

# TECHNICAL MEMORANDUM



**Date** 17/06/2014  
**Reference** 2101-UA006807-UU71M-03-Red\_Lodge\_Memo  
**From** Hyder Consulting (UK) Ltd  
**To** Marie Smith, Magnus Magnusson, Gareth Durrant (Forest Heath District Council)  
**Copies** Rob Morris (Anglian Water Services)  
**Subject** Red Lodge Sewerage and Wastewater Treatment Capacity

## Introduction

Hyder Consulting (Hyder) were commissioned by Forest Heath District Council (FHDC) in March 2014 to produce an independent study of the capacity of the sewerage network and wastewater treatment facilities serving the Red Lodge settlement.

The scope of this works includes assessing whether it is now appropriate for FHDC to rescind the embargo on additional development prior to Red Lodge before 2021, which was initially instigated due to wastewater treatment capacity concerns. It is intended that this study inform the finalisation of the FHDC Single Issue Review (SIR) and also provide evidence to support planning decisions in the interim.

Due to delays in provision of third party data, quality assurance requirements, and the need to adhere with any data confidentiality agreements, this independent study cannot be satisfactorily completed prior to the early July 2014 FHDC Committee meeting.

The purpose of this Technical Memo is to update FHDC Officers and Members as to the progress of the study and any interim conclusions which may be of value in advance of the July Committee meeting.

## Historical Context

Hyder were commissioned by Forest Heath District Council (FHDC) in 2008 to prepare a Water Cycle Study (WCS) to support the development of the Core Strategy.

The Outline WCS (Hyder, 2009) identified a number of wastewater infrastructure and water environment constraints that would require further investigation by the WCS stakeholders in order to support the proposed growth in the District. FHDC took these constraints in to account in their Core Strategy by proposing that the majority of development in Red Lodge be constructed towards the end of the plan period (post 2021), hence allowing adequate time for the identified constraints to be resolved.

Following adoption of the Core Strategy (2010), FHDC again commissioned Hyder to produce a Stage 2 WCS, the purpose of which was to bring the constraint information up to date, and further analyse the detailed wastewater infrastructure to provide guidance to FHDC as they progressed through their Local Development Framework (LDF) to Site Specific Allocations (SSA).

Following consultation with AWS, the Stage 2 WCS (Hyder, 2011) concluded that:

- The extant planning permissions at Red Lodge would use up any existing capacity within the discharge consent at Tuddenham Water Recycling Centre (WRC). Any additional

growth from FHDC Policy CS7 would require negotiation of an increased discharge consent from 2021 onwards. The resulting tightening of discharge quality standards may make the current discharge location unfeasible, and hence require AWS to undertake significant capital works (such as a new discharge pipe to the River Lark). It was recommended that the stakeholders continued to investigate options prior to 2021;

- AWS were planning a programme of improvement works during the Asset Management Plan period 2010-2015 (AMP5), to upgrade the hydraulic and process capacity at Tuddenham WRC to accommodate the new wastewater flows from the extant planning permissions. However, any additional flows from Policy CS7 growth post 2021, and the associated tightening of discharge consent standards, would require the construction of additional process capacity, and potentially a step change in treatment process, taking up to 10 years to plan and construct;
- Proposed development sites to the west of Red Lodge would require extensive upgrades to the existing sewer network through the town;
- Due to the proximity of the proposed development sites to the east of Red Lodge to either the Warren Road Sewage Pumping Station (SPS) or Kings Warren SPS, connection to the existing pumped sewerage network at would be relatively simple (subject to some capacity investigations/ improvements); and
- The Herringswell Terminal Pumping Station (TPS), which conveys flows from the Red Lodge network to the inlet at Tuddenham WRC, was recently upgraded to provide the necessary capacity to accommodate the extant planning permissions. Additional growth in FHDC Policy CS7 may however require that further capacity improvements are constructed here.

