

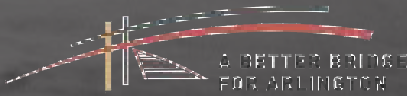


2019 CANADIAN CONSULTING
ENGINEERING AWARDS

Preliminary Design for the
**Arlington Street Bridge
Replacement** over the
CPR Yards

Category: Transportation





Vision

The Arlington Bridge over the CPR Yards has been part of Winnipeg's history since its construction in 1912. An urban legend has long persisted about the bridge – that it was intended for the Nile River in Egypt but was too short and then sold to Winnipeg for a bargain. The structure has since been riddled with repairs and has been closed several times for maintenance. The bridge was built in 1912 for the community, connecting north and south Winnipeg together. The City had visions of the bridge being illuminated and providing street car access to the communities. Canadian Pacific (CP) Rail did not accept the plan for the many lights and the approaches were too steep for street cars. The Arlington Bridge has always had a dark past yet it is well known, a skyline symbol for the North End and at times a stage for Hollywood Movies. The vision for the new bridge had to retain the character of the existing bridge while providing modern transportation amenities.

Project

In late 2016, the City of Winnipeg undertook a Preliminary Design of the Arlington Bridge which was completed over two years. Through a united approach involving Stantec Consulting Ltd., a highly specialized team of technical experts, City's Project Steering Committee, CP Rail and the Public Advisory Committee the goals and risks were optimized resulting in a successful assignment and a step forward for the North End community.

The project involved the Preliminary Design of the proposed new Arlington Street Bridge and determination of all works required, including property, drainage and traffic management (rail, vehicular and pedestrian) to complete the bridge replacement and cost estimate to 30% accuracy.

Goals

Develop a design that met the requirements of the City while incorporating desired improvements from the community and develop a plan that minimizes impacts to CP Rail so that an agreement with CP Rail can be executed.

Challenge

Building a new multilane bridge over an active railyard that operates 24/7/365, impacting business and housing and obtain community support for the project. This was not an easy challenge, but the project team succeeded. How did Stantec overcome this challenge – **We listened!**

Neighbourhood

The CP Rail Yards extend from Keewatin Street to Main Street west to east and Logan Avenue to Selkirk Avenue for the Weston Yard and Logan Avenue to Dufferin for the Winnipeg Yard.

The 1150 acre yards divide much of Northwest Winnipeg. Crossings were added over the years as Winnipeg grew however they are about 1 km apart. None of the existing yard crossings from McPhillips Street to Main Street are considered pedestrian friendly. Even with the steep ramps and cage covered sidewalk, the Arlington bridge is the preferred pedestrian and cyclist crossing. When the Arlington Bridge is periodically closed, the neighbourhood is significantly impacted.

The Arlington Bridge is at the end of its life and must be decommissioned. The City must look at options to maintain the movement of traffic in the neighbourhood, which required effectively and efficiently crossing the CPR Yards.

Current Demographic

Another challenge in this project is the demographic of the communities adjacent to the bridge. Dufferin West Alexander and the North End are economically modest communities. Options for transit were identified as essential. Residents and stakeholders also wanted to be sure they were adequately represented in the decision-making process.

Engagement

Through the Project Advisory Committee, we worked with the community to understand their needs community. The Stantec project team invested time in the community presenting and educating anyone and everyone about the project and challenges. However, we ended up as the ones being educated as we learned so much about their great community. The Stantec team participated in:

- 4 PAC Meetings
- 9 Stakeholder Forums
- 7 Pop-up Events
- Dublin Residence Association AGM
- Property Impact Forum
- North End Biz Traffic Forum
- 2 Virology Lab Meetings
- 4 CPR Meetings
- Bear Clan Walks participation
- North End Renewal Corporation Meeting
- Aboriginal Youth Opportunities – Meet Me at the Bell Tower Forum
- 4 School Spaghetti Bridge Competition
- Open House
- Social Media
- Interactive On-Line Project Website
- Project Videos
- Online survey

From these meetings and discussions, we gained invaluable information and respect for the community. We reached out for input and the

