

Summary of notional sewer capacity assessments undertaken for strategic development proposals to the north-west of Redditch.

Executive Summary

Following discussions with Redditch Borough and Bromsgrove District councils (RBC) regarding potential development proposals to the north-west of Redditch, Severn Trent has undertaken notional sewer modelling work to assess the potential impact of these developments on existing sewerage capacity.

Due to the size of the potential developments in relation to the existing sewerage infrastructure, concerns have been raised through the Water Cycle Study that development to the north-west of Redditch is likely to impact existing sewer performance which would require infrastructure investment.

Using development options provided by RBC, three potential development scenarios have been assessed. These assessments have been undertaken using the current best available 2009 hydraulic sewerage model for the Redditch network.

The finding of the notional modelling work indicates that all three scenarios will require sewer capacity improvements to the existing sewerage network to ensure there are no adverse deterioration in sewer performance. Intervention measures have also been identified to upsize sewers and/or provide attenuation storage to provide additional capacity where required. These notional solutions will need to be reviewed once detailed development flows and connection points are available but indicative investment needs are summarised below:

Scenario	Notional investment to provide additional sewer capacity
A: Redditch Borough Preferred Option (including 2800 Foxlydiate site)	£1,004,000 based on a pumped option plus annual operating costs of £6,000 - £8,000, or £2,800,000 (minimum) for a potential gravity option <u>excluding</u> capacity improvements to Priest Bridge STW
B: Focus to west of Arrow Valley (excluding 2800 Foxlydiate site)	£829,400 (gravity solution)
C: Focus around top of Arrow Valley (excluding 2800 Foxlydiate site)	£844,800 (gravity solution)

These notional estimates only include for capacity upgrades to the existing sewerage system (which would be funded by Severn Trent Water) and excludes the cost of new sewers within a development and the cost of connection to the existing sewers (which would be funded by the developer).

Based on findings of the modelling work, preference would be for either Scenario B or C, as these will require less sewer capacity investment and both also avoid pumping associated with the 2800 dwelling Foxlydiate site.

