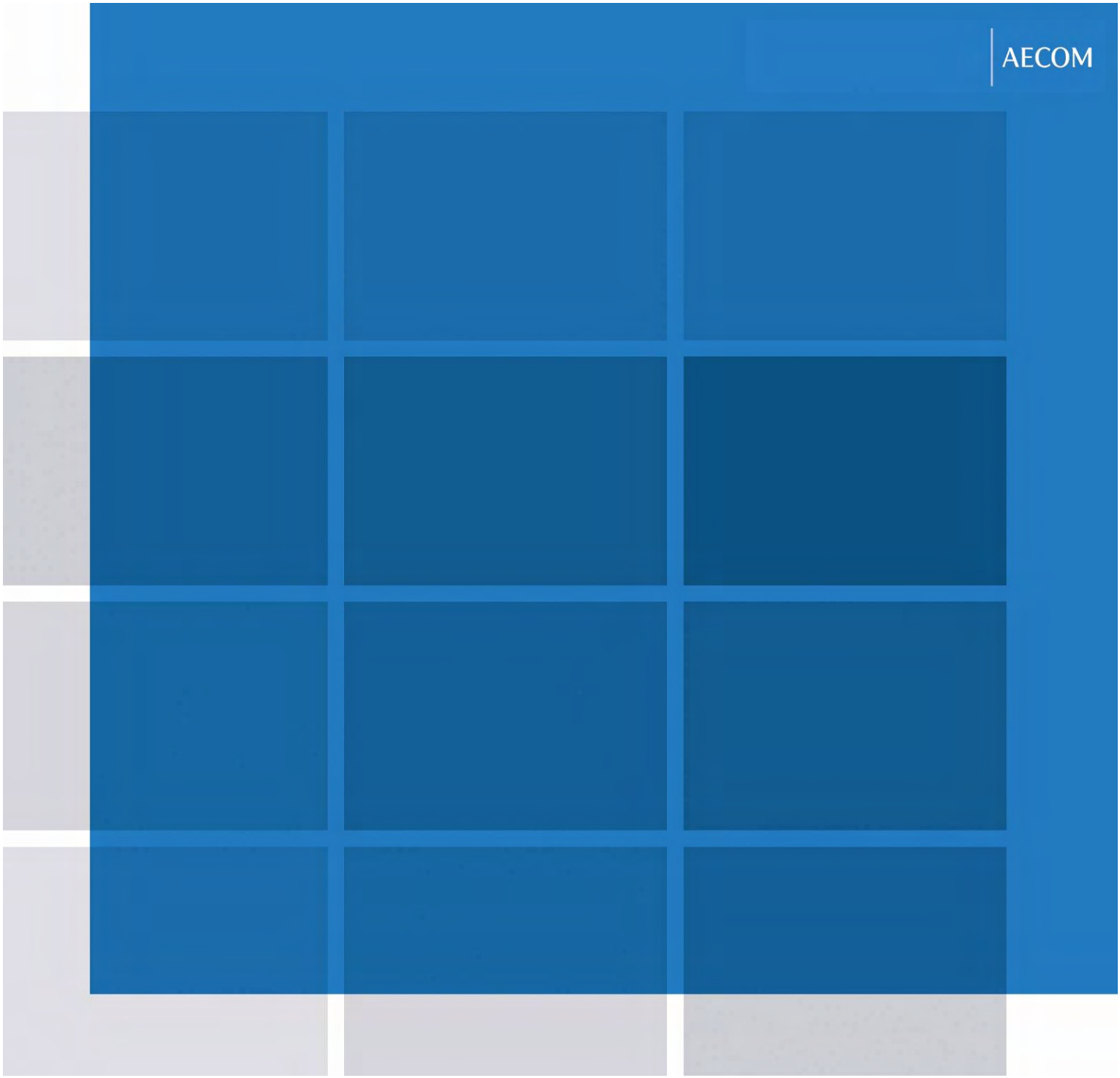
Greater Norwich Infrastructure Needs & Funding Study

Final Report: Appendix F

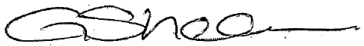
Utilities Assessment

October 2009



Greater Norwich Infrastructure Need and Funding Study - Stage 2
Utilities Assessment

EDAW
May 2009

Prepared by: 

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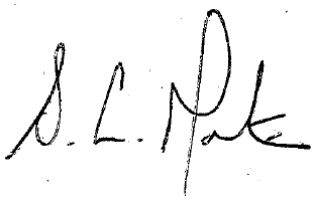
Checked by: 

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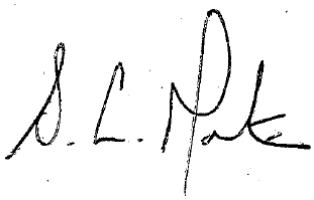
Approved by: 

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Regional Director

Greater Norwich Infrastructure Need and Funding Study - Stage 2

Rev No	Comments	Checked by	Approved by	Date
1	Draft issue	SLM	SLM	May 2009
2	Details of updated housing figures added.	SLM	SLM	May 2009
3	Gas services info added following reply from National Grid dated 22-5-09; potable water costings adjusted; electricity info added following reply from EDF dated 11-6-09	SLM	SLM	June 2009

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1 Introduction

1.1 Project Background

As part of the East of England Plan, the Greater Norwich area has been earmarked for significant development to 2021 and beyond. The Greater Norwich Development Partnership (GNDP), which includes Broadland District Council, Norwich City Council, South Norfolk Council and Norfolk County Council, was set up to address these requirements and is preparing a Joint Core Strategy for the area.

The current requirements mean that from 2006-2026, the Greater Norwich area will need to accommodate approximately 40,000 new dwellings. Of these, 14,000 are already committed through the planning system, leaving approximately 26,000 to be accommodated on new sites throughout the region.

As a result of this proposed level of growth, the Greater Norwich area was awarded new Growth Point Status in 2006.

1.2 Work to date

In December 2007, EDAW issued “Norwich Growth Area – Infrastructure Need and Funding Study” which was intended to identify the infrastructure requirements to facilitate the proposed growth in the region. The study assessed social and physical infrastructure based on two growth scenarios.

The utilities element of this study was undertaken by Peter Brett Associates (PBA) and identified that the level of growth planned for the area would place considerable pressure on the utilities infrastructure.

Since that study, the development proposals have been developed by GNDP. New information was supplied in December 2008 and a single option is now being considered.

Based on the information supplied by GNDP and stakeholder interviews carried out in February 2009, EDAW produced a “Key Assumptions Paper” in March 2009. This aimed to clarify the basis of the next stage of the Infrastructure Need and Funding Study, including the housing and employment locations and the phasing of the proposed growth.

1.3 Purpose of this Report

The Utilities Assessment is intended to identify the major infrastructure requirements to accommodate the latest Greater Norwich development proposals, as detailed in the “Key Assumptions Paper”. Where possible, the Assessment identifies tipping points in the provision of utilities infrastructure to enable a staged programme of works to be established. It also seeks to gain budget estimates from the Statutory Undertakers for any likely reinforcement works.

While it is likely that services diversions will be necessary as a result of the proposed developments, the plans are not sufficiently progressed to allow any likely diversions to be identified. Therefore, costings associated with diversion works are omitted from this report.

2 Scope and Methodology

2.1 Scope

AECOM (formerly Faber Maunsell) was given the following brief:

- liaise with Statutory Undertakers in the Greater Norwich area to establish the likely reinforcement works required to accommodate the current development proposals; and,
- seek to obtain budget cost estimates from utility companies for reinforcement works for provision of mains services to the proposed development areas. Where possible, the costing should be staged in line with the likely timings of the works.

2.2 Methodology

A review of the following documentation was carried out to establish the level of work done to date and the data available:

- Key Assumptions Paper (EDAW March 2009)
- Norwich Growth Area – Infrastructure Need and Funding Study (EDAW, December 2007);
- Strategic Flood Risk Assessment (Millard Consulting, January 2008);
- Greater Norwich Water Cycle Study Stage 2a (Scott Wilson, September 2008);
- Technical Consultation Regulation 25 (GNDP, August 2008);
- Greater Norwich Employment Growth Study (Arup, September 2008); and
- Sustainable Energy Study – Draft (ESD, February 2009).

This review identified some similarities between the previous proposals and the new proposals detailed in the “Key Assumptions Paper”. However, it was decided to approach the Statutory Undertakers with a complete new set of loading information to allow them to provide an updated response.

A loading assessment was carried out based on the housing and employment projections provided in the “Key Assumptions Paper”. Due to a lack of detail in the “Key Assumptions Paper” regarding the locations of many of these proposed new dwellings, only those dwellings with specified locations have been considered in detail as part of this study.

It should be noted that following the issue of the “Key Assumptions Paper”, the development details have been refined further with regard to the split and phasing of the non-specified developments. Details of these new figures, supplied by EDAW, are provided in Appendix B. It can be seen that the total number of dwellings has increased by approximately 8,000. While the named development locations are largely unaffected by this update, with the exception of Norwich, the non-specified development numbers have changed. These non-specified dwellings include:

- urban and rural committed developments;
- windfall schemes;
- schemes resulting from the Regional Spatial Strategy (RSS) review;
- small rural schemes in Broadland and South Norfolk; and,
- projected post-2026 developments.

Where possible, comments have been made regarding any potential implications of the additional non-specified dwellings. However, it should be noted that a detailed assessment of the likely utility costs will not be possible until the proposed locations and phasing of all of the new developments are confirmed.

The following assumptions were made in arriving at the utility loading figures used in this assessment:

- based on the breakdown of housing types, an average occupancy of residential dwelling of 2.55 has been used;
- phasing of the employment growth has been matched with the phasing of the closest residential growth;
- industrial employment sites totalling approximately 85ha have been identified across the Greater Norwich area, plus sites at Longwater, the Airport and Wymondham;
- for industrial (B2/B8) sites, a Gross Employment Area (GEA) of 40% has been assumed;
- office employment sites totalling 300,000sqm have been identified, including Norwich City Centre, Norwich Research Park, Broadland Business Park; and,
- for office (B1) sites, a GEA of 20% has been assumed.

The locations of the proposed development sites are provided in Figure 1.

The loading figures for each site have been split across the year bands 2009-2016, 2017-2021, 2022-2026 and 2027-2031. This is to enable the Statutory Undertakers to identify tipping points in their current infrastructure provision and the timing of any likely reinforcement works. Summaries of the loading figures are provided in Appendix A. As detailed above, these figures are based on the “Key Assumptions Paper”, which has since been updated to the figures in Appendix B.

A further point to note is that the loading calculations are based solely on the housing and employment figures. At the time of writing of this report, there were no details available regarding any new social buildings, eg. schools, healthcare facilities, sports facilities and community buildings, which would also create a demand on the relevant utilities. As such, it has not been possible to include the likely loading for any such facilities in this study.

The electricity and gas loading data was forwarded to EDF Energy and National Grid respectively. Copies of the correspondence are included in Appendices C and D respectively. The figures sent to EDF Energy and National Grid reflected the original development assumptions, as set out in the “Key Assumptions Paper”.

With regard to potable water supply and foul water, it is understood that Stage 2b of the “Water Cycle Study” (WCS) is currently being prepared by Scott Wilson. This study will include detailed liaison with Anglian Water regarding, amongst other things, the infrastructure requirements to supply the proposed development areas with potable water and foul water drainage and treatment.

To avoid repetitive work in this area, this Utilities Assessment draws on the information provided in Stage 2a of the WCS, and tailors the data to reflect the latest development proposals. It should be noted that further, more accurate information about potable water and foul water can be gained from the Stage 2b WCS when it is complete.

Details of the findings for each of the utilities are provided in the following Chapters.

3 Electricity Provision

3.1 Introduction

As part of the previous "Infrastructure Need and Funding Study", PBA received a detailed response from EDF Energy, prepared by Peter Simpson, an Infrastructure Planning Engineer based in Bury St Edmunds. We were keen to utilise this existing knowledge of the scheme and the area, so all correspondence was addressed to the same contact.

The enquiry letter was forwarded to EDF Energy on 30 March 2009, a copy of which is included in Appendix C. This letter enclosed details of the likely electricity loadings for the latest development proposals.

A telephone acknowledgement was received on 1 April 2009, and an electronic version of the figures was requested to assist with the assessment. This was sent by email, a copy of which is attached in Appendix C.

Further emails were sent to EDF Energy on 28 April and 5 May, and there was a telephone conversation on 4 June. A formal response was received on 10 June. A copy of EDF Energy's report is provided in Appendix C.

3.2 Details of Requirements

The response received from EDF Energy details the likely improvements to a series of Primary Substations and then looks at the three Council areas in detail – Norwich, Broadland and South Norfolk. Finally impact of the proposals on the Grid Substations in the area is considered, with budget costings provided. A summary of the findings is given below. It should be noted that as the locations of many of the proposed dwellings have not yet been identified, EDF Energy have made some assumptions that would need to be revisited once further detail is known.

3.2.1 Primary Substations

The likely improvements required to Primary Substations in the area are summarised in Table 3.1 below. The locations of these Substations are given in Figure 2.

Primary Substation	Works required	Comments
Alpington	None up to 2031	
Barrack Street	None up to 2031	Redevelopment of Barrack Street and possible redevelopment of Anglian Square may trigger need for reinforcement
Cringleford	None up to 2031	No account taken of Round House Way development, although this may be included in "Urban Commitments".
Mousehold	None up to 2031	Minor 11kV network transfers may be required to adjacent s/s. This will depend on nature of Salhouse Road employment development.
St Stephens	None up to 2031	Possible regeneration of St Stephens Street may require upgrade of s/s to 132kV/11kV working. Not taken account of in this study as this development is not specifically identified in the proposals.
Tuckswood	None up to 2031	No account taken of possible redevelopment of former shoe factory site as this site is not specifically identified in the proposals.

Table 3.1 – Reinforcement Works to Primary Substations in Greater Norwich Area

3.2.2 Norwich City and Fringe Growth Areas

Improvements are underway at the Earlham Grid Substation in advance of anticipated growth in the area at sites such as Longwater, Three Score, Bowthorpe and the Science Park. The initial phase of this work was completed in 2007 and included the installation of additional 33kV/11kV

transformer capacity. The second phase, due for completion in 2011, will include the installation of additional 132kV circuit capacity from the Norwich Main Supergrid Substation. The final phase has not been programmed yet and will depend on the phasing of the proposed growth. This phase will include the construction of a new 132kV/11kV Substation at Earlham Grid.

Any new development in the area to the north of Norwich, including Hellesdon, the existing Norwich Airport Industrial Estate and the proposed site to the north-east of Norwich Airport, would require a new Primary Substation. EDF Energy Networks owns a site on Hurricane Way that could accommodate such a Substation, and also a new Grid Substation (see below). A new Primary Substation could release capacity in the Boundary Park and George Hill Primary Substations by transferring the existing 11kV distribution network. This in turn would allow for additional growth in these areas, including any commercial or industrial development in the area of the Airport. This work is required imminently to provide this additional capacity.

The area to the north east of Norwich includes significant proposed development and if this were to be progressed, there would be a significant shortfall in supply capacity in the period leading up to 2021. This shortfall would occur even with the new Primary Substation at Hurricane Way discussed above. An additional new high capacity 30MW Primary Substation would be required to meet demand. However, the 33kV network does not currently exist to supply this new Substation, and there would not be sufficient capacity at the local Grid Substations to meet this additional demand. One possible solution highlighted by EDF Energy is the provision of a new Grid Substation at a site known as Norwich East. This is discussed in further detail below.

3.2.3 *Broadland District Growth Areas*

The existing Broadland Business Park is fed from the Primary Substation at Peachman Way which has capacity to accommodate the original proposals for the Business Park. Any additional expansion to the Business Park or the development of the adjacent Broadland Gate development will trigger the need for additional capacity. To meet this additional demand, a new Primary Substation could be built within the new development or the old transformers and 11kV switchgear at Peachman Way could be replaced. The 33kV cables linking the Peachman Way Primary Substation to the Thorpe and Trowse Grid Substations only have sufficient capacity for the existing equipment so would also require upgrading. An alternative solution would be the creation of a new Grid Substation at Norwich East, as discussed below.

Development in the Rackheath and Sprowston areas would require significant reinforcement to the Sprowston Primary Substation and the upgrading of the existing 33kV underground cables. As such, a preferred option for supplying development in this area is from a new Norwich East Grid Substation.

3.2.4 *South Norfolk District Growth Areas*

Long Stratton and the surrounding area is currently supplied at 11kV from the Hapton Primary Substation. These transformers are already close to capacity so the proposed development will trigger the need for the upgrading of this Primary Substation in the period 2017-2021.

Wymondham and the surrounding area is currently supplied at 11kV from a Primary Substation at Lady's Lane in Wymondham. Based on the development proposals, this substation would be approaching its capacity at the end of the period 2022-2026, so would require upgrading. These works would include the replacement of the existing transformers and also the upgrading of the switchboard to provide additional capacity.

3.2.5 *Grid Substations*

Development in the area of Norwich Airport could potentially be accommodated through the introduction of a new Grid Substation at Hurricane Way, in addition to the new primary substation detailed above. However, if further development were to also take place at Broadland Business Park and the adjacent Broadland Gate, there would be an additional shortfall in capacity. As such, EDF consider that this is not the optimal option for serving the proposed developments to the north and east of Norwich.

It is proposed that a new Norwich East Grid Substation is established on an existing EDF Energy Networks site on Green Lane, to the north of Broadland Business Park. When the last was originally purchased by EDF Energy Networks, it was anticipated that it would house a new 132kV Grid Substation, subject to obtaining the usual planning consents. This Grid Substation

would then feed new Substations at Norwich Airport North and Broadland Park East and the existing Substations at Peachman Way and Sprowston via new 33kV circuits.

In addition, new 33kV circuits could also be provided to a new Primary Substation in Rackheath which could potentially feed heat pumps in the new Eco-Town or to absorb excess power from potential on-site bio-generation.

Although not specifically included in the latest development proposals, any increases in development to the south of Norwich City Centre could not be accommodated by the existing 132kV/33kV transformers at the Trowse Grid Substation. Additionally, there is insufficient land on the Substation site to install additional capacity. Should additional capacity be required in this area, the only practicable way of achieving this would be to transfer some of the existing demand on the 33kV network to elsewhere on the system. EDF Energy has suggested that the conversion of the existing St Stephens Substation in the Chapelfield shopping development to 132kV/11kV operation would be the easiest way of transferring this demand. This reinforcement would include the installation of new 132kV underground cables, the removal of relatively new 33kV/11kV transformers and the installation of 132kV/11kV units. EDF Energy has indicated that they would not wish to carry out this work until it could be combined with the programmed replacement of nearby underground cables, thereby minimising the cost and disruption. The programming of this work is not yet known but it is anticipated that it is likely before 2031.

3.2.6 *Summary*

EDF Energy summarise the requirements as follows:

- major reinforcement works would be required in the Greater Norwich area to accommodate the growth proposals;
- a new Grid Substation will be required to the east of Norwich at an existing EDF Energy site on Green Lane;
- three new Primary Substations will be required across the area, while two existing Substations will require the replacement of the transformers and switchgear;
- significant lengths of 132kV and 33kV underground cables will be required to feed these new developments, the laying of which will have the usual impacts on traffic and local residents.

EDF Energy has provided indicative costings for the proposed works and the likely timescales. These are summarised in Tables 3.2 and 3.3 below:

Substation	Works required	Indicative overall cost (£K)	Developer's Contribution (£K)	Timescale
Hurricane Way Primary	New Primary Substation on existing site	5,436	1,630	2009-2016 (before 2012)
Norwich Airport North	New Primary Substation on new site + 33kV circuits	6,320	6,320	2017-2021
Sprowston/ Rackheath No. 2	New Primary Substation on new site + 33kV circuits	4,313	4,313	2022-2026
Hapton Primary	Replacement of transformers and switchgear in existing site	2,530	430	2022-2026
Wymondham Primary	Replacement of transformers and switchgear in existing site	2,530	826	2022-2026
Norwich East Grid	New Grid Substation on existing site + 132kV cables	17,060	0	2017-2021
St Stephens	Reinforcement of existing Substation + 132kV cables	10,750	0	2027-2031
TOTAL		**48,939**	**13,519**	

Table 3.2 – Indicative Costs for Electricity Infrastructure Improvements

Substation	Electricity network reinforcement costs for proposed growth in: (£K)			
	2009-2016	2017-2021	2022-2026	2027-2031
Hurricane Way Primary	5,436			
Norwich Airport North		6,320		
Sprowston/ Rackheath No. 2			4,313	
Hapton Primary			2,530	
Wymondham Primary			2,530	
Norwich East Grid		17,060		
St Stephens				10,750
TOTAL	**5,436**	**23,380**	**9,373**	**10,750**

Table 3.3 – Potential Funding Projection for Electricity Infrastructure Improvements

Based on EDF Energy's initial cost assessment of the reinforcement requirements, the total cost is in the region of £49,000,000, which could potentially attract a developer's contribution of £13,500,000.

The costs in Tables 3.2 and 3.3 are intended to give an order of cost and are purely indicative. Possible routes of cables have been identified as part of a desk top study but no on site investigations have been carried out. The costs are based on 2009 material prices and labour costs, so there is likely to be considerable variation in these costs by the time the projects come online.

The developer's contributions in Table 3.2 are based on a connection charging policy, which has to be agreed with the regulator Ofgem (Office of the Gas and Electricity Markets). There is no guarantee that the same charging policy will be in place at the time of each development. These policies are reviewed at each Distribution Price Control Review (DPCR) and a new review is carried out every 5 years. The current review, DPSR5, is currently underway.

3.3 Funding Options

EDF Energy has indicated that they would not want to commit to any infrastructure costs for potential demand that may not materialise. In addition, they could be faced with the situation where they provide significant up-front infrastructure that could then be used by another supplier. As such, developments would need to have detailed planning permission to provide some surety that the predicted additional demand will become a reality.

Strategic infrastructure improvements are intended to satisfy expected growth within realistic timescales to meet the requirements of the regulator Ofgem. Any additional development beyond this baseline may need to be delayed or scaled down to allow for the necessary reinforcement to be provided.

Reinforcement works associated with standard, developer-led developments would be programmed in following receipt of planning permission. However, for larger scale developments, such as those proposed in the Greater Norwich area, this programme is not possible. For example, a new grid connection could take 5-10 years to implement, while a new primary sub-station could take 3-5 years. As planning permission is only valid for a period of 3 years, it would not be possible to carry out these significant infrastructure improvements within the timescales provided. Additionally, as the onus would be on the developer to fund the necessary infrastructure, many developers may not be willing to be the first to apply for planning permission.

EDF has indicated that funding for the reinforcement works to Earlham Grid Substation, detailed above, has been obtained via a site-specific infrastructure capacity charge, which has been specifically agreed with Ofgem for this project. This method of funding resulted from the absence of a lead developer who was willing to make the first planning application. Each subsequent planning application in the area of the Earlham Grid Substation will be subject to this capacity charge, allowing EDF Energy to claw back some of the initial outlay.

A further point to note is that the East of England Development Agency (EEDA) has recently commissioned a “Power Infrastructure Study” which is to look specifically at the electricity infrastructure in the East of England with regard to:

- pinch points in the existing infrastructure that could potentially restrict growth in the area;
- methods of providing the necessary power infrastructure in a cost effective and timely manner;
- methods of accommodating renewable generation in the existing network; and,
- potential new or amended methods of funding reinforcement works to the power infrastructure.

It is understood that a draft version of this report has recently been issued, with the final report expected to follow shortly.

4 Gas Provision

4.1 Introduction

No previous correspondence with National Grid was available to inform this study, and as such, a developer's enquiry letter was forwarded to National Grid's Transmission and Distribution arms on 1 April 2009. A copy of this correspondence is included as Appendix D.

An acknowledgement email was received on 3 April 2009, indicating that there would be a two week delay in responding to the enquiry.

A formal response was received from National Grid Transmission in an email dated 29 April 2009. This response gives details of the existing National Grid assets located in the study area, for both electricity and gas transmission. No details were provided for Gas Distribution, however. A copy of this letter is provided in Appendix D.

A follow up email was forwarded to National Grid Distribution on 30 April 2009. A detailed response was received from National Grid Distribution on 22 May 2009, a copy of which is provided in Appendix D. The details of this response are summarised below.

It should be noted that no information can be provided at this stage about potential diversionary works. In addition, the information supplied by National Grid discounts any other potential loads on the network from other sources. As such, future supplies at all of the sites analysed could be influenced by other factors.

As there are no specific details of the development locations, assumptions have been made by National Grid in their analysis. The main assumption is that connections will be made, where possible, to existing Medium Pressure (MP) and Intermediate Pressure (IP) mains. Where no such main exists, the connection has been made to the nearest supply, potentially a Low Pressure (LP) main. As the proposed location of each development currently covers a wide area, a single central connection point has been assumed. Once the proposals have been progressed further, a more detailed assessment can be made for each development.

4.2 Details of Requirements

The response from National Grid Transmission confirms that there are unlikely to be any capacity issues relating to the high pressure gas transmission assets. The existing gas networks in the area are of sufficient size to accommodate significant growth.

Details of the National Grid Gas Transmission pipelines are provided in the response letter in Appendix D and copies of the Asset Plans are included in Appendix E.

4.2.1 Norwich

The existing gas infrastructure has sufficient capacity to accommodate the proposed growth up to 2016, but beyond that time, reinforcement works would be required. This is based on connection into the IP main (2-7bar) in St Faith's Road. As stated above, this single connection point has been assumed in order for National Grid to carry out this initial analysis. Once more detailed proposals are available, a more accurate indication of the necessary reinforcement works can be provided.

4.2.2 Broadland – Rackheath

There is insufficient capacity in the existing gas distribution infrastructure to accommodate the proposed growth in this area. Upgrades would be required to cater for the first phase of growth in the period 2009-2016. The IP network would require reinforcement to ensure that the minimum pressure can still be achieved at the extremities of the network. It has been assumed that a new connection to the IP main would be made at the Salhouse Road/Green Lane East junction.

It is noted that an MP network (75mbar – 2 bar) is also located nearby but this too would be unable to support development in this area and an upgrade to the IP network may be preferable.

4.2.3 *Broadland – Sprowston Fringe*

The infrastructure in this area has sufficient capacity to accommodate the proposed residential growth up to 2016, but beyond that date, reinforcement would be required. This reinforcement would be needed to the local IP main at Wroxham Road. It is noted that a LP main (30-75mbar) is also present in Wroxham Road, but this would not support the proposed development.

Any potential employment development in Sprowston Fringe is likely to be located in the Salhouse Road area. This development could connect to the existing IP network in Salhouse Road, although, as with Rackheath, reinforcement would first be required.

4.2.4 *Broadland – Thorpe St Andrew (Broadland Business Park)*

Potential additional employment development at Broadland Business Park, up to 2031, could be accommodated within the capacity of the existing gas distribution infrastructure. This is based on an assumed connection to the IP main in Green Lane/Cranley Road.

It should be noted that in the previous assessment carried out by PBA, National Grid identified that further development at Broadland Business Park would require “significant investment” in terms of gas infrastructure. It is understood that it is likely that the original assessment was carried out based on supplying the development from a nearby LP main, which would require significant reinforcement.

Once further details about the development are known, the most appropriate and cost effective connection option can be determined.

4.2.5 *South Norfolk – Wymondham*

The closest gas distribution infrastructure to Wymondham is an MP main at Norwich Road/ Norwich Common. The proposed development could be fed from this main but the analysis carried out by National Grid indicates that reinforcement would be required at the network extremities to maintain the minimum pressure. This reinforcement work would be needed to cater for the first phase of growth in the period 2009-2016.

4.2.6 *South Norfolk – Long Stratton*

The only option for supplying the proposed development at Long Stratton is to utilise the local IP main. Substantial reinforcement would be required to accommodate any level of development in this area.

4.2.7 *South Norfolk – Hethersett*

The infrastructure in this area has sufficient capacity to accommodate the proposed residential growth up to 2016, but would require reinforcement beyond that date. This is based on connecting to the MP main in Norwich Road.

This additional loading combined with the loading at Wymondham would tap into the same network causing failure, which would result in significant reinforcement.

4.2.8 *South Norfolk - Cringleford*

Any new gas loading in Cringleford would be fed from the same MP main as Wymondham and Hethersett. As such, reinforcement would be required at the network extremity points to maintain the minimum pressure.

4.2.9 *South Norfolk - Easton*

The closest gas infrastructure to the proposed development at Easton is the LP main along the A47. There is sufficient capacity in this main to supply the first phase of development in the period up to 2016, but beyond that date, significant reinforcement work would be required to both the LP main and also the supplying IP infrastructure.

4.2.10 *South Norfolk – Costessey (Longwater)*

The closest gas infrastructure to the existing Longwater development is the LP main in Longwater Lane. Any additional loading on this main resulting from new development at Longwater would require reinforcement works.

4.2.11 *South Norfolk – Colney (Norwich Research Park)*
The closest gas infrastructure to Norwich Research Park is the MP main in Colney Road. Based on an additional 50ha of the site being developed for employment use, the analysis indicates that no additional reinforcement works would be required.

4.2.12 *Other sites*
As only limited location information is currently available, National Grid are unable to provide details of any likely reinforcement works for the other proposed dwellings and employment areas. This information can be obtained when details of the development locations have been progressed.

4.3 Summary of Gas Requirements

Based on the development information supplied at this stage, National Grid has identified the areas where reinforcement works would be required to accommodate the proposed levels of growth. These are summarised in Table 4.1 below:

Area	Gas network reinforcement required for proposed growth in:				Additional information:
	2009-2016	2017-2021	2022-2026	2027-2031	
Norwich		✓			IP connection
Rackheath	✓				IP connection
Sprowston Fringe		✓			IP connection
Thorpe St Andrew (Broadland Business Park)					No reinforcement required
Wymondham	✓				MP connection – combined effect with Hethersett and Cringleford
Long Stratton	✓				IP connection – substantial reinforcement
Hethersett		✓			MP connection – combined effect with Wymondham and Cringleford
Cringleford	✓				MP connection – combined effect with Wymondham and Hethersett
Easton		✓			LP connection, but LP and IP reinforcement
Costessey (Longwater)	✓				LP connection
Colney (Norwich Research Park)					No reinforcement required

Table 4.1 – Summary of Gas Reinforcement requirements

At this stage, it is not possible for National Grid or any other Utility Infrastructure Provider (UIP) or Independent Gas Transporter (IGT) to provide a meaningful quotation for the likely reinforcement works as there is insufficient detail in the proposals.

When the proposals have been progressed sufficiently, a quotation request can be submitted to either National Grid or one of the UIPs or IGTs. National Grid are not the only company who can provide a quotation for a new gas supply or work on existing gas pipes/infrastructure. In most instances there is a choice of companies that can be used for gas connection services.

A quotation request would need to be submitted for each development area rather than the Norwich Growth Area as a whole, and there is a sliding scale of charges for the provision of

quotation information. A copy of National Grid's "Quotation Charges and Service Category Table" is provided as Appendix F.

4.4 Funding Options

As with EDF Energy, National Grid Gas is regulated by Ofgem. National Grid is required to put in place strategic improvements to the network that will satisfy expected growth in demand in a realistic timescale. This Asset Management Plan (AMP) is prepared in advance of each period, so the expected growth should be sufficiently committed to allow the additional demand to be included. Any network improvements included in the AMP are funded from the company's revenue and National Grid commits to a range of improvements over a 5 or 10 year period.

Strategic improvements to the gas network that can be funded in this way cover reinforcement works to High Pressure (HP) and IP mains. Therefore, there is the potential for a number of the improvements identified in Table 4.1 to be included in National Grid's next AMP. This is, however, dependent on the proposals being sufficiently developed within the required timescale. Growth in demand is notoriously difficult to predict, so the development proposals for the Greater Norwich area should be identified as early as possible to allow them to be taken into account.

In cases where the actual demand from a development exceeds the existing capacity or that predicted for the AMP, the shortfall in provision will be partially funded by the developer. The exact level of developer funding is calculated by offsetting the capital expenditure against the likely long-term revenue to National Grid.

Improvements to other, non-strategic mains cannot be included in the AMP. As such, these improvements are expected to be funded by the developer, albeit at a level offset against potential revenue to National Grid.

At this stage, it is not possible for National Grid to identify diversion works associated with the proposed growth as the development locations are not sufficiently advanced. However, the cost of any diversion works will be borne by the developer, with the works undertaken by National Grid, a UIP or IGT. If the new demand is resulting from a number of different developments, the cost is distributed proportionally to each developer.

5 Potable Water Supply

5.1 Introduction

The Stage 2a WCS was prepared by Scott Wilson in September 2008 and looks at the infrastructure requirements for various development scenarios throughout the Greater Norwich area.

The WCS also includes detailed liaison with Anglian Water Services Ltd (AWS) and the Environment Agency (EA), who have provided information where it is available.

This Chapter summarises the findings of the Stage 2 WCS in relation to the supply of potable water, extracting the data specific to the latest development proposals, as defined in the "Key Assumptions Paper" and subsequent update.

The WCS assesses a series of potential development locations, which are illustrated in Appendix G, which is a copy of Appendix B of the WCS.

