Alma Road Rain Gardens, London

SuDS used

- Rain gardens
- Permeable paving
- Tree planting

Benefits

- Reduction in flooding from intense rainfall.
- Reduced surface water pollution to receiving water bodies.
- More aesthetically pleasing public highway with increased biodiversity.
- Promotion of community cohesion through community engagement activities.

1. Location

Alma Road, London Borough of Enfield, EN3 7UE.

2. Description

Alma Road is situated in Ponders End, a deprived area in the London Borough of Enfield, part of the Brimsdown Ditch – Salmons Brook Catchment. This part of Enfield is generally low lying, as it forms part of the Lee Valley. The natural flow path to the nearby watercourse, Brimsdown Ditch, is obstructed by the adjacent railway line which exacerbates surface water flood risk.

Enfield has a separated foul and surface water drainage system, however most surface water sewers discharge directly into the nearest watercourse. As a result, local rivers suffer from poor water quality from urban diffuse pollution, and high risk of flooding. Ponders End is known to suffer some localised surface water flooding, particularly in connecting roads. This is due to the impermeable nature of the surroundings created by the expanse of hard-surfaces (increasing as a result of urban creep), lack of green spaces and inadequate capacity in the existing drainage system. This is not unusual for many roads in Enfield.

The overall project was split into 2 phases:

- Phase 1: The delivery of 5 Alma Road Rain Gardens was the first phase of the project. The main purpose was to disconnect most of the highway runoff from the surface sewer system for up to a 5 year return period. Due to the permeable nature of the underlying geology, most of the

runoff along that stretch of Alma Road would have the opportunity to soak into the ground naturally. This would reduce the pressure on the existing drainage system. Some gullies and manholes were retained as overflows for exceedance events;

- Phase 2: Alma Road is undergoing a regeneration project overseen by Enfield Council; the second phase of the project involves constructing SuDS components within the red line boundary of the new development. This will include the extension of the rain gardens constructed on the highway north of the Lee Valley flyover to the south.

Key objectives:

- Reduce surface water flood risk;
- 'Normalise' SuDS and thereby encourage wider take-up;
- Improve the public realm;
- Make roads safer through the use of traffic calming measures;
- Inform rain garden design considerations and standards, so this could be replicated by Highway Engineers with ease across the borough.

Figure 1 Alma Road before

Figure 2 Alma Road after

The first phase of the scheme also created the opportunity to utilise the rain gardens for horizontal traffic management. The junction between Alma Road and Scotland Green Road had a bell-mouth which was over 30 m wide, which compromised the safety of crossing pedestrians. A new rain garden (RG1) was built into the carriageway to reduce the width of the bell-mouth with a new permeable paved pathway running through it.

Figure 3 Alma Road/Scotland Green Road junction

Figure 4 Alma Road/Scotland Green Road junction after with permeable footway

It was recognised that the existing traffic calming measures, two speed cushions, in this particular stretch of road did not help to reduce speeds to the required 20 mph. This posed some risk to the nearby Alma Road Primary School. The speed cushions were removed and replaced by rain gardens 4 and 5 (RG4 and RG5). These act as horizontal traffic calming by giving the impression that the road is narrowing.

3. Status

Phase 1: Alma Road rain garden construction works (north of the Lee Valley flyover)- Completed March 2016 (4 weeks).

Street artwork delivery with residents, Alma Road Primary School, Oasis Academy, and corporate volunteers – Completed July 2016 (2 weeks).

Phase 2: Rain garden and SuDS construction works (south of the Lee Valley flyover) will be delivered by Countryside developers as part of the Alma Road Regeneration Project. This extent of the highway has been included within the red line boundary of the development - 2017 – 2020.

4. Main SuDS components used

The following SuDS components were used on this site:

- Rain gardens;
- Permeable paving;
- Tree planting.

5. How it works

A total of five rain gardens were built on a 200 m stretch of Alma Road. These were built into the footway and carriageway. Their shapes are such that the areas of rain garden are maximised on both the carriageway and footway without having a significant impact on pedestrian and vehicular traffic.

Figure 5 Rain Garden Layout

Due to existing cross-overs there was little opportunity to construct rain gardens on the eastern side of Alma Road, therefore most of the rain gardens were installed on the western side.

The rain gardens maximise infiltration of highway runoff into the ground. Each individual rain garden has a different standard of protection with respect to its contributing area, but each rain garden roughly drains a catchment area of 200 m^2. All are designed to manage at least a 1 in 1 year, 6 hour storm event, with the largest rain garden having a standard of protection > 1 in 50 year, 6 hour storm event. These calculations were based on very conservative infiltration rates and did not include interception losses. A total of 1000 m^2 of Highway runoff has been intercepted by the five rain gardens. Gullies have been retained as an overflow mechanism for exceedance (see Figure 8).

