4.0 CONSTRUCTION METHODS AND ACTIVITIES

4.1 Introduction

This chapter describes the construction methods and activities that are expected to occur during construction of the Proposed Action. The potential environmental impacts that may be associated with these construction activities are presented in the environmental resource sections of Chapter 5: Potential Environmental Impacts. Detailed estimates of construction-related truck and equipment quantities that have been assumed for the purposes of this EA are included in Appendix F.

At the time of preparation of this EA, the South Ferry Terminal Project is undergoing preliminary engineering, and detailed project and construction information is still being developed. The construction methodologies and activities described in this chapter are based on conceptual approaches which will continue to be refined as project engineering and design progresses. Some of the initial construction methodology may change as the design develops, particularly since the construction contract for the project will be issued as a design-build contract. Therefore, this chapter presents a description of the construction process for the purpose of quantification of impact-causing activities only; it is not intended to describe the precise construction methods that may ultimately be used, nor is it intended to dictate or confine the construction process. As such, where the scope of the design, the likely construction methods, and the sequencing of activities is uncertain, this EA assumes a reasonable peak-case scenario for the purpose of impact analysis. Where a variety of construction methods or techniques could be utilized, the analysis evaluates the method that was considered to have the greatest potential for adverse environmental impact. This approach ensures that, irrespective of the methods used to construct the Proposed Action, the potential environmental impacts that could be associated with construction will have been analyzed and represent the most conservative assumptions.

For the purposes of the analysis of cumulative effects associated with the construction of multiple projects in Lower Manhattan concurrent with the South Ferry Terminal Project (Chapter 6.0 of this EA), the analysis includes assumptions with respect to the construction methods and activities that are expected to be implemented during the construction of other such projects. These assumptions have been coordinated with the project sponsors of the other Lower Manhattan projects and are contained in Appendix E.

4.2 Construction Methods

MTA/NYCT has identified several possible methods for excavation of soil and rock materials that may be employed during construction of the South Ferry Terminal Project, depending on the component of the project being constructed and its location along the proposed alignment. The components of the Proposed Action, their locations, and possible excavation and construction methods are described below.

4.2.1 Bellmouth and Fan Plant

Construction of the bellmouth will require reconstruction of about 275 feet of existing subway tunnel. The reconstruction will require demolition of portions of the subway roof and sidewalls. New columns will be installed to define the widened tunnel and support the new, longer roof beams. Reconstruction of the tunnel will require open cut excavation to fully expose the existing tunnel structure. Roadway and sidewalk surfaces will be removed, and temporary excavation support and street decking structures will be installed so that vehicular and pedestrian circulation is maintained as major excavation takes place beneath the decking.

Utility relocation and support will also be necessary within and adjacent to the bellmouth work area. Some relocations, such as sewer work, would be permanent and would be done prior to major excavation work, whereas water mains would be temporarily relocated outside the work area and replaced after completion of the bellmouth structure. For other utilities, such as telecommunication lines, it is feasible to hang or otherwise temporarily support ducts and conduits from the temporary excavation and decking support structures.

The temporary excavation and decking support structure will span over the width of the reconstructed tunnel, and will encroach onto the sidewalk along the east side of Greenwich Street, adjacent to the building at One Broadway (International Mercantile Marine Building). The granite sidewalk slabs would be removed and stored to preclude damage during bellmouth construction, and reinstalled following the completion of construction. A portion of the basement-level vaults underneath the sidewalk would be demolished prior to installation of excavation support, and would be reconstructed upon removal of the temporary support systems. Upon completion of the reconstructed subway tunnel/bellmouth structure, the excavation would be backfilled, the temporary excavation and decking supports removed, and basement vaults and street surfaces reconstructed and restored.

The floor of the existing bellmouth tunnel would also be reconstructed to accommodate the new descending vertical track profile. The descending grade would be initiated about 100 feet north of the northerly limit of the tunnel wall and roof reconstruction. The existing track alignment that will remain (to the South Ferry Station) must also be lowered at this point, requiring replacement of the track slab, reconstruction of the tunnel invert, and underpinning of existing sidewall and center columns. The existing tracks would be temporarily supported at their present elevation after reconstruction and lowering of the tunnel invert, in order to maintain existing service to the South Ferry Station. Work to lower and reconstruct inverts and underpin columns within existing tunnel segments to remain would be accomplished from within the tunnel envelope, with no exterior excavation or access required.

Fan plant construction will be accomplished by conventional cut and cover methods (described in the following section) beneath street decking to maintain vehicular and pedestrian traffic.

Construction of the bellmouth and fan plant structures will be coordinated with the NYSDOT Route 9A/Battery Place reconstruction project, which is anticipated to occur at about the same time as construction of the South Ferry bellmouth and fan plant. Construction will also be coordinated with NYCDOT to ensure adequate traffic flow through the work zones. Work on the bellmouth and fan plant portion of the project will be scheduled in coordination with the adjacent projects so as to minimize traffic impacts.