It should be noted that the costings applied to the different water supply options in the WCS have been taken at face value and no detailed checks have been carried out on the figures. However, where there are obvious discrepancies in the figures, these have been addressed as part of this assessment. It is understood that the costings in the WCS were prepared as a means of comparing the potential development sites and will need to be refined as the WCS progressed to the next stage.

5.2 Summary of Requirements and Options

AWS has indicated that the existing water supply network in the Greater Norwich area is at capacity, so all new development will require a new mains system. Any infill development is assumed to be accommodated within the existing network capacity, however.

It has been assumed in the WCS that the existing infrastructure at the Heigham Water Treatment Works (WTW) is sufficient to receive additional water supply for distribution around the Greater Norwich area. This WTW will be able supply all of the development areas and this approach has been agreed with AWS. The location of Heigham WTW is shown in Figure 3.

There are a number of potential water sources within the Greater Norwich area that could be used to supply potable water for the proposed development areas. These are discussed below.

While costs have been provided in the WCS for each water resource option, the actual water source for each site cannot be decided until further detail is available on the exact location, size, type and phasing of the proposed developments. As a result, both best and worst case costings are provided in this report.

5.2.1 Thorpe St Andrew BH and Colney BH

Both of these existing boreholes have spare capacity associated with their current licensed abstraction volumes. Each has approximately 4Ml/day spare capacity, totalling 8Ml/day. This capacity is sufficient to supply up to 21,000 of the 40,000 new homes. The locations of these existing boreholes are indicated in Figure 3.

All of this spare capacity would be required if all of the development areas were to be progressed. It is proposed that this spare capacity is prioritised to minimise the need for new water resources from outside the study area and also provide capacity to accommodate the first stages of development while other options are considered for future supply.

For the smaller, rural development areas, the costings have been based on using only the closest of these two boreholes.

Costs include any new pipework and pumping stations needed to maximise each borehole.

As this source is to be prioritised, it has been assumed for this study that the infrastructure required to connect these boreholes to each development location is implemented to allow for

the first stages of each development. Beyond the initial period, another water resource option is then considered to meet additional demand.

5.2.2 *River Wensum Reuse*

It is assumed that there is no spare capacity in the River Wensum for abstraction as there are low flow issues that have significant ecological impacts in the Wensum Special Area for Conservation (SAC). This SAC extends along the River Wensum adjacent to the Costessey Abstraction Points (AP).

However, the option of reusing water from the River Wensum has been considered in the WCS. This allows for the pumping of effluent from Whitlingham WwTW back up the River and discharging it downstream of Costessey AP, thereby minimising the ecological impact. For this exercise, it was assumed that only the additional discharge associated with the new developments in the Greater Norwich area would be reused, equating to a maximum of 44,500. All existing discharge would continue to be discharged at its current outfall, downstream of the WwTW. The locations of the WwTW and Costessey AP are shown in Figure 3.

This is an approach that has been considered feasible by AWS, and would reduce the need to import water resource from outside the catchment.

Costs include any new pipework and pumping stations needed to pump effluent from Whitlingham WwTW to Heigham WTW.

5.2.3 *Great Ouse Groundwater Development System (GOGDS)*

AWS has produced a Draft Water Resources Management Plan (WRMP) which has identified the GOGDS as a potential water resource for the area. This involves the transfer of treated groundwater south of the study area via the Thetford catchment. The WRMP estimates that this source could potentially supply up to 12.3Ml/day.

Costs include only new pipework and pumping stations from Heigham WTW. There will be additional costs associated with this option which are outside the WCS study area, and therefore, the GOGDS costs in the WCS and hence this report will be underestimated.

5.2.4 *Water Resource Storage*

To mitigate the impact of additional abstraction from the River Wensum during periods of low flow, this option allows for the abstraction and storage of water during periods of high flows. The stored water is then discharged back into the river when it is required.

This could be achieved through the creation of online storage, by means of a dam across the watercourse. However, this option is likely to be opposed due to the SAC status of the area.

The other option is off-line storage where water is directed from the watercourse by means of a gate, spillway or pipe, into an adjacent storage area. Again, this water would then be discharged back into the river during periods of low flow to mitigate the additional abstraction. This method of storage is currently in use at Costessey AP, but on a much smaller scale.

It should be noted that the WCS estimates that the total off-line storage requirement for all of the development sites combined would be in the region of 2,190,000m^3/year, with up to 110Hha of land required. While the costs of this land have been included in the costs estimates, the practicalities of releasing this area of land have not been considered in detail.

Costs include estimates for excavation, civil works, structural works and the costs of land.

5.3 Budget Costings

5.3.1 *Norwich*

This area forms part of Norwich Policy Area (NPA) 11 in the WCS, known as Norwich City.

The current proposals, based on the updated figures provided in Appendix B, include for 13,400 new dwellings, on allocated and committed sites throughout the city. The majority of these dwellings would be completed prior to 2026.

This area also includes 100ha of allocated employment land, assumed to be split 50/50 between B1 office space and B2/B8 industrial development.

As the WCS considers only the proposed residential developments, the loading calculations included in Appendix A have been used to convert the employment loading to an equivalent residential loading to enable the costs data to be extracted from the WCS.

The loading associated with the proposed employment developments in Norwich City is equivalent to approximately 3,200 additional dwellings, giving an effective total of 16,600 dwellings.

Based on this information, estimates of the costs associated with the supply of clean water to this development area are as shown in Table 5.1. For the purposes of this study, a best case and worst case cost has been calculated. The total costs are based on the supply of water from Heigham WTW and the initial demand being met by the two existing boreholes, plus either the single largest or smallest other water resource cost that may be required once the spare borehole capacity has been used.

Option	Water Main (£M)	Pumping Stations (£M)	Pipework from Source (£M)	Total (£M)
Water supply from Heigham WTW	1.8	1.0	-	**2.8**
Maximise Thorpe St Andrew BH	-	2.7	4.6	**7.3**
Maximise Colney BH	-	1.9	3.3	**5.2**
River Wensum Reuse	-	-	-	**14.5**
GOGDS	-	-	-	**2.8**
Offline Storage	-	-	-	**28.9**
TOTAL - Worst Case (supply and BHs plus largest water resource cost only)				**44.2**
TOTAL - Best Case (supply and BHs plus smallest water resource cost only)				**18.1**

Table 5.1 – Norwich Estimated Water Supply Costs

It can be seen from Table 5.1 that the highest additional water resource cost for Norwich is the use of offline storage. The best case uses the GOGDS. It should be noted that for both cases, the existing boreholes will be maximised before any other resources are used. The actual source of water for Norwich will depend on a number of factors, including the phasing of the development.

5.3.2 *Broadland - Rackheath*

This area forms part of NPA3a in the WCS, known as the North East Sector (outside NNDR, vicinity of Rackheath).

The current proposals include for 3,400 new dwellings, the majority of which would be implemented prior to 2026.

Based on this information, estimates of the costs associated with the supply of clean water to this development area are as shown in Table 5.2. For the purposes of this study, a best case and worst case cost has been calculated. The total costs are based on the supply of water from Heigham WTW and the initial demand being met by the two existing boreholes, plus either the single largest or smallest other water resource cost that may be required once the spare borehole capacity has been used.

Option	Water Main (£M)	Pumping Stations (£M)	Pipework from Source (£M)	Total (£M)
Water supply from Heigham WTW	3.6	2.0	-	**5.6**
Maximise Thorpe St Andrew BH	-	3.0	5.2	**8.2**
Maximise Colney BH	-	2.6	4.5	**7.1**
River Wensum Reuse	-	-	-	**8.3**
GOGDS	-	-	-	**5.2**
Offline Storage	-	-	-	**6.0**
TOTAL - Worst Case (supply and BHs plus largest water resource cost only)				**29.2**
TOTAL - Best Case (supply and BHs plus smallest water resource cost only)				**26.1**

Table 5.2 – Rackheath Estimated Water Supply Costs

It can be seen from Table 5.2 that the highest additional water resource cost for Rackheath is the River Wensum Reuse. The best case uses the GOGDS. It should be noted that for both cases, the existing boreholes will be maximised before any other resources are used. The actual source of water for Rackheath will depend on a number of factors, including the phasing of the development.

5.3.3 *Broadland – Sprowston Fringe*

This area forms part of NPA2 in the WCS, known as the North East Sector (inside NNDR).

The current proposals include for 6,600 new dwellings in the Sprowston Fringe area, the majority of which would be implemented between 2017 and 2031.

This area also includes the potential employment development at Salhouse Road. This has been assumed to be B2/B8 industrial development with a total area of 3.1ha.

As the WCS considers only the proposed residential developments, the loading calculations included in Appendix A have been used to convert the employment loading to an equivalent residential loading to enable the costs data to be extracted from the WCS.

The loading associated with the Salhouse Road employment area is equivalent to approximately 50 additional dwellings, giving an effective total of 6,650 dwellings.

Based on this information, estimates of the costs associated with the supply of clean water to this development area are as shown in Table 5.3. For the purposes of this study, a best case and worst case cost has been calculated. The total costs are based on the supply of water from Heigham WTW and the initial demand being met by the two existing boreholes, plus either the single largest or smallest other water resource cost that may be required once the spare borehole capacity has been used.

Option	Water Main (£M)	Pumping Stations (£M)	Pipework from Source (£M)	Total (£M)
Water supply from Heigham WTW	3.9	2.3	-	**6.2**
Maximise Thorpe St Andrew BH	-	3.0	5.1	**8.1**
Maximise Colney BH	-	3.4	5.6	**9.0**
River Wensum Reuse	-	-	-	**10.0**
GOGDS	-	-	-	**4.2**
Offline Storage	-	-	-	**11.6**
TOTAL - Worst Case (supply and BHs plus largest water resource cost only)				**34.9**
TOTAL - Best Case (supply and BHs plus smallest water resource cost only)				**27.5**

Table 5.3 – Sprowston Fringe Estimated Water Supply Costs

It can be seen from Table 5.3 that the highest additional water resource cost for Sprowston Fringe is offline storage, while the best case uses the GOGDS. It should be noted that for both cases, the existing boreholes will be maximised before any other resources are used. The actual source of water for Sprowston Fringe will depend on a number of factors, including the phasing of the development.

5.3.4 *Broadland – Thorpe St Andrew (Broadland Business Park)*

Broadland Business Park lies closest to NPA3b in the WCS, known as the East Sector (outside NNDR).

The current proposals include employment development at Broadland Business Park. This has been assumed to be B1 office development with a total area of 25ha.

As the WCS considers only the proposed residential developments, the loading calculations included in Appendix A have been used to convert the employment loading to an equivalent residential loading to enable the costs data to be extracted from the WCS.

The loading associated with the Broadland Business Park employment area is equivalent to approximately 580 dwellings.

Based on this information, estimates of the costs associated with the supply of clean water to this development area are detailed in Table 6.3 below. As the smallest development size considered in the WCS is 1000 dwellings, these figures have been used where interpolation cannot be achieved. For the purposes of this study, a best case and worst case cost has been calculated. The total costs are based on the supply of water from Heigham WTW and the initial demand being met by the two existing boreholes, plus either the single largest or smallest other water resource cost that may be required once the spare borehole capacity has been used.

Option	Water Main (£M)	Pumping Stations (£M)	Pipework from Source (£M)	Total (£M)
Water supply from Heigham WTW	2.8	1.3	-	**4.1**
Maximise Thorpe St Andrew BH	-	1.8	4.1	**5.9**
Maximise Colney BH	-	1.6	3.5	**5.1**
River Wensum Reuse	-	-	-	**6.6**
GOGDS	-	-	-	**4.1**
Offline Storage	-	-	-	**1.0**
TOTAL - Worst Case (supply and BHs plus largest water resource cost only)				**21.7**
TOTAL - Best Case (supply and BHs plus smallest water resource cost only)				**16.1**

Table 5.4 – Thorpe St Andrew (Broadland Business Park) Estimated Water Supply Costs

It can be seen from Table 5.4 that the highest additional water resource cost for Thorpe St Andrew is River Wensum Reuse. The best case option is the use of offline storage. It should be noted that for both cases, the existing boreholes will be maximised before any other resources are used. The actual source of water for Thorpe St Andrew will depend on a number of factors, including the phasing of the development.

5.3.5 *Broadland – Smaller Sites*

The smaller sites around the Broadland area potentially cover Reepham, Aylsham, Wroxham and Acle. Each of these sites is covered in the WCS as Rural Policy Area (RPA) 1, 2, 3 and 4 respectively.

The current proposals include for a total of 2,000 new dwellings at these sites, all of which would be implemented prior to 2026.

It has been assumed that the 2,000 new dwellings are split equally between each of these sites, resulting in 500 additional dwellings in each location.

Based on this information, estimates of the costs associated with the supply of clean water to this development area are as shown in the following tables. For the purposes of this study, a best case and worst case cost has been calculated. The total costs are based on the supply of water from Heigham WTW and the initial demand being met by the closest of the two existing boreholes, plus either the single largest or smallest other water resource cost that may be required once the spare borehole capacity has been used.

Option	Water Main (£M)	Pumping Stations (£M)	Pipework from Source (£M)	Total (£M)
Water supply from Heigham WTW	3.9	1.7	-	**5.6**
Maximise Thorpe St Andrew BH (23.0km)	-	2.3	5.2	**7.5**
Maximise Colney BH (20.5km)	-	2.1	4.7	**6.8**
River Wensum Reuse	-	-	-	**6.5**
GOGDS	-	-	-	**5.6**
Offline Storage	-	-	-	**0.9**
TOTAL - Worst Case (supply and BH plus largest water resource cost only)				**18.9**
TOTAL - Best Case (supply and BH plus smallest water resource cost only)				**13.3**

Table 5.5 – Reepham Estimated Water Supply Costs

Option	Water Main (£M)	Pumping Stations (£M)	Pipework from Source (£M)	Total (£M)
Water supply from Heigham WTW	4.1	1.8	-	**5.9**
Maximise Thorpe St Andrew BH (24.0km)	-	2.4	5.4	**7.8**
Maximise Colney BH (21.5km)	-	2.2	4.9	**7.1**
River Wensum Reuse	-	-	-	**6.5**
GOGDS	-	-	-	**5.9**
Offline Storage	-	-	-	**0.9**
TOTAL - Worst Case (supply and BH plus largest water resource cost only)				**19.5**
TOTAL - Best Case (supply and BH plus smallest water resource cost only)				**13.9**

Table 5.6 – Aylsham Estimated Water Supply Costs

Option	Water Main (£M)	Pumping Stations (£M)	Pipework from Source (£M)	Total (£M)
Water supply from Heigham WTW	3.3	1.5	-	**4.8**
Maximise Thorpe St Andrew BH (20.5km)	-	2.1	4.7	**6.8**
Maximise Colney BH (18.0km)	-	1.8	4.1	**5.9**
River Wensum Reuse	-	-	-	**6.5**
GOGDS	-	-	-	**4.8**
Offline Storage	-	-	-	**0.9**
TOTAL - Worst Case (supply and BH plus largest water resource cost only)				**17.2**
TOTAL - Best Case (supply and BH plus smallest water resource cost only)				**11.6**

Table 5.7 – Wroxham Estimated Water Supply Costs

Option	Water Main (£M)	Pumping Stations (£M)	Pipework from Source (£M)	Total (£M)
Water supply from Heigham WTW	4.8	2.1	-	**6.9**
Maximise Thorpe St Andrew BH (27.0km)	-	2.7	6.1	**8.8**
Maximise Colney BH (24.5km)	-	2.5	5.6	**8.1**
River Wensum Reuse	-	-	-	**6.5**
GOGDS	-	-	-	**6.9**
Offline Storage	-	-	-	**0.9**
TOTAL - Worst Case (supply and BH plus largest water resource cost only)				**21.5**
TOTAL - Best Case (supply and BH plus smallest water resource cost only)				**15.9**

Table 5.8 – Acle Estimated Water Supply Costs

Area	Water Supply from Heigham WTW (£M)	Maximise Existing BH (Colney) (£M)	River Wensum Reuse (£M)	GOGDS (£M)	Offline Storage (£M)	Worst Case TOTAL (£M)	Best Case TOTAL (£M)
Reepham	5.6	6.8	6.5	5.6	0.9	**18.9**	**13.3**
Aylsham	5.9	7.1	6.5	5.9	0.9	**19.5**	**13.9**
Wroxham	4.8	5.9	6.5	4.8	0.9	**17.2**	**11.6**
Acle	6.9	8.1	6.5	6.9	0.9	**21.9**	**15.9**
TOTAL						**77.5**	**54.7**

Table 5.9 – Summary of Broadland Smaller Sites Estimated Water Supply Costs

All of the smaller Broadland sites lie closer to the Colney BH, so the Thorpe St Andrew BH costs have been discounted in each case. In terms of additional water resources, the River Wensum Reuse option gives the greatest potential cost in all cases apart from Acle, where the GOGDS has the highest cost. It should be noted that the GOGDS costs included in the WCS and hence this report deal only with the costs from Heigham WTW only. There will be additional costs associated with this option which are outside the WCS study area. Offline storage gives the best case cost for all sites.

It should also be noted that for both cases, the existing boreholes will be maximised before any other resources are used. The actual source of water for these sites will depend on a number of factors, including the phasing of the development. In addition, due to the relatively small nature and associated high infrastructure costs of these sites, it may be possible to supply them totally from the existing boreholes, thereby removing the need for any additional water resource costs.

5.3.6 *South Norfolk – Wymondham*

This area forms part of NPA7 in the WCS.

The current proposals include for 2,200 new dwellings in the Wymondham area, the majority of which would be implemented between 2017 and 2031.

This area also includes the potential employment development at Gateway 11. This has been assumed to be B2/B8 industrial development with a total area of approximately 8.5ha.

As the WCS considers only the proposed residential developments, the loading calculations included in Appendix A have been used to convert the employment loading to an equivalent residential loading to enable the costs data to be extracted from the WCS.

The loading associated with the Gateway 11 employment area is equivalent to 180 additional dwellings, giving an effective total of 2,380 dwellings.

Based on this information, estimates of the costs associated with the supply of clean water to this development area are as shown in Table 5.10. For the purposes of this study, a best case and worst case cost has been calculated. The total costs are based on the supply of water from Heigham WTW and the initial demand being met by the two existing boreholes, plus either the single largest or smallest other water resource cost that may be required once the spare borehole capacity has been used.

Option	Water Main (£M)	Pumping Stations (£M)	Pipework from Source (£M)	Total (£M)
Water supply from Heigham WTW	4.2	2.2	-	**6.4**
Maximise Thorpe St Andrew BH	-	3.0	5.8	**8.8**
Maximise Colney BH	-	2.7	5.1	**7.8**
River Wensum Reuse	-	-	-	**7.7**
GOGDS	-	-	-	**8.0**
Offline Storage	-	-	-	**4.2**
TOTAL - Worst Case (supply and BHs plus largest water resource cost only)				**31.0**
TOTAL - Best Case (supply and BHs plus smallest water resource cost only)				**27.2**

Table 5.10 – Wymondham Estimated Water Supply Costs

It can be seen from Table 5.10 that the highest additional water resource cost for Wymondham is the Great Ouse Groundwater Development Scheme. It should be noted that the GOGDS costs included in the WCS and hence this report deal only with the costs from Heigham WTW only. There will be additional costs associated with this option which are outside the WCS study area. The best case is the use of offline storage.

It should also be noted that for both cases, the existing boreholes will be maximised before any other resources are used. The actual source of water for Wymondham will depend on a number of factors, including the phasing of the development.

5.3.7 *South Norfolk – Long Stratton*

This area forms part of NPA6 in the WCS.

The current proposals include for 1,800 new dwellings in the Long Stratton area, all of which would be implemented between 2017 and 2026.

This area also includes the potential employment development at Ipswich Road. This has been assumed to be B2/B8 industrial development with a total area of approximately 5ha.

As the WCS considers only the proposed residential developments, the loading calculations included in Appendix A have been used to convert the employment loading to an equivalent residential loading to enable the costs data to be extracted from the WCS.

The loading associated with the Ipswich Road employment area is equivalent to 110 additional dwellings, giving an effective total of 1,910 dwellings.

Based on this information, estimates of the costs associated with the supply of clean water to this development area are as shown in Table 5.11. For the purposes of this study, a best case and worst case cost has been calculated. The total costs are based on the supply of water from Heigham WTW and the initial demand being met by the two existing boreholes, plus either the single largest or smallest other water resource cost that may be required once the spare borehole capacity has been used.

Option	Water Main (£M)	Pumping Stations (£M)	Pipework from Source (£M)	Total (£M)
Water supply from Heigham WTW	5.1	3.0	-	**8.1**
Maximise Thorpe St Andrew BH	-	3.8	6.5	**10.3**
Maximise Colney BH	-	3.4	5.9	**9.3**
River Wensum Reuse	-	-	-	**7.5**
GOGDS	-	-	-	**7.9**
Offline Storage	-	-	-	**3.4**
TOTAL - Worst Case (supply and BHs plus largest water resource cost only)				**35.6**
TOTAL - Best Case (supply and BHs plus smallest water resource cost only)				**31.1**

Table 5.11 – Long Stratton Estimated Water Supply Costs

It can be seen from Table 5.11 that the highest additional water resource cost for Long Stratton is the Great Ouse Groundwater Development Scheme. It should be noted that the GOGDS costs included in the WCS and hence this report deal only with the costs from Heigham WTW only. There will be additional costs associated with this option which are outside the WCS study area. The lowest additional resource cost is for the use of offline storage.

It should also be noted that for both cases, the existing boreholes will be maximised before any other resources are used. The actual source of water for Long Stratton will depend on a number of factors, including the phasing of the development.

5.3.8 *South Norfolk – Hethersett, Cringleford and Colney*

These areas form part of NPA8 in the WCS, known as the South West Sector (A11-B1108). Cringleford and Colney lie just outside the boundary detailed in the WCS Figure 4-9, but are sufficiently close to be included in NPA8 for the purposes of this study.

The current proposals include for 1,000 new dwellings at Hethersett and 1,200 new dwellings at Cringleford, all of which would be implemented prior to 2026, with the majority being completed between 2017 and 2021.

This area also includes the potential employment development at Norwich Research Park in Colney. This has been assumed to be B1 office development with a total area of approximately 50ha.

As the WCS considers only the proposed residential developments, the loading calculations included in Appendix A have been used to convert the employment loading to an equivalent residential loading to enable the costs data to be extracted from the WCS.

The loading associated with the Norwich Research Park employment area is equivalent to 1150 additional dwellings, giving an effective total of approximately 3,350 dwellings.

Based on this information, estimates of the costs associated with the supply of clean water to this development area are as shown in Table 5.12. For the purposes of this study, a best case and worst case cost has been calculated. The total costs are based on the supply of water from Heigham WTW and the initial demand being met by the two existing boreholes, plus either the single largest or smallest other water resource cost that may be required once the spare borehole capacity has been used.

Option	Water Main (£M)	Pumping Stations (£M)	Pipework from Source (£M)	Total (£M)
Water supply from Heigham WTW	1.9	1.1	-	**3.0**
Maximise Thorpe St Andrew BH	-	1.9	3.5	**5.4**
Maximise Colney BH	-	1.6	2.8	**4.4**
River Wensum Reuse	-	-	-	**8.3**
GOGDS	-	-	-	**2.7**
Offline Storage	-	-	-	**5.9**
TOTAL - Worst Case (supply and BHs plus largest water resource cost only)				**21.1**
TOTAL - Best Case (supply and BHs plus smallest water resource cost only)				**15.5**

Table 5.12 – Hethersett, Cringleford and Colney Estimated Water Supply Costs

It can be seen from Table 5.12 that the highest additional water resource cost for Hethersett, Cringleford and Colney is the River Wensum Reuse. The lowest cost is associated with the GOGDS. It should be noted that the GOGDS costs included in the WCS and hence this report deal only with the costs from Heigham WTW only. There will be additional costs associated with this option which are outside the WCS study area.

It should also be noted that for both cases, the existing boreholes will be maximised before any other resources are used. The actual source of water for these sites will depend on a number of factors, including the phasing of the development.

5.3.9 *South Norfolk – Easton and Costessey (Longwater)*

These areas form part of NPA9 in the WCS, known as the West Sector (River Yare to River Wensum).

The current proposals include for 1,000 new dwellings in the Easton area, all of which would be implemented prior to 2026, with the majority being completed between 2017 and 2021.

This area also includes the potential employment development at Longwater in Costessey. This has been assumed to be B2/B8 industrial development with a total area of approximately 50ha.

As the WCS considers only the proposed residential developments, the loading calculations included in Appendix A have been used to convert the employment loading to an equivalent residential loading to enable the costs data to be extracted from the WCS.

The loading associated with the Longwater employment area is equivalent to 1,040 additional dwellings, giving an effective total of 2,040 dwellings.

Based on this information, estimates of the costs associated with the supply of clean water to this development area are as shown in Table 5.13. For the purposes of this study, a best case and worst case cost has been calculated. The total costs are based on the supply of water from Heigham WTW and the initial demand being met by the two existing boreholes, plus either the single largest or smallest other water resource cost that may be required once the spare borehole capacity has been used.

Option	Water Main (£M)	Pumping Stations (£M)	Pipework from Source (£M)	Total (£M)
Water supply from Heigham WTW	1.4	0.8	-	**2.2**
Maximise Thorpe St Andrew BH	-	1.6	2.8	**4.4**
Maximise Colney BH	-	1.3	2.2	**3.5**
River Wensum Reuse	-	-	-	**7.7**
GOGDS	-	-	-	**2.1**
Offline Storage	-	-	-	**3.6**
TOTAL - Worst Case (supply and BHs plus largest water resource cost only)				**17.8**
TOTAL - Best Case (supply and BHs plus smallest water resource cost only)				**12.2**

Table 5.13– Easton and Costessey (Longwater) Estimated Water Supply Costs

It can be seen from Table 5.12 that the highest additional water resource cost for Easton and Costessey is the River Wensum Reuse. It should also be noted that for both cases, the existing boreholes will be maximised before any other resources are used. The actual source of water for these sites will depend on a number of factors, including the phasing of the development.

5.3.10 *South Norfolk - Smaller Sites*

The smaller sites around the Broadland area potentially include Hingham, Diss, Harleston and Loddon. Each of these sites is covered in the WCS as RPA5, 6, 7 and 8 respectively.

The current proposals include a total of 1,800 new dwellings at these sites, all of which would be implemented prior to 2026.

It has been assumed that the 1,800 new dwellings are split equally between each of these sites, resulting in 450 additional dwellings in each location.

Based on this information, estimates of the costs associated with the supply of clean water to this development area are as shown in the following tables. For the purposes of this study, a best case and worst case cost has been calculated. The total costs are based on the supply of water from Heigham WTW and the initial demand being met by the closest of the two existing boreholes, plus either the single largest or smallest other water resource cost that may be required once the spare borehole capacity has been used.

Option	Water Main (£M)	Pumping Stations (£M)	Pipework from Source (£M)	Total (£M)
Water supply from Heigham WTW	4.4	2.0	-	**6.4**
Maximise Thorpe St Andrew BH (235.0km)	-	23.4	53.0	**76.4**
Maximise Colney BH (23.0km)	-	2.3	5.2	**7.5**
River Wensum Reuse	-	-	-	**6.5**
GOGDS	-	-	-	**6.4**
Offline Storage	-	-	-	**0.9**
TOTAL - Worst Case (supply and BH plus largest water resource cost only)				**20.4**
TOTAL - Best Case (supply and BH plus smallest water resource cost only)				**14.8**

Table 5.14 – Hingham Estimated Water Supply Costs

Option	Water Main (£M)	Pumping Stations (£M)	Pipework from Source (£M)	Total (£M)
Water supply from Heigham WTW	7.4	3.3	-	**10.7**
Maximise Thorpe St Andrew BH (38.75km)	-	3.9	8.8	**12.7**
Maximise Colney BH (36.0km)	-	3.6	8.2	**11.8**
River Wensum Reuse	-	-	-	**6.5**
GOGDS	-	-	-	**10.7**
Offline Storage	-	-	-	**0.9**
TOTAL - Worst Case (supply and BH plus largest water resource cost only)				**33.2**
TOTAL - Best Case (supply and BH plus smallest water resource cost only)				**23.4**

Table 5.15 – Diss Estimated Water Supply Costs

Option	Water Main (£M)	Pumping Stations (£M)	Pipework from Source (£M)	Total (£M)
Water supply from Heigham WTW	6.9	3.1	-	**10.0**
Maximise Thorpe St Andrew BH (36.5km)	-	3.7	8.3	**12.0**
Maximise Colney BH (34.0km)	-	3.4	7.7	**11.1**
River Wensum Reuse	-	-	-	**6.5**
GOGDS	-	-	-	**10.0**
Offline Storage	-	-	-	**0.9**
TOTAL - Worst Case (supply and BH plus largest water resource cost only)				**31.1**
TOTAL - Best Case (supply and BH plus smallest water resource cost only)				**22.0**

Table 5.16 – Harleston Estimated Water Supply Costs

Option	Water Main (£M)	Pumping Stations (£M)	Pipework from Source (£M)	Total (£M)
Water supply from Heigham WTW	4.7	2.1	-	**6.8**
Maximise Thorpe St Andrew BH (26.5km)	-	2.7	6.0	**8.7**
Maximise Colney BH (24.0km)	-	2.4	5.5	**7.9**
River Wensum Reuse	-	-	-	**6.5**
GOGDS	-	-	-	**6.7**
Offline Storage	-	-	-	**0.9**
TOTAL - Worst Case (supply and BH plus largest water resource cost only)				**21.4**
TOTAL - Best Case (supply and BH plus smallest water resource cost only)				**15.6**

Table 5.17 – Loddon Estimated Water Supply Costs

Area	Water Supply from Heigham WTW (£M)	Maximise Existing BH (Colney) (£M)	River Wensum Reuse (£M)	GOGDS (£M)	Offline Storage (£M)	Worst Case Total (£M)	Best Case Total (£M)
Hingham	6.4	7.5	6.5	6.4	0.9	**20.4**	**14.8**
Diss	10.7	11.8	6.5	10.7	0.9	**33.2**	**23.4**
Harleston	10.0	11.1	6.5	10.0	0.9	**31.1**	**22.0**
Loddon	6.8	7.9	6.5	6.7	0.9	**21.4**	**15.6**
TOTAL						**106.1**	**75.8**

Table 5.18 – Summary of South Norfolk Smaller Sites Estimated Water Supply Costs

All of the smaller South Norfolk sites lie closer to the Colney BH, so the Thorpe St Andrew BH costs have been discounted in each case. In terms of additional water resources, the River Wensum Reuse option gives the greatest potential cost for Hingham, while the greatest potential cost for the other sites is associated with the GOGDS. It should be noted that the GOGDS costs included in the WCS and hence this report deal only with the costs from Heigham WTW only. There will be additional costs associated with this option which are outside the WCS study area. Offline storage gives the best case cost for all sites.

It should also be noted that for both cases, the existing boreholes will be maximised before any other resources are used. The actual source of water for these sites will depend on a number of factors, including the phasing of the development. In addition, due to the relatively small nature and associated high infrastructure costs of these sites, it may be possible to supply them totally from the existing boreholes, thereby removing the need for any additional water resource costs.

5.3.11 *Non-specified developments*

The figures provided in the tables above include only those developments that have specified locations in the current proposals. The smaller sites in Broadland and South Norfolk have been assumed based on the details in the WCS.

In addition to the dwellings included above, the following non-specified developments are also proposed:

Area	Detail	2009-2016	2017-2021	2022-2026	2027-2031	Total
Broadland	Additional rural sites	110	270	270	0	**650**
	Urban commitments	1,678	351	0	0	**2,029**
	Rural commitments	662	0	0	0	**662**
	Urban Windfall	180	300	300	300	**1,080**
	Rural Windfall	225	375	375	375	**1,350**
	RSS Review	232	145	145	145	**667**
	NPA Post-2026 (NE sector)	0	0	0	3,000	**3,000**
	NPA Post-2026 (elsewhere)	0	0	0	750	**750**
	Rural Post-2026	0	0	0	400	**400**
Broadland TOTAL		**3,087**	**1,441**	**1,090**	**4,970**	**10,588**
South Norfolk	Additional rural sites	162	405	403	0	**970**
	Urban commitments	4,126	30	0	0	**4,156**
	Rural commitments	1,328	0	0	0	**1,328**
	Urban Windfall	222	370	370	370	**1,332**
	Rural Windfall	288	480	480	480	**1,728**
	RSS Review	232	145	145	144	**666**
	NPA Post-2026	0	0	0	4,000	**4,000**
	Rural Post-2026	0	0	0	600	**600**
South Norfolk TOTAL		**6,358**	**1,430**	**1,398**	**5,594**	**14,780**
GRAND TOTAL		**9,445**	**2,871**	**2,488**	**10,564**	**25,368**

Table 5.19 – Non-specified Dwellings in Broadland and South Norfolk

Table 5.19 indicates that over 25,000 new dwellings have been omitted from the costing figures above as the locations of the dwellings have not been specified in the current proposals. The costs of supplying clean water to new developments is so closely linked to the size of the development and the distance of the development from the WTW and water resources that it is difficult to identify the cost implications at this stage.

