URBAN PASSENGER RAIL

Stations
**We are WSP**

As one of the world’s leading professional services firms, WSP provides technical expertise and strategic advice to clients in the Transportation & Infrastructure, Property & Buildings, Environment, Industry, Resources (including Mining and Oil & Gas) and Energy sectors, as well as offering project and program delivery and advisory services. Our experts include engineers, advisors, technicians, scientists, architects, planners, surveyors and environmental specialists, as well as other design, program and construction management professionals. With approximately 48,000 talented people globally, we are uniquely positioned to deliver successful and sustainable projects, wherever our clients need us.
Designing World Class Rail Stations

Increasing rail transport demand around the world is prompting more infrastructure development in urban, commuter and high-speed rail systems. The creation of new stations and the renewal of older ones are integral to this multifaceted global undertaking.

As arrival–departure points and intermodal passenger transport hubs, stations enable connectivity and thus mobility throughout cities, regions and countries. Today, digital technology-enhanced design and engineering know-how are delivering fully accessible passenger stations with better navigability and experience-enriching aspects. Innovative people-centric schemes, such as the formation of intuitive circulation paths and daylight-filled, spacious interiors, are creating welcoming station spaces.

What will be the role of stations as cities grow and passenger demand continues to rise? How will stations contribute to expanding communities throughout the world?

For existing and emerging stations to be future-ready, they must incorporate the features and operational capabilities that fulfill passenger expectations for efficient and enjoyable train travel. Many stations already facilitate social and commercial activities by providing places where people can meet, eat and shop. As cities struggle to accommodate growing populations, urban Transit-Oriented Development (TOD) plans will utilize stations as centerpieces and magnets for 21st-century residential and commercial development. By assuming these roles, stations can advance their own evolvement and contribute to the overall livability of cities.

At WSP, we strive to design and shape resilient stations that will endure far into the future. By leveraging our worldwide multidisciplinary expertise to tackle complex projects, we continue to address current needs, push past boundaries and deliver envisioned outcomes.

Here is an in-depth look at diverse projects we have undertaken to advance rail travel throughout the world.
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Also see our Light Rail Transit Brochure
The Anaheim Regional Transportation Intermodal Center—known as ARTIC—is an iconic gateway for Southern California. It is situated at the juncture of major freeways and between a major stadium and a sports and entertainment center.

The transportation hub accommodates Metrolink commuter rail, Amtrak and Orange County Transportation Authority buses and was designed to accommodate the future needs of California High-Speed Rail.

ARTIC was designed to meet platinum LEED certification by the U.S. Green Building Council. The landmark building, which opened in December 2014, has an open feeling, skyline presence and an impressive recognition factor.

WSP provided the City of Anaheim and the Orange County Transportation Authority with overall project management, master planning, and civil, site structural and rail engineering services. The scope of the project included site work and preparation, a terminal and supporting facilities, track work and platforms, parking, public art, and access and street improvements.
With a population of over 10 million, Bangkok is one of the most traffic-congested cities in Asia. Over the years, the government has invested in building mass transit systems to alleviate traffic congestion and air pollution. As existing lines have limited interconnectivity, the government aims to change this situation with two extensions of the Bangkok Mass Rapid Transit Green Line. The Green Line North extension will link from downtown to the northeastern district, and the Green Line South extension will extend to the southeastern district.

The Green Line North, under the contract of Mass Rapid Transit Authority of Thailand (MRTA), extends 18.2km, with 16 stations from Mo Chit to Khu Khot. With four to six car trains, the extension will have a 19ha depot near Khu Khot Station.

The Green Line South, under the contract of Krungthep Tanakom (KT), an agency under Bangkok Metropolitan Administration (BMA), extends 12.8km, with 9 stations from Bearing to Kheha Samut Prakan Station. With three to six car trains, the extension will have a 20ha depot near Bang Ping, Samut Prakan.

As a member of a consortium, WSP provides project management and construction supervision consultancy services for alignment and trackwork regarding the Green Line North Extension. WSP provides construction supervision consultancy services for Railway M&E works regarding The Green Line South Extension.
Bangkok Red Line Stations

To reinforce rail interconnectivity in Bangkok’s northern and western suburban districts, the State Railway of Thailand planned the construction of the Red Line to link these residents to the downtown core.

The Red Line is a combination of the 15.3km, six station western section from Taling Chan to Bang Sue, and the 26.3km, seven station northern section from Bang Sue to Rangsit. Together, the new depots and the redevelopment of the Bang Sue Grand Central Station will serve up to 131,000 passengers per day, providing connections to the airport and the Metropolitan Rapid Transit system.

While most of the Red Line stations typically only have side platforms and a concourse level, the 244,600m² Bang Sue Grand Central Station will be the new railway hub for the city. As one of the largest railway stations in Southeast Asia, it will have 26 platforms up to 600m in length.

There are a total of 5 levels: the 2 lower levels serve the underground Metropolitan Rapid Transit lines, levels 1 and 2 serve commuter and long-distance rail services, and level 3 serves the airport link and the future high-speed rail.

As a member of the MAA Consortium, WSP served as the project management consultant. Currently, under a separate contract, WSP is providing independent checking engineer services for the State Railway of Thailand.

Location
BANGKOK, THAILAND

Client
STATE RAILWAY OF THAILAND (SRT)

Status
ONGOING

LENGTH OF LINES
41.6km

PASSENGERS PER DAY
>300,000

STATIONS
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Birmingham New Street Station

In 2005, WSP was appointed as lead consultant to help Network Rail transform Birmingham New Street into a major transport and shopping hub. As the busiest UK station outside London, the project sought to increase passenger capacity, at platform and concourse level, and enhance the links to the city by improving pedestrian connections.

To provide a 21st-century gateway to Birmingham that fulfilled the brief of being “iconic”, “landmark” and “world class”, the station’s facade was remodelled, and local and transport interchange facilities were significantly improved.

Network Rail also needed to incorporate a flagship retail store into what was an existing major redevelopment project without affecting existing project timescales or the management of the existing project works.

Our study considered detailed options for the proposed redevelopment scheme, from which a preferred solution could be developed and the planning application could be submitted and approved, with conditions. This requirement enabled Network Rail to secure funding for this extensive city centre redevelopment and extension.

The finished scheme provides increased station capacity, modern facilities, improved arrival points, a new roof to the concourse and retail areas, and enhanced pedestrian connectivity to the city. Our team combined in-house structural, civil, mechanical and electrical engineers with alliance architects John McAslan and Partners and Chapman Taylor.

WSP completed its option selection and scheme design work in 2008. Our work also involved supporting specialist subprojects, including the development of train operator and access facilities, the renovation of Ladywood House and the refurbishment of Navigation Street footbridge. We continue in our role as Independent Certifier to peer review works for the new John Lewis Store, where we are addressing the defects, the refurbishment of the NCP oversight carpark, and the Grand Central Shopping Centre.
Europe's largest infrastructure project, High Speed Two (HS2) will set a new standard for rail travel in the UK, with high-capacity trains dramatically reducing journey times between key cities and providing additional capacity for the existing network. Since 2012, WSP has been HS2’s consultant for the development of railway systems, operations, maintenance, construction planning and land referencing services, and is currently developing the design of the new HS2 Old Oak Common and Curzon Street stations.

At Euston Station in London, we successfully developed the hybrid Bill design into an affordable concept. We developed the masterplan, which integrated the Network Rail, London Underground, HS2 and proposed Crossrail 2 stations with potential development opportunities. This provided the framework for the appointment of HS2's Master Development Partner.

Old Oak Common, mid-way between Heathrow and the centre of London will be a key hub connecting the city to the rest of the UK. The six sub-surface HS2 platforms are connected to the eight surface level platforms of the Great Western Mainline and new Elizabeth line. Built on the site of the old maintenance depot, the new station box will stretch to one kilometre in length and 20 metres in depth, making it the UK’s largest sub-surface station. WSP is leading the design development, working with more than 35 disciplines. Co-located with HS2, our team is designing a world class, people-centred station that will act as a powerful catalyst for the regeneration of the area, paving the way for 25,000 new homes and creating 65,000 new jobs. Our innovative value engineering is finding space for adjacent site developments and eliminating unnecessary construction to control costs, achieve the construction programme and provide commercial opportunities.

In Birmingham, the former Victorian railway station at Curzon Street will be transformed into a landmark destination at the heart of a 140-hectare regeneration. The 140-strong project team’s ethos is to create a transport hub that is “simple, elegant and refined”. Putting the customer journey first, WSP’s detailed design features a spacious station concourse without columns, improving navigability and reducing overall journey time. It will be fully integrated with pedestrian, cycle, taxi, bus, conventional rail and tram connections, to provide a joined-up customer experience.
Network Rail is undertaking a major development program to improve accessibility at 160 train stations around the country by installing lifts and ramps. The aim of the development program is to provide step-free access from entrance to platform at each of these stations, benefiting disabled people and those with reduced mobility, or those with children. WSP delivered seven of these Access for All (AFA) schemes in Scotland: Perth, Newton, Dyce, Shotts, Rosyth, Gleneagles, and Dunblane.

Each station brought its own challenges, with our work involving the installation of footbridges, lifts, ramps, CCTV and PA systems, and a range of mechanical and electrical, and telecommunications installations. We also provided architectural input to incorporate listed buildings into our AFA designs.

**Awards**

- Heritage Award won in 2015 for this Scheme
Gourock rail station is on the shoreline of the Firth of Clyde in Inverclyde, Scotland. The existing concrete sea wall protecting the quayside of platform one was regularly overtopped by sea water, causing temporary flooding to the station platforms that resulted in line closures.