4.2.2 Approach Tunnel

The new approach tunnel will pass beneath the eastern edge of Battery Park between the bellmouth and the new terminal. The tunnel will consist of two tracks and will include a double track crossover to permit flexible train routing into and out of the terminal.

The most critical area of approach tunnel construction is where the new tunnel will cross beneath the existing South Ferry Station and Joralemon Street approach tunnels. Transit service must be maintained over these existing routes during construction of the new tunnel. Since the new tunnel will be relatively shallow and partially in soil, and pass just below the bottom (invert) of the existing tunnels, the existing tunnels must be underpinned or otherwise permanently supported by means of new construction to ensure their structural integrity during and after construction of the new tunnel. The existing tunnels will be monitored to detect the level of construction vibrations imparted to the structures, and any vertical or horizontal movements of the tunnels which could impact rapid transit operations.

MTA/NYCT's typical method of construction for relatively shallow tunnels is the cut and cover method, in which a trench is excavated and braced, column foundations placed, steel columns and roof beams installed, concrete walls and roof placed and waterproofed, and the excavation and tunnel backfilled. However, because the approach tunnel construction will be located within the eastern portion of Battery Park, other possible methods of excavation and tunnel construction are being considered. Each of these methods is described below.

Cut and Cover
The cut and cover method involves removal of rock and/or soil from the right-of-way by excavating a trench from the surface, in which a structural steel frame structure consisting of columns and roof beams is erected, waterproofed and encased in concrete. The structural box is then backfilled with soil and the surface features restored. Within the eastern part of Battery Park, the tunnel alignment will be beneath various pathways, lawn areas, flower beds and shrubbery. These areas would be excavated from the surface, requiring temporary closure of some areas to the public. Walkways would be maintained over the excavation to the extent possible.

Excavation would proceed through various soil and possibly rock strata to the required depth; excavation within soil would be braced for safety and structural integrity. Groundwater could be expected to enter the excavation; thus, a dewatering system to lower the water table at the excavation site would likely need to be installed. Removed

groundwater would likely be discharged to the municipal sewer system in accordance with all applicable regulations. Appropriate discharge permits would be obtained.

The excavated soil would need to be stored near the construction location and reused as backfill upon completion of the tunnel. Rock and excess soil removed during excavation would be removed from the site and disposed via truck out of the area.

Tunneling
Tunneling generally consists of subsurface horizontal excavation. Tunneling within rock strata typically consists of drilling into the face of the rock and breaking the rock into removable chunks by mechanical or chemical splitting, or by blasting. For tunneling through rock over considerable distances, a tunnel boring machine can be used. The rock maintains its structural integrity by acting as an arch structure supporting overhead loads. The tunnel interior is typically finished by placing precast concrete segmental liners and grouting the space between the liner and the remaining rock from within the tunnel.

For the approach tunnel in Battery Park, the subsurface consists of soil and fill over rock. It is anticipated that the proposed tunnel invert levels will generally rest on rock; however, the upper portion of the tunnel, to varying degrees, will be within soil. Boring a tunnel through mixed face strata can be difficult due to the widely varying resistance offered by the soil and rock. To address this problem, the soil strata can be grouted to turn it, in effect, into a concrete-like mass that has a greater resistance than soil. Soil grouting operations would require the use of grout mixing, pumping and injection equipment at the work site.

Hybrid Cut and Cover/Tunneling
This is a hybrid excavation method that consists of soil excavation by cut and cover methods followed by rock excavation by tunneling methods. Soil excavation would be done from the surface by conventional cut and cover methods. Concrete walls would then be constructed on the exposed rock just beyond the limits of the new tunnel's outer sidewalls. These walls would be used as supports for a permanent platform that would support backfilled soil above the new tunnel. The platform would function as a shield to protect horizontal rock excavation operations. Rock excavation would occur from a vertical shaft, and would be mined by drilling and splitting methods. Loosened rock would be hauled back to the shaft for removal from the site.

Vertical sheeting (corrugated metal sheets) would be used to support the soil excavation, and interlocking steel sheet piling, grouted at its base, would be used to minimize the intrusion of groundwater into the excavation. Water that does enter would be pumped out and discharged to the local sewer system. Soil excavation equipment could be placed either along side the excavation, space permitting, or working in-line along the excavation.

By excavating only the soil through cut and cover methods, and working underground for the remaining tunnel construction, the amount of time that Battery Park is open to excavation would be minimized. The work could proceed sequentially along the

alignment through the eastern edge of Battery Park. Thus, restoration of parkland could be accelerated and completed while rock excavation and tunnel structure construction is proceeding below. Excavated soil could be stored onsite and used as backfill.