An important point to note is that it would be more economical for these additional dwellings to be located close to the other new development areas. As AWS has confirmed that there is no spare capacity in the existing water main network, any new pockets of development will require new connections to Heigham WTW, and depending on the size and location of the development, this pipework alone is likely to cost millions of pounds.

By the same token, it would also be more cost effective to provide fewer, large developments. The cost of providing the infrastructure to a single development of 1,000 dwellings would be significantly less than double the cost of two 500 dwelling developments a similar distance from the WTW and the water resources.

In terms of providing water resources for these additional dwellings, the costings in the WCS for maximising the existing boreholes, the River Wensum Reuse and the GOGDS are all dependent on the size and location of the individual developments. The WCS would need to be updated to provide these costs once further details are known about the likely spread of these additional dwellings.

However, the cost of off-line water resource storage in the WCS has been calculated on a pro-rata basis, based on the estimated costs for a maximum of 44,500 dwellings. While the new projections give a total of 57,000 dwellings, these figures can be extrapolated to provide an estimate of the likely additional cost for the non-specified dwellings. Therefore, for Broadland, the total additional cost for this water resource alone would be approximately £18.5M, while for South Norfolk, the total additional cost would be approximately £17.1M.

5.3.12 *Summary*

The information above provides details of the total water supply infrastructure costs for each of the proposed development areas. It is understood that the costings in the WCS were prepared as a means of comparing the potential development sites and will need to be refined as the WCS progressed to the next stage. Details of how the costs of the works would be phased for each development area will be investigated in later stages of the WCS. However, assumptions can be made as part of this assessment to provide an indication of the potential funding profile.

In order to do this, the following assumptions are necessary:

- the water main pipework is installed during the first phase of the development with the necessary capacity to accommodate the full development proposals;
- the pipework to maximise the existing boreholes at Thorpe St Andrew and Colney is installed during the first phase of development to utilise their existing capacityas a priority; and,
- the additional water resource costs are introduced for the majority of sites in the period 2017-2021. This allows for the specified and non-specified sites to utilise the capacity in the existing boreholes for the first phases of the developments. However, there is sufficient capacity in the existing boreholes to accommodate some development beyond that initial period. Due to the relatively high costs involved, it may be economical to allow the rural sites to be totally fed from the existing boreholes, thereby removing the need for expensive additional water infrastructure over long distances. This assumption has been used for the purposes of this study.

Based on these assumptions, the water supply costs for each development area could potentially be phased as shown in Tables 5.20 and 5.21 below:

It should be noted in relation to the worst case figures that the actual costs could be markedly reduced with the selection of a more favourable additional water resource. However, the “up front” costs of the infrastructure from Heigham WTW and from the two existing boreholes are unlikely to change significantly from those shown in the table.

With regard to the best case costs, the “up front” infrastructure costs are the same, assuming the first phases of each development is fed from the existing boreholes. However, many of the best case options of additional water resources make use of the Great Ouse Groundwater Development Scheme. The costs attributed to this option in the WCS only consider the infrastructure from Heigham WTW, with no account being taken of costs outside the WCS study area. Therefore, it is likely that the costs included in Table 5.21 are underestimated.

It should also be noted that the costs attributed to each water resource option in the WCS assume that the whole development is to be fed from that source. Therefore, the pumps and pipes have been sized and costed based on supplying water to the whole development area. However, as discussed above, it is anticipated that each development will be partly fed from the existing boreholes for the earlier phases. Therefore, the costs associated with the additional water resources are likely to be over-estimated.

Area	Cost per Year band (£M)				Worst Case Total (£M)
	2009-2016	2017-2021	2022-2026	2027-2031	
Norwich TOTAL	**15.3**	**28.9**	**0**	**0**	**44.2**
Broadland - Rackheath	20.9	8.3	0	0	**29.2**
Broadland - Sprowston Fringe	23.3	11.6	0	0	**34.9**
Broadland - Thorpe St Andrew (Broadland Business Park)	15.1	6.6	0	0	**21.7**
Broadland Smaller Sites	51.1	0	0	0	**51.1**
Broadland TOTAL	**110.4**	**26.5**	**0**	**0**	**136.9**
South Norfolk - Wymondham	23.0	8.0	0	0	**31.0**
South Norfolk - Long Stratton	0	35.6	0	0	**35.6**
South Norfolk - Hethersett, Cringleford & Colney	12.8	8.3	0	0	**21.1**
South Norfolk - Easton and Costessey	10.1	7.7	0	0	**17.8**
South Norfolk Smaller Sites	72.2	0	0		**72.2**
South Norfolk TOTAL	**118.1**	**59.6**	**0**	**0**	**177.7**
GRAND TOTAL	**243.8**	**115.0**	**0**	**0**	**358.8**

Table 5.20 – Potential Funding Projection for Estimated Water Supply Costs based on Worst Case Water Resource Options

Area	Cost per Year band (£M)				Best Case Total (£M)
	2009-2016	2017-2021	2022-2026	2027-2031	
Norwich TOTAL	**15.3**	**2.8**	**0**	**0**	**18.1**
Broadland - Rackheath	20.9	5.2	0	0	**26.1**
Broadland - Sprowston Fringe	23.3	4.2	0	0	**27.5**
Broadland - Thorpe St Andrew (Broadland Business Park)	15.1	1.0	0	0	**16.1**
Broadland Smaller Sites	51.1	0		0	**51.1**
Broadland TOTAL	**110.4**	**10.4**	**0**	**0**	**120.8**
South Norfolk - Wymondham	23.0	4.2	0	0	**27.2**
South Norfolk - Long Stratton	0	31.1	0	0	**31.1**
South Norfolk - Hethersett, Cringleford & Colney	12.8	2.7	0	0	**15.5**
South Norfolk - Easton and Costessey	10.1	2.1	0	0	**12.2**
South Norfolk Smaller Sites	72.2	0	0		**72.2**
South Norfolk TOTAL	**118.1**	**40.1**	**0**	**0**	**158.2**
GRAND TOTAL	**243.8**	**53.3**	**0**	**0**	**297.1**

Table 5.21 – Potential Funding Projection for Estimated Water Supply Costs based on Best Case Water Resource Options

5.4 Funding Options

The WCS document is intended, amongst other things, to provide evidence for AWS to present to their regulators, the Office for Water Services (Ofwat). This will be used to support AWS' investment plans. If the development proposals are sufficiently developed, there is the potential for many of the necessary improvements to be included in future Asset Management Plans (AMPs). This will be investigated in Stage 2b of the WCS.

As with electricity infrastructure, AWS are not able to provide significant infrastructure in advance of any development, as they have a duty to maintain and improve services for their existing customers.

Stage 2b of the WCS will investigate in further detail the funding and programming options available. This will be carried out in liaison with AWS, the EA and each of the Local Authorities. A number of funding sources are possible, including the option of roof tariffs. A system will be developed as part of the Stage 2b WCS that divides the costs in a justified and rational method.

It is understood that there is the potential for AWS to obtain developer funding towards some of the strategic network improvements required to provide potable water to these new developments. However, such funding is unlikely for key assets such as treatment works and pumping stations. This will be investigated further as part of the Stage 2b WCS.

The next stage of the WCS will also investigate potential incentives for developers to invest in the WCS project.

6 Foul Water Drainage and Treatment

6.1 Introduction

The Stage 2a WCS was prepared by Scott Wilson in September 2008 and looks at the infrastructure requirements for various development scenarios throughout the Greater Norwich area.

The WCS also includes detailed liaison with AWS and the EA, who have provided information where it is available.

This Chapter summarises the findings of the Stage 2 WCS in relation to the drainage and treatment of foul water, extracting the data specific to the latest development proposals, as defined in the “Key Assumptions Paper” and subsequent update.

It should be noted that this assessment relates only to the drainage and treatment of foul water. The drainage of surface water is not included in this Utilities Assessment, but is considered in the WCS.

The costings applied to the different water supply options in the WCS have been taken at face value and no detailed checks have been carried out on the figures. However, where there are obvious discrepancies in the figures, these have been addressed as part of this assessment. It is understood that the costings in the WCS were prepared as a means of comparing the potential development sites and will need to be refined as the WCS progressed to the next stage.

6.2 Summary of Requirements and Options

AWS has stated that there is no capacity within the existing wastewater network. As such, all proposed development will result in the need for additional wastewater collection and transfer infrastructure. Any infill development is assumed to be accommodated within the existing network capacity, however.

It has been shown that a number of the existing Wastewater Treatment Works (WwTW) in the Greater Norwich area have volumetric headroom, which would be optimised where possible before new infrastructure is provided. This is to ensure the most cost effective solution and also allow adequate time for phasing of the development, as construction of a new WwTW can take 10-15 years. However, the Stage 2a WCS does not give details of the phasing of works; only the total costs involved.

For each main potential development area, three wastewater treatment options have been considered. Detailed below are the three options, including the elements that have been included in the costings:

- Option 1 – Whitlingham WwTW. It is understood that Whitlingham WwTW has 109,000PE (Population Equivalent) of spare headroom capacity, equating to approximately 52,000 new properties, so volumetric upgrade would have negligible resultant cost. Other items included in the costs are nutrient load removal for the additional load and also the primary sewer linking the development area to the WwTW.
- Option 2 – Upgrade existing WwTW. Many of the development areas have a local WwTW that could be utilised and upgraded where necessary to accommodate the proposed development.
- Option 3 – New WwTW. Cost includes the provision of a new local WwTW to receive all of the flow from the proposed development. As the new WwTW would be located within the development area, the cost of strategic sewers has been assumed to be negligible.

For the rural locations and Norwich City, a single option has been considered of upgrading the existing WwTW to cater for the proposed increased loading. This upgrading includes increasing

the volumetric capacity of the works and also providing additional nutrient removal for the increased loading.

Only the costs of main trunk sewers linking the development area to the WwTW have been included in each case. It has been assumed that the cost of collector sewers within the new developments would be covered by the individual developers.

The costings included in the WCS are based on industry standard techniques and on a number of recently constructed schemes. Further details of these costing assumptions are included within the WCS document.

The locations of all WwTW are shown in Figure 4.

6.3 Budget Costings

6.3.1 *Norwich*

This area forms part of NPA11 in the WCS, known as Norwich City.

The current proposals include for 13,400 new dwellings, on allocated and committed sites throughout the city. The majority of these dwellings would be completed prior to 2026.

This area also includes 100ha of allocated employment land, assumed to be split 50/50 between B1 office space and B2/B8 industrial development.

As the WCS considers only the proposed residential developments, the loading calculations included in Appendix A have been used to convert the employment loading to an equivalent residential loading to enable the costs data to be extracted from the WCS.

The loading associated with the proposed employment developments in Norwich City is equivalent to approximately 1,800 additional dwellings, giving an effective total of 15,200 dwellings.

Based on this information, estimates of the costs associated with the provision of wastewater treatment for this development area are as follows:

Option and associated WwTW	Trunk Sewer - rising (£M)	Trunk Sewer - gravity (£M)	Pumping Stations (£M)	New WwTW - volumetric increase (£M)	New WwTW - Nutrient removal (£M)	Total (£M)
1 (Whitlingham)	-	5.0	-	-	2.0	**7.0**

Table 6.1 – Norwich Estimated Wastewater Costs

6.3.2 *Broadland - Rackheath*

This area forms part of NPA3a in the WCS, known as the North East Sector (outside NNDR, vicinity of Rackheath).

The current proposals include for 3,400 new dwellings, the majority of which would be implemented prior to 2026.

The local WwTW to this development area is Rackheath, which currently has no spare capacity. Therefore, any additional flow into this WwTW would necessitate an upgrade.

Based on this information, estimates of the costs associated with the provision of wastewater treatment for this development area are as follows:

Option and associated WwTW	Trunk Sewer - rising (£M)	Trunk Sewer - gravity (£M)	Pumping Stations (£M)	New WwTW - volumetric increase (£M)	New WwTW - Nutrient removal (£M)	Total (£M)
1 (Whitlingham)	-	4.7	-	-	4.7	**9.5**
2 (Rackheath)	-	1.5	-	12.0	4.7	**18.2**
3 (New)	-	-	-	12.0	4.7	**16.7**

Table 6.2 – Rackheath Estimated Wastewater Costs

6.3.3 *Broadland - Sprowston Fringe*

This area forms part of NPA2 in the WCS, known as the North East Sector (inside NNDR).

The current proposals include for 6,600 new dwellings in the Sprowston Fringe area, the majority of which would be implemented between 2017 and 2031.

This area also includes the potential employment development at Salhouse Road. This has been assumed to be B2/B8 industrial development with a total area of 3.1ha.

As the WCS considers only the proposed residential developments, the loading calculations included in Appendix A have been used to convert the employment loading to an equivalent residential loading to enable the costs data to be extracted from the WCS.

The loading associated with the Salhouse Road employment area is equivalent to 50 additional dwellings, giving an effective total of 6,650 dwellings.

The local WwTW to this development area is Rackheath, which currently has no spare capacity. Therefore, any additional flow into this WwTW would necessitate an upgrade.

Based on this information, estimates of the costs associated with the provision of wastewater treatment for this development area are as follows:

Option and associated WwTW	Trunk Sewer - rising (£M)	Trunk Sewer - gravity (£M)	Pumping Stations (£M)	New WwTW - volumetric increase (£M)	New WwTW - Nutrient removal (£M)	Total (£M)
1 (Whitlingham)	-	3.5	-	-	9.4	**12.9**
2 (Rackheath)	-	1.6	-	15.0	9.4	**26.0**
3 (New)	-	-	-	15.0	9.4	**24.4**

Table 6.3 – Sprowston Fringe Estimated Wastewater Costs

6.3.4 *Broadland - Thorpe St Andrew (Broadland Business Park)*
Broadland Business Park lies closest to NPA3b in the WCS, known as the East Sector (outside NNDR).

The current proposals include employment development at Broadland Business Park. This has been assumed to be B1 office development with a total area of 25ha.

As the WCS considers only the proposed residential developments, the loading calculations included in Appendix A have been used to convert the employment loading to an equivalent residential loading to enable the costs data to be extracted from the WCS.

The loading associated with the Broadland Business Park employment area is equivalent to approximately 250 additional dwellings.

The local WwTW to this development area is Rackheath, which currently has no spare capacity. Therefore, any additional flow into this WwTW would necessitate an upgrade.

Based on this information, estimates of the costs associated with the provision of wastewater treatment for this development area are detailed in Table 6.3 below. As the smallest development size considered in the WCS is 1000 dwellings, these figures have been used where interpolation cannot be achieved.

Option and associated WwTW	Trunk Sewer - rising (£M)	Trunk Sewer - gravity (£M)	Pumping Stations (£M)	New WwTW - volumetric increase (£M)	New WwTW - Nutrient removal (£M)	Total (£M)
1 (Whitlingham)	-	2.2	-	-	0.1	**2.3**
2 (Rackheath)	-	2.5	-	1.2	0.1	**3.8**
3 (New)	-	-	-	1.2	0.1	**1.3**

Table 6.4 – Thorpe St Andrew (Broadland Business Park) Estimated Wastewater Costs

6.3.5 *Broadland - Smaller Sites*
The smaller sites around the Broadland area potentially cover Reepham, Aylsham, Wroxham and Acle. Each of these sites is covered in the WCS as Rural Policy Area (RPA) 1, 2, 3 and 4 respectively.

The current proposals include for a total of 2,000 new dwellings at these sites, all of which would be implemented prior to 2026.

It has been assumed that the 2,000 new dwellings are split equally between each of these sites, resulting in 500 additional dwellings in each location.

For the rural sites, only the upgrading of the local WwTW has been considered. These WwTW are as follows:

- Reepham – Reepham WwTW, with spare capacity for 325 additional dwellings;
- Aylsham – Aylsham WwTW, which is 226 dwellings over capacity;
- Wroxham – Belaugh WwTW, with spare capacity for 1,915 additional dwellings; and,
- Acle – Acle-Damgate WwTW, with negligible spare capacity.

Based on this information, estimates of the costs associated with the provision of wastewater treatment for this development area are as follows:

Area and Existing WwTW	Trunk Sewer - rising (£K)	Trunk Sewer - gravity (£K)	Pumping Stations (£K)	New WwTW - volumetric increase (£K)	New WwTW - Nutrient removal (£K)	Total (£K)
Reepham (Reepham WwTW)	-	170	-	580	70	**820**
Aylsham (Aylsham WwTW)	-	330	-	2,380	70	**2,780**
Wroxham (Belaugh WwTW)	-	490	-	-	70	**560**
Acle (Acle - Damgate WwTW)	-	170	-	1,180	70	**1,420**
TOTAL	**-**	**1,160**	**-**	**4,140**	**280**	**5,580**

Table 6.5 – Broadland Smaller Sites Estimated Wastewater Costs

6.3.6 *South Norfolk - Wymondham*
This area forms part of NPA7 in the WCS.

The current proposals include for 2,200 new dwellings in the Wymondham area, the majority of which would be implemented between 2017 and 2031.

This area also includes the potential employment development at Gateway 11. This has been assumed to be B2/B8 industrial development with a total area of approximately 8.5ha.

As the WCS considers only the proposed residential developments, the loading calculations included in Appendix A have been used to convert the employment loading to an equivalent residential loading to enable the costs data to be extracted from the WCS.

The loading associated with the Gateway 11 employment area is equivalent to 120 additional dwellings, giving an effective total of 2,320 dwellings.

Based on this information, estimates of the costs associated with the provision of wastewater treatment for this development area are as follows:

Option and associated WwTW	Trunk Sewer - rising (£M)	Trunk Sewer - gravity (£M)	Pumping Stations (£M)	New WwTW - volumetric increase (£M)	New WwTW - Nutrient removal (£M)	Total (£M)
1 (Whitlingham)	-	9.0	-	-	0.4	**9.4**
2 (Wymondham)	-	1.5	-	-	-	**1.5**
3 (New)	-	-	-	11.0	0.4	**11.4**

Table 6.6 – Wymondham Estimated Wastewater Costs

It can be seen from Table 6.6 that there are no costs associated with utilising the existing Wymondham WwTW. The only costs for this option are for sewers linking the site to the

WwTW. It is understood that Wymondham WwTW has sufficient spare capacity to accommodate the equivalent of 4,000 dwellings. Therefore, the development proposals for this area could be accommodated within existing capacity. It should be noted, however, that these figures take account of development at Wymondham in isolation. If other developments were also to feed into Wymondham WwTW, it is likely that the headroom would be taken up and additional volume required. This is considered in further detail below.

6.3.7 *South Norfolk – Long Stratton*

This area forms part of NPA6 in the WCS.

The current proposals include for 1,800 new dwellings in the Long Stratton area, all of which would be implemented between 2017 and 2026.

This area also includes the potential employment development at Ipswich Road. This has been assumed to be B2/B8 industrial development with a total area of approximately 5ha.

As the WCS considers only the proposed residential developments, the loading calculations included in Appendix A have been used to convert the employment loading to an equivalent residential loading to enable the costs data to be extracted from the WCS.

The loading associated with the Ipswich Road employment area is equivalent to 30 additional dwellings, giving an effective total of 1,830 dwellings.

Based on this information, estimates of the costs associated with the provision of wastewater treatment for this development area are as follows:

Option and associated WwTW	Trunk Sewer - rising (£M)	Trunk Sewer - gravity (£M)	Pumping Stations (£M)	New WwTW - volumetric increase (£M)	New WwTW - Nutrient removal (£M)	Total (£M)
1 (Whitlingham)	-	8.6	-	-	0.3	**9.4**
2 (Wymondham)		8.2		-	-	**8.2**
2 (Long Stratton)	-	0.7	-	3.3	0.2	**4.2**
3 (New)	-	-	-	10.2	0.3	**10.5**

Table 6.7 – Long Stratton Estimated Wastewater Costs

It can be seen from Table 6.7 that there are no costs associated with utilising the existing Wymondham WwTW. The only costs for this option are for sewers linking the site to the WwTW. It is understood that Wymondham WwTW has sufficient spare capacity to accommodate the equivalent of 4,000 dwellings. Therefore, the development proposals for this area could be accommodated within existing capacity. It should be noted however, that these figures take account of development at Long Stratton in isolation. If other developments were also to feed into Wymondham WwTW, such as the Wymondham development detailed above, it is likely that the headroom would be taken up and additional volume required. This is considered in further detail below.

In addition, the costs in Table 6.7 associated with improving the existing WwTW at Long Stratton take account of existing spare headroom for 1,000 new dwellings. Therefore, the costs relate to upgrading the WwTW to cater for 830 additional dwellings.

6.3.8 *South Norfolk – Hethersett, Cringleford and Colney*

These areas form part of NPA8 in the WCS, known as the South West Sector (A11-B1108). Cringleford and Colney lie just outside the boundary detailed in the WCS Figure 4-9, but are sufficiently close to be included in NPA8 for the purposes of this study.

The current proposals include for 1,000 new dwellings at Hethersett and 1,200 new dwellings at Cringleford, all of which would be implemented prior to 2026, with the majority being completed between 2017 and 2021.

This area also includes the potential employment development at Norwich Research Park in Colney. This has been assumed to be B1 office development with a total area of approximately 50ha.

As the WCS considers only the proposed residential developments, the loading calculations included in Appendix A have been used to convert the employment loading to an equivalent residential loading to enable the costs data to be extracted from the WCS.

The loading associated with the Norwich Research Park employment area is equivalent to 470 additional dwellings, giving an effective total of approximately 2,700 dwellings.

Based on this information, estimates of the costs associated with the provision of wastewater treatment for this development area are as follows:

Option and associated WwTW	Trunk Sewer - rising (£M)	Trunk Sewer - gravity (£M)	Pumping Stations (£M)	New WwTW - volumetric increase (£M)	New WwTW - Nutrient removal (£M)	Total (£M)
1 (Whitlingham)	-	5.9	-	-	0.4	**6.3**
2 (Wymondham)	-	3.9	-	-	-	**3.9**
3 (New)	-	-	-	11.0	0.4	**11.4**

Table 6.8 – Hethersett, Cringleford and Colney Estimated Wastewater Costs

It can be seen from Table 6.8 that there are no costs associated with utilising the existing Wymondham WwTW. The only costs for this option are for sewers linking the site to the WwTW. It is understood that Wymondham WwTW has sufficient spare capacity to accommodate the equivalent of 4,000 dwellings. Therefore, the development proposals for this area could be accommodated within existing capacity. It should be noted however, that these figures take account of development at Hethersett, Cringleford and Colney in isolation. If other developments were also to feed into Wymondham WwTW, such as the Wymondham or Long Stratton developments detailed above, it is likely that the headroom would be taken up and additional volume required. This is considered in further detail below.

6.3.9 *South Norfolk – Easton and Costessey (Longwater)*

These areas form part of NPA9 in the WCS, known as the West Sector (River Yare to River Wensum).

The current proposals include for 1,000 new dwellings in the Easton area, all of which would be implemented prior to 2026, with the majority being completed between 2017 and 2021.

This area also includes the potential employment development at Longwater in Costessey. This has been assumed to be B2/B8 industrial development with a total area of approximately 50ha.

As the WCS considers only the proposed residential developments, the loading calculations included in Appendix A have been used to convert the employment loading to an equivalent residential loading to enable the costs data to be extracted from the WCS.

The loading associated with the Longwater employment area is equivalent to 700 additional dwellings, giving an effective total of 1,700 dwellings.

Based on this information, estimates of the costs associated with the provision of wastewater treatment for this development area are as follows:

Option and associated WwTW	Trunk Sewer - rising (£M)	Trunk Sewer - gravity (£M)	Pumping Stations (£M)	New WwTW - volumetric increase (£M)	New WwTW - Nutrient removal (£M)	Total (£M)
1 (Whitlingham)	-	7.8	-	-	0.3	**8.1**
2 (Wymondham)		5.9		-	-	**5.9**
3 (New)	-	-	-	10.2	0.3	**10.5**

Table 6.9– Easton and Costessey (Longwater) Estimated Wastewater Costs

It can be seen from Table 6.9 that there are no costs associated with utilising the existing Wymondham WwTW. The only costs for this option are for sewers linking the site to the WwTW. It is understood that Wymondham WwTW has sufficient spare capacity to accommodate the equivalent of 4,000 dwellings. Therefore, the development proposals for this

area could be accommodated within existing capacity. It should be noted however, that these figures take account of development at Easton and Costessey in isolation. If other developments were also to feed into Wymondham WwTW, such as the Wymondham, Long Stratton or Hethersett, Cringleford and Colney developments detailed above, it is likely that the headroom would be taken up and additional volume required. This is considered in further detail below.

6.3.10 *South Norfolk - Smaller Sites*

The smaller sites around the Broadland area potentially include Hingham, Diss, Harleston and Loddon. Each of these sites is covered in the WCS as RPA5, 6, 7 and 8 respectively.

The current proposals include a total of 1,800 new dwellings at these sites, all of which would be implemented prior to 2026.

It has been assumed that the 1,800 new dwellings are split equally between each of these sites, resulting in 450 additional dwellings in each location.

For the rural sites, only the upgrading of the local WwTW has been considered. These WwTW are as follows:

- Hingham – Wymondham WwTW, with spare capacity for 4,000 additional dwellings, but see below for further details;
- Diss – Diss WwTW, with spare capacity for 4,838 additional dwellings;
- Harleston – Harleston WwTW, with spare capacity for 1,192 additional dwellings; and,
- Loddon – Sisland WwTW, with spare capacity for 1,058 additional dwellings.

Based on this information, estimates of the costs associated with the provision of wastewater treatment for these development areas are as follows:

Area and Existing WwTW	Trunk Sewer - rising (£K)	Trunk Sewer - gravity (£K)	Pumping Stations (£K)	New WwTW - volumetric increase (£K)	New WwTW - Nutrient removal (£K)	Total (£K)
Hingham (Wymondham WwTW)	-	2,260	-	-	70	**2,330**
Diss (Diss WwTW)	-	170	-	-	70	**240**
Harleston (Harleston WwTW)	-	360	-	-	70	**430**
Loddon (Sisland WwTW)	-	810	-	-	70	**880**
TOTAL	**-**	**3,600**	**-**	**-**	**280**	**3,880**

Table 6.10 – South Norfolk Smaller Sites Estimated Wastewater Costs

It should be noted that the figures for Loddon to Sisland WwTW differ from those in the WCS as an incorrect distance was applied to the sewer costings in the WCS. An assumption has been made for the correct distance as part of this study, and 2.5km has been used, rather than 25km.

The costs detailed in Table 6.10 above make allowance for the spare capacity in all of the WwTW. While the developments at Diss, Harleston and Loddon would be the only potential developments to feed their local WwTW, it is proposed that the Hingham development would use the Wymondham WwTW. As detailed in the previous sections, this WwTW could potentially be utilised by a number of other developments. Therefore, the costings for the Hingham development may be underestimated. This is discussed further below.

6.3.11 *Summary*

The information contained within this chapter looks at a number of potential options for the treatment of wastewater in the Greater Norwich area. Table 6.11 below summarises the potential costs associated with the treatment of wastewater from each development site. It is understood that the costings in the WCS were prepared as a means of comparing the potential development sites and will need to be refined as the WCS progressed to the next stage.

Development Area	WCS Ref	Option 1 (Whitlingham WwTW) (£M)	Option 2		Option 3 (New WwTW)
			Local WwTW	Cost	
Norwich	NPA11	6.2	-	-	-
Rackheath	NPA3a	9.5	Rackheath	18.2	16.7
Sprowston Fringe	NPA2	12.9	Rackheath	26.0	24.4
Thorpe St Andrew	NPA3b	2.3	Rackheath	3.8	1.3
Broadland Smaller Sites	RPA 1	-	Reepham	0.8	
	RPA2	-	Aylsham	2.8	
	RPA3	-	Belaugh	0.6	
	RPA4	-	Acle-Damgate	1.4	
Wymondham	NPA 7	9.4	Wymondham	1.5	11.4
Long Stratton	NPA6	9.4	Wymondham	8.2	10.5
			Long Stratton	4.2	
Hethersett, Cringleford and Colney	NPA8	6.3	Wymondham	3.9	11.4
Easton and Costessey	NPA9	8.1	Wymondham	5.9	10.5
South Norfolk Smaller Sites	RPA5	-	Wymondham	2.4	-
	RPA6	-	Diss	0.3	-
	RPA7	-	Harleston	0.5	-
	RPA8	-	Sisland	8.2	-

Table 6.11 – Summary of Estimated Wastewater Costs

Table 6.11 above summarises the total costs for each wastewater treatment option. The next section looks at each affected WwTW in turn and assesses the potential phasing of improvement works.

6.4 WwTW Phased Costings

6.4.1 *Whitlingham WwTW*

Option 1 for all of the NPA areas in the WCS considers the upgrade of Whitlingham WwTW. It is understood that Whitlingham WwTW has spare capacity to accommodate up to 52,000 new dwellings, so volumetric capacity would not need to be increased. However, there would be costs associated with increased nutrient load removal and also the costs of sewers from the development area to the WwTW.

The proposed phasing of each of the developments potentially feeding the Whitlingham WwTW is as follows:

Development Area	Proposed Dwellings* 2009 - 2016	Proposed Dwellings* 2017 - 2021	Proposed Dwellings* 2022 - 2026	Proposed Dwellings* 2027 - 2031	Total Proposed dwellings*
Norwich	6,992	3,192	2,508	2,508	15,200
Rackheath	1,035	1,150	1,150	65	3,400
Sprowston Fringe	353	1,763	1,763	2,771	6,650
Thorpe St Andrew (Broadland Bus. Park)	14	66	66	104	250
Wymondham	390	975	955	0	2,320
Long Stratton	0	660	1,170	0	1,830
Hethersett, Cringleford and Colney	215	1,650	835	0	2,700
Easton and Costessey	240	1,360	100	0	1,700
TOTAL	**9,239**	**10,816**	**8,547**	**5,448**	**34,050**

* - Numbers of dwellings include equivalent number of dwellings for employment areas

Table 6.12 – Development phasing potentially feeding Whitlingham WwTW

In terms of the phasing of the necessary infrastructure works for each development, it can be assumed that the necessary sewers are put in place during the first period of development. Upgrades to the nutrient removal at the WwTW could then be phased as necessary across each time period, in line with the proposed increase in housing numbers. Therefore, the costing trajectory could be broken down as shown in Table 6.13.

Area	Item	Cost per Year band (£M)				Total (£M)
		2009-2016	2017-2021	2022-2026	2027-2031	
Norwich	Gravity Sewer to WwTW	5.0				**5.0**
Rackheath	Gravity Sewer to WwTW	4.7				**4.7**
Sprowston Fringe	Gravity Sewer to WwTW	3.5				**3.5**
Thorpe St Andrew (Broadland Bus. Park)	Gravity Sewer to WwTW	2.2				**2.2**
Wymondham	Gravity Sewer to WwTW	9.0				**9.0**
Long Stratton	Gravity Sewer to WwTW		8.6			**8.6**
Hethersett, Cringleford and Colney	Gravity Sewer to WwTW	5.9				**5.9**
Easton and Costessey	Gravity Sewer to WwTW	7.8				**7.8**
All	Upgrade to WwTW (nut. removal)	4.8	5.8	4.3	2.7	**17.6**
TOTAL		**42.9**	**14.4**	**4.3**	**2.7**	**64.3**

Table 6.13 – Potential Funding Projection for Whitlingham WwTW

6.4.2 *Wymondham WwTW*

As detailed in a number of the cases above, the existing WwTW at Wymondham could potentially be used for the treatment of wastewater. The WCS indicates that this WwTW currently has spare headroom to accommodate 4,000 additional residential properties.

All of the examples above which give the Wymondham WwTW as an option assume that the existing headroom is available for that development, giving a best case scenario. However, if all of those developments were to go ahead, the 4,000 dwelling spare capacity would quickly be used up and additional volume would be required.

The development areas potentially affected by this are as follows:

- Wymondham;
- Long Stratton;
- Hethersett, Cringleford and Colney;
- Easton and Costessey; and,
- Hingham.

The proposed phasing of development in these areas varies, as detailed in Table 6.14 below:

Development Area	Proposed Dwellings* 2009 - 2016	Proposed Dwellings* 2017 - 2021	Proposed Dwellings* 2022 - 2026	Proposed Dwellings* 2027 - 2031	Total Proposed dwellings*
Wymondham	390	975	955	0	2,320
Long Stratton	0	660	1,170	0	1,830
Hethersett, Cringleford and Colney	215	1,650	835	0	2,700
Easton and Costessey	240	1,360	100	0	1,700
Hingham	70	190	190	0	450
TOTAL	**915**	**4,835**	**3,250**	**0**	**9000**

* - Numbers of dwellings include equivalent number of dwellings for employment areas

Table 6.14 – Development phasing potentially feeding Wymondham WwTW

The figures included in Table 6.14 above indicate that if all of these developments were to utilise the WwTW at Wymondham, there would be no upgrading requirements up to 2016, as there is sufficient spare capacity in the existing works to accommodate 915 additional dwellings.

However, in order for the next phase of development to take place, additional volume would be required at the WwTW between 2017 and 2021. However, some of this projected development could take place, eg. at Hethersett, Cringleford and Colney and at Easton and Costessey, within the existing capacity.

The total number of 9,000 dwellings indicates that the WwTW would ultimately need to be upgraded to accommodate 5,000 additional dwellings.

