

*Chapter 2: Probable Impacts of Project 1,
Shaft and Bypass Tunnel Construction*

Section 2.1: Description of the Project 1 Construction Program

2.1-1 INTRODUCTION

This section of Chapter 2 summarizes the anticipated construction activities and phases associated with Project 1, Shaft and Bypass Tunnel Construction, along with construction practices. Subsequent sections in Chapter 2 identify the potential for significant adverse impacts that could result from construction activities, discuss measures that would be implemented during Project 1 to avoid or reduce the potential for significant adverse impacts, and describe additional mitigation measures to further reduce any potential significant adverse construction-related impacts.

Since DEP is concurrently undertaking design of the proposed bypass tunnel construction and connection while the EIS was under preparation, many measures have been incorporated into the Project 1 design that have substantially reduced the potential for additional temporary significant adverse impacts resulting from the construction of Project 1. These included eliminating the need for additional shafts at both connection sites and employing inundation plugs instead; limiting work hours at the east connection site for phases of work that do not delay completion of Project 1; limiting the inundation plug installation at the east connection site to one 12-hour shift from 7 AM to 7 PM; limiting truck traffic to and from the east connection site between 11 PM and 7 AM; committing to tree clearing at both connection sites during seasonal periods that would not disturb potential Indiana bat populations; and utilizing connection sites already under DEP ownership or sold to DEP by willing sellers.

This section is organized as follows:

- Section 2.1-2 provides an overview of the construction schedule and phasing for activities on both the west and east connection sites.
- Section 2.1-3 describes the construction activities by phase on the west connection site.
- Section 2.1-4 discusses work hours and the maximum peak workers and trucks on the west connection site.
- Section 2.1-5 details the construction activities by phase on the east connection site.
- Section 2.1-6 discusses work hours and the maximum peak (workers and trucks) on the east connection site.

2.1-2 CONSTRUCTION SCHEDULE AND PHASING

All construction for Project 1, Shaft and Bypass Tunnel Construction is expected to be completed over an approximately 7½-year period between 2013 and 2020.

Project 1 construction can be organized into four primary phases that would be carried out at or between both the west and east connection sites:

- Phase 1: Site Preparation
- Phase 2: Shaft Construction
- Phase 3: Bypass Tunnel Excavation
- Phase 4: Bypass Tunnel Lining, Project 1 Demobilization, and Preparation for Project 2B

The overall schedule shown on **Figure 2.1-1** illustrates the anticipated timeline for the four primary construction phases; some major activities within those four primary phases are also highlighted and are discussed in more detail below in sections 2.1-3 and 2.1-5 as they relate to the west and east connection sites, respectively. These durations are based on the current construction estimates.

2.1-3 DESCRIPTION OF CONSTRUCTION PHASES—WEST CONNECTION SITE

On the west connection site, Phase 1: Site Preparation is expected to begin in early 2013 and be complete in the first quarter of 2014. It is important that work start near the beginning of 2013, so tree clearing activity can be undertaken before the breeding season of the endangered Indiana Bat. Site preparation activities would be followed by Phase 2: Shaft Construction, which would include the construction of a new shaft on the west connection site (Shaft 5B). Shaft construction is expected to commence in the first quarter of 2014 and be complete in the first quarter of 2015. Phase 3: Tunnel Excavation would follow, which would consist of the construction of the bypass tunnel, a portion of the connector tunnel, and a portion of the inundation plug. All the Phase 3 work is expected to be undertaken between the first quarter of 2015 and the third quarter of 2018.

Phase 4: Bypass Tunnel Lining, Project 1 Demobilization, and Preparation for Project 2B is expected to start in the fourth quarter of 2018 and would extend through the second quarter of 2020. Phase 4 would consist of the installation of the final liner through the length of the bypass tunnel, construction of a shaft plug and distribution chamber, the demobilization from the west connection site, and preparation to support Project 2B, Bypass Tunnel Connection and RWBT Inspection and Repair, including Wawarsing.

2.1-3.1 PHASE 1: SITE PREPARATION—WEST CONNECTION SITE

Phase 1: Site Preparation would consist of the demolition of certain on-site structures, the clearing and grading of a large portion of the site (see **Figure 2.1-2**), and the construction of certain facilities in preparation for future construction phases (see **Figure 2.1-3**). These facilities

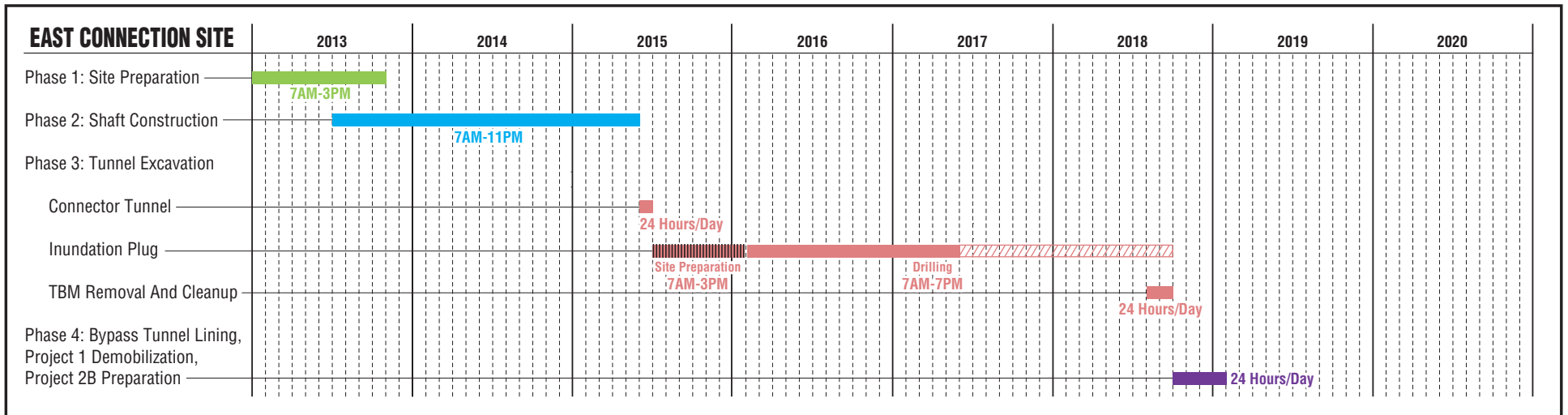
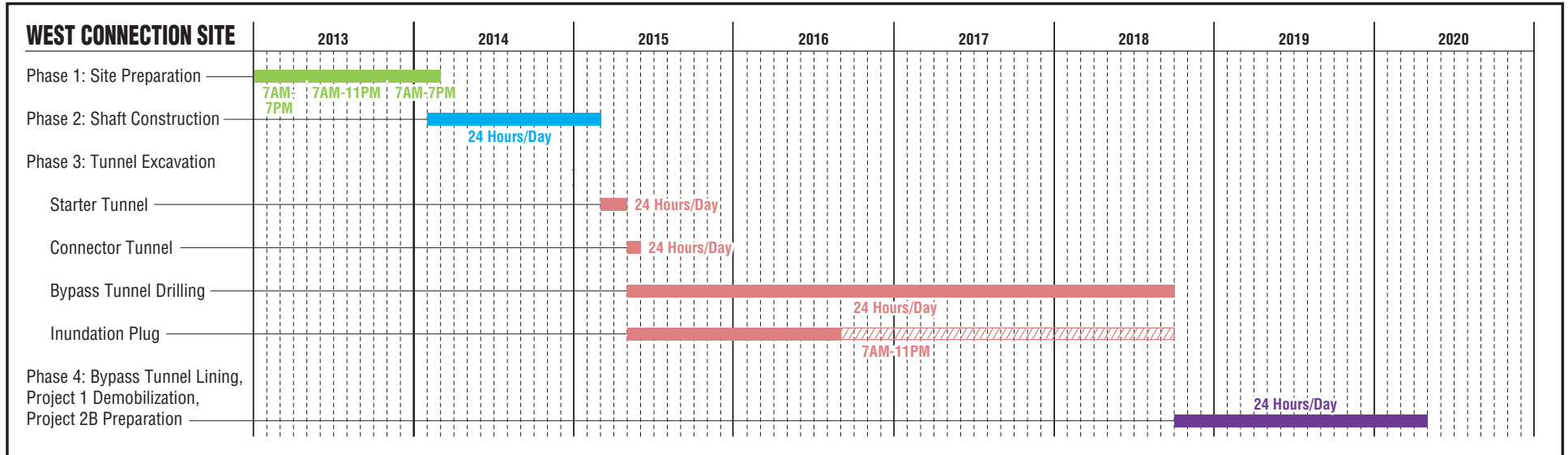
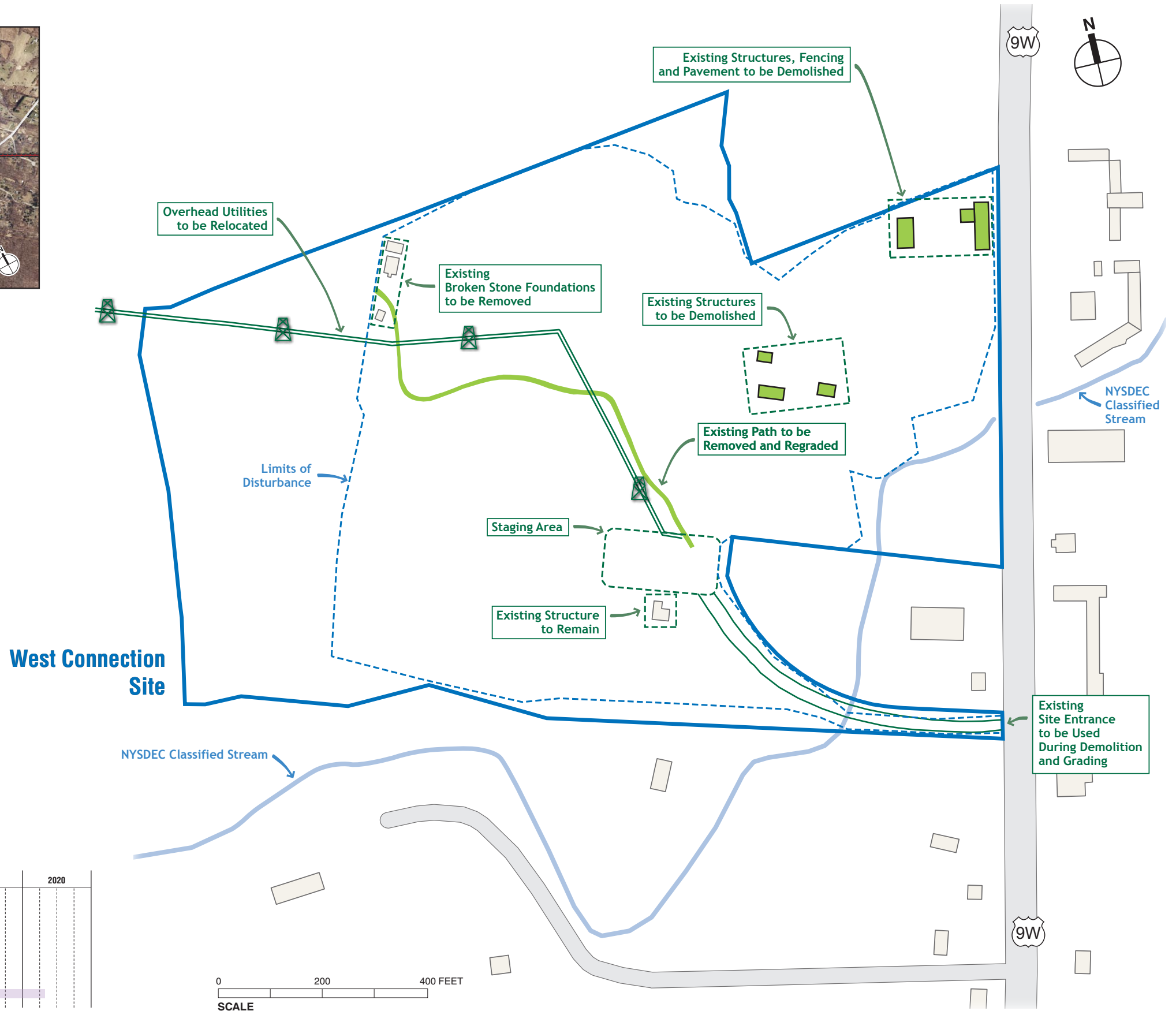


Figure 2.1-1
Construction Schedule and Work Hours

KEY MAP



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CONSTRUCTION SCHEDULE

WEST CONNECTION SITE	2013	2014	2015	2016	2017	2018	2019	2020
Phase 1: Site Preparation	█							
Phase 2: Shaft Construction		█						
Phase 3: Tunnel Excavation			█					
Phase 4: Bypass Tunnel Lining, Project 1 Demobilization, and Project 2B Preparation						█		

West Connection Site

Phase 1: Site Preparation (Demolition and Clearing)

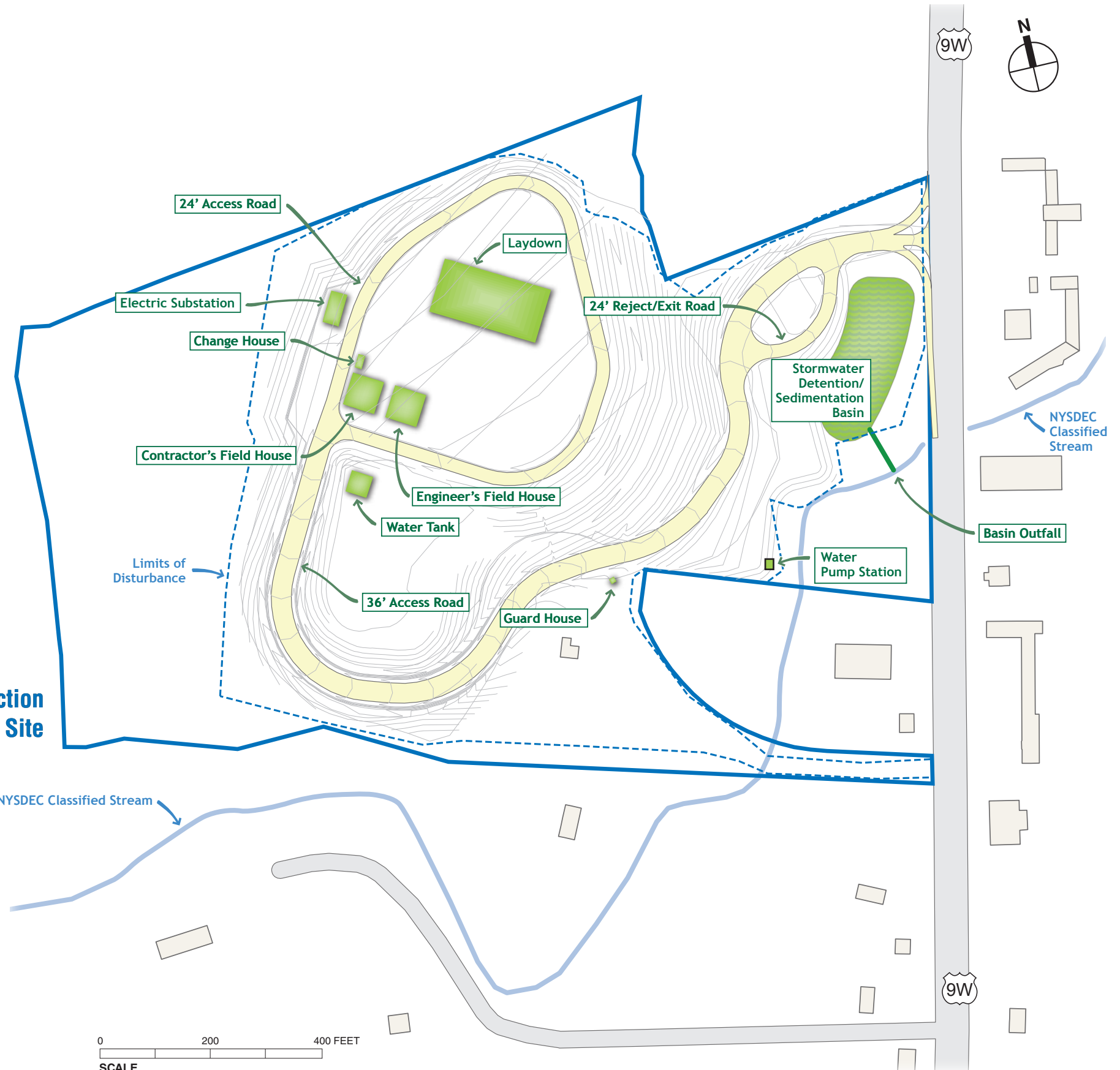
Figure 2.1-2

KEY MAP



12.16.11

West Connection Site



CONSTRUCTION SCHEDULE

WEST CONNECTION SITE	2013	2014	2015	2016	2017	2018	2019	2020
Phase 1: Site Preparation	█							
Phase 2: Shaft Construction		█						
Phase 3: Tunnel Excavation			█					
Phase 4: Bypass Tunnel Lining, Project 1 Demobilization, and Project 2B Preparation							█	

West Connection Site

Phase 1: Site Preparation (Site Infrastructure)

Figure 2.1-3

would consist of a new site access road, a stormwater management system, and some of the infrastructure necessary for later construction phases.

