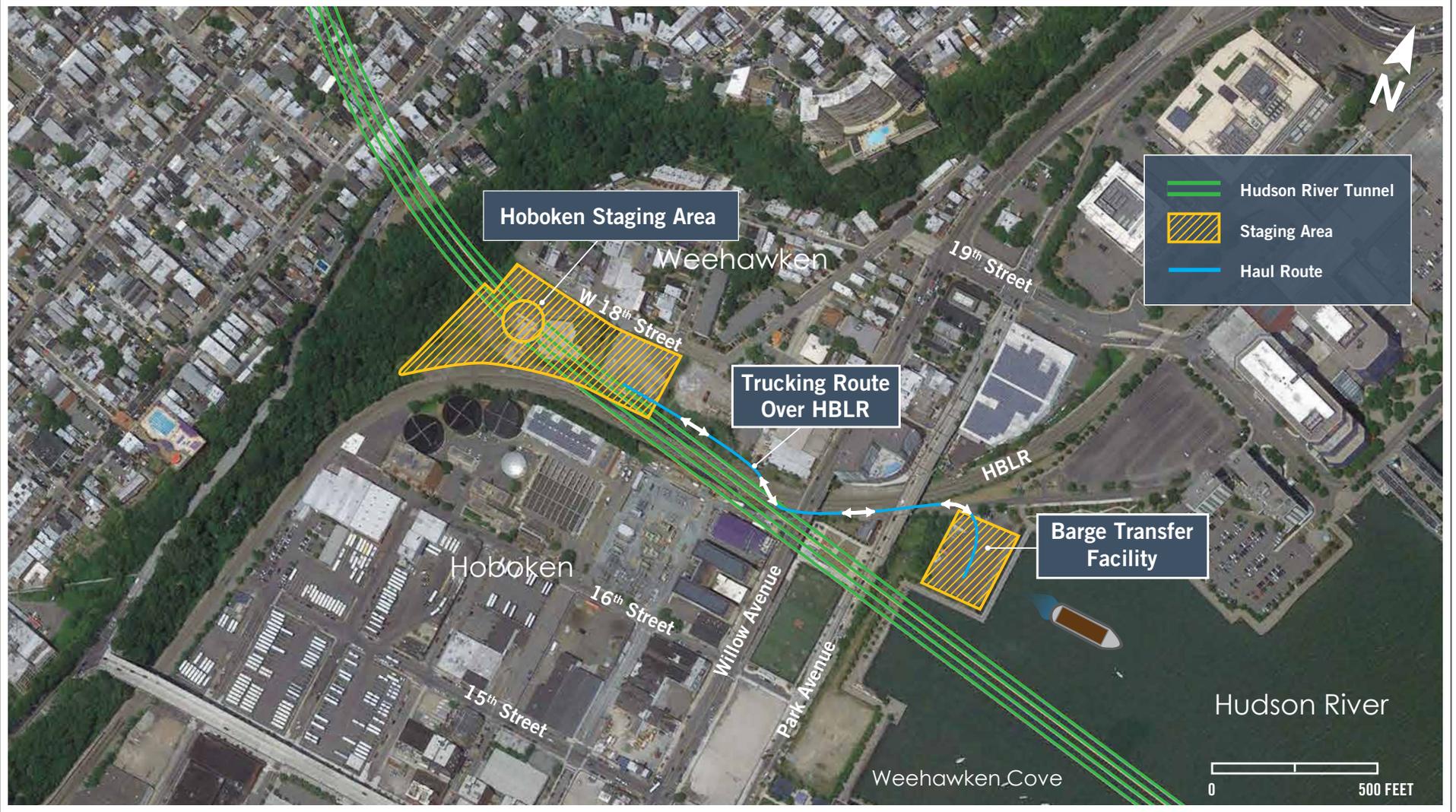
- **Option 1** (analyzed in the DEIS) would use trucks for spoils removal and materials delivery. Trucks would travel to and from the Hoboken staging area via an off-street construction roadway along the north side of the Hudson-Bergen Light Rail (HBLR) tracks, then on local streets between that construction roadway and Route 495, using the Willow Avenue service road (for outbound trucks) and Park Avenue service road (for inbound trucks), 19th Street, and JFK Boulevard East. See **Figure A.3-1**.
- **Option 2** (analyzed in DEIS) would use trucks for spoils removal and materials delivery. Trucks would travel to and from the Hoboken staging area via an off-street construction roadway along the north side of the HBLR tracks, then on local streets between that construction roadway and Route 495, using the Willow Avenue service road for both outbound and inbound trucks, 19th Street, and JFK Boulevard East. See **Figure A.3-2**.
- **Option 3** would use trucks for spoils removal and materials delivery. Trucks would travel to and from the Hoboken staging area via an off-street construction roadway along the north and west side of the HBLR tracks that would extend as far as 19th Street, then on local streets between that construction roadway and Route 495, using 19th Street and JFK Boulevard East. See **Figure A.3-3**.
- **Option 4** would use barges for spoils removal and possibly for materials delivery. Three different sub-options were developed to connect between the Hoboken staging area and the barges. Option 4a would use a conveyor system to connect the Hoboken staging area to a new waterfront barge transfer facility (see **Figure A.3-4**). Option 4b would use a truck route instead of a conveyor to connect the Hoboken staging area to the barge transfer facility, with an at-grade crossing of the truck route across the HBLR right-of-way (see **Figure A.3-5**). Option 4c would use an on-road truck route to connect the Hoboken staging area to the barge transfer facility, to avoid the at-grade crossing of the HBLR right-of-way (see **Figure A.3-6**).
- **Option 5** would use freight trains running on the HBLR alignment for spoils removal and materials delivery. See **Figures A.3-7 through A.3-9**.
- **Option 6** would provide an additional staging area for spoils loading to the south of the main Hoboken staging area, which would shift trucking activities related to spoils removal to that site. However, the trucks would still run through Weehawken via Park Avenue to reach Route 495. See **Figure A.3-10**.
- **Option 7** would use the Palisades tunnel segment to remove spoils from the river tunnel segment to the Tonnelle Avenue staging area, from which point spoils removal and materials delivery via trucks would occur. See **Figures A.3-11 and A.3-12**.
- **Option 8** would use a single TBM to construct the river tunnel segment from Hoboken to New York, to reduce the daily volume of trucks needed at the Hoboken staging area for spoils removal and materials delivery. This option could use the same truck routes as Options 1, 2, and 3 for the daily trucking. See **Figure A.3-13**.

