London's Rooftops: Potential to Deliver Housing

for

Apex Airspace Development

part of Apex Housing Solutions

APEX AIRSPACE DEVELOPMENT

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Contents

Introduction

This research has been commissioned by Apex Airspace Development Ltd. Apex Airspace was set up exclusively to promote, procure, and deliver rooftop apartment living across the Greater London area. This research builds on its commitment to better understand the market in London, and develop shared learning that can benefit wider adoption of rooftop development. Apex Airspace Development Ltd is part of the Apex Housing Group. The Apex Group was founded in 2008, and has built up an extensive range of partnerships with the private and public sectors, delivering innovative housing solutions to assist London's growing housing needs.

The study by HTA Design LLP aims to provide an informed analysis of the scale of opportunity for the creation of new homes through development on underused rooftop space in existing residential locations. This has been done by identifying potential locations for the delivery of rooftop development for housing suitable for consideration by Apex Airspace Development Ltd, and setting out the relevant associated considerations in relation to planning, design, sustainability and construction. The scope of this study is to look at rooftop space which could accommodate self-contained accommodation - that is new homes - not just additional residential floorspace through extension, although this is recognised as another very important component of the potential of rooftop development. Pending the outcome of the Government and Mayor of London's recent Consultation on Upward Extension in London, individual owner occupiers with access to roof space would be able to adopt such measures at large scale.

The research has been undertaken within a context where severe housing pressures exist in London. Around 49,000 new homes are required every year in London over the next two decades[1] although some sources refer to the need for up to 60,000[2] homes per annum. The Government's focus is very much on brownfield land to deliver housing, but there is wide recognition that more varied and innovative methods of delivering housing need to be considered, as the ever mounting pressure increases. More creative and lateral thinking needs to be applied to how we can increase the supply of housing.

Currently, only 2% of new homes per year in London come about as a result of an element of 'upward extension'[3]

Rooftop development is recognised as one of many innovative housing solutions that can contribute to the delivery of more homes. It is not the solution but one of many allowing new entrants into the market to deliver housing. Numerous researchers, policy makers and designers, and others have previously explored and highlighted the potential of this concept. Currently, only 2% of new homes per year in London come about as a result of an element of 'upward extension'[3]. Following the recent planning policy consultations on rooftop development, now is the time to seriously consider both the potential of this type of development in further detail, alongside the technical constraints that will need to be overcome, to realise more of this type of development on a far greater scale.

This study focuses on the London Borough of Camden as a typical inner London borough. It identifies all potential rooftop development sites across the entire borough, and calculates the overall quantum of development potential that this relatively untapped opportunity holds. Camden offers a central London location. In some ways it is an unusual case as approximately half of the borough consists of Conservation Areas, but this is not necessarily a constraint. That said, it is very conceivable that the scale of the opportunity is substantially more in boroughs with fewer conservation areas.

It is recognised that rooftop development is not an opportunity without obstacles. As with brownfield development sites, rooftop 'sites' have various complex and challenging constraints that need to be overcome to realise this kind of development. We address some of these considerations in this report. Different typical common building typologies with potential for rooftop development are categorised, and typical design solutions which would address the unique challenges faced by each of the different typologies are illustrated.

The overall findings of the report are summarised in the concluding section.

Background

Rooftop development is not new. Across London there are many examples of new structures added at roof level to the existing built fabric. In Camden, planning application records over the last 10 years indicate at least 15 instances where applications have been submitted to create new self-contained homes through rooftop extensions. Many more instances are present where home owners or land owners have expanded existing residential floorspace through extensions[4]. At present, householders have a range of permitted development rights for extending residential properties at rooftop level without the need for planning permission[5], as long as an extension at roof level adheres to a number of criteria regarding the height and volume, amongst other things, in particular not extending beyond the principal elevation of the dwelling house fronting a public highway.

As the supply of developable land in London diminishes, a great deal of attention is being focussed into innovative ways of ensuring that existing developed land is utilised in the best possible way. In 2015 the NLA (New London Architecture) launched a competition 'New Ideas for Housing' to gather ideas illustrating new approaches to the delivery of homes. Winners had the opportunity to present these ideas to officers at the Greater London Authority. Some of the ideas explored could be delivered within the current regulatory system, whilst others focussed on shifting planning policy and funding channels to support alternative delivery methods. Many of the competition submissions concentrated on the potential of unused rooftop space across the capital as an additional source of development sites.

Amongst the entries focussing on roof tops, a number of scenarios were explored such as building over local authority housing assets and public building assets such as schools, libraries and hospitals. Ways of encouraging private landowners and tenants to consider rooftop development on private assets were also explored, with a particular focus on the terraced dwelling typology that is prevalent across much of London. Key ideas included those from Bell Philips Architects, WSP and Adam Collingwood Architects.

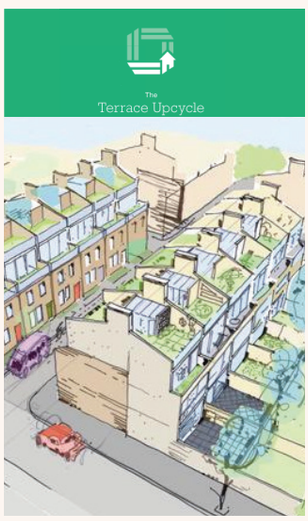
Selected Rooftop Development Competition Entries

from NLA 'New Ideas for Housing'[6]

Rooftop Re(generation), by Bell Philips Architects

Bell Phillips identifies Local Authority Post-war housing estates as having potential to make a significant contribution to the delivery of new homes. Their entry identifies the issues and challenges faced by existing approaches, such as the fragmentation of existing communities when wholescale demolition and redevelopment is adopted; or the extensive time and costs involved, for a small number of homes, when infill development is undertaken on tightly constrained plots such as disused garage sites. Their proposal suggests that on a typical housing estate this could increase the number of homes by approximately 30% without impacting on typical key planning considerations such as open space, car parking and trees. In order to minimise disruption to existing residents their proposed solution would use modular cross laminated timber construction to provide these new homes.

A typical housing estate could increase the number of homes by approximately 30% without impacting on key planning issues.



