Northstowe
Phase 1 Planning Application

Water Conservation Strategy
February 2012

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Northstowe

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1 Introduction

1.1 INTRODUCTION

1.1.1 Northstowe to the north west of Cambridge is located in the East Anglia region and therefore experiences low rainfall levels compared with the rest of the UK. In the future, total annual rainfall is likely to reduce, while intensity increases, putting strain on existing water resources while increasing the risk of flooding. In this part of the UK, water is a precious resource and the Northstowe development aspires to treat it as such.

1.1.2 Whilst the water companies have confirmed that they can supply the development with water and treat and dispose of the sewage, Northstowe is keen to minimise the impact on local water resources.

1.1.3 Water will be promoted as a key defining element of the Northstowe development and will include;

- water demand reduction through demand minimisation and reuse;
- sustainable drainage systems (SUDS) in order to treat surface water runoff and provide ecology and amenity benefits; and
- an aspiration to instil the need to save water into the minds of the residents of Northstowe and surrounding areas as part of a wider living sustainable strategy for the site.

1.1.4 This Water Conservation Strategy is divided into two key areas;

- A policy compliant strategy
- Wider aspirational objectives used to develop strategies going forward to allow Northstowe to act as an exemplar for both the Cambridgeshire sub-region and the UK

1.1.5 As part of the wider aspirational objectives, Northstowe seeks to;

- Pilot projects in parts of the development designed to monitor, control and appraise emerging technologies such as rainwater harvesting and grey water systems in order to understand how they are used, their reliability and the true sustainable benefit they present;
- Provide a mechanism for local and regional projects to educate the end users about the importance of saving water and the benefits it can bring to the region;
- Work with the water companies to reduce water demand throughout the region and building on the education of residents by encouraging the retrofitting of existing dwellings with water saving features such as flow restrictors at taps and cistern capacity reduction.

1.1.6 Northstowe will aim to become an exemplar development for water sustainability, from which future developments can learn to further benefit water stress throughout the UK.

1.2 PURPOSE OF THIS REPORT

1.2.1 This report has been prepared by WSP on behalf of Gallagher to provided details of the Water Conservation Strategy for Phase 1 of the proposed Northstowe development. The requirements for this report are detailed in South Cambridgeshire District Council (SCDC) District Design Guide Supplementary Planning Document and in the Northstowe Area Action Plan.

1.2.2 The report sets out the potential opportunities, constraints and benefits of different water conservation strategies and how they can be applied to Northstowe.

1.3 SITE DETAILS

1.3.1 Northstowe is located within South Cambridgeshire District, approximately 10km to the north west of Cambridge, to the east of Longstanton and to the north of Oakington and is bounded by the Cambridgeshire Guided Bus Route (CGB) to the east. Refer to site location plan in Appendix A.

1.4 CURRENT PLANNING APPLICATION – PHASE 1

1.4.1 Outline planning application for the Phase 1 development comprises:

- up to 1,500 dwellings; a primary school;
- mixed-use local centre (including a community building, and provision for non-residential institutions, financial and professional services, shops, cafes and restaurants, drinking establishments, and hot food takeaways);
- leisure, community, residential institutions, cultural, health, and employment provision (business, general industry and storage & distribution) including a household recycling centre;
- formal and informal recreational space and landscaped areas;
- infrastructure works including site re-profiling and associated drainage works, foul and surface water pumping stations, two flood attenuation ponds on land east of Hattons Road; and
- associated works including the demolition of existing buildings and structures.

1.4.2 The land use schedule for Phase 1 is shown in Table 1.1 overleaf.

Table 1.1: Land Use Schedule

Land Use	Area (ha)
Residential	42
Community / local centre	1.22
Employment & recycling centre	5
Primary school	3
Sports hub	6.17
Public open space / parks / play space	23
Allotments	1.57
Other land (including streets & water bodies)	40.04
Total	**122**

1.4.3 Affordable housing will be up-to a maximum of 35% of the total number of dwellings provided on-site.

1.4.4 The site layout is shown in the parameters plan located in Appendix B.

1.5 PHASE 1 AND ITS CONTEXT TO NORTHSTOWE

1.5.1 A Development Framework Document (DFD), including a Framework Master Plan has been prepared which refreshes the master plan for Northstowe and provides place making principles and guidance for individual phases of development. The DFD defines the rationale and structure for Northstowe’s planning and delivery as a comprehensive development enabling Phase 1 to come forward as part of an integrated whole.

1.5.2 The spatial planning and urban design principles of the framework master plan are founded on the vision, development principles and policies of the Northstowe Area Action Plan (NAAP, July 2007). Given the passage of time since the NAAP was adopted, the DFD takes into account more recent and emerging changes in national and local planning policy and the impact of current and likely future economic events to ensure that the master plan is future proofed and remains relevant.

1.5.3 As a consequence, the master plan and development principles for Northstowe have been strengthened and brought up-to-date to ensure a viable scheme for creating a sustainable community. The new town is to be built to high standards of design and layout within a framework of green infrastructure comprising formal and informal open space and wildlife habitat corridors.

2 Policy Framework

2.1 SOUTH CAMBRIDGE DISTRICT COUNCIL POLICY

2.1.1 The Northstowe Area Action Plan (AAP) (adopted July 2007) Policy NS/21 section 6 states:

> *"All development in Northstowe will incorporate water conservation measures, including water saving devices, rainwater harvesting and greywater recycling whilst managing the recycling of water in order to achieve between 33% and 50% reductions on mains water use compared with conventional housing".*

2.1.2 The Northstowe AAP Policy NS/23 (An Exemplar in Sustainability) further states that

> *"1. Northstowe will include within the development exemplar projects in sustainable development, including energy efficient measures. This could be achieved by:*
>
> *a. Providing an increased level of sustainability across the development as a whole above current requirements to a material extent;*
>
> *b. Building a proportion of the development to advanced practice which fully addresses sustainability issues and minimises any environmental impact by pushing at the boundaries of the proven technology available at the time of the development".*

2.1.3 Policy NE/12 (Water Conservation) of the South Cambridgeshire District Council Development Control policies DPD (adopted July 2007) states that

> *"Development must incorporate all practicable water conservation measures. All development proposals greater than 1,000 m^2 or 10 dwellings will be required to submit a Water Conservation Strategy prior to the commencement of the development to demonstrate how this is to be achieved".*

2.1.4 Similar to Policy NE/12, the South Cambridgeshire District Council District Design Guide SPD (adopted March 2010) also includes the essential requirement of a Water Conservation Strategy be submitted for this site, to demonstrate how such measures will be brought forward and implemented.

2.1.5 The District Design Guide SPD Desired Outcome:

> *"Alongside energy, responding to the sustainable supply and use of water within the design and construction process is almost certainly the most pressing resource management issue that new development must tackle and lead on. This is especially the case in the East of England where rainfall is lowest in the country (South Cambridgeshire averages less than 50mm per month). As with energy, consumption has increased dramatically in recent decades. At the domestic scale, each of us now averages a daily consumption in excess of 150 litres of water – almost all of which is delivered to premises as a drinking standard (with not insignificant carbon emission implications) even though the vast majority is used for washing, toilet flushing and watering the garden."*

2.1.6 The District Design Guide SPD Principles:

"As with most sustainable resource management issues, the design principles for reducing water usage are held within a hierarchical framework. The first level, as always, involves reducing need or demand for water in domestic, business and industrial activities attached to the development. The second level is to intercept and use rainwater before returning it to mains, or ideally a sustainable, drainage system. The third level involves a more concerted interception of water already used within a residential or commercial process for a lower grade use such as waste removal (e.g. toilet flushing) or municipal or domestic irrigation."

2.1.7 However, no specific guidance on the reduction in demand is provided.

Figure 2.1: Water Saving Hierarchy. (Source District Design Guide SPD)

2.1.8 With regards to water use in home, the SPD states:

"Again as with energy, new development will, unless very tightly accounted for, increase gross water resource usage. Reducing 'mains' water consumption is thus considered a priority outcome in the consideration of planning applications."