4.2.3 Terminal Structure

The new South Ferry Terminal will be constructed generally within the limits of Peter Minuit Plaza, and immediately north of the Whitehall Ferry Terminal. Soil and rock excavation for the South Ferry Terminal will be performed from the surface by conventional cut and cover methods. Steel sheet piling would be driven and braced to support the excavation. Portions of the excavation closest to the Whitehall Ferry Terminal would be supported by means of a secant pile retaining wall. The secant piles offer a permanent support to protect the existing foundation elements of the adjacent ferry terminal.

MTA/NYCT will stage the excavation and construction operations in Peter Minuit Plaza to minimize construction impacts to the Whitehall Ferry Terminal (see Section 4.4). NYCDOT has the flexibility to temporarily close off certain access/egress points within the terminal as necessary to guide passengers away from planned work zones. As most of the South Ferry Terminal construction will occur within the limits of Peter Minuit Plaza, and this Plaza is used as the approach to the Whitehall Ferry Terminal by pedestrians, it will be necessary to deck over the excavation area. Also, MTA/NYCT will maintain approximately 30-foot wide minimum protected corridors through and adjacent to the work zones for uninterrupted use by pedestrians and ferry patrons. Peter Minuit Plaza will be finished in accordance with the reconstruction plan for the Whitehall Ferry Terminal following completion of the South Ferry Terminal.

4.3 Construction Schedule

The South Ferry Terminal Project is expected to be in construction from late-2004 to the end of 2007, with the peak construction activity occurring within a 12-month period between 2005 and 2006. The work that would occur from mid-2006 to the end of 2007 is finishing work to the terminal, tunnels, and bellmouth/fan plant, all of which will occur below ground and have limited access requirements to the surface. Street preparation work for the South Ferry Terminal under Peter Minuit Plaza is expected to occur first in 2004. Construction of the approach tunnels, including underpinning of the existing 1 9 and 4 5 subway tunnels, in the eastern edge of Battery Park would occur next, from fall 2004 through spring 2005 or the following season, fall 2005 through spring 2006. Terminal construction would occur in 2005 and 2006, and the bellmouth and fan plant construction would occur in 2006. Again, finishing work would be ongoing from mid-2006 through 2007 and would occur underground.

It is assumed that construction would take place in two 8-hour shifts, six days per week for the majority of construction tasks. However, some activities, particularly sub-grade construction and finishing, safety related work, and activities that require coordination with MTA/NYCT services, may occur anytime within a 24-hour/7-day week period.

Truck movements may occur at any time within a 16-hour, 6-day week that includes morning and evening peak hours.

4.4 Construction Staging and Maintenance and Protection of Traffic Plan

Construction staging is the logistics of equipment storage, site access, temporary truck parking, and crane access to staging areas. Construction contractors are most likely to require staging space immediately adjacent to the site, such as the bellmouth and fan plant and the terminal location in Peter Minuit Plaza. The construction staging area for the bellmouth and fan plant component will generally be located on the sidewalks adjacent to Greenwich Street near its intersection with Battery Place, and the staging area for the tunnel approach and terminal will be located in Peter Minuit Plaza. Figure 14 shows the anticipated construction excavation and staging area locations.

Pedestrian and traffic circulation can be affected from construction activities due to surface disruption. Traffic and pedestrian impacts can be minimized using construction sequencing and lane closure management measures within an overall Maintenance and Protection of Traffic Plan (MPT Plan). The majority of work for the South Ferry Terminal Project will necessitate the design, development, implementation and organization of a traffic management scheme, which will also be a critical component of the work. Satisfactory traffic management will need to be undertaken by the construction contractor and given the highest priority in all aspects of planning for the phasing of the work.

The MPT Plan is generally described in Section 5.9 of this EA, and will continue to be refined in conjunction with the MPT Plans of other project sponsors in Lower Manhattan. Meetings are ongoing with State and City Departments of Transportation to identify overlapping construction areas, schedules and traffic/truck/bus routes. This coordination effort will continue throughout the design and planning process and into the construction phase at regularly scheduled meetings.

Meetings among NYCDOT, Staten Island Ferry Operations, New York City Department of Parks and Recreation (NYCDPR), New York City Economic Development Corporation (NYCEDC, sponsors of the Whitehall Ferry Terminal reconstruction project) and MTA/NYCT have commenced to coordinate work in Peter Minuit Plaza, which is anticipated to be the primary construction staging area for the South Ferry Project. The median of Battery Place, just west of Greenwich Street, will be used as a secondary staging area for the tunnel bellmouth and fan plant construction. It is anticipated that NYSDOT would prepare the staging area in the median as part of the Route 9A project, and MTA/NYCT would use the area after NYSDOT vacates the site. If the South Ferry construction precedes the NYSDOT Route 9A project, MTA/NYCT would prepare the site for staging, in coordination with NYCDOT. The motorcycle parking currently provided in the median would be removed by NYCDOT on behalf of NYSDOT for the Route 9A project, and motorcyclists would be directed to an alternative parking facility underneath FDR Drive just north of Wall Street.