The Terrace Upcycle, by Adam Collingwood Architects

This proposal suggests an 'upcycling' of the typical terraced house typology which is prevalent across many parts of London. They propose introduction of a new permitted development right that enables upwards extensions within certain design parameters. They suggest the addition of a single storey extension to the top floor, incorporating a roof garden, to provide a maisonette, and conversion of the ground floor to a garden flat. The competition entry estimates that 1.7 million ground floor dwellings could be achieved on this basis. They also suggest that the existing elements could be upgraded to zero carbon to provide additional environmental and planning benefits.

An estimated 1.7 milliion ground floor dwellings could be created through 'upcyling' of the terraced house typology.

Housing over Public Assets, by WSP | Parsons Brinckerhoff

WSP teamed up with UCL to study the potential of municipal buildings to accommodate homes above them. Their submission considered Lambeth as a case study, and calculated that an additional 630,000 residential homes could be supported across London, by adding additional homes above London's municipal buildings. Their study worked on an assumption of an additional 6 storeys above existing buildings and an average of 100m^2 per home. Their research concluded that with a mixed height strategy there would be twice the potential to meet the entire 2021 monitoring target and estimated capacity deficit for Lambeth (9,835 homes).

An additional 630,000 residential homes could be supported across London, by adding additional homes above municipal buildings.

Urban Darning, by Patrick Massey of CZWG

This proposal draws inspiration from the sewing technique for repairing holes in worn fabric. The project aims to encourage development of small sites, such as infill, and end conditions, as well as rooftop development. The project proposes that each London borough would commission a team of planners and architects to collaboratively produce a strategic report which identifies desirable development sites, alongside a set of schematic annotated drawings for each site. The logic behind this idea is that it will incentivise development in more complex small locations by reducing the risk of failing to secure planning permission for prospective developers, and thus act as a catalyst for development of small sites.

Multiplying London: Space and Time, by Urbem, Elemental, Ratti and Triptyque

This proposal suggests the encouragement of upwards extension, termed 'onfill' as opposed to 'infill', through positive encouragement in planning policy, by the introduction of a city-wide 'storey(s) addition policy'. The idea is threefold –

(1) simple densification – whereby existing two storey buildings are extended upwards from one to three storeys. It is suggested that revenues would be shared by landowners, tenants and developers, to incentivise this kind of development.

(2) the ambitious next step – suggests 'multiplying' existing housing in London by height, and creating publicly accessible and maintained elevators to access the upper storeys, as well as creating public green space on the resulting rooftops.

(3) From CO2 to CO3 – sets out a picture of the resulting benefits the increased density of the city would provide.

It is widely recognised that rooftops are a hugely under exploited source of potential additional housing. The concept has received significant media and political coverage with reported figures for its potential ranging from 500,000 extra rooms according to estate agents[7] 130,000 new homes according to Landmark Lofts[8], or 140,000 new homes according to Zac Goldsmith's campaign[9].

The purpose of this study by HTA Design LLP is to identify and analyse the range of suitable rooftop development opportunities for the creation of new dwellings in the London Borough of Camden. The study not only indicates the scale of the opportunity but also the additional benefits to existing land owners.

Whilst various manifestations of rooftop extensions have been considered by others we believe this to be the first piece of research that comprehensively reviews the capacity of rooftop development on top of existing residential and mixed use buildings in a London Borough using a rigorous and methodical approach to calculating the potential scale of this opportunity.

The scale of potential latent in rooftop development in London is reported in the media to range from 500,000[7] extra rooms, to 130,000[8] new homes, to 140,000[9] new homes.

The analysis contained within this report moves beyond providing just a broad estimate of capacity, and provides realistic figures that draw on the combined experience of both HTA Design LLP and Apex Airspace Development Ltd. Not only do we specifically identify and measure the potential across the Borough of Camden, but we also couple this with real world planning, design and technical construction constraints that need to be considered to provide a realistic assessment of the scale of opportunity presented by rooftop development.

Planning Policy

At the time of undertaking this research, no adopted planning policy existed providing explicit support for the use of rooftop space as suitable for additional housing. Recent planning policy guidance by the Mayor does however recognise its potential.

The London Plan Housing SPG (March 2016) has recently been updated with a section on 'airspace development over existing and new non-residential premises'[10]. It recognises the significant potential for housing intensification above existing low density commercial and leisure uses, as well as above supermarkets and associated car parks. As such there is recognition that untapped potential exists for rooftop development in areas or sites where intensification would be suitable.

Despite the lack of explicit policy support, rooftop extensions do already take place and a number of examples have been consented and delivered through the conventional planning process. These applications are judged against relevant borough-specific planning policies (to ensure quality development) and also policies contained within the 2016 Mayor's Housing Supplementary Planning Guidance (addressing the required minimum sizes of units, private amenity space and accessibility.)

DCLG & Mayor of London Consultation on Upwards Extensions

The DCLG and the Mayor of London, ran a joint consultation on upward extensions earlier this year from February to April 2016. At the time of publishing this research, the outcome of this consultation is not clear. Pending on measures that will be adopted to support permitted rooftop extensions, it is likely that further technical details would need to be considered to ensure that potential impact on the quality of the built environment.

The Government consultation was undertaken with the purpose of establishing support for implementing what is regarded as an innovative approach to enable additional housing supply. Through enabling greater freedom to build upwards in London, the assumption is that it would reduce the pressure on the Green Belt.

Three options were presented in the consultation paper in order to enable greater housing delivery through rooftop extensions in London, not necessarily mutually exclusive:

- Permitted Development (PD) rights for additional storeys in London;
- Local Development Orders (LDOs) for additional storeys in specific areas; and
- The support for upward extension through policy in the London Plan.

All three options present significant opportunities for increasing housing supply subject to local considerations. However, the permitted development for rooftop extensions will only apply if such buildings are already situated next to taller structures.

Typical Planning Considerations

It is likely that the opportunities identified in this report will have to go through the conventional planning process in any regard. As such, there are a range of material planning considerations likely to apply. We consider these to be the following:

- Conservation Areas & Listed Buildings
- Design Standards
- Public Transport Accessibility
- Car Parking
- Supportive Spatial Planning Policy Designations
- Other Restrictive Spatial Planning Policy Designations
- Existing Uses
- Space Standards
- Private Open Space Requirements
- Sustainability
- Section 106 & Community Infrastructure Levy

Conservation Areas & Listed Buildings

If the existing building is within conservation areas, whilst this will not prohibit development altogether, it will present added challenges to deal with. Potential rooftop extensions in proximity to listed buildings will also need to carefully consider the impact on these buildings. Rooftop extensions to Listed Buildings, whilst not impossible, will require very special design considerations to protect the value of the heritage asset.