It should be noted that certain elements that would be developed on the west connection site, such as the access road and stormwater management system, would be constructed in the approximate locations shown on the figures in this section. Other elements, such as certain infrastructure or parking areas, could ultimately be developed in locations on the site other than those shown in the figures to allow the construction contractor sufficient flexibility to most efficiently complete any necessary work. The subsequent sections in Chapter 2 represent reasonable worst-case analyses with respect to these types of elements. Regardless of whether an element is fixed or flexible, construction on the west connection site would remain within the limits of disturbance shown on Figure 2.1-2.

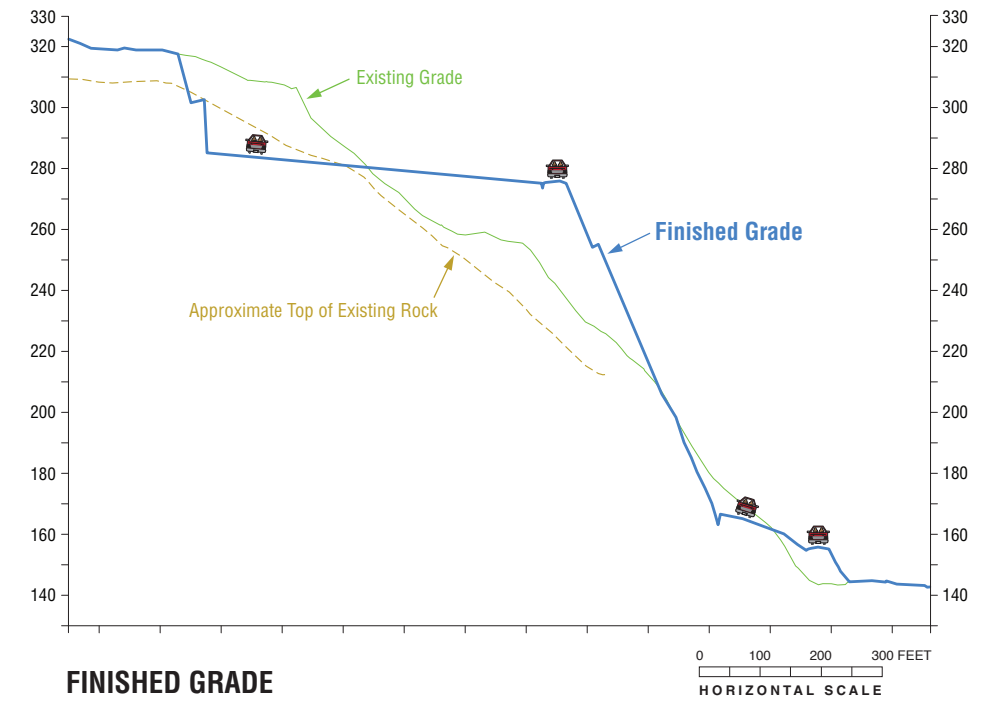
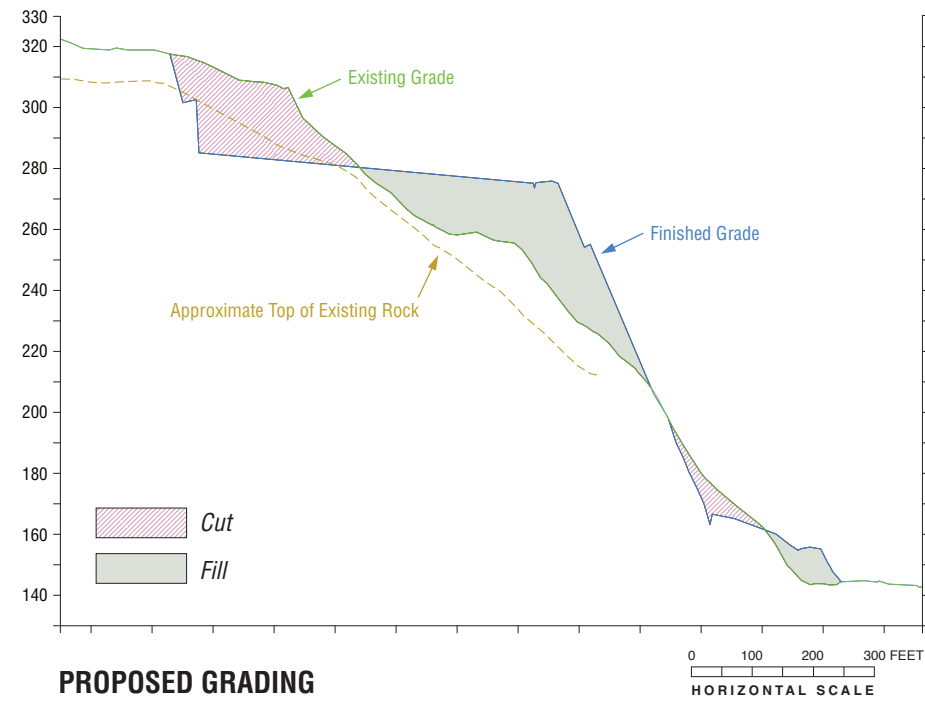
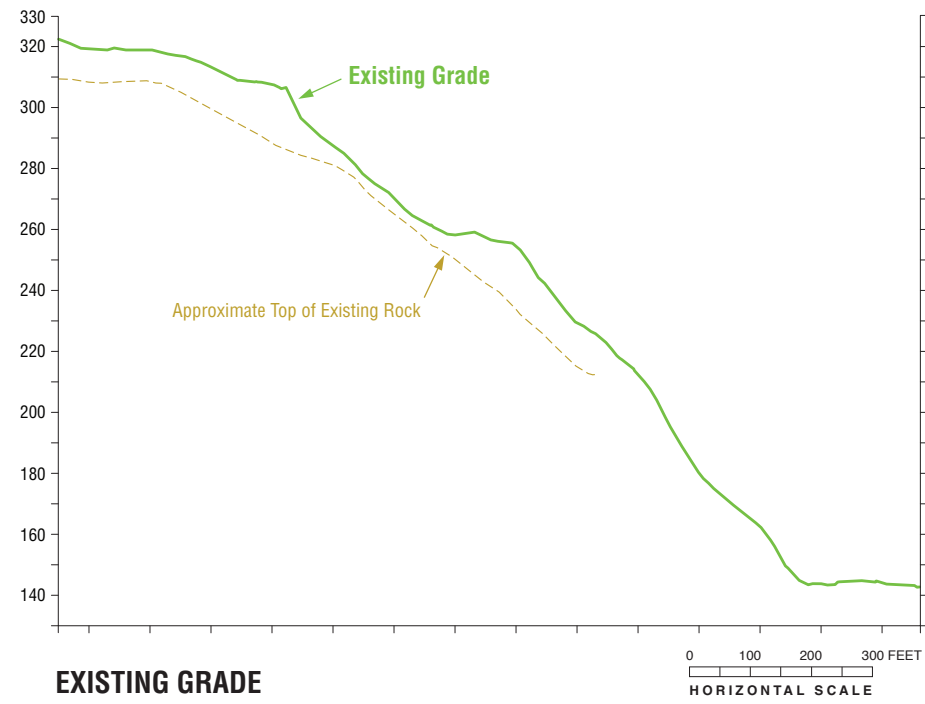
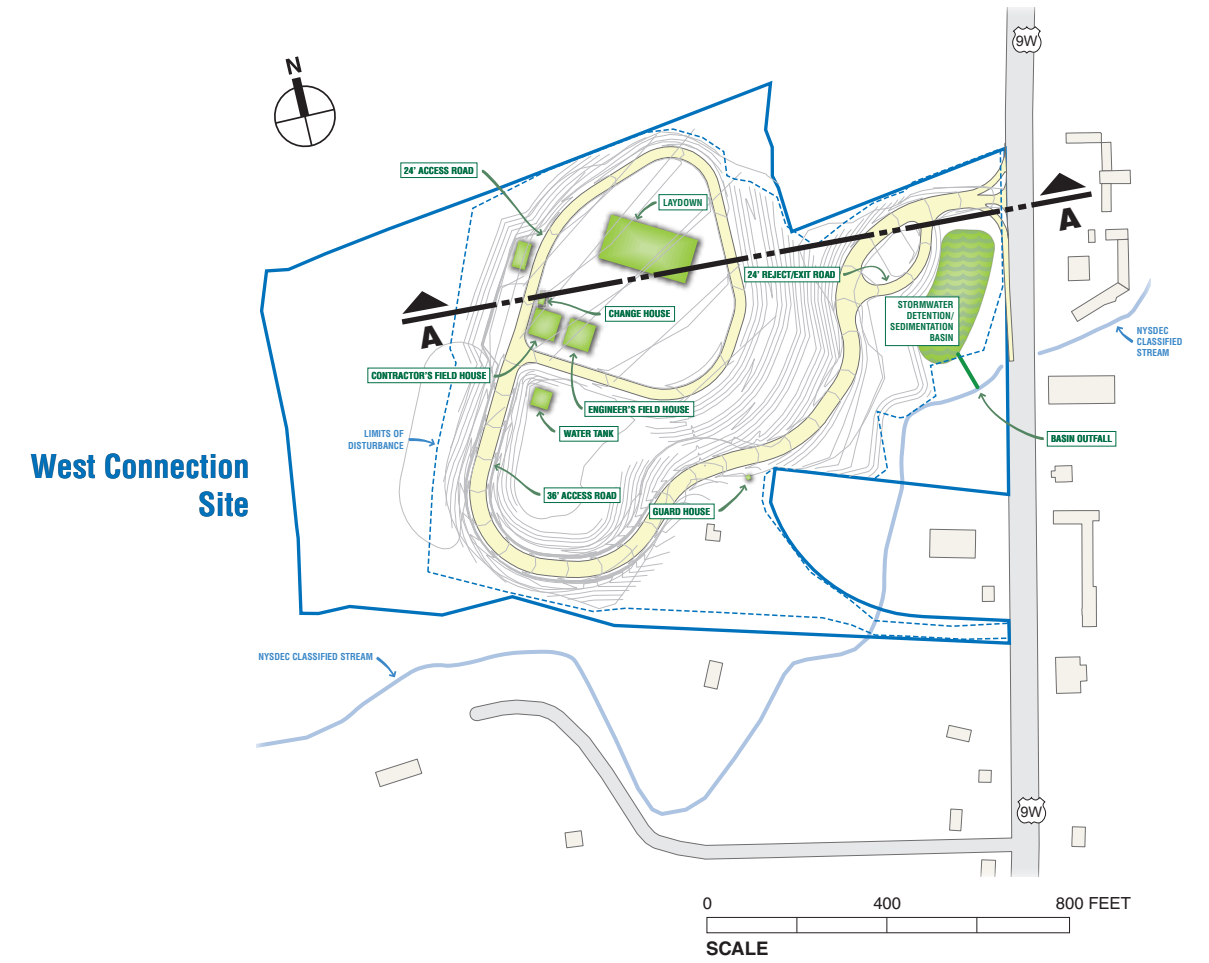
The likely activities during Phase 1: Site Preparation are described below.

DEMOLITION, SITE CLEARING, AND GRADING

At the west connection site, approximately 22.5 acres would be cleared and graded as part of site preparation (see “Limits of Disturbance” on Figure 2.1-2). Within the 22.5 acres, the site’s vegetative cover, which includes brush, shrubs, and trees, would be cleared (see Section 2.8, “Natural Resources and Water Resources”). Existing features of the site that would be demolished or relocated (shown on Figure 2.1-2) include existing overhead utilities and several of the existing structures on the site. In addition, a portion of the existing driveway that extends into the site would be removed.

