REPORT N^{O} WWTW-01

MANYDOWN CURRENT LOCAL PLAN

WASTE WATER AND SEWERAGE STRATEGY

SEPTEMBER 2015

WSP | PARSONS BRINCKERHOFF

MANYDOWN

WASTE WATER AND SEWERAGE STRATEGY

Basingstoke and Deane Borough Council
Hampshire County Council

For Planning (1)

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1 EXECUTIVE SUMMARY

1.1.1 WSP | PB have been engaged by Hampshire County Council (HCC) and Basingstoke and Deane Borough Council (BDBC) to undertake a Waste Water and Sewerage Strategy for the proposed Manydown ("the site") development on land to the west of Basingstoke and to the north of Pack Lane.

1.1.2 For the purposes of this report, the development will seek to provide:

- Up to 4,000 residential units by the year 2029;
- Local facilities and amenities, including schools and centres.

1.1.3 This report outlines:

- Constraints to provision and location of infrastructure;
- A strategy for provision of waste water and sewerage infrastructure, including possible locations for on-site sewage treatment;

1.1.4 Two main waste water strategy options are discussed, giving an overview of how sewage from each area of the site will be drained to treatment facilities, with potential outfall routes. The options are general overviews, and there is a potential for variation within each one:

- Option 1: Connect strategic infrastructure to existing Water Authority networks;
- Option 2: Provide on-site waste water treatment facilities.

1.1.5 The report identifies two potential Waste Water Treatment Works (WWTW) locations across the site, with the preferred location being to the west of Area 5 (identified as location "N1" in the report).

1.1.6 A WWTW, if proposed, would be based on the Activated Sludge process, which is easily scalable and an established treatment method. This may take the form of a package treatment works, comprised of either pre-cast modular units for flexibility, or of permanent construction (e.g. reinforced concrete tanks). As potential outfall locations to watercourse would involve several kilometres of pumped main and gravity sewer, it is recommended that methods of discharging treated effluent to ground (i.e. through soakaways) are investigated.

1.1.7 The report concludes that, subject to ground investigation, an "inset agreement" - where waste water treatment and sewerage infrastructure is located within the site boundary and operated by a utility company independent of the local Water Authorities - is a potential alternative to physical connection to existing Water Authority networks that should be considered as part of the planning process.

2 INTRODUCTION

2.1 CONTEXT

2.1.1 WSP | PB have been engaged by Hampshire County Council (HCC) and Basingstoke and Deane Borough Council (BDBC) to undertake a Waste Water and Sewerage Strategy for the proposed Manydown ("the site") development on land to the west of Basingstoke and to the north of Pack Lane.

2.1.2 For the purposes of this report, the development will seek to provide:

- Up to 4,000 residential units by the year 2029;
- Local facilities and amenities, including schools,

2.1.3 This report outlines:

- Constraints to provision and location of infrastructure;
- A strategy for provision of waste water and sewerage infrastructure, including possible locations for on-site sewage treatment;

2.1.4 The areas for development within the site boundary are greenfield agricultural, bounded to the west and east by residential development (Oakley and Basingstoke, respectively); to the south by National Rail land and Pack Lane; and to the north by a mixture of greenfield agricultural and woodland areas with isolated residential areas.

2.1.5 The site falls in between the coverage of the local Water Authorities Thames Water and Southern Water.

2.1.6 A site location plan is included in **Appendix A**.

2.2 SUPPORTING INFORMATION AND REFERENCES

2.2.1 Hampshire County Council have provided WSP with the following information:

- URS development strategy documents: E01526 DM03G Manydown URS "Draft Local Plan Submission Document" and "Technical Strategies" June 2014;
- OS Mapping. All OS mapping reproduced under HCC contractor license and WSP Licence No. 100048755;
- LiDAR data in GIS format;
- Red line boundary data in AutoCAD format;

2.2.2 Further to this WSP have obtained and consulted:

- Thames Water and Southern Water asset mapping;
- EA flood mapping;

2.2.3 Other documents used for consultation:

- National Planning Policy Framework (NPPF) and Technical Guidance;
- Sewers for Adoption 7th Edition;