Design Standards

In tightly constrained urban sites considerations of privacy, overlooking, and sunlight and daylight levels are often key issues that shape development. If adding additional storeys, these matters will need to be considered, and may restrict the location and height of development opportunities. In some instances it may be possible to overcome this with creative design strategies.

Public Transport Accessibility

Within the London Plan public transport accessibility levels are the basic starting point from which appropriate density levels for new developments are assessed. Areas of high public transport accessibility levels are deemed most appropriate for higher density development.

Car Parking

The London Plan sets overall car parking expectations which are based on public transport accessibility levels. Areas with high levels of public transport provision will be acceptable to be proposed as car-free, with the exception of the need to provide wheelchair access parking. In other locations further negotiation may be necessary, and demonstrating how any impact on parking demand in the area can be mitigated will be necessary.

Supportive Spatial Planning Policy Designations

Area specific designations, such as town centre designations, areas identified within area action plans for redevelopment, or intensification areas to encourage development would suit rooftop development. Other suitable buildings in areas with untapped density potential may also offer further opportunity.

Other Restrictive Spatial Planning Policy Designations

Conservation areas are likely to be the most prevalent restrictive spatial planning policy within inner London boroughs. However, other planning policy designations such as protected view areas, or parking requirements may restrict the acceptability of upwards extensions, depending on the impact that development proposals cause.

Existing Uses

In instances where the existing use of the building is residential at lower floors, the principle of residential use in the location will have already been established. However in locations identified above other uses – such as public buildings or employment uses - the principle of residential development will need to be considered. The retention of employment floorspace and office space is an important consideration for many London Boroughs as pressure to provide more housing is evidenced to be impacting on the amount of available employment space available. Housing above commercial shops (A class uses) are quite common, and likely to be supported in most instances. Housing above other buildings, such as schools and hospitals will be highly dependent on individual locations. Regard will need to be had as to whether existing uses could complement residential development.

Space Standards

The London Plan Housing SPG sets out minimum space standards for dwellings of various sizes.

These standards will typically need to be met, unless sound justification can be provided demonstrating why this is not possible.

Private Open Space Requirements

The provision of good quality private amenity space in line with London-wide and locally adopted standards is likely to be a planning requirement. In certain circumstances, such as in locations in close proximity to open space or where larger internal unit sizes could be provided, the requirement for these might be demonstrable as unnecessary.

Sustainability

High performing sustainable units that meet London Plan policy guidelines would be considered necessary. The London Plan supports a 'fabric first' approach, which involves maximising the performance of the components and materials that make up the building fabric itself, before considering the use of mechanical or electrical building service systems. This method involves approaches such as maximising air tightness; using super-high insulation; and optimising solar gain and natural ventilation. Following this, the provision of photovoltaic panels could be considered, as well as green roofs in order to increase biodiversity.

Section 106 & Community Infrastructure Levy

The quantum of dwellings produced by this kind of development is likely to be fewer than 10 dwellings, beneath which point affordable housing contributions are not normally essential. A recent appeal decision has restored a 2014 government policy which removed the need to seek affordable housing contributions for sites of under 10 homes. Section 106 contributions and Community Infrastructure Levy (CIL) will be payable on all new residential floorspace. This cost constraint should be factored into proposals from the outset.

The National Planning Policy Landscape

The NPPF was introduced in 2012 to simplify the quantity of national planning policy guidance that existed previously; it focuses on delivery of new development. The key principle at the heart of the NPPF is 'a presumption in favour of sustainable development', recognised as relating to economic, social and environmental spheres. The NPPF states planning must ensure 'sufficient land of the right type is available in the right places and at the right time to support growth' and should provide 'the supply of housing required to meet the needs of present and future generations'. A number of policies contained within the NPPF can both act to incentivise and limit roof top development.

One of the 12 core principles of the NPPF is that planning should not 'simply be about scrutiny, but instead be a creative exercise in finding ways to enhance and improve the places in which people live their lives' (para 17). Another of the 12 core principles encourages the effective use of previously developed land (brownfield land). In addition, the core principles focus on the need to manage patterns of growth to make the fullest use of public transport, walking and cycling and seek high quality design and a good standard of amenity for all existing and future occupants of buildings and land. The framework also specifies that development proposals should optimise the use of a currently underutilised brownfield sites.

The London Planning Policy Landscape

The latest version of the London Plan was adopted by the Greater London Authority (GLA) on the 10th March 2015. It is very likely that it will significantly change in emphasis over the coming year following the election of the new Mayor and the change in administration in particular in the focus towards providing more affordable housing. The Plan provides the London-wide strategic planning policies relevant to rooftop development in London Borough of Camden, and across the capital. The policies within the plan encourage brownfield development particularly though intensification (policy 3.3), and optimising housing potential on sites based on local context, character, and design principles (policy 3.4). In addition, the plan makes clear that the quality and design of housing design is fundamental and should be in line with standards and guidance set out in the London Plan Housing SPG (2016). In addition, development proposals will need to have regard to the 2015-16 Minor Alterations (MALPs) which were prepared to bring the London Plan in line with the national housing standards and car parking policy.

Policy 3.14 of the London Plan which discusses existing housing is relevant to rooftop development. The policy supports maintenance and enhancement of poor quality existing housing stock and efficient use of existing housing stock by reducing the number of vacant, unfit and unsatisfactory dwellings, as well as bringing back into use long-term empty homes.

The addition of space through rooftop development in many locations, for example on high streets, has the potential to enliven and bring back into use disused lost dwellings. Therefore, while this study focusses on the potential for rooftop development alone, there is also clearly great potential for additional residential floorspace that could arise from rooftop development in certain locations where homes are empty. High levels of empty properties are recognised as having serious impact on the viability of communities. Statistics published by the DCLG put the number of empty homes in England in October 2015 at 600,179[11]. In London, approximately 1.63% of homes, or 56,715 homes are empty[12]. If even 20 per cent of these could be brought back into use through addition of rooftop development – possibly creating additional homes - then an additional 11,344 dwellings could be brought back into use across London, in addition to the new homes created through rooftop development.

If 20% of the 56,715[12] empty homes across London could be brought back into use through rooftop development an additional 11,344 dwellings could be brought back into use.