"The importance of reducing consumption is recognised within the Code for Sustainable Homes where water usage is set as a mandatory standard for Levels 1 and 2 at 120 litres/person/day, Levels 3 and 4 at 105 litres/person/day, and Levels 5 and 6 at 80 litres/person/day."

2.1.9 Reducing commercial (including schools) potable water demand is quite similar to the domestic approach. By fitting water efficient fittings and appliances, significant water consumption savings can be made. The District Design Guide SPD states:

"For industrial and office units, that often have significant roof areas, rainwater collection should similarly be the norm (where uses can run from commercial processes to toilet flushing)."

2.1.10 Reuse and recycling measures are typically more viable within commercial buildings as the control and maintenance of these systems can be achieved more readily. These measures include rainwater harvesting, grey water reuse and black water recycling.

2.2 THE CODE FOR SUSTAINABLE HOMES

2.2.1 The Code for Sustainable Homes became operational in England in April 2007 and a Code rating for new build homes became mandatory from 1 May 2008.

2.2.2 The Code for Sustainable Homes measures the sustainability of a home against design categories, rating the 'whole home' as a complete package.

2.2.3 A design stage assessment will be carried out on each home type within any development – not every single home. Post-completion checks will be carried out on a sample basis.

2.2.4 The Code provides the following:

- introduces minimum standards for energy and water efficiency at every level of the Code, therefore requiring high levels of sustainability performance in these areas for achievement of a high Code rating;
- uses a simpler system of awarding points, with complex weightings removed; and
- includes new areas of sustainable design, such as Lifetime Homes and inclusion of composting facilities.

2.2.5 The Code uses a sustainability rating system to communicate the overall sustainability performance of a home.

2.2.6 A home can achieve a sustainability rating from level 1 to level 6 depending on the extent to which it has achieved Code standards. Level 1 is the entry level above the level of the Building Regulations (Building regulations are likely to reduce the water consumption to approximately 125l/p/d); and level 6 is the highest level, reflecting outstanding development in sustainability terms.

2.2.7 The sustainability rating (level) which a home achieves represents its overall performance across the nine Code design categories. Credits are awarded under these nine categories which are added up to provide an overall Code level. There are some minimum requirements in the Code for energy and water efficiency, but apart from that, the Code is flexible. Developers can choose which and how many standards they implement to obtain 'credits' under the Code in order to achieve a higher sustainability rating.

2.2.8 Code assessors will conduct initial design stage assessments, recommend a sustainability rating and issue an interim Code certificate.

2.2.9 Category 3 WAT1 details water reduction requirements including mandatory levels required for specific overall Code levels. For example, in order to achieve an overall Code level 6, it is necessary to obtain a minimum of 5 credits under WAT1, equal to 80 l/p/day or less.

2.2.10 The Phase 1 development aims to achieve a Code level 4. The mandatory requirement under WAT1 required for a level 4 rating is a minimum of 3 credits (equal to or less than 105 l/p/day), as shown in Table 2.1 overleaf.

Table 2.1: Code Credit Levels and Mandatory Requirements

Water Consumption (litres/person/day)	Credits	Mandatory Levels
≤ 120 l/p/d	1	Levels 1 and 2
≤ 110 l/p/d	2	
≤ 105 l/p/d	3	Levels 3 and 4
≤ 90 l/p/d	4	
≤ 80 l/p/d	5	Levels 5 and 6
Default Cases: None		

3 Objectives of the Strategy

3.1 INTRODUCTION

3.1.1 The objective of the strategy is to ensure that Northstowe respects the water environment of the region and uses water wisely while providing opportunities to showcase as an exemplar for the future.

3.2 DEVELOPING EXEMPLAR PROJECTS

3.2.1 Northstowe will become an exemplar in sustainable water management, both in terms of resource management and delivering results on the ground. The development will reduce the demand through minimisation technics and then consider re-use and recycling. At this time the development industry and the public are not ready for the wide spread delivery of recycling at a household scale. However, there are a number of opportunities for Northstowe in partnership with South Cambridgeshire District Council, Anglian Water, Cambridge Water and Cambridgeshire County Council to set-up and run a number of pilot projects.

3.2.2 Whilst the industry utilises theoretical models and assessments, the monitoring and testing of different technologies in the real world would be invaluable for the housing industry.

3.2.3 The scope, feasibility and remit of these projects can be discussed and agreed with all the parties as the project progresses, but we have included some examples below that could be investigated:

- Monitoring the effectiveness of education strategies and programs
- Monitoring the effectiveness of low flow technology
- Testing different grey water reuse and rainwater harvesting system
- Creating a water partnership to promote demand reductions an example, by working with local water companies and parishes there is the potential to promote or even supply basic water saving devices for use within existing dwellings off-site by:
  - Installing a WC cistern ‘brick’ which displaces water resulting in less consumption per flush and/or installing dual flush mechanisms to WCs where these can be retro fitted to existing single flush cisterns
  - Flow restrictors to taps in the kitchen and/or bathroom
  - Water efficient shower heads
  - Water butts in gardens

3.3 DOMESTIC WATER CONSERVATION STRATEGY OBJECTIVES

3.3.1 The Joint Promoters aim to achieve a Code for Sustainable Homes Level 4 with a 3 credit rating for water demand (under WAT1) for residential dwellings, which equates to a demand of 105 l/person/day or less. WAT1 awards credits based on reducing the calculated internal water demand of residents by either minimisation of demand, reuse or recycling.

3.3.2 The Code for Sustainable Home utilises the BRE Water Calculator in order to estimate internal water consumption. The calculator is comprised of use factors, which are multiplied by the capacity or flow rate of each fitting and added together to give a total consumption figure.

3.3.3 Section 5.1 of this document demonstrates how demand can be reduced to less than 105 l/capita/day (3 credits under WAT1) based on minimisation of demand using the BRE Water Calculator, in line with the overall aspiration for a Code Level 4.

3.3.4 The SPD also encourages developers to raise future occupant awareness to further reduce water demand and a number of available options to help achieve this objective are outlined.

3.4 COMMERCIAL WATER CONSERVATION STRATEGY OBJECTIVES

3.4.1 The strategy for commercial buildings is to provide a 33% to 50% reduction in demand over typical industry baseline figures, in line with domestic demand reduction requirements set out within the Northstowe AAP. This will be achieved through the implementation of demand reduction (low flow taps, dual flush WCs and low consumption/water free urinals) and rainwater harvesting, and is discussed in more detail in section 5.2. In addition, the viability of grey water reuse will be assessed.

3.5 SCHOOL WATER CONSERVATION STRATEGY OBJECTIVES

3.5.1 Although schools would have separate design specifications provided by the Cambridgeshire County Council, they should be treated largely as commercial properties and aim to provide a 33% to 50% reduction in demand over typical baseline figures in line with domestic demand reduction requirements set out within the Northstowe AAP. This will be achieved through the implementation of demand reduction (low flow taps, dual flush WCs and low consumption/water free urinals).

3.5.2 Rainwater harvesting should be used throughout. In addition to the water saving benefits this would provide, it could also be used as an educational tool for pupils as it can help demonstrate how much water can be saved and make them more aware of their water usage.

3.5.3 Grey water reuse within schools has the potential to provide significant benefits due to the high level of WC usage and should be considered in all cases. Grey water may additionally be used for irrigation where an excess is available.

3.6 INTEGRATION OF PUBLIC OPEN SPACE

3.6.1 The development will seek as part of the landscaping strategy to use more drought resistant plants for use on sport pitches and for general landscaping, reducing water demand required for irrigation.

3.6.2 As the scheme progresses, the Joint Promoters will look at the feasibility of using recycled water for any irrigation needs on the site, looking at the viability and sustainability of different sources of recycled water. This recycled water could be either surface water runoff collected and taken from the strategic lakes in the water park, or localised storage under car parks within the development or alternatively black water re-cycling of effluent from Uttons Drove STW (see section 6.6).

