

Hollywood Sewer Network Improvements Project

improvements project delivering environmental benefits for the Hollywood and Kinnegar areas of North Down and Belfast Lough coastal waters

by Mark Sefton

The Hollywood South sewer catchment includes a mixture of medium to high density residential areas that drain by gravity to the Kinnegar WwTW, currently operated by a Public Private Partnership (PPP) consortium. The total area of the catchment is approximately 107 hectares with a modelled population of 3,524. In Autumn 2014, NI Water commenced its Hollywood Sewer Network Improvements Project, a challenging project aimed at reducing ongoing odour nuisance, delivering environmental improvements and improving water quality in Belfast Lough coastal waters in the area of Hollywood and Kinnegar, North Down. NI Water and its contract team have successfully embarked on delivering the project, which involves construction of a new dual foul and stormwater pumping station and the construction of tunnelled sewers below key rail, road and gas infrastructure.



Tunnel boring machine being lowered into position - Courtesy of NI Water

Background and project drivers

Three combined sewer overflows (CSOs), known as Strathearn Court, Palace Barracks and Jacksons Road spill excessively to large lagoons adjacent the Kinnegar WwTW site. These lagoons, which total approximately 2 hectares in area, are owned by NI Water and were in the past planted out with reeds, which have since died off.

The lagoons fill and empty, under tidal influence, through an existing pipeline to Belfast Lough. During low tides odours from hydrogen sulphide gas are produced by the decomposition of settled sewage sludge from the CSO discharges in muds in the lagoon beds. The odours, which can be intense, have generated ongoing and increasing complaints from the local residential population and commuters over recent years.

With mounting pressure from the public, local politicians and the NI Environment Agency, NI Water commissioned a detailed investigation into the local sewerage network and an appraisal study to determine the best long-term solution to the ongoing odour problem.

Project development and selection of preferred option

Investigations and appraisal work, which involved extensive CCTV surveys and hydraulic modelling, determined that a number of the existing sewers were problematic due to flat gradients and restrictions caused by the build-up of silt, fats, oils and grease.

The sewers were also virtually inaccessible in some areas having been laid deep below the lagoons, the Belfast to Bangor railway



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line and the A2 Belfast to Bangor Dual carriageway. This dual carriageway is one of Northern Ireland's busiest traffic routes, carrying in excess of 50,000 vehicles per day. The sewers are also in close proximity to one of the Scotland to Northern Ireland gas transmission pipeline's key high pressure reduction & distribution facilities.

CSO discharges

The Strathearn Court and Palace Barracks CSOs were found to be discharging well in excess of the maximum ten spills per annum allowable under the European Shellfish Waters Directive and the NI Environment Agency stipulated that such unsatisfactory intermittent discharges to the lagoons must cease.

The extensive investigation and appraisal work also brought to light the potential for a number of short-term measures that could be implemented in advance of the main solution. These included :

- Remedial works at the problematic CSOs.
- Sewer cleaning and de-silting work.
- Raising the level of the lagoons' outlet weir coupled with the installation of flap valves so as to remove the tidal influences and keep the lagoon beds submerged at all times.

These measures were subsequently implemented and results have reduced the occurrence and intensity of odour problems.

A number of existing constraints in the area influenced the choice of long-term options available. Such constraints included the lagoons themselves, the Kinnegar WwTW site, the A2 dual carriageway, the Belfast to Bangor railway line, the gas pipeline & gas facilities site, local Ministry of Defence (MOD) facilities, tidal influences, private lands and lands leased (which included the lagoons) to the PPP consortium.

Possible solutions

A number of possible solutions were considered with two main options being selected for analysis in terms of compliance, capital expenditure and whole-life operating costs.

- The first option comprised the provision of individual online or offline storm water storage to deal with flows from each of the CSOs - i.e. three storage locations.
- The second option comprised the provision of one, new, single storage location to deal with flows from all three CSOs collectively.

After careful consideration, the second option was selected for further development. This entailed intercepting and upsizing the continuation pipes from each of the CSOs to a single spill point, downstream of the lagoons, which then discharges via an existing pipeline to the existing Kinnegar WwTW long sea outfall.

Project elements

The fully developed solution comprises the construction of new interceptor sewers and a new pumping station that will enable the closure of all three CSOs. The new pumping station will also intercept existing foul sewage flows from the adjacent MOD facility and the nearby Belfast Harbour Estate and pump them to the Kinnegar WwTW for treatment. Key project elements are as follows:

- New dual foul and stormwater pumping station comprising.
 - ▲ 10.5m diameter x 11.3m deep segmental shaft sunk to firm bearing strata.
 - ▲ 1,130m³ of storage (includes upstream sewers).
 - ▲ 4 (No.) submersible storm pumps in duty/assist/assist-standby configuration delivering 860l/s pumped storm flow to the existing Kinnegar WwTW long sea outfall.



