Longcross Garden Village – Infrastructure and Viability Assessment

Final Report

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Quality information

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1. Introduction

1.1 Background

1.1.1 Longcross was designated a Garden Village at the start of 2017 along with 13 other proposed settlements granted this status by the Department for Communities and Local Government (DCLG).

1.1.2 This latest Garden Village initiative has developed from a renewed interest in the Garden City movement, as promoted by the Town and Country Planning Association (TCPA), and adopted into a Government programme through an Expression of Interest launched by DCLG in March 2016[1]. Proposed developments of between 1,500 and 10,000 homes were invited to apply for Garden Village status based on their ability to meet certain eligibility criteria. These requirements stipulated that a Garden Village be a free-standing settlement as opposed to an urban extension, and be Local Authority led. Other desirable criteria were set out including the ability to demonstrate viability and deliverability, the reuse of brownfield land, the provision of a high number of starter homes, a strong understanding of local infrastructure requirements, and innovation in housebuilding and delivery.

1.1.3 Successful applicants to the scheme were potentially able to access a limited amount of Central Government funding for administering delivery, as well as advice and guidance from the Homes and Communities Agency (HCA).

1.1.4 In Runnymede Borough Council's (RBC) application for Garden Village status[2] for the Longcross development, they expressed their aim for the development to align with the TCPA's nine guiding principles for Garden Cities, and include features supporting:

- Land value capture for the benefit of the community;
- Strong vision, leadership and community engagement;
- Community ownership of land and long-term stewardship of assets;
- Mixed-tenure homes and housing types that are genuinely affordable;
- A wide range of local jobs in the Garden City within easy commuting distance of homes;
- Beautifully and imaginatively designed homes with gardens, combining the best of town and country to create healthy communities, and including opportunities to grow food;
- Development that enhances the natural environment, providing a comprehensive green infrastructure network and net biodiversity gains, and

[1] DCLG, March 2016 , Locally-Led Garden Villages, Towns and Cities, https://www.gov.uk/government/publications/locally-led-garden-villages-towns-and-cities
[2] RBC, July 2016, Longcross Garden Village, Expression of Interest Bid Document, https://www.runnymede.gov.uk/CHttpHandler.ashx?id=16097&p=0

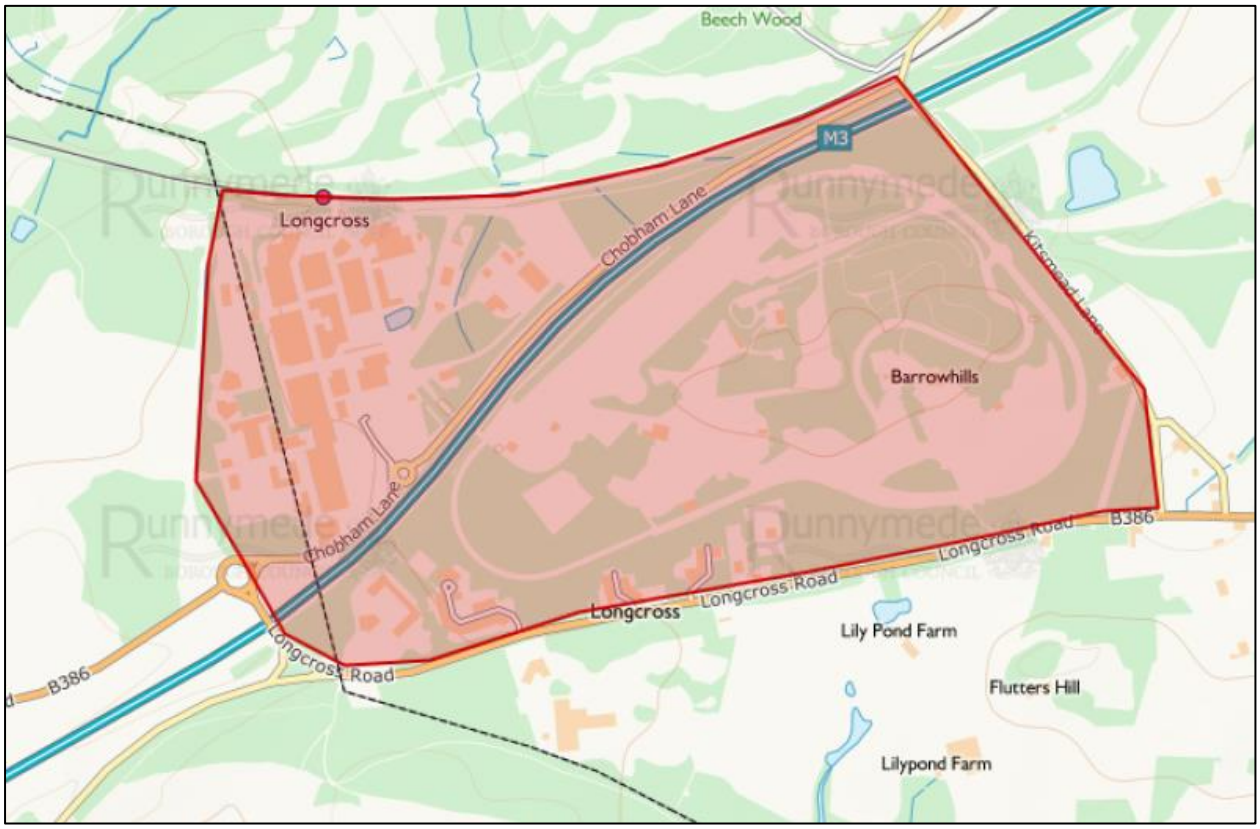
that uses zero-carbon and energy-positive technology to ensure climate resilience;

- Strong cultural, recreational and shopping facilities in walkable, vibrant, sociable neighbourhoods;
- Integrated and accessible transport systems, with walking, cycling and public transport designed to be the most attractive forms of local transport.

1.1.5 The vision statement for the Longcross Village project is as follows:

1.1.6 ‘To deliver an exemplar development which fully encompasses garden village principles, creates a sustainable mixed use community with a wide variety of housing types and where residents will be able to access on-site services and facilities to fulfil many of their daily needs. […] The new and existing community of Longcross will be supported by a range of infrastructure with opportunities for community ownership and long-term stewardship of assets. […] The village will be well connected to other centres and served by a range of sustainable and active transport choices.’

1.2 The development site



1.2.1 Longcross is situated in North West Surrey, and west of the three main RBC towns of Egham, Chertsey and Addlestone, and forms part of the border between RBC and Surrey Heath, immediately to the west. For much of its history, Longcross was a military vehicle testing site for the former Defence Evaluation Research Agency (DERA) (and its predecessors), although most recently it has been used as a film studio.

1.2.2 The site is split into two areas, North and South Longcross, separated by the M3 Motorway. The north site covers 40.5ha and is masterplanned for approximately 200 homes and 79,000 sq.m of employment space plus a 36,000sq.m data centre. Planning permission was granted in 2011 for the first phase of about 120 of the 200 homes, the construction of which has already begun. This initial phase of the development began prior to Longcross's designation as a Garden Village. Applications for the second phase have now been received for 90 homes, 16,765sq.m of B1a office floorspace and a focal building of 1,265sq.m comprising a mix of A1-A5, B1, D1 & D2 uses.

1.2.3 The larger, southern section of the site (82.5ha adjacent to the M3 motorway) has currently been masterplanned to the level of a development framework, which the developer published in 2012 (also prior to Garden Village designation). Proposals are set out for 1,500 further homes on this part of the site, in addition to a small village centre with some space for commercial and community activity. The north and south sites will be linked over the motorway via two pedestrian-vehicle bridges.

1.2.4 The site is located next to the Thames Basin Heaths Special Protection Area and, in line with Natural England recommendations, an additional site – immediately adjacent to the Trumps Farm - has been identified to provide 31ha of Suitable Alternative Natural Greenspace (SANG) immediately outside of the Garden Village's eastern boundary, as well as 2.67ha of SANG within the development along the eastern fringe of the northern site and a further 6ha within the southern site, amounting to around 39.7ha of SANG in total. The 2.67ha SANG on the northern site has been implemented and phase 1 of the 31ha SANG at Trumps Farm (5.1ha) has also been completed.

1.2.5 AECOM has been commissioned by RBC to undertake a high level assessment of the viability of bringing forward infrastructure at Longcross in line with Garden Village principles.

1.2.6 RBC asked AECOM to focus its analysis on the key Garden City principles already outlined, with some modifications to tailor them to Longcross and take into account the goals and aspirations of RBC as well as the local context. These modified principles, along with the broad approach used for this commission, are presented in the next Chapter.

2. Scope and Approach

2.1 Selected Garden City principles

2.1.1 This report focuses on the following Garden City principles identified as most relevant to the Longcross development by the client:

- Land value capture for the benefit of the community
- Community ownership of land and long-term stewardship of assets
- Local food production
- Support carbon neutral energy
- Enhanced biodiversity
- Integrated, accessible and sustainable mobility
- Viability and housing overview

2.2 Approach

2.2.1 AECOM setup separate internal workstreams to assess each of the Garden City principles listed above within the specific context of development at Longcross. Each of these workstreams studied the existing Longcross development framework and additional information already available related to the site. For each of the principles, the workstreams assessed best practice case studies from around the UK and determined how applicable these might be at Longcross.

2.2.2 The scope of each workstream is described below:

- Land value capture for the benefit of the community: workstream to identify and assess potentially relevant options and review their applicability to Longcross taking into account likely infrastructure requirements.
- Community ownership of land and long-term stewardship of assets: workstream to review the development framework and other available public documents and identify potential opportunities for community owned assets, drawing on best practice analysis of TCPA guidance.
- Local food production: workstream to estimate land requirements for local food production, as well as develop best practice examples of mechanisms for securing land, community ownership, and long term local stewardship of gardens and allotments.
- Support carbon neutral energy: workstream to estimate energy demands at the site and test high level assumptions for energy generation from various local, sustainable sources.
- Enhanced biodiversity: workstream to understand the fit of the Development Framework with the specific local Biodiversity Opportunity Area, incorporating biodiversity within the site
- Integrated, accessible and sustainable mobility: workstream to conduct a detailed review of site accessibility for all modes, develop demand analysis

and mode share targets, and review best practice principles for encouraging public and active transport solutions. This workstream also provides a high level assessment of the viability and feasibility of a junction with the M3.

- Viability overview and mixed tenure homes: a key component of the project was to provide an understanding of how any additional requirements for Garden Village 'infrastructure' might impact upon the development's viability. For example, any negative impacts on viability would be principally those that would raise the cost of infrastructure requirements, or those that would involve significant additional land-take, which would reduce potential revenue from the site. Positive impacts on viability would be those that might raise land value by improving the amenity value of the site, or any infrastructure which could generate self-sustaining revenue of its own. Therefore for this workstream, AECOM created a high level, viability dashboard which assessed the likely viability of the project given variations in housing mix, local knowledge of land and house values, and likely estimated unit and infrastructure costs.

3. Land Value Capture and Funding Infrastructure

3.1 Introduction

3.1.1 This section considers the site and its infrastructure needs arising from current development potential and the likely programme, to start to identify the nature, scale and cost of infrastructure required. Land value capture is a key garden village principle in that it is a part of the ethos of ensuring that development value is retained within the community. To the extent that land value capture is intertwined with the funding of infrastructure which produces land value uplift, this section studies how mechanisms for funding infrastructure requirements could enable land value capture.

3.1.2 An initial review of funding sources is provided together with suggested areas for further work. Funding options are reviewed in light of their ability to capture value from the infrastructure investments which they are supporting.

3.1.3 These findings are based on AECOM's current understanding of the proposed developments and any advice should be considered high level and requiring more detailed investigation in due course.

3.1.4 The two distinct North and South parcels of land referenced in the introduction are owned in the main by a Crest Nicholson / Aviva partnership, as well as the Trumps Farm SANG site, with Longcross Barracks in separate ownership. A site in single or limited ownerships provides pros and cons for land value capture. Principally, value capture is simplified in that there is not the requirement to deal with multiple land owners, although land value capture must necessarily be indirect via contributions or in-kind provisions.

3.2 Overview of identified infrastructure requirements and costs

Northern Longcross – Enterprise Zone and Residential

3.2.1 The current hybrid consent at the north site is for up to:

- 79,000sq.m of B1 office (Gross Internal Area - GIA) (including 1,850 sq.m of business incubation-start up space)
- 36,000sq.m of sui generis data centres use (GIA)
- 1,550 sq.m retail and food (A1 – A5) (GIA)
- 200 residential dwellings – 108 under construction with a reserved matters application for 90 units for phase 2 under consideration (within the rest of the north site)
- 600 sq.m D1 uses (eg. childcare facilities) (GIA)
- 1,900 sq.m D2 uses health and leisure (GIA)

- Publically accessible open space, play areas.

3.2.2 An 18.75 ha site with Enterprise Zone (EZ) status sits within the overall 40.5ha northern site and is planned to accommodate largely commercial uses. This EZ is one of three that make up the overall EZ provision within the geographical remit of the Enterprise M3 Local Enterprise Partnership (LEP). Compared to the other two EM3 EZ sites in Basingstoke and Whitehill and Bordon going forward the infrastructure investment costs are understood to be higher at Longcross.

3.2.3 There are currently 64 buildings on the future EZ site, mainly industrial and on short term licences including, as mentioned above, some film making activity (Longcross Studios). The development plan would involve the sequential demolition of these buildings taking care to preserve jobs and business rate receipts as effectively as possible. There are potentially some abnormal demolition costs due to concrete structure and asbestos. Significantly, a major constraint at the site is a lack of electricity capacity which means that only the first 9,300 sq.m of new development could proceed without a new substation upgrade.

3.2.4 Regarding infrastructure requirements, a S106 agreement of £8.97m specifically for the north site has already been agreed comprising:

- £0.88 million for bus improvements
- £0.75 million for train station upgrades
- £0.70 million for train service improvements
- £0.15 million for Runnymede Travel Initiative (School Buses)
- £2.50 million for offsite highways (site entrance) development
- £1.60 million for education provision
- £2.00 million for Suitable Alternative Natural Greenspace (SANG)
- £0.27 million SANG maintenance contribution
- £0.12 million Strategic Access Management and Maintenance (SAMM)

3.2.5 Whilst on the surface this provides a potentially scalable amount of S106 infrastructure costs for the rest of the development site, it is important to note that this part of the development has been planned and commenced before the granting of Garden Village status. The remainder of the development would be expected to contain further investment in Garden Village principles.

Southern Longcross - Residential

3.2.6 Some 1,500 additional homes are planned for the southern parcel of land. The initial assessment undertaken for the southern part of Longcross in the Infrastructure Needs Assessment (INA) (April 2017) identified **£16.0 million** of infrastructure investments.

3.2.7 However, the education investment set out in the INA should have been based on the costs of providing a new 2FE Primary School on site rather than the cost of providing for a number of school places as forecast. As such, investment in the area is actually £22.7 million, broken down as:

- Up to £15 million for education comprising:
  - 2 FE Primary School new building excluding land: £7.1 million[3]
  - Cost (financial contribution) of building school facility for 299 secondary school pupils excluding land: £7.9 million[4]
- Health Centre (3 GPs): £1.3 million[5]
- Other social infrastructure as identified in the INA: £2.7 million
- Green infrastructure £3.5 m (42.5ha SANG) + £0.2m allotments

Note that this excludes investments required for local and strategic transport, water, energy and waste, although cost estimates for these items are included in the cost estimates for the developer in Section 9 of the report, based on AECOM knowledge of average developer-infrastructure costs per dwelling.

Total Infrastructure Costs

3.2.8 Initial high level estimation for the total infrastructure requirements across the northern and southern sites is presented below.

Total high level infrastructure cost breakdown

Item	Cost	Basis

[3] Source AECOM estimate. 2 FE Primary estimated as 30 x 2 x 7 x £17,024 = £7,150,000 excluding land.
[4] Source AECOM estimate. 1,500 units x 0.21 yield x 0.95 x £26,386 = £7,889,324 excluding land
[5] Source AECOM estimate. 165 sq.m/GP x 3 x £2,500/sq.m = £1,237,500 excluding land.

Item	Cost	Basis
Initial infrastructure for Longcross Park (northern site)	£8.97 million	Agreed S106
INA and other costs for Southern Longcross	£22.7 million	AECOM INA
Additional infrastructure to bring forward full build out of EZ over 20 years approximately up to million to cover electricity sub-station, 5G investments and other building specific investments.	c£30 million	Discussions with RBC and AECOM analysis
Additional costs for Southern Longcross to achieve garden village principles	c£40m	High level estimate based on case study analysis

Total = c £101.7 million

3.3 Overview of financing options

3.3.1 The most relevant options for funding housing and infrastructure investments on large sites such as Longcross can be grouped into a number of headings:

- Land value capture comprising:
  - planning gain (Section 106, Community Infrastructure Levy (CIL) and a Milton Keynes style roof tariff/tax though CIL is now the mechanism for pooled receipts),
  - betterment (from business rates including Tax Incremental Finance (TIF)) approaches, levying of business rate supplements and other CILs from Mayors or Combined Authorities) or
  - proceeds from direct development;
- Direct Government funding including infrastructure grant funding (e.g. £2.3 bn Housing Infrastructure Fund, Starter Homes Fund, etc.), capital for financial transactions and Local Authority prudential borrowing;

- Government guarantees;
- Private finance including development finance, long term institutional finance and registered provider funding; and
- Potential use of Development Rights Auctions Model (DRAM) currently being trialled by Transport for London (TfL) / Greater London Authority (GLA) / DCLG.

3.3.2 The table below lists the funding options available in more detail, summarising their key features, strengths and weaknesses as well as maturity.

S106 and CIL

"CIL differs fundamentally from S106 in that the funds collected are not tied to a specific development or the provision of specific infrastructure. Unlike infrastructure provided through S106 planning obligations, which must be necessary to mitigate the impact of a particular development and used only for that specific purpose, CIL funds can be used flexibly by the LPA to fund any infrastructure as defined within the regulations. They can be pooled freely (unlike S106) to fund infrastructure priorities and collectively between authorities towards larger strategic investments. They should be seen as a contribution to assisting with the provision of overall infrastructure priorities which may well change over time."

"Authorities will want to pay particular attention to how they deal with large strategic sites. These can have major and expensive infrastructure demands which need to be delivered early to enable development to proceed. Where this is the case (and the statutory tests can be met) it is more likely that S106 obligations will be the appropriate delivery mechanism, and care needs to be taken that the R123 list is prepared accordingly and that the CIL rates take account of the likely S106 costs."
POS Advice Note, Feb 2015 - Section 106 Obligations and the Community Infrastructure Levy

Selected Funding Options at Longcross

	Description			Project types	Maturity
Section 106 Agreements	Developer contribution. They are focused on site specific mitigation of the impact of development. Linked to viability and value of land.	Can be pooled (up to 5 obligations per infrastructure project) Well developed Necessary to make the development acceptable in planning terms Directly related to the development	One off payment Has to be linked to development so can be narrow resulting in "S106 islands" Fairly and reasonably related in scale and kind to the development.	Any but typically affordable housing, transport , community infrastructure	Mature
Section 278 Agreements	Developer contribution. Developer funded improvement works to the existing highway where highway objections to proposals can be overcome by improvements to the existing highway	Developer payment for specific transport improvements	S278 funds are exempt from CIL pooling restrictions. One off payment	Highways improvements	Mature
Community Infrastructure Levy (CIL)	Developer contribution. Since April 2010 CIL has been a fixed tariff based levy directed at new development to fund infrastructure. Levy rates are set by individual local authorities and may vary across each LPA and are subject to consultation with local communities and developers.	Provides greater certainty for both developers and LPAs	CIL may not be in place. One off payment based on net additional floorspace	Any but typically, transport and community infrastructure	More common
Strategic Land and Infrastructure	Developer contribution. Contributions at a set rate per house or square metre of	Focus on strategic elements rather than local Can work across multiple	Requires upfront work and strong leadership to set and agree strategic	More strategic so tend to be roads and utilities.	Milton Keynes Tariff, agreed in 2004, was

	Description	👍	👎	Project types	Maturity
Contracts	commercial floorspace in exchange for agreement on strategic infrastructure investments across the whole site.	sites and ownerships	priorities. Can require large upfront investment.		essentially a SLIC. Pooled S106 not possible now.
Prudential borrowing	Loans at low rates from the Public Works Loan Board (PWLB) under prudential principles.	Low rates Reliable Prudential approach determined by local authorities	Availability of revenue funding to repay the loan Political appetite for borrowing	Any	Mature
Local authority bonds	A fixed- interest bond, repayable on a specific date, used by a local authority in order to raise a loan and similar to a Treasury bond. Could be used as part of a TIF scheme (see below).	Reliable Stable repayment amounts over time	Ability to repay the loan	Any	Re-emerging, with the implementation of a UK Municipal Bonds Agency
Business Rates Retention (BRR)	Local authorities can retain a proportion of business rates revenue as well as growth on the revenue that is generated. The scheme could be used to meet the cost of infrastructure as and when the revenue is received, or it could be used to raise finance to meet up-front infrastructure costs.	No cost to the local authority Potential track record with Enterprise Zones Potential long term revenue stream	Use of funds from BRR for infrastructure must be weighed against other local authority needs Allocation issues if cross-boundary receipt.	Any	Emerging
Tax increment financing (TIF)	Enables local authorities to borrow against the value of the future uplift in volume of local rate receipts in order to deliver the necessary infrastructure (usually based on BRR)	Prudential system	Ability to repay dependent on achievement of predicted growth in value	Sites / areas where substantial business rate growth is a realistic prospect.	Emerging