3.7 CONSTRUCTION PHASE

3.7.1 The construction phase of the development will also use a substantial amount of water, the Joint Promoters believe that water conservation measures should be included at this stage of the development. As part of the detailed construction management plans the site water conservation will be a separate topic to ensure the importance of this issue is conveyed to the site staff. An example of this approach could be -using collected rain water in the water park ponds for dust suppression, the feasibility of which will need to be tested nearer the time.

4 Water Demand Reduction Overview

4.1 INTRODUCTION

4.1.1 Reducing Northstowe's demand for water has a clear benefit to the Cambridge sub-region as a whole by minimising the increase in demand placed on local water resources For example the city of Cambridge is supplied from groundwater and therefore it is important to protect this resource as much as possible. Demand can be reduced in a number of ways. This section investigates the options available for the site.

4.2 WATER DEMAND REDUCTION OPTIONS

4.2.1 Essential requirements of the District Design Guide SPD and Policy NE/12 are that the development incorporates all practicable water conservation measures.

4.2.2 Reducing domestic potable water demand while maintaining our standard of living is largely straightforward, consisting of a combination of user awareness and the use of water efficient fittings and appliances.

4.2.3 There are typically 5 ways to reduce potable water demand, these include:

- Provision of efficient fittings and appliances
- Rainwater harvesting
- Grey water recycling
- Education of the end user
- Tiered tariffs and smart metering

4.2.4 User awareness can have a great impact if people take on board the advice given. Turning off taps while brushing teeth is one example of how water can be saved easily. The installation of visible/smart water meters can also have an impact on user awareness, as homeowners will have a financial incentive to save water.

4.2.5 Of the five methods above, the last two cannot be fully quantified as each end user will be different. The Code for Sustainable Homes takes into account savings made by physical intervention through efficient fittings and appliances, rainwater harvesting and grey water recycling.

4.2.6 Where practicable, the above demand reduction methods will be utilised to reduce the demand for potable water across the development, in line with the SPD and Policy NE/12 requirements. This is covered in greater detail later in this report.

4.3 TYPICAL BASELINE DEMAND

4.3.1 Based on standard fittings and appliances, typically found in Cambridgeshire dwellings, the average demand is assumed to be 150 l/person/day. Table 4.1 below shows a typical demand scenario based on the BRE water demand calculator:

Table 4.1: Assumed Typical Cambridge Water Demand

Installation Type	Unit of measure	Capacity/ flow Rate	Use factor	Fixed use (litres/ person/ day)	Litres/ person/day
WC (single flush)	Flush volume (litres)	6.00	4.42	0.00	26.52
WC (dual flush)	Full flush volume (litres)		1.46	0.00	0.00
	Part flush volume (litres)		2.96	0.00	0.00
WCs (multiple fittings)	Average effective flushing volume (litres)		4.42	0.00	13.53
Taps (excluding kitchen taps)	Flow rate (litres/ minute)	7.00	1.58	1.58	12.64
Bath (where shower also present)	Capacity to overflow (litres)	260.00	0.11	0.00	28.60
Shower (where bath also present)	Flow rate (litres/ minute)	12.00	4.37	0.00	52.44
Bath only	Capacity to overflow (litres)		0.50	0.00	0.00
Shower only	Flow rate (litres/ minute)		5.60	0.00	0.00
Kitchen sink taps	Flow rate (litres/ minute)	12.00	0.44	10.36	15.64
Washing machine	Litres/kg dry load	11.00	2.10	0.00	23.10
Dishwasher	Litres/place setting	1.80	3.60	0.00	6.48
Waste disposal unit	Litres/use	0.00	3.08	0.00	0.00
Water softener	Litres/person/day	0.00	1.00	0.00	0.00
		Total calculated use (litres/person/ day)			165.42
		Normalisation factor			0.91
		Total water consumption (litres/person/day)			**150.50**

4.4 DEMAND MINIMISATION THROUGH EFFICIENT FITTINGS

4.4.1 Efficient fittings can take the form of low flow showers and taps, dual flush toilets and smaller baths and basins. Water-efficient appliances in the form of low consumption dishwashers and washing machines can be used to further reduce the demand for potable water. Individual appliances are described below.

WC Flushing

4.4.2 Toilet flushing is one of the largest uses of water within the home; therefore, a reduction of water consumption here can have a dramatic effect on the overall use of water.

4.4.3 Toilet cisterns must meet or exceed the requirement of the Water Supply (Water Fitting) Regulations 1999. This limits toilets to using no more than 6 litres per flush. The low flush of a dual flush toilet should use no more water than 67% of the full flush.

4.4.4 A typical old style cistern can use more than 8 litres per flush, sometimes well over 10 litres per flush.

4.4.5 Water-efficient WCs are specifically designed to clear the pan effectively with smaller flush volumes. Efficient dual flush WCs can provide a choice of a full or partial flush, typically as low as 4 and 2 litres respectively.

4.4.6 Based on a single occupant using the toilet 5 times per day, with only one use of the full flush, a water efficient 4/2 litre WC will result in a 12 litres per person per day usage. Within the Water Supply (Water Fittings) Regulations 1999, a single flush 6 litre WC could be used, generating a total requirement of 30 litres per person per day, clearly much greater than required by an efficient dual flush WC.

4.4.7 Bidets typically use between 2 and 3 litres per use. Within this document, it is assumed that bidets will not be installed, as they are not an efficient use of water.

4.4.8 Grey water may be used as a source for toilet flushing, however this is more common in commercial and educational buildings where monitoring and control can be better managed.

Wash Basin

4.4.9 A wash basin found in a bathroom is typically used for personal washing. Great amounts of waste can be generated here due to lack of consideration or education of the user. Typical inefficient waste through wash basins include:

- Leaving the tap running unnecessarily when brushing teeth.
- Leaving the tap running when shaving, when simply filling the basin with a small amount of water would be sufficient.
- Leaks from taps.

4.4.10 The most effective methods of reducing water use from taps are to fit spray inserts, flow restrictors or aerators to new or existing taps. Most European taps have threaded outlets to which these can be fitted. There are also taps where the user has to consciously increase water flow and switch to hot water (saving energy), this is done by implementing a two-position stop on the tap, which requires extra force to move onto the next stop. Hot water would only be available when specifically selecting it, instead of it being on by default during water flow.

4.4.11 Efficient taps can reduce water flow from many litres per minute down to 1.7 litres per minute without a reduction in perceived flow. This is done through the use of spray fittings. Higher quality taps are also less susceptible to developing leaks.

4.4.12 Water from a bathroom sink can be used as a source of grey water, which can be used for toilet flushing, garden watering and even as a supply for the washing machine.

Showers

4.4.13 Homeowners are usually aware that showers use much less water than taking a bath.

4.4.14 There are typically three types of shower used within domestic dwellings:

- Mixer showers supplied from mains hot and cold water
- Power showers supplied from mains hot and cold water
- Electric showers supplied from cold water only

4.4.15 Out of the above three types of shower, electric showers are typically the most efficient in the use of water and energy.

4.4.16 The Water Supply (Water Fittings) Regulations 1999 states that consent from the local water company is required where showers using greater than 12 litres per minute are to be fitted. A limit of 10 litres per minute is being considered for future shower regulations.

4.4.17 A low flow shower head can reduce consumption to as low as 6 litres per minute, saving up to half the amount used by some less efficient showers. The use of specially designed shower heads can reduce flow without a large impact on the perceived flow by the user.

4.4.18 Water from the shower can be used as a source of grey water, which can be used for toilet flushing, garden watering and as a supply for the washing machine.

Bath

4.4.19 Depending on the exact size, a typical bath can use between 100 and 250 litres of water, assuming they are filled to the overflow.

4.4.20 Fitting smaller baths can reduce the consumption of water in two ways:

- Less water is required to fill the bath
- Smaller baths may cause people to enjoy bathing less, thus promoting the use of more efficient showers.

4.4.21 In some cases, a bath may not be necessary and therefore can be left out entirely.

4.4.22 Bath water can be used as a source of grey water, which can be used for toilet flushing, garden watering and even as a supply for the washing machine.

