

Hartridge UID Scheme

sustainable solution through efficiencies to address aesthetic pollution to a local watercourse and Newport Gwent Levels from two CSOs

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Hartridge Farm Sewage Pumping Station is the terminal pumping station serving approximately 10,000 people within the catchment of Hartridge, Newport. The catchment drains into the pumping station from the North and East via a 325mm diameter and 525mm diameter sewer respectively. This pumping station then passes forward flows at a rate of 200l/s to Pill Reen Sewage Pumping Station located to the South. The wider catchment area is served by Nash Sewage Treatment Works.



Tunnelling beneath Newport SDR
Courtesy of Grontmij



The temporary watercourse crossing in Sullivan Circle
Courtesy of Grontmij

Existing asset

Currently flows greater than the pump duty (200l/s) at Hartridge Sewage Pumping Station are spilt through the Hartridge Farm CSO via a 10mm bar screen into Liswerry Pill Reen (the receiving watercourse) which flows into the Newport Gwent Levels. An additional CSO was installed at a manhole upstream of Hartridge SPS in Sullivan Circle, a residential street, to alleviate internal sewer flooding of residential properties. This measure was agreed to by the National Resources Wales (NRW), previously the Environment Agency Wales (EAW) on a temporary basis and remained unconsented.

Spills from both CSOs are unscreened and highly visible. Therefore in line with Urban Wastewater Treatment Directive, Dŵr Cymru Welsh Water set out to meet the conditions placed on the assets by the NRW including storage of all flows up to and including a 5-year storm event prior to first spill, and the screening of spill flows by 6mm screening in two dimensions.

NRW storage condition

Liswerry Pill Reen, the receiving watercourse, was judged to be sluggish by the NRW. To mitigate the impact of future spills on the

watercourse the NRW placed a local environmental condition on the assets requiring the storage of all flows up to and including a 5-year storm event. Hydraulic modelling carried out by the Welsh Water AMP4 design consultants indicated that storage in the order of 5,000m³ would be required to meet this driver.

Outline solution

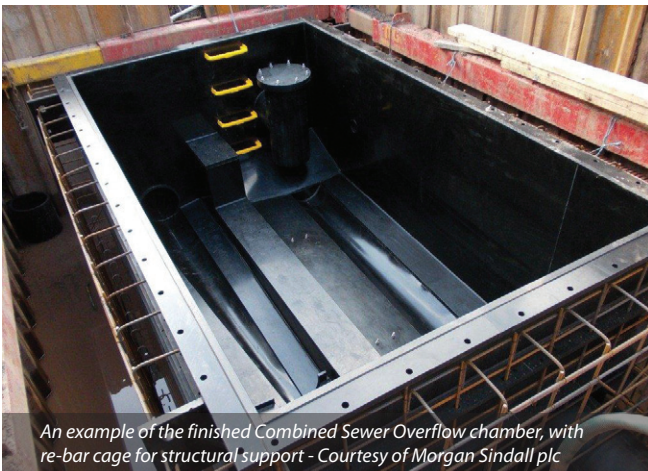
Hartridge UID was a named Price Review 2009 (PR09) scheme for construction in Asset Management Plan 5 (AMP5). As such the promoted PR09 solution called for the abandonment of the 'temporary' CSO in Sullivan Circle, the transfer of all flows to a new CSO with 6mm screen at Hartridge SPS site and the provision of 5,000m³ of storage within the locality of the existing SPS site.

Objectives

Morgan Sindall plc and their designers Grontmij were challenged to address the pollution being caused to Liswerry Pill Reen watercourse and the subsequent risk to the Newport Gwent Levels. There was the additional challenge of reviewing the condition of 5000m³ of storage upstream of Hartridge CSO, minimising impact to local residents and businesses as well as mitigating the impact of large scale construction on local wildlife habitats.



Walking the watercourse for water voles
Courtesy of Grontmij



An example of the finished Combined Sewer Overflow chamber, with re-bar cage for structural support - Courtesy of Morgan Sindall plc



Reinstatement at Sullivan Circle
Courtesy of Grontmij



Designing a pipe route of least resistance, offline and through the verge in a residential area - Courtesy of Grontmij

Challenging the NRW approach

In order to meet project deliverables the team firstly reviewed the condition of storage placed on the assets by the NRW as this was not in line with standard industry practice with regards to the control of intermittent CSO spills.

Based on early consultations with the NRW in October 2011 it was identified that a challenge to the condition could be raised based on evidence gathered to demonstrate that the receiving watercourse would offer sufficient dilution in the ratio of 1:8 during a storm spill event and that the stream also reacted to storm events quicker than the NRW first thought. To that end Morgan Sindall survey crews and Grontmij instigated and carried out a series of site investigations including a 14-week flow monitoring exercise within the watercourse and foul sewer network.

