

BENEATH THE EARTH: SUSTAINABLE TUNNELS

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BENEATH THE EARTH: SUSTAINABLE TUNNELS

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1. A U.S. LEADER IN LARGE, COMPLEX INFRASTRUCTURE

Lane is the innovative leader of transportation and heavy civil construction products and services that connect and improve the world's communities. The Company has a 125-year legacy based upon solid traditions, unique skills, and a reputation for quality, safety, and care for people. Lane builds value in the infrastructure sector to improve life for current and future generations.

Founded in 1890, with a solid base of around 5,000 employees, with operations in the United States in more than 30 states, Lane has been and is

currently involved in the construction of some of the largest infrastructure projects in the United States: 395 Express Lanes in Virginia; Interstate 70 in Pennsylvania; the Max Brewer Bridge in Florida; and the Gerald Desmond Bridge in California. Lane recently completed the Anacostia River Tunnel wastewater management system in Washington, D.C.; current work includes the adjacent Northeast Boundary Tunnel project.

Lane is highly skilled in major complex infrastructure projects and leverages on the worldwide experience of its parent company, Salini Impregilo.



2. TUNNELING EXPERIENCE

2.1 Competence

Lane has inherited a 95-year history of tunneling experience from S.A. Healy Company (Healy), a tunneling and heavy civil contractor located in Henderson, Nevada. Healy merged with Lane in 2018.

Lane is highly competitive in the tunneling sector because of the resources and proven results from Healy, as well as the global experience from its parent company, Salini Impregilo.

Lane's acquired tunneling portfolio consists of over 100 miles—more than one half million feet—and more than 200 projects worth billions of dollars. This tunneling experience can be seen throughout America's largest cities including Cleveland, Portland, Las Vegas, Chicago, New York, Dallas, San Francisco, and Washington, D.C.

2.2 Our Most Valuable Asset

Lane believes in the skills of its people as a key asset of the company to fulfill business goals. In an ever-more-complex world, human capital is a key factor to maintain leadership and provide clients and all other stakeholders with quality performance and results.

Lane is guided by a value-based culture and endeavors to maintain an innovative, high-quality, and ethical environment that is essential to the development of its employees.

The company encourages innovation and creativity, and pursues employee-generated ideas that help everyone work better and more efficiently.

Lane's employees are the foundation of the company's success, and the company is committed to helping them build meaningful careers.

Main Tunneling Projects in the U.S.

Ongoing

1 Dugway Storage Tunnel

Cleveland, OH | 2015 - 2019



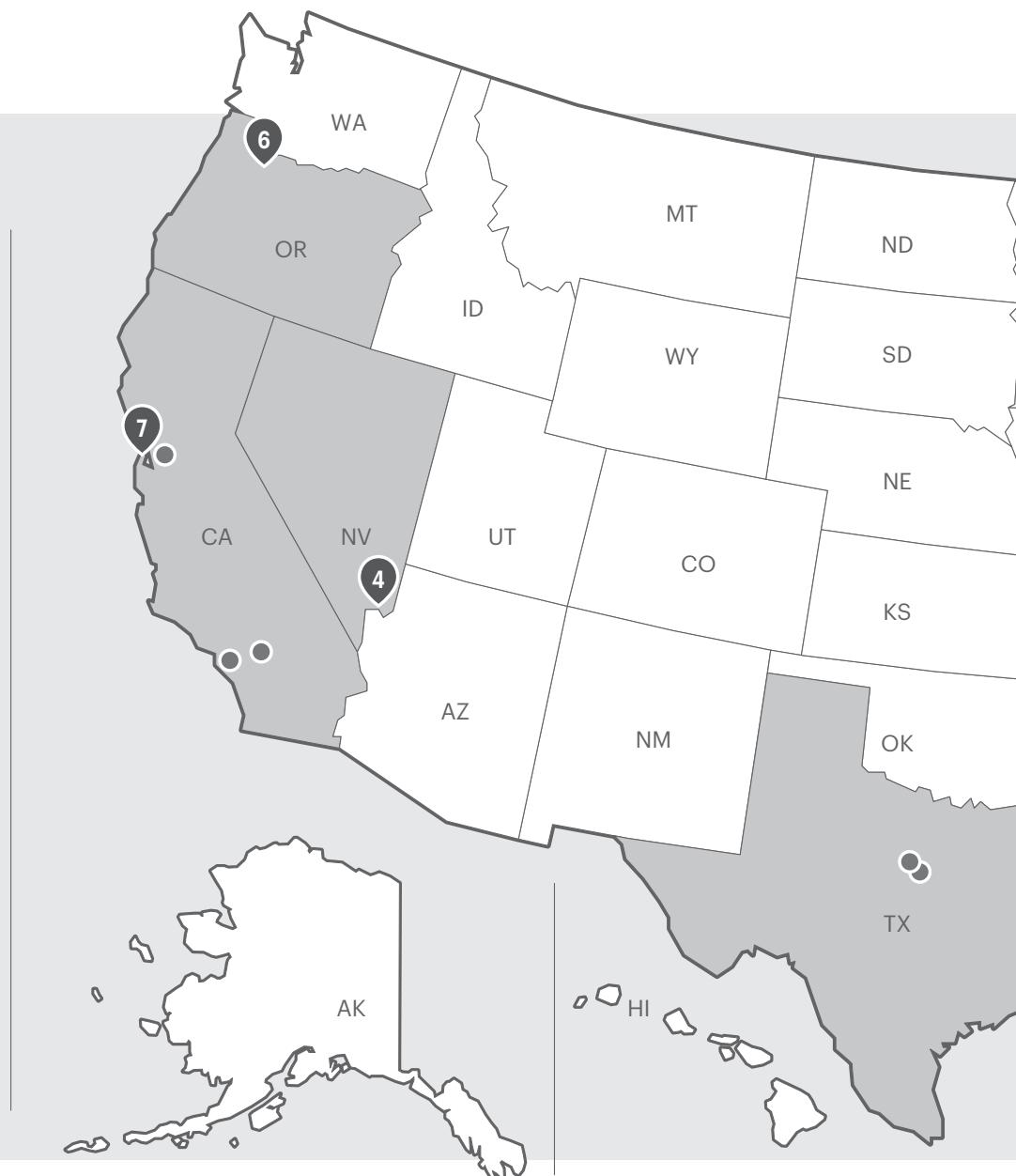
2 Northeast Boundary Tunnel (NEBT)

