

Schuylkill River Crossing (SRX) Impact Statement

Philadelphia faces a challenge, much like other large cities across the country — the need to update its aging infrastructure. Most of the City's drinking water infrastructure was installed more than 60 years ago, making critical improvements necessary to maintain a reliable water supply for the future of our City.

The Water Revitalization Plan (WRP) is Philadelphia's answer to this challenge: a **multi-decade plan to upgrade essential drinking water infrastructure**. This means upgraded infrastructure and improved pipes, treatment plants, and processes for safe water in every neighborhood. We need to do this work now to be ready for the challenges facing our changing City.

By strategically aligning several projects on a multi-decade timeline, the Philadelphia Water Department (PWD) can extend capital spending and help keep water rates affordable for our residents. With a focus on improving existing facilities and building new infrastructure, the WRP comprises approximately 400 projects, including the SRX project.

What is the SRX project?

The Schuylkill River Crossing (SRX) project is a new 60-inch-diameter underground drinking water pipeline (transmission main) that will be constructed in a tunnel crossing under the Schuylkill River to connect the Queen Lane Water Treatment Plant (WTP) in East Falls and Belmont WTP in West Philadelphia.

While these two WTPs serve nearly half of Philadelphia's 1.6 million residents, SRX will provide the redundancy required for advancing other WRP projects that will help provide all the City's residents, businesses, and future generations with access to safe, reliable tap water. This project aligns with PWD goals for uninterrupted water service to the entire City in the event of emergencies.

The SRX project is preliminarily planned and will be refined during the detailed design and engineering phase. Specific project details may be adjusted as further evaluations are completed.

How does the SRX project fit into the WRP?

PWD established level-of-service goals for the WRP to identify water system needs and evaluate performance. One goal of the WRP is to improve redundancy to serve the City of Philadelphia better. This redundancy will provide PWD more flexibility when operating the water system, including the ability to supply the entire City from either river indefinitely to maintain reliable water service during extended emergencies. To achieve source water redundancy, PWD needs to construct various WRP projects, starting with SRX.

With the planned improvements from the WRP (including SRX), PWD will have full river redundancy. If this redundancy had already existed, the Delaware River chemical spill in March 2023 would have been less impactful, as the City could have utilized the Schuylkill River as the source water for treatment until the threat of contamination has passed.

Why does SRX need a tunnel?

PWD evaluated different approaches for crossing the Schuylkill River to construct the plant-to-plant pipeline, including:

- **Installing a water transmission main underneath a bridge.** Of the 29 bridges that cross the Schuylkill River within city limits, PWD ruled out 26 due to challenges of ownership, maintenance, coordination, design, proximity to large water transmission lines (48-inch diameter or larger), and land availability for installing a pump station. We later disqualified the three remaining bridges based on community impacts related to anticipated disruptions caused by construction and operational issues around connections to the existing drinking water system. Constructing a new utility bridge also did not pass the initial evaluation due to ownership, maintenance, coordination, and cost challenges.
- **Constructing a tunnel underneath the Schuylkill River.** PWD evaluated alternatives for a tunnel crossing under the river with a large water transmission pipeline inside the tunnel and identified this as the preferred approach. We identified tunnel locations based on proximity to existing large water transmission pipelines, land availability for pump stations and shafts, and avoidance of major transit corridors.

Once PWD confirmed that a subterranean tunnel is the preferred approach for the river crossing, we evaluated the installation method for connecting the new large transmission pipeline from each side of the river to the Queen Lane WTP and Belmont WTP (Figure 1). We considered whether to use a combination of tunneling under the Schuylkill River with open trench excavation east and west of the river or to bore tunnels for the full length of the plant-to-plant pipeline.

We evaluated the installation methods against three primary criteria: constructability, environmental impact, and public impact.

- **Constructability** considers the difficulty of construction based on existing utilities located along the alignment, like utility crossings, large gas or power lines, railroad tracks, sewer lines, or similar large infrastructure.
- The **environmental impact** considers the effect the project will have on environmentally sensitive areas such as streams.
- The **public impact** considers the impacts of the construction on the community, including traffic disruptions.

