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- Concrete block permeable paving for housing
 - Delivering SuDS without additional land-take
 - Managing runoff from roofs, drives, parking and roads
 - Demonstrating the effectiveness of permeable paving
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FLEETWOOD CRESCENT PETERBOROUGH



INTRODUCTION

This case study demonstrates how concrete block permeable paved drives, parking and adopted roads can store and treat runoff from all the hard surfaces on a typical new housing development without any additional land-take or other SuDS features.

Fleetwood Crescent is the 28-home first phase of a new development in the Eastfield Area of Peterborough for Cross Keys Homes. It makes extensive use of concrete block permeable paving, reflecting Peterborough City Council's desire to incorporate SuDS in developments. The estate road is a trial site for the adoption of permeable paving by the Local Highway Authority and will be adopted under the 'Section 38' process, and its performance monitored.



A separate case study published by Peterborough City Council, *Fleetwood Crescent Report*, provides additional information about design and construction, and a useful insight into lessons learnt. It is available via: <http://www.peterborough-suds.org/developers/>



A video including a trial at this project that demonstrates the effectiveness of concrete block permeable paving is available at: <http://www.paving.org.uk/commercial/video.php>

"The Council's approach to sustainable drainage has developed over the last few years enabling the Highways Authority to adopt SuDS within the highway. This has proven to be very effective in promoting SuDS to developers as it removes the headache of maintenance for them. Using the Section 38 process also enables us, as an authority, to approve the construction drawings, inspect the works as they proceed on site and then have a maintenance period – everything the SuDS Approving Body tried to achieve."

Andrew Leadbetter, Sustainable Drainage Manager, Peterborough City Council



PHASE 1 LAYOUT



Site Plan: Courtesy of The Design Partnership.

DRAINAGE STRATEGY

The 0.87ha brownfield site – formerly a secondary school – has a 0.8m depth of made-up ground with underlying clay and sand, giving a low permeability. The drainage is designed to temporarily store rainwater runoff on site and remove pollutants, before gradual discharge to an existing surface water sewer that eventually outfalls into a nearby watercourse.

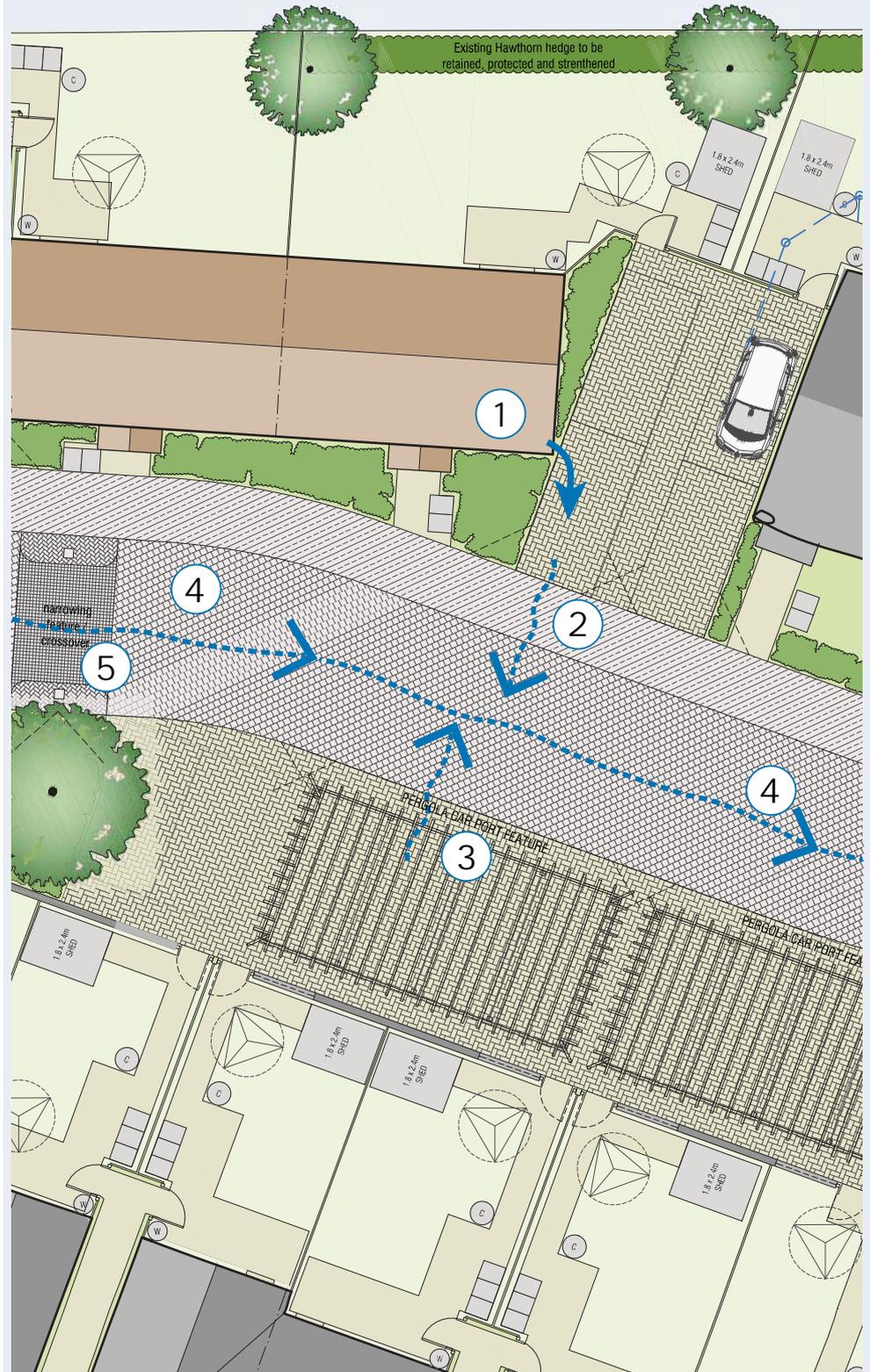
The adopted estate road is tanked (System C) permeable paving due to the low soil permeability. A perforated pipe within the construction collects water, running the length of the road and connecting to the sewer. Here, water discharge from the development via the permeable paving is restricted to 'greenfield' runoff rates by an orifice plate flow control chamber protecting the sewer. Surface water storage volumes on the site are designed to cater for rainfall events exceeding the 1 in 100 year storm plus 30% allowance for climate change.