As lead designer, WSP was responsible for design of the refurbishment works. This included the demolition of redundant station buildings, strengthening of the existing buildings and station roof, platform and concourse resurfacing and associated drainage, two new platform canopies, and renewal of all lighting, CCTV, and PA systems. We also performed the coastal defence design that included the addition of rock-armoured revetment, to further protect the station area by reducing wave impact. Finally, WSP also carried out an environmental impact assessment of the revetment.

We were able to reduce construction cost by changing the design to steepen the revetment, reducing material quantities.

The discovery of significant structural damage to the existing timber columns supporting the concourse roof structure led to the design of new steel columns and additional roof bracing. We completed this design on a fast-tracked program to minimize delays to the ongoing ground level civil works and canopies.
The introduction of around 11,000 new homes as part of the Waterbeach New Town development, north of Cambridge, meant Waterbeach station would need to meet a substantial increase in passenger demand.

Network Rail was separately considering extending the platforms at the existing Waterbeach Station as part of its train lengthening study between King's Lynn and Cambridge. This measure could, however, only cater for existing demand.

Working for the developer, RLW Estates, and in parallel with Network Rail, we reviewed the feasibility of relocation of the station. Our study has since been accepted by Network Rail as part of the package of infrastructure improvements that can be delivered to support the proposed Waterbeach New Town.

WSP has been retained by RLW Estates to provide the design option to support the planning application for the relocated station, which will integrate seamlessly with a wider vision to develop Waterbeach New Town. This vision is of a highly sustainable new community, which features an accessible, cycle-friendly station and public transport hub that reduces reliance on car trips.

The relocated and enhanced step-free station is due to be operational by 2021. Passive provision is built in to our design so that the station can accommodate 12-carriage trains, turn-back facilities and the space and pedestrian modelling needed for effective fire and emergency strategies to be achieved from day one of operation.

We are providing services across 15 disciplines, including transport planning & highways, track, civils, overhead line electrification, rail infrastructure and station design. WSP was involved in RLW Estates' public consultation in November 2017, which has helped to inform the design development, and further stakeholder engagement activities are planned.
A new railway station at Beaulieu is being developed as part of wider ambitions to create a vibrant new neighbourhood in Chelmsford, Essex, along with 3,600 new homes, a school, parks, and business developments. The new Beaulieu station will be a transport hub for the area, unlocking growth in East Anglia and easing congestion for the nearby Chelmsford Station, which is the busiest two-platform station in England.

Having previously delivered the feasibility study for the new station scheme, WSP has been engaged by Network Rail to undertake the role of Lead Designer for the multidisciplinary single option selection and Outline Design for Beaulieu Station. As part of this work, WSP will explore the need, and, if necessary, support Network Rail in its application for a Transport Works Act Order. In addition, WSP will be providing services for some of the Enabling Works that are required at this stage of the design process.

Drawing on our extensive experience in developing station schemes, our report recommended construction of a new three-platform station with one island platform, and a single-face platform. In compliance with the Equality Act 2010, the station will also have an Access For All (AFA)-compliant footbridge and associated lifts, a 300 premium-space car park directly outside the station, a bus interchange, a taxi rank, a cycle storage for 500 bicycles, as well as a new 1100-capacity multi-storey car park, which will be situated adjacent to the station building.
WSP was the prime consultant and led the initial design effort for Chicago’s 95th Street Station and Terminal. This project consists of the complete demolition of the existing 95th Street Station and its replacement with an entirely new, modern and expanded facility. The 95th Street/Dan Ryan Station is the southern terminus for the Chicago Transit Authority’s (CTA) Red Line and a transfer facility for bus routes serving Chicago’s South Side.

When completed, the new passenger transit facility will accommodate a 780-foot double sided subway platform, 26 bus bays, two new passenger concourses (north and south terminals) with retail and CTA offices with a combined, enclosed area of nearly 4,645 m². The new facility will more than double the size and capacity of the existing station.

This challenging site is physically constricted by the northbound and southbound lanes of the Dan Ryan Expressway. The station design had to phase construction to maintain a fully functioning station for transit vehicles and private vehicles, on the expressway as well as on local city streets, continuously throughout construction.

To add further complexity to the challenge, WSP was asked to develop a design, on a public works budget, for a facility that would be an architectural icon. To achieve these ambitious objectives, WSP used a fully integrated Building Information Modeling (BIM) platform. This platform allows all disciplines to perform their work in three-dimensions, with a common, virtual model.

The stakeholder involvement process focused on assessment and fulfillment of CTA’s programmatic and functional requirements. Public meetings, presentations, and press releases were critical to gaining both community and stakeholder buy-in for the project.
Chicago O’Hare Blue Line Stations

The California, Damen and Western elevated stations were built in 1895 and are key historic structures along Chicago’s O’Hare Blue Line elevated transit system. After 120 years of serving travellers, however, the stations each required rehabilitation and upgrades.

A team led by WSP provided construction engineering and design review services for the reconstruction of the California, Damen, and Western stations, part of a Chicago Transit Authority (CTA) program known locally as “Your New Blue.” Together with the CTA and the design-build general contractor, the WSP team successfully completed the project during two very short construction windows of 42 days for the California station and 62 days for the Damen station, while the Western station remained open throughout construction. The project was delivered under budget with very positive feedback from the public.

Unforeseen structural issues, logistical concerns with off-site renovation work of the historical elements, and the short construction windows added levels of complexity that set this project apart from other station renovations. At the California and Damen stations, the team needed to elevate the platforms in order to meet the elevation of the train floor. Key components also included new light poles and integrated railings, along with the restoration of existing historic railings and light poles.

Awards
- American Council of Engineering Companies-Illinois - Engineering Excellence Special Achievement Award, 2016
Coventry Station

Coventry is expected to grow by 15 percent by 2021, but its Grade II-listed 1960s station building was not designed for 21st century passenger volumes. It was hampered by limited facilities and restricted capacity for growth. To improve connectivity with the rest of the UK and to accommodate predicted passenger growth of 100 percent by 2043, WSP was appointed to develop a master plan for the site.

The client had a specific vision for an attractive, integrated, modern station working harmoniously with the adjacent architecturally significant existing building. WSP’s initial challenge was to develop a master plan in 12 weeks that was acceptable for all key stakeholders. The scheme needed to be compatible with the adjacent Friargate development, and include a new secondary station entrance, footbridge, multi-storey car park, and transport interchange.

We identified an opportunity to use the existing topography of the adjacent road levels to provide step-free access through the new station to the new pedestrian overbridge for the platforms.

We engaged with the local community to develop design ideas and with various rail user groups to identify aspects of station design that could be easily modified to improve the usability of station facilities for disadvantaged groups.

In 2017, WSP was re-appointed to deliver a concept scheme design. Our team’s deep understanding of the site and close working relationship with the client team has enabled a seamless transition from feasibility into scheme design. We will ensure that the best option for the enhanced design is realized. Later in 2017, WSP was once again awarded selected detailed-design packages of work to assist the client in mitigating risk.

Awards

- Runner-up ‘Putting Passengers First’ Award, Network Rail Partnership Awards 2018
Denver Union Station

Location
DENVER, COLORADO, UNITED STATES

Client
REGIONAL TRANSPORTATION DISTRICT

Status
COMPLETED IN 2014

NEW PARKING SPACES
21,000

PASSENGERS PER DAY BY 2030
200,000

TRAINS PER DAY BY 2030
500

WSP was the lead consultant for a master plan that envisioned Denver Union Station as a new multimodal facility for the Denver region.

The plan encompasses an at-grade, eight-track commuter rail station, relocation of RTD’s regional bus facility to the new below-grade concourse beneath 17th Street, the relocation of the light rail station at-grade adjacent to the consolidated main line, a new Downtown Circulator bus service for easy commuter rail and light rail transfers, and the refurbishment of the historic Union Station building itself. The development potential for the site includes retail, commercial, office, and residential uses totaling approximately 1.7 million square feet.

The new Denver Union Station establishes a single, unified regional multimodal transportation centre that accommodates both public and private modes of ground transportation in one location. The facility unites five transit systems—commuter rail, light rail, local and regional bus, the 16th Street Mall Shuttle, and the free MetroRide Circulator—within a single transit district. It also reuses one of Denver’s architecturally historic buildings and creates a pedestrian-friendly transportation district that helps to connect neighborhoods and create a new gateway to downtown Denver.

As prime consultant for the project, WSP was responsible for transforming broad design concepts into a functional design program. This included overseeing the master plan; alternatives analysis; environmental studies; preliminary engineering; rezoning to encourage high-density, mixed-use development; local historic designation; public outreach; and facilitation of a public-private partnership.
Edinburgh Gateway Station

The Edinburgh Gateway station is a new, “airport quality” train station on the East Coast Main Line, running from Edinburgh to Aberdeen and connecting passengers to the airport. The project involved development of a new station, concourse, and bridge linked to a vertical transfer building for trams, a feature wall, and an underpass for pedestrian and cyclists below the main artery road into the city.

WSP was appointed as Balfour Beatty’s lead designer on the design and build contract. We completed the full “one-stop shop” delivery service, including mechanical, electrical, public health, and communications designs, as well as civil and structural work, and used BIM modelling for the full design.

By revisiting the outline designs, our team identified ways that would not only enhance the overall design but save the client significant costs. Replacing part of the lightweight ethylene tetrafluoroethylene (ETFE) roof pillows with an extended canopy removed the health and safety risks associated with cleaning them of diesel fumes and steam engine discharge, an action that saved almost £1.4m in construction costs. Our review found further significant savings in remodelling the car park, platform, and overall station layout, leading to over £2M in total savings.

