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PROJECT DELIVERY



Choosing the right project delivery path

Case Study of the Bonnybrook WWTP Plant D Expansion

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When initiating the Bonnybrook WWTP Plant D Expansion the team was faced with the question ‘*What project delivery approach is best suited to this project?*’ In this article we will provide an overview of the Alternative Project Delivery (APD) Methods Analysis employed on the Bonnybrook WWTP Plant D Expansion project and describe the reasons for considering APD approaches and the process for selecting the preferred delivery method(s) for a project.

Drivers for Alternative Project Delivery

Most major construction projects in the water & wastewater industry have conventionally been delivered through a design-bid-build (DBB) method of delivery. In this “traditional method” of delivery, an owner separately procures an engineer and contractor to complete the design and construction phases of the project in a sequential fashion.



However, APD methods are being considered more frequently in the public sector because they can provide a variety of benefits over traditional delivery methods such as time and/or cost savings. It is important to recognize that these benefits sometimes come

with trade-offs, such as reduced control or change in risk, so the pros and cons of each APD method needs to be weighed for specific projects.

While there are numerous factors, or drivers, that can lead an owner to consider APD methods it is important to take into account which of these drivers are applicable to the specific owner as well as the specific project in order to determine the most appropriate delivery method. For the Bonnybrook WWTP Plant D Expansion project, the team held a series of workshops with various City stakeholder teams to assemble a consensus on which drivers were of greatest importance. In doing so, the team discussed factors such as:

- How rigid is the project schedule?
- Is funding available and does it align with the desired schedule?
- What market conditions are expected at the time of tender? Will the project be able to attract the most qualified personnel and proponents onto the project?

Drivers	Applicability to BBWWTP Plant D
Qualifications-Based Selection of Contractors	✓
Shortened Project Schedule	✓
Work Sequencing of Multiple Construction Contracts	✓
Integration with Operations on an Active WWTP Site	✓
Constructability Input Through Design	✓
Flexibility to Align Scope with Project Affordability Goals	✓
Early Negotiation of Pricing	✓
Risk Allocation Control	✓
Major Equipment Procurement Schedule	✓
Transfer Facility Operational Risk	
Alternative Financing Options	

Because different Alternative Delivery Methods accomplish different goals, it is important to prioritize drivers specific to the client and project. This table presents the drivers that were deemed applicable for the Bonnybrook WWTP Plant D Expansion project.



Of the five project delivery methods initially considered, two were short-listed as potentially suitable for the Bonnybrook WWTP Plant D Expansion project.

Delivery Method	Suitable	Comments
Design-Bid-Build (DBB)	✓	Current City standard. Has been successful on many projects in the past.
Design-Build (DB)		Risk due to limited ability to influence design to integrate with the existing wastewater infrastructure at the Bonnybrook WWTP.
Construction Management At Risk (CMAR)	✓	Good applicability, however would require new procurement processes to be established.
Public-Private-Partnership (PPP or P3)		Evaluation completed through Building Canada Fund tool determined project was not a good fit for this delivery model. P3 Favors DBO model which may have risks as outlined below.
Design-Build-Operate (DBO)		High risk due to loss of owner control of design and operations. Risk to integrate private sector ops/ maintenance into existing plant.

- Do we foresee the potential need for any major scope changes as the project progresses?
- Is there a need to design and construct portions of the project sooner or can we wait until the entire design is complete and tender as one or more lump sum packages?
- How can we, as a team maximize the potential direct and indirect economic impacts that can be generated by this project (i.e., benefit to local business)?

Bonnybrook Plant D Expansion Project

The Bonnybrook Plant D Expansion project is a \$600M capital expansion to an operational wastewater treatment plant. The project consists of retrofits to existing infrastructure and the construction of new large-scale infrastructure for both the liquid and solid streams at the plant. The project includes dozens of contracts for major scopes of work, hundreds of tie-ins to the operating facility and required a multitude of permits and approvals.

Due to the size, complexity, and tight implementation timeline of the project, it was highly beneficial – if not necessary – for the City to divide it into several smaller work packages. Reasons for this include optimizing scheduling of the various project elements, limiting disruption to facility operations, mitigating space constraints and leveraging resources to the greatest extent possible. This approach would result in cost and time savings for the project. In addition, by dividing the Plant D Expansion into

smaller work packages, there would be opportunities for more local vendors and contractors to participate in the project.

Alternative Project Delivery Methods

Five APD methods were identified for consideration for the Plant D Expansion project. Each method has advantages and disadvantages that the team evaluated prior to creating a short-list for the project. Of the five project delivery methods initially considered, three were eliminated because they severely limited the City's control over the project.

Selecting a Project Delivery Approach

Once the project drivers and applicable APD methods were identified, an assessment was performed to determine which APD method was most appropriate for the project. An evaluation matrix was developed to quantitatively compare the two shortlisted APD methods (DBB and CMAR) through collaboration with City stakeholder groups these were prioritized and weighted. The evaluation matrix was based on six primary criteria:

- Ability to meet schedule
 - Work Sequencing of multiple contracts
 - Cost certainty & future market risk
 - Resource availability
 - Scope flexibility to City affordability & cash flow
 - Coordination of construction, engineering and operations
- Selection of the preferred delivery approach was largely based on the

prioritized driver of schedule vs. cost certainty and available cash flow such that:

- Preferential consideration be given to Construction Management at Risk (CMAR), if the priority driver was deemed to be meeting the tight timeline; whereas:
- The Design-Bid-Build approach was preferential if the primary driver is for cost certainty, protection from future market fluctuation and need to delay cash flow expenditure beyond upcoming budget cycles. The DBB approach however did require that the project schedule be extended by a year or more.

Based on the results of the quantitative analysis and subsequent workshop discussions, **the Construction Management at Risk (CMAR) method** was selected for the project. The CMAR method was selected for the following characteristics and benefits specific to this project:

- Ability to fast track construction;
- Collaborative design and construction process (City-Consultant-Contractor);
- Contractors involved early to provide constructability & risk management during design phase;
- Early cost feedback to assist with aligning scope to City budget and cash flow;
- Cost and qualifications-based selection of contractors provides more control over selection process and ideally a higher quality end product;
- Single point of accountability for coordination of multiple construction contracts, equipment procurement contracts and interface with ongoing plant operations.

The selection of a CMAR delivery model for the Bonnybrook Plant D Expansion project has provided numerous benefits, particularly related to contractor input during design and the coordination of construction activities on site. The division of the project into separate work packages has given the team flexibility to prioritize key infrastructure that is required to meet the needs of Calgary's growing population, while postponing non-critical scopes to defer expenditures during this economic downturn. Construction of the Bonnybrook Plant D Expansion project began in 2016 and is expected to be complete in 2024. 💧