LIONS GATE BRIDGE

Reversible Lane Control System Rehabilitation Project

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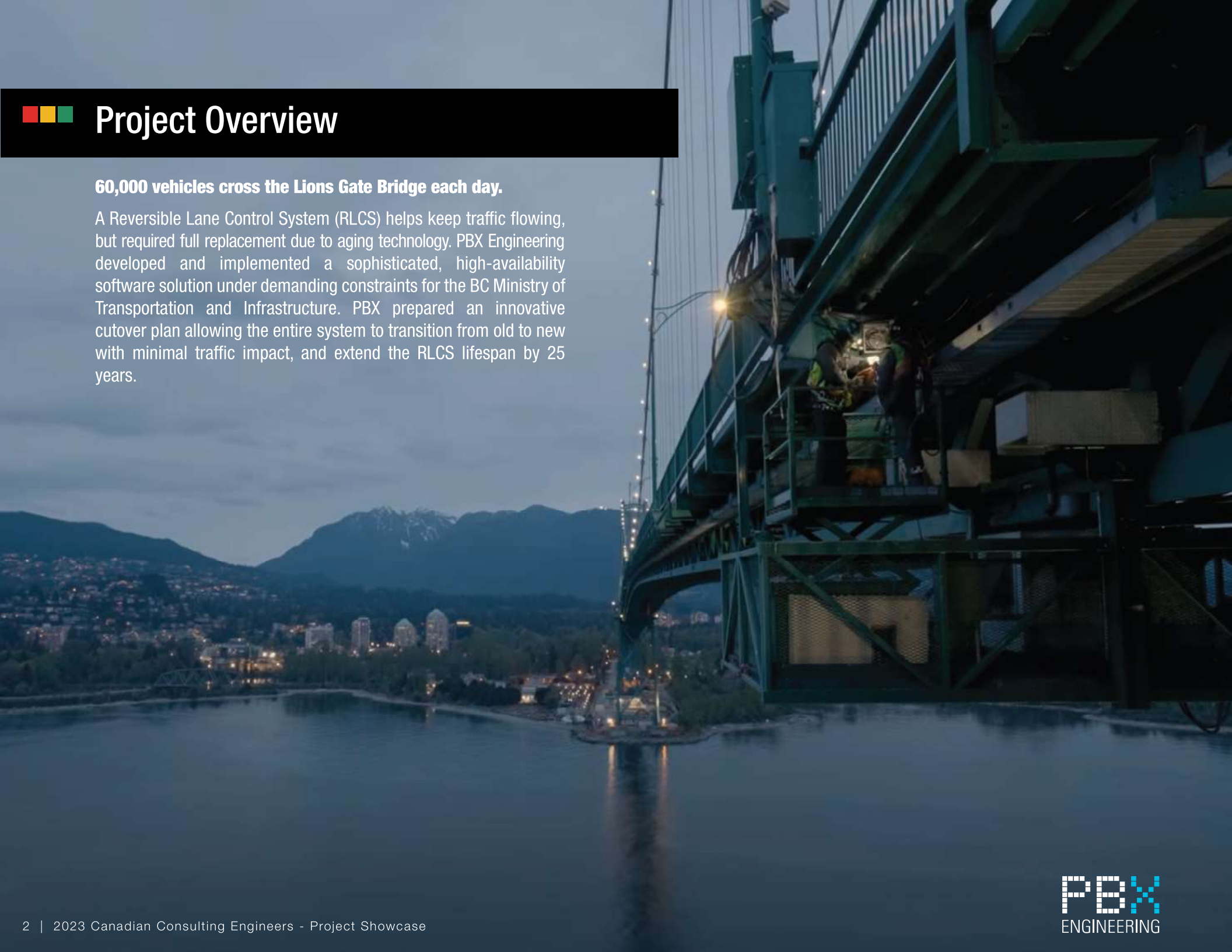
Project Overview

60,000 vehicles cross the Lions Gate Bridge each day.

A Reversible Lane Control System (RLCS) helps keep traffic flowing, but required full replacement due to aging technology. PBX Engineering developed and implemented a sophisticated, high-availability software solution under demanding constraints for the BC Ministry of Transportation and Infrastructure. PBX prepared an innovative cutover plan allowing the entire system to transition from old to new with minimal traffic impact, and extend the RLCS lifespan by 25 years.



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Innovation

The new lane control system is secure, extensible, and utilizes high-performance interface standards.

The Lions Gate Bridge (LGB) is a critical transportation corridor in Metro Vancouver. More than 60,000 vehicles commute over the bridge each day leading to congestion, especially during the morning and afternoon commute. The original Reversible Lane Control System was installed in 1994 to improve traffic flow during peak periods, and was partly upgraded in 2002 as part of the bridge rehabilitation project. In the intervening years, the system operated reliably and was integrated with MoTI's Traffic Management Centre, located 25 km away, to enable remote control of the RLCS.