We ultimately eliminated the open trench excavation approach due to anticipated major disruption to residents and challenges with congested utility corridors, and we decided to use tunneling to construct the entire length of the new large pipeline. A tunnel is preferred compared to open trench excavation because it offers:

- A more direct route, reducing construction time and cost.
- Reduced surface-level construction: less excavation and no open trenches along the alignment.
- Fewer street closures and less traffic disruption.

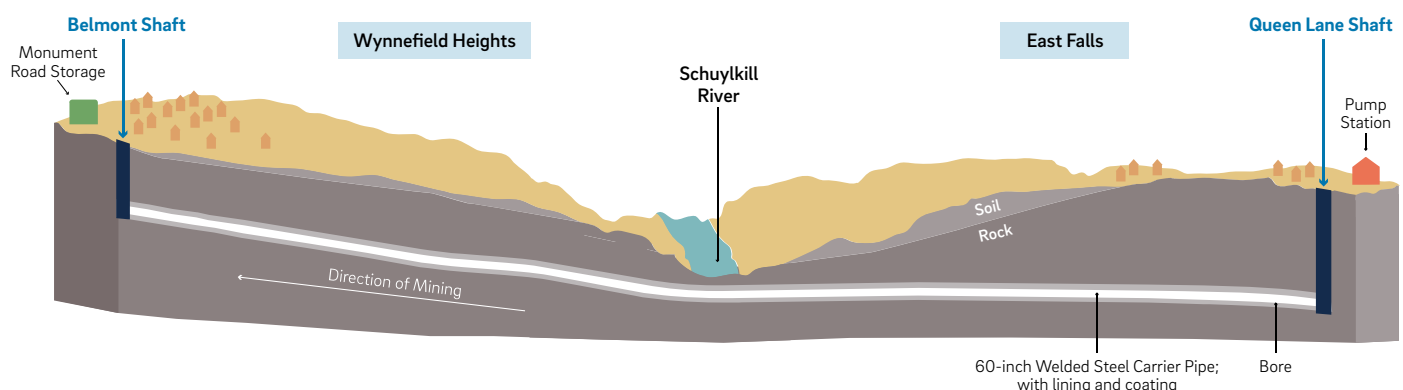


Figure 1. A 60-inch-diameter pipeline will be placed within the underground tunnel that connects Queen Lane and Belmont WTPs

How is a tunnel built?

Tunnel construction involves subsurface (trenchless) construction, vertical shafts, and horizontal bores to complete the crossing.

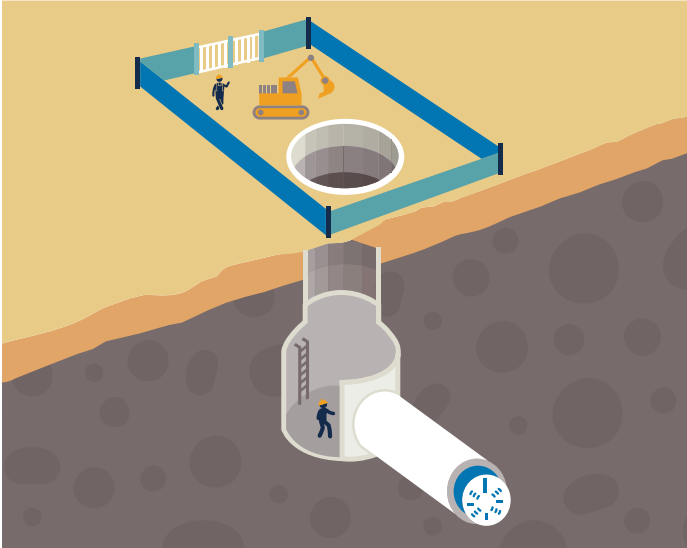


Figure 2. Vertical shafts are the doorways to underground tunnels where all materials enter and exit.



Figure 3. A TBM is a large machine designed to bore circular tunnels through hard rock and soil.

Vertical shafts

To bore the tunnel, PWD will build two vertical shafts (Figure 2) from the ground surface at each end of the tunnel: a launch shaft at Queen Lane WTP and a receiving shaft at Belmont WTP. Once the shafts are constructed, a tunnel boring machine will dig the tunnel underground to connect the two shafts.

