Chapter 15: Construction Impacts

A. INTRODUCTION

This chapter describes the anticipated construction activities for the Proposed Project and the potential environmental impacts that might result from those construction activities. The chapter describes the construction activities that would be required to build the new water intake, intake pumping station, water treatment plant, and raw water transmission line and potable water mains associated with the Proposed Project, and then evaluates the potential environmental impacts associated with those activities.

This chapter of the DEIS includes the following sections:

Section B: Description of Construction Activities and Schedule. This includes a review of construction phasing and of the construction activities required for the river water intake and intake pumping station, raw water transmission line, water treatment plant, and potable water mains.

Section C: Potential Impacts of Construction Activities. This section of the chapter evaluates potential impacts of construction on the full range of technical areas considered in other chapters of this DEIS.

The analysis presented in this chapter concludes that the three-year construction period associated with Phase 1 of the Proposed Project would result in temporary and intermittent disruptions to the surrounding neighborhoods. These would be primarily associated with construction-related traffic and increased noise from that traffic and from the construction activities on the Project Sites. Disruption (traffic, noise, dust) would occur to nearby land uses, and particularly the residences closest to the Intake Site on Grassy Point Road. Access would be maintained to all land uses throughout construction. Maintenance and protection of traffic plans would be employed to manage construction-related traffic and maintain traffic on roads near the Project Sites throughout the construction period. In addition, minor signal retimings were also identified to address potential traffic impacts during construction.

A stormwater pollution prevention plan would be implemented to minimize potential impacts to the Hudson River and Minisceongo Creek. The use of trenchless technology to construct the river tunnel and of a cofferdam to enclose the water intake site would minimize potential changes to water quality and impacts to aquatic biota during construction. Overall, construction of the Proposed Project would not result in significant adverse impacts to water quality or to the species identified as important for the Significant Coastal Fish and Wildlife Habitat of Haverstraw Bay.

A construction health and safety plan would be prepared and implemented to address potential issues related to contamination of soil and groundwater near the Project Sites. During construction, a dust suppression program would be in place to minimize dust from earthmoving activities.

B. DESCRIPTION OF CONSTRUCTION ACTIVITIES AND SCHEDULE

Planning for the Proposed Project is still under way. Some aspects of the Proposed Project are not yet fully known, since final designs have not yet been prepared. In such cases, this DEIS describes and analyzes a reasonable assumption for the design, as is common for projects of this nature. The construction information presented in this chapter represents conservative but reasonable assumptions for the types, durations, and intensity of construction activities expected to occur, based on the conceptual designs developed for the Proposed Project and experience with other, similar construction projects.

CONSTRUCTION PHASING

As described in Chapter 2, "Project Description," the Proposed Project is being designed to treat and deliver up to 7.5 million gallons per day (mgd) of potable water. Initially, the plant would be constructed to treat 2.5 mgd to potentially 5 mgd. As Rockland County's water demand increases, the Proposed Project would be expanded to meet that demand, with the ultimate capacity at 7.5 mgd.

Accordingly, construction would also occur in phases. Based on the conceptual designs developed to date, it is assumed that the construction phasing would occur as follows:

- **Phase 1:** By the end of 2015, the intake pumping station and water treatment plant would be constructed to an initial production capacity of either 2.5 mgd or 5 mgd. Major hydraulic components, such as the intake system and the raw water transmission line, would be designed and constructed to accommodate full build-out (7.5 mgd production capacity) to eliminate subsequent disruptions when the facility is expanded. Most likely, the building envelopes for the intake pumping station and some of the buildings at the water treatment plant would be constructed to be large enough to accommodate the equipment of future phases, but the equipment would not be installed. Construction work for this phase of the Proposed Project would begin in spring 2013 and the Proposed Project would be operational by the end of 2015, although some construction activities may extend into 2016. Potential upgrades to the nearby Haverstraw Joint Regional Sewage Treatment Plant (JRSTP) would also be completed by the end of 2015. Overall, the estimated duration for construction activities in Phase 1 is 36 months.
- **Phase 2:** If the Proposed Project is built to produce 2.5 mgd of potable water in Phase 1, a second phase of construction after 2015 would bring production to 5.0 mgd. This would involve installing additional pumps and mechanical equipment at the intake pumping station. At the Water Treatment Plant Site, additional equipment would be installed within buildings constructed during Phase 1 (or, if smaller buildings were built in Phase 1, then expanding the buildings to accommodate the equipment), and additional raw water storage tanks and finished water reservoirs and chlorine contact basins would be added. Additional water mains or upgrades to existing water mains to transmit potable water to the existing United Water New York (United Water) distribution system would be added for this phase. Construction work for this phase of the Proposed Project would occur to allow completion of the work to meet increasing demand for water. This is potentially anticipated to be approximately five years after completion of Phase 1 (i.e., approximately 2020) if the plant is not initially constructed to produce 5.0 mgd. Overall, the estimated duration for construction activities in Phase 2 is up to 12 months.

- **Phase 3:** A third phase of construction, initiated at some point in time after completion of the second phase, would expand on the intake pumping station and the water treatment plant to accommodate production capacity of 7.5 mgd. Similar to Phase 2, this would involve installing additional pumps and mechanical equipment at the intake pumping station, and installing additional equipment, raw water storage tanks, and finished water reservoirs and chlorine contact basins at the water treatment plant. Additional water mains to transmit potable water to the existing United Water distribution system or upgrades to existing water mains would be added for this phase. Construction work for this phase of the Proposed Project would occur to allow completion of the work to meet increasing demand for water at some point in the future, after 2020. Overall, the estimated duration for construction activities in Phase 3 is up to 12 months.

If two phases are constructed together, the total duration (and level of activity) of construction for the two phases combined would be less than the sum of each individual phase. This is because combining phases would eliminate the need to create staging areas and mobilize workers a second time, and would allow other efficiencies of effort as well.

CONSTRUCTION ACTIVITIES

The construction activities required for the different elements of the Proposed Project are described in this section. These include construction of the raw water intake system, the intake pumping station to be constructed on the Intake Site, the raw water transmission line to be installed beneath Beach Road and Ecology Lane, the water treatment plant, and the new water mains to transmit finished (potable) water to the distribution system from the water treatment plant. In total, based on the conceptual design information available at this time, the preliminary construction schedule for Phase 1 is estimated at 36 months. A construction schedule depicting a conceptual timeline for the construction activities described below is provided in Figure 15-1.

RAW WATER INTAKE SYSTEM CONSTRUCTION ACTIVITIES

Construction of the raw water intake system would be staged from the Intake Site and would occur prior to construction of the raw water intake pumping station on the Intake Site. This work would consist of five basic steps, as follows:

Step 1: Site Preparation and Staging Area;
Step 2: River Intake Area Preparation;
Step 3: Tunneling;
Step 4: Installation of Intake System; and
Step 5: Demobilization and Completion.

These steps, described below, may not occur sequentially, and may overlap. The schedule for the work would be adjusted as necessary to account for seasonal limitations on in-water construction activities, to be developed in coordination with the New York State Department of Environmental Conservation (NYSDEC) and New York State Department of State (NYSDOS), to avoid adverse impacts to fish spawning and early development.

Step 1: Site Preparation and Staging Area

Construction would begin with development of a staging area at the Hudson River shoreline on the Intake Site. This area would be used to store large pieces of equipment and machinery needed for construction of the intake system, including installation of the 60-inch-diameter steel tunnel structure, 36-inch-diameter intake pipe and two 12-inch-diameter air backwash pipes. It is also possible that some equipment storage and staging may also occur at a nearby property, such

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PROJECT ELEMENT	DURATION (Calandar Days)
Raw Water Intake System	**150**
Land-side Site Preparation and Equipment Delivery	30
Excavation and Drilling	60
Install Cofferdam in Water	30
Work within Cofferdam to Install Intake Structure	40
Landside Backfilling and Equipment Removal	40
Pumping Station	**365**
Site Preparation and Equipment Delivery	30
Drive Sheet Piling	21
Excavation	22
Drive Foundation Piles	21
Foundation and Building Construction - Concrete Work	120
Building Construction	90
Mechanical Work	150
Architectural Finishes	80
Electrical and I&C Work	180
Final Grading, Roadwork, and Landscaping	60
Raw Water Transmission Line	**365**
Site Preparation (Clearing and Grading)	90
Piping and Stone Bedding Material Delivery	300
Install Sheet Piles	300
Install Pipe and Remove Sheet Piles	300
Haul Excess Material, Seed & Mulch	60
Water Treatment Plant	**990**
Site Preparation, Staging, and Equipment Delivery	90
Excavation and Grading	120
Drive Foundation Piles	300
Yard Piping	180
Foundation and Building Construction - Concrete Work	300
Building Construction	210
Install Equipment	270
Mechanical Work	570
Architectural Finishes	360
Electrical and I&C Work	480
Remove Equipment	30
Final Grading, Roadwork, and Landscaping	120

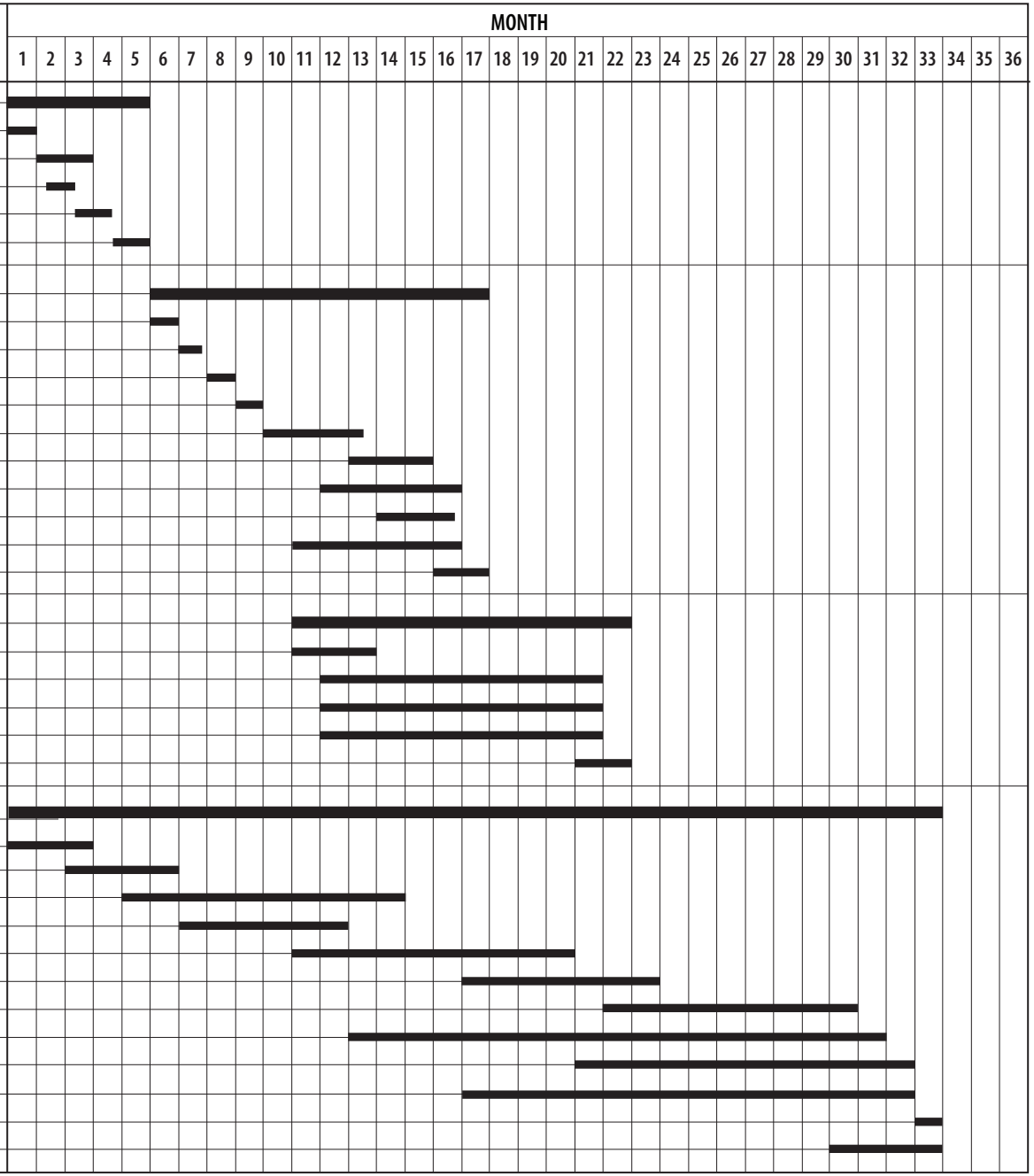


Figure 15-1

UNITED WATER Haverstraw Water Supply Project

Conceptual Construction Schedule - Phase 1

as the vacant property adjacent to the Water Treatment Plant Site owned by DSB Realty Associates, LLC (DSB) or another property near the Intake Site.

The tunneling operation would occur from the staging area, as discussed below. A "launch pit" would be constructed, from which the tunneling operation would occur. This pit would be excavated on the Intake Site and the excavation would be supported by steel sheet piling or another retaining wall system. Sheet piles are sections of pre-fabricated wall, typically constructed of steel or pre-cast concrete, that are driven vertically into the ground to obstruct the lateral movement of earth or water.

Preparation of the staging area would take approximately one month to complete.

During construction of the river tunnel, construction crews would operate from the staging area. Deliveries would arrive by truck at this area and excavated materials being removed from the tunnel would be stockpiled and removed via truck at this location. Materials would be transported to the construction zone in the river (discussed below) by barges. Barges would operate from an existing dock or pier, such as at the Haverstraw Marina, rather than from the Intake Site.

Step 2: River Intake Area Preparation

While the staging area is being prepared, the intake area would also be prepared in the Hudson River. As described in Chapter 2, "Project Description," the intake is proposed to be located approximately 1,000 to 1,200 feet east of the shoreline in the river. To construct the intake, a tremie cofferdam would be constructed to enclose a 30-foot diameter area of the river at the water intake location. A tremie cofferdam is a cofferdam that includes a "tremie" seal, a thick layer of concrete at the bottom of the cofferdam that acts as a counterweight to prevent the cofferdam from floating out of the ground. The work would be performed from a floating work platform created by connecting four barges together at the work zone. Working from the barges, which would be equipped with a crawler crane, pile driving equipment, and other construction equipment and materials, the cofferdam would be constructed by driving sheet piling into the river bottom down to solid rock.

As noted earlier, sheet piles are sections of pre-fabricated wall, typically constructed of steel (or pre-cast concrete), that are driven vertically into the ground to obstruct the lateral movement of earth or water. They are typically installed using either a pile hammer or vibrating hammer. The sections are interconnected and driven one at a time, sequentially, to form a continuous barrier. Once the sheet piling is installed, circular steel bracing is installed on the inside perimeter of the cofferdam.

Before dewatering the inside of the cofferdam, the earthen material within the cofferdam would be excavated down to solid rock using a clamshell bucket, and the dredged material would be loaded onto a scow (a type of boat) anchored adjacent to the barges. Each time the scow is filled up, it would transport the dredged material back to shore, where it would be stockpiled on shore and subsequently trucked off-site for appropriate disposal. A small portion of the material dredged from the river bottom during construction of the cofferdam would be stored for replaced within the cofferdam once construction of the intake structure is complete (see Step 5, below).

Once all earth material is removed from the cofferdam, the inside of the cell would be dewatered and a concrete seal would be placed at the bottom of the cofferdam using a concrete "tremie" method, on top of the rock. This concrete would serve to overcome the significant forces from the water pressure, buoyancy, water current, wave impact, and mooring forces. The tremie seal

thickness would be about equal to the dewatered depth (i.e., if the area within the cofferdam held 30 feet of water before being dewatered, the tremie seal would be approximately 30 feet deep, extending from approximately the elevation of the river bottom downward). Water removed at the cofferdam would be pumped through a filter system and discharged back into the Hudson River. A State Pollutant Discharge Elimination System (SPDES) permit would be required for this discharge.

Dewatering pumps would remove any river water that seeps into the cell. The water would be pumped through a filter system and discharged back into the river.

Preparation of the cofferdam would take approximately one month.

Step 3: Tunneling

When the cofferdam construction is complete, tunneling would begin to construct the 60-inch-diameter tunnel that would house the raw water intake pipe and the air-cleaning system piping. This tunnel would be constructed beneath the river bed, extending 1,000 to 1,200 feet between the shoreline and the water intake location out in the river. The tunnel would not be installed by excavating an open trench in the river bottom. It would instead be constructed using trenchless construction methods from the shoreline, to avoid the need to disturb the river bottom and the aquatic environment. The tunnel most likely would be constructed using either horizontal directional drilling (HDD) or microtunneling.

- **Horizontal directional drilling** involves construction of a tunnel using a two-step process. Working from the shoreline, a small "pilot" hole would be drilled using an HDD machine. The drill would also pull a drilling rod through the pilot hole. As the tunnel advances, additional lengths of drill rod would be added to the pipe string by the machine. These would be stored at the staging area before being added to the machine. The pilot hole would be filled with a thick bentonite slurry—a mix of water and bentonite, which is a natural (inert) clay material—that would also be used to transport the excavated soils back to the staging area.

  The drill assembly would be removed in the protected cofferdam area in the river and the pilot hole would then be enlarged ("reamed") to a larger diameter. This would be accomplished by attaching a "reamer" to the drilling rod in the cofferdam and pulling it back through the pilot hole to the shoreline staging area. This can be accomplished through one or several passes until the tunnel is at the required diameter. Throughout the reaming process, the hole is kept open by filling it with a thick bentonite slurry—a mix of water and bentonite. Once the tunnel is large enough, the steel casing pipe, attached to the drilling rod with a swivel, would be pulled from the cofferdam through the excavated bore to the shoreline intake location using the HDD machine. During pull-back of the casing pipe into the tunnel, the slurry would be displaced into the slurry pit located on the shoreline at the staging area.

  To avoid the potential risk of bentonite slurry escaping through fractures in the soils around the tunnel, best practices would be followed as established by the tunneling industry. Operations would be conducted in general accordance with *Horizontal Directional Drilling Good Practices Guidelines*, published by the HDD Consortium, dated May 2001 (or as updated when the drilling occurs), and as modified for specific conditions related to the Proposed Project.

- **Microtunneling** involves drilling a small-diameter tunnel using a micro-tunnel boring machine (MTBM) that is operated remotely, with real-time operation/guidance control, and "jacked" pipe installation. The MTBM is launched from a pit dug at the start of the tunnel drive—in this case, the launching pit would be at the shoreline at the Intake Site. The MTBM would proceed from the launching pit under the river bed to the receiving pit created by the cofferdam. Typically, MTBMs tunneling through soil use a pressurized face in front of the machine to provide ground support around the excavation area. The MBTM exerts pressure to balance the natural downward pressure of the earth through the use of a slurry mixture. The pressure is constantly monitored so that adjustments to the slurry mixture can be made if pressure is lost. Soils excavated by the MTBM are mixed with the bentonite slurry and removed from the tunnel behind the machine, via slurry lines to the launching pit. At the launching pit, the spoil (excavated soils) would be separated from the slurry using a slurry separation plant and the slurry would then be circulated back to the head of the tunnel for re-use. The slurry system is a closed loop system. The slurry plant would be located on the Intake Site or, if an adjacent area is used for staging, could be located there.

  As part of the construction process for the tunnel, permanent steel casing pipe sections are hydraulically "jacked" (pushed using hydraulic equipment) into place from the launching pit. The pipes are installed behind the MTBM as it moves forward. When the MTBM reaches the end of its drive, it would be removed via a receiving area within the cofferdam area at the intake location in the river. Following removal of the MTBM, the pipe would be jacked into the receiving pit. A small volume of slurry would be present in front of the MTBM as it moves through the cofferdam sidewall into the pit. Following completion of mining operations, the slurry lines would be pumped free of slurry to a tanker at the Intake Site and disposed of in accordance with applicable federal, state, and local regulations.

Using either HDD or microtunneling, the tunnel would be dewatered during construction at the Intake Site. Water would be filtered prior to discharge back to the river. A SPDES permit would be required for this discharge.

The tunneling activities associated with the water intake system would take approximately two months.

Step 4: Installation of Intake System

Following installation of the steel casing pipe, the water pipes and air pipes would be installed within the river tunnel using a spacer that would position the pipes correctly within the casing pipe.

Once the piping is in place, the vertical riser and supports for the water intake system would be installed on top of the concrete tremie seal at the bottom of the cofferdam, and the wedge-wire screen intake system would be installed.

This stage would take approximately six weeks to complete.

Step 5: Demobilization and Completion

Upon completion of the tunnel and installation of the intake screen system, the cofferdam would be flooded and then removed. A small portion of the material dredged from the river bottom during construction of the cofferdam would be stored and replaced within the cofferdam to create substrate on top of the concrete. The dredged material would be replaced prior to removal of the sheet pile walls. The steel sheet piling would then be extracted using a vibratory extractor. This step would take approximately one week.

The staging area at the shoreline Intake Site would also be removed. Most likely, the launch pit that was used for the tunneling operation would be maintained for re-use as part of the intake pumping station to be built on the Intake Site.

This final step would take approximately three weeks to complete.

Schedule and Personnel

In total, the construction of the river tunnel and intake system described above is expected to be completed within five months. During that period, the floating work platform of connected barges would be in place about 10 weeks.

As noted earlier, all construction activities for the river tunnel and intake system would be staged from the Intake Site. Deliveries would be made to this Site and excavated materials ("muck") would be removed from this location. Staging and worker parking for the construction activities would be located on the Intake Site during construction of the river tunnel and intake system.

Construction of the raw water intake system would require an average of 10 construction workers each day, with 20 workers on peak days. An estimated four trucks on average would arrive at the Intake Site each day in connection with the river intake construction. This would result in an average of eight truck "trips" each day, since each truck is considered to be two truck "trips" (an arrival and a departure) for purposes of traffic analyses. Using HDD technology for tunneling, an estimated 27 trucks per day may be required for approximately one week, when the muck is being removed from the tunnel.

Phases 2 and 3

The intake system would be constructed to accommodate the full capacity required for the 7.5 mgd water treatment plant, so that no additional construction work would be required for Phases 2 and 3.

INTAKE PUMPING STATION CONSTRUCTION ACTIVITIES

Construction of the Proposed Project's intake pumping station on the Intake Site would most likely begin after construction of the river tunnel and intake system is completed, so that multiple construction crews are not working on the Intake Site at the same time.

Construction Activities

Construction of the intake pumping station would consist of four basic steps:

Step 1: Site preparation;
Step 2: Excavation;
Step 3: Building construction and installation of large equipment;
Step 4: Installation of piping, mechanical, and electrical equipment and site finishes.

Once the staging area for the river tunnel work is removed, construction of the intake pumping station could begin. The first step would be the delivery of equipment and preparation of the new construction zone.

The next step in construction of the intake pumping station would be excavation of the area where the intake pumping station would be located. As noted earlier, the excavation area that was used for the river tunnel construction could potentially be re-used as a required excavation area for the intake pumping station. Excavation would consist of installing sheet piles and

excavating the area within the area protected by the sheet piles. Following that work, foundation piles would be installed (for approximately three weeks).