Kitchen Sink

4.4.23 A kitchen sink is used in a very different way to a bathroom sink. Typically, the tap in the kitchen is used to fill pots, pans kettles etc. In this case, reducing the flow rate would not have a major impact on the amount of water required, but could irritate the user, especially if they are waiting for a washing bowl to fill.

4.4.24 If hand washing is to be done, a smaller sink can save on water, especially over the very large old style farmhouse sinks, which are still available on the market.

4.4.25 Some uses of the kitchen tap can waste water, such as rinsing plates before they are put in the dishwasher, therefore there is a small element of waste here. As such, the flow rate at the kitchen tap should be restricted to no less than 4 litres per minute.

4.4.26 Dishwashers are more water efficient than washing dishes by hand.

4.4.27 Due to the nature of what we put down the kitchen sink, this water is not a suitable source of grey water.

Washing Machine

4.4.28 Washing machines consume large quantities of water and are a good place to make savings. Efficient appliances not only save water, but also save energy,

4.4.29 A typical washing machine can use over 70 litres per wash. Most manufactures are trying to reduce this figure and there are now many that use less than 50 litres per wash.

4.4.30 Further savings on water consumption can be made by ensuring that the washing machine is only used to wash full loads, although some high-end machines can detect the load size and adjust the amount of water required accordingly.

4.4.31 The calculations for the Code for Sustainable Homes have recently been updated to take into account load sizes. Some washing machines may be more efficient when calculating litres of water required per kilogram load of washing. The Code now considers l/kg wash, not the total usage per wash.

4.4.32 A developer may choose to promote l efficient washing machines in new dwellings in order to help towards the overall score under the Code for Sustainable Homes. Alternatively, a default figure of 8.17 litres per kg wash is assumed within the calculations. This figure is in fact quite low in comparison to what appears to be a typical consumption figure. Where efficient washing machines will not be provided, a developer will promote the use of water efficient appliances to the purchasers.

4.4.33 In some cases, washing machines are used as a source and more commonly a consumer of grey water. The Code for Sustainable Homes is a little unclear on the details of this topic and details may be dependent on the type of grey water recycling system installed.

Dishwasher

4.4.34 Like washing machines, savings here can be made by ensuring that the dishwasher is only used when full.

4.4.35 Dishwashers vary in size and are measured by the number of place settings they cater for. Again, the Code for Sustainable Homes does take into account load sizes and therefore promotes the use of the most efficient dishwashers, as larger dishwashers will typically be used less often. For instance, a Bosch dishwasher with a load capacity of 12 place settings and using 12 litres per wash is less efficient than a Hoover dishwasher, which washes 15 place settings with 13 litres of water.

4.4.36 A developer may choose to install dishwaters in new dwellings in order to help towards the overall score under the Code for Sustainable Homes. As dishwashers are more efficient than hand washing, their use should be promoted by at least providing space for one within the kitchen layout. The BRE calculator assumes that a dishwasher will be used whether supplied by the developer or not. If a developer does not install a dishwasher, a figure of 1.25 litres per place setting is used for the BRE calculations. Where efficient dish washers will not be provided, a developer will promote the use of water efficient appliances to the purchasers.

4.4.37 Flows from dishwashers are not typically suitable for reuse as grey water.

Water Softener

4.4.38 Water Softeners are used to treat hard water. They work by replacing the calcium and magnesium in the water with sodium. They are relatively expensive to both purchase and maintain.

4.4.39 If a water softener is installed, a supply of un-softened water for drinking and cooking should be provided.

4.4.40 Due to the way water softeners operate, they can consume around 30 litres per day, making them extremely inefficient with regards to saving water. It has been assumed that no water softeners will be installed.

Garden Watering

4.4.41 The Code for Sustainable Homes encourages the use of rainwater for garden watering, although this is not a mandatory element.

4.4.42 Garden watering is not assessed within the water usage calculations, but a credit is given for the provision of an outdoor rainwater collection system (water butt) within WAT2.

4.4.43 If there are no private or communal gardens specified, or if only balconies are to be provided, the credit is given by default.

4.4.44 The collection and use of rainwater in the garden is extremely straightforward. A rain water butt can be installed at the down pipe from the roof, diverting water into the butt and overflowing to the surface water drainage system.

4.4.45 The size requirement for the water butt is dependent on the type of garden and size of the property and can range from 100 to 200 litres.

4.4.46 Such rainwater collection systems depend on the availability of a roof drainage down pipe in a suitable location on the property.

4.4.47 Omitting an outside tap will also help ensure that the rainwater supply is used by the homeowner.

4.5 POTABLE WATER SUPPLY

4.5.1 Potable water will be provided by the local water company. The connection to the site should be designed to ensure that excessive pressure is not provided to the dwellings. Excessive pressure increases use and leakage.

4.6 CULTURAL CHANGE

4.6.1 Cultural change is the education of residents in the efficient use of water, how to reduce water and why saving water is important.

4.6.2 Cultural change cannot be easily measured but should be incorporated into the proposals as a matter of course. The following can help to raise awareness of end users:

- The installation of a visible water meter gives residents a financial incentive to save water as their consumption is proportional to the amount they pay for their supply
- Home owner welcome packs should be provided containing information on water efficient fittings installed in the home, how to use them efficiently and where to find equivalent replacements when required
- The Joint Promoters will work with the water providers to supply the education of sustainable use of water – e.g. the Anglian Water "Love Every Drop" scheme.
- Stickers or notices in discrete locations to remind users to save water
- Periodic leaflet delivery reminding users how to save water, why it is important and the financial benefits

5 Potable Water Demand Minimisation

5.1 DEMAND MINIMISATION

5.1.1 It is possible to reduce demand to less than 105 l/p/d by minimising water demand through the specification of low flow and efficient water fittings and/or appliances. It is not necessary to implement recycling or reuse in order to achieve this target, however under WAT2, an additional non-mandatory credit is given for the provision of a rainwater butt for external irrigation requirements.

Table 5.1: Potential 3 Credit (Code Level 4) Water Demand Scenario

Installation Type	Unit of measure	Capacity/ flow Rate	Use factor	Fixed use (litres/ person/ day)	Litres/ person/day
WC (single flush)	Flush volume (litres)		4.42	0.00	0.00
WC (dual flush)	Full flush volume (litres)		1.46	0.00	0.00
	Part flush volume (litres)		2.96	0.00	0.00
WCs (multiple fittings)	Average effective flushing volume (litres)	3.06	4.42	0.00	13.53
Taps (excluding kitchen taps)	Flow rate (litres/ minute)	4.00	1.58	1.58	7.90
Bath (where shower also present)	Capacity to overflow (litres)	150.00	0.11	0.00	16.50
Shower (where bath also present)	Flow rate (litres/ minute)	8.00	4.37	0.00	34.96
Bath only	Capacity to overflow (litres)		0.50	0.00	0.00
Shower only	Flow rate (litres/ minute)		5.60	0.00	0.00
Kitchen sink taps	Flow rate (litres/ minute)	8.00	0.44	10.36	13.88
Washing machine	Litres/kg dry load	8.17	2.10	0.00	17.16
Dishwasher	Litres/place setting	1.25	3.60	0.00	4.50
Waste disposal unit	Litres/use	0.00	3.08	0.00	0.00
Water softener	Litres/person/day	0.00	1.00	0.00	0.00
		Total calculated use (litres/person/ day)			108.44
		Normalisation factor			0.91
		Total water consumption (litres/person/day)			**98.7**

5.1.2 Table 5.1 above shows the specific fittings requirements in order to reduce water demand to less than 105 l/person/day. It does not include efficient appliances and therefore uses the default figures for these. It also does not include recycling or reuse.

5.1.3 Based on the above example, in order to reduce demand to less than 105 l/person/day, the following water efficient fittings would be required.

- Efficient dual flush 4/2.6 litre WCs
- Low flow showers at around 8 l/min
- Low flow/Aerator taps in bathrooms at around 6 l/min
- Low flow kitchen taps at 8 l/s
- Efficient (smaller) baths typically no bigger than 150 litres to the overflow

5.1.4 Efficient appliances can be specified to further reduce demand. However; if bathroom and kitchen fittings are carefully selected, it is possible to achieve without the extra expense of providing appliances.

