

Canadian Consulting Engineers Awards 2011

Trafalgar St/Hale St & CN Rail Elevated Roundabout Grade Separation

Completion Date: December 17, 2010
Location of Project: City of London
Project Owner: City of London and CN



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PROJECT HIGHLIGHTS

The level railway crossing at the intersection of Trafalgar Street and Hale Street has been a longstanding bottleneck in the City of London's Arterial Road Network. This unique location features an arterial road, a collector road and three CN rail lines intersecting to form a single, level crossing in an area where there is a mix of residential, commercial and industrial land uses. The crossing serves local and city-wide vehicular traffic, transit, cyclists and pedestrians as well as freight and high speed passenger trains.

Improvements to the crossing were proposed to:

- Address delays and safety concerns for the 15,000 vehicles using the crossing on a daily basis;
- Provide improved safety for cyclists and pedestrians;
- Reduce traffic infiltration through adjacent local neighborhoods; and
- Enable the railway to improve efficiency for their shunting operations and for 47 daily freight and passenger trains.

The recommended design alternative produced by the Environmental Assessment process consisted of a raised, signalized intersection perched over the rail line on a concrete rigid frame structure. A subsequent Value Engineering review concluded that implementing a roundabout rather than traffic signals would provide additional benefits as follows:

- Reduce the length of the bridge from 115m to 86m resulting in savings of \$2M;
- Eliminate the need for traffic signals and their associated maintenance costs;
- Eliminate the need for left turn lanes;
- Reduce the number of potential traffic conflict points resulting in improved safety;
- Reduce the forecasted number and severity of collisions;
- Reduce unnecessary idling, air emissions and fuel consumption resulting in improved air quality; and
- Provide a focal point for community landscaping.

Delcan undertook the full range of services for the project including the environmental assessment, project management, design and construction administration. Delcan was assisted by Ourston Roundabout Engineering who provided a preliminary roundabout design and Golder Associates who provided recommendations for bridge foundations and pavement design. McKay-Cocker Construction was the general contractor responsible for construction.

Achievements

This crossing is the first raised roundabout over a rail line in North America and has become a landmark for the City of London. Since it's opening, the feedback from the public has been very positive. The delays to vehicular traffic have been eliminated and CN is able to conduct operations without hindrance.

Improvements to the existing crossing and the provision of more efficient railway operations benefits:

- **The Railway** since improved efficiency enables them to compete for additional commercial freight, while maintaining jobs in London;

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- **The Federal Government**, since improved rail efficiency supports their objectives to reduce greenhouse gas emissions;
- **The Provincial Government**, since improved rail efficiency could also potentially reduce commercial traffic utilizing freeways such as Highways 401 and 402;
- **The City of London**, by supporting economic development and addressing neighborhood traffic and safety concerns.

The City of London has taken additional steps to involve the community by dedicating the bridge in honour of the great Canadian World War II fighter pilot and hero from the London area, Charles (Charley) W. Fox. A community competition is being held to commission a piece of military themed artwork for the center of the roundabout commemorating Charley and all veterans.

Technical Innovations and Challenges

The Trafalgar St./Hale St. & CN Rail grade separation supporting an elevated roundabout is a unique solution which resolved a number of issues for a variety of stakeholders. Development of the engineering plans for the elevated crossing required design of roadway and structural elements from basic first principles as common design guidelines and standards could not directly be applied to this situation. Ourston Roundabouts Engineering assisted Delcan in this process by providing a preliminary design layout for the roundabout.

Since the crossing is located in an area with residential, commercial and industrial land uses, context sensitive design principles were employed to maintain the character of the neighborhood. Selection of construction materials, fixtures and landscaping elements was done with this in mind.

This multi-year, multi-phase project demonstrates a significant and varied scope of work completed by Delcan. Services involved the complete end to end project life, including environmental impact assessment and approvals, detailed design of all disciplines of physical infrastructure, and construction administration. In addition, Delcan coordinated utility relocations, CN track relocations and facilitated property acquisition by participating in legal hearings and working directly with homeowners. Throughout, Delcan managed a large team of local specialist sub-consultants, and employed key experts for various specified tasks. Coordinated stakeholder engagement and management through the various phases provided for continuity of input for local government interests, the local community, property owners and CN Rail.

