Stantec

2023 CANADIAN CONSULTING ENGINEERING AWARDS

Tweddle Place Drainage: Dry Pond & Sewer Upgrades

Category: C. Water Resources

CANADIAN CONSULTING Engineer
For professional engineers in private practice

2023 Canadian Consulting Engineering Awards Project Owner Form

I am authorized, on behalf of (INSERT ORGANIZATION NAME) EPCOR, to confirm and consent to the following relating to (INSERT PROJECT NAME) Tweddle Place Drainage: Dry Pond & Sewer Upgrades, being submitted to the 2023 Canadian Consulting Engineering Awards by (INSERT SUBMITTING FIRM'S NAME) Stantec:

- The project was completed to our satisfaction;
- The submitting firm(s) performed duties as described in their submission;
- We are not, and do not expect to be, in litigation with the submitting firm(s) regarding the project being submitted

I also acknowledge and agree to the following:

- Submitted projects will be evaluated by a panel of jurors who are engineering experts and/or have expertise relevant to the judging criteria;
- The decision of the panel will be accepted as final;
- The submitting firm(s) whose projects are selected for an award by the jury will be notified in Q2 of 2023
- Winning projects will be announced publicly in Q4 during an awards gala hosted by the Association of Consulting Engineering Companies – Canada (ACEC)
- Videos and descriptions of the winning projects will be produced for the awards gala by ACEC and will be available to the submitting firms, owners and clients upon request following the gala.
- Following the awards gala, winning projects will be publicized through, but not limited to, the following:
    - *Canadian Consulting Engineer* magazine and website
    - ACEC publications and website
    - ACEC #20DaysofExcellence social media campaign
    - Press releases issued by ACEC
- Submitting firms may also publicize the winning projects
- The entire project entry will be archived on the *Canadian Consulting Engineer* website, whether it was selected as a winning project or not.

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Position: Project Manager

Company: EPCOR Water Services Inc.

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Signature: Fei, Wenhui (Gary) Digitally signed by Fei, Wenhui (Gary) DN: cn=Fei, Wenhui (Gary) Date: 2023.04.06 10:55:48 -06'00' Date: April 6, 2023

2023 Canadian Consulting Engineering Awards Consent Form

For a project entry to the 2023 Canadian Consulting Engineering Awards to be considered complete, the following documents must be included with the submission:

- This form, completed and signed by an individual on behalf of the entering consulting engineering firm(s).
- A completed and signed project owner consent form.
- A completed and signed client consent form (if not the same as the project owner).

TO BE COMPLETED BY AN INDIVIDUAL SIGNING ON BEHALF OF THE ENTERING COMPANY (COMPANIES).

I (We) confirm that this entry complies with the contest rules and that the information submitted is accurate.

I (We) also agree to accept as final the decision of the panel of jurors.

I (We) consent to having the entire project entry archived on the *Canadian Consulting Engineer* website, whether it is selected as a winning project or not.

Name: Dave Krywiak

Position: Principal, Water

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Signed Krywiak, Dave Digitally signed by Krywiak, Dave Date: 2023.04.05 15:18:32 -06'00'

Date

75 word summary: Common for neighbourhoods built before the 1980's, ponding and flooding can occur due to the lack of overland drainage. Stantec was fortunate to participate with our client, EPCOR in implementing flood mitigation measures in southeast Edmonton from 2012-2022. This included project management, initial assessment and analysis, concept generation, preliminary and detailed design, cost estimation and procurement assistance, inspection, and construction management. Using 2D modeling technologies, Stantec identified root causes of the flooding and mitigation solutions.

Q1

INNOVATION

From 2012-2022, EPCOR Water Services Inc. (EPCOR) implemented flood mitigation measures in response to destruction to homes in southeast Edmonton caused by a series of severe thunderstorms in July 2012. Stantec was fortunate to partner with EPCOR and provide the initial assessment and analysis of flooding causes, concept generation of upgrades, the preliminary and detailed design of upgrades, cost estimation and procurement assistance, inspection, and construction management and engineering support during construction.