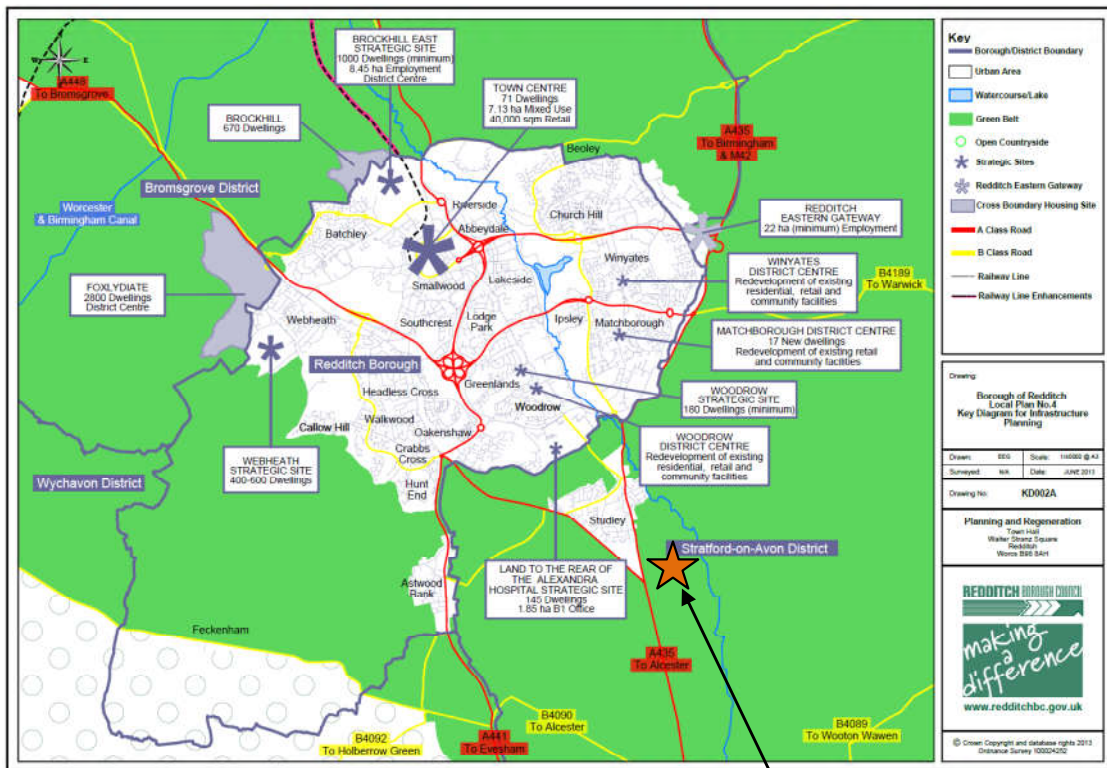
Introduction

This report summarises the findings of notional sewer capacity assessments to identify potential sewer capacity investment required to accommodate development options to the north-west of Redditch. These assessments have been made based on the current best available 2009 hydraulic model, making assumptions relating to likely connection points and flow rates. The assessments have only been made for foul sewer flows. It is assumed that all surface water from the new developments will be managed sustainably to avoid increased surface water flood risk.

Background

The draft Borough of Redditch Local Plan No. 4 proposed a total of 6,380 dwellings across Redditch Borough between 2011 and 2030. This includes 3,000 dwellings within the Redditch Borough administrative area with 3,400 dwellings being allocated adjacent to Redditch but within Bromsgrove District.

The primary focus for development locations in the Redditch area is to the north-west of the town. In addition to draft strategic sites already identified within the Local Plan No. 4 at Brockhill East (1000 dwellings) and Webheath (400-600 dwellings), two further cross boundary housing sites have been identified at Foxlydiat (2,800 dwellings) and Brockhill (670 dwellings).



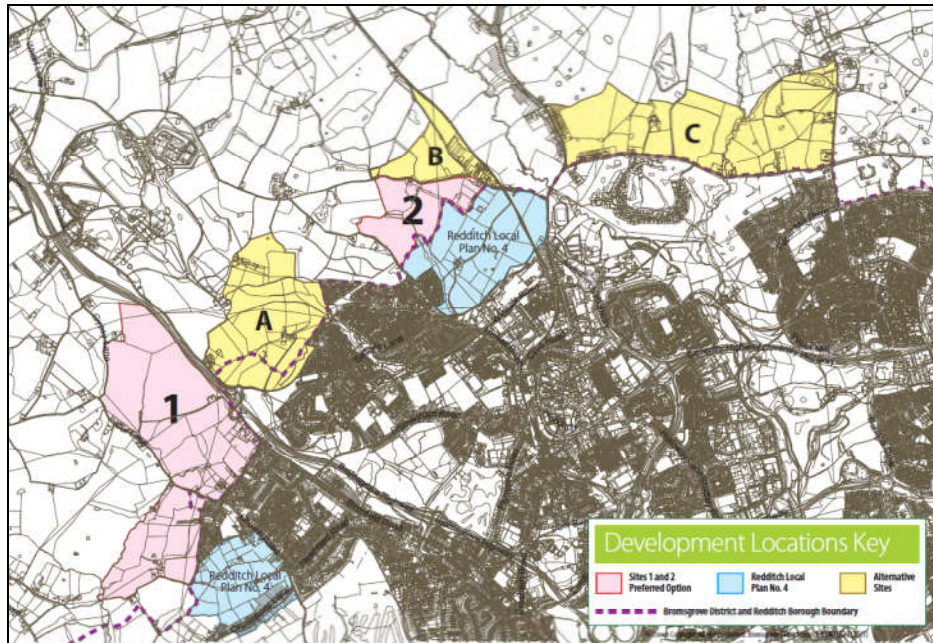
(Plan provided by Redditch Borough)

Redditch (Spernal) sewage treatment works

From a sewerage perspective, all these developments will need to drain through the Redditch sewerage system to Redditch (Spernal) sewage treatment works located to the south-east of Redditch (as indicated above).