Tunnel boring machine

A tunnel boring machine (TBM) similar to the one shown in Figure 3 will construct the tunnel using a circular cutterhead to cut through rock layers over 150 feet below ground on average. Tunnel construction will not be visible from street level or from the Schuylkill River Trail. TBM construction is a proven method that has been used around the world for nearly 200 years as an alternative to drilling and blasting for tunnel construction, especially in urban settings where those methods carry risks, including ground surface disturbance and subsidence. Further, PWD has successfully completed a tunneling project for Dobson's Run, as described on page 6.

The TBM will begin at the launching shaft and bore along the alignment until it reaches the receiving shaft.

Pipeline in tunnel

The new 60-inch-diameter water transmission pipeline will be placed inside the tunnel (Figure 4). The space between the tunnel and pipeline will be backfilled to protect the pipeline by stabilizing the rock around it.

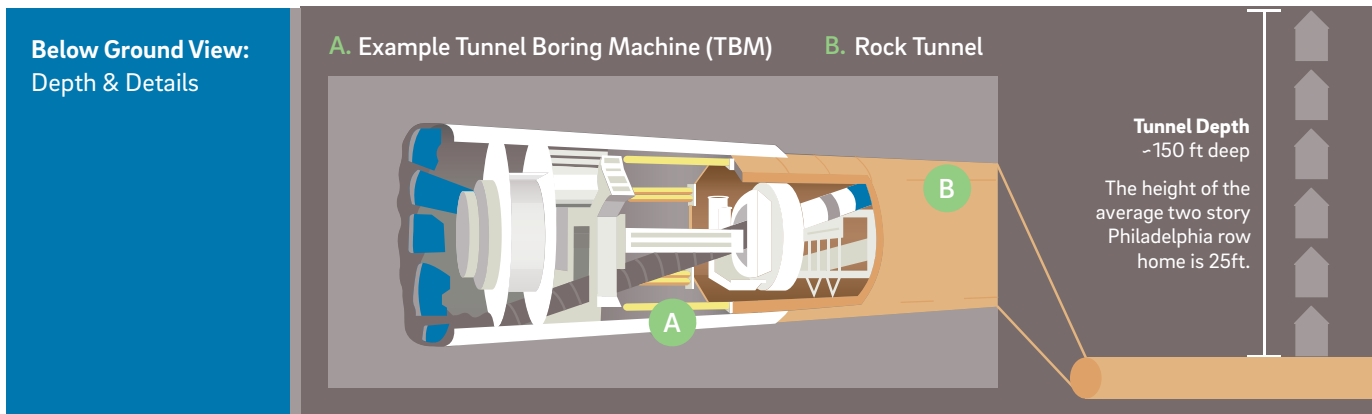


Figure 4. On average, the tunnel will be over 150 feet below ground level, which is the equivalent of stacking six average two-story row homes.

