

# SMART

## TECHNICAL NOTE 5

# FLOOD & WATER MANAGEMENT IN SHROPSHIRE

This document is part of the “**Shropshire Manual for Adoptable Roads & Transport 2021**” (SMART) and should be read in conjunction with all other appropriate documents.

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## TN5.1. GENERAL

### IMPORTANT NOTES –

**1. This guidance is for dedicated standalone highway surface water systems only which are to be offered for adoption by Shropshire Council.**

**Surface water systems which serve both the public highway and private areas of the development, to be adopted by water companies, should continue to be in designed and constructed in accordance with the Design and Construction Guidance and the adopting companies' standards**

**2. Shropshire Council has a general presumption against new highway drainage systems connecting into the existing highway network for an effective outfall. It is only in exceptional circumstances where this will be permitted and only in such cases where it can be demonstrated there is no viable alternative solution. For any connection to be permitted, the highway drain to which the connection will be made must be improved to an**

**adoptable standard (up to the point where the system either interacts with the public sewer network, or reaches a surface water outfall) and then offered up for adoption to STW. The highway drain upstream of the new connection will remain in the ownership of Shropshire Council.**

**Shropshire Council will also expect the developer to model the impact of the new connection on the receiving highway drainage network to prove that any connection will not cause upstream flooding due to a loss of capacity. The results of this modelling should be submitted to Shropshire Council for approval. Should the modelling predict flooding upstream as a result of the proposed connection, the developer should agree any necessary upgrades to the highway drainage network with Shropshire Council before approval will be granted.**

## **TN5.2. BACKGROUND**

1. Shropshire Council have a statutory legal duty under the Highways Act 1980 to effectively drain the public highway. To ensure that the Council can fulfil this duty it is important that any highway put up for adoption includes an appropriately designed highway drainage network.
2. This section should be read in conjunction with the Council's Sustainable Drainage Systems Handbook (available on the Council website) which has been produced by Shropshire Council as the Lead Local Flood Authority (LLFA) for Shropshire in collaboration with other flood authorities within the West Midlands area. This will ensure a consistent approach to sustainable drainage systems (SuDS) across the West Midlands region.
3. Where possible, a positive drainage system should be provided for all roads to be offered for adoption. Shropshire Council will permit the use of highway soakaways only where they are in accordance with BRE 365. The use of pumps to drain the public highway will not be permitted.
4. It is normal practice to provide highway gullies that discharge into a public surface water sewer, with any new connection being subject to a Section 104 agreement under the Water Industry Act (1991) with Severn Trent Water Ltd who are the Water and Sewerage Company serving the Shropshire Council area.
5. Evidence of this agreement must be provided before we will agree to the Section 38 agreement, although this can be done in tandem. On developments where it is envisaged there could be complications it is encouraged that you seek the Section 104 approval at the early stages. Any system installed will not be adopted until the appropriate certification has been received from the water company.
6. Shropshire Council has a general presumption against new highway systems connecting into the existing highway network for an effective outfall. It is only in exceptional circumstances where this will be permitted and only in such cases where it can be demonstrated there is no viable alternative solution. In these situations, for any connection to be permitted, the highway drain to which the connection will be made must be improved to an adoptable standard (up to the point where the system either interacts with the public sewer network, or reaches a surface water outfall) and then offered up for adoption to STW. The highway drain upstream of the new connection will remain in the ownership of Shropshire Council.

Shropshire Council will also expect the developer to model the impact of the new connection on the receiving highway drainage network to prove that any connection will not cause upstream flooding due to a loss of capacity. The results of this modelling should be submitted to Shropshire Council for approval. Should the modelling predict flooding upstream as a result of the proposed connection, the developer should agree any necessary upgrades to the highway drainage network with Shropshire Council before approval will be granted.

7. Where a new highway system discharges to a SuDS feature that serves the public highway only, this must also be put up for adoption. Any highway SuDS features should be designed in line with the CIRIA SuDS Manual C753 and the Council's Sustainable Drainage Systems Handbook.
8. Due to the bespoke nature of SuDS systems the adoption of each feature is dependent on the agreement and provision of an appropriate commuted sum to secure the ongoing maintenance of the feature. Shropshire Council's Developing Highways Team should be contacted at the earliest opportunity to agree the principle of adoption of each feature.
9. The right to discharge water from a highway drain into any ditch or watercourse must be provided with written evidence that the developer has the right to discharge and there is no future liability on the Council. Evidence of an appropriate Environmental Permit from the EA, or [Ordinary Watercourse Consent](#) from the Lead Local Flood Authority (LLFA) should also be submitted.
10. Where a highway system discharges to a watercourse the connection should be made in line with the direction of flow an angle of between 45 and 90 degrees. A detailed design of the headwall should be submitted which should include appropriate erosion/scour protection for the bankside.

