#190 - Rethinking existing gross pollutant infrastructure – consolidation of underperforming assets at the Second Creek and River Torrens Confluence

A. J. Sheehan[1#], H. Ghajarnia[1], B.C. Phillips[2], J. Miller-Norman[3], K. Wardd[4], R. Murchland[4], S. Dearman[5] and S. Abou-Hamdan[6]

[1] *Cardno Victoria Pty Ltd, Swanston Street, Melbourne, Victoria, 3000, Australia*

[2] *Cardno NSW/ACT Pty Ltd, Pacific Highway, St Leonards, NSW, 2065, Australia*

[3] *Dryside Engineering Pty Ltd, Unley, SA, 5061*

[4] *Green Adelaide, Department of Environment and Water, Waymouth St, Adelaide, South Australia 5000, Australia*

[5] *City of Norwood, Payneham & St Peters, The Parade, Norwood, South Australia 5067, Australia*

[6] *Nova Systems, London Rd, Mile End, South Australia, 5031, Australia*

**Corresponding author email: andy.sheehan@cardno.com.au*

Highlights

- Innovative 'out of the box' concept optioneering process to deliver asset optimisation.
- Integration of previously separate treatment measures on the River Torrens and Second Creek.
- Delivering a safer design response and improving amenity and environmental performance.

Introduction

In 2012, the then Adelaide and Mount Lofty Ranges (AMLR) NRM Board undertook a comprehensive condition assessment and performance review of its twenty three (23) Gross Pollutant Traps (GPTs). Two (2) of these assets were (i) an end of line GPT comprising settling chambers and a row of trash nets installed at the Second Creek outlet to the River Torrens and (ii) a floating debris trap (FDT) across the River Torrens and located just upstream of the Second Creek outlet. The FDT was ranked as the poorest performing asset. The most significant performance issues for the River Torrens FDT and the Second Creek GPT are listed below:

- Frequent blow outs of the trash nets due to high velocity flows;
- A highly constrained maintenance access path and the lack of free draining sediment settling chambers inhibiting maintenance access to the trash nets;
- A complicated maintenance collection arrangement involving a multi-stage capture, collection and disposal process;
- Ineffective hydraulics preventing effective capture of floating debris in the River Torrens; and
- An unsafe work environment for maintenance contractors due primarily to the unsafe vehicle manoeuvrability and areas of standing water within designated gross pollutant collection areas.

Stakeholders including Green Adelaide[1], the City of Norwood, Payneham & St Peters, the Australian Government and the site maintenance contractors (Mechanical Vegetation Solutions) with Cardno, Dryside Engineering and Nova Systems to identify a suitable solution to improve the operational efficiencies of the stormwater assets at the Second Creek confluence. All key workshops were conducted on-line due to the Covid-19 global pandemic and given the design team were located remotely in Melbourne without access to the South Australia during the course of most of the period the project was delivered.

[1] Green Adelaide was established on 1 July 2020 as part of a National Resources Management reform in South Australia with the AMLR NRM Board ceasing on 30 June 2020.

In addition to responding to the findings of the asset condition and performance review, the project aim was to meet the Australian Government's Environment Restoration Fund national environmental priorities[2] by improving water quality, protecting the River Torrens and contributing to the clean-up and recovery of gross pollutants. Importantly this is the last location at which gross pollutants are captured along the River Torrens prior to discharge into Torrens Lake in the Adelaide Central Business District.

The Cardno design team also undertook the detailed design of an upgrade to the adjacent Linear Path which included a number of safety, amenity and biodiversity initiatives. Complimentary to this was a Landscape Design undertaken by Tract consultants and an electrical design by Electel Resources Pty Ltd.

Methodology

Concept Design

In 2016 *Design Flow* completed an Options Report which identified options to improve the capture of gross pollutants at the Second Creek outlet and by the River Torrens FDT. These options provided a starting point for the Concept Design phase of the project.