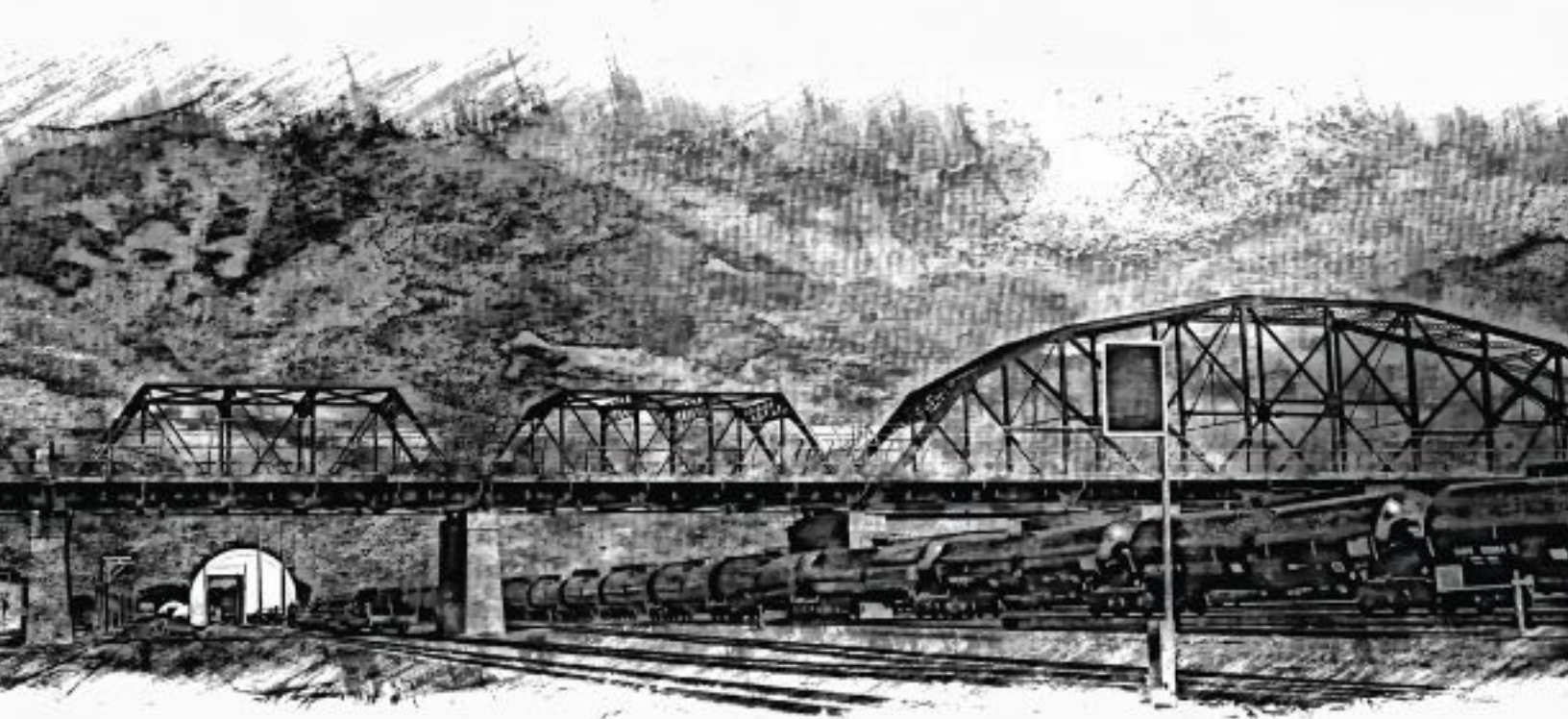
community responded by the thousands.

What we heard?

- The people of the community care about the North End
- It was important that the new bridge be a vibrant addition to the Winnipeg Skyline
- The bridge should be easier to use, wide sidewalks, bike lanes and better traffic flow
- Bridge should be able to support buses and emergency response vehicles
- Keep the new crossing at the current location, Arlington
- Quick access to Health Science Centre
- Improved Safety and lighting on the bridge
- More greenspace at the foot of the bridge

The community support was tremendous and critical to the success of the project. The community input was used in finalizing the Preliminary Design and included:

- Community Space & Parks
- Improved lighting on and around the bridge
- Improved sidewalks, bike lanes and vehicular transportation.