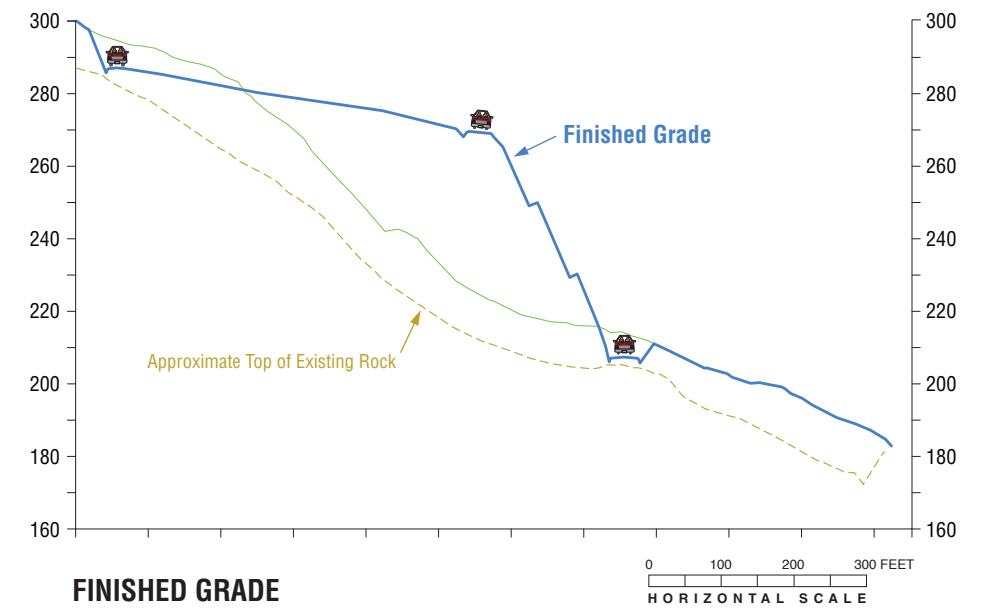
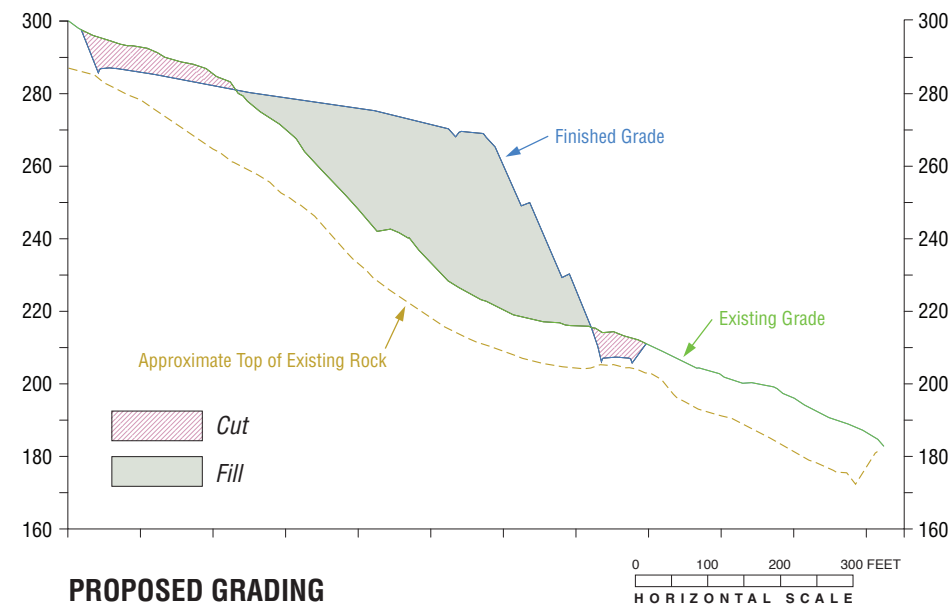
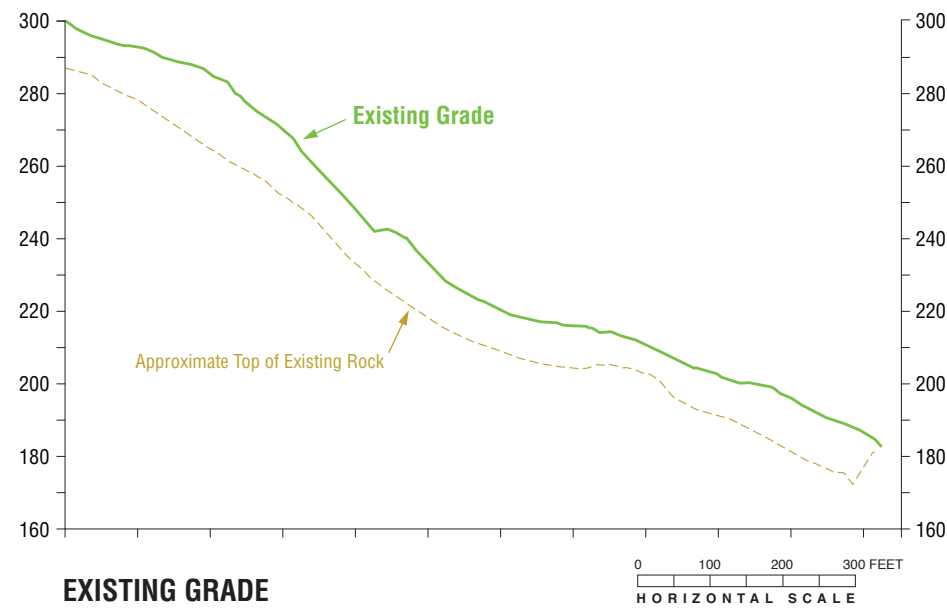
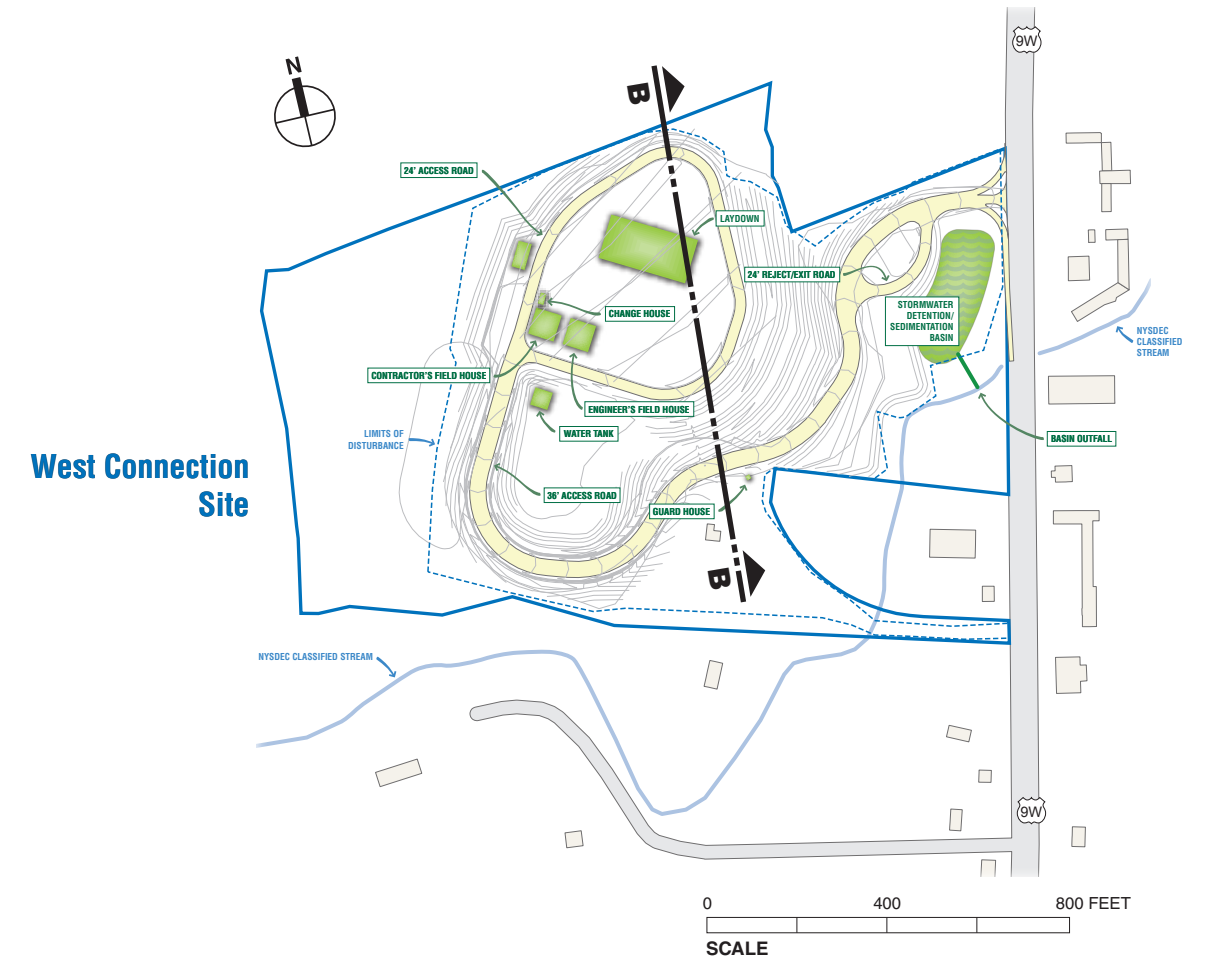
As described in Chapter 1, “Program Description,” the west connection site has a large change in elevation between its eastern and western portions, and a substantial site grading effort would be required (see **Figures 2.1-4a through 2.1-4c**). Site grading would be undertaken using cut and fill techniques. Blasting would also likely be required (probably on and off over a 3- to 6-month period) because shallow bedrock has been encountered on portions of the site. The grading plan would seek to reuse as much material on-site as possible. The current grading plan anticipates that approximately 180,000 cubic yards of cut and 230,000 cubic yards of fill would be required. Much of the on-site soils would likely be suitable for backfill, but some would not be suitable for re-use and would have to be disposed. There would be a need for approximately 50,000 cubic yards of additional fill and/or topsoil for the site. Rock crushing would likely occur on the west connection site to reduce the size of the rock before shipment off-site.

During demolition, site clearing, and initial stages of grading, the existing driveway that provides access to the site from Route 9W would likely be used (see Figure 2.1-2). The driveway would be improved with minor regrading and gravel placement as needed to make it suitable for temporary use by the contractor, and would lead to a temporary staging area for this period of construction.



West Connection Site

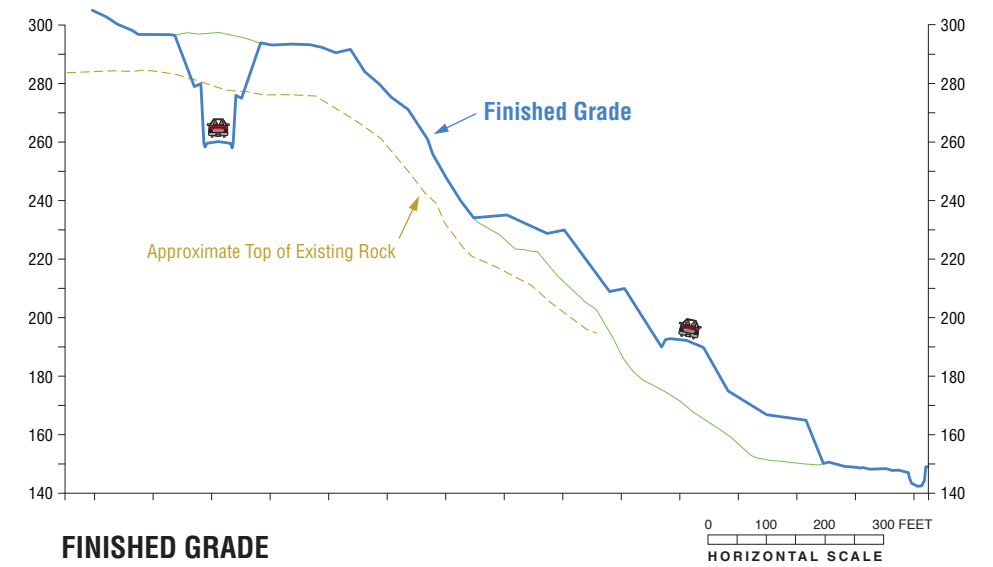
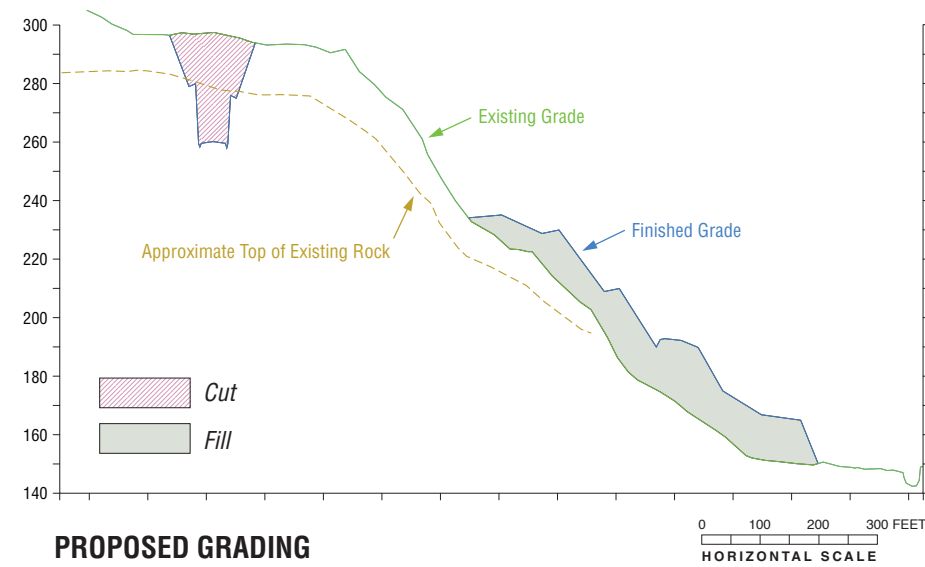
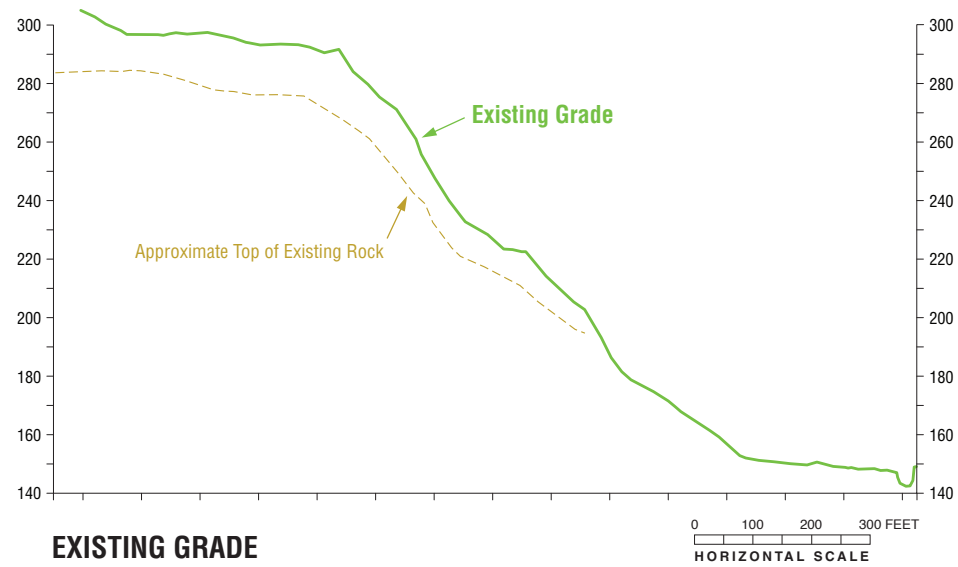
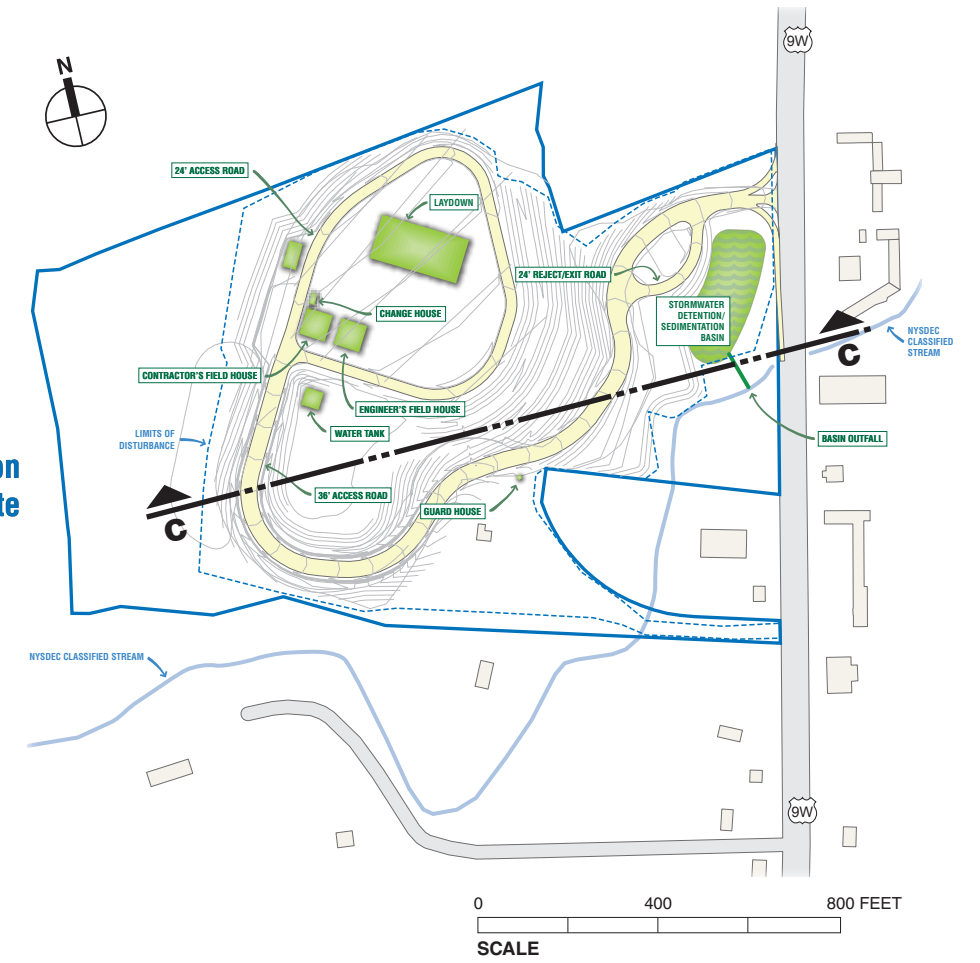
Figure 2.1-4a
Phase 1: Site Preparation Grading Sections—View A



West Connection Site

Figure 2.1-4b
Phase 1: Site Preparation Grading Sections—View B

West Connection Site



West Connection Site

Figure 2.1-4c
Phase 1: Site Preparation Grading Sections—View C

CONSTRUCTION OF ON-SITE INFRASTRUCTURE

The purpose of Phase 1: Site Preparation is to construct the infrastructure required to support future construction phases, as shown in Figure 2.1-3. These facilities include a stormwater management system; new site access road, and parking areas; and power supply, water supply, and wastewater treatment and management.

Stormwater Management System

A stormwater management system would be developed on the west connection site to manage stormwater runoff at the site. This system would include a stormwater detention/sedimentation basin to detain and treat stormwater runoff during clearing, grading, site preparation activities, and subsequent phases of Project 1, Shaft and Bypass Tunnel Construction. The stormwater basin would discharge to the existing on-site NYSDEC Class C stream.