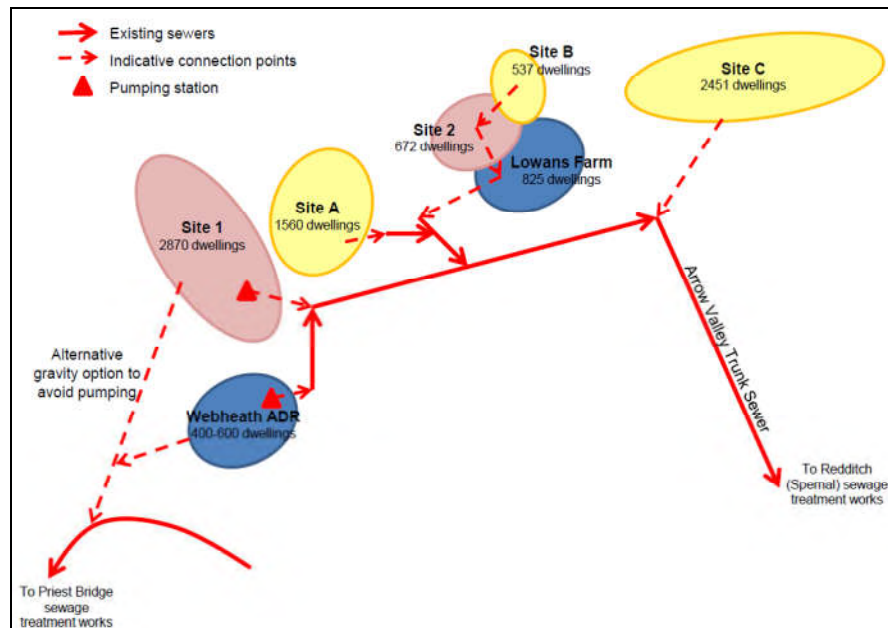
In addition to the two preferred sites at Foxlydiat and Brockhill indicated on the above plan, Redditch/Bromsgrove Borough also identified three potential alternative sites to the east of the

Bromsgrove Highway (Site A: 1560 indicative dwellings), north of the existing Brockhill preferred site (Site B: 537 indicative dwellings) and Bordesley Park north of the B4101 (Site C: 2451 indicative dwellings).



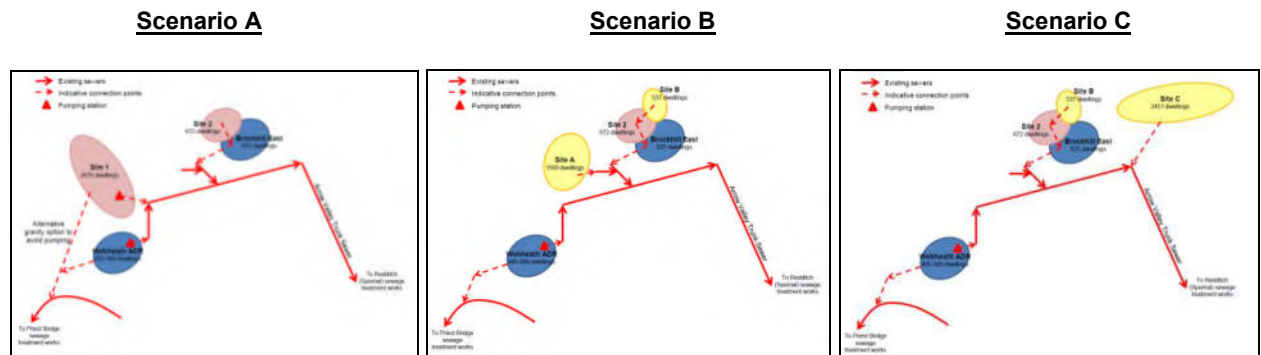
(plan provided by Redditch Borough)

From a sewer capacity perspective, developments located to the west are envisaged to have more capacity issues compared to those to the north-east due to the proximity to the main trunk sewer which runs along to the Arrow Valley to the sewage treatment works located to the south east of the town centre. Below is a schematic showing the relationship of each site to the sewerage system and the indicative connection points based on topography.



Whilst there are multiple permutations of the five sites which could potentially be modelled, resource availability has limited modelling to the following three scenarios. These scenarios have been chosen to reflect the potential impact on different parts of the sewerage system.

Site Ref	Area (ha)	Indicative Capacity (dwellings)	Scenario A (Redditch/Bromsgrove Preferred option)	Scenario B (Focus to west of Arrow Valley)	Scenario C (Focus around top of Arrow Valley)
1	147.2	2870	2870		
2	34.5	672	672	672	672
A	80.1	1560		1560	
B	27.5	537		537	537
C	125.7	2451			2451
		TOTAL	3542 dwellings	2769 dwellings	3750 dwellings



NOTE: All the above scenarios include the two sites proposed in the Redditch Local Plan No. 4 at Brockhill East (1000 dwellings) and Webheath (400-600 dwellings).

Notional Modelling Assessments

Principles of Capacity Assessment

The hydraulic sewer capacity model used for the assessments is the current best available Redditch model, last updated in 2009. Due to limited information on actual flow rates and developer drainage proposals/connection points, some assumptions have had to be made based on standard drainage design practice. These capacity assessments will need to be reviewed once detailed development flows and connection points are available.