Arlington Bridge Looking West

Stakes

A Neighbourhood in Need of Transition

This neighbourhood is an area of the city that has above average crime, lower income, single parent homes and the trends are not positive. The Arlington Street Bridge project is an opportunity to improve the corridor of Arlington Street as well as provide business and retail opportunities for the community. Transportation options for residents of this community are limited. Vehicle traffic movement has limitations, Transit does not travel over the bridge nor do school buses, bike routes are limited and or unsafe which is a concern for students biking to school. The community needs a spark to trigger improvement. The Arlington Bridge project is that potential spark.

CP Rail Yards

Often not referred to in a positive way, the functioning rail yards were a challenge to this assignment. The community and Winnipeg residents do not really understand the importance of a rail yard. Over 90% of consumer goods are transported through a rail yard. Impacting the rail yard impacts us all. CP Rail is a business and therefore any impacts to operations would have a financial impact as well.

To reduce rail interruptions, CP Rail was invited and participated in all three Value Engineering Design Workshops. Over 20 experts including CP Rail met multiple times to gather a better understanding

of the construction challenges and rail operations. Together, as a team, the group agreed upon the best option to proceed forward with. The baseline understanding resulted in a fundamental agreement between CP Rail and the City of Winnipeg two years before construction is slated to commence.

Just Move the Rail Yards

The CP Rail Yards have been scrutinized for their central location. Many believe that the Yards interrupt access unnecessarily and should be moved outside the City or to CentrePort. The option to move the Yards is a significant undertaking with miles of tracks, mainlines, intermodal facilities and CP's main repair shops within the yards. Studies have been completed in the past and twice concluded it was not feasible. Certainly, there are benefits of relocating the rail yards. However, it involves support from many stakeholders from all three levels of Government, intermodal facilities, trucking industry, customers serviced with rail lines within the City, other rail line coordination; CN Rail, VIA Rail and BNSF, CentrePort and the land owner(s) for the new location. To design and coordinate the relocation of an active yard, one of the largest in North America, would take decades and the process has not even started yet in Winnipeg, only talked about or scrutinized for not happening. For this reason, relocation of the rail yard does not fit with the project timeline for the replacement of the Arlington Street Bridge.



Project Preliminary Design Team

Strategy

A Highly Qualified Team

Stantec brought together a specialized team for this assignment. Building on the success of the Functional Design Study, our team consisted of team member involved with the first phase and new experts to address the needs of the next assignment.

The Project Team included:

- Stantec Consulting Ltd. (Prime Consultant)
- Blueprint (Public Engagement)
- COWI International (Bridge Consultant)
- HTFC Planning & Design (Landscape Architecture)
- Cibinel Architecture Ltd. (Bridge Architect)
- Stevenson Group (Property Advisors)
- Barns & Duncan (Legal Surveyors)
- SMA Consulting (Value Engineering)

Stantec professionals were from Winnipeg, Edmonton, Vancouver, Lexington, Boston, Saskatoon, Minneapolis and Montreal.

The key to success is to ensure we continue

connecting with the community. Blueprint, the engagement consultant, developed innovative ideas and methods for reaching out to a community with limited access. We went to them to obtain information and participated in their events. Blueprint initiated safety community walks, school involvement and competitions, PAC meetings and Forum and developed project videos involving the community.

To address the needs of a design of a long span bridge over a rail yard, Stantec teamed up with COWI International. COWI successfully completed the Preliminary Design of a multi span bridge over a similar CP Rail Yard in British Columbia. The design process was challenging, but our project team had the right people and experience which resulted in a reasonable solution for all parties.

Cibinel Architecture's lead architect on the project has indigenous roots. The Community has a large indigenous population and various indigenous associations were on the PAC. Having an indigenous Architect lead the aesthetic design for the community was well received and provided a level of connection and respect between the community and the project team.