	Description	👍	👎	Project types	Maturity
Local asset backed vehicle	Local Asset-Backed Vehicles (LABVs) allow local authorities to use their assets (usually land) to lever long-term investment from the private sector for regeneration projects.	Unlocking value from previously undeveloped / unused local assets. Brings in funding and expertise from private sector to develop the asset.	Need to secure political buy-in. Difficulty and cost of implementation: working across a range of partners; managing risks; stakeholder engagement; operation costs; procurement and legal requirements.	Contaminated or under-developed urban areas; housing projects.	Developing
Strategic Asset Management	Maximising the contribution of local authority assets as sources of long-term funding through a combination of: refurbishing and repurposing buildings in order to make better use out of them and ready them for sale; selling off to generate receipts, or to remove liabilities and reduce costs; acquiring new assets to meet local council or civic needs, to deliver where the market cannot or to grow the investment portfolio.	Limited costs Maximises value of local authority assets Facilities working across the public sector locally Some dedicated funds to support (e.g. Open Public Estate)	Difficulty in aligning objectives of different public sector owners Need to adopt an entrepreneurial approach, working to commercial timescales and accepting risk Tensions and trade-offs between short-term financial gain and long-term economic growth benefit	Revenue from SAM can be used for any purpose	Mature
European Funding	A range of EU funds are accessible to local authorities in the forms of loans, grants or equity funding. The main source is the 'EU Structural Investment Funds (ESIF) Growth Programme' made available to Local Enterprise	Provides additional source of funding to national / local streams. This is one of the criteria for eligibility.	Requires match-funding There may not be a pipeline of projects ready to apply for funding The quality of proposals may not be sufficiently high.	Projects meeting eligibility criteria e.g. for ERDF, projects relating to Innovation, ICT, SME competitiveness, Low Carbon,	Mature

	Description	👍	👎	Project types	Maturity
	Partnerships. Discounted borrowing through EIB for major schemes (e.g. light rail) is also available		Uncertainty of the impact of Brexit on UK access to EU funds beyond 2020.	Climate Change Adaptation, Environmental Protection, and Sustainable Transport.	
Local Infrastructure Fund	The fund offers repayable finance for upfront infrastructure investment and other site preparation works that will support economic growth, jobs and homes.	Additional funding for site-based development	Limited life cycle and strict eligibility criteria	Any	Mature
New Homes Bonus	The New Homes Bonus is a grant paid by central government to local councils to reflect and incentivise housing growth in their areas. It is based on central government match funding the Council Tax raised for new homes and properties brought back into use, with an additional amount for affordable homes, for the following six years. To be reduced to 5 years 2017/18 and 4 years 2018/19	Clear financial incentive for local authorities to permit new housing Bonus is relatively easy to calculate	Limited impact on planning applications and decisions Uncertainty about the long-term future of the policy	Local councils can decide how to spend the NHB.	Mature
Private Finance Initiative (PFI)	Under a PFI, the private sector will typically design, build, finance and maintain infrastructure facilities under a long-term contract. The public sector body which uses the	Enables a local authority to embark on large capital projects with little upfront commitment of resources	Higher costs and risks than conventional funding Business case for PFI can be weak Local authority's ability	Generally linked to buildings (e.g. schools, hospitals)	Mature

	Description	👍	👎	Project types	Maturity
	infrastructure repays the debt over a long period, often 25-30 years.		to manage risk and achieve appropriate contract		
Local Government Pension Funds	The Local Government Pension Scheme (LGPS) is a funded, statutory, public service pension scheme. The LGPS may be able to invest part of its fund in supporting the development of local communities across the UK.	Source of investment with a long-term view and interest in the UK infrastructure market.	Scope for involvement of LGPS currently evolving	Any	Emerging
Institutional investors	Sovereign wealth funds and pension funds show a growing interest in the UK infrastructure market as a place to invest.	Large operators with long-term view of investment.	Likely limited potential as infrastructure debt competes for attention with other asset classes Has to perform against other competing asset classes on risk / reward basis	Any	Emerging
Crowd funding	Funding a project or venture by raising monetary contributions from a large number of people, typically via the internet.	Direct link with local population and their need Ability to address gaps in funding for small projects which contribute to well-being and sense of place Dynamic and grass-rooted	Small scale funding	Small projects (e.g. community gardens)	Emerging

3.3.3 AECOM's advice at this stage would be to focus on the more tried and tested options given the risks and transaction costs of new financial models. These are:

- **S106 / S278 developer contributions** to part fund upfront site specific and transport investments. A S106 agreement of £8.97 million has been enacted on the northern site.

- **CIL contributions** (once a charging regime for Runnymede is in place) to part fund upfront specific investments. AECOM estimate that CIL receipts for 1,500 homes on the site could be worth up to £30.6 million[6].

- **SLIC agreements** for more strategic investments. The key feature of a SLIC is that it builds developer certainty by enabling the early delivery of infrastructure; it operates in a similar way to CIL in that it is a strategic planning obligation, although it goes beyond what CIL can offer. This reflects the fact, in the words of Paper 13, that a CIL agreement is 'unlikely, on its own, to build sufficient resources or any real sense of confidence that infrastructure will be developed on a particular site in a timely way'. The way in which a SLIC operates is that an urban development corporation, LEP or other strategic delivery entity negotiates with landowners and developers, central government (DCLG, the Treasury or both) and local government (District and County council) to deliver infrastructure funds early (through mechanisms such as commitments like match funding), thus building a virtuous circle of confidence among private sector developers. As such, a SLIC tends to be most useful in locations with multiple private sector landowners, all of whom need to be convinced that there is a strong strategic vision for development before they invest. Given this, a SLIC may not be as applicable to the Longcross circumstances, where a majority of the land is already in Crest's control.

- **Borrowing from the Public Works Loan Board (PWLB) / UK Debt Management Office** (DMO) to fill the upfront funding gap by RBC and / or Surrey County Council. By way of example, borrowing £100 million from the DMO currently would have annual repayment and interest charges of around £5.4 million per annum over 25 years and £3.7 million per annum over 50 years[7]. Runnymede BC has a track record of borrowing from PWLB[8] and commercially if a business case can be made to support revenue generating developments (e.g. developments in Addlestone and Egham).

- **Ongoing business rate retention from the EZ** to payback PWLB / DMO principal and capital in a Tax Incremental Finance model dependent on the agreed split of receipts. It has been estimated that there could be a surplus of approximately £110 million (undiscounted), or £14m (net present value) after 25

[6] Assuming a house size of 120 sq.m, 85% gross to netand a levy of £200/sq.m ~ £20,400/dwelling. In 2004 the Milton Keynes roof tax was levied at £18,500 per property.
[7] £100m PWLB (DMO) (as at 19 July 2017). 25Y @ 2.59% = Repayments of principal and capital of c.£5.4m/annum. Total costs c.£137m. 50Y @ 2.89% = Repayments of principal and capital of c.£3.7m/annum. Total costs c.£190m.
[8] RBC borrowed £75 million to finance a brownfield mixed use development in Addlestone which includes 200 homes, retail, hotel and leisure elements.

years but this would be relatively "back ended" in terms of cash receipt profile[9]. See below in Box 2 for further discussion.

- Potential for a **community owned Energy Services Company** (ESCO) or Local Energy Services firm to support the residential development and EZ given the energy demand, possibly as part of a Combined Heat and Power scheme for the Garden Village linked to the sub-station investment. Runnymede has some experience of a CHP scheme in their area.

- **Discretionary bids to EM3 LEP** for road access improvements to unlock significant additional growth potential. In the past the LEP has made interest free loans to Runnymede BC (e.g. £3 million for roadways).

- **Any other receipts and revenues achievable by Runnymede BC** (e.g. land and assets sales). The Borough Council has established three wholly owned companies to manage flat leases, as a service company and for a CHP scheme.

- **Ongoing council tax receipts** to fund local service provision. Across the site, 1,500 homes should yield around £2.6 million per annum[10]. With a cap on Council Tax increases of 2% the maximum this would raise is estimated at £600k a year.

Enterprise Zone Business Rate Receipts from Longcross

3.3.4 Current Government Policy is that 100% of business rates (NNDR) can be retained locally by the "end of this Parliament" subject to top-ups, tariffs and re-basing. After investment, LEPs and Local Authorities can retain the full increase in revenue from additional business rates. For non-EZ areas this is limited to an amount above the re-basing which occurs on a five yearly basis.

3.3.5 For an EZ area such as Longcross this would be 100% of the growth receipts after the five year rate free period ends and for up to 25 years to 2042. Currently this Business Rate Income Growth (BRIG) is notionally split 50:50 between EM3 LEP and Runnymede BC/Surrey CC. Initial financial modelling has been undertaken using estimated investment costs against forecasted income.

3.3.6 More detailed work is required to model the potential business rate receipts against revised investment costs as bids come forward to the EM3 LEP.

[9] Rateable Value (open market rental value 1 April 2015) x multiplier (standard 2017 = 47.9 pence) = £30psf x 80% assume (GEA) x 850,000 sqft x 0.479 x 50% for Runnymede share = £4.9m/annum when full x 20 years (5 years zero) ~ £100 million (undiscounted) – See amendment to e) above.

[10] Assuming Band D rate of £1,710 per house per annum.

Case Study 1: The Milton Keynes Tariff.

The Milton Keynes tariff was first introduced in 2004. The tariff comprised a Strategic Land and Infrastructure Contract (SLIC) whereby S106 contributions were standardised into a per dwelling and commercial hectare tariff. This allowed Milton Keynes to capture a proportion of the land value in a simplified manner, reducing potential negotiation delays. These contributions could also be provided 'in kind' with developers constructing key pieces of infrastructure in lieu of monetary payments. The phasing of the payment structure allowed for developers to pay 25% of their contribution upfront, with the remainder paid upon completion of each dwelling. This had the simultaneous effect of reducing the level of pre-construction cost and increasing the certainty of development finances; preventing unnecessary delays to delivery. This forward funding of infrastructure was made possible through loans via the HCA against the value of the remaining 75% of development receipts. The implementation of a tariff based system demonstrated the clear ambition and development support from within the Local Planning Authority. Although one factor amongst many, the Milton Keynes tariff contributed to a rate of delivery over 235% the background rate in Milton Keynes.

Lessons learnt:

- Allowed for simplified land value capture through reducing negotiation delays.
- Contributed to significant rate of delivery.
- Milton Keynes tariff has since been withdrawn due to pooling restrictions on S106 contributions implemented as part of CIL framework.

3.3.7 The long term Enterprise Zone receipts can be central to financing the additional infrastructure requirements. It is therefore important to try to accelerate the full build out of the EZ. As well as close working with the LEP (and its accountable body, Hampshire County Council), this requires an early agreement on a potential split in receipts – building on the Memorandum of Understanding - between EM3 LEP and RBC to allow a more detailed financial modelling.

3.3.8 There is a need to seek clarity from Central Government on the future plans for the localisation of all Business Rates. Currently Runnymede collects £54 million in Business Rates but retains only £2.3 million.

3.3.9 Prioritise and sequence infrastructure investments to examine financing options in more detail. Explore long term revenue generating potential from investments by the public sector.

3.3.10 Estimate likely receipts form developers, working closely with RBC planning department.

3.3.11 Any local road projects would need to be discussed and agreed with Surrey County Council and their Local Transport Plan and investment schedule.

3.3.12 LEP's have Local Growth Fund (LGF) monies which can be used to fund transport schemes on a competitive basis. However, LGF is coming to the end and more funds will be aligned with the Productivity Fund to support the UK's Industrial Strategy.

3.3.13 Any strategic road options need to be discussed with Highways England and consideration taken of their inclusion in the relevant Road Investment Strategy (RIS).

3.3.14 Any rail investments at Longcross station or elsewhere would need to be discussed with Network Rail and consideration taken of their inclusion in the relevant Route Utilisation Strategy (RUS) operating over five year Control Periods. Service levels would have to be agreed with the new Train Operating Companies for the South West franchise: First Group and Hong Kong-based MTR take over the franchise on 20 August 2017 and will run it for seven years to 2024.

4. Community Ownership

4.1 Introduction

4.1.1 This section sets out recommendations for potential community ownership options at Longcross and highlights best practice examples of community ownership schemes from elsewhere in the UK.

4.2 Key features of community ownership

4.2.1 There is no one model of community ownership and the assets that are in community ownership across different schemes can vary substantially. A key component of community ownership is how assets are funded and financed. Many forms of community ownership might require initial grant or charitable investment, such as the food production case studies outlined in section 4.3, although some of these will be able to recoup a proportion of initial investment via income generating activities. Other forms of community ownership, such as some of the Energy Services Companies (ESCos), also included in the case studies, have the potential to be entirely self-sufficient, and in some cases net positive from a financial perspective.

4.2.2 A second key component of community ownership is that participation and management is open and democratic. Given that many organisational models for community owned schemes do not have legal status – and may not want it – a key role for the Local Authority can be to help regulate the governance of such schemes to ensure that they are operating towards stable and inclusive arrangements.

4.3 Community ownership examples

4.3.1 The following case studies have been chosen due to their relevance and applicability to Longcross. In particular, they do not require significant amount of land take, can potentially be financially self-sustaining, and fit in with the variety of assets and services already being proposed through the Development Framework. Models of community ownership that involve significant amounts of land in public or community ownership, such as community owned housing schemes, were not considered at a large scale due to viability constraints from having a single or limited number of landowners at the site.

Case Study 2: Park Trust, Milton Keynes

The public parks in Milton Keynes are owned by a community-owned trust rather than the Local Authority itself. Public ownership of park assets extends from open green spaces to charged spaces such as sports pitches and courts. The trust generates income from these assets as well as from activities and events held within its park estate, such as sporting and cultural activities and events, in order to fund and finance the maintenance and upkeep of the parks.

Community ownership of the parks helps to drive strong volunteer participation in the management and improvement of park spaces, and community involvement in caring for the parks is embedded in the ethos of the structure and arrangement. Educational activities and schools engagement is also a significant focus of the local outreach of the Parks Trust.

The Trust is managed by a board of volunteer trustees who are nominated and appointed, although all local residents are able to apply to join the board. This model of governance helps to ensure that the parks are run in the interests of the local community by those best placed to represent it, and that any member of the local community can aspire to manage it.

This structure could be employed at a small scale at Longcross as an alternative to Local Authority ownership of local green space. Given the limited amount of public green space at Longcross, and the relatively small population of the eventual community, Local Authority leadership and funding will likely be required, at least in the establishment of any community ownership initiatives.

The development framework has identified sites for two village green or plaza areas – one at the 'Heart of Longcross' proposed residential and retail area in the southern site on the main north-south route, and a second near the Barrow hills historic assets -, as well as additional small woodland areas. The two SANG areas provide the largest amount of green space, and the north eastern part of the site is set aside for ecological consideration of local biodiversity. There is potential for community involvement in education and conservation opportunities available at these sites.

Lessons learnt:

- Self-sufficient method of funding maintenance and upkeep of parks.
- Increases local participation.

Case Study 3: Letchworth Garden City Heritage Foundation

The Letchworth Garden City Heritage Foundation directly owns and manages a sizeable portfolio of commercial space within Letchworth, from which it generates significant income for reinvestment into the Garden City. The Foundation runs many additional volunteer organisations that manage a range of schemes and activities throughout the City, such as developing and maintaining public squares and gardens, and providing services to elderly and disadvantaged residents.

Although the Letchworth Heritage Foundation operates at a large scale, it could provide inspiration for a much more limited operation at Longcross. The Heritage Foundation was initiated by the handing over of originally Local Authority owned assets to the Foundation. A purchase and sale of a handful of sites for community ownership, such as a small amount of office, commercial or retail space, could provide a non-for-profit source of community income. The Letchworth Foundation is run by a partially locally elected board of governors, which is a replicable model for ensuring transparency and local participation in the operation and management of community commercial assets.

Lessons learnt:

- Demonstrates that community run facilities can generate significant income.
- Can be used to assist disadvantaged groups of society.

Case Study 4 Woking Thameswey

In 1999, Woking Borough Council setup an ESCo to deliver a combined heat and power district energy offering via a local, private network. An ESCo is a company that is formed to provide localised energy services within a community.

The company, Thameswey Energy, provides a combined heat and power solution via its own Energy Centres (for energy generation) and a private pipe and wire network (for distribution). Energy production is more efficient than regional, separated distribution of heating and electricity, with wastage reduced through combined production, and also a local network through which there is less scope and surface area for heat and energy loss.

Such ESCos can be run and owned locally, with revenues reinvested into local projects, including expanding the network to more homes and businesses. Governance models can involve public-private joint ventures, using local capital funding or private finance.

These schemes can be used to provide subsidised energy to local recipients, including residents at risk of fuel poverty, or to social enterprises or other community run organisations.

- Local ownership can be both financially and environmentally efficient and sustainable

4.4 Conclusions and emerging recommendations

4.4.1 A Garden Village Forum should be established at Longcross at the earliest practical opportunity in order to start genuine local involvement in any community stewardship programme, and to ensure that schemes reflect and are relevant to the desires of the local population.

4.4.2 Whilst the Longcross area does not currently have a recognisable hub or focal point that might naturally lend itself to community ownership activities, there are a number of local cultural and heritage assets, such as Barrow Hills and the Bowl Barrow which could be developed with a community focus. Furthermore, community hubs and places of congregation will evolve over time, and whilst this will to some extent be an organic process, it is necessary to plan for the kinds of spaces that might lend themselves to development into centres of community activity.

4.4.3 In the current development framework, the main north-south route runs over the M3, from the proposed 'Heart of Longcross' area on the southern site, northwards directly adjacent to the commercial land on the northern site and up to the railway station. Sites around this route could be natural areas for community owned assets to be located given that they will naturally attract the largest average flows of residents. These kind of community owned assets could be related to providing local services, such as nurseries, cafes, and cultural and social spaces. Additionally, the south east corner of the site has been identified in the Development Framework as a potential location for a village green with community uses, including possible public house.

4.4.4 Furthermore, the areas immediately surrounding sites for recreation, such as those that incorporate and nurture local biodiversity, or the areas set aside as SANG, could lend themselves to other forms of locally-led activities. Community owned assets and services here could be more naturally focused towards education and environmental protection, recreation and leisure – including sports pitches and facilities, green energy production and food production.

4.4.5 Models of community ownership could also be incorporated into the respective village centre and green and recreational land allocations already identified within the existing development framework.

5. Local Food Production

5.1 Introduction

5.1.1 This section envisages how Longcross Garden Village can create "beautifully and imaginatively designed homes with gardens, combining the best of town and country to create healthy communities, and including opportunities to grow food" as per one of the garden village principles[11].

5.1.2 AECOM built on the Infrastructure Needs Assessment and other planning work already undertaken by RBC to understand existing allotment provision in the Borough and the allocation of land to food production desired for the development of Longcross Garden Village. This section presents research of food production case studies and exemplars which are relevant for the site, as well as a general overview of lessons learnt in securing land, community ownership and stewardship of community gardens.

5.2 Expected required provision in Longcross Garden Village

Existing allotment provision in Runnymede

5.2.1 There are currently 36.60ha of allotments, community gardens and city farms, which is the equivalent to 0.45ha per 1,000 of the population and 15.6 plots per 1,000 households.

Provision standards for new development

5.2.2 The National Society of Allotment and Leisure Gardeners (NSALG) standard recommendations as applied to Runnymede imply requirement for 20 plots per 1,000 households with an assumption of 250m^2 per plot. Therefore, there is currently a shortage of allotments in Runnymede of 4.4 plots per 1000 households.

Allotment demand in Runnymede

5.2.3 Based on additional population growth forthcoming via Longcross, combined to other growth across Runnymede, and outstanding provision requirements, it is estimated that demand for allotments will be between 3.1 and 4.7 additional ha depending on the average occupancy mix of new homes.

Expected provision on new development

5.2.4 Assuming the provision of at least 1,500 households on site and applying the standard of 20 plots per 1,000 households, the site would be expected to provide at least 30 allotment plots, the equivalent of 7,500m^2 or 0.75ha of food growing land.

5.3 Community food growing case studies

[11] Town and Country Planning Association, 2017. https://www.tcpa.org.uk/garden-city-principles

Case Study 3: Forty Hall Farm, Enfield Borough London

What is the issue/model: A cooperative food growing and further education establishment funded by the Local Authority.

How it works: The Garden Enfield project was initially given a £600,000 grant from the Mayor of London's £70 million regeneration fund in 2013 to carry out a feasibility and planning study to promote community gardening in the area. The fund was initially set up to help those Boroughs impacted by the 2011 riots. The project uses a cooperative growing model where members of the community come together and work with the council to grow food produce. Garden Enfield originally started with a food growing project at Forty Hall Farm which sells vegetables through the associated Enfield Veg Company. Forty Hall Farm is run by Capel Manor College as a mixed farm and educational resource for its students. The college and farm are part of the Forty Hall estate which is managed by Enfield Presents, a Local Authority-managed organisation. As well as selling vegetables through a delivery service, it also does so via a café and market garden on site and has a community orchard and community vineyard. Other community projects which followed the Forty Hall Farm in the Garden Enfield Project include Raynham Community Farm based at the Raynham Children Centre and numerous community gardens in parks established by community groups. Initial upfront grant funding in these models is partially recouped via revenue from production and sale.

Lessons learnt: Potential exists to combine education with community food growing, including through government funded establishments. There is also an opportunity in attracting funding from local and national government, including schemes such as the LEADER Grant Programme nationally, and any funding for community schemes or assets available from Surrey or Runnymede grant or loan schemes. The possibility to combine funding for a project with existing or new heritage or community assets could be explored.

Figure 5.3 1: Volunteers at Forty Hall Farm (Source: Fortyhallfarm.org,uk)

Case Study 4: Croydon Saffron Central

What is the issue/model: A crowdfunded project built on a temporary council-owned site, which is educational and humanitarian in nature.