At the start of this project the system was now over 20-years old, with all critical software and control components no longer supported by manufacturers. The RLCS was not capable of sustaining long-term reliability, maintainability, and operational throughput needs of this important transportation link. PBX was engaged to design, program, and implement a replacement RLCS for the LGB, including software, control systems, field devices, and all supporting infrastructure.

Using proven Systems Engineering principles and innovative best practices, PBX developed a modern, highly resilient, highly integrated solution. PBX architected and programmed a complete new lane control system software package that is secure, extensible, and utilizes high performance interface standards. Extensive software testing and validation procedures were undertaken at all stages.

A critical part of the implementation was a comprehensive cutover plan that took months to develop and coordinate to transfer the RLCS from old to new control systems with minimal interruption to motorists. This highly detailed plan leveraged PBX's extensive integration experience and reduced the cutover of the entire control system to just three evening bridge closures over one weekend.

This was a pivotal project for MoTI as it refreshed the lifecycle for another 25 years and left this critically important asset in a highly resilient and reliable condition. This project sets the stage for future upgrades to other Ministry assets. Indeed, across Canada, many important transportation technology assets are nearing the end of their lifespan. The LGB-RLCS rehabilitation demonstrates their usefulness can be extended for years to come by upgrading or replacing underlying technologies and platforms.

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Project Highlights

Minimizing bridge closures kept traffic moving during the upgrade with minimal disruptions and motorist inconvenience.

Complexity

The LGB demands high reliability and availability in all aspects of the control system. The refreshed 25-year lifespan required replacing all software, control system, network, and infrastructure components. Using Systems Engineering best practices, PBX planned, designed, and programmed the system to address the requirements of all stakeholders.

Software development was the cornerstone of this project. RLCS are unique – there are no standards and PBX's experience in this field, and related industries, was invaluable. PBX architected and programmed the complete software solution to control this critical life safety system. Modern software development methodologies were employed to provide a secure, scalable, and future-proof solution. The technical design used state-of-the-art industrial control methods with full redundancy of critical components including controllers, servers, network appliances, cameras, and fibre optics.

Our hands-on approach to systems integration was critical to the project's success. PBX developed and implemented a comprehensive project test plan with multiple stages of testing throughout the development life cycle. To minimize risk, the entire new control system was integrated and tested off site prior to installation.

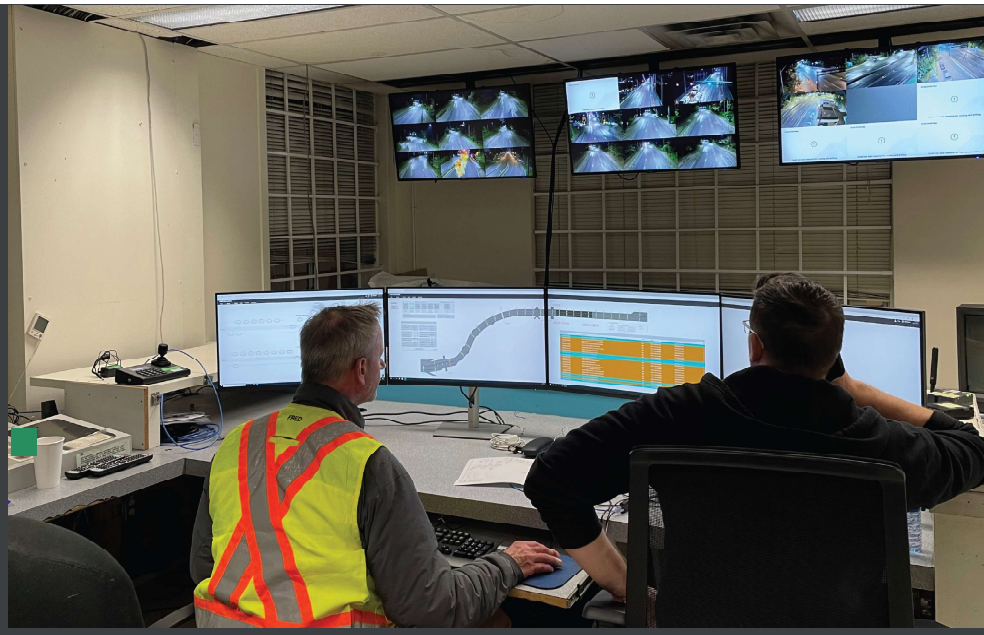
PBX planned and oversaw a safe and efficient cutover, including lane control software, power distribution, network, and video management, that required only three nighttime closures on one weekend, allowing normal traffic flow during the day.