Getting Involved

To ensure that the community understands that the City intends to listen and not overlook the neighbourhood, the Stantec project team got involved with community events. The project team was very active and participated in various events:

Bear Clan Walk – Several members of the project team participated on a safety walk within the neighbourhood. We learned first hand of the problem areas, illumination problems, crime activities and how to prevent or reduce some of the crime with an improved, wide open and illuminated design. Stantec and other firms provided supplies and donations to the organization.

Spaghetti Bridge Competition – Four schools were involved with the competition. Stantec met with the schools and explained the Arlington Bridge Project and asked the students what they would like to see out of the bridge project. The Spaghetti Bridge Competition had criteria that the students needed to satisfy representing similar challenges the project team had to overcome. Stantec donated the supplies, provided presentations and guidance, tested the bridges and provided prizes for the top three teams from each school and a Certificate for participation. The spaghetti Bridges were shown on display at the Project Open House for the public and parents to see.

Meet Me at the Bell Tower, Aboriginal Youth Opportunities – Attended several gatherings to discuss the project with the AYO group and obtain information on how to improve safety within the project area.

Project Advisory Committee – Held four meetings with representatives from the community to vet the project through the committee and for the committee members to take information on the project back to their respective groups.

Tec Voc Videos – Presented to the Tec Voc school on the project and worked with student groups to prepare assignment videos about the projects and social impact on the community.

Project Videos – A series of videos were developed and available online for public engagement. The videos involved Committee and Project Team members requesting information from the community. A summary “What We Heard” video was also prepared involving Team members and people from the community discussing what the surveys yielded and the next steps of the project.



Bear Clan Walk



Spaghetti Bridge Competition



Meet Me at the Bell Tower Meeting



Traffic Video



L to R: Councillor Mike Pagtakhan (City of Winnipeg), Mike Boissonneault (Stantec), Darren Burmey (City of Winnipeg)

Work

A Multi Disciplinary Assignment with Complex Scheduling Requirements

The scope of work included almost every discipline of engineering to overcome the challenges in this assignment. The Stantec team completed the following tasks:

- Bridge Design
- Roadway Design
- Railway Track Design
- Environmental Assessment
- Geotechnical Engineering
- Noise Study
- Drainage Analysis
- Utility and Underground Services Design
- Traffic Planning
- AT Design
- Landscape Design
- Art and Aesthetic Design
- Decommissioning Design
- Bridge Inspection
- Community Outreach
- CP Rail Consultation

- Property Evaluation and Assessment
- Value Engineering
- Value for Money Analysis
- Procurement Evaluation
- Risk Evaluation
- Construction Planning
- Construction Cost Estimate

The project started with further learning about CP Rail yard operation and review bridge options that fit within CP's restrictions. Track modification options were also developed for each substructure location to determine if we can overcome some of CP's identified challenges. An inspection of the yard was completed with the track modification designs in hand. Solutions were developed and accepted which then allowed the bridge design and decommissioning design to move forward.

The bridge footprint and approach roads impacted 54 properties. For surplus land post bridge construction, redevelopment plans were created based on community input and local needs. Parks, green space, basketball courts and a Farmer's Market area were designed and funds included as part of the project. Art from a local artist is to be included within the redeveloped areas as well as part of the bridge aesthetics.



Proposed Arlington Bridge Renderings & Model

Results

Goals Accomplished

The results from the Preliminary Design were very well received from the public, community, CP Rail and the City of Winnipeg. The Goals and Vision of the project were achieved with the final results. Although the North End will be without a landmark when the existing Arlington Bridge is removed, the new bridge and proposed surrounding developments will restore the pride of the North End and allow for future development and economic growth.

Adding dedicated bike lanes on either side of Arlington provides an opportunity to increase activity and transportation for all ages and abilities. The proposed bike lanes connect to an existing bike lane from the Health Science Centre over the CP Rail Yards to Selkirk Avenue providing safe transportation to King Edward Community School. In addition to the bike lanes, wide unobstructed sidewalks provide a transportation spine down the centre of the community where local residents who commute by foot have safe access to many destinations within the community.

From property impacts, combined sewer drainage management, staged construction, the Preliminary Design completed by Stantec addressed all issues and the project is ready to move forward once funding has been secured.

