Dacorum Borough Council Strategic Infrastructure Study

>Utilities and Physical Infrastructure

Final // February 2011

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Dacorum Infrastructure Study

Utilities and Physical Infrastructure Assessment

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ABBREVIATIONS

AMPl	Asset Management Plan
AMPe	Asset Management Period
BERR	Department for Business, Enterprise and Regulatory Reform
CfSH	Code for Sustainable Homes
CLG	Department of Communities and Local Government
DBC	Dacorum Borough Council
DEFRA	Department of Environment Food and Rural Affairs
DIM	Dacorum Infrastructure Model
DSIS	Dacorum Strategic Infrastructure Study
EA	Environment Agency
EDF	EDF Energy
EfW	Energy from Waste
EU	European Union
GWh	Gigawatt-hours
HP	High Pressure
HWRC	Household Waste Recycling Centres
IP	Intermediate Pressure
kVA	Kilovolt-Ampere
LATS	Landfill Allowance Trading System
LDF	Local Development Framework
LDZ	Local Distribution Zone
LP	Local Pressure
m3	Cubic Metres
MBT	Mechanical Biological Treatment
Ml/d	million litres per day
MP	Medium Pressure
MRF	Materials Recycling Facility
MSW	Municipal Solid Waste
MVA	Megavolt Ampere

OfGEM	Office of Gas & Electricity Markets
OfWAT	Office of Water Services
ONS	Office for National Statistics
PFI	Private Finance Initiative
PPS	Planning Policy Statement
PRS	Pressure Reducing Stations
SPD	Supplementary Planning Document
SUDS	Sustainable Urban Drainage Systems
URS	URS Corporation Ltd
WCA	Waste Collection Authority
WDA	Waste Disposal Authority
WRZ	Water Resource Zone
WSZ	Water Supply Zone
WTS	Waste Transfer Station

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URS thanks all those who contributed to this report. Without the input and efforts of the many stakeholders involved, this project would not have been possible.

EXECUTIVE SUMMARY

This technical report is part of the *Dacorum Strategic Infrastructure Study* (*DSIS*). It identifies the utilities and physical infrastructure needs of the Borough of Dacorum over the period 2011 to 2031. It feeds into an Infrastructure Delivery Plan (IDP) for the Borough, and a Planning Obligations Supplementary Planning Document (SPD) on Development Contributions. It covers energy (electricity and gas), water, sewerage and waste management infrastructure.

The *DSIS* meets the requirement of *Planning Policy Statement 12 – Local Spatial Planning* for planning authorities to place infrastructure planning at the heart of the planning process, and for evidenced infrastructure planning to support Local Development Frameworks (LDFs), housing growth targets and the creation of sustainable development and communities. The *DSIS* also supports the goals of the *Dacorum Sustainable Community Strategy* (2008), the *Emerging Core Strategy* (2009) and the aspirations of the Hemel 2020 Partnership.

The primary source of information on planned and required infrastructure provision to 2031 has been infrastructure providers and their partners. This report draws on published written sources of information as well as stakeholder consultation including phone interviews and meetings with various infrastructure providers and a workshop in March 2010. Local planning authorities are often not directly responsible for the delivery of utilities and physical infrastructure; a key parameter for the *DSIS* has been that utilities providers plan not with the 20 year LDF in mind but on a more short-term basis in five year plans and at spatial levels unrelated to administrative boundaries.

Where appropriate URS has also modelled requirements on the Dacorum Development Trajectory, developed in collaboration with Dacorum Borough Council (DBC) and using broad-brush benchmark standards relating to 'trigger points' for infrastructure and to costs. It is estimated that additional demand arising from the projected residential and commercial growth in Dacorum, for the low and high growth scenario respectively, will be:

- 38.3 kVH to 52.0 kWH electricity
- 9,368 m3 to 15,016 m3 gas
- 1.3M l/day to 4.5M l/day water and foul sewerage
- 8.1M tonnes to 14.3M tonnes household waste.

Potential shortfalls in the capacity of existing networks were highlighted with regard to sewerage and electricity networks. The physical infrastructure that could be required as a result of the scale of growth envisaged includes the following, though it should be noted that the magnitude, limitations and the locations of these requirements are not confirmed at this stage:

- For electricity: an additional primary substation and two primary substation upgrades at Hemel Hempstead
- For water and gas: local network reinforcement
- For sewers: new and refurbished WWTWs at a number of locations

- For waste management: a new waste to energy facility.

Recommended next steps for DBC to take this work forward include:

- Regular up-dating of the DSIS, for progress against goals for provision to be monitored and for estimates of requirements to be revisited, and also to reflect changing models of service delivery and the changing regulatory and fiscal context; elements of a monitoring framework are suggested in the *DSIS Executive Summary*

- On-going collaboration with infrastructure providers, maintaining and building upon the channels of communication established through this study and promoting mechanisms whereby utilities can effectively feed into the strategic planning process; this is especially important given that this study found a lack of immediately available information around strategic planning for utilities, reflecting that utilities are set up to respond reactively to planning applications as they arise, rather than proactively to longer term strategic planning drivers

- More generally, this study should be used as a lobbying tool to ensure that sufficient resources are allocated to the process so that strategic planning can successfully continue; champions could potentially be assigned within each service area to work with the Council and other partners in the strategic planning process.

1. INTRODUCTION

Scope

1.1. This technical report is part of the Dacorum Strategic Infrastructure Study (DSIS). The purpose of this report is to identify the utilities and physical infrastructure needs of the Dacorum over the period 2011 to 2031. It feeds into an Infrastructure Delivery Plan (IDP) for the borough, and a Planning Obligations Supplementary Planning Document (SPD) on Development Contributions.[1]

1.2. This report examines the following types of infrastructure:

- Energy (electricity and gas)
- Water
- Sewerage
- Waste management facilities

1.3. The report is part of a suite of documents and outputs making up the *DSIS*. The accompanying outputs are:

- Executive Summary and Infrastructure Delivery Plan
- Transport Infrastructure Assessment
- Social Infrastructure Assessment
- Dacorum Infrastructure Model (DIM) (an excel spreadsheet model, presented within Appendix C of the Executive Summary).

Key Drivers for the Study

1.4. *Planning Policy Statement 12 – Local Spatial Planning* requires planning authorities to place infrastructure planning at the heart of the planning process. Accordingly, it supports evidenced infrastructure planning to corroborate LDFs and their core strategies, as well as housing growth targets and the creation of sustainable development and communities

1.5. Dacorum's *Emerging Core Strategy* (2009) cites development of effective utilities policies; especially relating to water and waste management, as 'critical in (their) response to climate change'. The *Emerging Core Strategy* highlights utilities infrastructure as a key consideration in new development, in order to mitigate environmental impacts associated with borough expansion.

[1] The Planning Obligations (SPD) is being formulated by Cushman and Wakefield LLP.

1.6. The key visions outlined in the *Dacorum Sustainable Community Strategy* (2009) also address the need to reduce energy and water consumption, and manage and reduce waste production through the effective development and management of infrastructure utilities.

1.7. DBC has a coherent conceptual vision for Dacorum, in which the diverse parts of the borough develop in a unified and complimentary way. The vision includes a clear set of aspirations for Hemel Hempstead, as articulated in the work of the Hemel 2020 Vision, which is owned by the Dacorum Partnership, The Local Strategic Partnership (LSP). Hemel 2020 currently has key five projects:

- Town centre regeneration
- Maylands
- Neighbourhood improvements and regeneration
- Green spaces
- Housing in growth areas.

1.8. Considerable planning work has been undertaken on these workstreams by the Hemel 2020 projects and by other stakeholders, and there are likely to be implications for infrastructure in key sites such as the 'gateways' at Maylands and the station, ranging from utilities and transport infrastructure to public realm works and social facilities. Elements relating to utilities works are covered throughout this report as relevant. The regeneration plans have been revised in recent months due to economic pressures, however DBC remains committed to their implementation in collaboration with its partners.

Planning for Utilities and Physical Infrastructure

1.9. Utilities, sewers and waste management facilities are essential for development to go forward and for communities to adapt to a growing population. However, strategic planning for their delivery can prove challenging, as explained in greater detail below.

1.10. The primary reason for this is that Dacorum is not directly in charge of planning for the provision of utilities and physical infrastructure. Utilities and sewer providers are private companies that operate in a private market, albeit heavily regulated to ensure that the incentives to underprovision are minimised, where they contract arrangements directly with their end users. Waste management is predominantly planned by the Hertfordshire County Council (HCC), which works in co-operation with the local authorities in the county.

1.11. Secondly, the physical facilities and infrastructure under investigation are not provided in unitised form, but are delivered in variable sizes and capacities. Whilst we are able to model the additional demand for electricity, gas and water for the growth areas up to 2031, and to estimate potential sewage flows and waste generation, URS is not in a position to translate this additional demand into requirements for physical infrastructure without assistance from the relevant agencies.

1.12. Thirdly, all the infrastructure areas covered within this report are managed and/or planned for at a geographical level that is wider than Dacorum's administrative boundaries. Waste disposal is planned at the Hertfordshire level. Utilities and sewer providers cover even wider geographical areas. This means that baseline information and forecasts are unlikely to be available at the Dacorum level, with ad hoc (and expensive) modelling exercises required if the implications of growth within the borough are to be accurately assessed in terms of additional physical requirements. For this reason, it should be noted that it has not been possible to definitively conclude an assessment of specific infrastructure requirements for some utilities.

1.13. Fourthly, whilst providers plan at a wider geographical level, the time horizon tends to be short (or sometimes medium) term only. For instance, utilities companies work on the basis of five year plans[2]. Utilities providers in particular tend to adopt a reactive rather than proactive approach that tends to reflect a given solution for a particular development. Further, each of the providers works under different growth assumptions, which do not necessarily relate to local authorities' residential and commercial growth targets and aspirations. As a result even if the planning horizon were in line with the LDF 2011-2031 period, the demand for additional services that they would estimate as part of their own planning process would be likely to differ substantially from what would emerge from DBC's Development Trajectory.

1.14. Finally, while it is possible to estimate the additional demand arising from the projected residential and commercial growth, estimating the extent and cost of the associated physical infrastructure needs is practically impossible at a strategic level, as the specifics of the location of need and of the individual sites are the key determinants of the scale and cost of works.

1.15. These considerations inform the approach of this assessment.

Approach and Structure

Research Methods

1.16. This report has been prepared as a technical study and is a desktop review that has drawn on published written sources of information; phone interviews and meetings with various utilities, services or infrastructure providers and agencies; and additional written information provided by those agencies. Sources are provided in footnotes where relevant.

Growth Trajectory

1.17. An important early step in understanding the demand for infrastructure over a future forecast period is to have a clear understanding of the nature, type, and timing of growth that is expected. Accordingly, URS and Dacorum Borough Council (DBC) have worked together to identify Dacorum's Development Trajectory.

[2] Thames Water also has a 25 years plan which does not however provide investment details beyond 2015.

1.18. The Development Trajectory shows the residential and commercial development growth that is expected to take place in Dacorum. The Trajectory extends to 2031 and is divided into four phases of five years duration per phase starting from 2011. To account for development that has recently occurred, or is about to occur, a separate period from 2009 to 2011 has also been identified in the case of residential and retail development.

1.19. The Trajectory includes two scenarios for residential growth in the borough, as well as leisure and retail development. However, these high and low scenarios only relate to Hemel Hempstead, where the majority of growth in the borough is likely to be located. Growth in the rest of the borough is assumed to be of the same quantum under both scenarios.

1.20. The Development Trajectory is set out below in Figure 2-1 and Figure 2-2. Further details of how the Trajectory was derived and how it should be interpreted are set out in Section 2 of this report as well as in the accompanying *DSIS Executive Summary* and the *DIM*.

Dacorum Infrastructure Model

1.21. URS has produced a bespoke *Dacorum Infrastructure Model* (*DIM*) that can be used to help assess and model the demand for infrastructure arising from development.

1.22. The Model is driven by the Development Trajectory and is used within the *DSIS* for assessing demand where there is a direct relationship between residential and/or commercial development and infrastructure requirements.

1.23. The *DIM* assists in the independent assessment of infrastructure requirements and costs which is a key element of planning infrastructure as described in PPS12. It enables the providers' forecasts of future requirements to be tested, and in the absence of any provider forecasts it provides a basis for infrastructure planning. It also enables the identification of potential demand-supply gaps and costs over the entire LDF planning period, and the breakdown of information by geographical sub-area and phase. The Model has been constructed in a simple and malleable way so that future users can easily adjust the inputs and assumptions within it as they evolve.

1.24. At the same, it is recognised that there is not always a straight-forward relationship between growth and infrastructure requirements, and there is a danger in over-simplifying what is a dynamic and complex picture. The Model has been used only as and when appropriate, to test information supplied by service providers and to provide an indicative, high-level assessment where no such information is forth-coming.

1.25. Within the utilities and physical infrastructure assessment, URS has modelled expected future flows for water and loads for energy (including gas and electricity). However URS has not modelled the physical requirements associated with such expected flows and load.[3] For the

[3] Planning undertaken by utilities companies is generally reactive rather than proactive. It also depends on complicated flow modelling to which each respective utilities company solely holds the rights. Utiltiies would need to undertake the assessment themselves to ensure that the impact of growth on their entire network is fully considered.

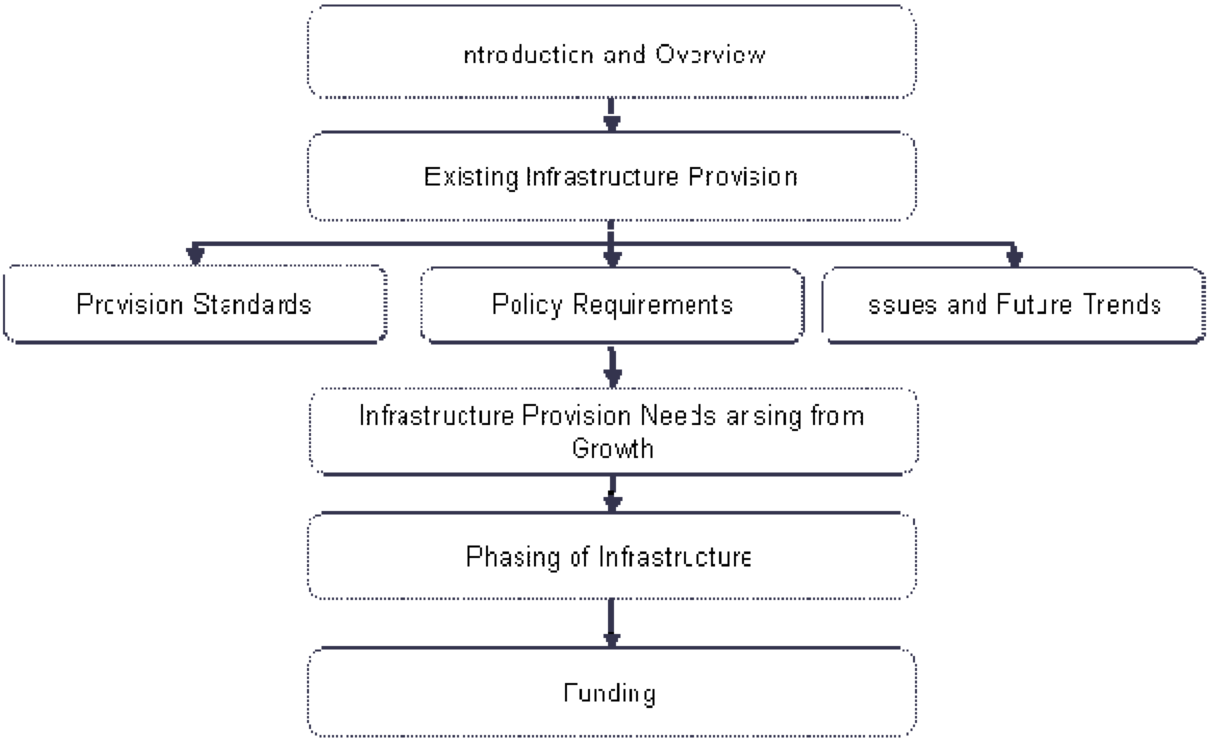
physical infrastructure associated with waste management, demand is estimated using benchmarks provided by service providers; these workings are straight-forward and while they are described in the text they are not included within the model.

Report Structure

1.26. The report is broken into a series of sections that deal with each type of infrastructure in turn.

1.27. Each section is then laid out in accordance with the approach that has been taken to investigate the implications of growth for that type of infrastructure. Figure 1.1 below illustrates this process and is followed by an explanation of the approach.

Figure 1.1: Chapter Structure Reflecting Research Approach



1.28. The assessment is structured in accordance with a step-by-step process as described below:

- Introduction and overview: This section sets out the relevant policy drivers for each type of infrastructure and the context in which providers operate. It also defines the scope of the analysis

- Existing and committed infrastructure provision: This section provides an account of the baseline position with respect to the existing level of provision of the infrastructure in question, and any imminent (and therefore certain) planned investments that will add to existing provision. Where possible, detail is given as to how the forthcoming infrastructure provision has been funded and its cost. It concludes on the adequacy of existing and committed infrastructure.

- Estimating future demand: this includes use of industry provision standards and reference to policy requirements at the national, regional and local levels. Trends or issues that could impact upon future provision are also explored as part of this section.

- Demand arising from growth: This section sets out, as far as is possible and with reference to the DIM where relevant, the extent and location of future additional demand for services.

- Resulting infrastructure requirement: This section discusses the likely implications for the provision of new facilities to provide a broad understanding of the scale of the requirements associated with the projected levels of growth. It also identifies, with reference to the Infrastructure model, when the additional demand is likely to come forward and whether the projected phasing of residential and commercial growth is expected to trigger the need for additional provision

- Costs and funding of infrastructure: The section sets out costs to meet the future requirement for infrastructure investment, and the funding options to support the delivery of any infrastructure facilities or studies / investigations

- Summary and Recommendations: This section sets out a summary of the infrastructure needs assessment findings, together with any recommended actions or a list of infrastructure requirements wherever appropriate.

2. ESTIMATING DACORUM'S INFRASTRUCTURE REQUIREMENTS

Dacorum's Development Trajectory

2.1. To understand the nature, type, and timing of growth that is expected and for which additional infrastructure provision is required, URS and DBC worked together to identify Dacorum's expected future development growth under the following categories:

- Residential (dwellings; population)
- Commercial (both floorspace and jobs for retail; office, industry, warehousing and leisure).

2.2. The resulting Development Trajectory is set out below in Figure 2-1. Further details of how the Dacorum Development Trajectory was derived, how it should be interpreted and how it inter-relates with the *DIM* are set out in the accompanying *Dacorum Strategic Infrastructure Study Executive Summary Report* and within the *DIM* itself.

Geographical Areas and Phasing

2.2. The Development Trajectory takes account of the anticipated spatial layout of future development in Dacorum. Most of Dacorum's growth will occur within or as an extension to existing urban areas of the borough. Accordingly, for the purposes of this study the borough is broken down into eight areas, comprised of the three towns, three large villages, and two rural areas encompassing the remainder of the borough.

2.3. Development growth has, where possible and meaningful, been forecast for each area in isolation to breakdown the different types and locations of growth. Details regarding the spatial impact of growth have been included where relevant.

2.4. However it should be noted that the infrastructure types covered in this report tend to be planned at a relatively high geographical level and to be less sensitive to local variations in demand than some social infrastructure. Local-level detail has only been provided where considered robust and relevant to the analysis.

2.5. To enable the phased assessment of infrastructure requirements, the forecasts for development have been divided into four five-year development periods extending to the Core Strategy planning horizon of 2031, beginning with 2011-2016 and ending with 2026-2031.

Low and High Scenarios and the Distribution of Growth

2.6. The Development Trajectory includes a low growth and a high growth scenario to account for two possible outcomes with respect to growth at Hemel Hempstead, the settlement where most of the growth in the borough will occur.

2.7. Under the low growth scenario, most of the growth in Hemel Hempstead is expected to be achieved within the town's existing urban settlement boundaries, mostly through redeveloping brownfield sites. Under the high growth scenario, the additional growth would be accommodated outside of the town's existing boundaries – by developing sites at West Hemel Hempstead, Marchmont Farm, Wood End Farm and Leverstock Green. These sites are identified in Figure 2.2.

2.8. The expected number of new dwellings for each of the sub-areas of Dacorum is given in Table 2-1, including both high and low options for Hemel Hempstead. Smaller amounts of growth are expected in Berkhamsted and Tring. Growth in the remainder of the borough, including the three large villages of Bovingdon, Markyate and Kings Langley, is anticipated to be modest.

Table 2-1: Overall Projected Residential Growth

Sub-Area		**Residential Growth (No. of Dwellings)**					
		2009-11	**2011-16**	**2016-21**	**2021-26**	**2026-31**	**Total (2009-31)**
Hemel Hempstead	Low Scenario	714	2,256	2,198	950	1,103	7,221
	High Scenario	714	3,156	3,798	3,450	2,903	14,021
Berkhamsted		115	157	359	70	96	797
Tring		35	90	43	40	97	305
Rural East		3	10	15	30	30	88
Bovingdon		19	32	5	10	17	83
Markyate		4	49	51	10	10	124
Kings Langley		10	10	5	16	42	83
Rural West		18	68	45	45	65	241
Total	**Low Scenario**	**918**	**2,672**	**2,721**	**1,171**	**1,460**	**8,942**
	High Scenario	**918**	**3,572**	**4,321**	**3,671**	**3,260**	**15,742**

Source: Dacorum Development Trajectory, developed by URS and Dacorum Borough Council.

