Parkside Re-Development, Bromsgrove

Fig 1: School building and SuDS court

SuDS used

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Benefits

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1. Location

The Parkside Re- Development was undertaken on the site of the old Parkside Grammer School located on the Southam Road leading out of Bromsgrove. The old school building is Grade 2 listed so was subject to a number of conditions before re-development could be undertaken. This included retaining the facade of the building and the landscape frontage to Southam Road.

Fig 2: Landscape Plan

2. Description

The site comprises firstly the existing school building and frontage to be retained and an extensive area behind the school. There is proposed car parking along an existing access road to a Health Centre running to the north of the site and proposed additional Library with Local Authority facilities proposed for the south of the main site enclosing a large central courtyard space for civic and community use.Main SuDS components used

3. Main SuDS components used

The site comprises 5 sub-catchments, each with a different character and therefore with different SuDS components.

The first sub-catchment is the school frontage and following discussion it was decided that the existing Georgian condition should be retained as the soakaway and sewer connection still functioned and additional costs could not be justified. Raingardens were initially proposed to capture roof water as a protection measure to the existing combined sewer but were not constructed.

The second sub-catchment is the new car parking to the north of the existing access road to the Health Centre. The whole site is situated on sandy soil overlying sandstone and is suitable for infiltration. However, there was significant PAH hydrocarbon pollution in this location where the car parking was proposed. A series of lined permeable block double parking bays were constructed with impermeable access surfaces from the road. Each double bay has its own control structure linked to a final chamber directing clean water under the access road to an infiltrating swale-basin in the main part of the site. The water that does not infiltrate is conveyed down the western boundary in a solid pipe where it is close to the building or perforated pipe where it passes through an under-drained basin overflowing if necessary into the storm sewer.

The third sub-catchment is a small access area behind the main central space with car parking and access pathways. The tarmac surface has been re-used so manipulation of this space has only allowed partial collection of runoff. This is effected through 2 bio-retention features that collect and clean everyday first flush volumes with occasional larger storms overflowing to the existing combined sewer.

The fourth sub-catchment, comprising the main part of the site, was designed as a civic square in the 20th century garden tradition. The square integrates with the Georgian school elevation, an existing school hall and the new library with Local Authority services. There is a small car park at the entrance to the square. The whole central space was considered as an infiltration surface and therefore the peripheral path is both permeable block and slab paving. The central green space infiltrates water and is slightly lower than the surrounding paving acting as a detention basin during very heavy rain. Permeable block car parking forms another small soakage area. A small area of impermeable tarmac falls to a swale-basin with an underdrain that leads to a controlled flow overflow and the exceedance route. The swale basin is the only dedicated SuDS surface in the central area. Much of the new building has a green roof that mitigates flows and cleans the runoff before it flows to ground level infiltrating through low planters or permeable surfaces.

Finally, the fifth sub-catchment is the very small entrance space that also acts as a collection route for some green roof runoff. This is collected in small planters that link directly to the path sub-base. There is a raised control structure that ensures day to day rainfall infiltrates but bigger volumes can discharge to the storm sewer if necessary.

4. How it works

The overall SuDS objective was to protect the buildings and surroundings from flooding but also to prevent polluted runoff flowing to the stream that runs through Bromsgrove that is the ultimate destination of the drainage from this site.

The management of rainfall is a combination of retaining existing conditions at the front of the school, SuDS retrofit to the small access space behind the court and re-development where a full SuDS provision can be achieved.

The school frontage and retrofit access space discharge to the existing combined sewer to the west of the school.

The bio-retention features in the access space provide interception losses, clean the 'first flush' from the road and car park infiltrating at least the first 10mm of runoff into the ground.

All other runoff from the site is collected, cleaned and stored within open graded stone before infiltration into the ground or release via flow control structures to the storm sewer to the south of the site. It is expected that nearly all rainfall will infiltrate into the ground.

The car park collection, cleaning and storage of runoff is reasonably straightforward in a series of permeable paved compartments before it is conveyed away from the northern area of contamination into a swale-basin and infiltration trench to the south.

The civic space is unusual in that all the new surfaces act as infiltration surfaces. The peripheral pedestrian paths and central pavement is a mixture of permeable concrete block paving and concrete slabs with spacers for grit joint infill.

The central grass space is also an infiltrating surface but is also slightly lower than the surrounding paving to act as a detention basin during exceptional rainfall.

Roofwater from the existing Georgian school building is directed to a spout that flows down a sett cascade to a wetland rill and planted pool. This ensures only incident water falls on paving adjacent to the building. An overflow directs clean water to a perforated pipe below the car park and ultimately the under-drained swale before a final flow control and overflow along the western side of the new building. Roofwater from new downpipes is directed via shoes on the bottom of downpipes to a spreader slab in the permeable block paving or lowered planters.