Washington, DC | 2017 - 2023



3 Three Rivers Protection & Overflow Reduction Tunnels and Shafts

Fort Wayne, IN | 2017 - 2021



By the Numbers

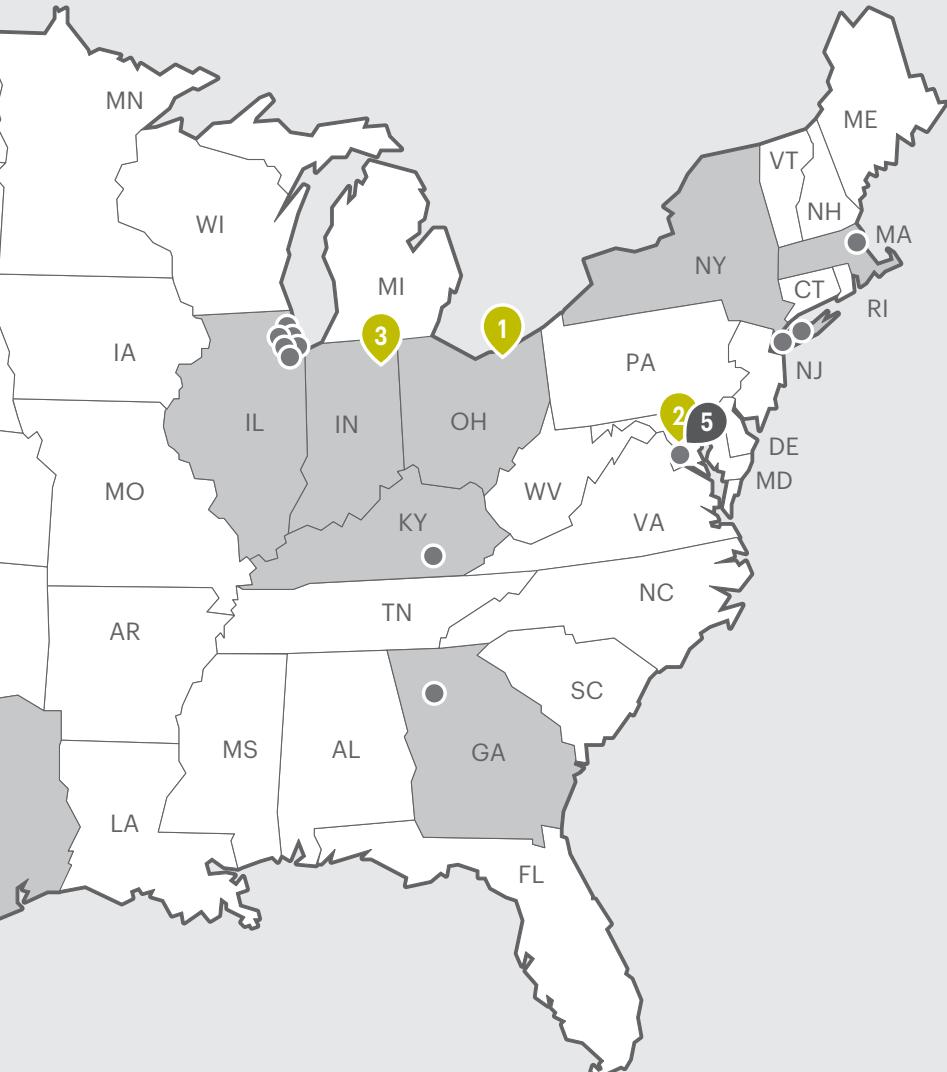
Lane has tunneled over

100
miles

95
years of tunneling
experience



Completed



200 +
contracts
worth more than



18
billion

- 4 Lake Mead Intake No. 3 Shafts and Tunnel
Las Vegas, NV | 2008 - 2015



- 5 Anacostia River Tunnel
Washington, D.C. | 2013 - 2018



- 6 West Side CSO Tunnel and Pump Station
Portland, OR | 2002 - 2006



- 7 Third Street Light Rail Program
Phase 2 - Central Subway
San Francisco, CA | 2012 - 2015



- See page 27 for a historical list
of key tunneling projects.



3. KEY PROJECTS

Lane's tunneling works support sustainable infrastructure that helps communities thrive. From clean water initiatives to reliable transportation alternatives, Lane's experience focuses on improving the quality of life within America's largest cities.

Lane has recently completed three combined sewage overflow (CSO) tunnel projects and is working on two additional CSO projects; all of which contribute to improving the quality of community rivers and lakes to benefit both current and future generations.

Lane provided a reliable water source to two million residents through the Lake Mead Intake No.3 Shafts and Tunnel, which included one of the world's deepest subaqueous tunnels. In San Francisco, Lane constructed a subway tunnel that provides a time-saving travel

alternative in one of the fastest growing cities in the country.

Lane's parent company, Salini Impregilo, builds sustainable tunneling projects throughout the world. In Denmark, they are building the Cityringen Metro, an underground circular line around Copenhagen to transport 240,000 passengers a day and help drastically reduce atmospheric pollution.

In Saudi Arabia, they are building the Riyadh Metro Line 3, the longest line in the new underground system, which will extend underneath the city with a total length of 109 miles for an estimated total investment of \$20 billion. Salini Impregilo is also building the first underground line in Doha, in Qatar, under extreme environmental conditions.

LAS VEGAS, NV

LAKE MEAD INTAKE NO. 3 SHAFTS AND TUNNEL

Owner

Southern Nevada Water Authority

Construction Cost

\$503.7 million

Procurement Type

Design-Build

Status

Completed (2008–2015)

Lake Mead is the largest reservoir in the United States in terms of water capacity. It serves as the main water supply for the residents and tourists of the iconic city of Las Vegas. The Colorado River, which brings water to the area, is flowing less forcefully because of a severe, multi-year-drought resulting in the water level of Lake Mead dropping 110 feet since 2000, leaving it at half capacity.

The Lake Mead Intake No. 3 Program is intended to protect the existing water system capacity of the Southern Nevada Water Authority (SNWA) against potential inoperability of the existing intakes. It also enables better quality water to be drawn from a deeper elevation/location in the lake, and brings clean water to more than two million people in southern Nevada.

The project was one of the most technically challenging in the industry because of the very complex geological conditions. It required tunneling under water pressure that was so extreme, it had never been done before. The intake structure itself was located 377 feet deep in the middle of the lake.