Through a forensic investigation, Stantec reconstructed the flood events and found that while sewer bottlenecks, surcharge, and lack of inlet capacity were factors in causing the flooding, a critical aspect in the worst-hit area was the lack of an emergency overland flow route—a common factor for neighbourhoods built before the 1980s when safe outlet points to avoid water ponding around homes were introduced. Another aggravating feature was the large earthen berm built on the west side of the community intended to block road noise that also acted as a dam trapping water and causing it to pond until it surrounded and flooded homes. The large volume of stormwater also entered the sanitary sewer system, causing sewer backups.

Stantec recommended a list of storm and sanitary upgrades. Because of the large number of projects, capital cost requirements, and implementation considerations, the program was rolled out over eight years, with construction completing in 2021-22.

Some of Stantec's innovative uses of technology include the following:

- The forensic investigation used 2D modeling in 2012-13 which, at the time, was more powerful than traditional 1D models and allowed us to understand causes and interactions of the flooding event.
- Custom vertical sound barrier using natural materials and re-use compost to mitigate sound and provide enhanced environmental benefits.
- Augmented reality tool (vGIS) — to visualize infrastructure below the ground and the configuration of infrastructure.
- 3D technology combined with VR goggles used at public open house sessions to demonstrate proposed improvements.
- A cloud-based construction management software (ProCore) streamlined our design and construction interactions within the team.
- First design and installation of large diameter municipal PVC pipe (1,500mm), and of 2,400mm by 1,800mm concrete box sanitary pipelined with HDPE and welded plastic connections to reduce infiltration and inflow into sanitary sewers.

Image 1: Area Resident Photo of 2012 in Tweddle Place

Image 2: A Rendered Surface View of the Existing Noise Berm, looking North, with Tweddle Place neighbourhood on the right handside.

Q2

COMPLEXITY

Stantec's 2D modeling approach determined flooding causes and upgrades to mitigate root causes up to a return period of 1:100 years. From an implementation perspective, the designing, constructing, and phasing of the infrastructure upgrades throughout an established neighbourhood was a challenge. These risks were managed through a series of value engineering sessions, constructability workshops, and risk reviews.

Salient project features—all installed in an established neighbourhood, phased over eight years of construction include the following:

- Over 1,300m of open-cut installed new sanitary sewer pipe for additional conveyance and storage capacity.
- Over 3,000m of new open-cut storm sewer pipe.
- Purchase of two private properties and demolition of the property to create public overland flow channels from trapped low areas.
- Installation of hundreds of new catch basins and catch basin lead upgrades to increase inlet capacity to storm sewer system.
- Removal of existing noise berm and excavation to create retrofitted urban dry pond for flood mitigation.
- Detailed noise modelling and confirmatory noise monitoring which ensured that the removal of berm did not exceed allowable noise limits.
- Pilot and deployment of over 1,000m of newly-created living wall vertical sound barrier product to replace noise berm's screening and noise attenuation functions.
- Pilot of new stormwater quality techniques including 900mm deep catch basin sumps (from existing 600mm) and installation of CB Shield catch basin insert devices to prevent resuspension of collected grit and sediment.
- Extra sewer system capacity facilitated expansion of Edmonton's new Light Rail Transit (LRT) Valley Line.

Image 3: Stantec's 2D Modeling Outputs for the North Millbourne neighbourhoods.

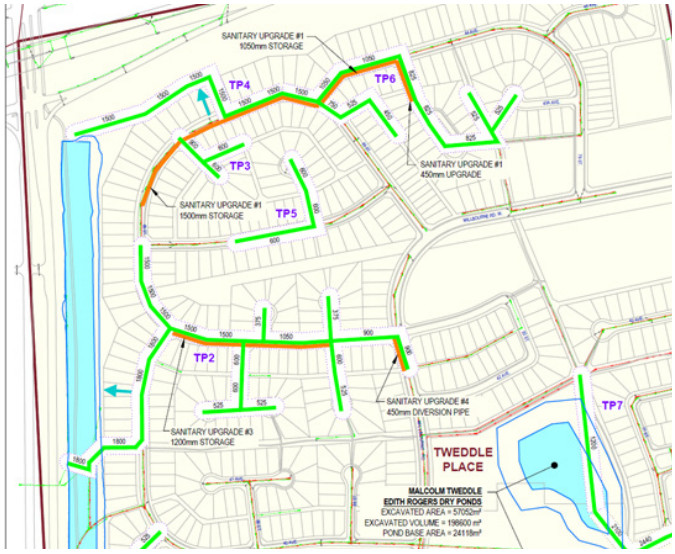

Image 4: Summary Figure highlighting the storm and sanitary system and dry pond upgrades in Tweddle Place.