Additionally, FHDC have advised Hyder that residents and Members remain concerned regarding the capacity of the sewerage network, particularly Warren Road SPS and Herringswell TPS.

## Development Context

Following consultation with FHDC, the following development trajectory is being considered in the Independent Study for the Red Lodge/ Tuddenham WRC catchment:

<u>No of new properties:</u>	<b>2013-2016</b>	<b>2016-2021</b>	<b>2021-2026</b>	<b>2026-2031</b>	<b>TOTAL</b>
Existing permission as per 5 year supply (Apr 2013)	363	-	-	-	<b>363</b>
Emerging site (Crest Nicholson)	-	374	-	-	<b>374</b>
Brownfield (Policy CS7)	-	-	20	20	<b>40</b>
Greenfield (Policy CS7) – <i>previously delayed until after 2021 due to FHDC embargo in Core Strategy, 2010</i>	100	100	100	100	<b>400</b>
Mixed (Policy CS7)	-	-	200	200	<b>400</b>
<b>TOTAL</b>	<b>463</b>	<b>474</b>	<b>320</b>	<b>320</b>	<b><u>1,577</u></b>

## Study Progress

In March 2014 Hyder undertook a site visit at Tuddenham WRC accompanied by the AWS Regional Services Planner, Treatment Manager, and Senior Growth Planning Engineer.

The ongoing AMP5 construction works were witnessed on site, which were nearly completed and due to be commissioned within the following month.

AWS have made available to this study:

- Records of customer contacts/ complaints made within the catchment since 2010, with some specific cases including incidents from 2008;
- The design envelope for the above mentioned capital improvement works, plus detailed drawings and specification for the new tertiary treatment module recently completed;
- Population estimates, wastewater flow calculations and daily measured in-flow data for Tuddenham WRC for the last four years;
- Discharge consent data, and quality performance data for the last 19 months;
- Plans and Graphical Information System (GIS) asset data for the Tuddenham sewerage network;
- Pump run times for the Kings Warren SPS; and
- A descriptive assessment of sewerage network capacity and connectivity changes

Hyder have completed a process capacity assessment based on the dimensions of the existing and new process units identified in the above. This will be appended to the Independent Study report.

## Baseline WRC capacity

AWS estimated that the Tuddenham WRC catchment had a population equivalent (PE) of 3,850 at the end of 2011/12. Comparison of this estimate with recorded flow data, and the 2011 census data, suggests that this was an appropriate estimate, given that there are a number of properties across the catchment not connected to the AWS sewerage network.

FHDC report that 164 properties were completed within the catchment in 2012/13. It is therefore reasonable to assume that the Tuddenham WRC PE increased by 377 in this period, and therefore stood at 4,227 by April 2013.

FHDC has not made data available regarding completions in 2013/14, hence the baseline for this independent study is considered to be April 2013.

Using conventional flow calculations, and catchment specific consumption and infiltration rates provided by AWS, the following baseline flows can be estimated for April 2013:

Dry Weather Flow (DWF): 637 m<sup>3</sup>/day      Average Flow: 758 m<sup>3</sup>/day (equivalent to 8.8 l/s)

This compares well with the average measured in-flow to Tuddenham WRC in 2012/13, of 767 m<sup>3</sup>/day.

For reference, the existing DWF volumetric discharge consent/ Environmental Permit is 1,100 m<sup>3</sup>/day.

## Future WRC capacity (consent)

3,850 PE was the baseline for AWS AMP5 design. In line with the Stage 2 WCS, AWS had estimated that 682 properties would be built at Red Lodge between 2011/12 and 2021, and a further 1,200 properties from 2021-2031.

Using an estimated occupancy rate of 2.3, AWS had therefore predicted that the PE would be 5,418 by 2021, and 8,178 by 2031.