This project included funding from the Infrastructure Stimulus Program and was completed through a partnership among the Canadian Federal and Ontario Provincial Governments, the City of London, and the Canadian National Railway.

The intersection was opened to traffic in December 2010 and is the first major roundabout in London. It has been well received by the public and it is operating successfully.

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PROJECT DESCRIPTION

BACKGROUND

Delcan Corporation was retained by the City of London to provide Environmental Assessment, detailed design and construction administration services for improvements to the level railway crossing at the intersection of Trafalgar Street and Hale Street. The crossing is located on the busiest rail line in London handling VIA Rail passenger and Canadian National Railway (CN) freight services. The crossing is also a strategic location for CN as this level crossing separates two existing railway yards.

This railway crossing has been a longstanding bottleneck in London's Arterial Road Network. As motorists attempt to avoid delays with through trains and shunting trains, the diversion of arterial traffic to other local routes has continued to increase. Brydges Street is one adjacent route that has for many years been forced to accommodate traffic demands that far exceed the normal capacity of a collector road. Increased traffic delays and driver frustration at the rail crossing have prompted individuals to take greater risks by disregarding the warning devices. A tragic accident claimed the life of one member of the community in 2004.

PROJECT OBJECTIVES, SOLUTIONS AND ACHIEVEMENTS

Improvements to the existing crossing have been proposed to:

- Address traffic delays and safety concerns at the rail crossing;
- Reduce traffic infiltration (short-cutting) through the adjacent local neighborhoods;
- Enable the railway to improve the efficiency of their operations;
- Support future industrial growth within the London area.

The existing railway crossing at Hale and Trafalgar Streets is strategically located and a grade separation would provide the railway with 3.9 km of track to assemble trains that is unencumbered by level crossings. Shifting the shunting operations to this area would also reduce the traffic delays at five other railway crossings in downtown London west of the crossing.

CN employ 170 employees in London but more significantly provides transportation for over 37 industries in the London area. CN has identified that a grade separation at Hale Street would allow them to improve the efficiency of their operations while maintaining these jobs in London. Improving the efficiency of railway operations represents a strategic advantage for London to help attract and maintain industrial development.

Planning Solutions and Design Alternatives

The Study examined four potential planning solutions as follows:

- Do Nothing,
- At Grade Improvements,
- Closure of Hale and Trafalgar Streets, and
- Provision of a Grade Separation.

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From an initial evaluation and comments from the public, the provision of a Grade Separation was clearly the preferred Planning Solution. Eight design alternatives were developed and a detailed evaluation was completed for each. The alternatives included:

- 2 options for at grade improvements
- 6 configurations for a railway grade separation.

Recommended Alternative

A grade separation with Trafalgar and Hale Streets over the railway was selected based upon a detailed technical evaluation and a public response that overwhelmingly supported this alternative. The bridge would be constructed as a concrete rigid frame to reduce the required deck thickness and to minimize the height of the fill slopes and the resulting property requirements.

A signalized intersection for the two intersecting roads was originally envisioned however following a value engineering review, it was determined that a roundabout in place of a signal controlled intersection would greatly simplify the traffic operations, improve safety and significantly reduce construction costs.

Consistent with current City policy to promote cycling, commuter cyclists would be accommodated along Trafalgar Street. Area recreational cyclists would be accommodated by the City Parks and Recreation Department's plans to extend the multi-use pathway in Kiwanis Park to the south of the crossing.

ORIGINALITY AND INNOVATION

The Trafalgar St. / Hale St. & CN Rail grade separation supporting an elevated roundabout on top of a busy rail line is a unique solution and the first such installation in North America. It resulted in the resolution of a number of issues for a variety of stakeholders and significant cost savings over the original solution with minimal impact to adjacent lands.

Development of the engineering plans for the elevated crossing required design of roadway and structural elements from basic first principles as common design guidelines and standards could not directly be applied to this situation. Ourston Roundabouts Engineering assisted Delcan in this process by providing a preliminary design layout for the roundabout.