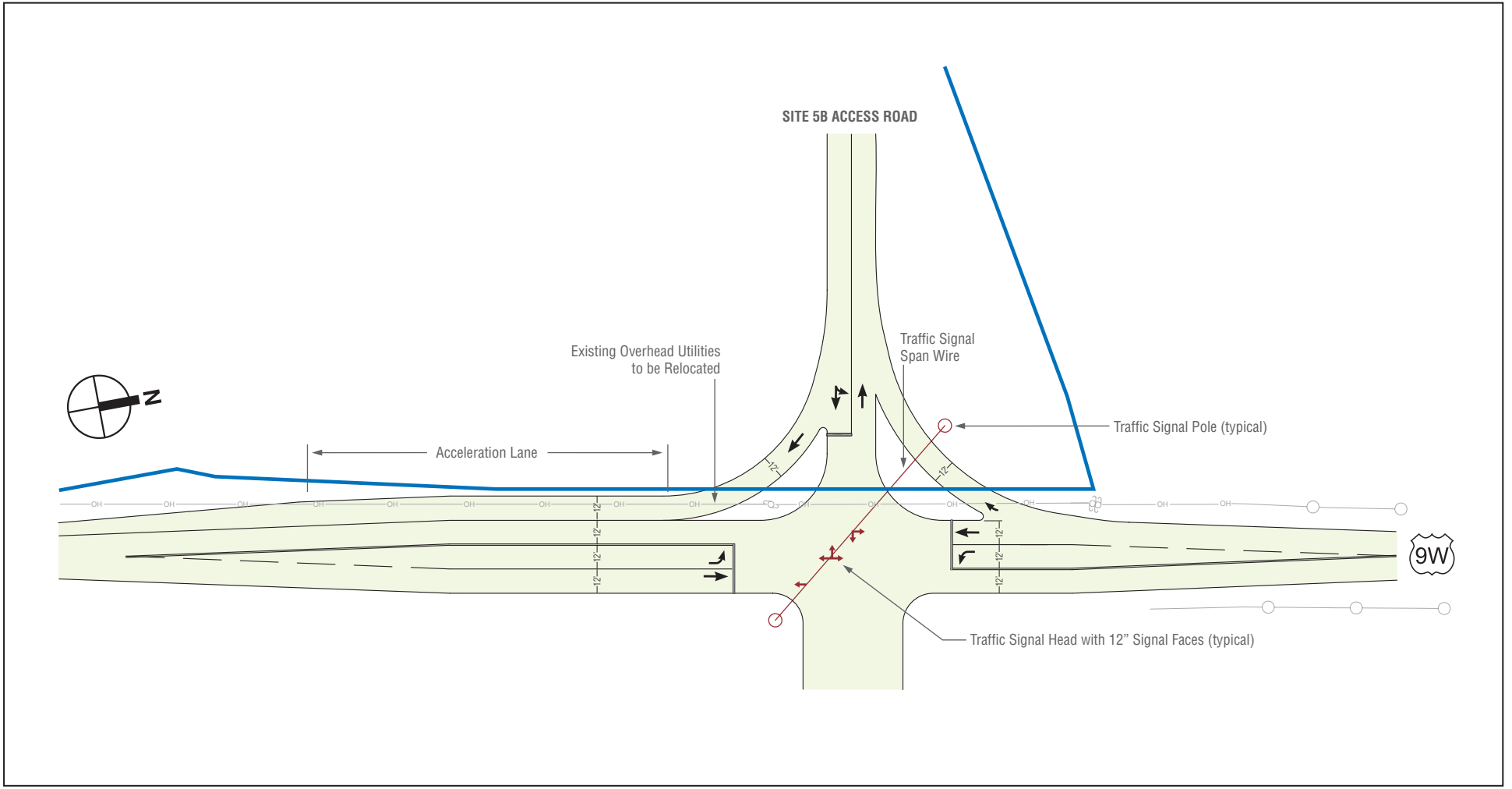
As described in detail in Section 2.14, “Infrastructure,” soil erosion and sediment control devices would also be installed throughout the site, including around the perimeter of the stormwater detention and sedimentation basin, along the site’s Route 9W frontage, along the new site roadways, and at the limits of disturbance. Channel protection along the existing stream would be installed.

Site Access, Roads, and Parking

As discussed above, during the early stages of Phase 1: Site Preparation, the existing southern driveway would provide access to the west connection site. Early in Phase 1: Site Preparation, the driveway would be improved as needed to support construction activities until the new site entrance is in place.

The new site access and an internal roadway system would be required to provide access to and egress from the site and to provide internal circulation. Because the west connection site has a large change in elevation between its eastern and western portions, the internal roadway system would be configured to wind from the new entrance through the site, thereby allowing an acceptable grade change for vehicles. The internal roadway system would be paved.

Once the new site entrance is in place, it is anticipated that the existing southern driveway would no longer be used except for emergency access. The new site entrance would serve as the primary location for access to and egress from the west connection site. In connection with this new site entrance, Route 9W would be reconfigured to provide a dedicated left-turn lane for northbound traffic to access the site and a dedicated right-turn lane for southbound traffic to access the site (see **Figure 2.1-5**). A new traffic signal would be installed at this location. These measures would be implemented to enhance safety for trucks entering and leaving the site. Based on meetings conducted with NYSDOT before the DEIS was issued, it was determined that the southbound right- and left-turn lanes would remain in place after construction is complete; the northbound left-turn lane space would remain but would be converted to a painted median opposite the southbound left-turn lane.



 West Connection Site Boundary



Figure 2.1-5
West Connection Site: Proposed Site Driveway

In order to construct the site entrance and install the traffic signal, partial lane closures (with lane shifts) may be necessary on Route 9W. These partial lane closures would require approval by the New York State Department of Transportation (NYSDOT), and Work Zone Traffic Control Plans (WZTCPs) would be implemented to ensure safe traffic operating conditions within the work zone.

Parking for construction workers would be accommodated on the west connection site within the limits of disturbance shown; no dedicated parking locations would be provided during this phase.

Power Supply, Water Supply, and Wastewater Treatment and Disposal

New electrical service and water supply would be needed at the west connection site to support construction. Additionally, systems for sewage disposal would be needed.

Power Supply

During Phase 1: Site Preparation, power would be supplied at the west connection site by on-site generators. An electric substation to provide power during later construction phases on the west connection site is planned to be built during this phase. The electric substation would connect to Central Hudson Gas & Electric's (CHG&E) existing power supply network.

Water Supply

During Phase 1: Site Preparation, bottled potable water would be provided for consumption. Non-potable water would be needed for equipment washdown and dust control, and would be trucked to the site and stored for use in a water tank.

A long-term potable water supply is required for later phases of construction. Therefore, Phase 1 would also include a connection to the Town of Newburgh water supply; to make this connection, a water main would be extended from the west connection site along Route 9W to the town's existing main. A pump station would be constructed on the west connection site to boost pressure of the water that would be drawn from the water main extension.

Long-term non-potable water needs would be met with a combination of sources, potentially including the town supply and re-use of treated construction dewatering discharges. A well monitoring program would be implemented for the existing well to remain on the west connection site and the well located at 5505 Route 9W, Newburgh. Coordination would be undertaken with the off-site property owner to install a well filter, and well level sensor and provide filter maintenance. If any of the wells being monitored are impacted by the construction of Project 1, such that the well production or the water quality is less than satisfactory, an alternate supply of potable water to each household impacted, up to 300 gallons per household per day, would be provided until the issue has been sufficiently resolved.

Dewatering Pipeline

In addition to the water main described above, construction would commence on- and off-site for a dewatering pipeline that would be needed during Phase 3: Bypass Tunnel Excavation. As

described in Chapter 1, “Program Description,” there are two options for the pipeline route that were considered in the DEIS. Both options involved the construction of a dewatering pipeline over a mile long that would require special stream and road culvert crossings to be constructed (see **Figure 2.1-6**). Subsequent to the issuance of the DEIS, while Figure 2.1-6 depicts both options, DEP advanced the design of the dewatering pipeline that would be constructed from the west connection site to the Hudson River, selecting one potential dewatering pipeline route (Option 2 in the DEIS) as the only route further evaluated for the FEIS. In March 2012, DEP submitted a Joint Application to USACE for an individual permit for the dewatering pipeline as well as the water main extension and other project elements, and to NYSDEC with supplemental information to facilitate its review in the context of Protection of Waters and 401 Water Quality Certification approvals.

Where the route of the dewatering pipeline and the water main extension overlap (along Route 9W from the site entrance to Old Post Road), work would be coordinated and would occur simultaneously to minimize disruptions to the Route 9W corridor. Similarly to the installation of the new site entrance and traffic signal, construction of the dewatering pipeline and the water main extension from the northern driveway to Old Post Road could necessitate partial lane closures (with lane shifts) on Route 9W. NYSDOT approval and a WZTCP would be required.

Sanitary Sewage Disposal

During Phase 1: Site Preparation, sanitary wastewater from the west connection site would be pumped and hauled from the site.

Other Elements

During Phase 1: Site Preparation, work areas would be located on the west connection site. Field offices for the project engineer and contractor would be installed on the site in a temporary staging area. Staging areas would be covered with gravel.








In addition, construction would likely commence on a dewatering treatment plant to be used in Phase 2: Shaft Construction (see below).

2.1-3.2 PHASE 2: SHAFT CONSTRUCTION—WEST CONNECTION SITE

Phase 2: Shaft Construction would consist of the construction of a new shaft (Shaft 5B) on the west connection site (see **Figure 2.1-7**). The shaft would be located in the northern portion of the west connection site and would extend to a depth of approximately 900 feet below local grade. Support equipment and a crane would likely be located adjacent to the shaft; the crane would be used to provide access to the shaft for materials and equipment. A bin would also be located in this area to store muck from excavation of the shaft before it is transported by truck off-site. The disposal location for these excavated materials would be determined by the contractor.

Construction of the shaft would be undertaken by excavating the shaft through rock to the elevation of the bypass tunnel where a “bellout” would be constructed. A bellout is a wider



-  West Connection Site
-  Dewatering Pipeline Option 1
-  Dewatering Pipeline Option 2
-  Water Main Extension
-  Stream/Culvert Crossing
-  Road Crossing
-  Railroad and Utility Crossing

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Figure 2.1-6

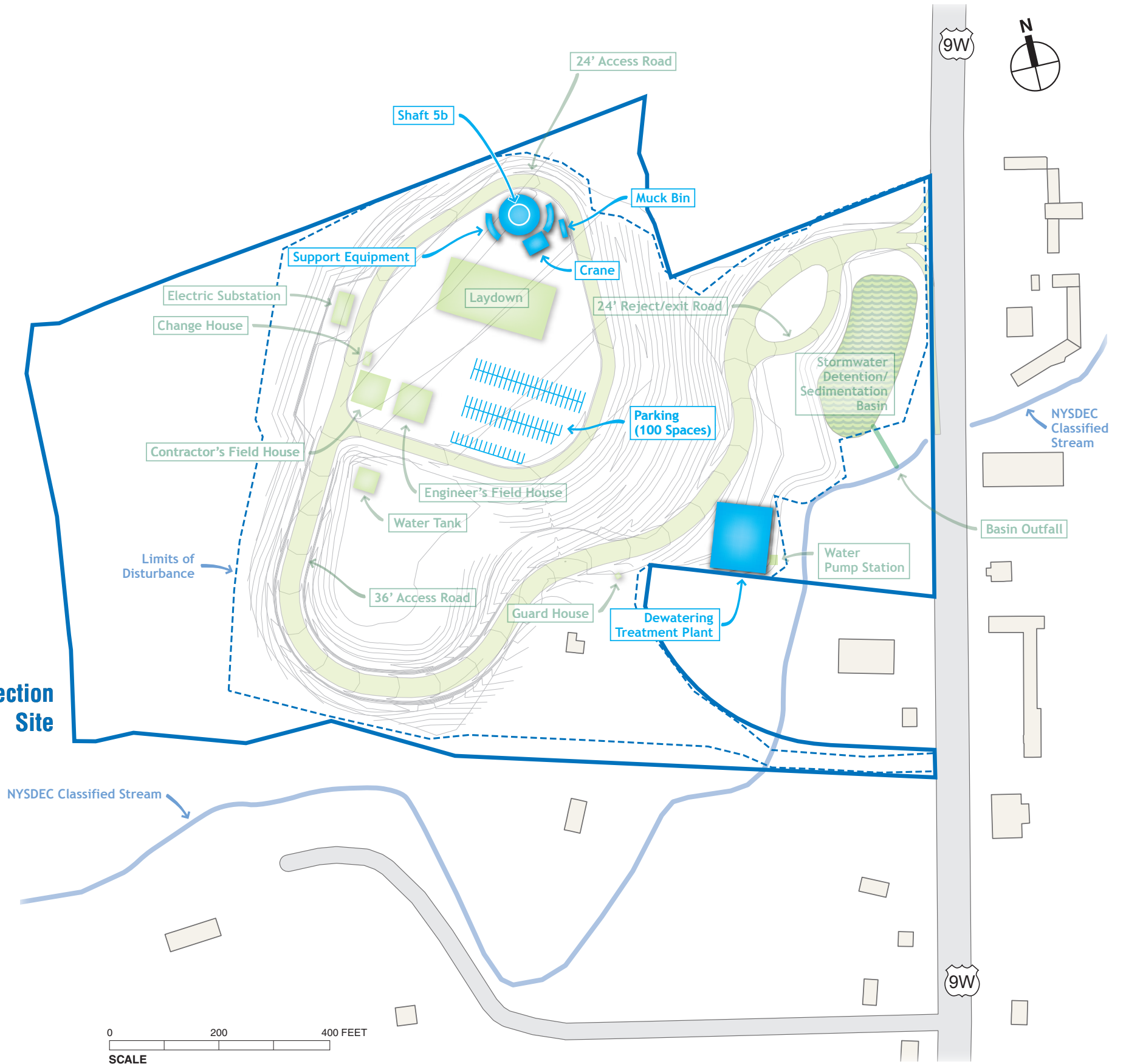
West Connection Site: Water Main Extension and Dewatering Pipeline

KEY MAP



12.16.11

West Connection Site



CONSTRUCTION SCHEDULE

WEST CONNECTION SITE	2013	2014	2015	2016	2017	2018	2019	2020
Phase 1: Site Preparation	█							
Phase 2: Shaft Construction		█						
Phase 3: Tunnel Excavation			█					
Phase 4: Bypass Tunnel Lining, Project 1 Demobilization, and Project 2B Preparation							█	

West Connection Site

Figure 2.1-7 Phase 2: Shaft Construction

portion of the shaft at the bottom where support structures would be installed to ensure the structural integrity of the shaft and where the tunnel boring machine (TBM) assembly would take place. The total excavation diameter of the shaft would be approximately 32 feet wide. The finished interior diameter of the shaft would be approximately 28 feet, and the bellout would be approximately 41 feet. The support structures within the bellout would consist of temporary walls that would then be replaced by a permanent concrete lining.

Excavation of the shaft through rock is anticipated to advance in 100-foot increments using controlled drilling and blasting. The rock loosened during blasting of the shaft would be removed upward through the shaft itself, stockpiled at the surface, and then removed from the west connection site by truck. Blasting would be required intermittently for approximately 3 to 6 months during Phase 1: Site Preparation in connection with site grading. Blasting would also be required for the full duration of Phase 2: Shaft Construction in connection with construction of the shaft, for approximately 13 months, for a total of between 16 and 19 months. ~~During the approximately 16 to 19 month period~~ When blasting would occur, one to two blasts can be expected on a given day. Based on experience with other construction projects that involve blasting, it is expected that blasting would typically occur during the first shift (7 AM to 3 PM). In general, the blast would not likely occur immediately at the start of work, since it takes time to set up and prepare the charge. The second blast, if it occurred at all, would generally occur in the early afternoon. More information on blasting is provided later in this chapter.

During construction of the shaft, measures would be implemented to reduce the amount of groundwater infiltrating into the shaft. These measures would consist of the installation of piles during the excavation through soil, and grout injection during the excavation through bedrock. Groundwater that is recovered during shaft construction would be directed to the dewatering treatment plant constructed during Phase 1: Site Preparation. The recovered groundwater is anticipated to intermittently flow at up to 1 million gallons per day (mgd). This water would be treated and stored for re-use for non-potable construction needs. Any excess would be discharged to the Class C stream on the west connection site.

The stormwater management system installed during Phase 1: Site Preparation would remain in place and would accommodate Phase 2: Shaft Construction work.

2.1-3.3 PHASE 3: BYPASS TUNNEL EXCAVATION—WEST CONNECTION SITE

Phase 3: Tunnel Excavation would follow, which would consist of the construction of the bypass tunnel, a portion of the connector tunnel¹, and a portion of the inundation plug. This section first

¹ As described in Chapter 1, “Program Description,” the connector tunnel is the relatively short tunnel that provides the ultimate connection from the bypass tunnel to the existing aqueduct. In this phase, only a portion of the connector tunnel would be constructed. The remaining segment would be constructed during the connection of the bypass tunnel to the existing Delaware Aqueduct (Project 2B).

describes the Phase 3 construction and then discusses the support facilities that would be needed for this phase. **Figure 2.1-8** shows the potential site layout during Phase 3.

STARTER, CONNECTOR, AND BYPASS TUNNELS

First, a 300-foot starter tunnel would be drilled and blasted from the bellout. The TBM would be assembled at the base of the west connection shaft in the bellout and in the starter tunnel, where the initial launch of the TBM would take place. The starter tunnel would be larger than the tunnel the TBM would bore, allowing access to the machine to prepare it for tunneling.

The connector tunnel would be constructed using drill and blast methods with support provided by rock bolts, shotcrete, steel ribs, and a cast-in-place concrete final liner. During Phase 3: Bypass Tunnel Excavation, only a portion of the connector tunnel would be constructed, advancing to a predetermined safe distance from the existing aqueduct; the final connection between the connector tunnel and the existing aqueduct would be made during Project 2B, Bypass Tunnel Connection and RWBT Inspection and Repair, including Wawarsing, as described in Chapter 4.