Location plan showing combined sewer overflow discharges to Kinnegar lagoons - Courtesy of NI Water

- ▲ 4 (No.) submersible foul pumps in duty/assist/assist/standby configuration delivering 220l/s pumped foul flow to the existing Kinnegar WwTW.
- ▲ 6mm static screen on overflow.
- ▲ Associated valve chambers and ancillaries on precast concrete piled foundations.
- 305m of 700mm nominal diameter PE100 storm overflow pumping main.
- 360m of 400mm nominal diameter PE100 foul pumping main.
- 460m of micro-tunnelled 1,200mm nominal concrete diameter interceptor sewer.
- 140m of 1,050mm nominal diameter concrete interceptor sewer.
- 135m of 750mm nominal diameter concrete interceptor sewer.
- 210m of 200mm nominal diameter PVCu gravity sewer.

A substantial proportion of the sewer construction work involves micro-tunnelling works below the Belfast to Bangor A2 dual carriageway, below and adjacent to the Belfast to Bangor railway line, below the high pressure gas transmission pipeline and within the perimeter of the gas facility site.

Professional services

NI Water appointed Atkins Ltd to carry out the initial investigations, hydraulic modelling and appraisal study. White Young Green Ltd was appointed for general project management duties encompassing:

- Detailed geotechnical site investigations.
- Scientific investigations into the nature of the lagoon muds and the local environment.
- Other requisite surveys.
- Stakeholder liaison.
- Statutory assents and consents.

They developed NI Water's standard NEC ECC contract documentation (based on NI Water Asset Standards and Engineering Specifications), assisted with the construction contract tendering process and are presently engaged on NEC project management, CDM Coordination and site supervision duties.

Contract and procurement

NI Water selected an NEC3 ECC Option A (Priced Contract with Activity Schedule) as the contract strategy with a well-developed reference design and requirements for facilitating the constraints and needs of key stakeholders. Requirements for the provision of work opportunities for the unemployed, students and apprentices were also included within the contract.

GEDA Construction Ltd was appointed principal contractor following a competition amongst contractors appointed to 'Lot 3' (Water and Wastewater Infrastructure - Major Works) of NI Water's 'Integrated Capital Delivery Framework 19'. This framework contract for the delivery of water and wastewater infrastructure and non-infrastructure assets was developed by NI Water's Engineering Procurement team and has been in operation since January 2014.

GEDA Construction Ltd subsequently appointed F&B Tunnelling Ltd to carry out micro-tunnelling and segmental shaft subcontract works and FM Environmental Ltd to carry out mechanical, electrical, instrumentation, control and automation subcontract works.

Stakeholder engagement

Given the heightened public and political sensitivities surrounding the nature of the problem to be resolved, as well as the range of challenges posed by the various project constraints, a detailed stakeholder management plan was developed and implemented by the project team in collaboration with NI Water's PR team. The plan involved ongoing communication and meetings with local political representatives and other key stakeholders including the



Location plan showing proposals for diversion of overflow discharges - Courtesy of NI Water



Tunnel boring machine being lowered into position for first tunnel drive
Courtesy of NI Water

Members of the project delivery team with tunnel boring machine in the background - Courtesy of NI Water



NI Environment Agency, Planning Service NI Transport NI (local highway authority), Northern Ireland Railways, Mutual Energy (owners of the gas pipeline and gas facility site) and the Kinnegar WwTW PPP consortium.

Open information sessions were held to present proposals and to address any concerns from local residents, elected representatives and other local stakeholders. This programme of stakeholder engagement will continue until the completion of the project.

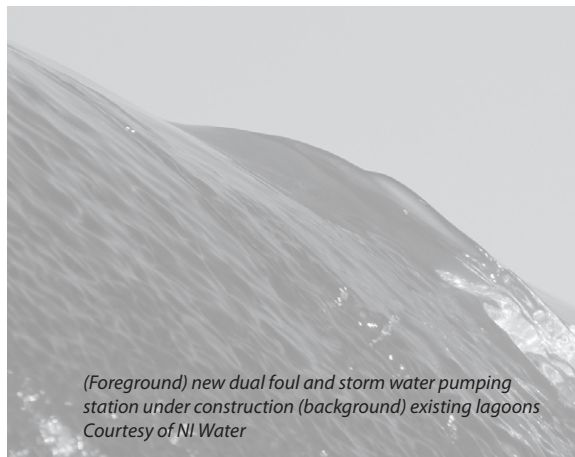
The stakeholder management plan was also supported by regular press releases and letters to local political representatives, as well as information on NI Water's website www.niwater.com and social media sites.

Current position

The £4.5m project commenced on site in October 2014 and at the time of writing (June 2015), construction work is progressing well with the project team anticipating commissioning and completion by Spring 2016.

The elimination of CSO discharges to the lagoons will allow for either their natural or bio-remediated recovery and ongoing odour monitoring and scientific study will help inform any future decisions as to whether or not further intervention to restore them to their former condition will be required.

The editor & publishers thank Mark Sefton, Senior Project Sponsor with NI Water, for providing the above article for publication.



(Foreground) new dual foul and storm water pumping station under construction (background) existing lagoons
Courtesy of NI Water



Construction of segmental shaft manhole at Strathearn Court, Holywood - Courtesy of NI Water