A conservative estimate of the weight of gross pollutants collected by the GPT and the FDT was undertaken for comparison purposes. We used a frequency-volume approach to estimate the trapping efficiency of assets before and after rectification works. It was estimated that under existing conditions sixty five (65) tonnes of gross pollutants were being collected from the Second Creek GPT and thirty seven (37) tonnes captured by the River Torrens FDT annually.

Following an extensive review process and two (2) site visits, a total of eight (8) options for the site were identified. Importantly those with *in-depth* knowledge and experience of the site were engaged to identify the sites complexities, confirm the design constraints and to inform the optioneering process. A multi-criteria assessment of the 8 options was undertaken with three (3) options being shortlisted. These included a low cost retrofit option at the Second Creek outlet to incorporate removable baskets into the separation chamber at the outlet, an option to upgrade the FDT and an option to integrate the GPT and the FDT into one asset.

Functional Design

At the functional design a range of assessments were undertaken to inform the design including: Feature Survey, Geotechnical Assessment, Water Quality Modelling and Performance Assessment, a Safety in Design Workshop and an independent review of the design.

These assessments led to the adoption of the option which integrated the Second Creek GPT and the River Torrens FDT by constructing a new trafficable bypass channel to convey frequent flows from the Second Creek outlet to the consolidated gross pollutant collection area which incorporates positive drainage through the collection area to also convey floating debris intercepted by the FDT into the collection area.

Detailed Design

At the detailed design a Structural Design, Detailed Design Drawings and Environmental Management Plan was undertaken. A Maintenance and Operations Manual was also delivered to drive a safe, efficient and effective approach to undertake cleaning and maintenance at the site.

Results and discussion

It was estimated from water quality modelling of existing conditions and future conditions that the integrated treatment facility would increase the capture of gross pollutants from around 2.75 tonnes to 19.9 tonnes per month representing more than a six-fold increase in the capture of gross pollutants.

Upon completion of construction, the project will deliver the following additional benefits:

[2] This project received grant funding from the Australian Government

- **Asset optimisation and environmental performance:** eliminating inefficient and unsafe maintenance tasks and increasing the capture efficiency of gross pollutants.
- **Safety and maintenance**: contributing to a safer environment by achieving a reduction in areas of standing water and the provision of a reversing area will ensure multiple vehicular point turns are avoided and forward entry and egress is enabled for maintenance equipment.
- **Amenity and connectivity:**
    - decommissioning the existing steep maintenance path which was in poor condition will significantly increase the amenity of the site and restores a large portion of the linear park for revegetation and enhanced habitat and improved connectivity; and
    - the Linear Path upgrade and associated landscaping combined with the new integrated facility will reinvigorate this site for the benefit of the community.

Conclusions and future work

The innovative integration of two former separate treatment measures on the River Torrens and Second Creek outfall required 'out of the box' thinking to conceptualise and determine the most appropriate design response to the challenging site conditions.

While an industry standard stormwater quality modelling approach was implemented, a more detailed understanding of the expected hydraulic performance of the new facility could be gained through computation fluid dynamics (CFD) 3D modelling approach. This would more comprehensively consider the combined flow dynamics for the River Torrens and Second Creek flows under different hydraulic conditions.

To fully implement the vision for this area, the following was recommended:

1. Interpretive signage be installed at the key vantage point for the site to raise the awareness of the community on how the integrated facility contributes to healthy waterways and oceans; and
2. Installation of a carefully positioned camera to assess the 'before and after' conditions and to enable the condition of the site to be assessed over time and under different flow conditions to alert decision makers in 'real time' when cleaning and maintenance needs to be undertaken to maintain the effectiveness of the new facility.

Some key lessons learned from the project included:

- Adopting an 'all options on the table' approach at the outset of the project facilitated the robust discussion of a range of options which addressed the complex project objectives;
- The adopted configuration required innovative thought and a fit-for-purpose approach; and
- Any challenges from working remotely including extended periods of lockdown for a number of project team members can be overcome through collaboration and innovation.

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