Awards
- Winner of Saltire Society and ICE ‘Building’ award, 2017
Edinburgh
Waverley Station

Waverley Station is the largest station in the UK outside of London. Originally built in the mid-1850s, it sits in the middle of Edinburgh city in Scotland. We undertook design work alongside the contractor-client in a co-located office, with responsibility for the refurbishment and strengthening of the station roof, the remodelling of the concourse, and renewal of the platforms.

As lead designer, we also coordinated all the other specialist design elements, including new siphonic drainage, glazing, cladding, maintenance access systems, station lighting, and ventilation. One of the biggest challenges was the geometrically complex roof structure. Our 3D modelling helped us understand how all the different roof components would be integrated into a single design, and established a build sequence, managing conflicts between components. The entire 34,000m² roof was replaced with clear, strengthened glass to shed new light on the station concourse and platforms.

Parts of the 3D model were also used on the design drawings. These isometric views of the roof also facilitated an efficient construction process. Using modern materials in a Victorian station also presented challenges. On one occasion, where there were no modern equivalents, damaged ornamental cast-iron plates had to be replaced like-for-like.
WSP is providing multidisciplinary engineering consulting services for this new terminus station on GO Transit’s Lakeshore West Line. The Confederation GO Station is part of a plan to eventually expand the service to Niagara Falls, Ontario. This new GO Station is of significant benefit to residents in the immediate East Hamilton and Stoney Creek areas and to a significant number of commuters travelling from St. Catharines and Niagara Falls who currently need to drive into Hamilton to access GO Service.

Currently, there are approximately 20,000 daily trips on the Niagara Falls – Hamilton – Toronto corridor that are Niagara-based, with the main form of transportation being by car. Total trips are expected to increase by 30 percent in the next 25 years, driving the need for improved public transit. The Confederation GO Station is the next station to be developed to support this growth and will be followed by stops in Grimsby, St. Catharines, and Niagara Falls. In addition, the new station will be the new major bus terminus for all current GO Bus routes from Niagara.

WSP is proud to be part of this critical transit project which will improve the quality of people’s lives through the provision of more accessible public transit. The new LEED Gold targeted Confederation GO Station includes a new main station building, island rail platform, vertical access and tunnel connections, allowing access from both sides of the rail corridor, south parking lot and pavilion structure, kiss and ride, bus loop, and exterior plaza spaces.
Hong Kong
Hung Hom Station

The Shatin to Central Link is a new 17km railway project that will link the existing Ma On Shan Line in the east with the West Rail Line, and the major interchange at Admiralty Station on the Hong Kong Island via Hung Hom Station.

Located on the Kowloon peninsula, Hung Hom Station will be extensively modified to become a super interchange station. To accommodate the rail extension, an underground level platform and an at-grade platform will be built beneath and alongside the existing station podium. A key challenge is to maintain full operations of the existing railway lines while modification works take place. To minimize noise during the daily train operations from 5am to 1am, the station can only undergo 3 to 4 hours of noise-bearing construction a day. Completion of the station modification work in phase one of the Shatin to Central Link is expected in 2019.

WSP is the detailed design consultant for the modification work and the improvement of the existing fire protection system by adding Long Throw Sprinklers. Hung Hom Station—which consists of intercity and Customs Immigration and Quarantine (CIQ) facilities—is the first Hong Kong railway station to adopt these Long Throw Sprinklers.

Unlike other conventional subway stations, where the E&M plant rooms are typically located underground, the Hung Hom Station extension will use an existing freight yard for platform and E&M plant rooms, reducing construction cost for underground space. The project also involves the decommissioning of existing commercial areas during different construction phases, under an operating station environment and without affecting the operation of the CIQ and intercity train service.
Kowloon Station serves as a key transport hub for the Airport Express and Tung Chung Line, connecting the city with the airport and the town of Tung Chung.

WSP served as the mechanical & electrical design consultant from concept to detailed design stages. Key elements included HVAC, security and surveillance systems, as well as fire protection and detection systems. Since Kowloon Station connects to the immersed tube tunnel under Victoria Harbour, WSP also designed the flood detection system linked to the floodgates.

Located in the West Kowloon area, the station has a 220,000m² station floor area spanning two underground levels and one ground level, in addition to extensive top-side development comprised of a shopping complex, fully landscaped podium gardens, and a comprehensive commercial/residential development. At the time of construction, Kowloon Station featured the world's deepest bored piles (105m) to support this commercial/residential development. Airport check-in services are also available for the Airport Express passengers.
Hong Kong
Tseung Kwan O Extension Stations

The Tseung Kwan O Extension is an underground rail line built to serve the town of Tseung Kwan O. Built mainly on reclaimed landfill, the town was previously accessible only via a road tunnel. The 10km rail line provides an alternative and efficient mode of transport for its residents, with trains running every 2 minutes. Its five stations are integrated within commercial/residential buildings as transport-oriented developments (TOD). All stations on the Tseung Kwan O Extension are fully air-conditioned and fitted with platform screen doors to enhance safety and energy saving.

WSP was the lead consultant in a consortium of international consultants for Po Lam and Hang Hau Stations, with responsibility for planning, project management, architectural services, civil/structural, station MEP systems, system-wide coordination, tender packaging, and construction-stage supervision.

Po Lam Station is an at-grade terminus station. WSP implemented various cost-saving initiatives including a re-arrangement of the station rail operation to a pinched loop configuration, removing the need for a running track and the associated platform, thereby reducing the estimated construction costs by over 40 percent.

Hang Hau Station is a semi-underground station with the track and side platforms below ground, served by a common at-grade concourse. Using a top-down construction method allowed for excavation to continue below ground, while sealing the project at street level to minimize noise and dust pollution.

Under a separate contract, WSP was the MEP consultant for the Tseung Kwan O and Tiu Keng Leng Stations, with responsibility for station MEP systems design and construction-stage supervision.
Hong Kong
South Island Line
Stations

The South Island Line East provides a much-needed alternative mode of transport to the 350,000 residents living in the Southern District, who had faced daily traffic congestion to and from the downtown area of Hong Kong. With daily capacity of 170,000 passengers, the South Island Line East is Hong Kong's second fully-automated medium-capacity mass transit system. Running partly underground and partly elevated, it spans 7km from the downtown hub in Admiralty to the South Horizons residential development, via three intermediate stations located in Ocean Park, Wong Chuk Hang, and Lei Tung.

WSP provided civil, structural, mechanical, and electrical engineering consultancy services for the underground South Horizons and Lei Tung Estate Stations, including associated above-ground entrances and the ventilation building. WSP also served as the lead MEP consultant for the elevated stations of Wong Chuk Hang and Ocean Park.

A temporary traffic deck was erected to maintain the operation of a public transport interchange while construction of the South Horizons Station proceeded below. In order to move forward in the limited underground space, WSP relocated part of the station facilities and utilities to a two-storey building above ground.

With the platforms situated 40m below ground, the cavernous Lei Tung Estate Station is one of the deepest stations in Hong Kong. The two-level underground station is comprised of a concourse on the upper level and an island platform on the lower level. Four high-speed passenger lifts carry passengers from street level to the concourse below.

Wong Chuk Hang Station is an above-ground station that is situated above a nullah. The station also serves as the future interchange station for the South Island Line West. Originally planned as a double island platform with the South Island Line West taking up the center dual tracks, the project has been revised to two island platforms stacked on top of one another.

Being naturally ventilated, Ocean Park Station has large spans of windows at the concourse level to take advantage of cross breezes and natural daylight. With the absence of chiller plants and air-conditioning, only blower fans increase the natural air circulation throughout the summer, making this station one of the greenest in Hong Kong.
Hong Kong West Rail Stations

The West Rail Line provides a mass transit service to the increasing population in the western New Territories, linking them directly to the downtown area of Tsim Sha Tsui in Kowloon. The project involved the construction of nine new stations and modifications to three existing stations.

WSP was the lead consultant, project manager, and construction supervisor for the elevated Kam Sheung Road Station and nearby 21ha depot. Aspects of design included architectural, civil, structural, MEP, and safety and risk management. Under a separate contract, WSP served as the MEP consultant for the Siu Hong and Tuen Mun Stations. Services included design of the cabin concept based on a fire engineering approach to achieve effective smoke control for the station trading areas, rail systems, as well as station building services.

WSP was commissioned by MTRC to perform a comprehensive energy survey for all nine stations as part of an operational cost-saving assessment and to create a sustainable environment for the future. The objectives of this energy survey were to identify major energy consumption items, analyze the energy consumption data, identify any energy saving opportunities, and recommend further actions to enhance energy performance.
The southeast section of the Crossrail project will link the central Crossrail lines emerging at Plumstead Portal to a new station and turnback facility at Abbey Wood. In 2010, we were appointed main contractor in the design and build contract to undertake the necessary works. The key challenge was delivering them within a densely populated urban residential environment while maintaining an operational railway. Successful delivery came through a series of complex construction stages.

The physical works included several steps. The existing 3km rail corridor was widened from two to four tracks, to make provision for the Crossrail lines. New rail systems, including two different power systems for the adjacent lines (AC overhead lines and DC traction rail), were added. Provision of major civil engineering infrastructure in the form of ground improvement works, drainage, utility diversions, highway realignment, four new overbridges, and alterations to two existing highway bridges and lineside infrastructure were also accomplished. A new terminus station, including two island platforms, is also a part of the design, with an interim station implemented during the construction phase.