In order to accommodate all of this proposed development within the Wymondham WwTW, the following costings could be applied:

Area	Item	Cost per Year band (£M)				Total (£M)
		2009-2016	2017-2021	2022-2026	2027-2031	
Wymondham	Gravity Sewer to WwTW	1.5	-	-	-	**1.5**
Long Stratton	Gravity Sewer to WwTW	-	8.2	-	-	**8.2**
Hethersett, Cringleford and Colney	Gravity Sewer to WwTW	3.9	-	-	-	**3.9**
Easton and Costessey	Gravity Sewer to WwTW	5.9	-		-	**5.9**
Hingham	Gravity Sewer to WwTW	2.3	-	-	-	**2.3**
All	Upgrade to WwTW (volumetric)	-	13.5	-	-	**13.5**
All	Upgrade to WwTW (nutrient removal)	0.2	0.7	0.5	-	**1.4**
TOTAL		**13.8**	**22.4**	**0.5**	**-**	**36.7**

Table 6.15 – Potential Funding Projection for Wymondham WwTW

The figures in Table 6.15 use the following assumptions:

- All five development areas utilise the Wymondham WwTW. However, as the previous sections show, other options are available for all sites apart from Hingham;
- the existing capacity at the WwTW is utilised during 2009-2016 and part of the period 2017-2021;
- the volume upgrading works for the additional 5,000 dwellings are undertaken at one time, rather than being phased. This provides a worst case in terms of funding, but would need to be discussed and agreed with Anglian Water; and,

- the upgrading of the WwTW in terms of nutrient removal has been phased proportionally across the development periods.

It should also be noted that there are other development areas within South Norfolk that may need to use Wymondham WwTW. These developments have not been included in this study but potentially include up to 3,000 additional dwellings.

6.4.3 *Rackheath WwTW*

Rackheath WwTW currently has no spare capacity so all developments feeding to this WwTW would necessitate upgrading works. These developments are as follows:

- Rackheath;
- Sprowston Fringe; and,
- Thorpe St Andrew.

The phasing of these development areas varies across the 2009 – 2031 time frame. The proposed trajectories are shown in Table 6.16 below.

Development Area	Proposed Dwellings* 2009 - 2016	Proposed Dwellings* 2017 - 2021	Proposed Dwellings* 2022 - 2026	Proposed Dwellings* 2027 - 2031	Total Proposed dwellings*
Rackheath	1,035	1,150	1,150	65	3,400
Sprowston Fringe	353	1,763	1,763	2,771	6,650
Thorpe St Andrew (Broadland Business Park)	14	66	66	104	250
TOTAL	**1,402**	**2,979**	**2,979**	**2,940**	**10,300**

* - Numbers of dwellings include equivalent number of dwellings for employment areas

Table 6.16 – Development phasing potentially feeding Rackheath WwTW

The figures in Table 6.16 indicate that Rackheath WwTW could ultimately need to accommodate the wastewater from 10,300 additional dwellings. As there is currently no spare capacity in this WwTW, some upgrading works would be required early on to accommodate the first phase of development in the period 2009-2016.

The current operation of the Rackheath WwTW works is not known at this stage, and the WCS has not yet investigated the phasing of any of the upgrading works or the funding option available to AWS. Therefore, as a worst case funding scenario, it may potentially be necessary to fully accommodate the 10,300 additional dwellings in a single upgrade in the period 2009-2016. A breakdown of the costs is shown in Table 6.17.

Area	Item	Cost per Year band (£M)				Total (£M)
		2009-2016	2017-2021	2022-2026	2027-2031	
Rackheath	Gravity Sewer to WwTW	1.5	-	-	-	**1.5**
Sprowston Fringe	Gravity Sewer to WwTW	1.6	-	-	-	**1.6**
Thorpe St Andrew (Broadland Bus. Park)	Gravity Sewer to WwTW	2.5	-	-	-	**2.5**
All	Upgrade to WwTW (volumetric)	28.2	-	-	-	**28.2**
All	Upgrade to WwTW (nut. removal)	14.2	-	-	-	**14.2**
TOTAL		**48.0**				**48.0**

Table 6.17 – Potential Funding Projection for Rackheath WwTW

6.4.4 *Broadland WwTW*

It has been assumed as part of the WCS that the potential developments in Broadland would feed into the existing local WwTW. These are as follows:

- Reepham – Reepham WwTW, with spare capacity for 325 additional dwellings;
- Aylsham – Aylsham WwTW, which is 226 dwellings over capacity;
- Wroxham – Belaugh WwTW, with spare capacity for 1,915 additional dwellings; and,
- Acle – Acle-Damgate WwTW, with negligible spare capacity.

As part of this study, it has been assumed that each of the Broadland smaller developments would consist of approximately 500 additional dwellings. This is, however, an assumption and the actual numbers could be higher or lower.

A proposed housing trajectory for the smaller sites in Broadland has been assumed as part of the Key Assumptions Paper. For the purposes of this study, this trajectory has been applied to each of the smaller sites. It should be noted, however, that it is possible that the smaller sites would have staggered start dates and be completed over a shorter timescale than assumed here.

The potential housing trajectories for Broadland sites are as follows:

Development Area	Proposed Dwellings 2009 - 2016	Proposed Dwellings 2017 - 2021	Proposed Dwellings 2022 - 2026	Proposed Dwellings 2027 - 2031	Total Proposed dwellings
Reepham	86	212	212	0	500
Aylsham	86	212	212	0	500
Wroxham	86	212	212	0	500
Acle	86	212	212	0	500

Table 6.18 – Development phasing potentially feeding Reepham WwTW

Based on these potential housing trajectories and the spare capacity in each of the WwTW, the volumetric upgrade of each WwTW can be delayed until it is required, utilising the spare capacity first. However, the sewer infrastructure would need to be implemented in the 2009-2016 period for each site, and the nutrient load removal for each WwTW would need to be increased in line with the loading increase. Therefore, a potential breakdown of the costs is as shown in Table 6.19 below:

Area	Item	Cost per Year band (£K)				Total (£K)
		2009-2016	2017-2021	2022-2026	2027-2031	
Reepham	Gravity Sewer to WwTW	170	-	-	-	**170**
	Upgrade to WwTW (volumetric)	-	-	580	-	**580**
	Upgrade to WwTW (nutrient removal)	12	29	29	-	**70**
Reepham WwTW TOTAL		**182**	**29**	**609**	**-**	**820**
Aylsham	Gravity Sewer to WwTW	330	-	-	-	**330**
	Upgrade to WwTW (volumetric)	-	2,380		-	**2,380**
	Upgrade to WwTW (nutrient removal)	12	29	29	-	**70**
Aylsham WwTW TOTAL		**342**	**2,409**	**29**	**-**	**2,780**
Wroxham	Gravity Sewer to WwTW	490	-	-	-	**490**
	Upgrade to WwTW (volumetric)	-	-		-	**-**
	Upgrade to WwTW (nutrient removal)	12	29	29	-	**70**
Belaugh WwTW TOTAL		**502**	**29**	**29**	**-**	**560**
Acle	Gravity Sewer to WwTW	170	-	-	-	**170**
	Upgrade to WwTW (volumetric)	1,180	-		-	**1,180**
	Upgrade to WwTW (nutrient removal)	12	29	29	-	**70**
Acle-Damgate TOTAL		**1,362**	**29**	**29**	**-**	**1,420**

Table 6.19 – Potential Funding Projections for Broadland WwTW

The figures in Table 6.19 indicate that while the cost of new sewers is relatively high from Wrohxam to Belaugh WwTW, the significant existing spare capacity at the WwTW has resulted in comparatively lower overall costs. With this in mind, it may be preferable to more heavily weight the Broadland development numbers towards the Wroxham area and away from the WwTW that are closer to capacity, particularly at Aylsham and Acle.

6.4.5 *South Norfolk WwTW*

It has been assumed as part of the WCS that potential developments at Diss, Harlseston and Loddon would feed into the existing local WwTW and Diss, Harleston and Sisland respectively. Each of these WwTW has sufficient spare capacity to accommodate the likely developments in these areas as follows:

- Diss – Diss WwTW, with spare capacity for 4,838 additional dwellings;
- Harleston – Harleston WwTW, with spare capacity for 1,192 additional dwellings; and,
- Loddon – Sisland WwTW, with spare capacity for 1,058 additional dwellings.

As part of this study, it has been assumed that each of the South Norfolk developments would consist of approximately 450 additional dwellings. This is, however, an assumption and the actual numbers could be higher or lower.

The proposed South Norfolk development at Hingham would feed to the Wymondham WwTW, which has been considered in Section 6.3.13 above.

A proposed housing trajectory for the smaller sites in South Norfolk has been assumed as part of the Key Assumptions Paper. For the purposes of this study, this trajectory has been applied to each of the smaller sites. It should be noted, however, that it is possible that the smaller sites would have staggered start dates and be may be completed over a shorter timescale.

A potential housing trajectory for South Norfolk sites is as follows:

Development Area	Proposed Dwellings 2009 - 2016	Proposed Dwellings 2017 - 2021	Proposed Dwellings 2022 - 2026	Proposed Dwellings 2027 - 2031	Total Proposed dwellings
Diss	75	188	187	0	450
Harleston	75	188	187	0	450
Loddon	75	188	187	0	450

Table 6.20 – Development phasing potentially feeding Diss WwTW

Due to the large headrooms at each of these WwTW, no volumetric upgrades would be required to accommodate these potential local developments. However, new sewer infrastructure would be required in the 2009-2016 period for each site and the nutrient load removal would need to be increased at each WwTW in line with the loading increase. Therefore, a potential breakdown of the costs is as shown in Table 6.21 below:

Area	Item	Cost per Year band (£K)				Total (£K)
		2009-2016	2017-2021	2022-2026	2027-2031	
Diss	Gravity Sewer to WwTW	170	-	-	-	**170**
	Upgrade to WwTW (volumetric)	-	-		-	**-**
	Upgrade to WwTW (nutrient removal)	12	29	29	-	**70**
Diss WwTW TOTAL		**182**	**29**	**29**	**-**	**240**
Harleston	Gravity Sewer to WwTW	360	-	-	-	**360**
	Upgrade to WwTW (volumetric)	-	-		-	**-**
	Upgrade to WwTW (nutrient removal)	12	29	29	-	**70**
Harleston WwTW TOTAL		**372**	**29**	**29**	**-**	**430**
Loddon	Gravity Sewer to WwTW	810	-	-	-	**810**
	Upgrade to WwTW (volumetric)	-	-		-	**-**
	Upgrade to WwTW (nutrient removal)	12	29	29	-	**70**
Sisland WwTW TOTAL		**822**	**29**	**29**	**-**	**880**

Table 6.21 – Potential Funding Projection for South Norfolk WwTW

6.4.6 *Non-specified developments*

Based on the details provided in the Stage 2a WCS, it could be assumed that the wastewater from the non-specified developments detailed in Table 6.22 below would be accommodated within the local WwTW, as with the other RPAs in the study.

In both the Broadland and South Norfolk areas, it is unlikely that the existing smaller WwTW would have the capacity to accommodate 10,500 and 14,800 additional dwellings respectively. However, other than the WwTW detailed in the WCS, no details are available regarding the spare capacity in any of the other smaller WwTW in Broadland or South Norfolk. This information would be covered in Stage 2b of the WCS.

Area	Detail	2009-2016	2017-2021	2022-2026	2027-2031	Total
Broadland	Additional rural sites	110	270	270	0	**650**
	Urban commitments	1,678	351	0	0	**2,029**
	Rural commitments	662	0	0	0	**662**
	Urban Windfall	180	300	300	300	**1,080**
	Rural Windfall	225	375	375	375	**1,350**
	RSS Review	232	145	145	145	**667**
	NPA Post-2026 (NE sector)	0	0	0	3,000	**3,000**
	NPA Post-2026 (elsewhere)	0	0	0	750	**750**
	Rural Post-2026	0	0	0	400	**400**
Broadland TOTAL		**3,087**	**1,441**	**1,090**	**4,970**	**10,588**
South Norfolk	Additional rural sites	162	405	403	0	**970**
	Urban commitments	4,126	30	0	0	**4,156**
	Rural commitments	1,328	0	0	0	**1,328**
	Urban Windfall	222	370	370	370	**1,332**
	Rural Windfall	288	480	480	480	**1,728**
	RSS Review	232	145	145	144	**666**
	NPA Post-2026	0	0	0	4,000	**4,000**
	Rural Post-2026	0	0	0	600	**600**
South Norfolk TOTAL		**6,358**	**1,430**	**1,398**	**5,594**	**14,780**
GRAND TOTAL		**9,445**	**2,871**	**2,488**	**10,564**	**25,368**

Table 6.22 – Non-specified Dwellings in Broadland and South Norfolk

As with the water supply costings, it is likely to be more economical for these additional dwellings to be located close to other areas of new development, to minimise the additional infrastructure costs. However, depending on the distance of the new dwellings to the nearest WwTW, the provision of a new package WwTW closer to the development could be the preferred option. The WCS provides a figure of £500,000 for a new package WwTW to serve 500 dwellings, while a package WwTW for 1,000 new dwellings would cost approximately £3.25M. Again, this information would be considered as part of the Stage 2b WCS.

6.5 Funding Options

The WCS document is intended, amongst other things, to provide evidence for AWS to present to their regulators, the Office for Water Services (Ofwat). This will be used to support AWS' investment plans. If the development proposals are sufficiently developed, there is the potential for many of the necessary improvements to be included in future Asset Management Plans (AMPs). This will be investigated in Stage 2b of the WCS.

As with electricity infrastructure, AWS are not able to provide significant infrastructure in advance of any development, as they have a duty to maintain and improve services for their existing customers.

Stage 2b of the WCS will investigate in further detail the funding and programming options available. This will be carried out in liaison with AWS, the EA and each of the Local Authorities. A number of funding sources are possible, including the option of roof tariffs. A system will be developed as part of the Stage 2b WCS that divides the costs in a justified and rational method.

The next stage of the WCS will also investigate potential incentives for developers to invest in the WCS project.

7 Sustainability Issues

7.1 Water Consumption

The potable water calculations in the WCS have been carried out based on the number of dwellings in each development area, rather than a calculated demand for potable water. It is not clear whether these calculations take into account any likely reduction in mains demand post-2016 as part of the requirement to achieve Code Levels 5 and 6 of Code for Sustainable Homes. At Code Levels 5 and 6, water consumption has been set at 80 litres/person/day, which is just over half of the current UK average of 150 litres/person/day.

If this reduction in mains water demand is to be achieved, a non-potable water supply will need to be incorporated into each household, potentially including wastewater or greywater recycling and rainwater harvesting. As the majority of water used in the home does not need to be drinking water quality, this could have a significant impact on household potable water demand. Other smaller measures could be employed to reduce water usage generally, such as low-flush toilets, low-flow showers or aerating taps.

Table 7.1 below is an extract from the Government's water strategy for England, "Future Water". It clearly shows that the requirements could only be achieved by water reuse.

	Standard new built house (150 l/p/d) (Source: BRE)		**House meeting Code for Sustainable Homes Level 5 (80 l/p/d) (Source: CSH)**		
Appliance/ Fitting	**Specification**	**Contribution to daily use (litres)**	**Specification**	**Water Reuse (litres)**	**Contribution to daily use (litres)**
WC	6 litre single flush	28.8	4/2.6 litre dual flush (6.33 + 8.36)	14.69	14.69
Wash Basin Taps	4 litres/min	14.11	6 litres/min		15.87
Shower	10 litres/min	30	7.75 litres/min		23.25
Bath	180 litres/min	28.8	120 litre		19.2
Sink Taps	8 litres/min	28.22	7 litres/min		18.52
Washing Machine	49 litre	16.66	40 litre	13.6	13.6
Dishwasher	13 litre	3.9	10 litre		3
Water Reuse System	-	0	100sqm roof, 0.6m annual rainfall, 0.6 efficient, 3 persons. Water butts could also meet a significant proportion of garden watering demand	Collected 32.88 WC and washing machine use = 28.29 Max benefit = 28.29	28.29
TOTAL		**150.49**			**79.84**

Table 7.1 – Water Use – Standard and Sustainable Homes (Source: Future Water)

7.1.1 *Greywater Recycling*

Greywater recycling refers to the reuse of of wastewater as a non-potable water supply. This wastewater is from showers, baths, hand basins and washing machines. Wastewater from kitchen sinks and dishwashers is often considered too contaminated for reuse.

Greywater recycling is particularly advantageous in areas where water supplies are limited and the demand is high, such as with the development proposals in the Greater Norwich area. It reduces the demand for potable water, which subsequently leads to costs savings on water charges, particularly where the supply is metered. In addition, the wastewater volumes are less, reducing the load at WwTW, potentially resulting in a saving in sewerage charges.

Greywater recycling requires a separate drainage system from the standard foul system which collects the greywater and conveys it to a settling tank before it is treated and made available for reuse. Part H of the Building Regulations stipulates that pipework for greywater reuse should be clearly marked as such.

Once treated, the recycled water can either be stored in a storage tank before being pumped back into the system, or pumped to a header tank from which it could gravitate into a separate supply system. The recycled water can only be used for toilet flushing, gardens use, cleaning and other non-potable uses.

Bacterial growth can be a problem if warm greywater is stored for an extended period. Therefore, some form of disinfection or periodical emptying of the tank is required to minimise this risk.

Three options are available for providing greywater recycling systems:

- Systems for individual properties – each property is fitted with its own system, which automatically switches to mains supply if there is insufficient treated greywater. This option may not be cost effective and would require maintenance from individual homeowners;
- Communal/multi-dwelling systems – these systems collect greywater from a number of properties before treating it and pumping the recycled water to the point of application or to the header tanks of individual dwellings or commercial buildings. A central control unit is provided that monitors the process. Energy costs are relatively low and maintenance is required annually. This system could also be combined with a rainwater harvesting system; and,
- Catchment-level black water recycling system – this option has been included in the WCS as River Wensum Reuse, considered in Chapter 5 above.

7.1.2 *Rainwater Harvesting*

Rainwater harvesting involves the collection of rainwater from property roofs for reuse in non-potable applications, such as toilet flushing, washing machines, car washing and garden watering.

These systems can be expensive and there have been health and safety concerns regarding the recycled water. Financial benefits are greater in larger buildings, due to the larger roof areas and potentially greater demand for non-potable water. They are now commonly used on large commercial schemes, such as supermarkets.

Rainwater systems filter the rainwater to remove debris, such as leaves and twigs, before storing the water in a holding tank. In this tank, fine particles are allowed to settle, further cleaning the water. Water is then pumped from the holding tank to the header tank or directly to the point of application. During dry periods, the systems allow for top-up from the mains water supply.

There are two main options for rainwater harvesting:

- Systems for individual properties – this method is widely used in Europe and is expected to become more common in the UK. As well as providing a source for non-potable water, this method also provides some storm water attenuation, which can reduce the rick of flooding. When the development site are progressed, storm water runoff limits will need to be agreed with the EA in line with PPS25, which stipulates that developments should not increase flood rick downstream. Therefore, the inclusion of rainwater harvesting systems can provide an important source control feature; and,

- Communal/multi dwelling systems – these systems are the same as the single dwelling systems but on a larger scale. The benefits of this option are increased where it is combined with a greywater recycling system.

7.2 Sustainable Drainage Systems (SUDS)

SUDS are to be considered in further detail as part of the Stage 2b WCS, and have been included in the "Strategic Flood Risk Assessment" (SFRA) prepared by Millard Consulting, dated January 2008. Further details can be found in those documents but this section outlines the options available and the benefits.

The objectives of SUDS are as follows:

"Surface water drainage systems developed in line with the ideals of sustainable development are collectively referred to as Sustainable Drainage System (SUDS). At a particular site, these systems are designed both to manage the environmental risks resulting from urban runoff and to contribute wherever possible to environmental enhancement. SUDS objectives are, therefore, to minimise the impacts from the development on the quantity and quality of the runoff, and maximise amenity and biodiversity opportunities." (CIRIA C697, 2007).

These objectives are achieved through the use of the SUDS Management Train. This uses a hierarchy of drainage techniques to incrementally reduce pollution, flow rates and volumes of stormwater from a site, as follows:

- **Prevention** – the use of good site design and housekeeping measures to prevent runoff and pollution. This can include rainwater harvesting.
- **Source controls** – control of runoff at source or as close to source as possible. These measures can include the use of soakaways, green roofs and pervious pavements.
- **Site control** – management of water in a local area. This can include below ground storage/ attenuation, detention basins and large infiltration devices.
- **Regional control** – management of water from a site or various sites and can include wetlands and balancing ponds.

The use of SUDS techniques within a particular site will depend on the characteristics of that site and will require consultation and agreement with the EA. The SFRA investigated the SUDS suitability of the ground conditions across the GNDP area. The results indicate that Norwich City and the areas to the north would appear to be more suitable for the use of SUDS infiltration techniques, whereas the South Norfolk area generally has poor SUDS suitability. However, due to natural variations in ground conditions, it is recommended that more detailed site investigations are carried out at each development site to determine the likely performance of these SUDS techniques.

It is recommended that a Greater Norwich Area SUDS Strategy is developed to set out the SUDS requirements for all of the development sites. As each development site is progressed, this strategy will provide guidance to developers as to the SUDS requirements. A Site Specific Flood Risk Assessment (FRA) and Drainage Assessment will then be required to identify the proposed measures for each site and gain agreement from the EA.

7.3 Renewable Energy

A "Sustainable Energy Study" has been prepared by ESD on behalf of the GNDP which investigates low-carbon energy options for the potential developments in the Greater Norwich Area. At the time of writing, the Draft version of this report, dated February 2009, is available, although it is understood that a final version is currently being progressed.

The Study considers methods for helping the developments achieve low to zero carbon (LZC) standards and three energy supply strategies were modelled:

- microgeneration technologies;
- communal energy systems; and,
- balance of microgeneration, communal energy systems and offsetting measures.

The technical potential for renewable energy within the GNDP area is 7.7 million MWh, which equates to 129% of the area's current energy consumption. These figures assume that all of the

opportunities for renewable energy are exploited, whereas commercial factors would ultimately need to be considered. Two specific technologies dominate this technical potential:

- large wind turbines (36% of total potential); and,
- woody biomass for Combined Heat and Power (CHP) plant (43% of total potential).

The modelling has shown that there is the technical potential for renewable energy to supply far more energy that that required by the proposed developments in the Greater Norwich Growth Area. This shows that there is significant resource to support LZC development.

However, as part of this Utilities Assessment, a worst case has been assumed that all energy for the proposed developments is taken from the grid. This will enable realistic costings to be determined that can then be refined once the development proposals are progressed and the "Sustainable Energy Study" report has been finalised.

EDF Energy has indicated that renewable sources could provide a significant proportion of the new energy requirements, but that the grid needs to have sufficient capacity to provide back-up power when required. In addition, the option also exists for excess renewable energy to be put back into the grid. In this case, there could be significant infrastructure costs to allow electricity to flow back into the grid at substations and grid stations.

These options should be considered further as part of the "Sustainable Energy Study".

8 Summary and Conclusions

8.1 Electricity Summary

EDF Energy has provided details of the likely reinforcement works required to accommodate the development proposals. A summary of the requirements is as follows:

- major reinforcement works would be required in the Greater Norwich area to accommodate the growth proposals;
- a new Grid Substation will be required to the east of Norwich at a site on Green Lane;
- three new primary substations will be required across the area, while two existing Substations will require the replacement of the transformers and switchgear;
- significant lengths of 132kV and 33kV underground cables will be required to feed these new developments, the laying of which will have the usual impacts on traffic and local residents.

Indicative costings for the proposed works and the likely timescales. These are given in Table 8.1 below:

Substation	Works required	Indicative overall cost (£K)	Developer's Contribution (£K)	Timescale
Hurricane Way Primary	New Primary Substation on existing site	5,436	1,630	2009-2016 (before 2012)
Norwich Airport North	New Primary Substation on new site + 33kV circuits	6,320	6,320	2017-2021
Sprowston/ Rackheath No. 2	New Primary Substation on new site + 33kV circuits	4,313	4,313	2022-2026
Hapton Primary	Replacement of transformers and switchgear in existing site	2,530	430	2022-2026
Wymondham Primary	Replacement of transformers and switchgear in existing site	2,530	826	2022-2026
Norwich East Grid	New Grid Substation on existing site + 132kV cables	17,060	0	2017-2021
St Stephens	Reinforcement of existing Substation + 132kV cables	10,750	0	2027-2031
TOTAL		**48,939**	**13,519**	

Table 8.1 – Indicative Costs for Electricity Infrastructure Improvements

Substation	Electricity network reinforcement costs for proposed growth in: (£K)			
	2009-2016	2017-2021	2022-2026	2027-2031
Hurricane Way Primary	5,436			
Norwich Airport North		6,320		
Sprowston/ Rackheath No. 2			4,313	
Hapton Primary			2,530	
Wymondham Primary			2,530	
Norwich East Grid		17,060		
St Stephens				10,750
TOTAL	**5,436**	**23,380**	**9,373**	**10,750**

Table 8.2 – Potential Funding Projection for Electricity Infrastructure Improvements

8.2 Gas Summary

National Grid has indicated that the development proposals will not have an impact on the gas transmission lines in the Greater Norwich area.

Details have been provided by National Grid Distribution regarding the reinforcement requirements for the proposed growth. At this stage it is not possible to provide budget costings for the works as there is not sufficient detail in the proposals. Once the proposals have been advanced, a quotation can be requested from National Grid or one of the UIPs or IGTs.

Table 8.3 below summarises the gas reinforcement requirements for the current development proposals:

Area	Gas network reinforcement required for proposed growth in:				Additional information:
	2009-2016	2017-2021	2022-2026	2027-2031	
Norwich		✓			IP connection
Rackheath	✓				IP connection
Sprowston Fringe		✓			IP connection
Thorpe St Andrew (Broadland Business Park)					No reinforcement required
Wymondham	✓				MP connection – combined effect with Hethersett and Cringleford
Long Stratton	✓				IP connection – substantial reinforcement
Hethersett		✓			MP connection – combined effect with Wymondham and Cringleford
Cringleford	✓				MP connection – combined effect with Wymondham and Hethersett
Easton		✓			LP connection, but LP and IP reinforcement
Costessey (Longwater)	✓				LP connection
Colney (Norwich Research Park)					No reinforcement required

Table 8.3 – Summary of Gas Reinforcement requirements

8.3 Potable Water Supply Summary

It has been assumed in the Stage 2a WCS that all of the development sites would be supplied from the existing Heigham WTW, which has sufficient spare capacity to receive additional water to supply the Greater Norwich area.

Additional water resources would be required to supply this level of new development and the potential sources that have been considered are:

- Existing Thorpe St Andrew and Colney boreholes – these boreholes would be used to their full capacity before any additional resources are drawn upon;
- River Wensum reuse;
- Great Ouse Groundwater Development System (GOGDS); and,
- Water resource storage.

The costings provided in the WCS include the following:

- water mains and pumping stations from Heigham WTW to the development site;
- pumping stations and pipework needed to maximise the existing boreholes;
- pumping stations and pipework needed for River Wensum reuse;
- pumping stations and pipework needed to link to the GOGDS, including only the infrastructure within the study area; and,
- civils, structural, excavation and land costs relating to water resource storage.

It should be noted that the costings in the WCS were prepared as a means of comparing the potential development sites and will need to be refined as the WCS progressed to the next stage.

Based on the projected development phasing for each development area, the following potential funding phasing has been identified for the provision of potable water. These figures provide best and worst case costings depending on which of the additional water resources is selected.

Area	Cost per Year band (£M)				Worst Case Total (£M)
	2009-2016	2017-2021	2022-2026	2027-2031	
Norwich TOTAL	**15.3**	**28.9**	**0**	**0**	**44.2**
Broadland - Rackheath	20.9	8.3	0	0	**29.2**
Broadland - Sprowston Fringe	23.3	11.6	0	0	**34.9**
Broadland - Thorpe St Andrew (Broadland Business Park)	15.1	6.6	0	0	**21.7**
Broadland Smaller Sites	51.1	0	0	0	**51.1**
Broadland TOTAL	**110.4**	**26.5**	**0**	**0**	**136.9**
South Norfolk - Wymondham	23.0	8.0	0	0	**31.0**
South Norfolk - Long Stratton	0	35.6	0	0	**35.6**
South Norfolk - Hethersett, Cringleford & Colney	12.8	8.3	0	0	**21.1**
South Norfolk - Easton and Costessey	10.1	7.7	0	0	**17.8**
South Norfolk Smaller Sites	72.2	0	0		**72.2**
South Norfolk TOTAL	**118.1**	**59.6**	**0**	**0**	**177.7**
GRAND TOTAL	**243.8**	**115.0**	**0**	**0**	**358.8**

Table 8.4 – Potential Funding Projection for Estimated Water Supply Costs based on Worst Case Water Resource Options

Area	Cost per Year band (£M)				Best Case Total (£M)
	2009-2016	2017-2021	2022-2026	2027-2031	
Norwich TOTAL	**15.3**	**2.8**	**0**	**0**	**18.1**
Broadland - Rackheath	20.9	5.2	0	0	**26.1**
Broadland - Sprowston Fringe	23.3	4.2	0	0	**27.5**
Broadland - Thorpe St Andrew (Broadland Business Park)	15.1	1.0	0	0	**16.1**
Broadland Smaller Sites	51.1	0		0	**51.1**
Broadland TOTAL	**110.4**	**10.4**	**0**	**0**	**120.8**
South Norfolk - Wymondham	23.0	4.2	0	0	**27.2**
South Norfolk - Long Stratton	0	31.1	0	0	**31.1**
South Norfolk - Hethersett, Cringleford & Colney	12.8	2.7	0	0	**15.5**
South Norfolk - Easton and Costessey	10.1	2.1	0	0	**12.2**
South Norfolk Smaller Sites	72.2	0	0		**72.2**
South Norfolk TOTAL	**118.1**	**40.1**	**0**	**0**	**158.2**
GRAND TOTAL	**243.8**	**53.3**	**0**	**0**	**297.1**

Table 8.5 – Potential Funding Projection for Estimated Water Supply Costs based on Best Case Water Resource Options

Funding options for the provision of potable water to the development sites is to be investigated as part of the Stage 2b WCS.

8.4 Wastewater Summary

The Stage 2a WCS investigated a number of options for the conveyance and treatment of wastewater from the development areas, as follows:

- Option 1 – upgrading the existing Whitlingham WwTW. It is understood that Whitlingham WwTW has 109,000PE of spare headroom capacity, equating to approximately 52,000 new properties, so volumetric upgrade would have negligible resultant cost. Other items included in the costs are nutrient load removal for the additional load and also the primary sewer linking the development area to the WwTW.
- Option 2 – Upgrade existing local WwTW. Many of the development areas have a local WwTW that could be utilised and upgraded where necessary to accommodate the proposed development.
- Option 3 – New WwTW close to the development area. Cost includes the provision of a new local WwTW to receive all of the flow from the proposed development. As the new WwTW would be located within the development area, the cost of strategic sewers has been assumed to be negligible.

While all three options have been considered for the larger growth areas, only Option 2 has been considered for the smaller, more rural development sites. In addition, for the Norwich City growth area, only Option 1 has been considered as this is the only feasible option.

Costings, including potential phasing, have been assembled, as detailed in Tables 8.6 and 8.7 below. It is understood that the costings in the WCS were prepared as a means of comparing the potential development sites and will need to be refined as the WCS progressed to the next stage.

Option	WwTW	Cost per Year band (£M)				Total (£M)
		2009-2016	2017-2021	2022-2026	2027-2031	
1	Whitlingham	42.9	14.4	4.3	2.7	**64.3**
	TOTAL Option 1	**42.9**	**14.4**	**4.3**	**2.7**	**64.3**
2	Whitlingham (Norwich only)	5.0	0.8	0.4	0	**6.2**
	Wymondham	13.8	22.4	0.5	-	**36.7**
	Rackheath	48.0				**48.0**
	TOTAL Option 2	**66.8**	**23.2**	**0.9**	**0**	**90.9**
3	Whitlingham (Norwich only)	5.0	0.8	0.4	0	**6.2**
	Rackheath (new)	16.7				**16.7**
	Sprowston Fringe (new)	24.4				**24.4**
	Thorpe St Andrew (new)	1.3				**1.3**
	Wymondham (new)	11.4				**11.4**
	Long Stratton (new)	10.5				**10.5**
	Hethersett area (new)	11.4				**11.4**
	Easton area (new)	10.5				**10.5**
	TOTAL Option 3	**91.2**	**0.8**	**0.4**	**0**	**92.4**

Table 8.6 –Potential Funding Projection for Wastewater Treatment Options for Larger Development Sites

Option	WwTW	Cost per Year band (£K)				Total (£K)
		2009-2016	2017-2021	2022-2026	2027-2031	
2	Reepham	182	29	609	-	**820**
	Aylsham	342	2,409	29	-	**2,780**
	Belaugh	502	29	29	-	**560**
	Acle-Damgate	1,362	29	29	-	**1,420**
	Diss	182	29	29	-	**240**
	Harleston	372	29	29	-	**430**
	Sisland	822	29	29	-	**880**
	TOTAL	**3,764**	**2,583**	**783**	**0**	**7,130**

Table 8.7 –Potential Funding Projection for Wastewater Treatment at Smaller Rural Development Sites

8.5 Conclusions

Based on the information available at the time of writing, funding projections are only possible for the supply of potable water and the treatment of wastewater for the latest development proposals, as detailed in the Key Assumptions Paper and subsequent update. No response has yet been received from EDF Energy with regard to electricity supply. The response received from National Grid identifies likely reinforcement works, but budget quotations for the works are not possible without increased development details.