2.9. Table 2-2 shows the overall quantum of commercial growth envisaged for Dacorum over the period to 2031, mostly dated from 2011 with the exception of retail (where figures are presented from 2009[4]). The majority of commercial development in each class (ca. 90% on average) is forecast to take place in Hemel Hempstead, with only a small amount forecast to occur in Berkhamsted and Tring (around 5% in each respectively).

2.10. Low and high scenarios are differentiated for leisure and retail, reflecting potential variations in the level of development at Hemel Hempstead.

2.11. The Development Trajectory does not identify any commercial growth in the Rural West or Rural East (including Bovingdon, Markyate and Kings Langley) areas, as it is expected that commercial development will be restricted to Dacorum's three towns.

2.12. The growth figures for office, industry, warehouse and leisure are based on the *Hertfordshire London Arc Jobs and Employment Land Study* which forecast growth for Dacorum from 2006

[4] The retail figures for 2009 to 2011 exclude major schemes which may be developed during that time and for which permission has already been granted, as the development control process will have considered the impact on, and demand for, infrastructure prior to granting permission.

to 2031. The majority of commercial development is expected to be office space, followed by warehousing and retail. Conversely, there is expected to a significant decline in the amount of industry, and it is important that this relative decline is taken into account when looking at the demand for infrastructure, as the decline in industry may reduce demand for things such as energy and water, thus freeing up spare capacity within the infrastructure networks.

Table 2-2: Overall Projected Commercial Growth

	Commercial Growth by Phase (Floorspace - sqm)					
Phase:	**2009 – 11**	**2011 – 16**	**2016 – 21**	**2021 – 26**	**2026 – 31**	**Total (2011-31)**
Business / Office	na	39,841	39,841	47,845	55,333	**182,860**
Industry	na	-17,141	-17,141	-17,141	-3,666	**-55,088**
Warehouse	na	23,495	23,495	23,495	6,802	**77,286**
Retail						
Low	4,090	13,150	9,800	12,350	16,111	**55,501**
High	4,540	14,350	11,100	16,621	22,150	**68,761**
Leisure						
Low	na	3,862	3,862	3,862	3,862	**15,447**
High	na	6,394	6,394	6,394	6,394	**25,574**

Source: Dacorum Development Trajectory, developed by URS and Dacorum Borough Council.

Strong Housing Growth; Modest Population Growth

2.3. While the number of new dwellings in the borough will be quite significant, the anticipated increase in population will be much less so. This is due to changes in the existing population, as the number of people residing in the borough's existing dwelling stock is expected to fall over the forecast period. This is due to a projected decline in average household size due to changing household and family structures, and an ageing population. Accordingly, the proportionate increase in population in the borough is not anticipated to be nearly as marked as the proportionate increase in the number of dwellings. Table 2-3 shows the extent of the disparity between the dwelling and population forecasts. Despite an increase, under the low growth scenario, of 8,942 dwellings over the plan period, which equates to an extra 15%, the population will only increase by just over 2% (2,942 residents). Similarly under the high growth scenario, while the number of dwellings is expected to increase by over 26% compared with existing levels, the population is expected to rise by 17.5%.

2.4. While overall population growth will be more muted than the increase in the number of dwellings, the pattern of population increase will be very uneven. Existing areas of housing will experience a decline in population levels, while major development sites and zones will see relatively sharp increases in population. This will be more pronounced under the high growth scenario where development will take place beyond Hemel Hempstead's existing urban settlement boundary.

Table 2-3: Relative Increase in Dwellings and Population

Category	Existing (~2009)	Predicted Growth 2009 to 2031	Growth as % of Existing
Low Growth Scenario			
Number of Dwellings	59,957	8,942	14.9%
Population (residents)	139,499	2,954	2.1%
High Growth Scenario			
Number of Dwellings	59,957	15,942	26.6%
Population (residents)	139,499	24,352	17.5%

Source: (Dwellings): Dacorum Population Trajectory, developed by URS and Dacorum Borough Council and (Population) Hertfordshire Property (HCC) Population Projections

2.5. This is a significant consideration for infrastructure planning as population is a significant determinant of demand for infrastructure. The existing infrastructure may be able to absorb some of the impact of new housing given the projected decline of population in the existing dwelling stock.

2.13. It will, however, critically depend on the type of infrastructure in question, its catchment area, and the way in which people need to access the infrastructure services provided.

- Infrastructure that serves an entire area, town or even region from fixed or central locations will, all other factors being equal, only need to expand in accordance with the additional demands placed upon it by the borough-wide increase in population. The demand for these types of infrastructure is less sensitive to the geographical location of growth within the borough. The infrastructures covered in this report come into this category.

- By contrast, there are certain types of infrastructure that are sensitive to the location of demand. Ideally, these types of infrastructure should be located close to the population that they are intended to serve as their ‘catchment’ is very local. In this case new investment in infrastructure may be needed in localities where the development is concentrated, despite relatively low overall levels of population increase at a wider geographical level. Moreover, existing facilities may come to have spare capacity as their location does not match that of demand. Many social infrastructures come into this category – for example, child play space, primary schools and health centres should all ideally be within walking distance of home.

2.14. These considerations inform the approach to our independent assessments of demand for utilities and physical infrastructure, as set out within the *DIM* and within the individual sections of this report.

Figure 2-1 Dacorum's Development Trajectory, 2009 to 2031

URS
Dacorum Infrastructure Delivery Plan
Dacorum Sub Areas: Growth Scenarios

❶ HEMEL HEMPSTEAD

	2009 - 2011		2011 - 2016		2016 - 2021		2021 - 2026		2026 - 2031		Total	
	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH
	714	918	2,256	3,572	2,198	4,321	950	3,671	1,103	3,250	7,221	15,742
	-	-	35,857	35,857	35,857	35,857	43,061	43,061	49,800	49,800	164,574	164,574
	-	-	-15,426	-15,426	-15,426	-15,426	-15,426	-15,426	-3,299	-3,299	-49,579	-49,579
	-	-	21,145	21,145	21,145	21,145	21,145	21,145	6,122	6,122	69,558	69,558
	3,547	3,997	11,800	13,000	8,250	9,550	10,450	14,721	14,111	20,150	48,158	61,418
	-	-	3,222	5,754	3,222	5,754	3,222	5,754	3,222	5,754	12,889	23,017

❷ BERKHAMSTED

	2009 - 2011	2011 - 2016	2016 - 2021	2021 - 2026	2026 - 2031	Total
	115	157	359	70	96	797
	-	1,992	1,992	2,392	2,767	9,143
	-	-857	-857	-857	-183	-2,754
	-	1,175	1,175	1,175	340	3,864
	554	900	1,000	1,250	1,300	5,004
	-	320	320	320	320	1,279

❸ TRING

	2009 - 2011	2011 - 2016	2016 - 2021	2021 - 2026	2026 - 2031	Total
	35	90	43	40	97	305
	-	1,992	1,992	2,392	2,767	9,143
	-	-857	-857	-857	-183	-2,754
	-	1,175	1,175	1,175	340	3,864
	-11	450	550	650	700	2,339
	-	320	320	320	320	1,279

❹ BOVINGDON

	2009 - 2011	2011 - 2016	2016 - 2021	2021 - 2026	2026 - 2031	Total (2009-2031)
	19	32	5	10	17	83

❺ MARKYATE

	2009 - 2011	2011 - 2016	2016 - 2021	2021 - 2026	2026 - 2031	Total
	4	49	51	10	10	124

❻ KINGS LANGLEY

	2009 - 2011	2011 - 2016	2016 - 2021	2021 - 2026	2026 - 2031	Total
	10	10	5	16	42	83

❼ RURAL EAST

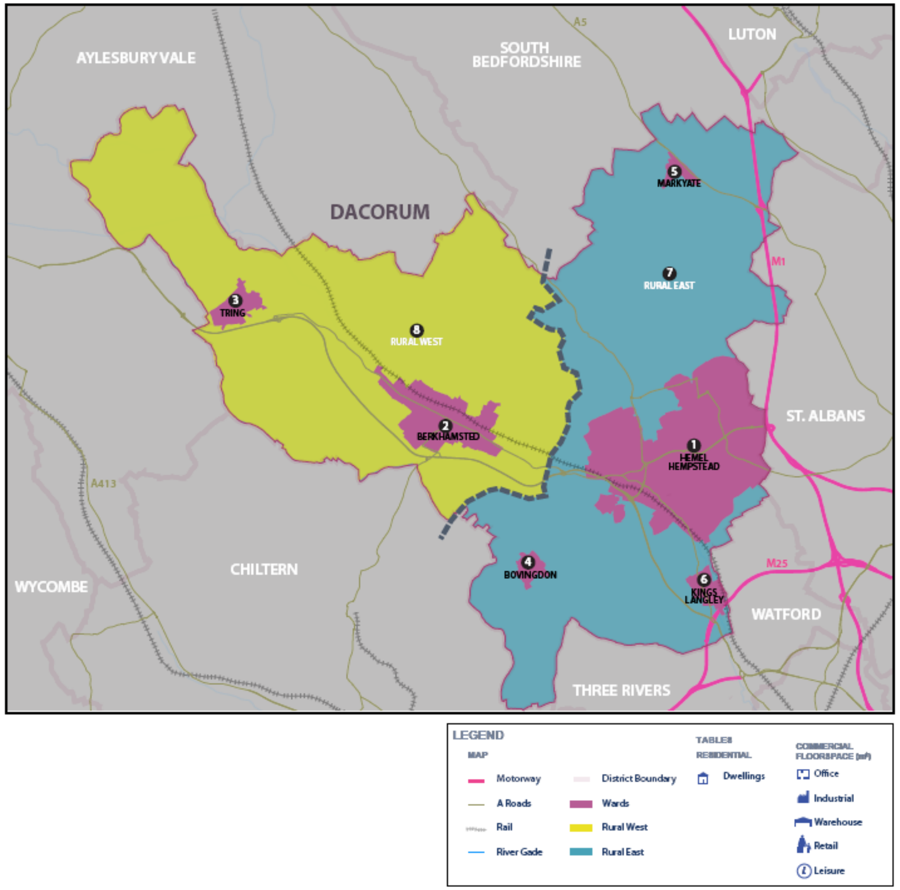
	2009 - 2011	2011 - 2016	2016 - 2021	2021 - 2026	2026 - 2031	Total
	3	10	15	30	30	88

❽ RURAL WEST

	2009 - 2011	2011 - 2016	2016 - 2021	2021 - 2026	2026 - 2031	Total
	18	68	45	45	65	241

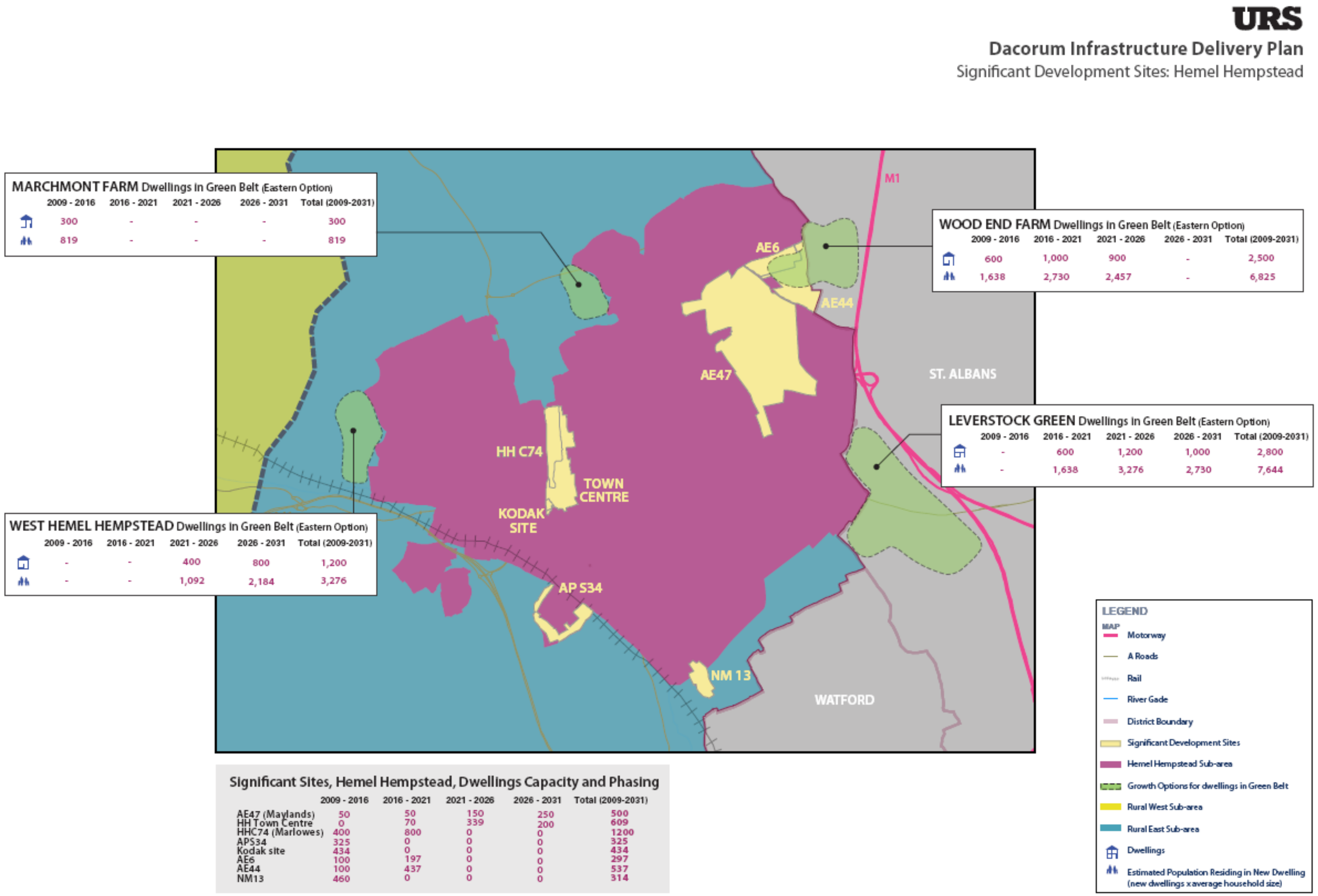
DACORUM BOROUGH - TOTAL

	2009 - 2011		2011 - 2016		2016 - 2021		2021 - 2026		2026 - 2031		Total	
	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH
	918	918	2,672	3,572	2,721	4,321	1,171	3,671	1,460	3,260	8,942	15,742
	-	-	39,841	39,841	39,841	39,841	47,845	47,845	55,333	55,333	182,860	182,860
	-	-	-17,141	-17,141	-17,141	-17,141	-17,141	-17,141	-3,666	-3,666	-55,088	-55,088
	-	-	23,495	23,495	23,495	23,495	23,495	23,495	6,802	6,802	77,286	77,286
	4,090	4,540	13,150	14,350	9,800	11,100	12,350	16,621	16,111	22,150	55,501	68,761
	-	-	3,862	6,394	3,862	6,394	3,862	6,394	3,862	6,394	15,447	31,968



Source: Joint Analysis by Dacorum Borough Council and URS

Figure 2-2: Hemel Hempstead Key Development Sites, 2009 to 2031



Source: Joint Analysis by Dacorum Borough Council and URS

3. ENERGY (ELECTRICITY AND GAS)

Introduction and Overview

3.1. This section reviews the potential implications of residential and commercial development for energy networks, both electricity and gas, in Dacorum[5].

3.2. In order to undertake this assessment, a thorough understanding of each energy network is required to ascertain if there is available spare capacity to accommodate further growth and demand. This is important to establish an understanding of the risks and opportunities for delivering the proposed growth, and requires the input of the relevant utility network operators.

3.3. This section does not comprehensively review the potential for sustainable energy in Dacorum, except where relevant initiatives are explicitly contained within the strategies of existing energy providers. However a range of opportunities exist around sustainable energy and exploring and exploiting these opportunities is an integral part of the planning work underway by DBC and other stakeholders. Much work has been done, for example, on the potential of the Maylands Gateway in Hemel Hempstead to include a green energy facility. It should be noted that more generally the scale of the regeneration opportunities for Hemel Hempstead Town Centre implies a potential requirement for new and expanded utilities infrastructure, though these regeneration opportunities are still each at a relatively early stage and details of any such requirements have yet to be established.

Policy Drivers

Management Arrangements and Responsibilities

3.4. Energy is afforded via a system of pipes or cables which are generally laid under the streets and designed to give regulated pressure requirements and security. In more rural areas, overhead electricity wires may be present but for the purposes of the report, the commentary will refer to cables.

3.5. EDF Energy is the electricity network operator for Dacorum and they supply energy via a system of underground cables to each connection required. Historically, EDF was Eastern Electricity Board, but it has subsequently been privatised as part of a Government programme and absorbed into the EDF conglomerate.

3.6. For gas, the network operator for the bulk of Dacorum is National Grid (historically nationalised as British Gas and more recently Transco) with a system broadly the same as EDF's but with pipes as opposed to cables. The exception is that within Tring, there are elements that fall

[5] It would be possible to assess electricity and gas infrastructure requirements separately. However, as they are to some degree interchangeable sources of energy, there are significant benefits in treating them together in this section.

under the jurisdiction of Southern Gas Networks.[6] The system is designed and operated in a similar way to that of National Grid given that historically National Grid owned and operated this system before selling to Southern Gas Networks.

3.7. Both National Grid and EDF manage their respective strategic networks against the backdrop of a regulatory process that is controlled by OfGEM. This process includes monitoring the success of each operator and those throughout the UK, measuring performance via set criteria. The elements of this success most visible to the general public include quality of supply and security of supply.

3.8. Regardless of the requirements arising from residential and commercial growth in Dacorum, both EDF and National Grid review their network against known development as part of the general planning process and the statutory consultee process. Subsequently, a capital expenditure programme is then prepared to match their obligations. The system however suffers from inherent weaknesses in that it encourages reactive management in many instances.

Reporting and Forward Planning

3.9. As required under national guidance, both EDF and National Grid submit their own growth plans to OfGEM, the regulator, to ensure that economic and environmental aspects of provision are fully considered. Once the process has been reviewed and commented upon, the Secretary of State for Environment, Food and Rural Affairs (DEFRA) ultimately approves the final document.

3.10. These five year plans ultimately serve to determine the capital expenditure that each company is committed to (for example, to replace existing assets or promote new capacity) as well as agreeing a formula to recover costs from end users.

Existing and Committed Infrastructure

Dacorum's Energy Network

3.11. For gas, National Grid have a local management team that look after the gas 'East Anglia LDZ' or Local Distribution Zone. This zone includes major conurbations such as Barnet and Tottenham in North London, Peterborough, Cambridge, Norwich and Ipswich as well as more rural areas.

3.12. For electricity, EDF is operational in what is known as 'EPN', or Eastern Power Networks. Technical criteria are specifically set for this geographical area. The EPN zone covers some 20,300 sq km and employs circa 94,000 km of cables. Dacorum constitutes only an element of the overall zone.

[6] Broadly, the part of Dacorum to the north-east of the Tring railway station and Wigginton Bottom are covered by Southern Gas Networks.

3.13. The expansion of each network has continued for many years with the last 40 years seeing an ever increasing demand for energy. The energy networks are typically designed for a minimum of a 40 years life cycle although extending asset life is beneficial to the owners of the network as well as the wider environment in general. The general congestion of the streets both above (with traffic) and below ground mean that options to work become more limiting.

3.14. Energy resources for Dacorum, and the UK in general, are derived via a grid connected system that has mains of varying capacities and pressures that depend upon the strategic nature of the asset. For example, a main for a side street in Berkhamsted will have a different cross sectional area and pressure to that of a main serving Hemel Hempstead. The gas and electricity infrastructure delivers energy to individual properties via mains and service pipes that are sized relative to the requirement. The operational concept is that energy is drawn from each respective grid and subsequently transformed down to appropriate pressures.

3.15. Maintaining pressures is important for many technical reasons. From an end user point of view, the most obvious is that home appliances are designed to operate within defined criteria[7] and operating outside of this could cause damage to the unit or result in it operating ineffectively (low voltage causes a kettle to take longer to boil water for example).

Gas

3.16. National Grid has a system of mains throughout the Dacorum area that deliver gas to each connection point. The system operates at medium and low pressure (intermediate and high pressure mains provide the strategic feed[8]). The medium pressure network distributes gas to pressure reducing stations (PRS) located at various points within the borough and it is at this juncture that gas is subsequently reduced to a lower pressure. This low pressure network is the system that affords most residential supplies and some commercial requirements. For certain installations where gas demand is high (factories / large office facilities), there is however an ability to secure a medium pressure connection.

3.17. The gas capacity within the borough is projected by National Grid to provide sufficient energy without the need of upstream reinforcement, though all utility networks are dynamic and subject to change at relatively short notice.