A key aim was for Abbey Wood station to act as a catalyst for regeneration and provide opportunities for local employment and support local authority development aspirations. The complexity of the project led the principal contractor to engage WSP’s capabilities in project engineering management, engineering design and environmental consultancy.

WSP formed a core team to integrate with the project delivery team. Through its technical capability, this team led the engineering, multidisciplinary design management and systems integration across the project. This team also provided CAD and BIM management, project controls, town planning and consents support, and environmental management services including: environmental assurance, interim CEEQUAL assessments, environmental surveys, and contaminated land assessments.

Our engineering design teams included civil and geotechnical engineering, highways and bridges, drainage, signalling and electrification, and plant.
Liverpool

Hamilton Square Station

We successfully delivered essential improvements to Hamilton Square Station as part of a £40 million upgrade, intended to breathe new life into the existing Merseyrail stations, offering a new look and improved signage.

This design and build project needed to be ready in time for the Grand National at nearby Aintree giving WSP just six months to provide Tier 1 Principal Contractor Galliford Try with the civil engineering, MEP, telecoms, and rail systems work needed to upgrade this Victorian underground station to modern standards.

This was particularly challenging as the station featured significant gaps between platform and train (sometimes of nearly 300mm), which required the platform to be raised and lowered in places—with the platform riser wall being repaired during the process. We worked in close coordination with the architect to replace the clad lining of the tunnels to ensure that the designs were fully integrated.

In addition to designing the temporary hoarding so workers could carry out operations safely next to the live track, we delivered the full electrical works to provide attractive customer information and advertising screens on the upper concourse. Our team also replaced electrical systems and lighting with more modern and efficient versions throughout the station.

Problem solving often characterizes design and build work. Working collaboratively with Network Rail engineers, we produced an “idealized” track alignment. Given that the track was on a relatively tight radius through the station, we offset the platform edge to bring stepping distances into tolerance, therefore avoiding costly wholesale track realignment on the approach and exit to the station.
The Elizabeth line is a brand new high frequency railway for London and the south east which will link Reading and Heathrow Airport in the west to Shenfield and Abbey Wood in the east. Bond Street will be one of the ten new stations on the 21km tunnelled section of the new route connecting to the existing underground stations and surface services.

As lead consultant, we provided a multidisciplinary design service for the station, integrating the 6.2m diameter running tunnels and the 10m diameter mine sprayed concrete platforms. Our top down design solution was dictated by the integrated programme requirements and location of the existing Jubilee line running tunnels directly under the western ticket hall box.

We created a station environment aligned with Crossrail Ltd’s design vision to create a light, safe, and contemporary space for the 21st century. Our design emphasises the customer experience, considering such matters as wayfinding and ambient lighting (both day and night) to provide calm, ordered, and logical spatial arrangements. The modern classical approach gives the station entrance broad portals flanked by colonnades.

Bond Street is in central London (Mayfair) and is surrounded by roads. Making extensive changes in this densely populated, congested, and constrained space required outstanding planning to avoid disruption to retailers and residents. We minimised risk to the many listed, high-value buildings in the area.

Inner city development is about keeping the city moving. We worked with key stakeholders, to understand their needs and create the best station possible. Collaboration enabled us to unlock the surrounding highways to provide traffic and transport services and ensure the safe and timely delivery of this high-profile project.
London Bridge Station

London Bridge station has been completely rebuilt, transforming the city’s oldest station into one fit for the 21st century by making it modern, spacious and fully accessible. This has all been achieved while keeping London’s fourth busiest station open for the 50 million passengers who use the station each year, and will help the Thameslink Programme deliver a metro style service of 24 trains per hour through central London from 2019.

WSP was appointed as lead designer, and was faced with the challenge of developing an affordable world-class design which delivered the necessary railway improvements while keeping London Bridge Station operating with minimum disruption.

The scheme involved the design of an 8,000m² concourse at street level, with a live railway running over the top on a viaduct, incorporating its Victorian brick arches, and featuring a new deck supported on columns located within the concourse. Several parts of the station were heritage-listed, and we incorporated these original features into the final design, while creating an attractive environment that allowed free passenger movement through the station from street to platform level.

Despite significant changes to scope, our project team completed services within the timescale through a flexible approach to delivery, co-location of staff and progressive sign off of deliverables. We also introduced almost £40 million of savings to the original project costs through innovative design solutions, and avoidance of costly utilities diversions.

During the 5 year construction phase, we functioned as lead designer for the management and preparation of all construction-related design documents. Completion of the design was subject to several significant challenges, including the need to maintain the integrity of the Victorian arches during demolition.

Over the five-year construction period, the key challenge has been to minimize disruption for passengers. The complex construction strategy involves a phased demolition and reconstruction with over 70 sub-stages, ensuring that the station remains operational throughout the works. Through expert programming and collaborative working, the London Bridge team has met all of the possession dates.

Awards

- CEEQUAL Sustainability Award – Outstanding (96.9%)
- Putting Passengers First Rail Partnership Awards 2018
- Overall Winner of New London Awards 2018
- Station of the Year Award, National Rail Awards 2018
Farringdon station will be one of the busiest stations in the United Kingdom, connecting Thameslink with the London Underground. Over 140 trains per hour will flow through the Farringdon interchange when it becomes London’s only link between Thameslink, the Elizabeth line and London Underground lines, serving passengers from outer London to business hubs in the City and Canary Wharf. It includes two Elizabeth line platform tunnels, each the length of three football pitches, linking two new ticket halls to the east and the west.

In August 2012, WSP was appointed to develop the detailed mechanical, electrical and public health designs for the ticket halls, platforms, lifts and escalators, and provide construction support. This has required close collaboration with our client and all design parties including the railway system contractors. Our MEP engineers and 3D BIM modellers have been co-located with the contractor’s architect to efficiently and effectively solve complex design challenges in constrained spaces. This collaborative approach has enabled us to deliver a co-ordinated and integrated Mechanical, Electrical and Public Health design for all the station areas, to a BREEAM excellent rating, and ensure Crossrail Ltd’s delivery schedule remains on track for this station.
London Paddington Station

The heritage of the existing Grade I station, and the adjacent Grade II Listed Macmillan House have been reflected and preserved in the design of Paddington Elizabeth line station. The station is a 260m long x 25m wide and 23m deep box which sits below Eastbourne Terrace, a busy thoroughfare within Westminster. There are direct links to the existing National Rail station and the LU Bakerloo line via a new passenger tunnel entering the Elizabeth line station below platform level. Interchange is also possible with the Circle, District and Hammersmith & City LU lines. To minimize disruption, the box was designed top-down to enable Eastbourne Terrace to be re-opened in February 2014 while construction work continued below.

WSP is completing the detailed design and fit out of the station, as well as providing construction support. We are providing an experienced multidisciplinary team of engineers, architects, facade engineers, and specialists in bomb blast mitigation. Support is also being provided by our specialists in Engineering Safety Management, Fire, EMC, RAMS, and Design Assurance.

The team is co-located in the site project office working in a collaborative environment with Costain Skanska and their supply chain, and the Crossrail Project Team, and interfacing with systemwide contractors. Specific focus is on design and clash detection/co-ordination of a Bentley MicroStation 3D model which will be developed into a full asset tagged BIM model. The design ensures that the station operates safely, reliably, efficiently, and is easily maintained.
London
Tottenham Court Road Station

Tottenham Court Road Station is in the heart of Soho, where the recently upgraded Tube station currently serves over 100,000 passengers a day. This number will grow to over 170,000 when the Elizabeth line opens in autumn 2019. The design includes two oversite developments incorporating commercial space, residential space and a new theatre, as well as a significant public realm enhancement that will transform the protected conservation area.

WSP is working with Crossrail Ltd on the detailed design of the new western ticket hall at Tottenham Court Road and is providing construction support for the contractor Laing O'Rourke. When complete, Tottenham Court Road station will feature two 234-metre long platforms and new concourse areas extending between two new ticket halls at Dean Street (western ticket hall) and Goslett Yard (eastern ticket hall).

The construction of the station is a complex phased operation, and its method and sequence of construction is an integral part of the design process. The work is being integrated with the adjacent London Underground station upgrade, to provide interchange with the Central and Northern lines.

WSP’s team consists of an experienced multidisciplinary team of engineers, architects, acousticians, environmentalists, and specialists in engineering safety management, fire, EMC, RAMS, and design assurance. The 100+ team is co-located in the site project office working in a collaborative environment alongside Crossrail Ltd, Laing O’Rourke and their supply chain as well as the system-wide contractors. Specific focus is on the co-ordination of the integrated Bentley Microstation 3D model, which is being developed into a full asset-tagged BIM model.
As part of the Victorian Government’s initiative to improve public rail safety, the Level Crossing Removal Authority will oversee the removal of 50 dangerous and congested level crossings across Melbourne. The Caulfield to Dandenong project will remove nine dangerous level crossings on the Cranbourne-Pakenham line in Melbourne, and rebuild five train stations along the line with new modern facilities: Carnegie, Murrumbeena, Hughesdale, Clayton, and Noble Park Stations.

The reliability of the metropolitan, regional and freight services is expected to markedly improve with the completion of the project. When the project is complete in 2023, capacity on the Pakenham and Cranbourne lines will increase by 42 percent, providing room for an additional 11,000 passengers in the morning peak.

The project is being delivered by a project Alliance consisting of Lendlease, WSP, CPB Contractors, and Aurecon together with Metro Trains Melbourne and the Level Crossing Removal Authority. Supporting the group will be urban design and landscape architects Cox Architecture and Aspect Studios, as well as property developer Lendlease Urban Regeneration. We are part of the project team that is delivering the detailed design and construction phase design services.