5.1.5 All domestic dwellings should have a water butt installed to promote the use of rainwater reuse. The default installation of an outside water tap should be avoided.

5.2 COMMERCIAL WATER DEMAND STRATEGY

5.2.1 Reducing commercial potable water demand is quite similar to the domestic approach described above.

5.2.2 By specifying water efficient fittings and appliances, water consumption savings can be made. Starting with a typical industry standard figure of 50 litres/person/day (l/p/day), a saving of 21.8 l/p/day can be made.

Table 5.2: Potential Savings in Commercial Properties Using Efficient Fittings

	Proportion of use		**Potential Use with Efficiencies**	
	% share	**l/p/day**	**% reduction**	**l/p/day**
Cleaning	1%	0.5	0%	0.5
Canteen	9%	4.5	0%	4.5
Washing	27%	13.5	50%	6.8
Urinal	20%	10.0	75%	2.5
WC	43%	21.5	35%	14.0
	100%	**50**		**28**

5.2.3 This saving of 43% can be made by:

- Installing efficient taps which flow 1.7 l/min
- Installing smart urinal flushing system
- Installing efficient dual flush WCs

5.2.4 An element of grey water recycling and rainwater harvesting should also be used to provide further reductions in potable water demand. See chapter 6.

5.2.5 The design of the school will be the responsibility of the Cambridgeshire County Council who will have their own water minimisation strategy. This should include all the foregoing and should consider rainwater harvesting and grey water recycling where viable. They should aim to meet the requirements of the adopted Water Conservation policy and Strategy.

6 Water Reuse and Recycling

6.1 INTRODUCTION

6.1.1 It is possible to recycle or reuse water for use within the home. This can take the form of rainwater harvesting and grey water recycling.

6.1.2 Both rainwater and grey water systems are made up of a collection system, storage and a distribution system. With basic treatment and filtration, both are suitable for toilet flushing, garden watering and as a supply for washing machines.

6.1.3 Rainwater recycling systems typically collect rainwater falling on the roof and as such, are dependent on there being sufficient rainfall to maintain water levels in the storage tank. The Code for Sustainable Homes takes local rainfall, roof area, run-off coefficient and occupancy rate into account when calculating the amount of water available per person. It is typical that approximately 14 l/person/day is collected (figure based on a typically 2 bedroom home with an occupancy rate of 3); however this figure can vary considerably, and the merits of rainwater harvesting should be considered on a case by case basis.

6.1.4 Grey water systems redirect water from baths, showers, bathroom sinks and in some cases, the washing machine, through a filter and treatment system to a storage tank.

6.1.5 Both rainwater and grey water are unsuitable for bathing or human consumption. This water should not be used to irrigate produce in the garden destined for human consumption, although nutrients contained within recycled water can help promote plant growth.

6.1.6 Both systems require a mains water backup, overflows to appropriate sewers and regular maintenance. A dual pipe work system is required to be installed within dwellings where recycling will occur. These pipes will need to be clearly labelled so that inadvertent connections are not made resulting in inadvertent human consumption.

6.1.7 In domestic dwellings, grey water production typically exceeds its requirement for use in toilet flushing and washing machines, therefore an excess of grey water will usually be available.

6.1.8 Minimisation can be pushed further, but taking this too far can result in undesirable results such as showers with too little flow, taps that take too long to fill a kettle, WC flushes that use so little water, users end up flushing twice etc. The long term result of fitting over restrictive fittings is that the end user is likely to change them for inefficient fittings.

6.1.9 A developer may choose to pre-install water efficient appliances such as washing machines and dish washers.

6.1.10 Grey water recycling is a reliable source of water for use in WC flushing and possibly as a washing machine feed. However, the additional plant required to provide this within individual homes is costly and will require on-going maintenance. As a result, non-functioning grey water recycling units may be left out of service, resulting in an increase in potable water demand.

6.1.11 Any additional savings made can be included in the BRE Water Demand Calculator, earning additional credits within WAT1.

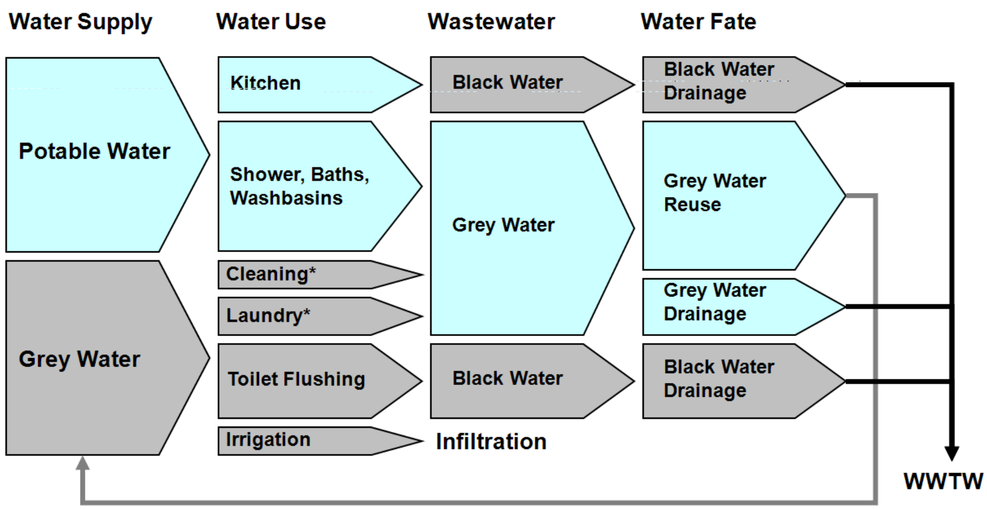
6.2 GREY WATER RECYCLING

6.2.1 Grey water recycling can be undertaken at a number of different scales from individual house/building scale systems to neighbourhood schemes. There are a number of technical, regulatory and public acceptability with neighbourhood schemes. Many of these issues relate to the required quality of grey water and how this water can be managed to ensure there is no cross contamination. Whilst there is a British Standard (BS….) covering grey water systems there is no definitive water quality standards for grey water. Therefore, this section only considers building scale systems.

6.2.2 Grey water source selection should be informed by available volumes and pollution levels. At smaller application scales this tends to prohibit the use of sources from the kitchen and clothes washing as they represent more heavily polluted sources but at larger scale all non-toilet sources tend to be included to maximise water savings.

6.2.3 Grey water systems require a mains water backup, overflows to appropriate sewers and regular maintenance.

Figure 6.1 Typical Grey Water System Flow Schematic



**Most systems recycle grey water for WC flushing only, although many systems can treat water to a suitable standard for use in laundry and general cleaning.*

Grey Water Considerations

6.2.4 In considering the use of rainwater or grey water in and around buildings it should be placed in the context of total water use and the application of water efficient devices. Grey water use can supplement mains water use and, in a few cases, replace it.

6.2.5 Using grey water is still quite low risk. There needs to be a failure of disinfection or stagnation of the system followed by inhalation of aerosols, direct skin contact, or ingestion for health to be affected (the result of this on an individual's health could, however, be considerable). A precautionary approach should be taken to using grey water.

6.2.6 To bring the risk to acceptable levels, water can be reclaimed through filtration and chemical or UV treatment/disinfection processes. It is advisable to filter collected rainwater to remove any debris that may lead to the degradation of the water quality. Rainwater can be treated with UV disinfection, which kills off bacteria as long as the UV light can penetrate the water. Chemical treatment will always be required to treat grey water and usually uses chlorine or bromine based disinfectant (as used in swimming pools); either chemical should be used where the water is cloudy. After such treatment, the water is appropriate for use in toilet flushing. Other uses may require higher and (occasionally) lower treatment levels to be applied.

6.2.7 Grey water systems do require materials, for example tanks and pipe work, and will contain embodied energy and directly use resources. The level of such consumption has not been compared in detail with mains water use (this warrants separate investigation). Grey water systems also consume resources during operation, for example, electricity for pumping or chemicals for grey water disinfection. When comparing the resources used during system operation with mains water, the separation between the two options is less obvious. There will be economies of scale in treating large volumes (millions of litres) for mains supply compared to small volumes used for rainwater and grey water systems.