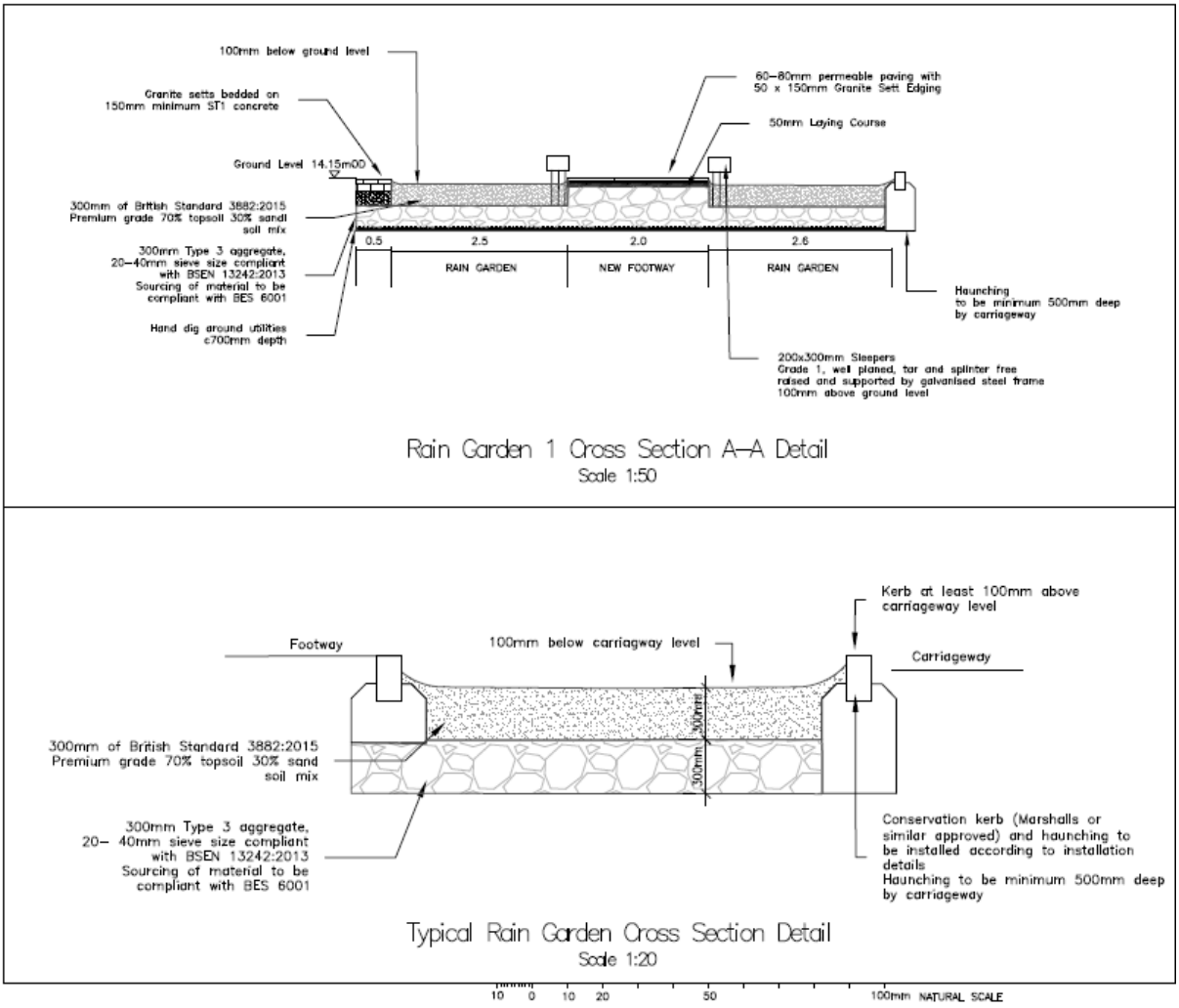

Figure 6 Rain garden details

The largest rain garden (RG1 – see Figure 6) reduces the large bell-mouth on Scotland Green Road North, and has a new length of permeable paving footway running through it to facilitate a safer crossing point. This rain garden was large enough to plant a tree to further enhance the new green space.

The existing bus cage was reduced in length by the construction of RG2 and RG3, but had to be a minimum of 22 m in length, as agreed by TfL London Buses. This was to ensure that there would be enough room for two buses to pull in and out of the bus stop.

The shortest width of the carriageway between RG4 and 5 is 5.7 m, which is wide enough for two buses to pass each other. However, the design gives the impression that the road has narrowed enough to slow traffic.

Granite setts (see Figure 7) were installed by each inlet to reduce erosion of topsoil, and capture larger silt particles carried by road runoff.

Figure 7 Granite sett apron

The rain garden plants manage contaminants from road runoff. Specific plants that were both drought tolerant and could survive in waterlogged conditions were chosen.