The project included design and construction of the following structures:

- **15,000-foot-long** intake tunnel bored in rock with cover ranging from 587 feet (at launch) to about 30 feet upon entering the intake structure
- Custom dual-mode, slurry shield tunnel boring machine designed to withstand **17 bars** of water pressure or **40,000 gallons** per minute
- **30-foot** finished diameter, **611-foot** deep access shaft
- Stub Tunnel from the access shaft at a depth of **400 feet** that is **83.5 feet** long from shaft to bulkhead
- **202-foot-long** Tunnel Boring Machine launch chamber at the bottom of the shaft
- **85-foot-long** IPS-X connection stub tunnel and back-shunt tunnel
- **360-foot-long, 26-foot** horseshoe TBM starter tunnel

SIGNIFICANT MARINE WORKS INCLUDE

- **11,000** of tremie concrete placed underwater
- **48,000 CY** of material excavated underwater
- In-house design and engineering
- Preservation of endangered wildlife within a national park

Recognition

- 2016 Outstanding Civil Engineering Achievement Award, American Society of Civil Engineering (ASCE) Finalist
- 2016 Tunnel Achievement Award for Project Excellence (*Tunnel Business Magazine*)
- 2015 Global Tunneling Project of the Year (over \$500 million), *Tunneling & Underground Space Awards*



DISCOVER EXCLUSIVE CONTENT

CLEVELAND, OH

DUGWAY STORAGE TUNNEL

Owner

Northeast Ohio Regional Sewer District

Construction Cost

\$153 million

Procurement Type

Bid-Build

Status

Ongoing (2015–2019)

Lake Erie is the fourth largest of the Great Lakes. Spanning from the United States to Canada, it is widely used for its beaches, parks, and hiking areas, and is one of the world's largest freshwater commercial fisheries.

The Dugway Storage Tunnel (DST) project is part of a broader program to improve the quality of Lake Erie. The DST creates additional storage capacity for combined sewer overflows during wet weather events. It will store up to 58 million gallons of storm and wastewater until the rain subsides and the treatment plant has the capacity to treat them. The DST will contribute to a reduction in the raw sewage discharge from 4.5 billion gallons to 494 million gallons (during an overall period of 25 years).

TECHNICAL HIGHLIGHTS

The project includes construction of the following elements:

- **14,840 linear feet of 24-foot diameter tunnel**
- Six deep shafts
- Adit connections between shafts and tunnel
- Concrete structures for the collection and transporting of wastewater and rainwater
- Site/civil restoration
- Modifications to existing surface structures



WASHINGTON, DC

ANACOSTIA RIVER TUNNEL

Owner

District of Columbia Water and Sewer Authority (DC Water)

Construction Cost

\$253 million

Procurement Type

Design-Build

Status

Completed (2013–2018)

DC Water's Clean Rivers project is an infrastructure improvement plan focused on storing and purifying water during rainstorms before it reaches the capital city's important rivers. The plan involves a system of tunnels to store and transport combined sewage and storm water to a nearby wastewater treatment plant.

The recently completed Anacostia River Tunnel project is one component of the Clean Rivers project. The Anacostia River Tunnel connects with the Blue Plains Tunnel and delivers captured combined sewer overflows (CSOs) to the Blue Plains Advanced Wastewater Treatment plant for treatment prior to discharge to the Potomac River.

TECHNICAL HIGHLIGHTS

The project consisted of the final design and construction of the following main components:

- **12,500-foot** long, **23-foot** diameter, reinforced concrete segmentally lined tunnel
- **Six shafts** with various configurations that include hydraulic internal structures, vortex drop facilities, and diversion chambers
- **Two shafts** constructed at CSO-019 and connected by an interconnecting tunnel constructed by Sequential Excavation Methods
- Diversion chambers with connecting diversion sewers and approach channels at **two shaft** locations
- Adit tunnels to connect the shafts to the tunnel at **three shaft** locations
- Ventilation control facilities to regulate air flow in the tunnel system

Recognition

- *Sustainability Initiative of the Year (November 2017) from the International Tunneling and Underground Space Association (ITA-AITES)*



DISCOVER EXCLUSIVE
CONTENT

WASHINGTON, DC

NORTHEAST BOUNDARY TUNNEL (NEBT)

Owner

District of Columbia Water and Sewer Authority (DC Water)

Construction Cost

\$580 million

Procurement Type

Design-Build

Status

Ongoing (2017-2023)

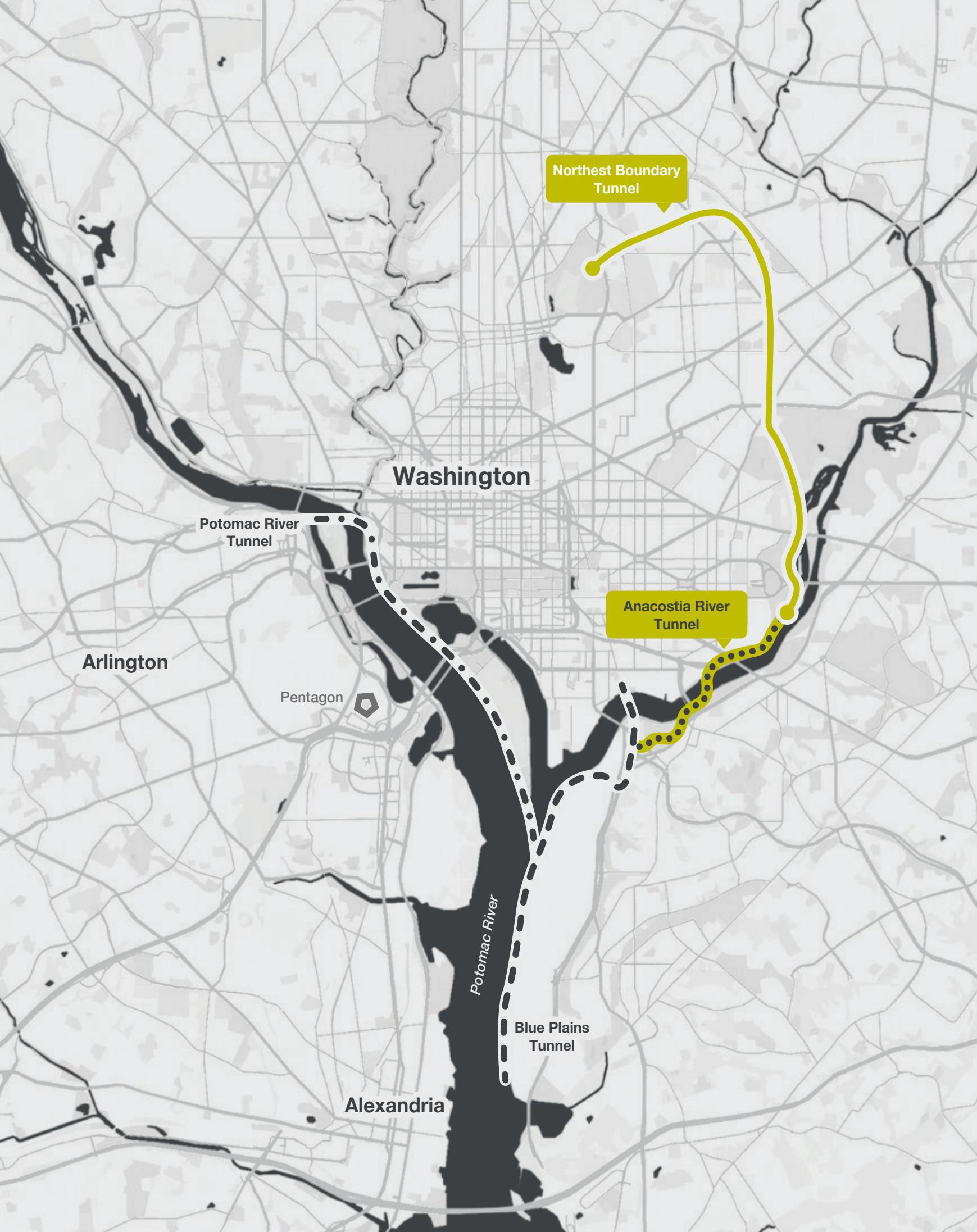
The Northeast Boundary Tunnel (NEBT) project is the biggest component of DC Water's Clean Rivers plan. The combined sewage overflow (CSO) tunnel will help to increase the capacity of the District's sewer system, significantly mitigating the frequency, magnitude, and duration of sewer flooding, ultimately improving the water quality of the Anacostia River.

