The Challenges Faced in Naturalising Channelised/Urbanised Waterways Extend Far Beyond the Physical Design of a Functioning Waterway.

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Abstract

The Daylighting Dandenong Creek project is a key part of the Enhancing Our Dandenong Creek Program currently being implemented by Melbourne Water. Dandenong Creek, in suburban eastern Melbourne has undergone significant modification since the late 1960s, with the majority channelised and some sections piped. The "Daylighting" reach consists of 850 m of grassed floodway channel with a low flow pipe. In 2014 Melbourne Water in conjunction with EPA, local government and the community initiated a program of works to naturalise the creek back to a functioning waterway. With works commencing January 2018, the 'daylighting' process involves replacing an 850m piped section of waterway, with an open, flowing channel that more closely resembles the natural formation of the creek.. The process of going from an initial aspiration to the constructed naturalised channel has taken several years including extensive consultation and engagement with community and collaboration with project partners throughout the design process. The design development has involved overcoming a number of complex challenges ensuring a successful construction outcome.

This paper discusses details the process for Dandenong Creek, from project initiation and development, which adopted a collaborative and participatory approach to decision making, through several stages of design, and finally construction. It highlights key design constraints which were addressed in this project and should be considered for all future naturalisation projects.

As with any naturalisation process a number of design stages were undertaken from concept to detailed design. Through this process key design features such as establishing limitations for recovery and achieving a geomorphically, hydraulically and ecologically sound design were addressed. Importantly a number of other processes formed a large component of the design process, including:

- Constructability of the works to ensure the passage of flow;
- Consideration of contaminated land management;
- Management of pedestrians and the public through the site during and post construction;
- Safety in design for the public post construction; and
- Continual stakeholder and community engagement during the design process.

In addition to design and construction considerations, the consultation process with community and stakeholders has been equally insightful. These project highlights key opportunities and issues that must form a key part of the naturalisation design process to ensure successful outcomes.

Overview

As liveability becomes an ever increasing consideration in planning for how our cities will look in the future, more focus is being placed upon waterways to improve the social wellbeing of our community. As such, an ever increasing number of waterways are being assessed to be determined if channelisation works from several decades ago can be reversed to provide improved social value.

After public health, amenity is arguable the most important beneficial use of Dandenong Creek. It is the third most visited creek in Melbourne's whole region, and is highly valued as an active transport link - the popular Dandenong Trail runs along its banks and is frequented by cyclists, walkers and runners alike.

A Working Group was established, consisting of Maroondah Council, Knox Council, First Friends of Dandenong Creek, Knox Environment Society, Heathmont Bushcare and Port Phillip and Westernport Catchment Management Authority. The Melbourne Water project team looked to the working group provide direct input, advice and innovation into the development of various amenity improvement options for the creek. The workshops were designed around a participatory decision making model, which built a shared commitment and allowed members time and space to reflect.

The Working Group clearly expressed the design should provoke physical and emotive connectivity with the place. The options also considered accessibility, recreation, safety and maintenance aspects. Melbourne Water empowered the Working Group to ultimately choose the final option to be delivered, which was to "daylight" Dandenong Creek.

The Daylighting Dandenong Creek project in the eastern suburbs of Melbourne has been one of the first waterways in Australia where this aspiration to improve the waterway has been taken from a community aspiration and vision through the design process to construction and now completion.

The design phase of the project has been completed in a number of stages including concept design, functional design and detailed design. At each of these stages a number of challenges have been encountered which have influenced the design, budget and final design outcome. It is important to learn from the findings of this project to assist in driving robust achievable designs for future projects of similar nature

The design included consultation with stakeholders and the community to determine their aspirations for the creek. From this a general layout of the proposed daylighting reach was determined. This phase of the project was relatively straight forward, in that ecological and geomorphic aims for the creek were established. This phase was also used to identify key design parameters including no net increase in flooding, enhancing waterway amenity and maintaining functionality as an urban drain. Key investigative studies were also undertaken including vegetation surveys, geotechnical testing and preliminary contaminated land mapping.

Functional design followed. This phase was important in better understanding key site constraints such as levels of contamination, and provided the opportunity to undertake more detailed hydraulic modelling to understand likely erosion potential and inform scour design. At this point in the project further contamination mapping was undertaken to better inform the project capital cost estimate by quantifying likely volumes of contaminated material that would require costly removal and disposal.

From this project stage it was possible to apply for planning approval necessary prior to the construction of any works.

Detailed design included the provision of more detailed drawings suitable for construction and a range of finer detail including pedestrian access, provisions for maintenance, stormwater management and bicycle safety.

Finally, during the construction stage a number of requests for information were negotiated with the contractor to ensure a quality product.