The intake pumping station foundation would be constructed of concrete that would be poured on-site. The masonry walls and the roof of the pump station would then be erected to form the shell of the structure. When the structure is in place, the large vertical pump(s) and other large equipment would be installed. It is anticipated that two pumps would be installed in Phase 1.

The final stage of construction work at the intake pumping station would be the installation of piping, mechanical and electrical equipment, and information and communications systems required within the building. At the same time, architectural finishes would be completed (such as exterior brickwork, for example) and final landscaping and site finishes would be completed.

Schedule and Personnel

Construction activities for the intake pumping station would last an estimated 12 months. During that time, an average of 15 construction workers would be on the Intake Site daily and as many as 55 workers would be present daily during the peak construction period. An estimated three to five trucks would arrive at the Intake Site on average each day (for a total of 6 to 10 round-trip truck trips), with an additional 8 to 10 concrete trucks on average and 40 concrete trucks on peak days.

Staging and worker parking for the construction activities would be located on or near the Intake Site during construction of the intake pumping station.

Phases 2 and 3

For Phases 2 and 3, some additional construction work would be required at the intake pumping station to add the additional pumps required for the increased capacity of the water treatment plant. In each subsequent phase, this work would consist of installation of an additional pump and associated mechanical equipment, electrical, and information and communication systems and, other than the delivery of materials, would occur inside the existing structure completed in Phase 1. In total, this work would take approximately four months for each phase.

RAW WATER TRANSMISSION LINE CONSTRUCTION ACTIVITIES

The 30-inch-diameter pipeline that would transmit raw water from the intake pumping station to the water treatment plant would be installed beneath the roadbed of Beach Road and Ecology Lane, and then alongside the JRSTP to reach the Water Treatment Plant Site.

Construction Activities

Installation of the pipeline would follow standard procedures for installation of water mains, used by United Water throughout its service area when new water mains are provided. This would consist of four basic steps, described below.

Step 1: Pavement cutting and excavation;
Step 2: Placement of bedding and water main;
Step 3: Removal of excavation support; and
Step 4: Backfill and repaving.

During the first step, the contractor would use machinery to cut the existing roadway asphalt and concrete base and excavate a trench of the required width and depth. The trench would be approximately six to eight feet wide and a minimum of seven feet deep, so that the top of the completed pipe would be at least four feet below ground. The sides of the excavation would be

supported by steel sheeting or other supporting measures. The excavated roadway material and soil would be removed with a backhoe and placed in dump trucks. Sump pumps would be used as needed to maintain dry conditions in the trench.

The second step would consist of placement of "bedding" material in the trench (i.e., materials used to support the loading of the water main in the excavated trench). For the Proposed Project, it is anticipated that the bedding material would consist of a reinforced concrete cradle to support the water main. Concrete trucks (one per day) would make deliveries to the construction zone throughout construction to provide the needed materials. The water main itself would then be placed into this bedding using a small crane. The water main would subsequently be aligned and installed with connecting joints.

The third step would consist of removing the sheet piling or excavation support. It is anticipated that a crew of construction workers working at the rear of the water main route would remove the sheet piling once the pipe is in place and transport it to the front of the construction zone for re-use in a new portion of the construction zone as construction proceeds.

The final (fourth) step would consist of backfilling of the trench with fill material, removal of the supporting materials, and repaving of the street.

Where Beach Road crosses Minisceongo Creek, the water pipeline would also cross the creek. Depending on the ground conditions near the creek, this would be accomplished in one of two possible ways. The pipeline could be installed beneath the creek through the use of a tunneling technology, such as microtunneling or horizontal directional drilling, described above. Another technique that could be used is "jacking and boring." Jacking and boring would involve digging access pits on each side of the creek and hydraulically jacking (pushing) a steel casing from the first pit under the creek to the second pit. The water transmission pipe (carrier pipe) would then be installed through the casings from pit to pit. The space between the casings pipe and the carrier pipe would then be filled with flowable grout. Alternatively, the pipe may be routed above the creek, beside the roadway in an above-grade crossing. In this case, the pipe would be heat-insulated to protect against freezing.

Schedule and Personnel

Installation of the water main is anticipated to proceed at approximately 40 feet per day, for a total of 10 months for installation of the entire 7,500-foot-long water main. During that time, Beach Road and Ecology Road would remain open and traffic would be routed around the construction zone, as is typical for water main and road improvement projects throughout Rockland County. Staging areas for laydown of materials would likely be located within the streets where construction is occurring. One to two construction crews of 5 to 10 people each would be working in the construction zone during that time. An estimated four trucks would arrive each day in connection with the water main construction, including one concrete truck, other delivery trucks, and trucks removing excavated soils from the construction zone.

Phases 2 and 3

The pipeline that would be installed would be large enough to accommodate the full capacity of the water treatment plant, so that no additional raw water pipeline installation would be required for Phases 2 and 3.

WATER TREATMENT PLANT CONSTRUCTION ACTIVITIES

Construction of the water treatment plant on the Water Treatment Plant Site would occur at the same time as construction work on the other sites, described above.

Construction Activities

Construction of the water treatment plant would consist of the following basic steps:

Step 1: Site preparation and grading;
Step 2: Pile driving;
Step 3: Building and basin construction;
Step 4: Installation of the water treatment equipment; and
Step 5: Site finishes.

Construction staging, including storage of materials, would likely occur on the Water Treatment Plant Site. An additional staging area may be established on an adjacent property, such as the adjacent DSB property, subject to an agreement with the owner of that property.

The first step would be to clear the limited vegetation from the Water Treatment Plant Site. Once clearing is complete, grading would occur. Based on the conceptual designs developed at this time, it is anticipated that minimal grading would be required. Any re-grading of the Site would be minimized by the fact that the facility's planned layout takes advantage of the natural grades of the Site. Some cutting of higher elevations and some filling of the low areas at the center of the Site would be required. Soil removed by cutting operations would be re-used for filling operations, to minimize the amount of soils that must be either exported or imported during grading. If the grading resulted in excess material that could not be managed on site, the material would be characterized, loaded into trucks, and transported for off-site disposal at an appropriately licensed facility. If the grading required a net import of soils, the fill material would be transported from either a site containing uncontaminated soil from other construction sites, material that can be considered "beneficial re-use" according to NYSDEC regulations, or material from regulated recycling facilities.

Following grading of the Water Treatment Plant Site, foundation piles would be driven throughout the Site. (Alternatively, depending on the final construction schedule, pile driving could also occur prior to grading activities.) Pile driving is expected to occur for approximately 10 months on the Water Treatment Plant Site, with multiple crews working in different areas of the Site during that time.

The foundation and basements for the water treatment plant buildings would be constructed of concrete that would be poured on-site. Concrete would also be used to construct the finished water reservoirs, chlorine contact basins, and the new stormwater detention basin in the northeast corner of the Water Treatment Plant Site. Concrete work on the Site would last an estimated 9 to 12 months, during which time up to 8 to 10 concrete trucks would arrive at the Site each day, with a peak of 40 concrete trucks per day. Alternatively, a concrete batching plant could be located at the Site to process the concrete needed for the construction, which would eliminate the need for concrete truck deliveries.

The masonry walls and the roof of the water treatment plant buildings would then be erected to form the shell of the buildings planned for the Site. At the same time, work would be under way installing the water treatment equipment at the Site. Construction work at the Water Treatment Plant Site would also include installing the underground pipes and connections across the Site that would transmit raw water, process wastewater, and finished water to and from the Site.

The work related to yard piping and installation of mechanical and electrical equipment, and information and communications systems required within the buildings would take almost two years. At the same time, architectural finishes would be completed (such as exterior brickwork, for example).

Final grading, landscaping, and construction of the driveway and parking area would be the final construction activity at the Site.

As described in Chapter 2, the Proposed Project would also require some upgrade to the outfall at the JRSTP and connection of new effluent pipelines to the JRSTP. These upgrades and connections would be performed during the same period as work on the water treatment plant, and would not require disruption to operations of the JRSTP.

Schedule and Personnel

Construction activities at the Water Treatment Plant Site would occur over an estimated three-year-long (36-month) period. The activities with the longest durations would be pile driving (10 months); concrete work (9 to 12 months); and mechanical work, architectural work, and installation of information and communications, which would all occur simultaneously and would have a duration of approximately 20 months.

Construction of the water treatment plant would require an average of 50 to 75 construction workers daily and as many as 100 workers daily during the peak construction periods.

During the three-year construction period, delivery vehicles and concrete trucks would arrive at and depart from the Water Treatment Plant Site each day. An estimated three to five delivery trucks would arrive at the Site each day (for a total of 6 to 10 round-trip truck trips daily). In addition, an average of 8 to 10 concrete trucks would be required each day, with a peak of up to 40 concrete trucks per day.

The construction access point would potentially be the same as the final location for the water treatment plant driveway. The most likely construction access route would be a new roadway from Railroad Avenue alongside the CSX railroad right-of-way. Alternatively, a new roadway could be created extending from the end of Carol Street or North Wayne Avenue. In addition, United Water will explore the possibility of using the adjacent CSX railroad tracks for delivery of construction materials by rail.

Phases 2 and 3

As described earlier in this chapter, construction of the water treatment plant could include as many as three separate phases. Depending on final designs developed for the plant, the initial phase may be constructed to include buildings large enough to house all the equipment that would eventually be needed at the plant. In that case, construction work in Phases 2 and 3 would consist of installation of equipment and construction of additional water tanks and storage reservoirs. Alternatively, it is possible that the buildings at the plant would also be expanded for Phases 2 and 3 and then additional equipment, tanks, and reservoirs would be added. Figure 15-2 illustrates the elements of the Proposed Project that might be added in Phases 2 and 3. As shown in the figure, this could include expansion of processing buildings and the addition of raw water reservoirs, chlorine contact basins, and treated water reservoirs as the plant is expanded. The construction work for Phases 2 and 3 would last approximately one year for each phase, and would be conducted so as not to interfere with ongoing operations of the completed portions of the water treatment plant. During that time, a similar number of workers and delivery vehicles would be expected as for the first phase of construction.

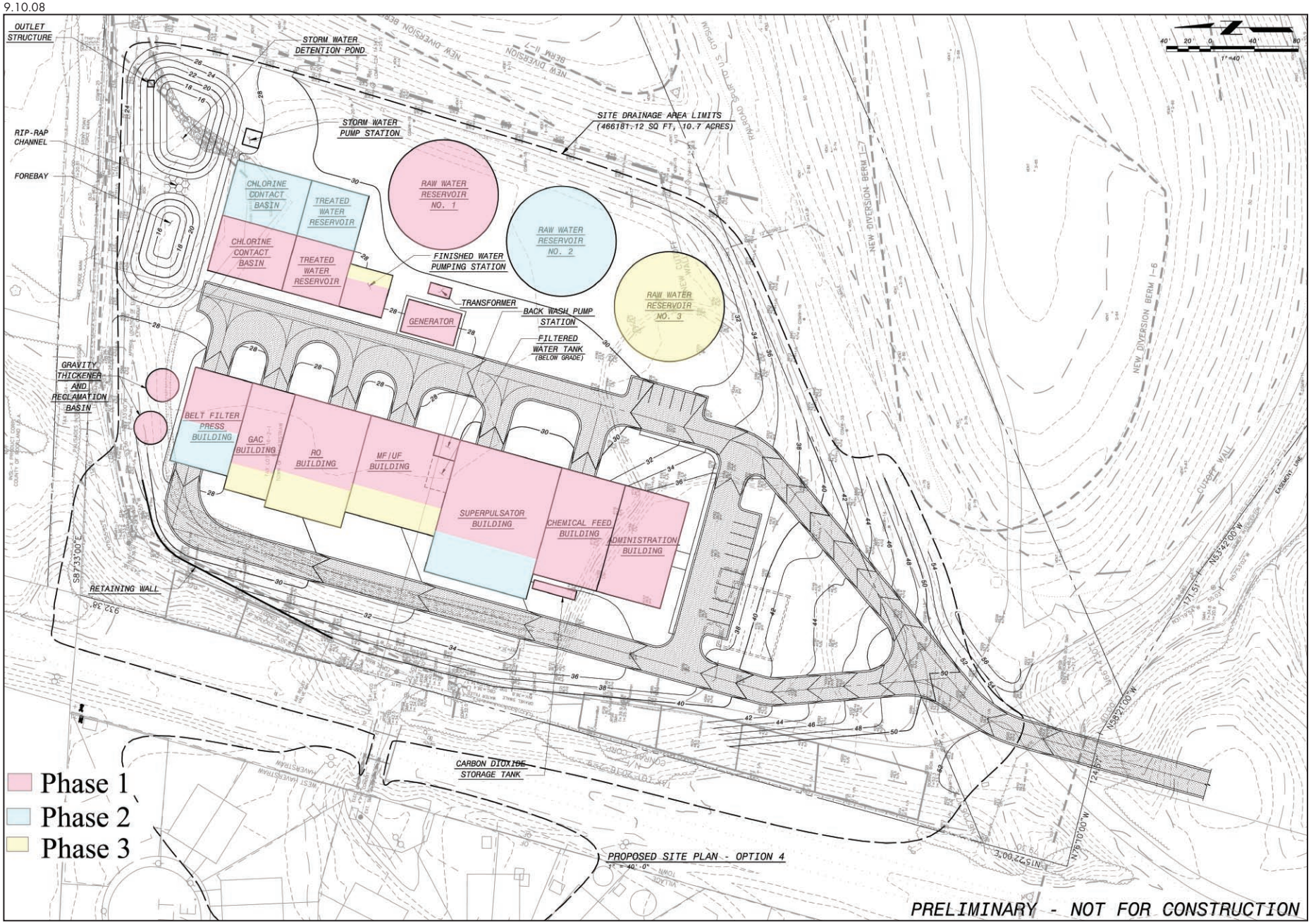


Figure 15-2

Equipment Phasing Site Layout

POTABLE WATER MAINS CONSTRUCTION ACTIVITY

The installation of buried water mains that would carry the finished (potable) water from the water treatment plant to the United Water distribution system would be conducted in the same manner as described earlier for the raw water transmission line. The water mains would be installed either in existing streets or in existing utility rights-of-way. As described above, the construction would consist of four basic steps:

Step 1: Pavement cutting and excavation;
Step 2: Placement of bedding and water main;
Step 3: Removal of excavation support; and
Step 4: Backfill and repaving.

Installation of the water mains is anticipated to proceed at approximately 40 to 80 feet per day, depending on geological conditions. During that time, the affected roadways would remain open and traffic would be routed around the construction zone, as is typical for water main and road improvement projects throughout Rockland County. One to two construction crews of 5 to 10 people each would be working in the construction zone during that time. Staging areas for laydown of materials would likely be located within the streets where construction is occurring.

At locations where new water mains must cross major intersections, it is possible that the mains would be laid using "jacking and boring," described above in the discussion of the raw water transmission mains. As discussed above, this construction technique allows installation of short segments of water mains without excavation. This technique would also be used for any locations where the mains must cross beneath the CSX railroad right-of-way, unless the water main can cross beneath an existing railroad trestle.

As described in Chapter 2, potential routes have been identified but not finalized for the potable water main connections. Final routes would depend on the results of utility surveys and geological investigations to be conducted following completion of this DEIS. The potential routes are shown in Figure 15-3. As shown in the figure, some of the potential routes extend westward from the Water Treatment Plant Site, crossing the CSX railroad tracks and continuing along an east-west street to meet Route 9W. Others extend south from the Water Treatment Plant Site, along North Wayne Avenue, Carol Street, or the CSX access road adjacent to the railroad tracks, and then continue via Railroad Avenue either westward to Route 9W or eastward to Tanneyanns Lane.

For Phases 2 and 3, it is possible that some existing water mains would need to be rehabilitated or replaced with larger mains to accommodate the increased flow. This may include an existing main beneath Route 9W and a main beneath Filors Lane between Route 9W and Thiells Road. This replacement and/or rehabilitation could be conducted as part of United Water's regular water main rehabilitation program.

In addition, it is possible that one or more additional pumping stations may be required in Phase 2 or 3 to transmit the additional water to locations farther from the water treatment plant. These would be added as part of the replacement and/or rehabilitation project. United Water's pumping stations are sometimes located below-ground in the public right-of-way, and at other times are above-grade structures located outside the right-of-way. They are typically relatively small structures, e.g., less than 2,000 square feet in size and 30 feet high. Any new pumping stations located outside the right-of-way may be subject to review under the State Environmental Quality Review Act (SEQRA) and future site plan approval.

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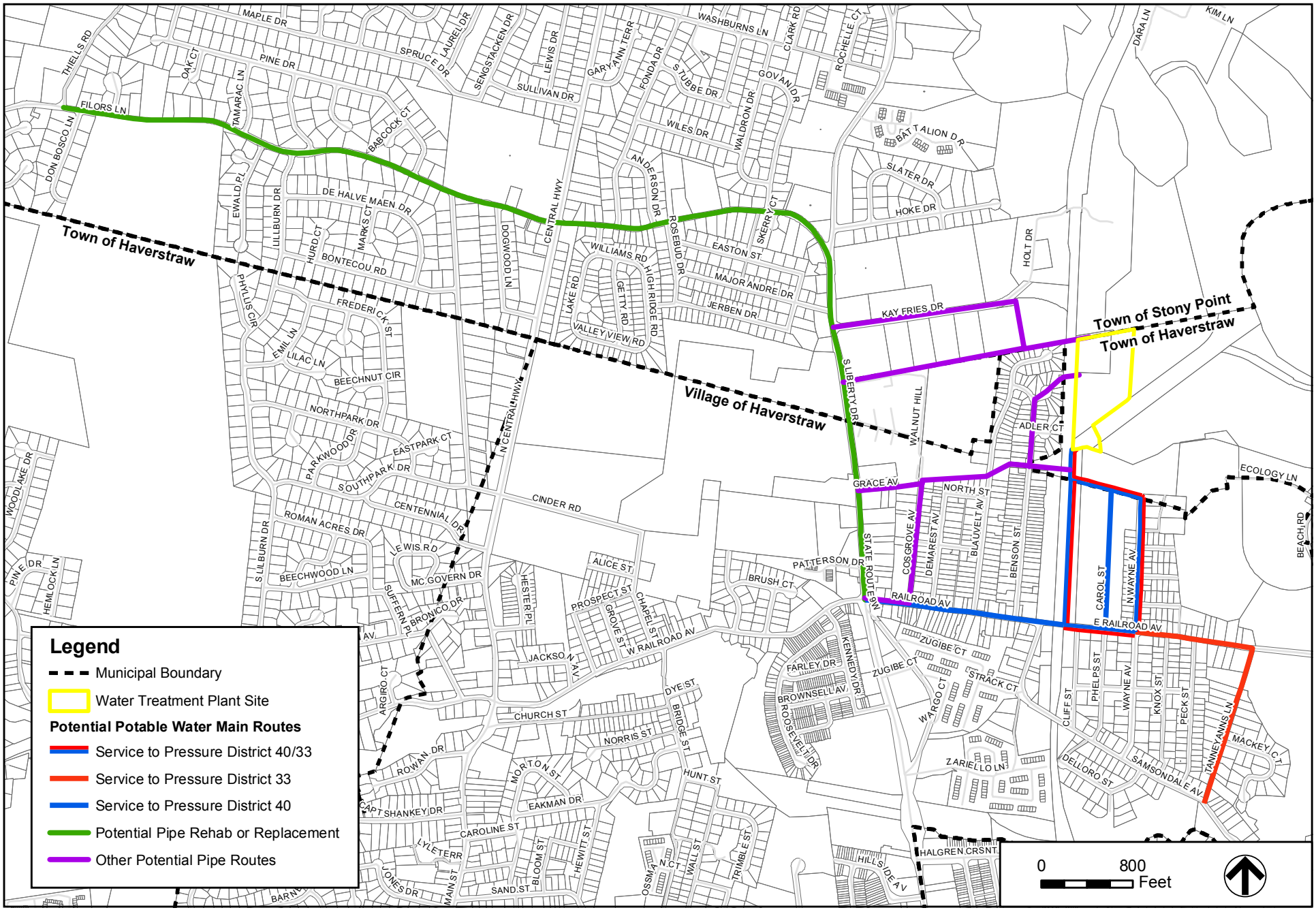


Figure 15-3

Potential Potable Water Main Routes

GENERAL CONSTRUCTION PRACTICES

The following section describes general construction practices that are typical in New York State and/or the Town of Haverstraw, and that would be observed throughout construction of the Proposed Project.

COMMUNITY LIAISON

United Water would designate a contact person for community relations throughout the construction period. This person would serve as the contact for the community to voice concerns about construction activities, and would be available to meet with the community to resolve concerns or problems. In addition, United Water would establish a construction "hot line" that could be used to register complaints or ask questions. Calls to the hot line would be returned within 24 hours. United Water would also maintain a website with information on upcoming construction activities.

HOURS OF WORK

Construction activities generally would take place in accordance with Town of Haverstraw Zoning Code § 167-40 regulations, which permit construction, blasting, drilling, and demolition between the hours of 7:00 AM and 7:00 PM on weekdays, and from 8:00 AM to 5:00 PM on Saturdays. Under the Zoning Code, work is prohibited on Sundays and legal holidays.[1] It is possible that some non-intrusive construction work at the Project Sites (e.g., interior work within buildings on the Project Sites) may be conducted beyond those hours with permission from the Town of Haverstraw.

STAGING AND LAYDOWN AREAS

It is expected that most staging and laydown areas for construction activities would be located within the boundaries of the Project Sites. It is possible that a site nearby, such as the vacant DSB property adjacent to the Water Treatment Plant Site and/or a property near the Intake Site, may also be used for staging and/or construction worker parking. Materials that are needed during the day are usually delivered early that day. These materials, such as reinforcing bars and prefabricated pieces, are stored until needed. In certain cases, several days of construction materials would be stored. As noted above, construction deliveries would include concrete trucks for delivery of concrete; however, it is possible that a concrete batching plant could be used at one of the Project Sites to provide the concrete on-site.

DELIVERIES AND ACCESS

Access to the construction sites would be controlled. The work areas would be fenced off, and limited access points for workers and trucks would be provided. After work hours, the gates would be closed and locked. Unauthorized access would be prevented after work hours and during the weekend. Material deliveries to the Project Sites would be controlled and scheduled.

CONSTRUCTION WORKER PARKING

For construction work on the Water Treatment Plant Site, a worker staging area would be established with a contractor trailer and parking area. Workers would report to this location and would travel to the construction site in groups. The staging area may be located on an adjacent

[1] Times of permitted construction, blasting, drilling, and demolition do not apply to emergency work and work performed by a municipal agency.

industrial property, as noted above, or another property within a few minutes' drive of the construction area.

C. POTENTIAL IMPACTS OF CONSTRUCTION ACTIVITIES

The potential impacts of the anticipated construction activities required for the Proposed Project are described below. Unless otherwise noted, the impact discussions generally describe the effects of construction activities required for Phase 1 of the Proposed Project. Phases 2 and 3 would result in similar but reduced effects, because construction would be less intensive and of shorter duration. As noted earlier, if two phases are constructed together, the total duration (and level of activity) of construction for the two phases combined would be less than the sum of each individual phase. This is because combining phases would eliminate the need to create staging areas and mobilize workers a second time, and would allow other efficiencies of effort as well.