How it works: The concept was to create a pop-up saffron farm in Croydon, promoting the heritage of Croydon's name, meaning Crocus Valley in Anglo-Saxon due to the historic tradition of saffron farming in the area including by early Roman settlers. It was not intended to be commercially-led, but rather about educating and inspiring, helping more disenfranchised community members to express themselves and feel a stronger part of local society. The concept was initiated by one member of the public approaching Croydon Councillors about the idea, leading the Councillor for Regeneration to liaise with Council officers to explore the viability. Councillors agreed subject to the site being managed safely and that the site would only be used temporarily until which time it would be needed for development (a period which has extended from an estimated three months to present, which is almost two years). The area is a brownfield site and expecting a high rise residential tower to be built on it. The site is a total of around 700m2, 500m2 of which is the main garden area (including 105m2 for saffron growing) and 200m2 of which is paved and used for storage.

While there were no costs from Croydon Council to use the space, the project needed to pay for material and equipment. In 2015 it generated the £4,275 needed using Spacehive (a crowdfunding platform for places) in just six days, which paid for scaffold boards, ten tonnes of earth, ten tonnes of gravel, 21,000 crocus sativus corms, as well as some fixtures and fittings. Since commencement, the project has sold around £600 worth of saffron mainly to people who have supported the project on the understanding that the money would go back into the project. The ongoing revenue for the project is therefore dependent on the quality of the harvest and donations from the public. Therefore, the amount of revenue generated is minimal but has not been a priority for the project. Interest in the site has grown with summer projects on the site including Croydon Beehaven and Chasing Rainbows (planting a spectrum of colourful plants).

The site is owned by the council and managed by members of the public who founded it, along with volunteers who work there each day. Hundreds of people have volunteered to the project, bringing ideas and shaping its direction, and there is a core group of 100-150 volunteers. At the initiation of the project, about 150 people potted up the 19,000 crocus corms in one day (2,000 were given away to councillors for each of their wards), and 75 people helped harvest the saffron. In 2016 there were around 70 volunteers to repot the crocuses and around 50 harvested the saffron (due to a lower yield than 2015). Although there were thoughts to set this project up as a social enterprise, this never came to fruition. The site is due to be vacated in September 2017, and there is an ongoing search for a new location for the project.

Lessons learnt: There is potential to use crowdfunding to raise funds and also to generate interest around the site. Using the historic context also gave the project an educational narrative that local people can get behind. There is potential to bring temporary community uses to sites that may be planned for housing or other development, but later on in the development pipeline.

Case Study 5: Organic Lea, Waltham Forest

What is the issue/model: Cooperative community garden, outreach centre and café funded and expanded using lottery funding.

How it works: This project started as an initiative to encourage local food production in the Lea Valley area. The inception of this project was the agreement by Waltham Forest Council to develop a formerly derelict plot of allotment land of approximately one acre in size. This development consisted of landscaping by volunteers to clear overgrowth, as well as building other structures including a pond and a compost toilet. On a day to day basis, volunteers who contribute to the growing effort on site can take a share of the harvest and any extra produce would be sold on local market stalls. In an effort to expand the reach of permaculture in the area, the organisation runs training sessions for those interested in growing produce and puts on social events for the community. A particular emphasis is put on inclusion of vulnerable groups including those from deprived backgrounds, the disabled and the elderly, who may otherwise lack social contact.

OrganicLea is a workers' cooperative meaning that the organisation is managed by members directly, who undergo a probationary period and pre-qualification checks before progressing to full membership. These criteria are mainly around the adherence to the organisation's cooperative ethics and commitment to permaculture. Members are also directors, and sub-committees and working groups are appointed by the members in order to more efficiently allocate resource where necessary. OrganicLea is a non-profit enterprise and surplus is therefore reinvested within the project or in other similar organisations.

In 2007, after two years of lease negotiations, funding applications and design development, production was scaled up to include the lease of a local formerly council-owned 12 acre site. Funding for this new site was secured using the Local Food funding scheme which ran from 2008-2014 and was supported by the Big Lottery Fund and The Wildlife Trusts. With the growing momentum of the project, the organisation submitted a proposal to make a 'local food hub' which would provide one location for local produce and education on local food issues.

The Hornbeam Centre served as a base for this hub, which was a weekly market stall selling locally-grown organic produce. In 2008 the project received a grant from Big Lottery's Making Local Food Work programme, allowing refurbishment of the Hornbeam Centre including provision of a Café on site, starting of a weekly box scheme, and support for local food growers in selling their produce through the Centre and Café.

Lessons learnt: It is easier to build a movement when there is a narrative which stems from a history of food growing in the area, or generally a unifying story of identity people can get behind. There is potential success in using the cooperative model when there is appetite for community food growing in the area, this requires effective community engagement and if done effectively can promote social cohesion.

5.4 Conclusions and emerging recommendations

5.4.1 From the case studies, there are a number of lessons for Longcross Garden Village in how it can accommodate food production according to garden village principles. In the creation of an effective community food growing scheme in itself it can contribute to several Garden Village principles, beyond providing 'opportunities to grow food"[11].

5.4.2 In order to achieve "strong vision, leadership and community engagement"[11] around community food growing, a number of mechanisms can be used.

5.4.3 An educational element could be combined with the food growing, whether formally such as through an agricultural college or more informally through training sessions. Mechanisms for securing land could also engage the community and foster strong leadership, including through using a crowdfunding mechanism which can trigger local interest and promote a feeling of ownership. Similarly, the model for running a community garden can impact this, by for example using a cooperative model for running a community food growing scheme to promote social cohesion and community ownership. A narrative could be developed which ties in the community food growing as part of local identity, culture and history, and this can be part of the offering of "strong cultural, recreational and shopping facilities in walkable, vibrant, sociable neighbourhoods"[11].

5.4.4 The project can have "community ownership of land and long-term stewardship of assets" through funding mechanisms such as receiving government grants, funding from nearby interested parties such as existing landowners, and crowdfunding. Community ownership and effective asset stewardship can take place for instance through setting up a charitable organisation which is run through cooperative principles.

5.4.5 The creation of community gardens which are part of the broader green infrastructure and form corridors and networks throughout the site can also improve the general natural environment of Longcross and promote modes of active travel. This can help achieve the "development that enhances the natural environment, providing a comprehensive green infrastructure network and net biodiversity gains" and "integrated and accessible transport systems, with walking, cycling and public transport designed to be the most attractive forms of local transport"[11].

5.4.6 Longcross Garden Village should consider its next steps to work towards an effective system of food production, according to garden village principles. Based on the assumption of at least 1,500 households on site at Longcross Garden Village, at least 30 allotment plots or 0.75ha of food growing area should be provided. Consideration should be given to where this area of food production could be located and to what spatial morphology would maximise benefits for the community. The community should be engaged through various consultation methods, to establish what their optimum method of community food production would look like and how it would run. Based on this, funding mechanisms should be explored such as looking to attract grants and crowdfund. This consultation would also shape how the site can foster effective community ownership and stewardship of gardens, for example with a focus on an educational, charitable, or cooperative model.

6. Support Carbon Neutral Energy

6.1 Introduction

6.1.1 This section investigates, in a high level analysis, the potential options for delivering low or zero carbon development options at the Longcross site. The options have been assessed against their ability to contribute to or entirely deliver a zero carbon or net positive development. To provide additional context on the potential to deliver these schemes, a number of case studies showing the effective integration of local communities with sustainable developments have been included.

6.1.2 The options provided do not set out a full viability assessment of any of the technologies or options, but set out the approximate scale of the opportunity and the likely principal constraints and opportunities for each. If any of the options set out in this study are to be considered for the final development, it is recommended that a full viability assessment is undertaken to fully understand the scale of the opportunity and ensure that the scheme is appropriate for its intended use.

6.2 Definitions & method

Energy demand

6.2.1 The energy demands for the site were developed on the basis of benchmark data from similar sites and applied to the site as a whole. The number and types of buildings were based on indicative data from the Development Framework and by using a number of assumptions relating to breakdown, use and size of the buildings. The benchmark energy demand data was taken from what has been assumed to be similar models to those intended for the site; developed in line with SAP 2012 and BRUKL output data. This calculation gave the baseline energy demand and CO_2 emissions for the site, against which the various strategies and technologies were assessed.

Renewable energy calculations

6.2.2 The reduction in emissions and / or energy demand for the various technologies and scenarios presented below has been developed from benchmark data for what are assumed to be similar systems to those that may be proposed on the site. No detailed modelling of any technologies, efficiency measures or energy systems has been undertaken as part of this study.

Defining the targets

6.2.4 Over the past number of years the definition of a zero carbon building has not been consistent. It has ranged from the reduction of all of a building's CO_2 emissions to zero, including embodied carbon, to only considering regulated emissions and being able to offset a portion of these with allowable solutions or payments into green funds. In this study, zero carbon has been defined at a site level i.e. the scenario in which the site will reduce all of its regulated emissions to zero.

6.2.5 Net positive is another term that has been defined in a number of different ways in the past. For the purposes of this study the net positive term has been used on a site wide level where the entire site produces enough zero carbon energy to offset all of its energy use, including regulated and un-regulated purposes.

6.2.6 There is a standard process that is usually followed when designing low carbon development; this is sometimes referred to as 'be lean, be clean, be green'. Broadly speaking this means that the first step considered in the design is reducing the energy demand. Once the energy demand has been reduced as much as possible, the use of clean or highly efficient technologies should be used to deliver the energy needed. With the total site demand as low and efficient as possible, the final step is to provide the energy demands via renewable sources such as Photovoltaics (PV) or wind.

6.3 Development stage options

6.3.1 One of the simplest ways to reduce CO_2 emissions from the built environment is through energy efficiency, or to 'be lean'. This reduces the energy demand in the building and so regardless of what technology is producing the energy to the dwelling, it will have less impact on the environment; be that through less gas or electricity needed, or through less dependence on renewable technologies such as PV which may be difficult to situate in the locality.

6.3.2 To reduce energy use in a building it is important to consider the efficiency of each of its parts; these can be simplified to the fabric and the services of the building. In general, the better insulated and air tight a building is, then the less heat or cooling will be needed to keep it at a comfortable temperature. Likewise, the more efficient the services are (boilers, chillers, control systems, etc.) then the less energy is needed to deliver the required energy to the building.

PassivHaus standard

6.3.3 The PassivHaus standard is a useful benchmark to use to represent a highly efficient building as it gives a fixed framework and set of performance parameters required to be a certified PassivHaus. Whilst PassivHaus requirements go beyond building regulations implementable by Local Authorities, it is set out here as a best practice exemplar for achieving the garden village principles of "zero-carbon and energy-positive technology to ensure climate resilience". In practice, any regulations more stringent than those set out in buildings regulations would need to be part of an agreement with the developer, and would likely involve a financial impact on build costs. Therefore, whilst we set out the implications of PassivHaus standards in this section, the viability analysis in section 9 makes assumptions against an upper quartile of average build costs for South East England.

6.3.4 Nevertheless, if the PassivHaus standard was applied to all of the residential dwellings on the site, then it would save in the region of 19% of the site's total regulated CO_2 emissions. The advantage of implementing a system such as PassivHaus, in addition to the CO_2 reductions, is that the residents of the homes would be insulated from fluctuations in energy prices in the future as they would require very little energy to run their homes. This can deliver benefits in the form of preventing fuel poverty, as well as minimising emissions in the local area through the reduction in the need to deliver boilers or biomass to produce heat for the dwellings. In addition to this, there is no need to manage a PassivHouse as is often the case with low or zero energy technologies, reducing the risk of emissions increasing in the future as dwellings change hands and knowledge may be lost.

6.3.5 The 19% reduction in emissions from the use of residential PassivHaus on the site underlines the implications of fabric energy efficiency of dwellings on the site. However, there are other less onerous standards that could be applied to the site. The simplest of these would be a fixed improvement over the building regulations minimum fabric efficiency standard.

Case Study 6: Agar Grove large scale Passivhaus in London

The Agar Grove development is building 360 new dwellings to the Passivhaus standard as well as retrofitting others in the London Borough of Camden. The site is being re-developed by Camden Borough Council who is also the client on the project and is driving the use of the methodology to ensure long lasting low running costs on the homes they will be managing. The scheme is post planning and is currently at approximately RIBA stage 4.

The site has a number of blocks of flats (some new and one refurbished) which are served by a district heating system, which is primarily to deliver hot water to the development as the heating costs are expected to be very low as a result of the Passivhouse standard.

Lessons learnt:

- A clear brief is needed to drive the design early on, along with buy-in from the wider design team from the beginning of the project (RIBA stage 1 or 2)
- The design teams needs to have the relevant skills and experience to deliver the project effectively
- Site layout and set up is key and must be addressed from an early stage, e.g. single aspect flats will not work
- Costs for building to Passivhaus at scale can be the same as building to building regulations, provided it is adopted at the very beginning of the design process.

Solar water heating

6.3.6 Solar water heating (SWH) uses tubes or flat panels, usually mounted on a building's roof, to heat some of the water needed within the building. They can provide a sustainable, low carbon way to significantly reduce the emissions associated with domestic hot water demands; which is future proofed against changes in technologies or availability of resources. Typically, a dwelling will have a more significant domestic hot water demand than a non-domestic building, with some exceptions such as swimming pools so they are typically considered most suitable for SWH.

6.3.7 If SWH was delivered to all the dwellings on site, and could meet half of their annual hot water demands, then it would reduce the emissions from the site by around 15%. However, if SWH was combined with the PassivHaus standard for all dwellings, then the regulated CO_2 emissions would be reduced by approximately 34% for the entire site. This would deliver a secure, long term low emissions scenario with the benefits being seen directly by residents in the form of low energy bills in their homes. In addition reducing energy demand locally reduces the need for additional generation which may come from technologies such as boilers, improving the local air quality in the area and delivering benefits to the wider community.

Individual heat pumps

6.3.8 Heat pumps in the form of either air source heat pumps (ASHP) or ground source heat pumps (GSHP) can be used to heat individual dwellings, although typically GSHP are only used on blocks of flats as part of a block level heat network. There are a number of considerations that need to be included in the assessment of a site's suitability for individual heat pumps depending on which type is being considered. In addition to the physical constraints required to capture the heat, there are a number of other issues that need to be resolved.

6.3.9 ASHP have been known to be costly to run due to the high cost of grid electricity compared to mains gas, so careful design is required to ensure that residents receive low bills as well as a low carbon home. Both GSHP and ASHP work best at low distribution temperatures, so typically underfloor heating is favoured to deliver this, although larger radiators can also be used; either way this needs to be factored into the overall cost and design requirements for the technologies.

GSHP

6.3.10 A GSHP will need to have pipe work in the ground to extract the heat before upgrading it for use within the property. This requires either a large area of land available for the system, such as a large garden; or deep bore holes to run the collection pipework vertically.

6.3.11 If a GSHP was used on all dwellings on the site roughly 31% of the regulated CO_2 emissions could be offset. However, as the heat pump runs on grid electricity, this will improve in the future as the grid decarbonises; using the SAP 2016 consultation grid intensity, the GSHP would deliver up to a 47% reduction in regulated emissions.

6.3.12 Nevertheless, vertical pipework tends to be expensive and is not often used for small scale residential development of less than 10 to 15 stories where bore holes are not required for the building's foundations, and thus may not be appropriate for Longcross.

ASHP

6.3.13 ASHP needs to have a suitable location on the outside of the dwelling to locate the evaporating coils needed to collect the heat, and these will often include a fan used to drive the external air over the heat collection coils. This is often a noisy piece of equipment that can be difficult to blend into the architectural lines of a building and so again, needs to be included in the design from very early on to ensure that the technology does not become a nuisance to residents.

6.3.14 If ASHP were used across the site, then the regulated emissions could be reduced by approximately 13%. However, again using the SAP 2016 consultation grid intensity factor this number would further improve to 34%.

6.3.15 Both types of heat pumps provide challenges to the designers to ensure they perform as required, but can deliver significant CO_2 reductions and low energy bills to residents. Additionally, as they run on grid electricity, there are no associated emissions in the locality, improving air quality in the area. Further to this, as the grid is predicted to continue to decarbonise into the future, the systems would continue to increase their CO_2 emissions reductions as the grid decarbonises.

Photovoltaics

6.3.16 Photovoltaic (PV) panels can be used to generate electricity effectively as small arrays on the roofs of individual homes, larger arrays on the roofs of blocks of flats or commercial buildings or as large scale electricity producers coving large areas of land. They are a proven technology in the UK and have been used widely, particularly across the South of England, to help to reduce CO_2 emissions of new developments by producing low carbon electricity on site.

6.3.17 A large new development such as Longcross could utilise PV panels in a number of different ways to deliver low carbon power to the site. These include:

- Small arrays to the roofs of individual properties such as houses, flats and commercial units
- One or more larger arrays placed directly on the ground.

- Benefits of the smaller arrays on individual buildings would be that the systems would be rolled out as the development is completed and would allow individual control of the systems by building owners. This would ensure that the financial benefits were delivered directly to residents and users of the site. In addition there would be no additional land required to site the panels, leaving space for other uses across the development.

6.3.18 Installing a larger 'solar farm' type system would require a specific area to be found to locate the panels as well as potentially less subsidies in the form of the Feed-in-Tariff (FiT), which would have negative viability implications if impinging on space for housing. However, it could allow for the use of the kind of community ownership models discussed above, where the community directly benefits from the financial performance of the system and ensures a sustainable energy system into the future, with profit from the system being reused to fund future renewable energy systems or community benefit projects.

6.3.19 Estimating the total carbon that would be emitted from the site, the amount of PV needed to deliver a zero carbon site, were it to be the only low carbon technology used, has been calculated. If only regulated emissions (zero carbon) were to be offset using PV (heating, hot water and lighting) then approximately 5,500-6,000 kWp would be required. This equates to roughly 60,000 – 65,000 m^2 of roof or ground area. If all the emissions were to be offset (net positive), including unregulated uses, then these figures would increase significantly to approximately 10,000-11,000 kWp or 110,000-120,000 m^2 of available area.

6.3.20 As a very rough estimation of what might be possible to fit on the roofs of the buildings on the site, as a maximum, roughly 2,200 kWp could be accommodated. This would leave a further 3,800 kWp to be situated elsewhere to achieve a zero carbon development.

Case Study 7: Maidstone Museum Solar PV and GSHP

In 2012 Maidstone Council installed 18 solar PV panels (3kWp) and 3 70kW simultaneous heating and cooling ground source heat pumps (GSHP), connected to 14 vertical 125 meter boreholes, on the new East Wing of Maidstone Museum & Bentlif Art Gallery.

The project cost around £210,000 in total, with the majority of cost being for the GSHP. At current prices it is estimated that the PV array would cost in the region of £6,000. One of the 10 key objectives of the wider project was to reduce the Museum's carbon impact. The Local Authority also wanted to demonstrate its commitment to renewable energy. Estimates suggest the renewable installations will save around 15 tonnes of CO2 per year. The project will also attract people to the Museum, which will educate visitors on the renewables installed, providing an important resource for the area. The existing building is Grade II Listed so the extension project had to be carried out sympathetically.

Lessons learnt:

- Experience of writing successful grant applications was important to the project's success;
- Support was needed from external sources including expert advice from consultants covering renewables; experience of M&E (AECOM) contractors; and forward-thinking architects who suggested using renewables. It was seen as being important to appoint experts to get it right at the start for a project of this size, and to get advice independent of installers.
- Through carrying out a project of this kind the Council gained a greater understanding of renewable technologies and their appropriate application;
- Maidstone council were able to secure a £30,000 grant from the EDF Energy Green Fund, which explores green investment avenues possible for renewable projects;
- GSHP system coupled with increased energy efficiency measures within the building fabric have reduced the amount of electricity consumption and reduced the carbon emissions;
- The PV element of the project was seen as being easy compared to the GSHP, from a cost and technical perspective;
- Be aware of running costs for heat pumps, especially if building fabric is not at a good practice/best practice level;
- Ongoing management is very important, as is having knowledge and training in-house – renewable technologies need to be run properly to get benefits from them.

Case Study 8: Ouse Valley Energy Service Company Limited (OVESCo)

Harvey's brewery warehouse in Lewes, East Sussex was the site for the installation of a 98kW PV installation delivered by a community/private joint venture between a co-operative of community members and Ouse Valley Energy Service Company Limited (OVESCo), the company that had successfully tendered the contract to run Lewes Council's microgeneration grant scheme.

The availability of the FiT encouraged the company to target a PV installation within the local area and a community group was sought after to make the project possible. The Brewery warehouse was selected as a favourable agreement was reached between the brewery, the landowner, and the project team with the two companies entering a partnership. 250 community members were brought on board and a total of £330,000 was raised by the joint venture, £23,000 more than the project cost which would ultimately be invested in future projects.

OVESCo offered a 4% return on the community investment which promoted a positive response with 74% of investors stating they were willing to reinvest in later projects and the successful business model allowing OVESCo to secure a £50,000 low interest loan for further projects.

The system consisted of 544 panels and required roof condition works before installation, as Harvey's were a partner and required the works regardless of the PV installation the brewery covered the costs. There were also capital costs involved with the installation of a broadband connection to allow the hour by hour data recording and sharing. Maintenance costs included the cleaning of the panels, and any servicing. Project revenue was generated from the FiT secured at a higher rate than the standard 3.1 pence per kWh exported.

Lessons learnt:

- Strong community identity and confidence in investment has been a key driver in raising fund and securing reinvestment for future projects;
- Community awareness of environmental issues due to previous flooding events within local area promoted positive attitude toward renewable projects and reducing the community's impact on the climate;
- PV seen as a lower risk investment in comparison to wind by community investors;
- Changes in FiT structure encouraged quick decision making to ensure project was online before changes were implemented;
- Compiling a 25 year cash flow was important in demonstrating security of investment;
- Promoting the community benefit of a project plays a key role in attracting investors.