- Flows and Loads, published by British Water

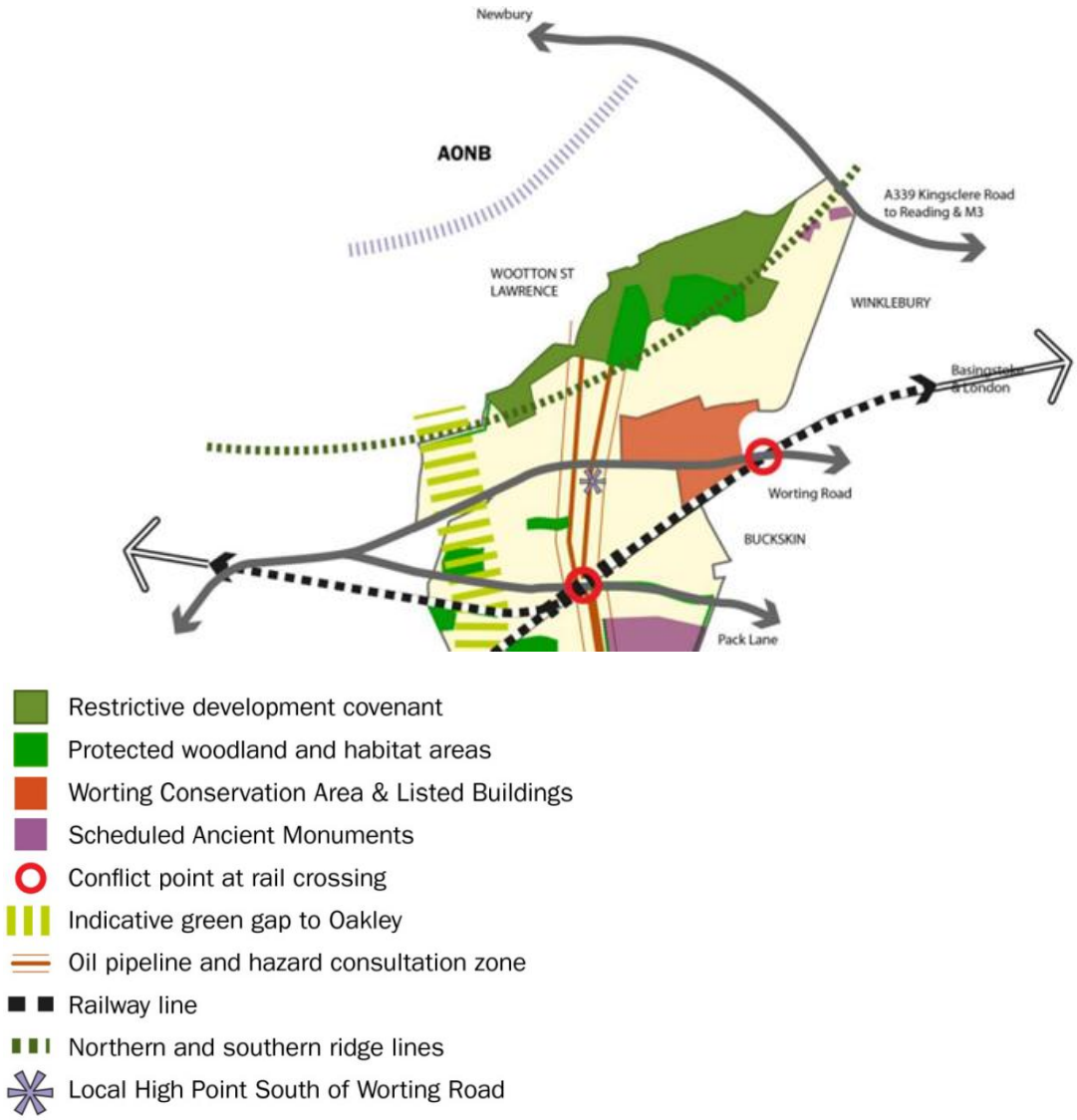
3 CONSTRAINTS FOR WASTE WATER INFRASTRUCTURE

3.1 SITE LOCATION

3.1.1 WWTW and related infrastructure are most efficient when they can be operated using gravity systems, rather than having to pump flows uphill. A review of available data has been used to identify potential constraints to the infrastructure strategy. These constraints are analysed in this section.

3.1.2 General constraints have been identified in the Vision for Manydown report, 2014 (Beyond Green Ltd), replicated below in **Figure 3.1**.

Figure 3-1 – Geographical Constraints Diagram



3.2 MASTERPLAN

3.2.1 The masterplan itself can apply constraints to the locations of infrastructure. Infrastructure such as WWTWs and pumping stations will have an associated land-take and would need to be positioned to not adversely impact on site amenity. Aesthetically, infrastructure will need to be located so that it is not visually intrusive – screening with trees and other landscaping can be considered.

3.2.2 Pumping stations necessary to route flows will need to be positioned at or close to topographically low points within the site. Reviewing the site with respect to levels shows that these low points occur within designated development parcels. This means that pumping stations, with necessary exclusion zones (for odour issues etc.) will need to be located in green public open space areas with sufficient easement, depending on the noise and odour reduction technology applied. It should be noted that well-designed pumping stations should cause little or no disturbance to local residents.

3.2.3 An illustrative site masterplan can be found in Section 3 of the Draft Local Plan Submission Document (URS, 2014).

3.3 UTILITIES

3.3.1 The existing public WWTW locations are approximately 10km away (Thames Water's Whitmarsh Lane site in Basingstoke) and 2km away (Southern Water's Ivy Down Lane site in Oakley).

3.3.2 **The Thames Water (TW) site** discharges treated effluent to the River Loddon which has existing issues with high phosphor levels. The Halcrow "Water Cycle Study Phase 2" Report (2009) states that Thames Water plan to meet strategic increase in demand for new development in Basingstoke (between 740 and 915 dwellings per year):

> *"Thames Water have currently planned to provide the necessary infrastructure at Basingstoke STW to meet growth up to 2021, and to maintain the current consent. For growth beyond 2021, a policy decision needs to be made in the RBMP with respect to consent standards to ensure good ecological status is achieved by 2027. Our analysis shows that it might be possible to secure compliance with good ecological status by using novel technology in combination with closing two smaller STWs, but there is a financial implication and a large carbon and energy implication in so doing. Although the high standards of treatment are believed to be achievable with treatment techniques applied for potable water, such as reverse osmosis, further research and development along with pilot application of the techniques would be required before application on a works the size of Basingstoke could take place."*

3.3.3 According to the URS "Technical Strategies" document, the strategic increase in capacity includes an allowance of 300 units per annum for the proposed Manydown development:

> *"The Phase 2 Water Cycle Study Development considers the effect of directing wastewater to the existing Basingstoke Sewerage Treatment Works up to 2021 and includes an allowance of approximately 300 dwellings per annum for the Proposed Development."*

3.3.4 **Table 3.2**, below, details potential connection points within the TW Basingstoke networks.

