NORTHUMBRIAN WATER *living water*

Rainwise

Sustainable Drainage Solutions

Working with communities to manage rainwater

Killingworth and Longbenton, North Tyneside

The Killingworth and Longbenton area of North Tyneside to the north of Newcastle upon Tyne comprises a mix of approximately 20,000 residential and commercial properties.

Figure 1: Location of Killingworth and Longbenton in North Tyneside

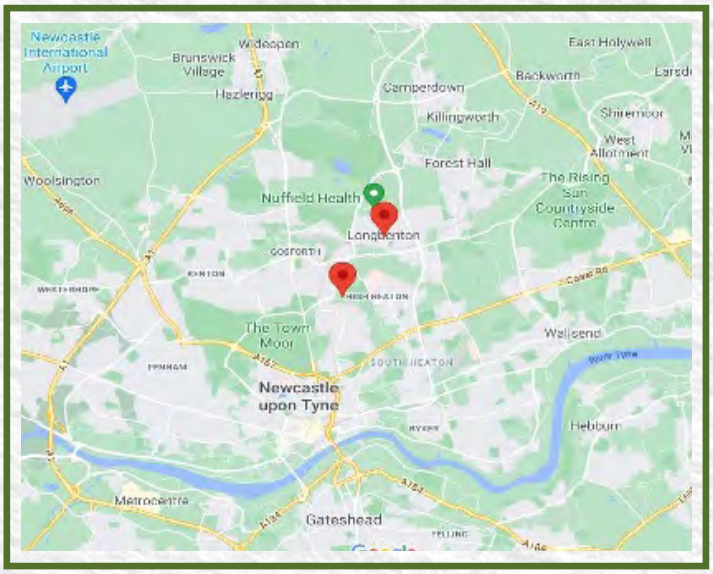

Figure 2: Killingworth and Longbenton area

This case study outlines the collaborative and sustainable approach carried out by Northumbrian Water (NW), the Environment Agency (EA) and North Tyneside Council (NTC) to surface water management, reducing the risks of highway, external and internal property flooding for residents of Killingworth and Longbenton.

The Longbenton area had a history of flooding, which was exacerbated by a main river (the Longbenton Letch) flowing into a combined sewer adjacent to the worst-affected properties. A second waterbody – Killingworth Lake – overflowed into the combined sewer upstream of the letch. Together the letch and lake took up valuable sewer capacity and contributed to flows at the downstream overflow and sewage treatment works. The project would divert Longbenton Letch out of the sewer and into another main river to the north – Forest Hall Letch.

The lake overflow would be diverted into a tributary of the Ouseburn which flows into the River Tyne. The project presented the opportunity to reduce the risk of flooding to 3,594 properties in the area while returning the Longbenton Letch back to a natural watercourse and increasing local biodiversity.

NW, the EA and NTC shared their respective records and data. However, separate studies by NW and the EA had not been able to deliver justifiable projects in isolation. The opportunity to work together produced a new prospect for the project.

PROJECT DEVELOPMENT

The overall strategic objective for the Killingworth and Longbenton scheme was to reduce the potential for flooding of properties from the combined sewer, while also increasing the potential for development in the area and increasing local biodiversity.

This project was developed to reduce the risk of property flooding from the public sewers. The key stakeholders – NW, EA and NTC (the Lead Local Flood Authority) – determined that the residents would be best served by a collaborative sustainable approach to reduce the risk of further repeat flooding.

NW, the EA and NTC entered a formal partnership to develop and deliver the scheme which was overseen by a project board including representatives from the three key stakeholders.

To deliver a sustainable approach to reduce the risk of sewer flooding, the partners had to address the specific challenges of stakeholder management, programming and new ways of working which were inherent in the project.

A number of physical constraints presented challenges for the diversion routes, including a new school build, a village green, a cemetery, a public park, the East Coast mainline and farmland.

Longbenton is served by predominantly combined sewers while Killingworth is primarily separately sewered before discharging the surface water run-off to the lake.

Diversion of the Longbenton Letch into the Forest Hall Letch meant that additional capacity had to be formed in the receiving letch so as not to create a flood risk. This capacity was created in the form of SuDS basins in school grounds and farmland. Due to topography, the river diversion had to be in the form of an underground culvert through a cemetery, village green and school field before emerging at the Forest Hall Letch.

The Killingworth Lake works involved reprofiling of the Lakeside Park to create exceedance basins plus tunneled pipework to take the overflow to an existing culvert under the North East Mainline.

Northumbrian Water used their framework consultant to deliver feasibility and design of the project and framework contractor for construction of the entire scheme including the main river diversion, SuDS structures, plus sewers and manholes. The Northumbrian Water consultant also delivered the EA's Project Appraisal Report (PAR) to secure partnership funding as well as carrying out the hydraulic analysis.

At an early stage the partners decided to maximise the social, environmental and financial benefits of the scheme by choosing to promote SuDS options for surface water management. The overall scheme benefits were assessed using the CIRIA B£ST tool. This helped in calculating the sum that the EA was able to contribute towards the scheme.