Upon completion, the NEBT will connect with the Anacostia River Tunnel and the First Street Tunnel to provide a complete gravity flow water distribution system from Northwest DC to Blue Plains Advanced Wastewater Treatment Plant. There all flows captured by the tunnel system will be delivered for treatment prior to discharge to the Potomac River.

Once the NEBT is connected to the other Clean Rivers tunnels, CSOs to the Anacostia River will be reduced by 98 percent.

TECHNICAL HIGHLIGHTS

- Installation of **26,700-foot-long** tunnel,
90 to 180 feet below ground
- **Seven** deep shafts
- Ventilation control facilities to regulate air flow
- Construction of diversion facilities along tunnel alignment
- Green infrastructure for **11 sites**
- **100-year** life requirement



PORLAND, OR

WEST SIDE CSO TUNNEL AND PUMP STATION

Owner

City of Portland

Construction Cost

\$306.4 million

Procurement Type

Joint Venture

Status

Completed (2002–2006)

The city of Portland needed to improve the quality of the Willamette River, a major tributary of the Columbia River. The West Side Tunnel aims to collect and store combined sewer overflows (CSOs) before they reach the river, and instead transports the overflow to a pump station, where it is treated before returning to the river.

The project involved the construction of a new main sewer collection, storage, and conveyance system. The system included a deep storage and conveyance tunnel, a belowground pumping station, five shafts approximately 130 feet deep, and a network of micro-tunneled and open cut pipelines and diversion structures to connect existing sewers to the tunnel.

As part of a series of other CSOs projects, the combined projects reduced the city's sewer overflows into the Willamette River by 94%.

TECHNICAL HIGHLIGHTS

Tunnel

- Installation of an **18,180-foot** tunnel, with an excavated diameter of **16.5 feet**, and a pre-cast concrete bolted, gasketed segmental lining
- Two **16.5-foot** diameter, full-face slurry mixshield tunnel boring machines (TBM) were used for excavation, marking the first use of this technology in the tunneling industry
- No pre-excavation grouting from within the tunnel during mining with either TBM

Pumping Station

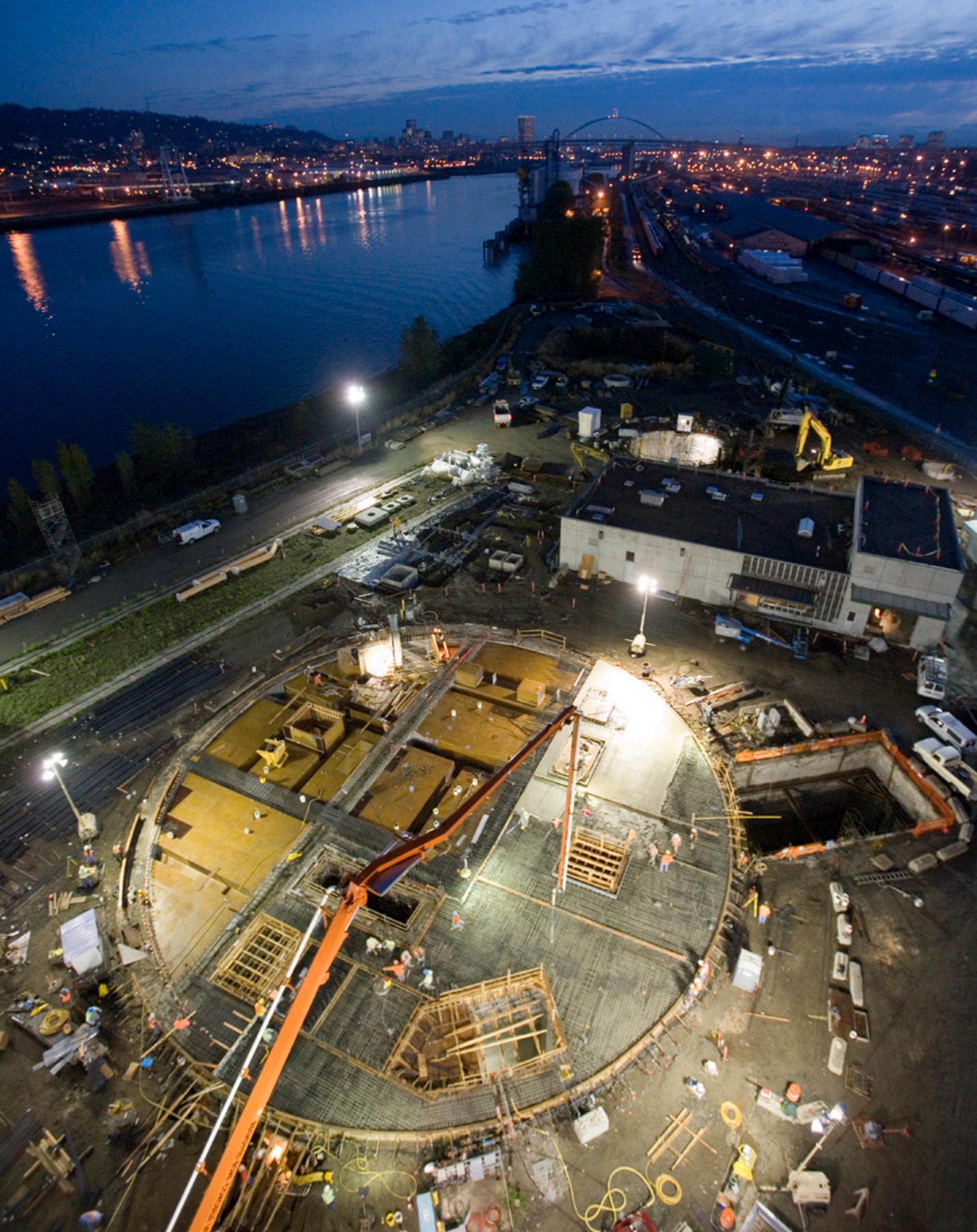
- A **160-foot-deep** and **137-foot-diameter** pumping shaft
- **120 million gallons** per-day capacity
- Excavation support consisted of a **four-foot** thick slurry wall extending to a **depth of 200 feet**
- Internal wall consisted of cast-in-place concrete tied to the external slurry wall to form a final composite wall
- Some of the deepest jet grouting columns in the world, at **six feet** in diameter each, extended **320 feet deep** to tie into the top of a mudstone formation to form a groundwater cut-off wall