Table 3-1 - Potential Thames Water connection points.

Development Area	Location	TW Manhole Reference	Pipe Diameter (mm)	Cover Level (mAOD)	Invert Level (mAOD)
1	Kingsclere Road	1501	150	125.45	123.45
1	Kenilworth Road	7601	225	110.99	109.24
2	Roman Road	5101	225	105.56	101.53
1 and 2	Popley Way	621E	900	83.89	77.98
6A	Dorset Crescent	031N	150	107.275	105.664
6A	Lowlands Road	2002	150	101.09	97.39
6A	Pack Lane	3601	300	100.37	98.02

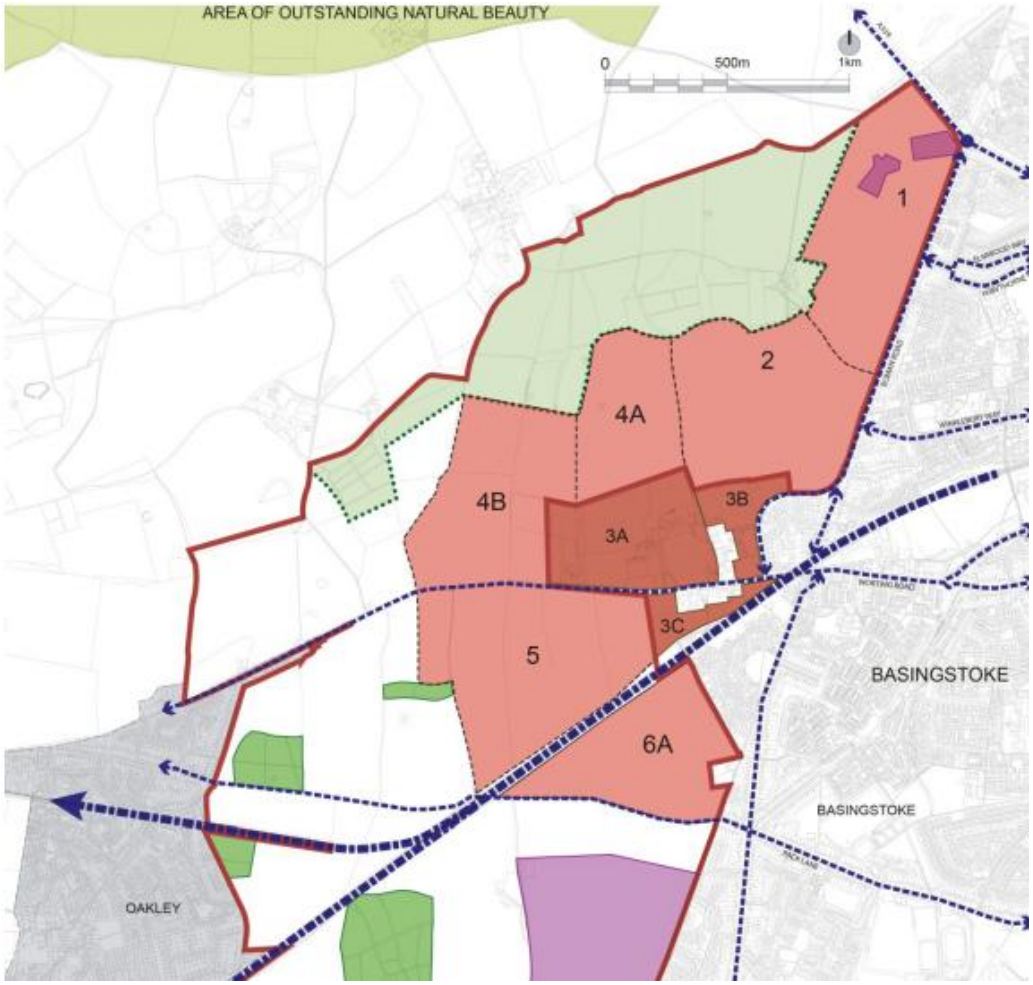
N.B. Refer to Figure 3.2 for development area plan.

3.3.5 **The Southern Water (SW) site** discharges treated effluent directly to ground through infiltration ditches. The URS Technical Strategies report states that there is potential additional capacity that could be provided at the works:

> *"Southern Water has indicated that the site is situated in close proximity to the Ivy Down Lane Oakley wastewater treatment works, which underwent a £2.75M upgrade to accept flows from Oakley that were formerly treated at Water Ridges Wastewater Treatment Plant and to enable flows to be treated to a higher standard. Southern Water indicated that a portion of the site could potentially drain to the Ivy Down Lane Oakley wastewater treatment work and that it would be possible to accommodate new development of 1,350 houses through extension of the existing works, subject to an environmental permit being granted by the EA."*

3.3.6 Based on review of Southern Water apparatus mapping and for the purposes of this report, it has been assumed that a gravity connection to the Ivy Down Lane WWTW will not be possible via the existing Southern Water network in Oakley, particularly for the initial phases of the development. Connection would be via pumped rising main. Review of Land Registry information shows that the works is constrained by existing boundaries, so Southern Water would need to purchase adjacent land if creating further capacity to expand the works was to be considered.