6.4 Management Stage options

District heating

6.4.1 District heating (DH) can provide a number of benefits to a new development, allowing the use of low carbon heat sources and future proofing the development through the ability to change the central plant to the most effective technology as technology and infrastructure changes. However, not all sites are suitable for DH, primarily based on density. If the buildings are spread across a wide area, then the amount of heat lost through the distribution network in comparison to the heat used, can become significant and the amount of heat that would be wasted offsets the other advantages of the system.

6.4.2 Additionally, DH networks can provide a piece of infrastructure that can be managed and owned by the community, providing a revenue stream and other associated benefits to the locality. This is the case with all of the suggested heat source types giving the community an opportunity to own, manage and benefit from the low carbon technologies serving their locality.

6.4.3 The layout and density of the Longcross garden village is not yet finalised, but it has been assumed that at least a significant number of units will be located close to the identified settlement core areas (e.g. the EZ or 'Heart of Longcross') and that these areas could have sufficient density to make a DH system viable. This may be limited to only the north site, but may include a small area of the south site depending on the final layout.

6.4.4 If a DH system was to be installed, the most likely options would be:

- Gas Combined Heat and Power (CHP)
- Biomass CHP or boilers
- Heat pumps from either waste heat or a ground or water source

Gas CHP

6.4.5 Gas CHP at the scale that would be considered for Longcross is typically a reciprocating gas engine generating electricity that is then sold to the grid: the heat is then recovered and delivered through the heat network. The CHP displaces CO_2 from the grid and so the heat provided to the network can be considered to be low or even zero carbon at times.

6.4.6 The key to the low carbon performance of a gas CHP engine is the CO_2 intensity of the grid. When the grid is highly CO_2 intense, for example when there is a lot of coal generation online, then the CHP is displacing coal generation and so is providing low carbon energy. However, if the grid CO_2 intensity is low, such as when there is a lot of wind and solar power online, then the CHP is displacing less CO_2 intense electricity and producing more CO_2 intensive heat.

6.4.7 The current CO_2 intensity of the grid is quite low and so gas CHP is not as beneficial as it was a few years ago. As a result it may not be as beneficial as some of the alternatives. To highlight this, the predicted CO_2 savings for the site if it was to be served by a gas CHP would be approximately 40% using the calculation set out in AD Part L1a 2013 and SAP 2012. However, if the methodology set out in the SAP 2016 document which is currently under consultation, was used, this saving would be closer to 30%, and this decreasing trend is projected to continue over the coming years.

Biomass

6.4.8 Providing heat from biomass, particularly in the context of a heat network, has the potential to provide an affordable, low carbon heat source that fosters community engagement. Where the fuel source is located near the network, this can further drive interest and participation, as well as reducing the cost of the fuel and its associated CO_2 emissions from transport. For example, where a local woodland is used, then a sustainable woodland management programme can be implemented and the woodland developed to include walking trails and outdoor activity areas, delivering both a public amenity and a sustainable fuel source. Further to this, the fuel source would provide local employment and insulate the site against price fluctuations in the wider economy.

6.4.9 Biomass can be used in two principal ways, a CHP engine or a boiler. The boiler is the simpler option and typically uses wood chips or pellets which are efficiently burned to produce heat for the network. The CHP option requires a more complex process where biomass is converted into a gas which is then used in much the same way as a gas CHP engine described in section 0.

6.4.10 A wood chip biomass boiler fuelling a local heat network for the site could deliver approximately a 40% reduction in regulated CO_2 emissions. This number could be reduced further if a biomass CHP option was used; however this would be highly dependent on the available fuel source and capital investment required.

Case Study 9: Kent Schools Biomass Project

St Augustine's Catholic Primary School in Tunbridge Wells and Valley Park Community School in Maidstone have both installed woodchip boilers, replacing oil as their fuel source. In the period 2006-8, Valley Park installed one 500kW biomass boiler (and one 500kW gas boiler) at a cost of £415k, and St Augustine's installed one 150kW biomass boiler (and one 200kW gas boiler) at a cost of £192k (£81k additional cost for biomass elements).

Funding was provided by the schools and by grants from Kent County Council and other sources. Fuel is sourced locally from Torry Hill farm and the Neville Estate in Kent. Pupils were engaged through launch activities and use of the boilers as a learning resource, including visits to wood suppliers. The projects have resulted in a reduction of CO2 emissions from heating by around 90% in participating schools. Valley Park is projected to save around 114 tonnes of CO2 per year, and St Augustine's around 43 tonnes of CO2 per year.

These projects were used as pilots to trial the use of biomass and examine the benefits for schools and other benefits for Kent. Biomass boilers have since been installed in Bapchild and Tonge School, Chaucer Technology College, and 6 Building Schools for the Future programme (BSF) schools in North Kent. The majority of the projects were school-led with Local Authority support, and the BSF projects were undertaken using a PFI model.

The Chaucer Technology College project has been able to qualify for SALIX funding and with the Renewable Heat Incentive it is projected to pay back within 5 years. The projects complement Kent County Council's promotion of Kent as a biomass investment location under the Locate in Kent programme, and its aims of developing the local fuel supply chain, benefiting the rural economy and promoting better woodland management.

Lessons learnt:

- Importance of project management expertise and experience of biomass projects;
- In-house expertise and knowledge sharing between schools has been developed through undertaking the projects;
- The profile of schools is enhanced through such projects;
- Importance of external grants/incentives: KCC were able to secure a £30,000 grant from the EDF Energy Green Fund, one of the green investment avenues possible for renewable projects;
- Costs incurred for the delivery of fuel are sensitive to volume and distance from source (35% difference between the two schools), therefore these two factors can have a significant impact on the overall payback time of the systems;
- Distance fuel travels and delivery method impact significantly on fuel cost at this scale;
- Biomass is not feasible for all schools and factors such as access for fuel delivery vehicles, space for woodchip storage and space in boiler rooms for larger biomass boilers, as well as levels of interest from the schools need to be considered;
- Procurement and contract-writing lessons have been learnt by Kent County Council.
- Maintenance cost for biomass systems are higher than for gas or oil: rough maintenance costs of £5,000 per annum are approximately 100-150% higher than gas / oil systems. Typically the additional cost arise from the greater number of moving parts required (e.g. fuel transfer motors) and that maintenance personnel are required for tasks such as emptying the ash, checking for blockages, monitoring fuel levels.

Heat pump

6.4.11 Heat pumps can be used to take heat from an existing source and raise the temperature of that heat to one that can be used in a heat network. Examples of heat sources are large bodies of water or waste heat from cooling plant such as supermarkets or data centres. The use of waste heat can be difficult to arrange as there will need to be complex contractual arrangements between the waste heat supplier and the heat network operator; however, if these are resolved they can provide a highly effective, low carbon heat source.

6.4.12 Taking heat from a waterbody can be highly effective, however there are limitations to the amount of heat that can be safely taken from these sources and so careful design work is required to ensure there is sufficient benefit from the source without it being detrimental to the other uses of that body of water. It is anticipated that the amount of water available to the Longcross area would not be sufficient to deliver this option.

6.4.13 A novel heat source that is relatively new to the UK, but is showing some promise, is the use of heat taken from sewers. This uses heat exchangers to remove some of the heat from the waste in the sewer and heat pumps to upgrade this heat to one suitable for a heat network. This type of system is ideal in redevelopment projects where a sewerage system could be designed alongside the heat network.

6.4.14 The ability of heat pumps to deliver carbon savings is dependent on two key factors:

- The coefficient of performance (COP) of the heat pump
- The carbon intensity of the grid electricity

6.4.15 The COP represents the amount of heat energy a heat pump produces in relation to the amount of electricity it uses. For example a heat pump with a COP of 3 would produce 3 kWh of heat for every 1 kWh of electricity it used.

6.4.16 As noted above when discussing the gas CHP option, the grid CO_2 is falling rapidly. Using the current Part L2013 methodology a heat pump fuelling a heat network would deliver very little CO_2 savings over conventional gas boilers. But, using the SAP 2016 consultation methodology, the same system would deliver a 37% reduction in regulated emissions. With the grid CO_2 projected to continue to fall in the coming years, this CO_2 saving will grow with no changes required to the scheme. However, the amount of CO_2 savings available would depend on the source of that heat and the design of the heat network.

Wind

6.4.17 The Energy Saving Trust (EST) research does not recommend that a wind turbine be used at wind speeds below 5 m/s taken as an average over a year. The NOBAL wind map which gives wind speeds for the UK at different altitudes indicates that the average wind speed at Longcross at 10 m will be 5 m/s and 5.8 m/s at 25 m. This is on the edge of what would be viable in an open area; however as the site is developed and buildings are added this will reduce the average wind speed and so negatively impact the performance of a wind turbine.

6.4.18 Wind turbines can provide positive community renewable energy projects, delivering long term benefits to the locality so even if a wind turbine is not delivered on site initially, a suitable location could be selected and the infrastructure developed to allow a wind turbine in the future. This would create the opportunity for a community funded and delivered wind turbine in the future.

Case Study 10: Castle Farm Wind Turbine

Planning permission has been granted for a 225kW turbine planned to supply electricity to Castle Farm fruit farm in East Farleigh in Maidstone, which has a large electricity demand from cold storage. The scheme is a commercially-led joint commercial-community scheme. Energy company DistGen plans to finance the scheme and cover costs including planning, the turbine and its installation, operation and maintenance. The farmer will enter into a land leasing agreement with the company. The scheme would be one of the first of this kind in the UK, and will bring several benefits to the local community:

- It is to run as a community investment model, as used frequently in Denmark: 49% of the shares are to be offered to local community, and the remainder divided between company and landowner.
- 6% gross annual income is to be granted freely to East Farleigh Parish Council for reinvestment into the community.
- There are plans to use it for educational purposes, establishing links with local schools.
- Drivers for the scheme include the Feed in Tariff and diversification of income for the land owner.

Lessons learnt:

- There are opportunities for farmers and other land owners to diversify their income streams;
- Delivery models which benefit the community should be encouraged;
- Once turbine sizes reach commercial scale (>30m), planning requirements increase.
- This, along with the cost of planning, and long process of preparation before installation is achieved, may deter community schemes from being delivered;
- Misconceptions about renewable energy had to be addressed at Planning Committee – it is important to demonstrate the case for renewable energy projects to the community and planning committee at an early stage;
- There may be a need for renewable energy capacity training for Members involved in planning decisions, and for Local Authorities to promote schemes of this kind more strongly.
- Significant commitment is needed, plus sales skills and knowledge of renewable energy to gain landowner's and community's confidence; and
- Expertise is needed to get planning permission, including use of specialist software to generate noise reports and knowledge of planning law.

6.5 Conclusions and emerging recommendations

6.5.1 Delivering zero carbon or net positive sites remains a significant challenge, even with the significant developments in sustainable technology in recent years and the rapidly falling grid CO_2 intensity. However, there are a range of options available to deliver large reductions in emissions and significant community benefits at a reasonable cost.

6.5.2 To deliver a low or zero carbon site at Longcross, it would be advisable to begin with energy efficiency measures and consideration could be given to aspirations beyond building regulations through energy efficiency measures only, such as the PasivHaus Standard or improvements beyond building regulations minimum fabric energy efficiency standard.

6.5.3 Additionally, other local generation technologies should be considered such as building level PV panels or solar water heating which deliver benefits directly to residents. Following these, community led renewable projects could deliver significant amounts of renewable energy alongside community benefits. However, the amount of space needed on site to deliver these could be significant and consideration would need to be given to other potential uses of those areas before pushing ahead with these larger renewable schemes.

Microgrids and energy storage

6.5.4 The use of low and zero carbon energy technologies like PV to provide an on-site source of low-carbon power is common practice in new developments, driven by building regulations, planning policy and/or financial incentives. However, in almost all cases these sources of power only provide a relatively small amount of the total power demands of a development and there is still a grid connection to provide the additional power to the site when demands are high and/or generation from the low and zero carbon technologies are low or non-existent.

6.5.5 Removing a grid connection would require the use of significant on-site power generation from low and zero carbon energy technologies alongside large power storage systems and most likely some conventional backup generation, all of which pose significant challenges. Installing large amounts of low and zero carbon energy technologies would be extremely expensive, have significant design implications and also significant operation and maintenance implications.

6.5.6 In regard to storage, large scale batteries are becoming more feasible but remain very expensive and suitability for large scale microgrids remains mostly undemonstrated in the UK, with most microgrids relying on a grid connection or diesel generators as backup. For example, The University of Chester, in collaboration with ABB, is developing a grid connected microgrid for its technology science park. This will use ABB equipment to control the grid and allow connection and disconnection to the local grid as required; integrating PV, CHP diesel generators and batteries.

6.5.7 The proposed scheme as assessed in the previous sections and with the assumptions noted could provide in the region of 30% of its baseline electricity demand through PV on building rooftops; assuming the roof space is maximised for PV and the base case energy strategy of gas heating. This generation is unlikely to be during periods of peak demands and so would not on its own allow for a decrease in grid infrastructure, which is typically sized around peak demands. If significant battery storage was to be integrated to the system, this could provide the peak power demands to the site a number of different ways. When renewable generation is high, the batteries could be charged, such as during summer days when PV is producing electricity. Equally, when renewables are not generating sufficient electricity, the batteries could charge directly from the grid when demand is low and deliver the energy at peak periods to reduce the peak demand.

6.5.8 One of the most significant obstacles to reducing grid infrastructure with renewables or storage will likely come from the management and contractual arrangements that would be required. Primarily this would be between an Energy Supply Company (ESCo) and the District network Operator (DNO), as the DNO would in normal circumstance be responsible for delivering peak electrical demand to the site. But with the use of offsetting with renewables or batteries, this would need to be shared or transferred to the ESCo. Additionally, the need to export electricity as well as import it could have significant implications for the equipment required, and could under certain conditions increase the need for grid infrastructure There could also be knock on impacts to the pricing of resident's electrical power, limitations around switching providers, and implications for the lifetime of equipment on-site.

6.5.9 The possibility of offsetting some grid capacity using renewables is not impossible and technology does exist to deliver it; however this would have significant design and cost implications which would need to be assessed. This could be investigated in a detailed assessment at a later stage when more detailed information about the proposals for the site are available.

7. Enhanced Biodiversity

7.1 SANG overview

7.1.1 The Thames Basin Heaths Special Protection Area (TBH SPA) was designated on 9th March 2005 and forms part of Natura 2000, a European-wide network of sites of international importance for nature conservation established under the European Community Wild Birds and Habitat directives. Development within the proximity of the SPA must undergo an 'Appropriate Assessment' to ascertain any significant impacts on the SPA and identify mitigating actions.

7.1.2 Given the extent of the TBH SPA, management of development (over 60 dwellings in Runneymede) within its proximity has led to the precedent of Suitable Alternative Natural Greenspaces (SANGs) being required to reduce the impact of the potential increase in recreation activities on the important habitats. SANGs provision is generally provided at a rate of 8ha per 1,000 additional population and requires ongoing input into Strategic Access Management and Monitoring (SAMM) of the TBH. The Longcross development proposals have identified SANG provision that is sufficient to accommodate the future population.

7.1.3 Other mitigation measures include the establishment of a 400 metre buffer around the SPA within which no net new residential development will be permitted.

7.2 Habitat specific measures at Longcross

7.2.1 Development within Longcross itself could also contribute to supporting the TBH habitat. Longcross sits within the TBH02 Biodiversity Opportunity Area which highlights the importance of the following priority habitats (i.e. habitats listed on S41 of the NERC Act 2006).

Broad habitat	**Habitat name**
Arable and horticulture	Traditional orchards
Boundary	Hedgerows
Freshwater	Ponds
Freshwater	Rivers
Grassland	Lowland dry acid grassland
Heathland	Lowland heathland
Inland rock	Open mosaic habitats on previously developed land
Woodland	Lowland mixed deciduous woodland
Woodland	Wet woodland
Woodland	Wood-pasture and parkland

7.3 Conclusions and emerging recommendations

7.3.1 There are likely to be many opportunities to support habitat creation throughout the site. Perhaps the greatest potential measures are:

- Sustainable Drainage Systems, particularly surface attenuation and conveyance (i.e. swales), and providing a range of opportunities from ponds through to wet woodland.

- Green roofs can support grasslands and heathland as well as providing a patchwork of other habitats. Although there are examples of blanket green roof policies in places such as Hamburg[12], this could impact viability. Green roofs could however be prioritised on public buildings.
- Amenity spaces can support a wide variety of the habitats highlighted above, reducing areas of gang mowed grass to allow for the development of meadows and species of rich grassland which could help provide new habitats and reduce maintenance costs, such as demonstrated in the Castle and Manor estates in Sheffield[13].
- Hedgerows, incorporating native species, could be used to replace boundary walls and fence lines.

[12] http://climate-adapt.eea.europa.eu/metadata/case-studies/four-pillars-to-hamburg2019s-green-roof-strategy-financial-incentive-dialogue-regulation-and-science

[13] https://www.forestry.gov.uk/pdf/urgp_case_study_008_Sheffield_estates.pdf/$FILE/urgp_case_study_008_Sheffield_estates.pdf

8. Integrated, Accessible and Sustainable Mobility

8.1 Introduction

8.1.1 As mentioned in the introduction, Longcross Garden Village will be located along the western boundary of Runnymede Borough Council, located on the former Defence Establishment Research Agency (DERA) site. The development is split into two distinct parcels of land by the M3, which provides access to the M25 London Orbital and London in the east and Hampshire and the south coast in the west. The existing Longcross railway station is located in the north of the site providing access to train services to Reading and London Waterloo.

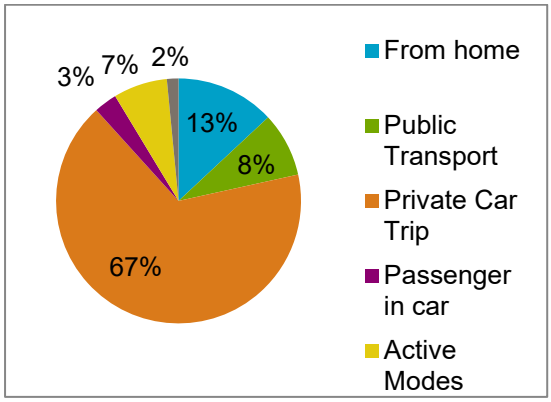
8.2 Overview of travel patterns

By mode

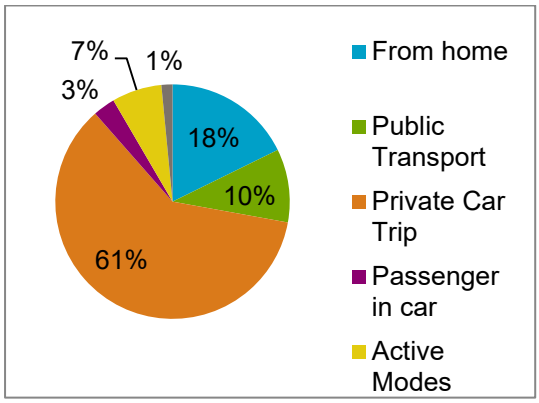
8.2.1 In order to understand how and where people are travelling in the area and to inform the future transport strategy of the site and associated mode shares, an analysis of census data has been undertaken. Whilst this data relates to employment trips only it has been used in this study to provide an indication of likely future travel patterns.

8.2.2 Given the low level of occupation currently on the development site, Census data on Method of Travel to Work census has been extracted for the Middle layer Super Output Areas (MSOAs) surrounding the Longcross Village (Runnymede 005 (Virginia Water and Trumpsgreen), Runnymede 008 (Ottershaw and Lyne) and Surrey Heath 001 (Windlesham and Chobham)) to reflect a more realistic existing mode share and distribution. Both 2001 and 2011 data has been interrogated to analyse how travel patterns have changed over time.

8.2.3 The mode share for these MSOAs is illustrated in the figures below for 2001 and 2011 respectively. Both figures demonstrate that the car represents the majority of trips (69% and 64% respectively) undertaken by residents travelling to work, although its share has dropped by five percentage points over the period, which is likely due to changes in travel patterns and opportunities to work from home created by technology.



2001 Mode Share



2011 Mode Share[14]

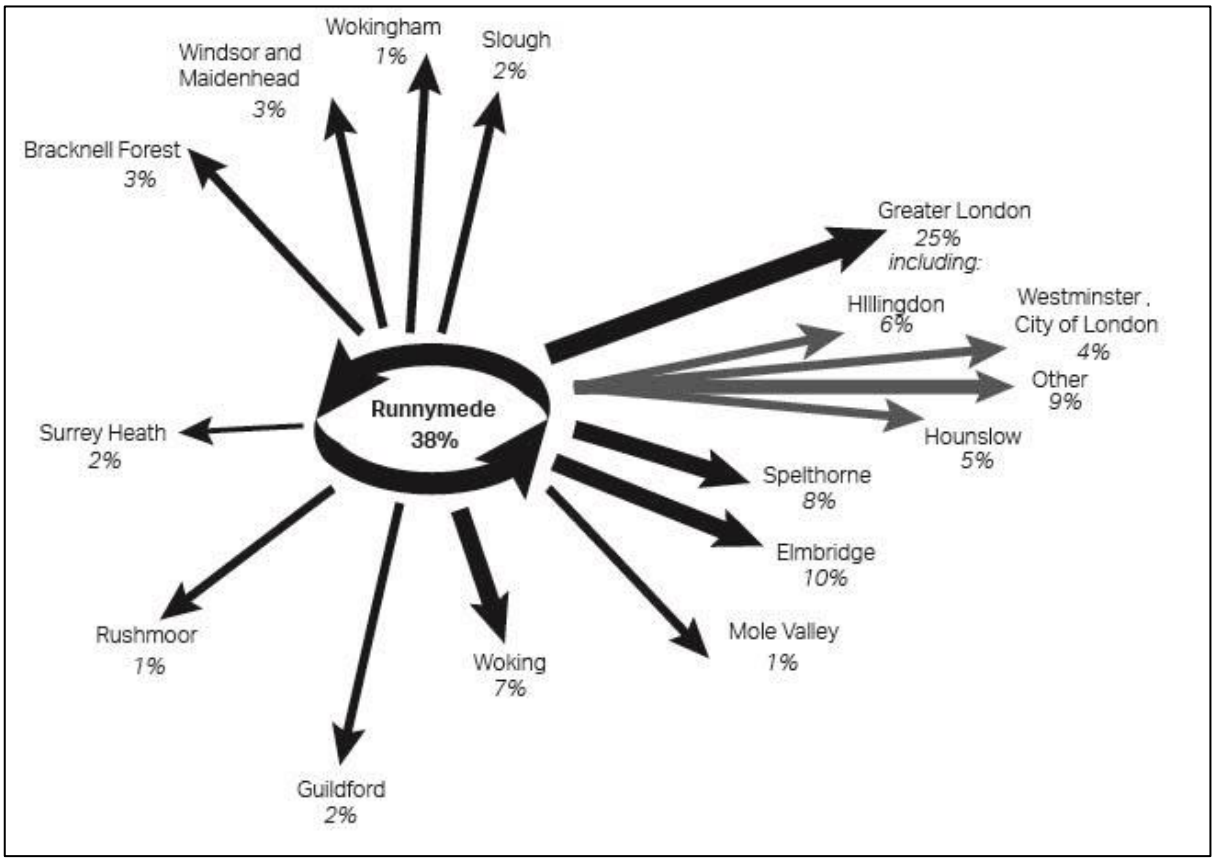
8.2.4 Trips undertaken by public transport remained relatively low between the two surveys (9% and 10% respectively). This is due to the rural nature of the area and lack of a comprehensive public transport offering in terms of frequency (a frequent peak train service was only established in 2016), destinations and journey time of services.