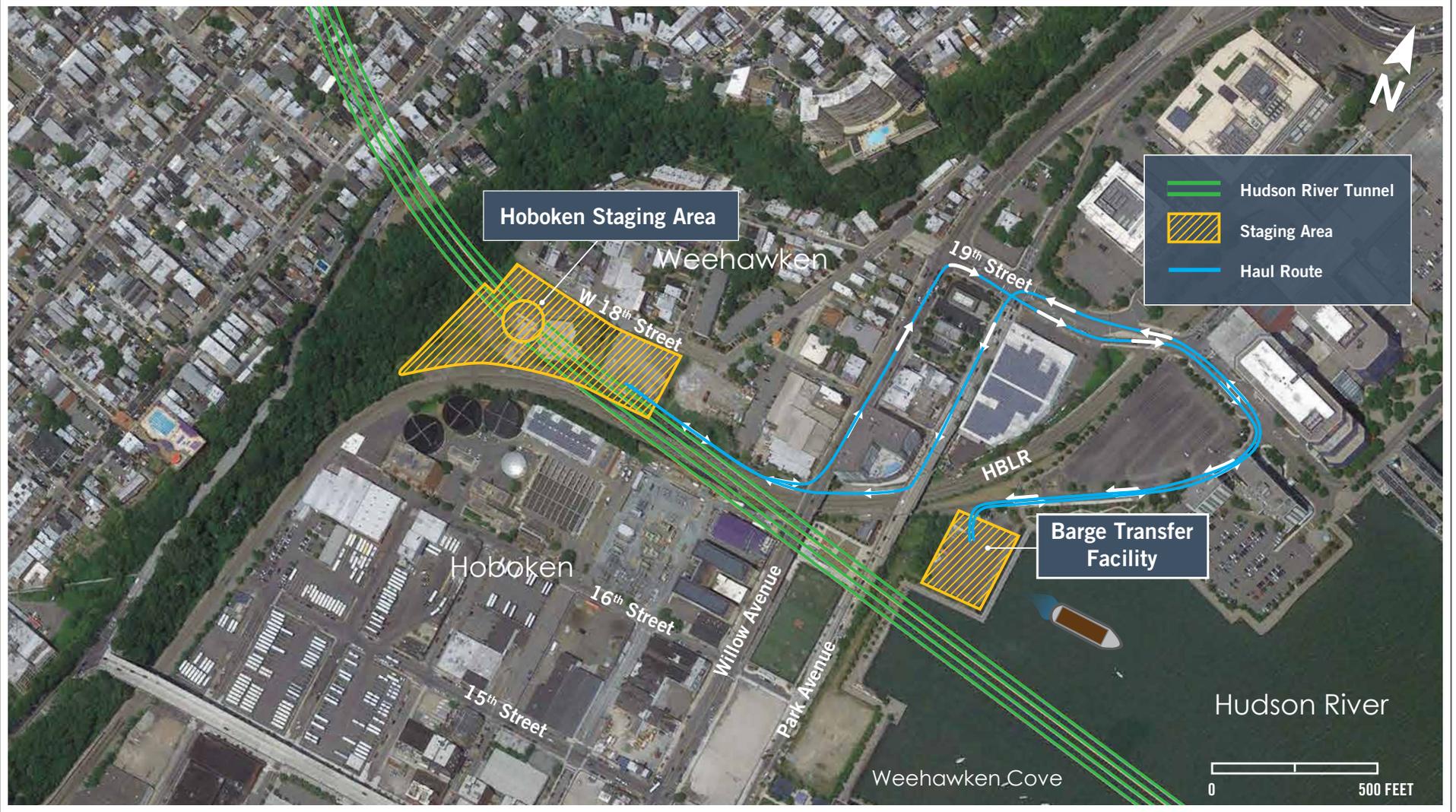


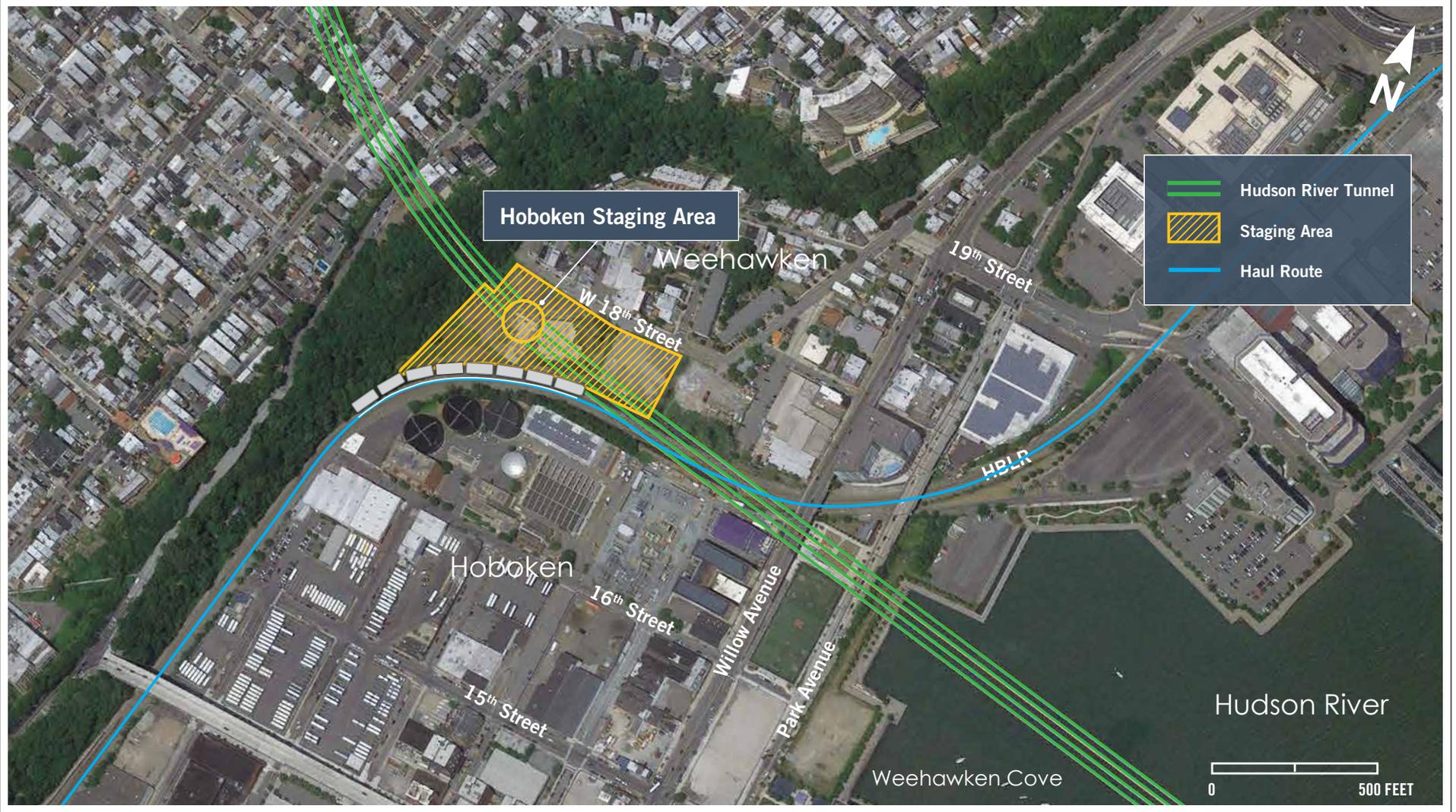


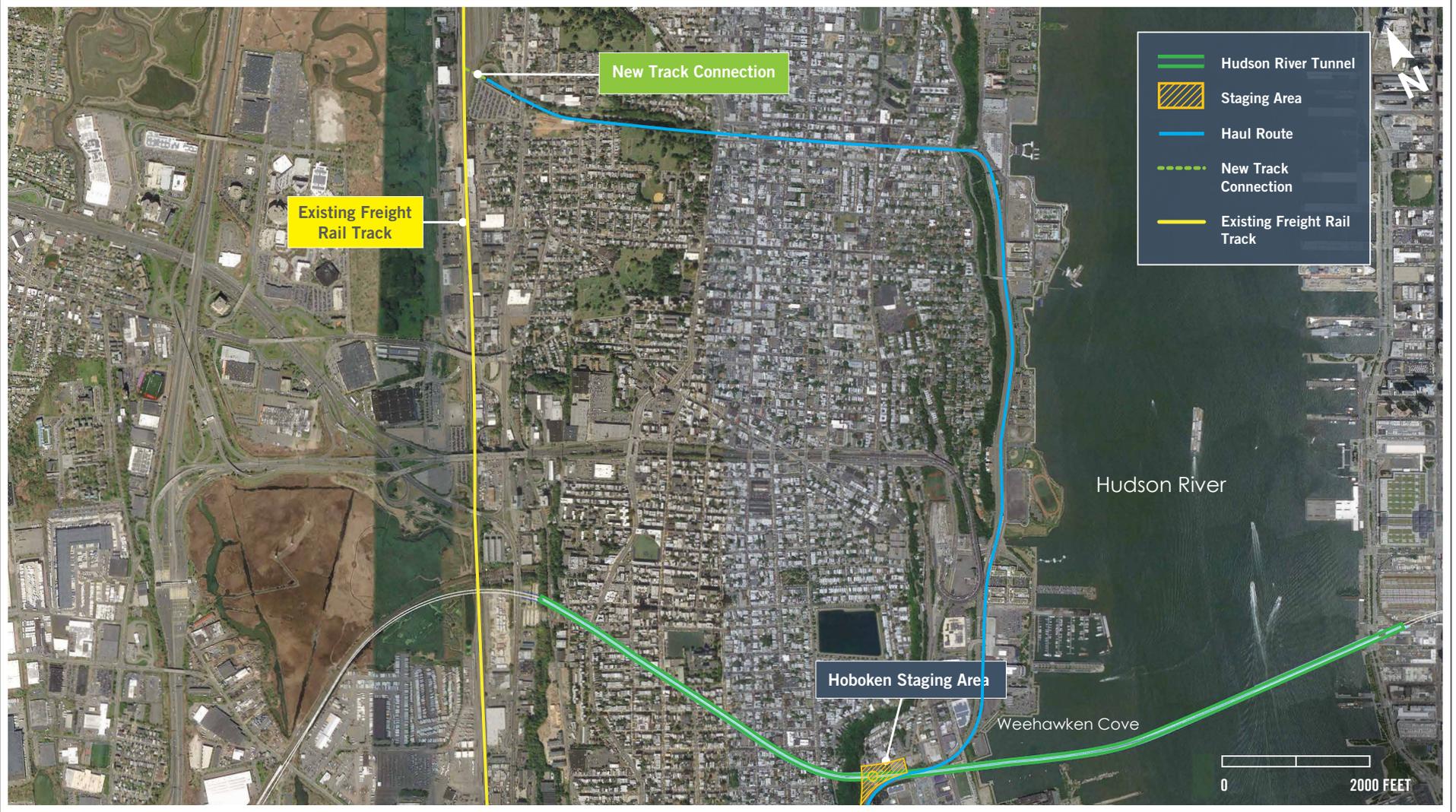