The Camden Planning Policy Landscape

Camden will in the near future have a very up to date Local Plan. It is currently at submission stage and expected to be the subject of an Examination by an Inspector in Summer 2016.

A key strategic policy within this Plan is to create the conditions for growth to deliver the homes, jobs, infrastructure and facilities that Camden needs for those who live and work in the borough (Policy G1). Supporting development that makes the best use of its site is a key component of supporting growth, taking into account quality

of design, local surroundings, sustainability, amenity, heritage, transport accessibility, and other considerations relevant to a site. Housing need in Camden has been assessed as 16,800 additional homes up to 2031[13], including 11,130 additional self-contained homes. It is expected that most of the growth in the Borough will take place in:

- The Growth Areas of King's Cross, Euston, Tottenham Court Road, Holborn, West Hampstead Interchange and Kentish Town Regis Road; and,
- Highly accessible locations such as the town centres of Camden Town, Finchley Road/ Swiss Cottage, Kentish Town, Kilburn High Road and West Hampstead.

It is estimated that the above areas will deliver in the region of 7,200 homes in the period 2011 to 2031[14].

The borough sees further housing growth taking place as a result of its Community Investment Programme (CIP). This comprises the regeneration of Council-owned sites and/ or selling of sites no longer suitable, underused or expensive to maintain. In the long term, the CIP is programmed to deliver 3,050 new homes, although this includes a significant component of replacement homes[15].

The borough's objectively assessed housing need for 2016-2031 of 16,800 homes amounts to 1,120 homes per annum. At present the Borough have enough deliverable sites to deliver this target for the period 2015/16 to 2019/20 but not thereafter[16]. Higher density development and intensification seem at present the ways additional homes would be delivered.

There is undisputable need for more homes in Camden, and the Borough's emerging policy framework is supportive of maximising site capacity and creating mixed used developments to increase its housing supply. Rooftop development could be a useful and substantial additional source for housing delivery.

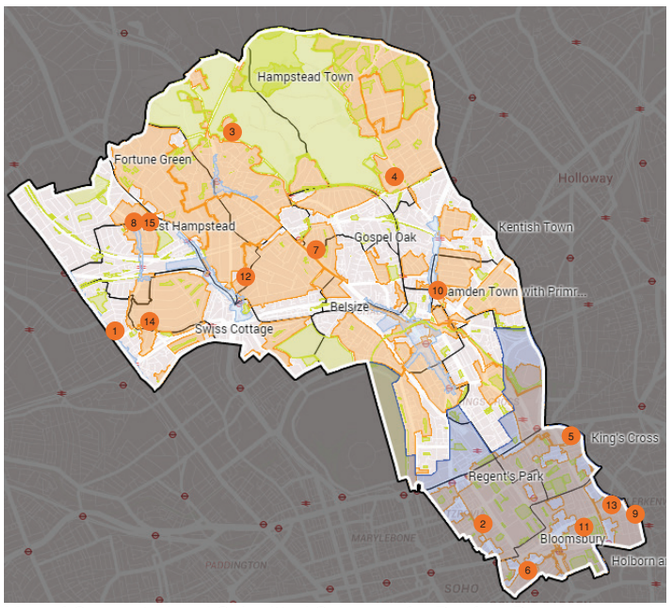
Local character and distinctiveness are important considerations in the case of rooftop development. Approximately half of the Borough of Camden falls within a Conservation Area[17]. Whilst rooftop development can and is taking place in these areas, specific guidance contained within some of the Borough's Conservation Area Statements specifically prohibit roof extensions and alterations which will change the shape and form of the roof. In particular, if properties affected form part of a group or terrace that remain largely unimpaired, if the property forms part of a symmetrical composition of which the balance would be upset, or if the roof is prominent or the roof extension would be unacceptably prominent, the design of development proposals will need to be especially carefully considered.

The role of community support of rooftop extensions will be an important factor in creating support for planning applications proposing additional units on existing roofs. There are potential significant benefits to existing residents of buildings that will be affected by roof top extensions, such as financial incentives, and improvements to the current built fabric.

Proposed & Consented Rooftop Schemes in Camden

A review of submitted and consented schemes across the borough indicates that a noteworthy number of homes in schemes proposing rooftop extensions to provide new dwellings have been submitted and consented across the borough of Camden to date. Fifty three homes (in 8 applications) have been consented, and 14 homes (in 7 applications) are currently being determined. This number does not include schemes which may have received pre-application advice from the LPA as this information is not made publicly available, therefore it is probable that this does not accurately reflect the number of proposed rooftop developments in the pipeline for Camden.

Records of consented and submitted schemes have been found across the whole borough - indicating that the principle of rooftop extensions appears to be acceptable across the whole borough, including within conservation areas, dependent on site specific considerations. The records of submitted and consented schemes have involved proposals above both residential and commercial premises, indicating that both existing residential and high street locations may be appropriate and can be supported for this kind of development. In the table below, we have listed only applications for the creation of new self-contained accommodation.



Map of Consented and Submitted Schemes for Rooftop Developments in LB Camden

The proportion of submitted and consented schemes across the borough of Camden to date is currently quite low. The schemes are distributed around the borough with no discernable spatial distribution pattern. Schemes can be found towards both the north and south fo the borough, as well as in conservation areas. The schemes found include a mixture of those above solely residential properties, as well as mixed use buildings, with retail and commercial uses on the ground floor. The single trend that has been found among the proposed and consented developments is the majority provide just 1 or 2 additional units.