8.2.5 Finally, the use of active modes (walking and cycling) as a mode of transport for work related trips has remained low (7%) for both 2001 and 2011, once again reflecting the rural nature of the area, lack of existing formal active mode infrastructure and implying the need to travel significant distances to the work place. Further analysis of Census data demonstrates that the majority (51%) of commuter trips exceeds 10km, meaning travel by active modes offers an unrealistic method of travel for most journeys to work. Implementing Garden Village principles will require findings ways to address this,

8.2.6 As illustrated in the figure below, in 2011 the highest proportion of Runnymede's population lived and worked within the district (38%). The other main destinations for work were the surrounding Surrey districts (31%) and Greater London (25%), in particular in Hounslow, Hillingdon, Westminster and the City of London. Key destinations within Surrey included Elmbridge (10%), Spelthorne (8%), or Woking (7%). Overall, work related trips originating from Runnymede seem to be directed eastwards, with lower level of movements towards the Reading/Slough/Windsor area or Guildford.

By destination

[14] *KS015 - Travel to work (2001) QS703EW - Method of Travel to Work (2001 specification) – Nomisweb*



Key Commuter Destinations by District[15]

8.2.7 The mode split and travel patterns of residents in Runnymede reflects the flexibility of travel, frequency and journey time offered by the various modes. The table below provides details of existing journey times by mode from Longcross to key destinations identified from origin destination data, although interrogation of train timetables at peak hours gives the average journey times by rail indicated in brackets.

Journey time (minutes) by mode from Longcross to key destinations

Virginia Water	30 (5)	5	15
Waterloo	70 (49)	60	-
Elmbridge	85 (25 to Weybridge)	20	55
Spelthorne	90 (13 to Staines-upon-Thames)	20	50
Woking	90 (57)	15	40
Heathrow	110 (117)	20	-

[15] *WU01UK - Location of usual residence and place of work by sex - Nomisweb*

8.2.8 This highlights the advantageous journey times by car over other modes, whilst travel by bike also potentially presents a quicker journey when compared to public transport to locations such as Woking. It should be noted that the train journey times do not take into account walking to the station at Longcross, which could add up to 20 minutes to the journey from the furthest point of the site which is approximately 2km away.

8.3 Transport infrastructure at Longcross

Strategic and local roads

8.3.1 The northern part of the site is bound by Burma Road to the west, Chobham Lane and the M3 to the south, the London Waterloo to Reading railway line in the north and an internal access road to the east. A secondary access road joining both parts of the development site is accessed via a three arm roundabout with Chobham Lane.

8.3.2 Chobham Lane is subject to a 60mph speed limit which reduces to 40mph to the east at the junction with Kitsmead Road. In the southwestern corner of the site, Chobham Lane forms a roundabout with Burma Road, Chertsey Road and B386 Longcross Road which also provides access to the southern section of the site. Burma Road runs around the western boundary of the site and provides access to Longcross Railway Station which is located at the northern end of the site. It is accessed via a four arm roundabout with B386 Chertsey Road, B386 Longcross Road and Chobham Lane.

8.3.3 The southern section of the site is currently occupied by uses related to the film studio. It is bound by the M3 to the northwest, B386 Longcross Road to the south and Kitsmead Lane in the east. The B386 Longcross Road is subject to a 60mph speed restriction and is currently used to access residential plots.

8.3.4 Whilst the development is located on the land surrounding the M3, there is no direct access from the M3 to the site; therefore access to the strategic highway network occurs via local roads including the B386 Chertsey Road in the west and the B386 Longcross Road in the east.

8.3.5 Local roads provide access to the M25 in the east via junction 11 and to the M3 in the west via junction 3 at Bagshot, both approximately 12 minutes' drive (off peak). The M25 is located approximately 9km east of the site and provides a strategic link to London, Heathrow and Gatwick International airports, whilst the M3 continues south-westwards providing a route towards Southampton and the south coast.

8.3.6 Significant levels of congestion are experienced along the M3 between junctions 2 and 4, however smart motorway implementation has recently been completed in this area to address capacity issues. The southwest quadrant of the M25 is identified as the busiest road in Britain, with the section between junctions 10 and 16 currently planned for major improvement scheme committed within Road Investment Strategy One (2015-2020)[16].

[16] London Orbital and M23 Gatwick Route Strategy 2015 – Highways England

8.3.7 The route based strategies undertaken by Highways England present an analysis of network performance delay in 2012/13 and show that the top 10% of delays of the total travel time experienced by all road users over and above the theoretical free flow travel time were experienced on these sections of the M25[17] and the M3[18].

Impacts of future growth on the road network

8.3.8 Runnymede Borough Council published an updated Transport Assessment of strategic highways in October 2017. The Transport Assessment modelled two key scenarios, a 'do-minimum' scenario (scenario 1), and a 'Local Plan' scenario (scenario 2). Respectively, the two models cover the following potential changes to network usage:

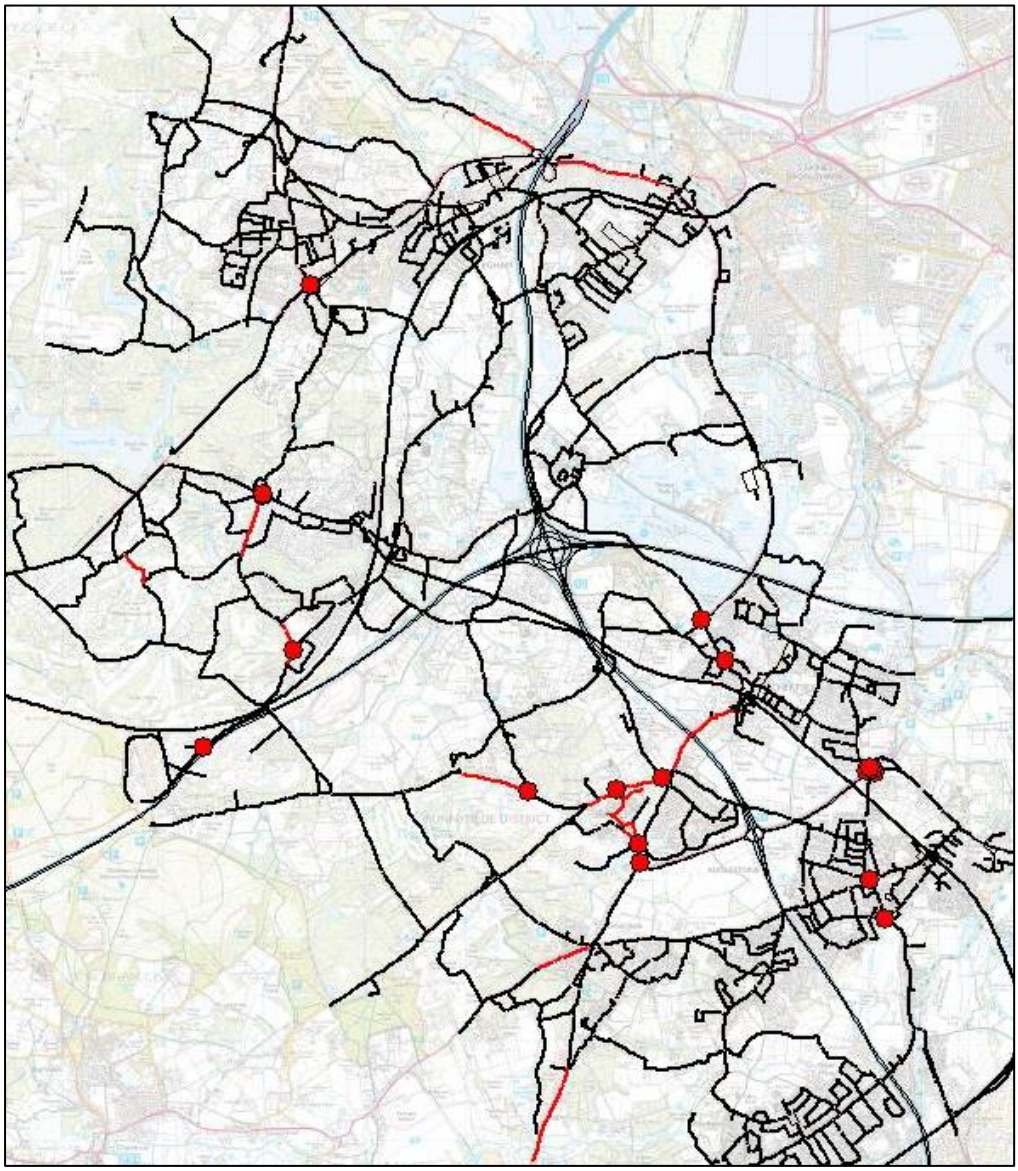
- Scenario 1: Only currently committed (i.e. planned and under construction) development comes forward in Runnymede up to 2036, with the rest of the country undertaking development in line with DfT forecasts.
- Scenario 2: Development comes forward in line with preferred options identified in the emerging Runnymede Local Plan. In particular, this incorporates forecasts for the impact of the garden village at Longcross.

Total vehicle distance (000km), all roads - AM peak hour (0800-0900)

	All Vehicles	Cars	LGV	HGV
Scenario 1	541.3	434	81.7	25.9
Scenario 2	540.3	433.7	80.6	25.7

[17] London Orbital and M23 to Gatwick 2014 – Highways England
[18] M25 to Solent Route based Strategy – Highways England

8.3.9 The assessment found that given high levels of existing congestion in Runnymede, the impact of significant development at Longcross will be to push goods transit onto the motorway network. This is shown by the fact that LGV and HGV forecasts within Runnymede are greater in scenario 1 rather than scenario 2, whilst local car trips generated by the residential and employment impact of the Longcross development mean that car trips are greater in scenario 2. Some of the greatest increases in vehicle flows are on the roads which surround Longcross development site. The links and junctions with high levels of stress as a result of the proposed developments are indicated below.



Network hotspots in the Local Plan scenario

8.3.10 In Scenario 2, involving implementation of the Local Plan, the Transport Assessment identifies 11 link hotspots and 18 junction hotspots where traffic impacts are deemed to be severe, causing considerable delay to drivers, and likely requiring mitigation in order to bring forward further development. Of these hotspots, the areas between Longcross and west of Chertsey / St Peter's Hospital and south of Virginia Water are particularly impacted by the garden village development. These areas include 6 of the link hotspots and 8 of the junction hotspots, namely:

Link Hotspots:

- Silverlands Close (St Peter's Hospital)
- B386 Holloway Hill
- B386 Longcross Road
- Portnall Rise
- Wellington Avenue
- A320, Guildford Road

Junction Hotspots:

- Chobham Lane j/w Longcross Station
- B386 Longcross Road j/w Lyne Lane
- B389 Christchurch Road westbound approach to j/w Callow Hill and Wellington Avenue
- Callow Hill southbound approach to j/w B389 Christchurch Road and Wellington Avenue
- Trumps Green Road j/w Wellington Avenue
- Holloway Hill j/w Hardwick Lane
- Holloway Hill j/w St Peter's Hospital Access
- St Peter's Hospital Access approach to A320 Guildford Road roundabout

8.3.11 Runnymede Borough Council are also working with Surrey Heath and Woking Borough Councils as well as Surrey County Council to understand the impacts of cumulative development within the area on the A320 which runs from J11 of the M25 to Woking Town Centre. A joint study is being commissioned by the authorities and is due to report by the end of the year.

8.3.12 Both the A320 study and SHAR may highlight the need for a strategic approach to mitigation on the A320 and/or further joint working and this will be considered through preparation of infrastructure studies by individual Local Authorities and in the case of Runnymede the Infrastructure Delivery Plan (IDP). Again, any requirement for mitigation on the local highway network as a result of growth in Runnymede including from Longcross Garden Village will be considered through the IDP having regard to joint working with Duty to Cooperate (DtC) partners. The measures to reduce car usage set out within this assessment should be considered alongside preparation of the Runnymede IDP.

Public Transport

8.3.13 Longcross Railway Station is located at the most northern point of the site, currently accessed via Burma Road. The station is formed of two platforms providing access to South Western train services to Reading and London Waterloo.

8.3.14 Services to London Waterloo are provided at a frequency of three trains during the two hour AM peak (08:00 – 10:00) and PM peak (17:00 – 19:00), whilst services to Reading operate at a frequency of four trains during the two hour AM peak and three trains during the two hour PM peak. Services are more limited during off-peak times and restricted to weekdays only. Additional services can be accessed via Virginia Water Station which is located approximately 3km northeast of the site, offering access to the London Waterloo to Weybridge line as well as the Reading to London Waterloo line.

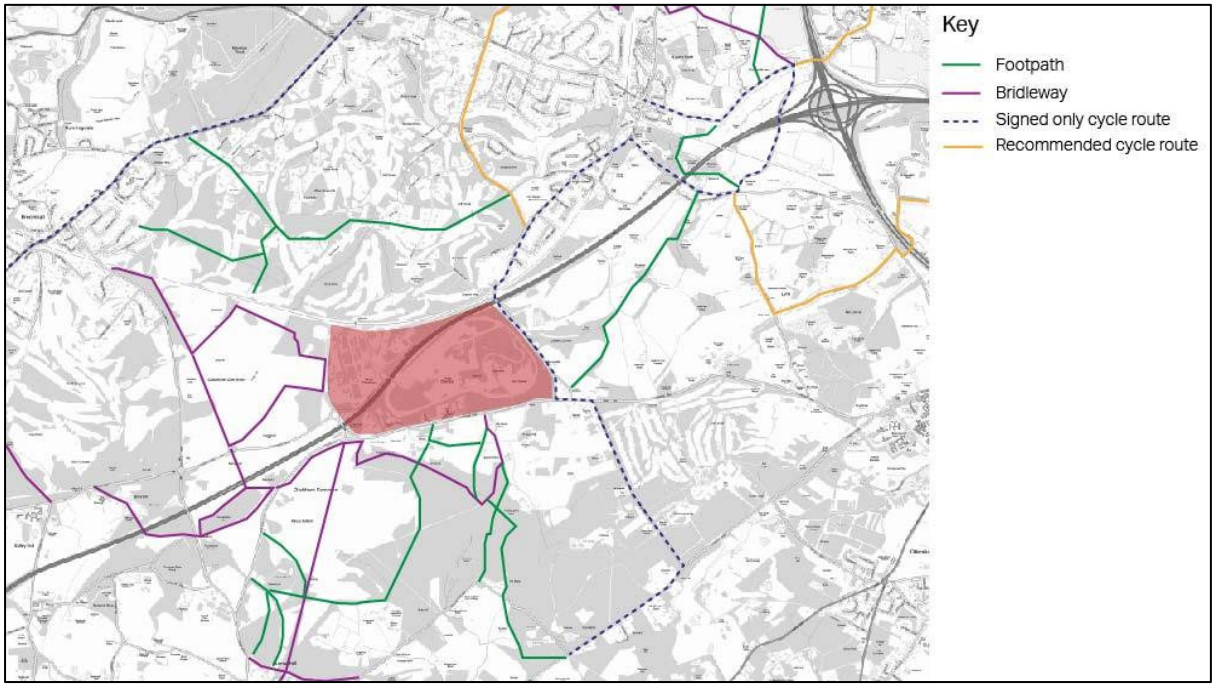
8.3.15 Demand Responsive Transport (DRT) is a form of public transportation that responds to the demands / requests of passengers and could be considered as somewhere between a bus and a taxi. A DRT service is already in operation in East Surrey. The East Surrey Rural Transport Partnership (ESRTP) operates the Buses4U services throughout the Mole Valley District, Reigate & Banstead Borough and Tandridge District in Surrey and the Sevenoaks District in Kent. As well as the DRT service Buses4U also runs a more traditional fixed route service.

8.3.16 The ESRTP is a registered charity which aims to, ‘improve access to transport services in the east Surrey area, for those who because of age, physical disability, geographic remoteness or lack of available public transport cannot make the journeys that they need, to undertake a range of day to day activities that most would consider to be normal.’

8.3.17 Runnymede Borough Council operates the Yellow Bus scheme which provides a demand responsive route on demand by schools. At present the Yellow Bus service operates a dedicated bus to each secondary school and picks up students near to their home. The nearest secondary school to the site is Salesian Secondary School located to the south west of Chertsey. The Yellow Bus scheme currently provides services to Salesian school; therefore a pick-up point could be implemented through consultation with the operator, First Group. This service is paid for by parents of students which attend the school and is paid directly to the school. Developer funding could be used to subsidise these fares to encourage the take up of this service instead of travel by car.

Walking and Cycling

8.3.18 As illustrated in Figure 8.3-5 there is limited cycle and pedestrian infrastructure provision currently available in and around the existing site, with few footways along the existing rural roads in the vicinity of the site.



PROWs and Cycle Routes

8.3.19 A pedestrian route exists along the internal motorway bridge over the M3, providing a link between the two development parcels. Public rights of way in the form of a bridleway are located to the west of the development through Chobham Common towards Sunningdale. These pedestrian and cycle routes are unlit with little formal infrastructure providing a leisure route rather than a commuter route. A network of bridleways and footways is also present to the south of the site running from Longcross Road south towards Chobham.

8.3.20 Sustrans route 223 runs between Chertsey and Shoreham by Sea, approximately 5km (20 minutes) cycle from the development. Virginia Water rail station is located approximately 10 minute from the site by bike, whilst Sunningdale is a 15 minute cycle. Both locations provide access to additional retail and leisure facilities. An existing signed cycle route runs to the east of the site along Longcross Road and Trumps Green Road towards Virginia Water where it connects to other cycle infrastructure. A route recommended for cyclists by Runnymede Borough Council runs along Wellington Avenue northwards towards Egham.

8.3.21 At present there is little provision for pedestrians and cyclists to the east of the site, meaning areas such as Chertsey are inaccessible by active modes.

Electric Charging Points and Car Clubs

8.3.22 The closest electric vehicle charging point to the site is in Addlestone in the Waitrose car park. Other electric vehicle charging points are located some distance from the site in Woking, Weybridge and Frimley.

8.3.23 Enterprise Car Club currently operates 19 vehicles in Surrey in five towns, the closest being Woking. Surrey County Council's Travel SMART team are working with the organisation to expand provision across the county. Surrey residents are offered a reduced membership of only £10 a year (reduced from £60 full price) by using a promotional code.

Section 106 Transport Provision

8.3.24 As part of the planning consent for Longcross North a Section 106 agreement has been signed by the developer for the northern part of the site to support the housing development. As part of this agreement several financial contributions have been agreed in terms of the provision of transport to the site:

8.3.25 Provision is made in the Section 106 agreement to upgrade Longcross rail station. These enhancements include improvements to access the rail station via the site and safety and provision for waiting passengers. In addition developer contributions have been secured to provide at least two services per hour in each direction from Longcross station from Monday to Saturday and an hourly service on Sunday, hence offering a more reliable and frequent service and providing a partial weekend service. Funding for this service has been secured for a four year period.

8.3.26 A new DRT service will be provided offering routes to Addlestone, Chertsey and Egham operating within a six mile radius of the site for nine years in lieu of a full bus route serving the site. The DRT service will be on an interim basis from the occupation of the first dwelling and until the occupation of the 185th dwelling or 20,000 sq.m of GIA Class B1 floorspace, when the Bus Service is introduced. The DRT will be a bookable service operating Monday to Saturday from 7am until 7pm; subject to demand, a more frequent / hourly service may be provided at the County Council's discretion.

8.3.27 In addition to the DRT, the developer for the site will contribute £150,000 towards the provision of school buses.

8.3.28 Traffic calming highway works have also been secured through the Section 106 agreement. These physical measures will be implemented in line with the recommendations of Chobham Windlesham and Bagshot Traffic Study 1 and Chobham Windlesham and Bagshot Traffic Study 2.

8.3.29 Prior to site occupation a site wide Travel Plan Strategy will be submitted in draft form. Upon site occupation the Travel Plan will be maintained and monitored with results being provided to the Council.

8.3.30 A cycle lane will be provided on Chobham Lane into the site to the junction with Kitsmead Lane where it will link with the existing on-road route connecting with Virginia Water.