Electricity

3.18. EDF operate a similar system to that of gas in terms of distribution. In essence, electricity for Dacorum is broadly provided by an 11kV (11,000 volts) network that extends throughout the borough and connects into local substations. The substations subsequently transform the

[7] The basic national requirement is that gas is afforded at 21mB and electricity, assuming a single phase connection, 230 volts with a performance criteria of +10% to -6%.

[8] The medium pressure network is locally strategic for the borough but not necessarily the region. The low pressure is the local delivery network. In addition, there are intermediate and high pressure networks that operate up to 85 Bar and provide this function as strategic mains.

voltage from 11kV to 400V / 230V which is the voltage that is typically utilised in residential circumstances.

3.19. As with the gas, if there is a large energy user, the connection into the property could be 11kV and not the lower 'residential' value. Commercial applications, such as factories, large office facilities and supermarkets all fall within this category.

Existing Energy Provision via the Network

3.20. The networks in Dacorum deliver substantial gas usage for both residential and non residential gas users alike. In 2007, the gas consumed equated to circa 1,321 gigawatt-hours (GWh) of energy and this was split across 53,251 domestic consumers and 1,048 commercial users.[9] Broadly, the domestic users therefore accounted for circa 78% of demand.

3.21. For electricity, consumed electricity units in Dacorum related to circa 603GWh of energy in 2007. Broadly, this equated to 59,894 domestic consumers and 4,896 commercial users meaning that the domestic users accounted for circa 92% of demand.

Planned Investment

3.22. Based upon current forecasts, National Grid have identified that the projected load demand can be taken on the gas network without reinforcement (see below for further details). The planned investment for Dacorum is therefore predominantly reflected in mains replacement. This is subject to stringent requirements by OfGEM as the capital expenditure programme is covered via the five yearly plan submitted to, and approved by, OfGEM[10].

3.23. In terms of electricity, EDF are planning to replace assets in the Dacorum area in line with their submission to OfGEM and bearing in mind key performance requirements. Currently, EDF are working to plans for the period 2010 to 2015 and this process will be repeated in 2014 for the period 2015 to 2020.

3.24. Further details were not available on existing planned investment in the gas or electricity networks, though the longer-term works which are required as part of the on-going maintenance and upgrade works are set out together with the longer term requirements in below.

Adequacy of Existing and Committed Infrastructure

3.25. Given the ageing networks, the requirement for each company is not only to develop capacity but also undertake significant asset replacements as the tendency to fail increases and their efficiency, and inherent safety, deteriorates. The greatest growth in the gas and electricity occurred in the 1960s and therefore, with most assets using a 40 year lifecycle, they will need

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[9] http://www.berr.gov.uk/energy/statistics/regional

[10] Source : EDF Energy : http://edfenergynetworks.dialoguebydesign.net/bgo/background.asp accessed on 18th April 2009.

replacing in the short term. The electricity network also saw a second ‘explosion’ of growth during the 1990s and therefore the cycle will be repeated in future years.

3.26. Relevant details relating to the constraints of the existing energy networks are set out in Appendix A. Key points relating to the electricity network are as follows:

- Dacorum’s 132kV strategic supplies offer very limited spare resource; the system works via a network of interconnecting sources and the current configuration means that Hemel Hempstead is somewhat self reliant and this could be a constraint to growth in the future.
- The 33kV cluster at Hemel Hempstead Eastern comprises three substations; all have elements of local capacity available but would not be able to accommodate forecast growth. While Hemel North is well served with alternative supplies, Hemel East and Industrial are not. The 33kV supplies are on a ‘single feed’ or share common routes which mean that the system security is not as robust as it could be.
- Hemel Hempstead Western is covered by two primary substations that are nearly at full capability.

3.27. Works required as part of the on-going maintenance and upgrade programme are set out together with the longer term requirements below.

Estimating Future Demand

Provision Standards and Assessment of Network Capacity

3.28. To secure a basic understanding of the system capabilities, each type of additional development requirement has a recognised energy consumption demand placed against it.

3.29. Table 3-1 identifies the standard electrical and gas usage rates utilised in our independent assessment of current and potential future load on the network in this section of the report and within in the *DIM*. It should be noted that this assessment, presented in terms of kilovolt-amperes (kVA) of electricity and cubic metres (m^3) of gas, relates to the potential capacity of the network at any one time and is relevant to the consideration of the impacts of new dwellings and commercial activities on local networks. This is a different assessment to that presented above, which utilises GWh and expresses the amount of energy consumed.

3.30. The assessment for residential units utilises a simple approach which generally only distinguishes between electrically heated units and non-electrically heated units. Commercial uses are broadly broken down into floorspace and general use type. For gas, there is a difference in approach although the systems are broadly similar. For residential gas computations, the energy will broadly be designed on a consumption rate of $1m^3$ of gas per dwelling. Commercial requirements vary greatly as the application of energy is so diverse. For example an office facility, if using gas as opposed to air conditioning, will have a completely different footprint to that, say, of a swimming pool whilst the floor area may well be identical.

3.31. A series of caveats should be noted with regard to these standards:

- Outturn figures will be only broadly indicative of engineering requirements as, until a formal design is completed against set network criteria, the utility system, given its dynamic nature, is always subject to change and re-configuration.
- There are generalisations within use classes – for example an office will attract an energy profile different to that, say, of a small shop[11]. Utilisation rates by industrial processes will vary greatly depending on the exact nature of the activity.
- The likely impact of the Code for Sustainable Homes (CfSH) and the increased desire for decentralised energy, which may well utilise gas as the primary energy source and reduce electricity consumption[12], are at this stage largely unknown.

Table 3-1 Gas and Electricity Provision Standards

Development Type		Provision Standard: Gas	Provision Standard: Electricity
Residential		0.81 m^3 per hour per dwelling[13]	1.6 kVA per dwelling
Commercial:	Offices	0.001 m3 per hour per sqm	0.08 kVA per sqm
	Industrial and warehousing	0.05 m3 per hour per sqm	0.04 kVA per sqm
	Retail and Leisure	0.01 m3 per hour per sqm	0.12 kVA per sqm

Source: All figures are typical utility company figures for both development design and strategic planning; it should be noted that the strategic planning figures change with volume and the information is not published as it is commercially sensitive.

3.32. An independent assessment of current gas demand is presented in Table 3-2, based on data from DBC and ONS and using the standard assumptions for usage set out above. This indicates that the gas network currently carries 84,145 m3/hr in Dacorum.

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[11] Diversity is applied but this is not based upon published information as the utility industry is somewhat self regulating, with performance measurement being the basis of assessment as opposed to detailed technical connection data. It is noteworthy that figures utilised for a single development will inherently be different to that of the whole borough given that diversity does differ; as a single example, a residential dwelling using gas central heating in a, say, 100-unit development will have a baseline design criteria of 2kVA - there is a very distinct difference between M&E assessment and utility assessments, in this instance M&E consultants will normally apply a figure closer to 12kVA. For the strategic network in Dacorum, this 2kVA figure may be 1.4kVA; for the strategic network across Hertfordshire, this may reduce further to, say, 0.8kVA.

[12] EDF Energy: http://edfenergynetworks.dialoguebydesign.net/docs/PlanningForTheFuture_Screen.pdf

[13] This is an average between design figures of 1.13, 0.79 and 0.51, for a low, medium and high density residential development respectively with gas central heating.

Table 3-2 Estimated Baseline Gas Loads in Dacorum

	No / sq m	m3/hr
Dwellings	59,957	48,706
Office	337,000	337
Industry	185,000	9,250
Warehouse	497,000	24,850
Retail	101,094	1,003
Total		**84,145**

Source: URS Calculations based on DBC and ONS data

3.33. An independent assessment of current electricity loads is presented in Table 3-3, based on data from DBC and ONS and using the standard assumptions for usage set out above. This indicates the Dacorum's current electricity network accommodates a demand of 162,302 kVA.

Table 3-3 Estimated Baseline Electricity Loads in Dacorum, kVA

	No / sq m	kVA
Dwellings	59,957	95,931
Office	337,000	26,960
Industry	185,000	7,400
Warehouse	497,000	19,880
Retail	101,094	12,131
Total		**162,302**

Source: URS Calculations based on DBC and ONS data

Issues/ Future Trends

3.34. Added into the complexity of network assessment is the desire to become more energy efficient and an acceptance that energy is a valuable commodity.

The Code for Sustainable Homes

3.35. The Code for Sustainable Homes (CfSH) aspires to a decrease in energy consumption via the application of building materials and an encouragement to utilise energy efficient apparatus.

3.36. As data is not yet available to indicate the impact on CfSH on energy consultation, assumptions will need to be made. For the purposes of the study, no allowance has been made for CfSH. Part of this reasoning is reflected in the balance of certain improvements that the CfSH will bring to that of the wider population who generally aspire to a more affluent lifestyle. See Figure 3-1 for further details.

3.37. That said, National Grid are anticipating a period of negative growth in demand (see below) of up to -1% for the Dacorum area, due to high unit prices, the pressure to utilise more efficient appliances, the potential impact of the CfSH and a greater shift towards air conditioned buildings amongst other factors.

Decentralised Energy Generation and CHP

3.38. There is also the general aspiration to utilise decentralised or low carbon energy and the impact may well prove to be significant. However, a major issue currently identified is that there is a conflict from both a technical and a regulatory perspective which limits opportunity to fully exploit the situation.

3.39. From a technical point of view, particularly in the context of electricity, the electricity network has never been designed to readily accept generation and interconnectivity as in other parts of the world. The fault levels that are derived inherently limit opportunity, particularly at the higher voltage levels, and this is likely to constitute a constraint to connecting onto the electricity network and export any spare capacity.

3.40. Furthermore, the regulatory process does not fully encourage the use of low carbon technology such as CHP given that the whole ethos of OfGEM is to encourage customer choice and competition, and this inherently assumes that both facilitate price and / or service benefits. Current regulations allow very limited opportunity for combining the operational aspects of installing a CHP plant for example on the basis that the preference appears to be that of being a generator, or a distributor, or a supplier of energy, but not all three.

Figure 3-1: Efficient Appliances and Inefficient Behaviours

The Code for Sustainable Homes requires appliances, such as washing machines and refrigerators, to be energy efficient so that energy consumed is kept to a minimum. There is also a wider tendency to encourage this trend for the general population when replacing old appliances given that the CfSH does not currently apply to existing housing stock.

The CfSH policy, and the wider political will, assumes to a certain extent that the status quo remains – i.e. population habits and aspirations don't change. In reality, modern life involves a far greater use of technology that, whilst individually doesn't have a huge impact, negates some of the Government committed environmental targets.

For instance people nowadays have mobile telephones that need charging, computers, televisions (probably in more than one room), a refrigerator for food and a refrigerator for wine / beer – the list is long but the trend is a greater reliance upon energy and not necessarily less.

Another example is that of television: 20 years ago, a single television would most likely have served a residential dwelling. It is now quite normal for a property to have several televisions, plus Sky or Freeview digiboxes, as well as games consoles. Whilst this is not a criticism of modernity, there is an inherent consequence on the utility networks.

The conflict between efficiency and increasing numbers of items demanding energy becomes greater with education of the wider population becoming ever important.

3.41. In order to fully exploit the opportunities that exist with low carbon technology, the regulatory process may need to be examined so that benefits can be fully maximised. The balance will ultimately prove to be that of customer choice, cost and environmental requirements.

3.42. These supposed limitations facing the market over the next few years will require political will and acceptance that choice, particularly when considering environmental impact, may not be best served by existing guidelines.

Energy Demand arising from Growth

3.43. EDF and National Grid, both being the incumbent utility operator for their respective networks, are obliged to provide capacity provision utilising capital expenditure recovery mechanisms permitted via their operational licence issued by OfGEM.

3.44. Based upon current forecasts, National Grid predict up to a 1% decline in gas consumption for the East Anglia distribution zone. The assumptions regarding residential and commercial growth sitting behind this assessment are not published; nor are Dacorum-specific figures available. This forecast of reduced demand relates to higher unit prices, the pressure to utilise more efficient appliances, the potential impact of the CfSH and a greater shift towards air conditioned buildings. It is also likely that the decline in industrial activities is also implicit in the forecasts, though without detail on the type of activities in question and their use of gas this factor is something of an unknown quantity.

3.45. No equivalent forecasts of demand for electricity were available from the provider.

3.46. Below, an independent assessment of demand associated with planned growth in Dacorum to 2031 is made, based on the Development Trajectory and the standards set out above. This assessment relates to the potential capacity of the network at any one time rather than consumption per se, and is relevant to the consideration of the impacts of new dwellings and commercial activities on local networks.

3.47. The assessment identifies an increase in loads on gas networks in Dacorum of 9,368 / 15,016m^3 of gas (high / low scenario), representing an 11 / 18% increase over the estimated baseline. See Table 3-4 and Table 3-5 below. The assessment takes account of the forecast decline in industrial floorspace and the associated fall in demand, as well as increases in demand from other commercial sectors and residential growth. It should be noted that it is difficult to accurately predict the impacts of declining industrial activities due to a lack of detail on the exact nature of these uses.

Table 3-4: Estimated Increase in Gas Flows Associated with Forecast Growth in Dacorum to 2031, m3, Low Scenario

Low Scenario		2009-2011	2011-2016	2016-2021	2021-2026	2026-2031	Total
Residential	H' Hempstead	580	1,833	1,786	772	896	5,866
	Other sub-areas	166	338	425	180	290	1,398
Non- residential	H' Hempstead	117	471	471	478	340	1,877
	Other	5	55	57	62	47	227
Total	H' Hempstead	697	2,303	2,256	1,250	1,236	7,742
	Other	171	393	482	241	337	1,626
	Dacorum	868	2,697	2,739	1,491	1,573	**9,368**

Source: URS Calculations

Table 3-5: Estimated Increase in Gas Flows Associated with Forecast Growth in Dacorum to 2031, m3, High Scenario

High Scenario		2009-2011	2011-2016	2016-2021	2021-2026	2026-2031	Total
Residential	H' Hempstead	580	2,564	3,085	2,803	2,358	11,390
	Other sub-areas	166	338	425	180	290	1,398
Non- residential	H' Hempstead	40	508	474	532	448	2,001
	Other	5	55	57	62	47	227
Total	H' Hempstead	620	3,072	3,559	3,335	2,806	13,391
	Other	171	393	482	241	337	1,626
	Dacorum	791	3,465	4,041	3,576	3,143	**15,016**

Source: URS Calculations

3.48. The forecast increase in electricity loads is c.38MVA / 52MVA (under the respective low / high growth scenarios), representing a 24 / 32% increase over the estimated baseline. See Table 3-6 and Table 3-7 below.

Table 3-6 Estimated Increase in Electricity Loads Associated with Forecast Growth in Dacorum to 2031, kVA, Low Scenario

Low Scenario		2009-2011	2011-2016	2016-2021	2021-2026	2026-2031	Total
Residential	H' Hempstead	1,142	3,610	3,517	1,520	1,765	11,554
	Other sub-areas	326	666	837	354	571	2,754
Non-residential	H' Hempstead	426	4,900	4,474	5,314	6,177	21,291
	Other	65	583	607	713	772	2,740
Total	H' Hempstead	1,568	8,510	7,991	6,834	7,942	32,844
	Other	392	1,248	1,444	1,067	1,343	5,493
	Dacorum	1,960	9,758	9,434	7,901	9,285	**38,338**

Source: URS Calculations

Table 3-7: Estimated Increase in Electricity Loads Associated with Forecast Growth in Dacorum to 2031, kVA, High Scenario

High Scenario		2009-2011	2011-2016	2016-2021	2021-2026	2026-2031	Total
Residential	H' Hempstead	1,142	5,050	6,077	5,520	4,645	22,434
	Other sub-areas	326	666	837	354	571	2,754
Non-residential	H' Hempstead	480	5,348	4,934	6,131	7,205	24,097
	Other	65	583	607	713	772	2,740
Total	H' Hempstead	1,622	10,397	11,011	11,651	11,850	46,531
	Other	392	1,248	1,444	1,067	1,343	5,493
	Dacorum	2,014	11,646	12,454	12,717	13,193	**52,024**

Source: URS Calculations

Resulting Energy Infrastructure Requirements

Gas

3.49. Based upon their current forecast of up to a 1% decline in demand for the East Anglia distribution zone, National Grid have identified that the projected load associated with growth in Dacorum demand can be taken on the strategic network without reinforcement. The likelihood is that major improvement works are therefore not necessary for the gas network. The following requirements, which are discussed in more detail within Appendix A, have however been identified by National Grid to accommodate growth and the increased capacity which may be required on local networks[14]:

- In Hemel Hempstead, development at Leverstock Green would require a new pressure reduction station or extension / reinforcement of the low pressure (LP) system; at West Hemel Hempstead some reinforcement of the LP system may be required; at Wood End Farm reinforcement of the medium pressure (MP) network would be necessary; and at Marchmont Farm reinforcement of the LP supply may be required
- At Markyate some small local reinforcement of the LP supply may be required depending on the location of development within Markyate
- At Tring, on the small part of the network operated Southern Gas, localised reinforcement on the low pressure (LP) mains may also be required
- In Berkhamsted, MP supply reinforcement would be required to accommodate growth; development to the south west of Berkhamsted would require greater reinforcement, on both the MP and the LP systems within Berkhamsted.

3.50. National Grid have not employed the same low and high growth scenarios to assess the potential impact of growth as used in this study, though at both the distribution zone level and the local level potential impacts have been identified. It is not therefore meaningful to differentiate between impacts under the low and the high scenarios. However, it is anticipated that once a certain trigger point is reached where new equipment or apparatus is installed, the capacity of that equipment will be sufficient to afford supplies for either growth scenario. This is because National Grid use standard equipment sizes as this aids procurement and technical designs.

Electricity

3.51. EDF have identified elements of reinforcement within the electricity network which are anticipated.[15] The strategic 132kV network will, via new lines / cables and substation, need to be extended to afford provision and there is also a likelihood that a primary sub-station site will be required, particularly for the Hemel Hempstead eastern development area, in order to

[14] Source: Meeting with National Grid, 6th April 2010. National Grid do not distinguish between a high and low growth scenario.

[15] Source: Meeting with EDF, 8th April 2010. EDF do not distinguish between a high and low growth scenario.

satisfy need. In the absence of firm development briefs it is not possible to set out an infrastructure phasing plan. The ability to understand the trigger points will determine the level of reinforcement required.[16] However EDF did report that provision of a new 132kV grid site would require a five to 10 year lead in time.

3.52. The following requirements relating to the electricity network, which are discussed in more detail within Appendix A, have been identified:

- Extension of the strategic network will require a new site. Potential locations include towards the M1 or at the back of Abbots Hill school
- New primary sub-station at Hemel Hempstead (east): £2m excluding land and cabling costs
- Primary sub-station upgrade (Warners End, Hemel Hempstead western): £4m excluding land and cabling costs
- Primary sub-station and cabling (Frogmore, Hemel Hempstead western): £2m excluding land and cabling costs.

3.53. Similar to the gas network it is not meaningful to consider impacts and infrastructure requirements in terms of a low and high growth scenario. It is anticipated that once a certain trigger point is reached where new equipment or apparatus is installed, the capacity of that equipment will be sufficient to afford supplies for either growth scenario because EDF use standard equipment sizes as this aids procurement and technical designs. This would apply for example to the new electricity primary sub-station required in Hemel Hempstead East: there are two standard sizes of primary sub-station that EDF employ for an urban development and the smallest size unit installed would easily be capable of taking the computed demand under both the high and the low scenario.

Costs and Funding

3.54. Details of the required investment and associated costs are not available because of the lack of detailed engineering information available to support making a cost estimate.

3.55. EDF provided indicative broad brush unit costs for infrastructure works as follows:

[16] All growth will impact upon local infrastructure and the strategic network. Noting that the more strategic requirements will generally require longer lead in times, the study aimed to assess the point at which the system fails. The design of the system will establish a point at which it will fail technically so, as an example, it may be that the local mains can afford an extra 500 residential units but the 501st requires a new main from location a to location b; of course, strategically, the capability may be significantly different so whilst the local mains are suitable for 500 units, the strategic capability may only be able to support, say, 200. EDF and National Grid are expected to be the primary funder of any necessary works, partly through customer bills and set by agreed capital expenditure programmes, but also by means of direct contributions from developers. Typically, the utility industry works on reactive processes that use specific data provided at the design stage to achieve an engineering proposal·

- New Primary substation with land provided free of charge: £2M
- 33kV cabling per kilometre: £500,000
- 132kV cabling per kilometre: £2M
- 132kV Grid site: provided by EDF as part of their Regulatory requirements

3.56. Based on these the costs of the required infrastructure works are estimated as follows. These estimates have not been verified with EDF and should be taken as highly indicative only:

- Extension of strategic (132kV) network to cater for additional demand (estimated at between 37MVA and 52MVA) - £6M-£7M plus cabling
- New primary sub-station at Hemel Hempstead (east): £2m excluding land and cabling costs
- Primary sub-station upgrade (Warners End): £4m excluding land and cabling costs
- Primary sub-station and cabling (Frogmore): £2m excluding land and cabling costs.

3.57. Both National Grid and EDF are responsible for providing strategic capacity and the five yearly regulatory reviews[17] take into account projected growth, system performance improvements, safety improvements and maintenance. It is this vehicle that determines part of the price for energy that each consumer in the UK pays and as a result the main financial resource available to the utilities providers to fund works to their networks.