Figure 3-2 – Site Plan (URS)



3.3.7 Sewer mapping extracts are included in **Appendix C**.

3.3.8 Government **oil pipelines** (one operational and one disused) cross the site in an approximately north-south route. Confirmation of invert, soffit levels and the diameter of the pipelines will be necessary so that they can be considered in developing a detailed network strategy.

3.4 ENVIRONMENTAL

3.4.1 Water quality issues have been identified in the River Loddon.

3.4.2 There will be a maximum rate/volume of discharge of treated effluent to each river/watercourse and variation of existing discharge licenses is likely to be necessary.

3.4.3 The River Test, from experience with watercourses in this area and from review of map and satellite data, is ephemeral. This means that, particularly in the upper reaches (where an outfall from the WWTW would most likely be made), the channel only fills during extended periods of rainfall. Environment Agency approval would be required for a constant flow into the river channel. Therefore a soakaway method may be more appropriate for disposal of treated effluent, as used in the existing Southern Water Ivy Down Lane WWTW.

3.5 RAILWAY

3.5.1 Network Rail consultation and approval will need to be sought for any pipe routes through, under or near to the railway embankments.

3.6 TOPOGRAPHY

3.6.1 High and low points in the development have been located. These will affect the type of drainage regime that will be used for each land parcel and the position of waste water and sewerage infrastructure.

3.7 ASSUMPTIONS

3.7.1 The foul flows (rates/volumes) developed and analysed in this report have assumed residential equivalent populations, which include an estimated allowance for industrial foul demand based on current best practice.

3.7.2 Laying a treated effluent carrier drain to the River Loddon through Basingstoke has been considered less attractive for the purposes of this report. This is due to the large number of service crossings and potential clashes that may occur when attempting to plan and construct a pipe route through built-up areas. However, an option to use a route via Basingstoke should be considered pending the results of discussions with local Water Authorities and approving bodies.

3.7.3 Surface Water and Highway drainage has not been considered and will require a separate strategy for disposal of this water.

3.7.4 For the purposes of calculating the WWTW size/volume, it has been assumed that the population increases linearly over the current local plan period. This can be reviewed as more detailed information on the number of units planned to be constructed per year becomes available, subject to local planning reviews etc.

4 WASTE WATER AND SEWERAGE STRATEGY

4.1 PROVISION OF INFRASTRUCTURE

4.1.1 To provide wastewater and sewerage services to the Manydown area will require a network of strategic infrastructure including:

- Trunk sewers;
- Rising mains;
- Pumping stations (including balancing storage for shut-down during maintenance etc.);
- Wastewater Treatment Works (WWTW);
- Treated effluent sewers to outfall and/or infiltration ditches;

4.1.2 It is possible that the strategic infrastructure would be constructed by BDBC/HCC, possibly in partnership with a contractor/MUSCO. Under this scenario, individual parcels of land for residential/commercial development would be purchased by a consortium of development partners who would then construct the parcel drainage and infrastructure which would connect into the Manydown strategic network.

4.1.3 There is a potential, due to the distance of existing sewer networks from the site, for operating strategic infrastructure as an inset Water Company. This would allow infrastructure to be operated independently within the site boundary.

4.1.4 The routes of sewers and mains will be constrained by topography and will co-ordinate with and follow strategic highway routes through the development. Location options for pumping stations and the WWTW are discussed and compared in the following sub-section.

4.1.5 Different options for providing the strategic infrastructure are also discussed, looking at the outline parcel phasing (particularly where this is available for the northern area of the development) and the comparative feasibility of each option.

4.1.6 For sizing purposes and to allow for a degree of flexibility, the proposed development has been scoped to consist of up to 4,000 units within the draft Local Plan allocation (Phases 1, 2, 4, 5 and 6A). To achieve this would require a build-out rate of approximately 350 units per year between 2017 and 2029 (inclusive).