The level of detail available in the current proposals is not great, and as such, several assumptions have been made in the compiling of this data. Once more detailed development sizes and locations are provided, more accurate costings can be determined.

Details of funding mechanisms are not included in the current (Stage 2a) WCS and have also not yet been made available from National Grid or EDF Energy. This report will be updated when the information has become available.

Sustainability issues are largely considered as part of separate studies, such as the “Sustainable Energy Study”, WCS and SFRA.

This Utilities Assessment takes no account of renewable energy resources at this stage in order to provide a more robust cost analysis.

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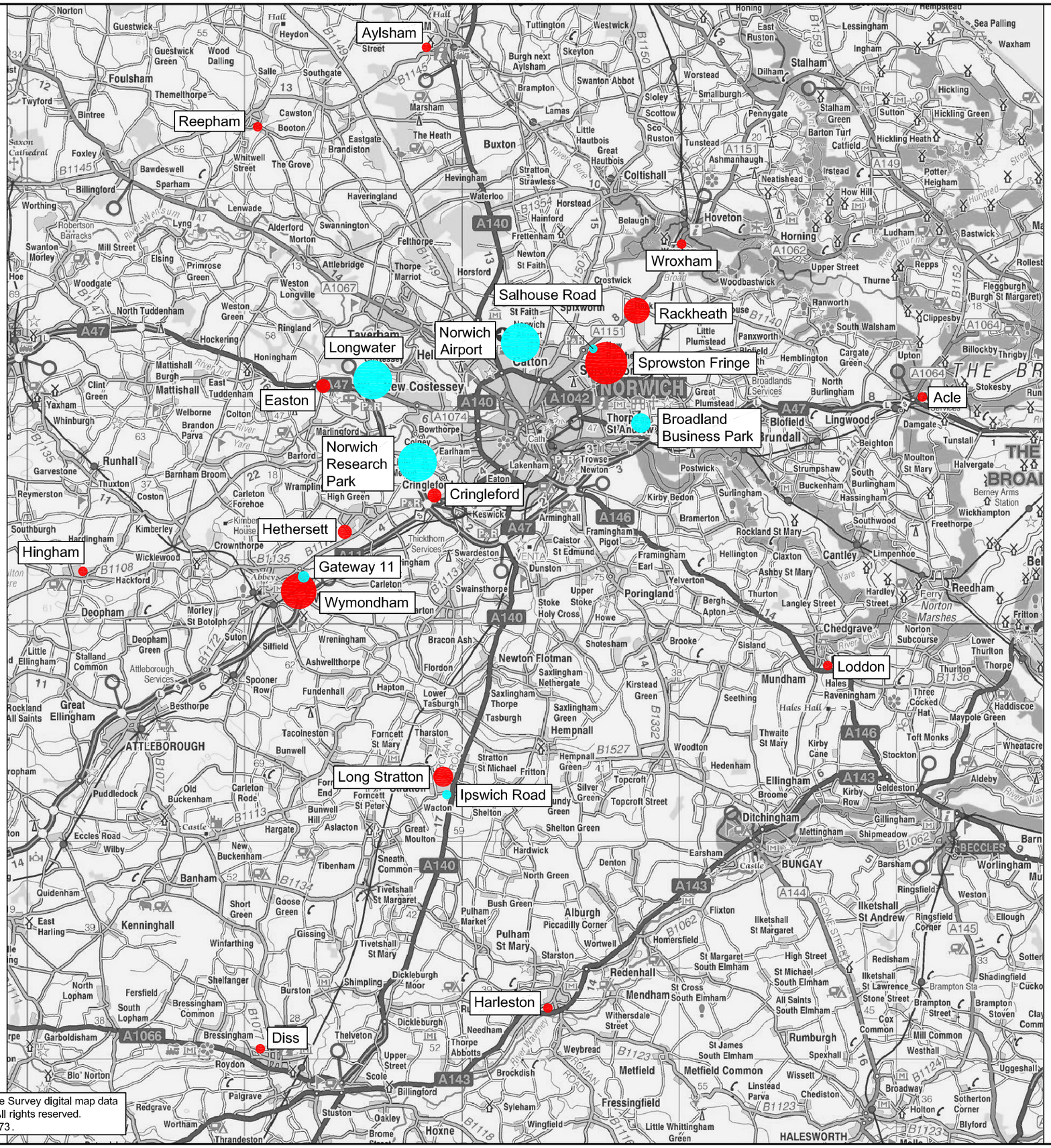
Figures



NOTES

1. Information based on data supplied in the Greater Norwich Infrastructure and Funding Study, Key Assumptions Paper (EDAW, March 2009).
2. Information shown for Broadland and South Norfolk areas only. Details for Norwich area omitted for clarity.
3. Housing and employment details are provided only for named locations - no potential "smaller sites" are included.

KEY

- Proposed area of Housing (approximate relative sizes shown)
- Proposed area of Employment (approximate relative sizes shown)

Rev	Date	Detail	Made	Chk'd	App'd
P2	May 09	Area extended to include rural sites. Labels added.	GSH	SLM	SLM
P1	Mar 09	Initial issue	GSH	SLM	SLM

Client:

GREATER NORWICH DEVELOPMENT PARTNERSHIP

Project:

Greater Norwich Infrastructure & Funding Study - Utilities Assessment

Title:

Proposed Housing and Employment Sites Location Plan

Design:	GSH	CAD:	GSH
Chk'd:	SLM	App'd:	SLM
Date:	March 2009	Scale:	NTS

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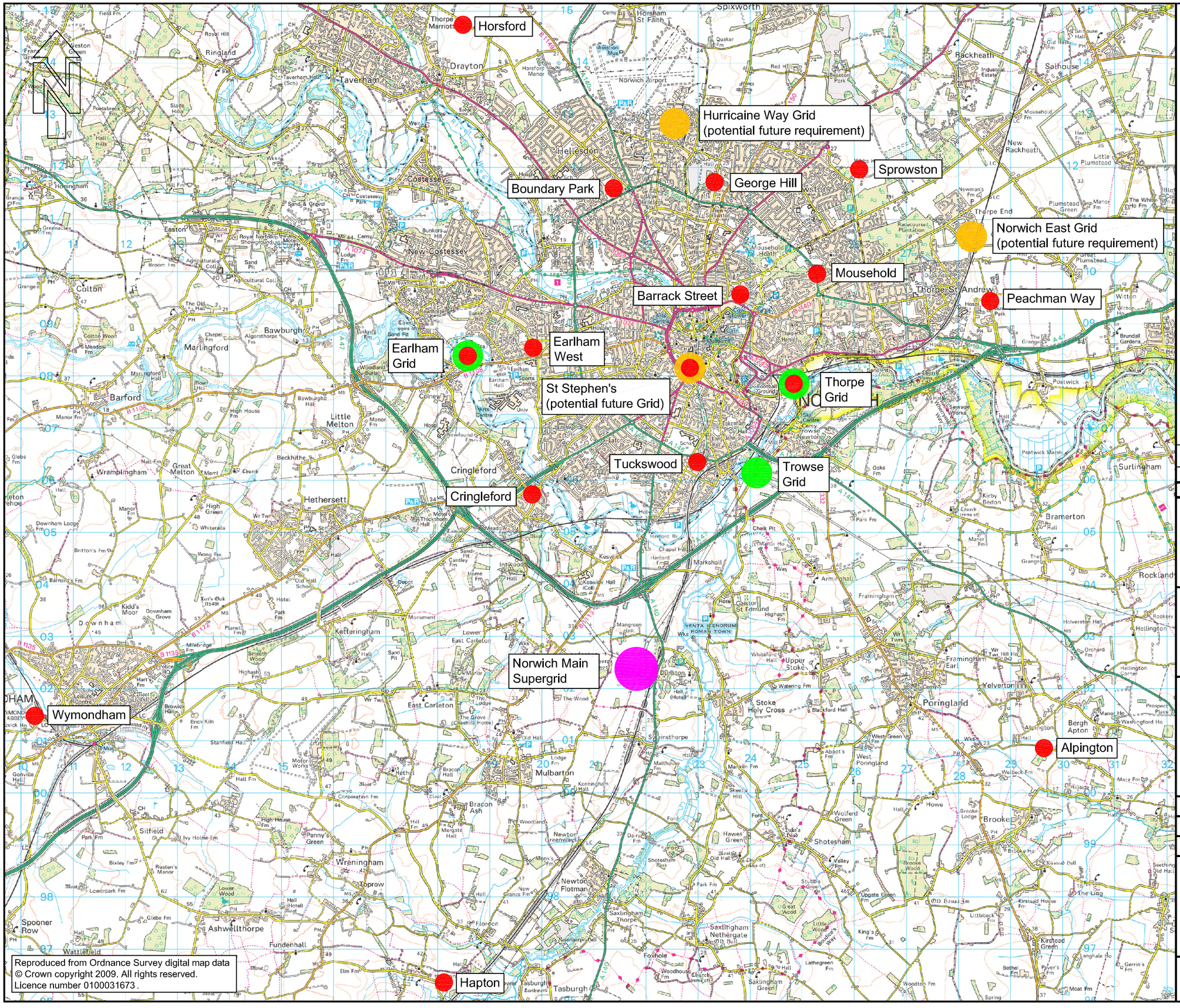

NOTES

1. Information based on data provided in EDF Energy "Report on Possible Network Reinforcement Requirements Resulting from the Proposed Greater Norwich Growth Area", dated 11-6-09.

KEY

- Existing Primary Substation
- Existing Grid Substation
- Existing Norwich Main Supergrid
- Potential Future Grid Substation (dependent on proposed demand)

Rev	Date	Detail	Made	Chk'd	App'd
P2	Jun 09	Substations at Alpington, Wymondham and Hapton added. Scale changed.	GSH	SLM	SLM
P1	May 09	Initial issue	GSH	SLM	SLM

Client:

GREATER NORWICH DEVELOPMENT PARTNERSHIP

Project:

Greater Norwich Infrastructure & Funding Study - Utilities Assessment

Title:

Existing Electricity Assets Location Plan

Design:	GSH	CAD:	GSH
Chk'd:	SLM	App'd:	SLM
Date:	May 2009	Scale:	NTS

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No. Figure 2

Rev: P2

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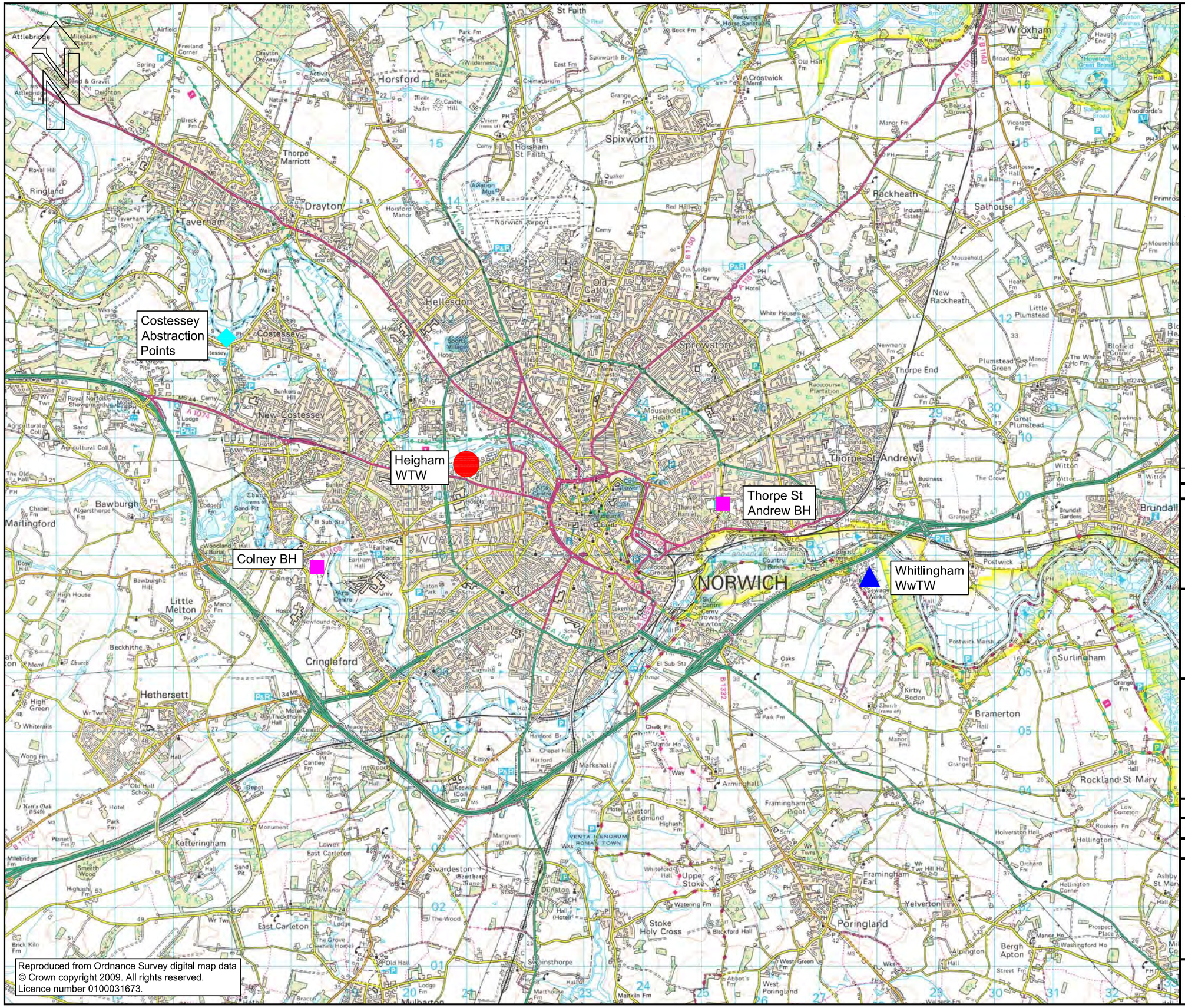
cm A3



NOTES

1. Information based on data provided in the Stage 2a Water Cycle Study (Scott Wilson, September 2008).

KEY

- Existing Water Treatment Works
- Existing Wastewater Treatment Works (for River Wensum Reuse)
- Existing Borehole
- Existing Abstraction Point

Rev	Date	Detail	Made	Chk'd	App'd
P1	May 09	Initial issue	GSH	SLM	SLM

Client:

GREATER NORWICH DEVELOPMENT PARTNERSHIP

Project:

Greater Norwich Infrastructure & Funding Study - Utilities Assessment

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Existing Potable Water Assets Location Plan

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No. Figure 3

Rev: P1

cm

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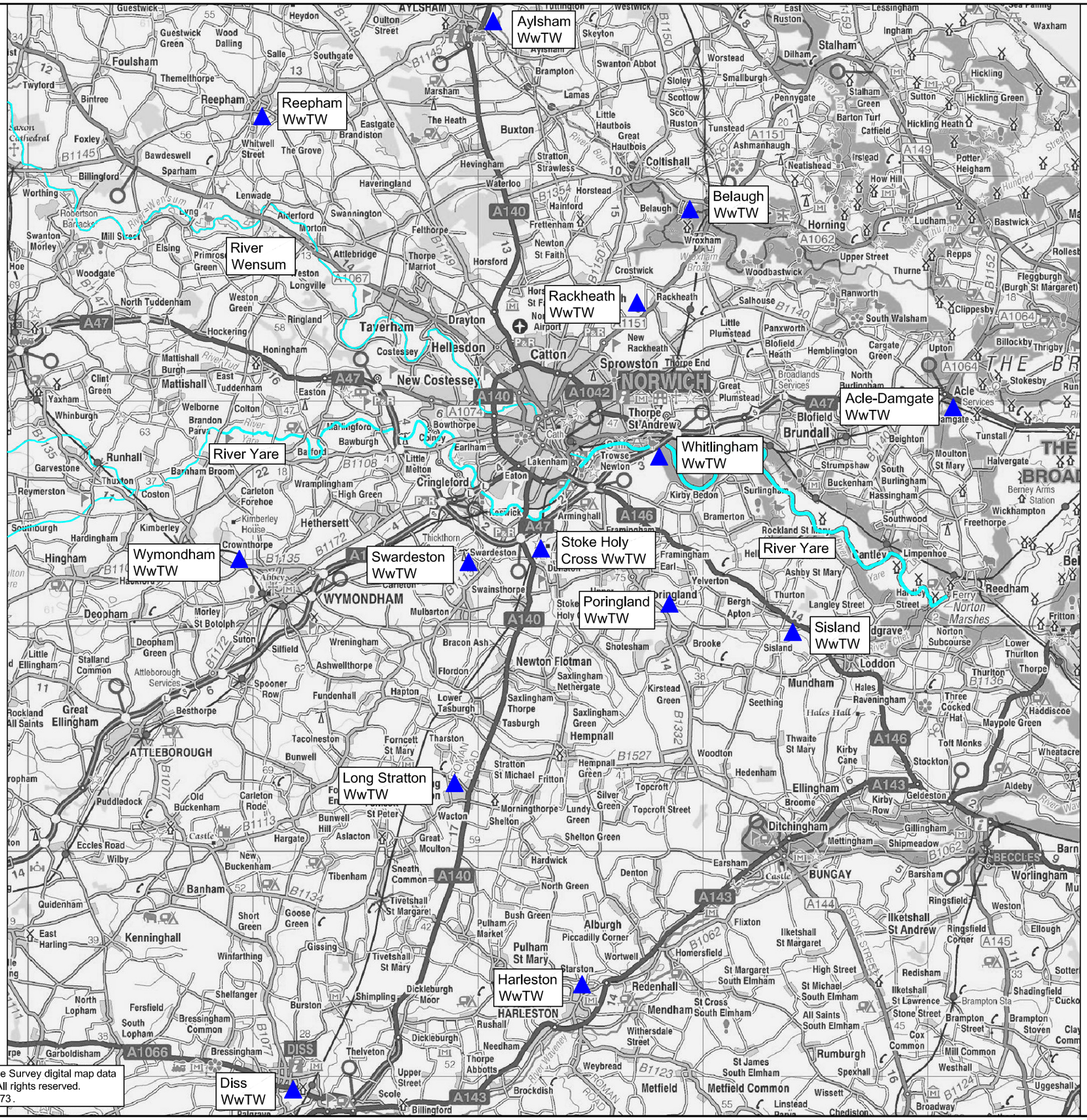

NOTES

1. Information based on data provided in the Stage 2a Water Cycle Study (Scott Wilson, September 2008).

KEY

▲ Existing Wastewater Treatment Works (as identified in WCS)

Rev	Date	Detail	Made	Chk'd	App'd
P1	May 09	Initial issue	GSH	SLM	SLM

Client:

GREATER NORWICH DEVELOPMENT PARTNERSHIP

Project:

Greater Norwich Infrastructure & Funding Study - Utilities Assessment

Title:

Existing Foul Water Assets Location Plan

Design:	GSH	CAD:	GSH
Chk'd:	SLM	App'd:	SLM
Date:	May 2009	Scale:	NTS

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No. Figure 4

Rev: P1

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Appendix A
Utility Loading Calculations

Development Proposals

Notes:
1. Housing figures are given in Dwellings; employment figures are given in Hectares.
2. Employment areas are total site areas.
3. For loading calculations, GEA of 20% has been assumed for B1 land use; GEA of 40% has been assumed for B2/B8 land use.
4. For loading calculations, average occupancy of residential dwellings assumed to be 2.55.
5. Figures provided for each year band are incremental, not cumulative.

Broadland

Area	WCS Policy Area	Housing/ Employment	Land Use	Totals	2009 - 2016	2017-2021	2022-2026	2027-2031
Rackheath	NPA3a	Housing		**3400**	1035	1150	1150	65
		Employment		**0**	0	0	0	0
Sprowston Fringe	NPA2	Housing		**6600**	350	1750	1750	2750
(Salhouse Rd)		Employment	B2/B8	**3.1**	0.16	0.82	0.82	1.29
Thorpe St Andrew	NPA3b	Housing		**0**	0	0	0	0
(Broadland Bus Pk)		Employment	B1	**25**	1.33	6.63	6.63	10.42
Smaller Sites	RPA1, 2, 3 & 4	Housing		**2000**	340	850	810	0
		Employment		**0**	0	0	0	0
Urban Commitments		Housing		**2029**	369	1162	498	0
		Employment		**0**	0	0	0	0
Rural Commitments		Housing		**662**	213	416	33	0
		Employment		**0**	0	0	0	0
Totals		**Housing**		**14691**	2307	5328	4241	2815
		Employment		**28.1**	1.49	7.45	7.45	11.71

Norwich

Area		Housing/ Employment	Land Use	Totals	2009 - 2016	2017-2021	2022-2026	2027-2031
Allocations	NPA11	Housing		**3250**	500	1250	1250	250
(City Centre)		Employment	B1	**50**	7.69	19.23	19.23	3.85
(Airport)		Employment	B2/B8	**50**	7.69	19.23	19.23	3.85
Commitments		Housing		**5592**	1028	3518	1046	0
		Employment		**0**	0	0	0	0
Totals		**Housing**		**8842**	1528	4768	2296	250
		Employment		**100**	**15.38**	**38.46**	**38.46**	**7.69**

South Norfolk

Area		Housing/ Employment	Land Use	Totals	2009 - 2016	2017-2021	2022-2026	2027-2031
Wymondham	NPA7	Housing		**2200**	370	925	905	0
(Gateway 11)		Employment	B2/B8	**8.5**	1.43	3.57	3.50	0.00
Long Stratton	NPA6	Housing		**1800**	0	650	1150	0
(Ipswich Road)		Employment	B2/B8	**5**	0.00	1.81	3.19	0.00
Hethersett	NPA8	Housing		**1000**	140	800	60	0
		Employment		**0**	0	0	0	0
Cringleford	NPA8	Housing		**1200**	50	600	550	0
		Employment		**0**	0	0	0	0
Easton	NPA9	Housing		**1000**	140	800	60	0
		Employment		**0**	0	0	0	0
Costessey	NPA9	Housing		**0**	0	0	0	0
(Longwater)		Employment	B2/B8	**50**	7	40	3	0
Colney	NPA8	Housing		**0**	0	0	0	0
(Norwich Res Pk)		Employment	B1	**50**	2.08	25.00	22.92	0.00
Smaller Sites	RPA5, 6, 7 & 8	Housing		**1800**	300	750	750	0
		Employment		**0**	0	0	0	0
Urban Capacity		Housing		**65**	12	28	25	0
		Employment		**0**	0	0	0	0
Urban Commitments		Housing		**4156**	1348	2623	185	0
		Employment		**0**	0	0	0	0
Rural Commitments		Housing		**1328**	514	776	38	0
		Employment		**0**	0	0	0	0
Totals		**Housing**		**14549**	**2874**	7952	**3723**	**0**
		Employment		**113.5**	**10.51**	70.38	**32.61**	**0.00**

RSS Review

Area		Housing/ Employment	Land Use	Totals	2009 - 2016	2017-2021	2022-2026	2027-2031
Greater Norfolk Area		Housing		**2000**	696	435	435	434

Additional Dwellings

Area		Housing/ Employment	Land Use	Totals	2009 - 2016	2017-2021	2022-2026	2027-2031
Greater Norfolk Area		Housing		**10000**	0	0	0	10000

Potable Water Loading Calculations

Broadland

Area	Housing/ Employment	2009 - 2016 Daily (l/day)	2009 - 2016 Peak (l/s)	2017-2021 Daily (l/day)	2017-2021 Peak (l/s)	2022-2026 Daily (l/day)	2022-2026 Peak (l/s)	2027-2031 Daily (l/day)	2027-2031 Peak (l/s)
Rackheath	Housing	343103	5	234600	4	234600	4	13260	0.2
	Employment	0	0	0	0	0	0	0	0
Sprowston Fringe	Housing	116025	2	357000	5.51	357000	5.51	561000	8.7
(Salhouse Rd)	Employment	731	0.02	3655	0.1	3655	0.1	5744	0.16
Thorpe St Andrew	Housing	0	0	0	0	0	0	0	0
(Broadland Bus Pk)	Employment	6280	0.17	31400	1	31400	1	49342	1
Smaller Sites	Housing	112710	2	173400	3	165240	3	0	0
	Employment	0	0	0	0	0	0	0	0
Urban Commitments	Housing	122324	2	237048	4	101592	2	0	0
	Employment	0	0	0	0	0	0	0	0
Rural Commitments	Housing	70610	1	84864	1	6732	0.1	0	0
	Employment	0	0	0	0	0	0	0	0
Totals	**Housing**	**764772**	**12**	**1086912**	**17.51**	**865164**	**14.61**	**574260**	**8.9**
	Employment	**7011**	**0.19**	**35055**	**1.1**	**35055**	**1.1**	**55086**	**1.16**
	Combined	**771783**	**12.19**	**1121967**	**18.61**	**900219**	**15.71**	**629346**	**10.06**

Norwich

Area	Housing/ Employment	2009 - 2016 Daily (l/day)	2009 - 2016 Peak (l/s)	2017-2021 Daily (l/day)	2017-2021 Peak (l/s)	2022-2026 Daily (l/day)	2022-2026 Peak (l/s)	2027-2031 Daily (l/day)	2027-2031 Peak (l/s)
Allocations	Housing	165750	3	255000	4	255000	4	51000	1
(Combined)	Employment	104853	3	262134	7	262134	7	52427	1
Commitments	Housing	340782	5	717672	11	213384	3	0	0
	Employment	0	0	0	0	0	0	0	0
Totals	**Housing**	**506532**	**8**	**972672**	**15**	**468384**	**7**	**51000**	**1**
	Employment	**104853**	**3**	**262134**	**7**	**262134**	**7**	**52427**	**1**
	Combined	**611385**	**11**	**1234806**	**22**	**730518**	**14**	**103427**	**2**

South Norfolk

Area	Housing/ Employment	2009 - 2016 Daily (l/day)	2009 - 2016 Peak (l/s)	2017-2021 Daily (l/day)	2017-2021 Peak (l/s)	2022-2026 Daily (l/day)	2022-2026 Peak (l/s)	2027-2031 Daily (l/day)	2027-2031 Peak (l/s)
Wymondham	Housing	122655	2	188700	3	184620	3	0	0
(Gateway 11)	Employment	6357	0.18	15893	0.44	15550	0.43	0	0
Long Stratton	Housing	0	0	132600	2	234600	4	0	0
(Ipswich Road)	Employment	0	0	8030	0.22	14206	0.39	0	0
Hethersett	Housing	46410	1	163200	3	12240	0.19	0	0
	Employment	0	0	0	0	0	0	0	0
Cringleford	Housing	16575	0.26	122400	2	112200	2	0	0
	Employment	0	0	0	0	0	0	0	0
Easton	Housing	46410	1	163200	3	12240	0.19	0	0
	Employment	0	0	0	0	0	0	0	0
Costessey	Housing	0	0	0	0	0	0	0	0
(Longwater)	Employment	31129	1	177882	5	13341	0.37	0	0
Colney	Housing	0	0	0	0	0	0	0	0
(Norwich Res Pk)	Employment	9868	0.27	118421	3	108553	3	0	0
Smaller Sites	Housing	99450	2	153000	2	153000	2	0	0
	Employment	0	0	0	0	0	0	0	0
Urban Capacity	Housing	3978	0.06	5712	0.09	5100	0.08	0	0
	Employment	0	0	0	0	0	0	0	0
Urban Commitments	Housing	446862	7	535092	8	37740	1	0	0
	Employment	0	0	0	0	0	0	0	0
Rural Commitments	Housing	170391	3	158304	2	7752	0.12	0	0
	Employment	0	0	0	0	0	0	0	0
Totals	**Housing**	**952731**	**16.32**	**1622208**	**25.09**	**759492**	**12.58**	**0**	**0**
	Employment	**47354**	**1.45**	**320226**	**8.66**	**151650**	**4.19**	**0**	**0**
	Combined	**1000085**	**17.77**	**1942434**	**33.75**	**911142**	**16.77**	**0**	**0**

RSS Review

Area	Housing/ Employment	2009 - 2016 Daily (l/day)	2009 - 2016 Peak (l/s)	2017-2021 Daily (l/day)	2017-2021 Peak (l/s)	2022-2026 Daily (l/day)	2022-2026 Peak (l/s)	2027-2031 Daily (l/day)	2027-2031 Peak (l/s)
Greater Norfolk Area	Housing	230724	4	88740	1	88740	1	88536	1

Additional Dwellings

Area	Housing/ Employment	2009 - 2016 Daily (l/day)	2009 - 2016 Peak (l/s)	2017-2021 Daily (l/day)	2017-2021 Peak (l/s)	2022-2026 Daily (l/day)	2022-2026 Peak (l/s)	2027-2031 Daily (l/day)	2027-2031 Peak (l/s)
Greater Norfolk Area	Housing	0	0	0	0	0	0	2040000	31

Electricity Loading Calculations

Broadland

Area	Housing/ Employment	2009 - 2016 Peak Hourly (kW)	2017-2021 Peak Hourly (kW)	2022-2026 Peak Hourly (kW)	2027-2031 Peak Hourly (kW)
Rackheath	Housing	18630	20700	20700	1170
	Employment	0	0	0	0
Sprowston Fringe	Housing	6300	31500	31500	39500
(Salhouse Rd)	Employment	38	189	189	296
Thorpe St Andrew	Housing	0	0	0	0
(Broadland Bus Pk)	Employment	304	1521	1521	2391
Smaller Sites	Housing	6120	15300	14580	0
	Employment	0	0	0	0
Urban Commitments	Housing	6642	20196	8964	0
	Employment	0	0	0	0
Rural Commitments	Housing	3834	7488	594	0
	Employment	0	0	0	0
Totals	**Housing**	**41526**	**95184**	**76338**	**40670**
	Employment	**342**	**1710**	**1710**	**2687**
	Combined	**41868**	**96894**	**78048**	**43357**

Norwich

Area	Housing/ Employment	2009 - 2016 Peak Hourly (kW)	2017-2021 Peak Hourly (kW)	2022-2026 Peak Hourly (kW)	2027-2031 Peak Hourly (kW)
Allocations	Housing	9000	22500	22500	4500
(Combined)	Employment	5296	13240	13240	2648
Commitments	Housing	18504	63324	18828	0
	Employment	0	0	0	0
Totals	**Housing**	**27504**	**85824**	**41328**	**4500**
	Employment	**5296**	**13240**	**13240**	**2648**
	Combined	**32800**	**99064**	**54568**	**7148**

South Norfolk

Area	Housing/ Employment	2009 - 2016 Peak Hourly (kW)	2017-2021 Peak Hourly (kW)	2022-2026 Peak Hourly (kW)	2027-2031 Peak Hourly (kW)
Wymondham	Housing	6660	16650	16290	0
(Gateway 11)	Employment	328	820	802	0
Long Stratton	Housing	0	11700	20700	0
(Ipswich Road)	Employment	0	414	733	0
Hethersett	Housing	2520	14400	1080	0
	Employment	0	0	0	0
Cringleford	Housing	900	10800	9900	0
	Employment	0	0	0	0
Easton	Housing	2520	14400	1080	0
	Employment	0	0	0	0
Costessey	Housing	0	0	0	0
(Longwater)	Employment	1607	9180	689	0
Colney	Housing	0	0	0	0
(Norwich Res Pk)	Employment	478	5738	5259	0
Smaller Sites	Housing	5400	13500	13500	0
	Employment	0	0	0	0
Urban Capacity	Housing	216	504	450	0
	Employment	0	0	0	0
Urban Commitments	Housing	24264	47214	3330	0
	Employment	0	0	0	0
Rural Commitments	Housing	9252	13968	684	0
	Employment	0	0	0	0
Totals	**Housing**	**51732**	**143136**	**67014**	**0**
	Employment	**2413**	**16152**	**7483**	**0**
	Combined	**54145**	**159288**	**74497**	**0**

RSS Review

Area	Housing/ Employment	2009 - 2016 Peak Hourly (kW)	2017-2021 Peak Hourly (kW)	2022-2026 Peak Hourly (kW)	2027-2031 Peak Hourly (kW)
Greater Norfolk Area	Housing	12528	7830	7830	7812

Additional Dwellings

Area	Housing/ Employment	2009 - 2016 Peak Hourly (kW)	2017-2021 Peak Hourly (kW)	2022-2026 Peak Hourly (kW)	2027-2031 Peak Hourly (kW)
Greater Norfolk Area	Housing	0	0	0	180000

Adjusted Electricity Loading Calculations (1.5kW/dwelling)