The placement of an intersection on an upgrade needs to be done with careful consideration in order that adequate sight lines are provided and that approaching drivers can recognize and react to the upcoming situation. The vertical grades, roadway and bridge geometry were carefully designed to facilitate these needs.

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COMPLEXITY OF THE PROJECT

This multi-year, multi-phase project demonstrates a significant and varied scope of work completed by Delcan. Services involved the complete end to end project life, including environmental impact assessment and approvals, detailed design of all disciplines of physical infrastructure, and construction administration. In addition, Delcan coordinated utility relocations, CN track relocations and facilitated property acquisition by participating in legal hearings and working directly with homeowners. Throughout, Delcan managed a large team of local specialist sub-consultants, and employed key experts for various specified tasks. Coordinated stakeholder engagement and management through the various phases provided for continuity of input for local government interests, the local community, property owners and CN Rail.

Implementation of the project required resolution of a number of challenges.

- The design of the elevated roundabout required careful consideration of sightlines for vehicles approaching the intersection.
- Drainage of the bridge deck, center of the roundabout and landscaping areas on the bridge required measures that were unobtrusive to the users.
- The new roadway embankments approaching the roundabout blocked the natural overland drainage path resulting in the need for placement of oversized stormwater conduits and erosion control measures.
- With recommendations provided by Golder Associates, support of the bridge foundations and lengthy retaining walls on the native silty and sandy soils was accomplished by the installation of 184 steel piles.
- Scheduling of the property acquisitions, utility relocations and construction were influenced by the strict deadlines imposed by the Federal Stimulus funding;
 - The implementation phase began with acquisition and demolition of 18 homes and one home-based business;
 - Following property acquisition, Bell Canada, Rogers Communications, Union Gas, Hydro One and London Hydro utilities were relocated. Relocations were coordinated to avoid having two utilities working in the same area at the same time. Bell fibre relocations were delayed to avoid impacting data communications from the 2010 Winter Olympics in Vancouver;
 - CN Rail relocated buried fibre optic lines, aerial communications lines and a short spur line within their right-of-way.
- Construction of the new overpass commenced in February 2010 with a fundamental condition to not impact the 47 scheduled trains and shunting operations by CN. Access to their adjacent rail yard was also maintained;
- Specialized formwork, temporary supports and construction sequencing was developed by McKay Cocker Construction to erect the steel reinforcing and to place the concrete for the 86m wide structure;

Delcan achieved a successful construction program with careful staging of construction elements, continuous coordination with rail operations, local residents and businesses and allocation of experienced resources for oversight and management.

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ECONOMIC, SOCIAL AND ENVIRONMENTAL BENEFITS

The general operational and safety benefits of roundabouts are well known and documented. Construction of a raised roundabout at the Trafalgar/Hale and CN rail crossing resulted in a number of benefits to the community's economic, social and environmental quality of life:

- A reduction in delays to traffic and emergency services at the crossing and on adjacent side streets;
- A reduction in air emissions by improved traffic operations;
- A reduction in noise to surrounding homes;
- An improvement in safety for pedestrians and cyclists who often crossed the railway tracks when crossing gates were active;
- Improvement in linkages to nearby community parks, pathways and cycling routes;
- Surplus property became available for re-development as parkland or residential/commercial use;
- Creation of an unencumbered 3.9 km length of railway track allowing CN to assemble longer trains in order to optimize efficiency of operations;
- Conversion of a portion of Trafalgar Street from an arterial road to a quiet cul-de-sac on the north side of the tracks. A public process is currently underway to choose a new street name in honor of a local public servant or veteran;
- Creation of a focal point for landscaping and community art work within the roundabout commemorating the actions of Canadian veterans and WWII fighter pilot Charlie Fox.

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Photo 1: Aerial view of the existing intersection

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Photo 2: A view looking south on Hale Street



Photo 3: A view looking north on Hale Street (note the cyclist crossing the tracks)

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Image 4: The Value Engineering Alternative – elevated roundabout intersection

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Photo 5: An aerial view of the final construction taken December 2010 (Photo courtesy of the London Free Press)

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