Arlington Street Bridge Decommissioning

As this project moves forward, the existing bridge will be closed and torn down. The historic Arlington Street Bridge, installed and opened in 1912 is scheduled to be removed in 2024. The steel camelback truss spans will be removed one at a time, within six hours. Coordination with CP Rail determined the best option for bridge removal was to lift the truss span up from within the yard with Self Propelled Modular Transporters (power dollies) and roll the span to an open area for the truss to be dismantled. The truss movement will need to happen within six hours to minimize impacts to CP Rail. Preparation work is required for the span removal. Estimated one truss span to be removed a week, so within two months, the former glory of the North End skyline will be gone forever. The remaining steel spans and concrete piers will be removed thereafter until nothing is left.



Arlington Bridge Looking Southwest

Future

What Happens Next

The Preliminary Design prepared all loose ends and determined that the next step is to secure funding for this assignment. The Community, Public, CP Rail and the City of Winnipeg Project Steering Committee support this project and therefore the next step is to move forward. Once funding has been secured, Stantec will commence the detailed design. The anticipated project start date is 2020

Arlington Bridge Decommissioning Date

The scheduled decommissioning of the Arlington Street Bridge is 2024, pending project approval. Once the new bridge is in service, the existing bridge will be removed schedule for summer 2024. Until the Arlington Bridge is closed, Stantec inspects the structure annually and recommends repairs as required to ensure the structure is safe for public use.

Is a Preliminary Design Worthy of Recognition

With a Preliminary Design as complicated as this project, what is worthy of recognition is how all facets of the project came together which resulted in majority support from all stakeholders and groups. The recognition is how the Project Team accomplished this. The skilled project team just listened. We heard the concerns and challenges of each group and developed ideas and solutions for the surfaced issues. Our design was then communicated with on-line videos, renderings, traffic animated videos, plans and a scale model not only of the proposed bridge, but of the existing as well so that the public and all interested could understand the project and its challenges. The model, built by the project team is over 7 metres long, scaled to match HO Trains, 1/87th scale.

Project Highlights

Q.1 INNOVATION

Technology was used in several ways. Stantec used our design models and files to generate 3D images, renderings and animated traffic video. The traffic analysis model from VISSIM, AutoCAD files, and bridge design model files were all converted and used in the preparation of a Traffic Animated video. The videos include cyclist on the bike lanes moving and interacting with traffic at the intersections. This was an excellent tool to use and educate the public and stakeholders of the final product and how traffic will flow once the project is complete.

A series of Project Engagement videos were developed to educate the public about the project and encourage the public to get involved.

Q.2 COMPLEXITY

The challenge to this assignment was accommodating the railway traffic within the yard during construction of the new bridge. The best option for the railway was not always the best bridge or roadway design option. The restrictions for the design consisted of vertical clearance requirements at the north and south limits of the yard, pier placement within the yard and connection to Logan Avenue on the South. To reduce the slope of the existing ramps the ramp design would need to be longer or not as high. Reducing the height was not an option as we needed to meet CP Rail's minimum clearance envelop. Lengthening the ramp on the south side was a significant challenge as the Arlington approach needed to connect to Logan Avenue. The team developed a design that involved relocating a spur line track on the south side of the CP Rail Yard extending the ramp length, incorporating a horizontal curve on the ramp which further extended the ramp length, incorporating a vertical curve from the south ramp onto the network arch span and partially raise the Logan Avenue and Arlington Street intersection.

The videos included Project Team members, PAC Members and Councilor Pagtakhan.

All videos were made available via multiple platforms online. The project survey questionnaire was also online. During Pop-Ups, stakeholder meetings, PAC meetings and other engagement events, surveys were complete via tablets and results were available instantaneously.

For discussions with CP Rail, video animation of the existing bridge removal, span by span was developed to illustrate potential impacts to rail lines and the reasons why the specific span decommissioning methodology was selected.