3.58. The current rules established by OfGEM however encourage reactive management to a certain degree. This is because the works required to provide connection for new developments and the associated increased energy requirements and diversions can broadly be charged to third parties, e.g. developers. Accordingly, works that are planned for by providers in advance of the actual need will be funded by the providers themselves; whereas if the works are needed as a result of a specific development then the respective utility company can charge private developers. This system, particularly for local infrastructure, therefore provides an opportunity to undertake works only when they become strictly necessary.

3.59. Most developments, separate to S106 payments within the usual planning process, will be subject to a charge for developing the utility network, particularly electricity. The general argument is that the existing system is capable of working without load increase and therefore the changes required to accommodate growth must be paid for by the development. In the event that the utility company gains benefit from the network extension or upgrade, there are rules which effectively apportion cost.

3.60. In defence of the utility industry, developments do not always proceed and given that energy requirements are based upon individual client specifications, it is difficult to design and install

[17] Every five years the utility industry submits proposals to their respective regulators to establish capital expenditure programmes and revenue generating formulas.

apparatus in advance. Likewise, from a business point of view, having a third party pay for assets is an attractive proposition as it means that all capital expenditure is focussed upon managing assets and providing for natural growth. Current rules employed by OfGEM support this position.

3.61. The negative element to this is that infrastructure is then only planned against individual requirements, and normally reactively.

3.62. Options for consideration are to lobby OfGEM for a change in process whereby the development parcel is allocated a load profile and EDF or National Grid is charged with establishing capacity to a given point in advance. The incoming developer would then be tasked with designing a building to that profile and this inherently encourages developing technologies or stimulating engineering excellence.

3.63. Alternatively, Dacorum, as an asset provider, could install utility apparatus based upon the above and recover costs plus administration from each developer – effectively a roof tax but based upon a true business model.

3.64. In most cases, national political factors will determine how the regulatory framework is tailored to tackle this issue in the longer term. However, as the system operates currently there is little encouragement to develop utility networks in advance of development.

Summary and Recommendations

3.65. The utility providers plan for the medium and long term through a five year asset management process, though typically the utility industry works on reactive processes that use specific data provided at the design stage to achieve an engineering proposal.

3.66. National Grid report that there is the strategic capability within the existing gas network to cater for residential and commercial growth in Dacorum, including the quantum of development set out under the high growth scenario. However there are potential local issues to resolve as the development briefs are established for each development zone and the load on networks local to planned growth increases.

3.67. There are strategic electricity requirements associated with catering for growth within the electricity network. The 132kV network will need to be extended to afford provision. There is also a likelihood that a primary sub-station site will be required, particularly for the eastern development area of Hemel Hempstead, in order to satisfy need, as well as two primary sub-station upgrades in the western area. These works would be required under both the low and high growth scenario. Indicative costs for these works total £14 to 15M; however these are high-level estimates only and have not been verified with EDF.

3.68. In light of the above, it is suggested that DBC engage, on an ongoing basis, with EDF and National Grid. The Hemel 2020 Infrastructure and Delivery Board offers a sensible platform for undertaking such engagement. The utility providers need to assess, on an ongoing basis, the impact of all growth against the baseline values they are currently operating to as this will then identify potential shortfalls.

3.69. Clear policy driven requirements for on site requirements, such as the *Code for Sustainable Homes*, need to be set out so that developers are led to a position that establishes Dacorum as a market leader.

4. WATER

Introduction and Overview

Scope

4.1. Drinking, or potable, water for Dacorum is supplied via a system of pipes owned and operated mainly by Veolia Water, formerly Three Valleys Water, with Tring being supplied by Thames Water. Regardless of supplier, the water is frequently monitored to ensure that it is safe to drink.

4.2. This section aims to review infrastructure that currently exists and establish the capacity of the water network, compared to its current utilisation. Risks and opportunities to delivering the proposed growth are subsequently established.

4.3. Given that the bulk of the growth is to occur within the Veolia Water area, the report focuses upon this, whilst making reference to the Thames Water area where necessary. Information has been obtained through a review of published documentation and consultation with Veolia Water.

4.4. Much of the information which is available from the provider and which is presented in this section relates to the entire Veolia Water region (which covers the Home Counties of Surrey, Bedfordshire, Buckinghamshire, Hertfordshire and Essex, plus elements of north west London) or to the entire Central Water Resources Zone (WRZ). Dacorum-specific information has been drawn out wherever possible.

4.5. A Water Cycle Strategy for five Local Planning Authority areas, including Dacorum, is being formulated by the five Local Planning Authorities (LPAs) and stakeholders such as Veolia Water and Thames Water. The first stage of the strategy, the Scoping Study, was completed in April 2010 with the next stage of the strategy due to start shortly. The aim of the study is to draw specific conclusions about the extent of the improvements required to the water network and it is due to be finished in spring 2011.

Policy Drivers

Management Arrangements and Responsibilities

4.6. The incumbent and predominant water network operator for Dacorum is Veolia Water[18]. Veolia Water is the historic Water Board that was privatised in 1988 as part of a Government programme and is responsible for the safe operation of the water network.

4.7. Dacorum itself is part of a wider Water Resource Zone (WRZ) and this is defined as an area within which all water resources can be shared, enabling customers to experience the same

[18] The Veolia Water region covers the Home Counties of Surrey, Bedfordshire, Buckinghamshire, Hertfordshire and Essex, plus elements of north west London. This equates to c.3.2M end users.

level of service. Water resources are planned at a WRZ level though specific developments may impact upon more local networks. Within each WRZ, there are several water supply zones with networks which interconnect and support each other.

4.8. Veolia Water is tasked, via obligations placed upon them by the regulator OfWAT through the Environment Agency and the Water Act of 1989, with affording potable water to the borough. It is measured in terms of its performance by various means, including security of supply and quality of drinking water.

4.9. Veolia Water reviews its network against known development and project capital expenditure programmes to identify their obligations. Like other utilities, there is an inherent weakness in their approach to planning which encourages reactive management in many instances. Whilst Veolia Water do consider the forward planning of asset replacement and capacity provision strategically, the system, particularly at a local level, only reacts to developments that are actively in planning. Therefore any extension of the network is generally geared to that sole requirement limiting opportunity to plan for the wider area. This reactive approach also encourages financing to be developer-led although costs can be discounted as consumed water generates revenues for the water companies.

Reporting and Forward Planning

4.10. To reflect national policies, Veolia Water submit a water management plan to OfWAT, the Regulator, and the Environment Agency, to ensure that economic and environmental aspects are fully considered. Once the process has been reviewed and commented upon, DEFRA ultimately approves the final document. This document serves to determine the capital expenditure that Veolia Water is committed to (for example, to replace existing assets or promote new water resources) as well as agreeing a formula to recover costs from end users.

Existing and Committed Infrastructure

Dacorum's Water System

4.11. A general description of how potable water is supplied to homes and businesses is set out in Figure 4-1.

4.12. Dacorum's water network is part of the wider Central WRZ that began in the Victorian era and subsequently extended as additional requirements have been identified. The network is based upon large cross sectional diameter mains that decrease in size until service pipes afford final connection into individual properties.

4.13. Water provision is derived from various sources within the water zone and broadly equates to 60% from groundwater abstraction (i.e. boreholes) and 40% from the river systems that cross the resource area. For Dacorum, these include the Rivers Lea, Colne, Misbourne and Ver.

4.14. The water is subsequently stored in reservoirs before being treated and distributed to each WRZ. In addition, there are also cross-border agreements in place such as the one with Anglian Water that utilises the River Ouse as its source.

Figure 4-1: Drinking Water Provision

'Raw' water is taken from a variety of both natural and manmade resources including rivers and lakes and reservoirs and transported via pipes to the treatment works.

The pipes take the water to an underground service reservoir or a water tower. The reservoirs are covered with grass or gravel so that the water will stay clean. When the pipes lead to a water tower, the water is pumped to the top, then gravity will transport the water to houses and factories.

From here water travels through smaller mains, flowing into the network of pipes in our towns and cities. All the water that then flows into our homes is of drinking water quality. In some areas it can take up to a week for the water to get from the treatment works to our homes and more chlorine will be added to ensure that it is still clean when it comes through to our taps.

Source: waterguide.org.uk

4.15. Across the Central WRZ, there are some 260 boreholes sited at 110 locations and this, together with the River abstraction, derives some 880M litres of water per day.

4.16. More locally, there are two operational reservoirs covering Berkhamsted and seven in Hemel Hempstead. The trunk mains, i.e. those mains that are strategic in nature, broadly operate as per the diagram shown in Figure 4-2 below.

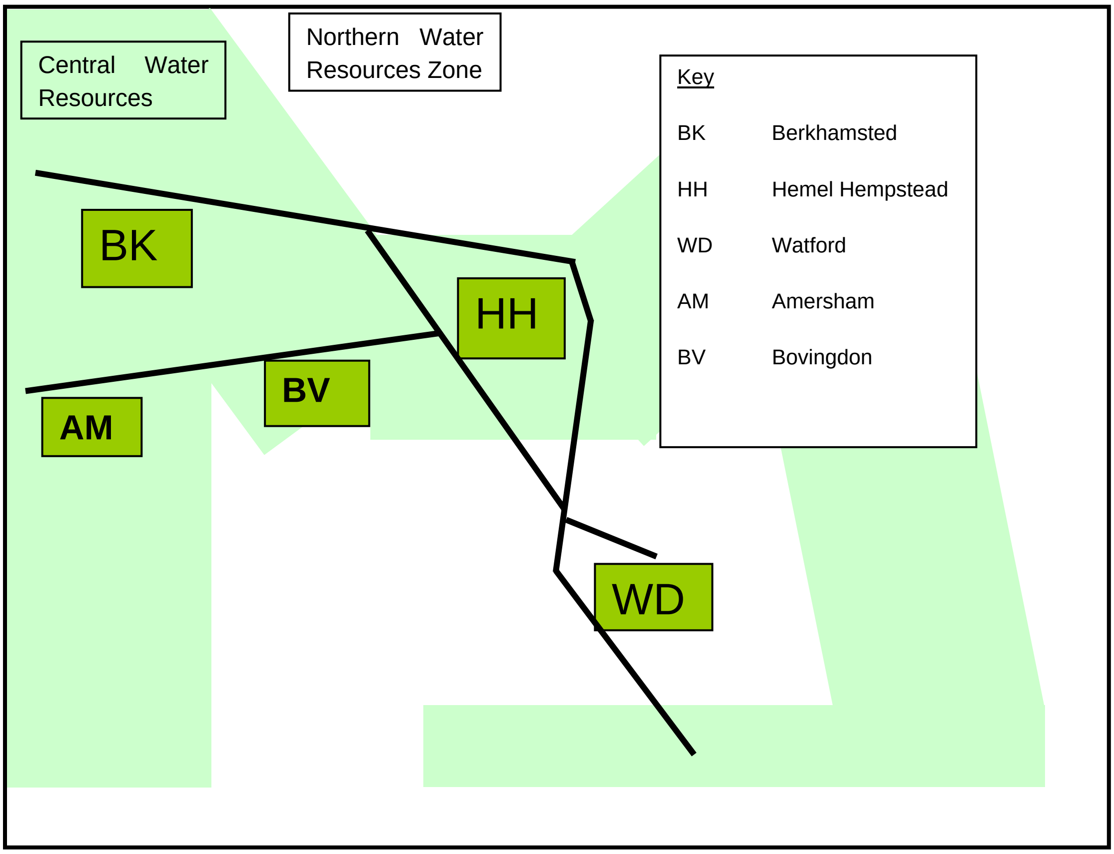
4.17. The service pipes that provide water to individual properties are installed of a size that reflects the requirement of the building; this too is true of mains in the road. A main located in a main thoroughfare therefore is likely to have a greater cross sectional area than, say, a main that services a secondary road such as a cul-de-sac. Likewise, a pipe that serves a swimming pool is likely to be greater in cross sectional area than that of an individual dwelling. Typically, and as an example only, two storey dwellings will use a $25mm^2$ or $32mm^2$ service pipe for each unit. For an apartment building, the intake is likely to be at least twice the size. .

4.18. To ease both the impact on the water network and to provide suitable pressure, particularly in high rise buildings, it is normal to store water in tanks and use pumps. For developments of semi detached or detached properties, not exceeding three floors, this is not required.

4.19. The management of the impact on the water system by storage means that buildings have enough water to manage normal consumption and the tanks are then replenished with a steady 'trickle' rather than a substantial drawdown that would cause problems on the wider network. With enough storage, and as an example only, a large building could run off the same size service pipe as that of a single residential unit.

4.20. The sizing of all mains and services is critical as Veolia Water provide a minimum pressure of 1Bar for the purposes of getting appliances, such as washing machines, to work and also to keep the water flowing; this latter point is crucial as water needs to be kept moving in the distribution system. If water is not kept flowing it can stagnate, which can lead to the presence of bugs which endanger human health.

Figure 4-2: Trunk Mains Network in Dacorum and Surrounding Area



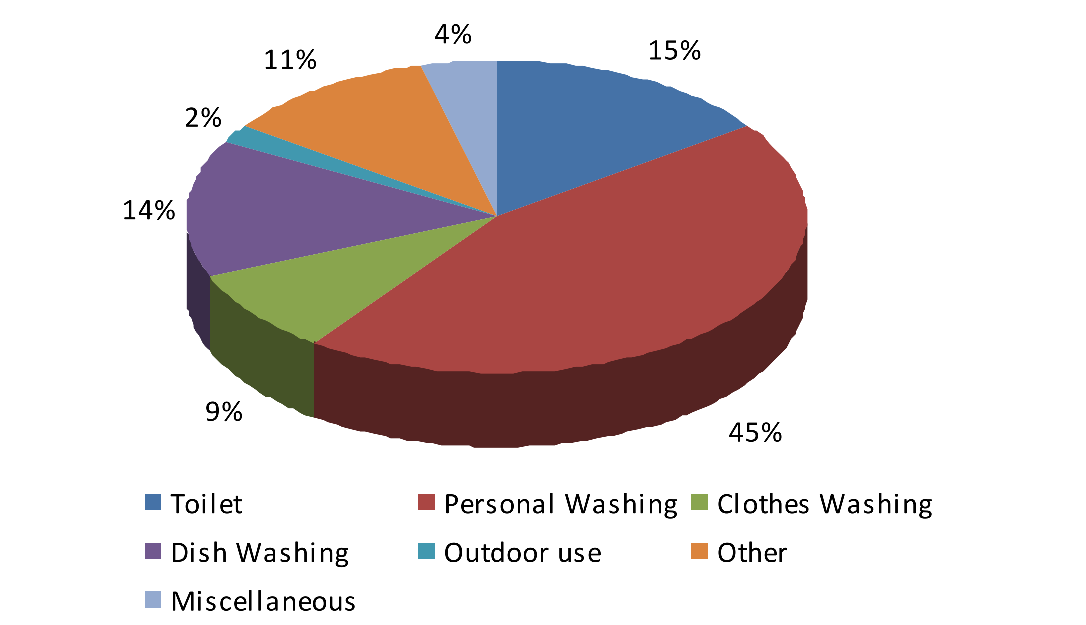
Source: Veolia Water

Existing Provision of Water via the Network

4.21. Figure 4-3 represents the Central WRZ residential usage based on 2007 figures and a metered supply.[19] The actual residential metered consumption for the Central WRZ totals some 159.9M litres (Ml) of water per day which by 2035 is expected to reduce to 152.1Ml of water per day. As shown in Figure 4-3, personal washing accounts for the greatest proportion of residential use.

[19] In fact, unmetered water supplies account for greater volumes of water than metered supply, but this information gives an indication of the distribution of uses of water in the home.

Figure 4-3: Residential Water Consumption, 2007



Source: Veolia Water: http://www.veoliawater.co.uk/lib/vwuk/3valleys/5602,VWC-FWRMP-Version-3.0-Website.pdf accessed on 10/05/2010.

4.22. Figures on current water usage in Dacorum are not published. An independent estimate of water usage is set out below.

Planned Investment

4.23. Water infrastructure is planned and funded over five-yearly investment programmes. Currently Veolia Water is undertaking Asset Management Plan (AMPl) 5 which is due to end in 2015. AMPl 5 runs from 2010 to 2015, followed by AMPl 6 in 2015-2020 and AMPl 7 in 2020-2025, etc. By implication the scope of this report extends to AMPl 9, concluding in 2035.

4.24. Detailed data is not available on planned investment on water infrastructure in Dacorum.

Estimating Future Demand

Provision Standard and Independent Assessment of Current Demand

4.25. Over the whole of its supply area, Veolia Water estimate that each resident uses on average 148 litres (l) of water per day. For commercial floorspace a figure of 74 litres per employee per day represents a broad guide. There is a caveat around industrial uses for which water usage will vary depending on the type of industrial activity being undertaken. In the absence of detailed information about the present and future nature of industrial activities, a rate identical to other commercial uses has been used.

Table 4-1 Water Provision Standards

Development Type		Provision Standard
Residential		148 l/day per resident
Commercial	(Offices, industrial, warehousing, retail, leisure)	74 l/day per employee

Source: Residential standards are those published by Veolia Water; commercial standards have been computed from known projects but these will vary as they are ultimately dependant upon actual fittings.

4.26. It should be noted that until a formal design is completed against set network criteria, the water system, given its 'dynamic' nature, is always subject to change and re-configuration. At the formal design stage, conventional computations, normally derived by mechanical and electrical (M&E) consultants, utilise figures for specific and known quantums; i.e. a building with a particular specification will require a given level of water consumption. The utility industry applies diversity factors[20] to those figures and these change somewhat dependant upon the strategic level – for example, a main in High Street will have a lower diversity factor applied than that of computations for a new main that is required for the borough.

4.27. However, this assessment reflects reasonable judgements and scenarios and therefore provide a high-level understanding of the requirements in order to deliver the greater growth.

4.28. An estimate based on the standards of provision set out above, data from DBC and ONS Rateable Values data, indicates that a total of approximately 23.2M l/day are currently used in the borough.

Table 4-2: Estimate of Current Water Usage in Dacorum

	People / employees	L/day
Population	139,499	20,645,852
Office	14,454	1,069,596
Industry	7,074	523,476
Warehouse	8,235	609,390
Retail	5,055	374,070
Total		23,222,362

Source for baseline data: DBC; ONS Rateable Values Data (from 2005 Re-evaluation, but reset for 1st April 2008).

4.29. The overall capacity for the Water Resource Zone area is some 990Ml per day, providing coverage to the whole system.

[20] Diversity factors are those applied to networks that assume that not all appliances are to be utilised at the same time. As an example, a building may have a total requirement, if all appliances within it were used, of 200 litres of water. Given that not all items will be used, the actual likely local impact on the water network may be, say, 100 litres. On the network in Dacorum, as a borough, this may translate into, say, 50 litres and for the Central WRZ, say 10 litres. These are purely fictional figures but the purpose is to demonstrate that when more and more buildings are considered, the impact changes at different levels of the network.

4.30. Due to the ageing network and limited funding for asset replacement, leakage from the network has historically accounted for some 16% of total demand of overall capacity for the area or 140Ml of water per day[21] . Recent commentary from Veolia Water identifies that the network, which was developed largely from the Victorian era, has leaks that may never prove to be economical to repair. The mains located in the Dacorum area have been designed for a lifecycle of between 40 and 60 years.

4.31. The local Dacorum networks contain a mixture of underground storage facilities, pumping stations, large cross section mains and smaller bore mains and services. The strategic main that serves Berkhamsted ends in the town as this is the western extent of the Veolia Water area. However, there are a myriad of smaller diameter networks that subsequently serve the rural communities to the west, north and south of the town. The main that serves Bovingdon is larger than the Berkhamsted main as it continues to Amersham in Buckinghamshire where it ultimately is interconnected to a resource just outside the Veolia Water area. For Hemel Hempstead, the mains effectively form a ring to encircle the town and this, in turn, makes development easier to accommodate.

4.32. On the whole, and noting how rural parts of Dacorum are, the area is reasonably well connected with regards to network infrastructure.

Adequacy of Existing and Committed Infrastructure

4.33. From the published *Water Management Resources Plan* (2010)[22], and based upon their current forecasts, Veolia Water predict as a whole that the Central WRZ will have suitable strategic capacity until 2035. This is based upon an assumption that the housing stock will increase by some 25%, the population by some 13% and a climate change impact of some 2.5%. There is no further local detail available within the report for Dacorum.

4.34. Veolia Water is committed to the on-going replacing of assets across their operational area. As with all works in existing highway, space is extremely limited and so works to replace mains are expensive and can be constrained, particularly when considering that other statutory bodies, such as gas, electricity and telecommunication providers, are also under extreme pressure to maintain their own regulatory obligations.

In addition to physical constraints, indirect pressures and requirements are also inherent in the delivery process. Typically, they include pressure from local stakeholders whose perception is that they are continually affected by excavations in highways, potential working hours restrictions and limited resources.

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[21] Veolia Water: http://www.veoliawater.co.uk/lib/vwuk/3valleys/5602,VWC-FWRMP-Version-3.0-Website.pdf accessed on 10/05/2010.

[22] Veolia Water Central, *Water Management Resources Plan*, March 2010. http://www.veoliawater.co.uk/lib/vwuk/3valleys/5602,VWC-FWRMP-Version-3.0-Website.pdf accessed on 10/05/2010.