Option 5: Use of Freight Trains on HBLR Tracks (Northern Route)

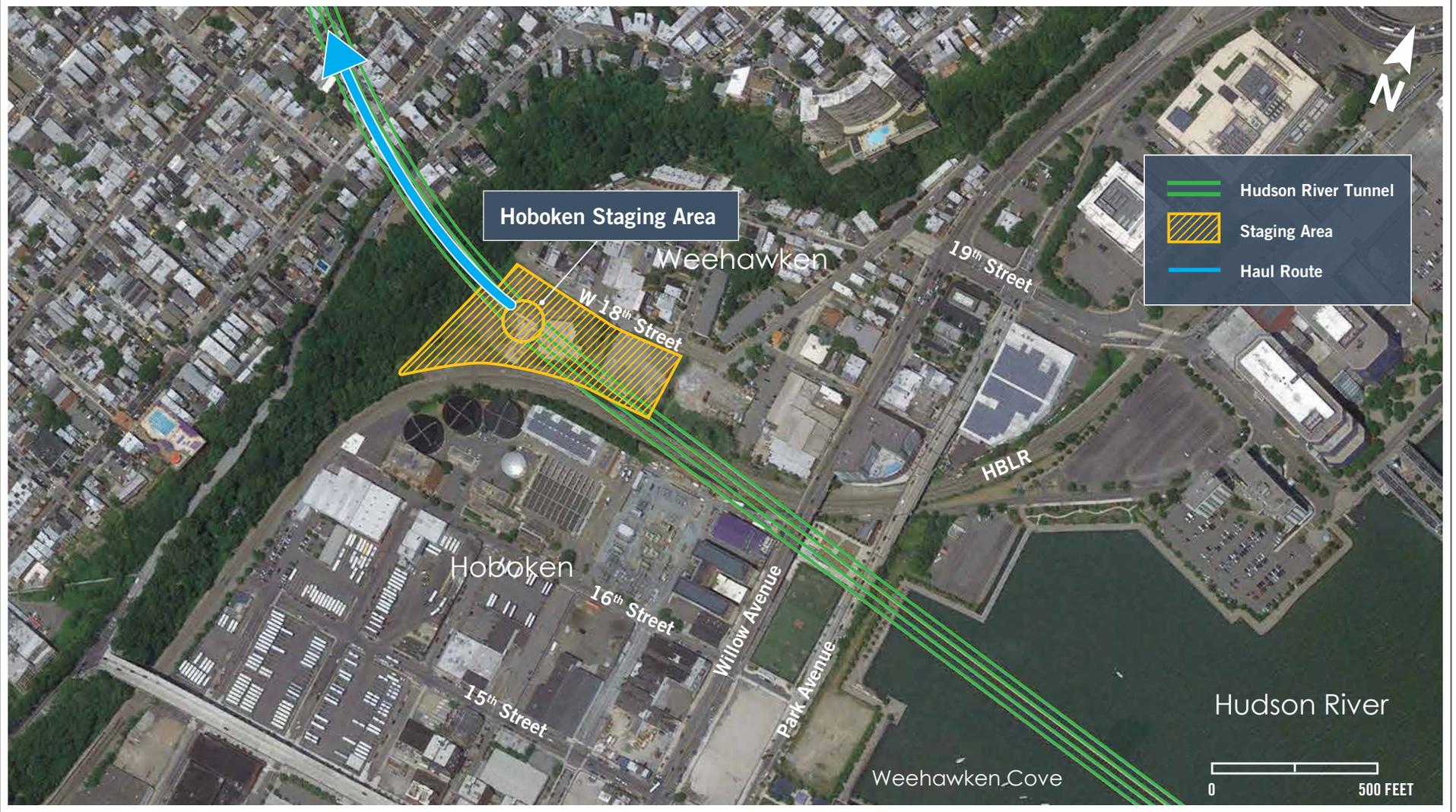
Figure A.3-8



Option 5: Use of Freight Trains on HBLR Tracks
(Southern Route)