LAND USE, ZONING, AND OTHER ACTIONS

Construction activities would result in limited disruption to nearby land uses during the three-year construction period, and again during Phases 2 and 3. As described in Chapter 3 of this DEIS, "Land Use, Zoning, and Other Actions," those uses are predominantly industrial and commercial, but do also include some residential uses and parks. Near the Intake Site, a small residential neighborhood and a waterfront park are located north of the Site on River Road/Grassy Point Road. In addition, the Haverstraw Marina is immediately south of the Intake Site. Near the Water Treatment Plant Site, a residential neighborhood is located to the south of the Site along both sides of North Wayne Avenue. Another residential neighborhood is immediately west of the Water Treatment Plant Site (across the CSX tracks) along Benson Street and Blauvelt Avenue.

Construction activities for the river intake, intake pumping station, and water treatment plant would be largely contained on the Project Sites, although it is possible that land nearby could be used for staging and/or construction worker parking. Construction activities would be noisy and intrusive to nearby residential and park uses at times, particularly during the period when pile driving would occur (up to 2 months for sheet piles and foundation piles at the Intake Site and approximately 10 months for foundation piles at the Water Treatment Plant Site). In addition, the truck traffic associated with the Proposed Project's construction would be noticeable from nearby residences and parks. However, the primary construction sites—the Intake Site and the Water Treatment Plant Site—are somewhat buffered from most nearby sensitive land uses (i.e., residences and parks) by distance and intervening structures, vegetation, and topography. Construction would be most intrusive at the single residence immediately north of the Intake Site, which is the closest sensitive use to a construction site. Construction activities would be discernable from the residences near the Water Treatment Plant Site, and particularly those at the north ends of Benson Street and Blauvelt Avenue, but the intervening grade changes and vegetation would help to buffer that disruption.

Construction associated with installation of the raw water transmission pipe and potable water mains would require lane closures on the affected roadways. As described earlier, this would include Beach Road for the raw water transmission pipe, and potentially North Wayne Avenue, a portion of Railroad Avenue, and possibly Tanneyanns Lane for the potable water mains. This construction work would move along at approximately 40 feet per day, so the disturbance to any particular area would be of limited duration. As discussed below under "Traffic and Transportation," Maintenance and Protection of Traffic (MPT) plans would be developed and implemented to limit the amount of disruption to traffic on the affected roadways. In addition to

the disruption to traffic, the construction work associated with water main installation would be noisy and potentially dusty.

Throughout the construction period, access to residences and businesses would be maintained to the greatest extent possible. Some traffic delays may occur, especially along Beach Road (County Road 108) which is the primary route for the raw water transmission line. Businesses along Beach Road, including the Haverstraw Marina, a contractor business along Beach Road, commercial boating businesses along Beach Road associated with the Haverstraw Marina, and a machine and tool shop, could experience disruption during the year when the raw water transmission pipe is being installed. This disruption would be particularly noticeable during the summer months, when the boat-related businesses, including the marina, are busiest. The potable water main routes could potentially result in disturbance to residential neighborhoods, such as those along North Wayne Avenue, Railroad Avenue, and Tanneyanns Lane.

Overall, the amount of construction-related disruption to nearby land uses would be limited through the use of MPT plans and dust suppression measures. The primary construction sites—the Intake Site and the Water Treatment Plant Site—are somewhat buffered from nearby sensitive land uses (i.e., residences and parks) by distance and intervening structures, vegetation, and topography. Access would be maintained for all uses near the construction sites.

During Phases 2 and 3, construction would be more limited and less disruptive, although noisy activities, truck traffic, and worker vehicle traffic could result in temporary disturbances to land uses near the Water Treatment Plant Site. Little construction work would be required during these phases at the Intake Site, so only limited disruption would be expected.

VISUAL RESOURCES

Construction activities would result in temporary changes to views of the Project Sites. During the five-month period when the river water intake system is being installed, for example, views of the waterfront from the Haverstraw Marina and Riverfront Park along Grassy Point Road/River Road in Stony Point would include views of the barges and barge-mounted crane in the river. These would be located close to the existing U.S. Gypsum conveyor and therefore would not be intrusive in views of the water from the surrounding area. At the Intake Site and Water Treatment Plant Site, construction activities may be visible from the surrounding area as well, although the Water Treatment Plant Site is largely shielded from view by its bowl-like topography (see Chapter 4, “Visual Resources”). Any impacts to visual resources from construction activities in the vicinity of the Intake Site, raw water transmission line route, and Water Treatment Plant Site would be temporary and would not significantly affect the overall visual character of the community in the long-term.

COMMUNITY FACILITIES

LAW ENFORCEMENT, FIRE PROTECTION, AND EMERGENCY SERVICES

Construction activities on the Intake Site and Water Treatment Plant Site would not be anticipated to increase demands for law enforcement or fire protection services. Construction activities associated with installation of the raw water transmission line and the potable water mains would result in some disruption to traffic patterns on affected roadways, but with implementation of MPT plans, this disruption would be minimized. Traffic would be routed around the construction zone but all affected streets would remain open to traffic during water main installation. Access would be maintained at all times for fire trucks, ambulances, and responder vehicles at Thiells Fire District Station #3, which is located at the intersection of

Railroad Avenue and Beach Road. Therefore, construction-related traffic disruption would not result in significant adverse impacts to provision of these emergency services.

RECREATION AND PARKS

Construction activities associated with the Proposed Project could be discernible at the nearby Haverstraw Marina, Haverstraw Bay County Park, and Riverfront Park in Stony Point along River Road/Grassy Point Road. Construction activities in the Hudson River would also be visible from all three of those locations. The noise associated with driving sheet piles for the cofferdam in the river (approximately one month) and driving sheet piles and foundation piles at the Intake Site (approximately two months) would be particularly noticeable. If that occurs during the summer, park-goers may choose not to visit the beaches along the east side of Grassy Point Road/River Road immediately north of the Intake Site, where the noise would be most disruptive. Noise at Haverstraw Bay County Park would be less disruptive, since that park is farther from the construction zone.

Public access would be maintained at those parks and at the boat launch and canoe/kayak launch at Haverstraw Marina during construction in the Hudson River, at the Intake Site, and along Beach Road. As described earlier, MPT plans would be developed and implemented so that Beach Road would remain open to traffic during construction.

OTHER COMMUNITY FACILITIES NEARBY

Two schools are located in the residential neighborhood to the southwest of the Water Treatment Plant Site. These are the North Rockland High School Satellite Campus, on the north side of Railroad Avenue at Cosgrove Avenue, and the West Haverstraw Elementary School on Blauvelt Avenue. The high school is approximately 1,500 feet from the Water Treatment Plant Site, and the elementary school is approximately 800 feet from the Site. These two schools would be unaffected by most construction activities, but the noisiest construction activities (e.g., pile driving) might be discernible at the schools. In addition, construction-related traffic headed to and from the Water Treatment Plant Site would directly pass the high school and would pass the Blauvelt Avenue, on which the elementary school is located. As described below in the discussion of traffic, some potential impacts on traffic could result during construction, but these could be mitigated.

SOCIOECONOMICS

The economic benefits associated with construction activities are directly related to the cost of the Proposed Project. Those benefits were estimated using the IMPLAN (IMpact analysis for PLANning) input-output modeling system, which estimates the number of direct and indirect jobs, tax revenues, and economic output that would result from construction of the Proposed Project. The methodology used for the IMPLAN model is described in Chapter 6 of this DEIS, "Socioeconomics." The IMPLAN model was used to estimate the economic benefits of construction of the full plant.

Estimated construction costs for the Proposed Project were used to estimate the benefits associated with construction activity. The construction costs include sitework, hard costs (actual construction), and soft costs (engineering). The total cost reflects the cost of physical improvements to the Project Sites and therefore excludes other values (such as the value of the land) not directly a part of the expenditures for construction. The total cost including the value of the land would be substantially more.

Costs for equipment were deducted for this analysis on the assumption that much of the equipment (e.g., pumps, water filtration and processing equipment) would be manufactured outside of New York State, and therefore, the purchase of this equipment would not have a direct effect on the regional or statewide economy. The installation of this equipment, however, would result in direct and indirect economic effects. The direct costs of construction, which serve as the basis for calculating indirect and induced economic effects, were organized into IMPLAN industry sectors (which are based on the U.S. Census Bureau's North American Industry Classification System, or NAICS) and modeled accordingly. Table 15-1 shows the direct inputs to IMPLAN and the distribution of construction costs across industry sectors.

Table 15-1
Construction Costs Used as Bases for Economic and Fiscal Benefits Modeling
(Shown in 2008 Dollars)

IMPLAN Sector	Description of Industry Sector	Project Costs (including Equipment)	Equipment Costs	Construction Only
40	Water, sewer, and pipeline construction	$94,590,000	$10,380,000	$84,210,000
38	Commercial and institutional buildings	$2,056,000	-	$2,056,000
439	Engineering*	$24,162,000	-	$24,162,000
Total		**$120,808,000**	**$10,380,000**	**$110,428,000**

Note: * For a conservative analysis of economic impacts in Rockland County, it was assumed that engineering costs are in the State, not in Rockland County.

Sources: Black & Veatch Corporation; AKRF, Inc.

Estimated economic effects from construction of the Proposed Project are shown in Table 15-2 and summarized below.

EMPLOYMENT BENEFITS

The $110.4 million represents the direct expenditures in New York State during the construction period. Of this total, $86.3 million are the direct expenditures in Rockland County during the construction period. As discussed above, it has been assumed that engineering services would be in New York State, not in Rockland County. Thus, the estimated construction cost in the State is higher than the estimated construction cost in Rockland County.

As a result of the direct expenditures, approximately 701 direct jobs (127 per year for 5.5 years) would be generated in the County. Another 203 direct jobs would be generated in New York State due to engineering activities. Based on the modeling conducted, 266 indirect jobs and 404 induced jobs will be created in New York State, of which 226 indirect jobs and 277 induced jobs would be created in Rockland County. Indirect employment would include jobs in industries that provide goods and services to the contractors, and induced employment would include jobs generated by new economic demand from households spending salaries earned through the direct and indirect jobs.

Table 15-2
Economic Benefits from Construction of the Proposed Project

Benefit	Cumulative Effect on Rockland County	Annual Effect on Rockland County*	Cumulative Effect on New York State	Annual Effect on New York State*
Employment (full and part-time jobs)				
Direct (Jobs in construction)	701	127	904	164
Indirect (Jobs in support industries)	226	41	266	48
Induced (Jobs from household spending)	277	50	404	74
Total	1,203	219	1,574	286
Employee Compensation (millions of 2008 dollars)				
Direct (Earnings in construction)	$34.0	$6.2	$45.5	$8.3
Indirect (Earnings in support industries)	$9.3	$1.7	$13.5	$2.4
Induced (Earnings from household spending)	$9.5	$1.7	$16.5	$3.0
Total	$52.8	$9.6	$75.5	$13.7
Total Economic Output or Demand (millions of 2008 dollars)				
Direct (Output from construction)	$86.3	$15.7	$110.4	$20.1
Indirect (Output from support industries)	$26.4	$4.8	$36.5	$6.6
Induced (Output from household spending)	$29.7	$5.4	$51.4	$9.4
Total	$142.4	$25.9	$198.4	$36.1

Notes: Detailed amounts may not add to totals due to rounding.
* Assumes that the construction period would be 5.5 years.
Sources: Construction cost estimate provided by Black & Veatch Corporation. Indirect and induced output and employment and employee compensation estimates generated using IMPLAN.

EMPLOYEE COMPENSATION BENEFITS

Direct construction worker earnings are estimated at $34.0 million in Rockland County and $45.5 million in New York State. Total direct, indirect, and induced employee compensation resulting in Rockland County is estimated at $52.8 million. Total employee compensation in New York State is estimated at $75.5 million.

TOTAL ECONOMIC OUTPUT BENEFITS

Construction costs are estimated at approximately $86.3 million in Rockland County and $110.4 million in New York State. Based on the IMPLAN models for the New York State and Rockland County, the total indirect and induced economic activity resulting from this direct investment would be $87.9 million in the state and $56.1 million in the County.

TAXES

The economic benefits from constructing the Proposed Project would have associated with them non-property tax revenues for Rockland Country, the Metropolitan Transportation Authority (MTA), and New York State. These taxes include sales tax, personal income tax, corporate and business taxes, and numerous other taxes. Based on the construction cost and the existing sales tax rate, sales tax on construction materials would be expected to equal approximately $2.6 million, including approximately $1.2 million for Rockland County, $117,000 for the MTA, and $1.2 million for New York State (all figures in 2008 dollars). Based on the projected employee compensation, New York State personal income tax from constructing the Proposed Project is estimated at approximately $1.66 million from the direct earnings, and $0.95 million from the

indirect and induced earnings, and therefore, to total approximately $2.61 million. In addition, construction of the Proposed Project would be expected to generate corporate and business taxes, utilities taxes, and numerous other taxes on the direct, indirect, and induced activity.

CULTURAL RESOURCES

Chapter 7, "Cultural Resources," describes the cultural resources investigations conducted for this DEIS. As discussed in that chapter, no architectural resources were identified on any of the Project Sites or in the immediate vicinity, and therefore none would be affected during construction of the Proposed Project. In addition, the Intake Site, Water Treatment Plant Site, much of the raw water transmission line route, the potential access roads to the water treatment plant, and the potential potable water main routes have been determined not to be sensitive for archaeological resources.[1] Therefore, construction of the Proposed Project would not result in adverse impacts to archaeological resources at these Project Site locations.

However, the Phase 1A archaeological study conducted for the Project Sites (described in Chapter 7) identified the western portion of the raw water transmission line route as potentially containing pre-contact (i.e., Native American) archaeological resources. If such resources are present, they could be adversely affected by subsurface construction-related activities in these areas.

To determine the presence or absence of archaeological resources in that area, further investigation in the form of Phase 1B archaeological subsurface testing will be undertaken at the western portion of the raw water transmission line route prior to any construction disturbance. The results of the field testing will be submitted to the New York State Office of Parks, Recreation and Historic Preservation (OPRHP) for review. Should archaeological resources be encountered, United Water, in consultation with NYSDEC and OPRHP, would take appropriate measures to identify the significance of such resources. If significant, mitigation measures, such as data recovery, would be undertaken in consultation with OPRHP.

GEOLOGY, SOILS, AND GROUNDWATER

SOILS, GEOLOGY, AND SEISMOLOGY

Construction of the water treatment plant would require some re-grading of the Water Treatment Plant Site. Cutting or filling operations would utilize on-site material to the extent possible. If the re-grading results in excess material that can not be managed on site, the material would be characterized, loaded into trucks, and transported for off-site disposal at an appropriately licensed facility. Any placement of fill within any of the Project Sites to raise the ground elevation would use uncontaminated soil that satisfies 6 NYCRR Part 360-1.15 Beneficial Use, or material from NYSDEC-regulated or registered construction and demolition debris recycling facilities, provided the material complies with the Part 360 regulations. Erosion and sediment controls in accordance with NYSDEC requirements would minimize potential soil losses.

No blasting would occur during construction, and therefore no significant adverse impacts would occur to geologic resources or affect the current low earthquake potential of the Project Sites.

[1] As noted in Chapter 7, the Phase 1A assessment for the potable water main routes is currently under way as of September 2008. This chapter assumes that because of the location of those routes in public streets, the potable water main routes are disturbed and do not have the potential to contain archaeological resources.

GROUNDWATER RESOURCES

As described earlier in the description of construction activities (see section B of this chapter), limited dewatering is anticipated at the Project Sites during construction. Construction of the Proposed Project would not have the potential to result in adverse impacts to the deeper bedrock aquifer beneath the Project Sites, which is isolated from the shallow, sandy aquifer in the vicinity of the Project Sites. Prior to dewatering, testing would be performed to ensure that the groundwater would meet applicable requirements for discharge to the storm sewer system or Hudson River. If necessary, pretreatment would be conducted prior to discharge, as required by NYSDEC SPDES permits.

NATURAL RESOURCES

A detailed discussion of the existing natural resources on and near the Project Sites and the Proposed Project's effects on those natural resources during construction and operation is provided in Chapter 9 of this DEIS, "Natural Resources." The effects of construction activities for the Proposed Project on natural resources—including wetlands; aquatic resources; terrestrial resources; threatened, endangered, and rare species; and special habitats—are summarized below.

WETLANDS

The construction activities associated with installation of water intake tunnel beneath the Hudson River bed would be conducted using trenchless technology that would minimize the potential for disturbance of tidal wetlands during construction of the intake.

Construction activities along Beach Road for the raw water transmission line would minimize adverse impacts to the adjoining wetlands and watercourses. As currently envisioned, the pipeline would be constructed beneath Minisceongo Creek using a microtunneling technique, or traverse the creek adjacent to the existing bridge. Burying the pipeline would not result in significant adverse impacts to the existing wetlands in the vicinity Beach Road. Placing the pipeline adjacent to the bridge may result in loss of wetlands due to the placement of riprap at the edge of the creek in association with supports for the pipeline. However, the area of wetlands affected by the placement of riprap would be minimal and would not result in a significant adverse impact to wetland resources.

As discussed in Chapter 9, construction activities would require the elimination of wetland features on the Water Treatment Plant Site.

The Proposed Project would be covered under the NYSDEC SPDES General Permit for Stormwater Discharges from Construction Activity Permit No. GP-0-08-001. To obtain coverage under this permit, a Stormwater Pollution Prevention Plan (SWPPP) would be prepared and a Notice of Intent (NOI) would be submitted to NYSDEC. Implementation of erosion and sediment control measures, and stormwater management measures identified in the SWPPP would minimize potential impacts to tidal wetlands along the edges of the Intake Site and raw water transmission line route associated with discharge of stormwater runoff during land-disturbing activities resulting from construction of the Proposed Project. The SWPPP would include procedures for soil stockpiling and runoff control. Excavated soil would be stockpiled for future reuse or off-site disposal. Stormwater management measures, such as hay bales or silt fencing, would be placed around stockpiles and properly maintained to ensure that stormwater runoff complies with the applicable requirements.

AQUATIC RESOURCES

Water Quality

Implementation of erosion and sediment control measures (e.g., silt fences and straw bale dikes), and stormwater management measures as part of the SWPPP during construction and operation of the upland Proposed Project elements would minimize potential for significant adverse impacts to water quality of the Hudson River and Minisceongo Creek associated with stormwater runoff during land-disturbing activities.

The primary in-water construction activity for the Proposed Project with the potential to result in sediment disturbance is the driving of sheet-pile cofferdam to be installed at the intake location in the Hudson River. The installation and removal of the sheetpile, and the discharge of small amounts of river water recovered during dewatering, has the potential to result in disturbance of sediment, and consequently result in minor, short-term increases in suspended sediment, and resuspension and re-deposition of contaminants. These temporary effects would be localized and confined to the immediate vicinity of construction activity at the cofferdam. Any sediment resuspended during driving and removal of the sheet pile, or resulting from the discharge of river water recovered during dewatering, would move away from the area of in-water construction and would be expected to dissipate shortly after the completion of pile-driving activity. Furthermore, the installation of the sheet pile, by encircling and containing the area for the installation of the water intake, would minimize the potential for adverse impacts to water quality associated with the construction of the intake structure and pipeline. Therefore, in-water construction activities would not result in significant adverse impacts to water quality. Similarly, any contaminants released to the water column as a result of sediment disturbance would be expected to dissipate rapidly and would not result in significant long-term impacts to water quality.

Aquatic Biota

Implementation of the SWPPP would minimize potential adverse impacts to aquatic biota from the discharge of stormwater during construction of the upland elements of the Proposed Project.

The period when in-water construction would occur would be based on seasonal limitations developed in coordination with NYSDEC and NYSDOS to avoid adverse impacts to fish spawning and early development. The primary in-water construction activity for the Proposed Project with the potential to result in sediment disturbance is the driving of sheet-pile cofferdam to be installed at the intake location in the Hudson River. As noted earlier, all in-water construction work would be done using a barge-based crew using barge-mounted cranes. The work would be performed from a floating work platform created by connecting four barges together at the work zone. The barges would be in place for approximately 10 weeks. To create the cofferdam, sheet piling would be driven through the overburden to rock using a pile hammer or vibratory hammer.

Increases in suspended sediment would be localized and temporary and would not result in significant adverse impacts to aquatic biota of the Hudson River. While Hudson River sediments have been found to contain contaminants at concentrations that may pose a risk to some benthic macroinvertebrates, the resuspended sediments are expected to dissipate quickly, and redeposition within or outside the study area is not expected to adversely affect benthic macroinvertebrates or bottom fish. Use of the cofferdam, by encircling and containing the site for the installation of the water intake, would minimize the potential for adverse impacts to water quality associated with the construction of the intake structure and pipeline.

Life stages of estuarine-dependent and anadromous fish species, bivalves and other macroinvertebrates generally are tolerant of elevated suspended sediment concentrations and have evolved behavioral and physiological mechanisms for dealing with variable concentrations of suspended sediment Fish are mobile and generally avoid unsuitable conditions such as increases in suspended sediment and noise. While the localized increase in suspended sediment may cause fish to temporarily avoid the area where driving of the sheet pile is occurring, the affected area would be small. Similar nearby suitable habitats would be available for use by fish to avoid the area being disturbed. Fish also have the ability to expel materials that may clog their gills when they return to cleaner, less sediment laden waters. Most shellfish are adapted to naturally turbid estuarine conditions and can tolerate short-term exposures by closing valves or reducing pumping activity. Mobile benthic invertebrates that occur in estuaries have been found to be tolerant of elevated suspended sediment concentrations.

The installation of the sheet pile for the cofferdam has the potential to result in localized direct impacts to aquatic resources in Haverstraw Bay due to temporary noise and vibration effects during directional drilling, dredging, construction and pile-driving activities, and temporary loss of water column and benthic habitat from the installation of the cofferdam. During the construction of the intake and intake pumping station, the in-water construction period would be only five months, and the length of time during which sheet pile driving would occur for the cofferdam would expected to last no more than two weeks. The length of time for driving each new section of pile should be several hours. Because the length of time for driving each pile section is expected to be short, and the sound generated during pile driving intermittent, individual fish would not be exposed to potentially dangerous sound pressure levels long enough to result in mortality. Therefore, the pile driving that would occur as a result of the Proposed Project would not result in significant adverse impacts to aquatic biota.

The installation of the cofferdam would result in the temporary loss of approximately 700 square feet (0.016 acre) of Hudson River bottom habitat and water column habitat within the dammed area. Benthic organisms unable to move from the vicinity of the cofferdam during driving of the sheet pile would be lost during dredging and dewatering activities. The loss of benthic organisms within this small area of river bottom would not have the potential to result in significant adverse impacts to benthic invertebrate populations within the Hudson River, nor would the loss of these individuals result in significant adverse impacts to fish due to the loss of prey species. The benthic macroinvertebrate community is expected to recover quickly upon completion of the intake structure, replacement of a portion of the dredged sediment, and removal of the cofferdam. Benthic abundance and diversity of benthic communities typically returns to reference or pre-dredging levels within a single year following cessation of dredging/construction activity, with species diversity and faunal similarity achieving pre-construction conditions rapidly.