In this way all rainfall is expected to infiltrate into the central space. This assists in ensuring healthy growth of planting in the square which would otherwise be at risk form drought on these sandy soils. It also cleans runoff and allows water to recharge the watercourse in Bromsgrove through interflow and baseflow in the soil rather than by damaging surges of contaminated runoff.

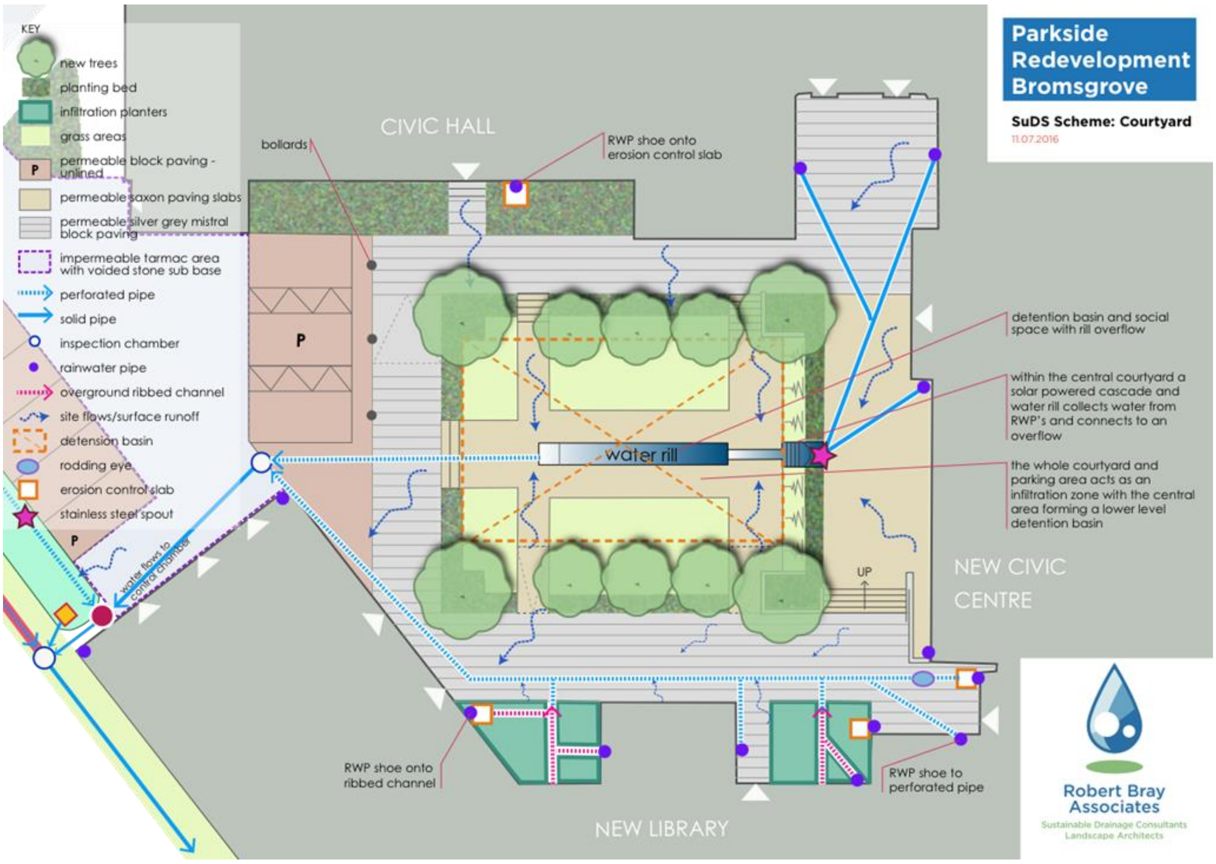

Fig 3: Plan 2.0 – Courtyard Plan

5. Specific project details

The project uses some tried and tested details like lined permeable paving and an under-drained swale-basins but has developed some bespoke details for this prestigious site.

Firstly, the bio-retention basin with integral overflow in the access space behind the school hall building uses a simple block flow reducer along the edge as runoff drops 100mm into the basin and integrates with the overflow grating just below the surface kerb. Bollards prevent overrun into the feature.

The main court space displays a number of innovative features. The slab paving uses relatively small units with infiltrating grit joints and a slab with a shot blasted arris edge to reduce trip hazard. This allows the landscape design to provide visual interest without loss of SuDS functionality.

Water from the Georgian school roof is directed to a visually interesting stainless steel spout and sett cascade. This is to reduce the infiltration load next to the school and create an ornamental but cost effective drop to the lower level of the court. Some water is diverted to a storage tank which pumps water back down the cascade when the sun shines. This is because a solar panel is located on the school hall building trapping solar energy when it is sunny. The panel and pumping arrangement was provided by an environmental initiative for the site.