4.2 POTENTIAL WWTW LOCATIONS

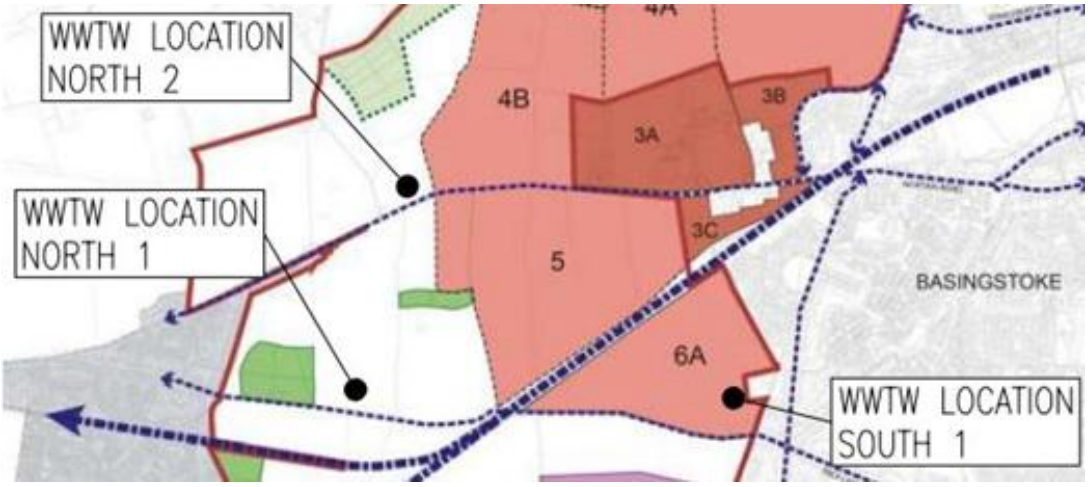
4.2.1 Potential locations for infrastructure have been selected based on a review of topography and masterplanning showing the proposed land parcels for development. This section describes how locations have been selected and gives overviews of strategy options based on estimated residential unit development numbers.

4.2.2 There are three potential WWTW locations identified, as shown in Table 4.1 and Figure 4.1, below.

Table 4.1, Potential WWTW Locations.

REFERENCE	DEVELOPMENT LOCATION	TOPOGRAPHIC LOCATION
North 1 (Identified in URS Report)	West of Parcel 5	Adjacent to and north of West of England Main Line
North 2	West of Parcel 4B	Adjacent to and north of B3400 (Worting Road)
South 1	Parcel 6A	Adjacent to Pack Lane/Lowlands Road

Figure 4.1, Potential WWTW Locations.

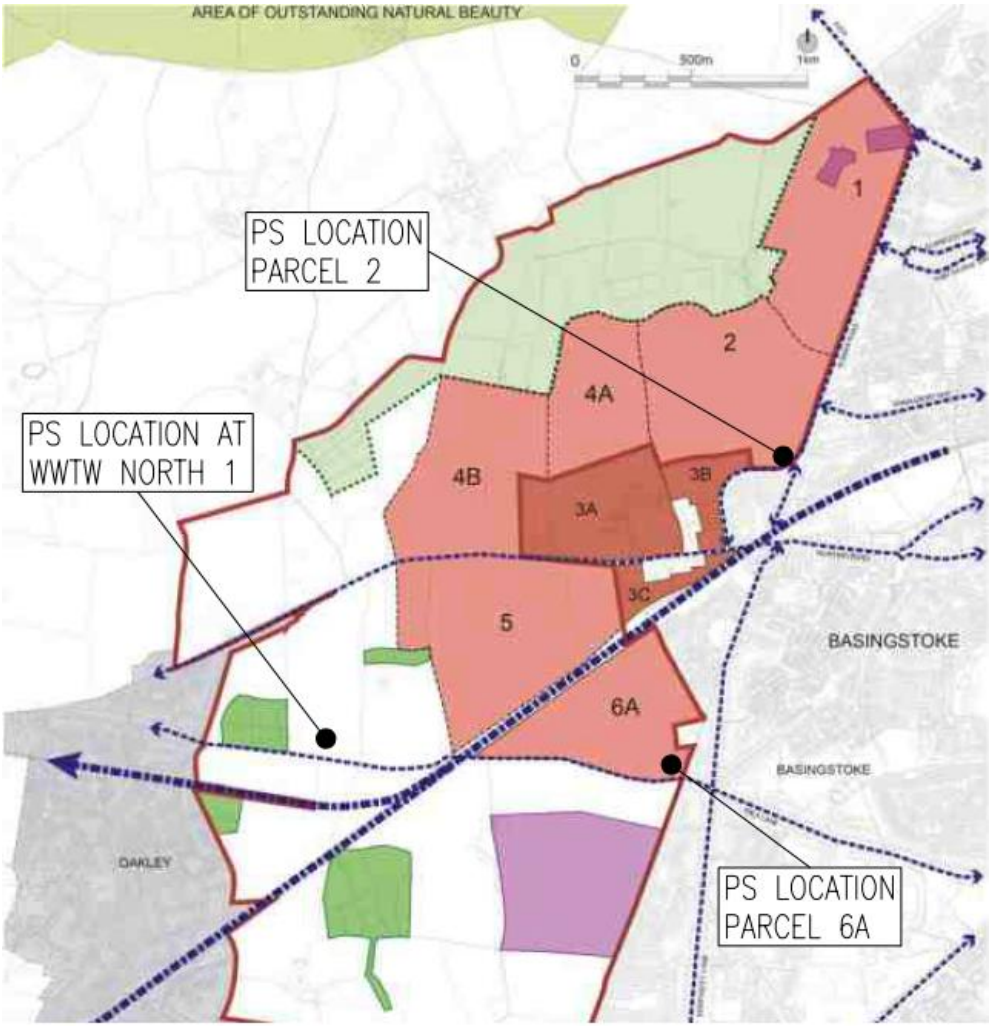


4.2.3 A number of locations have also been identified for possible strategic pumping station locations, as shown in **Table 4.2** and **Figure 4.2**, below:

Table 4.2, Potential Pumping Station Locations.