### TN5.3. NETWORK DESIGN

11. The following criteria should be applied to the design of any dedicated highway drainage network being put up for adoption to Shropshire Council:M

### TN5.4. DESIGN CRITERIA

12. The rate of discharge from a new highway scheme should not exceed the greenfield rate of 5 litres/second/hectare for all events up to the 1 in 100 year design storm plus an appropriate allowance for future climate change (+CC). Information on climate change allowances for new development can be found in the EA's [Climate Change Allowances for Planning](#) guidance document.
13. Any submissions for a stand alone highway system should include a MicroDrainage (or equivalent) model of the proposed highway network. The modelling parameters for any model should be in line with those found in the Council's Sustainable Drainage Systems Handbook.
14. If the new dedicated highway system is designed as part of a new development the rate of discharge and climate change allowance should be incorporated into the overall site design as set out in the drainage condition on the planning decision notice. Where no rate is specified the greenfield rate of discharge should be applied.
- 15.

## TN5.5. DESIGN FOR EXCEEDANCE

16. The use of highways within the proposed development for surface water conveyance for events that exceed the 1 in 100+CC event is permitted. However, details on how these exceedance flows will be directed away from properties and into appropriately designed public open spaces (POS) within a development will be required. *Shropshire Council requires exceedance flows for events up to and including the 1 in 100 year plus CC should not result in the surface water flooding of more vulnerable areas (as defined below) within the development site or contribute to surface water flooding of any area outside of the development site.*

*Vulnerable areas of the development are classed by Shropshire Council as areas where exceedance flows are likely to result in the flooding of property or contribute to flooding outside of the development site. For example, vulnerable areas may occur where a sag curve in the carriageway vertical alignment coincides with lower property threshold levels or where ground within the development slopes beyond the development boundary*

17. The use of the highway for exceedance may not be suitable in all locations particularly in steeper catchments. Designers should consider the impacts of the velocity of exceedance flows on traffic, pedestrians and adjacent structures.

## TN5.6. HIGHWAY GULLY SPECIFICATION

18. Gully gratings and frames shall be class D400 and installed to BS EN124 2015 with a minimum width of 450mm, and a minimum waterway area of 900cm<sup>2</sup>. The use of slot drains on the adoptable highway will not normally be permitted unless it can be demonstrated that these are required due to engineering difficulties.
19. Gully pots should be specified as plastic or pre-cast concrete units with a minimum diameter of 450mm and a minimum depth of 900mm. All highway gullies should be installed in line with the manufacturer's specifications. Brick built gully pots will not normally be accepted unless it can be demonstrated that these are required due to engineering difficulties. The use of brick built gully pots should be agreed with Shropshire Council prior to the submission of a highway drainage scheme.
20. The minimum allowable pipe diameter for gully connections to either the public sewer or a main highway carrier drain is 150mm. Each gully should be connected directly to a chamber where possible.
21. The drained area for road gullies should be designed in accordance with CD 526– Spacing of Road Gullies unless control for exceedance flow are required as detailed in Section 5.5 where the design will be based on a 100 year plus CC 15minute storm event for that particular highway catchment.
22. Gullies shall be positioned away from areas of regular vehicle overrun, including driveways, footpath crossings, and potential informal desire lines. All road gully gratings are to be hinged and a minimum of 100mm deep on estate roads, 150mm deep in all locations of block paving.
23. Where it is not possible to meet the above requirements Shropshire Council will accept the use of kerb drainage in short stretches where it can be demonstrated that kerb drainage can be effectively maintained. The use of kerb drainage

should be agreed with Shropshire Council prior to the submission of a highway drainage scheme.

24. Any highway to be put up for adoption should be designed to avoid the creation of flat spots. Where the development will utilise an existing highway where flat areas are already present, the introduction of false flats or the re-profiling of the existing highway to create a fall should be considered. A pair of gullies are required at all low points along a road channel, each with independent connections to the carrier drain.