The most significant construction during Phase 3 is the excavation of the bypass tunnel, which would take place in a series of steps. First, the TBM would be mobilized, wherein it is delivered to the site in pieces. These pieces would be lowered down the shaft and assembled at depth. Only then would excavation of the tunnel begin.

The bypass tunnel would be constructed using a shielded TBM. The TBM would consist of a drill head attached to several hundred feet of machinery; this machinery would power the drilling head, move the spoils or muck so it can be removed through the west connection shaft, and propel the TBM forward. The circular drill head would be outfitted with numerous rotating, hardened steel roller bits, which would cut as they rotate, producing a circular tunnel (see Figure 1-7). At the rear of the drilling head, hydraulic jacks would exert high pressure against the newly drilled bypass tunnel to push the machine's drilling head against the rock or soil face.

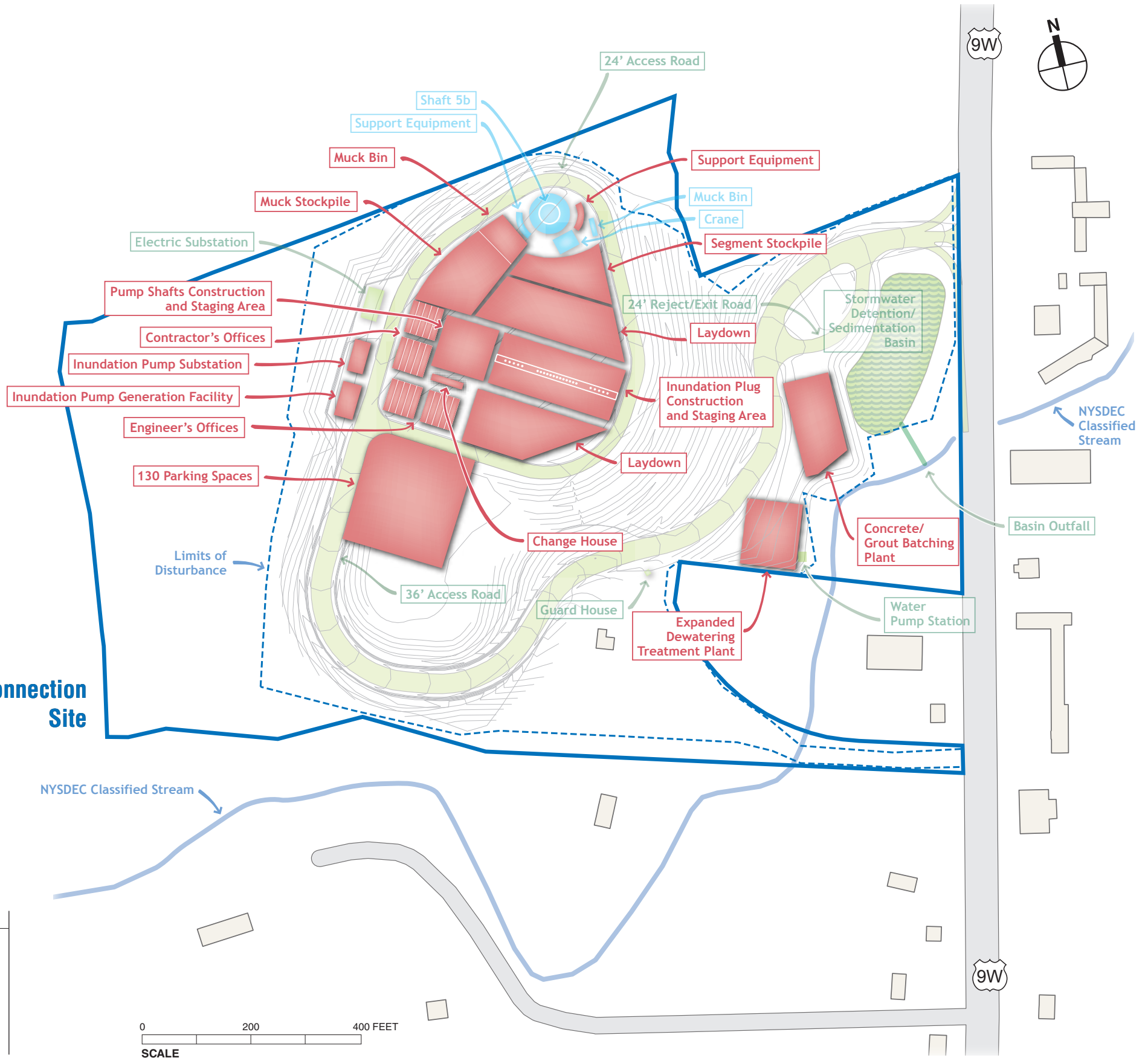
The TBM for Project 1 would operate by installing tunnel support systems concurrently with the excavation. Such supports would protect the tunnel workers and also create the bypass tunnel's interior walls. Next, pre-cast concrete tunnel liners would then be installed. As the concrete liner is installed, voids between the lining and the rock would be sealed by injecting cement grout under high pressure into the voids. This is to create an effective barrier against the seepage of water into the bypass tunnel. An additional second liner would be installed during Phase 4: Tunnel Lining.

Behind the drill head (the cutting wheel at the face of the TBM), the TBM would have long compartments containing computerized control rooms from which the boring operations would be conducted. Behind those compartments, trailing gear on wheels would support the drilling operations. This equipment would include pumps, transformers, and grouting equipment, as well

KEY MAP



5.2.12



CONSTRUCTION SCHEDULE

WEST CONNECTION SITE	2013	2014	2015	2016	2017	2018	2019	2020
Phase 1: Site Preparation	█							
Phase 2: Shaft Construction		█						
Phase 3: Tunnel Excavation			█					
Phase 4: Bypass Tunnel Lining, Project 1 Demobilization, and Project 2B Preparation							█	

West Connection Site

Phase 3: Bypass Tunnel Excavation

Figure 2.1-8

as mechanisms for removing the excavated rock and conveying it back behind the machine by either rail or conveyor.

The TBM would be powered by electricity from the substation constructed during Phase 1: Site Preparation at the west connection site. This power would be supplied to the machines through feeder cables running through the bypass tunnel as drilling progresses.

The TBM would be launched from the west connection site and extracted at the east connection site. To reach the east connection site, the TBM would travel approximately 2.3 miles and generate approximately 460,000 cubic yards of spoils, which would be transported from the west connection site by trucks.

INUNDATION PLUG

The final construction element During Phase 3: Bypass Tunnel Excavation, is construction of facilities to support installation of an inundation plug during Project 2B.²

The inundation plug would be constructed using drill rigs to drill 26 approximately 18-inch diameter vertical holes (the plug holes) into the existing tunnel. During Phase 3, these holes would be drilled to a safe distance above the existing aqueduct (see **Figure 2.1-9**), with the remaining depth drilled during Project 2B. In addition, three pump shafts would be constructed to a safe distance above the aqueduct.³ The pumps associated with the construction of the inundation plug would have their own substation and backup generator (inundation pump substation), which would be constructed as part of Phase 3: Tunnel Excavation.

SUPPORT FACILITIES

Stormwater Management System

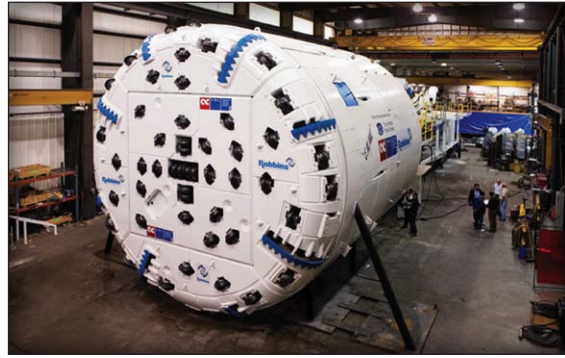
The stormwater management system developed under Phase 1: Site Preparation would be maintained and would continue to manage stormwater runoff at the site.

Construction Dewatering Treatment and Disposal

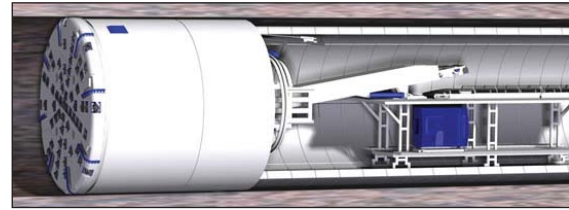
Groundwater that infiltrates the tunnel during Phase 3: Bypass Tunnel Excavation would be pumped to the surface for treatment in the dewatering treatment plant, which would be expanded during this phase to treat the additional flow of up to 3 mgd that is expected at times. During

² As described in Chapter 1, “Program Description,” the purpose of the inundation plug is to block off the leaking area of the RWBT in Roseton in the event that water inflow from the Hudson River exceeds DEP’s ability to pump water out of the tunnel during construction of Project 2B. Initial construction of the inundation plugs would begin during construction of Project 1; the inundation plugs would be completed, if needed, during Project 2B.

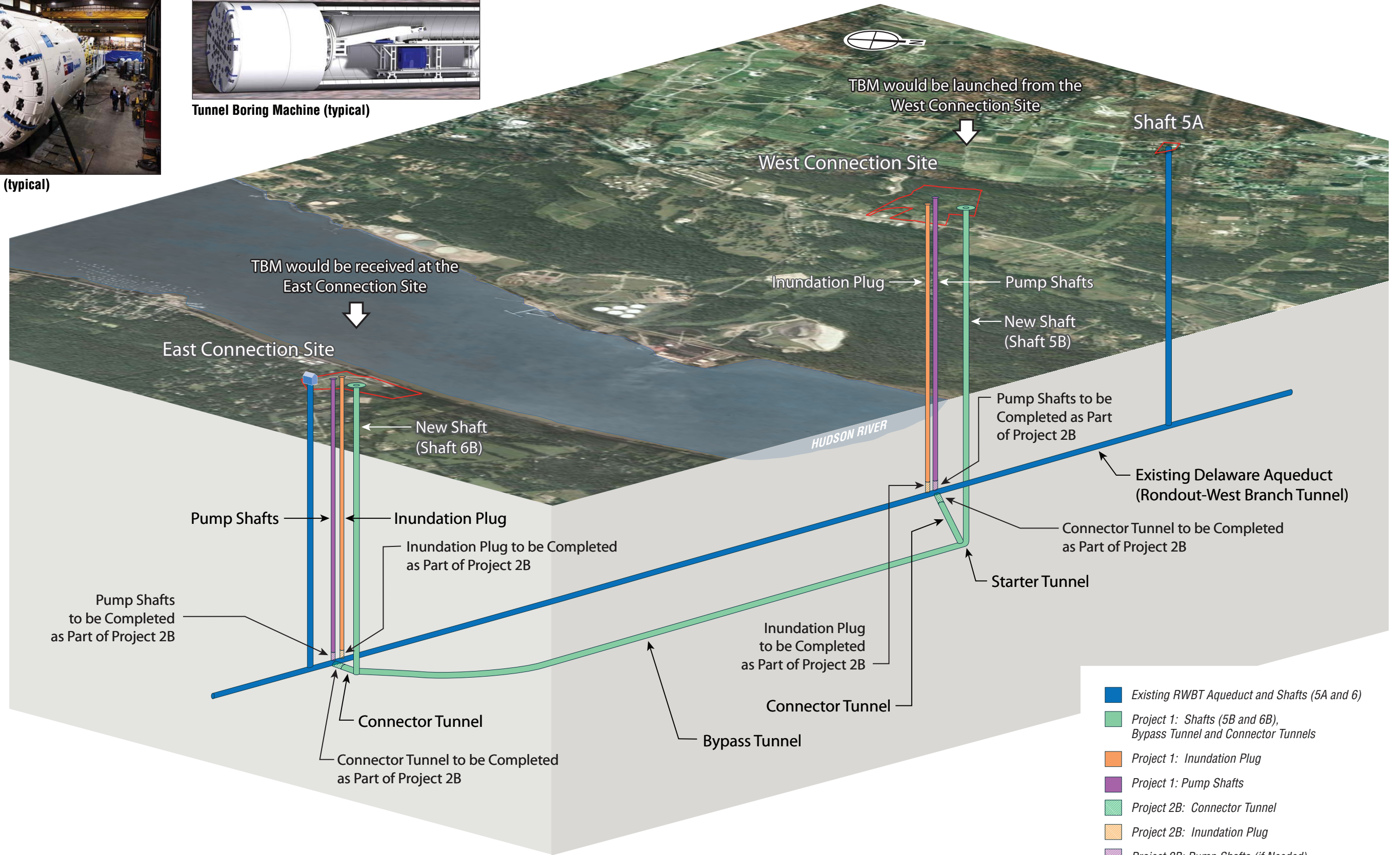
³ As described in Chapter 1, “Program Description,” water would be pumped out of the tunnel through the pump shafts, if needed, during Project 2B.



Tunnel Boring Machine (typical)



Tunnel Boring Machine (typical)



This Figure Has Been Modified Since the DEIS

Figure 2-1.9

Bypass Tunnel: Major Components (Illustrative View)

Phase 3, the treated water would continue to be re-used for non-potable supply, with any excess disposed of through the dewatering pipeline described above (~~Option 1 or Option 2~~).

Grout/Concrete Batch Plant

At the beginning of this phase, a grout/concrete batch plant would be constructed and used to provide grout during the placement of the pre-cast concrete segments by the TBM. The batch plant would also produce concrete for the final bypass tunnel lining and connector tunnels during Phase 4 as well as for the connector tunnels, junction chambers, and other project elements for Project 2B. Sand, aggregate, cement, and water would be processed to produce the concrete.

2.1-3.4 PHASE 4: BYPASS TUNNEL LINING, PROJECT 1 DEMOBILIZATION, AND PREPARATION FOR PROJECT 2B—WEST CONNECTION SITE

Phase 4: Bypass Tunnel Lining, Project 1 Demobilization, and Preparation for Project 2B would consist of two main efforts: (1) Bypass Tunnel Lining and (2) Project 1 Demobilization and Preparation for Project 2B, as described below (see **Figure 2.1-10**, which shows the potential site layout during Phase 4).

BYPASS TUNNEL LINING

During this phase, a steel liner, which would be made up of steel segments, would be installed within certain segments of the bypass tunnel to reinforce the tunnel in areas where the surrounding rock is weak or disintegrated. Following installation of the steel liner, a cast-in-place concrete liner would be installed throughout the full length of the bypass tunnel, as well as the starter tunnel and connector tunnels.

Also during this phase, a shaft plug and access chamber would be constructed. These permanent structures would be underground after final grading is completed following Project 2B, and would allow future access to the shaft and the bypass tunnel.

PROJECT 1 DEMOBILIZATION AND PREPARATION FOR PROJECT 2B

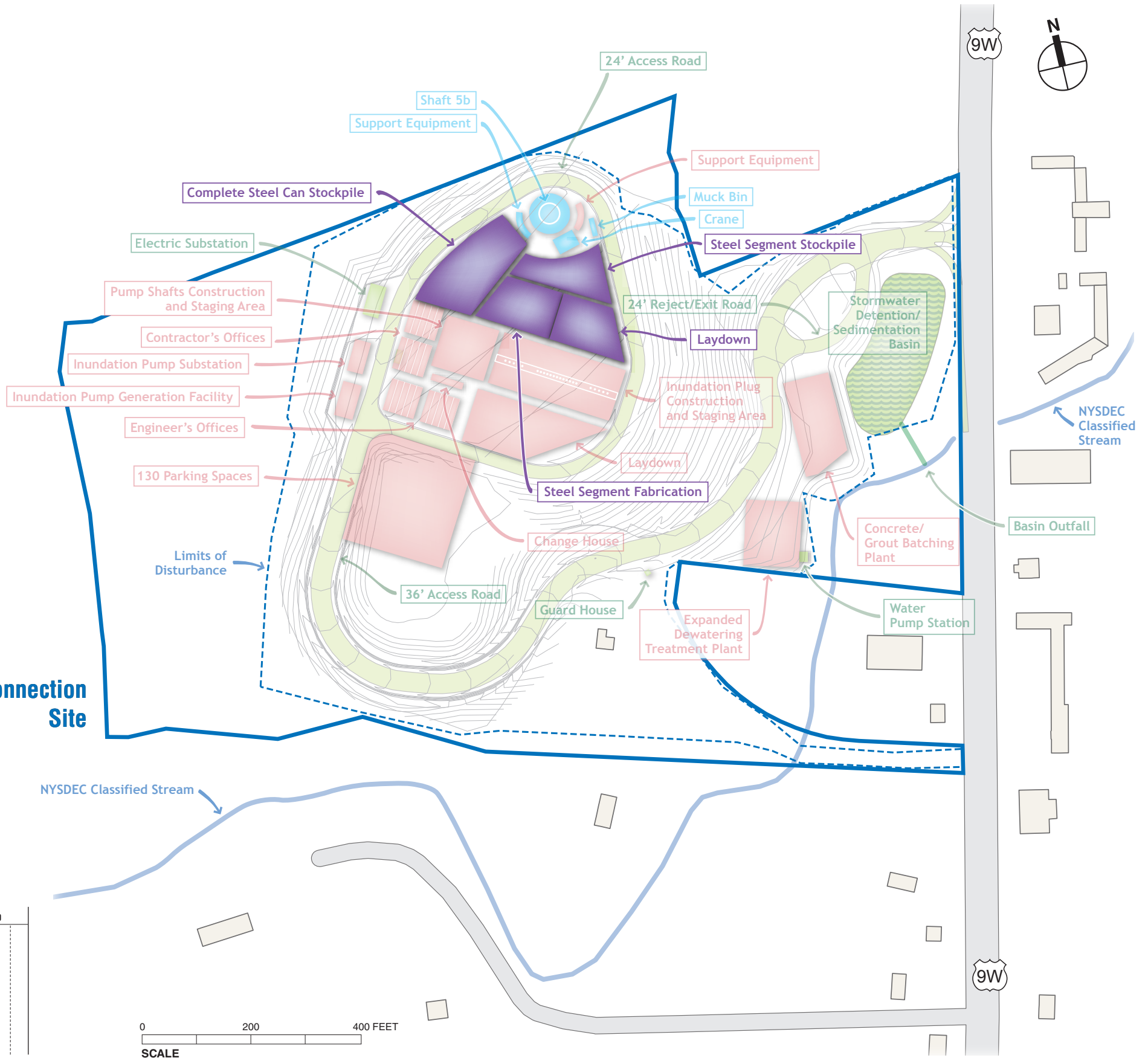
Toward the end of Phase 4, the shaft and bypass tunnel workers and equipment would be demobilized and the site would be prepared for Project 2B, Bypass Tunnel Connection and RWBT Inspection and Repair, including Wawarsing.