Pipelines

- A micro-tunnel TBM with multiple shields and diameter varying **from 84 inches to 108 inches** was used for excavation and to install concrete PCP pipe lining
- Overall pipeline length of approximately **15,000 feet**

Recognition

- Accepted into the Voluntary Protection Program (VPP) from OR-OSHA for an exemplary safety record
- 2006 Contractor of the Year from the Oregon Association of Minority Entrepreneurs



FORT WAYNE, IN

THREE RIVERS PROTECTION & OVERFLOW REDUCTION TUNNELS AND SHAFTS

Owner

City of Fort Wayne, IN

Construction Cost

\$188 million

Procurement Type

Bid-Build

Status

Ongoing (2017-2021)

The tunnel is a major portion of the effort to clean up Fort Wayne's rivers and protect neighborhoods from basement backups and street flooding.

The Three Rivers Protection & Overflow Reduction Tunnel (3RPORT) project is part of a tunnel system that will collect combined sewage overflow (CSO) from 22 outfalls along the St. Mary and Maumee Rivers and transport it to a nearby sewage treatment plant.

The project will reduce the number of CSOs into the rivers by 90% — or more than six billion gallons on average each year — which occur during large rainstorms.

TECHNICAL HIGHLIGHTS

- Segmentally lined, deep-rock tunnel, **200 to 250 feet** below ground
- Consolidation sewers, **nine drop shafts**, and a deep rock tunnel
- The TBM is designed to withstand **six bars of pressure** with inflow ranges from **5,000-10,000 gallons per minute**
- The tunnel pump station will be complete and the tunnel will be operational in 2021
- Approximately **16,600 feet** of near surface sewer lines will convey sewage and rainwater to diversion structures, to drop shafts, and into the tunnel.
- **100-year** life expectancy



SAN FRANCISCO, CA

THIRD STREET LIGHT RAIL PROGRAM PHASE 2 CENTRAL SUBWAY

Owner

San Francisco Municipal
Transportation Agency

Construction Cost

\$233.6 million

Procurement Type

Bid-Build

Status

Completed (2012–2015)

At the heart of the city of San Francisco lies the Central Subway light-rail line. Extending the Muni Metro T Third Line improves public transportation to and from some of San Francisco's busiest, most densely populated areas, offering travelers an alternative to heavy traffic congestion.

In addition to the technical difficulties with drilling two tunnels across a city like San Francisco, the close proximity of active subway routes — with only eight feet of separation in the soft ground sections of the alignment — added to the challenge.

TECHNICAL HIGHLIGHTS

- Two parallel **1.6-mile, pre-cast concrete**, segmentally lined, twin-bored subway tunnels
- Tunnel boring machine (TBM) launch shaft and extraction shaft
- Consolidation and compensation grouting work to prevent building settlement
- **Five** emergency cross passages
- Perimetral slurry walls for the future stations
- Completion works for the associated connecting structures (launch shaft for cutters)
- A final service shaft approximately **39 feet in diameter**

Recognition

- Award of Merit 2015 from Engineering-News Record (ENR)
- The Outstanding Transportation Project 2015 award given by the local section of the American Society of Civil Engineers (ASCE)





TUNNEL WORK HIGHLIGHTS

PROJECT LIST

NEW/ONGOING

Three Rivers Protection and Overflow Reduction Tunnel (3RPORT), IN
Northeast Boundary Tunnel (NEBT), Washington, D.C.
Dugway Storage Tunnel, OH

COMPLETED

Anacostia River Tunnel, Washington, D.C.
Lake Mead Intake No. 3 Shafts and Tunnel, Las Vegas, NV
Third Street Light Rail Program Phase 2-Central Subway, San Francisco, CA
West Side CSO Tunnel and Pump Station, Portland, OR
FERMILAB NuMI Tunnels and Halls Project, Chicago, IL
North Central Rail Line Segment NC-1B, Dallas, TX
West Oak Cliff Line Section WOC-2, Dallas, TX
Bear Valley Road Street and Bridge Widening at I-15 Freeway, Victorville, CA
Cumberland Gap National Historical Park Tunnel, KY
Des Plaines Tunnel System, Chicago, IL
Rogers Pass Tunnel, British Columbia, Canada
Arts Center Station and Subway Line, Atlanta, GA
East Valley Interceptor Sewer, Los Angeles, CA
Tunnels and Shafts, Central Ave. to Damen Ave., Chicago, IL
DC Metro Subway (various contracts), Washington, D.C.
Weller Creek-Upper, Des Plaines 20 Rock Tunnels and Drop Shafts, Chicago, IL
Milwaukee Avenue Subway, Chicago, IL
Subway Tunnel for Bay Area Rapid Transit, Oakland, CA
Chicago Westside Subway, Chicago, IL
Bowery Bay Sewage Treatment Works, Long Island, NY
Boston Sewer Tunnels, Boston, MA
Water and Sewer Tunnels, New York, NY



4. THE LEGACY

It all began in 1890 when railroad entrepreneur John S. Lane started a stone-crushing operation for railroads and streets. By the turn of the century, the road construction business quickly became a success, paving 75,000 square yards of macadamized road (a mixture of stone, sand, and raw asphalt) in 1895 alone. With the invention of the automobile, the demand for roadway improvements skyrocketed, and John S. Lane seized the opportunity by incorporating The Lane Construction Corporation in 1902.