8.3.31 A parking review will be carried out upon the occupation of 77,320 m^2 GIA of B1 offices to review any off-site parking along roads or other pedestrian routes resulting from the development on highways, common land or other available spaces that might occur. For any parking issues resulting from the development, remedial measures (such as controlled parking zones, bollards or lining and signing) will be funded by the developer.

8.4 Transport – Best practice

8.4.1 This section sets out best practice examples of sustainable travel measures throughout the UK to identify the type of measures that may be suitable for implementation at Longcross.

Community Car Clubs

8.4.2 Car clubs allow members to access a pool of shared vehicles on a pay-as-you-go basis at specific locations on the road network. . Vehicles are often provided in clusters to ensure access remains possible if another vehicle is in use. Whilst car clubs can be particularly successful in areas of high density and low car ownership, they can also be successful in lower density areas allowing people to move away from owning their own or multiple private vehicles.

8.4.3 According to gov.uk, car clubs can save irregular drivers potentially around £3,500 a year. These benefits in terms of monetary savings, maintenance requirements and time can be promoted as one of the philosophies of car clubs to residents of a development.

8.4.4 There are three types of car club, including:

- Round-trip car clubs – a member books a specific car located in a dedicated parking bay, for a period of time and then they return the car to the same dedicated parking bay;
- Fixed one-way car sharing – a member starts a reservation of an available car at a designated parking bay and drive this vehicle to another designated parking bay; and
- Floating one-way car sharing – a member identifies an available car, reserves and drives the car to their destination. To end their reservation, the car needs to be parked within a specified area.

8.4.5 Evidence from the Carplus Annual Survey 2014/2015 suggests that around a third of car club members who had intended to buy a private vehicle, no longer plans to do so after becoming a member of a car club. Five outcomes of the take up of a car club are: reduced traffic impacts; reduced parking pressures; promotes modal shifts and supports broader transport objectives; enables more intensive (and profitable) development; improves the urban environment.

Case Study 11: Co-Cars South West

Co-Cars South West provides an example of the provision of car clubs across small towns and rural locations in Devon and Dorset. This scheme provides integration with the First Great Western rail network across Devon and Cornwall to help develop a multi-modal offer.

Case Study 12: Malmo

Another successful example exists in Malmo in Sweden, where an initiative was set up to provide individuals and companies with access to an environmentally efficient vehicle as a way to discourage private ownership. The initial scheme looked to establish separate car-sharing sites for business users and a public only – with one site for the residential area, possibly in partnership with a housing developer, one next to the railway in partnership with the public transport operator and another in central Malmo for businesses, local authority and the general public. However, it was found that providing a site for all users together was more economic and practical, meaning the initial cost could be recovered more quickly. Between 2003 and 2008 awareness of the scheme grew from 28% to 47%.

Case Study 13: Zipcar

Zip car delivers on-demand mobility with the aim of reducing CO2 emissions through car sharing and to become an integral part of communities. Whilst at present Zipcar mostly operates within Greater London, they have been exploring the opportunity to provide Zipcars within a more rural setting. Zipcar recommend providing one vehicle at first occupation of the site, with the view to increase provision in line with utilisation and demand. Zipcar provide a managed service, which includes:

- Procuring and maintaining the vehicles during the contract
- Designing all the collateral required, from the bespoke landing page explaining the concept and offer, to the PDF insert for the welcome packs/user guides
- Managing the sign-up process (including licence and insurance eligibility)
- Post launch they will provide reports on utilisation of the car club (if required) and ensure that all the vehicles in the area are maintained to our high service level agreements.

In order provide a Zipcar, for a minimum of two year contract the developer at Longcross would need to make a contribution of £28,800 paid prior to date of occupation. In exchange Zipcar would provide each resident that signs up within the contract period with a free membership and £50 driving credit. The full Zipcar proposal is included in **Appendix A.**

Potential for Longcross

Case Study 14: Arriva Click and Slide

Arriva Click and Slide have recently launched a DRT bus service within Kent and Bristol respectively. Both services utilise a high-tech telemetric algorithm, which is accessed through a smartphone app in order to process customer demand. The smartphone app allows passengers to request a minibus from their desired pick up point at any time they want and to any destination of their choosing within a specified geographical area. Payment for their journey is accommodated through the app as customers register their payment card details making it more user friendly.

8.4.6 Using the same principles, Runnymede Borough Council or the developer could cover the initial capital costs of a fleet of vehicles and the physical and technological infrastructure required to set up a development centric car club platform, which would be accessible to residents and employees of businesses within the development, once signed up to a membership. By keeping the user group of the cars flexible it will ensure that financial gain is maximised. The scheme would be non-profit, with profit reinvested into additional provision where required. The utilisation of the car club scheme would be monitored through the site wide TP and assessed on a six monthly basis to ensure that the provision addresses demand. Hence this scheme can become community owned and run once initial capital costs have been made.

8.4.7 Due to the large quantum of employment space proposed, the employers on site could also create a consortium to fund and run the provision of a car club for employees to use for site visits and access. These would likely be utilised during the weekdays, therefore access could be extended to residents during the evenings and weekends.

8.4.8 A key factor for all car clubs is publicity and marketing particularly in relation to promoting awareness and therefore sustaining the scheme. This would be an important part of the site wide TP.

DRT

8.4.9 As mentioned, DRT is a form of public transportation that responds to the demands / requests of the passenger. Users can arrange a pick up and drop off point with a DRT service, for a pre-determined time-window, with a vehicle that operates within a certain geographical area. During the journey, other service users who have also made reservations with the DRT service can be picked up / dropped off along the way. Due to a traditional lack of / inefficiency in public transport infrastructure in rural locations, DRT services can be very helpful and very popular with local residents.

8.4.10 In recent years, telematics-based DRT has been pivotal in the implementation and success of DRT services. Telematics-based DRT uses a booking and reservation system, which assigns passengers to vehicles via the optimal route – using the least number of vehicles, to carry the highest volume of passengers, in the quickest journey time possible.

8.4.11 This type of technology driven DRT scheme could be implemented at Longcross. The use of a smartphone app makes it more user friendly as opposed to more traditional schemes where users have to call to book a DRT service. The use of smart phone apps for transport has proved to be highly successful for Uber, and the use of DRT smart phone technology is becoming more popular. Initial funding for the DRT could be secured through the S106 with the aim of the service becoming commercially viable as the development is built out and the customer base grows.

8.4.12 Through the use of development specific branding a feeling of community ownership would develop. Modern developments generally feature a ground rent to enable the upkeep of public areas that are not adopted by the local highway authority. The ground rent is collected by a management company who are appointed by an elected board of directors normally made up of residents and businesses that occupy the development. Such a model could be used here to give residents autonomy over how the service operates and will allow the residents to decide how this service is to benefit them and ensure the long term success of the service.

8.4.13 It will be important for any scheme considered as part of the Longcross Village project to use the lessons learned in the above case studies to provide the most effective DRT service possible. The service will be required to:

- Be flexible to the needs of its users;
- Preferably community led to provide increased autonomy and longevity of the services; and
- Be backed up by appropriate technology that is user friendly and allows the residents to use the service as it was intended to fulfil their journey requirements.

Car Share

8.4.14 Car sharing is when two or more people travel together by car and share the cost of their journey. In general terms, car sharing can be described as:

- Formal – an organised scheme that puts drivers and passengers together who may not otherwise have come together to share car journeys; and

- Informal – generally where family, friends and colleagues agree among themselves, on an ad hoc or regular basis, to share car journeys.

Case Study 16: Travelshare, Essex

Travelshare-Essex is a closed-group, web-based, fully automated journey matching service, funded by a joint partnership of Essex County Council and the Chelmsford Environment Partnership and is free for individuals to join and to use. It is intended mostly for employees of registered companies, although individuals unconnected with an organisation can also join. Once registered, it provides the member with details of other members making similar journeys to their own. 19 organisations have now joined the scheme.

A specific feature of Travelshare-Essex is the variety of incentives it offers to members as a reward for car-sharing: it sees incentives as an integral part of any successful car-sharing scheme. The guaranteed ride home is a condition of corporate membership of Travelshare-Essex but is restricted to those who miss their ride home through an emergency. The Travelshare-Essex website also has an impact indicator showing how much a member can save by car-sharing.

Case Study 15: Travel Plan Working Group, Somerset County Council

In response to rising levels of traffic, Somerset County Council set up a travel plan working group and through this group a countywide car share scheme in the form of an online database was launched to supplement the relatively sparse public transport network in the rural parts of the county. Any business or organisation across the county is able to join the scheme and can choose from an open scheme available to all users or a closed scheme which is restricted to the organisation members only. Open membership has proved to be the most popular. Organisations pay an initial joining fee from £100 for 50 employees to £1,500 for over 2,500 employees and an additional annual licence fee.

Within a month of launch 140 members were registered in the database, which eventually doubled with 15 organisations joining. The success is shown by 12.5% of members sharing on five days of the week, and mode share surveys before and after showed that multiple car occupancy more than doubled.

Measures used by Somerset County Council to encourage car sharing include dedicated car sharing bays, guaranteed ride home in emergency, flexitime to enable employees greater choice in commuter options and if drivers lose their partner they are given a grace period to find another partner. In terms of fees, Somerset County Council pay Jambusters (the site host) £2,500 per annum to administer the site, with £75 also paid by each organisation to Jambusters. The organisations also pay Somerset County Council the initial joining fee.

8.4.15 Car sharing schemes can be funded from a variety of sources;

- Developer contributions secured through a Section 106 Agreement attached to

planning permission for new development. The contribution usually relates to travel planning in general, rather than car sharing in particular, but site constraints, such as parking restrictions, can make car sharing a key element of the resultant travel plan.

- Businesses can collectively meet the running costs of a car sharing scheme.

Case Study 17: Smart Bike - Various Schemes

Stationless smart bike sharing schemes are currently trialling in cities in the UK and worldwide. Examples include OBike (London), Mobike (Manchester), Ofo (Cambridge) and Yobike (Bristol). This offers a convenient, on-demand alternative mode of transport. The user searches for a bike, reserves and unlocks it, and at the end of the ride the user parks the bike within the designated public bike parking area (which in this case could be at the boundaries of the development or specific zones).

8.4.16 At Longcross due to the mixed use nature of the development a closed car sharing scheme would work well for all residents and employers/employees on the development. The businesses which occupy the site could fund the yearly maintenance cost of running a car share website for the employees and residents, which would provide a benefit to their employees. This would mean that Longcross would not be reliant on developer funding or Local authority grants and would become self-sufficient.

Cycle hire

8.4.17 In order to promote walking and cycling as an attractive choice of travel, safe and clear routes need to be provided not only within the development, but to connect with existing infrastructure and key destinations located within reasonable cycle and walking distances. Bike sharing facilities offer a flexible mode of transport for commuter, leisure and business trips, which can complement the public transport network.

Case Study 18: London Borough of Haringey

In Haringey, a total of 7,193 residents were given tailored travel advice in the first phase of the PJP. The second phase of the project involved a follow up survey to identify travel behaviour change. The survey indicated that 17% of residents in the study area changed to a sustainable mode of travel as a result of the PJP advice. The key successes of this project have been identified as the PJP team being able to offer discounts to purchasing items at a local bike shop, discount cards for the use of public transport and the use of tablets to capture the travel data and provide an accurate record of the PJP conversations with residents.

Case Study 19: Royal Borough of Greenwich

In Greenwich, based on a target population of 5,000 households, a total of 3,500 households were contacted and of these 2,175 went on to receive tailored travel advice.

8.4.18 Examples of funding sources include partnerships with the Local Enterprise Partnership, as illustrated in Brighton and Derby where Coast to Capital awarded Brighton and Hove City Council with £1.16million funding to deliver 439 bikes at 50 stations, with the council funding the remaining £290,000. In Derby, D2N2 LEP supported Derby City Council's bike share scheme of around 115 bikes and 15 stations, providing £480,000 towards capital costs. In contrast, Sheffield Bicycle, a scheme set up by Sheffield University, was funded by the university's parking levy.

8.4.19 On a smaller scale, an alternative would be an in house cycle sharing scheme which would be implemented at local community centres and employment hubs. It is important for bikes to be located in an easily accessible area, which could potentially be accessed using an existing access card using smart locks. There are a number of UK host sites currently operating.

8.4.20 Further initiatives which are being implemented in similar sustainable developments include one in North West Bicester which will provide bike fixing workshops to educate residents on important bike safety checks and maintenance tips. Alongside this a program of incentives will be rolled out including electric bike loan schemes to encourage cycling as a mode of travel to work.

Travel Planning

8.4.21 Residential Personal Journey Planning (PJP) offers the opportunity for a trained journey planner to visit residents to discuss their travel patterns and identify opportunities for travel by sustainable modes.

8.4.22 Examples include the London Borough of Haringey and the Royal Borough of Greenwich where a total of 10,000 households were targeted. The aim of the PJP was to address the low propensity to cycle in these areas and to address health inequalities and high car ownership within these areas.

8.4.23 PJP could form a key measure of any Travel Plan secured for the development.

Mode Share Targets

8.4.24 It is evident from census data analysis that travel by car has remained the dominant mode of travel over the last ten to twenty years in the local area. However, Garden Village principles emphasise the need to significantly reduce this with a modal shift towards travel by public and active modes of transport. Whilst an initial baseline for the development is unavailable due to the lack of active residential and employment uses on site, other example of developments have been sought to provide a realistic outlook.

8.4.25 The above case studies provide good examples of how car clubs, car sharing, cycle hire, PJP and DRT services can be implemented as part of a coherent and flexible package to reduce isolation and increase sustainable mobility in more remote locations that are not well connected by public transport.

Case Study 20: The North West Bicester Masterplan

The North West Bicester masterplan provides a new eco town, which will eventually provide 6,000 homes and employment facilities to provide 4,000 jobs on site. An initial phase of development has been brought forwards to the southwest of Bicester. Development proposals include a new bus route providing a connection between the site and the town centre. The site is approximately 1.2km distance from two railway stations. The site features a Travel Plan and within this the action plan states that by 2026 50% of journeys should be undertaken by non-car modes.

The Travel Plan also establishes a target to reduce the annual average distance travelled by private car by 10%. This masterplan aims to provide a new quarter to the town instead of being a bolt-on to Bicester, which encourages a strong sense of community. It differentiates itself from a normal housing development by including such things as open streets to encourage communities to gather, a community car club and real time information systems for each house.

Monitoring of this Travel Plan is ongoing with the current travel survey illustrating a vehicular mode share of 39% (significantly exceeded the target set for 2026 already). This example demonstrates that ambitious targets can be set for non-car travel and can be achieved using a mixture of DRT provision, walking and cycling and encouraging flexible working behaviours.

8.5 A sustainable transport strategy for Longcross Garden Village

Introduction

8.5.1 Transport and connectivity form an essential part of a garden community's philosophy, with priority given to highly sustainable and integrated transport. The role of the car is marginalised while public transport and active modes are prioritised for movements within the garden settlement itself and locally. Car use is restricted to longer distances.

8.5.2 The overall vision for the provision of transport at Longcross Garden Village is to:

- *'Seek to maximise the opportunities for using sustainable modes of transport, whilst undertaking specific mitigating actions at particular points in the highways network.'*[19]

8.5.3 In order to achieve this overarching vision, the Transport Strategy for the site should be articulated around the following objectives:

- Promote sustainable travel by developing high quality public transport provision, and walking and cycling infrastructure for internal trips within the site
- Reduce car journeys both in the site and outside. This requires an integrated approach to land use and transport, as well as a diverse offer of facilities on site to meet the everyday needs of employees and residents;
- Reduce second car ownership amongst households;

[19] http://www.longcrossvillage.info/transport.html

- Reduce the number of single occupancy car trips external to the site
- Support the uptake of cleaner vehicles.

8.5.4 In order to achieve these ambitious objectives, the Garden Village needs to provide an integrated, diverse and comprehensive offer for both public and active modes of transport across the development, and plan the site in a way which reduces external journeys.

8.5.5 After estimating the potential impact of the development on travel demand, the rest of this section builds on the case studies and knowledge of other developments to produce a transport strategy in line with Garden Village Principles.

Travel Demand

8.5.6 The vehicular trip rates set out in the northern masterplan transport assessment have been extracted and scaled up to calculate a provisional trip generation for the whole site. These vehicular trip rates have been used in tandem with the existing mode share set out in Section 8.2 to create a provisional multi modal trip generation for the purposes of identifying likely demand by mode before the transport strategy outlined in this document is implemented. The trip rates from the northern masterplan have been used as opposed to the Local Plan Transport Assessment because they are higher and will therefore provide a more robust worst case scenario.

8.5.7 **The table below** sets out the provisional trip generation associated with the whole masterplan during the AM and PM peak.

Provisional Multi Modal Trip Generation

Mode of Transport	Mode share	AM	PM
Train / London Underground	15%	548	393
Bus, minibus or coach	3%	106	76
Taxi	0%	11	8
Motorcycle, scooter or moped	1%	39	28
Driving a car or van	66%	2438	1751
Passenger in a car or van	4%	147	105
Bicycle	2%	93	67
On foot	9%	316	227
Other method of travel to work	1%	19	14
Total	100%	3717	2670

8.5.8 Demand for rail based services is anticipated to be 548 and 393 passengers during the AM and PM peak respectively, based on current frequency levels. The origin destination data suggests that most commuter trips by rail will utilise the eastbound service (91%). Two additional services will be provided in each direction as part of the development proposal, therefore this equates to the following additional passengers:

- 298 passengers on the AM eastbound service;
- 214 passengers on the PM eastbound service;
- 29 passengers on the AM westbound service; and

- 21 passengers on the AM westbound service.

8.5.9 In terms of bus based travel, the level of demand is estimated to be 106 during the AM and 76 during the PM peak. This is relatively low in comparison to other modes, so changing travel behaviours from the outset will be important. The availability of a DRT or bus service will provide residents with a supplementary service for the bus network lacking in the area.

Public Transport Strategy

Rail

8.5.10 Currently Central London and Reading (with intermittent stops at more local stations) can be accessed by train from the site's railway station, although commute times are long and frequencies low at present. Nevertheless, with improved service, the station potentially could provide a significant source for share of out commuting.

8.5.11 In order to enhance the role of rail for journeys external to the site, while reducing the need for car use to reach stations, it will be important to provide a direct and safe route from key nodes across the development to the station.

Bus and DRT

8.5.12 Limited commercial bus services currently operate within close proximity of the Longcross site. The lack of a comprehensive bus service in the wider area surrounding the site means travel to destinations within the district is difficult. The majority of bus services within Runnymede are concentrated along routes surrounding the M25 corridor via Chertsey, Addlestone, Virginia Water and Egham. The closest bus routes (566, 567) are accessed from Trumps Green Road approximately 2.1km from the site, however the frequency is low and therefore it may not prove beneficial to extend these into the site.

8.5.13 Key employment centres such as Camberley, Woking and Heathrow should be identified and commuters targeted. Commuter DRT could be provided along these corridors during the peak hours providing a minibus commuting service for a group of residents travelling to a similar destination. Examples of this service can be seen in Kent via ArrivaClick and in Bristol using Slide, both requested by phone apps. The technological availabilities demonstrated by the ArrivaClick and Slide DRT service in Kent and Bristol respectively, shows that a new development could introduce a scheme of this nature and utilise technology that has already been streamlined and made user friendly. Using technology that has already been designed will reduce the cost on implementation as well as ensuring that a workable interface can be provided to customers that is tried and tested. This technology is also very current with other smartphone apps such as Uber.

8.5.14 The existing Yellow Bus initiative serves the nearest secondary school to the site, whilst this does not currently provide services to Longcross, future demand could facilitate this. The S106 agreement for the north of the site includes £150,000 to be paid to Runnymede Council towards the provision of school buses which could be used for this purpose and further contributions towards the Yellow Bus initiative could come forward from the south site.

Travel Planning

8.5.15 A site wide Travel Plan (TP), covering both the southern and northern parcels of the site should be implemented to provide a comprehensive strategy for encouraging sustainable transport across the development. A key element of the TP will be PJPs. PJPs should be carried out to show residents on first occupation (before residents settle into travel patterns such as primarily using the car) the best and most sustainable modes of travel to work or leisure facilities. Benefits in time, money and environmental advantages should be emphasised during this process to highlight to residents the savings available by taking public and active modes of transport as opposed to the car.

8.5.16 Through the PJP access to further incentives such as discounts to season tickets for commuters from Longcross Station, discounts for fares for bus and DRT services and free membership for a year to a potential car club should be encouraged.

8.5.17 The existing Longcross Garden Village website should be updated and provide detailed travel information for the site including links to the national rail and travel Smart Surrey websites, up to date bus time tables and details of walking and cycling routes. This website could also provide an easy booking system for car clubs, planning lift sharing and accessing bus and train times.

8.5.18 As part of the planning approval process the site is likely to require a S106 agreement with the Highways Authority which would include monitoring of the site's mode shares to ensure that targets set out in the TP are being achieved and measures are put in place if the targets are not met.

Walking and cycling strategy

8.5.19 The rural nature of the site means a higher level of car use is expected for trips external to the site than would be the case for an urban extension. However, it is widely acknowledged that trips of up to 5km can be reasonably undertaken by active modes of transport.

8.5.20 In order to promote walking and cycling as an attractive choice of travel, safe and clear routes need to be provided not only within the development, but connect with existing infrastructure connecting to key destinations located within reasonable cycle and walking distances. Virginia Water is located approximately 4.2km (14 minute cycle) from the site, which can be accessed via the on road cycle route identified along Kitsmead Lane which bounds the southern site. Therefore connections between the eastern borders of the site should be provided to allow access.

8.5.21 The provision of cycle hire or a cycle sharing scheme should be investigated to encourage cycling as a mode of travel.