1 **Address:** 146-162 Kilburn High Road (& 4-10 Kingsgate Road)
No of Homes: 38

2 **Address:** 11-13 Goodge Street London W1T 2PG
No of Homes: 4

3 **Address:** Flat 10 Ladywell Court 22 East Heath Road London NW3 1AH
No of Homes: 1

4 **Address:** Gordon House 6 Lissenden Gardens London NW5 1LX
No of Homes: 4

5 **Address:** Tune Hotel 322-326 Gray's Inn Road & 76-78 Swinton Street London WC1X 8BU
No of Homes: Additional hotel accommodation (C1 use class)

6 **Address:** 41-45 Neal Street London WC2H 9PJ
No of Homes: 2

7 **Address:** 2 Atrium Grove, London. NW3 4XR
No of Homes: 1

8 **Address:** 1 - 2 Wilmot Place London NW1 9JS
No of Homes: 1

9 **Address:** 46 Hatton Garden London EC1N 8EX
No of Homes: 1

10 **Address:** 123 Kentish Town Road London NW1 8PB
No of Homes: 1

11 **Address:** 25 - 26 Red Lion Street London WC1R 4PS
No of Homes: 1

12 **Address:** Belsize Park House 59 - 60 Belsize Park
No of Homes: 2

13 **Address:** 125 Clerkenwell Road London EC1R 5DB
No of Homes: 8

14 **Address:** 145 A Sylvan Court Abbey Road London NW6 4SP
No of Homes: 1

15 **Address:** 309 West End Lane London NW6 1RD
No of Homes: 1

Camden as a Case Study

Camden is a diverse Borough. The southern portion forms part of Central London and includes offices, hotels and the retail attraction of the West End at Tottenham Court Road. It is also the home of major regeneration projects such as Kings Cross.

The Borough owns 33,000 properties[18] - 23.6% of the boroughs housing stock is local authority owned[19]. A number of the Borough's estates are currently the subject of regeneration, including the Abbey area, Agar Grove estate, Bacton low rise, Bourne estate, Chester Road and Balmore Street, Maiden Lane estate, Holly Lodge Estate and the Tybalds estate. Potential new development are also underway at 24 Crowndale Road/Godwin and Crowndale Estate, Harrington Square, Hadley Street, the Three Fields Estate[20]. These landholdings in itself points to tremendous potential, although it is recognised that some of these Estates may be the current subject of demolition and redevelopment.

Aerial View of Part of Camden demonstrating the built form and mix of typologies (from Bing Maps)

Camden Key Facts:

23.6% of the Borough of Camden's housing stock is local authority owned[19]

More than 50% of Camden is in a Conservation Areas

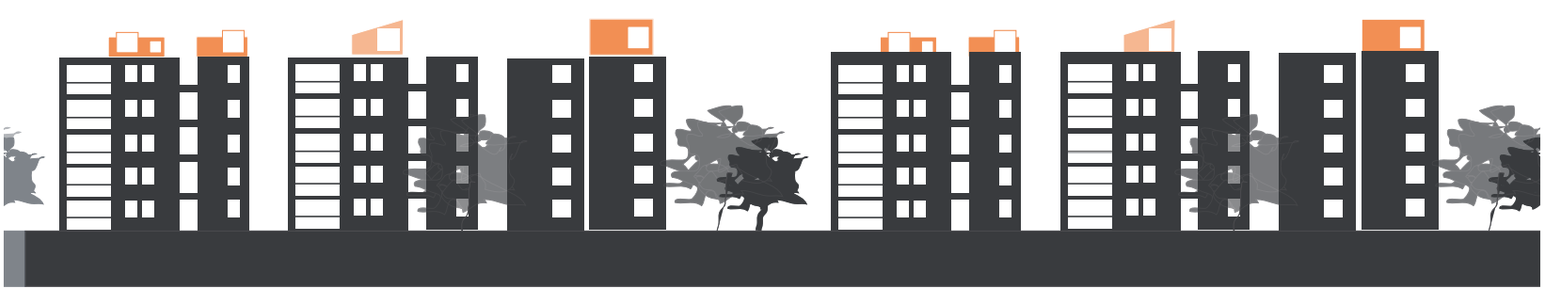
27% of Camden is covered by open spaces[21]

The pattern of development across the Borough has responded to its proximity to the centre of London, to the topography and to the infrastructure that cuts across the Borough. The area to the south of Euston Road is more urban in form, a tight grid of blocks with open spaces provided as squares that sit within this gridded pattern. This form extends in a looser more open fashion towards Camden Town and then makes way for a network of residential streets that extend across much of the rest of the Borough[21].

To the north of the Borough, the character changes with many residential areas and neighbourhoods, including Camden, Hampstead and Highgate, Swiss Cottage, West Hampstead, and Kentish Town each with their own distinctive identity and characteristics.

More than half of the Borough is covered by Conservation Areas. Roughly twenty seven per cent of the Borough is also covered by open spaces[17], including Metropolitan Open Land: Hampstead Heath and adjoining areas, the eastern edge of Regent's Park, Primrose Hill/ Barrow Hill Reservoir and Highgate Cemetery/ Waterlow Park/Fairseat. In addition, a further 14 open spaces in Camden are also on English Heritage's Register of Parks and Gardens of Special Historic Interest[22].

The character of Camden's residential neighbourhoods is hugely influenced by the period within which the buildings originate. This includes Victorian buildings, buildings from the first half of the 20th Century, post war housing and housing from the latter part of the 20th Century.