4.35. Whilst this report solely covers Dacorum, there is also demand from wider growth in the region. *The Water Cycle Study Scoping Study* recently published (April 2010) sponsored by five local Planning Authorities, including Dacorum, identifies growth scenarios that may require Veolia Water to adjust its supply arrangements for the wider area. This is very much an ongoing assessment as any such arrangements will depend on the ultimate scale and location of growth, which will in turn depend on wider market forces.

Issues/ Future Trends

4.36. Water use per person is affected by several factors, which typically include:

- Household occupancy
- Water use via appliances
- Fixture and fittings within the property
- Householders' water use behaviour, including garden use
- Whether the property is metered or not.

4.37. The figure of 148l/day/person used to estimate future residential water consumption is a current baseline utilised by Veolia Water; however there is an aspiration, via the establishment of the Code for Sustainable Homes, to reduce this value. Opportunities in new developments include rainwater harvesting (for example use of 'raw' water for toilets) and more efficient appliances. General education is also being promoted.

4.38. However, progress in these trends is not known at this stage. Moreover, pressures in the demand for water will potentially rise and these are predominantly due to:

- An increasing population
- An increase rise in single occupancy houses still using all the appliances of a larger unit
- Smaller family groups
- Climate change.

4.39. As a result, despite the Code for Sustainable Homes criteria to significantly reduce water in new build projects, the magnitude of the increase in residential numbers alone is expected to continue to add pressure to the water system, particularly at a more local level.

4.40. As well as the issues over leakages experienced in the wider water network, various population habits are likely to continue to increase demand, for instance: high volume, high pressure, showers negate the benefit of showering in terms of water consumption.

4.41. Responses to increasing demand and climate change are discussed in further detail below.

Demand Management

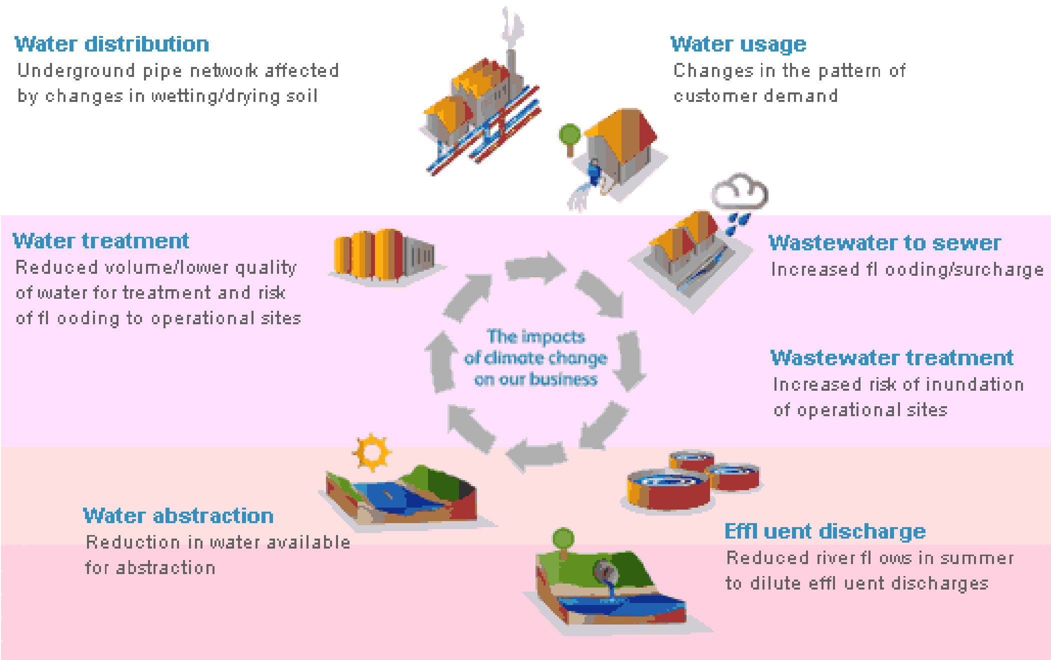
4.42. Veolia Water is proposing a significant programme of demand management. Measures include:

- Leakage reduction techniques
- Active leakage control targeting 20Ml of water per day
- A progressive programme to employ compulsory metering to all new developments as well as retro-fitting to existing housing stock, targeting some 90% of residential properties by 2013
- Establish an enhanced water efficiency programme, including education
- Peak time charging so that mid-summer usage, for example, is charged at a greater rate than, say, mid-winter.

Climate Change

4.43. Added to the pressures of managing our resources better, climate change is likely to result in hotter, drier summers and milder, wetter winters. As a result there is an expectation of greater demand for water in the summer as people bathe, shower or water their gardens more frequently. On average, about 2 per cent of household water is used in the garden, but on hot days this could rise significantly.

Figure 4-4: Impact of Climate Change on Water Consumption, Thames Water



Source: Replicated from Thames Water website: http://www.thameswater.co.uk/cps/rde/xchg/corp/hs.xsl/5586.htm accessed 18/04/2009

4.44. The amount of water businesses use is also likely to rise - as air conditioning is increasingly used to cool offices and IT systems, for example. Whilst not necessarily an issue in urban areas, the agricultural industry is also expected to be affected; climate change is predicted to result in soils being able to hold less moisture, meaning that more water for crops is likely to be needed.

4.45. This increased demand for water will come at a time when existing water resources are under increasing pressure. Climate change will reduce the period when our groundwater sources can refill and will reduce summer rainfall. As a result, managing demand for water though activities like wider water metering and water efficiency programmes to encourage people to use water wisely will be increasingly important in adapting to the impacts of climate change.

Demand for Water arising from Growth

4.46. Currently, up until 2034/35, Veolia Water has assessed that within their operational area, the population will rise by 13% and the housing stock by 25%. The detailed workings behind this assessment are not available and, as Veolia Water covers a greater area than Dacorum, it is not clear whether their assumptions on growth are wholly in line with Dacorum's Development Trajectory, as used in this study.

4.47. Based on Dacorum's Development Trajectory and the standard per person usage rates set out above, an independent assessment of demand for water in Dacorum to 2031 has been projected. Full workings are set out in the *DIM*.

4.48. Potential demand for water associated with residential growth is estimated with reference to a usage per resident standard. As described in Section 2 of this report and in the *DSIS Executive Summary Report*, there are two approaches to considering potential population increases relating to housing growth: applying a projected average household size to the net increase in dwellings; and alternatively using demographic projections which take change within the whole housing stock (existing as well as new) into account. The latter approach to population growth has been used in assessing potential demand for water associated with residential growth, given that water infrastructure has a wide catchment and is not very sensitive to the geographical location of growth. HCC, who provided the demographic projections for Dacorum, advised that it is not robust to break down population figures into sub-areas beneath the borough level. Therefore, for the estimates of demand for water from residents, no sub-area breakdown is given.

4.49. As set out in Table 3-10 below, the modelling exercise indicates that under the low growth scenario water usage in Dacorum could increase by 1.3M l/day, an increase of 6% over the current estimated baseline. It is likely that Hemel will account for much of this growth given that this is where housing growth will be greatest.

4.50. Under the high scenario, there is projected growth in usage of 4.6M l/day, an increase of 20% over the current estimated baseline.

Table 4-3: Additional Water Demand in Dacorum to 2031, l/day, Low Scenario

		2009-2011	2011-2016	2016-2021	2021-2026	2026-2031	Total
Residential	Dacorum	200,392	363,488	366,892	-248,492	-245,088	437,192
Non-residential	H' Hempstead	13,197	152,012	138,877	215,016	258,550	777,652
	Other	2,009	18,191	18,931	27,781	32,650	99,562
Total	Dacorum	215,598	533,691	524,700	-5,695	46,112	**1,314,406**

Source: URS calculations

Table 4-4: Additional Water Demand in Dacorum to 2031, l/day, High Scenario

		2009-2011	2011-2016	2016-2021	2021-2026	2026-2031	Total
Residential	Dacorum	675,324	525,400	874,384	782,032	746,956	3,604,096
Non-residential	H' Hempstead	14,891	166,861	154,096	234,741	282,146	852,734
	Other	2,009	18,191	18,931	27,781	32,650	99,562
Total	Dacorum	692,224	710,452	1,047,411	1,044,554	1,061,752	**4,556,392**

Source: URS calculations

Resulting Water Infrastructure Requirements

4.51. Strategic requirements generally require longer lead in times and therefore confirmation that strategic capacity is projected through to 2035 indicates that long term planning by the service provider is underway.

4.52. There is a likelihood that local network reinforcement, via the replacement of existing mains or indeed the addition of new mains, will be required. However at this stage it is not feasible to determine the exact nature of the requirement as the demand placed upon the network can only be assessed once the design process is commenced. It is important to understand (at the time when formal discussions on development design begin) the point at which the system effectively can no longer cater for additional growth. For example, it may be that the local mains can afford an extra 500 residential units but that 501 extra units would trigger a requirement for a new main from location A to location B.

Costs and Funding

4.53. No data on potential costs and planned spending on water infrastructure in Dacorum are available.

4.54. Veolia Water, being the incumbent network operator for the majority of Dacorum, will be obliged to afford suitable water capacity utilising capital expenditure recovery mechanisms permitted via their operational licence issued by OfWAT. This expenditure recovery is partly through customer bills and set by agreed capital expenditure programmes, however there are direct contributions likely from developers that are recovered separate to S106 within the normal planning process.

4.55. In certain areas of the UK, other water companies are charging what is effectively a ‘roof tax’ against each dwelling given that the infrastructure required is so significant for new developments. This has been approved by OfWAT and the process is underway using a recovery mechanism outside of the normal planning process; the benefit is that the infrastructure will be available for the developments as they ‘go live’.

4.56. That said, the Regulatory framework does recognise that revenue from water consumed is significant and costs, particularly for residential units, can be offset during the economic assessment that Veolia Water undertake at the time of working up a design to serve a development.

Summary and Recommendations

4.57. Long term planning is undertaken by Veolia Water on the basis of five-year Asset Management Plans. Strategic capacity for the borough is reported by the service provider as being present for planned growth to 2035. However, this assessment relates to the entire Veolia Water area and for more local infrastructure it is not possible within this report to definitively conclude an assessment of specific infrastructure requirements for Dacorum between 2010 and 2035.

4.58. Our independent assessment of potential demand for water in Dacorum to 2031 indicates that demand could be an additional 1.3M l/day under the low growth scenario and 4.6M l/day under the high growth scenario, representing a 6% and a 20% increase over the estimated baseline respectively. This demand is predominantly attributable to growth in Hemel Hempstead.

4.59. Information on costs and planned investment is not available in the published documents. Those costs that are presented by Veolia Water (and to a lesser degree, Thames Water) will be met via either the regulatory process as part of asset replacement programmes or more likely developer contributions.

4.60. Developers will be expected to pay costs though these will be offset by revenue computations which are concluded during the formal scheme process. In some instances, offset costs may not be applicable.

4.61. It is recommended that as plans develop, Dacorum should continue to engage with all stakeholders, including Veolia Water and Thames Water, to ensure that dialogue on water provision is maintained.

4.62. The *Water Cycle Study* currently underway by five LPAs and other stakeholders will provide more detail on the potential impacts of growth on water supplies when it is published in 2011. The information in the recently published Scoping Report is consistent with the information presented in this chapter.

5. SEWERAGE

Introduction and Overview

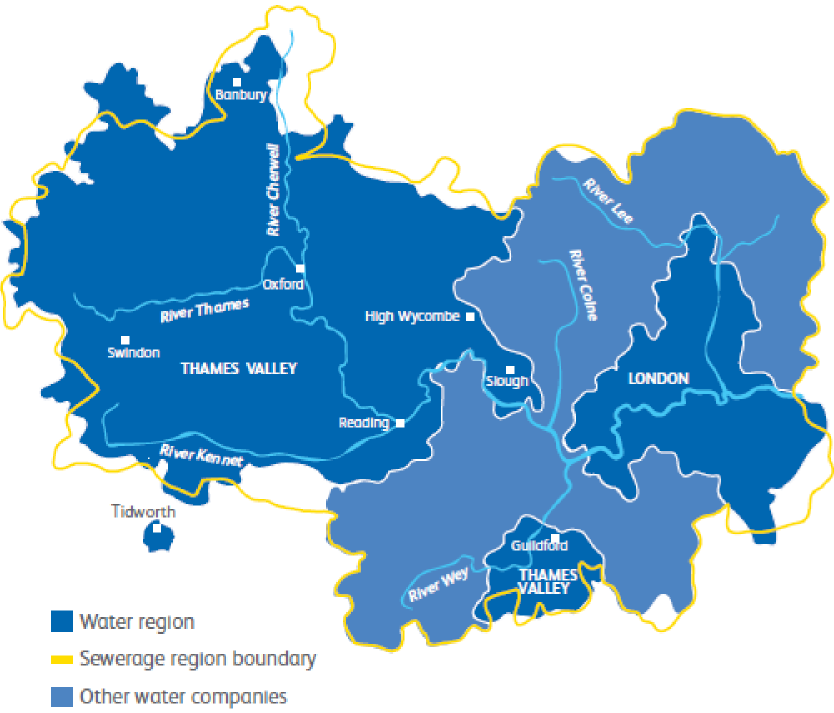
Scope

5.1. The elements of infrastructure covered in this section include physical assets associated with conveying and treating surface and foul water from the Dacorum area and discharging the treated effluent to watercourses. Sewerage infrastructure includes: sewage treatment works; pumping stations; sewers; maintenance and control equipment; IT and buildings. Private drainage networks within individual sites (i.e. non-adopted drainage) have been omitted because sewer records are generally not available from private owners.

5.2. Sewers in Dacorum are separated for foul or sanitary drainage, and surface water or storm-water run-off. The sewer system removes waste water, including rainwater from roofs and paved or impermeable surfaces, and conveys it to treatment works.

5.3. Sewerage infrastructure in Dacorum is a separate surface and foul water system owned and operated by Thames Water. The Thames Water region includes most of the Thames catchment area, from Warwickshire to Sussex and from Gloucestershire to Essex, as shown in Figure 5-1 below.

Figure 5-1: Thames Water Region



Source: Thames Water (2007), Taking Care of Water – The Next 25 Years (2010-2035), p.5

5.4. Thames Water plans for sewerage infrastructure provision across the region as a whole and its published forward strategy covers its entire area of administration. Therefore much of this section of the report presents information for the entire Thames Water region. However, Dacorum specific details are included where available. Most significantly, a Water Cycle Study is being formulated for five Local Planning Authorities, including Dacorum, by consultants, and Thames Water are a stakeholder for this study. Stakeholders include the LPAs and Thames Water. The first stage of the study, the Scoping Study, was completed in April 2010 and the next stage of the strategy is due to start shortly. It will include conclusions about the extent of the improvements required to sewerage network and is due to be finished in spring 2011.

Policy Drivers and Context

5.5. The key policy drivers behind sewerage infrastructure provision include providing for sanitation, prevention of sewer flooding, environmental improvements such as raising effluent quality standards from treatment works to protect rivers; providing new infrastructure to meet the demands of population growth and new office, retail and leisure development; and dealing with increased rainfall intensities due to climate change.

5.6. The East of England Plan (May 2008), Policy WAT2, requires the Environment Agency and water companies to work with OFWAT, EERA, local authorities, delivery agencies and others to ensure timely provision of the appropriate additional infrastructure for waste water treatment to cater for the levels of development provided through the plan, whilst meeting surface and groundwater quality standards. It advocates a co-ordinated approach to plan making through a programme of water cycle and river cycle studies to address waste water treatment relating to development proposed in this RSS.

5.7. At national and EU level, major policy drivers will be the Urban Waste Water Treatment Directive and the Water Framework Directive improving water quality standards.

5.8. The UK Water and Flood Management Bill, published in draft form in April 2009, is designed to improve flood risk management in response to the summer 2007 floods. Under the proposed Bill, the council would gain new roles and responsibilities including local flood risk mapping and identifying ownership to resolve flooding problems as they arise, and would have new responsibilities for drainage. Developers' automatic right to connect to the sewer system under *The Water Industry Act 1991* would be amended and connection would become conditional on meeting new standards including SUDS (Sustainable Drainage System) implementation.

Existing and Committed Infrastructure Provision

Future Ability of Existing Infrastructure to cope with Additional Growth

5.9. A number of data sources yield information on the current provision, capacity and state of sewerage infrastructure relevant for servicing Dacorum.

East of England Plan and East of England Capacity Delivery Strategy Study

5.10. The East of England Plan highlights that in parts of the region, existing waste water treatment infrastructure (sewage treatment works and the associated pipe network) operate at the limits of their current discharge consents, and that the scale of investment required suggests that sewerage infrastructure will be a critical delivery issue for the region[23]. Consultation responses to the draft East of England Plan's Policy WAT2 accounted for 31% of all responses, highlighting the significance of waste water treatment issues.

5.11. The East of England Capacity Delivery Strategy Study (December 2006) identifies that the Maple Lodge waste water treatment works (WWTW), which is located in Rickmansworth and serves Hemel Hempstead, requires significant upgrades to meet growth in demand. Together with Rye Meads WWTW in Ware it will treat 12% of the sewage resulting from growth in the East of England region. The report recommends that a strategic review is undertaken to investigate the potential issues around funding availability, which is dictated by OfWAT, and that timetables for growth are reconciled to allow for the delivery of growth in a sustainable manner.

5.12. The *East of England Capacity Delivery Strategy Study* (December 2006) included a high level gap analysis undertaken by Thames Water examining the Maple Lodge WWTW which concluded that its catchment population would increase by 53,000, or 11%.

5.13. The same report states that Maple Lodge WWTW has insufficient stormwater storage capacity at present within the main works but is supplemented by the smaller Blackbirds facility resulting in adequate existing capacity overall. Final settlement tanks at Maple Lodge are undersized and will require expansion to accommodate future growth. Based on a linear rate of growth the existing discharge consent will be exceeded in 2016 based on the existing regulatory regime. However the Environment Agency are known to be considering tightening the regime which will increase the scale of investment required. Thames Water are undertaking further analysis to determine the investment required.

Water Cycle Study Scoping Study

5.14. According to the *Water Cycle Study Scoping Study* recently published by Hyder (April 2010), the large scale growth within the Maple Lodge catchment will severely impact the existing trunk sewers as they approach Maple Lodge WWTW. Thames Water will undertake network modelling to understand the implications for sewer flood risk. Significant improvements will be required to either Maple Lodge WWTW or Blackbirds WWTW, dependant on Thames Water's strategy. Further work will be required once current consent levels and development targets are confirmed to develop a waste water treatment strategy for the study area.

5.15. On a localised scale, the *Water Cycle Study Scoping Study* indicates that upgrades to the existing networks will be further assessed and potential opportunities to construct new strategic sewers will be investigated in line with the growth proposals for the larger settlements in Dacorum. Output from Thames Water's sewerage models will allow a range of growth numbers and locations to be assessed against existing strategic sewer capacity.

5.16. Water and sewerage undertakers have limited powers under the Water Industry Act to prevent connection ahead of infrastructure upgrades and therefore rely heavily on the planning system to ensure infrastructure is provided ahead of development either through phasing or the use of

[23] Halcrow (December 2006).East of England Capacity Delivery Strategy Study: Phase One Final Report.

Grampian style conditions. A constraints matrix is established within the *Water Cycle Study Scoping Report* and it summarises the issues relating to future waste water infrastructure provision under two growth scenarios. It identifies the following conclusions for each area:

- Berkhamsted: Moderate or significant upgrades, depending on the level of growth, are likely to be required to Berkhamsted WWTW. New strategic sewer would likely be required linking the site to the southeast directly to the WWTW

- Bovingdon: Chesham WWTW can accommodate growth under both scenarios within its existing capacity. Some localised network improvements may be required. Capacity of sewage pumping station from Bovingdon requires checking. Sites to the south of town will be closer to this pumping station, therefore requiring fewer network upgrades

- Hemel Hempstead: Both growth scenarios will severely impact the trunk sewer network to Maple Lodge WWTW. Thames Water modelling is required to assess the extent of network upgrades required. Sites to the south would be preferable as they minimise the distance of upgrades needed through the urban area. Maple Lodge or Blackbirds WWTWs will need upgrading given the growth in the catchment

- Kings Langley: Impact on trunk sewer and Maple Lodge WWTW capacity is negligible for both growth scenarios. Any localised network upgrades should be assessed once site-specific details are confirmed

- Tring: Tring WWTW will require upgrades under both growth scenarios. Sites to the east, south and west may require substantial network upgrades through the existing settlement, or a new direct sewer to the WWTW.

5.17. It should be emphasised that the *Water Cycle Study* is in the scoping stages only and these initial findings will be further investigated in the coming months.

Consultation with Thames Water

5.18. Thames Water confirmed the assessment of infrastructure requirements set out above, and were unable to provide further information regarding the location of pressure points on the existing infrastructure without more detailed site specific information about proposed developments.

5.19. Under the Water Industry Act, Thames Water have limited powers to prevent connection ahead of infrastructure upgrades, as developers have an automatic right to connect to the sewers system once their development has been granted planning permission.