The linked construction barges would result in adverse impacts to fish habitat due to shading but would be temporary (i.e., 10 weeks) and affect a small area, less than 0.04 acres. The temporary shading of this small area of aquatic habitat would not result in significant adverse impacts to aquatic biota.

TERRESTRIAL ECOLOGY

Vegetation

Construction activities for the Proposed Project would result in the clearing of most or all of the limited vegetation on the one-acre Intake Site. As a result of construction of the Intake Site, three

large individual trees that have been observed being used by overwintering bald eagles, as perches during foraging activity would be removed. Additional coordination with NYSDEC would be conducted with respect to overwintering bald eagles and use of the Intake Site for perching habitat prior to the anticipated start of construction on the Intake Site.

The area of disturbance for the Proposed Project would result in the loss of three acres of disturbed vegetated habitat at the Water Treatment Plant Site, which would not result in significant adverse impacts to regional vegetation resources.

The installation of the raw water transmission pipeline would adversely impact approximately 1.38 acres of oak-hickory forest near Ecology Lane due to clearing and installation of the pipeline. This minimal loss, while it is adverse, would not result in significant adverse impacts to this habitat type, which is distributed throughout the upstate New York region.

Wildlife

Site clearing, grading, and construction within the Project Sites would have the potential to disturb wildlife using habitats within these areas and may result in the direct loss of individual wildlife that are less mobile and/or secretive species (e.g., small mammals, turtles, snakes, salamanders, frogs, and toads), due to collision with construction equipment, or burial during site clearing and grading. In particular, reptiles and amphibians, and mammals such as muskrat, observed or with the potential to use the stormwater management retention pond and other areas of the site containing wetland hydrology would be adversely impacted by the Proposed Project's construction activities. The loss of wildlife individuals using the portion of the Water Treatment Plant Site containing wildlife habitat, while an adverse impact, would be low and would not be expected to result in significant adverse impacts to regional populations of these species. Other mammals and birds using the portion of the Water Treatment Plant Site with wetland hydrology (e.g., eastern cottontail, mice, white-tailed deer, redwing blackbird, and robin) would likely move to nearby suitable habitats in response to disturbance and habitat loss in the Site. However, wildlife individuals unable to find suitable habitat nearby would be adversely affected by construction activities. The loss of these few individuals, while an adverse impact, would not result in significant adverse impacts to regional populations of these common species.

The Intake Site provides limited habitat for birds and other wildlife species common to habitats affected by human development and activity (i.e., rock pigeon, mourning dove, American robin, European starling, house finch, and house sparrow). Construction activities on the Intake Site would have the potential to disturb wildlife individuals using this area, adversely affecting those individuals unable to find suitable available habitat in the vicinity of the Intake Site. The potential loss of a small number of wildlife, while an adverse impact, would not result in significant adverse impacts to regional populations of these common species. Construction activities on this Site would not be expected to result in significant adverse impacts to concentrations of wintering waterfowl known to use the marsh and protected areas of the Hudson River (pier areas, coves, marinas, and near-shore areas) near the Intake Site, due to the limited area and duration of disturbance associated with the construction of the intake, and the existing level of human activity already occurring within the vicinity of the Intake Site.

Depending on the schedule, construction may disturb some overwintering bird species using early successional habitats, or spring or fall bird migrants in the vicinity of the Water Treatment Plant Site. In addition, a portion of the raw water transmission line would be constructed through forested habitat and, as a result, may negatively affect some forest edge species.

THREATENED, ENDANGERED, AND RARE SPECIES

As discussed above, water quality impacts associated with in-water construction activities for the Proposed Project would be localized. Therefore, the deep channel habitat preferred by shortnose and Atlantic sturgeon would not be adversely impacted during installation or removal of the sheet pile for the cofferdam, or other in-water construction activities associated with the intake.

Endangered species observed or expected near the Project Sites include the peregrine falcon and short-eared owl. Threatened species observed or expected near the Project Sites include the bald eagle and northern harrier, Special concern species observed or expected in the vicinity include Cooper's hawk, sharp-shinned hawk, osprey, horned lark, and checkered white. No significant adverse impacts to any of these species would be expected during construction of the Proposed Project. The area of disturbance at the Project Sites would be small, and generally would not result in a significant loss of prey species or overwintering habitat.

At the Intake Site, removal of several trees from the shoreline would result in the loss of over-winter habitat for bald eagles. While the loss of these roosting trees would adversely affect overwintering bald eagles, it would not be expected to result in a reduction in foraging activity within the vicinity of the Intake Site and would not result in a significant adverse impact due to the presence of other known day roosting and perching habitats in the vicinity of the Intake Site. To minimize potential adverse impacts to overwintering bald eagles, to the extent possible outside construction activities would be kept to a minimum in areas being used by bald eagles during the overwintering period. Coordination with NYSDEC would be conducted with respect to overwintering bald eagles and use of the Intake Site for perching habitat prior to the anticipated start of intake pumping station and intake structure construction.

SIGNIFICANT COASTAL FISH AND WILDLIFE HABITAT

Construction of the Proposed Project would not result in significant adverse impacts to water quality or to the species identified as important for the Significant Coastal Fish and Wildlife Habitat of Haverstraw Bay due to in-water construction activities. The intake construction has been designed to minimize effects on the significant habitat. Measures to protect aquatic life and aquatic habitat during construction of the intake in the Hudson River would include the use of a sealed sheet-pile cell that would contain the dredging and all construction work in the river. The period when in-water construction would occur would be based on seasonal limitations developed in coordination with NYSDEC and NYSDOS to avoid adverse impacts to fish spawning and early development. There would be no significant loss of habitat quantity and only a temporary reduction of functional value during and immediately after construction. Restoration of the disturbed area through natural processes would result in a complete restoration of the functional values of the designated habitat. The construction activities would not alter the physical, biological, and chemical processes of Haverstraw Bay; thus the habitat would recover as it has from the previous dredging operations that were not designed and conducted with the care applied to the proposed intake. While the construction of the intake has the potential to disturb waterfowl, the in-water construction period would be short and would not affect a large area of the Bay. Therefore, construction of the intake would not be expected to result in significant adverse impacts to waterfowl that use the area for feeding and resting during spring and fall migrations.

HAZARDOUS MATERIALS

Chapter 10, "Hazardous Materials," summarizes the results of Phase I and Phase II hazardous materials investigations conducted for the Project Sites. Those investigations concluded that it is

possible that contaminated material, especially petroleum-contaminated soil or groundwater, may be encountered during construction of the Proposed Project. If contaminated soil is encountered, it would be excavated, stockpiled, characterized, and transported for disposal at an appropriately licensed facility, as would any other excavated material not planned to be reused on-site. Other materials, including solid wastes excavated (e.g., adjacent to the Haverstraw Landfill) and excavation spoils from the Intake Site could potentially be reused on-site, but only with NYSDEC approval. If additional fill is required for filling activities on the Water Treatment Plant Site, clean fill would be imported.

Minor impacts to aquatic sediments could occur during intake system construction, as discussed above in "Natural Resources." Due to the short-term nature of this disturbance, no significant impact on Hudson River sediment and water quality would be expected.

The SWPPP to be implemented for the Proposed Project would prevent contaminated sediment runoff into nearby water bodies.

Detailed procedures would be incorporated into the Proposed Project's construction documents to govern excavation and other activities that would entail subsurface disturbance, to protect the safety of the public, community residents, and construction workers, as well as the larger environment. A Construction Health and Safety Plan (CHASP) would be prepared to address potential contamination issues identified in the Phase I and Phase II studies and contingency items (e.g., finding unexpected petroleum-contaminated soil) for all Project Sites. The CHASP would describe in detail the health and safety procedures needed to minimize exposure of hazardous materials to workers and the public. The CHASP would include specifications related to the following (for more information, see Chapter 10):

- Health and safety training requirements for workers.
- Procedures for identification and management of known or unexpected contaminated materials that might be encountered during construction.
- Specifications for dust control and air monitoring. During all subsurface disturbance work, dust control measures would be implemented and air quality during subsurface disturbance would be monitored for dust (measured as respirable particulate matter of diameter less than 10 microns—PM_{10}); hydrogen sulfide gas, which is a compound associated with landfills and the gypsum facility; volatile organic compounds (VOCs), which are associated with petroleum or the chlorinated VOCs detected in groundwater; and methane, associated with landfill wastes or natural materials, such as peat. Action levels would be identified, and the appropriate response actions established, which could include increased monitoring and/or corrective actions.
- Requirements for gas monitoring wells. During the construction phase of the Proposed Project, United Water will monitor the existing gas monitoring wells at the Water Treatment Plant Site to monitor for the presence of airborne VOCs and methane gas. Measures would be taken to avoid construction activities in areas if detected airborne methane gas levels exceed the Lower Explosive Limit of 5 percent.
- Specifications for waste management. The CHASP would address procedures for stockpiling, testing, loading, transporting (including truck routes), and properly disposing of all excavated material which would not be reused on-site. All excavated material would be handled and, if required, disposed of properly to comply with federal, state, and local environmental laws.

- Specifications for dewatering. Prior to dewatering, testing would be performed to ensure that the groundwater would meet applicable requirements, whether it was discharged to a municipal stormwater or sewer system, or discharged to the Hudson River. If necessary, pretreatment would be conducted prior to discharge, as required by NYSDEC SPDES permits.

INFRASTRUCTURE

Chapter 11, "Infrastructure," describes the location of water mains, sanitary sewers, storm sewers, electric mains, and natural gas lines serving the Project Sites. During construction of the new intake pumping station on the Intake Site and the new water treatment plant on the Water Treatment Plant Site, temporary disruption to water supply for the nearby areas would be required when service connections are made for the new buildings. This would be a short-term disruption, similar to what occurs for any new building construction. Similar disruptions could also occur to electric service and natural gas. During connections to the sanitary sewer system, no disruptions would be required.

As described earlier in this chapter and in Chapter 2, "Project Description," the Proposed Project would involve upgrades at the JRSTP. These upgrades would be to the effluent system at the plant, and could be made without disturbing the ongoing operations of the JRSTP. Additionally, other construction activities associated with the Proposed Project, including work at the Water Treatment Plant Site and installation of the raw water transmission pipe near the JRSTP, would not require disruptions to the ongoing operation of the JRSTP.

The SWPPP to be prepared and implemented for construction of the Proposed Project would include erosion and sediment control measures, and stormwater management measures. This is discussed earlier in this chapter under "Natural Resources."

TRAFFIC AND TRANSPORTATION

During construction of the Proposed Project, construction-related traffic would be added to the local roadways. As described above in section B of this chapter, construction would occur at the Intake Site and Water Treatment Plant at the same time. During this period, the new raw water transmission lines would also be installed beneath Beach Road.

CONSTRUCTION-RELATED TRAFFIC VOLUMES

Table 15-3 summarizes the assumptions about construction-related traffic during simultaneous construction on the Intake Site and Water Treatment Plant Site that were used for the traffic analysis. Additional details are provided in Appendix 12.1. The traffic volumes shown in the table were developed for the purposes of performing a conservative (i.e., worst-case) analysis of construction-related traffic impacts. These worst-case numbers of construction trucks and worker vehicle trips for the Intake Site and Water Treatment Plant Site are therefore conservatively high and do not reflect the level of construction activity on a typical day-to-day basis, which would be less. The number of vehicles associated with construction work on the raw water transmission line would be smaller, and would be within the total estimated for the other two Project Sites.

Table 15-3
Daily and Peak Hour
Project-Generated Construction Traffic

Item	Intake Site	Water Treatment Plant Site	Combined Construction Traffic
Daily Trips			
Delivery Trucks	3 – 5	3 – 5	6 – 10
Concrete Trucks	40 maximum (8 – 10 average)	40 maximum (8 – 10 average)	80 maximum (16 – 20 average)
Dump Trucks	50 loads	50 loads	100 loads
Total Trucks	93 – 95	93 – 95	186 – 190
Total Truck Trips (Round-Trip)	186 – 190	186 – 190	372 – 380
Construction Worker Trips	75	150	225
Peak-Hour Trips			
Truck Trips (Round-Trip)*	38	38	76
Construction Worker Trips**	75	150	225
Total Peak-Hour Trips*	**113 trips**	**188 trips**	**301**

Notes: * The analysis assumes that 20 percent of the total truck trips occur during the peak hour.
** The analysis assumes that all construction worker trips occur during the peak hour.

While construction-related truck deliveries may be scheduled to avoid peak traffic conditions, this analysis assumes that 20 percent of the deliveries would arrive during the peak hour. Typically, construction workers are on-site before the regular commuter peak hour and frequently work a 7:00 AM to 4:00 PM shift; however, the analysis conservatively assumes that all workers would arrive between 7:00 AM and 8:00 AM, just prior to the observed local roadway peak hour of 8:00 AM to 9:00 AM, and depart during the afternoon peak hour (4:30 PM to 5:30 PM). No major construction activity is anticipated during the weekend periods.

ASSIGNMENT OF SITE-GENERATED TRAFFIC

Construction traffic would arrive at and depart from the Intake Site via Beach Road. Construction traffic would access the Water Treatment Plant Site via an access drive that connects to Railroad Avenue. This access drive may be located alongside the CSX railroad tracks, at the CSX railroad access drive. Alternatively, it may also be at the northern end of North Wayne or Carol Street.

The routes traveled by construction-related traffic on the local roadways near the Project Sites were estimated based on an evaluation of current traffic patterns in the immediate vicinity of the Project Sites. Based on this evaluation, it is estimated that approximately 65 percent of the total construction-related truck traffic would arrive/depart to the south via US Route 9W, and 35 percent would arriving/departing to the north via US Route 9W. For construction workers, it was assumed that 55 percent would arrive/depart to the south via US Route 9W, 35 percent would arrive/depart to the north via US Route 9W, and 10 percent would use other local roadways.

It is anticipated that all commercial truck and heavy vehicle traffic would be directed to avoid local roadways and follow designated truck routes such as US Route 9W. The analysis also assumes that the Maintenance and Protection of Traffic plans to be implemented for the Project would direct all traffic for the Water Treatment Plant Site via Railroad Avenue from the west, to avoid using Beach Road. Similarly, the MPT plans would direct all traffic for the Intake Site via the route north of the Site, so that construction-related traffic would not use the portion of Beach

Road south of the Intake Site. This would avoid any potential conflicts resulting from the combination of the two Project Sites' traffic on Railroad Avenue, and related to traffic on Beach Road where installation of the raw water pipe would be occurring. It would also avoid possible conflicts with Haverstraw Marina.

No conflicts are anticipated between construction vehicles associated with the Proposed Project and the planned reconstruction of the Farley Bridge on Route 9W at Cedar Pond Brook in the Town of Stony Point, because that reconstruction is scheduled to be completed in summer 2011, before construction of the Haverstraw Water Supply Project would begin.

Figures 15-4 through 15-11 present a breakdown of construction-related site-generated traffic by peak hour and trip type (construction worker and truck trips). Figures 15-12 and 15-13 present total construction-generated traffic for the AM peak hour and PM peak hour, respectively.

2015 TRAFFIC VOLUMES WITH CONSTRUCTION TRAFFIC

Chapter 12 of this DEIS, "Traffic and Transportation," describes the locations near the Project Sites where traffic data were collected for existing conditions and presents the existing and future baseline traffic volumes at those locations. As discussed in Chapter 12, future baseline conditions were estimated by applying an annual growth factor to the existing traffic volumes to account for general background growth and traffic associated with planned and proposed future developments in the area. These estimates were made for the year 2015, the latest construction year for the Proposed Project. The peak year of construction activity would likely be 2014, when all elements of the Proposed Project could be under construction together, but the use of 2015 background traffic volumes results in a more conservative analysis, since those volumes are higher.

The projected site-generated traffic volumes were added to the 2015 No Build traffic volumes to create the 2015 Build traffic volumes, which are shown in Figures 15-14 and 15-15 for the AM peak hour (7 AM to 8 AM) and PM peak hour (4:30 PM to 5:30 PM), respectively. Project Site-generated traffic for the construction period during the AM and PM peak hours would be approximately 188 trips for the water treatment plant and 113 trips for the water intake pumping station.

CAPACITY ANALYSIS METHODOLOGY

Procedures have been established by the Transportation Research Board through which roadway segments and intersections can be tested to determine their ability to accommodate traffic volumes. These procedures are described in this section.

The capacity analyses for the study area intersections are based on the methodologies described in the *2000 Highway Capacity Manual (HCM)*, and use Synchro Software, Version 6 (Build 614) to determine the levels of service (LOS), a qualitative measure of an intersection's function based on the amount of vehicle delays. Table 15-4 summarizes the relationship between LOS and delay at intersections.

9.22.08

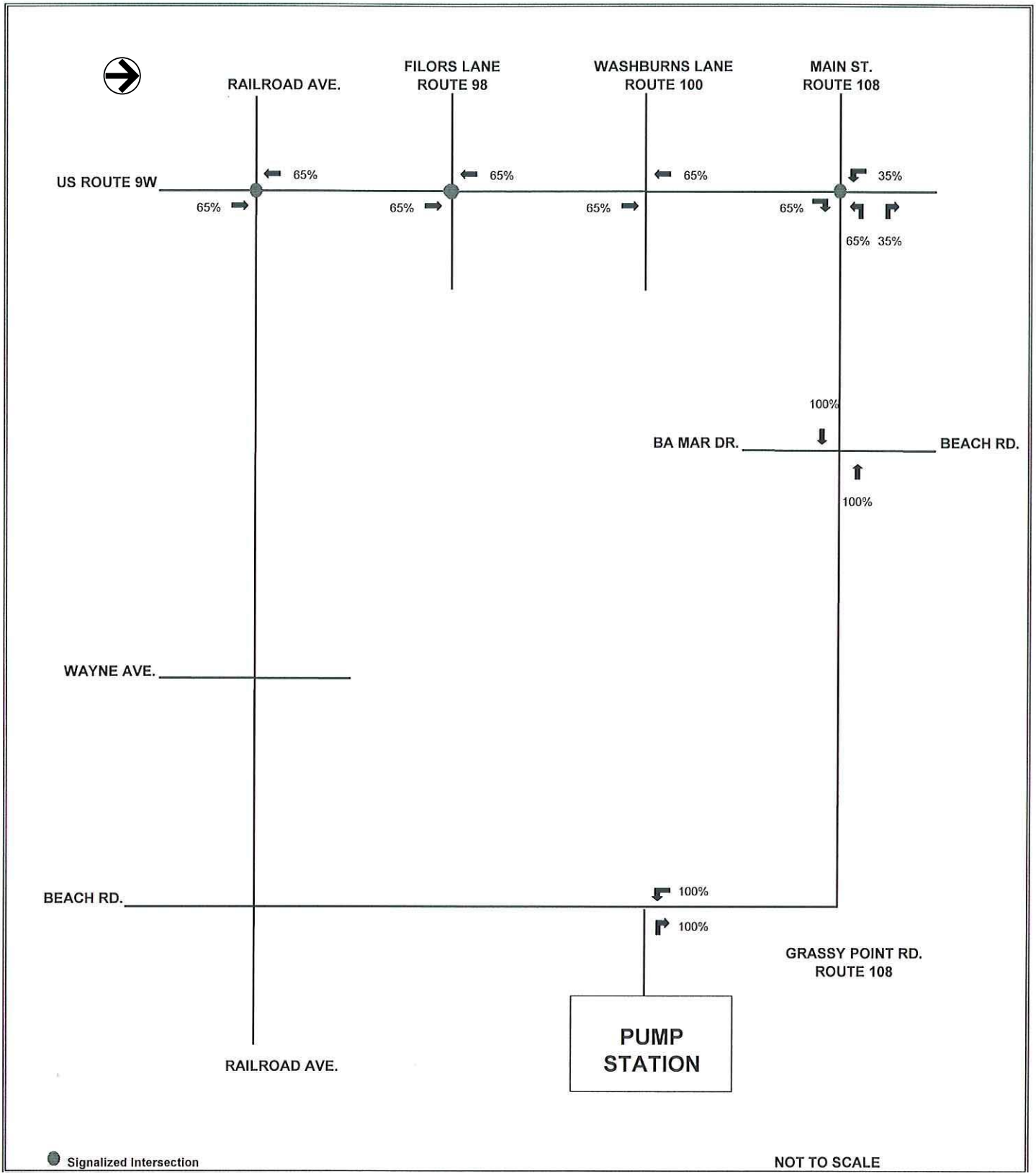


Figure 15-4

Construction Truck Trips
Pump Station Percent

9.22.08

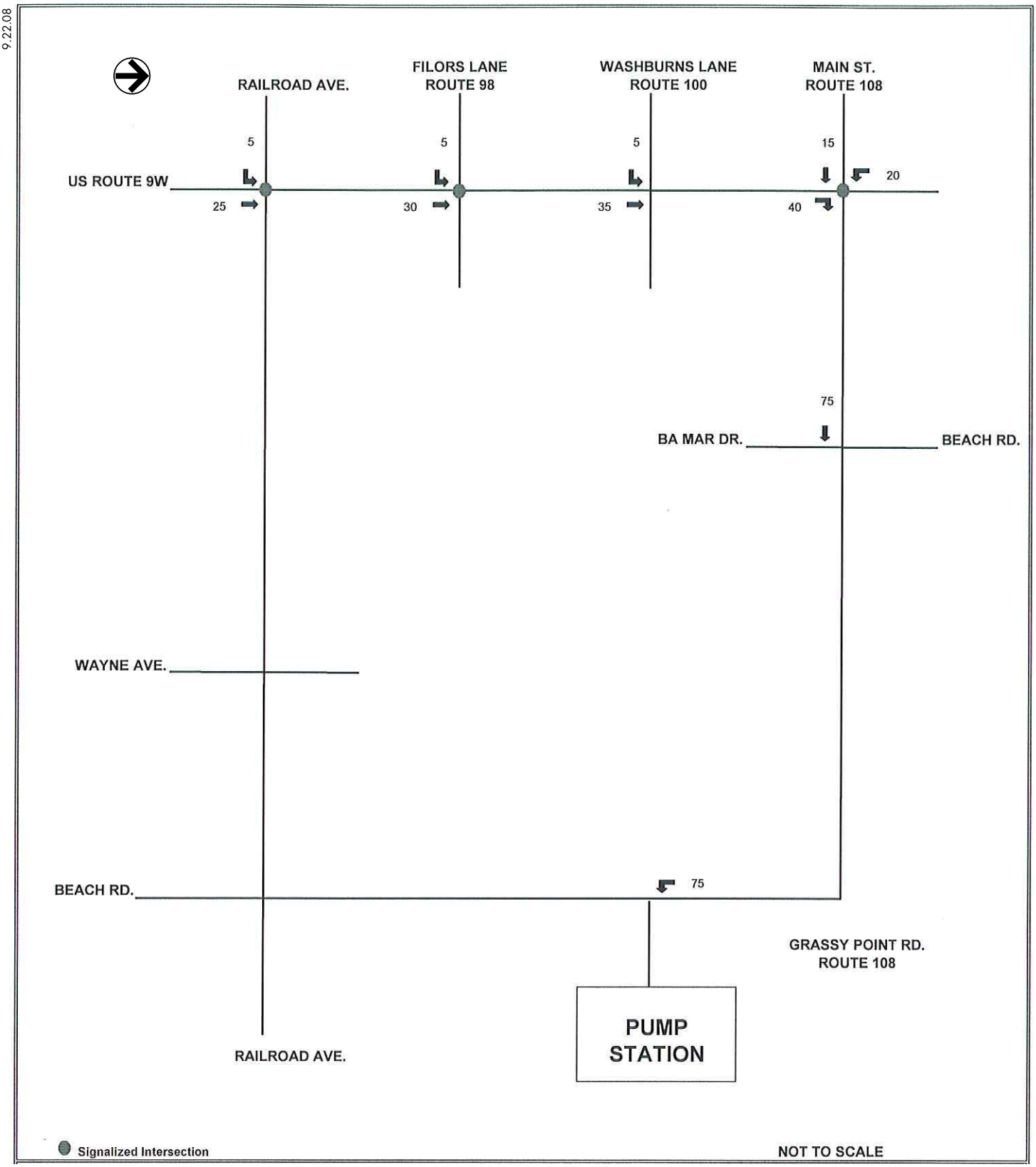


Figure 15-5

Construction Worker Trips Pump Station
AM Peak Hour (7:00-8:00 AM)