#### TN5.7. PIPE AND CATCH PIT SPECIFICATION FOR DEDICATED HIGHWAY DRAINS

25. Desirable minimum cover to any highway pipework should be 1200mm where trenches are backfilled with suitable granular material. The absolute minimum cover should be 900mm, where this occurs all drains must be provided with concrete protection. Refer to the DMRB for further details on materials.
26. All pipework should be designed to be self-cleansing with a minimum velocity of 0.85m/sec when at full flow. Any main carrier drain running in the highway should have a minimum diameter of 225mm.
27. Catch pits should be constructed with a minimum sump of 300mm and should be located at every change of direction, at any change of diameter, and where any system joins the main line. (Single gully connections may be permitted without the construction of a catch pit with agreement of the Highways Drainage Team).
28. Chambers will be required at a maximum spacing of 100m for systems that run for a long distance without any incoming connections to allow access for jetting. Changes of direction of more than 90 degrees in catch pits will not be permitted.
29. All chamber covers on the adoptable network are to be 150mm deep D400 ductile iron. Future maintenance and access to chambers must be considered, where possible chambers must not straddle centrelines/ lanelines/ kerblines in order to minimise disruption.
30. Sub-surface drainage will be required where the water table is within 300mm of the formation.

#### TN5.8. WATER QUALITY

31. The adopted highway network has the potential to generate a significant volume of surface water flows during storm conditions. Due to vehicle traffic this water can often carry pollutants and have a high sediment loading. It is therefore important that highway surface water is properly attenuated and treated before it reaches a receiving watercourse or other water body.
32. Any new highway drainage system put up for adoption by Shropshire Council should therefore pass through a minimum of 2 levels of surface water treatment prior to discharging to any outfall. These levels of treatment can either be provided as part of the design of the highway drainage system or as part of the wider "site wide" drainage design.
33. Features such as highway gullies and catch pits are familiar to Highway Engineers and can provide some pre-treatment and form an effective method for sediment removal, however these do not have the capability to provide any

treatment of dissolved pollutants meaning they will not be considered as a level of surface water treatment.

34. The design of SuDS can incorporate various mechanisms that retain pollutants or prevent the pollution of controlled waters through one or more of the following techniques:
- Sedimentation – whereby suspended solids are settled out of solution by reducing the velocity of flow through the SUDS component. The design should consider the risk of re-suspension of solids during extreme rainfall events
  - Filtration – where pollutants conveyed with sediment are trapped either within the soil or gravel media matrix, or on geotextile layers that form part of the SuDS construction
  - Biodegradation – provides a biological process that allows the creation of microbial communities to be established within the soil or gravel media to degrade organic pollutants including hydrocarbons
  - Absorption – occurs when pollutants attach themselves or bind to soil, gravel media particles or to other media
  - Uptake by vegetation – provides a mechanism for removal of nutrients such as phosphorous and nitrogen
35. Attenuation and treatment of highway water can be achieved through the use of filter strips, infiltration trenches/soakaways, swales, and other sustainable drainage features located in wide adoptable highway verges. Where larger highway SuDS features are required these should be located in adoptable areas of public open space. The required number of treatment stages can be accommodated in site wide SuDS features if the highway is being designed as part of a wider residential or commercial development.

#### TN5.9. FLOW CONTROL CHAMBER

36. Chambers constructed to control surface water discharge to the existing drainage network should ideally be situated outside of the carriageway to be offered for adoption. Large chambers (>3.0m diameter) will not be permitted within the carriageway without consideration of all maintenance activities and safeguarding the movement of members of the public during any works, including the replacement of a chamber cover slab.
37. All flow control chamber cover slabs should be kitemarked. Where chamber cover slabs are bespoke, a structural design will need submission for approval. Whilst the use of a vortex control device is the preferred method of flow control on a highway system, Shropshire Council will permit the use of orifice plates with a minimum internal diameter of 75/100mm.

#### TN5.10. HIGHWAY SUDS DESIGN CRITERIA

38. The design of SuDS features serving the public highway should comply with the requirements of both the CIRIA SuDS Manual and the Council's Sustainable Drainage Systems Handbook.

#### TN5.11. SIDE SLOPE GRADIENTS

39. The gradient of side slopes for swales and other attenuation features should not exceed 1 in 5 (20%) when constructed adjacent to high speed roads, with maximum depths of water not exceeding 200mm. Side slopes should not exceed 1 in 3 (33%) in residential areas, however more shallow gradients are preferred in all locations to permit easier maintenance.