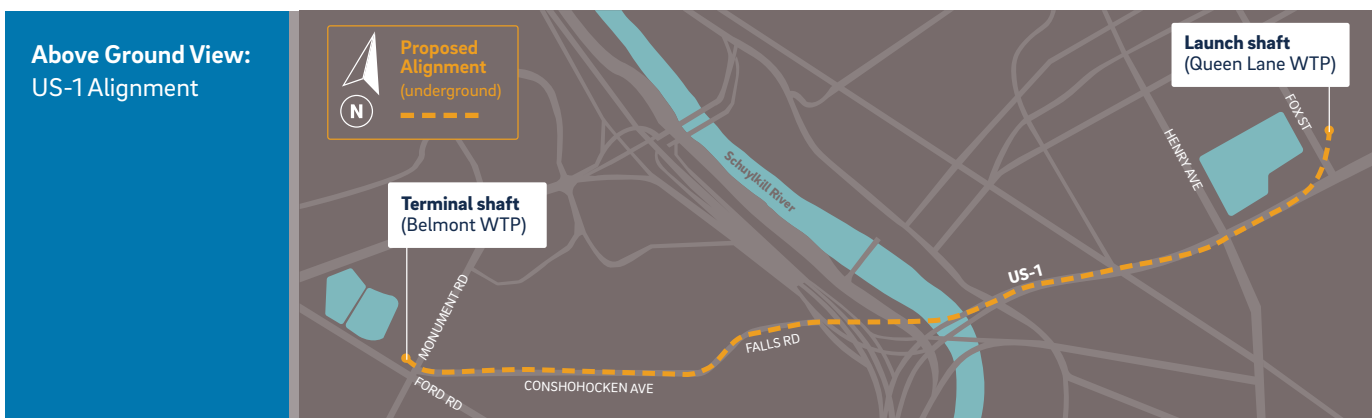


Figure 5. The preferred alignment for the SRX Project follows US-1 east of the river as shown in above ground view.

How did PWD select the alignment?

PWD evaluated various alignments for the plant-to-plant pipeline and subterranean tunnel before deciding on the preferred alignment shown in Figure 5.

The various alignments were evaluated using the following criteria:

- **Technical feasibility:** assessing design, construction, and operational feasibility related to the vertical shafts, river crossing, and pipeline
- **Construction impacts:** impacts of constructing the vertical shafts, river crossing, and pipeline on traffic, property, utilities, the environment, the public, and communities near the shaft locations
- **Financial considerations:** capital and lifecycle costs
- **Operability:** ability to meet operational objectives, including flexibility, complexity, and redundancy
- **Performance:** ability to transfer water efficiently and reliably between Queen Lane and Belmont WTPs
- **Sustainability:** sustainable approach in design, construction, or operations
- **Industry status:** state of the industry technology
- **Regulatory concerns:** permitting requirements and regulatory constraints

While PWD considered all these criteria in determining a preferred alignment, the consideration of construction impacts was paramount. PWD is committed to working with stakeholders and engineering partners throughout the design process to mitigate construction impacts as possible. Surface-level impacts to properties along the alignment are not anticipated.

Once the alignment is finalized, PWD will need to coordinate closely with various public stakeholders that have properties and/or facilities proximate to the respective alignment. Public stakeholders include PennDOT, Philadelphia Department of Streets, Philadelphia Parks & Recreation, SEPTA, and Norfolk Southern. The preferred alignment does not cross underneath any private property.

Several other alignments are feasible and remain potential options if the US-1 alignment encounters unanticipated challenges as the project progresses to the detailed design.

What communities will be impacted, and how?

SRX project construction will impact areas near the two vertical shaft sites, as identified in Figure 6. Once construction is completed, impacts are not anticipated because the SRX project will result in minimal permanent, surface-level changes.