Services are generally accommodated in 'corridors' within the impermeable asphalt footways, with an impermeable block paved road crossing also acting as a narrowing, traffic-calming feature. Un-adopted driveways next to dwellings and shared parking areas are also constructed in concrete block permeable paving, linked to the permeable road construction with pipes below the footway. Rainwater from all roofs drains into adjacent driveway permeable paving via perforated diffuser pipes.



DRAINAGE STRATEGY DIAGRAM

- 1 Roof-water downpipes discharge into permeable paved driveways
- 2 Permeable paved driveways discharge, via pipes through the impermeable footway/ service corridor, into the permeable paved road
- 3 Permeable paved private parking areas also discharge into the permeable road construction
- 4 Water from the permeable road is collected in a perforated pipe connected to the sewer, which is protected by an orifice plate flow control chamber
- 5 Impermeable paved road narrowing and crossing for services



PAVING DESIGN & CONSTRUCTION

All the concrete block permeable paving has been designed and constructed in accordance with Interpave guidance (available from www.paving.org.uk). The pavement was designed for 'Load Category 4' and a low CBR subgrade of 1%, and comprises:

- 80mm thick concrete paving blocks with 2/6.3mm jointing material
- 50mm depth of 2/6.3mm bedding course material
- 150mm depth of Dense Bitumen Macadam (DBM) running course for construction traffic, subsequently cored with 75mm holes at 750mm intervals and filled with 2/6.3mm clean stone
- 600mm depth permeable sub-base of 4/20mm coarse graded aggregate

A capping layer was required in places and the private parking areas were designed with no DBM running course layer, reduced sub-base depth and a more rounded sub-base material.

"Fleetwood Crescent provided an ideal opportunity for the Local Highway Authority to trial a permeable paving site within Peterborough. The council Highway Control and Sustainable Drainage Teams worked closely with the Local Planning Authority and the developer throughout the planning and adoption processes to ensure the site complied with industry standards to give the necessary drainage and highway functions. This approach negated the need for additional water storage on site and meant that the impact of the development on the receiving environment was minimised, with the water being both cleaned and attenuated before it was discharged. The scheme also highlighted how the presence of relatively weak and impermeable clay soils should not be a barrier to the use of SuDS"

Richard Whelan, Water Management Engineer, Peterborough City Council



Central road base with drainage pipe in trench and inlets from driveways



Services crossing in 'Type 1' material (shown completed at the bottom of the page)



Block laying and bedding course over cored DBM layer (in foreground)





The adopted, concrete block permeable paved road seamlessly extends into the now-completed Phase 2.

PERMEABLE PAVING FOR HOUSING

The first phase of this development demonstrates how concrete block permeable paved drives, parking and adopted roads on a typical new housing scheme can attenuate, store and treat runoff from all the hard surfaces without any additional land-take or other SuDS features.

By its very nature, concrete block permeable paving is uniquely placed to help meet requirements for SuDS on developments. Of course, hard surfaces are necessary on housing schemes anyway – whether for traffic, parking, pedestrians or play. But permeable paving also provides an inherent drainage system, addressing both flooding and pollution issues by attenuating and cleaning water runoff at source.

This technology largely eliminates pipework, gulleys and manholes, and should cost less than conventional drainage. Concrete block permeable paving can simply infiltrate to the ground where conditions allow or collect water for transmission to other SuDS features along the 'management train' or to conventional drainage, as in this case.

Guidance on SuDS and concrete block permeable paving can be downloaded via the Interpave information resource: www.paving.org.uk

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