Vehicular Strategy

8.5.22 The sustainable garden village design should look to:

- Reduce car journeys
- Work on reducing car ownership, within the garden village, in particular targeting reducing secondary car ownership within households
- Support the uptake of cleaner vehicles

8.5.23 This can only happen if sustainable alternatives such as the ones explored in the previous sections are provided to residents and employees.

Reduce car journeys

8.5.24 The proposed northern masterplan will provide limited vehicular connectivity between the residential and employment land uses and dissuade through traffic. These objectives should be extended to the southern envelope of land during masterplan development. By reducing the number of vehicular connections between the residential, employment and leisure elements located across the site, whilst providing high quality active mode infrastructure this will encourage users undertaking trips to destinations within the development to use active and sustainable modes of transport instead of using a more convoluted route by private car, hence reserving private car use for longer trips.

8.5.25 This in itself will reduce the number of private vehicle trips, if all local amenities can be accessed by foot, cycle and bus. In tandem with this, the provision of a car club scheme would introduce an environment where longer trips, which are less frequent, can be undertaken by a shared car reducing overall levels of car ownership.

8.5.26 Whilst car clubs are usually aimed towards the residents in a development, the opportunity for staff of the employment units located in the development to utilise the car club should be encouraged, and buy in from employers sought. Therefore employees who travel to work by public modes of transport or active modes still have the opportunity for travel by car when required, for example to site visits and meetings in more rural less connected areas.

Reducing second car ownership

8.5.27 Due to the rural location of the site car ownership by households is still likely to prevail. However the reduction in ownership of a second car should be targeted through the implementation of the car club and car sharing database.

8.5.28 The opportunity exists to promote a flexible car sharing initiative within the community to facilitate the efficient use of under-utilised vehicles. This can provide a database of users who either want to liftshare with car drivers on long distance trips, but also to provide an opportunity for users to rent private cars known as peer to peer car-sharing. Whilst sites currently exist which offer this service such as Easycar, Hiyacar, Ridelink and Blahblah car, a localised website could be set up prior to occupation to provide a more community owned scheme which is safe and trusted.

Support the uptake of cleaner vehicles

8.5.29 Increased ownership of electric vehicles should be encouraged to reduce emissions and the viability analysis in Section 9 therefore assumes all homes will be built with electric charging points. Low emission targets and aspirations should also be applied to public transport solutions as well as private vehicles.

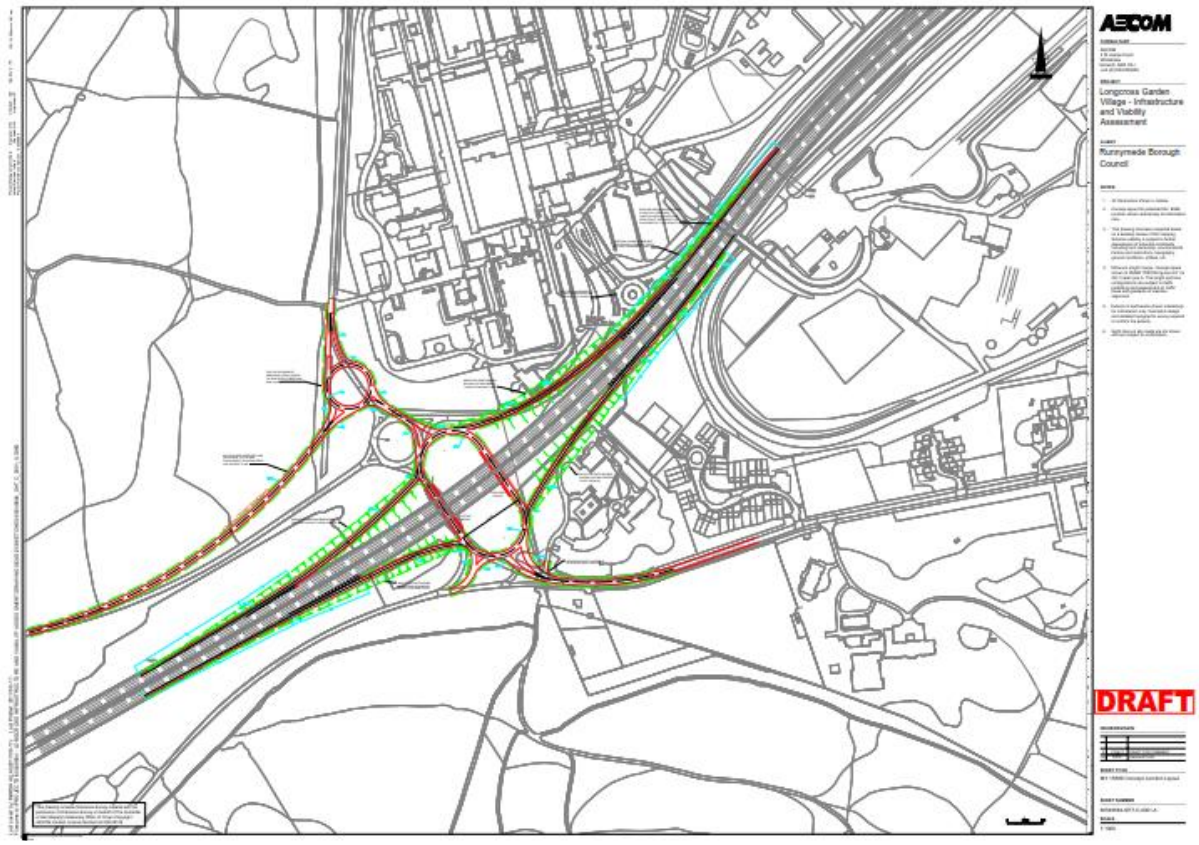
8.6 M3 Junction feasibility assessment

8.6.1 Despite being located adjacent to the M3, Longcross does not currently feature direct access to the Strategic Road Network (SRN). As set out in the baseline section the closest M3 junction is junction 3 at Bagshot or the M25's junction 11, both of which are approximately 12 minutes' drive from the site via local roads. The feasibility of providing a direct connection to the SRN has therefore been investigated.

8.6.2 Whilst not encouraged through the transport strategy for Longcross, direct access to the SRN from the site could reduce the traffic on the local road network and provide environmental benefits as there would be a reduction in mileage to access the SRN. However, at this early stage no modelling has been undertaken to determine the impact of such a junction on the strategic or local road network in the area.

Technical feasibility

8.6.3 AECOM has produced a concept layout for an M3 junction near Longcross based on limited available public information and OS mapping.



AECOM conceptual Mastermap layout of an M3 junction at Longcross

8.6.4 There are a large number of unknowns regarding the layout, including land ownership, environmental constraints, utilities, topography and ground conditions that would require further analysis.

Financial feasibility

8.6.5 A very early, high level preliminary cost estimate for the scheme could be between £30 to £40 million for the construction works. Given potential funding available considering land value capture options and likely developer contributions, the scheme would be financially unviable without significant external grant contributions.

SRN policy

8.6.6 Highways England policy for additional junction access onto the SRN does not appear to support the development of an additional M3 junction at Longcross. Guidance on the provision of new accesses on the SRN has changed over time:

8.6.7 Circular 02/2007 restricted new accesses onto the SRN to facilitate developments.

8.6.8 In 2013 a new HE circular (02/2013) superseded Circular 02/2007 and proposed a graduated approach to the provision of new junction accesses where other network-wide benefits could be delivered. However, the circular continued the policy of no new access to/from the SRN. The only exception to this restriction was for new service stations. The latest HE guidance 'the strategic road network - Planning for the future: A guide to working with Highways England on planning matters' sets out potential safety issues with the provision of additional junctions:'*Access points and junctions on busy, high speed roads generate weaving and turning manoeuvres by drivers, which are likely to create adverse effects on the safety and reliability of journeys.'*

8.6.9 A key factor that affects weaving on the SRN is the distance between junctions. The provision of a new junction between junctions 2 and 3 on the M3 could compromise the ability to deliver on- and off-slip roads lengths (particularly the east-facing slip roads) that would be sufficiently separated from adjacent ones, and avoid increased weaving, in line with DMRB guidelines. Where this can not be safely delivered - and it is likely that there will be an increase in weaving and therefore potential safety issues - the guidance indicates that such assesses will be restricted unless there is a significant economic benefit.

8.6.10 HE's current policy position indicates that it would prove difficult to justify the provision of a new access to the M3 to serve Longcross Garden Village.

9. Housing and Viability Assessment

9.1 Introduction

9.1.1 Following the above sections looking into a number of Garden City principles and their possible prioritisation and application to the Longcross development, AECOM has undertaken a high level viability assessment of the scheme. The analysis is based on publically available information sources and, where applicable, previous studies and work commissioned and undertaken by the client team. When looking at the viability of the scheme AECOM also tested the sensitivity of the scheme against changes in a number of key variables, including tenure mix and infrastructure cost.

9.1.2 This section contains an overview of the approach taken, the variables against which the viability was tested and five scenarios looking at the sensitivity of the scheme to changes in these variables.

9.2 Method

9.2.1 In the planning and development process of a large scheme such as Longcross, understanding the viability of the scheme is paramount.

9.2.2 AECOM has developed a Land Use Viability Tool (LUVIT) for the Longcross scheme to test viability scenarios based on differing types and tenure of housing mix, local knowledge of land and house values, affordable housing assumptions and likely estimated development and infrastructure costs. This tool demonstrates not only how the viability of the scheme is likely to react to changes in market conditions and legislation but also how it can be expected to contribute to wider on and off site infrastructure demands created as a consequence of a new population centre.

9.2.3 AECOM has focused on the variables the client team indicated they are currently testing. To ensure flexibility in the tool it approaches the development from the perspective of the land owner developing and selling all of the residential products on the site. This approach provides us with a conservative indication of the viability, while allowing for flexibility in testing other variables. In reality the land owner is likely to act as a master developer and selling off some parcels of the development to specialist providers. *As the project evolves, this tool can be expanded to factor in a higher level of detail as and when required by the client team, subject to a separate commission.*

9.2.4 The key assumptions and sources used in LUVIT are detailed over the following pages. As the project is currently in early stages of development and the method of financing is undefined we have therefore excluded financing assumptions from this appraisal.

Longcross Land Use Viability Tool Assumptions

			Source and Notes
General and Inflations			
Base Year	2017		Current Year
Inflation Rate	Off		-
Unit Delivery and Tenure Mix			
Expected First Year of Unit Sales	2020		Assumption Based on Current Year
Unit Delivery per Year	130		NLP Report
Total Units within Scheme	1,500		Client Information
Tenure Mix	*100.0%*		
Market Housing	54.0%		Client Information
Affordable Homes	30.0%		Client Information
Serviced Traveller Pitches	1.0%		Client Information – Construction in model Year 3, 7 and 11
Specialist Accommodation	10.0%		Client Information
Non-Specialist	5.0%		Client Information - Construction in model Year 3 and 8
Average Unit Size	**Net (sq.m)**	**Gross (sq.m)**	
Market Housing (built)	109.65	109.65	Andrew Golland Associates (Ottershaw) - Client unit size distribution - *Note, smaller than Crest*
Affordable Homes (built)	71.32	71.32	Andrew Golland Associates (Ottershaw) - Client unit size distribution
Serviced Traveller Pitches (plot)	700.00	700.00	Runnymede Site Capacity Analysis - *Note this is total plot area, not building area*
Specialist Accommodation (built)	48.00	56.47	Runnymede Site Capacity Analysis
Non-Specialist (plot)	109.65	109.65	In line with market housing sizes - assumes a range of product sizes
Unit Pricing – (Net Area)			
Market Housing	5,900	GBP/Sq.m	Andrew Golland Associates (Ottershaw) - Client unit size - Increase over time at 3.5% (10 year average) based on market data for area-based trend house price inflation.
Affordable Homes			
Afforable Rent	12,494	Annual Rent/Unit	Local Housing Allowance
Social Rent	5,725	Annual Rent/Unit	Average RBC Rent
Shared Ownership	3,835	GBP/Sq.m	65% Market Value - Homes and Communities Agency
Starter Homes	4,720	GBP/Sq.m	80% Market Value - Homes and Communities Agency
Serviced Traveller Pitches	-		*Assumed revenue and operating costs are zero*
Specialist Accommodation	35,100	GBP/Bed/Year	Industry Reports - KF / Laing Buisson
Occupancy	88%		Industry Reports - KF / Laing Buisson
Non-Specialist	2,500	GBP/Sq.m	Based on land plots with PP for sales in Surrey
Allowance for Developer Risk on Revenues @	2.5%		From Cost Consultants - Standard Contingency - can vary substantially based on developer
Cost of Sales / Operating Expenses (as % of Gross Revenue)			
Market/Affordable - Sales	3.5%		Based on typical market values
Affordable Homes - Rental	25.0%		Based on typical market values

Longcross Land Use Viability Tool Assumptions

			Source and Notes
Serviced Traveller Pitches	0.0%		*Assumed revenue and operating costs are zero*
Specialist Accommodation	72.0%		Industry Reports - KF / Laing Buisson
Non-Specialist	3.5%		Based on typical market values
Development Cost Assumptions – (Gross Area)			
Base Case Average Construction Cost			
Market Housing	1,358	GBP/Sq.m	BCIS South East Region upper Q (inc external work and prelims)
Affordable Homes	1,358	GBP/Sq.m	BCIS South East Region upper Q (inc external work and prelims)
Serviced Traveller Pitched	-		Assumed no on-plot costs
Specialist Accommodation	1,440	GBP/Sq.m	SPONS - 2017 Mid Rate
Non-Specialist	-		Assumed no on-plot costs
Professional Fees % Construction Cost	10.0%		AECOM Cost - Standard industry rate
Contingency % Construction Cost	7.5%		AECOM Cost - Standard industry rate
Infrastructure Cost - GBP per Unit	40,000		High level Assumption from AECOM Cost Consultants - Phased over time in line with unit delivery
Land Cost	100,000,000		*Unknown – Conservative estimate based on sale over 30 years ago*

9.2.5 As shown in the assumptions table we have currently allowed for an infrastructure cost of GBP 40,000 per unit, which includes expected contributions from S106 (estimated as average contributions for residential development in South East England).

	Cost per Unit (GBP)
Site Preparation	3,667
Transport Infrastructure (on and off site)	9,879
Utility Infrastructure (on and off site)	8,967
Community Infrastructure	8,942
Green Infrastructure	2,534
Professional fees	2,738
Design Development & Construction Contingency	3,273
Total Cost Per Unit	**40,000**

9.2.6 At this point as no detailed infrastructure cost assessment has been undertaken, we have used a high level assumption on the phasing of these costs over time. While we initially considered phasing the infrastructure cost in line with unit delivery, in order to use a conservative approach as our Base Case scenario we have revised this to incorporate a higher proportion of infrastructure costs in the first five years of the project. We explore the impact of the infrastructure cost being in line with unit delivery as a sensitivity scenario.

9.3 Longcross viability scenarios

9.3.1 Using the Land Use Viability Tool we have run six scenarios for Longcross, demonstrating the sensitivity of the development to changing key variables:

- **Scenario 1 –** Base Case
- **Scenario 2 -** Affordable Housing – 35 percent
- **Scenario 3 -** Affordable Housing – 40 percent
- **Scenario 4 –** Infrastructure Cost – 10 percent Increase (above Base)
- **Scenario 5** – Affordable Housing Mix (Increased Affordable Rent)
- **Scenario 6 –** Infrastructure Cost Phasing

9.3.2 The key metric that we have focused on while testing the viability of the development and its sensitivity to changes in different variables is the project internal rate of return (IRR). The minimum rate of return that a developer would expect for a development is linked to the perception of risk for that development. Broadly speaking for this type of investment a minimum return in the region of 20% would be expected. As the financing assumptions for this development are currently unknown we would therefore anticipate a requirement for the IRR to sit slightly above 20% to account for costs of financing.

Scenario 1 – Base Case

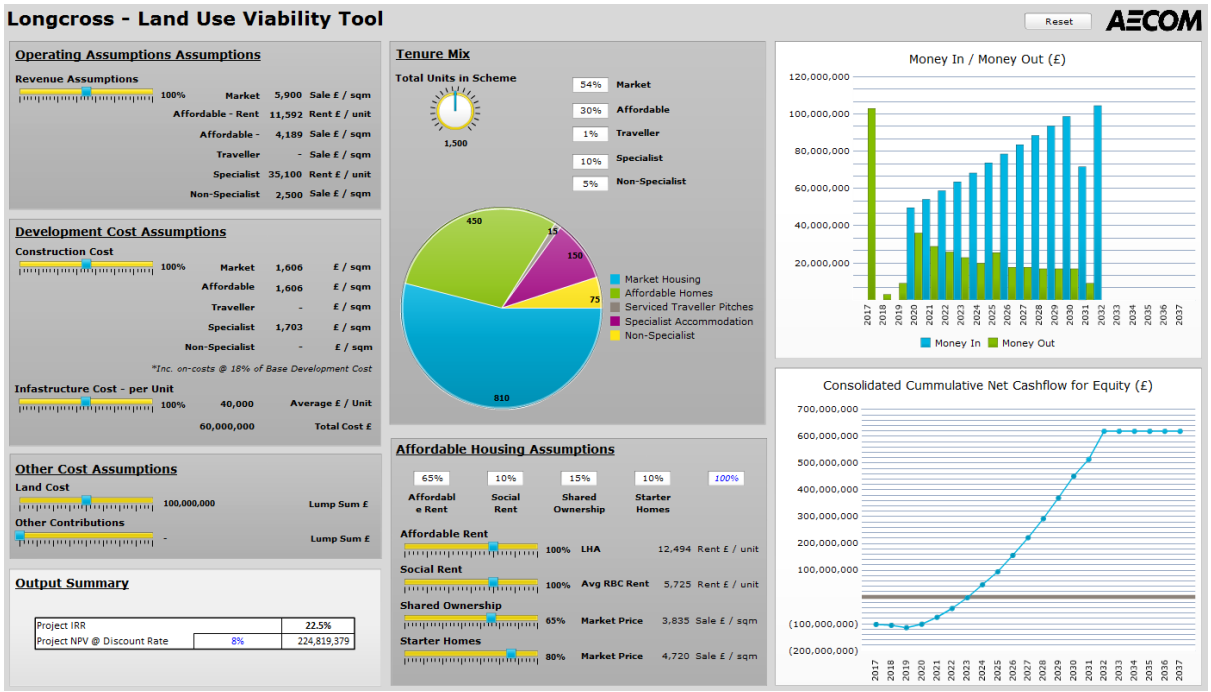
9.3.3 This scenario shows the viability of Longcross using the Base Case variables as outlined in the following table below.

9.3.4 As can be seen under the Base Case scenario the project internal rate of return lies above 20%, at 22.5%. This level of return allows for developer return, plus any cost of financing that may be required by the developer in the initial years where the infrastructure and construction costs will exceed the revenue. This indicates there may be flexibility for the developer to make additional community contributions, which could be in the form of an increased proportion of affordable homes or other community infrastructure, while the return of the scheme is still above 20%.

Land Use Viability Tool – Scenario One Summary Table

	Total Review Period (2017 – 2037) (Figures in £000s)
Total Net Revenue	**986,955**
Construction Cost	208,586
Infrastructure Cost	60,000
Land Cost	100,000
Other	-
Combined Capital Cost	**368,586**
Net Cashflow	**618,369**
Project IRR	***22.5%***
Project NPV at 8% Discount Rate	***224,819***

9.3.5 Below we have provided a snapshot of the Longcross Land Use Viability Tool under the base case scenario.



9.3.6 Using Runnymede BC pricing data informing Local Plan development, a further test was run for the base case adding the unit costs of meeting local policy requirements for accessibility as well as an additional provision of electric vehicle charging. In this scenario, all homes are delivered to compliance with at least M4(2) accessibility standards and 75 homes (5% of total homes) are delivered to M4(3) standards, split 45 for adaptability (3%) and 30 for accessibility (2%). Additionally, all 1500 are provided with electric vehicle charging points.

9.3.7 This scenario added £6m to overall lifetime costs, approximately 1.6% of total costs, which had the effect of reducing the overall IRR by half a percentage point to 22.0%

9.3.8 An additional sensitivity test, applies an assumption that the Starter Homes are to be sold in line with the Outer London cap (i.e. that they cannot be sold for more than £250,000). 10% of the affordable homes (45) are therefore capped at £250,000, which equates to 59% of market rate given floorspace requirements. This additional requirement had the impact of reducing the IRR in the base case by a further 0.6% to 21.4%

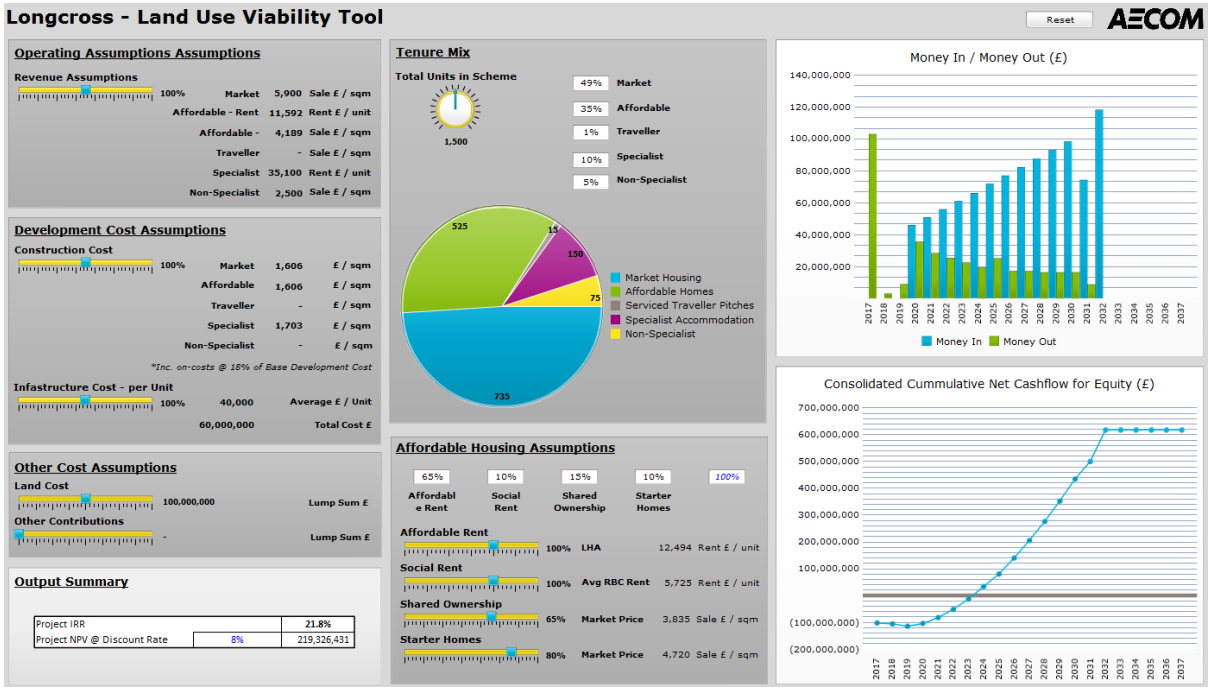
Scenario 2 – Affordable Housing 35%

9.3.9 This scenario shows the viability of Longcross using the Base variables as outlined previously, but increasing the proportion of affordable housing to 35%. As can be seen the internal rate of return still lies above 20%.