For the tender design, we worked to deliver an innovative, robust and cost-effective solution, using BIM technology to provide visualizations of the project through 3D models. This resulted in a unique design plan centered on maximizing open space. It will deliver the completion of all nine level-crossing removals as “rail-overs”, placing an elevated rail above the existing corridor. Designing the line this way eliminates the issue of major barriers currently separating communities and offers numerous other benefits, including new station precincts with safer access for bus and car drop offs, as well as incorporating retail and gateways to new open space.

The design team has focused on incorporating a number of innovations to deliver one overall integrated scheme. On average, trains operate along the railway 8m above the existing ground level. Stations are elevated at 10m above ground level, which assists with reducing traction power consumption as trains brake uphill into stations and accelerate downhill out of stations.
Melbourne
Footscray to Deer Park Stations

The Regional Rail Link project is one of Australia’s largest public transport infrastructure projects and Melbourne’s first new major rail line in 80 years. The Footscray-Deer Park Alliance section of the project involved, among other deliverables, the design and construction of new stations at West Footscray and Sunshine, and a major upgrade at Footscray in Victoria.

We delivered upgrades to Footscray station, including new platforms adjacent to Irving Street, improved station entrance, and forecourts incorporating escalators, ramps, lifts and stairs. For the rebuild of West Footscray station, the work included ramps, lifts, and stairs. The rebuild of Sunshine station included a new platform and pedestrian overpass, improved station entrance, ramps and forecourts, lifts, and stairs.

WSP was predominantly involved with the design management, design development, and detailed design of all elements of the works, including track alignment, traction power, civil/structural design, signalling design, and design of new and upgraded stations.

The WSP team actively participated in delivering an innovative design delivered on an accelerated timetable, enabling a four-month program reduction on a 36 month baseline program. The innovative design also brought about improved community through enhanced urban design outcomes.

Innovation through the design development phase strongly influenced innovation during delivery. This included optimizing the functional layout of West Footscray station by re-aligning the station overpass to provide improved connectivity with population centres on each side of the rail corridor, as well as optimizing design solutions to provide minimized whole-of-life costing. By implementing the ground-breaking application of LED lighting to minimize the carbon footprint of new stations, we were able to achieve a 4-Star Green Star rating at both new and modified stations. Optimizing modularization and the use of precast elements allowed us to support the safest, most economical, and quickest build.

Awards
- Infrastructure Partnerships - Australia’s Infrastructure Project of the Year, 2014
- Premier’s Sustainability Award - Infrastructure and Buildings category, 2014
Southern Cross Station - the redeveloped and revitalised Spencer Street Station - is located on the western side of Melbourne's central business district. With its close proximity to the growing Docklands area, Southern Cross Station acts as an efficient and comprehensive public transport hub for commuters, providing connections to bus services, metropolitan, regional and interstate trains, trams, and taxis.

A key design feature of the station is the large span wave-form roof: the undulating structure was developed to assist with the extraction of diesel fumes and other air contaminants, by way of a louvered natural ventilation system.

Whilst the northwest and southwest winds are essential to the operation of the ventilation system, the roof also serves as a means of sheltering passengers from the sun, wind, and rain. Passenger amenities within the station include retail tenancies, a food court, waiting areas, baggage-handling, and information systems. A two-storey office 'pod' beneath the roof provides accommodation for station administrative staff.

The development also features above-rail air-rights, commercial developments at '664 Collins Street', a medium-rise office and carpark development, and 'West End Plaza', a major retail centre.
New York City Fulton Center

The Fulton Center brought together five underground stations built by three competing subway systems. The new station makes transferring among nine subway lines (A, C, J, Z, R, 2, 3, 4, 5) convenient and rational—two qualities sorely lacking in the old Fulton Street station, which forced travellers to navigate a confusing jumble of passageways.

The new transit center, which features an aboveground structure clearly visible from the street, aims to make underground transit less congested and circuitous and more accessible to people with disabilities. The centerpiece of the station is a glass-and-steel structure at the corner of Broadway and Fulton streets that features a soaring glass oculus, 27m high, and a large atrium. The public areas of the complex include 6,000 square meters of high-quality shopping and dining for travellers and visitors.

WSP, in joint venture with Bovis Lend Lease, served as consultant construction manager to the MTA, ensuring that construction was carried out in accordance with the approved design, and advising the client on issues that arose during construction. Given the complexity of the new structure, and the need to maintain 24/7 passenger access to all subway lines, managing the construction process posed a number of challenges.

The project comprised 11 separate construction contracts. Joint venture responsibilities included preconstruction services during the project’s design phase, technical assistance during bid and award, and construction management of all contracts during the construction and close-out phases. In addition to the foundation and building, the joint venture provided oversight for the demolition of various commercial and office buildings necessary to clear the site, a cut-and-cover tunnel for the new underground passageway below Dey Street, and various subway station improvements.

One of the major challenges during construction was consolidating multiple communications systems—for functions such as fire alarm, public address, and smoke exhaust—into a central command center in the new building. Other problems were posed by the need for construction crews to work around temporary corridors and covered passageways that were constantly in use by subway patrons.

Awards
- New York Construction News - Project of the Year Civil/Public Works, 2010
- Engineering News-Record New York - Project of the Year, 2015
- ASCE Metropolitan Section - Construction Achievement Project of the Year, 2015
New York City
34th Street/Hudson Yards Station

When a new subway station opened at New York City’s Hudson Yards, it marked the culmination of more than a decade of work by WSP in planning a new neighborhood and bringing rail transit to midtown Manhattan’s far west side. The new station, at 34th Street and 11th Avenue, serves the city’s No. 7 line subway, which was extended 1.5 miles from its previous terminus at Times Square (8th Avenue at 42nd Street).

The 34th Street station, the first new station in 25 years and the 469th in the system, is deep by New York City subway standards—125 feet underground—and is reached by escalators and inclined elevators. Designing the project posed several challenges. The need to avoid the existing tunnels, buildings and other infrastructure required relatively deep tunnels—about 100 feet deep in most places. As the TBM’s dug the tunnels, a cavern for the station was mined through the drill-and-blast method.

WSP led conceptual, preliminary and final design for the subway extension, assisted the MTA in developing the phased construction program and contract packages, prepared the project’s eight-volume, 6,600-page environmental impact statement and provided construction support services. Final design services included civil, structural, geotechnical, architectural, mechanical, electrical and communications design elements, as well as construction cost estimating and scheduling support services. As a consultant to the contractor, we also served as systems integrator, responsible for ensuring that mechanical-electrical-plumbing systems perform as designed.

Awards
- American Council of Engineering Companies – Grand Award, 2016
- American Council of Engineering Companies – Empire Award, 2016
- Urban Land Institute New York – Excellence in Development Award, Civic Space Category, 2016
- New York State Society of Professional Engineers, Metro Chapter – Project of the Year Award, 2016
New York City
Second Avenue Subway Stations

The Second Avenue Subway will be used by an estimated 213,000 passengers daily, and will reduce overcrowding on the Lexington Avenue line, two blocks to the west, by 13 percent, according to the Metropolitan Transportation Authority. The new line extends 3km under Second Avenue from 63rd Street to 96th Street, with new stations at 72nd Street, 86th Street, and 96th Street.

WSP was the Second Avenue Subway’s consultant construction manager, responsible for overseeing the work of contractors on behalf of the MTA. Our scope of work included resident engineering and inspection, constructability reviews, contract management and administration, project controls, utility coordination, commissioning and startup, and project closeout. During much of the nine years of construction, WSP had an average of 120 people on site managing as many as eight construction contracts simultaneously.

Phase 1 involved several methods of construction, including drill-and-blast and cut-and-cover tunneling, as well as excavation by a tunnel boring machine. Stations excavated by traditional drill-and-blast caused considerable disruption to the local community, and those impacts, as well as many other inconveniences, had to be managed by the MTA and the WSP construction management team.

The new subway stations are free of columns and include mezzanines between the street and the train platforms, making the stations much more spacious. Each of the stations includes artwork. The 86th Street station features mosaic and ceramic-tile portraits by noted artist Chuck Close of celebrities such as Philip Glass, Lou Reed and Cindy Sherman.

Awards
- Engineering News-Record - Best of the Best Awards, 2016
- American Council of Engineering Companies New Jersey - Honor Award, 2017
Manhattan's South Ferry subway station is back in service, fully rehabilitated following severe flooding sustained in Superstorm Sandy in 2012.

The South Ferry terminal station, which dates to 1905 and had been extensively renovated in 2009, was submerged in 24m of water – an estimated 57,000m³ of water from track level to the concourse level, and was forced to close.

The intrusion of salt water and sewer water caused a great deal of damage to both the station environment and the operational system equipment, including the escalators/elevators, fare control, electrical, mechanical/ventilation systems, communications systems, and track/signal systems.

WSP, in joint venture, performed station rehabilitation, flood mitigation designs and construction-phase support to bring the South Ferry subway station back on line in 2017. The firm was also responsible for leak remediation, addressing the leakage problems that the station and adjacent tunnels experienced since the original construction of the complex.

Other station improvements and customized design solutions included: hardening of various rooms and ventilation structures to handle flood loads; use of marine-type flood doors and watertight hollow metal doors for several critical rooms; use of flood panels at elevator doors, stairs and service corridors; large-capacity pumps at track level, powered by emergency generators; vent covers for street grates; and check valves, backwater valves, and isolation valves to minimize or prevent water infiltration in critical rooms.

