

# Hagley (Newfield Road) Flood Alleviation

## delivering design and build efficiencies on Severn Trent Water's complex Hagley sewer flood alleviation project

by Will Hooper MEng GMICE

The small town of Hagley, Worcestershire is served by an ageing sewer network which drains the wastewater of the 6,000 inhabitants towards the large Milestone Drive Sewage Pump Station. Following decades of growth, misconnections and increased urbanisation within the existing catchment, hydraulic pinch points on the foul sewer network subjected numerous clusters of low-lying properties across the village to flooding during times of heavy rainfall. Extensive flow monitoring, hydraulic modelling and engagement with the active local Flood Group soon led to the promotion of a £1.3m scheme to holistically solve the foul sewer flooding at 17 locations across the town.



Installation of 3 (No.) 1800mm diameter tanks - Courtesy of Severn Trent Water

### Background

Under the AMP6 framework agreement, NMCNomenca was appointed as principal designer and principal contractor on the project and worked collaboratively with Severn Trent at an early stage to enable an outline solution that would avoid closing the A456 in Worcestershire; a significant 30-125 MSA road and an important source of trade for the bustling shopping high street in Hagley.

The design philosophy of delivering the project entirely as a gravity solution and avoiding closing the A456 led to providing two large network transfers in order to free up capacity in the main sewer flowing below the A456. The re-routed flows could then be stored in large attenuation tanks, 705m<sup>3</sup> in Hagley Playing Fields and 110m<sup>3</sup> in Summervale Road prior to being discharged through throttle pipes back to the neighbouring sub-catchment. Flooding on Newfield Road and Station Drive was alleviated through a traditional sewer upsized to safely convey the wastewater away

from the flooding properties and respectively providing 165m<sup>3</sup> and 233m<sup>3</sup> of storage to ensure pass forward flows did not exceed downstream capacity.

### Design

During the extensive stakeholder engagement, the initial designs for the main storage tanks in Hagley Playing Fields came under much scrutiny from the Parish Council due to a planned expansion of their Community Centre. NMCNomenca became regular Monday evening Parish meeting attendees and re-designed the location of the tanks on multiple occasions to provide a future-proof solution satisfying both key stakeholder requests and maintenance access needs of Severn Trent.

Further deviations from the initial design were facilitated by taking on the challenge of working on a short length of critical sewer within the centre of the A456. NMCNomenca was able to utilise its supply chain expertise to design a contraflow across the dualled





Offloading of 1800mm diameter CPM concrete pipes  
Courtesy of Severn Trent Water



Aerial photo of site compound and tank installation  
Courtesy of Severn Trent Water



Polypipe prefabricated chambers - Courtesy of NMCNomenca

section on the A456 junction and operated a vacuum excavator to safely excavate around the dozens of buried services to eliminate a significant restriction on the foul sewer network without closing the road. This in turn negated the initial requirement for a tank sewer on Western Road which brought considerable savings to Severn Trent as there was no longer the need for 120m of gas main and water main statutory diversions or the requirement to compensate the businesses associated with that section of road closure.

The contraflow on the A456 was also pivotal in facilitating a local surface water diversion for North Worcestershire Water Management (NWW) which directed flows away from the A456 highway drainage network. Through a close collaboration with Richard Allitt Associates, NWW, Worcestershire Highways, Severn Trent and NMCNomenca, the project team was able to take the lead with the design and build of this surface water diversion and by working in partnership with the Environment Agency, external funding for the project was made available.

The proposed contraflow on the A456 and closure of Station Drive forced NMCNomenca to accelerate the design phase to meet the requirements of Worcestershire Highways and London Midland in order to facilitate these works during the school summer holidays. Careful phasing of the works across the village permitted NMCNomenca to have road closures running simultaneously and the ability to manage three separate gangs working concurrently in different sections of the catchment. These programme efficiencies led to the successful completion of the project 4 months prior to the STW planned completion date.

The requirement to retain the network operating under gravity and to create additional capacity through the section of sewer running under Gallows Brook presented additional challenges to the design team. The obligation to satisfy the environmental regulations of installing a sewer under a water course with sufficient cover and without disturbing any of the existing mature trees led to the specification of a laser guided auger which could also be installed from large sheeted pits in Station Drive and Hagley Playing Fields without interfering with flows and associated wildlife in the brook.