Grey Water Treatment

6.2.8 The quality of grey water varies depending on the source of the water, and the uses to which the water has been put. The following table indicates the likely constituents of water from various household sources.

Table 6.1 Source: Centre for the Study of the Built Environment

Grey Water Source	Possible Contents
Washing Machine	Suspended solid (dirt, lint), organic material, oil and grease, sodium, nitrates and phosphates (from detergent), increased salinity and pH, bleach, heat.
Dishwasher	Organic material and suspended solids (from food), bactrica, increased pH and salinity, fat, oil and grease, detergent material, heat.
Bath and Shower	Bacteria, hair, organic material and suspended solids (skin, particles, lint), oil and grease, soap and detergent residue, heat
Sinks, including Kitchen	Bacteria, organic matter and suspended solids (food particles), fat, oil and grease, soap and detergent residue, heat.
Swimming Pool	Chlorine, organic material, suspended solids.

6.2.9 The risk of becoming infected from grey water where it is used for toilet flushing is considered to be low. Infection would require ingestion, or skin contact with untreated grey water.

6.2.10 There is a significantly higher risk if the grey water has been stored untreated for some time and proliferation of bacteria and infective organisms allowed to take place. Grey water must, therefore, be disinfected if it is to be a safe option for use.

6.2.11 Grey water treatment systems can be categorised in five groups:

- Simple (coarse filtration and disinfection)
- Chemical (photo catalysis, electro-coagulation and coagulation)
- Physical (sand filter, adsorption and membrane)
- Biological (biological aerated filter, rotating biological contractor and MBR)
- Extensive (constructed wetlands).

6.2.12 Most systems include a screening or sedimentation stage prior to the main treatment and/ or final disinfection stage.

Filtration of Grey Water

6.2.13 It is essential that grey water is coarse filtered before it is stored. This is to prevent the build up of debris in the storage tank, which would encourage bacterial growth. Coarse filters also ensure that large particles, such as hair, do not impair pump and valve functions, clog pipes, or appear at the point of use.

6.2.14 Filtration can be divided into two sub-categories; sand filters and membranes.

Disinfection of Grey Water

6.2.15 It is recommended that no total coliform or E.coli counts should be detectable in 100 ml treated reclaimed water. This will require disinfection which can be either chemical or physical (UV).

Chemical Treatment

6.2.16 Few schemes use chemical technology for grey water recycling. Examples were found on coagulation with aluminium, and photo catalytic oxidation with titanium dioxide and UV. These technologies achieve results in relatively short contact times.

Biological Treatment of Grey Water

6.2.17 Active biological treatment has, so far, been limited to multi-residential and communal grey water systems. This is because of the need for supervision of this more sophisticated technology.

6.2.18 Slow sand filters provide passive biological treatment as a bio-film establishes on the sand. Active biological treatment takes place in a reactor vessel that contains media (usually small plastic shapes with high surface area) on which bacteria are encouraged to grow.

6.2.19 A wide range of biological processes can be used for grey water recycling; fixed film reactors, rotating biological contractors, anaerobic filters, sequencing batch reactors, membrane bioreactors and biological aerated filters.

6.3 DOMESTIC GREY WATER RECYCLING CALCULATIONS

6.3.1 A house can only use as much grey water as it produces, so firstly, the amount of grey water available is calculated. This is done by assessing which fittings and appliances are suitable sources of grey water. In this case, grey water can be collected from the hand basin, shower and bath. This equates to 54.02 l/p/day. Assuming an 80% efficiency of the grey water system, this gives a total available supply of grey water of 43.2 l/p/day.

6.3.2 In most domestic situations, more grey water is produced than is required, this means that some grey water goes to waste. In order to calculate the total amount of grey water demand, the limiting factor must be known – i.e. is demand limited by the amount of water available, or is the demand less than the grey water available.

6.3.3 In order to determine our grey water demand, an assessment was made to determine which fitting can be supplied with grey water; in this case, the WC and washing machine. This is a total demand of 27.9 l/p/day. Therefore, a total of 43.2 l/p/day is available and a requirement of 27.9 l/p/day. This means that the total potable water saving per day is 27.9 l/p/day, resulting in a potable water demand of 70.5 l/p/day.

Table 6.2 Grey Water Supply and Demand (Based on Minimised Demand)

	Demand With Minimisation	Supplied with Grey Water?	Grey Water Required	Source of Grey Water?	Grey Water Available	Consumption with Grey Water Re-use
	l/p/day		**l/p/day**		**l/p/day**	**l/p/day**
WC	13.5	Yes	13.5	No	0.00	0.00
Wash hand basin	7.9	No	0	Yes	7.9	7.9
Shower	35.0	No	0	Yes	35.0	35.0
Bath	16.5	No	0	Yes	16.5	16.5
Kitchen Sink	13.9	No	0	No	0.00	13.9
Washing Machine	17.2	Yes	17.2	No	0.00	0.00
Dish Washer	4.5	No	0	No	0.00	4.5
Normalisation Factor	0.91		0.91		0.91	0.91
Total	**99**		**28**		**54**	**71**

6.3.4 The use of grey water recycling can achieve 5 Code for Sustainable Homes credits when used to supply the WC and washing machine, in conjunction with demand minimisation.

6.3.5 Grey water for use in the washing machine needs to be treated to a suitable level – greater than that which is required for WC flushing only. If a simple grey water system is required only for toilet flushing, potable demand savings are less. Potable demand will then only be reduced to a demand of 88 l/p/day.

6.4 COMMERCIAL GREY WATER RECYCLING CALCULATIONS

6.4.1 Commercial properties can only use as much grey water as they produce, so firstly, the amount of grey water available is calculated. This is done by assessing which fittings and appliances are suitable sources of grey water. In this case, grey water is collected from the washing facilities only.

6.4.2 A calculation was then made to determine the amount of grey water the system requires. The total saving is the lower of the two figures.

Table 6.3: Demand Reduction with Grey Water Reuse (Based on Minimised Demand)

	Demand With Minimisation	Supplied with Grey Water?	Grey Water Required	Source of Grey Water?	Grey Water Available	Consumption with Grey Water Re-use
	l/p/day		l/p/day		l/p/day	l/p/day
Cleaning	0.5	No	0	No	0	0.5
Canteen	4.5	No	0	No	0	4.5
Washing	6.8	No	0	Yes	6.8	6.8
Urinal	2.5	Yes	2.5	No	0	2.5
WC	14.0	Yes	14.0	No	0	7.2
	28		**17**		**7**	**22**

6.4.3 In this case, there is only 7.0 l/p/day (rounded up to whole numbers) grey water available. This reduces the total potable water consumption to less than 22 l/p/day (at total of 57% reduction over the baseline 50 l/p/day).

6.5 RAINWATER RECYCLING

6.5.1 Rainwater recycling systems typically collect rainwater falling on the roof and as such, are dependent on there being sufficient rainfall to maintain water levels in the storage tank. This water can be used in the home for flushing WC's and other uses in the home as well as use in the garden. The analysis below assumes that the water is used in the home and therefore relates to the population of the house.

6.5.2 The savings possible with the use of a rainwater recycling system depends greatly on the average annual rainfall of the area, the available roof area, the number of occupants sharing the roof area and tank size.

6.5.3 Rainfall varies throughout the year, so during the winter, there may be more available water than in the summer months. The calculations are based on an average occurrence.

6.5.4 The Masterplan identifies areas of different types and densities of development in different locations across the site. At this stage it is not possible to identify the individual building focal points and future population of each area.

6.5.5 The reduction in potable water consumption, by reuse of rainwater, is a function of roof area/population of a property and the size of the storage tank. These can only be determined in more detail as the design levels and detailed planning applications come forward.

6.5.6 The following table shows how the above variables have an impact on the availability. The calculations use an annual rainfall of 550mm, a figure of 105 l/p/day, a runoff coefficient of 90% and a filter coefficient of 90%. The calculations follow the methodology set out in the Code for Sustainable Homes.