**Awards**
- American Council of Engineering Companies of New York - Gold Award for Transportation, 2018
New Jersey
Performing Arts Center Station

The Broad Street Extension of the Newark Light Rail system connects the downtown district, providing service to two of Newark’s busiest intermodal facilities—Penn Station and Broad Street Station. By connecting Newark’s two major rail stations, the extension offers more travel options in downtown Newark. The project includes four aboveground stations, and provides easier access to NJ TRANSIT’s city subway, commuter rail and bus networks, Amtrak, Greyhound, and Newark Liberty International Airport.

From Penn Station, Newark, the city’s main rail hub, light rail vehicles travel north to Broad Street Station in less than 10 minutes, stopping at Center Street near the New Jersey Performing Arts Center (NJPAC), Atlantic Street’s growing commercial district and Riverfront Baseball Stadium and return southbound, stopping at Washington Park’s cultural institutions and again at Center Street.

The stations were designed to be compatible with adjacent structures by using similar elements and materials. Public art displayed at the stations includes leaning rails, windscreens and paving inserts inspired by historical or cultural connections or the local communities. A Walk of Fame commemorating New Jersey’s rich performing arts community and granite blocks in the rail bed form patterns replicating musical scores from Newark’s rich jazz heritage.
Ottawa Confederation Line

STATIONS

Location
OTTAWA, ONTARIO, CANADA

Client
INFRASTRUCTURE ONTARIO,
CITY OF OTTAWA

Status
ONGOING

13

EXPECTED TRIPS IN 2021
51,000,000

EXPECTED TRIPS IN 2031
76,000,000

WSP is the lead design firm in the joint venture design-build consortium Rideau Transit Group which is overseeing the Ottawa Light Rail Transit (OLRT). The project involves converting a portion of the existing bus rapid transit system into a light rail transit system, and adding new track in other areas, including upgrading existing stations and construction of new stations—for a total of 13 stations. Project challenges included the design of the administration portion of the building as a post-disaster facility, as it contains system-critical computer systems.

WSP provided overall project and design management of the pursuit including management of seven main subconsultants and several other specialists. WSP provided the structural, mechanical and electrical preliminary designs for the above-ground stations and MSF; station

and guideway civil, structural and utility pre-designs; traffic and environmental pre-designs; IT and security; landscaping; bridges; and commissioning services on the project.

Ridership of the new OLRT system is expected to rise from 51 million trips in 2021 to 76 million trips in 2031. The OLRT will manage a peak flow per direction and per hour of 18,000 passengers in 2031, greatly improve transit times in the central Ottawa area, and provide the convenience of three underground stations in the city core.
Philadelphia 30th Street Station

WSP is part of a team led by Skidmore, Owings & Merrill that developed a comprehensive master plan for the area around Philadelphia’s 30th Street Station. The 30th Street Station District Plan represents an unmatched opportunity to create a compelling, modern civic vision for the area around the station, which serves Amtrak, SEPTA (Southeastern Pennsylvania Transportation Authority), and NJ TRANSIT. With the monumental 81-year-old rail station at its core, the master plan supports the station’s role as an intermodal transportation hub and community center.

The goal was to develop a plan that places a revitalized station at the epicenter of a dynamic, urban neighborhood full of opportunities for community development, economic development and improved transportation connections.

A wide range of commercial opportunities, including a new vision for retail spaces within the station and the potential development of air rights above approximately 85 acres of rail yards adjacent to the station, was considered.

WSP was responsible for leading the multifaceted transportation elements of the master plan and provided project management support. The long-range program was created to enhance and ensure the long-term functionality of one of world’s great train stations and integrate the many modes passing through the station and district, including intercity and commuter rail, subway, trolley, local and intercity buses, bicycles and pedestrians.

Awards
- American Institute of Architects - Honor Award for Regional and Urban Design, 2017
San Francisco
Central Subway
Stations

WSP has been involved in the Central Subway project since 2003, when it led the joint venture responsible for preliminary engineering to transform the subway from a largely cut-and-cover alignment to a direct route optimized for pressurized face tunnel boring machines. The firm continued as the lead in two joint ventures for the final design of the tunnels and underground stations. Central Subway is the second phase of the Third Street Light Rail project, and will extend the line 2.7km northward through the Yerba Buena district to Union Square and Chinatown. The project includes one surface station and then descends underground through a double portal under Interstate 80, to continue northward to three new underground stations. The Yerba Buena/Moscone Station employed a top-down, cut-and-cover method, with an off-street headhouse and entrance designed to support future transit-oriented development. The Union Square/Market Street Station, unique for its use of inclined tangent piles as the station walls, extends from the BART (Bay Area Rapid Transit) and Muni Metro Powell Street Station under Market Street to Union Square. The Chinatown Station has an off-street station headhouse that extends more than 30m below ground through sand into sandstone and shale bedrock. Fully mined sequential excavation methods were used for the platform and crossover caverns to lessen traffic disturbance to Stockton Street, a major commercial and bus transit artery through Chinatown.

When the Central Subway opens in 2019, it will serve 43,700 travellers daily and significantly decrease travel times along Fourth and Stockton streets, two of San Francisco’s most congested corridors. It will decrease travel time and increase mobility, connect local communities with limited transit access and low automobile ownership, and enable more housing development in the southeast section of the city.

Awards
- 2015 Outstanding Transportation Project of the Year in California, American Society of Civil Engineers (ASCE) Region 9.
Seattle
Angle Lake Station

A new light rail extension, station and parking garage are providing travellers with convenient transportation in Greater Seattle. The 1.6km South Link Extension to Angle Lake Station in the Seattle suburb of SeaTac connects Sound Transit travellers to the existing 30km Link light rail that runs north to Seattle-Tacoma Airport, the city’s downtown, Capitol Hill, and the University of Washington.

Angle Lake Station will serve as the southern terminus for Seattle’s light rail system until a planned extension of the system opens in 2023.

WSP provided design-build project management services on behalf of Sound Transit. The project included a double-track elevated guideway between the new terminal station and the existing tracks, as well as a park-and-ride garage. The project was completed ahead of schedule and $40 million under budget.

The elevated Angle Lake Station consists of a canopied centre platform built on precast girders with a topping slab and an at-grade plaza level. A steel-framed canopy protects travellers from the elements, and escalators and elevators provide easier access to the station from the ground level. One of the notable features of Angle Lake Station is a sculpture on the platform entitled “Cloud” by artist Laura Haddad. The sculpture consists of 6,000 hanging disks that alter their appearance when there are changes in light, weather, or when a train approaches.

By 2018, 5,400 passengers are expected to use the new station on a daily basis. Angle Lake Station is the 16th station on the Link light rail line. The new 1,092-space parking garage built adjacent to Angle Lake Station offers a commuting alternative for students, workers and visitors heading to downtown Seattle and the University of Washington. WSP provided civil, structural, architectural, systems and mechanical, electrical and plumbing engineering for the parking garage, a concrete structure with a blue steel exterior.
Singapore Circle Line Stations

The 35.5km Circle Line forms a connection with several existing Mass Rapid Transit lines, allowing passengers to transfer between rail lines while avoiding the city centre.

The Circle Line was constructed in five stages, with stages 4 and 5 completed in October of 2011. Stage 4 extended 10.11km from the north-western station of Marymount to Kent Ridge. Stage 5 extended 7km from the southwestern station of Kent Ridge to Harbourfront. WSP was the architectural and engineering consultant for stages 4 and 5, providing architectural, civil/structural, and MEP engineering services for the stations and associated tunnels.

WSP extended its services to the construction stage by providing construction supervision services, with over 60 site staff for underground stations, twin bored tunnels, underpinning of road bridges, cut and cover tunnels for turn-back facilities, demolition, and re-building of three pedestrian overhead bridges.

The Circle Line is a fully-automated, fully-underground, medium-capacity MRT system, of which Stages 4 and 5 consist of 12 stations, served by a fleet of 64 driverless three-car trains. Buona Vista Station is a 6-level underground interchange station, which also serves as one of four civil defence facilities.

Awards
- Singapore’s Building & Construction Authority - Construction Excellence Award, 2013
Singapore
Downtown Line
Stations

The Downtown Line is a 42km underground Mass Rapid Transit system, with a fleet of 81 fully-automated, driverless three-car trains with 34 stations, 15 of which can alternatively serve as civil defence shelters during national emergencies. It was constructed in three phases, opened in December 2013, December 2015, and October 2017.

The first phase of the line formed a loop in the downtown core. WSP provided tunnel ventilation engineering services as well as civil, structural, and MEP consultancy services for Promenade Interchange station, which is comprised of a 42m-deep stacked-platform underground interchange station with 7 basement levels and 1.12km of bored tunnels. It is the second deepest Mass Rapid Transit station in Singapore. Top-down construction and 1.5m-thick diaphragm walls were utilized to prevent the settlement of surrounding buildings.

The second phase extends 16.6km with 12 stations, bored/cut and cover tunnels and a depot, connecting the downtown Bugis Station with Bukit Panjang in northwest Singapore. WSP was the lead MEP consultant for the 12 stations, depot, and tunnels, including the design of the environmental control system, fire protection system, architectural lighting, as well as interfacing with 9 design–build main civil contractors and construction supervision services. One of the key challenges of the project was the underground construction works adjacent to the existing Expo MRT station, which had to remain fully operational during construction. Rochor Station also faced a major construction challenge due to different ground conditions and the need to temporarily divert the Rochor Canal.

For the 21km-long third phase connected Chinatown Station with Expo Station, with 16 stations, WSP was the lead MEP consultant for the stations and associated tunnels. Project work encompassed ECS, fire protection, escalators, and lighting. This project included Bencoolen Station, with 6 basement levels reaching to a depth of 43m, the deepest MRT station in Singapore.