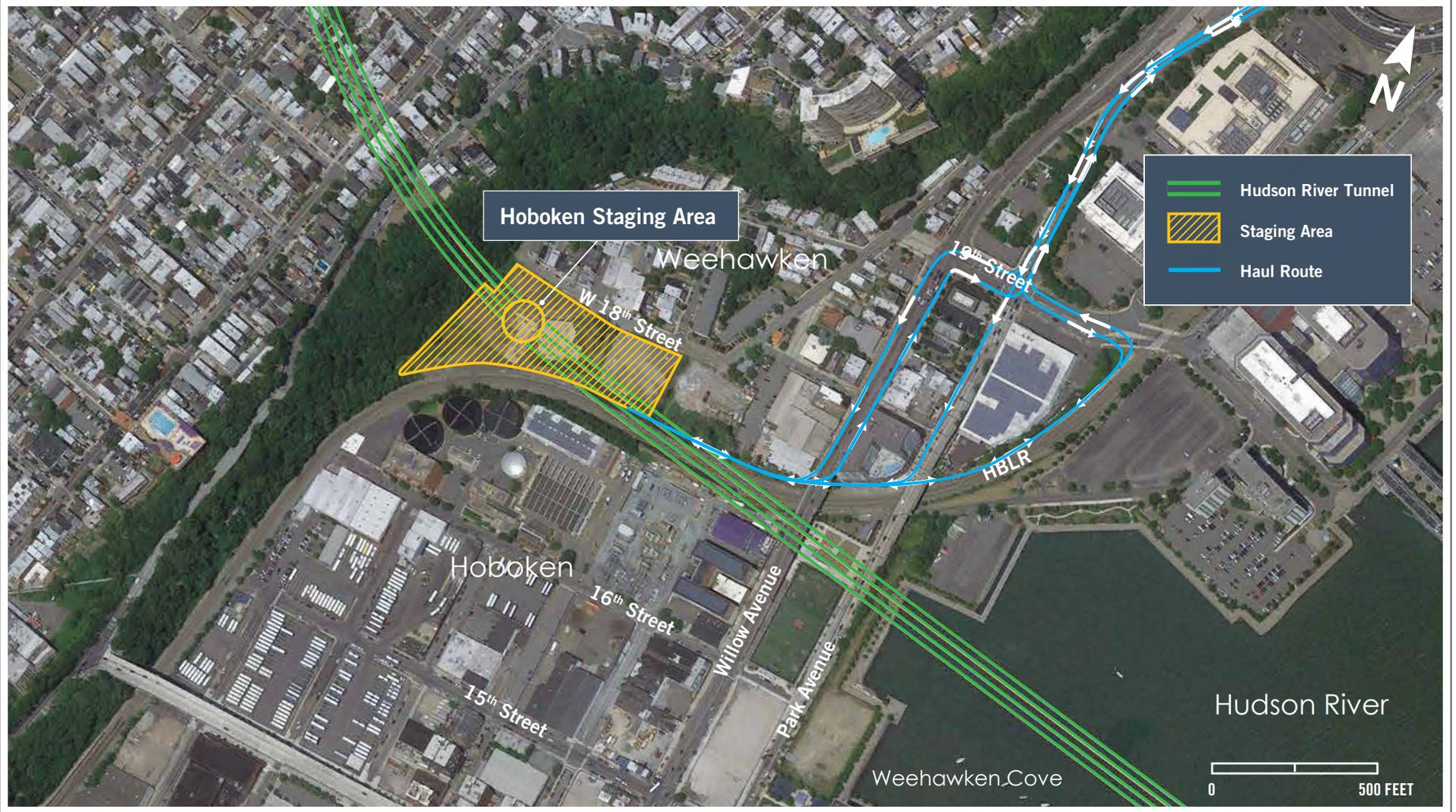
Figure A.3-9







Option 7: Use of Palisades Tunnel Segment to Tonnelle Avenue Staging Area
Figure A.3-12



A.3-1.3.1 SPOILS REMOVAL AND MATERIALS DELIVERY OPTIONS 1 AND 2 (DEIS OPTIONS): TRUCK ACCESS VIA WILLOW AND PARK AVENUES

In these two options, trucks would bring materials deliveries for all construction at the Hoboken staging area and trucks would remove spoils excavated from the vertical shaft and from the river tunnel segment at the Hoboken staging area. Trucks would arrive at and depart from the Hoboken staging area using an off-street construction roadway that would run along the north side of the HBLR right-of-way between the staging area and Willow and Park Avenues, to keep trucks away from the local streets near the construction site. Options 1 and 2 were presented and evaluated in the DEIS.

Trucks would travel between the off-road haul route and Route 495 using the Willow Avenue service road and Park Avenue service road, which are located beside the Willow Avenue and Park Avenue bridges over the HBLR, respectively, connecting to 19th Street and JFK Boulevard East. The DEIS included an evaluation of two different routing options for trucks:

- **Option 1:** Vehicles leaving the staging area would travel eastward on the off-street construction road along the north side of the HBLR right-of-way, pass under the Willow Avenue bridge, and turn left (i.e., north) onto the Willow Avenue service road. At 19th Street, trucks would turn right (i.e., east) and then left (i.e., north) onto northbound JFK Boulevard East, which leads to Route 495 near the Lincoln Tunnel entrance. Trucks headed in the other direction, toward the Hoboken staging area, would travel south on JFK Boulevard East and after crossing 19th Street would continue on the Park Avenue service road adjacent to the Park Avenue bridge. At the HBLR tracks, trucks would turn right (i.e., west) onto the construction access road along the north side of the HBLR right-of-way.
- **Option 2:** This option would be the same as Option 1 except that trucks headed to the site would use the southbound Willow Avenue service road rather than the Park Avenue service road.

Figures A.3-1 and A.3-2 illustrate Options 1 and 2.

Options 1 and 2 are the spoils removal and materials delivery options presented in the DEIS, and therefore are the options that raised substantial concerns among residents of Weehawken. The considerations for these two options with respect to the evaluation criteria are as follows:

- **Feasibility and Reasonability:** Options 1 and 2 are feasible and reasonable. However, residents of Weehawken raised concerns about constructability and construction risk, as discussed below.
- **Effects on Project Schedule:** Options 1 and 2 represent the baseline condition assumed in the schedule presented and evaluated in the DEIS. With both Options 1 and 2, construction of the river tunnel segment would be staged from the Hoboken staging area at the same time that construction of the Palisades tunnel segment would be staged from the Tonnelle Avenue staging area, allowing completion of the new Hudson River Tunnel in approximately 7 years and completion of the full Hudson Tunnel Project including rehabilitation of the North River Tunnel approximately 4 years later, for a total Project construction duration of approximately 11 years.
- **Constructability and Construction Risk:** Both Options 1 and 2 would involve supporting excavation of the river tunnel segment at the Hoboken staging area, using the ventilation shaft for access to the tunnel. Spoils would have to be hauled away regularly since the Hoboken staging area is not large enough to support stockpiling and storage of large quantities of spoils. Similarly, materials deliveries for the tunneling (such as concrete tunnel liners) would have to be made frequently to support the TBM operation, since the Hoboken staging area cannot

accommodate large laydown areas. The limited size of the site would introduce some risk to the Project's construction schedule, since during periods when the TBMs are able to advance quickly, the materials may be removed from the tunnel faster than they can be trucked away, but there would not be space to store the excess. In this case, the TBM operation would have to be slowed or halted until spoils could be removed from the Hoboken staging area. The same situation could also occur with respect to delivery of tunnel liner rings.

In addition, even with average TBM production rates, residents of Weehawken are concerned that the required volume of trucks (an average of up to 16 trucks per hour in each direction during peak construction activities) may not be realistic given the already congested conditions on the nearby roadways and highway system. Residents and elected officials commented that trucks would not be able to arrive at the site at the frequency necessary to avoid Project delays from running out of spoils storage space on the site, or from late materials deliveries to the site, because of the extensive traffic congestion that can occur on and near Route 495, and that this would introduce risk to the Project's construction schedule and therefore also to its overall schedule.