2.1-4 LEVEL OF ACTIVITY AT THE WEST CONNECTION SITE (WORKERS, TRUCKS, AND EQUIPMENT)

As discussed above, the intensity of construction work for the construction phases would vary over time. This section describes this variation and highlights peak activities.

This section starts with a discussion of work hours and is followed by a discussion of estimated truck trips and construction workers at the west connection site.

KEY MAP



CONSTRUCTION SCHEDULE

WEST CONNECTION SITE	2013	2014	2015	2016	2017	2018	2019	2020
Phase 1: Site Preparation	█	█						
Phase 2: Shaft Construction		█	█					
Phase 3: Tunnel Excavation			█	█	█	█	█	
Phase 4: Bypass Tunnel Lining, Project 1 Demobilization, and Project 2B Preparation							█	█

West Connection Site

Figure 2.1-10
Phase 4: Bypass Tunnel Lining

2.1-4.1 HOURS OF WORK

Table 2.1-1 provides a summary of the number of shifts per day, the number of days per week in which work would take place, work hours, and the length of time each phase is expected to last at the west connection site. As shown in the table, construction at the west connection site would be expected to occur Monday through Friday with the exception of Phase 1: Site Preparation, which would also require Saturday work.

Table 2.1-1
West Connection Site: Hours of Work

Phase	Shifts/Day	Days/Week	Work Hours
Phase 1: Site Preparation (One shift for first and last 4 months and two shifts for 6 months)	1 or 2	6	1 Shift: 7 AM to 7 PM 2 Shifts: 7 AM to 11 PM
Phase 2: Shaft Construction (13 months, with 1-month overlap with Phase 1)	3	5	24 hours/day
Phase 3: Tunnel Excavation (except Inundation Plug work) (43 months)	3	5	24 hours/day
Phase 3: Tunnel Excavation (Inundation Plug work) (13 months; longer if fewer than 3 drill rigs employed)	2	5	7 AM to 11PM
Phase 4: Bypass Tunnel Lining/Project 1 Demobilization and Preparation for Project 2B (19 months)	3	5	24 hours/day
Note: During Phase 1: Site Preparation, such activities as demolition, tree clearing, and log hauling would generally occur during one shift, while rock cutting, breaking, blasting, grading, and paving activities would occur over two shifts.			

For the first 4 months of Phase 1: Site Preparation (first quarter 2013), it is expected with weather conditions permitting that work would be undertaken during a single daily 12-hour shift, beginning at around 7 AM and ending at 7 PM. Beginning in the second quarter of 2013 and for approximately 6 months, work would be undertaken in two 8-hour shifts (between 7 AM and 11 PM). For the remainder of Phase 1, work would be undertaken in one daily 12-hour shift. In general for Phase 1: Site Preparation, activities such as demolition, tree clearing, and log hauling would generally occur during one shift, while rock cutting, breaking, blasting, grading, and paving activities would occur over two shifts.

As Phase 1 nears completion, Phase 2: Shaft Construction would begin. At this time, work would generally shift to a 24-hour/day cycle of three 8-hour shifts, and continue through Phase 3: Bypass Tunnel Excavation and Phase 4: Bypass Tunnel Lining, Project 1 Demobilization, and Preparation for Project 2B. Some work, such as the inundation plugs undertaken during Phase 3, would have distinct work efforts; this work would be undertaken in two 8-hour shifts. The inundation plug work duration would depend on the number of drill rigs employed by the contractor; if the contractor employs three drill rigs, the inundation plug drilling work would occur over an approximately 16-month period in 2015 and 2016. If only one or two rigs are employed on site during this phase, the duration would be longer. For the morning shift, it is anticipated that some workers would arrive as early as 6 AM and most would leave within

approximately half an hour of the end of their shift. At limited times, late-night deliveries during construction would be necessary due to traffic agency restrictions that require large trucks to make bridge crossings at night (see “2.1-4.2, Truck Projections,” below).

As discussed above, certain phases of the construction program, such as those that are related to underground tunneling work, would require 24-hours per day work. The nature and safety requirements of tunneling work mandate a 24-hour cycle. In addition, extended work hours for site preparation are projected along with 24-hour work days for shaft construction, because these two phases need to be completed to allow start of the TBM work as soon as practical.

2.1-4.2 TRUCK PROJECTIONS

~~Based on the likely activities involved in Phases 1 through 4, Estimates of the maximum average and maximum number of daily truck trips were generated for the anticipated 7½ years of construction at the west connection site based on the amount of material being brought to and from the connection site, the average truck capacity, and the likely activities within each construction phase that are expected to occur at the same time within the current schedule.~~ **Table 2.1-2** provides the maximum average trucks trips by key phase. As shown in Table 2.1-2, truck trip estimates would vary over the construction phases, with the greatest amount of truck trips sustained over a long period due to muck removal as the TBM advances (Phase 3: Tunnel Excavation). During this period, the maximum average reported is for the duration of the current schedule (e.g., 90 trucks trips per day over 43 months) and the ratio would vary by construction phase. ~~Number of truck trips per day would be 90 (i.e., 45 trucks with two trips per truck, one in and one out of the site).~~

Table 2.1-2
West Connection Site: Maximum Average Trucks Trips by Construction Phase

Phase	Maximum Average Truck Trips (per day)
Phase 1: Site Preparation	26
Phase 2: Shaft Construction	38
Phase 3: Tunnel Excavation	90
Phase 4: Bypass Tunnel Lining, Project 1 Demobilization, and Preparation for Project 2B	30 off-site truck trips 82 truck trips going from the west connection site to the east connection site.
Note: Each truck results in two truck trips.	

2.1-4.3 WORKER PROJECTIONS

Based on the likely activities involved in Phases 1 through 4, estimates of the average maximum number of construction workers were developed for the anticipated 7½ years of construction at the west connection site. The number of workers on-site would vary with the various work shifts and would also vary over the construction phases, as shown in **Table 2.1-3**, which provides a summary of the maximum estimated workers for the four phases of Project 1.

Table 2.1-3
West Connection Site: Maximum Estimated Workers (by Phase)

	7 AM – 3 PM	3PM – 11 PM	11 PM – 7 AM	Total Daily
Phase 1: Site Preparation	57	57	-	114
Phase 2: Shaft Construction	48	42	42	132
Phase 3: Bypass Tunnel Excavation	81	81	66	228
Phase 4: Bypass Tunnel Lining, Project 1 Demobilization, and Preparation for Project 2B	69	63	64	195

2.1-5 DESCRIPTION OF CONSTRUCTION PHASES—EAST CONNECTION SITE

On the east connection site, Phase 1: Site Preparation is expected to begin in early 2013 and be complete in the fourth quarter of the same year. Phase 2: Shaft Construction, which would consist of the construction of a new shaft, would overlap with Phase 1, and is expected to commence in mid-2013 and continue to mid-2015. Phase 3: Bypass Tunnel Excavation would consist of the construction of the first part of a connector tunnel and inundation plug and the removal of the TBM. Phase 3 is expected to extend from mid-2015 through the end of the third quarter of 2018. Phase 4: Bypass Tunnel Lining, Project 1 Demobilization, and Project 2B Preparation are expected to commence in late 2018 and be complete in early 2019. Figure 2.1-1 shows the anticipated schedule for construction at the east connection site.

2.1-5.1 PHASE 1: SITE PREPARATION—EAST CONNECTION SITE

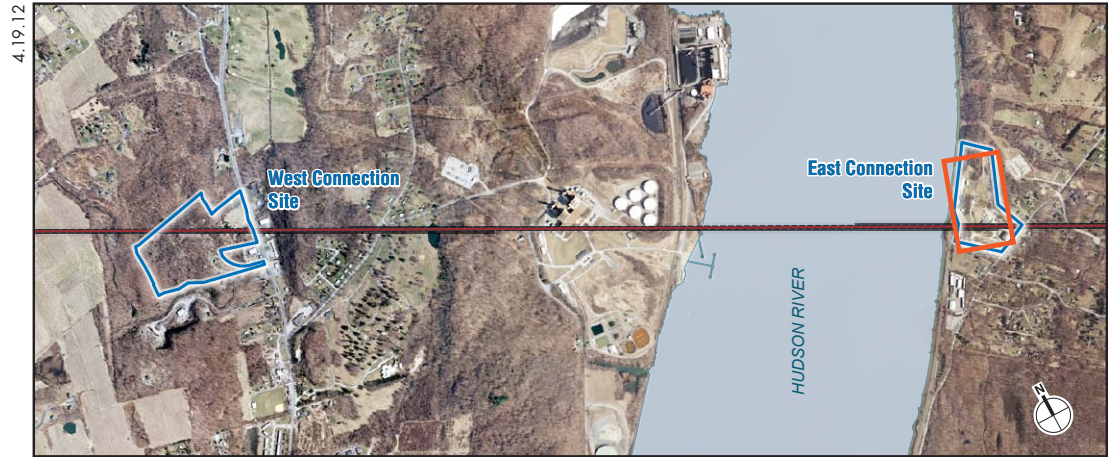
Phase 1: Site Preparation would consist of the removal or relocation of certain on-site buildings, trailers, and storage containers that would be on site in connection with DEP’s tunnel and shaft rehabilitation construction effort (see **Figure 2.1-11**).⁴ In addition, certain facilities would be constructed in preparation for future construction phases (see **Figure 2.1-12**).

It should be noted that certain elements that would be developed on the east connection site, such as the driveway, internal roadways, and stormwater management system, would be constructed in the approximate locations shown on the figures in this section. Certain infrastructure could ultimately be developed in locations on the site other than those shown in the figures to allow the construction contractor sufficient flexibility to most efficiently complete any necessary work. The subsequent sections within Chapter 2 represent reasonable worst-case analyses with respect to these types of elements. Regardless of whether an element is fixed or flexible, construction on the east connection site would remain within the limits of disturbance shown on Figure 2.1-2.

This section describes the likely activities that would occur during Phase 1: Site Preparation.

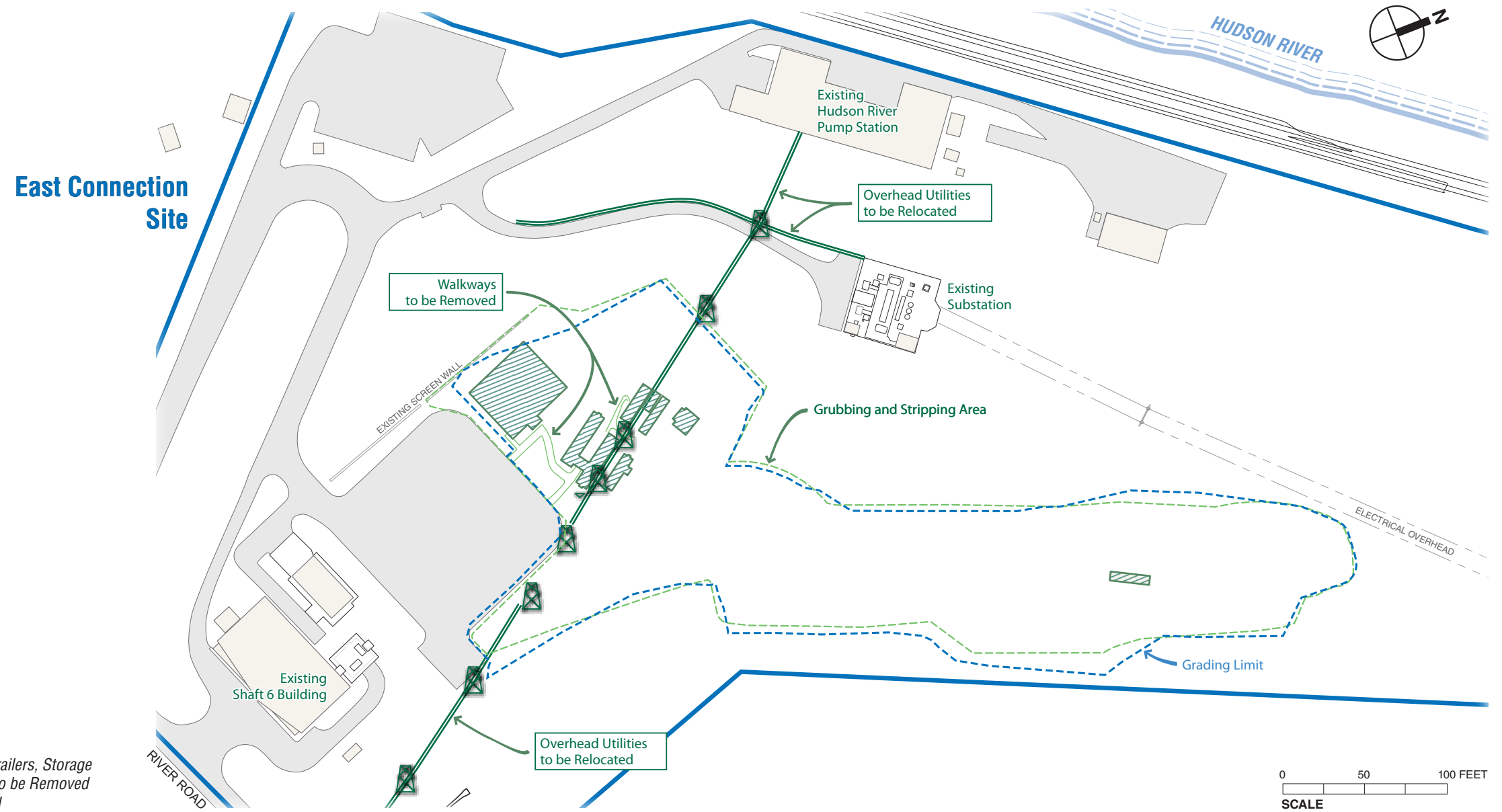
⁴ As described in Chapter 1, “Program Description,” the tunnel and shaft rehabilitation work will improve DEP’s capability to unwater the tunnel and is expected to be complete in 2013.