9.9.08

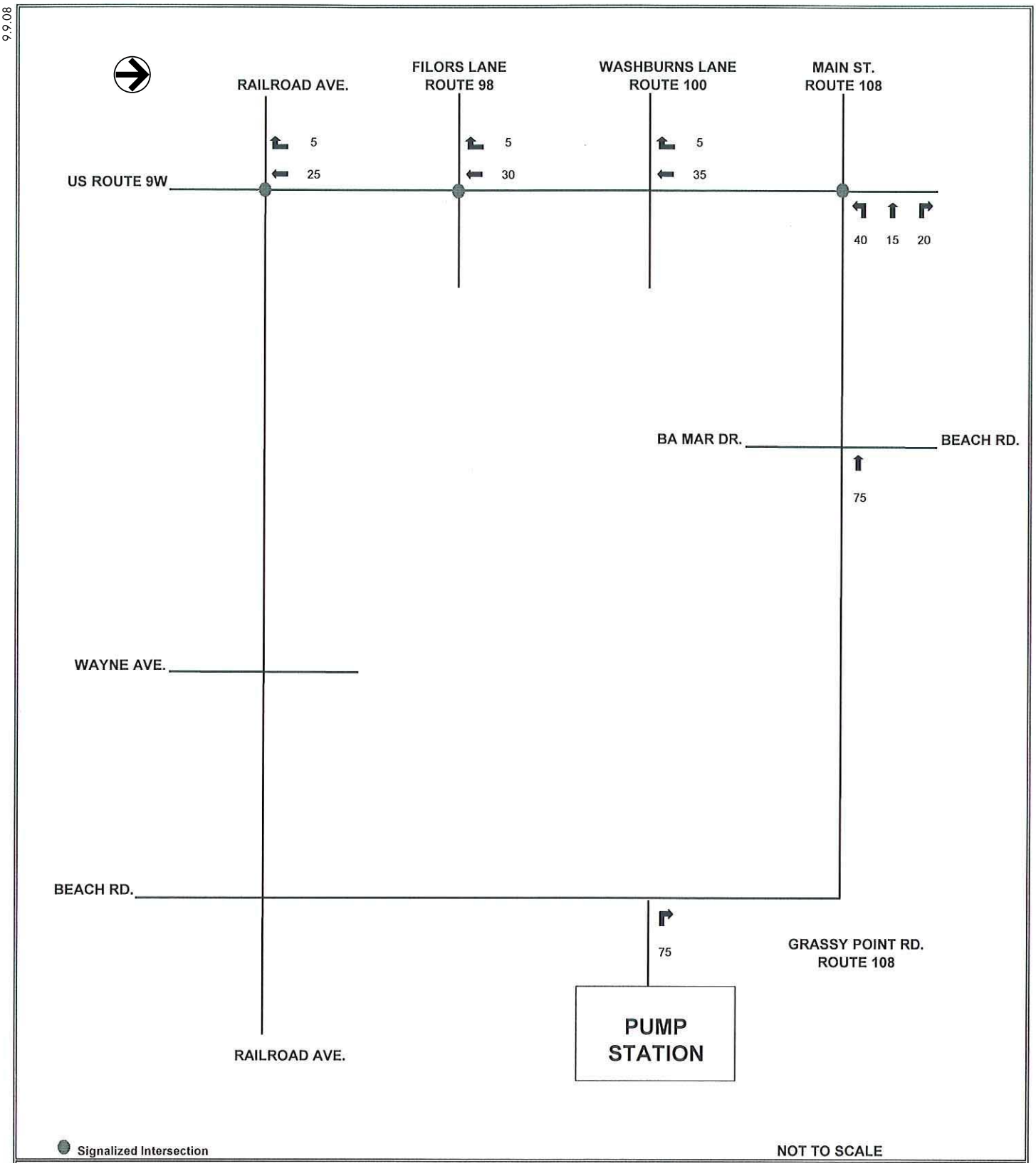


Figure 15-6

Construction Worker Trips Pump Station
PM Peak Hour (4:30 - 5:30 PM)

9.22.08

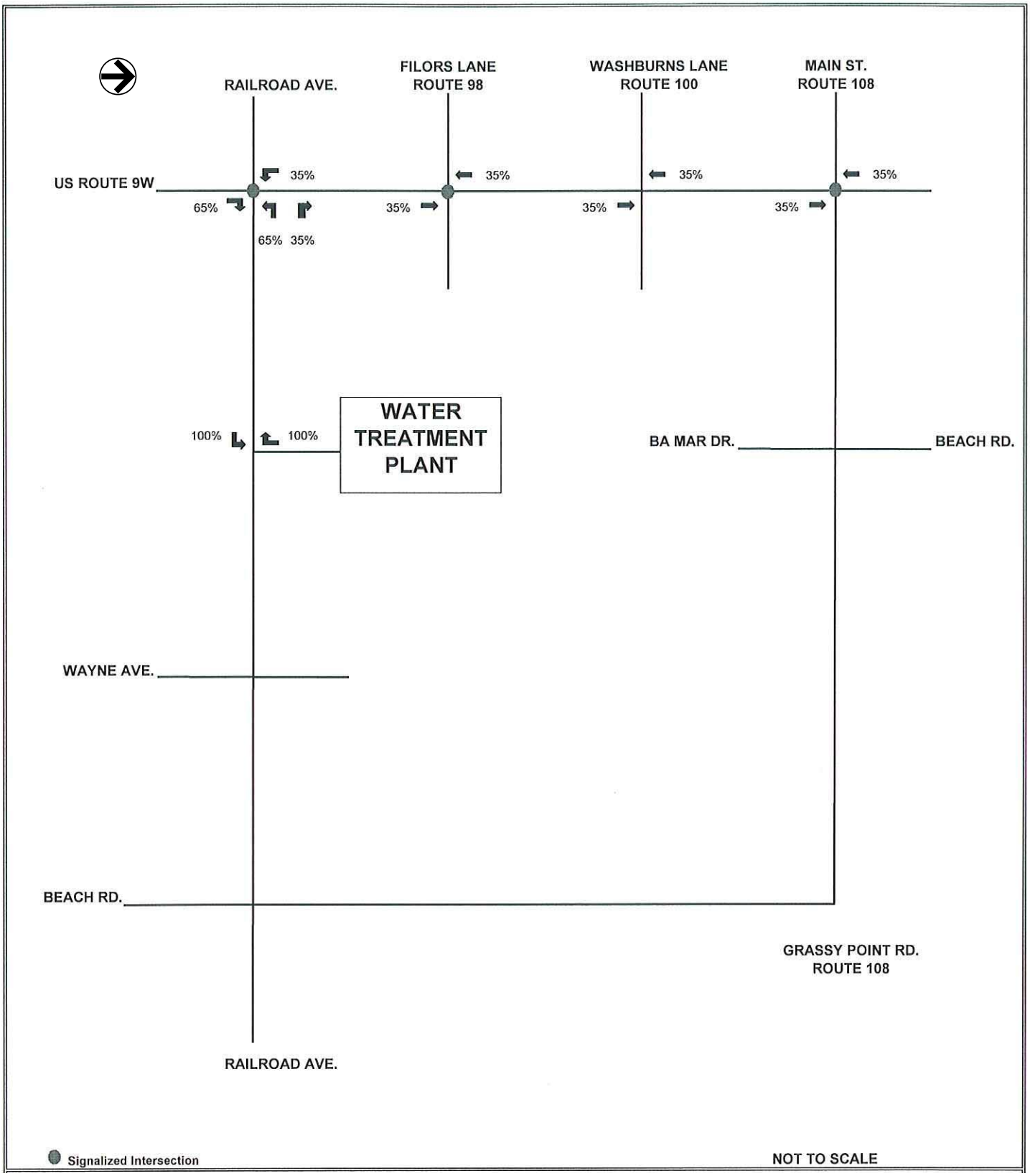


Figure 15-7

Construction Truck Trips Water Treatment Plan Percent Distribution

9.22.08

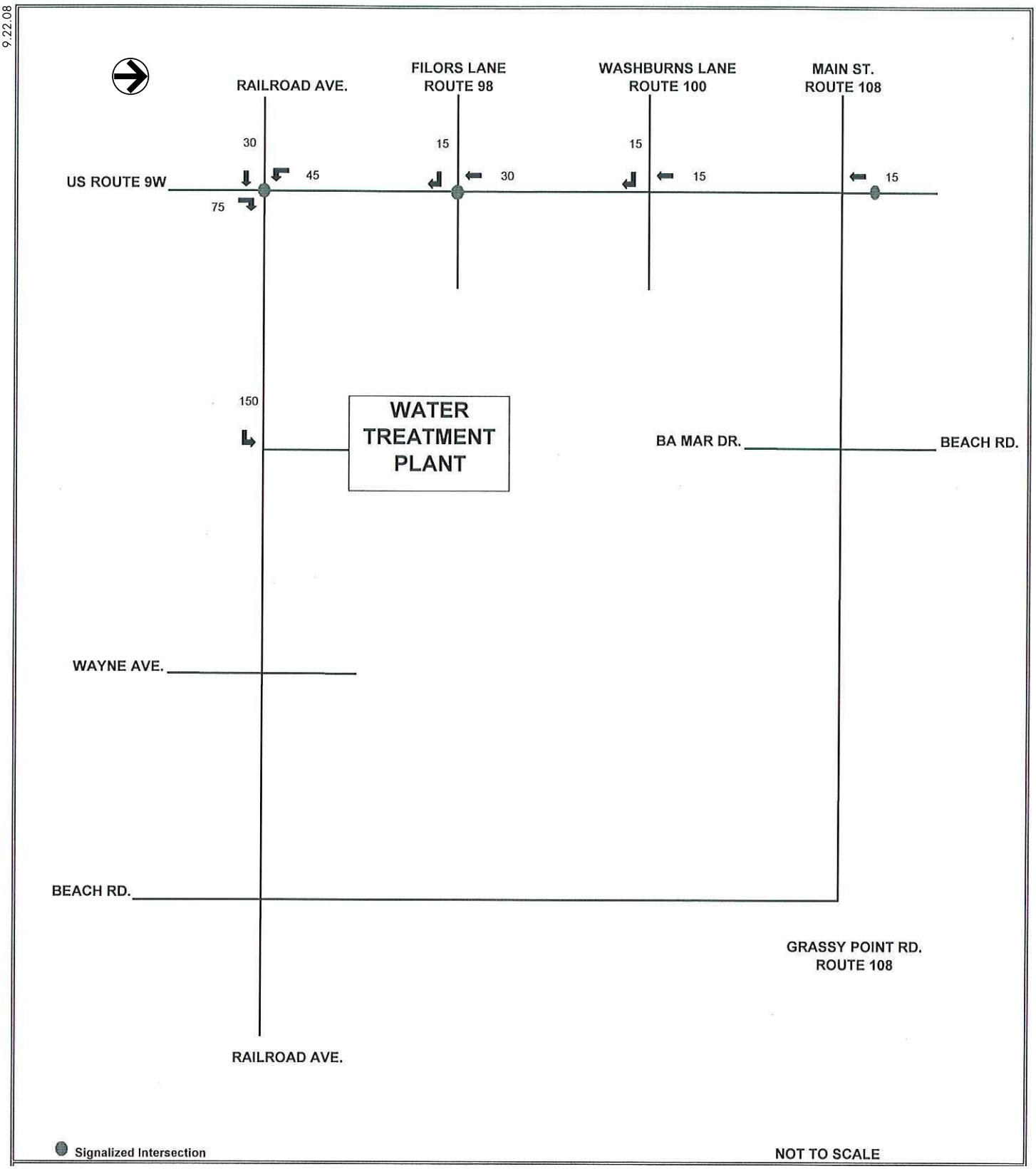


Figure 15-8

Construction Worker Trips Water Treatment Plant - AM Peak Hour (7:00-8:00AM)

9.22.08

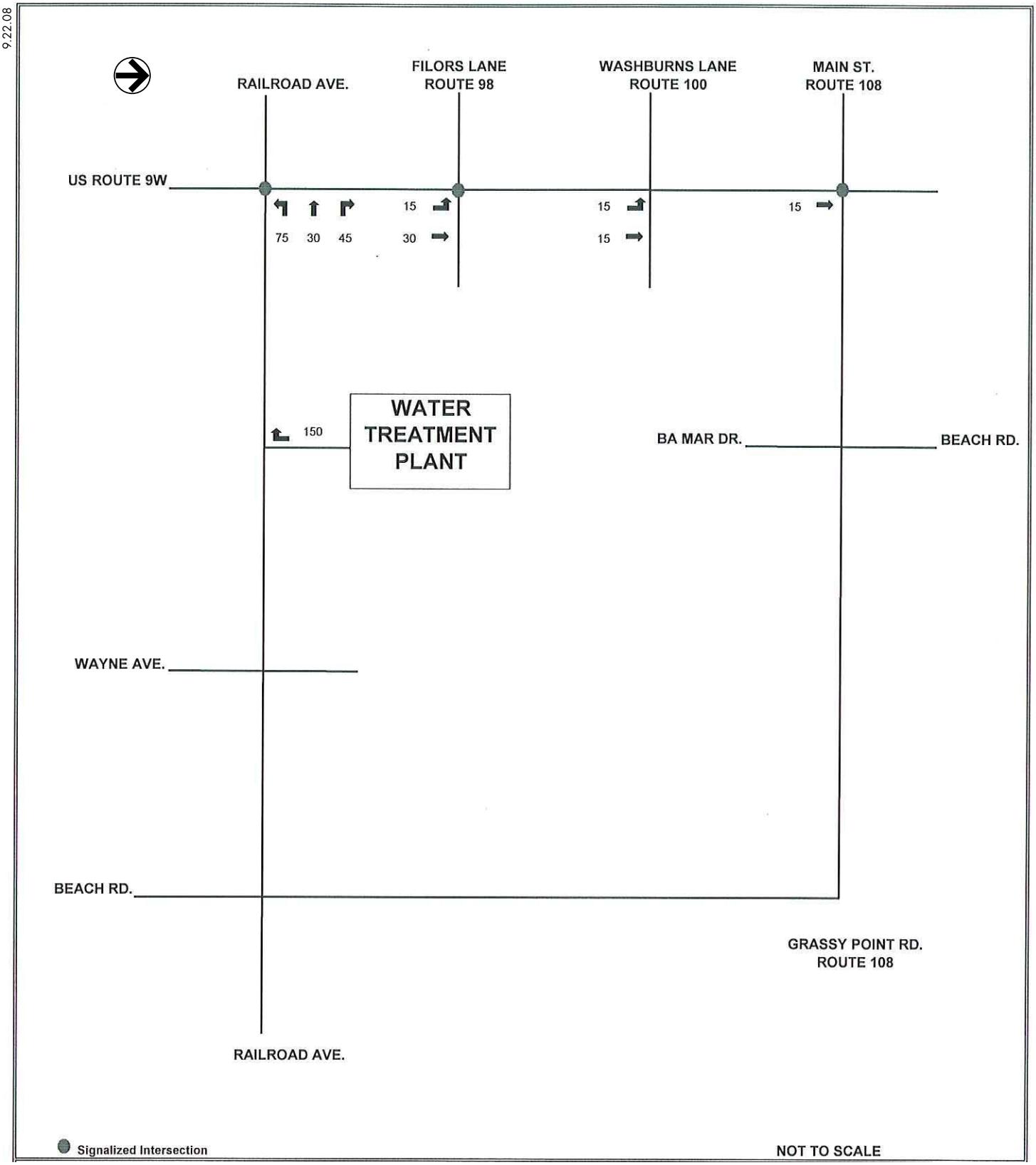


Figure 15-9

Construction Worker Trips Water Treatment Plant PM Peak Hour (4:30-5:30 PM)