DEVELOPMENT LOCATION	TOPOGRAPHIC LOCATION	SERVES
Parcel 2 (PS2)	At low point, adjacent to Roman Way/Roman Road	Parcels 1 and 2
Parcel 6A (PS6A)	At low point, adjacent to Pack Lane/Old Kempshott Lane	Parcel 6A and potentially 1-5
West of Parcel 5, WWTW North 1 (PSN1)	Adjacent to and north of West of England Main Line	Parcels 1-6 (if connection to Thames Water/Basingstoke apparatus unfeasible)

Figure 4.2, Potential Pumping Station Locations.



4.2.4 Table 4.3, below outlines the comparative benefits and disadvantages of the proposed WWTW locations identified.

Table 4.3, Proposed WWTW Locations Comparison.

WWTW LOCATION	BENEFITS	DISADVANTAGES
North 1 (N1)	Close to railway line. Close to low point, topographically, so less visible. Can take gravity feed from Parcel 5. Pumping station and WWTW in same area, sterilises less land for development. Cordon Sanitaire between works and Oakley and proposed development. Existing topography and landscape features provide some screening.	If all sewage could flow by gravity to low point in Parcel 6A, flow would have to be pumped to WWTW then effluent pumped to gravity network. Falls outside Local Plan allocation area. Potential issue with screening if Combined Heat and Power (CHP) is considered later.
North 2 (N2)	Close to B3400 (Worting Road). Easier to access from existing road network. If all sewage could flow by gravity to low point in Parcel 6A, flow could be pumped once to WWTW with effluent discharged to gravity network.	Higher land, topographically, so WWTW more visible. Proximity to residential areas in Parcel 4b.
South 1 (S1)	At topographic low point of whole site.	Sterilises large area of Parcel 6A. Close to existing residential areas.

4.3 STRATEGY OPTIONS

4.3.1 The following sub-sections describe potential options for Waste Water Treatment Strategies. There are two main options:

- → Option 1, provide pumping stations and rising mains to connect sewerage to existing Thames Water and Southern Water networks;
- → Option 2, providing a new WWTW on-site, with treated effluent discharged off-site or to ground via soakaways.

4.3.2 On balance, the preferred location for a new WWTW would be N1, as this appears to have the most positive benefits.

4.3.3 Drawings outlining the strategy options are included in **Appendix B**.

4.4 OPTION 1

4.4.1 The outline strategy for Option 1 is described below:

- → Foul flows from eastern portions of the development routed to Thames Water assets;
- → Foul flows from western portions of the development routed to Southern Water assets;

4.4.2 Tables 4.4 to 4.7 demonstrate the strategy and possible residential unit numbers for the northern phases, with nominal total numbers used at this stage based on initial estimates.

Table 4.4, Phase 1, Option 1.

AREA	APPROXIMATE NUMBER OF PROPERTIES	FOUL DRAINAGE STRATEGY
1	300	Gravity sewer connection to Thames Water WWTW (via Kenilworth Road)
6A	300	Gravity sewer connection to Thames Water WWTW (via Pack Lane)
4B	700	Gravity sewer connection to Southern Water WWTW (via the B3400)
5	400	To PSN1. Pump to gravity sewer in B3400
	Total= 1,700	

Table 4.5, Phase 2, Option 1.

AREA	APPROXIMATE NUMBER OF PROPERTIES	FOUL DRAINAGE STRATEGY
1	300	Gravity sewer connection to Thames Water WWTW (via Kenilworth Road)
2	100	Gravity sewer connection to Thames Water WWTW (via Pack Lane)
5	150	To PSN1. Pump to gravity sewer in B3400
	Total= 550. Cumulative Total= 2,250	

Table 4.6, Phase 3, Option 1.

AREA	APPROXIMATE NUMBER OF PROPERTIES	FOUL DRAINAGE STRATEGY
1	200	Gravity sewer connection to Thames Water WWTW (via Kenilworth Road)
2	550	Gravity sewer connection to Thames Water WWTW (via Pack Lane)
	Total= 750. Cumulative Total= 3,000	