- **Ability to Reduce Community Impacts:** Residents of Weehawken raised concerns about the impacts that would result from construction traffic traveling to and from the Hoboken staging area for the seven-year construction period in Options 1 and 2. Local streets and Route 495 are already operating with congested conditions throughout much of the day, and traffic conditions will likely be exacerbated in the future by concurrent construction projects affecting these roadways. These projects include the Route 495 bridge rehabilitation project, ongoing construction at the Lincoln Harbor Redevelopment, the Hoboken Rebuild By Design project, the Willow Avenue bridge rehabilitation project, and the Lincoln Tunnel Helix Replacement Program (described in Chapter 20, "Indirect and Cumulative Effects," Section 20.6.2.2.1). Residents are concerned about increased traffic congestion on local streets in Weehawken, with the potential to spill over into Hoboken, that may result from the construction trucks, as well as related noise, air quality, and quality of life concerns related to the truck traffic.

A.3-1.3.2 SPOILS REMOVAL AND MATERIALS DELIVERY OPTION 3: TRUCK ACCESS BESIDE THE HBLR TRACKS

In Option 3, as in Options 1 and 2, trucks would bring materials deliveries for all construction at the Hoboken staging area and trucks would remove spoils excavated from the vertical shaft and river tunnel segment. Trucks would arrive at and depart from the Hoboken staging area using the same off-street construction roadway as in Options 1 and 2, along the north side of the HBLR right-of-way between the staging area and Willow and Park Avenues, to keep trucks away from the local streets near the construction site.

However, east of Park Avenue, Option 3 would extend the off-road portion of this truck route farther east than in Options 1 and 2, and therefore would move trucks farther from the residential neighborhood that is close to the Hoboken staging area. In Option 3, the off-street haul route would continue along the north and west side of the HBLR right-of-way past Willow and Park Avenues to 19th Street, where trucks would join the local street network. A new intersection would be created where the off-road portion of the haul route meets 19th Street. Trucks would travel between this intersection and Route 495 using 19th Street and JFK Boulevard East. **Figure A.3-3** illustrates Option 3.

This option would have similar effects to Options 1 and 2, except that it would shift trucks farther from the residential neighborhood, which could reduce impacts to those residents. Consideration Option 3 with respect to the evaluation criteria is as follows:

- **Feasibility and Reasonability:** Based on preliminary review, Option 3 appears to be feasible and reasonable. However, the concerns raised by the residents of Weehawken about constructability and construction risk for Options 1 and 2 would remain, as discussed below.
- **Effects on Project Schedule:** Option 3 would have the same overall Project schedule as Options 1 and 2.
- **Constructability and Construction Risk:** Option 3 would introduce the same construction risks as Options 1 and 2 related to the potential for TBM production to be limited because of the small amount of storage space available on the construction staging area. In addition, Option 3 would not alleviate the concerns raised by residents of Weehawken that the required volume of trucks (an average of up to 16 trucks per hour in each direction during peak construction activities) may not be realistic given the already congested conditions on the nearby roadways and highway system, which could introduce risk to the Project's construction schedule and therefore also to its overall schedule. Further, Option 3 could require one-way truck operation on a portion of the haul route due to restricted right-of-way width, which could introduce additional risk to the construction schedule. Option 3 would also require a new intersection where its off-street route meets 19th Street at the HBLR tracks, and this intersection requires further study to determine how well it would function.
- **Ability to Reduce Community Impacts:** Option 3 would move truck traffic farther from the local residential community, which could reduce truck-related disturbances, but truck traffic would still have to traverse the same congested intersections as in Options 1 and 2 between the end of the haul route and Route 495.

A.3-1.3.3 SPOILS REMOVAL AND MATERIALS DELIVERY OPTION 4: USE OF BARGES

Spoils Removal and Materials Delivery Option 4 would use barges on the Hudson River for spoils removal from the vertical shaft and river tunnel segment and potentially for deliveries. It would require a new barge transfer facility to be constructed at Weehawken Cove, with a new barge docking area and a landside staging area for materials transfer adjacent to the dock. In this option, the dock and transfer area would be along the south side of the HBLR right-of-way, using the paved parking area present along the water's edge.

Barging could be used for delivery of some or all materials and for removal of excavated spoils. Deliveries that arrive by barge would have to be transferred from the barges to the Hoboken staging area by trucks; other deliveries would continue to be brought to the site by trucks without the use of barges. Excavated spoils would be transferred from the staging area to the barges either by a conveyor system (Option 4a) or by trucks (Options 4b and 4c). **Figure A.3-4, Figure A.3-5, and Figure A.3-6** illustrate these options.

In Option 4a, tunnel spoils would be moved between the Hoboken staging area and the barge transfer facility using a conveyor system. The conveyor would be approximately 1,500 feet long, extending from the Hoboken shaft along the north side of the HBLR right-of-way and passing over the Willow Avenue bridge, across the HBLR right-of-way above the HBLR catenary system, over the Park Avenue bridge, and across the undeveloped park area on the east side of Park Avenue, to the waterfront staging area. The conveyor would be approximately 50 feet (five stories) high, so that it could pass over the Willow Avenue and Park Avenue bridges. The conveyor could not run beneath the two bridges, because at that height it would conflict with the HBLR catenary system. In Option 4a, materials deliveries that arrive by barge would be transferred to the Hoboken staging area by truck, since the conveyor would be designed and in use for spoils removal only. The conveyor system would not be available for deliveries since it would be designed as an enclosed system for removal of semi-liquid spoils, and would not be large enough to transport

large items such as segmental liners and rebar back to the staging area. Trucks making deliveries would use the routes described below for Option 4b.

In Option 4b, spoils would be transferred to the barges by trucks and any deliveries that come by barge would be transferred to the Hoboken staging area by trucks. To keep trucks off the local streets, FRA, NJ TRANSIT, and the Project Partners evaluated the use of an off-road haul route between the staging area and the barge facility alongside the HBLR right-of-way. The route would run along the north side of the HBLR right-of-way to approximately Willow Avenue, would cross the HBLR tracks via an at-grade crossing, and then would run along the south side of the HBLR right-of-way to the new barge staging area. Using a bridge over the HBLR rather than an at-grade crossing is not feasible due to the long approaches that would be required to cross over the HBLR tracks at an appropriate height while maintaining a grade that heavy trucks could feasibly negotiate. Such approaches cannot fit in the limited space available between the Hoboken staging area and the Willow Avenue bridge.

If trucks used local streets rather than an off-road haul route (Option 4c), their routing would be circuitous since there is no direct route between the Hoboken staging area and the waterfront. Trucks would have to use the Willow and/or Park Avenue service roads, 19th Street, and Harbor Boulevard to reach the waterfront.

Consideration of Option 4 with respect to the evaluation criteria is as follows:

- **Feasibility and Reasonability:** Options 4a, 4b, and 4c are feasible. However, the at-grade crossing of trucks across the HBLR in Option 4b raises substantial safety and operational concerns and therefore is not reasonable. This section of HBLR track is between two sharp curves, so that train operators would not have advance warning of truck crossings. In addition, the frequency of trucks crossing the HBLR tracks would likely adversely affect HBLR schedules and on-time performance. For these reasons, NJ TRANSIT, the operator of the HBLR, does not support an at-grade crossing of the HBLR for Project trucks. Options 4a and 4c appear reasonable; however, there are concerns about construction risk and community impacts with these options, as discussed below. In addition, Option 4 may be more expensive than the Preferred Alternative evaluated in the DEIS because of the need to acquire additional land for the waterfront staging area, to construct the conveyor, and operate the barging system.
- **Effects on Project Schedule:** Option 4 would not affect the overall Project schedule.
- **Constructability and Construction Risk:** Option 4 would provide additional staging area for stockpiling of tunnel spoils at the barge transfer facility, which would reduce the risks present for Option 1, 2, and 3 related to limits to TBM production rates. In addition, Option 4 would alleviate concerns raised by residents of Weehawken that the required volume of trucks (up to 16 trucks per hour in each direction on average during peak construction activities) may be higher than the highway system can handle, as Option 4 would use barges for spoils removal and materials delivery, rather than trucks operating over the highway system. However, the use of barges would introduce construction risk related to difficulties in reliably operating barges during the winter, particularly if ice is present in the Hudson River.
- **Ability to Reduce Community Impacts:** With Option 4c, trucks would have to use local streets to travel between the Hoboken staging area and the waterfront, since an at-grade crossing of the HBLR (Option 4b) is not reasonable. The truck routes would use the same local streets and the same intersections as Options 1 and 2. Therefore, this option would not address concerns of local residents about the increased traffic congestion on local streets in Hoboken and Weehawken that may result from the construction trucks, as well as related noise, air quality, and quality of life concerns related to the trucks.

