NI Water - Carrowreagh Storm Sewer Sustainable Drainage (SuDS) Project

9/12

Key Points

NI Water - storm infrastructure for 290 homes in East Belfast.

Cost: approximately £600,000.

Used a 1300m³ offline geocellular attenuation tank designed for resilience against a 1 in 30 year storm.

High levels of collaboration with key stakeholders was neccessary - in this case Roads Service and Rivers Agency .

Lesson Learned:
Innovation is key to creating resilient infrastructure.

This case study details the planning and construction of the Carrowreagh SuDS project in 2012 by Northern Ireland Water. It sits within the 'flooding' action category of the Northern Ireland Climate Adaptation Programme.

The 'Carrowreagh Storm Sewer Sustainable Drainage Project' is located within the Ballybeen Housing Area in Dundonald, East Belfast. It was highlighted to NI Water as a project of specific interest through a requisition to NI Water Developer Services. (A developer of a new housing project requested a storm sewer.) The project was originally to serve a development of 110 homes but it evolved to provide storm infrastructure for 290 homes. A large amount of cross-organisation collaboration was required to bring the project to completion; between NI Water, DARD and DRD.

Graham Construction, consultancy firm White Young and Green and Polypipe Ulster were involved in the design and construction of the project. The collaboration between NI Water and Rivers Agency was particularly vital, as the only watercourse available for discharge was the River Enler. A series of scoping exercises was completed, including camera surveys of culverts, a site investigation and a risk assessment on the operation and maintenance of the proposed tank. In June 2012, NI Water began implementation of the project.

Overview

This project involved the building of a large modular geocellular plastic storage tank. Whilst NI Water presently does not accept modular storage tanks built by others for adoption, they built this project as a pilot and as a statement of their strong support for the implementation of SuDS.

Aims/objectives

Design and implementation of a Sustainable Urban Drainage (SuDs) system to serve the housing development in Carrowreagh.

In recent years the Dundonald area has experienced significant growth, mainly due to residential development. This growth, combined with a need to comply with strict Rivers Agency flow rates to mitigate against river flooding, meant that work was required to install a new storm sewer tank. NI Water aimed to diminish surface water flows and improve the sewerage infrastructure for future developments.

The Technology

An offline geocellular attenuation tank was selected, with a proposed storage volume of 1300m^3 to cope with a 1 in 30 year storm. A similar tank was built in Derry/Londonderry seven years prior to the Carrowreagh scheme and no incidents of poor performance or infrastructure issues have been reported.

The Carrowreagh tank was constructed of modular geocelluar plastic units. NI Water used this technology for the first time in this pilot scheme. It was chosen for its ability to offer a more cost efficient, quicker, and more environmentally-friendly construction process. In addition, it offered faster construction of the storm tank when compared to the alternative option of a conventional concrete tank.

The structural integrity of the tank complied with British Standards. It was designed with 8.5% extra capacity to allow for sediment deposition based on storm flow from a housing development. The introduction of catch pits within manholes, and the design allowing for the tank to be offline, also substantially reduces any grit or sediment deposition.

Challenges

Rivers Agency confirmed that the maximum permissible discharge to the River Enler was a greenfield run-off at 10 l/s per hectare. This was because of its sensitivity to additional flow from new developments. The development area is measured at 20 hectares, which allows a maximum flow of 200 l/s for discharge.

Due to this restriction, NI Water had to provide storm attenuation within the existing wastewater network to comply with regulation. In this case, the development consists of three phases with a maximum permissible storm discharge of 1258 l/s in a peak storm event.

The project is on an arterial route, so restrictions were placed on works. Works had to comply with normal working hours, 08.00 – 17.00 due to the proximity of homes.

"The new modular storage tank is a unique sustainable drainage system and this is the first time this technology has been used by NI Water as a pilot project."

Keith Haslett NI Water

Successes

Successful outcomes included:

The project gained support from internal stakeholders to change the NI Water SuDS Policy.

NI Water now has a detailed review of different technologies in the market place.

High engagement with key stakeholders, including Roads Service and Rivers Agency.

Increased awareness at a community level through Information leaflets distributed.

The scheme not only improved the sewage infrastructure for the Millreagh development, but also reduced the risk of flooding from the Enler River.

In 2012 the Carrowreagh project was a runner -up in the ICE Sustainability Award.

Climate Adaptation

This project is a clear example of climate adaptation. NI Water studied future projections about the frequency and intensity of rainfall predicted in the Northern Ireland Adaptation Programme. It reacted to this information proactively, which should prove cost-effective in the long-term.

"This project was driven by regulation, policy and initiatives aimed at mitigating flood risk in order to protect "citizens, property and the environment." - NI Water

Lessons learned

The Carrowreagh SuDs scheme taught NI Water to look to innovation in order to adapt to the effects of climate change on water resources and drainage infrastructure.

One of the main lessons learned was the re-use of excavated material and the minimising of waste disposal, which provided savings to the project.

This development was originally requested by the developer indicating awareness in the industry. Collaboration is the best way to develop systems like this in the future.

The location of NI Water's Carrowreagh project

Case Study

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