9.22.08

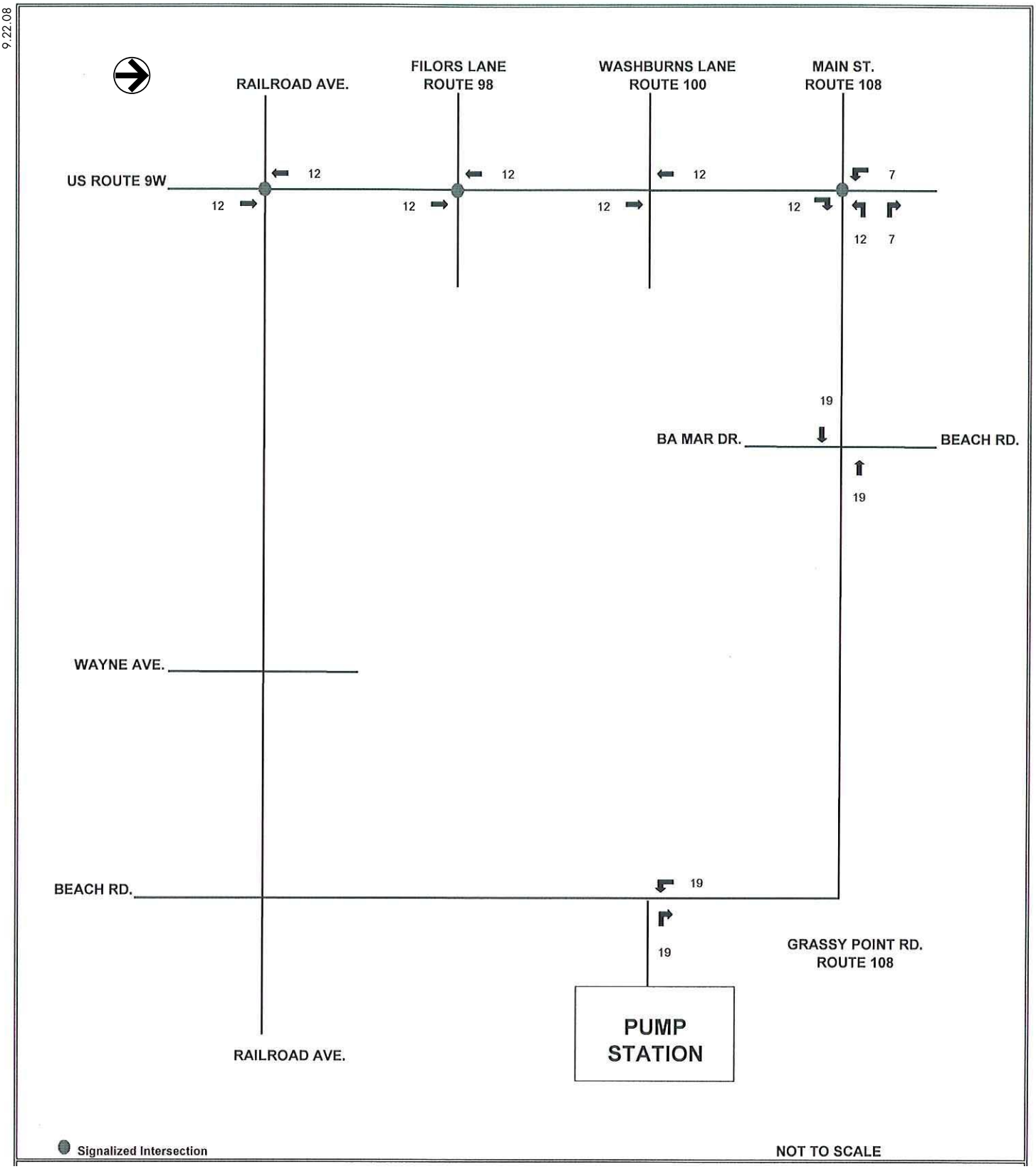


Figure 15-10

Construction Truck Trips
Pump Station AM & PM Peak Hours

9.22.08

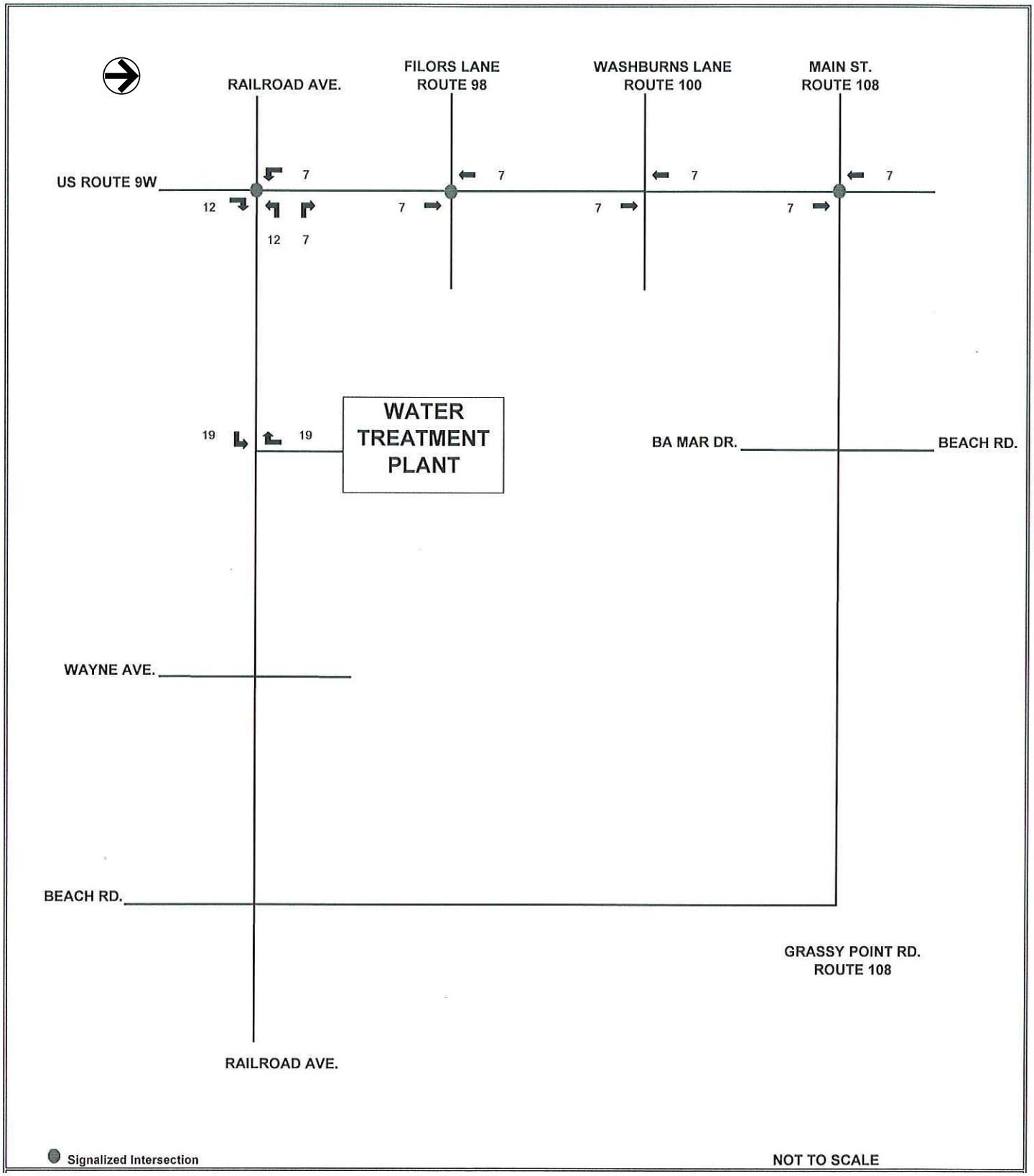


Figure 15-11

Construction Truck Trips Water Treatment Plant AM & PM Peak Hours

9.22.08

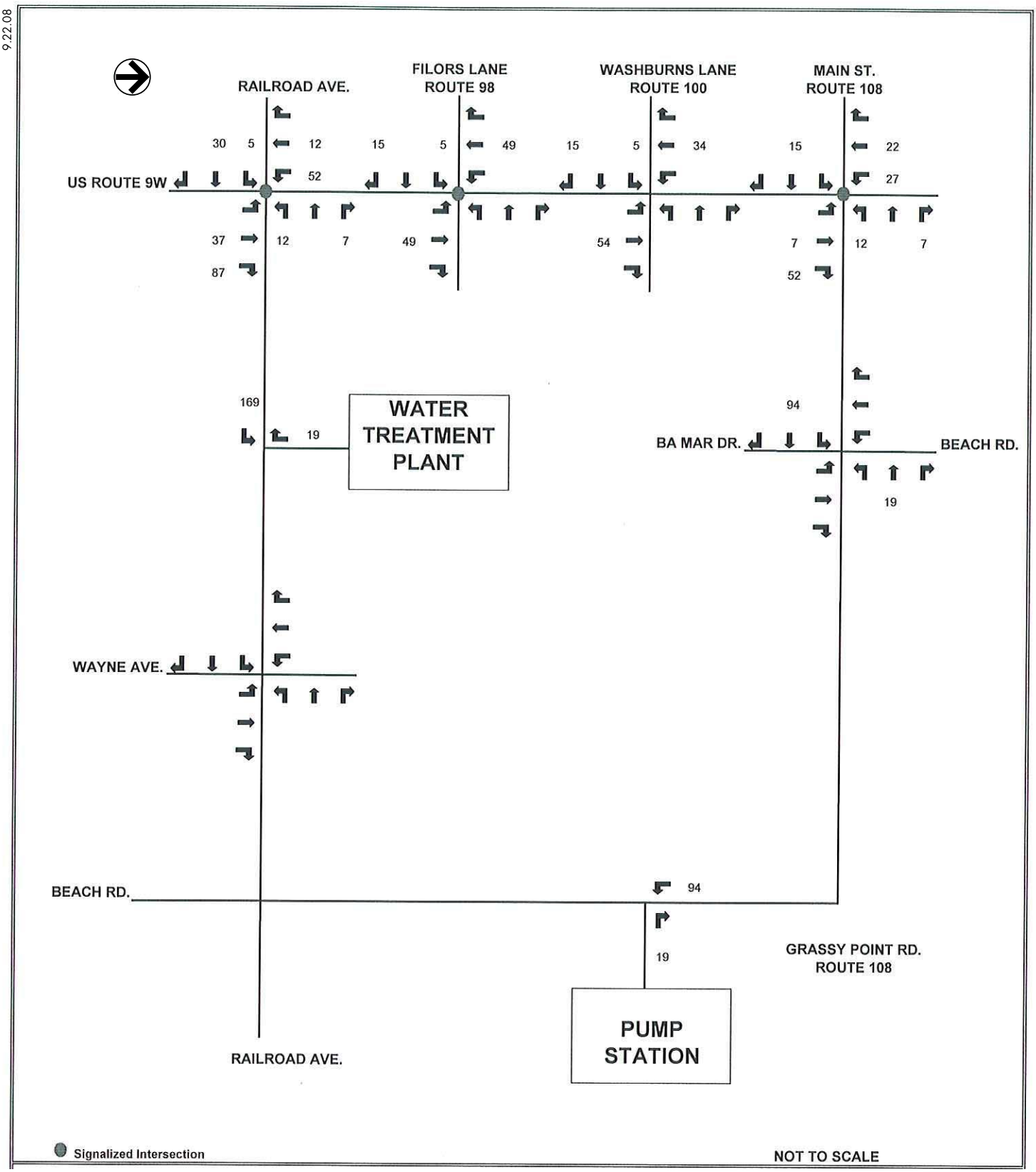


Figure 15-12

Construction Generated Traffic Network 2015 - AM Peak Hour

9.22.08

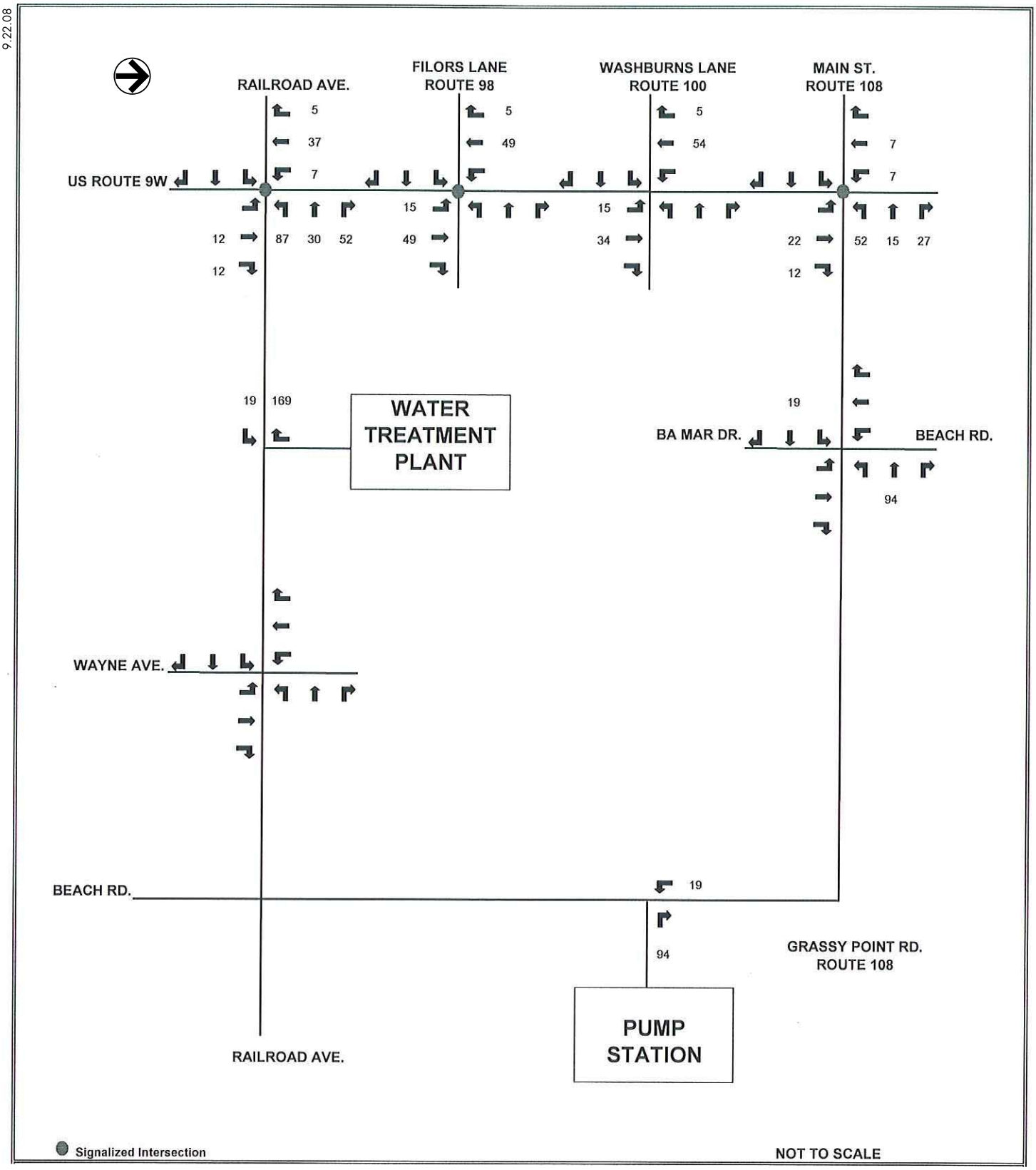


Figure 15-13

Construction Generated Traffic Network 2015 - PM Peak Hour

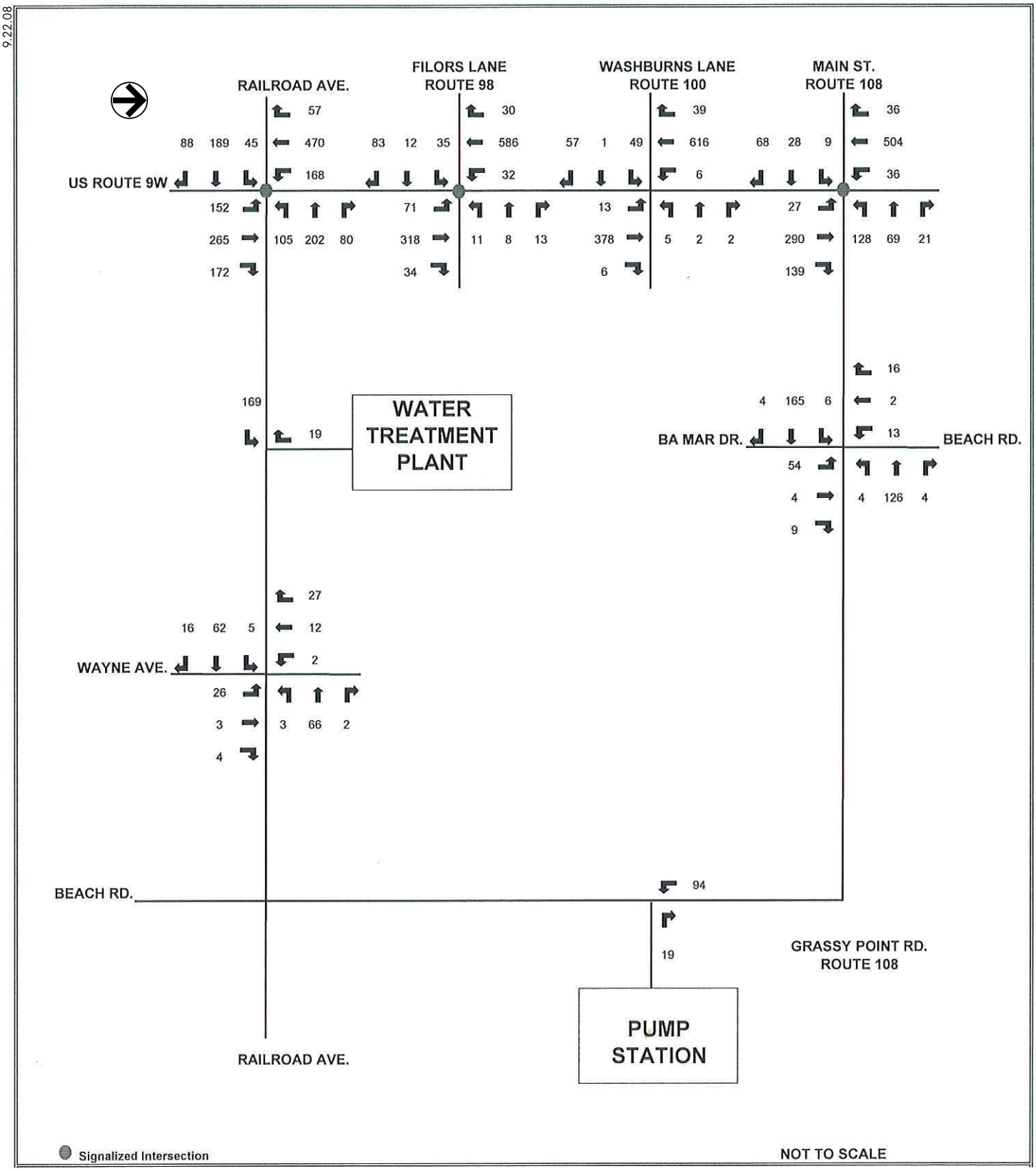


Figure 15-14

Build Condition Traffic Network 2015 - AM Peak Hour

9.22.08

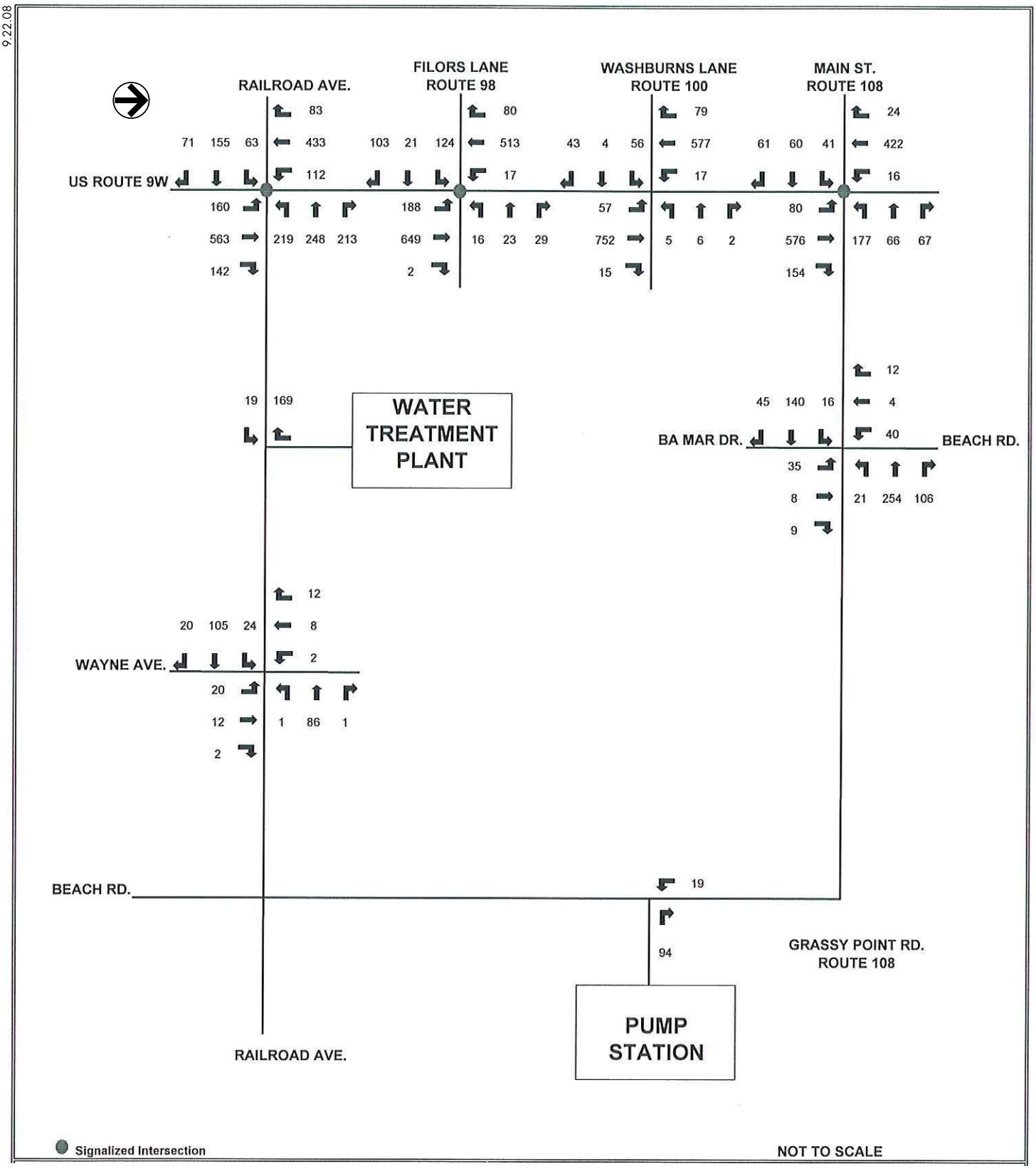


Figure 15-15

Build Condition Traffic Network 2015 - PM Peak Hour

Table 15-4
Level of Service (LOS) Criteria For Intersections

Level-of-Service (LOS)	Signalized Intersection Average Total Control Delay (seconds/vehicle)	Unsignalized Intersection Average Total Control Delay (seconds/vehicle)
A	≤10	≤10
B	> 10 and ≤ 20	> 10 and ≤ 15
C	> 20 and ≤ 35	> 15 and ≤ 25
D	> 35 and ≤ 55	> 25 and ≤ 35
E	> 55 and ≤ 80	> 35 and ≤ 50
F	> 80	> 50

Source: *Highway Capacity Manual*. Transportation Research Board. Washington, DC. 2000.

LOS A represents ideal conditions. LOS F represents conditions characterized by long delays and traffic operational breakdowns at the signalized intersection. LOS B, C, D, and E are the gradual increments between ideal conditions (LOS A) and traffic operational breakdown conditions (LOS F). A further description of LOS is as follows:

LOS A describes operations with low control delay, up to 10 seconds per vehicle. This LOS occurs when progression is extremely favorable and most vehicles arrive at the intersection during the green phase. Many vehicles do not stop at all. Short cycle lengths may tend to contribute to low delay values.

LOS B describes operations with control delay greater than 10 and up to 20 seconds per vehicle. This level generally occurs with good progression, short cycle lengths, or both. More vehicles stop than with LOS A, causing higher levels of delay.

LOS C describes operations with control delay greater than 20 and up to 35 seconds per vehicle. These higher delays may result from only fair progression, longer cycle lengths, or both. Individual cycle failures may begin to appear at this level. Cycle failure occurs when a given green phase does not serve queued vehicles, and overflows occur. The number of vehicles stopping is significant at this level, though many still pass through the intersection without stopping.

LOS D describes operations with control delay greater than 35 and up to 55 seconds per vehicle. At this level, the influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, and high volume-to-capacity ratios. Many vehicles stop, and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.

LOS E describes operations with control delay greater than 55 and up to 80 seconds per vehicle. These higher delay values generally indicate poor progression, long cycle lengths, and high volume-to-capacity ratios. Individual cycle failures are frequent.

LOS F describes operations with control delay in excess of 80 seconds per vehicle. This is considered unacceptable to most drivers, and often occurs with oversaturation, that is, when arrival flow rates exceed the capacity of lane groups. It may also occur at high volume-to-capacity ratios with many individual cycle failures. Poor progression and long cycle lengths may also contribute significantly to high delays.

For the unsignalized intersections, delay is defined as the total elapsed time from when a vehicle stops at the end of the queue until the vehicle departs from the stop line: LOS A describes operations with very low delay; LOS B, LOS C, and LOS D describe operations with delays which are considered to be acceptable. LOS F describes operation with delays in excess of 50 seconds per vehicle, which is considered unacceptable to most drivers. This condition exists when there are insufficient gaps of suitable size to allow side street traffic to cross safely through a major vehicular traffic stream.

CAPACITY ANALYSIS BY INTERSECTION

A capacity analysis was conducted for the weekday AM and PM peak hours to assess Project-related traffic impacts during the construction period. Representative intersections were selected where Project-generated trips would occur.

For informational purposes, a capacity analysis was also conducted for the existing and No Build conditions for the Saturday midday peak hour. However, no construction activity is anticipated for the weekend periods, so that information is not presented in this chapter. The results of the capacity analyses are discussed below. More information on the analyses, as well as on the Saturday analyses conducted, is provided in Appendix 12.1.

East Main Street (CR 108)/Grassy Point Road and Beach Road/Ba Mar Drive

This four-legged intersection is a two-way stop-sign controlled intersection. Ba Mar Drive forms the northbound approach and Beach Road forms the southbound approach, with the eastbound leg formed by East Main Street and westbound leg formed by Grassy Point Road. The northbound approach provides one shared left-turn/through/right-turn lane and the southbound approach provides one shared left-turn/through lane and a channelized right-turn lane separated by a gore. The eastbound and westbound approaches provide one shared left-turn/through/right-turn lane.

The existing, No Build, and Build capacity analyses are presented in Table 15-5.

As shown in the table, the construction-related traffic associated with the Proposed Project would result in minimal delays to this intersection during the AM and PM peak hours and all movements would continue to operate at LOS B or better. The estimated change in operating conditions under the Build Condition is summarized as follows:

- Weekday AM peak hour: The eastbound approach would change from LOS A to LOS B, with an increase in delay of 2.5 seconds, from 8.3 seconds to 10.8 seconds.
- Weekday PM peak hour: The eastbound approach would changes from LOS A to LOS B, with an increase in delay of 1.6 seconds, from 9.5 seconds to 11.1 seconds.

Table 15-5
East Main Street (CR 108)/Grassy Point Road and Ba Mar Drive/Beach Road (CR 110)—Unsignalized Intersection

Movement	2008 Existing		2015 No Build		2015 Build	
	LOS	Delay	LOS	Delay	LOS	Delay
Weekday AM Peak Hour						
BA MAR DRIVE						
Northbound LTR	A	8.2	A	8.3	A	9.0
BEACH ROAD						
Southbound LT	A	7.9	A	8.0	A	8.5
Southbound R	A	6.3	A	6.3	A	6.3
EAST MAIN STREET						
Eastbound LTR	A	8.1	A	8.3	B	10.8
GRASSY POINT ROAD						
Westbound LTR	A	8.1	A	8.2	A	8.8
OVERALL	**A**	**8.0**	**A**	**8.2**	**B**	**9.8**
Weekday PM Peak Hour						
BA MAR DRIVE						
Northbound LTR	A	8.7	A	8.9	A	9.3
BEACH ROAD						
Southbound LT	A	8.9	A	9.1	A	9.5
Southbound R	A	6.2	A	6.3	A	6.3
EAST MAIN STREET						
Eastbound LTR	A	9.0	A	9.3	A	9.9
GRASSY POINT ROAD						
Westbound LTR	A	9.7	B	10.1	B	12.6
OVERALL	**A**	**9.2**	**A**	**9.5**	**B**	**11.1**

Notes:
Delays are measured in seconds per vehicle.
Overall delay at unsignalized intersection is based upon the critical approach.