In Option 4a (the conveyor option), the conveyor would be an enclosed structure, potentially 11 feet wide and high, supported on 50-foot-high piers with pile foundations. When piles are being installed, this activity would result in adverse noise impacts along and near the entire route. In addition, once the conveyor is in place and operating, it would be an intrusive visual presence running past a residential building and a park and could also be noisy. The conveyor would cut across the Hudson River Waterfront Walkway, a public park used by residents of Weehawken, Hoboken, and other nearby communities. In addition, construction of the barging facility would have impacts to in-water natural resources. With Option 4a (the conveyor option), for any deliveries brought by barge, trucks would have to use the same routes as in Option 4c. The conveyor system would not be available for deliveries, as described above.

Overall, therefore, Option 4 would not reduce local construction-related impacts on nearby residential neighborhoods in Hoboken and Weehawken, and may increase the impacts instead.

A.3-1.3.4 SPOILS REMOVAL AND MATERIALS DELIVERY OPTION 5: USE OF FREIGHT TRAINS ON HBLR TRACKS

Spoils Removal and Materials Delivery Option 5 would use freight trains for removal of spoils from the vertical shaft and river tunnel segment; deliveries to the site could be made by freight train or could continue to arrive by truck. In this option, freight trains would operate on the HBLR tracks, which are immediately south of the Hoboken staging area. A rail siding would be constructed from the existing tracks onto the staging area property; spoils would be loaded onto rail cars stationed on the siding, then moved to disposal locations using the HBLR tracks and connections onto the existing rail freight network, by connecting either to Conrail tracks south of the Hoboken staging area in Jersey City or to Conrail tracks north of the staging area in North Bergen, where the HBLR system's Tonnelle Avenue station is adjacent to a freight rail yard. **Figure A.3-7, Figure A.3-8, and Figure A.3-9** illustrate Option 5.

Consideration of Option 5 with respect to the evaluation criteria is as follows:

- **Feasibility and Reasonability:** Option 5 is neither feasible nor reasonable, for the following reasons:
 1. The Hoboken staging area does not have enough room to accommodate a rail siding for loading freight trains as well as the large-diameter shaft and other construction activities that must be housed there.
 2. Operation of light rail and freight trains on shared tracks requires approval from FRA pursuant to Federal regulations (49 CFR Part 209); Appendix A to Part 209 states that "If the light rail and conventional operations will share trackage during the same time periods, the petitioners will face a steep burden of demonstrating that extraordinary safety measures will be taken to adequately reduce the likelihood of a collision between conventional and light rail equipment to the point where the safety risks associated with joint use would be acceptable." Operation with temporal separation—i.e., freight trains operating at different times from light rail trains—would also require approval and would allow only late-night operations for freight trains, since NJ TRANSIT operates passenger service on the HBLR system for approximately 21 hours per day (approximately 5:30 AM to 2:30 AM). Loading and moving 144 truckloads of spoils each day via rail would be difficult and potentially infeasible in a three-hour window.
 3. NJ TRANSIT, the owner of the HBLR system, does not support operation of freight trains on its light rail system because of the potential safety conflicts from simultaneous operation of light rail and freight trains and the disruption to HBLR operations even if freight operations were restricted to late-night hours.

4. If the window for nighttime operations of spoils removal via freight train were increased by curtailing passenger service early, this would have impacts on passenger service that would be unacceptable to NJ TRANSIT because it would adversely affect commuters in the study area who use this service.
 5. For a route using the HBLR right-of-way north of the Hoboken staging area, freight trains would have to pass through the existing tunnel beneath the Palisades between the Port Imperial and Tonnelle Avenue stations. Although this tunnel originally accommodated freight trains before construction of the HBLR, clearances are now limited in the tunnel by the presence of overhead catenary for the light rail system and by the platforms of the Bergenline Avenue station within the tunnel. There is not sufficient clearance for freight trains, particularly at the station.
 6. For a route using the HBLR right-of-way south of the Hoboken staging area, approximately a half-mile of new freight track through Jersey City would be needed to connect from the HBLR right-of-way to existing Conrail tracks. This would require additional property acquisition and rail construction beyond what is already needed for the Project, with the associated increase in costs and schedule delay.
 7. In addition, the HBLR track system currently in place is not heavy enough to support use by freight trains and would need to be upgraded or replaced before spoils transport via freight train could be undertaken. A new signal system would also be required for freight operations.
- **Effects on Project Schedule:** If it were feasible and reasonable, Option 5 could substantially extend the Project's construction schedule because it would require additional property acquisition and then construction to prepare the HBLR track system prior to construction of the vertical shaft or river tunnel segment.
 - **Constructability and Construction Risk:** The reasons presented above regarding feasibility and reasonability would also introduce substantial construction risk if this option were pursued.
 - **Ability to Reduce Community Impacts:** If it were feasible and reasonable, hauling spoils by rail freight would not reduce impacts to the local residential community in Weehawken and neighboring communities. While this option would remove the trucking activity associated with removal of spoils from the shaft and river tunnel, it would instead introduce noisy activities at the Hoboken staging area (loading and movement of freight cars) late at night and operation of freight trains where no freight trains currently operate today, on a right-of-way that passes very close to residential communities and has multiple grade crossings where freight trains are required to sound train horns. The frequent freight train operation during late night hours where no freight trains operate today would have the potential to result in noise impacts on residential communities where the HBLR alignment is located.

A.3-1.3.5 SPOILS REMOVAL AND MATERIALS DELIVERY OPTION 6: ADDITIONAL STAGING AREA FOR SPOILS LOADING

Spoils Removal and Materials Delivery Option 6 would involve transferring spoils from the vertical shaft and the river tunnel segment by a conveyor system from the Hoboken staging area to a new secondary staging location south of the Hoboken staging area, with spoils removal via truck staged from that site. Deliveries would continue to arrive at the Hoboken staging area by truck.

The proposed secondary staging location would be in northern Hoboken, in a predominantly industrial and commercial area near the North Hudson Sewerage Authority's wastewater treatment plant. The site evaluated is Block 116, Lot 2, located between 14th and 15th Streets, Madison Street, and the HBLR right-of-way. This site is owned by Academy Bus and stores approximately 28 buses (some are NJ TRANSIT buses but are operated under contract by

Academy). This site is part of a large complex that Academy uses for midday and overnight bus storage in support of their commuter bus operations.

Spoils would be moved from the Hoboken staging area to the new secondary staging area using a conveyor system running alongside the HBLR tracks. From the secondary staging location, spoils would be removed by trucks on the local street network to Route 495. Trucks would travel to and from Route 495 using 15th Street, Park Avenue, and JFK Boulevard East. Since 15th Street is currently one-way westbound between Park and Willow Avenues, this block would either have to be converted to two-way operation or outbound trucks leaving the site would have to use Willow Avenue and 16th Street to reach Park Avenue. **Figure A.3-10** illustrates Option 6.