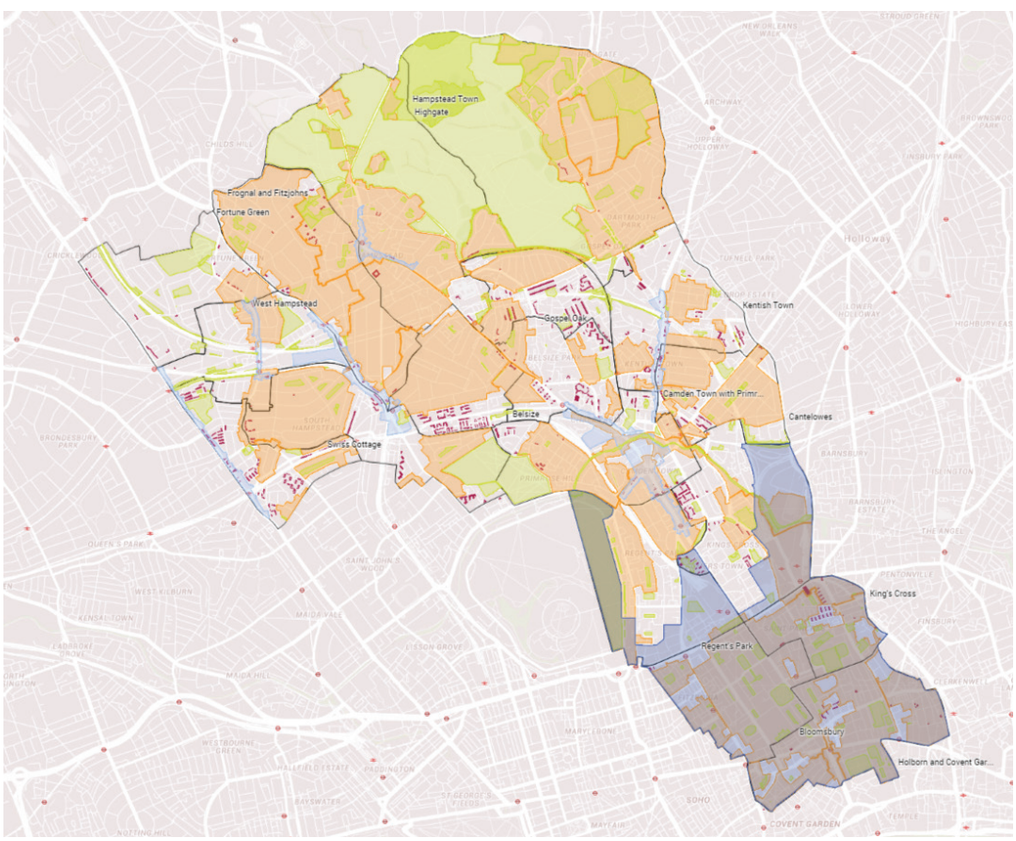
The Potential

Methodology

The Borough has been surveyed using satellite imagery to undertake a desktop assessment of suitable rooftop extension sites. Suitable sites have been identified with regard to the planning, design and technical considerations set out in this document. Only those sites which have been deemed to have realistic potential for rooftop development have been included. Furthermore, large parts of the borough including estates or growth areas with planned regeneration have also been excluded.

The sites have been identified by Ward. The full address, and area of roofspace have then been recorded, along with a visual record of the site. Each site has then been assessed to analyse the building typology, the potential developable area, and the condition of the building (which could inform further research about when development opportunities might come forward).

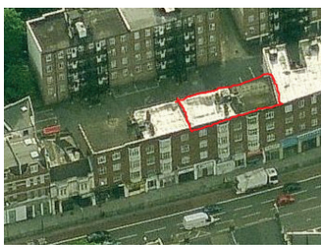
The full database of information is not included within this report, but extracts of the workings and methodology have been included below for reference.



Map of potential rooftop development sites across the Borough of Camden (from Google Maps)

Detailed extract of map of potential rooftop development sites across the Borough of Camden

(from Google Maps)



9-12 Frognal Parade, Finchley Road
180m²

1 Gilden Crescent
50m²

24-28 Buckland Crescent
560m²

Extracts from database detailing properties identified

(from Bing Maps)

Typologies

The planning, design and technical constraints that will need to be considered will obviously be unique from site to site. However, the borough has a number of typical typologies that the majority of development can be categorised into. Our analysis focuses on eight separate typologies. Within each typologies the challenges and likely solutions are broadly similar. The eight typologies we have identified as suitable for rooftop development in the borough are set out on the following pages. The typical characteristics, considerations and potential proposed solutions for rooftop extension development for each is discussed in turn.

London Borough of Camden

475 **Potential Rooftop Development Sites**

198,660 m²

@ average of 60m² per home
utilising 75% of suitable floorspace
(based on Apex Airspace Development experience)

2,485 new homes

28% of London Plan 2015 Housing Target for Camden

Greater London

the study identifies a ‘potential rooftop development density of 1.14 homes per hectare in the London Borough of Camden. If this is extrapolated to the entirety of Greater London this could produce

14,330,080m ^{2}

@ average of 60m^2 per home
utilising 75% of suitable floorspace
(based on Apex Airspace Development experience)

179,126 new homes

42% of London Plan 2015 Housing Target for London

whilst the typical design solutions reviewed in the report respond to the most common typologies in the Borough of London, other studies, including those reviewed from the NLA New Ideas for London demonstrate how typical suburban typologies found in outer London could also be adapted.

Typology 1: Victorian Terraced Dwelling In Solely Residential Use

Victorian development accounts for a large proportion of development across the borough of Camden, particularly within the conservation areas. These dwellings provide an attractive yet robust layout that is easily adaptable with a strong character. Properties are typically laid out in terraces, or as semi-detached pairs with ornamentation including bay windows and parapet walls.

43 Potential Buildings Identified for Rooftop Development

equivalent to

10% of identified properties

4830m²

rooftop space identified

equivalent to

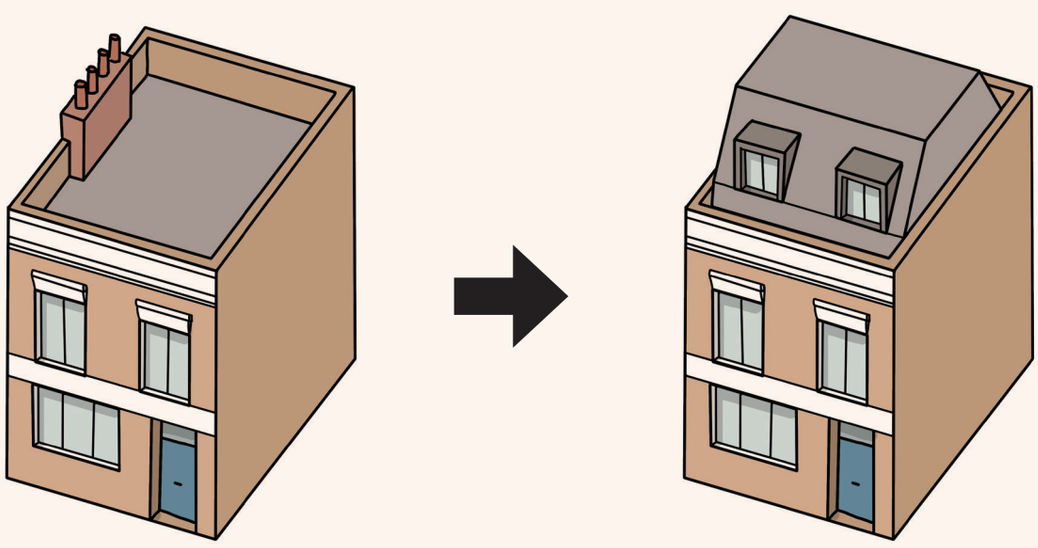
60 Homes

Typical technical considerations

- Weak brickwork with lime mortar;
- A flat roof or pitched or butterfly roof, which may require additional work to the roof structure, and of which the profile might be considered as very typical of the existing stock with resistance to change;
- Services are typically located to the subservient rear side.