#### TN5.12. CELLULAR STORAGE

40. Above ground storage should primarily be considered in order to enhance biodiversity and green areas. If above ground storage is not proposed the LLFA will need to be satisfied through evidence the reasons why it is not feasible. The construction of a cellular storage system directly under the public highway will not be permitted. Any system must be located in an adjacent area of adopted highway verge directly adjacent to the highway.
41. The approval of a cellular storage system will be subject to the submission and approval of a detailed design. All systems put up for adoption must be suitable for use in trafficked areas and certified accordingly.
42. The design of the specified system must allow jetting along the entire length of the feature. A plan which identifies access arrangements for maintenance should be submitted. It must be demonstrated that the chosen system permits the inspection of the entire tank with conventional CCTV apparatus. Crates with solid internal walls will not be accepted.
43. Any storage tank must be appropriately vented and include a sump catch pit at the main inlet and adjacent to, or constructed as part of, the outfall/flow control structure to allow the jetting of the entire feature and the removal of sediment.

#### TN5.13. HIGHWAY RAIN GARDENS

44. Highway rain gardens in areas of adopted public open space can be used to treat and drain small areas of highway where larger highway swales are not feasible.
45. The sizing of rain gardens should be based on the storage volume required to appropriately drain the contributing area of highway up to the 1 in 100 year (1% AEP) event. Where a rain garden is proposed side slopes should be no greater than 1 in 4 (ideally 1 in 5) to allow the feature to be mown as part of the maintenance of the surrounding area.
46. Ideally rain gardens should utilise infiltration and test results undertaken in line with the requirements, these should be submitted with the design of any feature for approval. Where infiltration is not possible, a land drainage trench should be constructed in the base of the feature connected to an emergency overflow set 100mm below the proposed top water level.
47. Any highway rain gardens serving the public highway should be put up for adoption by Shropshire Council.

#### TN5.14. ADOPTABLE HIGHWAY SOAKAWAYS

48. Where soakaways are the proposed method of highway drainage and are being offered for adoption as part of the S38 Agreement, the design will need to be



approved by Shropshire Council. Evidence that sufficient rates of infiltration are present to effectively drain the highway are required.

#### TN5.15. INFILTRATION TEST SPECIFICATION

49. To ensure that infiltration rates are representative of the site ground conditions, infiltration tests should be undertaken on site as close as possible to the actual location of the proposed soakaway, and within the same depth range as the proposed soakaway. Where tests are taken more than 15m away from the final position of the soakaways then additional tests will be required at the location of the proposed soakaway.
50. The infiltration tests are to be carried out by a UKAS accredited laboratory in accordance with BRE365 'Soakaway Design'. All designs should take into consideration the requirements of CD 530 Design of soakaways. Trial pit logs are to be provided with each test pit, logged in accordance with as EN1997-2:2007.

#### TN5.16. SOAKAWAY DESIGN CRITERIA

51. The proposed soakaways should be designed using the slowest infiltration rate from one of the three tests in each pit. A minimum of a 1 in 100+CC year return period should be used for design purposes.
52. It is appreciated that conventional highway drainage systems can only convey a limited volume of water and it may take some time to fill the storage required to attenuate the 1 in 100+CC year event. For this reason, the temporary flooding of the highway during storms above the 1 in 30 year event would be accepted, as long as it can be demonstrated that this exceedance volume will be completely contained within the adopted highway or other designated exceedance storage areas. The flooding of 3<sup>rd</sup> party land or property curtilages would not be permitted.
53. Adoptable soakaways should be constructed using either preformed plastic crates or perforated rings and installed in accordance with the manufacturer's instructions. All soakaways put up for adoption must be suitable for use in trafficked areas and certified accordingly. All soakaways and filter drains are to be lined in a suitable geotextile to prevent fines being washed away.
54. All soakaways should be designed with a suitable access point at each point of connection to allow future cleansing of the system. The design of this access point should follow the catch pit design guidance set out above.
55. If plastic crates are utilised, the design of the specified unit type must allow jetting along the entire length of the feature. Crates with solid internal walls will not be accepted and must be appropriately vented. On larger soakaways additional inspection chambers should be provided to allow future cleansing of the system.

#### TN5.17. HIGHWAY SOAKAWAY LOCATION

56. The position of the soakaways should be considered early in the design process and should be incorporated into the highway verge or an area of public open space put up for adoption by Shropshire Council. Designs where highway soakaways are proposed in inaccessible areas between plots will not be accepted.