KEY MAP



CONSTRUCTION SCHEDULE

EAST CONNECTION SITE	2013	2014	2015	2016	2017	2018	2019
Phase 1: Site Preparation	█						
Phase 2: Shaft Construction	█						
Phase 3: Tunnel Excavation			█				
Phase 4: Bypass Tunnel Lining, Project 1 Demobilization, and Project 2B Preparation						█	



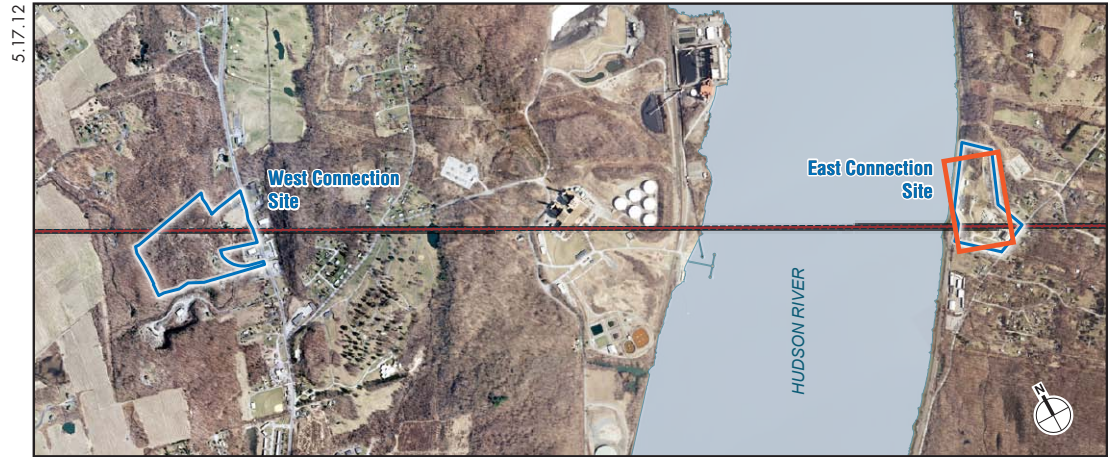
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East Connection Site

Phase 1: Site Preparation (Demolition and Clearing)

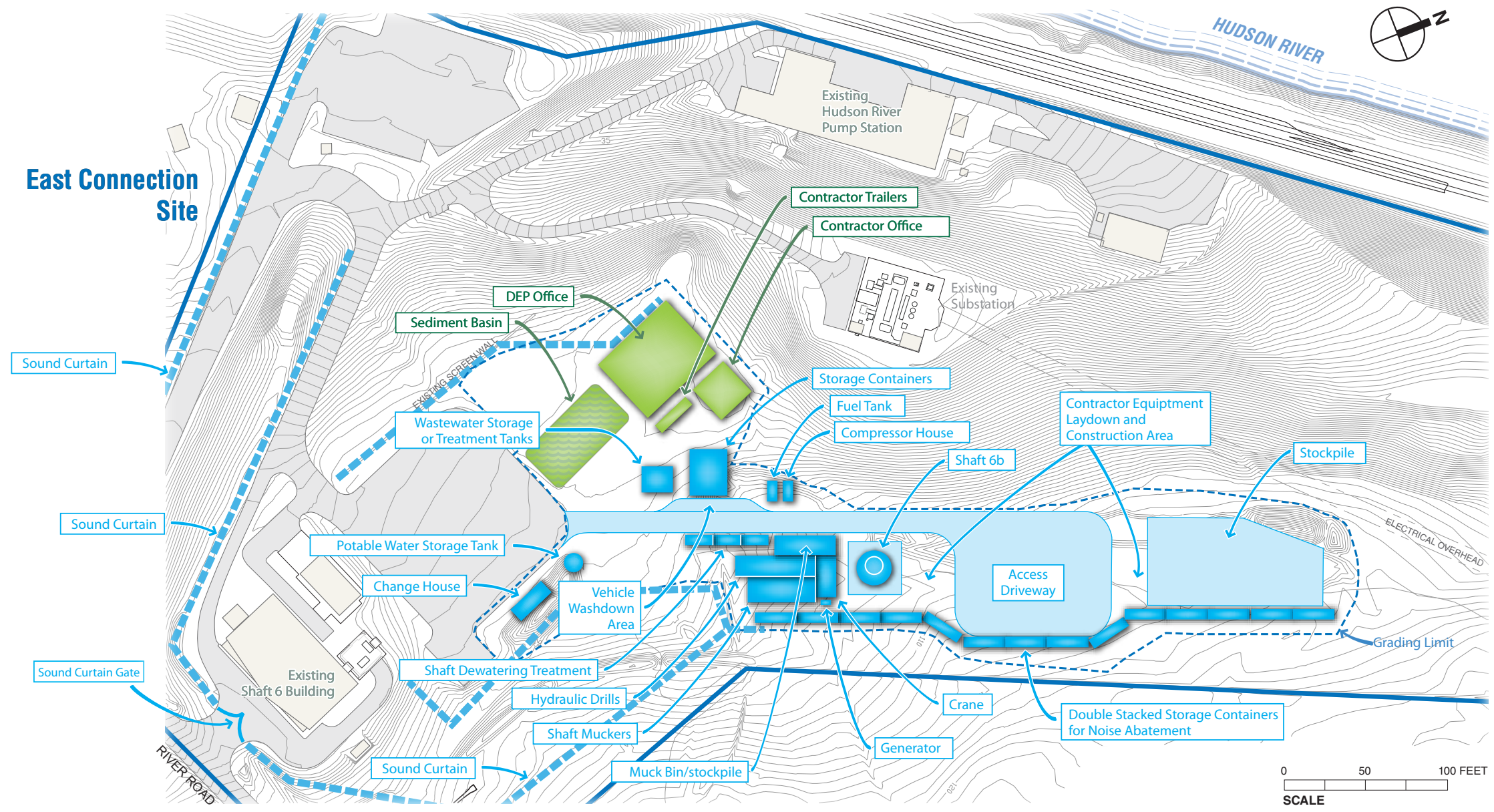
Figure 2.1-11

KEY MAP



CONSTRUCTION SCHEDULE

EAST CONNECTION SITE	2013	2014	2015	2016	2017	2018	2019
Phase 1: Site Preparation	█						
Phase 2: Shaft Construction	█						
Phase 3: Tunnel Excavation			█				
Phase 4: Bypass Tunnel Lining, Project 1 Demobilization, and Project 2B Preparation						█	



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East Connection Site Phase 1: Site Preparation (Site infrastructure) and Phase 2: Shaft Construction

Figure 2.1-12

DEMOLITION, SITE CLEARING, AND GRADING

The east connection site generally slopes toward the Hudson River. At the east connection site, approximately 4.1 acres would be cleared and graded as part of site preparation (see “Limits of Disturbance” on Figure 2.1-11). Within this area, the site’s vegetative cover, which includes brush, shrubs, and trees, would be cleared (see Section 2.8, “Natural Resources and Water Resources”). Existing features of the site that would be demolished or relocated (shown on Figure 2.1-11) include existing overhead utilities and several of the existing structures (such as trailers and storage containers) on the site.

Grading would be required on the east connection site (see Figure 2.1-11 for the limits of grading). Site grading would be undertaken using cut and fill techniques. Blasting would likely not be needed for site preparation. The grading plan would seek to reuse as much material on-site as possible. The current grading plan anticipates that no fill would be required to be trucked in during Phase 1: Site Preparation or the subsequent construction phases.

The existing driveway that provides access to the site from River Road would continue to be used for Project 1 construction.

CONSTRUCTION OF ON-SITE INFRASTRUCTURE

The purpose of Phase 1: Site Preparation is to construct the infrastructure required to support future construction phases, as shown in Figure 2.1-12. These facilities include a stormwater management system, and modified power supply, water supply, and wastewater management. Offices and trailers for the contractor would also be put into place.

Stormwater Management System

The site’s existing stormwater management system would be retained and modified to manage stormwater runoff at the site during Project 1 construction. This system would include an additional stormwater detention/sedimentation basin to detain and treat stormwater runoff during clearing, grading, and site preparation activities. The stormwater basin would discharge to the site’s existing stormwater system, which ultimately discharges to the Hudson River. Elements of the existing stormwater management system, such as catch basins, yard drains, conveyance system, underground sand filters, and outfalls, would remain in place and would be protected during construction. Soil erosion and sediment control devices would also be installed throughout the site, including around the perimeter of the stormwater detention and sedimentation basin.

Site Access, Roads, and Parking

The east connection site’s existing roadway system would be used during Phase 1: Site Preparation. Parking for construction workers would be accommodated in the existing parking lot on the east connection site.

Power Supply, Water Supply, and Wastewater Treatment and Disposal

The east connection site's existing power supply, water supply, and wastewater treatment and disposal systems would need to be modified for Project 1 construction.

Power Supply

During Phase 1: Site Preparation, power would be supplied at the east connection site by a new supply feeder from CHG&E. Back-up power generation for health and safety support would be provided by standby generators.

Water Supply

During Phase 1: Site Preparation, potable water would be needed for consumption and restroom facilities. Non-potable water would be used for equipment washdown and dust control. Potable water would be trucked to the site and stored for use in a water tank. Non-potable water would be supplied by an existing tunnel riser from the Delaware Aqueduct during Project 1.

A well monitoring program would be implemented for properties located within 500 feet horizontal distance of the centerline of the east connection site shaft and properties located at 179, 191, 192, 198, 212, 216, 217, 219, and 225 River Road North in the Town of Wappinger. Coordination would be undertaken with these property owners to install well filters and well level sensors, and provide filter maintenance services. If any of the wells being monitored are impacted by the construction of Project 1, such that the well production or the water quality is less than satisfactory, an alternate supply of potable water to each household impacted, up to 300 gallons per household per day, would be provided until the issue has been sufficiently resolved.

An alternate option to provide a reliable potable water supply to the east connection site would involve the potential construction of a water main between the site and the Town of Wappinger water supply (United Wappinger Water District [UWWD]), prior to construction of the east connection shaft under Project 1. The nearest suitable UWWD trunk main is located approximately 3.5 miles northeast of the east connection site and is primarily supplied from a series of deep gravel wells positioned along Wappingers Creek. The district has sufficient excess capacity capable of meeting DEP's daily demand. A connection to the UWWD, would allow for a reliable water supply to the east connection site during construction of Projects 1, 2A, and 2B. Once construction is complete, this water main could potentially provide the town with a connection to the RWBT and a long-term source of potable water.

The proposed water main connection, and subsequent use of the water main and any distribution lines, additional piping, or treatment necessary for the distribution of water within the Town of Wappinger would be subject to a separate environmental review. The construction and environmental review of this water main connection would be undertaken by the Town of Wappinger. If this option is chosen, construction of the water main would be similar to a typical installation along public right-of-ways, and would cover approximately 100 linear feet per day. Temporary Work Zone Traffic Control Plans would likely be implemented, as required, to ensure worker and public safety during construction on or adjacent to public roadways.

Sanitary Sewage Treatment and Disposal

During Phase 1: Site Preparation, sanitary wastewater from the east connection site would be pumped and hauled from the site.

Other Elements

During Phase 1: Site Preparation, work areas would be located on the east connection site. Field offices for the project engineer and contractor would be installed on the site in a temporary staging area.

2.1-5.2 PHASE 2: SHAFT CONSTRUCTION—EAST CONNECTION SITE

Phase 2: Shaft Construction would consist of the construction of a new shaft (Shaft 6B) on the east connection site (see Figure 2.1-12). The shaft would be located along the eastern boundary of the east connection site and would extend to a depth of approximately 600 feet below grade. Support equipment and a crane would likely be located adjacent to the shaft; the crane would be used to provide access to the shaft for materials and equipment. A bin would also be located in this area to store muck from excavation of the shaft before transport by truck off-site.

Construction of the shaft would be undertaken by excavating through soil (the first approximately 70 feet) and then rock for the remainder of the shaft. The finished interior diameter of the shaft would be approximately 33 feet. The total excavation diameter of the shaft would be greater—approximately 36.8 feet—to allow for the installation of support structures to ensure the structural integrity of the shaft. These support structures would consist of temporary walls that would then be replaced by a permanent concrete lining.

Excavation of the shaft through rock is anticipated to advance in 100-foot increments using controlled drilling and blasting. The rock loosened during blasting of the shaft would be removed upward through the shaft itself, stockpiled at the surface, and removed from the east connection site by truck. Blasting would be required intermittently during Phase 2: Shaft Construction in connection with the construction of the shaft for approximately 21 months. During the 21-month period When blasting would occur, one to two blasts can be expected on a given day. Based on experience with other construction projects that involve blasting, it is expected that blasting would typically occur during the first shift (7 AM to 3 PM). In general, the blast would not likely occur immediately at the start of work, since it takes time to set up and prepare the charge. The second blast, if it occurred at all, would generally occur in the early afternoon. More information on blasting is provided later in this chapter.

During construction of the shaft, measures would be implemented to reduce the amount of groundwater infiltrating into the shaft. These measures would consist of the installation of piles during the excavation through soil and grout injection during the excavation through bedrock. Groundwater that is recovered during shaft construction would be directed to the dewatering treatment plant constructed during Phase 1: Site Preparation. The recovered groundwater is anticipated to intermittently flow up to 1 mgd. This water would be treated and could be stored

for re-use for non-potable construction needs. Any excess would be discharged (after treatment) to the Hudson River through existing infrastructure.

The stormwater management system modified during Phase 1: Site Preparation would remain in place and would accommodate Phase 2: Shaft Construction work.

2.1-5.3 PHASE 3: BYPASS TUNNEL EXCAVATION—EAST CONNECTION SITE

Phase 3: Bypass Tunnel Excavation would consist of three main efforts: the construction of the first part of a connector tunnel,⁵ the construction of the first part of an inundation plug, and the extraction of the TBM. As described above, the bypass tunnel would be excavated from the west connection site, where the TBM would be launched; the TBM would be extracted at the east connection site.

This section first describes these three main efforts and then discusses the support facilities that would be needed for this phase. **Figure 2.1-13** shows the potential site layout during Phase 3.

CONNECTOR TUNNEL

First, the connector tunnel would be constructed using drill and blast methods with support provided by rock bolts, shotcrete, steel ribs, and a cast-in-place concrete final liner. During Phase 3: Bypass Tunnel Excavation, only a portion of the connector tunnel would be constructed, advancing to a predetermined safe distance from the existing aqueduct; the final connection between the connector tunnel and the existing aqueduct would be made during Project 2B, Bypass Tunnel Connection and RWBT Inspection and Repair, including Wawarsing, as described in Chapter 4.

INUNDATION PLUG

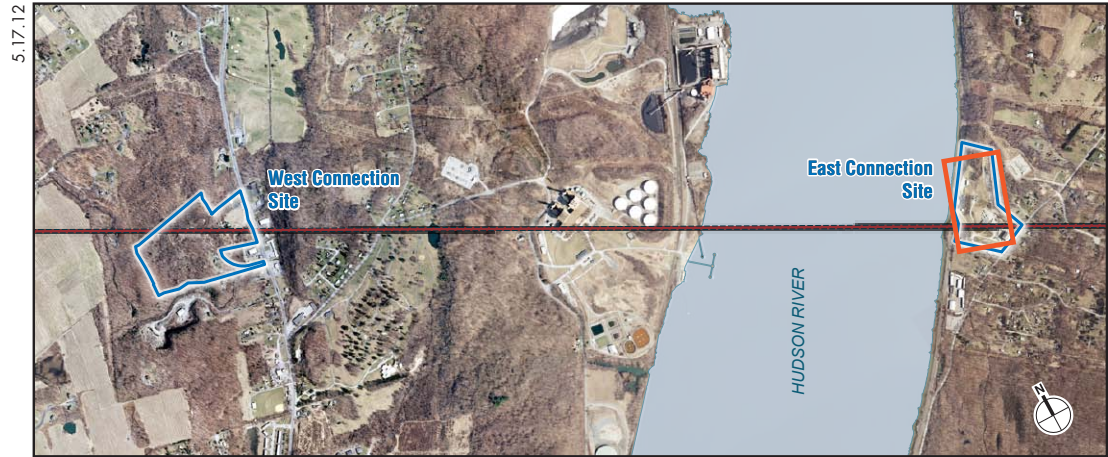
The final element during Phase 3: Bypass Tunnel Excavation is construction of facilities to support installation of an inundation plug during Project 2B.⁶

The inundation plug would be constructed using drill rigs to drill 26 approximately 18-inch diameter vertical holes (the plug holes) into the existing tunnel. During Phase 3, these holes would be drilled to a safe distance above the existing aqueduct (see Figure 2.1-9), with the

⁵ As described in Chapter 1, “Program Description,” the connector tunnel is the relatively short tunnel that would provide the ultimate connection from the bypass tunnel to the existing aqueduct. In this phase, only a portion of the connector tunnel would be constructed. The remaining segment would be constructed during the connection of the bypass tunnel to the existing Delaware Aqueduct (Project 2B).