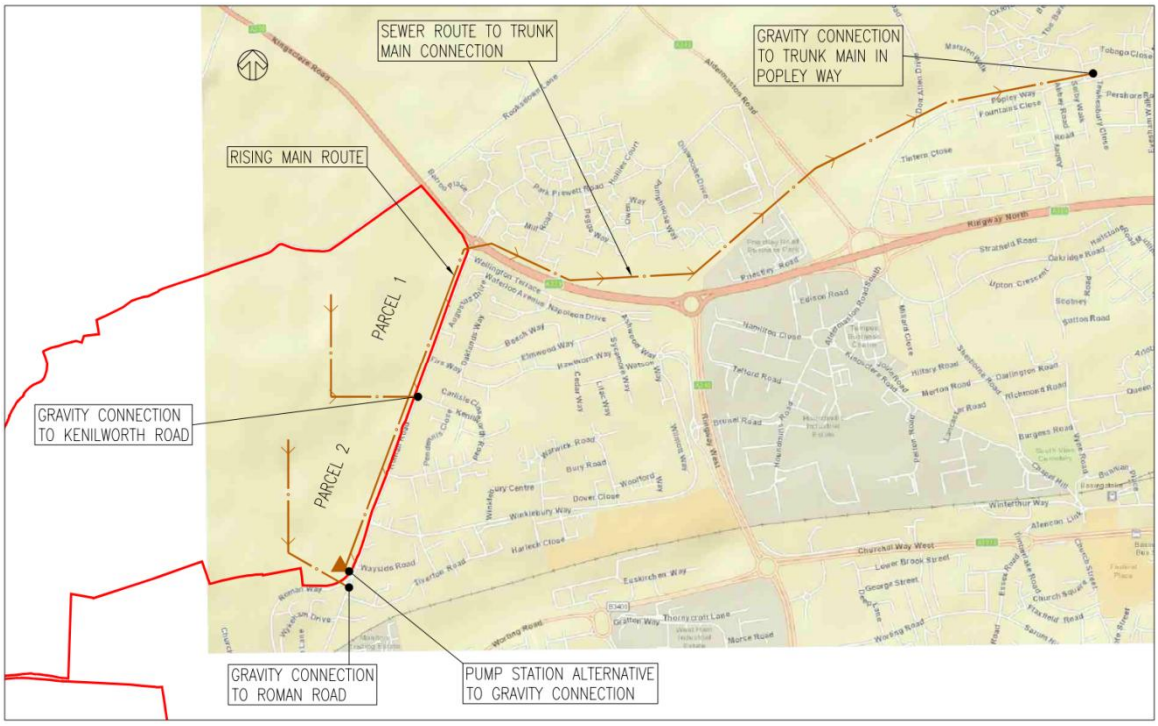
Table 4.7, Phase 4, Option 1.

AREA	APPROXIMATE NUMBER OF PROPERTIES	FOUL DRAINAGE STRATEGY
4A	500	Gravity sewer connection to PSN1 via Parcel 5
4B	500	Gravity/pumped sewer connection to Southern Water WWTW (via the B3400)
	Total= 1,000. Cumulative Total= 4,000	

4.4.3 Option 1 relies upon sufficient capacity being available in the existing Thames Water and Southern Water waste water treatment and sewerage infrastructure. Although the possibility of gravity connection to Thames Water has been considered, it may be that all proposed flows are routed via pumping stations to Popley Way.

4.4.4 The benefits of this option are that existing waste water treatment infrastructure can be used, reducing the land-take required for on-site treatment. Construction of site infrastructure may be part-funded by the Water Authorities under an S104 agreement, based on their estimated revenue from new connections.

Figure 4.3, Parcel 1 and 2 Potential Thames Water Connection Options.



4.5 OPTION 2

4.5.1 Option 2 assumes that connection to Thames Water is not possible, either due to:

- Cost of sewer requisition to Popley Way;
- Capacity issues in Kilworthy Road, Roman Road and Pack Lane area sewer connection points;
- Cost of funding improvements/increased capacity in Whitmarsh Lane.

4.5.2 The outline strategy for Option 2 is described below:

- → Foul flows from eastern portions of the site pumped to gravity sewers in west of site;
- → Flows from Area 6A pumped north and to west of site (gravity connection to Thames Water could still be considered in this area, subject to capacity check);
- → Treated effluent pumped to outfall to the River Test or pumped/drained to soakaway ditches on-site.

4.5.3 Tables 4.8 to 4.11 demonstrate the strategy and possible residential unit numbers for the northern phases, with nominal total numbers used at this stage based on initial estimates.

Table 4.8, Phase 1, Option 2.

AREA	APPROXIMATE NUMBER OF PROPERTIES	FOUL DRAINAGE STRATEGY
1	300	Gravity sewer route to PS2. Pump to sewers in Parcel 4B.
6A	300	Pump from 6A to WWTW Location N1.
4B	700	Gravity sewer to WWTW Location N1
5	400	Gravity sewer to WWTW Location N1.
	Total= 1,700	Treated effluent pumped from PSN1 to new pipe route in B3400 to River Test, or preferably drained to soakaway ditches on-site.

Table 4.9, Phase 2, Option 2.

AREA	APPROXIMATE NUMBER OF PROPERTIES	FOUL DRAINAGE STRATEGY
1	300	Gravity sewer route to PS2. Pump to sewers in Parcel 4B.
2	100	Pump from PS 2 to sewers in Parcel 4B.
5	150	Gravity sewer to WWTW Location N1.
	Total= 550. Cumulative Total= 2,250	

Table 4.10, Phase 3, Option 2.

AREA	APPROXIMATE NUMBER OF PROPERTIES	FOUL DRAINAGE STRATEGY
1	200	Gravity sewer route to PS2. Pump to sewers in Parcel 4B.
2	550	Pump from PS 2 to sewers in Parcel 4B.
	Total= 750. Cumulative Total= 3,000	

Table 4.11, Phase 4, Option 2.

AREA	APPROXIMATE NUMBER OF PROPERTIES	FOUL DRAINAGE STRATEGY
4A	500	Gravity sewer to WWTW Location N1 via Parcel 5.
4B	500	Gravity sewer to WWTW Location N1
	Total= 1,000. Cumulative Total= 4,000	

4.5.4 Option 2 relies on agreement from Water Authorities and the Environment Agency that ground water receptors will not be adversely affected by discharge of treated effluent. The use of soakaways are also subject to the results of ground investigation. It is recommended that this investigated further. The existing Ivy Down Lane WWTW also uses soakaways to discharge treated effluent and it is expected (based on a desktop review of ground conditions) that a similar regime would be suitable for the proposed development.