Typical solution

- Single module custom made to suit site;
- Extend existing staircase.



Before

After

Typology 2: Victorian Terrace with Ground Floor Commercial Uses

As with the previous typology, Victorian development accounts for a large proportion of development across the borough of Camden. In central and town centre locations many of these buildings now have ground floor commercial uses.

86 Potential Buildings Identified for Rooftop Development

equivalent to

19% of identified properties

11,160m²

rooftop space identified

equivalent to

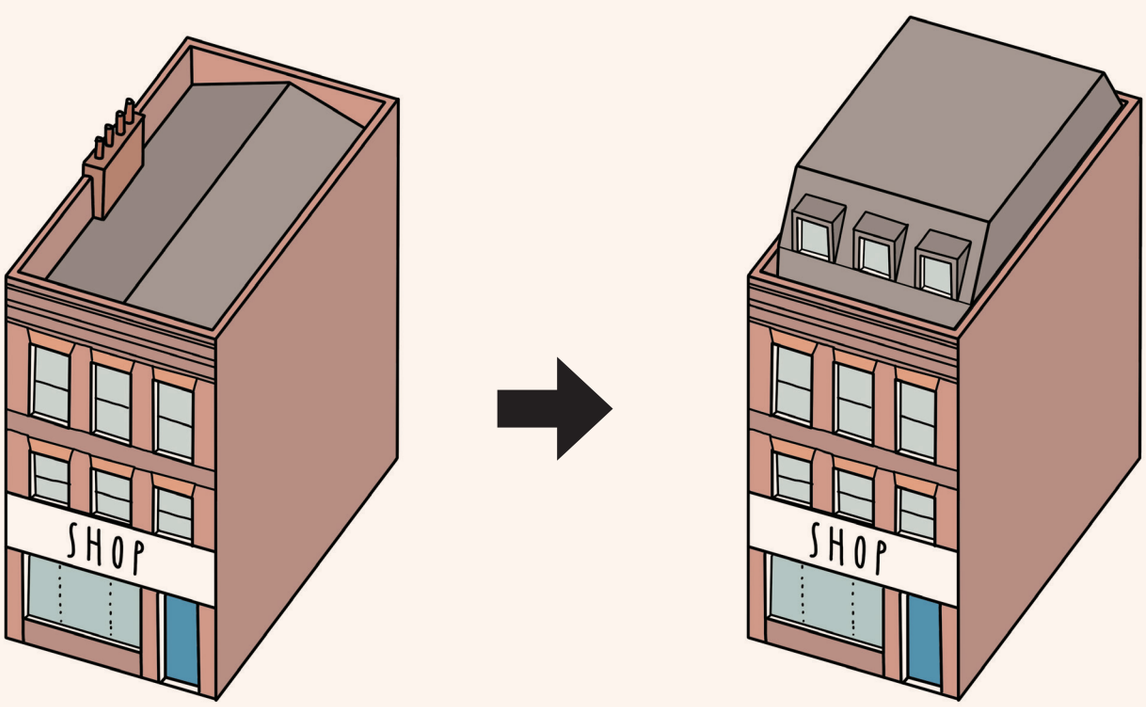
140 Homes

Typical technical considerations

- Weak brickwork with lime mortar;
- A flat roof or pitched or butterfly roof, which may require additional work to the roof structure;
- Services are typically located to the subservient rear side;
- Compatibility with ground floor uses;
- Access and land assembly may be more challenging to resolve than the above typology.

Typical solution

- Single module custom made to suit site;
- Extend existing staircase.



Before

After

Typology 3: Mansion Block

The majority of development in the borough occurred within the Victorian era, and therefore the early part of the 20th century offered limited opportunities for further development. These are typically substantial robust brick construction of four to five storeys with a strong street frontage.

61 Potential Buildings Identified for Rooftop Development

equivalent to

13% of identified properties

38,430m²

rooftop space identified

equivalent to

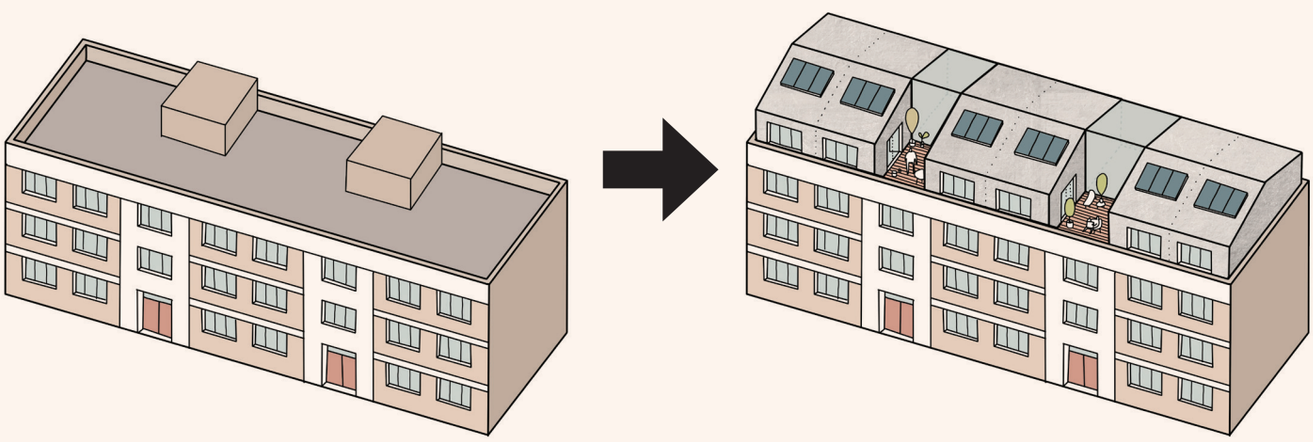
480 Homes

Typical technical considerations

- Strong masonry construction;
- Flat roof or pitched roof;
- Services are typically centrally located buried within the plan;
- Usually a single freeholder.

Typical solution

- Multiple modules custom made to suit site;
- Extend existing staircase.



Before

After

Typology 4: Inter-war Residential Block with Ground Floor Shopping Parade

The majority of development in the borough occurred within the Victorian era, and therefore the early part of the 20th century offered few opportunities for further development. This typologies occurs in limited locations, typically with a masonry finish and with simple fenestration and detailing.