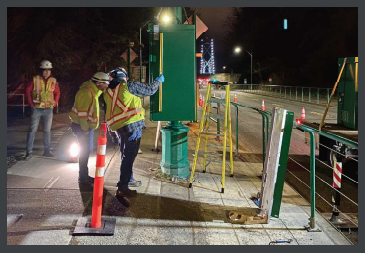
Social/Economic Benefits

The Lions Gate Bridge is a vital transportation corridor and a designated National Historic Site of Canada. Tens of thousands of commuters use it daily to travel between downtown Vancouver and several North Shore communities for work, pleasure, and the movement of goods. It is the gateway to several popular local ski hills and, farther north, to world-class, year-round resorts in the Whistler-Blackcomb area.

Additionally, it links Greater Vancouver to northern Vancouver Island and the Sunshine Coast via a major BC Ferries terminal. It is both a landmark and an essential travel and trade link. By minimizing closures during the upgrade, PBX was able to keep traffic moving with minimal disruptions and driver inconvenience. To a larger degree, upgrades to the counterflow system greatly improve the flow of traffic over the bridge deck and causeway, adding to the quality of life for the people who use the bridge daily by reducing the time it takes for people to get to and from work or recreational activities.

By updating its technology backbone and incorporating modern ITS applications, PBX has helped add decades to the asset lifespan of this Vancouver landmark and essential transportation route.





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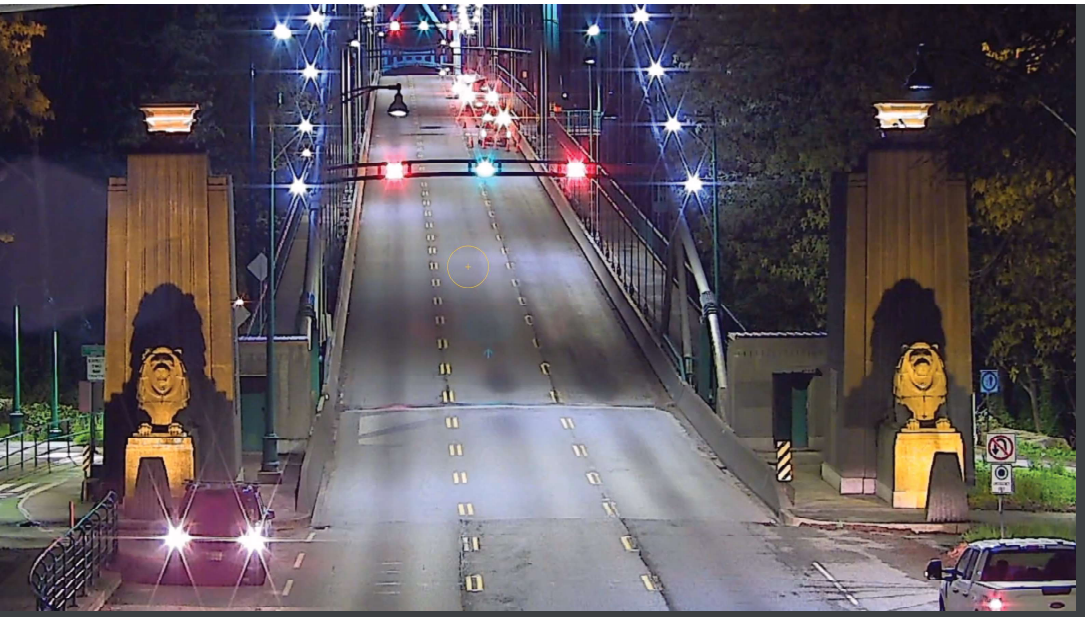
Project Highlights



The Lions Gate Bridge rehabilitation demonstrates existing system usefulness can be extended for years to come by upgrading or replacing underlying technologies and platforms.

Environmental Benefits

The Reversible Lane Control System leverages existing infrastructure to maximize it's utilization and traffic throughput to it's full capacity. This reduces the greenhouse gas emissions from levels that would otherwise been emitted if the bridge did not have reversible lanes. This project included an assessment of existing electrical and control equipment condition. The design considers the reuse of existing equipment which might have otherwise been replaced. Material replacement was minimized while still meeting the projects lifespan requirements. The LGB-RLCS rehabilitation demonstrates existing system usefulness can be extended for years to come by upgrading or replacing underlying technologies and platforms.

From a construction perspective, the project works were undertaken in an environmentally responsible manner by following environmental policies, standards, specifications, and best practices.

Meeting Client Needs

The client's existing the RLCS was no longer capable of sustaining long-term reliability, maintainability, and operational throughput needs. Using proven Systems Engineering principles and innovative best practices, PBX developed a modern, highly resilient, highly integrated solution. PBX architected and programmed a completely new lane control system software package that is secure, extensible, and utilizes high performance interface standards. Extensive software testing and validation procedures were undertaken at all stages.

The client's requirements for minimal interruption to motorists required significant planning. PBX's comprehensive and highly detailed cutover plan leveraged PBX's extensive integration experience and reduced the cutover of the entire control system to just three evening bridge closures over one weekend.

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