In summary the scheme was delivered in three phases and involved the following elements:

Phase 1

- Divert Longbenton Letch watercourse out of sewer and into Forest Hall Letch watercourse – 670m of culverted watercourse.
- Create attenuation basin in school field.

Phase 2 – upstream flow attenuation and phase 1 goes live

- Create 5,000m^3 of online storage along Forest Hall Letch upstream of point where Longbenton Letch enters the watercourse.
- Flow controls to manage the flow going from the attenuation and continuing downstream.
- Allow phase 1 watercourse diversion to 'go live'.

Phase 3 – divert Killingworth Lake overflow to existing watercourse and away from sewers

- Install new pipework between lake and existing culvert which takes flows to existing watercourse.
- Create 3,500m3 of surface water storage on top of the lake by making the top water level 100mm lower.
- Create approximately 3,000m3 of storage adjacent to Killingworth Lake – land goes from sloped to basin shaped.
- Install three floating islands to mitigate against permanently lower top water level in lake.

DESIGN AND CONSTRUCTION

The scheme was delivered in three phases. Phase 1 comprising the main river diversion and SuDS pond in the school field. This phase commenced in Spring 2016 and continued until Winter 2016.

Phase 2, which comprised construction of the upstream SuDS areas on Forest Hall Letch commenced in Spring 2017 and continued until Autumn 2017.

The final phase of the scheme centred on Killingworth Lake. This phase of work commenced in Autumn 2018 and ran until Autumn 2019. Phase 3 entailed extensive stakeholder communications and planning permission.

The phased approach to the construction was required to ensure that flows could be redirected to the Forest Hall Letch without causing flooding issues.

The existing Forest Hall Letch channel was utilised as a 'low flow' channel which conveys surface water flow. Additional SuDS storage was created by excavating three basins between the existing Forest Hall Letch channel and the adjacent farmland to provide the necessary storage volume during larger storm events.

In dry weather the SuDS basins are expected to remain dry. The base and sides of the SuDS basins were reinstated with a pre-seeded matting to promote quick growth and provide protection against scour as the basins established

The SuDS basins at Killingworth Lake are intended to be dry for the majority of the time. A range of plant species were planted on the sides and base of the basins for a diverse environment.

While NW led and project managed the joint scheme through the design and construction phases, this included reporting progress and financial data to the EA as well. A good working relationship was maintained throughout.

NW will retain responsibility for the manhole structures and underground pipe aspects of the project, with the EA taking on maintenance of the SuDS channel and basins.

Planning consent was required for key elements of the project. These included the works in Killingworth Lakeside Park. The planning permission covered items such as access, reinstatement, health and safety and environmental considerations.

Figure 3: Killingworth Lakeside Park

CHALLENGES

The scheme involved numerous challenges with the main ones being around managing stakeholders and customers in key locations and funding/programming issues around new ways of working for NW, EA and NTC.

Managing stakeholders and customers in key locations

In view of the nature and scale of the scheme and the inevitable disruption to a variety of locations in the area, a detailed customer engagement plan was jointly developed by the partners to ensure effective communications, and updates were made to and from customers and other third-party stakeholders in the Longbenton, Killingworth Moor and Killingworth Lake areas.

Longbenton Community College had significant concerns regarding the impact of the scheme as the school was planning a rebuild in the year leading up to our project. There was also concern around the drainage to the school playing field and the timing of the works within the school car park.

We arranged regular meetings with the contractors for the school rebuild and the school managers to see how we could integrate the two programmes of work. It transpired that the contractors were planning to drain the surface water from the new build to an underground storage tank. By working together, we were able to change this design to become an educational dipping pond. Through considerable effort by all partners, we were able to bring forward our programme by a year and be on site at the same time as the school contractor to avoid going onto site just as the school rebuild was complete. We planned the works in the car park through the summer holidays to minimise disruption. We installed field drainage to the school field during reinstatement.

The first phase of construction also involved installing pipework across designated village green land in Longbenton. Extensive liaison with the village green committee enabled us to establish the aims of the group and incorporate these into the reinstatement. Building a good relationship with the group meant that not only could we install the pipework but we were also able to utilize some of the area as a site compound. Upon reinstatement we were able to provide some tree planting and lighting as well as accessible planters to enhance the village green in ways that would have been beyond the volunteer group.

Another section of the pipework required to transfer the Longbenton Letch into the receiving watercourse had to be installed along the boundary of a cemetery. We had a series of meetings with the cemetery managers to agree the exact route of the new pipe to cause least disruption. We also reinstated to include a new area for growing plants for cemetery and chapel use.

Phase 2 of the project entailed creating overflow basins adjacent to the existing watercourse which runs through private farmland. This phase involved much liaison and communication with both the landowners and the customers living in adjacent housing to explain the purpose of the project and how the land would look following completion of the works.

The final phase of the project was located primarily in public parkland including Killingworth Lake, a local beauty spot in a very urban landscape.