Figure 8 Gully retained

Figure 9 Approach to the rain gardens

In order to involve the local residents in the project, a mural (see Figure 11) was commissioned by Thames21 to describe how the rain gardens work. This was painted under the Lee Valley flyover bridge, which is located next to the new rain gardens. The mural was designed by the artist Jo Peel, and students at Alma Road Primary School created artwork that contributed to the final design. Local residents, students from Alma Primary School and Oasis Academy, and corporate volunteers helped paint the mural (see Figure 10). Thames21 also led sessions on the water cycle, river pollution and SuDS with Alma Primary School.

Figure 10 Volunteer event – mural painting

Figure 11 Mural finished – story of rivers and pollution

All key stakeholders were consulted throughout the project such as local residents, Alma Road Primary School, utility companies, TfL London Buses, the developers of Alma Road Regeneration and relevant Highway and Traffic officers in the Local Authority; all of which had opportunities to comment on the proposals and mural design. Local residents were kept informed by regular leaflets, posters, and ward forums, including published updates in the Alma Road Regeneration scheme which is distributed to 2000 people in the local area.

6. Maintenance and operation

As the rain gardens are within the public highway, the adoption and maintenance is carried out by the Highway Services team in Enfield Council. A general cost analysis has shown that the additional cost of maintaining the SuDS is not significant when the cost savings achieved by reducing the maintenance required for the gullies are accounted for.

The maintenance programme is as follows:

- Litter Picking – conducted on a weekly basis;
- Vegetation management – cutting and pruning plants, and weeding carried out once or twice a year as part of routine Highway grounds maintenance contract. The visits include cleaning inlets into the rain gardens. Additional contributions were made to ensure the establishment of plants for the first few years, which included replacement of plants, additional mulching and additional watering during the summer months. The plants themselves have been reviewed by the Highways grounds maintenance officers and landscape architects to denote which species are thriving, as a means to inform future rain garden planting;
- Silt removal – carried out infrequently as part of long-term maintenance.

7. Monitoring and evaluation

The monitoring regime is as follows:

- Enfield's Highway Engineers conduct site visits during and after rainfall events to monitor the function of the rain gardens, along with other flood risk assets. So far, the rain gardens have been functioning well during storm events;
- A mechanism for local people to report on flooding issues and SuDS performance is provided in a poster, which is attached to the new Alma Road tree and nearby lamp columns;
- A series of surveys to monitor the change in attitude/public perception about the Highway SuDS has yet to be conducted, however there has been positive feedback from local residents on the look of the street;
- Traffic engineers to observe and record changes in traffic behaviour before and after SuDS installation (traffic and speed surveys yet to be conducted after installation).

8. Benefits & achievements

Key benefits:

- Reduction in flooding caused by intense rainfall;
- Increased resilience of infrastructure to flooding;
- More aesthetically pleasing public highway with increased biodiversity;
- Promotion of community cohesion (through community engagement activities);

- Positive public perception of green infrastructure and SuDS development. Alma Primary School has been particularly perceptive to the project and has engaged their pupils in "River" sessions with Thames21. As a result, the Primary School is keen to employ its own SuDS components within the school premises, and have already retrofitted several Thames21 Rain planters intercepting roof runoff (see Figure 12);
- Inspiring more SuDS development across the borough - more SuDS are being incorporated in the Council's Highway Schemes, and the Alma Road Regeneration Scheme's approach to SuDS may inspire a similar approach for other developments;
- Reduced surface water pollution to receiving water bodies;
- Slowing traffic ensuring increased safety for pedestrians.

Figure 12 Alma Road Primary School raised planters

9. Challenges & lessons learnt

The plants utilised for the rain gardens were drought resilient, and the topsoil used was engineered to be highly permeable. Though the frequency of failure was low and despite drought tolerance, the younger plants required frequent watering in order to fully establish. Therefore, a more intensive maintenance regime was agreed within Highway Services for new rain gardens for the first two years, and the standard landscape maintenance regime would be in place thereafter.

The final design was influenced by the demands of traffic implications. As such some of the rain gardens had their size reduced at the design stage due to:

- Traffic flows - the designs need to ensure there was enough space for two-way traffic;
- Bus route flows - implications for narrowing road and reducing the length of the bus cage;
- Allowing adequate space for footway traffic;
- Private cross-overs limited the areas where rain gardens could be installed.

In addition, it takes a while for drivers to change their driving habits and behaviours when the nature of the road has been altered.

10. Interaction with local authority

- The project was funded by the Greater London Authority, as part of investment into Green Infrastructure Sustainable Drainage Systems. The total cost was £50,000;
- The construction and planting of the rain gardens was £43,000 and community engagement costed £7,000;
- Additional funding to install more rain gardens along Alma Road (as part of Phase 2) will be provided by Countryside Developers/London Borough of Enfield.

11. Project Team

Client and Designers: London Borough of Enfield

Funder: Greater London Authority

Contractors: AH Nicholls & Sons

Planting Contractors: Glendale

Public Engagement: Thames21

Mural Artist: Jo Peel