Broadland

Area	Housing/ Employment	2009 - 2016 Peak Hourly (kW)	2017-2021 Peak Hourly (kW)	2022-2026 Peak Hourly (kW)	2027-2031 Peak Hourly (kW)
Rackheath	Housing	1553	1725	1725	98
	Employment	0	0	0	0
Sprowston Fringe	Housing	525	2625	2625	3292
(Salhouse Rd)	Employment	38	189	189	296
Thorpe St Andrew	Housing	0	0	0	0
(Broadland Bus Pk)	Employment	304	1521	1521	2391
Smaller Sites	Housing	510	1275	1215	0
	Employment	0	0	0	0
Urban Commitments	Housing	554	1683	747	0
	Employment	0	0	0	0
Rural Commitments	Housing	320	624	50	0
	Employment	0	0	0	0
Totals	**Housing**	**3461**	**7932**	**6362**	**3389**
	Employment	**342**	**1710**	**1710**	**2687**
	Combined	**3803**	**9642**	**8072**	**6076**

Norwich

Area	Housing/ Employment	2009 - 2016 Peak Hourly (kW)	2017-2021 Peak Hourly (kW)	2022-2026 Peak Hourly (kW)	2027-2031 Peak Hourly (kW)
Allocations	Housing	750	1875	1875	375
(Combined)	Employment	5296	13240	13240	2648
Commitments	Housing	1542	5277	1569	0
	Employment	0	0	0	0
Totals	**Housing**	**2292**	**7152**	**3444**	**375**
	Employment	**5296**	**13240**	**13240**	**2648**
	Combined	**7588**	**20392**	**16684**	**3023**

South Norfolk

Area	Housing/ Employment	2009 - 2016 Peak Hourly (kW)	2017-2021 Peak Hourly (kW)	2022-2026 Peak Hourly (kW)	2027-2031 Peak Hourly (kW)
Wymondham	Housing	555	1388	1358	0
(Gateway 11)	Employment	328	820	802	0
Long Stratton	Housing	0	975	1725	0
(Ipswich Road)	Employment	0	414	733	0
Hethersett	Housing	210	1200	90	0
	Employment	0	0	0	0
Cringleford	Housing	75	900	825	0
	Employment	0	0	0	0
Easton	Housing	210	1200	90	0
	Employment	0	0	0	0
Costessey	Housing	0	0	0	0
(Longwater)	Employment	1607	9180	689	0
Colney	Housing	0	0	0	0
(Norwich Res Pk)	Employment	478	5738	5259	0
Smaller Sites	Housing	450	1125	1125	0
	Employment	0	0	0	0
Urban Capacity	Housing	18	42	38	0
	Employment	0	0	0	0
Urban Commitments	Housing	2022	3935	278	0
	Employment	0	0	0	0
Rural Commitments	Housing	771	1164	57	0
	Employment	0	0	0	0
Totals	**Housing**	**4311**	**11928**	**5585**	**0**
	Employment	**2413**	**16152**	**7483**	**0**
	Combined	**6724**	**28080**	**13068**	**0**

RSS Review

Area	Housing/ Employment	2009 - 2016 Peak Hourly (kW)	2017-2021 Peak Hourly (kW)	2022-2026 Peak Hourly (kW)	2027-2031 Peak Hourly (kW)
Greater Norfolk Area	Housing	1044	652.5	652.5	651

Additional Dwellings

Area	Housing/ Employment	2009 - 2016 Peak Hourly (kW)	2017-2021 Peak Hourly (kW)	2022-2026 Peak Hourly (kW)	2027-2031 Peak Hourly (kW)
Greater Norfolk Area	Housing	0	0	0	15000

Gas Loading Calculations

Broadland

Area	Housing/ Employment	2009 - 2016 Peak Hourly (kWh)	2009 - 2016 Annual (MWh)	2017-2021 Peak Hourly (kWh)	2017-2021 Annual (MWh)	2022-2026 Peak Hourly (kWh)	2022-2026 Annual (MWh)	2027-2031 Peak Hourly (kWh)	2027-2031 Annual (MWh)
Rackheath	Housing	31050	25104	34500	27893	34500	27983	1950	1577
	Employment	0	0	0	0	0	0	0	0
Sprowston Fringe	Housing	10500	8489	52500	42446	52500	42446	82500	66701
(Salhouse Rd)	Employment	148	181	740	906	740	906	1163	1424
Thorpe St Andrew	Housing	0	0	0	0	0	0	0	0
(Broadland Bus Pk)	Employment	398	487	1989	2436	1989	2436	3125	3828
Smaller Sites	Housing	10200	24990	25500	62475	24300	59535	0	0
	Employment	0	0	0	0	0	0	0	0
Urban Commitments	Housing	11070	27122	34860	85407	14940	36603	0	0
	Employment	0	0	0	0	0	0	0	0
Rural Commitments	Housing	6390	15656	12480	30576	990	2426	0	0
	Employment	0	0	0	0	0	0	0	0
Totals	**Housing**	**69210**	**101361**	**159840**	**248797**	**127230**	**168993**	**84450**	**68278**
	Employment	**546**	**668**	**2729**	**3342**	**2729**	**3342**	**4288**	**5252**
	Combined	**69756**	**102029**	**162569**	**252139**	**129959**	**172335**	**88738**	**73530**

Norwich

Area	Housing/ Employment	2009 - 2016 Peak Hourly (kWh)	2009 - 2016 Annual (MWh)	2017-2021 Peak Hourly (kWh)	2017-2021 Annual (MWh)	2022-2026 Peak Hourly (kWh)	2022-2026 Annual (MWh)	2027-2031 Peak Hourly (kWh)	2027-2031 Annual (MWh)
Allocations	Housing	15000	12128	37500	30319	37500	30319	7500	6064
(Combined)	Employment	16154	19788	40385	49471	40385	49417	8077	9894
Commitments	Housing	30840	24934	105540	85329	31380	25371	0	0
	Employment	0	0	0	0	0	0	0	0
Totals	**Housing**	**45840**	**37062**	**143040**	**115648**	**68880**	**55690**	**7500**	**6064**
	Employment	**16154**	**19788**	**40385**	**49471**	**40385**	**49417**	**8077**	**9894**
	Combined	**61994**	**56850**	**183425**	**165119**	**109265**	**105107**	**15577**	**15958**

South Norfolk

Area	Housing/ Employment	2009 - 2016 Peak Hourly (kWh)	2009 - 2016 Annual (MWh)	2017-2021 Peak Hourly (kWh)	2017-2021 Annual (MWh)	2022-2026 Peak Hourly (kWh)	2022-2026 Annual (MWh)	2027-2031 Peak Hourly (kWh)	2027-2031 Annual (MWh)
Wymondham	Housing	11100	8974	27750	22436	27150	21951	0	0
(Gateway 11)	Employment	1287	1576	3217	3940	3147	3855	0	0
Long Stratton	Housing	0	0	19500	15766	34500	27893	0	0
(Ipswich Road)	Employment	0	0	1625	1991	2875	3522	0	0
Hethersett	Housing	4200	3396	24000	19404	1800	1455	0	0
	Employment	0	0	0	0	0	0	0	0
Cringleford	Housing	1500	1213	18000	14553	16500	13340	0	0
	Employment	0	0	0	0	0	0	0	0
Easton	Housing	4200	3396	24000	19404	1800	1455	0	0
	Employment	0	0	0	0	0	0	0	0
Costessey	Housing	0	0	0	0	0	0	0	0
(Longwater)	Employment	6300	7718	36000	44100	2700	3308	0	0
Colney	Housing	0	0	0	0	0	0	0	0
(Norwich Res Pk)	Employment	625	766	7500	9188	6875	8422	0	0
Smaller Sites	Housing	9000	7277	22500	18191	22500	18191	0	0
	Employment	0	0	0	0	0	0	0	0
Urban Capacity	Housing	360	291	840	679	750	606	0	0
	Employment	0	0	0	0	0	0	0	0
Urban Commitments	Housing	40440	32696	78690	63621	5550	4487	0	0
	Employment	0	0	0	0	0	0	0	0
Rural Commitments	Housing	15420	12467	23280	18822	1140	922	0	0
	Employment	0	0	0	0	0	0	0	0
Totals	**Housing**	**86220**	**69710**	**238560**	**192876**	**111690**	**90300**	**0**	**0**
	Employment	**8212**	**10060**	**48342**	**59219**	**15597**	**19107**	**0**	**0**
	Combined	**94432**	**79770**	**286902**	**252095**	**127287**	**109407**	**0**	**0**

RSS Review

Area	Housing/ Employment	2009 - 2016 Peak Hourly (kWh)	2009 - 2016 Annual (MWh)	2017-2021 Peak Hourly (kWh)	2017-2021 Annual (MWh)	2022-2026 Peak Hourly (kWh)	2022-2026 Annual (MWh)	2027-2031 Peak Hourly (kWh)	2027-2031 Annual (MWh)
Greater Norfolk Area	Housing	20880	16881	13050	10551	13050	10551	13020	10527

Additional Dwellings

Area	Housing/ Employment	2009 - 2016 Peak Hourly (kWh)	2009 - 2016 Annual (MWh)	2017-2021 Peak Hourly (kWh)	2017-2021 Annual (MWh)	2022-2026 Peak Hourly (kWh)	2022-2026 Annual (MWh)	2027-2031 Peak Hourly (kWh)	2027-2031 Annual (MWh)
Greater Norfolk Area	Housing	0	0	0	0	0	0	300000	242550

Foul Water Discharge Loading Calculations

Broadland

		2009 - 2016		2017-2021		2022-2026		2027-2031	
Area	**Housing/ Employment**	**Daily (l/day)**	**Peak (l/s)**	**Daily (l/day)**	**Peak (l/s)**	**Daily (l/day)**	**Peak (l/s)**	**Daily (l/day)**	**Peak (l/s)**
Rackheath	Housing	527850	40.3	586500	44.8	586500	44.8	33150	2.5
	Employment	0	0	0	0	0	0	0	0
Sprowston Fringe	Housing	178500	13.6	892500	68.2	892500	68.2	1402500	107.1
(Salhouse Rd)	Employment	1184	0.1	5918	0.5	5918	0.5	9300	0.8
Thorpe St Andrew	Housing	0	0	0	0	0	0	0	0
(Broadland Bus Pk	Employment	6280	0.5	31400	2.6	31400	2.6	49342	4.1
Smaller Sites	Housing	173400	13.2	433500	33.1	413100	31.6	0	0
	Employment	0	0	0	0	0	0	0	0
Urban Commitmen	Housing	188190	14.4	592620	45.3	253980	19.4	0	0
	Employment	0	0	0	0	0	0	0	0
Rural Commitment	Housing	108630	8.3	212160	16.2	16830	1.3	0	0
	Employment	0	0	0	0	0	0	0	0
Totals	**Housing**	**1176570**	**89.8**	**2717280**	**207.6**	**2162910**	**165.3**	**1435650**	**109.6**
	Employment	**7464**	**0.6**	**37318**	**3.1**	**37318**	**3.1**	**58642**	**4.9**
	Combined	**1184034**	**90.4**	**2754598**	**210.7**	**2200228**	**168.4**	**1494292**	**114.5**

Norwich

		2009 - 2016		2017-2021		2022-2026		2027-2031	
Area	**Housing/ Employment**	**Daily (l/day)**	**Peak (l/s)**	**Daily (l/day)**	**Peak (l/s)**	**Daily (l/day)**	**Peak (l/s)**	**Daily (l/day)**	**Peak (l/s)**
Allocations	Housing	255000	19.5	637500	48.7	637500	48.7	127500	9.7
(Combined)	Employment	147206	12.3	368016	30.7	368106	30.7	73603	6.1
Commitments	Housing	524280	40	1794180	137.1	533460	40.8	0	0
	Employment	0	0	0	0	0	0	0	0
Totals	**Housing**	**779280**	**59.5**	**2431680**	**185.8**	**1170960**	**89.5**	**127500**	**9.7**
	Employment	**147206**	**12.3**	**368016**	**30.7**	**368106**	**30.7**	**73603**	**6.1**
	Combined	**926486**	**71.8**	**2799696**	**216.5**	**1539066**	**120.2**	**201103**	**15.8**

South Norfolk

		2009 - 2016		2017-2021		2022-2026		2027-2031	
Area	**Housing/ Employment**	**Daily (l/day)**	**Peak (l/s)**	**Daily (l/day)**	**Peak (l/s)**	**Daily (l/day)**	**Peak (l/s)**	**Daily (l/day)**	**Peak (l/s)**
Wymondham	Housing	188700	14.4	471750	36	461550	35.3	0	0
(Gateway 11)	Employment	10292	0.8	25732	2.1	25176	2.1	0	0
Long Stratton	Housing	0	0	331500	25.3	586500	44.8	0	0
(Ipswich Road)	Employment	0	0	13000	1.1	2300	1.9	0	0
Hethersett	Housing	71400	5.5	408000	31.2	30600	2.3	0	0
	Employment	0	0	0	0	0	0	0	0
Cringleford	Housing	25500	1.9	306000	23.4	280500	21.4	0	0
	Employment	0	0	0	0	0	0	0	0
Easton	Housing	71400	5.5	408000	31.2	30600	2.3	0	0
	Employment	0	0	0	0	0	0	0	0
Costessey	Housing	0	0	0	0	0	0	0	0
(Longwater)	Employment	50400	4.2	288000	24	21600	1.8	0	0
Colney	Housing	0	0	0	0	0	0	0	0
(Norwich Res Pk)	Employment	9868	0.8	118421	9.9	108553	9	0	0
Smaller Sites	Housing	153000	11.7	382500	29.2	382500	29.2	0	0
	Employment	0	0	0	0	0	0	0	0
Urban Capacity	Housing	6120	0.5	14280	1.1	12750	1	0	0
	Employment	0	0	0	0	0	0	0	0
Urban Commitmen	Housing	687480	52.5	1337730	102.2	94350	7.2	0	0
	Employment	0	0	0	0	0	0	0	0
Rural Commitment	Housing	262140	20	395760	30.2	19380	1.5	0	0
	Employment	0	0	0	0	0	0	0	0
Totals	**Housing**	**1465740**	**112**	**4055520**	**309.8**	**1898730**	**145**	**0**	**0**
	Employment	**70560**	**5.8**	**445153**	**37.1**	**157629**	**14.8**	**0**	**0**
	Combined	**1536300**	**117.8**	**4500673**	**346.9**	**2056359**	**159.8**	**0**	**0**

RSS Review

		2009 - 2016		2017-2021		2022-2026		2027-2031	
Area	**Housing/ Employment**	**Daily (l/day)**	**Peak (l/s)**	**Daily (l/day)**	**Peak (l/s)**	**Daily (l/day)**	**Peak (l/s)**	**Daily (l/day)**	**Peak (l/s)**
Greater Norfolk Are	Housing	354960	27.1	221850	16.9	221850	16.9	221340	16.9

Additional Dwellings

		2009 - 2016		2017-2021		2022-2026		2027-2031	
Area	**Housing/ Employment**	**Daily (l/day)**	**Peak (l/s)**	**Daily (l/day)**	**Peak (l/s)**	**Daily (l/day)**	**Peak (l/s)**	**Daily (l/day)**	**Peak (l/s)**
Greater Norfolk Are	Housing	0	0	0	0	0	0	5100000	389.6

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Appendix B
Updated Development Figures

Growth Scenario 2a

District																							Total Units
	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	
Broadland																							
Rackheath Eco-Community	0	0	0	115	230	230	230	230	230	230	230	230	230	230	230	230	230	230	65	0	0	0	0	3,400
Sprowston Fringe (inside NDR)	0	0	0	0	0	0	125	225	350	350	350	350	350	350	350	350	350	350	0	0	0	0	0	3,850
Additional smaller sites around Broadland NPA	0	0	0	0	0	0	170	170	170	170	170	170	170	170	170	170	170	130	0	0	0	0	0	2,000
Additional sites around rural Broadland	0	0	0	0	0	0	55	55	54	54	54	54	54	54	54	54	54	54	0	0	0	0	0	650
Broadland Urban Commitments	186	183	312	281	228	194	147	147	147	147	57	0	0	0	0	0	0	0	0	0	0	0	0	2,029
Broadland Rural Commitments	104	109	103	133	114	33	33	33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	662
Broadland Urban Windfall	0	0	0	0	0	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	1,080
Broadland Rural Windfall	0	0	0	0	0	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	1,350
Broadland RSS Review	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	667
Broadland NPA Post 2026: NE Sector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	600	600	600	600	600	3,000
Broadland NPA Post 2026: Elsewhere	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	150	150	150	150	150	750
Broadland Rural Post 2026	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	80	80	80	80	80	400
Broadland Total	**319**	**321**	**444**	**558**	**601**	**621**	**924**	**1,024**	**1,115**	**1,115**	**1,025**	**968**	**968**	**968**	**968**	**968**	**968**	**928**	**1,059**	**994**	**994**	**994**	**994**	**19,838**
Norwich																								
Norwich	0	0	0	0	0	0	250	250	250	250	250	250	250	250	250	250	250	250	0	0	0	0	0	3,000
Norwich Commitments	564	464	611	669	933	789	516	396	375	275	0	0	0	0	0	0	0	0	0	0	0	0	0	5,592
Norwich Windfall	0	0	0	0	0	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	2,880
Norwich RSS Review	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	667
Norwich Post 2026	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	250	250	250	250	250	1,250
Norwich Total	**593**	**493**	**640**	**698**	**962**	**978**	**955**	**835**	**814**	**714**	**439**	**439**	**439**	**439**	**439**	**439**	**439**	**439**	**439**	**439**	**439**	**439**	**439**	**13,389**
South Norfolk																								
Wymondham	0	0	0	0	0	0	185	185	185	185	185	185	185	185	185	185	185	165	0	0	0	0	0	2,200
Long Stratton	0	0	0	0	0	0	0	0	0	50	140	230	230	230	230	230	230	230	0	0	0	0	0	1,800
Hethersett	0	0	0	0	0	0	50	90	175	175	175	175	100	60	0	0	0	0	0	0	0	0	0	1,000
Cringleford	0	0	0	0	0	0	0	50	100	125	125	125	125	125	125	125	125	50	0	0	0	0	0	1,200
Easton	0	0	0	0	0	0	50	90	175	175	175	175	100	60	0	0	0	0	0	0	0	0	0	1,000
Additional smaller sites around South Norfolk NPA	0	0	0	0	0	0	150	150	150	150	150	150	150	150	150	150	150	150	0	0	0	0	0	1,800
Additional sites around rural South Norfolk	0	0	0	0	0	0	81	81	81	81	81	81	81	81	81	81	80	80	0	0	0	0	0	970
Additional urban capacity in South Norfolk	0	0	0	0	0	0	6	6	6	6	6	5	5	5	5	5	5	5	0	0	0	0	0	65
South Norfolk Urban Commitments	606	742	701	637	590	435	260	155	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4,156
South Norfolk Rural Commitments	341	173	110	211	178	180	97	38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,328
South Norfolk Urban Windfall	0	0	0	0	0	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	1,332
South Norfolk Rural Windfall	0	0	0	0	0	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	1,728
South Norfolk Review	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	28	666
South Norfolk NPA Post 2026	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	800	800	800	800	800	4,000
South Norfolk Rural Post 2026	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	120	120	120	120	120	600
South Norfolk Total	**976**	**944**	**840**	**877**	**797**	**814**	**1,078**	**1,044**	**1,101**	**1,146**	**1,236**	**1,325**	**1,175**	**1,095**	**975**	**975**	**974**	**879**	**1,119**	**1,119**	**1,119**	**1,119**	**1,118**	**23,845**
TOTAL	**1,888**	**1,758**	**1,924**	**2,133**	**2,360**	**2,413**	**2,957**	**2,903**	**3,030**	**2,975**	**2,700**	**2,732**	**2,582**	**2,502**	**2,382**	**2,382**	**2,381**	**2,246**	**2,617**	**2,552**	**2,552**	**2,552**	**2,551**	**57,072**

		2008-11	2011-16	2016-21	2021-26	2026-31	Total
Broadland	Rackheath Eco-Community	0	1,035	1150	1150	65	3,400
	Sprowston Fringe (inside NDR)	0	350	1750	1750	0	3,850
	Additional smaller sites around Broadland NPA	0	340	850	810	0	2,000
	Additional sites around rural Broadland	0	110	270	270	0	650
	Broadland Urban Commitments	681	997	351	0	0	2,029
	Broadland Rural Commitments	316	346	0	0	0	662
	Broadland Urban Windfall	0	180	300	300	300	1,080
	Broadland Rural Windfall	0	225	375	375	375	1,350
	Broadland RSS Review	87	145	145	145	145	667
	Broadland NPA Post 2026: NE Sector	0	0	0	0	3000	3,000
	Broadland NPA Post 2026: Elsewhere	0	0	0	0	750	750
	Broadland Rural Post 2026	0	0	0	0	400	400
Norwich	Norwich	0	500	1250	1250	0	3,000
	Norwich Commitments	1,639	3303	650	0	0	5,592
	Norwich Windfall	0	480	800	800	800	2,880
	Norwich RSS Review	87	145	145	145	145	667
	Norwich Post 2026	0	0	0	0	1250	1,250
South Norfolk	Wymondham	0	370	925	905	0	2,200
	Long Stratton	0	0	650	1150	0	1,800
	Hethersett	0	140	800	60	0	1,000
	Cringleford	0	50	600	550	0	1,200
	Easton	0	140	800	60	0	1,000
	Additional smaller sites around South Norfolk NPA	0	300	750	750	0	1,800
	Additional sites around rural South Norfolk	0	162	405	403	0	970
	Additional urban capacity in South Norfolk	0	12	28	25	0	65
	South Norfolk Urban Commitments	2,049	2077	30	0	0	4,156
	South Norfolk Rural Commitments	624	704	0	0	0	1,328
	South Norfolk Urban Windfall	0	222	370	370	370	1,332
	South Norfolk Rural Windfall	0	288	480	480	480	1,728
	South Norfolk Review	87	145	145	145	144	666
	South Norfolk NPA Post 2026	0	0	0	0	4000	4,000
	South Norfolk Rural Post 2026	0	0	0	0	600	600

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Appendix C
Electricity Correspondence

Mr P Simpson
EDF Energy Networks
Capital Programme - Asset Management
Barton Road
Bury St Edmunds
Suffolk
IP32 7BG

27 March 2009

Our Ref: 03223539/FY09.0020/GSH

Dear Peter

Subject: Greater Norwich Growth Area Proposals

In 2007, you carried out an assessment of network reinforcement requirements that could result from the proposals for the Greater Norwich Growth Area. This work was undertaken for Peter Brett Associates (PBA), who were carrying out a utility assessment on behalf of the Greater Norwich Development Partnership (GNDP). A copy of your report was appended to the "Norwich Growth Area – Infrastructure Need and Funding Study", produced by the lead consultant, EDAW, which dealt with all infrastructure requirements, including utilities.

Since your assessment was carried out, the GNDP have made steps in refining the options for the Greater Norwich Growth Area. A single option is now being considered, which includes proposals for housing and employment from now until 2031.

Faber Maunsell has been commissioned to revisit the utility assessment based on these new proposals and identify whether the requirements detailed previously are still applicable or whether they need to be revised. The new proposals have been divided into four time bands and the GNDP are keen to identify "tipping points" in the provision of new infrastructure to allow for more a more detailed funding programme.

A breakdown of the housing and employment projections are attached to this letter, along with a copy of the estimated electricity loadings associated with each development area. Where the development locations are known, these have been marked on the attached location plan. Points to note about this information are:

- the figures provided in these tables are as detailed as they can be at this stage;
- the "additional smaller sites" in Broadland and South Norfolk have not been specified at this stage, but each additional site is likely to include 50-300 new dwellings as extensions to existing towns, eg. Aylsham Acle, Blofield, Reepham and Brundall in Broadland and Diss Loddon, Chedgrave and Hingham;
- no further details are available about the exact locations of the existing urban and rural housing commitments;

- a study is being carried out to determine the likely requirements for education, healthcare and community facilities based on the new proposals. However, the outcome of this study is not yet known so no loading allowance is made for such facilities in the attached data;
- the additional 2,000 dwellings resulting from the Regional Spatial Strategy (RSS) review and the further 10,000 dwellings to be delivered between 2026 and 2031 have been included in the table as unallocated dwellings. At this stage there are no specific proposals for any of these dwellings, and their final locations are likely to be influenced by a number of factors, including the provision of services. Therefore, while we could not expect you to comment specifically about these additional loadings, we would appreciate some guidance on any likely areas of spare capacity where this additional housing could potentially be located. In the absence of any such locations, advice on the likely network reinforcement requirements would be appreciated.

For your information, a Sustainable Energy Study has been carried out on behalf of the GNDP which identifies the potential for low carbon growth in the Greater Norwich area and also assesses the feasibility of renewable energy resources. However, this study is still at the draft stage and we are keen to provide the GNDP with the costs assuming that all of the electricity requirements are met through the standard network infrastructure.

I would be grateful if you could review the information above and attached and provide an assessment of the likely network reinforcement requirements associated with the latest proposals for the Greater Norwich Growth area. Please also provide details of budget costs for any necessary works, broken down into the time bands indicated.

If you have any queries about this information or would like to discuss any aspect of this project, please give me a call on the number below. If necessary, I would be pleased to meet with you to discuss the latest proposals and formulate a way forward.

I would be grateful if you could acknowledge receipt of this letter and also provide a likely timescale for the turnaround of your assessment.

I look forward to hearing from you.

Yours sincerely

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E Gemma.Heath@fabermaunsell.com

Enc.

cc. D Bridge EDAW

Heath, Gemma S

From: Heath, Gemma S
Sent: 01 April 2009 15:28
To: peter.simpson@edfenergy.com
Cc: Bridge, Daniel; Martin, Steve L
Subject: Greater Norwich Growth Area
Attachments: Utility Loadings Summary Spreadsheet.xls; Utility Calcs Sprowston Fringe 09-16.xls

Hi Peter

Further to our conversation earlier today, please find attached a copy of the spreadsheet with all of the Greater Norwich development information and our calculated electricity loadings.

As I mentioned, the electricity loadings have been calculated using a Utility Loading spreadsheet (a sample of which is also attached) which covers electricity, gas, potable water and foul drainage. For the electricity loadings, we assumed the "worst case" of electrically heated dwellings, at 18kW/dwelling. From what you have told me, a more accurate figure would have been the "Housing with Diversification" option at 1.5kW/dwelling.

As we were dealing with four outputs from each loadings spreadsheet for each site in each time band, it was easier to manually input the results into the summary spreadsheet. Therefore the spreadsheets aren't linked.

Please let me know whether you would like me to update our results for you and if so, what figures we should use.

With regard to a meeting, I would be happy to come over to your offices to discuss this scheme if you feel this would be beneficial. Let me know if you would like to set something up.

Please give me a call if you would like any more information or have any further queries.

Many thanks

Gemma

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Heath, Gemma S

From: Heath, Gemma S
Sent: 28 April 2009 11:22
To: peter.simpson@edfenergy.com
Cc: frank.needham@edfenergy.com; Martin, Steve L
Subject: Greater Norwich Growth Area

Peter

I hope that you had a good holiday and are raring to go now that you are back!

As you may have heard from Frank Needham and Dale Harrison, I was drafted in at the last minute to help out at the Infrastructure Delivery Workshop in Norwich last Monday. I just presented a few slides about our work to date and then took part in the "Physical Infrastructure" discussion afterwards, with Frank and Dale.

A couple of things were brought up during the discussion that you may be able to help with:

- Frank mentioned that there are currently "electricity deserts" around Norwich that have little or no supply. One such area is to the north-east of Norwich, where some of the latest proposals are located. Do you have a plan or schematic image that shows the existing coverage of electricity supply in the area? It would be a useful image to overlay onto the current proposals to provide a visual indication of the likely electricity infrastructure issues.
- EDAW are keen to investigate potential sources and mechanisms for funding and it was mentioned that, in order to provide the electricity infrastructure up-front, there are options available. Frank cited a scheme in Aylesbury Vale. Do you have any further information about this or other potential funding options?

I am currently in the process of preparing our draft report and to date, I have not received any feedback from any of the Statutory Undertakers. This is not really surprising due to the spread and complexity of the proposals. However, I would be grateful if you could provide some of the background information above or even some preliminary findings from my original enquiry for inclusion in this first draft of the report.

Please give me a call if you have any queries or require any further information from me.

Many thanks for your help with this scheme.

Gemma

Gemma Heath
Principal Engineer
Faber Maunsell
14 Queen Victoria Road
Coventry
CV1 3PJ

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E. gemma.heath@fabermaunsell.com
W. www.fabermaunsell.com

Heath, Gemma S

From: Heath, Gemma S
Sent: 05 May 2009 12:55
To: peter.simpson@edfenergy.com
Subject: FW: Greater Norwich Growth Area

Hi Peter

I am hoping to get my first draft report in to the Client tomorrow. I understand that your report is likely to take some time to prepare, but I would be grateful if you could give an indication of timescale for me to include.

Also, referring to my queries below, could you provide some response to these so that I could include that information in the report too?

Please give me a call on 024 7625 3305 if you would like to discuss.

For your information, Faber Maunsell became AECOM on 4 May. However, I understand that both the Faber Maunsell and AECOM email addresses are still working.

Many thanks

Gemma

From: Heath, Gemma S
Sent: 28 April 2009 11:22
To: 'peter.simpson@edfenergy.com'
Cc: 'frank.needham@edfenergy.com'; Martin, Steve L
Subject: Greater Norwich Growth Area

Peter

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As you may have heard from Frank Needham and Dale Harrison, I was drafted in at the last minute to help out at the Infrastructure Delivery Workshop in Norwich last Monday. I just presented a few slides about our work to date and then took part in the "Physical Infrastructure" discussion afterwards, with Frank and Dale.

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Heath, Gemma S

From: Simpson, Peter [Peter.Simpson@edfenergy.com]
Sent: 10 June 2009 16:58
To: Heath, Gemma S
Subject: Greater Norwich Growth Area Proposals
Attachments: GNDP Report to ACECOM 10 June 2009.doc

Follow Up Flag: Follow up
Flag Status: Completed

Gemma,
Please find attached an updated version of the report which I originally prepared for Peter Brett Associates. I have made some changes to the content, in line with the revisions to the changes in the growth data. I apologise for the delay in dealing with your request and I hope that what I have now provided meets your requirements. Please feel free to contact me it you require and clarification of further information

Regards,

Peter Simpson

Infrastructure Planning Engineer

EDF Energy Networks

Tel 08701 963771

Fax 08701 965051

Report on Possible Network Reinforcement Requirements Resulting from the Proposed Greater Norwich Growth Area

Peter Simpson
Infrastructure Planning Engineer

Project Number: **Error! Unknown document property name.**
Document Number: **Error! Unknown document property name.**
Version: 2.1
Security Classification: **Error! Unknown document property name.**

Table of Contents

Possible Network Reinforcement Needs Resulting from the GNDP Growth Proposals

1. General Observations and Disclaimers

1.1 Network Loading

The network loading and available substation capacities used to produce this document are based on a snapshot of the network at a particular time during the winter of 2008/9.
There are a number of proposed developments within the Greater Norwich Development Partnership (GNDP) area which are in various stages in the connection application process. Most of these prospective demands have not been taken into account in this study as there is no certainty that these developments will proceed to final connection.
There may be other applicants who have yet to make application for new demand, which may proceed to final connection before some of the prospective developments indicated by the GNDP. Any network capacity taken up by these developments will no longer be available for use by GNDP projects. For this reason, the information provided in this document must be treated as indicative of the likely solutions rather than an absolute statement that these will be the solutions which are adopted should the proposals proceed. Loadings for domestic dwellings have been assumed to be 2kW per dwelling after diversity. This is a little higher than the current figures for existing domestic properties but there is likely to be a higher incidence of ground or air-source heat pumps and also the possibility of significant penetration of electric cars over the course of the proposed developments. Although providing overall reduction in energy use such developments are likely to result in increased electricity consumption.

1.2 Time periods used in study

In order to simplify the assessments, the proposed growth scenarios have been grouped into four time-slots; 2009 – 2016; 2017 – 2021; 2022 – 2026 and 2027 – 2031. However, there is little point in extending the projections much beyond 2026 as there may be other factors or policies that will influence the likely electrical demand. The majority of the loading figures provided for the non-specific growth areas are obviously generic in nature and therefore it is very unlikely that this growth will occur in the evenly distributed manner in which it has been presented. Therefore, it is difficult to predict the precise time at which a particular network reinforcement project may be required.

1.3 Provision of Electricity Network Infrastructure

Every new development will require its own on-site electrical infrastructure. The cost of this infrastructure is broadly the same regardless of the site location and is not included in any figures given in this document. Any figures given relate only to the cost of and/or any contribution required towards the

provision of up-stream infrastructure. The figures are generic costs based on costs of similar projects and are not derived from site-specific proposals or agreed cable routes. These costs include the provision of Primary Substations, the 33,000 volt circuits necessary to supply those Primary Substations and any additional 33,000 volt switchgear which will be required at the 132,000/33,000 volt Grid Substations in order to connect the new cables. Any figures quoted do not, therefore, give any indication of the total contribution that would be required for any particular development, only the contribution required for off-site upstream reinforcement work down to the 11,000 volt switchgear at the primary substation.
Under the connection charging policy in force at this time, the cost of establishing 132,000 volt infrastructure and 132,000/33,000 grid substations is borne by the general mass of customers through distribution use of system charges and not by individual developers. However, these policies are reviewed periodically and there is no certainty that this policy will be in force for the duration of the GNDP proposals.