Using what can be considered to be conservative variables, AWS predicted that the flows by 2021 would be:

Dry Weather Flow (DWF): 813 m<sup>3</sup>/day      Average Flow: 1,080 m<sup>3</sup>/day (equivalent to 12.5 l/s)

This suggests that the existing DWF consent would not be exceeded by 2021. This is contrary to the Stage 2 WCS findings, primarily because the baseline flows used in the Stage 2 WCS were based on measured flows which have since been shown to be erroneously high. AWS have since audited and revised the metering at the Tuddenham WRC site.

The capacity within the current DWF consent can be calculated as follows:

$$1,100 - 637 = 463 \text{ m}^3/\text{day}$$

Dependent on the variables used, this would allow the connection of an additional 2,760 to 3,213 PE (approximately 1,200 to 1,397 new properties).

This capacity is adequate to accommodate the 363 properties with extant planning permission, the 374 property site currently being promoted by Crest Nicholson, and an additional 473 to 660 properties. This is well above the current requirements of Policy CS7 prior to 2021, hence the 2021 embargo is not required in terms of protecting compliance with the discharge consent.

## Future WRC capacity (hydraulic/process)

Using conservative variables, the new wastewater flows predicted from the 363 properties with extant planning permission, the 374 property site currently being promoted by Crest Nicholson, and an additional 200 greenfield properties (as per the current FHDC Policy CS7 prior to 2021) would be:

$$937 \text{ new properties} = 2,155 \text{ PE}$$

$$4,227 + 2155 = 6,382 \text{ PE by 2021}$$

Dry Weather Flow (DWF): 1,015 m<sup>3</sup>/day      Average Flow: 1,211 m<sup>3</sup>/day (equivalent to 14 l/s)

Whilst the above PE is higher than that used by AWS in their 2021 designs, the recent capital improvements works to the Tuddenham WRC inlet works, flow balancing and tertiary treatment have been deliberately upsized, and constructed based on a design peak flow of 28 l/s, with space identified on site to increase the capacity as required beyond 2021.

The preliminary results of the Hyder process capacity assessment agree that the majority of the existing and new assets on the site are capable of satisfactorily treating this 28 l/s peak flow, hence the proposed flow of 14 l/s should not be considered as problematic.

The exception to this may be the existing secondary treatment trickling filters, which may struggle to meet the required reduction in ammonia. However, the new tertiary treatment recently installed is intended to cover any shortfalls from the secondary treatment, and the new flow balancing facilities should improve the performance of the secondary treatment.

It is therefore likely that the 2021 embargo is no longer required in terms of hydraulic/ process capacity at Tuddenham WRC. Again, this is contrary to the Stage 2 WCS findings, primarily due to the WCS being based on higher baseline flows which AWS have now confirmed were erroneous.

## Sewerage Network Capacity – west of Warren Road

As discussed in the Stage 2 WCS, the area of Red Lodge to the west of Warren Road is served by a network of small SPS, sometimes serving one or two individual streets. This network allows for the efficient transportation of wastewater without the need for large deep pumping stations and replication of sewer pipes, and similar systems are in place across the Mildenhall area.

However, the multitude of SPS increases the maintenance burden to AWS, and provides more locations where blockages or power outages can become problematic and result in sewer flooding. Historically, sewer flooding issues in this area were reported widely in the local media. Additionally, the location of some of these SPS was particularly poor in terms of health and safety and traffic management. Maintenance/ repair works often had to be undertaken overnight – causing disruption to residents.

Whilst the above issues will have been frustrating for residents, AWS are aware of the issue and it is apparent that they have been resolving the worst offending SPS.

Notably, in AMP5 AWS have been undertaking a programme of SPS replacement for sites such as these. At least 15 sites were targeted in the Mildenhall area with a capital cost of around £2.5M. As an example, the GIS record shows that the SPS at the Bennett Road/ Warren Road junction was replaced in 2012.

AWS advise that further wastewater connections from development at Red Lodge will not be connected in to this historically problematic area of the network, instead being connected directly into the network leading to Kings Warren SPS as and when developers requisition the necessary infrastructure.