Lane has played a critical role in the development and maintenance of the nation's infrastructure. In the 1940s, the company expanded into military bases to support the war effort, and in the 1950s and 1960s, Lane helped make the Interstate Highway System a reality, building some of the nation's most well-known superhighways.

Throughout the 1960s, 1970s and 1980s, Lane expanded its heavy civil capabilities and added many new public/private clients to its portfolio. In the early 1990s, Lane began work on a privately built toll road. In the 2000s, the Company became a leader in public-private partnerships (P3) and innovative financing solutions that moved forward projects that would have otherwise been postponed due to a lack of public funding.

Today, the firm has the resources and expertise to invest in the most complex infrastructure projects in the United States, and build them in a sustainable way.

Backed by Salini Impregilo's vast global experience, Lane looks toward the future with a focus on improving life for current and future generations.

The Lane Construction Corporation Evolution

The value of a company lies also in its history and origins.



John S. Lane
starts a stone crushing operation in Meriden, CT, providing stone for the rapidly growing railroad and street paving industries.



Lane's operations spread throughout New England and New York State.



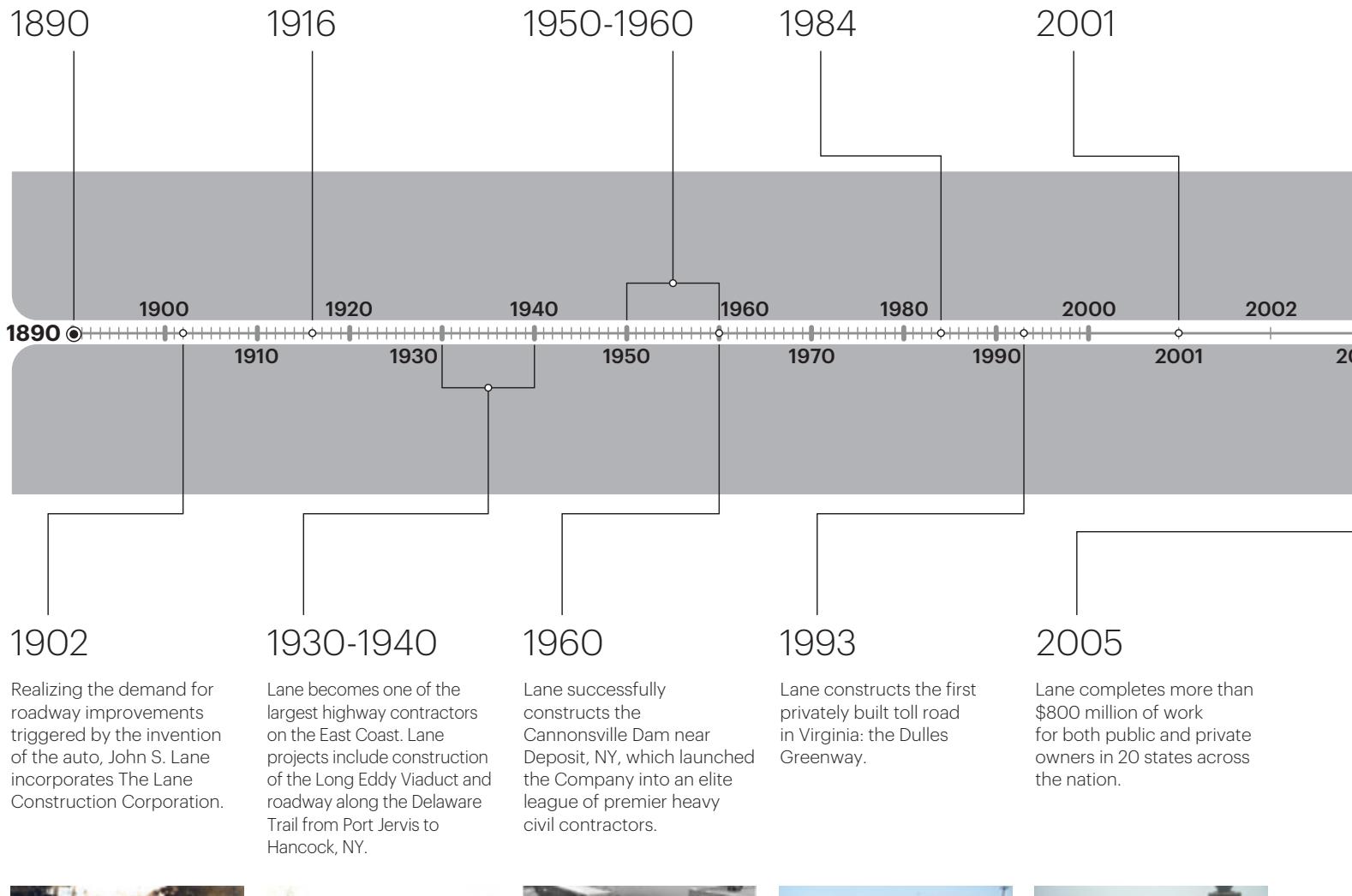
Lane is awarded contracts for the New York Thruway, Connecticut Turnpike, and the second largest contract on the Massachusetts Turnpike.