1.4 Existing Network Assets

Many of the areas identified as sites for possible development are crossed by EDF Energy Networks circuits both overhead and underground at various voltages up to and including 132,000 volts. No allowance has been made for the cost of diverting these assets as it is not possible to determine this until much later in the process once site layouts have been determined.

1.5 Other Local Development Frameworks

The GNDP is not the only body interested in development in Norfolk. Proposals currently being developed by North Norfolk and Breckland District Councils will have an impact on the ultimate form of the distribution network in the area. However, not all of these proposals have been taken into account in the information presented in this document. The Breckland DC proposal for approximately 4,000 new dwellings in Attleborough will have an impact on the electricity network in the Wymondham area as one of the 33,000 volt circuits which supplies the Attleborough area is fed via Wymondham.

2. Generic Growth Areas

There are some Primary Substations which do not appear to be impacted by the latest growth proposals; however there are some on-going developments which are very likely to be completed within the period which do not appear to be included in the latest figures provided by the GNDP. Among sites of this type are; the St Annes Wharf and Harford areas of Norwich; Queens Hills, Costessey; and Roundhouse Way, Cringleford. Some or all of these sites may be included within the 'Urban Commitments' section of the data supplied but without a breakdown of these figures, there is some doubt as to the accuracy of the assumptions made.
The scale of the developments listed as 'additional smaller sites' is unlikely to put any significant strain on existing upstream infrastructure, although on-site infrastructure will still have to be provided.

2.1 Alpington

No action required up to 2031.

2.2 Barrack Street

No action required up to 2031, on figures given. However, the on-going development in Barrack Street itself and the possible redevelopment of the Anglia Square area, which is not included in the GNDP data, may trigger the need for additional reinforcement.

2.3 Cringleford

No action required up to 2031. No data has been provided with respect to the on-going Round House Way development which may be significantly expanded. This may be included in the Urban Commitments section of the data supplied but can not be specifically identified.

2.4 Mousehold

No action required up to 2031, although minor 11,000 volt network transfers to adjacent substations may be required. This assumption is dependant on the type of businesses which take up space in the Salhouse Road development. An average loading of 135w/m² has been assumed but this figure can easily be doubled for industrial processes.

2.5 St. Stephens

No action required up to 2031. However, possible regeneration of the St. Stephens Street area, not specifically identified in GNDP figures, may require upgrade of this substation to 132,000/11,000 volt working.

2.6 Thorpe Grid Local

No action required up to 2031, unless development around the Norwich City football ground and the St. Anne's Wharf/King Street area, neither of which are specifically identified in the GNDP data, is greater than currently anticipated.

2.7 Tuckswood

No action required up to 2021, unless the proposed redevelopment of the adjacent former shoe factory site proceeds. Again, this proposal is not specifically identified in the GNDP estimates.

3. Norwich City and Fringe Growth Areas

3.1 Earlham Grid Local Substation

The primary substation at the Earlham Grid site has recently being upgraded with a view to meeting anticipated growth in demand in the area, such as Longwater; Three Score, Bowthorpe and the Science Park. The work is being carried out in three phases with installation of additional 33,000/11,000 volt transformer capacity being completed in 2007. The second phase will be the installation of additional 132,000 volt circuit capacity from Norwich Main supergrid substation in 2011. The final phase, the construction of a new 132,000/11,000 volt substation at the Earlham Grid site will be installed at a

time dictated by rate of growth in the area. The funding for this work is via a site-specific infrastructure capacity charge, which was specifically agreed with Ofgem in the absence of any lead developer who was willing to make the first application. Any subsequent applications for electricity supply in the area supplied by this substation will be subject to this capacity charge.

3.2 Hurricane Way Primary Substation

Before any significant new development can be accepted in Hellesdon; the existing Norwich Airport Industrial Estate or on the proposed site to the north east of Norwich Airport, it will be necessary to install a new primary substation on a site owned by EDF Energy Networks at Hurricane Way, on the existing industrial estate. This site is large enough to accommodate both a grid and a primary substation. Once the primary substation is commissioned, sections of the existing 11,000 volt distribution network can be transferred to it from Boundary Park and George Hill primary substations. This will release capacity in these substations to meet generic growth in these areas, in addition to providing for additional commercial/industrial development in the vicinity of the airport. This work will need to be put in hand as soon as possible if the capacity is to be available by 2012.

3.3 Norwich Airport North

If the projected loads for the north east industrial area come to fruition, there will be a significant shortfall in supply capacity in this area between 2012 and 2021, even taking into account the additional capacity provided at Hurricane Way. The figures provided by GNDP indicate that a new high capacity (30MW) primary substation will be required in this area, in addition to the proposed Hurricane Way primary substation. However, there is neither any significant 33,000 volt network in the area to supply such a substation nor is there sufficient capacity available at either Thorpe or Trowse grid substations to meet such a demand. The likely solution to providing additional grid transformer capacity in the area would be to establish a new grid substation at a site known as Norwich East (see section 6.2 below for more detail on Norwich East)

4. Broadland District Growth Areas

4.1 Broadland Business Park

Broadland Business Park is currently supplied from Peachman Way primary substation, which was designed to have adequate capacity to meet the estimated demand of the park as originally proposed. Any further expansion of the existing business park or the construction of the neighbouring BroadlandGate development will require the installation of additional primary transformer capacity in the vicinity of the proposed extension. This could be achieved by installing a new primary substation within the new park or by replacing the transformers and 11,000 volt switchgear at the existing Peachman Way primary substation with equipment of higher capacity. The 33,000 volt cables to Peachman Way from Thorpe and Trowse Grid have only sufficient capacity to match the full rating of the equipment already installed.

In addition, as with the Hurricane Way proposal above, there is insufficient capacity available at either Thorpe or Trowse grid substations to meet such a demand and the likely solution to providing additional grid transformer capacity in the area would be to establish a new grid substation at a site to the north of the business park, known as Norwich East (see section 6.2 below for more detail on Norwich East).

4.2 Broadland Fringe Sector

The development land in the Sprowston/Rackheath area proposed by the GNDP would require either major reinforcement works at Sprowston primary substation to enhance it to 30MW capacity or the construction of an additional primary substation within the development area. The existing 33,000 volt underground cables to Sprowston primary substation are of sufficient capacity to meet existing demand only. For this reason, it is likely that an additional primary substation will be required on the development, supplied via new 33,000 volt circuits from a new Norwich East grid substation. (See section 6.2 below for more detail on Norwich East.)

5. South Norfolk District Growth Areas

5.1 Hapton

The village of Long Stratton and its environs is supplied at 11,000volts from the primary substation at Hapton. The transformers at this substation are loaded close to their capacity and the proposed development at Long Stratton will trigger the need to replace these transformers with larger units around 2020. The rating of the existing 11,000 volt switchboard at Hapton is matched to the capacity of the existing transformers and will therefore have to be replaced with new equipment of greater capacity.

5.2 Wymondham

The village of Wymondham and its environs is supplied at 11,000volts from the primary substation at Lady Lane, Wymondham. The proposed developments in the area will mean that the transformers at this substation will be loaded close to their capacity by around 2026 and will need to be replaced. The rating of the existing 11,000 volt switchboard at Wymondham Primary is matched to the capacity of the existing transformers and will therefore have to be replaced with new equipment of greater capacity.

6. Grid Substation Requirements

6.1 Hurricane Way Grid Substation

If the Norwich Airport area were to be viewed in isolation, then the solution to meeting the grid substation capacity shortfall would be, subject to obtaining the necessary planning permission, to establish a new grid substation at the Hurricane Way site, in addition to the new primary substation. However, the proposed extension to the existing development at Broadland Business Park and the neighbouring BroadlandGate development will result in a further

shortfall in capacity which will probably mean that the establishment of Hurricane Way Grid substation is not the optimal solution to the overall growth scenario. The reason behind this conclusion being that the development of the Norwich East site would result in a more co-ordinated 33kV network.

6.2 Norwich East Grid Substation

EDF Energy Networks owns a site off Green Lane, to the north of Broadland Business Park. This site was purchased some time ago with the intention that it could be used to establish a new 132,000 volt grid substation to the north east of Norwich. Subject to planning consent, this site could be used for this purpose and new 33,000 volt cable circuits installed to the new substations which could be required at Norwich Airport North and Broadland Park East and the existing substations at Peachman Way and Sprowston. If necessary, additional 33,000 volt circuits could be provided to a new primary substation in the Rackheath area in the event of significant electrical demand created by heat pumps in the proposed Eco-town or the need to absorb surplus power from the proposed on-site bio-generation.

6.3 Trowse Grid Substation

The 132,000/33,000 volt grid transformers at Trowse Grid substation are already very well utilised and there is insufficient capacity remaining to cater for the demand created by increases in development around primary substations to the south of the city centre. There is insufficient land available at the Trowse site to install additional 132,000/33,000 volt grid transformer capacity. As it is difficult at this stage to determine where some of the "smaller sites" and "urban and rural commitments" are actually proposed it is difficult to determine if or when reinforcement at Trowse Grid will actually be required. The only practicable way of making capacity available for any future increase in demand on the 33,000 volt network supplied from Trowse Grid would be to transfer some of the existing demand elsewhere on the system. The most expedient way of achieving this transfer would be to convert the St. Stephens Substation, located in the Chapelfield shopping development, to 132,000/11,000 volt operation. However, this would entail the installation of new 132,000 volt underground cables from Trowse grid, in White Horse Lane, via the Martineau Lane roundabout, Bracondale and Queen Road to the substation which is located near the St. Stephens roundabout. It would also require the removal of relatively new 33,000/11,000 volt transformers and the installation of new 132,000/11,000 volt units. EDF Energy would not normally wish to carry out such a project until such time as the existing 33,000 volt underground cables, which are laid on a similar route, require replacement under the asset replacement programme. The replacement of these cables under the asset replacement programme is very likely to be required at some time before 2031 but it is difficult to determine at this stage when this may be required as this is determined by monitoring the condition of the cables on a yearly basis.

7. Conclusions

- The proposed level of growth will necessitate major construction works in and around the city of Norwich.

- It will be necessary to establish a new grid substation to the East of Norwich. There will be a requirement for the construction or reconstruction of up to six primary substations.
- The anticipated growth proposals will require the installation of significant lengths of 132,000 volt and 33,000 volt underground cables which will inevitably lead to some disruption to traffic and residents.
- The costs of the on-site infrastructure for proposed projects are broadly the same regardless of site location so do not have any bearing on the selection of areas for development.
- The contributions required from developers towards the cost of off-site infrastructure are difficult to estimate with any degree of accuracy for specific sites and there is no guarantee that the connection charging policy, which has to be agreed with Ofgem, will remain unchanged of the duration of these proposals as they are reviewed at each Distribution Price Control Review (DPCR). The current review (DPCR5) is currently underway and subsequent reviews will be held at five-yearly intervals.
- As noted in section 6.3, the work at St. Stephens substation and, more particularly, the associated 33,000 volt cable laying works would be particularly disruptive.

8. Table of Costs

The following table is a guide to the approximate level of costs and contributions:

Substation Name	Work Required	Overall Cost (£k)	Developer's Contribution	Time Scale
Hurricane Way Primary (Section 3.2)	New Primary Substation on existing site	5,436	1,630	Before 2012
Norwich Airport North (Section 3.3)	New Primary Substation on new site + 33kV circuits	6,320	6,320	2021
Sprowston/Rackheath No. 2 (Section 4.1)	New Primary Substation on new site + 33kV circuits	4,313	4,313	2026
Hapton Primary (Section 5.1)	Replacement of transformers and switchgear in existing site	2,530	430	Before 2026
Wymondham (Section 5.2)	Replacement of transformers and switchgear in existing site	2,530	826	Before 2026
Norwich East Grid	New Grid Substation	17,060	0	Before

(Section 6.2)	on existing site + 132kV cables			2021
St Stephens (Section 6.3)	Reinforcement of existing substation + 132kV cables	10,750	0	2027 - 2031

From this table it can be derived:

- Electricity up-stream infrastructure will cost around £48,939,000 in total and will attract a total developer's contribution of around £13,519,000

It should be noted that these costs are purely indicative and have been derived from minimal desk-top studies of possible cable routes. No on-site investigations or route feasibility studies have been carried out.
The costs are based on current 2009 material prices and labour costs. There is likely to be considerable variation in these costs by the time the projects are actually carried out.


HORSFORD
HURRICANE WAY GRID
(FUTURE)
SPROWSTON
BOUNDARY PARK
GEORGE HILL
NORWICH EAST GRID
(FUTURE)
MOUSEHOLD
BARRACK STREET
PEACHMAN WAY
EARLHAM GRID
EARLHAM WEST
ST STEPHENS
(FUTURE GRID)
THORPE GRID
TUCKSWOOD
TROWSE GRID
CRINGLEFORD
NORWICH MAIN
SUPERGRID

AECOM

Appendix D
Gas Correspondence

Plant Protection
National Grid
Block 1; Floor 1
Brick Kiln Road
Hinckley
LE10 ONA

30 March 2009

Our Ref: 08223539/FY09.0020/GSH

Dear Sir

Subject: Greater Norwich Growth Area

Faber Maunsell has been appointed by the Greater Norwich Development Partnership (GNDP) to carry out an assessment of the gas supply options for the above development proposals. The proposals cover the Broadland, Norwich and South Norfolk areas, with the main development areas highlighted on the attached plan (Figure 1)

A study was undertaken in 2007 by Peter Brett Associates (PBA) which looked at a number of development options and obtained information from National Grid regarding the potential impact on your plant. Unfortunately, we do not have copies of any correspondence from that time, so do not know who within National Grid dealt with that enquiry. At that stage, it was only possible to carry out high-level tests on your existing model, which identified whether or not any reinforcement would be required to the National Grid network. The outcome of that study indicated that the existing gas infrastructure had sufficient capacity to cater for the proposed new residential developments, but reinforcement would be required for employment developments at Broadland Business Park and Salhouse Road.

Since that study was undertaken, the GNDP have made steps in refining the options for the Greater Norwich Growth Area. A single option is now being considered, which includes proposals for housing and employment from 2009 until 2031. The proposals have been broken down into time bands as the GNDP are keen to identify “tipping points” in the provision of services to these developments.

The attached spreadsheet gives details of the current development proposals, including residential and employment figures, for each potential site. Please note the following in relation to these figures:

- the figures provided in these tables are as detailed as they can be at this stage;
- the “additional smaller sites” in Broadland and South Norfolk have not been specified at this stage, but each additional site is likely to include 50-300 new dwellings as extensions to existing towns, eg. Aylsham, Acle, Blofield, Reepham and Brundall in Broadland and Diss, Loddon, Chedgrave and Hingham;
- no further details are available about the exact locations of the existing urban and rural housing commitments;
- a study is being carried out to determine the likely requirements for education, healthcare and community facilities based on the new proposals. However, the outcome of this study is not yet known so no loading allowance is made for such facilities in the attached data;
- the additional 2,000 dwellings resulting from the Regional Spatial Strategy (RSS) review and the further 10,000 dwellings to be delivered between 2026 and 2031 have been included in the table as “unallocated” dwellings. At this stage there are no specific proposals for any of these dwellings, and their final locations are likely to be influenced by a number of factors, including the provision of services. Therefore, while we could not expect you to comment specifically about these additional loadings, we would appreciate some guidance on any likely areas of spare capacity where this additional housing could potentially be located. In the absence of any such locations, advice on the likely network improvement requirements would be appreciated.

Existing National Grid Network

At this stage we do not require record information. However, I would be grateful if you could provide the following information, based on the details above and attached:

1. Will any of your existing plant be affected as a result of the development proposals?
2. If yes, please provide a budget estimate for any divisionary/reinforcement works deemed necessary. If no, please confirm in writing.
3. Confirm whether there are any conditions with regard to the existing network that we will need to take into account when developing the sites.

Gas Supply

We have undertaken an assessment of the likely gas loadings for the proposed developments and details are included on the attached spreadsheet. The potential loadings have been divided into year bands to allow “tipping points” to be identified in the requirements for new infrastructure and to provide a more detailed funding programme.

We would be grateful if you could provide the following information:

4. A named representative who we can contact with any future enquiries regarding this development.
5. Does your existing infrastructure have sufficient capacity to serve this development?
6. If yes, where would these supplies be fed from?
7. If no, what reinforcement work would be required in order to meet the requirements of the proposed sites and within what timeframe? Please provide budget costs for any reinforcement works.

I am aware that the attached information is extensive and covers a wide geographical area. However, it is important at this stage to identify any potential costs associated with providing the services infrastructure to these sites. In order to facilitate this enquiry, we would be pleased to meet with you to discuss the attached details and formulate a way forward with regard to the provision of gas supply information.

If you require any further information or would like to arrange a meeting, please do not hesitate to contact me on the number below.

Yours faithfully

Gemma Heath
Principal Engineer
T +44 (0)24 7625 3300
F +44 (0)24 7625 3301
E gemma.heath@fabermaunsell.com

Enc. Figure 1 – Proposed Housing and Employment Sites Location Plan
Development Proposals and Gas Loading Information

cc. D Bridge EDAW

Transmission Enquiries Team
Land & Development Group
National Grid
P.O Box 3484
National Grid House
Warwick Technology Park
Gallows Hill
Warwick CV34 6TG

30 March 2009

Our Ref: 08223539/FY09.0020/GSH

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6. If yes, where would these supplies be fed from?
7. If no, what reinforcement work would be required in order to meet the requirements of the proposed sites and within what timeframe? Please provide budget costs for any reinforcement works.

I am aware that the attached information is extensive and covers a wide geographical area. However, it is important at this stage to identify any potential costs associated with providing the services infrastructure to these sites. In order to facilitate this enquiry, we would be pleased to meet with you to discuss the attached details and formulate a way forward with regard to the provision of gas supply information.

If you require any further information or would like to arrange a meeting, please do not hesitate to contact me on the number below.

Yours faithfully

Gemma Heath
Principal Engineer
T +44 (0)24 7625 3300
F +44 (0)24 7625 3301
E gemma.heath@fabermaunsell.com

Enc. Figure 1 – Proposed Housing and Employment Sites Location Plan
Development Proposals and Gas Loading Information

cc. D Bridge EDAW

Heath, Gemma S

From: Morris, Leslie [leslie.morris@uk.ngrid.com]
Sent: 03 April 2009 11:51
To: Heath, Gemma S
Subject: Greater Norwich Growth Area

Dear Ms Heath,

I refer to your letter and enclosures relating to the above. I am consulting with my colleagues on the gas side of the business to obtain a response to your enquiry. The purpose of this email is to let you know that it may take a couple of weeks.

Regards

Les Morris

Town Planner

National Grid

National Grid House

Warwick Technology Park

Gallows Hill

Warwick

CV34 6DA

Tel 01926 653172

Fax 01926 656574

Email: leslie.morris@uk.ngrid.com

National Grid group please use the attached link:
http://www.nationalgrid.com/corporate/legal/registeredoffices.htm

Heath, Gemma S

From: Morris, Leslie [leslie.morris@uk.ngrid.com]
Sent: 29 April 2009 12:13
To: Heath, Gemma S
Subject: Greater Norwich Development Partnership - Joint Core Strategy
Attachments: Faber Maunsell (GNDP) Norwich Growth Areas 29 04 09.doc

Importance: High

Follow Up Flag: Follow up
Flag Status: Completed

Dear Gemma,

I apologise for the delay in replying to your email. I attach a copy of National Grid's response from a transmission point of view; unfortunately I have been unable to get a response from my colleagues in distribution who may be able to answer questions about capacity on the gas side of the business.

Please give me a ring if you want to discuss anything in my letter.

Kind regards

Les Morris

Town Planner

National Grid

National Grid House

Warwick Technology Park

Gallows Hill

Warwick

CV34 6DA

Tel 01926 653172

Fax 01926 656574

Email: leslie.morris@uk.ngrid.com

<<Faber Maunsell (GNDP) Norwich Growth Areas 29 04 09.doc>>

National Grid House
Warwick Technology Park
Gallows Hill, Warwick
CV34 6DA

Gemma Heath
Principal Engineer
Faber Maunsell
14 Queen Victoria Road
Coventry
CV1 3PJ

Les Morris
Land and Development Team
Town Planner
Leslie.morris@uk.ngrid.com
Direct tel +44 (0)1926 653172
Direct fax +44 (0)1926 656574

www.nationalgrid.com

29 April 2009

Dear Ms Heath

Greater Norwich Development Partnership
Greater Norwich Growth Area

Thank you for your letter dated 30 March 2009 regarding the above. Having reviewed your letter we would like to make the following general and specific comments and also take this opportunity to emphasise the role of National Grid and to highlight areas and issues where we feel consultation with National Grid would be appropriate in future Development Plan Documents (DPDs).

Overview – National Grid

National Grid is a leading international energy infrastructure business. In the UK National Grid's business includes electricity and gas transmission networks and gas distribution networks as described below.

Electricity Transmission

National Grid, as the holder of a licence to transmit electricity under the Electricity Act 1989, has a statutory duty to develop and maintain an efficient, co-ordinated and economical transmission system of electricity and to facilitate competition in the supply and generation of electricity.

National Grid operates the national electricity transmission network across Great Britain and owns and maintains the network in England and Wales, providing electricity supplies from generating stations to local distribution companies. We do not distribute electricity to individual premises ourselves, but our role in the wholesale market is key to ensuring a reliable and quality supply to all. National Grid's high voltage electricity system, which operates at 400,000 and 275,000 volts, is made up of approximately 22,000 pylons with an overhead line route length of 4,500 miles, 420 miles of underground cable and 337 substations. Separate regional companies own and operate the electricity distribution networks that comprise overhead lines and cables at 132,000 volts and below. It is the role of these local distribution companies to distribute electricity to homes and businesses. Please see the enclosed leaflet for more information on who to contact regarding electricity distribution issues in your area.

To facilitate competition in the supply and generation of electricity, National Grid must offer a connection to any proposed generator, major industry or distribution network operator who wishes to generate electricity or requires a high voltage electricity supply. Often proposals for new electricity projects involve transmission reinforcements remote from the generating site, such as new overhead lines or new development at substations. If there are significant demand increases across a local distribution electricity network area then the local network distribution operator may seek reinforcements at an existing substation or a new grid supply point. In addition National Grid may undertake development works at its existing substations to meet changing patterns of generation and supply.

Gas Transmission

National Grid owns and operates the high pressure gas transmission system in England, Scotland and Wales that consists of approximately 4,300 miles of pipelines and 26 compressor stations connecting to 8 distribution networks. National Grid has a duty to develop and maintain an efficient co-ordinated and economical transmission system for the conveyance of gas and respond to requests for new gas supplies in certain circumstances.

New gas transmission infrastructure developments (pipelines and associated installations) are periodically required to meet increases in demand and changes in patterns of supply. Developments to our network are as a result of specific connection requests e.g. power stations, and requests for additional capacity on our network from gas shippers. Generally network developments to provide supplies to the local gas distribution network are as a result of overall demand growth in a region rather than site specific developments.

Gas Distribution

National Grid also owns and operates approximately 82,000 miles of lower-pressure distribution gas mains in the north west of England, the west Midlands, east of England and north London – almost half of Britain's gas distribution network, delivering gas to around 11 million homes, offices and factories. National Grid does not supply gas, but provides the networks through which it flows. Reinforcements and developments of our local distribution network generally are as a result of overall demand growth in a region rather than site specific developments. A competitive market operates for the connection of new developments.

National Grid and Local Development Plan Documents

The Energy White Paper makes clear that UK energy systems will undergo a significant change over the next 20 years. To meet the goals of the white paper it will be necessary to revise and update much of the UK's energy infrastructure during this period. There will be a requirement for;

- An expansion of national infrastructure (e.g. overhead power lines, underground cables, extending substations, new gas pipelines and associated installations).
- New forms of infrastructure (e.g. smaller scale distributed generation, gas storage sites).

Our gas and electricity infrastructure is sited across the country and many stakeholders and communities have an interest in our activities. We believe our long-term success is based on having a constructive and sustainable relationship with our stakeholders. Our transmission pipelines and overhead lines were originally routed in consultation with local planning authorities and designed to avoid major development areas but since installation much development may have taken place near our routes.

Our aim in this is to ensure that the safe and secure transportation of electricity and gas is not compromised and to this end we would be happy to provide pre-application advice

National Grid infrastructure within the Greater Norwich Development Partnership Authorities' administrative areas

Electricity Transmission

National Grid's high voltage electricity overhead transmission lines / underground cables within the Greater Norwich Development Partnership Authorities' administrative areas that form an essential part of the electricity transmission network in England and Wales include the following:

- 4YM line, 400,000-volt routes from Bramford substation in Mid Suffolk to Norwich main substation in South Norfolk District.
- 4VV line, 400,000-volt route from Norwich Main substation in South Norfolk to Walpole substation in Kings Lynn and West Norfolk District.

The following substations are also located within the administrative area of Greater Norwich Development Partnership:

- Norwich Main Substation 400kV

National Grid has provided information in relation to electricity transmission assets via the following internet link:

http://www.nationalgrid.com/uk/LandandDevelopment/DDC/GasElectricNW

Gas Transmission

National Grid has the following gas transmission assets located within the administrative area of the Greater Norwich Development Partnership:

Pipeline	Feeder Detail
1705	5 Feeder Bacton / Yelverton
1706	5 Feeder Yelverton / Diss Comp Tee
1709	3 Feeder Bacton / Roudham Heath
1720	4 Feeder Bacton / Great Ryburgh
2648	2 Feeder Bacton / Kings Lynn Comp
2739	27 Feeder Bacton / Kings Lynn

National Grid has provided information in relation to gas transmission assets via the following internet link:

http://www.nationalgrid.com/uk/LandandDevelopment/DDC/GasElectricNW

Gas Distribution

National Grid Gas Distribution owns and operates the local gas distribution network in the Great Norwich Development Partnership area. If you require site specific advice relating to our local gas distribution network then information should be sought from:

Plant Protection Team
National Grid Gas
Lakeside House
The Lakes
Bedford Road
Northampton
NN4 7SN

Specific Comments

Existing National Grid Network

In response to questions 1-3 in your letter regarding the existing National Grid Network, it is unlikely that existing National Grid plant will be affected by the development proposals. From the plan provided it is apparent that National Grid's high voltage overhead electricity lines and high pressure underground gas transmission pipelines does not cross through any areas considered through of the Norwich Growth Area assessment. The following link provides information in relation to National Grid's electricity and gas transmission assets:

http://www.nationalgrid.com/uk/LandandDevelopment/DDC/GasElectricNW

In terms of capacity of the existing transmission network, development proposals within the Greater Norwich Development Partnership area will not have a significant effect upon National Grid's infrastructure, both gas and electricity transmission. It is unlikely that any extra growth will create capacity issues for National Grid given the scale of these gas and electricity transmission networks. The existing network should be able to cope with additional demands. The electricity and gas distribution companies in the area are EDF Energy Networks and National Grid Gas Distribution. It will be these suppliers who should be contacted for further information regarding constraints and opportunities that the distribution networks may have on growth in the area, and not the transmission network which operates at a much more strategic level.

Contact details for EDF Energy Networks can be found on the Energy Networks website. www.energynetworks.org

Gas Supply

If you require site specific advice relating to our local gas distribution network then information should be sought from:

Plant Protection Team
National Grid Gas
Lakeside House
The Lakes
Bedford Road
Northampton
NN4 7SN

Further Advice

National Grid is happy to provide advice and guidance to the Council concerning our networks. If we can be of any assistance to you in providing informal comments in confidence during your policy development, please do not hesitate to contact us. In addition the following publications are available from our web site or by contacting the team below:

- National Grid Electricity Transmission plc, Electricity Act 1989 – Schedule 9 Statement, preservation of amenity
- Specification for Safe Working in the Vicinity of National Grid High Pressure Gas Pipelines and Associated Installations – Requirements for Third Parties
- A sense of place – Design guidelines for development near high voltage overhead lines

Please remember to consult National Grid on any Development Plan Document (DPD) or site-specific proposals that could affect our infrastructure. We would be grateful if you could add our details shown below to your consultation database;

National Grid
Land & Development Stakeholder and Policy Manager
Land & Development Team
National Grid House
Warwick Technology Park
Gallows Hill
Warwick
CV34 6TG

Tel: 0800 7312961
www.nationalgrid.com/uk/landanddevelopment

I hope the above information is useful. If you require any further information please do not hesitate to contact me.

Yours sincerely,

[via email]
Les Morris
Land and Development Team
Town Planner

Heath, Gemma S

From: Brayson, Karl [karl.brayson@uk.ngrid.com]
Sent: 22 May 2009 16:15
To: Heath, Gemma S
Cc: Gomm, Malcolm
Subject: FW: Developer's Enquiry (National Grid Distribution)
Attachments: Figure 1 - Locations of Proposed Development Sites.pdf; Letter National Grid Gas Distribution 30-3-09.pdf; Gas Loadings Summary Spreadsheet.pdf; Faber Maunsell _GNDP_ Norwich Growth Areas 29 04 09.pdf

Follow Up Flag: Follow up
Flag Status: Flagged

Gemma,

I have carried out Network Analysis based upon your Proposed Housing and Employment Sites Location Plan with the loadings provided. I have assumed the connections are on the nearest relevant main to identify capacity constraints on our existing infrastructure. The analysis is based upon the current predicted load growth - with no diversionary works as yet taken into account, i.e. the existing infrastructure. The loads have been assessed in isolation of other potential loads in the area and as such the availability of future supplies to the sites may be influenced by other offers.

The MAP you provided is not detailed enough to identify specific connection points so I have concentrated on connections predominantly based on our existing Medium and Intermediate pressure mains and have supplied street names for possible connections where applicable.

The results form you loadings are detailed below;

Broadland
Rackheath
The existing infrastructure does NOT have sufficient capacity to serve this development based solely on the 2009-2016 loadings. Reinforcement will be required to the Intermediate pressure network (Crossroads Salhouse Road/Greenlane East) in order to maintain minimum pressures at the network extremities. The Medium pressure network is also located nearby but the existing infrastructure is not adequate to support this development.

Sprowsdon Fringe
The infrastructure has capacity for the 2009-2016 loadings but will require reinforcement beyond that. The analysis was carried out based on an IP connection at (Wroxham Road). There is a low pressure main along Wroxham Road but it is not adequate to support the development.

Salhouse Road
See Rackheath comments (Connection is on the same main further down Salhouse Road).

Thorpe St Andrew (Broadland Bus Park)
The existing infrastructure currently has capacity to support this load and the full development (2031). The Intermediate pressure main I analysed the loadings against was along Green Lane/Cranley Road. There is an LP system located in this area and reinforcement may be required depending on where the connection is made on the network. The map supplied does not give me enough detail to identify a suitable point of connection on the LP.

Smaller Sites, Urban Commitments, Rural Commitments
Cannot identify from site location plan.

Norwich (All Locations Combined)
The infrastructure has capacity for the 2009-2016 loadings but will require reinforcement beyond that. The analysis was carried out based on an IP connection at (St Faiths Road).

Commitments
Cannot identify from site location plan.

South Norfolk

Wymondham (Gateway 11)
The nearest main to supply this area is the MP at (Norwich Road/Norwich Common). Analysis shows that reinforcement will be required at the network extremity points based on the 2009-2016 loadings.

Long Stratton (Ipswich Road)
The only main in this vicinity is an IP main and substantial reinforcement would be required.

Hethersett
The infrastructure has capacity for the 2009-2016 loadings but will require reinforcement beyond that. The analysis was carried out based on an MP connection along Norwich Road. These loadings combined with the Wymondham loadings would cause failure on the network requiring reinforcement.

Cringleford
The results for Wymondam and Hethersett also apply to Cringleford as the development would come off the same MP main.

Easton
The nearest main is the LP along the A47. The 2009-2016 loadings can be taken off the LP but the additional loadings will require substantial reinforcement to the LP and supplying IP infrastructure.

Costessey (Longwater)
The nearest main is the LP along Longwater Lane. Analysis shows reinforcement will be required on the LP network with the 2009-2016 loading added.

Colney (Norwich Res Pk)
The nearest main is the MP along Colney Lane. Analysis indicates there is no reinforcement required for this development at this stage.

Smaller Sites, Urban Capacity, Urban Commitments, Rural Commitments
Cannot identify from site location plan.

RSS Review (Greater Norfolk Area)
Cannot identify from site location plan.

Additional Dwellings (Greater Norfolk Area)
Cannot identify from site location plan.

Just for your information when you are at a stage where you require an indication of costs, all the information you require can be found at the following link: http://www.nationalgrid.com/uk/Gas/Connections/

Then please look under Competitive Connections Providers.

After reading the information at the above link, if you require a quote from a UIP company please fill out the Competitive Quotation Form at the following link:
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All the above is also detailed on the OFGEM website www.OFGEM.gov.uk who also provide details of other Gas Transporters that you may wish to select.

Hopefully this will have provided you with an indication of the utility constraints with respect to gas supplies for these areas, but if you wish to discuss any part of this further or you would like to arrange a meeting to discuss please do not hesitate to get in touch on the number below.