Further design efficiencies were realised with the detailing of the proposed sewer upsize in Station Drive following a survey of the existing sewer and railway infrastructure where it became apparent that the size of excavations required to install the temporary works for the auger reception pit would require a Basic Asset Protection Agreement with Network Rail; a potentially costly and time-consuming exercise. The design team instead proposed a new offline, high level surcharge relief sewer to be built as to avoid any construction work within Network Rail's zone of influence.

This also enabled a significantly quicker construction period due to the shallower excavations and no longer requiring over-pumping setups on the existing network which helped in minimising the disruption to the users of Hagley Train Station.

#### Technical detailing

The requirement to provide the 165m<sup>3</sup> and 110m<sup>3</sup> storage tanks within the densely urbanised streets quickly led to the preference of installing HDPE pipework in order to minimise the size of machinery in residential streets and to facilitate the movement of the lightweight materials from the delivery area in the playing fields. NMCNomenca's extensive build experience ruled out satellite delivery compounds due to the residential nature of the scheme and instead focussed on providing off-site, pre-manufactured components to be installed with the HDPE pipework.

Under the Highways Act 1980 and Worcestershire County Council's technical requirements, NMCNomenca complied with the Category 2 design check procedures for installing large diameter HDPE pipework in public highway as set out in the DMRB (BD2/05).



**Hagley (Newfield Road) Flood Alleviation - Key participants**

Client	Severn Trent Water
Principal designer	NMCNomenca
Principal contractor	NMCNomenca
No-dig specialist	Active Tunnelling
Traffic management specialist	Beaumont Traffic Management
Pipework suppliers	CPM Group Polypipe UK

These technical approval schedules and design check certificates were able to certify Polypipe Rigestorm XL's range for use in the public highway for the first time within Worcestershire Highways.

Hagley Playing Field's existing perimeter of historic Lime Tree was widely regarded as vastly enhancing the amenity value of the area and NMCNomenca was conscientious in their design proposals to retain this from the outset. A new temporary access was constructed between two trees to facilitate the large number of vehicle movements into the site compound and by designing and installing a Cellweb geosynthetic grid, assurances could be met that no roots would be damaged during the works. Due to the requirement to install the large 1.8m diameter tanks and to retain the inspection lids outside of the recommended FA pitch run-off zones, the end turrets of the tanks were required to be installed in close proximity to the existing tree line. Although the majority of the tank was built in a battered, stepped excavation, the temporary work requirements closest to the tree line led to the innovative specification of a temporary gabion-style retaining wall which facilitates the installation of the tank with minimum distance to the protected root zone.

In order to minimize the volume of material being taken off-site from the large excavations in the playing fields, analysis and grading of the arisings under SHW Series 600 meant separate stockpiles were created of suitable backfill material, these were used for the highway works across Hagley which also led to a vast reduction in importing general fill material, reducing both disruption and the environmental impact of the works.

**Customer engagement**

Due to the nature of upsizing sewer networks and the associated disruption across the town, the Hagley project team established a comprehensive customer management plan encompassing regular update meetings with the Parish Council, a large public exhibition with over 250 residents in attendance, door to door business consultations by the Severn Trent business compensation team, notice boards, website update links, press releases and the distribution of an estimated 5,600 update letters.

The efforts made by Severn Trent and NMCNomenca were recognised by the overwhelmingly positive feedback forms returned by local residents and by being awarded the Institution of Civil Engineers West Midlands 2018 Communication Award. Additional site-based communication also included rolling out the ICE *#thisisCivilEngineering* campaign across the works to promote the scheme to the many playing field users. Enthusiasm within the team to further promote the successful project led to the invitation of STW Non-Infra Safety Improvement Group to learn from the positive implementation of H&S practices across the site.

NMCNomenca also invited the local fire and rescue team to practice a joint high risk confined space entry within the playing field tanks which provided the local nursery with some entertainment when the excitement of large construction equipment was complemented by four fire engines!

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13T excavator loading pipe bedding - Courtesy of Severn Trent Water



36T excavator loading graded sand for back-filling  
Courtesy of Severn Trent Water



Temporary gabion retaining wall to allow tank installation  
Courtesy of NMCNomenca



Reinstated Hagley Playing Fields - Courtesy of NMCNomenca