US Route 9W and Main Street (CR 108)

This four-legged intersection is controlled by an actuated traffic signal. US Route 9W forms the northbound and southbound approaches of this intersection, with the eastbound and westbound formed by Main Street. The northbound and southbound approaches provide one shared left-turn/through/right-turn lane. The eastbound approach provides one shared left-turn/through/ right-turn lane and the westbound approach provides one shared through/right-turn lane and a left-turn lane.

The existing, No Build, and Build capacity analyses are presented in Table 15-6.

Table 15-6
US Route 9W and Main Street (CR 108)—Signalized Intersection

Movement	2008 Existing		2015 No Build		2015 Build	
	LOS	Delay	LOS	Delay	LOS	Delay
Weekday AM Peak Hour						
US ROUTE 9W						
Northbound LTR	A	6.0	A	7.0	A	8.1
Southbound LTR	A	7.7	A	9.3	B	12.2
WEST MAIN STREET						
Eastbound LTR	A	9.4	A	9.0	B	10.5
EAST MAIN STREET						
Westbound TR	B	19.5	B	19.4	B	18.6
Westbound L	C	31.6	C	32.5	D	36.2
OVERALL	**B**	**10.3**	**B**	**11.4**	**B**	**13.4**
Weekday PM Peak Hour						
US ROUTE 9W						
Northbound LTR	A	9.5	B	10.8	B	13.3
Southbound LTR	A	6.5	A	6.9	A	7.9
WEST MAIN STREET						
Eastbound LTR	C	20.3	C	21.2	B	19.4
EAST MAIN STREET						
Westbound TR	B	14.3	B	14.2	B	13.1
Westbound L	C	32.8	C	34.8	D	44.2
OVERALL	**B**	**12.1**	**B**	**13.1**	**B**	**15.7**

Note: Delays are measured in seconds per vehicle.

As shown in the table, the overall intersection delay would increase minimally during the AM and PM peak hours under the Build condition and all approaches and movements would operate at LOS D or better. The estimated change in operating conditions under the Build condition is summarized as follows:

- Weekday AM peak hour
  - The southbound approach would change from LOS A to LOS B, with an increase in delay of 2.9 seconds, from 9.3 seconds to 12.2 seconds.
  - The westbound approach would change from LOS C to LOS D, with an increase in delay of 3.7 seconds, from 32.5 seconds to 36.2 seconds.
- Weekday PM peak hour
  - The left turn movement in the westbound approach would change from LOS C to LOS D, with an increase in delay of 9.4 seconds, from 34.8 seconds to 44.2 seconds.

The delay observed in the southbound approach during the AM peak hour would result from the construction worker trips and truck trips from the north headed to Railroad Avenue to reach the Water Treatment Plant Site. The increase in delay in the westbound approach during the PM peak hour can be attributed to the additional construction worker trips and truck trips coming from the Intake Site east of the intersection.

US Route 9W and Washburns Lane (CR 100)

US Route 9W forms the northbound and southbound approaches of this intersection, and the Washburns Lane forms the eastbound and westbound legs to this four-legged, two-way, unsignalized intersection. The northbound and southbound approaches provide one shared through/right-turn lane and one left-turn only shared travel lane. The eastbound and westbound approaches provide one shared left-turn/through/right-turn lane.

The existing, No Build, and Build capacity analyses are presented in Table 15-7. As shown in the table, the overall intersection delay would minimally increase during the AM and PM peak hours under the Build condition and all movements would operate at LOS D or better. The estimated change in operating conditions under the Build Condition is summarized as follows:

- Weekday AM peak hour: The eastbound approach would change from LOS C to LOS D, with an increase in delay of 6.7 seconds, from 24.2 seconds to 30.9 seconds.
- Weekday PM peak hour: The overall intersection would experience a change from LOS A to LOS B, with an increase in delay of 0.3 seconds, from 2.6 seconds to 2.9 seconds.

Table 15-7

US Route 9W and Washburns Lane (CR 100)—Unsignalized Intersection

Movement	2008 Existing		2015 No Build		2015 Build	
	LOS	Delay	LOS	Delay	LOS	Delay
Weekday AM Peak Hour						
US ROUTE 9W						
Northbound TR	A	0.0	A	0.0	A	0.0
Northbound L	A	9.7	A	9.7	A	9.9
US ROUTE 9W						
Southbound TR	A	0.0	A	0.0	A	0.0
Southbound L	A	8.1	A	8.2	A	8.4
WASHBURNS LANE						
Eastbound LTR	C	21.3	C	24.2	D	30.9
Westbound LTR	C	17.6	C	18.8	C	21.4
OVERALL	**A**	**2.5**	**A**	**2.8**	**A**	**3.8**
Weekday PM Peak Hour						
US ROUTE 9W						
Northbound TR	A	0.0	A	0.0	A	0.0
Northbound L	A	8.8	A	9.0	A	9.3
US ROUTE 9W						
Southbound TR	A	0.0	A	0.0	A	0.0
Southbound L	A	9.1	A	9.3	A	9.5
WASHBURNS LANE						
Eastbound LTR	C	23.4	D	27.0	D	31.8
Westbound LTR	C	20.6	C	22.2	C	24.8
OVERALL	**A**	**2.3**	**a**	**2.6**	**B**	**2.9**

Notes:
Delays are measured in seconds per vehicle.
Overall delay at unsignalized intersection is based upon the critical approach.

US Route 9W and Filors Lane (CR 98)

This four-legged intersection is controlled by an actuated traffic signal. US Route 9W forms the northbound and southbound approaches of this intersection, with the eastbound and westbound formed by Filors Lane. The northbound and southbound approaches provide one shared through/ right-turn lane and a left-turn lane. The eastbound approach provides one shared left-turn/ through lane and a right-turn lane, and the westbound approach provides one shared left-turn/ through/right-turn travel lane.

The existing, No Build, and Build capacity analyses are presented in Table 15-8. As shown in the table, the overall intersection delay would increase minimally during the AM and PM peak hours under the Build condition and all movements would continue to operate at LOS D or better.

Table 15-8
US Route 9W and Filors Lane (CR 98)—Signalized Intersection

Movement	2008 Existing		2015 No Build		2015 Build	
	LOS	Delay	LOS	Delay	LOS	Delay
Weekday AM Peak Hour						
US ROUTE 9W						
Northbound TR	A	6.0	A	6.2	A	6.9
Northbound L	A	4.2	A	4.2	A	4.8
US ROUTE 9W						
Southbound TR	B	10.7	B	13.5	B	15.9
Southbound L	A	3.7	A	3.8	A	3.9
FILORS LANE						
Eastbound LT	C	24.7	C	25.4	C	26.1
Eastbound R	A	8.6	A	8.5	A	8.3
Westbound LTR	B	16.3	B	16.2	B	16.1
OVERALL	**A**	**9.5**	**B**	**10.9**	**B**	**12.3**
Weekday PM Peak Hour						
US ROUTE 9W						
Northbound TR	A	6.9	A	7.4	A	8.0
Northbound L	A	4.6	A	5.0	A	5.8
US ROUTE 9W						
Southbound TR	B	10.6	B	11.3	B	12.8
Southbound L	A	4.6	A	4.7	A	4.7
FILORS LANE						
Eastbound LT	C	34.5	D	37.3	D	37.4
Eastbound R	A	7.9	A	7.8	A	7.8
Westbound LTR	B	15.9	B	16.1	B	16.1
OVERALL	**B**	**10.8**	**B**	**11.5**	**B**	**12.1**

Notes: Delays are measured in seconds per vehicle.

US Route 9W and Railroad Avenue (CR 94)

This four-legged intersection is controlled by a fully actuated traffic signal. US Route 9W forms the northbound and southbound approaches of this intersection, with the eastbound and westbound formed by Railroad Avenue. The northbound and southbound approaches provide one through lane, one left-turn lane and one right-turn lane. The eastbound and the westbound approaches provide one shared through/right-turn lane and a left-turn travel lane.

The existing, No Build, and Build capacity analyses are presented in Table 15-9.

Table 15-9
US Route 9W and Railroad Avenue (CR 94)—Signalized Intersection

Movement	2008 Existing		2015 No Build		2015 Build	
	LOS	Delay	LOS	Delay	LOS	Delay
Weekday AM Peak Hour						
US ROUTE 9W						
Northbound L	C	20.1	C	26.1	C	29.5
Northbound T	B	19.0	C	20.9	C	23.7
Northbound R	B	16.9	B	17.8	C	21.0
US ROUTE 9W						
Southbound L	B	13.0	B	14.3	B	18.9
Southbound T	C	23.7	C	27.6	C	30.6
Southbound R	B	16.8	B	17.5	B	18.2
RAILROAD AVENUE						
Eastbound TR	D	52.2	E	55.0	E	61.4
Eastbound L	C	23.3	C	23.4	C	23.0
Westbound TR	D	51.3	D	46.6	D	46.2
Westbound L	C	30.4	C	31.7	D	36.2
OVERALL	**C**	**30.9**	**C**	**32.6**	**C**	**34.8**
Weekday PM Peak Hour						
US ROUTE 9W						
Northbound L	B	17.4	B	19.5	C	22.5
Northbound T	C	26.3	C	30.2	C	32.4
Northbound R	B	17.9	B	18.6	B	19.5
US ROUTE 9W						
Southbound L	C	21.0	C	26.3	C	30.7
Southbound T	C	22.4	C	23.5	C	26.1
Southbound R	B	17.7	B	18.0	B	18.6
RAILROAD AVENUE						
Eastbound TR	D	46.9	D	47.4	D	47.4
Eastbound L	C	32.4	C	33.5	C	32.0
Westbound TR	E	60.6	E	71.1	F	138.5
Westbound L	C	28.7	C	30.6	D	46.2
OVERALL	**C**	**32.9**	**D**	**36.5**	**D**	**53.2**

Notes: Delays are measured in seconds per vehicle.

As shown in the table, the overall intersection delay would increase moderately during the AM and PM peak hours under the Build Condition. The estimated change in operating conditions under the Build condition is summarized as follows:

- Weekday AM peak hour
  - The northbound right-turn movement would change from LOS B to LOS C, with an increase in delay of 3.2 seconds, from 17.8 seconds to 21.0 seconds.
  - The westbound left-turn movement would change from LOS C to LOS D, with an increase in delay of 4.5 seconds, from 31.7 seconds to 36.2 seconds.

- Weekday PM peak hour
  - The northbound left-turn movement would change from LOS B to LOS C, with an increase in delay of 3.0 seconds, from 19.5 seconds to 22.5 seconds.
  - The westbound through/right-turn movement would change from LOS E to LOS F, with an increase in delay of 52.6 seconds, from 71.1 seconds to 138.5 seconds.
  - The westbound left-turn movement would change from LOS C to LOS D, with an increase in delay of 15.6 seconds, from 30.6 seconds to 46.2 seconds.

The most significant delays would be in the westbound direction during the PM peak hour. It should be noted that the increase in delay is less than one minute and the overall LOS for the intersection would remain LOS D.

Railroad Avenue (CR 94) and Wayne Avenue

Wayne Avenue forms the northbound and southbound approaches of this intersection, and Railroad Avenue forms the eastbound and westbound legs to this four-legged, unsignalized intersection. All approaches provide one shared left-turn/through/right-turn lane. The existing, No Build, and Build capacity analyses are presented in Table 15-10. No Project-related trips were assumed to travel on Wayne Avenue for this analysis, so the intersection would operate at the same level of service (LOS A) in the Build condition as in the No Build condition. This analysis is provided for informational purposes.

Table 15-10
Railroad Avenue and Wayne Avenue—Unsignalized Intersection

Movement	2008 Existing		2015 No Build		2015 Build	
	LOS	Delay	LOS	Delay	LOS	Delay
Weekday AM Peak Hour						
WAYNE AVENUE						
Northbound LTR	A	7.9	A	7.9	A	7.9
Southbound LTR	A	7.3	A	7.3	A	7.3
RAILROAD AVENUE						
Eastbound LTR	A	8.0	A	8.1	A	8.1
Westbound LTR	A	8.0	A	8.0	A	8.0
OVERALL	**A**	**7.8**	**A**	**7.9**	**A**	**7.9**
Weekday PM Peak Hour						
WAYNE AVENUE						
Northbound LTR	A	8.2	A	8.3	A	8.3
Southbound LTR	A	7.4	A	7.5	A	7.5
RAILROAD AVENUE						
Eastbound LTR	A	8.3	A	8.4	A	8.4
Westbound LTR	A	8.0	A	8.1	A	8.1
OVERALL	**A**	**8.1**	**A**	**8.3**	**A**	**8.3**

Notes:
Delays are measured in seconds per vehicle.
Overall delay at unsignalized intersection is based upon the critical approach.

SUMMARY OF IMPACTS AND MITIGATION

Table 15-11 summarizes the results of the capacity analyses conducted for each intersection included in this study.

Table 15-11
Overall Traffic Level of Service Summary

Intersection	Weekday AM Peak Hour (LOS / Delay)			Weekday PM Peak Hour (LOS / Delay)		
	Existing	No Build	Build	Existing	No Build	Build
East Main Street /Grassy Point Road & Ba Mar Drive /Beach Road—Unsignalized	A/8.0	A/8.2	A/9.8	A/9.2	A/9.5	B/11.1
US Route 9W & Main Street—Signalized	B/10.3	B/11.4	B/13.4	B/12.1	B/13.1	B/15.7
US Route 9W & Washburns Lane—Unsignalized	A/2.5	A/2.8	a/3.8	A/2.3	A/2.6	B/2.9
US Route 9W & Filors Lane—Signalized	A/9.5	B/10.9	B/12.3	B/10.8	B/11.5	B/12.1
Railroad Avenue & US Route 9W—Signalized	C/30.9	C/32.6	C/34.8	C/32.9	D/36.5	D/53.2
Railroad Avenue & Wayne Avenue—Unsignalized	A/7.8	A/7.9	A/7.9	A/8.1	A/8.3	A/8.3

Notes:
Delays are measured in seconds per vehicle.
Overall delay at unsignalized intersections is based upon the critical approach.

The results of the capacity analyses indicate that all intersections would operate at an overall acceptable Level of Service of D or better during the construction period (Build condition). However, the following intersection approach movements would experience a drop in LOS:

Signalized Intersections

- The westbound East Main Street left-turn movement at US Route 9W would drop from LOS C (delay = 31.6 seconds per vehicle) to LOS D (delay = 36.2 seconds per vehicle) during the weekday AM peak hour, and from LOS C (delay = 34.8 seconds per vehicle) to LOS D (delay = 44.2 seconds per vehicle) during the weekday PM peak hour.
- The westbound Railroad Avenue shared through/right movement at US Route 9W would drop from LOS E (delay = 71.1 seconds per vehicle) to LOS F (delay = 138.5 seconds per vehicle) during the weekday PM peak hour.

Unsignalized Intersections

- The eastbound Washburns Lane shared left/through/right movement at US Route 9W would drop from LOS C (delay = 24.2 seconds per vehicle) to LOS D (delay = 30.9 seconds per vehicle) during the weekday AM peak hour. This is an unsignalized intersection.

With minor signal retimings and MPT plan measures implemented at the above intersections, acceptable levels of service could be maintained at each intersection during the construction period. Construction traffic would, however, vary over time as different aspects of construction occur, and therefore these conditions are expected to be temporary in duration during the overall construction period. MPT plan measures would be implemented as needed for any partial temporary road closures that are necessary during construction activities.

In addition to these measures, United Water will investigate the possibility of delivering construction materials to the Water Treatment Plant Site via rail, using the adjacent CSX freight rail line. This would reduce the number of truck trips necessary to b ring materials to the Site.

MAINTENANCE AND PROTECTION OF TRAFFIC PLANS

During the three-year-long construction period for Phase 1 of the Proposed Project, Maintenance and Protection of Traffic plans would be in place to manage construction-related traffic. The MPT plans could include such measures as the following:

- Designated routes to be used by construction traffic, to route construction vehicles to the Water Treatment Plant Site via Railroad Avenue west of the Site and to the Intake Site via routes north of that Site. This would avoid any potential conflicts resulting from the combination of the two Project Sites' traffic on Railroad Avenue, and related to traffic on Beach Road where installation of the raw water pipe would be occurring. It would also avoid possible conflicts with Haverstraw Marina.
- Traffic routing on Beach Road when the raw water transmission line is being installed, to maintain traffic on that road.
- Potential monitoring of construction traffic along Railroad Avenue, and if warranted, use of flag personnel to ensure that construction traffic does not block the unsignalized intersections with side streets on Railroad Avenue east of Route 9W.

PUBLIC TRANSPORTATION

As discussed in Chapter 12, bus stops are located along U.S. Route 9W at the southwest and southeast corners of Filors Lane and U.S. Route 9W. With implementation of the MPT plan during construction of the Proposed Project, potential delays to bus traffic would be mitigated.

RAIL TRANSPORTATION

No significant adverse impacts to CSX railroad operations are anticipated as a result of construction activities associated with the Proposed Project. As described earlier in this chapter, at locations where new water mains must cross beneath the CSX railroad right-of-way, it is anticipated that the mains would be laid using "jacking and boring," a construction technique that allows installation of short segments of water mains without excavation. Other construction activities at the Water Treatment Plant Site would not affect operations of the railroad.

WATERBORNE TRANSPORTATION

Construction of the Proposed Project would include a four- to five-month period of in-water construction that could result in minor and temporary re-direction of recreational and commercial vessels. Construction of the raw water intake structure would take place 1,000 to 1,200 feet offshore of the Intake Site. This location would be outside of the Federal Navigation Channel, which is maintained to a depth of 32 feet below mean low water. It is expected that the U.S. Coast Guard would issue a Notice to Mariners during the construction work in the Hudson River. Temporary re-direction of small commercial and recreational vessels away from the in-river construction area is not expected to result in any indirect impacts to navigation in the vicinity of the intake. Recreational vessel traffic into and out of the local marinas in Haverstraw Bay and Minisceongo Creek would not be interrupted as a result of the construction of the intake.

The presence of the in-water construction activities also would not adversely affect U.S. Gypsum's waterborne operations, including the delivery of materials to their pier nearby. Boats arriving at and departing from U.S. Gypsum's pier would not be close enough to the proposed intake location to be adversely affected by it, nor would it be adversely affected by their operations.

NOISE

CONSTRUCTION-RELATED NOISE

Construction of the Proposed Project would result in noise impacts generated by the operation of construction equipment, and from construction-related vehicles and delivery vehicles traveling to and from the Project Sites. Noise levels caused by construction activities can vary widely, depending on the phase of construction and the location of the construction relative to receptor locations. The most significant construction noise sources are expected to be impact equipment such as pile driver cranes, excavators, and paving breakers, as well as the movements of trucks and other construction-related vehicles.

As described earlier in this chapter, construction activities generally would take place in accordance with Town of Haverstraw Zoning Code § 167-40 regulations, which permit construction, blasting, drilling, and demolition between the hours of 7:00 AM and 7:00 PM on weekdays, and from 8:00 AM to 5:00 PM on Saturdays.

Noise Analysis Methodology

A quantified construction noise analysis was performed. This analysis consisted of two parts: one that considered the effects of construction activities on the Project Sites and a second that considered the noise related to construction-generated vehicular traffic. The first part of the analysis was conducted using the Federal Highway Administration (FHWA) Roadway Construction Noise Model (RCNM), Version 1.0,[1] and the second part used proportional modeling techniques.

Noise levels at a given location depend on the kind and number of pieces of construction equipment being operated; the amount of time the equipment is in use; the distance from the construction site to "sensitive" receptors (i.e., noise-sensitive land uses, such as residences, schools, and parks); the effects of topography; and any shielding effects for those sensitive uses due to intervening structures that can block the construction noise. Similarly, noise from "mobile sources"—i.e., from construction-related traffic—depends on the noise emission levels of the type of vehicle (e.g., auto, light-duty truck, heavy-duty truck, bus, etc.), the vehicular speed, the distance between the roadway and the receptor, topography and ground effects; and shielding.

The construction noise analysis looked at "worst-case" conditions (i.e., the conditions which would have the potential for producing the maximum noise levels) for construction of the three primary components of the Proposed Project separately—the intake pumping facility, the raw water transmission line, and the water treatment plant. Noise from the operation of construction equipment on-site at a specific receptor location near a construction site was calculated by computing the sum of the noise produced by all pieces of equipment operating at the construction site. The noise receptor locations evaluated in the analysis are shown in

[1] The RCNM if the Federal Highway Administration's national model for the prediction of construction noise, and is a state-of-the-art analysis for noise analysis.

Figure 15-16. Assumptions about the equipment to be used and their noise generation were provided by Black & Veatch. Noise analyses were performed to determine maximum one-hour equivalent ($L_{eq(1)}$) noise levels that would be expected to occur during construction of each of the three components of Phase 1 of the Proposed Project separately.

The purpose of this analysis was to determine the magnitude of the "worst case" noise produced by construction activities, to determine if these noise levels would result in significant adverse noise impacts, and if so, to examine the feasibility of implementing mitigation measures to reduce or eliminate such impacts.

Construction Noise Impact Criteria

There are no standardized criteria for assessing construction-related noise impacts. The determination of the significance of Project-generated noise depends on the land use affected by the activities, the magnitude of the change in noise level, the existing and resulting noise level, and the duration of the change in noise level. For purposes of this analysis, significant impacts were identified if the same noise criteria as used for operational noise impacts (discussed in Chapter 13, "Noise and Vibration") were predicted to be exceeded for two years or more. Therefore, the impact criteria used in this analysis is as follows: An increase of more than 6.0 dBA in ambient $L_{eq(1)}$ noise levels that produces ambient noise levels of more than 65 dBA at residences or 79 dBA at industrial or commercial areas was considered a significant increase in noise levels; and if this increase would occur for 2 years of more, it would be considered a significant impact.

Construction Noise: Intake Site Construction Activities

The nearest noise-sensitive receptor to the Intake Site is a residence, immediately adjacent to the Site along River Road. As described in Chapter 13, existing daytime $L_{eq(1)}$ noise level at this location during typical construction hours range from approximately 56 to 71 dBA (see Table 13-4 in Chapter 13). Table 15-12, below, provides the predicted noise levels at this noise receptor for the noisiest month during each three-month (quarter) period of the Proposed Project's 18 months of construction on the Intake Site for the river water intake system and intake pumping station. The construction noise levels shown in the table are conservative (i.e., high), because they do not reflect shielding and topographical effects.

As shown in Table 15-12, during the quieter hours of the day, maximum on-site construction activities would significantly increase ambient noise levels and produce noise increases that would, in some cases more than double existing ambient noise levels, and be noisy and intrusive at the nearby residences on Beach Road. However, during hours when ambient noise levels are high and/or at locations further from the Intake Site of construction activities, these same maximum on-site construction activities would result in insignificant noise increases.

During the quieter hours of the day and at the closest receptor location locations, maximum construction activities would produce $L_{eq(1)}$ noise levels which would increase existing ambient noise levels by more than 6 dBA, and increase noise levels at residences to more than 65 dBA, resulting in significant increases. However, these increases would occur for less than two years. Consequently, the activities related to construction on the Intake Site would not result in any significant adverse noise impacts.