The Arlington Street Bridge decommissioning was an intense and challenging task completed by our team. The three Camelback and five Pratt truss spans of the existing Arlington Street Bridge are proposed to be removed with Self Propelled Modular Transporters (SPMT). A SPMT is a multi-wheel platform that is controlled remotely. Rolling out the existing bridge spans was deemed the least detrimental to CP Rail. However, CP Rail would only provide a 10 hour window for bridge span removal, (6 hours for the Camelback truss over the mainline). CP Rail required a plan to be submitted, track by track for each span removal. Stantec developed the staged bridge decommissioning plan, track by track impacts with durations for each of the eight truss spans to be removed. Drawings and an animation were also prepared to demonstrate the proposed plan. The decommissioning plan also had to consider the new bridge construction and available area to move the spans to.

Prior to the proposed decommissioning, preparation to the yard is required for the SPMTs to maneuver. This work also needed to be planned, schedule and vetted through CP Rail. The decommissioning plan was ultimately accepted by CP Rail.

Q.3 SOCIAL AND/OR ECONOMIC BENEFITS

The North End of Winnipeg is a struggling community. The neighbourhood has crime, gang and poverty issues to contend with. Solving crime and economical shortfalls was not part of this assignment. However, through Public Engagement the project team heard multiple times the desire to improve the neighbourhood and future of youth within. The project team, under support and guidance from the City, put a plan together for potential recreation, business and retail areas upon project completion. Within input from the Community, the surplus land will be used to provide some of the missing amenities this neighbourhood needs. From play structure parks, basketball courts and open green space, the plan for the project area will result in an improved local economy.

Q.4 ENVIRONMENTAL BENEFITS

The Preliminary Design of the Arlington Street Bridge included several direct and indirect environmental benefits. The bridge will have an extra lane and future expansion capabilities. More traffic is not necessarily a benefit to the environment, however the study concluded that the extra lane proposed is to offset inefficiencies with the current Arlington Street corridor thereby improving efficiencies and reducing toxic vehicle emissions.

Q.5 MEETING CLIENT'S NEEDS

The project goal was to develop a design that met the requirements of the City while incorporating desired improvements from the community and a plan to minimize impacts to CP Rail while being financially responsible. This is not an easy goal to achieve. Our first step was to listen. Understanding the community, CP Rail operations and various stakeholder's views allowed us to slowly develop plans, ideas, methodologies and innovation that build towards a viable solution. Involving the community and stakeholders through Project Advisory Committee meetings allowed for checks and balances throughout the development of our design. Several workshops were undertaken with many technical and construction experts addressed and refined the bridge design and construction plan.

Crime Prevention Through Environmental Design (CPTED) – was a term used throughout our design process. The Goals of the project included improved safety. Wider sidewalks, bridge lookouts, bike lanes, better access for all users are all good things when it is safe to use them. The design of the illumination, bridge and sidewalk geometry incorporated CPTED concepts. For the bridge, the sidewalks are to be well illuminated from the railing system, the 8' cage is proposed to be a soft stainless steel wire mesh, the bike lanes are separated and protected from vehicles, the arch bridge includes measures to prevent birds from landing on the structure to ensure the sidewalks are free of feces. The bridge supports were designed as columns and a curved wall at the abutment avoid corners to ensure open sight lines are available for pedestrians.

The new bridge will also be able to support transit bus vehicles and therefore potentially improving ridership in the community which would also potentially reduce emissions. Along with the extra traffic lane, separated bike lanes are proposed and wider sidewalks. These improvements will support a mode shift from vehicles to bikes and walking.

Direct environmental improvements include removal of any potentially contaminated soil within the CP Rail yard, bird mitigation to prevent feces on the sidewalk and reduced sound pollution within the Arlington corridor.

CP Rail participated in these workshops and heard first hand project challenges.

Working with and including CP Rail in the design process allowed the project team to move the design forward, rather than present a one-sided design for CP's consideration.

Stantec met the client's goals by addressing CP's concerns and when possible providing improvements to the yard and operation at the same time facilitate bridge construction. Reusing surplus land for redevelopment and recreation purposes was in-line with the community wish list. Involving the community and schools with input and ideas allowed the community to take pride and ownership of the new crossing. Aesthetics and art proposed by indigenous representatives connected the project to the site's and community's roots. Incorporating bike lanes and CPTED principles to improve active and safe methods of transportation for the community.