Awards
- Singapore Concrete Institute – Excellence Award, 2015
- Downtown Line 2 M&E Services – ACES Design Excellence Award, 2016
- MacPherson Interchange Station – Fire Safety Design Excellence Award, 2017
Singapore
Thomson-East Coast Line Stations

The Thomson-East Coast Line will be Singapore's sixth Mass Rapid Transit line that connects the northern and eastern regions of Singapore with the downtown district. The 43km, fully underground, medium-capacity MRT line will be one of the world's longest driverless rapid transit lines. WSP is the lead electrical and mechanical consultant for 11 of the 31 stations, as well as for the East Coast Integrated Depot.

Spanning 31 stations from Woodlands North station to Sungei Bedok station in the east, the line will open in stages from 2019 to 2024. Stage 1 consists of Mandai Depot, 2 new stations, and 1 refurbished station from Woodlands North to Woodlands South. Stage 2 consists of 5 new stations, 1 refurbished station, and 1 station box from Woodlands South to Caldecott. Stage 3 consists of 9 new stations and 4 refurbished stations from Caldecott to Gardens by the Bay. Stages 1 through 3 stretch across 30 km.

Stage 4 consists of 7 new stations from Gardens by the Bay to Bayshore. Stage 5 consists of the East Coast Integrated Depot, 1 new station, and 1 refurbished station from Bayshore to Sungei Bedok. Stages 4 through 5 stretch 13 km. The Thomson-East Coast Line interchanges at 7 stations with 5 MRT lines and 13 stations will also serve as civil defence shelters.

Awards
- Singapore’s Ministry of Transport - Value-for-Money Achievement Award, 2014
Stockholm Central Station

Stockholm Central Station is the busiest station in Sweden, both for long-distance travel and in the Stockholm commuter network, with 60 million passengers per year and a forecast of 150 million passengers per year by 2030. Adjacent to the central station is the main metro station (T-Centralen), which is the only station where all metro lines meet. More than 300,000 passengers pass through the metro station every day.

In 2017, commuter trains moved from existing tracks at Stockholm Central Station to a completely new line underneath the city centre, the City Line. The City Line is a vital project for long-term rail development in the region and for the creation of an efficient public transport system that meets city requirements. This new line has dramatically improved travel into and out of the city. The system includes a 6km new tunnel under the city centre and two new stations. The main one, City Station, is located under Stockholm Central Station and the metro lines passing through T-Centralen.

The project aims to increase capacity, permissible speed, and safety at Stockholm Central Station to accommodate for the needs of transport to, from, and within Stockholm. The station’s redevelopment was conducted in its existing environment, with different transportation modes, and involving a very complex setup of the north and south yards of the station with very limited space.

WSP was also responsible for coordination with other consultants to ensure overall project success. We mobilized an experienced multi-disciplinary team of engineers, construction planners, cost managers, and environmentalists, to establish a clear strategy aiming to reduce the risk and provide development and clarity to the delivery program.

Our mandate included rail design and engineering, as well as strategic consulting, in order to raise capacity and speed while increasing safety. We were involved in the project program from early studies all the way through to detailed design and construction documents. We provided services, specifically for the design of permanent way, overhead lines equipment design, land development, risk analysis, and operational analysis, as well as coordination for other technical fields.
Sydney
Glenfield Junction Station

Glenfield Junction is a complex train station project that required innovation in design because construction had to be completed in a live rail environment with limited access. Nonetheless, the new station opened for service four months ahead of schedule.

The new station facilitates interchange between the rail lines and provides various improvements, including an upgraded rail/bus interchange, grade-separated northern and southern flyovers, a multi-story commuter car park, covered bus stops and taxi stands, a covered walkway, and an expanded rail corridor.

The Glenfield Junction Alliance had to overcome the challenge of working within a live passenger and freight rail corridor with highly restricted site geography that required interfacing with the Southern Sydney Freight Line, an ethane gas pipeline, a nearby waste landfill, a floodplain, and protected forest areas. WSP’s lead structure team developed an alternative platform design that reduced the amount of excavation work required for the pile caps. In fact, the careful use of innovative methods, segregation walls, and precast concrete ensured efficient project delivery.

The station upgrade was part of a larger initiative, the South West Rail Link, which was launched in response to issues of reliability and passenger growth on the Australian rail network.

Awards
- New South Wales Engineers - Australia Excellence Awards, Project Infrastructure Category, Winner, 2013
- Bentley Be Inspired Awards - Innovation in Rail and Transit, Finalist, 2011.
- Permanent Way Institute - Ken Erickson Award, Winner, 2011.
Sydney Concord West Station

A new aerial concourse was built at Concord West Station, with four new lifts and platform upgrades that have improved accessibility. The upgrade also included a new ticket office, information displays, wayfinding signage, a family accessible toilet, and additional bike parking. Customer safety has also been improved with new CCTV and additional help points.

WSP, in joint venture, completed the detailed design and provided construction phase services for an alliance team comprising Bouygues Travaux Publics, John Holland, and Transport for NSW. We also delivered the Review of Environmental Factors (REF) and the submission report for NSRU in October 2012, as well as the associated signalling works as part of the Sydney Clearways Program. The complex detailed design project was delivered, eight months ahead of schedule. This was a significant achievement given the diverse and technically challenging scope of the works involving 21 different disciplines. The overall project was then commissioned six months ahead of schedule.

Technological innovations were key to the success of the project. BIM was used in the design of Concord West Station to plan construction work around passenger movements. Revit was responsible for ensuring that the 2D deliverables were produced based on a digitally-engineered finished product; the team had “built” the station in the office before it was built on site. Design models were used for some areas where a high level of design coordination and construction staging was required. As a result, there were very few construction design changes required, and the station was constructed while maintaining normal services.

Awards
WSP was retained by the Toronto Transit Commission to undertake preliminary design and detailed design, as well as to provide construction liaison services for Bayview Station, a major station on the Sheppard Subway Line.

Key features of WSP’s input included: an extensive stakeholder consultation program; design of a 325m long station box and cross-over structures; cut-and-cover construction to depths of 25m under Sheppard Avenue; complex traffic staging on Sheppard Avenue and Bayview Avenue—high volume arterial roadways; major utility relocations; major shoring and unwatering systems; and station entrances from nearby buildings—with the main entrance and substation integrated for future high-rise overhead development.

We were also involved in the three-level station with a pedestrian tunnel connection to the west entrance under Bayview Avenue; bus loop; Passenger pick-up and drop-off interface, complex construction interface with twin tunnels below Sheppard Avenue, reconstruction of Sheppard Avenue and Bayview Avenue intersection, and extensive reconstruction of both roads within contract limits.
Castle Frank Station features the construction of a new full-time exit facility connecting the subway platform to the existing bus platform at street level. This is achieved by constructing an underground pedestrian tunnel over the train tunnel that terminates with a new stair, which emerges into a street-level pavilion attached to the bus platform.

WSP provided project management, mechanical, electrical, structural, civil engineering design, landscape architecture, and contract administration services for the Toronto Transit Commission’s Fire Ventilation Second Exit Program. Under the program, six subway stations were identified as requiring a second means of egress from platform level to street level. This was achieved by constructing an underground pedestrian tunnel over the subway train tunnel which links to a new stair that emerges into a street-level pavilion attached to the bus platform.

This renovation project included a new ground-level entrance and exit area, access stairs to the platform level, and a connection tunnel above the subway box structure linking each of the platforms. As an extension of the work, WSP was asked to produce design documents for upgrades to the building envelope, electrical systems, mechanical systems, and miscellaneous interior improvements.
The Toronto-York Spadina Subway Extension (TYSSE) was the first expansion of Toronto’s subway system in almost 15 years. The 8.6km extension of Toronto Transit Commission’s (TTC’s) Line 1 subway involved the design and construction of six new fully accessible stations: Downsview Park, Finch West, York University, Pioneer Village, Highway 407 and Vaughan Metropolitan Centre.

The project also included four bus terminals, a regional train station connection, almost 3000 new commuter car parking spaces, and expansion of and upgrades to an existing train storage and maintenance facility.

WSP, along with its joint venture partners and TTC, managed the TYSSE project from the outset to completion, leading a large team of architects and designers, to ensure all facets of the project aligned to bring about a successful outcome. In addition, WSP provided project management and subject matter experts in electrical, mechanical, civil and structural engineering, and third-party stakeholder engagement professionals to coordinate planning, property, transportation and environmental issues. WSP also provided building science and sustainability consulting services.

TYSSE incorporated innovative approaches to design and construction. Art is integrated into the structural geometry, and natural light enters the station’s large windows then permeates all levels of the interior, supporting orientation and wayfinding. Applying the Sequential Excavation Method (SEM) allowed the construction of a triple-track pocket housing and crossover structure under a major hydro/pipeline corridor without impacting existing hydro, oil and gas lines.

A high water table and the associated buoyancy risk presented technical challenges. Deep box stations were utilized with over 110 linear kilometres of caisson piling. Each of the stations required extensive control measures to keep the boxes anchored in the ground. These measures included the integration of micropiles in the station base slab, tension piles, or over 2m-thick reinforced concrete floor slabs.

Modern amenities include a new train signalling system (Automatic Train Control), farecard-enabled gates, Wi-Fi in stations and tunnels, and integrated customer connections to a broad range of other transit services, such as regional bus and rail, bus rapidways and future LRTs.