Evidence of this strategy being implemented is apparent in the GIS sewer record, which shows the sewers serving the recently developed Fern Way bypassing the existing network in Turnpike Road, and instead connecting directly to Kings Warren SPS.

The existing sewer network serving the west of Warren Road should not therefore be considered a constraint to development.

## Sewerage Network Capacity – Warren Road SPS

AWS have advised that the historic capacity issues at Warren Road SPS were overcome in 2007/08, by altering the network connectivity. According to AWS, Warren Road SPS now only receives flows from the areas to the west of Warren Road, excluding the Newmarket Road area. Warren Road SPS pumps these flows northwards to Kings Warren SPS, which then pumps all flows from Red Lodge directly in to the rising main to Herringswell TPS.

This has reportedly resolved the historic problem which used to occur when the newer Kings Warren SPS pumped directly in to the older Warren Road SPS - which had limited capacity to accept such flows.

Unfortunately, the network GIS data for the area has not been updated locally to accurately update the change in connectivity. However, the GIS does show a pair of parallel rising mains between Kings Warren SPS and Warren Road SPS, which would make the AWS explanation plausible, as the change in connectivity would have been relatively straightforward given the existence of these mains.

Additionally, AWS have provided output flow data for Warren Road SPS for the month of May 2014. This shows a maximum flow recorded from Warren Road SPS of 74 m<sup>3</sup>/d. AWS have been unable to supply flow data prior to this period.

In comparison, 2011 census data suggested that the population of Red Lodge accounted for at least 75% of the Tuddenham WRC catchment. As average daily flows received at the WRC in 2012/13 were 767 m<sup>3</sup>/d, flows from Red Lodge can be approximated as 575 m<sup>3</sup>/d. Therefore, the significant difference between the Tuddenham WRC inlet flows, and the Warren Road SPS output, suggests that the majority of the flows from Red Lodge must be via Kings Warren SPS, which supports the AWS explanation of the network connectivity change.

The AWS customer contact/ complaint log only shows one complaint in the immediate vicinity of Warren Road SPS, initially dating from 2006, with further occurrences in 2008. This complaint was related to odour. For the occurrence in 2006, this may well have been related to the limited capacity at Warren Road SPS to accept and pump onwards the flows from Kings Warren SPS. However, the latter occurrence in 2008, after the change in network connectivity, is more likely to be a result of an operational failure or maintenance issue rather than lack of pump/ pipe capacity – particularly as there are no recent reoccurrences.

AWS advise that future development in Red Lodge, either to the east of Warren Road, or along Turnpike Road, will be connected in to Kings Warren SPS for direct pumping to Herringswell TPS, hence avoiding any additional flows being received at Warren Road SPS.

The above data supports the AWS explanation that historic capacity concerns at Warren Road SPS were addressed by the network connectivity change in 2007/08, and the proposed solution for future development should prevent capacity issues reoccurring at Warren Road SPS in the future.

## Sewerage Network Capacity – Kings Warren SPS

Regarding Kings Warren SPS, AWS have been unable to provide flow meter data for this site. However, AWS telemetry data reviewed by Hyder suggests that the pumps here ran for an average total of 79 minutes per day in 2013/14. AWS data shows that the average flow received at Tuddenham WRC in 2013/14 was 680 m<sup>3</sup>/d, which assuming 75% originated from Kings Warren SPS means that the pump rate should be equivalent to 108 l/s (AWS have been unable to confirm actual pump duty) – although this should be used with caution due to the assumptions made, and the influence of storage at Herringswell TPS, and the other TPS in the catchment.

A more conservative flow estimate for the Kings Warren SPS has been estimated by AWS as 56 l/s. Assuming conservative planning variables, the new wastewater from the 374 property site being promoted by Crest Nicholson would generate approximately 148 m<sup>3</sup>/d of domestic wastewater. This would require the pumps at Kings Warren SPS to run for a further 44 minutes per day, which is considered well within the capacity of the site given their current operational regime.