Regards

Karl

Karl Brayson
Planning Supervisor
Network Strategy
UK Distribution
National**Grid**
Tel 7153 1606 (int) 01455 231606 (ext)

Fax 0845 0700868 (ext)
Email: karl.brayson@uk.ngrid.com
www.nationalgrid.com/uk

please consider the environment - do you really need to print this email?

From: Rosamond, Cassie
Sent: Tuesday, May 05, 2009 1:08 PM
To: Brayson, Karl
Subject: FW: Developer's Enquiry (National Grid Distribution)

Regards,
Cassy

Cassandra Rosamond
Planning Supervisor (North London)
UKD Network Strategy
National Grid
Tel: (Int) 7153 1636 (Ext) +44 (0)1455 231636
email: cassandra.rosamond@uk.ngrid.com
To access the Network Strategy site click on this link: http://ngtuk/dist_networkstrategy

---

From: .box.NGCustomersupport
Sent: Tuesday, May 05, 2009 1:07 PM
To: Rosamond, Cassie
Cc: Roach, Steph
Subject: FW: Developer's Enquiry (National Grid Distribution)

Cassie

Further to my telephone call with Steph, please see latest correspondence we have received regarding a "Developer's Enquiry".

I understand that you are currently dealing with this.

Can you please just give them a courtesy call to advise them of any updates? Hopefully this will prevent them emailing into the .Box chasing up their enquiry.

Thank you for your help

Kind regards

Sam

Samantha Myatt
Customer Support Advisor
Customer Services
Distribution Customer Support - Gas Distribution

Telephone 0845 0700203 Option 2
E Mail: Samantha.Myatt@uk.ngrid.com

From: Heath, Gemma S [mailto:IMCEAEX-_O=AECOM_OU=EUROPE_CN=RECIPIENTS_CN=HEATHGS@aecom.com]
Sent: Tuesday, May 05, 2009 12:49 PM
To: .box.NGCustomersupport
Subject: FW: Developer's Enquiry (National Grid Distribution)

Dear Sir

Following my email below, I would be grateful if you could acknowledge receipt of the enquiry and provide a likely timescale for your response. Due to the delay since the attached developer's enquiry letter was sent in on 30 March, I am currently preparing a draft report with the gas distribution information missing. I would like to indicate a timescale in the report to provide the Client with some limited data at this time.

Please don't hesitate to call me on 024 7625 3305 if you have any queries.

For your information, Faber Maunsell became AECOM on 4 May, but I understand that both the Faber Maunsell and AECOM email addresses are currently in use.

Many thanks

Gemma

From: Heath, Gemma S
Sent: 30 April 2009 12:19
To: 'customersupport@uk.ngrid.com'
Subject: Developer's Enquiry (National Grid Distribution)

Dear Sir

Faber Maunsell has been appointed by the Greater Norwich Development Partnership (GNDP) to carry out an assessment of the gas supply options for development proposals in the Greater Norwich Growth Area. The proposals cover the Broadland, Norwich and South Norfolk areas and are summarised on the attached plan.

Also attached is a developer's enquiry letter that was sent out at the end of March, but to date we have had no response.

For your information, we also sent a similar enquiry letter to National Grid Transmission and have received the attached response from their Town Planner, Les Morris.

I would be grateful if you could provide a response to the queries in our letter with regard to gas distribution in the area. I would also be grateful if you could send an acknowledgement of receipt of this email for our records.

Please don't hesitate to contact me on the number below if you have any queries.

Many thanks

Gemma

Gemma Heath

Principal Engineer
Faber Maunsell
14 Queen Victoria Road
Coventry
CV1 3PJ

T. +44 (0) 24 7625 3300
F. +44 (0) 24 7625 3301
E. gemma.heath@fabermaunsell.com
W. www.fabermaunsell.com

Please note: My e-mail has changed to Gemma.Heath@aecom.com. Please update your address books accordingly.

Faber Maunsell is now AECOM: Faber Maunsell's parent company, AECOM, is integrating its business lines and regions around the globe into a single entity giving clients access to over 43,000 employees operating in over 100 countries. As part of this integration, Faber Maunsell has changed its name to AECOM but the professionals who serve you, our focus on quality service and products, and our commitment to our employees remain unchanged. To find out more, visit www.aecom.com

Heath, Gemma S

From: Brayson, Karl [karl.brayson@uk.ngrid.com]
Sent: 28 May 2009 08:41
To: Heath, Gemma S
Subject: RE: Developer's Enquiry (National Grid Distribution)

Gemma

Unfortunately it is not possible to provide budget costings at this stage, more detail would be required. In order to provide costings for each development you will have to go though the UIP (Utility Infrastructure Providers) or IGT (Independent Gas Transporters) route.

I provided some internet links in my previous email which I've added again to the bottom of this one which should take you through the process required in order to receive budget indication of costs;

Just for your information when you are at a stage where you require an indication of costs, all the information you require can be found at the following link: http://www.nationalgrid.com/uk/Gas/Connections/

Then please look under Competitive Connections Providers.

After reading the information at the above link, if you require a quote from a UIP company please fill out the Competitive Quotation Form at the following link:
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I hope this helps

Regards

Karl

Karl Brayson
Planning Supervisor
Network Strategy
UK Distribution
National**Grid**
Tel 7153 1606 (int) 01455 231606 (ext)
Fax 0845 0700868 (ext)
Email: karl.brayson@uk.ngrid.com
www.nationalgrid.com/uk

From: Heath, Gemma S [mailto:gemma.heath@aecom.com]
Sent: Wednesday, May 27, 2009 12:58 PM
To: Brayson, Karl
Subject: RE: Developer's Enquiry (National Grid Distribution)

Karl

Many thanks for that information.

With regard to costs, is it possible for any budget costings to be provided at this stage, or would more detail be required?

Thanks

Gemma

From: Brayson, Karl [mailto:karl.brayson@uk.ngrid.com]
Sent: 22 May 2009 16:15
To: Heath, Gemma S
Cc: Gomm, Malcolm
Subject: FW: Developer's Enquiry (National Grid Distribution)

Gemma,

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Regards

Karl

Karl Brayson
Planning Supervisor
Network Strategy
UK Distribution
National**Grid**
Tel 7153 1606 (int) 01455 231606 (ext)
Fax 0845 0700868 (ext)
Email: karl.brayson@uk.ngrid.com
www.nationalgrid.com/uk

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Sent: Tuesday, May 05, 2009 1:08 PM
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Subject: FW: Developer's Enquiry (National Grid Distribution)

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Cassy

Cassandra Rosamond
Planning Supervisor (North London)
UKD Network Strategy
National Grid
Tel: (Int) 7153 1636 (Ext) +44 (0)1455 231636
email: cassandra.rosamond@uk.ngrid.com
To access the Network Strategy site click on this link: http://ngtuk/dist_networkstrategy
Please consider the environment - do you really need to print this email?

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To: Rosamond, Cassie
Cc: Roach, Steph
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Kind regards

Sam

Samantha Myatt
Customer Support Advisor
Customer Services
Distribution Customer Support - Gas Distribution

Telephone 0845 0700203 Option 2
E Mail: Samantha.Myatt@uk.ngrid.com

From: Heath, Gemma S [mailto:IMCEAEX-_O=AECOM_OU=EUROPE_CN=RECIPIENTS_CN=HEATHGS@aecom.com]
Sent: Tuesday, May 05, 2009 12:49 PM

To: .box.NGCustomersupport
Subject: FW: Developer's Enquiry (National Grid Distribution)

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Many thanks

Gemma

From: Heath, Gemma S
Sent: 30 April 2009 12:19
To: 'customersupport@uk.ngrid.com'
Subject: Developer's Enquiry (National Grid Distribution)

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Many thanks

Gemma

Gemma Heath
Principal Engineer
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Please note: My e-mail has changed to Gemma.Heath@aecom.com. Please update your address books accordingly.

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Faber Maunsell is now AECOM: Faber Maunsell's parent company, AECOM, is integrating its business lines and regions around the globe into a single entity giving clients access to over 43,000 employees operating in over 100 countries. As part of this integration, Faber Maunsell has changed its name to AECOM but the professionals who serve you, our focus on quality service and products, and our commitment to our employees remain unchanged. To find out more, visit www.aecom.com

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Heath, Gemma S

From: Brayson, Karl [karl.brayson@uk.ngrid.com]
Sent: 28 May 2009 12:50
To: Heath, Gemma S
Subject: RE: Developer's Enquiry (National Grid Distribution)

Gemma

Broadland Business Park has sufficient capacity for the 2009-2016 load (398kwh) on both the IP and LP, however beyond that the additional loading of 1989kwh (2017 onwards) would require reinforcement on the LP. The amount and cost of that reinforcement would depend on the connection and whether a service or a mains extension is required as part of the development.

The previous analysis back in 2007 would have been on the LP as the main supply to the existing infrastructure is LP. I predominantly used the IP for my analysis runs the MAP provided only gave me a large circle and no site boundary's so it was difficult to establish connection points with any degree of accuracy.

Regards

Karl Brayson
Planning Supervisor
Network Strategy
UK Distribution
National**Grid**
Tel 7153 1606 (int) 01455 231606 (ext)
Fax 0845 0700868 (ext)
Email: karl.brayson@uk.ngrid.com
www.nationalgrid.com/uk

From: Heath, Gemma S [mailto:gemma.heath@aecom.com]
Sent: Thursday, May 28, 2009 9:09 AM
To: Brayson, Karl
Cc: Martin, Steve L
Subject: RE: Developer's Enquiry (National Grid Distribution)

Hi Karl

Thanks - that is what I thought but I just wanted to clarify.

I have one further query regarding the information you sent through. The information for Broadland Business Park indicates that the existing infrastructure has sufficient capacity to accommodate the full development up to 2031 without any reinforcement works. Obviously this is a good thing, but the previous study (prepared by Peter Brett Associates) indicated just the opposite. I don't have copies of any of their correspondence with National Grid, but their report states that there is currently no spare capacity at this site, so significant investment would be required. Their report was prepared at the end of 2007, so do you know of any upgrading works that have been carried out in the meantime that could account for this? Another possibility could be that it was modelled with a connection to the LP system that you mention in your email rather than the IP system that you considered.

Could you let me have your thoughts on this as I'm sure that it will be picked up by our Client.

Thanks

Gemma

From: Brayson, Karl [mailto:karl.brayson@uk.ngrid.com]
Sent: 28 May 2009 08:41
To: Heath, Gemma S
Subject: RE: Developer's Enquiry (National Grid Distribution)

Gemma

Unfortunately it is not possible to provide budget costings at this stage, more detail would be required. In order to provide costings for each development you will have to go though the UIP (Utility Infrastructure Providers) or IGT (Independent Gas Transporters) route.

I provided some internet links in my previous email which I've added again to the bottom of this one which should take you through the process required in order to receive budget indication of costs;

Just for your information when you are at a stage where you require an indication of costs, all the information you require can be found at the following link: http://www.nationalgrid.com/uk/Gas/Connections/

Then please look under Competitive Connections Providers.

After reading the information at the above link, if you require a quote from a UIP company please fill out the Competitive Quotation Form at the following link:
http://www.nationalgrid.com/uk/Gas/Connections/CompetitiveQuotationForm/

I hope this helps

Regards

Karl

Karl Brayson
Planning Supervisor
Network Strategy
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Fax 0845 0700868 (ext)
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From: Heath, Gemma S [mailto:gemma.heath@aecom.com]
Sent: Wednesday, May 27, 2009 12:58 PM
To: Brayson, Karl
Subject: RE: Developer's Enquiry (National Grid Distribution)

Karl

Many thanks for that information.

With regard to costs, is it possible for any budget costings to be provided at this stage, or would more detail be required?

Thanks

Gemma

From: Brayson, Karl [mailto:karl.brayson@uk.ngrid.com]
Sent: 22 May 2009 16:15
To: Heath, Gemma S
Cc: Gomm, Malcolm
Subject: FW: Developer's Enquiry (National Grid Distribution)

Gemma,

I have carried out Network Analysis based upon your Proposed Housing and Employment Sites Location Plan with the loadings provided. I have assumed the connections are on the nearest relevant main to identify capacity constraints on our existing infrastructure. The analysis is based upon the current predicted load growth - with no diversionary works as yet taken into account, i.e. the existing infrastructure. The loads have been assessed in isolation of other potential loads in the area and as such the availability of future supplies to the sites may be influenced by other offers.

The MAP you provided is not detailed enough to identify specific connection points so I have concentrated on connections predominantly based on our existing Medium and Intermediate pressure mains and have supplied street names for possible connections where applicable.

The results form you loadings are detailed below;

Broadland
Rackheath
The existing infrastructure does NOT have sufficient capacity to serve this development based solely on the 2009-2016 loadings. Reinforcement will be required to the Intermediate pressure network (Crossroads Salhouse Road/Greenlane East) in order to maintain minimum pressures at the network extremities. The Medium pressure network is also located nearby but the existing infrastructure is not adequate to support this development.

Sprowsdon Fringe
The infrastructure has capacity for the 2009-2016 loadings but will require reinforcement beyond that. The analysis was carried out based on an IP connection at (Wroxham Road). There is a low pressure main along Wroxham Road but it is not adequate to support the development.

Salhouse Road
See Rackheath comments (Connection is on the same main further down Salhouse Road).

Thorpe St Andrew (Broadland Bus Park)
The existing infrastructure currently has capacity to support this load and the full development (2031). The Intermediate pressure main I analysed the loadings against was along Green Lane/Cranley Road. There is an LP system located in this area and reinforcement may be required depending on where the connection is made on the network. The map supplied does not give me enough detail to identify a suitable point of connection on the LP.

Smaller Sites, Urban Commitments, Rural Commitments
Cannot identify from site location plan.

Norwich (All Locations Combined)
The infrastructure has capacity for the 2009-2016 loadings but will require reinforcement beyond that. The analysis was carried out based on an IP connection at (St Faiths Road).

Commitments
Cannot identify from site location plan.

South Norfolk
Wymondham (Gateway 11)
The nearest main to supply this area is the MP at (Norwich Road/Norwich Common). Analysis shows that reinforcement will be required at the network extremity points based on the 2009-2016 loadings.

Long Stratton (Ipswich Road)
The only main in this vicinity is an IP main and substantial reinforcement would be required.

Hethersett

The infrastructure has capacity for the 2009-2016 loadings but will require reinforcement beyond that. The analysis was carried out based on an MP connection along Norwich Road. These loadings combined with the Wymondham loadings would cause failure on the network requiring reinforcement.

Cringleford
The results for Wymondam and Hethersett also apply to Cringleford as the development would come off the same MP main.

Easton
The nearest main is the LP along the A47. The 2009-2016 loadings can be taken off the LP but the additional loadings will require substantial reinforcement to the LP and supplying IP infrastructure.

Costessey (Longwater)
The nearest main is the LP along Longwater Lane. Analysis shows reinforcement will be required on the LP network with the 2009-2016 loading added.

Colney (Norwich Res Pk)
The nearest main is the MP along Colney Lane. Analysis indicates there is no reinforcement required for this development at this stage.

Smaller Sites, Urban Capacity, Urban Commitments, Rural Commitments
Cannot identify from site location plan.

RSS Review (Greater Norfolk Area)
Cannot identify from site location plan.

Additional Dwellings (Greater Norfolk Area)
Cannot identify from site location plan.

Just for your information when you are at a stage where you require an indication of costs, all the information you require can be found at the following link: http://www.nationalgrid.com/uk/Gas/Connections/

Then please look under Competitive Connections Providers.

After reading the information at the above link, if you require a quote from a UIP company please fill out the Competitive Quotation Form at the following link:
http://www.nationalgrid.com/uk/Gas/Connections/CompetitiveQuotationForm/

All the above is also detailed on the OFGEM website www.OFGEM.gov.uk who also provide details of other Gas Transporters that you may wish to select.

Hopefully this will have provided you with an indication of the utility constraints with respect to gas supplies for these areas, but if you wish to discuss any part of this further or you would like to arrange a meeting to discuss please do not hesitate to get in touch on the number below.

Regards

Karl

Karl Brayson
Planning Supervisor
Network Strategy
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National**Grid**
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Fax 0845 0700868 (ext)
Email: karl.brayson@uk.ngrid.com
www.nationalgrid.com/uk

From: Rosamond, Cassie
Sent: Tuesday, May 05, 2009 1:08 PM
To: Brayson, Karl
Subject: FW: Developer's Enquiry (National Grid Distribution)

Regards,
Cassy

Cassandra Rosamond
Planning Supervisor (North London)
UKD Network Strategy
National Grid
Tel: (Int) 7153 1636 (Ext) +44 (0)1455 231636
email: cassandra.rosamond@uk.ngrid.com
To access the Network Strategy site click on this link: http://ngtuk/dist_networkstrategy

---

From: .box.NGCustomersupport
Sent: Tuesday, May 05, 2009 1:07 PM
To: Rosamond, Cassie
Cc: Roach, Steph
Subject: FW: Developer's Enquiry (National Grid Distribution)

Cassie

Further to my telephone call with Steph, please see latest correspondence we have received regarding a "Developer's Enquiry".

I understand that you are currently dealing with this.

Can you please just give them a courtesy call to advise them of any updates? Hopefully this will prevent them emailing into the .Box chasing up their enquiry.

Thank you for your help

Kind regards

Sam

Samantha Myatt
Customer Support Advisor
Customer Services
Distribution Customer Support - Gas Distribution

Telephone 0845 0700203 Option 2
E Mail: Samantha.Myatt@uk.ngrid.com

From: Heath, Gemma S [mailto:IMCEAEX-_O=AECOM_OU=EUROPE_CN=RECIPIENTS_CN=HEATHGS@aecom.com]
Sent: Tuesday, May 05, 2009 12:49 PM

To: .box.NGCustomersupport
Subject: FW: Developer's Enquiry (National Grid Distribution)

Dear Sir

Following my email below, I would be grateful if you could acknowledge receipt of the enquiry and provide a likely timescale for your response. Due to the delay since the attached developer's enquiry letter was sent in on 30 March, I am currently preparing a draft report with the gas distribution information missing. I would like to indicate a timescale in the report to provide the Client with some limited data at this time.

Please don't hesitate to call me on 024 7625 3305 if you have any queries.

For your information, Faber Maunsell became AECOM on 4 May, but I understand that both the Faber Maunsell and AECOM email addresses are currently in use.

Many thanks

Gemma

From: Heath, Gemma S
Sent: 30 April 2009 12:19
To: 'customersupport@uk.ngrid.com'
Subject: Developer's Enquiry (National Grid Distribution)

Dear Sir

Faber Maunsell has been appointed by the Greater Norwich Development Partnership (GNDP) to carry out an assessment of the gas supply options for development proposals in the Greater Norwich Growth Area. The proposals cover the Broadland, Norwich and South Norfolk areas and are summarised on the attached plan.

Also attached is a developer's enquiry letter that was sent out at the end of March, but to date we have had no response.

For your information, we also sent a similar enquiry letter to National Grid Transmission and have received the attached response from their Town Planner, Les Morris.

I would be grateful if you could provide a response to the queries in our letter with regard to gas distribution in the area. I would also be grateful if you could send an acknowledgement of receipt of this email for our records.

Please don't hesitate to contact me on the number below if you have any queries.

Many thanks

Gemma

Gemma Heath
Principal Engineer
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For the registered information on the UK operating companies within the National Grid group please use the attached link:
http://www.nationalgrid.com/corporate/legal/registeredoffices.htm

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Appendix E
Gas Transmission Asset Plans

(Source: www.nationalgrid.com/uk/LandandDevelopment/DDC/GasElectricNW/gaspipes)

TF

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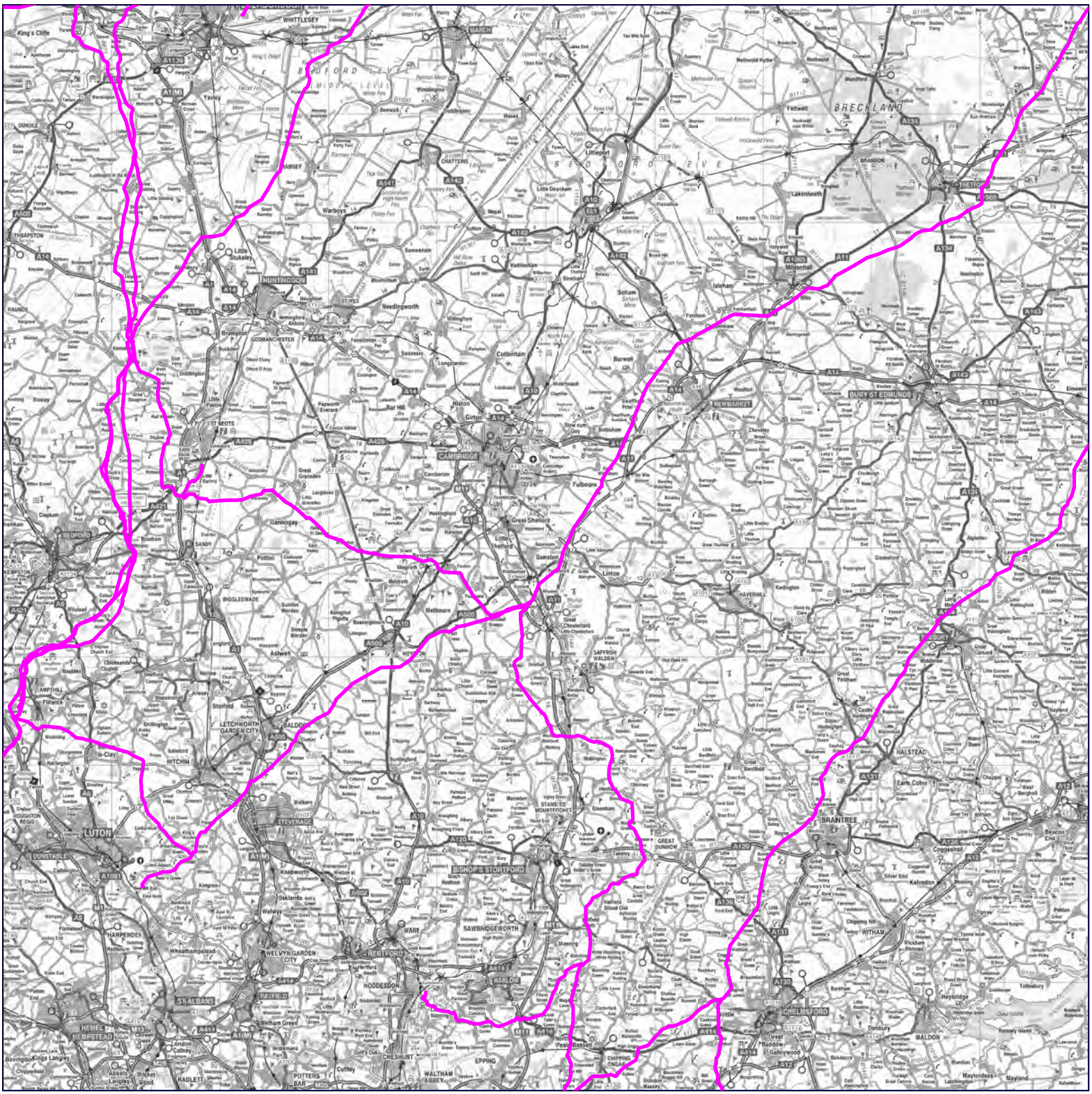
TL



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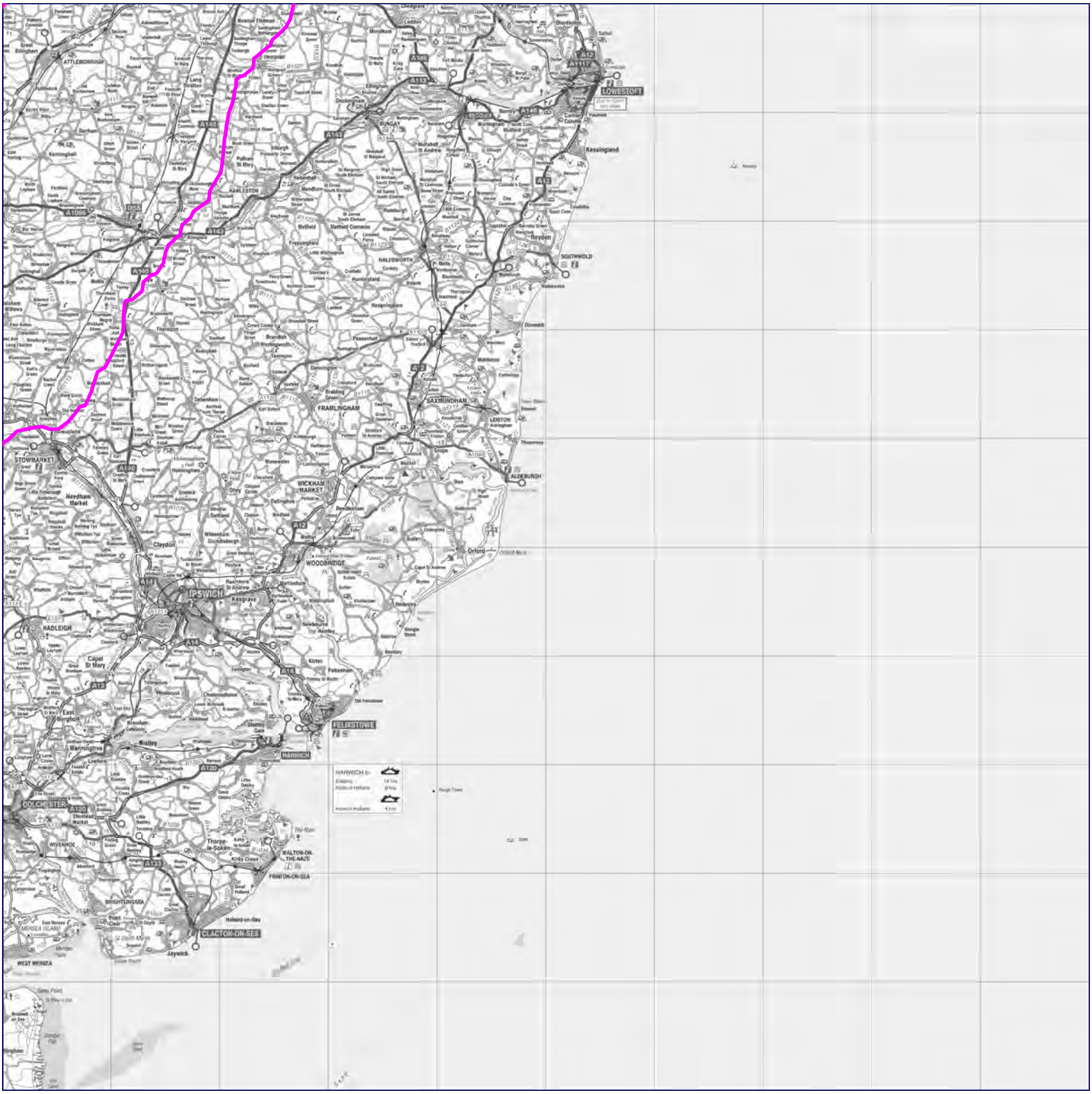
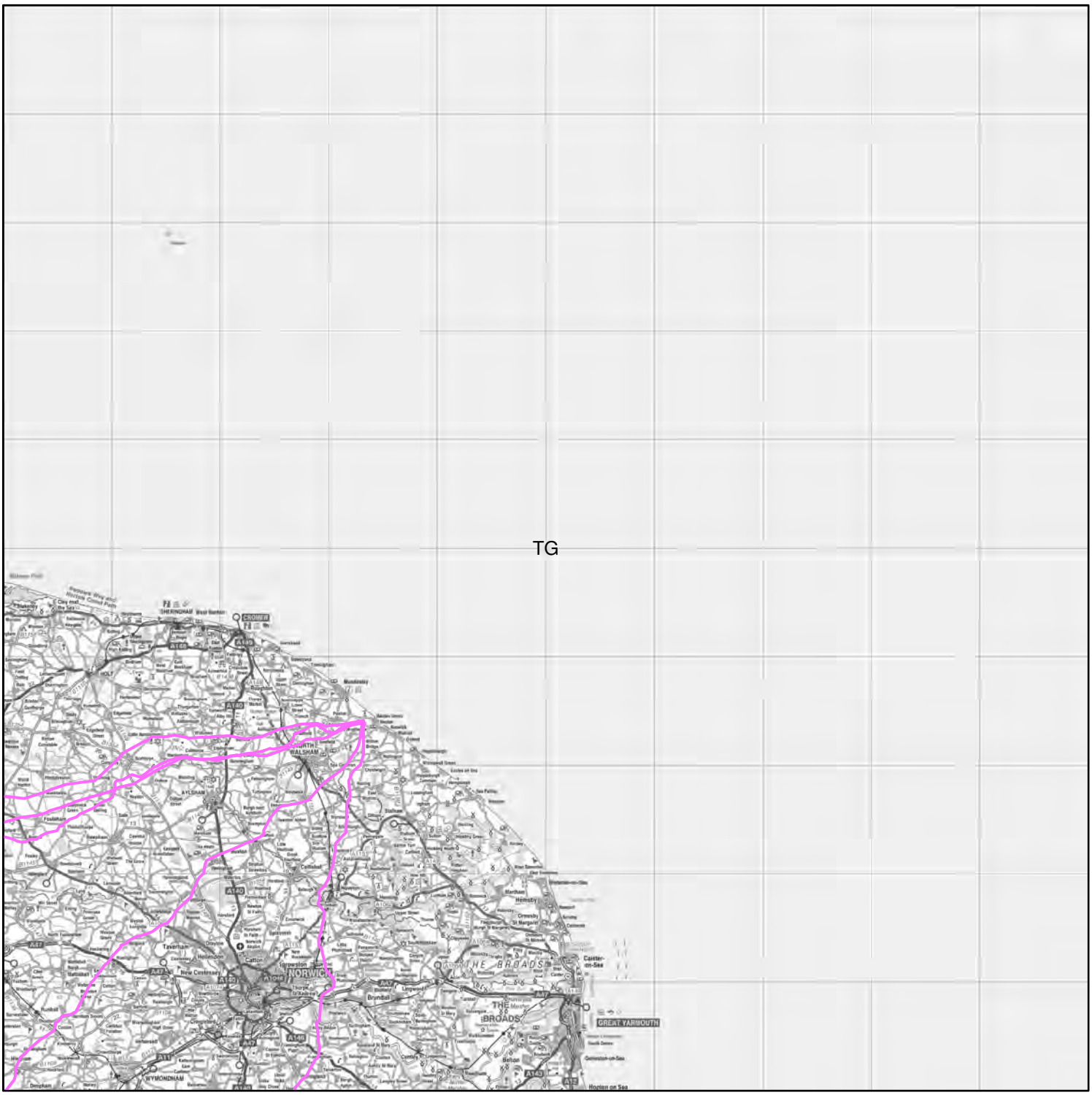
TM



0.0 4.0 8.0 12.0 16.0 20.0 km

TG



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Appendix F
National Grid Quotation Charges and Service Category Table

(Source: www.nationalgrid.com/uk/Gas/Connections/online/guides/guidance/QuotationCharges.htm)

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Quotation Charges and Service Category Table

Use this table to determine which service category your work falls into; you need this information to proceed with your **online quotation request**.

SERVICE CATEGORY	CRITERIA	BAND	QUOTATION CHARGE
New Gas Connection	• Property is used wholly or mainly for domestic purposes • Single connection only • Neighbour has a gas supply • Pipe to be laid on private land does not exceed 40m • Required load does not exceed 275kW	Domestic Standard Connection/ Alteration	No additional quotation charge
Alter Existing Gas Connection	• Where length of new additional pipe required between new and old position is equal to or less than 20m. [1]		
Non Standard Gas Connection	• Any Domestic New connection that does not meet the New Gas Connection criteria (see above) and where the load does not exceed 695kW • Any Non Domestic New Connection where the load does not exceed 695kW • Single Connection only • Pipes to be laid on private land does not exceed 40m • Neighbour has a gas supply and is within standard distances[3].	Band 1	£277[2]
Non Standard Gas Connection	• Any Non Domestic New Connection where the load is greater than 695kW but does not exceed 1733kW • Single or Multiple connections • Domestic New Connection above standard distances[3] where the load does not exceed 1733kW • Where connection requires pipework exceeding standard distances[3]	Band 2	£400[2]
Non Standard Alteration	• Non Domestic Alterations where the load does not exceed 1733kW • Domestic Alterations for loads greater than 695kW • Domestic Alterations above standard distances[1] where the load does not exceed 1733kW		
Non Standard Gas Connection	• As per band 2 but where load exceeds 1733kW	Band 3	£553[2]
Non Standard Alteration	• As per band 2 but where load exceeds 1733kW		

Please click here to **continue with your online quotation request**.

For any work requests that are categorised as 'sufficiently complex' bespoke Design & Study charges will apply (sufficiently complex work defined in National Grid's **Distribution Connections Charging Methodology**).

1. Standard alteration distance is up to 20m between new and old meter position requiring no more than 20m of new additional pipework.

2. Excluding VAT. Effective from 1 April 2009.

3. Standard distances are where the pipe to be laid is less than 23 metres on public land and less than 40 metres on private land.

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Appendix G
Water Cycle Study Potential Growth Areas

(Source: Appendix B of the WCS)

Appendix B: NPA and RPA Policy Areas