It is expected that all new developments will consist of separate foul and surface water drainage systems and in areas of redevelopment, existing combined drainage will be separated. It is assumed that all surface water flows from the new development will be managed sustainably and flows will not be discharged to a public sewer until all other 'non-sewerage' options have been assessed (in line with the principles of the proposed SuDS Approval Bodies (SABs); per Schedule 3 of FWMA 2010). The scope of the sewer capacity assessment therefore considers only the additional foul only flows. It is expected that these large development sites will incorporate sustainable drainage (SuDS) features which will be adopted by the proposed SuDS Approval Bodies (SABs), with surface water discharge rates limited to Greenfield run-off, in line with usual Environment Agency requirements.

Scenario A: Redditch/Bromsgrove Preferred Option

The topography for the Foxlydiate site (Site 1) indicates that ground levels fall south-west away from the Bromsgrove Highway and, whilst a small part of the site may be able to gravitate to existing public sewers in Foxlydiate Lane, it is expected that the majority of the 2800 dwellings will need to be pumped to connect to the existing sewerage system. It is assumed that the connection point for this site will be Brockhill Drive on the opposite side of the Bromsgrove Highway. Sewers downstream of the indicative connection point would then flow north-east towards the Arrow Valley trunk sewer, before heading south-east towards Redditch (Spernal) STW. The Foxlydiate site is located at the very top of the Redditch sewerage system, upstream of existing small diameter sewers with limited spare capacity. More details on drainage of this site are provided in Appendix A.

Site 2 at Brockhill is expected to be able to connect by gravity to existing sewers in the Brockhill Lane/Hewell Road area.

The notional modelling assessment indicates that the additional flows from these two developments will require capacity improvements due to increased sewer flood risk in the Hewell Road/Windsor Road and adverse deterioration of sewer overflow performance. Localised sewer improvements would also be required in the Pine Tree Close and Foxlydiate Crescent immediately downstream of the pumped connection point.

The notional cost to increase sewer capacity/provide attenuated storage is £1.04 million. This excludes the cost of constructing a pumping station as part of Site 1, which would be funded by the developer. Until more details are available regarding the design parameters of the new pumping station and power rating of the pumps, it is difficult to determine the annual operating costs, however based on a similar sized pumping station these costs are envisaged to be in the region of £6,000 - £8,000 per year (£4,000 - £5,000 on power usage/telecom and £2,000 - £3,000 on routine maintenance and repair services).

An alternative gravity solution is viable which would enable all 2800 dwellings to drain south to connect to an existing public sewer running along the Bow Brook valley to Priest Bridge sewage treatment works. This option would however require extensive off site sewerage infrastructure to connect the Foxlydiate site to this gravity sewer near the junction of Sillins Lane/Norgrove Lane. This option also has the advantage that it could accommodate the Webheath site which has been subject to a separate capacity assessment. This gravity option is outlined further below but is estimated to cost in excess of £2.8 million. Further investment would also be required at Priest Bridge STW.

Notional solution cost: **£1,004,000** based on a pumped option to Redditch (Spernal) STW plus annual operating costs of £6,000 - £8,000, or alternatively, £2,800,000+ gravity based option which would also require upgrades to Priest Bridge STW.

Scenario B: Focus development to west of Arrow Valley

Overall this option would deliver approximately 770 fewer dwellings based on indicative site capacity compared to the preferred option assessed as part of Scenario A and so may need to be supplemented with the addition development allocation on other sites. The key advantage of this option is that all three sites (Sites 2, A and B) will be able to connect by gravity and so avoids the pumping issues associated with the 2800 dwelling Foxlydiate site (Site 1). Ground topography

indicates that Site A would drain towards existing sewers in Brockhill Drive whereas Sites B & 2 would drain to sewers in the Brockhill Lane/Hewell Road area.

Modelling assessments indicate that the additional flows from this development will increase flood risk in the Windsor Road area. The notional solution to address the capacity issues is to provide attenuation storage in the Hewell Road area.

Notional solution cost: **£829,400**

Scenario C: Focus development to around top of Arrow Valley

This scenario is based on focussing additional development (preferred Site 2 and alternative Site B) to the north of the Brockhill East already identified in the Redditch Local Plan No. 4, together with a further 2451 dwellings in the Bordesley Park area.

Compared to the preferred Scenario A, this option could accommodate a further 200 dwellings and, as with Scenario B, all development will be able to connect by gravity. It is assumed that Site 2 would connect as per Scenario B, whilst Site C (Bordesley Park) would connect to the existing main sewer to the west of the River Arrow.