Estimating Future Demand: Provision Standards

5.20. The provision standards used by URS to estimate current sewage flow rates and the demand for new sewerage infrastructure arising from economic and population growth are shown in Table 5-1. The rates are the same as those used to estimate water usage in Section 4. This reflects guidance from service providers; the precise approach varies from company to company but generally assumes some level of parity between water consumption and sewage flows.[24]

5.21. There is a caveat around industrial uses for which water usage will vary depending on the type of industrial activity being undertaken. Industrial usage is of interest because of the fairly substantial decline in industrial employment and floorspace forecast over the period covered by the Development Trajectory. This could result in a freeing up of spare capacity, if the decline in industry resulted in reduced flows into the sewer network. In the absence of detailed information about the present and future nature of industrial activities, a rate identical to other commercial uses has been used.

Table 5-1: Sewerage Provision Standards

Development Type		Provision Standard
Residential		148 l/day per resident
Commercial	(Offices, industrial, warehousing, retail, leisure)	74 l/day per employee

Source: Veolia Water; average strategic design figures

Estimate of Current Sewage Flows

5.22. Table 5-2 shows an estimate of total sewage currently produced in Dacorum based on these standards and data from DBC and ONS on existing residents and floorspace. It should be noted that the assessment does not consider surface water drainage. The exercise indicates that sewage flows are approximately 22.3M l/day.

Table 5-2 Baseline Sewage Flow Rates for Residential, Commercial and Leisure Uses

	People / employees	L/day
Population	139,499	20,645,852
Office	14,454	1,069,596
Industry	7,074	523,476
Warehouse	8,235	609,390
Retail	5,055	374,048
Total		**23,222,362**

Source URS based on data from DBC and ONS

5.23. Thames Water estimate future infrastructure requirements in their five year plan, based on the growth figures within the East of England Plan. These estimates are for the entire Thames Water area and are not given for the county or district level.

[24] Some providers plan for sewage flows to be greater than the water consumed in order to accommodate extreme weather events; others assume that sewage flows to be less than the water consumed.

Estimating Future Demand

5.24. Thames Water carry out a significant amount of work assessing future growth and its impact at WWTWs. However local authority boundaries do not sit neatly over drainage areas so Thames Water also consider growth from neighbouring local authorities. An independent estimate of future discharge volumes in Dacorum is set out below, based on the provision standards described in Table 5-1 above. Full workings are set out in the *DIM*.

5.25. The assessment is an approximation and makes a number of assumptions, based on the limited information currently available, including:

- The volume of sewage treated per customer will remain the same to 2031[25]
- The surface water flow is not considered
- The number of Thames Water customers increases at a constant rate from now until 2031.

Residential flows are not broken down by sub-area because the estimates draw upon HC's borough-wide population estimates, which HCC advise should not be disaggregated below the borough level.

Table 5-3: Additional Sewage Flow in Dacorum to 2031, l/day, Low Scenario

		2009-2011	**2011-2016**	**2016-2021**	**2021-2026**	**2026-2031**	**Total**
Residential	Dacorum	200,392	363,488	366,892	-248,492	-245,088	437,192
Non-residential	H' Hempstead	13,197	152,012	138,877	215,016	258,550	777,652
	Other	2,009	18,191	18,931	27,781	32,650	99,562
Total	Dacorum	215,598	533,691	524,700	-5,695	46,112	**1,314,406**

Source: URS calculations

Table 5-4: Additional Sewage Flow in Dacorum to 2031, l/day. High Scenario

		2009-2011	**2011-2016**	**2016-2021**	**2021-2026**	**2026-2031**	**Total**
Residential	Dacorum	675,324	525,400	874,384	782,032	746,956	3,604,096
Non-residential	H' Hempstead	14,891	166,861	154,096	234,741	282,146	852,734
	Other	2,009	18,191	18,931	27,781	32,650	99,562
Total	Dacorum	692,224	710,452	1,047,411	1,044,554	1,061,752	**4,556,392**

Source: URS calculations

[25] With regard to the volume of sewage treated per customer, there are measures to reduce water consumption, including the Code for Sustainable Homes and BREEAM for new developments and the introduction of water metering. However, historic trends have always shown that water consumption tends to rise with increasing living standards. Given the two opposing trends, water consumption is assumed to remain constant to 2031.

Issues/ Future Trends

5.26. The factors driving sewerage infrastructure improvements include legal obligations, climate change and population growth.

5.27. Thames Water has legal obligations set at EU and national UK level to meet effluent quality targets. In the future, new legislation will further increase quality standards, driving future investment in treatment works improvements.

5.28. Population growth in recent years has increased pressure on treatment works, which increases the risk of breach in effluent quality targets. The projected residential and commercial growth in Dacorum will necessitate increased capacities of the network, treatment works and sludge disposal. Average household occupancy is anticipated to decrease, which is expected to result in an increase of per capita water use. However, metering of household water should counteract increased demand: meters will be installed in 28% of households by 2010 and 84% by 2025.[26] The implementation of Sustainable Urban Drainage Systems (SUDS) in new developments will also be an important measure mitigating increased run-off from developed areas[27].

5.29. Finally, climate change will lead to increased rainfall intensities placing further pressure on the sewer system. The anticipated increase in rainfall intensity due to climate change is estimated to be 5% in the period up to 2025[28]. Extreme rainfall events are predicted to increase in frequency over the years requiring greater capacity in sewers. Hotter, drier summers will increase the demand for water and therefore also increase pressure on sewers. Investment in treatment works will be required to meet increasingly stringent water quality targets.

In future years, existing assets will continue to require routine maintenance. The total length of sewers to be maintained by Thames Water across its entire area will increase from 68,000 to 108,000 km by 2015. In addition, investment is required to reduce sewer flooding and reduce odour from sewage treatment works. Cleaning and repairs will be increased in sewers where blockages are known to occur.

5.30. Table 5-5 presents a summary of the factors that may have an impact on the predicted investment plans.

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[26] Thames Water (2007), *Taking Care of Water – The Next 25 Years (2010-2035).*

[27] SUDS are designed to mimic the rainwater attenuation properties of a natural landscape and prevent large volumes of surface water runoff into the sewer system following intense rainstorms. SUDS can significantly reduce surface water or sewer flooding and methods suitable for urban environments are available such as porous paving and rainwater harvesting. Source: Construction Industry Research and Information Association (2007), The SUDS Manual.

[28] CLG (2007), Planning Policy Statement 25, Development and Flood Risk, Table B2

Table 5-5: Potential Factors Affecting Future Required Investment in Sewers in Dacorum

Customers	Assets	External Environment
Demographic changes: Increasingly mobile and/or transient population makes it difficult to predict demand for sewerage services Evolving public expectations regarding level of service, e.g. sewer flooding and river water quality Adaptation to and tolerance of climate change impacts, e.g. increased water use in the summer months; if water recycling becomes common place (i.e. rainwater or grey water harvesting) demand may be reduced	Innovations in treatment technology such as fuel cells Efficiency improvements such as automated monitoring Development of smaller scale, localised solutions Resilience of assets to climate change impacts - degradation may be accelerated or capacity exceeded Pressure to cut carbon emissions	Extent of climate change may differ from predictions Downturn in the economy will constrain investment; market forces will affect demand and price for sewage services Changing land use plans could alter existing / forecast drainage patterns Restructuring of the water industry to stimulate competition will affect investment plans Tightening legislative and regulatory environment

Source: Thames Water (2007) 'Taking Care of Water – The Next 25 Years (2010-2035)', p. 13

Demand for Sewerage Infrastructure arising from Growth

5.31. The standards in Table 5-1 have been used to estimate future sewage volumes (Tables 5-3 and 5-4). The results are the same as those for water supply (Table 4-3 and Table 4-4) because the standard flow rates and the growth assumptions are the same.

5.32. As set out in Table 5-3 and Table 5-4, the sewage flows in Dacorum could increase by 1.3m l/day, an increase of 6% over the current estimated baseline. It is likely that Hemel will account for much of this growth given that this is where housing growth will be greatest. Under the high scenario there is projected growth in sewage flows of 4.6M l/day, an increase of 20% over the current estimated baseline.

Resulting Sewerage Infrastructure Requirements

5.33. Thames Water have a duty to provide, maintain and extend the public sewerage system. An increase in sewage flows could result in the need for additional infrastructure both at the local level – e.g. additional sewers serving new development and improvements to the local sewers network – and at the strategic level. Potential requirements include new and refurbished sewers, pumping stations and waste water treatment works.

5.34. New infrastructure is planned and funded in five-year cycles known as Asset Management Periods (AMPe's)[29]. Currently Thames Water is within AMPe 5, which is due to end in 2015.

[29] The cost of planned maintenance and improvements to sewerage infrastructure up to 2031 was estimated based on a review of the Thames Water 5-year and 25-year investment plans. Beyond 2015 Thames Water have not yet made detailed investment plans other than the long term investment plans outlined here. Source: Thames Water (2009), *Our Plans for Water 2010 to 2015*; Thames Water (2007), *Taking Care of Water – The Next 25 Years (2010-2035)*.

AMPe 6 will run from 2015 to 2020, followed by AMPe 7 in 2020-2025 and AMPe 8 in 2025-2030.

5.35. Potential infrastructure upgrades, as identified from *the Water Cycle Study Scoping Study* and supplementary information from DBC, are as follows:

- Hemel Hempstead and Kings Langley are connected to the same trunk sewer network and waste is currently directed to Maple Lodge WWTW. However, Maple Lodge WWTW is approaching capacity, and creating additional capacity is complex and would require changing the layout of the existing site. Thames Water are investigating diverting additional flows to Blackbirds WWTW in the future. The culmination of growth proposed, including that at Hemel Hempstead (even under low growth scenario), Kings Langley and Abbotts Langley will lead to a requirement for significant upgrades to either Maple Lodge WWTW or Blackbirds WWTW, or both.
- Significant upgrades to meet growth demand given will also be required at Rye Meads WWTW in Ware
- Moderate to significant upgrades likely to be required to Berkhamsted WWTW[30] together with a new strategic sewer linking the site to the southeast directly to the WWTW
- Tring WWTW will require upgrades for both growth scenarios, as well as substantial network upgrades or a new direct sewer to the WWTW
- The WWTW serving Bovingdon (Chesham) may also need upgrade and the capacity of Bovingdon's pumping station needs checking.
- Markyate WWTW was upgraded in 2007 and does not need upgrading to serve growth.

5.36. The Water Cycle Study will investigate the constraints identified above further, and provide a more detailed insight into the future requirement for infrastructure works and investment.

Costs and Funding

5.37. Across their entire area, current Thames Water maintenance expenditure is on average £1bn per year. Thames Water plan to invest a total of £6.5bn between 2010 and 2015 in both water supply and sewer services, and a total of £27bn over the next 25 years. The proposed central London Tideway and Lee Tunnel projects due for completion in 2020 will involve significant investment.

5.38. Sewerage investment from 2010 to 2015 in AMPe 5 will total £4.2bn[31]. Detailed investment information for the region is available for the period from 2010 to 2015 and more approximate

[30] These upgrades may already have been carried out – tbc.

[31] Thames Water (2007), *Taking Care of Water – The Next 25 Years (2010-2035).*

costs are available for 2015 to 2020. Projects will be funded by revenue from Thames Water customers averaged over the whole Thames Water region.

5.39. Table 5-6 shows estimated planned capital investment in sewerage infrastructure within Dacorum up to 2030. Thames Water was unable to provide figures for Dacorum since much of their investment is directed towards large-scale assets that serve a much wider area. URS have allocated a proportion of total investment for the whole Thames Water region to Dacorum based on Dacorum's proportion of the total Thames Water region population.

Table 5-6: Capital Investment in Sewers Infrastructure in Dacorum, 2010 – 2030

Key Activity Projections	Estimated Dacorum Cost (Thames Water Region Cost in Brackets) [32]			
	2010-2015	**2015-2020**	**2020-2025**	**2025-2030**
New and renovated sewers	£23.7m (£2,297m)	£21.4m (£2,079m)	N/A	N/A
New and refurbished treatment works	£18.1m (£1,755m)	£17.3m (£1,682m)	N/A	N/A
New and refurbished pumping stations	£1.3m (£125m)	£1.2m (£118m)	N/A	N/A
Management and general costs	£2.0m (£191m)	£2.0m (£199m)	N/A	N/A
Total	**£45.1m**[33] **(£5,029m)**	**£41.9m (£4,739m)**	**£41.5m (£4,025m)**	**£31.1m (£3,220m)**

Source: Thames Water (2007), Taking Care of Water – The Next 25 Years (2010-2035), p. 67; Thames Water (2009), Our Plans for Water 2010 to 2015, p. 19.

5.40. In general, Thames Water infrastructure funding comes from investment through the business plan process whereby OfWat sets customers bills. Due to the funding regime, there is little certainty regarding funding of projects beyond the business plan cycle. Thames Water, through its periodic reviews and AMPe programmes, plan to provide upgrades for growth however, these investment plans can only be approved by OFWAT where they relate to confirmed development sites within an adopted LDF. Where sites come forward that have not been included in the AMPe plans then the developer would be expected to discuss with Thames Water, the means of bringing the necessary schemes forward. This may be by requisition or other financially related proposal. To ensure this type of situation can be managed then it would be expected that the LPA supports this action by appropriate conditions on any planning consent. Information from the Thames Water AMPe 5[34] shows that

[32] Estimated Dacorum cost is based on population equivalent: Dacorum population is 139,499 (2009); Thames Water Region population is 13.6m (http://www.thameswater.co.uk/cps/rde/xchg/corp/hs.xsl/825.htm accessed on 30 April 2010)

[33] Based on predicted total capital investment of £5,750m in 2020-2025 assuming 70% covers sewerage (the rest covers water supply), based on long term cost assessments; Thames Water (2007) *Taking Care of Water – The Next 25 Years (2010-2035),* p. 67.

[34] Thames Water (2009), *Our Plans for Water 2010 to 2015*

for the whole of the Thames Water region, Thames Water expect to develop a total of 36.8 km of new sewers, which will be funded through revenue plus additional fees paid by developers.

5.41. It is essential that developers demonstrate that adequate capacity exists both on and off site to serve development and that it would not lead to problems for existing users. In some circumstances this may make it necessary for developers to carry out appropriate studies to ascertain whether the proposed development will lead to overloading of existing water and sewerage infrastructure. Where there is a capacity problem and no improvements are programmed by the water company, then the developer needs to contact the water authority to agree what improvements are required and how they will be funded prior to any occupation of the development. Water and waste water infrastructure is essential to any development. Where upgrades to the infrastructure are identified to serve new development it is essential that these are in place ahead of occupation if sewer flooding to property and no/low water pressures are to be avoided.

5.42. Investment in sewerage infrastructure will be subject to financial risk. Thames Water is a private company and the estimated £159.6m investment needed to finance proposed improvements in Dacorum (Table 5-6) will come from a range of capital markets, with the risk of an increasing cost of borrowing. Any major scheme will be subject to high risks that are common to large scale construction projects, subject to OfWAT regulation of cost efficiency targets[35].

Summary and Recommendations

5.43. The additional flows estimated within this study (1.3M l/day to 4.6M l/day) will translate into the need for new or renovated sewage treatment works as well as new and renovated sewers.

5.44. Thames Water has developed an investment plan for the entire region for which they are responsible. The Water Cycle Study currently being formulated by five neighbouring LPAs including Dacorum, and being consulted upon by Thames Water, will provide more locally-specific information about the future constraints on the sewerage system in Dacorum and the investment requirements.

5.45. Sewerage infrastructure will be a critical delivery issue for growth in the East of England region. While it is not possible within this report to definitively conclude an assessment of specific infrastructure requirements for Dacorum between 2011 and 2031, the available evidence highlights that:

[35] The scale of the proposed investment will exceed the capacity of any single debt market, therefore the company will require access to a wide range of capital markets. Large projects such as the Tideway Tunnel may require funding in alternative ways to better define and allocate risk, as these projects have a different risk profile to a standard capital programme. To regulate prices, OFWAT sets cost efficiency targets every five years and benefits of cost savings are hence shared with sewerage customers. In summary there is a risk that the costs of the proposed investment may increase due to both the cost of borrowing and due to the high risks involved in major construction projects, but these are controlled to an extent by OFWAT to protect consumers from excessive price increases.

- Growth proposed at Hemel Hempstead (even under low growth scenario), Kings Langley and Abbotts Langley will lead to a requirement for significant upgrades to either Maple Lodge WWTW or Blackbirds WWTW, or both
- Significant upgrades to meet growth demand given will also be required at Rye Meads WWTW in Ware
- Moderate to significant upgrades likely to be required to Berkhamsted WWTW together with a new strategic sewer linking the site to the southeast directly to the WWTW
- Tring WWTW will require upgrades for both growth scenarios, as well as substantial network upgrades or a new direct sewer to the WWTW
- The WWTW which serves Bovingdon (Chesham) may also need upgrade and the capacity of Bovingdon's pumping station needs checking.

5.46. Dacorum-specific figures relating to costs and planned investment are not available. However apportioning costs identified for new and upgraded waste water treatment works for the entire Thames Water region by population indicates that potential investment could total:

- £45.1m in 2010-2015
- £41.9m in 2015-2020
- £41.5m in 2020-2025
- £31.1m in 2025-2030.

5.47. To meet the requirements of PPS12 to properly plan for infrastructure to support proposed future development plans, DBC should further engage with Thames Water, including through the Water Cycle Study.

5.48. Surface water input was not incorporated into the calculations in this section because it is not known what extent of external surface area drains to the Thames Water network. Additionally, detailed information on the Thames Water network (sewer size, length) is also unknown, as is the extent of current surface water attenuation and restricted discharge.

5.49. However, routine maintenance operations to roads and paved areas are a key opportunity for DBC to take preventative action and replace impermeable surfaces with permeable systems that will reduce the quantity of surface water runoff and hence mitigate flooding.

5.50. DBC should implement SUDS schemes and technologies wherever possible and private developers should be encouraged to do so. Retro-fitting of SUDS should be implemented where feasible, e.g. on large land-holdings and public realm open spaces.

5.51. Policy drivers such as the emerging Water and Flood Management Bill and the Code for Sustainable Homes aim to promote SUDS which treat water close to the source before it enters the surface water system, with the added benefit of minimising new infrastructure.

6. WASTE

Introduction and Overview

6.1. Municipal Solid Waste (MSW) is defined in the Waste and Emissions Trading Act (2003) as waste from households and other waste that, because of its nature and composition, is similar to waste from households. Local Authorities in England reported the collection and disposal of over 27 million tonnes of MSW during the financial year 2008/9[36].

6.2. The approach to dealing with waste is changing due to a range of environmental and financial considerations including climate change and resource scarcity. These considerations are leading to a movement away from traditional approaches such as landfill towards dealing with waste close to the point of generation.

6.3. In the UK, local authorities have responsibilities for Municipal Solid Waste (MSW) collection and for waste disposal for all households within their area. This report focuses on the management of this waste stream only.

6.4. Dacorum Borough Council (DBC), as a Waste Collection Authority (WCA) is responsible for collecting MSW from households and from commercial premises if requested to do so by the occupier. Hertfordshire County Council (HCC), as the Waste Disposal Authority (WDA) is responsible for providing the infrastructure for the disposal of MSW collected by the WCA.

Policy Drivers

6.5. European Directives and National Legislation dictate the changes in waste management practices which guide European, national and local waste policies and targets, including those within regional planning frameworks and the local planning policies.

6.6. Whilst DBC is developing its LDF, a number of existing waste management policies have been 'saved' (and are therefore still considered as planning policy) from the DBC Local Plan. Other documents which drive good waste management practices include the Hertfordshire Waste Strategy 2002-2024, the Joint Municipal Waste Management Strategy 2007 and the HCC Draft Municipal Waste Spatial Strategy. These documents are discussed in further detail in Table 6-1 below.

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[36] Defra Statistical Release, 5th November 2009, http://www.defra.gov.uk/evidence/statistics/environment/wastats/archive/mwb200809_statsrelease.pdf

Table 6-1: Policy Drivers and Associated Requirements Relevant to Waste Management in Dacorum

Policy	Statutory/Non-Statutory	Requirement
The EU Landfill Directive[37]	Statutory	By 2010, the amount of biodegradable municipal waste going to landfill in Europe is to be reduced to 75% of the total produced in 1995. By 2013 a reduction to 50% is required; by 2020 to 35%.
Revised national strategy[38]	Statutory	National targets for re-use, recycling and composting of at least 40% of household waste by 2010, 45% by 2015 and 50% by 2020
National Indicator (NI) target 191[39]	Non-Statutory	DBC to produce a maximum volume of residual household waste per household per year of 490kg in 2009/10. In 2008/9 the borough produced 492.57kg, which was within the 2008/9 target. DBC anticipates meeting the 2009/10 target and has reported that 366.34kg have been produced per household up to Q3 of 2009/10.
National Indicator (NI) target 192[40]	Non-Statutory	DBC to recycle or compost at least 48.5% of household waste in 2009/10. In 2008/9 the borough recycled/composted 47.8% of the household waste produced, which was within the 2008/9 target.
Planning Policy Statement 10; Sustainable Waste Management[41]	Non-Statutory	Guidance on a general approach for local authorities to encourage sustainable waste management through its planning decisions. E.g. the promotion of the waste hierarchy and encouraging communities to take more responsibility for their own waste ('self-sufficiency').
East of England Plan, the Regional Spatial Strategy[51]	Non-Statutory	Includes a target to reduce the volume of waste received from London, which is to be managed in Hertfordshire, from 170,000 tonnes in 2010/11 to 80,000 tonnes in 2015/16 (a decrease of 90,000 tonnes). The Plan also sets a target for Hertfordshire to manage increasing volumes of waste generated in the County from 2,220,000 tonnes in 2010/11 to

[37] Council Directive 1999/31/EC of 26 April 1999 on the landfill of waste; Official Journal L 182 , 16/07/1999 P. 0001 – 0019.