A considerable amount of engagement was carried out with local residents and specialist groups to explain the project and seek public opinion which led to various design changes prior to a formal planning application being submitted.

Funding and programming

The funding and programming of the scheme included particularly innovative elements. Northumbrian Water, the EA and North Tyneside Council all had different funding sources, profiles and contract procurement processes which had to be aligned to achieve the required outcomes for both parties.

These were brought together in a collaborative agreement which included the financial and non-financial contributions of each party, definition of roles and responsibilities, review processes to ensure project objectives were met, and a process to manage any disputes.

The EA agreed to have all the works designed and delivered by NW's framework suppliers. Up until design and construction, NTC had been the Lead Partner for the project. It was agreed that this role should be transferred to NW as they were now leading delivery. This was the first time the EA had delivered a main river diversion.

To deliver the funding and programming agreements, NW and EA carried out their own project appraisals. NW funding was from the sewer flooding capital programme while the EA secured a fixed allocation of fund through Local Levy and National Flood and Coastal Defence Grant in Aid. NTC provided a donation to the project plus land at Killingworth Lakeside Park.

New Ways of Working

The project initiated innovations in ways of working, most notably the integrated use of stakeholder powers for the diversion of the river and drainage assets as well as the SuDS implementation itself. Other important aspects included the joint communications strategy, risk apportionment and management of compensation claims.

The project team carried out a joint project risk workshop and developed strategies to enable them to be managed. Where the works are exclusive to NW or EA, the appropriate party was responsible for the associated risks. Risks were allocated to all parties and responsibilities set out within a legal agreement between them. Although the works were mainly on main river (owned by the EA), NW was designated to take on land and compensation processes via a legal agreement prepared by the EA and agreed by the NW legal team.

A joint communications approach was agreed between all parties with NW and the contractor leading the discussion and events.

Construction

The construction entailed mass earth movement through all three phases. Wherever possible, the earth was reused to create the new profiles of the land. Pre-seeded coir matting was used to stabilise the embankments along the basins at Killingworth Moor. As well as providing stability, the seeding was a particularly fast-growing variety, enabling the basins to return to grass as soon as possible. The floating islands at Killingworth Lake were the first time such a solution has been employed by NW. Local school children were invited to site to learn about the water cycle and help in planting the islands before they were floated into position.

Figure 4: Killingworth Lake

ACHIEVEMENTS

Flood risk reduction
As a result of this project, the risk of sewer flooding was reduced to 3,594 properties.

Wider benefits
Due to the diversion of the watercourse out of the combined sewer, the downstream pumping station is dealing with lower flows and so using less power. The watercourse diversion has also led to a significant reduction in the number of spills from the downstream storm overflow.

Further benefits of the project include:

Phase 1:
- Amphitheatre design created new outdoor area in unused part of school field.
- Create dipping pond using run-off from new school roof.
- Planting and profiling to Village Green (where we had site cabins).
- Accessible planters on village green for use by nearby school.
- Better drainage in school playing fields.
- Planting area and greenhouse at local cemetery where we laid diversion pipework.

Phase 2:
- Planting and fencing improved.

Phase 3:
- 300m^2 of floating islands
- 13 new trees
- 12 new bird/bat boxes
- 4,425 new plants
- 203 new shrubs
- New path around the south side of the lake
- New playground equipment
- New picnic tables and benches
- New signboards and noticeboard
- 3 new accessible fishing jetties
- Defibrillator donated to model boat club at end of works
- 5-year maintenance contract on all the planting and floating islands.

Collaborative working on a SuDS scheme
Local understanding of the benefits of the project plus the temporary disruption that would arise was a significant issue to overcome. Early communication and consultation were key to the success.

In this respect the following successes were critical:
- Working closely with active partners throughout the project.
- Early consultation with stakeholders for each phase of the project.
- Regular communication with key stakeholders.
- Listening to customers' views and flexibility with design where required.
- Presenting a united approach at stakeholder events.

In advance of the planning application for the works at Killingworth Lake, we held a customer information session and issued a joint press release for the media which was picked up by the written press. Their interest produced more opportunities to publicise the scheme.

Stakeholder engagement was more protracted than for conventional schemes. However, taking the necessary time ensured that great outcomes were achieved for project partners and the general public.

Public acceptance of SuDS projects cannot be taken for granted and the case for them must be explained to all stakeholders. Therefore, it is essential to factor in sufficient time for presentation and negotiation on SuDS proposals.

Budget and funding
The total cost of the scheme was £6.249M comprising the following funding elements:
- Northumbrian Water £3.058M
- Environment Agency £2.757M
- North Tyneside Council £0.433M

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Project Team
Risk Management Authorities
Northumbrian Water
Environment Agency
North Tyneside Council

Consultant Engineer
Esh Stantec

Contractor
Esh Construction

Status
The scheme was delivered in three phases. Phase 1 commenced in 2016 and was substantially complete in March 2017. Phase 2 commenced in April 2017 and was completed in October 2017. Phase 3 commenced in November 2018 and was completed in December 2019.

For further information please email **rainwise@nwl.co.uk.**

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