Construction of the South Ferry Terminal Project will affect traffic on Battery Place, Greenwich Street, and State Street. The tunnel bellmouth and fan plant will be constructed in the bed of Battery Place and Greenwich Street, while the terminal will be built at Peter Minuit Plaza adjacent to State Street. MTA/NYCT recognizes the importance of Battery Place as an east-west thoroughfare both for automobiles and buses. Various bus lines travel on Battery Place to eventually turn north onto Greenwich Street, which is used as a layover/pick-up/drop-off zone. Maintaining traffic flow at this intersection will be mandatory throughout the construction period. The maintenance of traffic flow in both directions on Battery Place and State Street, and access to Greenwich Street, is critical to vehicular and bus circulation in the area.

The construction of the bellmouth and fan plant structural boxes will take approximately 8-12 months. The first phase of construction, including the relocation of utilities and the installation of decking to replace the road bed of Battery Place and Greenwich Street, will be completed within 4-6 months. Once the decking is installed, the work is expected to be carried out with minimal impact on surface traffic. MTA/NYCT will establish an MPT Plan based on the premise that traffic in each direction is maintained on Battery Place and State Street, and access to Greenwich Street for buses is always available. In addition, MTA/NYCT will provide for traffic control personnel to be present during the peak periods to assist vehicular and pedestrian circulation in the area.

As noted previously, MTA/NYCT is expecting to start construction on the South Ferry Terminal Project in the last quarter of 2004. Peter Minuit Plaza, currently being utilized by the Whitehall Ferry Terminal reconstruction project (Whitehall project), is proposed as the main staging area for South Ferry. Coordination with NYCEDC and NYCDOT is ongoing to ensure a smooth transition of staging in the Plaza from one project to the next, as well as to coordinate any overlapping work. A Memorandum of Understanding (MOU) among NYCEDC, NYCDOT and MTA/NYCT will be executed to implement this coordination.

It is expected that by the end of 2004, MTA/NYCT will occupy approximately one-half to two-thirds of the Plaza. During this period, the MTA/NYCT contractor would mobilize and begin staging materials and equipment at the site**.** MTA/NYCT would gradually take over the entire Plaza during the first and second quarters of 2005, as exterior work for the Whitehall project is completed. A staging plan for MTA/NYCT's use of the Plaza is shown in Figure 14. The staging plan will provide sufficient pedestrian access for users of the Staten Island Ferry and nearby transit facilities, and vehicular traffic on State Street would also be maintained. The MPT Plan currently in place for the Whitehall project, which includes the temporary rerouting of buses, will be continued by MTA/NYCT (see Section 5.9). It is anticipated that the Whitehall project will be completed before the peak construction year for the South Ferry Terminal Project, as the former would be completed in early 2005 and South Ferry construction would begin intensifying in mid-2005. Therefore, substantial overlap in the construction of these two projects is not anticipated to occur. Construction activity in the transition period of late 2004 to early 2005 would be similar to existing construction conditions at Peter Minuit Plaza.

4.5 Spoils Removal and Waste Management

The detailed construction estimates contained in Appendix F indicate that approximately 140,000 cubic yards of spoils will be generated by the South Ferry Terminal Project, and will need to be removed from the construction site. These estimates are considered preliminary and are expected to be refined as new information is developed during the preliminary engineering work for the project. Spoils will be removed from the site via truck. A discussion of truck routes is presented in the cumulative effects analysis in Chapter 6. Calculations and assumptions used to generate the construction trip estimates are included in Appendix F.

On March 17, 1999, the MTA/NYCT Capital Program Management became the first Design and Construction Management public transportation entity to be registered to the ISO 14001 Environmental Management System. This registration indicates MTA/ NYCT's commitment to incorporate ISO 14001 standards in its future designs and construction projects, including the South Ferry Terminal Project. The ISO standards are designed to encourage the provision of products and services in accordance with internationally agreed upon environmental management criteria. In terms of subway construction and operation, this commitment involves employing methods that maximize energy efficiency, the use of cleaner fuels, source reduction by use of recycled and reusable materials, and other efforts to prevent and reduce environmental degradation.

The South Ferry Terminal construction contract will be required to develop, institute, and maintain a Waste Management Plan during the construction of the project, which may include:

- Identification of disposal sites;
- Identification of quantities to be excavated and disposed of;
- Identification of the split between waste and inert materials;
- Identification of measures to prevent nuisance;
- Identification of the amounts intended to be stored temporarily on site and the location of such storage;
- Identification of intended transport means; and
- Organization of the contractor's approach to waste management, including permit details.