No customer complaints are recorded in the vicinity of Kings Warren SPS related to capacity, flooding or odour issues.

## Sewerage Network Capacity – Herringswell TPS

Similar to the above, AWS report that the flow rate from Herringswell TPS was proven to be 60.8 l/s during their recent design works at Tuddenham WRC. The above increases in flow would therefore require the pumps to run for a further 41 minutes per day – again this is considered to be well within the capacity of the site.

A number of customer complaints have been recorded regarding Herringswell TPS. The majority investigated by AWS were found to be caused by blockages, typically resulting from misuse of sewers. This is not a pipe/pump capacity issue, and should not therefore be considered a constraint to development.

However, some of the customer logs dating back to at least 2006, with reports of odour and wastewater flooding gardens, were attributed in part to local network capacity. AWS increased the capacity of Herringswell TPS in 2010/11 to resolve capacity issues and include odour reduction treatment. This was widely reported in local media.

Other recent occurrences of external flooding, including events in 2011 and 2014, are reported by AWS as being caused by a power outage at the site. As evidenced in the log, AWS aim to attend site, restore power and reset the pumps as soon as practicable. Similar to all wastewater undertakers, AWS will typically employ a fleet of portable generators and vacuum tankers for use during power outages, subject to prioritisation. Whilst the potential effect of such events on customers and the environment can be serious, it is uneconomical to supply every pumping station with a permanent fixed standby generator (and can invite crimes such as fuel theft). Notably, the provision of additional pipe/ pump capacity would not have prevented these events from occurring, therefore this does not indicate a constraint to development.

## Conclusion

The Independent Study will confirm the potential impact of the additional development up to and beyond 2021; however the above suggests that there is no short term constraint on development due to sewerage network capacity.

Whilst the Independent Study report is still being finalised, the findings to date suggest that the 2021 embargo placed on further development (over and above extant permissions) proposed by FHDC is no longer appropriate.

The driver for this original embargo was wastewater treatment capacity at Tuddenham WRC. Hyder have witnessed the near completion of additional hydraulic/process capacity at Tuddenham WRC, the design documents supporting this capacity increase, and evidence to confirm that the original flow data used during the WCS analysis was erroneously high.

The level of development currently being proposed by FHDC prior to 2021 can be accommodated within the new treatment capacity provided at Tuddenham WRC, and the existing discharge consent/ environmental permit.

Data received from AWS as part of this Independent Study is still being processed, however with regards to the 374 property site being promoted by Crest Nicholson, the following conclusions are apparent:

- The change in sewerage network connectivity in 2007/08 means that flows received at Kings Warren SPS are no longer pumped to Warren Road SPS. This appears to have alleviated capacity concerns at Warren Road SPS. As future flows will also be connected directly to Kings Warren SPS, neither the capacity of Warren Road SPS nor the sewer network to the west of Warren Road are a constraint to development;
- Customer complaints regarding sewerage network in the area, particularly near Herringswell TPS were primarily related to blockages. Prior to 2010/11, TPS capacity was a known issue – however this was addressed by AWS with a capital scheme. More recent events at the TPS appear to have been caused by power outages, which are not indicative of a capacity constraint.

The remaining tasks to be included in the Independent Study are:

- Identification of a development threshold when further capacity improvements may be required at Kings Warren SPS and Herringswell TPS; and
- Assessment of the ability to accommodate the full plan growth (development to 2031) within the Tuddenham WRC hydraulic/ process capacity and discharge consent, and identification of development thresholds (post 2021) where additional investigation and capital investment may be required by AWS.

It is anticipated that the work above should be compiled in to a report, to be issued in draft by the 27<sup>th</sup> June for stakeholder approval, with issue of a Final Report by 18<sup>th</sup> July (subject to timely confirmation of any stakeholder comments).