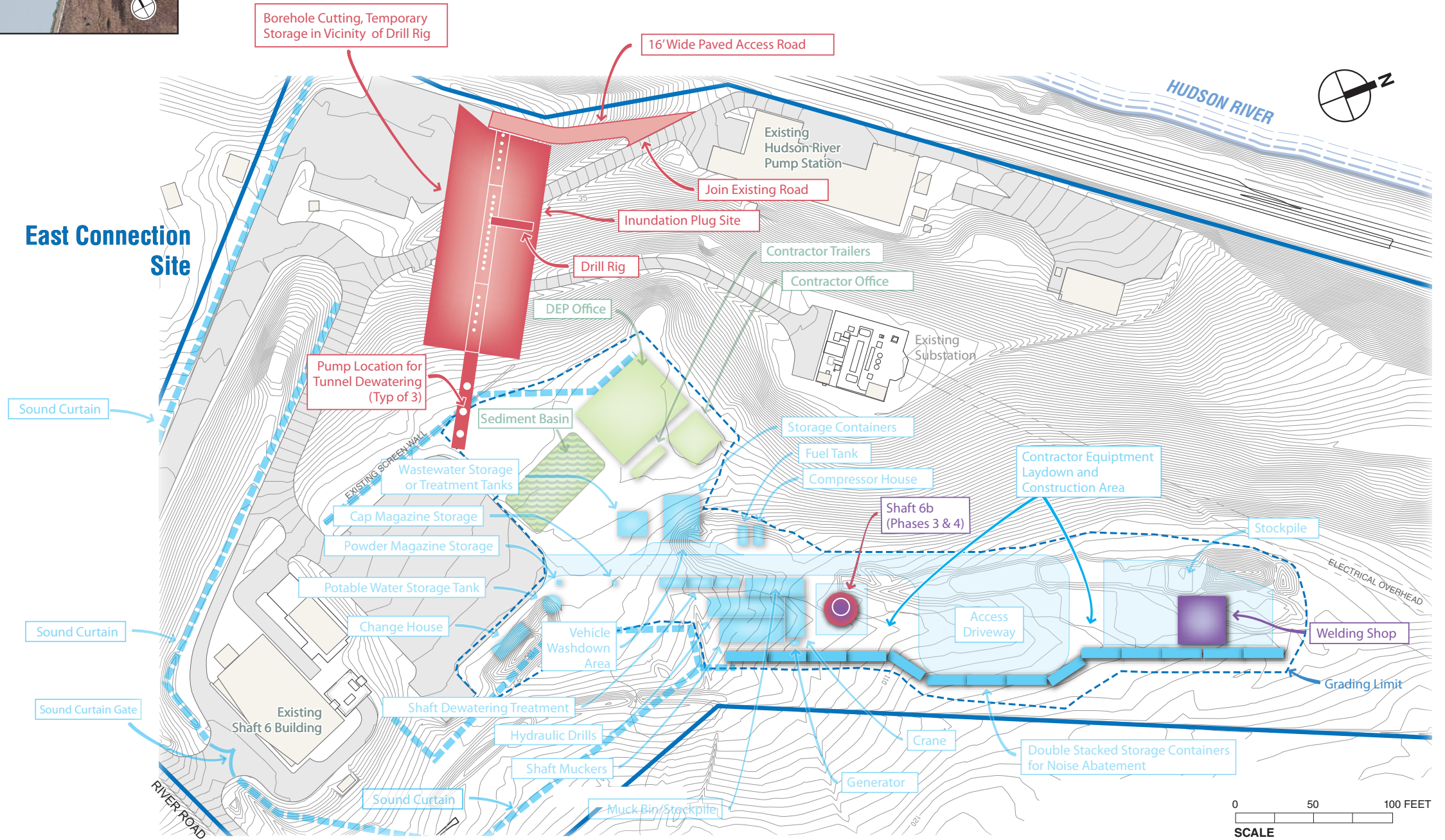
⁶ As described in Chapter 1, “Program Description,” the purpose of the inundation plug is to block off the leaking area of the RWBT in Roseton in the event that water inflow from the Hudson River exceeds DEP’s ability to pump water out of the tunnel during construction of Project 2B. Initial construction of the inundation plugs would begin during construction of Project 1; the inundation plugs would be completed during Project 2B.

KEY MAP



CONSTRUCTION SCHEDULE

	2013	2014	2015	2016	2017	2018	2019
Phase 1: Site Preparation	[Green bar]						
Phase 2: Shaft Construction	[Blue bar]						
Phase 3: Tunnel Excavation			[Red bar]				
Phase 4: Bypass Tunnel Lining, Project 1 Demobilization, and Project 2B Preparation						[Purple bar]	



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East Connection Site Phase 3: Bypass Tunnel Excavation and Phase 4: Bypass Tunnel Lining, Project 1 Demobilization, and Preparation for Project 2B Figure 2.1-13

remaining depth drilled during Project 2B. In addition, a pump shaft would be constructed to a safe distance above the aqueduct.⁷

TBM EXTRACTION

Following completion of the bypass tunnel excavation, the TBM would be disassembled and removed through the shaft at the east connection site.

SUPPORT FACILITIES

A concrete batch plant would not be required at the east connection site during this or subsequent phase of construction. Any concrete needed at the east connection site would be supplied by the grout/concrete batch plant on the west connection site or by local suppliers.

Stormwater Management System

The stormwater management system modified under Phase 1: Site Preparation would be maintained and would continue to manage stormwater runoff at the site.

Internal Circulation

The internal roadway system would be modified to allow room for construction of the inundation plug and to ensure that access to the Hudson River Pump Station would be maintained.

2.1-5.4 PHASE 4: BYPASS TUNNEL LINING, PROJECT 1 DEMOBILIZATION, AND PREPARATION FOR PROJECT 2B—EAST CONNECTION SITE

Phase 4: Bypass Tunnel Lining, Project 1 Demobilization, and Preparation for Project 2B would consist of two main efforts, as follows (see Figure 2.1-13).

BYPASS TUNNEL LINING

During this phase, a limited amount of bypass tunnel lining would occur from the east connection site (as described above, the majority of bypass tunnel lining would be staged from the west connection site). From the east connection site, a cast-in-place liner would be installed in a portion of the bypass tunnel and in the connector tunnel using concrete produced by the concrete batch plant at the west connection site or by local suppliers.

Also during this phase, a shaft plug and shaft access chamber would be constructed. The chamber is a permanent structure to allow access to the shaft cap. While it would be underground after Project 2B is completed, the chamber would be used as a permanent entry point to the shaft and the bypass tunnel.

⁷ As described in Chapter 1, “Program Description,” water would be pumped out of the tunnel through the pump shafts, if needed, during Project 2B.

PROJECT 1 DEMOBILIZATION AND PREPARATION FOR PROJECT 2B

Toward the end of Phase 4, the shaft and bypass tunnel workers and equipment would be demobilized and the east connection site would be prepared for Project 2B, Bypass Tunnel Connection and RWBT Inspection and Repair, including Wawarsing.

**2.1-6 LEVEL OF ACTIVITY AT THE EAST CONNECTION SITE
(WORKERS, TRUCKS, AND EQUIPMENT)**

As discussed above, the intensity of construction work for the construction phases would vary over time. This section highlights peak activities.

This section starts with a discussion of work hours and is followed by a discussion of estimated truck trips and construction workers at the site.

2.1-6.1 HOURS OF WORK

Table 2.1-4 below provides a summary of the number of shifts per day, the number of days per week in which work would take place, work hours, and the length of time each phase is expected to last at the east connection site. As shown in the table, construction at the east connection site would occur Monday through Friday; weekend work is not expected to be required.

**Table 2.1-4
East Connection Site: Hours of Work**

Phase	Shifts/Day	Days/Week	Work Hours
Phase 1: Site Preparation (8 months)	1	5	7 AM to 3 <u>7</u> PM
Phase 2: Shaft Construction (23 months)	2	5	7 AM to 11 PM
Phase 3: Tunnel Excavation (Connector Tunnel and TBM Removal) (Total of 3 months)	3	5	24 hours/day
Phase 3: Tunnel Excavation (Inundation Plug work) (<u>at least</u> 19 months, longer if fewer than 3 drill rigs employed)	<u>2-1</u>	5	7 AM to 4 <u>7</u> PM
Phase 4: Bypass Tunnel Lining, Project 1 Demobilization, and Preparation for Project 2B (4 months)	3	5	24 hours/day

During Phase 1: Site Preparation, it is expected with weather conditions permitting that work would be undertaken in a single daily 8-hour shift, ~~that may begin as early as beginning at around 7 AM and ending as late as at around 3 7 PM~~⁸. For the last 4 months of Phase 1, work

⁸ Site preparation would be undertaken in a single daily 8-hour shift; however, the work window is over a 12-hour period from 7 AM to 7 PM.

would be expected to overlap with Phase 2: Shaft Construction. During Phase 2, work would be undertaken in two 8-hour shifts per day (7 AM to 3 PM and 3 PM to 11 PM). During short portions of Phase 3: Bypass Tunnel Excavation, work would occur over a 24 hour/day cycle of three 8-hour shifts; specifically for work undertaken on the connector tunnel (approximately 1 month in duration in mid-2015) and on the extraction of the TBM (approximately 2 months in duration in late summer 2018). Site preparation work prior to the installation of the inundation plugs would occur for one shift of 8 hours and would last approximately 7 months. Drilling work undertaken on the inundation plugs would occur in ~~one~~ two shifts of 12 hours. The inundation plug work duration would depend on the number of drill rigs employed by the contractor; if the contractor employs three drill rigs, the inundation plug drilling work would occur for at least a 19-month ~~over an approximately 16-month~~ period in 2016 and 2017. If only one or two rigs are employed on site during this phase, the duration would be longer). During Phase 4: Bypass Tunnel Lining, Project 1 Demobilization, and Preparation for Project 2B, which is expected to occur over a 4-month period, work would continue for 24 hours/day.

For the morning shift, it is anticipated that some workers would arrive as early as 6 AM and most would leave within approximately half an hour of the end of their shift. At limited times, late-night deliveries during construction would be necessary due to traffic agency restrictions that require large trucks to make bridge crossings at night (see “2.1-6.2, Truck Projections,” below). However, trucks removing the spoils from the site would not operate during late-night hours (i.e., between 11 PM and 7 AM).

2.1-6.2 TRUCK PROJECTIONS

~~Based on the likely activities involved in Phases 1 through 4,~~ Estimates of the maximum average ~~and maximum~~ number of daily truck trips were generated for the anticipated 7½ years of construction at the east connection site based on the amount of material being brought to and from the connection site, the average truck capacity, and the likely activities within each construction phase that are expected to occur at the same time within the current schedule. Truck trip estimates would vary over the construction phases, as shown in **Table 2.1-5**, which provides the maximum average trucks by key phase. The greatest amount of truck trips would be generated during Phase 2 ~~4~~: Shaft Construction. During this period, the maximum average reported is for the duration of the current schedule (e.g., 48 trucks trips per day) and the ratio would vary by construction phase. ~~number of truck trips per day would be 48 (i.e., 24 trucks with two trips per truck, one in and one out of the site).~~

Table 2.1-5
Maximum Average Truck Trips by Construction Phase

Phase	Maximum Average Truck Trips (per day)
Phase 1: Site Preparation	8 (site prep only even though there is 1 month of overlap between site prep and shaft construction)
Phase 2: Shaft Construction	56 (during 1 month of overlap with site prep) 48 (shaft construction only)
Phase 3: Tunnel Excavation	40
Phase 4: Bypass Tunnel Lining, Project 1 Demobilization, and Preparation for Project 2B	66
Note: Each truck results in two truck trips.	

2.1-6.3 WORKER PROJECTIONS

Based on the likely activities involved in Phases 1 through 4, estimates of the ~~average~~ maximum number of construction workers were developed for the anticipated 7½ years of construction at the east connection site. Construction worker estimates would vary over the construction phases and would vary with the work shifts as shown in **Table 2.1-6**, which provides a summary of the maximum estimated workers for the four phases of Project 1.

Table 2.1-6
East Connection Site: Maximum Estimated Workers (by phase)

	7 AM – 3 PM	3PM – 11 PM	11 PM – 7 AM	Total Daily
Phase 1: Site Preparation	44	-	-	44
Phase 2: Shaft Construction	58	58	-	116
Phase 3: Bypass Tunnel Excavation	48	42	42	132
Phase 4: Bypass Tunnel Lining, Project 1 Demobilization, and Preparation for Project 2B	48	42	42	132

2.1-7 GENERAL CONSTRUCTION PRACTICES

Certain activities would apply throughout Project 1, Shaft and Bypass Tunnel Construction. These include community relations, coordination with appropriate governmental agencies, and site security. DEP would have a field representative on each of the connection sites throughout the entire construction period. The representative would serve as the contact point for the community and local leaders to voice any concerns about construction activities. Security staff would be on-site 24 hours a day, 365 days a year. DEP staff and a construction management firm contracted by DEP for oversight of contractors will enforce contract stipulations and project requirements and mitigation (within the control of DEP) as included in the FEIS.

2.1-7.1 BLASTING

WEST CONNECTION SITE

As described above, blasting would be needed intermittently for approximately 3 to 6 months during Phase 1: Site Preparation in connection with site grading. Blasting would also be required for the full duration of Phase 2: Shaft Construction in connection with construction of the shaft, for a total of between 22 and 25 months. One or two blasts can be expected on a given day.

The Town of Newburgh regulates blasting in §66-9 of the Town Code. If and when blasting is conducted, the Town Code limits blasting activity to the hours of 8 AM to 7 PM. The selected contractor would need to apply for a local blasting permit from the Town of Newburgh. While the Town of Newburgh does not require a pre-blast survey, DEP has committed to requiring the selected contractor to undertake a pre-blasting survey of adjacent residents and businesses, including videography. A preconstruction survey would be undertaken for all structures and facilities located within 500 feet horizontal distance of the centerline of the west connection site shaft for shaft blasting and 500 feet horizontal distance from the location of surface blasting at the west connection site. Subsidence surveys and preconstruction inspections for these facilities would be undertaken before blasting proceeded at the west connection site.

All explosives needed for blasting would be transported and stored in accordance with applicable regulations.

EAST CONNECTION SITE

As described above, blasting during shaft construction at the east connection site would occur over a 21-month period, during which one or two blasts can be expected on a given day. The Town of Wappinger Town Code permits blasting activity between the hours of 8:30 AM and 3 PM and requires that notice be given to adjacent property owners within 500 feet of the blasting area 7 days prior to a scheduled blast. Based on experience with other construction projects that involve blasting, it is expected that blasting would typically occur during the first shift (7 AM to 3 PM). In general, blasting of the shaft would not likely occur immediately at the start of work, since it takes time to prepare for the blast. The second blast, if it occurred, would generally occur in early afternoon.

Prior to initiating any blasting activity, the selected contractor and/or licensed blaster would apply for a blasting permit to conduct all necessary blasting activity. The blasting permit would include a site plan showing all structures within 500 feet of the blast site and a pre-blast condition report for all structures, wells, and septic systems both within the 500-foot required radius ~~and including additional nearby residential properties (as requested by the property owners)~~. A preconstruction survey would be undertaken for all structures and facilities located within 500 feet horizontal distance of the centerline of the east connection site shaft and any additional properties subject to the well monitoring program. Subsidence surveys and

preconstruction inspections for these facilities would be undertaken before blasting proceeded at the east connection site. DEP has committed to requiring the selected contractor to undertake videography as part of the pre-blasting survey.

All explosives needed for blasting would be transported and stored in accordance with applicable regulations.

2.1-7.2 LIGHTING PLAN

Lighting plans for both the west and east connection sites would be developed and would be subject to the local town codes and standards as well as operational performance requirements. Where local regulations or specific limits for site lighting are undefined, professional best-practice recommendations as established by the Illuminating Engineering Society of North America (IESNA), the Occupational Health and Safety Administration (OSHA), and the American National Practice for Roadway Lighting (RP-8) approved by the American National Standards Institute (ANSI) would be followed. Section 2.4, “Visual Resources,” discusses the proposed lighting plans in more detail.

2.1-7.3 SITE SECURITY DURING CONSTRUCTION

During construction, site security would be the contractor’s responsibility. Where not already installed, fencing would be erected around the east and west connection work sites to prevent unauthorized access. Security gates would be installed at both the main site entrance of the west connection site and the access road used during site preparation. The east connection site currently has fencing and a security gate installed. The contractor would be responsible for providing security personnel to patrol and control access to the sites.

During the construction period, DEP would secure the residence on the west connection site (tax parcel 8-1-15.3) as part of its overall plan for securing the entire connection site. DEP employees and/or contractors may use the residence to support construction activities (e.g., informal meeting space or storage of project files and documents).

2.1-7.4 SUSTAINABLE DESIGN GUIDELINES RELATED TO CONSTRUCTION

Erosion and sediment control practices would be implemented for all construction activities where any excavation, stripping, filling, grading, or earth movement takes place. The controls used for Project 1 would comply with the requirements in the New York State Standards and Specifications for Urban Erosion and Sediment Control (August 2005). See Section 2.14, “Infrastructure,” for additional details on the Stormwater Pollution Prevention Plan. *