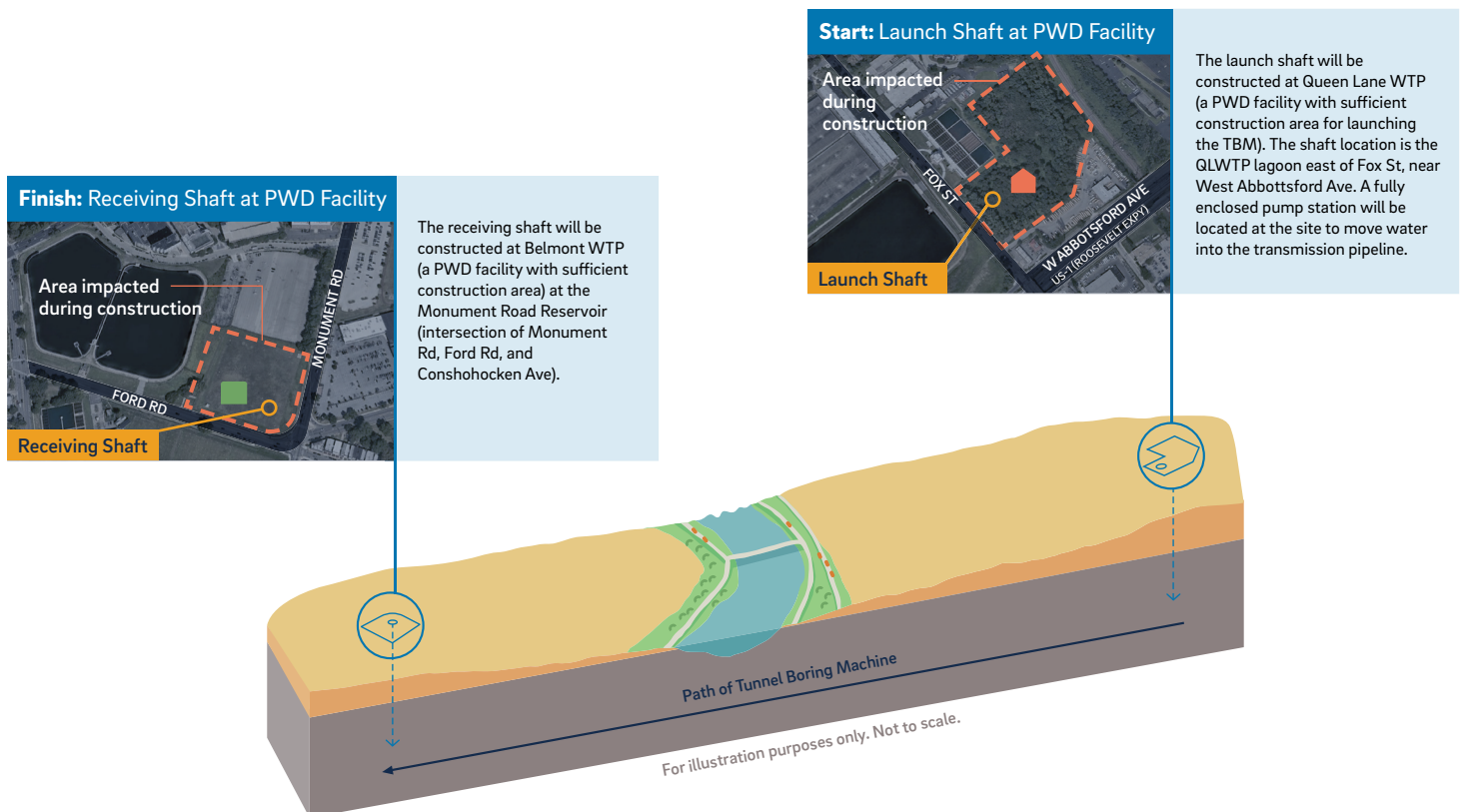


Figure 6. With the use of TBM, construction impacts on the surrounding communities will be limited to areas near the two vertical shafts.

Construction impacts

Tunnel and pipeline alignment

Key impacts that are typically evaluated and mitigated with tunnel projects are TBM vibrations and land subsidence. As noted in Table 1, these impacts are not anticipated for the SRX project. The TBM generates vibrations as part of its operation, but due to operating depth and geologic conditions, these vibrations are generally not anticipated to be felt at the surface. If perceivable, vibrations from the TBM are expected to be similar to those generated by someone walking on a wood floor. The tunnel will be constructed through hard rock, so measurable land subsidence is not anticipated.

Construction of a tunnel beneath bridges and buildings is commonplace. Transportation tunnels are often built in similar situations and are generally much larger in diameter than the planned SRX tunnel. For example, the Long Island Railroad was recently constructed with multiple rail tunnels bored and blasted approximately 125 feet below Grand Central Station in New York City.

PWD recently constructed a rock tunnel for Dobson’s Run Storm Relief Sewer to augment the existing brick storm sewer by building a new storm relief sewer and outfall. The new sewer was built in a rock tunnel approximately 100 feet below the ground surface to avoid disrupting the community and the numerous utilities located in the bed of the street.

Table 1. Anticipated impacts of tunnel and pipeline construction and PWD’s planned actions to mitigate impacts.

Potential construction impacts (tunnel and pipeline)	PWD mitigation actions
<i>TBM vibrations</i>	
Though intermittent vibrations may occur for a short duration (i.e., days) while the TBM advances, they are not anticipated to pose a safety risk.	PWD’s contractor will monitor surface vibrations during construction and take corrective action if necessary.
<i>Land subsidence</i>	
The tunnel will be constructed through hard rock. As a result, measurable land subsidence is not anticipated.	PWD’s contractor will monitor ground levels for potential land subsidence during construction.