Community and stakeholder engagement

In addition to the delivery of on-ground works, the project has also achieved significant social benefits among the organisations involved. The complexity and multiplicity of stakeholders and institutions makes delivering collaborative projects a challenge. The role of champions and trusted experts to advocate and provide a credible voice of support is critical to the success of the project. This, coupled with increased transparency, developed genuine buy-in from stakeholders. These benefits have enabled the successful and timely completion of the program, but will continue to yield in future collaborative efforts.

The program presents a demonstrable shift towards new governance models which involve participatory dialogue with community and empowerment in decision-making. This project has demonstrated leadership through adopting a high level of engagement intent from the outset, aiming to “collaborate” with key stakeholders (IAP2).

Key Factors Which Can Affect a Naturalisation Project

Within each of the following stages the construction cost was refined and ongoing negotiation with local government was necessary to maintain the potential for delivery of a successful project.

Constructability

It is relatively straight forward for stakeholder, community and stream management practitioners to establish an aspiration for a waterway which will as a minimum look something like a natural waterway. Similar waterways in the catchment can be assessed and ecological values upstream and downstream of the site investigated to determine the level of recovery the waterway is likely to achieve, and what the typical channel form should look like from a geomorphic perspective.

However, for all these honourable intentions it may not by physically possible to build such a channel, or the design may need to be refined to manage constraints. In the instance of Dandenong Creek, two major constraints, contaminated land and management of flow, drove the design process as much as ecological and geomorphic drivers.

A constructability assessment was completed in the concept design stage, and this was refined at the functional design stage to ensure any design features were physically buildable.

The channelised creek had a low flow pipe running below the invert of a grassed swale drain. As such, during relatively low flow events the whole channel is very hydraulically efficient and becomes inundated with water. It is estimated the channel will be inundated several times each month, with

a lower likelihood through Summer to Autumn periods. Similarly, the low flow pipe continually carries low flows in an efficient manner. Therefore, it is not possible in this instance, or we suspect for most proposed naturalisation projects, to construct works over the longitudinal length of the project through the life of construction. Staging of works is necessary to manage flows and pumping of low flows also becomes a necessity to ensure the project site is workable. Furthermore, the low flow pipe can be used to advantage to pass low flow and keep the majority of the site dry.

The management of contaminated material is another risk; this is discussed in the subsequent section.

The completion of a constructability report, ensures any design features can be built and provides a better understanding to inform the developing cost estimate for construction.

Limiting Factors

As discussed previously the initial geomorphic and ecological aspirations may need to be refined to recognise limiting factors present at the site.

In the Dandenong Creek example, the two factors which appear to have had the greatest impact on the overall design cost and layout are contaminated land and native vegetation management. It should be mentioned that other factors such as mitigating flood risk and utilising geotechnical conditions may affect other projects, however in this instance they have been relatively straight forward to manage.

Initial contaminated land testing of several test bores during concept design indicated material contaminated with asbestos and Category B waste over a number of bores. Given the reach is 850 m long, a need was identified to undertake further testing. A test grid was undertaken over the site during the functional design stage. This unfortunately identified that asbestos was endemic across the top 300 mm of bed material. At this stage, the project was significantly advanced with key stakeholders. A decision was made to proceed with the project, recognising this would have a significant impact on the overall budget for the construction of works. In hindsight, detailed contaminated land mapping earlier in the project would have better informed the budget and what length of reach or design features could have been achieved with the initial budget.

To a lesser extent, the maintenance of existing native vegetation within the design footprint was impacted as design progressed. Given the importance of protecting native vegetation within planning provisions, continued changes to design can impact native vegetation root zones. As such a detailed assessment of likely root zones and necessary tree protection zones should be established at an early stage to limit changes to planning permits and vegetation protection zones

Adjust Before Proceeding

As with any design project, as a design progresses refinements to the design also occur. There should however be rules established when completing a naturalisation project. These are:

- Determine limiting factors including contamination risk, vegetation protection, flood mapping, geotechnical constraints and cultural heritage features in preliminary stages of the project.

- Adjust the design features, extent or budget once these factors are well defined.

Key Findings

The Daylighting Dandenong Creek project will be complete once this paper is presented. It will significantly improve visual aspect, ecological values and social aspects of the creek over its extents. The economic cost of construction and the level of design input has been significant to achieve initial aspirations for the reach.

When designing channel naturalisation projects the following key considerations need to be considered in the preliminary or functional design stages of the project to ensure a successful outcome.

1. Engage the community and stakeholders early in the process, in particular focusing on vegetation selection, access and amenity;
2. Make sure the waterway can be constructed within your budgetary, seasonal and geographic limitations;
3. Look at all possible limiting factors including contamination, geotechnical constraints, ecological and heritage values and ensure your design can work within these important factors; and
4. Make sure equipment and a methodology is available that can actually construct these works.