**Awards**
- 2016 PEO York Engineering Project of the Year Award Winner - Large Sized Company Category
- 2015 Tunnelling Association of Canada - Infrastructure Project of the Year
The Union Pearson Express provides express, high-quality rail service connecting Union Station in downtown Toronto to Terminal 1 at Pearson International Airport.

WSP provided detailed design and engineering services for the UP Express Union Station platform and waiting lounge. This is a new station facility that was constructed as an addition to an existing building – the Skywalk – located immediately to the west of Union Station. Challenges of this project included constructing a significant addition at Union Station over existing structures and within a live rail corridor.

The main 1100m² platform level is comprised of a customer service desk, a retail service area, public washrooms, and a waiting platform, along with a second 600m² mezzanine level with a waiting lounge, a crew room, public and staff washrooms, and mechanical, electrical, and communication rooms.

The station’s platform is completely enclosed, and features a platform screen door system for passenger comfort and safety. The platform doors open in synchronization with the doors for the light rail vehicles used by the UP Express service. The Union Station platform and waiting lounge was the last element of the UP Express project to proceed into the construction stage.

The WSP team successfully project managed and designed this complicated addition on behalf of Metrolinx. The team effectively managed multiple stakeholders as well as the Contractor throughout the project.

**Awards**
- Global AirRail Awards - Project of the Year, 2013
Toronto Union Station

Location
TORONTO, ONTARIO, CANADA

Client
CITY OF TORONTO

Status
ONGOING

DAILY PASSENGERS
500,000

ORIGINAL CONSTRUCTION
1927

TRACKS
16

Constructed 100 years ago in downtown Toronto, Union Station is the largest and busiest rail station in Canada. The City of Toronto has undertaken the Union Station Revitalization Program as part of the strategy to increase the daily ridership through Union Station. The key objectives for the Revitalization Program include improving the quality of pedestrian movement in and around the station, restoring heritage architecture, and transforming Union Station into a major destination for shopping and dining. The project is currently in its second and third stages.

Upon general completion of Stage I, Stage II/III construction began in 2015: adding a second storey below track level to the Bay Concourse; rehabilitating the VIA Rail (intercity train) waiting area; general heritage restoration; and the addition of glass roofing along the exterior moats surrounding the station to create an indoor-conditioned space between buildings.

The most significant engineering challenge undertaken for this project was the excavation of an additional storey below track level. A shoring system was designed to support the train tracks while the existing concrete columns were excavated around, partially demolished, and then extended one full storey. This system was designed to allow trains to operate at full capacity throughout construction.

WSP was retained by the City of Toronto to provide program management services for Stages II and III of the Union Station Revitalization Program. As the program manager, WSP is the main point of contact between the city, the prime consultant, and the general contractor. The WSP team is providing vital program oversight through risk management and claims avoidance, schedule review and mitigation, cost consulting, and site services. Site staff proactively resolve site issues to ensure a successful project delivery.
The Wellesley Station addition provides alternate public access route connecting the station platform level with Dundonald Street through a proposed condominium development. This project includes a new set of access stairs to the platform level and a connection tunnel above the subway box structure linking each of the platforms. The connection tunnel extends from the box structure to an adjacent development, where the ground level entrance and exit are integrated into the proposed condominium.

WSP provided project management, mechanical, electrical, structural, civil engineering design, landscape architecture, and contract administration services for the Toronto Transit Commission’s Fire Ventilation Second Exit Program. Under the Fire Ventilation Upgrade Program, there were six subway stations identified that require a second means of egress from platform level to street level.

Wellesley’s second exit is currently in construction. For this project, design challenges included integration of second exit services and structure with the main station and tunnel, as well as with the neighbouring properties. In particular, portions of the second exit were coordinated with a proposed condominium development adjacent to the site.
Vancouver Canada Line Stations

The Canada Line is a rapid transit system that is approximately 19km long and connects Downtown Vancouver with the International Airport and the City of Richmond. It is fully separated from general traffic with track that is either below-grade or elevated, with only a short section of at-grade rail.

This high profile project is an integral part of Vancouver’s transportation infrastructure and was a key component of the City’s 2010 Olympic Bid commitment. The project was completed on budget and 3 months ahead of schedule, and was an incredible success during the Olympic Games. Even today, it continues to surpass ridership targets.

WSP provided multidisciplinary engineering services for 4 stations and civil engineering services for 13 of the 16 Canada Line Stations. Engineering for this project was highly complex, as the line spans two municipal authorities and travels through widely differing urban contexts with widely varying services and requirements. Each Canada Line station is slightly different in appearance, designed to blend in with its surrounding neighbourhood, and features as much local material as possible, including the abundant use of wood. Above ground stations were designed with an open-air concept, which negated the need for much mechanical or glazing, while maximizing natural light.

Awards
- Gold Award for Infrastructure Excellence, Canadian Council for Public-Private-Partnerships, 2009
- National Award for an Engineering Project, Engineers Canada, 2013
- Schreyer Award (for most technically innovative project), Canadian Consulting Engineering Awards, 2010
The Warm Springs/South Fremont Station of BART (Bay Area Rapid Transit) integrates cars, bicycles, and pedestrians into the region’s public transportation network, making it more convenient for commuters to ride BART trains north into Oakland and San Francisco.

The new station, which is part of an 8.7km BART rail extension project, offers 2,082 parking spaces and includes 42 solar-powered electric vehicle charging stations as a pilot program. Bike lockers and bike racks were also installed to ensure that the station is fully accessible by cyclists—with a new pedestrian bridge planned for completion in 2018.

The intermodal transit hub itself covers 13.75ha and includes photovoltaic panels on the roof and in the parking lots that can generate 512 kilowatt hours of energy—enough to meet the station’s daytime power needs. WSP provided the BART project with design and construction-phase services, including civil, structural, rail systems, and tunnel/geotechnical engineering, design support, right-of-way acquisition support and procurement support.

In addition to the station, we undertook preliminary engineering design of two rail lines, three control rooms, five track power facilities, and two box tunnels, including 100 percent design of a 1.6km cut-and-cover tunnel that travels under Lake Elizabeth in Fremont Central Park.
Wellington Station, the main railway hub in the eponymous capital of New Zealand, has been serving its community since it was constructed to amalgamate two previously existing rail stations in 1937. Each day, 29,000 passengers make 44,000 trips on 390 trains, (a number that excludes long-distance services through the station), up from 7,600 passengers and 140 trains daily in its first year of operation in the 1930s.

By 2007, the station was experiencing considerable delays because of a bottleneck caused where the rails entered the station. In the original design, four sets of tracks merged in the railway yards into two main lines that fed the eight station platforms. With four times the ridership than its original design, the bottleneck was causing delays for trains trying to enter or leave the station, negatively impacting passenger experience.

Our solution was to construct a third main line in order to alleviate the congestion problem. This new line is bidirectional, so that during the morning rush its signals allow trains to travel into the station and during the evening rush its signals allow trains to exit the station, thus doubling the capacity of Wellington Railway station during peak periods.

WSP served as sub-consultant for this project, providing planning, project management, and engineering design services to the upgrade of the infrastructure, the related railway signalling, and power supply. Throughout the work it was crucial that the station remained fully operational so as not to disrupt the lives of the people that depend on the station for their daily commuting needs. We produced a very detailed, staged work plan to assure that the station was open throughout the whole process.
WSP was appointed to the multidisciplinary design and build contract extension of platforms at 50-plus stations in the Wessex region of southeast England. This work is a part of the South East Train Lengthening Programme (SETLP) required to deliver Network Rail’s commitment to their Strategic Business Plan. In order to do so, we delivered the design, construction and commission of the infrastructural element required to facilitate the introduction of new, longer ten-car trains by extending each station’s platform.

The sites were of varying complexity and were required to be designed and constructed at multiple locations simultaneously. The key to success was planning the design and installations to ensure that disruption was kept to an absolute minimum.

WSP was lead designer, and we delivered design and construction support for infrastructure services, including signalling, civil and structural engineering, mechanical and electrical engineering, permanent way, as well as conductor rail and telecommunications design.

The stations where the platforms were extended were: Ashtead, Barnes Bridge, Berrylands, Bookham, Boxhill & Westhumble, Brentford, Chessington North, Chessington South, Chiswick, Clandon, Clapham Junction, Claygate, Cobham & Stoke D’Abernon, Earlsfield 1, 2 & 3, Effingham Junction, Effingham Junction sidings, Epsom, Epsom Siding, Ewell West, Fulwell, Guildford, Hampton, Hampton Court, Hampton Wick, Hinchley Wood, Horsley, Kempton Park, Kew Bridge, Kingston, Leatherhead, London Road, Malden Manor, Motspur Park, New Malden, Norbiton, Oxshott, Raynes Park 1, Raynes Park 2 & 3, Raynes Park 4, Shepperton, Stoneleigh, Strawberry Hill, Sunbury, Teddington, Thames Ditton, Tolworth, Upper Halliford, Vauxhall (7 & 8), Virginia Water, Weybridge, and Worcester Park.
International Agility

48,000
EMPLOYEES

5.4B
2017 NET REVENUES* (CAD)
*Non-IFRS measure

Top International Design Firm

#1
TRANSPORTATION

#1
MASS TRANSIT AND RAIL

Source: ENR Global Sourcebook 2018
Our Guiding Principles

We value our people and our reputation.

We are locally dedicated with international scale.

We are future-focused and challenge the status quo.

We foster collaboration in everything we do.

We have an empowering culture and hold ourselves accountable.
Our Urban Passenger Rail Community

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Can we anticipate the unforeseeable, perceive the unexplainable, and plan something unbelievable?

What if we can?