A further innovation is to use the lower lawn as a detention basin. This will only come into use in exceptional rainfall but further integrates SuDS functionality with urban and landscape design.

6. Maintenance & operation

Maintenance has been designed to be part of normal site management. This accords with the principle of 'passive' maintenance with site sweeping, grass cutting and litter collection being part of normal site care. The infiltrating nature of runoff collection means there are no inlet or outlet structures to inspect only 7 flow controls that require annual inspection. These are designed to be simple plate orifices with integral overflows.

7. Monitoring and evaluation

The Parkside re-development is a recent example of SuDS schemes undertaken for Worcestershire County Council by Robert Bray Associates so there is an understanding that these sites function with few problems. The new site facilities manager was introduced to the site management at the beginning of the defects period and has had no issues with the functioning of the SuDS.

The only issue experienced was the use of an industrial salt and grit spreader in the small access court. This affected both the planting beds and the bio-retention features. Usually the use of salt and grit does not seriously damage SuDS features but this does imply sensible use of de-icing materials. Industrial spreaders spray salt and grit over the whole planting area which causes significant dieback of planting to conventional planting and planted SuDS.

The SuDS features at Parkside have all functioned as expected and as designed.

8. Benefits and achievements

The early involvement of a SuDS designer and the integration with the landscape design of the site has allowed the management of rainfall across the whole site using permeable surfaces with only a very small dedicated SuDS surface.

Therefore there has been no significant land take and all the landscape surfaces contribute to SuDS functionality. The SuDs is an example of fully integrated design.

SuDS has contributed to the overall landscape design by integrating surface water features into the civic space design. The change in level from the existing school has allowed a spout and cascade to be incorporated with a wetland rill to carry water to a small pool.

The car park design and other hard surfaces have used permeable surfaces to collect, clean and store water within their construction profile providing full rainfall management 'at source' with minimum additional cost to the project.

Infiltration contributes to the site by sustaining soil moisture for site planting and providing slow interflow and base flow to the stream through Bromsgrove.

Initial responses from the people now using the landscape for both occasional and daily use are very favourable not necessarily knowing that rainfall is managed at the same time.

In the early days of SuDS design in the UK the features managing rainfall were usually dedicated structures within a separate SuDS landscape. Although this may still be appropriate in some situations and to provide enhanced amenity and biodiversity the Parkside re-development demonstrates how SuDS can be integrated into the urban fabric of development. It is therefore an important example of how this can be achieved with significant benefits to the development.

9. Lessons learnt

The integration of SuDS design with landscape design at the beginning of the project and a supportive design team confirmed the benefits of early engagement in the design process.

However, despite an early SuDS design meeting with the contractor, the SuDS planning of the construction was somewhat disjointed. A change of site agent during the contract added further coordination problems.

The permeable car park was constructed early in the project but not protected so a full cleaning exercise and some replacement of the grit layer in the pavement was necessary.

The need to keep a confined site clean and open graded stone free from contamination is always an issue but should become more routine as contractors become familiar with SuDS technology.

A full SuDS management plan was provided but in the mayhem of site handover it was clear that the SuDS maintenance had be overlooked. A dedicated SuDS management meeting was very useful for focusing attention and explaining in detail how the SuDS work and why the simple management tasks are important.

10. Interaction with local authority

Worcestershire County Council is now familiar with SuDS and the agreement from WCC was straightforward and supportive.

11. Project details

The integration of the SuDS features with both the hard and soft landscape made it difficult to separate costs.

The main feature of the costing is that all the surfaces used in the SuDS design were required by the development and the SuDS functionality was a convenient addition. Additional costs of permeable surfaces and sub-base materials was offset by the omission of gullys and minimum use of pipework. The provision of necessary site storage of runoff and infiltration capacity further reduced capital cost.

There was minimal land take for SuDS so there was no loss of site to dedicated SuDS structures. Even the bio-retention features and swale would probably have been allocated for planting had SuDS not been part of the site design.

SuDS design costs were partially absorbed in landscape design costs and again offset by savings in efficient site storage of runoff.

12. Project team

SuDS design	Robert Bray Associates
Project design	Bromsgrove District Council and Worcestershire County Council
	Worcestershire County Council Design now by Jacobs UK. Ltd
Contractor	Thomas Vale Construction
Landscape Contactor	Ground Control Limited

13. Project images and illustrations

Fig4 : Permeable block paving to car park

Fig 5: Solar powered water spout

Fig 6: Courtyard and Rill

Fig 7: Library entrance

Fig 8: Courtyard and Rill