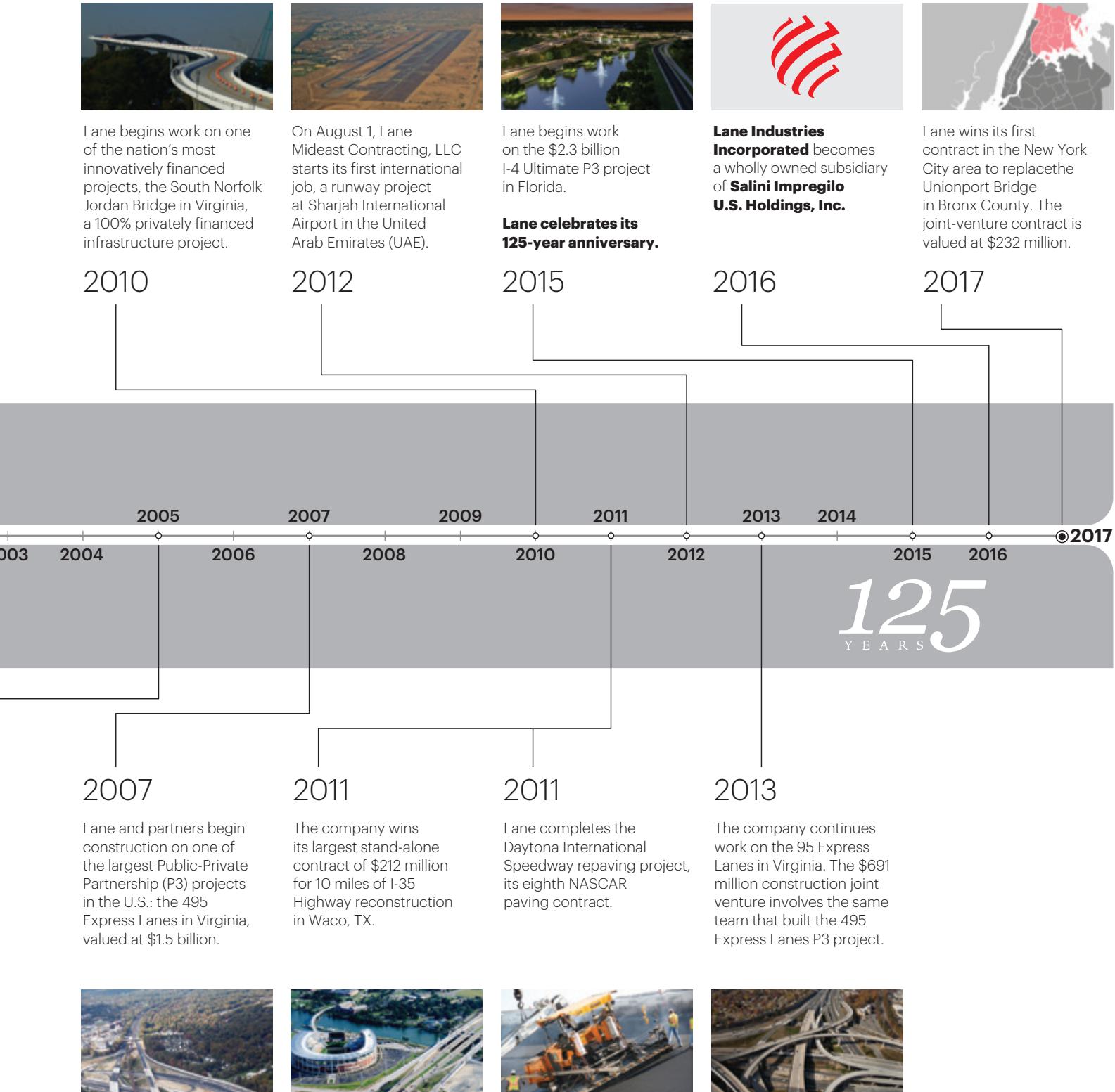


The Fort McHenry Tunnel job is one of the Lane's largest and most intricate projects. The completed tunnel opens to traffic in 1985, carrying I-95 traffic under Baltimore Harbor.



Lane completes its first Design-Build contract for runway reconstruction at Tinker Air Force Base in Oklahoma.







5. OWNERSHIP

Salini Impregilo S.p.A. is a multinational company based in Italy, listed on the Milan stock exchange, Borsa Italiana, specializing in the construction of major, complex infrastructure projects throughout the world.

It operates in more than 50 countries with design, engineering, and construction solutions. It is recognized as a worldwide leader in the water sector, together with metro, railway, and tunneling, since 2013 by Engineering News-Record (ENR).

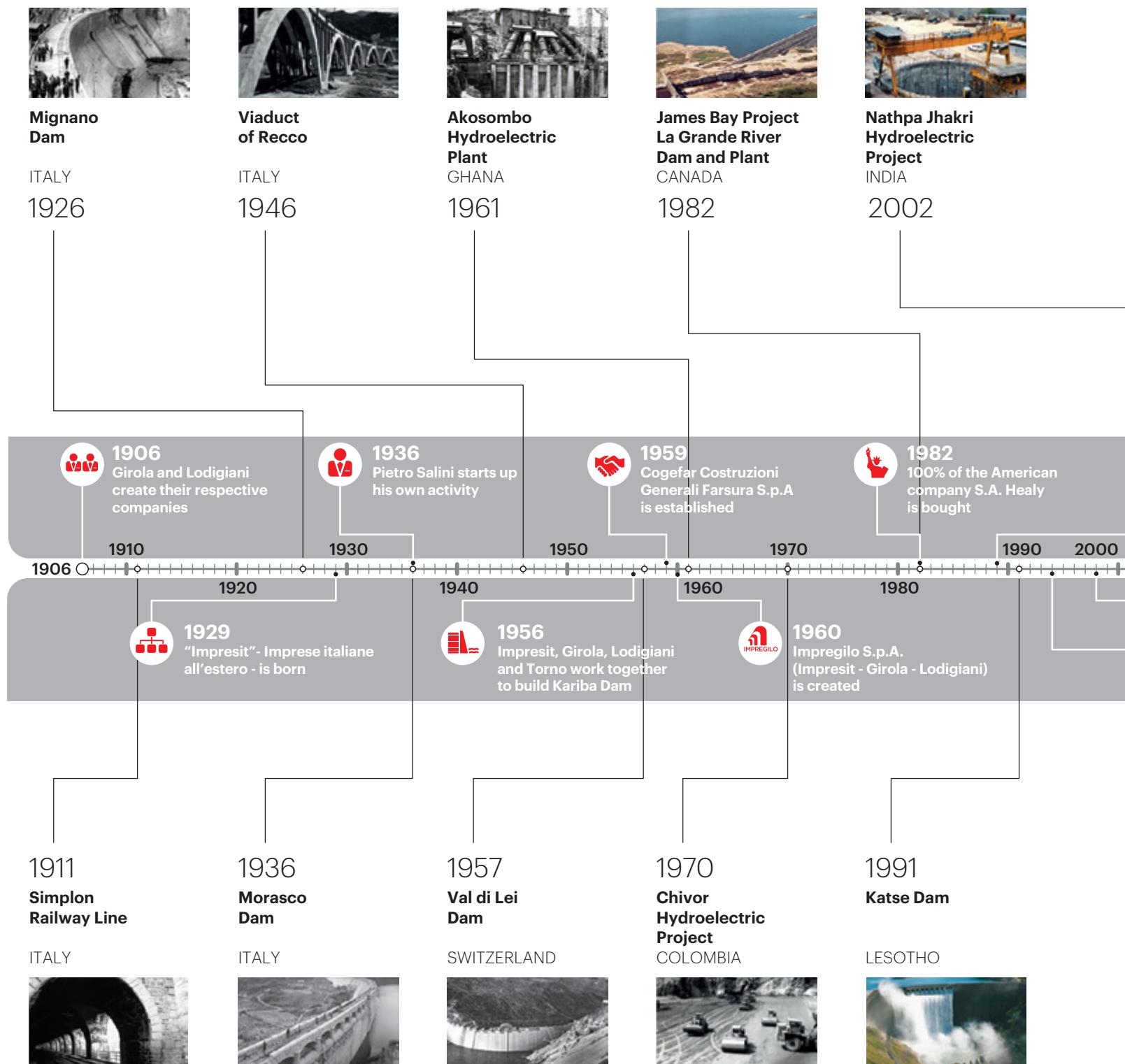
Its experience includes the construction of dams, hydroelectric plants and hydraulic structures, water infrastructures and ports; roads, motorways, railways, metro systems, and