Surface-level facilities

SRX construction impacts are limited to the areas proximate to the two shafts. The project will involve constructing the two shafts on PWD property—one at each of Queen Lane and Belmont WTPs—and trenching (cut-and-cover piping) in both Fox Street and Monument Road to connect the new large transmission line to the WTPs. In addition, PWD will construct a new pump station near the Queen Lane shaft and replace the existing water storage tank at Belmont WTP, both of which are on PWD property. PWD will require the contractor to use appropriate construction methods for safe, efficient completion of work and minimal impact on surrounding communities. Before construction, we will reach out to communities regarding the project through various channels, such as community listening sessions, a webpage dedicated to project information and updates, email, social media, public service announcements, and construction site signage. During construction, PWD will mitigate construction impacts, as summarized in Table 2.

Table 2. Anticipated construction impacts at shaft sites and PWD’s planned actions to mitigate impacts.

Potential construction impacts (shafts)	PWD mitigation actions
<i>Temporary storage areas</i>	
Construction equipment and materials will be temporarily stored in areas near the two shaft locations, restricted from public access.	<p>Temporary fencing surrounding construction sites will maintain community safety and protect equipment and materials.</p> <p>Wrapping for safety fencing will screen site appearance and minimize impacts to the community from dust and debris.</p> <p>Staggered delivery times will minimize additional congestion during peak travel periods.</p>
<i>Street closure and parking impacts</i>	
Minor traffic impacts may occur near the shaft locations due to surface-level facility construction.	<p>Traffic and parking disruptions will be limited to the shortest time necessary to complete construction activities.</p> <p>To minimize impacts, PWD will develop and maintain traffic plans in accordance with Philadelphia’s Streets Department and PennDOT.</p> <p>Truck traffic at the Queen Lane shaft can route to US-1 without traversing the residential area.</p> <p>Following construction, existing traffic operations will be restored.</p>
<i>Noise and lighting</i>	
At shaft locations, equipment will generate noise during construction, and construction activity will require the use of lights.	<p>Lighting will be designed to minimize light pollution and community impacts.</p> <p>Use of construction lighting and machinery will be limited to certain hours to minimize impacts on nearby communities.</p> <p>To limit noise impacts, above-and near-ground construction activities will be performed in compliance with city noise ordinances.</p> <p>Underground tunnel mining must occur 24/7, but hauling mined material will be limited to certain hours.</p>
<i>Dust, debris, and odors</i>	
<p>Dust and debris from construction and demolition are common on construction sites.</p> <p>Heavy equipment, generators, and other diesel-powered equipment will produce emissions during construction that may exceed ambient air levels.</p>	<p>Proper site maintenance and monitoring will be used to minimize dust, debris, and odors near construction sites.</p> <p>PWD has comprehensive construction standards, including measures for controlling dust and odorous emissions during construction.</p>
<i>Controlled blasting</i>	
<p>Crews will need to use controlled blasting for the two tunnel shafts to construct tunnels and excavate rock.</p> <p>Neighbors may hear noise from shaft construction when the excavation encounters rock.</p>	<p>Controlled blasting, which is an industry standard for subterranean construction, will occur at shaft sites only. In advance, PWD will notify local communities and conduct required inter-agency coordination. PWD’s contractor will carefully plan and monitor controlled blasting to adhere to safe practices, meet safe limits, eliminate fly rock, and avoid damage to nearby structures. Vibrations from controlled blasting are estimated to be below the safe limit by at least ten times.</p>

Project impacts

The SRX project is anticipated to result in minimal permanent, surface-level changes. Though the shafts extend to the surface, the tunnel will be deep underground. Typical transmission main operation will not result in exterior noise, similar to existing pipelines under streets. A new fully enclosed pump station next to the launching shaft at Queen Lane WTP will generate minimal sound, comparable to air conditioning units for cooling a small home. Because the project will mostly occur underground, within existing facilities, and in urban areas, impacts on biological resources are not anticipated.



Want to learn more?

For more information, visit: water.phila.gov/projects/revitalization/
Email: WRPsupport@phila.gov



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