Table 6.4 Rainwater Collection Volume Per Person (Domestic Dwellings)

Number of Occupants	Total Consumption	Roof Area	Storage Tank Size	Potable Water Saving Per Person		Consumption with Rainwater Recycling
	l/day	m^2	m^3	%	l/d	l/p/day
1	105	13	0.44	14	15.4	90
1	105	10	0.44	11	12.1	93
1	105	25	0.88	28	30.8	74
2	210	25	0.88	14	15.4	97
3	315	25	1.32	9	9.9	102
4	420	25	1.76	7	7.7	10
1	105	50	1.32	52	57.2	48
2	210	50	1.76	28	30.8	90
3	315	50	1.32	18	19.8	98
4	420	50	1.76	14	15.4	101

6.5.7 It can be seen from the above that increasing the number of residents in a property reduces the amount of rainwater available per person based on a constant roof area.

6.5.8 For domestic dwellings, assuming a UK typical occupancy rate of 2.5 with an assumed average roof area of 25m3, a typical saving of 12.1 l/p/day would be expected.

6.5.9 Clearly, this figure is much less than the savings available with grey water recycling, but a rainwater harvesting system is more simple, cheaper and reliable.

6.5.10 For commercial properties, the savings made by rainwater harvesting are difficult to quantify due to the large variation of roof area and the number of occupants. As such, no indication of the potential savings has been made at this stage, however rainwater harvesting should be utilised within all commercial buildings where viable.

6.5.11 Table 6.5 below shows how the above variables have an impact on the availability. These WinDes calculation use an AAR of 550mm, a figure of 21. l/p/day, a runoff coefficient of 90% and a filter coefficient of 90%.

Table 6.5 Rainwater Collection Volume (Commercial Properties)

Number of Occupants	Total Consumption	Roof Area	Potable Water Saving Per Person	Consumption with Rainwater Recycling
	l/day	m^2	l/p/day	l/p/day
25	535	200	9.6	12
50	1,070	200	4.8	17
100	2,140	200	2.4	19
25	535	400	19.2	2
50	1,070	400	9.6	12
100	2,140	400	4.8	17

6.5.12 It can be seen from the above that increasing the number of occupants in a building, reduces the amount of rainwater available based on a constant roof area.

6.5.13 Dependant on the specific roof area and occupancy, rainwater harvesting within a commercial building does have the potential to provide more water than a grey water recycling system.

6.6 BLACK WATER RECYCLING

6.6.1 Anglian water are currently investigating with the Joint Promoters the practicalities and viabilities or undertaking a strategic blackwater recycling scheme, where the treated sewage effluent from Uttons Drove STW could be returned to the site for use in irrigation and even flushing of toilets.

6.6.2 In order to produce the water quality required for irrigation and WC flushing, additional treatment may be required during the treatment process. This could be completed at the Anglian Water STW or on-site.

6.6.3 This approach would ensure that the quality of water was to the correct standard and that they system could guarantee the saving in the long term. There are a number of technical, legal and public perceptions issues to be addressed and therefore, it is unlikely that this study will be available at the start of phase 1.

7 Preferred Strategy

7.1 SUMMARY

7.1.1 This report satisfies the AAP Policy NE/12 which requires a Water Conservation Strategy to be produced for all significant developments. The report sets out a Water Conservation Strategy for Phase 1 of the Northstowe development to achieve Code for Sustainable Homes level 4 rating and comply with local policy as detailed in this report.

7.2 DOMESTIC DWELLINGS

7.2.1 Domestic dwellings will aim to reduce demand by 33% or more. Based on a base demand of 150 l/p/day, this would equate to 99 l/p/day. This level can be achieved by using minimisation alone, however, where viable; rainwater harvesting should be considered.

7.2.2 Dwellings are to include a rainwater collection butt in the garden to reduce demand for external uses where viable. Doing so provides an additional non-mandatory credit under WAT2 which will help towards the overall level 4 rating.

7.2.3 The domestic grey water demand is 27.9 l/p/day, resulting in overall potable water demand of 70.5 l/p/day. However, grey water reuse within domestic dwellings may not be necessary in order to meet local policy requirements. Also, grey water reuse on a household scale may not be cost efficient or sustainable in the long term.

7.2.4 If required in the future, further water conservation saving could be achieved via rainwater harvesting or grey water recycling. It would be possible using grey water or a combination of rainwater harvesting and additional minimisation techniques to achieve a demand figure less than 80 l/p/day.

7.3 COMMERCIAL PROPERTIES

7.3.1 Commercial properties have a typical potable water use of 50 litres/person/day. By fitting water efficient fittings and appliances in commercial buildings, water consumption savings of 21.8 l/p/day can be made, reducing the demand by 56%

7.3.2 As such, commercial properties can provide in excess of the required 33% reduction through demand minimisation only. This would take the form of low flow taps, dual flush WCs and low flow/water free urinals.

7.3.3 Commercial properties can benefit from rainwater harvesting and grey water. Rainwater harvesting should be considered as a default case for all commercial buildings (in line with the District Design Guide SPD), however both systems will be considered on a case by case basis as the benefits of the rainwater harvesting system are not fully known at this stage. It is not possible to calculate the exact contribution of the system to the reduction of potable water use as the roof areas and occupation rates of the different development types are unknown at this point in time.

7.4 SCHOOLS

7.4.1 The primary school design will be the responsibility of Cambridgeshire County Council who will have their own water minimisation strategy. However, targets should be kept in line with minimum policy of a 33% reduction over typical school demand.

7.5 DRAINAGE

7.5.1 The on-site SUDS strategy (refer to separate Flood Risk Assessment and Drainage Strategy) will provide amenity benefit for the development while providing a level of on-site treatment of run-off. Furthermore, the strategy will reduce the risk of flooding on and off-site.

7.5.2 The SUDS will attenuate flows and promote infiltration where ground conditions allow, thus recharging the underlying aquifer and completing the natural water cycle.

7.6 CONCLUSION

7.6.1 A proposed water demand figure of 99 l/p/day, a level equivalent to 3 credits under Code for Sustainable Homes and 33% less than a typical demand of 150 l/p/day satisfies both the local policy and the mandatory elements under WAT1 of the Code for Sustainable Homes required for an overall Code level 4 rating. This will be achieved through a combination of demand minimisation and water reuse, satisfying AAP Policy NS/21. In addition, commercial buildings and schools will aim to reduce demand by a minimum of 33% over typical demand figures.

7.6.2 In order to satisfy the AAP Policy NS/23, aspirations for the development are to push for further reduction in potable water use beyond policy compliance through initiatives such as:

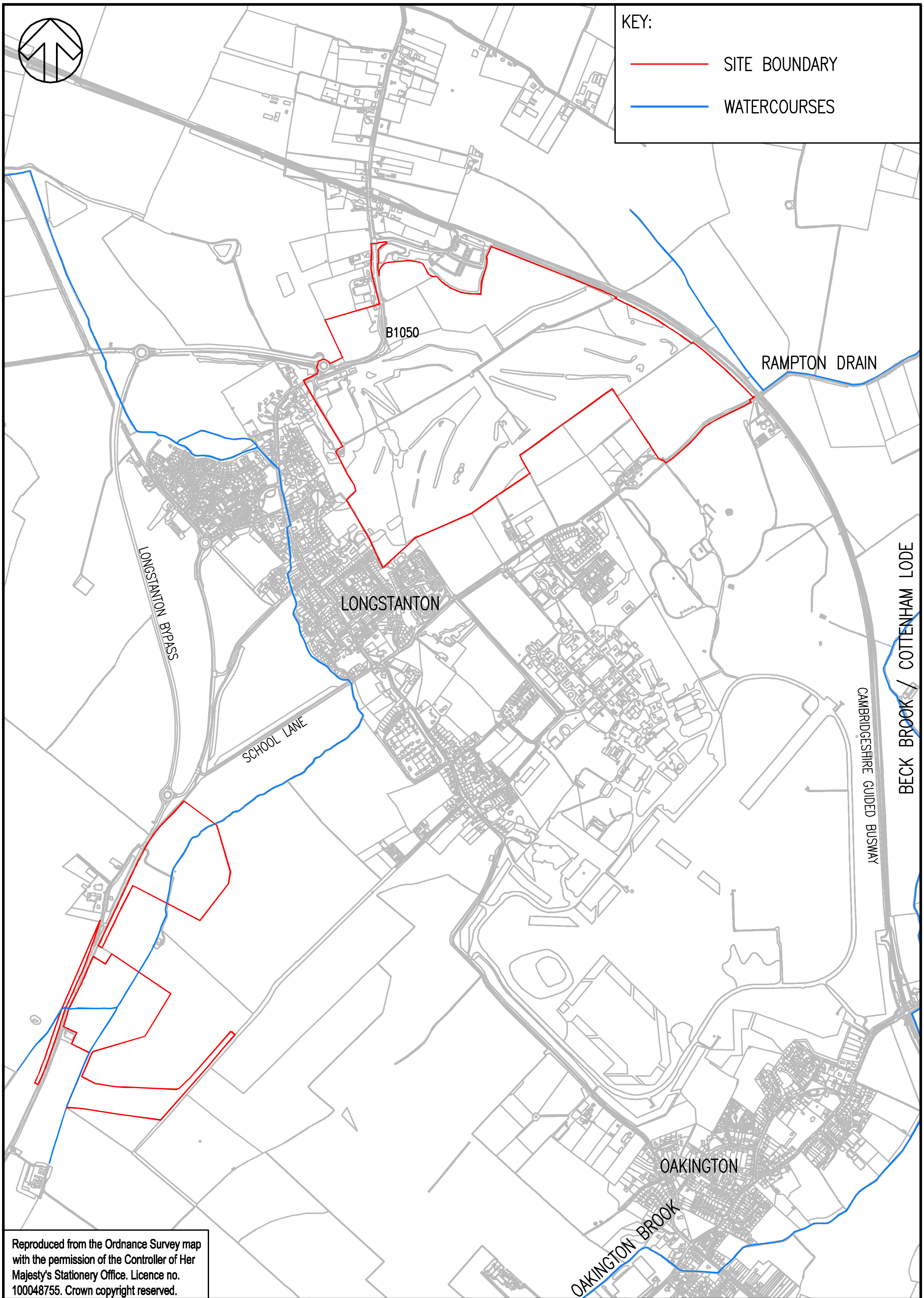
- Pilot projects designed to monitor, control and appraise emerging technologies such as rainwater harvesting and grey water systems
- Provide funding for local and regional projects to educate the end users about the importance of saving water and the benefits it can bring to the region
- Working with the water companies to reduce water demand throughout the region and building on the education of residents by encouraging the retrofitting of existing dwellings with water saving devices.
- The Northstowe development will aim to become an exemplar development with respect to water sustainability, from which future developments can learn from to further benefit water stress throughout the UK.

7.6.3 The SPD desired outcomes and principles are satisfied by reducing the potable water mains demand over the typical 150 l/p/day. This reduction is tackled by reducing the amount of water required through demand minimisation first. Further savings could then made by using rainwater harvesting and grey water recycling to reduce potable demand further.

Therefore the proposals comply with relevant policy objectives in relation to water conservation measures.

Appendices

Appendix A Site Location Plan



WSP

TITLE:

NORTHSTOWE PHASE 1
SITE LOCATION PLAN

FIGURE No:

PHASE 1, FIGURE 1

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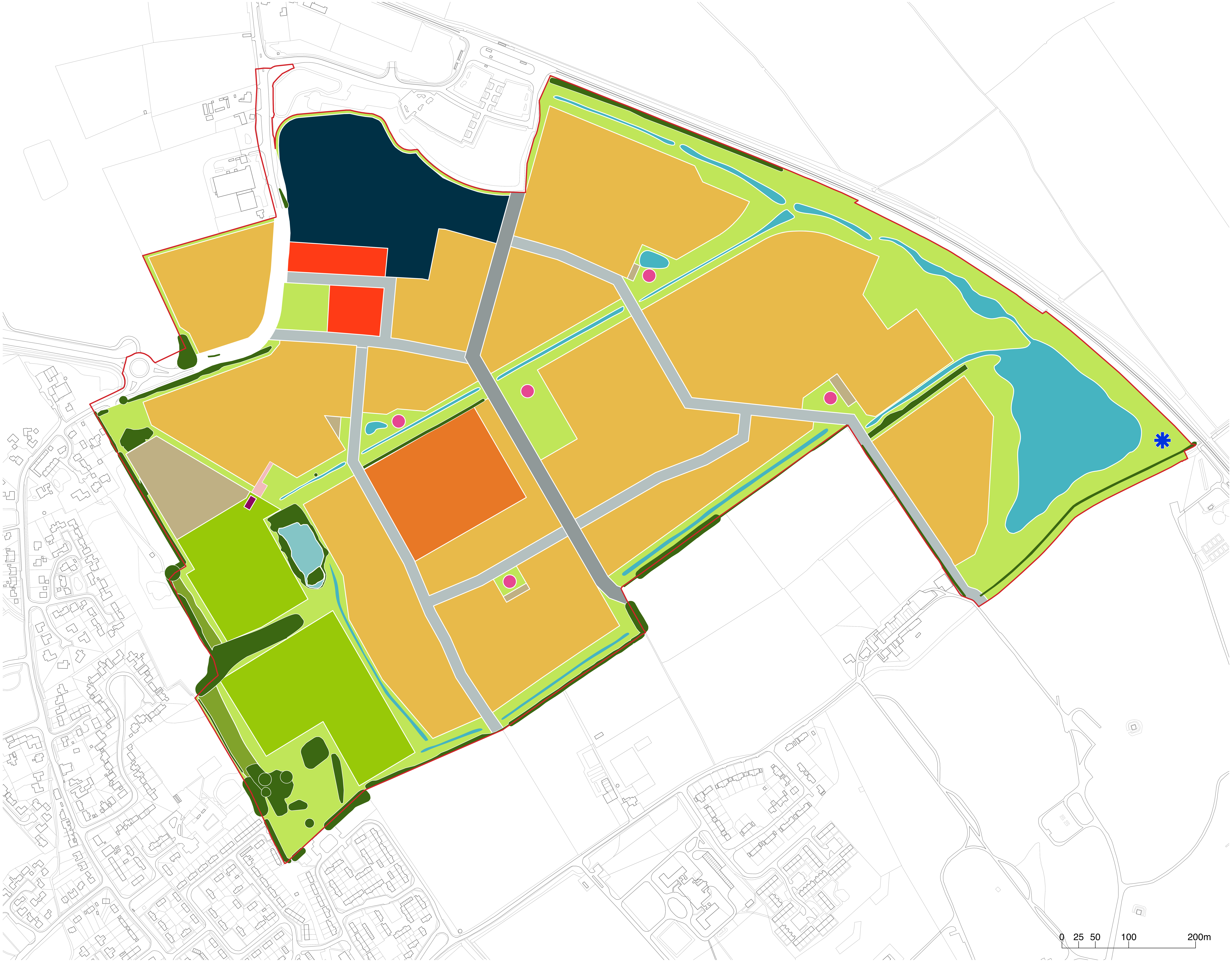
Appendix B Parameters Plan



Key

Planning application boundary

Proposed

- Residential
- Mixed use/Local centre
- Employment (including household recycling centre & foul water pumping station)
- Primary school/ community use
- Formal recreation/ sports pitches
- Informal open space, landscape & habitats
- Equipped areas of play (Neaps and Leaps)
- Allotments/ community gardens (incudes potential retained trees)
- Sports pavilion and associated parking
- CGB route
- Primary street
- Structural planting
- Balancing lakes & ditches/swales
- Surface water pumping station

Existing

- Tree groups to be retained (including canopy extent)
- Water bodies

Gallagher

Northstowe

Plan 1a
Parameters plan: Core area
Land use, open space & landscape

Final	*drawn by* SWD
Feb 2012	*checked by* RB
1:5000@A3	*revision*

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