[38] DEFRA (2007), National Waste Strategy.

[39] Dacorum Borough Council, Environment Overview & Scrutiny Committee Quarter 3 Performance Report, 09 March 2010 http://www.dacorum.gov.uk/pdf/Environment%20-%2010-03-09%20-%20Performance%20Report.pdf

[40] Ibid.

[41] Planning Policy Statement 10; Sustainable Waste Management, Office of the Deputy Prime Minister, 21 July 2005 http://www.communities.gov.uk/documents/planningandbuilding/pdf/147411.pdf

Policy	Statutory/Non-Statutory	Requirement
		2,650,000 in 2020/21 (an additional 450,000 tonnes).
Hertfordshire Waste Local Plan[42]	Non-Statutory	The Waste Local Plan includes a number of strategic waste policies to encourage HCC to promote sustainable waste management through the planning process. These include identifying proposed measures for waste minimisation, recycling and re-use when considering future developments, restricting landfill developments, the provision of waste storage and segregation facilities for new housing/commercial developments and considering the use of energy recovery in planning applications for incinerators.
Hertfordshire Joint Municipal Waste Management Strategy 2007 (Core Strategy)	Non-Statutory	This document strategy is a review and update of the Hertfordshire Waste Strategy 2002-24. It includes a number of objectives for the county, including prioritising household waste minimisation (with a target of 285kg per person by 2012), managing a growing proportion of Hertfordshire's residual waste within the county, minimising waste disposal to landfill and increasing recycling and composting of household waste to 50% by 2012.

Existing Waste Management Infrastructure Provision

Municipal Solid Waste Generation

6.7. In 2008/09, the total amount of MSW managed in Hertfordshire was 558,283 tonnes[47]. Of this, 31,000 tonnes (5.5%) was collected from businesses by the WCAs in the form of trade waste[43]. Table 6-2 below shows how the volumes of MSW generated in Hertfordshire have changed since 2001/2[47].

Table 6-2 MSW Generated in Hertfordshire 2001/2 to 2008/09

Year	Municipal Solid Waste (Tonnes)	Annual Change (Tonnes)	Annual Change (%)
2001/2	563,689	+ 13,366	+ 2.4
2002/3	559,132	- 4,557	- 0.8
2003/4	540,482	- 18,680	- 3.3
2004/5	555,600	+ 15,118	+ 2.8

[42] Hertfordshire Waste Local Plan 1995-2005, adopted January 1999, County Development Unit HCC http://www.hertsdirect.org/envroads/environment/plan/hccdevplan/wasteplanning/wlp/
[43] http://www.wasteaware.org.uk/strategy/minutes/membersgroup130709item10.pdf

Year	Municipal Solid Waste (Tonnes)	Annual Change (Tonnes)	Annual Change (%)
2005/6	566.617	+ 11,017	+ 2.0
2006/7	595,005	+ 28,388	+ 5.0
2007/8	566,096	- 28,909	- 4.9
2008/9	**558,283**	**- 7,813**	**- 1.4**

Source: http://www.wasteaware.org.uk/strategy/minutes/membersgroup130709item10.pdf

6.8. In 2008/2009, DBC reported that each household in its borough generated 492.57kg of residual household waste[44] and recycling rates of 47.79% for household waste[44]. Over 260,000 tonnes of MSW collected by the district councils within Hertfordshire was disposed of to landfill by Hertfordshire County Council (HCC) in 2009.

Municipal Solid Waste Management

6.9. DBC meets its recycling responsibilities through the operation of a kerbside recycling scheme (called *rECOllect*) which collects recyclable materials (such as plastic bottles, cans, newspapers, magazines, garden waste, food and glass) for segregation or transfer at a DBC operated licensed waste and transfer facility and Materials Recovery Facility (MRF) at Cupid Green, in Hemel Hempstead.[45]

6.10. The waste streams collected from household kerbsides in Dacorum are as follows[46]:

- Green wheeled bin for uncooked and cooked food waste including vegetable, fruit, meat, poultry, fish, cardboard and green garden waste
- Grey wheeled bin for general refuse that Dacorum cannot recycle ('residual waste')
- Black box for newspapers, magazines and junk mail
- Green box for all food and drink cans, aerosols and all plastic bottles
- A basket for all coloured glass bottles and jars.

6.11. In addition, there are a series of 'Bring' and Household Waste Recycling Centres (HWRCs – sometimes referred to as Civic Amenity Sites)[47] across Hertfordshire, where residents can

[44] Minutes of Environment Overview and Scrutiny Meeting, Dacorum Borough Council, 17 November 2009

[45] Recycling, Waste and Refuse Pages of the Dacorum Borough Council website http://www.dacorum.gov.uk/Default.aspx?page=4132

[46] Waste and Refuse pages of DBC website: http://www.dacorum.gov.uk/default.aspx?page=1602

take recyclables, which are collected by the relevant district council. In the case of DBC waste from the 'Bring' sites is taken to Cupid Green for sorting and segregation.

6.12. Recyclable and compostable MSW streams are transferred to processing facilities. HCC holds contracts for in-vessel composting at four facilities in order that all 10 Waste Collection Authorities have an outlet for their collected organic waste (green garden waste plus kitchen waste and cardboard). DBC transfers to Envar at St Ives. HCC also has two other contracts for green waste only composting to which it sends waste from the HWRCs.

6.13. The residual waste collected from DBC's households is transferred to landfill sites at Bletchley in Buckinghamshire and Stewartby in Bedfordshire as well as soon other HCC contracted facilities including the Energy from Waste (EfW) facility in Edmonton, Enfield.[47] HCC reported that in 2008/9 88.8% of the residual waste generated in Hertfordshire was disposed of to landfill. The majority of the remaining 11.2% was processed at the EfW plant in Edmonton[47].

6.14. Prior to a new waste treatment facility coming on stream (see below), HCC has placed interim waste contracts (to expire between 2014 and 2017) with a number of additional landfills, EfW and gasification facilities, and Mechanical Biological Treatment (MBT) plants in order to provide additional capacity for the volumes of waste generated in the county.

Waste Management Facilities in Dacorum

6.15. There are no large-scale waste management facilities (e.g. landfills or EfW facilities) located in Dacorum. A number of smaller-scale facilities are present as follows:

- Cupid Green Depot, Hemel Hempstead (MRF and licensed waste transfer facility) for the collection, segregation and onward transport of recyclable wastes
- Two HWRCs in Berkhamsted and Hemel Hempstead[47]
- 34 'Bring' sites located in Hemel Hempstead (19), Berkhamsted (6), Tring (5), Kings Langley (2) and Markyate (2)[48].

Future Plans and Commitments for Waste Management Investment

Emerging Plans

6.16. The relocation, improvement, expansion and/or commission of new waste management facilities are being considered by both DBC and HCC. New waste management facilities are being considered as part of the Herts Waste Partnership.

6.17. The existing MRF and DBC depot at Cupid Green is surrounded by a variety of uses on all sides leaving little room for expansion. The potential for intensification of the operations at the

[47] Draft Municipal Waste Spatial Strategy on behalf of HCC, Vincent and Gorbing, June 2009 RP/4181/JUNE 2009 (REVISED JULY 2009)

[48] http://www.dacorum.gov.uk/pdf/Waste%20Services%20-%20Bring%20Site%20list.pdf

existing site are also limited because access into the site is difficult for large refuse vehicles and the existing site is close to housing and may cause nuisance to adjoining properties. Options include relocating the Cupid Green depot to a larger site.

Adequacy of Existing and Committed Infrastructure

6.18. In the Draft Municipal Waste Spatial Strategy, HCC classified the 19 HWRCs in the county as Red, Amber or Green depending on whether the HWRC was considered to be fit for purpose in the foreseeable future (Green) or in need of relocation, improvement or expansion over the next 7 years (Amber or Red, depending on its priority). Of the three HWRCs located in Dacorum, the HWRC in Hemel Hempstead is classified as Red because it is 'too small to adequately deal with the high levels of demand that are placed upon it but, again, there is no land currently available for expansion although some may become available in the next two or three years. No options for relocation have been identified.' The HWRC in Tring is also classified as Red (scheduled for closure when the Strategy was written, but it is now understood to have closed[46]) and the HWRC in Berkhamsted is classified as Green (fit for purpose).

6.19. Compostable materials from the MRF at Cupid Green are transferred to the Envar composting facility at St Ives in Cambridgeshire. This contract is due to expire in 2018 and therefore will need to be extended or an additional facility provided to compost waste arisings from Dacorum beyond 2018. A new composting facility has been operational in Hertsmere, Hertfordshire since April 2010. HCC confirmed that whilst they use this facility, compostable waste from Dacorum is transferred to Envar rather than to the new facility in Hertsmere.[49]

6.20. HCC considers that another composting facility will be needed in the future to manage the extra demand for reprocessing compostable waste streams in the county. HCC has not confirmed the capacity or location of this facility; however it is currently considering that a 50,000 tonne capacity facility in the Hemel Hempstead / Watford corridor would be needed to serve Dacorum, Watford and Three Rivers Boroughs[47]. In 2007, the Hertfordshire Waste Partnership stated[50] that the need to divert residual waste from landfill had led to the development of a 45,000 tonne capacity in-vessel composting facility within Hertfordshire and sufficient transfer arrangements will also need to be developed to serve it. It is understood that this need has been met by the Hertsmere facility.

6.21. As described in the revised draft of the East of England Plan[51] the predicted population growth and development of businesses in Dacorum may result in an increase in waste generation. This, together with the Government's drive to push waste management up the 'Waste Hierarchy' (i.e. prioritise waste minimisation, reuse and recycling over waste disposal) and the

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[49] Pers. Comm. HCC Waste Management Team

[50] Hertfordshire Joint Municipal Waste Management Strategy 2007, Action Plan, Hertfordshire Waste Partnership (2007) http://www.wasteaware.org.uk/strategy/partnershipaction1107.pdf

[51] East of England Plan >2031, Draft Revision to the Regional Spatial Strategy for the East of England, March 2010 (www.eera.gov.uk) (Original Plan dated May 2008)

Hertfordshire Waste Partnership (HWP) target of 50% recycling by 2012[52], has driven the demand for the diversion of waste from landfill and the need for new waste facilities to serve the borough.

6.22. The need for an additional waste management facility within Hertfordshire prompted HCC to apply for Private Finance Initiative (PFI) funding from the Department for the Environment, Food and Rural Affairs (Defra) in October 2008[53]. This enabled them to secure £115.3 million of PFI 'credits' to go towards the estimated £200 million[54] required to develop a new waste treatment facility. The HWP estimates that the additional £84.7 million of funding required will come from the Community Infrastructure Levy (CIL) and / or developer contributions.

6.23. HCC invited companies to bid for the work to develop the new waste treatment facility and has shortlisted four bidders. By the end of July 2010 these will have been further reduced to two with a preferred bidder likely to be appointed by early in 2011. Each bidder has proposed constructing a single EfW facility as the most appropriate technology solution and the 'Planned Services Commencement Date' is 1st April 2015.

6.24. The location of the new facility is dependent on the locations of future development of other infrastructure such as housing, schools and business areas. The four shortlisted bidders were invited to provide more detailed proposals in April 2010, and at this stage no further information is available regarding the type, size, location or capacity of the proposed facility. HCC identified New Barnfield in its Outline Business Case in support of its bid for PFI credits

6.25. On the basis that the large-scale waste management facility above is commissioned and that the Westmill Landfill site in Ware (Hertfordshire) is "safeguarded" beyond 2020 (as drafted in the Waste Core Strategy Policy 3), HCC (as the Minerals and Waste Planning Authority) concluded that there is unlikely to be a landfill capacity problem in the next 30 years.[55] However, they noted that it will be important to keep this conclusion under review if a need to export both 'difficult to treat' and 'post-treatment' residual waste from the county is to be avoided.

Estimating Future Demand for Waste Management Facilities

Future Trends

6.26. As described above, a key driver for improved waste management is legislation at the European, national and local level. Technological advances, funding and investment in new

[52] The Future of Hertfordshire's Waste, November 2009. http://www.hertsdirect.org/docs/pdf/w/wpnewsnov09.pdf

[53] Waste pages of Hertfordshire County Council
http://www.hertsdirect.org/envroads/environment/waste/disposal/future/

[54] Hertfordshire Infrastructure and Investment Strategy, Final Technical Report, Dacorum Borough Council, May 2009

[55] Consultation on Hertfordshire Waste DPDs, Representations on behalf of the Waste Disposal Authority, Vincent and Gorbing, November 2009

waste management infrastructure are driven by changes to these policies, for example, the aim to maximise the diversion of waste from landfill and increase the number of recycling facilities available. In recent years the targets set by these statutory instruments and policies have become increasingly challenging and it is anticipated that this will continue. Therefore the drive to minimise the volume of waste generated, divert waste from landfill and maximise recovery and recycling is anticipated to increase into the future.

Estimated Future Demand Growth for Waste Management Facilities

6.27. The Dacorum Development Trajectory indicates that under the low growth scenario an additional 8,942 dwellings will be developed in Dacorum to 2031. The high growth scenario anticipates that the number of dwellings increases by 15,742 to 2031.

6.28. In 2008/09 DBC indicate that the volume of household waste generated per household was approximately 910 kg. Assuming the same volume of waster per household, the low growth scenario will result in an additional 8,137 tonnes of household waste generated per year in Dacorum. The equivalent figure for the high growth scenario is 14,325 tonnes.

6.29. According to DBC, for the financial year 2009/10 DBC collected 59,500 tonnes MSW, of which 4,600 tonnes was trade waste. HCC indicate that 29,835 tonnes of trade waste was collected in Hertfordshire in 2009/10.

6.30. Taking just MSW from households into account (54,900 tonnes in 2009/10), the new MSW generated under the low growth scenario comprises an additional 15% over the baseline. The high growth scenario on the additional MSW represents an additional 26%.

6.31. It should be noted that these calculations do not take into consideration any reductions made through waste minimisation programmes, or the potential impacts of fewer people living in each dwelling in the future.

6.32. It is worth comparing these estimates with HCC's MSW projections for the whole of the county up to 2031/32, made in June 2008.[56] HCC predicted that the additional dwellings to 2031 would result in an increase in MSW arisings in the county from 567,773 tonnes in 2007/8 to 679,269 tonnes in 2031/32. This represents an increase of approximately 20%. HCC also predicted that the volume of MSW recycled and composted between 2007/8 and 2031/32 would increase from 210,792 tonnes to 346,200 tonnes, resulting in a decrease in the volume of residual waste.[47]

[56] The HCC prediction was based on the assumption that the volume of MSW generated per head of population would remain constant with the total increasing in line with the increase in housing numbers over the projection period. HCC predicted the number of dwellings to increase by 95,570 between 2007/8 and 2031/32 as follows: an additional 4380 dwellings per year from 2008 to 2021 (totalling 56,940 additional dwellings); and an additional 3863 dwellings per year from 2021-2031 (totalling 38,630 additional dwellings).

Resulting Waste Management Infrastructure Requirements

6.33. The service providers' strategies for providing infrastructure to cater for future waste management requirements in Dacorum are described above.

6.34. There are several factors which have led both DBC and HCC to investigate possibilities for expanding, relocating, improving and commissioning new waste management facilities. These include the legislative and policy drivers discussed earlier, which are obligating local authorities to put in place planning policies which minimise waste generation, maximise recycling, composting and other forms of waste recovery and divert waste from landfill. The diversion of waste from landfill is further encouraged by the increasing taxes that must be paid for every tonne of waste disposed of to landfill (the 'landfill tax escalator'). The need to find alternatives to landfill, together with a predicted rise in population and volume of waste that may be generated, are the major factors in the investment by local authorities in major waste management infrastructure.

Costs and Funding

6.35. As stated above, HCC secured £115.3 million in PFI funding from Defra in October 2008[53] for an additional waste management facility. It is envisaged that additional £84.7 million required to complete the £200 million project will be provided by the CIL and/or developer contributions. This project is due for completion in 2015.

6.36. The Hertfordshire Infrastructure and Investment Strategy, Final Technical Report, May 2009[57] states that the development of new households potentially gives rise to the following additional requirements:

- HWRCs - sometimes referred to as Civic Amenity Sites. These may need to be extended, redeveloped or relocated to accommodate the increased waste throughput.
- Waste Transfer Stations. Depending on the location of any new development, it may be more economical to transfer waste from collection vehicles for onward transport to treatment/disposal facilities.
- Waste Treatment Facilities. These typically have a lifespan of at least 25 years and need to be designed to accommodate housing and waste growth over this period. It is generally not feasible to extend or upgrade waste treatment facilities and the capital costs for providing one large enough to deal with population and waste growth over its lifetime must be considered at the beginning of the project.

6.37. The different types of facility listed above each have their own cost. A new Civic Amenity Site / HWRC site may cost up to £2.5M, although this would include land costs. A maximum cost of £2M without land costs has been assumed in the report. The cost of a waste transfer station,

[57] Hertfordshire Infrastructure and Investment Strategy, Final Technical Report, May 2009, Dacorum Borough Council

including buildings and a weighbridge, is estimated to be £3M although the cost of any waste treatment facility depends entirely on the scale and technology adopted.

6.38. In addition to the provision of waste treatment facilities, consideration should also be given to the costs associated with waste collection. These include the provision of 'wheelie' bins and recycling boxes for individual dwellings. The need will increase directly in line with the increase in the number of new dwellings.

6.39. A figure of £50 per dwelling, to include individual bins and recycling boxes, is recommended by DBC's Neighbourhood Delivery Team. This would therefore total:

- £447,100 for the low growth scenario, and
- £787,100 for the high growth scenario.

6.40. This cost is borne directly from local authority capital expenditure budgets. There is no other available source of funding to address this. Therefore DBC may wish to request assistance with this cost from housing developers as part of planning obligations.

Summary and Recommendations

6.41. Waste management practices across the UK are changing due to both increasingly stringent environmental legislation and population growth. Diversion of MSW from landfill is one of the key drivers for the development of alternative waste treatment technologies and the increase in waste recycling.

6.42. The need for self-sufficiency has also led WDAs, such as HCC, to provide large-scale waste management facilities within its county boundaries, rather than depending on facilities in neighbouring counties. This, together with the need to find alternative disposal routes to landfill, has resulted in the commissioning of a large-scale EfW facility within Hertfordshire. The County Council has secured £115.3 million of PFI funding to contribute towards the estimated £200 million project cost. The HIIS indicates that the required additional £84.7 million of funding is anticipated to be provided from the CIL and / or developer contributions.

6.43. In addition to a large-scale EfW facility, DBC may consider relocating the Cupid Green depot to a larger site. HCC is also currently considering that a 50,000 tonne capacity facility in the Hemel Hempstead/Watford corridor would be needed to serve Dacorum, Watford and Three Rivers Boroughs. The capacities, locations and funding for these additional facilities have not been confirmed.

6.44. The increased number of dwellings within DBC anticipated in both the low and high growth scenarios will lead to an increase in household waste generation in the borough, estimated at 8,137 to 14,325 additional tonnes of waste to 2031. As the WCA, DBC will be responsible for the provision of waste containers, a waste collection service and capacity at the Cupid Green MRF to sort and segregate the additional waste generated. It is recommended that DBC considers whether any of these additional costs could be borne by future housing developers.

7. CONCLUSIONS AND INFRASTRUCTURE DELIVERY PLAN

Key Findings

7.1. The infrastructure assessments carried out in the preceding chapters have arrived at a series of recommendations for general utilities, foul water drainage and waste management infrastructure. An estimate of the additional demand for servicing arising from the projected residential and commercial growth has been made, though it has not been possible in all cases to definitively confirm quantums of infrastructure requirement and to translate the additional demand into specific requirements for physical infrastructure.

7.2. Local planning authorities are often not directly responsible for the delivery of utilities and physical infrastructure. The information is not developed with the 20 year LDF in mind but on a more short-term basis in five year plans and at spatial levels unrelated to administrative boundaries.

7.3. Potential shortfalls in the capacity of existing networks were highlighted with regard to sewerage and electricity networks. There was a lack of Dacorum-specific information around potential capacity for water supply, and until further information comes forward this information-gap should be highlighted as a potential risk.

7.4. Figure 7-1 below summarises the infrastructure requirements for each type of infrastructure covered by this report required to support the potential population and commercial growth in Dacorum over the Core Strategy planning period.

7.5. The amount of physical infrastructure that could be required as a result of the scale of growth envisaged includes the following, though it should be noted that the magnitude, limitations and the locations of these requirements are not confirmed at this stage:

- For electricity: an additional primary substation and two primary substation upgrades
- For water and gas: local network reinforcement
- For sewers: infrastructure upgrades at a number of locations
- For waste management: a new waste to energy facility.