Timely supply of design information from site was critical in meeting programme dates. The team had to contend with an extended period of dry weather between February and April 2012 which delayed hydraulic model verification as well as the vandalism of the flow monitors within the watercourse. The design team quickly determined the impact of these events on the overall scheme programme and budget, within the mechanisms provided by the NEC contract and were able to effectively communicate this to Welsh Water to ensure transparency and collaborative working during design development.

Based on evidence gathered from these surveys, and a comprehensive hydraulic modelling exercise using the software package Infoworks CS version 10.5 it was shown that the watercourse, modelled as an open channel conduit, was storm responsive to such an extent that it could provide significant dilution during spill events.

Following on from a presentation of the results by Grontmij to the NRW in June 2012 it was agreed by all stakeholders to remove the condition of storage based on the findings of the design team.

Revised solution & cost savings

Based on the feasibility investigations and hydraulic modelling results, a revised solution was approved and signed off by NRW in August 2012 mitigating the need for 5,000m³ of storage and therefore realising significant project cost savings within the overall Business Plan whilst confirming the reduction of the impact to the local environment.

Construction challenges

The pipework from Sullivan Circle to Hartridge CSO crosses the Newport Southern Distributor Road (SDR) and requires upsizing. As this formed part of a PFI scheme constructed in 2004 it was identified early on that working within the carriageway would attract occupation charges of up to £3,500 a day from the owning company.

Given the strategic value of the SDR an open cut construction would be highly disruptive and would place an unacceptable risk of negative PR and business compensation upon Welsh Water. To negate this risk, trenchless construction across the SDR in the form of micro-tunnelling is being progressed after site investigations confirmed ideal ground conditions across a cross section of the site, with significant layers of stiff clay with a small risk of obstruction in the form of cobbles.

With an industry wide accepted tolerance of +/- 50mm for 1,200mm diameter tunnel bore it was important to consider the impact of construction inaccuracies, due to the technology limitation, on the upstream pipework design. This required close consultation between Morgan Sindall and Grontmij to develop 'what if' scenarios in order to adequately consider all outcomes and to develop contingencies.

As the working area around the proposed CSO is restricted due to the adjacent watercourse, the existing SPS site fence boundary and a buried 11kV cable, a pre-fabricated HDPE CSO chamber with integral reinforcement cage solution, complete with static screen installation was progressed. Selection of a pre-fabricated solution was the preferred solution; minimising the construction footprint and construction time, as well as reducing the health & safety risks associated with confined space working.

Developing this solution required close working and liaison between the Welsh Water delivery supply chain including Pipex and Hydro International to ensure the chamber, incorporating the static screen, met design specification and construction programme.

Minimising risk

From the outset it was imperative that the risk posed to the construction team of operating within a sewerage system carrying highly transient flows was reduced. Apart from the risk of drowning, contact with sewage places risks of contracting diseases such as *Hepatitis C* (reportable under RIDDOR) and *Leptospirosis* (Weils Disease) to name a few. The design team therefore ensured that all options of constructing the new pipework offline were investigated from the offset. With tailored site investigation and the option of retaining the existing sewer system post construction ruled out, a completely offline route was designed. This would connect back into the existing terminal manhole avoiding complex connection work into the existing SPS wet well. With a much reduced requirement for over-pumping of flows, the reduction in pump noise and fumes will reduce the impact on local residents.

Ecological considerations

As part of the scheme development extensive habitat surveys were carried out within the local environment consisting of sewage lagoon and scrubland. Ecologists identified the potential for reptiles and bat roosting trees within the works corridor. In order

to limit disturbing these habitats and the creatures within them, a phased vegetation clearance is being undertaken under the close supervision of an experienced and qualified ecologist. Where required, alternative habitats will be provided at certain locations around the site to encourage wildlife to relocate outside of the works area and outside of harms way.

Where it was not practicably possible to design pipe routes away from existing trees, these trees have been fully assessed for wildlife habitats prior to felling and replacement trees will be planted by Morgan Sindall. This is in keeping with the ethos of sustainable development that the delivery team strive to attain on all projects.

Construction delivery

Site clearance is currently taking place with construction mobilisation on site due to start in July 2013. Construction is forecast to be complete 6 months later in December 2013.

Key participants:	
Client	Dŵr Cymru Welsh Water
Principal contractor	Morgan Sindall plc
Technical consultant	Grontmij
Commercial consultant	EC Harris
Hydraulic modelling	Grontmij
Prefabricated CSO chamber supplier	Pipex px
Static screen supplier	Hydro International

The Editor & Publishers would like to thank Jude Sira, Civil Engineer with Grontmij Ltd for providing the above article for publication. The author thanks Dŵr Cymru Welsh Water and Morgan Sindall plc for their assistance with this paper.

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