57. They must not be located directly beneath the adopted highway and should be situated not less than 5m from any building, wall or retaining structure. A 3m width easement from any property curtilage or the edge of the carriageway should also be provided.
58. No permanent structures, play equipment, steps or significant landscaping should be placed on or adjacent to the soakaway or within the easements. The bottom of the soakaway should not extend below a line drawn at 45 degrees from the edge of the carriageway.
59. When determining the location of the soakaway, due consideration should be given to future maintenance. Provision must be made for pedestrian and vehicular access from the adopted highway to the whole of the soakaway and associated drainage runs without significant changes in ground level. Gradients within the easements should not normally be steeper than 1:20 across grassed or landscaped areas without suitable reinforcement.
60. Easements are required for any drainage outside of the adoptable highway and these should be a minimum of 3m width around a soakaway and 3m width either side of the centre of any pipe. Additional areas for access may be required.

#### TN5.18. SOAKAWAY DESIGN CHECKLIST

61. When submitting a soakaway design for approval the following information must be provided to ensure that the design can be promptly checked and subsequently approved:
  - Impermeable drainage area assumed in the calculations.
  - Calculated percolation rate used in the design in accordance with BRE365
  - Design calculations in accordance with BRE365 using the critical 100 year +30% storm event.
  - Soakaway dimensions proposed and construction detail
  - Proposed invert level and effective drainage depth
  - Existing seasonally high water table level
  - Porosity of proposed drainage medium.
  - Location plan(s), indicating the position of the infiltration test(s) in relation to the proposed soakaway(s)
  - The design submission must provide evidence that contaminated land does not exist, or that the construction of the drainage system will not harm the environment.
  - Where appropriate, the design submission must provide evidence that the effects of past mining/quarrying activity have been considered and addressed

#### TN5.19. PERMEABLE PAVING

62. The use of permeable paving has the potential to both store and treat highway water without the land take of conventional sustainable drainage features. Engagement with the highway authority into the use of permeable paving is encouraged as early as possible.
63. At present Shropshire Council are not willing to adopt permeable paving on the adopted highway. However, the construction of permeable paving under private highways and shared parking areas is permitted subject to the submission of a

detailed design, maintenance plan and future ownership details at the planning stage.

64. Any permeable paving systems should be designed in line with the most up to date version of Interpave's permeable paving [guidance documents](#). The approval of permeable paving designs that rely on infiltration drainage will be subject to the design requirements above.
65. The construction of permeable paving on private drives is permitted. However, as home owners may replace their drives with cheaper impermeable material in the future, the inclusion of any storage volume in the site drainage design will not be permitted.

#### TN5.20. DRAINAGE OF PRIVATE AREAS

66. Drainage of private areas shall be considered as part of the technical submission. No element of private drainage will normally be permitted within the area offered for adoption.
67. Run off from private driveways and courtyards is to be intercepted by linear channels and discharge into the private network associated with the proposed dwelling/private structure. Similarly, the drainage design should ensure that no surface water runoff from proposed adoptable areas enters areas in private ownership.
68. Private culverts/structures will not be permitted within areas offered for adoption. This issue should be addressed as soon as possible during the design stage. Culverted watercourses should be restored to open channel in public open spaces wherever possible. If the de-culverting of the watercourse is not possible, the culverted section should be located in areas of public open spaces with clear evidence on their future ownership submitted as part of any planning submission.

#### TN5.21. FURTHER DESIGN GUIDANCE

69. Different sites will present different opportunities for sustainable highway drainage systems therefore early engagement with the Council's Developing Highways Team and the LLFA is advised. There is a range of guidance available on the design and construction of sustainable highway drainage systems which should be adhered to as part of any drainage system serving the adoptable highway.
70. The Design Manual for Roads and Bridges (DMRB) includes the following guidance relevant to sustainable highway drainage:
  - CG 501** – Design of highway drainage systems
  - CD 521** – Hydraulic design of road edge surface water channels and outlets
  - LA 113** – Road drainage and the water environment
  - CD 521** – Design of outfalls for surface water channels
  - CD 524** – Edge of pavement details
  - CD 526** – Spacing of road gullies
  - CD 532** – Vegetated drainage systems for highway runoff
  - CD 527** – Sumpless gullies
  - CD 530** – Design of soakaways

**CD 521** – Hydraulic design of road edge surface water channels

**CD 525** – Design of combined surface and sub-surface drains and management of stone scatter

71. In some exceptional circumstances there may need to be some variance from the above approved guidance documents. On these occasions designers are encouraged to consult with the Council's Developing Highways Team at the earliest possible opportunity.

Working draft