Infrastructure Delivery Plan

7.6. Table 7-1 gives the details of each type of infrastructure requirement, by type and phase, comprising an Infrastructure Delivery Plan (IDP) for the borough.

7.7. It also proposes the level of priority (1-3) relating to how critical the consultants consider the infrastructure item is to ensuring delivery of development in the borough in the context of the entire Strategic Infrastructure Study. Clearly, all the infrastructures covered by the *DSIS* are important to ensuring that growth is sustainable. However the process of prioritisation allows those items which are considered potential ‘show-stoppers’ to growth to be identified and also reflects factors such as DBC’s legislative requirements.

7.8. The prioritisation ranking should be interpreted as follows:

- Priority level 1 – these are infrastructure items that enable basic functionality and, if not provided have the potential to threaten the delivery of growth
- Priority level 2 – these items are considered critical to ensure that development is sustainable
- Priority level 3 – these items are considered very important for sustainable development.

7.9. The tables also set out where possible: when and where the infrastructure is required; who is responsible for delivery and funding; where the infrastructure is accounted for in the range of existing plans and investments strategies of the respective responsible agencies; and potential costs as identified by the provider and / or by URS. These dimensions of the analysis inform and add detail to the assessment of infrastructure priority.

Next Steps

7.10. This report, and the wider *DSIS*, provides a comprehensive evidence base for the LDF and a Planning Obligations SPD for Dacorum, and will inform these DBC work streams going forward.

7.11. There is a clear need for the *DSIS* to be up-dated over time, for progress against goals for provision to be monitored and for estimates of requirements to be revisited. Elements of a monitoring framework are suggested in the *DSIS Executive Summary.*

7.12. This work has engaged with service providers and other stakeholders who are key to the process of successful strategic planning in Dacorum. It is important that these channels of communication are maintained and that collaboration is on-going. In the most literal sense, infrastructure networks are dynamic and the Development Trajectory for Dacorum will evolve. It will therefore be necessary to update baseline assumptions and associated conclusions so the requirements around infrastructure provision are accurately assessed.

7.13. As anticipated, this study found a lack of immediately available information around strategic planning for utilities. Utilities are set up to respond reactively to planning applications as they arise, rather than proactively to longer term strategic planning drivers, and their planning and funding cycles do not correspond to those of the LDF. We recommend DBC take a proactive approach to engagement with utility providers to raise awareness of the strategic planning process, and to promote mechanisms whereby utilities can effectively feed into the process.

7.14. As well as leading the strategic infrastructure planning process, DBC has a key role in funding infrastructure through its role in raising developer contributions. While DBC plays a limited role in delivering most of the infrastructures covered in this report, its role as the statutory planning authority gives it the power and responsibility to promote high quality development through planning conditions, which can reduce the impact of new developments on the level of infrastructure required (for example, surface run-off to sewers can be reduced through routine maintenance operations to roads and paved areas and the promotion of SUDS schemes and technologies).

Figure 7.1: Summary of Physical Infrastructure and Utilities Infrastructure Requirements

Hemel Hempstead

Infrastructure	Demand Low	Demand High	Requirement
	32.8 MVA	46.5 MVA	
	7,742 m³	13,391 m³	
*	6.5 t	12.8 t	EFW

* Household waste only

Rest of Dacorum

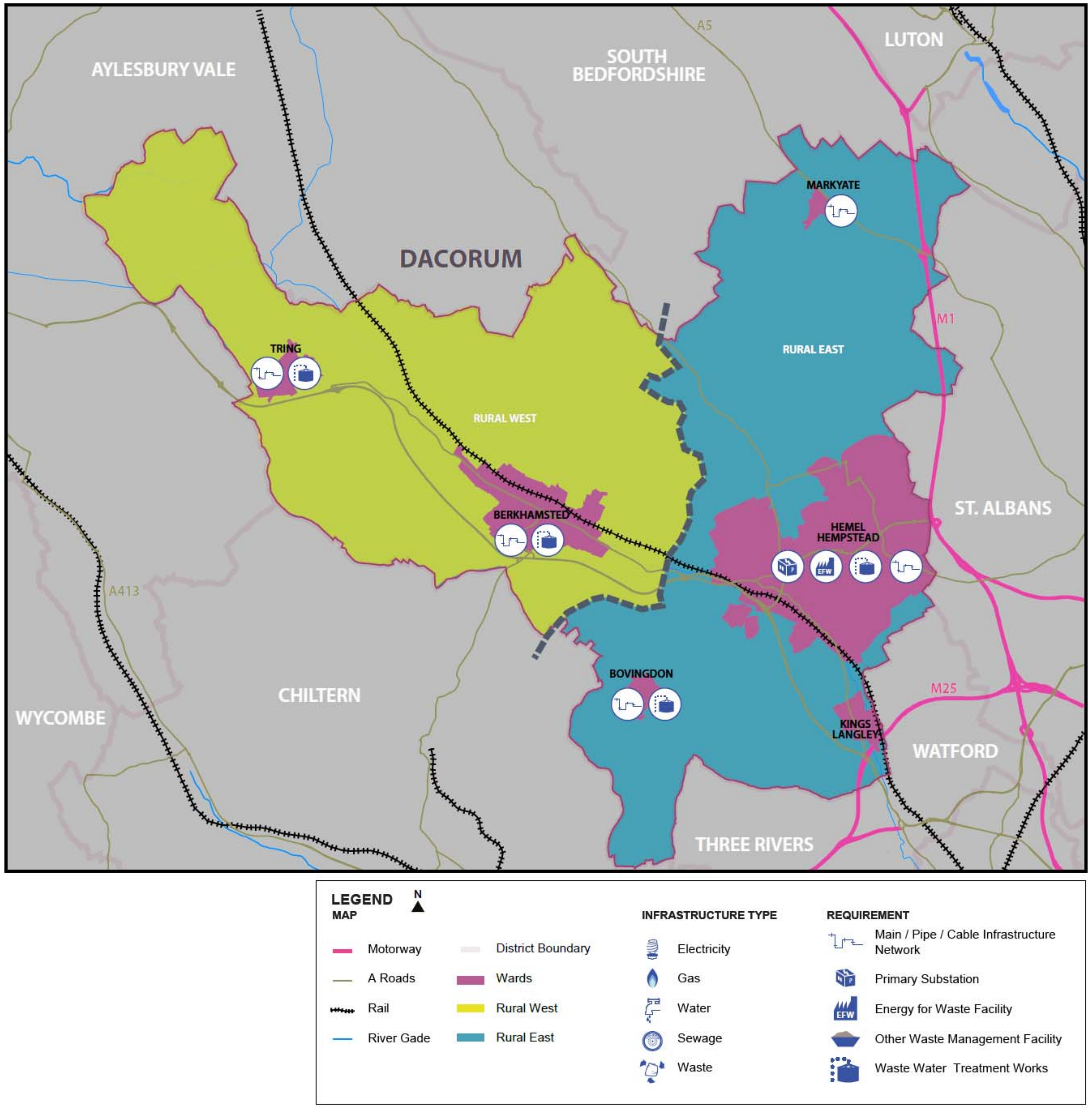
Infrastructure	Demand Low	Demand High	Requirement
	5.4 MVA	n / a	n / a
	1,626 m³	n / a	(Markyate, Tring, Berkhamsted)
*	1.5 t	n / a	n / a

* Household waste only

Borough Wide Total

Infrastructure	Demand Low	Demand High	Requirement
	38.3 MVA	52.0 MVA	
	9,368 m³	15,016 m³	
	1.3 M l/day	4.6 M l/day	(Borough wide - location tbc)
	1.3 M l/day	4.6 M l/day	(Hemel Hempstead, Bovington, Tring, Berkhamsted)
*	8.1 t	14.3 t	EFW

* Household waste only



Source: URS Corporation

Table 7.1: Utilities and Physical Infrastructure: Infrastructure Delivery Plan

Type of infrastructure	*Description of scheme / requirement*	*Priority*	*Time-scale*	*Location*	*Drivers*		*Costs (£)*	*Planning and Funding Status*			*Funding and Delivery Responsibilities*		*Notes*	*Source*
		1, 2 or 3 (1 Highest, 3 Lowest) Include rationale for rating and risks of non-delivery.	*Required delivery date and phasing*	*Sub-area*	*To meet existing defic-iency*	*To meet addition-al future demand*		*Is the need noted by the provider?*	*Planned and Committed Funds*	*Planned not committed funds*	*Funding Agency / Agencies*	*Delivery Agency / Agencies*		
Utilities and Physical Infrastructure	-		-	-	-	-	-	-	-	-	-	-	-	-
Electricity	Extension of strategic (132 kV) network to cater for additional demand (estimated at between 38MVA and 52MVA)	1	By 2031	New site towards the M1 or at the back of Abbots Hill School		✓	£6M-£7m plus cabling	✓			Utility provider / developers	Utilities provider	EDF plan investment through a five-year Asset Management Programme.	
	Primary sub-station (new)	1	By 2031	Hemel Hempstead (east)		✓	£2M (excluding land and cabling costs)	✓			Utility provider / developers	Utilities provider		
	Primary sub-station (upgrade)	1	By 2031	Hemel Hempstead (western - Warners End)		✓	£4M (excluding land and cabling costs)	✓			Utility provider / developers	Utilities provider		
	Primary sub-station & cabling (upgrade)	1	By 2031	Hemel Hempstead (western - Frogmore)		✓	£2M (excluding land and cabling costs)	✓			Utility provider / developers	Utilities provider		
TOTAL COSTS / FUNDING							£14M - £15M							
Gas	Local network reinforcement (new / upgraded mains) as appropriate to cater for additional gas usage (estimated at 9,368m3/hr to 15,016m3/hr)	2	By 2031	Hemel Hempstead, Markyate, Tring, Berkhamsted		✓		✓			Utility provider / developers	Utilities provider	National Grid and Southern Gas Networks plan investment through a five-year Asset Management Programme.	
TOTAL COSTS / FUNDING														
Water	Local network reinforcement (new / upgraded mains) as appropriate to cater for additional water usage (estimated at 1.4Ml/ day to 4.6Ml/day)	2	By 2031	Borough-wide (details not available)		✓		✓			Utility provider / developers	Utilities provider	Veolia (formerly Three Valleys Water) plan investment through a five-year Asset Management Programme.	
TOTAL COSTS / FUNDING														

Type of infrastructure	*Description of scheme / requirement*	*Priority*	*Time-scale*	*Location*	*Drivers*		*Costs (£)*	*Planning and Funding Status*			*Funding and Delivery Responsibilities*		*Notes*	*Source*
		1, 2 or 3 (1 Highest, 3 Lowest) Include rationale for rating and risks of non-delivery.	*Required delivery date and phasing*	*Sub-area*	*To meet existing defic-iency*	*To meet addition-al future demand*		*Is the need noted by the provider?*	*Planned and Committed Funds*	*Planned not committed funds*	*Funding Agency / Agencies*	*Delivery Agency / Agencies*		
Sewerage	New and refurbished waste water treatment works (WWTW) to cater for additional flows (estimated at 1.4Ml/ day to 4.6Ml/day)	1	2010-2020	Hemel Hempstead (served by Maple Lodge / Blackbirds), Markyate, Berkhamsted, Tring, Bovingdon		✓	£35.4M (DBC portion of cost for new and upgraded WWTWs across whole Thames Water area to 2020)	✓	£18.1M (DBC portion of cost for entire Thames Water area (2010-2015), based on population)	£17.3M (DBC portion of cost for entire Thames Water area (2015-2020), based on population)			Thames Water. Asset Management Plan for 2010-2015 has now been agreed with Ofwat.	Costs from 'Taking Care of Water – The Next 25 Years (2010-2035)'.
	(New and refurbished WWTW works)	1		(Rye Meads, Outside Dacorum - Ware)		✓								
	New / upgraded sewers	2		Hemel Hempstead, Berkhamsted, Tring, Bovingdon		✓								
TOTAL COSTS / FUNDING							£35.4M		**£18.1M**	**£17.3M**			**Costs are DBC portion of cost for new and upgraded WWTWs across whole Thames Water area to 2020)**	
Waste	Additional Energy from Waste Facility	1	2010	Not confirmed (may be outside Dacorum - New Barnfield in Welwyn Hatfield is a potential site).	✓	✓	£200M	✓	£115.3M	£84.7M	PFI provided by the Department for Environment, Food and Rural Affairs (Defra) and the Community Infrastructure Levy (CIL)	Herts CC and one of four potential bidders.	No further information on type, capacity or location of the facility. This will be decided when the preferred bidder is announced by HCC in 2011.	HCC Website
													The Herts Waste Partnership estimates that £84.7 million is required from CIL funding.	http://www.hertsdirect.org/envroads/environment/waste/disposal/future/ HCC Hertfordshire Waste Procurement Programme Residual Waste Project Invitation to Submit Outline Solutions and Descriptive Document, July 2009 HIIS Final Technical Report May 2009

Type of infrastructure	***Description of scheme / requirement***	***Priority***	***Time-scale***	***Location***	***Drivers***		***Costs (£)***	***Planning and Funding Status***			***Funding and Delivery Responsibilities***		***Notes***	***Source***
		1, 2 or 3 (1 Highest, 3 Lowest) Include rationale for rating and risks of non-delivery.	*Required delivery date and phasing*	*Sub-area*	*To meet existing defic-iency*	*To meet addition-al future demand*		*Is the need noted by the provider?*	*Planned and Committed Funds*	*Planned not committed funds*	*Funding Agency / Agencies*	*Delivery Agency / Agencies*		
	In-vessel composting facility with 50,000 tonne per year capacity	2	Not stated	Not confirmed, however the Hemel Hempstead/Watford corridor is being considered.	No	✓	Not stated	✓				HCC		Minutes of Environment Overview and Scrutiny Meeting, Dacorum Borough Council, 17 Nov 2009 Draft Municipal Waste Spatial Strategy on behalf of HCC, Vincent and Gorbing, June 2009 RP/4181/JUNE 2009 (REVISED JULY 2009)
TOTAL COSTS / FUNDING							**£200M**		**£115.3**	**£84.7**				

Appendix A – Details of Potential Requirements Relating to Energy Networks

The information in this appendix was obtained at meetings with National Grid (6th April 2010) and EDF (8th April 2010).

The existing infrastructure and likely future investment requirements relating to gas supplies in Dacorum operated by National Grid are reported as follows:

- Markyate is fed via a Medium Pressure (MP) main (75mbar to 2 bar) supply from the north. The proposed new development would more likely be fed from the LP supply and therefore some small local reinforcement of the LP may be required depending on location within Markyate.

- Tring is located on the border between National Grid and Southern Gas Networks. The National Grid network ends by feeding relatively small development clusters at Tring Railway Station to the north of the district and Wigginton Bottom to the south. (Most of the town of Tring itself is served by Southern Gas Networks – see below). Tring Station is only fed by a small 63mm diameter MP supply that would need significant reinforcement for any development other than a few dwellings or so. Wigginton Bottom is fed via a 125mm MP supply and therefore is able to absorb some development noting that local reinforcement of the Local Pressure (LP) LP network may be required.

- In Berkhamsted, the proposed level of development would currently require MP reinforcement. Given that the system is currently stretched, it is currently being proposed by National Grid to increase the pressure to its maximum and this is likely to secure the proposed development in the area. It should be noted that any development to the south west of Berkhamsted is the more problematic and will lead to greater reinforcement, on both the MP and the LP systems, within Berkhamsted.

- In Hemel Hempstead, the Intermediate Pressure (IP) (2 bar to 7 bar) runs from the High Pressure (HP) take off from the main regional site and this provides a suitable quantity of supply within the area. The IP main runs through the centre of Hemel Hempstead and should be noted as a constraint when development plans are submitted. Within Hemel Hempstead, the following local comments apply:

    - *Leverstock Green* - The IP main runs through the Leverstock Green area and it would be prudent that any development avoids the need to divert the main given the financial and operational restrictions. As part of the development process, the main is reported to be made of steel and therefore the minimum distance to any building would be 3 metres. Given the proposed size and location of development in the locale, it is anticipated that a new pressure reduction station, teed directly from the passing IP main would be the solution, although an extension / reinforcement of the LP system may also offer alternative options. The size and the timing of the requirement will ultimately derive the outcome.

    - *West Hemel Hempstead* - A 12" diameter HP main runs through the south part of the West Hemel Hempstead area and it would be prudent that development avoids this main given the financial and operational restrictions. The main is steel throughout and the minimum distance to any building would be stipulated by the Health and Safety Executive. The factors determining the requirements would include the type and size of development. To supply this area, it is anticipated a feed from the north would be likely as there is an available 180mm diameter LP supply. Some reinforcement of the LP system may be required noting that it would be beneficial if development progressed from North to South, given the only suitable connection point is to the north.

- *Wood End Farm* - This development location would almost certainly be fed from the MP system with reinforcement of the network being necessary.

- *Marchmont Farm* - This location is anticipated to be fed from the 125mm LP system which is located adjacent to the site. Reinforcement of the LP may be required albeit this will be dependant upon demand and location.

The existing infrastructure and likely future investment requirements relating to gas supplies in Dacorum operated by Southern Gas Networks are reported as follows:

- Tring is fed by a medium pressure MP supply from the north west and is not anticipated to require reinforcement for the expected growth in the town. However, depending upon the actual location within the town, some small localised reinforcement on the LP mains may be required. The east of the town, being further from the MP, is considered to be marginally more problematic given the impact upon local stakeholders and general congestion both above and below the highway surface.

The existing infrastructure and likely future investment requirements relating to electricity supplies in Dacorum are reported as follows:

- *132kV strategic supplies* The 132kV system is the largest system that EDF operate in this area. The incoming supplies to Hemel Hempstead extend from the 132kV system and this is predominantly via a main 'grid substation' known as 'Piccotts End Grid'. Alternative sources of strategic supplies emanate from Watford but these are limited. In terms of capacity, the system is running at c.66% although this is reported to require re-configuration in the near future for operational reasons and the consequence is that a further 27% is to be added, leaving a very limited spare resource. Furthermore, noting that the electricity system works via a network of interconnecting sources to afford security, the options in Hemel Hempstead are somewhat self reliant and this limits growth. There is only one main feed with limited support from Watford. The system is ringed and therefore needs to have sufficient alternatives; the additional load implies that this feature of the system becomes a constraint. To date, however, the planning process has suitably dealt with the requirements of the town.

- *Hemel Hempstead Eastern – 33kV cluster:* Hemel Hempstead eastern development area is served via three primary substations known as 'Hemel North', 'Industrial' and 'Hemel East'. The 33kV system is a primary system in terms of electricity operations and is locally strategic. Hemel Hempstead and the surrounding area have one grid substation; there are eight primary sub-stations.[58] The three substations all have elements of local capacity available noting that they are currently loaded at between 68% to 86% of their full operating ability. Excluding the impact of employment requirements, this theoretically would equate to c.6,000 residential units if they all

[58] To put the operational aspects into context, at each substation, whether it be 132kV, 33kV or 11kV, the incoming voltage is reduced via a transformer to a lower output. In the case of the 33kV transformers, the voltage is reduced to 11kV and it is this latter voltage that predominantly serves the town as described previously.

used gas central heating. In reality, and bearing on mind the reported limitations on the strategic network, the system would not cater with this quantum and a much lower figure is anticipated. Each of the sites is fed from 'Piccotts End Grid' substation and whilst Hemel North is well served with alternative supplies, Hemel East and Industrial are not. This does not mean that the system is at risk as EDF will operate a secure system in line with OfGEM requirements but they both are not ideally served.[59] In the case of Industrial and Hemel East, the 33kV supplies are on a 'single feed' or share common routes which mean that the system security is not as robust as it should or could be.

- *Hemel Hempstead Western* is covered by two primary substations also, has limited local capacity available with loadings ranging from 73% to 97%, i.e. nearly full capability. These substations are known as 'Warners End' and 'Frogmore'. The capacity theoretically available *would* accommodate c.2,600 residential units all using gas central heating but, again, in reality and excluding employment requirements, this is a much lower figure. As with Hemel East, Warners End has limited capability as the site only houses a single transformer instead of the ideal two, and with a single 33kV cable noting that there historically was a second 33kV circuit but this is now running at the lower voltage of 11kV. In terms of strategy, Frogmore is fed from Watford Grid but this is limited and there are proposals to transfer this to Piccotts End Grid. To the south of the town on the western side, there is a 'reserved' substation site at Apsley that can accommodate future growth once electrical apparatus, including cabling, is installed.

- *Hemel Hempstead Central* is served by a primary substation known as 'St Paul's' and is loaded to c.84% of its operational capacity. Equating this purely to residential units, this reflects a figure of up to 2,300 units assuming gas central heating.

- *Kings Langley's* the Kings Langley primary substation is at 63% utilisation and therefore has local capacity available. The substation is fed from Watford Grid and as with Frogmore, there are plans to transfer the load to Piccotts End.

- *Berkhamsted's* primary substation is 91% *loaded* with c.1.8MVA of capacity remaining, or c.1,100 residential units. The substation is fed via a ring main system and this emanates from Lye Green Grid to the south west.

- *Tring* currently is operating at c.74% and therefore capacity is available for the anticipated demand.

[59] As an example and to provide context, the ideal system utilised is one of ring main using diverse routes – in essence, if one supply fails, there is an alternative supply immediately available. This is true for all system voltages.