Consideration of Option 6 with respect to the evaluation criteria is as follows:

- **Feasibility and Reasonability:** Option 6 is feasible and appears reasonable. However, the loss of bus storage area for Academy Bus may result in impacts to their operations and the heavy truck traffic on 15th Street, which is a major route for Academy buses, may also adversely affect their operations.
- **Effects on Project Schedule:** This option would not affect the Project's construction schedule.
- **Constructability and Construction Risk:** Use of a secondary storage area would add flexibility for the Project's construction by increasing the amount of storage space for excavated spoils. This would reduce the risks present for Options 1, 2, and 3 related to limits to TBM production rates. However, with Option 6 the same volume of trucks would continue to travel through Weehawken and on Route 495 as with Options 1, 2, and 3, and therefore this option would not alleviate the concerns raised by residents of Weehawken that the required volume of trucks (up to 16 trucks per hour in each direction on average during peak construction activities) may be higher than the nearby roadways or highway system can handle, which could introduce risk to the Project's construction schedule and therefore also to its overall schedule.
- **Ability to Reduce Community Impacts:** This option would not reduce the truck activity on local streets in Weehawken, since the same number of trucks would continue to travel through Weehawken on many of the same local streets as in Options 1, 2, and 3. Therefore, this option would not address concerns of local residents about the increased traffic congestion on local streets that may result from the construction trucks, as well as related noise, air quality, and quality of life concerns related to the trucks. In addition, this option would introduce construction truck traffic to a new community, Hoboken, with trucks passing close to a school and several parks and large apartment buildings.

A.3-1.3.6 SPOILS REMOVAL AND MATERIALS DELIVERY OPTION 7: USE OF PALISADES TUNNEL SEGMENT TO TONNELLE AVENUE STAGING AREA

Spoils Removal and Materials Delivery Option 7 would involve removing river tunnel spoils and making deliveries for the river tunnel segment construction at the Hudson Tunnel Project's Tonnelle Avenue staging area rather than at the Hoboken staging area. From the Tonnelle Avenue staging area, spoils would be removed by truck and/or freight rail via a transfer to the Conrail tracks adjacent to the staging area. **Figures A.3-11 and A.3-12** illustrate Option 7.

This option would require a different plan for the tunnel construction staging than what was presented in the DEIS. As described above, to achieve expedient completion of the Project, the construction schedule presented in the DEIS assumed that tunneling for the Palisades tunnel segment of the new Hudson River Tunnel (between the Tonnelle Avenue portal and the Hoboken shaft) would occur at the same time as construction of the river tunnel segment (between the

Hoboken shaft and the Twelfth Avenue shaft). In the DEIS scenario, TBMs would bore from a staging area at Tonnelle Avenue eastward to the Hoboken shaft at the same time that TBMs would bore from the Hoboken shaft eastward toward New York. However, for Option 7, construction of the Palisades tunnel segment would need to occur before construction of the river tunnel can begin, so that tunnel spoils could be removed through the Palisades tunnel segment to Tonnelle Avenue.

For Option 7, spoils from vertical excavation of the Hoboken ventilation shaft (but not spoils from excavation of the Palisades or river tunnel segments) and deliveries for the shaft construction would still occur by trucks traveling from and to the Hoboken staging area. In addition, deliveries related to construction of the fan plant at the Hoboken staging area would also still be made by truck, since the continuing construction in the tunnel to install tracks and rail systems would preclude its ongoing use as a delivery point.

Consideration of Option 7 with respect to the evaluation criteria is as follows:

- **Feasibility and Reasonability:** Option 7 is feasible and reasonable with a revised tunnel construction staging plan.
- **Effects on Project Schedule:** With the revised tunnel construction staging plan, Option 7 would eliminate the ability to construct the Palisades tunnel segment simultaneously with the river tunnel segment. This would reduce the flexibility available to the Project Sponsor for contract procurement and the ability to adjust construction phases to address issues that arise during construction. To shorten the schedule increase associated with Option 7 to the extent practicable, and as part of ongoing refinement of the Project design, Amtrak and the Project Partners further revised the staging plan to shift the timing of some activities to occur sooner. With these changes, Option 7 would increase the overall construction schedule and consequently the overall Project schedule by approximately three months, for a total of approximately 11.5 years.
- **Constructability and Construction Risk:** By providing direct access to the Tonnelle Avenue staging area from the Hoboken staging area through the Palisades tunnel segment, Option 7 would provide much more space for construction staging than any of the other options considered in this analysis. The Tonnelle Avenue staging area could be used to store excess spoils or construction materials during periods when the TBM is advancing faster than the trucking schedule anticipates. This would reduce the risks present for Option 1, 2, and 3 related to limits to TBM production rates. To maintain flexibility for future contracting and keep the schedule increase associated with Option 7 to no more than three months, some deliveries associated with construction of the river tunnel segment may still be made at the Hoboken staging area rather than at the Tonnelle Avenue staging area. While Option 7 would reduce the truck activity associated with river tunnel construction in Weehawken, it would still require up to eight trucks per hour in each direction during the peak construction period, which would occur during construction of the vertical Hoboken ventilation shaft. Therefore, this option partially alleviates the concerns raised by residents of Weehawken that the required volume of trucks may be higher than the nearby roadways or highway system can handle, but as it does not eliminate trucking activity through Weehawken, there is still the potential for some element of risk to the Project's construction schedule and therefore also to its overall schedule.
- **Ability to Reduce Community Impacts:** This option would substantially reduce the volume of truck activity on local roadways in Weehawken. Construction of the Hoboken ventilation shaft and fan plant would still require some truck operations through Weehawken. However, this option would reduce the truck activity associated with river tunnel construction and therefore would reduce the duration of heavy trucking to and from the Hoboken staging area substantially; the maximum amount of truck activity would be reduced by half over the options

presented in the DEIS (Options 1 and 2). Trucking would be capped at a maximum of eight trucks per hour in each direction during the peak construction period (construction of the vertical Hoboken ventilation shaft), addressing concerns of local residents about the overall contribution of Project construction to traffic congestion on local streets in Hoboken and Weehawken, as well as related noise, air quality, and quality of life concerns related to the trucking activity.

At the same time, Option 7 would result in an increase in the duration of spoils removal activities at the Tonnelle Avenue staging area. The overall construction duration at Tonnelle Avenue would increase by approximately three months, and the period of the highest truck volumes on Tonnelle Avenue associated with construction of the new tunnel would increase from approximately 14 months to approximately 26 months. This is consistent with the worst-case assumptions presented in the DEIS, which involved trucking activity at Tonnelle Avenue throughout the Project's construction period (for seven years for the new Hudson River Tunnel and then for four years for rehabilitation of the North River Tunnel). In addition, the peak truck volumes would increase from the 20 trucks per hour in each direction analyzed in the DEIS to 26 trucks per hour in each direction with Option 7, because of the modifications to construction staging. The construction staging plan described in the DEIS would result in traffic impacts to three intersections along Tonnelle Avenue during construction of the new tunnel; the same intersections would also experience traffic impacts with the revised plan during construction of the new tunnel. In addition, both the DEIS plan and the modified plan would still result in construction noise levels that exceed the thresholds for impact according to the Federal Transit Administration's noise methodology that was used for the analysis.³ In other words, the traffic and noise impacts associated with the modified plan in North Bergen were also present in the original plan presented in the DEIS.