4.5.5 The costs of tankering away the by-products from a potential WWTW should also be considered, as this requires further treatment through a digestion plant before it can be disposed of.

4.5.6 The benefits of Option 2 are that it could be operated independently of local Water Authorities, if it is possible for an Inset Agreement to be set up. The development would not then be dependent on capacity being available in existing Water Authority networks. Sewerage and WWTW infrastructure would be scaled to suit the size of development. A package treatment facility, using pre-formed modules at first, then upgraded to a permanent installation if necessary as each phase comes forward.

4.6 OPTION SELECTION

4.6.1 At this stage, **Option 2** is the preferred option. This option has the following benefits:

- Potentially use of existing spare capacity in Southern Water's Ivy Down WWTW. There are alternatives within the option for serving early phases, e.g. connecting Area 6A to the Thames Water network. This enables the provision of new treatment works to be pushed back to serve later phases of the development. There will be initial investment required in the strategic gravity and pumped sewer network;
- Allows the development to be self-contained (subject to approval of discharges);
- The WWTW location is within land controlled by the Landowners;
- The WWTW location is close to railway line and does not sterilise areas of land for residential development;
- The WWTW is set within an extensive open area, minimising impact on residential amenity and offering potential for landscape screening.

4.6.2 **Option 2** assumes that treatment of by-products will not be provided within the development. A contractor will need to be employed to tanker by-product away from the WWTW – which would then be treated and disposed of by others, as happens at many other WWTWs.

4.6.3 Proposals for on-site treatment of by-products may be considered at a later stage in the development as demand increases.

5 FORM OF WASTE WATER TREATMENT WORKS

5.1 WWTW

5.1.1 It is anticipated that the WWTW will be an Activated Sludge Plant with phased process streams. This process is proven technology and is easily scalable, i.e. it has the flexibility to allow additional process streams to be installed and run in parallel. The activated sludge process will be utilised with the process designed for full nitrification, denitrification and phosphorous removal if necessary.

5.1.2 The removal of nitrogen and phosphorus (N&P) are two distinct phases within the treatment process. Nitrogen is removal biologically by nitrification within the aerobic reactor and denitrification within an anoxic zone. High internal recirculation between the two zones brings the nitrate rich mixed liquor in contact with the incoming sewage entering the anoxic zone where denitrification occurs.

5.1.3 Phosphorus is removed either chemically utilising coagulant chemicals or biologically by modifying the activated sludge process. It is the intent that biological phosphorus removal will be employed for the WWTW to reduce sludge volumes and operating costs.

5.1.4 To allow for the phased expansion of the works, design will be undertaken using a modular approach with the module size determined from the demand forecasts for the particular investment. The construction of each phase will be dependent upon the projected growth for the scheme.

5.2 FINAL SETTLEMENT

5.2.1 Final settlement tanks will be of radial flow design with the sizing undertaken using solids flux theory to allow for a critical SSVI of not less than 150 ml/gm. Although this approach utilises a greater land area it provides for robust and reliable operations and reduces the risk of loss of material from the clarifier. For this type of process it is not appropriate to use rectangular final tanks which cannot be designed on a reliable solids flux theory.

5.2.2 RAS will be withdrawn from each final settlement tank to a common pump sump for return to the aeration basin. The withdrawal of sludge from each tank will be adjustable to allow for a different underflow rate to be applied to each tank if required. The RAS system will be designed for the return rate from each tank to be adjustable from 0.5 to 1.5 of the applied flow to the tank. SAS will be withdrawn from the RAS system by dedicated SAS pumps. The system will be sized to allow for the maximum anticipated growth rate plus 20% at a range of volumetric feed rates that correspond to the anticipated SSVI range over which that the final tanks will operate.

5.3 FLOW MEASUREMENT

5.3.1 The full flow to treatment and final effluent stream will have continuous automatic flow measurement equipment recording the instantaneous flow plus the totalised daily flow. The flow measurement and recording equipment shall have an accuracy of not less than ± 2%.

5.3.2 In addition, flow measurement will also be provided at various locations through the process flow path. In conjunction with the sampling detailed below, these flow measurements will allow the calculation of the applied loads to the process and the planning of the dates for the implementation of the future phases of construction.

6 MITIGATION, CONCLUSIONS AND RECOMMENDATIONS

6.1 CONCLUSIONS

6.1.1 The report identifies two potential Waste Water Treatment Works (WWTW) locations across the site, with the preferred location being to the west of Area 5 (identified as location “N1” in the report).

6.1.2 A WWTW, if proposed, would be based on the Activated Sludge process, which is easily scalable and an established treatment method. This may take the form of a package treatment works, comprised of either per-cast modular units for flexibility, or of permanent construction (e.g. reinforced concrete tanks). As potential outfall locations to watercourse would involve several kilometres of pumped main and gravity sewer, it is recommended that methods of discharging treated effluent to ground (i.e. through soakaways) are investigated.

6.1.3 Subject to ground investigation, an Inset Agreement - where waste water treatment and sewerage infrastructure is located within the site boundary and operated by a utility company independent of the local Water Authorities - is a feasible alternative to physical connection to existing Water Authority networks that should be considered as part of the planning process.