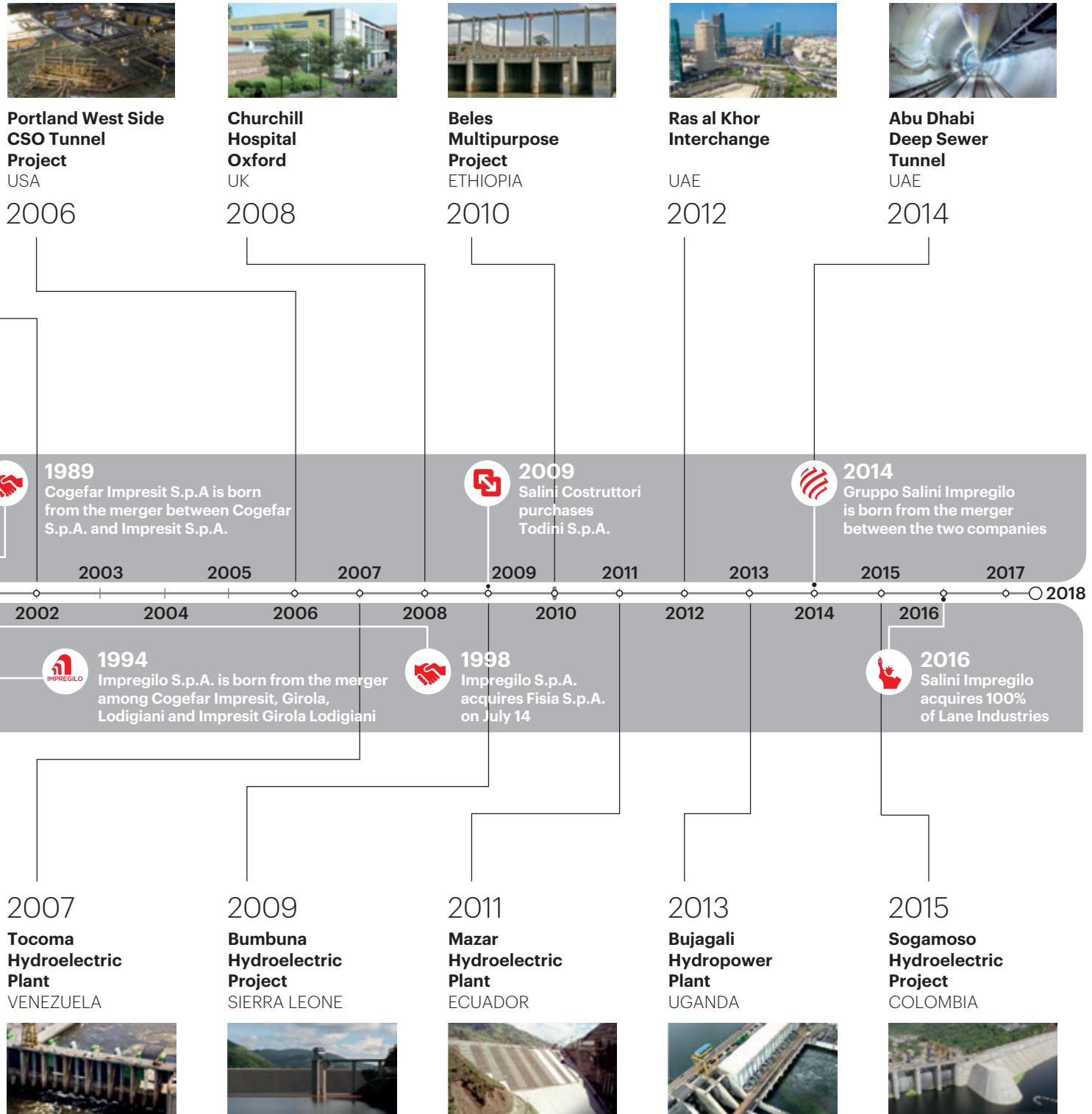
underground works; airports, hospitals, and public and industrial buildings; and civil engineering for waste-to-energy plants and environmental protection initiatives.

With more than 35,000 employees, revenues of €6.5 billion and a backlog of €34.4 billion, Salini Impregilo competes with the biggest companies in the world with a passion consolidated through a long history of successful projects on every continent.

Its management is committed to perform along the highest ethical and professional standards in accordance with the principles of social, economic, and environmental sustainability.

Salini Impregilo's Milestones and Iconic Projects Worldwide





The Lane Construction Corporation

www.laneconstruct.com

www.salini-impregilo.com

www.webuildvalue.com

Project Coordination

Lane and Salini Impregilo Communication Departments

Photos by

Enrique Shore for Lane (pg. 9, *prj. 5 Anacostia River Tunnel*; pg. 10, pg. 28)

Concept

Leftloft, Milan

Data Visualization and Augmented Reality

Viewtoo, Milan

June 2018

www.laneconstruct.com
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