Q3

SOCIAL AND/ OR ECONOMIC BENEFITS

This project has been an exemplar of what a holistically-focused urban flood risk reduction project can be. As utilities of all types face increasing risk of functional and condition failure due to increased system demands and adverse conditions such as climate change, infrastructure designs must respond by becoming resilient and multi-functional.

This infrastructure provides critical flood mitigation functions—lowering the risk to life and property damage in urban areas from intense rainfalls—a risk that many of our pre-1980s communities in Alberta still face. Furthermore, it expands the benefits beyond those of traditional drainage utility projects by using a green and grey infrastructure approach—creating improvements in environmental and social benefits, such as pollinator habitat improvement, air quality improvement, urban heat island effect reduction, and increased transportation connectivity.

This project was completed safely, on time and budget, with several technical innovations that can be applied to other projects. It serves as a good illustration of how frequent two-way communication and outreach with the community can engage the community and deliver infrastructure that provides multiple benefits.

Image 5: Earthworks

Q4

ENVIRONMENTAL BENEFITS

This project has several features which provide additional environmental benefits.

Living Wall Vertical Sound Barrier (VSB): Over 1,000m of new living wall VSB product was installed which included natural willow shrub species. This product used a wood frame wall and City-produced compost to absorb and attenuate acoustic energy and provide cleaner air, windbreaks and shading, increased aesthetics, and environmental benefits.

Dry Pond: The bowl shape of the retrofitted dry pond versus the prior bermed landscape allows a greater increase in flood storage and protection, but also improves resiliency through a wide range of wet and dry climate events. The added topsoil depth provides a sponge-like storage reservoir for moisture during drought periods and creates an infiltration location for groundwater recharge.

Naturalized Landscaping: Prior to this project, the noise berm space was a manicured monoculture of a single grass species. The post-rehabilitation landscaping plan involved using over 65,000 square metres of wild meadow grasses providing habitat benefits to natural vegetation and animal species such as pollinators.

Native Plantings: Over 6,500 square metres of landscaping beds and over 1,800 individual coniferous and deciduous native trees and shrubs were planted to help improve air quality, reduce the urban heat island effect, and provide resiliency.

Water Quality Retrofits: Including increased sump depths and CB Shield catch basin inserts are part of a treatment train approach which prevents the migration of sediment and grit material (and any bonded pollutants) to end-of-pipe stormwater facilities and watercourses where they may contaminate receiving waters and require eventual cleanout.

Image 8: Example of Vertical Sound Barrier - "living wall"

Q5

MEETING CLIENT'S NEEDS

While the core goal of this project was to increase flood protection in the community, several other benefits were realized through the execution of this work:

- First implementation of cloud-based-construction management software (ProCore) on an EPCOR Drainage rehabilitation project, allowing streamlined communication and information sharing between client, consultant, contractors, subconsultants, and suppliers.
- In addition to all the environmental benefits listed earlier, this area was also designated as an off-leash dog park, further enhancing its multi-use role as both a social space and drainage infrastructure.
- Sewer upgrades facilitated increased drainage capacity for the expansion of the new Valley Line LRT system on 66 Street/75 Street, including the new Melbourne/ Woodvale Transit Station and associated transit-oriented developments.
- Drainage system can potentially accommodate City's goals of increasing housing intensification.
- Incorporation of Crime Prevention through Environmental Design (CPTED) into all aspects of surface works, especially VSB alignments.
- Improved connectivity with City shared use pathway network via the over 1,100 metres of multi-use trails, increasing walkability and transit.
- Multiple constructability workshops ensuring City and other EPCOR departments are consulted, including Operations and Maintenance.
- Regular Risk Reviews and Workshops to reduce risk.
- Public Open Houses and at least twice annual public meetings to inform residents on progress and upcoming works.

Design with
community in mind