Modelling assessments indicate that the additional flows from this development will increase flood risk in the Windsor Road area and from sewers behind Dolphin Road. The notional solution to address the capacity issues is to provide attenuation storage in the Hewell Road and Dolphin Road area.

Notional solution cost: **£844,800**

Webheath (applicable to all scenarios)

All modelled scenarios include the two sites already identified as part of the Redditch Local Plan No. 4 at Brockhill East and Webheath. Whilst Brockhill East will be able to drain by gravity, it has previously been identified that the Webheath site will require pumping.

A developer enquiry was received in 2012 relating to the initial phasing of the Webheath site, with the developer proposing to provide a pumped connection to the existing sewers in Church Road, immediately upstream of an existing pumping station on Church Road (see Appendix A). Subject to planning approval, the developer has the right to connect to the nearest public sewer and, due to the expected connection upstream of an existing pumping station, Severn Trent's engineering team have been assessing options to avoid excessive pumping.

As stated earlier a gravity option has been identified to drain south to Priest Bridge sewage treatment works. This would require extensive new off-site sewerage to connect the development to the existing sewer in the Bow Brook valley, plus capacity improvements to avoid increase flood risk. The cost of this option is estimated at £2.8 million. Another option has been assessed which proposed an alternative pumped connection point to avoid 'double pumping' at the existing pumping station on Church Road. This option is estimated at £120,000. A further pumping based option has also been assessed which would include rationalisation of existing pumping stations in the Webheath area at a cost of £670,000.

The annual cost of this pumped solution is envisaged to be £2,000 - £3,000.

At this stage due to the uncertainty over development allocations in the area the currently preferred option is for the alternative pumped connection point at £120,000, however the £670,000 option will be reviewed subject to clarification over development proposals in the area.

Notional solution cost: **£120,000 to £670,000**

Who pays for what?

Under Section 94 of the Water Industry Act 1991 sewerage undertakers have an obligation to provide drainage capacity to ensure there is no adverse effect on the environment or undue increase of flood risk from the waste water system.

As part of the regulatory framework with Ofwat, investment required to provide additional capacity on the existing sewerage system and at sewage treatment works is funded through customers' bills across the entire Severn Trent customer base. Consequently there is a requirement to manage existing capacity and provide future capacity as required to minimise impact on customers' bills.

For new development, the developer is responsible for constructing and paying for new sewers associated with the development plus the cost of connecting their site to the existing sewerage network. Where new sewer connections require capacity improvements to existing sewers, these will be funded by Severn Trent as part of the regulatory framework with Ofwat, this also includes provision of additional sewage treatment capacity if needed. Where capacity improvements are identified these will usually be programmed for completion to align with occupancy of the new dwellings in consultation with developers.

Sewage Treatment Capacity

Redditch is primarily served by Spenal sewage treatment works. This site currently serves the equivalent of around 78,500 people and has sufficient spare capacity to accommodate the combined developments being proposed across the Redditch catchment.

Should the Webheath/Foxleydiate developments be connected by gravity these sites would drain south to Priest Bridge sewage treatment works, located approximately 7.4km to the south. This smaller works currently serves an equivalent population of around 15,000 and, whilst there have been some operational issues in recent years; this works is now performing satisfactorily. Subject to more detailed process assessments it is envisaged that there is sufficient spare capacity to be able to accommodate an additional development from Webheath development without the need for further investment. Additional investment would be required to cater a further 2800 dwellings should a gravity option be pursued for the Foxlydiate site (Site 1), as the additional flows generated an population increase from 2800 dwellings would require a 50% increase in treatment capacity. At this stage, the cost of the upgrading works has not been assessed due to the high sewerage improvement costs.

Summary

The notional modelling work indicates that sewerage capacity improvements will be required to accommodate all three development scenarios. Notional solutions will however need to be

reviewed once detailed development flows and connection points are available but indicative investment needs are summarised below:

Scenario	Notional investment to provide additional sewer capacity
A: Redditch Borough Preferred Option (including 2800 Foxlydiate site)	£1,004,000 based on a pumped option plus annual operating costs of £6,000 - £8,000, or £2,800,000 (minimum) for a potential gravity option excluding capacity improvements to Priest Bridge STW
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Based on the above, Severn Trent preference would be for either Scenario B or C, as these will require less sewer capacity investment and both would also avoid pumping associated with the 2800 dwelling Foxlydiate site.

19 August 2013
Paul Hurcombe
Severn Trent Water - Waste Water Strategy

Appendix A – Extract from public sewer records showing flow paths for Foxlydiat and Webheath sites