Land Use Viability Tool – Scenario Two Summary Table

	Total Review Period (2017 – 2037) (Figures in £000s)
Total Net Revenue	**982,236**
Construction Cost	203,969
Infrastructure Cost	60,000
Land Cost	100,000
Other	-
Combined Capital Cost	**363,969**
Net Cashflow	**618,267**
Project IRR	**21.8%**
Project NPV at 8% Discount Rate	**219,326**

Below we have provided a snapshot of the Longcross Land Use Viability Tool under the base case scenario, but changing the percentage of affordable housing to 35 percent.



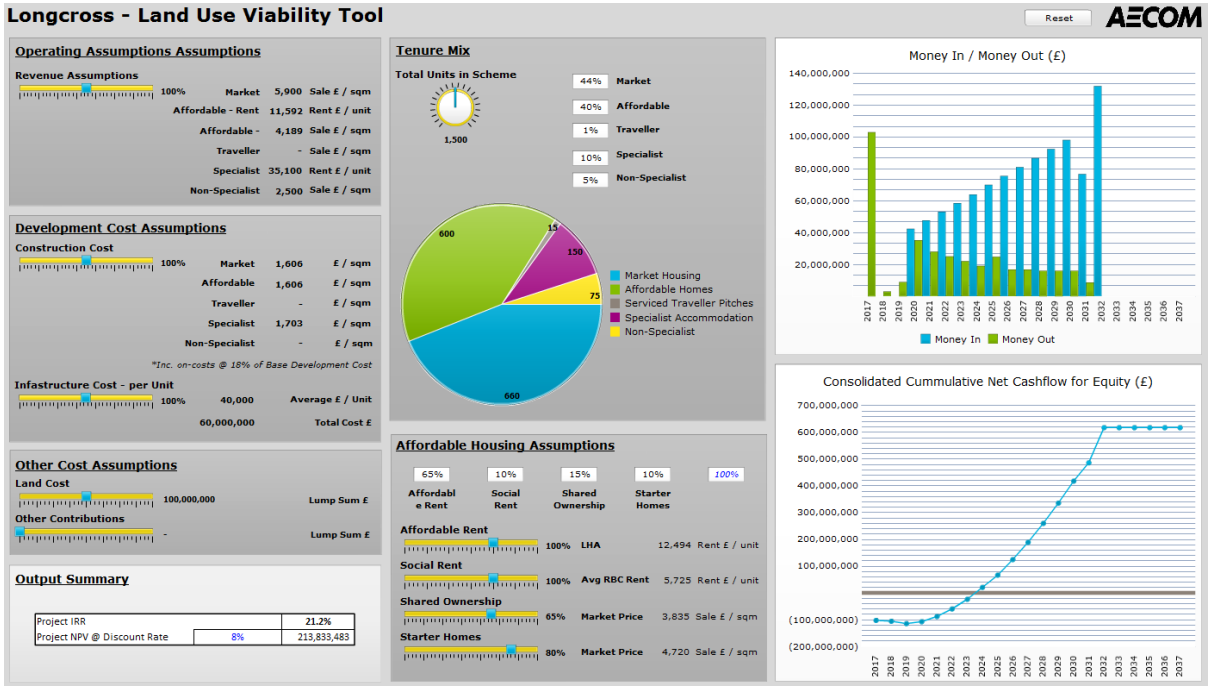
Scenario 3 – Affordable Housing 40%

9.3.10 This scenario shows the viability of Longcross using the Base Case variables but increasing the proportion of affordable housing to 40%. As can be seen the internal rate of return still exceeds 20%.

Land Use Viability Tool – Scenario Three Summary Table

	Total Review Period (2017 – 2037) (Figures in £000s)
Total Net Revenue	**977,517**
Construction Cost	199,353
Infrastructure Cost	60,000
Land Cost	100,000
Other	-
Combined Capital Cost	**359,353**
Net Cashflow	**618,164**
Project IRR	**21.2%**
Project NPV at 8% Discount Rate	**213,833**

Below we have provided a snapshot of the Longcross Land Use Viability Tool under the base case scenario, but changing the percentage of affordable housing to 40 percent.



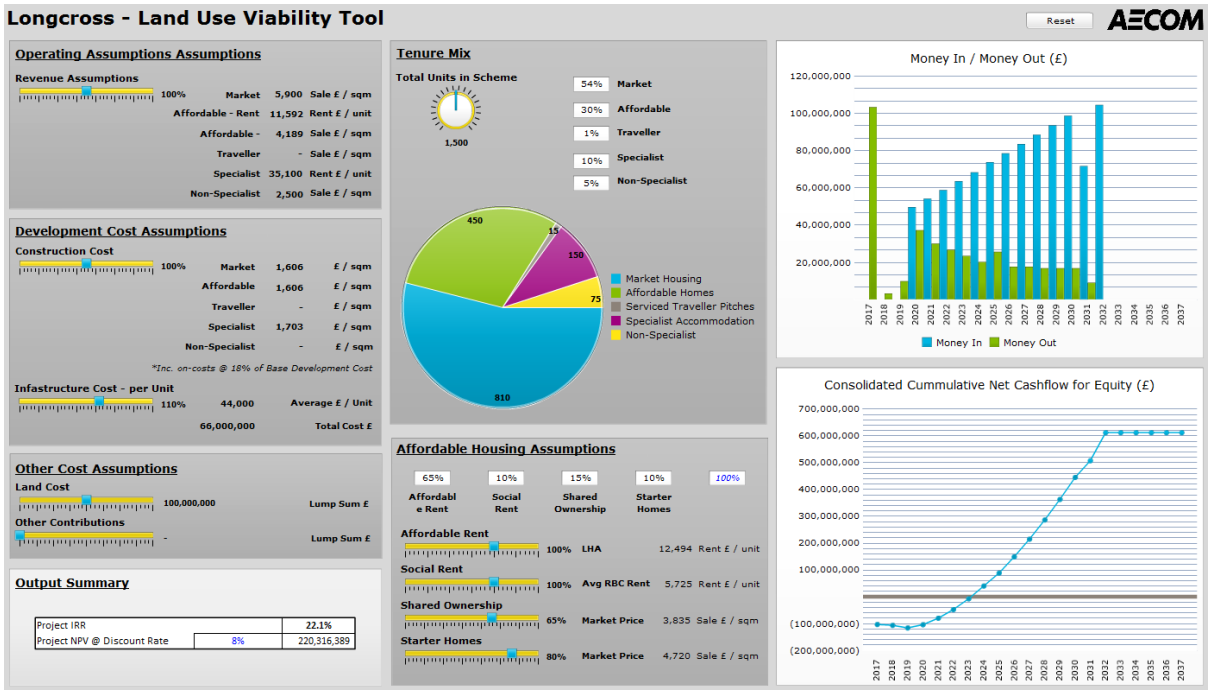
Scenario 4 – Infrastructure Cost – 10 percent Increase

9.3.11 This scenario shows the viability of Longcross using the Base Case variables but increasing the infrastructure cost by 10%, equating to £66.0 million (£44,000 per unit). In this case, the internal rate of return is 22.1%.

Land Use Viability Tool – Scenario Four Summary Table

	Total Review Period (2017 – 2037) (Figures in £000s)
Total Net Revenue	**986,955**
Construction Cost	208,586
Infrastructure Cost	66,000
Land Cost	100,000
Other	-
Combined Capital Cost	**374,586**
Net Cashflow	**612,369**
Project IRR	***22.1%***
Project NPV at 8% Discount Rate	***220,316***

9.3.12 Below we have provided a snapshot of the Longcross Land Use Viability Tool under the base case scenario, but increasing the infrastructure cost by 10 percent.



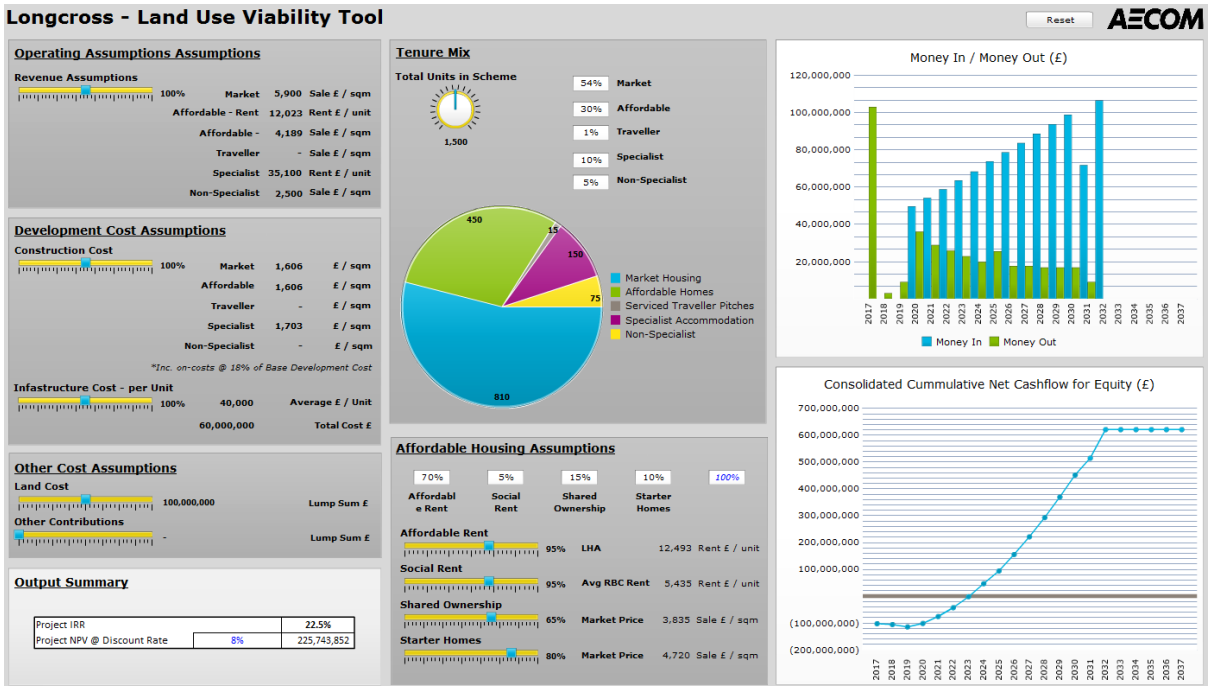
Scenario 5 – Affordable Housing Mix

9.3.13 This scenario shows the viability of Longcross using the Base Case variables but adjusting the mix of affordable housing, increasing the proportion of affordable rent to 70% (reducing the proportion of social rent to 5%). As can be seen the internal rate of return still lies above 20%.

Land Use Viability Tool – Scenario Five Summary Table

	Total Review Period (2017 – 2037) (Figures in £000s)
Total Net Revenue	**989,549**
Construction Cost	208,586
Infrastructure Cost	60,000
Land Cost	100,000
Other	-
Combined Capital Cost	**368,586**
Net Cashflow	**620,964**
Project IRR	**22.5%**
Project NPV at 8% Discount Rate	**225,744**

9.3.14 Below we have provided a snapshot of the Longcross Land Use Viability Tool under the base case scenario, adjusting the affordable housing mix as outlined above.



Scenario 6 – Infrastructure Cost Phasing

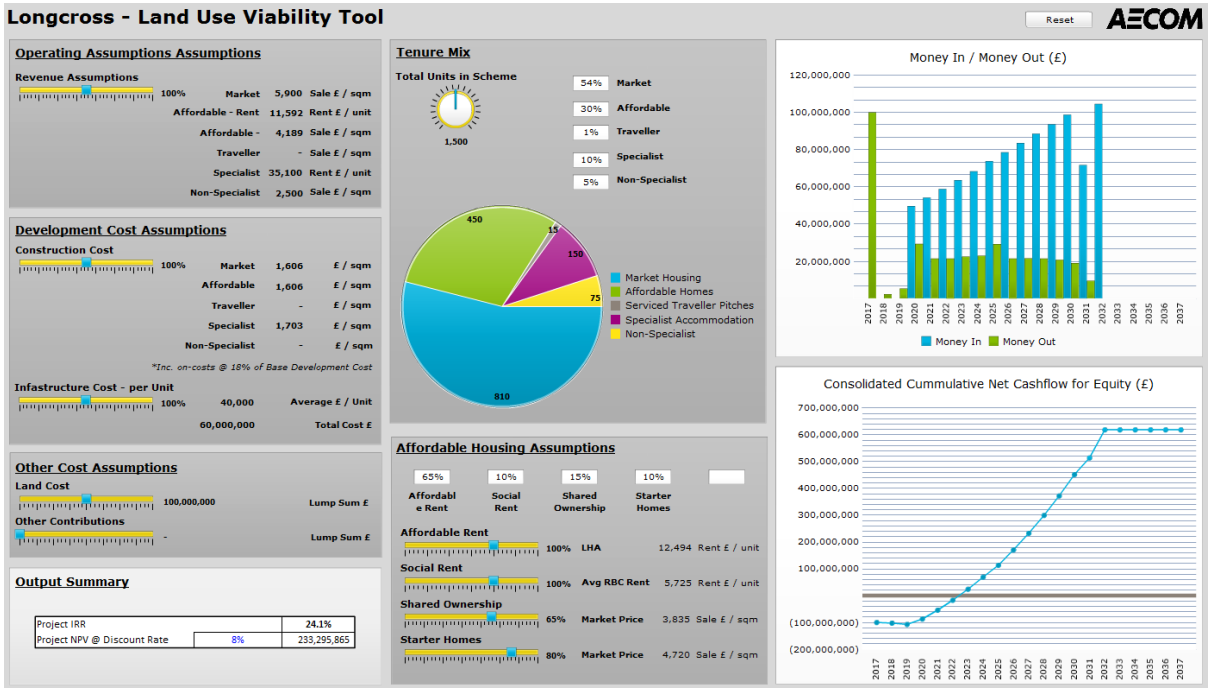
9.3.15 This scenario shows the viability of Longcross using the Base Case variables but adjusting the phasing of the infrastructure cost in line with the unit delivery. The following breakdown of infrastructure costs over time has been used: 20% in sales year; 50% in the year before; 30% in the year before that.

9.3.16 As can be seen the internal rate of return lies above the other scenarios and above 20%.

Land Use Viability Tool – Scenario Six Summary Table

	Total Review Period (2017 – 2037) (Figures in £000s)
Total Net Revenue	**986,955**
Construction Cost	208,586
Infrastructure Cost	60,000
Land Cost	100,000
Other	-
Combined Capital Cost	**368,586**
Net Cashflow	**618,369**
Project IRR	**24.1%**
Project NPV at 8% Discount Rate	**233,296**

9.3.17 Below we have provided a snapshot of the Longcross Land Use Viability Tool under the base case scenario, adjusting the phasing of the infrastructure costs in line with the unit delivery as outlined above.



9.1 Conclusions and emerging recommendations

9.1.1 This is a high-level viability overview containing strong assumptions related to likely residual value and should only be taken as guidance. Nevertheless, in the scenarios modelled, the scheme shows a likely strong viability outcome, even with relatively high proportions of affordable housing.

9.1.2 The scenarios involve broad estimates around estimated land costs and likely sale values based on known local values and prices at the time of the study.

9.1.3 Developer cost assumptions, including for community infrastructure are based on average costs for similar developments in Surrey and surrounding areas. They do not therefore include costs for any additional 'garden village infrastructure' such as the delivery of example schemes discussed above, apart from the inclusion of the levels or affordable and specialist housing.

9.1.4 Therefore, the above viability scenarios should be a baseline from which costs for additional garden village infrastructure should be added. Although, as discussed further in the overall conclusions in section 10 below, many additional items of infrastructure provision may not impact net costs given their ability to positively influence land values or provide financial returns of their own.

9.1.5 Overall, given high pre-existing land values, combined with the potential for the expected high quality of the development to further increase land values, affordable housing should be a key consideration in ensuring that Longcross meets the Garden Village principle of being genuinely affordable for a diverse community of future citizens.

10. Overall Conclusions

10.1.1 The workstreams above have assessed potential options for developing Longcross in line with garden village principles, citing best practice examples and AECOM's multidisciplinary expertise.

10.1.2 A key element factor in the potential to implement any local projects, or infrastructure that help meet Garden Village principles, whether community owned or otherwise, will be their impact on the viability of the development.

10.1.3 In the context of Longcross, this will be closely related to any land take needed for schemes, and the funding and ongoing financing mechanisms required. The long term success of local projects will be determined by their relevance to the needs of the local community, their management and governance structure, and their inclusivity.

10.1.4 Our high level assessment suggests that there is likely a high level of residual viability at the site. This would suggest that additional, reasonable investments at Longcross to support Garden Village principles would be unlikely to make the project unviable.

10.1.5 Furthermore, it is important to consider that not all investments should be seen as net costs. Many of the Garden Village principles create desirable places to live. In this regard, investments that create amenity value could have the impact of raising the value of the site and thus reducing or removing the net impact of the upfront and ongoing costs of any additional investments. For example, connectivity and environmental improvements in particular tend to have positive impacts on land value.

10.1.6 In addition, some investments as outlined could have income generating components which would further reduce net cost impacts over the long term.

10.1.7 Therefore, in terms of the optimum options for garden village infrastructure, solutions that do not require significant land take which detracts from housing provision, or solutions which can be combined with other uses or with housing itself, would not have negative revenue implications for the developer. Added to this, solutions which generate financial returns themselves or generate amenity value could provide net neutral or even positive benefits to the developer or community.

10.1.8 Beyond this, specific interventions to work towards garden village principles should be considered on an individual basis in terms of how they impact on those outlined core viability criteria – i.e. loss of revenue (land take effects) and cost impact (and whether these costs are recoverable), then weighted against likely positive amenity impacts on land values. The extent to which interventions with net negative consequences for viability could then be considered justifiable should be considered in the context of reasonable impacts for the deliver given the overall high level viability assessment.

10.1.9 The table below shows some examples of the impact of particular garden village options on overall viability; it is by no means exhaustive. The cost and revenue impacts are economic costs considered from a whole community perspective. The impacts on the developer should be considered separately. It is important to consider that this table does not consider the social benefits of the example interventions -which should be a key consideration in delivering garden village principles – but instead focuses on financial viability only. Land value capture options are addressed in the earlier table in section 3 above.

Example interventions by likely costs and benefits

Category	Type	Cost impact	Land take	Revenue possibility	Land value / amenity benefit	Notes
Community Ownership	Public space ownership (e.g. park)	Moderate	Minor	Moderate	Minor	The costs for these schemes are offset by their revenue generating potential. They are not likely to have significant amenity benefits, although social value could be high.
	Locally owned institutions / organisations	Moderate	Minor	Moderate	Minor	
	ESCo	Significant	Minor	Significant	None	
Food Production	Community food growing	Moderate	Moderate	Minor	Minor	Can require start-up costs and on-going costs for community engagement and training. Revenue potential to cover costs exists but is minimal. Likely high social benefits.
Energy	On-unit solutions	Significant	Minor	Minor	High	Local energy solutions can be expensive, although district models can derive sustainable financial returns. On-unit models can provide home owners with cost savings and are generally considered desirable.
	Neighbourhood / district solutions	Significant	Moderate	Significant	None	
Biodiversity	Natural borders / drainage	Moderate	Minor	None	Moderate	Although upfront costs may exist, long term potential savings exist from drainage and flood protection. Can also improve amenity value.
Transport	Improved rail service	Significant	Minor	Moderate	Significant	Amenity benefit from value of improved connectivity can be high. Costs vary depending on solution. Land-take largely small except for cars.
	Car sharing	Moderate	Moderate	Moderate	Moderate	
	Active transport provision	Minor	Minor	Minor	Moderate	
	Bus / DRT	Moderate	Minor	Moderate	Moderate	
Housing	Above average affordable housing	Minor	Minor	None	Minor negative	Not likely significant viability impact at reasonable volumes. Although potential negative amenity impact

10.1.10 List of sources

- Nomis
- Network Rail
- Runnymede BC

- Longcross Village website
- Development Framework
- North site transport assessment
- NEGC garden communities charter, AECOM 2016
- Civitas.eu
- North west Bicester one planet action plan
- http://www.polisnetwork.eu/uploads/Modules/PublicDocuments/ptp-cycle_final-report_march2016.pdf
- https://www.travelsmartsurrey.info
- https://www.carplusbikeplus.org.uk