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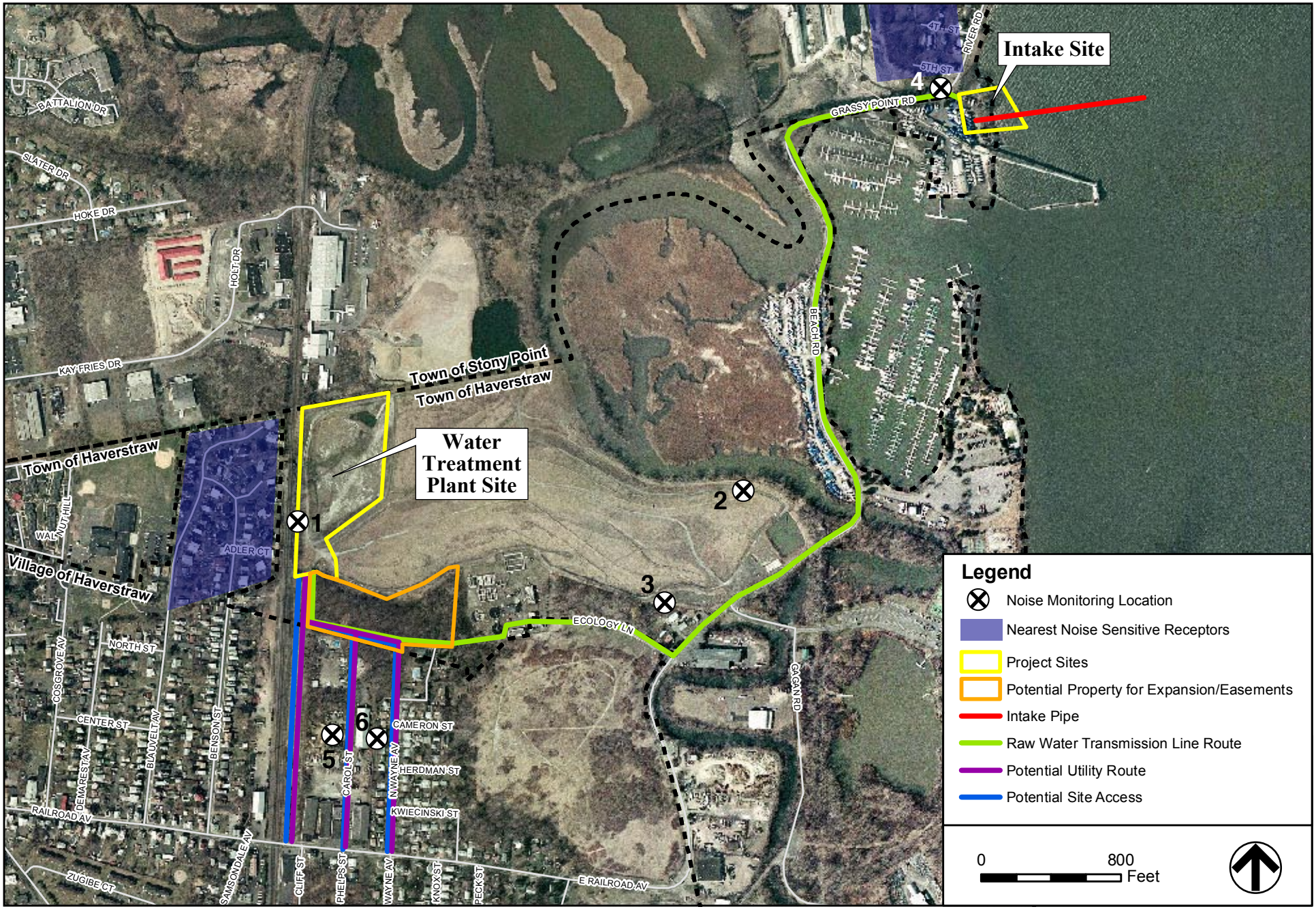


Figure 15-16

Noise Monitoring Sites

Table 15-12
Predicted Maximum $L_{eq(1)}$ Noise Levels (in dBA)
at Nearest Sensitive Receptors
Due to Construction at the Intake Site

Quarter	Maximum Construction $L_{eq(1)}$[1]	Lowest Ambient $L_{eq(1)}$[2]	Total $L_{eq(1)}$[3]	Increase $L_{eq(1)}$[4]	Highest Ambient $L_{eq(1)}$[5]	Total $L_{eq(1)}$[6]	Increase $L_{eq(1)}$[7]
1	67	56	67	11	71	73	2
2	64	56	64	8	71	72	1
3	69	56	69	13	71	73	2
4	71	56	71	15	71	74	3
5	71	56	71	15	71	74	3
6	72	56	72	16	71	75	4

Notes:
1 The maximum predicted $L_{eq(1)}$ noise levels due to on-site construction activities;
2 The lowest existing ambient $L_{eq(1)}$ noise levels during the hours when construction is taking place;
3 The lowest total $L_{eq(1)}$ noise levels with construction (i.e., the sum of construction and existing lowest noise levels);
4 The increase in $L_{eq(1)}$ noise levels due to construction (i.e., the difference between future total noise levels with construction and existing lowest noise levels);
5 The highest existing ambient $L_{eq(1)}$ noise levels during the hours when construction is taking place;
6 The highest total $L_{eq(1)}$ noise levels with construction (i.e., the sum of construction and existing highest noise levels); and
7 The increase in $L_{eq(1)}$ noise levels due to construction (i.e., the difference between future total noise levels with construction and existing highest noise levels).

Construction Noise: Raw Water Transmission Line

The new raw water transmission line may affect noise sensitive receptors located along its route, which include residences along Beach Road and Haverstraw Bay Park, near Beach Road and Gagan Avenue. The nearest noise-sensitive receptor to the water main construction (approximately 10 feet away) is a residence located on Beach Road at Ecology Lane. Two other noise-sensitive receptors were also considered: the residence on Beach Road just north of the Intake Site and a residence on Benson Street near the corner of Railroad Avenue. (Both of these residences are located further from the route of the proposed raw water transmission line.) As described in Chapter 13, existing daytime $L_{eq(1)}$ noise level at these locations during typical construction hours range from approximately 52 to 61 dBA (see Table 13-4). Analyses were conducted to determine noise-related impacts when the closest piece of construction equipment would be operating adjacent to the residence and when the closest piece of construction equipment is operating at a distance of approximately 300 feet from the residence. The results of the analysis are shown in Table 15-13. The analysis also assumed equipment is spaced at 25-foot intervals and conservatively did not account for shielding and topographical effects.

Table 15-13
Predicted Maximum $L_{eq(1)}$ Noise Levels (in dBA)
at Nearest Sensitive Receptors
Due to Construction of Raw Water Transmission Line

Residence Location	Distance	Maximum Construction $L_{eq(1)}$ [1]	Lowest Ambient $L_{eq(1)}$ [2]	Total $L_{eq(1)}$ [3]	Increase $L_{eq(1)}$ [4]	Highest Ambient $L_{eq(1)}$ [5]	Total $L_{eq(1)}$ [6]	Increase $L_{eq(1)}$ [7]
Beach Rd at Ecology Ln	Adjacent	91	52	91	39	61	91	30
	300 Feet	67	52	67	15	61	68	7
Beach Rd near Intake Site	Adjacent	81	56	81	25	71	81	10
	300 Feet	67	56	67	11	71	72	1
Benson St near Railroad Ave	Adjacent	76	49	77	28	75	79	4
	300 Feet	67	49	67	18	75	76	1

Notes:
1 The maximum predicted $L_{eq(1)}$ noise levels due to on-site construction activities;
2 The lowest existing ambient $L_{eq(1)}$ noise levels during the hours when construction is taking place;
3 The lowest total $L_{eq(1)}$ noise levels with construction (i.e., the sum of construction and existing lowest noise levels);
4 The increase in $L_{eq(1)}$ noise levels due to construction (i.e., the difference between future total noise levels with construction and existing lowest noise levels);
5 The highest existing ambient $L_{eq(1)}$ noise levels during the hours when construction is taking place;
6 The highest total $L_{eq(1)}$ noise levels with construction (i.e., the sum of construction and existing highest noise levels); and
7 The increase in $L_{eq(1)}$ noise levels due to construction (i.e., the difference between future total noise levels with construction and existing highest noise levels).

As shown in Table 15-13, construction for the raw water transmission line result in significant increases to ambient noise levels and produce noise increases that would, in some cases, more than double existing ambient noise levels, and be noisy and intrusive at the nearby residences. In addition, the analysis concludes that even when equipment is located 300 feet from away, during some quiet hours of the day construction activities would produce $L_{eq(1)}$ noise levels that would increase existing ambient noise levels by more than 6 dBA, and increase noise levels at residences to more than 65 dBA. However, these increases would only occur for a very limited time period. When construction activities are more than approximately 500 feet from a residence, at most locations, during most hours of the day the increases would be less than 6 dBA. Construction is expected to progress at approximately 40 feet per day, so that the significant noise increases would last only a limited time at any given location. Consequently, based upon the limited duration of the increased noise levels, activities related to construction of the raw water transmission line would not result in any significant noise impacts.

Construction Noise: Water Treatment Plant Construction Activities

The nearest noise sensitive receptors to the Water Treatment Plant Site are the residences on Benson Street west of the Site, across from the CSX freight line. As described in Chapter 13, existing daytime $L_{eq(1)}$ noise levels during typical construction hours at these residences range from approximately 49 to 75 dBA (see Table 13-4). Table 15-14, below, provides the predicted noise levels at the nearest residence on Benson Street, for the noisiest month during each three-month time (quarter) period of the Proposed Project's three-year construction period. The construction noise levels shown in the table are conservative (i.e., high), because they do not reflect shielding and topographical effects.

Table 15-14
Predicted Maximum $L_{eq(1)}$ Noise Levels (in dBA)
at Nearest Sensitive Receptors
Due to Construction at the Water Treatment Plant Site

Quarter	Maximum Construction $L_{eq(1)}$[1]	Lowest Ambient $L_{eq(1)}$[2]	Total $L_{eq(1)}$[3]	Increase $L_{eq(1)}$[4]	Highest Ambient $L_{eq(1)}$[5]	Total $L_{eq(1)}$[6]	Increase $L_{eq(1)}$[7]
1	71	49	71	22	75	77	2
2	83	49	83	34	75	84	9
3	83	49	83	34	75	84	9
4	83	49	83	34	75	84	9
5	83	49	83	34	75	83	8
6	69	49	69	20	75	76	1
7	62	49	62	13	75	75	0
8	64	49	64	15	75	75	0
9	63	49	63	14	75	75	0
10	63	49	63	14	75	75	0

Notes:
1 The maximum predicted $L_{eq(1)}$ noise levels due to on-site construction activities;
2 The lowest existing ambient $L_{eq(1)}$ noise levels during the hours when construction is taking place;
3 The lowest total $L_{eq(1)}$ noise levels with construction (i.e., the sum of construction and existing lowest noise levels);
4 The increase in $L_{eq(1)}$ noise levels due to construction (i.e., the difference between future total noise levels with construction and existing lowest noise levels);
5 The highest existing ambient $L_{eq(1)}$ noise levels during the hours when construction is taking place;
6 The highest total $L_{eq(1)}$ noise levels with construction (i.e., the sum of construction and existing highest noise levels); and
7 The increase in $L_{eq(1)}$ noise levels due to construction (i.e., the difference between future total noise levels with construction and existing highest noise levels).

As shown in Table 15-14, throughout the construction period, during the quieter hours of the day, maximum on-site construction activities would significantly increase ambient noise levels and produce noise increases that would more than double existing ambient noise levels and be noisy and intrusive at the nearby residences on Benson Street. However, during hours when ambient noise levels are high and/or at locations further from the Water Treatment Plant Site (during the 1st, 6th, 7th, 8th, 9th, and 10th quarters), these same maximum on-site construction activities, even at location receptor locations close to the construction site, would not result in significant noise increases.

The results indicate that during the quieter hours of the day and at the closest receptor location locations, maximum construction activities would produce $L_{eq(1)}$ noise levels that would increase existing ambient noise levels by more than 6 dBA, and increase noise levels at residences to more than 65 dBA, and these increases would be significant. However, construction activities would increase ambient noise levels by more than 6 dBA and increase noise levels at residences to more than 65 dBA for a limited time period (less than two years). Consequently, the construction activities on the Water Treatment Plant Site would not result in significant adverse noise impacts.

Off-Site Noise Related to Construction Traffic

As described earlier in this chapter, construction activities associated with the Proposed Project would result in increased vehicular trips to and from the locations where construction activities are taking place. These trips would include equipment and material delivery trips as well as employee and visitor delivery trips. The proportional modeling technique described in Chapter 13 was used to determine whether the projected increase in traffic on critical feeder roadways has the potential for significantly increasing noise levels and resulting in a significant noise impact.

The screening analysis indicated that truck delivery trips—and construction worker trips to a lesser degree—associated with construction of all three principal components of the Proposed Project would, during limited time periods, increase noise levels by more than 6 dBA at receptor locations on roadways with light or moderate traffic volumes. Noise from construction-related vehicles would not affect noise levels at receptor locations on heavily traveled roadways, such as Route 9W, particularly those roadways with high truck volumes.

In particular, construction-related truck and worker trips associated with construction on the Water Treatment Plant Site would increase $L_{eq(1)}$ noise levels at receptor locations along Railroad Avenue by more than 10 dBA during hours of peak truck traffic. This would be expected to occur for approximately 18 months (from approximately from month 3 through month 21 of construction). During the remaining period of construction on the Water Treatment Plant Site, the increase in noise levels would be less than 6 dBA. While these increases in noise levels would be noisy, intrusive, and significant, because the increase in noise level along this route would be less than two years, these increases would not be considered to be a significant impact.

Similarly, construction-related truck and worker trips associated with construction on the Intake Site would increase noise levels at receptor locations along East Main Street/Grassy Point Road/ Beach Road en route to the Intake Site and increase noise levels by more than 10 dBA during hours of peak truck traffic. This would be expected to occur for less than 12 months. While these increases in noise levels would be noisy, intrusive, and significant, because the increase in noise level along this route would be less than two years, these increases would not be considered to be a significant impact.

The same would be true for construction-related truck and worker trips associated with construction of the raw water transmission line. While these increased vehicle trips would result in increases in noise levels at receptor locations on roadways with light to moderate traffic volumes, and while these increases in noise levels would be noisy, intrusive, and significant, because these increases would be of limited duration (less than two years), these increases would not be considered to be a significant impact.

Therefore, it can be concluded that off-site vehicular trips associated with Project construction would, at some locations result in significant increases; however, they would not result in any significant adverse noise impacts.

Noise Reduction Measures

As the design of the Proposed Project advances, options will be explored to determine the effectiveness and practicality of implementing measures to reduce the magnitude of predicted increases in noise due to construction activities. In particular two types of mitigation measures will be explored—source controls and path controls.

In terms of source controls (i.e., measures that reduce noise levels at the source), the feasibility of implementing the following types of measures, which go beyond typical construction techniques, will be examined:

- The use of quieter construction equipment:
- The use of quieter construction procedures: and
- The use, as early in the construction period as practicable, of electrical powered equipment to replace diesel or gas-powered equipment;

In terms of path controls (e.g., placement of equipment, implementation of barriers or enclosures between equipment and sensitive receptors), the following measures will be examined:

- The feasibility and practicability of locating noisy equipment away from and shielded from sensitive receptor locations; and
- The use of noise barriers and acoustical curtains to provide shielding.

CONSTRUCTION-RELATED VIBRATION AND GROUND-BORNE NOISE

All construction activities have the potential to result in vibration levels that may in turn result in structural or architectural damage, and/or annoyance or interference with vibration-sensitive activities. In general, vibratory levels at a receiver are a function of the source strength (which in turn is dependent upon the construction equipment and methods utilized), the distance between the equipment and the receiver, the characteristics of the transmitting medium, and the receiver building construction. Construction equipment operation causes ground vibrations that spread through the ground and decrease in strength with distance. Vehicular traffic, even in locations close to major roadways, typically does not result in perceptible vibration levels unless there are discontinuities in the roadway surface. With the exception of fragile and possibly historically significant structures or buildings, generally construction activities do not reach the levels that can cause architectural or structural damage, but can achieve levels that may be perceptible and annoying in buildings very close to a construction site.

In terms of structural or architectural damage, with the exception of construction of the raw water transmission line, the distance between buildings and/or structures and equipment would be great enough that peak particle velocities (the standard measure of vibration) would be well below threshold values typically used for impact assessments. Construction of the raw water transmission line may in some cases result in equipment operating very close to buildings. In such cases, standard precautions would be taken as are typically used for installation or repair of water mains. These include, for example, the use of deep saw cutting prior to any required pavement breaking activities. Where and if necessary, vibration monitoring will be undertaken to ensure that no damage occurs.

In terms of potential annoyance or interference with vibration sensitive activities, again with the exception of construction of the raw water transmission line, the distance between buildings and/or structures and equipment would be great enough that the vibration levels would be well below perceptibility threshold values. Construction of the raw water transmission line may in some cases result in equipment operating very close to buildings. In such cases, for very limited time periods vibration levels may be perceptible. However, construction activities for the raw water transmission line will occur at any location for a very short period of time.

Based upon the above, construction activities would not be expected to result in significant adverse vibration impacts.

AIR QUALITY

Construction of the Proposed Project would generate air pollutants emitted from on-site non-road construction equipment and trucks (primarily diesel-powered and gasoline-powered equipment exhaust). Non-road engines to be used on the Project Sites would include equipment such as excavators, bulldozers, generators, and concrete pumps. In addition to emissions originating from trucks as they arrive and depart, concrete trucks would be required to run their engines continuously during concrete pours in order to keep the concrete mix in motion. (As noted earlier in the description of construction activities, however, it is possible that a concrete batching plant could be used at one of the Project Sites to provide the concrete on-site.)

Minor increases in air emissions would also occur on roadways near the Project Sites, because of the increase in worker vehicles and truck trips. On roads where water mains are installed, the temporary disruption to traffic there could also result in a minor increase in air emissions.

In addition, earthmoving operations would create some fugitive dust emissions, depending on soil moisture conditions. Fugitive dust can be suspended in air by construction activities such as site cleanup and preparation, excavation, and transferring and loading soil or loose material. Fugitive dust can also be re-suspended by construction vehicles traveling on unpaved surfaces and from wind erosion of stockpiled materials. Fugitive dust is mostly larger than the $PM_{2.5}$ size range, and would fall in the PM_{10} range or larger. If a concrete batching plant is used on one of the Project Sites, this would also result in fugitive dust.

Dust control measures would be implemented to ensure that dust emissions from construction activity are limited to the extent practicable. Measures would include the following:

- Washing off trucks and excavation equipment prior to exiting the Project Sites with water;
- Washing the streets near the entrances to the Project Sites at the end of every work day;
- Wetting unpaved truck routes within the Project Sites as needed or, in cases where a route would remain in the same place for an extended duration, stabilizing, covering with gravel, or temporarily paving the route to avoid the resuspension of dust;
- Equipping all trucks hauling loose material with tight fitting tailgates and covering the load prior to leaving the Project Sites;
- Enforcing an on-site vehicular speed limit of 5 mph;
- Using water sprays for all excavation and transfer of spoils to ensure that materials are dampened as necessary to avoid the suspension of dust into the air;
- Wetting or covering loose materials, or stabilizing them with a biodegradable suppressing agent; and
- Monitoring dust during subsurface disturbance (measured as respirable particulate matter of diameter less than 10 microns—PM_{10}). If action levels set forth in the CHASP are exceeded, control measures would be taken.

Overall, while it is possible that the construction activities could exceed certain thresholds used for assessing the potential for significant adverse air quality impacts, any exceedance would be limited in extent, duration, and severity.

CONCLUSIONS

Construction activities for the Haverstraw Water Supply Project would occur on the Intake Site (for the river intake and the intake pumping station); in Beach Road, Ecology Lane, and along the JRSTP and vacant private property nearby (for the raw water transmission line); and at the Water Treatment Plant Site (for the water treatment plant). Some construction activities would also occur nearby for access drives and potable water mains. Construction staging areas and worker parking zones may be established on properties adjacent to or near the Project Sites.

Construction within the Hudson River would be of limited duration (approximately five months) and would largely occur within an enclosed area (cofferdam) to minimize disruption to water quality or aquatic resources.

Construction of Phase 1 of the Proposed Project is anticipated to last 36 months, with construction of Phases 2 and 3 lasting up to a year. If construction of two phases occurs together, the total duration would be shorter.

Construction activities would result in temporary and intermittent disruptions to the surrounding neighborhoods. These would be primarily associated with construction-related traffic and increased noise from that traffic and from the construction activities on the Project Sites. General effects of construction activity would include the following:

- Disruption to nearby land uses, and particularly the residences closest to the Intake Site on Grassy Point Road. For most sensitive land uses, these disruptions would be buffered by distance and intervening structures, vegetation, and topography. Access would be maintained to all land uses throughout construction.
- Temporary changes to some waterfront views, particularly while construction is occurring within the river.
- Disruption to aquatic natural resources. A SWPPP would be implemented to minimize potential impacts to the Hudson River and Minisceongo Creek. The use of trenchless technology to construct the river tunnel and of a cofferdam to enclose the water intake site would minimize potential changes to water quality and impacts to aquatic biota during construction. The period when in-water construction would occur would be based on seasonal limitations developed in coordination with NYSDEC and NYSDOS to avoid adverse impacts to fish spawning and early development. The deep channel habitat preferred by shortnose and Atlantic sturgeon would not be adversely impacted during installation or removal of the sheet pile for the cofferdam, or other in-water construction activities associated with the intake.
- Disruption to terrestrial natural resources. While construction activities would require clearing of the Project Sites, no significant adverse impacts to regional populations of wildlife are expected. Coordination with NYSDEC would be conducted with respect to overwintering bald eagles and use of the Intake Site for perching habitat prior to the anticipated start of intake pumping station and intake structure construction.
- Effects on Haverstraw Bay Significant Coastal Fish and Wildlife Habitat. Construction of the Proposed Project would not result in significant adverse impacts to water quality or to the species identified as important for the Significant Coastal Fish and Wildlife Habitat of Haverstraw Bay.

- A CHASP would be prepared and implemented to address potential issues related to contamination of soil and groundwater near the Project Sites.
- MPT plans would be employed to manage construction-related traffic. The MPT plans would set forth designated routes for construction traffic, to avoid potential conflicts between construction traffic from the different Project Sites and to manage possible conflicts with traffic associated with the Haverstraw Marina. The MPT plans would maintain traffic on roads near the Project Sites throughout the construction period and, if warranted, would use flag personnel to ensure that construction traffic does not block unsignalized intersections near the Water Treatment Plant Site. In addition, minor signal retimings were also identified to address potential traffic impacts during construction.
- Noise levels during construction would exceed ambient noise levels by more than 6 dBA, resulting in significant increases at nearby residences. However, these increases would have a duration of less than two years and therefore were not considered to be significant adverse impacts.
- During construction, a dust suppression program would be in place to minimize dust from earthmoving activities.

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