A.3-1.3.7 SPOILS REMOVAL AND MATERIALS DELIVERY OPTION 8: EXCAVATION OF RIVER TUNNEL SEGMENT ONE TUBE AT A TIME

In Spoils Removal and Materials Delivery Option 8, the river tunnel segment would be constructed one tube at a time, rather than using two TBMs working in parallel as was included in the conceptual schedule presented and evaluated in the DEIS. Constructing the tunnel one tube at a time would reduce the intensity of construction at the Hoboken staging area, including reducing the volume of materials that must be delivered to and removed from the tunnel during tunnel construction by approximately half.

The TBM would launch from the Hoboken staging area to bore the first tube of the river tunnel, and upon reaching the Twelfth Avenue staging area in Manhattan, would be dismantled, trucked back to the Hoboken staging area, reassembled, and relaunched to bore the second tube of the river tunnel. This would reduce the daily production of tunnel spoils and the number of spoils trucks during TBM excavation by half; deliveries would also be cut in half. However, this option would increase the amount of time when the river tunnel segment is being constructed by almost double, also extending the overall construction schedule and delaying the Project completion date by that same amount. Tunnel construction activities at the Hoboken staging area would last approximately 11 months longer, and the overall construction schedule would also be extended by approximately 11 months.

For Option 8, spoils from excavation of the Hoboken ventilation shaft and deliveries for the shaft construction would still occur by trucks traveling from and to at the Hoboken staging area. In

³ U.S. Department of Transportation, Federal Transit Administration, FTA-VA-90-1003-06, *Transit Noise and Vibration Impact Assessment*, May 2006.

addition, deliveries related to construction of the fan plant at the Hoboken shaft site (the same site as the Hoboken staging area) would also be made by truck. These truck trips would use one or more of the same haul routes analyzed as part of Options 1, 2, and 3.

Figure A.3-13 illustrates Option 8.

Consideration of Option 8 with respect to the evaluation criteria is as follows:

- **Feasibility and Reasonability:** Option 8 is feasible, but is not reasonable given the extension of the Project schedule, since a key goal of the Project is expedient completion of the Hudson Tunnel Project. This option also raises concerns about construction risk and community impacts, which are discussed below.
- **Effects on Project Schedule:** The construction duration with Spoils Removal Option 8 would increase by approximately 11 months over the DEIS baseline due to the need to construct the two tubes of the river tunnel sequentially rather than simultaneously. This would delay completion of the Project by that same amount (11 months). Construction activities in the Hudson River and in Manhattan would be delayed by the extension of the river tunnel construction schedule.
- **Constructability and Construction Risk:** Because only a single river tunnel TBM would be in operation at any given time, the rate of spoils output would be cut in half in Option 8. This would reduce the risks present for Options 1, 2, and 3 related to limits to TBM production rates. While this option would reduce the truck activity associated with river tunnel segment construction, it would still require up to eight trucks per hour in each direction during the peak construction period (excavation of the shaft) and during river tunnel segment construction, which would last longer than in the DEIS baseline. Therefore, this option would not fully alleviate the concerns raised by residents of Weehawken that the required volume of trucks may be higher than the nearby roadways or highway system can handle, which could introduce risk to the Project's construction schedule and therefore also to its overall schedule.
- **Ability to Reduce Community Impacts:** This option would halve the hourly number of trucks using local streets through Weehawken during the river tunnel excavation, for a total of 8 trucks per hour in each direction rather than 16. However, the river tunnel construction and the associated truck hauling activity would continue for a substantially longer period of time, with a total of approximately two years of tunnel excavation. This option would still also require up to 8 trucks per hour in each direction during up to two years during excavation of the shaft, for a total of up to four years of this level of truck activity. Therefore, this option may not fully address concerns of local residents about the increased traffic congestion on local streets in Hoboken and Weehawken that may result from the construction trucks, as well as related noise, air quality, and quality of life concerns related to the trucks. In addition, this option would extend the duration of impacts in New York, because the extension of the river tunnel construction schedule by 11 months would also mean that ground freezing in Hudson River Park would have to occur over a longer period of time (potentially 11 months longer).

A.3-1.3.8 CONCLUSION

As a result of this evaluation, FRA, NJ TRANSIT, and the other Project Partners have identified modifications to the construction methodologies that can reduce impacts to local residential communities in Weehawken while minimizing impacts to the Project schedule, increases to construction risk, or new adverse impacts in other communities. **Table A.3-1** summarizes the results of the evaluation.



Table A.3-1

Evaluation of Spoils Removal and Materials Delivery Options

Option	Evaluation	Result
Option 1 (DEIS): Truck Access via Willow and Park Avenues	Does not reduce impacts in the local community associated with truck traffic	Truck route evaluated in FEIS for use as part of construction approach
Option 2 (DEIS): Truck Access via Willow Avenue	Does not reduce impacts in the local community associated with truck traffic	Truck route evaluated in FEIS for use as part of construction approach
Option 3: Truck Access Beside HBLR Tracks	Does not reduce impacts in the local community associated with truck traffic	Truck route evaluated in FEIS for use as part of construction approach
Option 4a: Use of Barges with Conveyor System	Reduces impacts associated with truck traffic but introduces new adverse impacts; raises new construction risk related to barging	Eliminated
Option 4b: Use of Barges with Off-Road Truck Access	Not reasonable because of safety and operational concerns for at-grade HBLR crossing; raises new construction risk related to barging	Eliminated
Option 4c: Use of Barges with On-Road Truck Access	Does not reduce impacts in the local community associated with truck traffic; raises new construction risk related to barging	Eliminated
Option 5: Use of Freight Trains on HBLR Tracks	Not feasible or reasonable; introduces new impacts in residential communities	Eliminated
Option 6: Additional Staging Area for Spoils Loading	Does not reduce impacts in the local community associated with truck traffic	Eliminated
Option 7: Use of Palisades Tunnel Segment to Tonnel Avenue Staging Area	Reduces the impacts in Hoboken and Weehawken associated with truck traffic; reduces risk to construction schedule associated with small staging area	Retained for evaluation in FEIS
Option 8: Excavation of River Tunnel Segment One Tube at a Time	Somewhat reduces impacts in local community associated with truck traffic but extends the period of impact substantially and extends Project's overall schedule	Eliminated

Based on this evaluation, the proposed construction staging plan for analysis in the FEIS will be modified as follows:

- Option 7 was identified as a feasible and reasonable approach to reducing construction truck traffic and related impacts to residential communities in Weehawken and Hoboken. The Project's construction staging plan will be modified to shift staging and spoils excavation for the river tunnel segment from the Hoboken staging area to the Tonnel Avenue staging area.
- To maintain flexibility for future contracting and keep the schedule increase associated with Option 7 to no more than three months if possible, some deliveries associated with construction of the river tunnel may still be made at the Hoboken staging area rather than at Tonnel Avenue. In addition, spoils associated with construction of the vertical shaft and deliveries during construction of the shaft and fan plant would still occur by truck. To ensure that impacts to the neighboring residential community are minimized to the extent practicable, a cap of no more than eight trucks per hour in each direction will be enforced at the Hoboken staging area throughout the construction period. For these truck trips, one or more of the truck routes identified as part of Options 1, 2, and 3 will be used. FRA, NJ TRANSIT, and the Project Partners will further evaluate the potential to use Option 3 as a haul route (either on its own, or in combination with Option 1 and/or Option 2) to shift traffic farther from the residential neighborhood near the Hoboken staging area to the extent practicable. *