12 Potential Buildings Identified for Rooftop Development

equivalent to

3% of identified properties

3930m^2

rooftop space identified

equivalent to

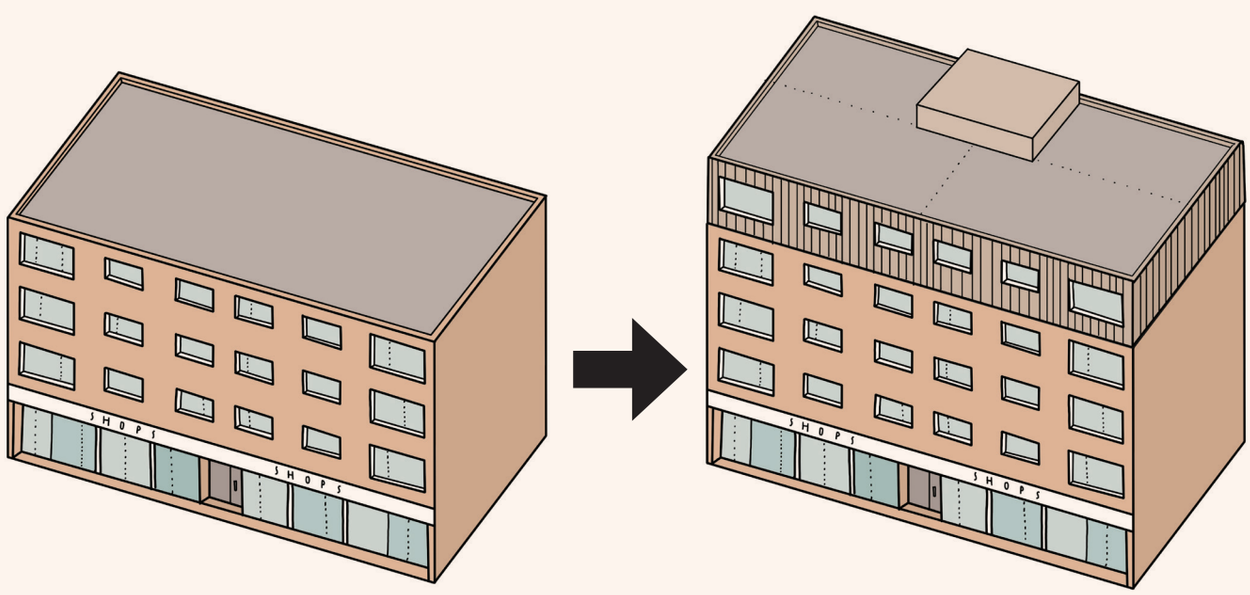
49 Homes

Typical technical considerations

- Concrete frame construction with brick infill;
- Flat roof or pitched roof;
- Services are typically centrally located buried within the plan;
- Land assembly may be more challenging to resolve.

Typical solution

- Multiple modules custom made to suit site;
- Alter roof shape in instances of pitched roof;
- Extend existing staircase.



Before **After**

Typology 5: Local Authority Estate Low-Rise and Mid-rise Blocks

The significant bomb damage experienced by Camden during WWII enabled the building of council houses shaped by the modernist approach to town planning. These estates are typically founded on the principle of the neighbourhood unit with the same building and house type repeated extensively over a large site. Blocks are typically of concrete frame construction, rising to up to 12 storeys with brick facades and simple detailing.

125 Potential Buildings Identified for Rooftop Development

equivalent to

27% of identified properties

99,995m²

rooftop space identified

equivalent to

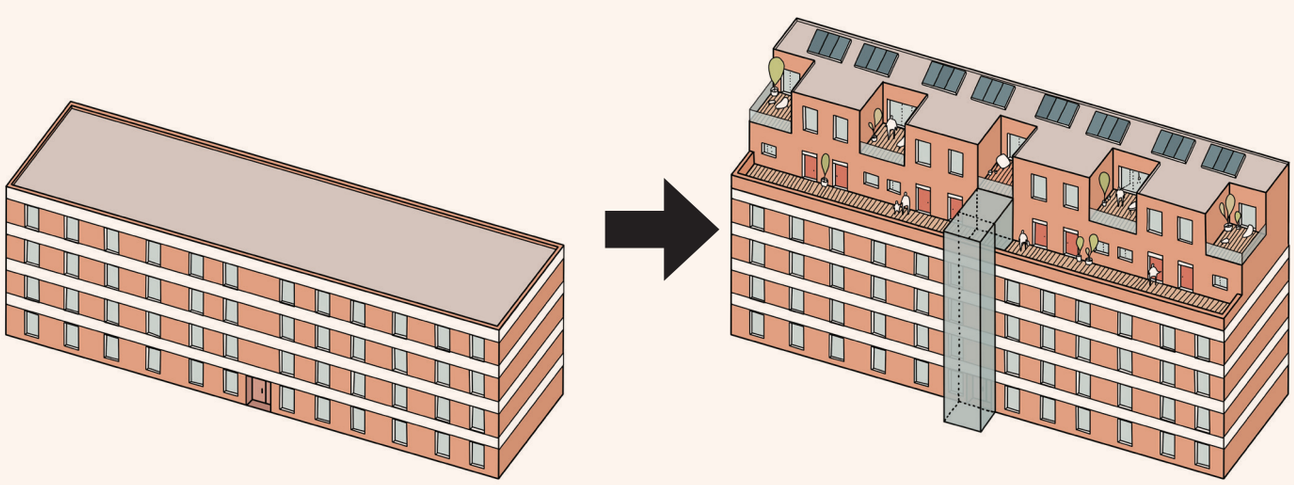
1250 Homes

Typical technical considerations

- Strong masonry construction;
- Flat roof or pitched roof;
- Services are typically centrally located buried within the plan;
- Usually a single freeholder.

Typical solution

- Multiple modules custom made to suit site;
- Extend existing staircase and extend of add new lift.



Before

After

Typology 6: Local Authority Estate Tower Blocks

The significant bomb damage experienced by Camden during WWII enabled the building of council houses shaped by the modernist approach to town planning. These estates are typically founded on the principle of the neighbourhood unit with buildings set within open space, rather than relating to the street pattern. The point tower blocks are typically of concrete frame construction, with inset balconies.

10 Potential Buildings Identified for Rooftop Development

equivalent to

2% of identified properties

5,790m²

rooftop space identified

equivalent to

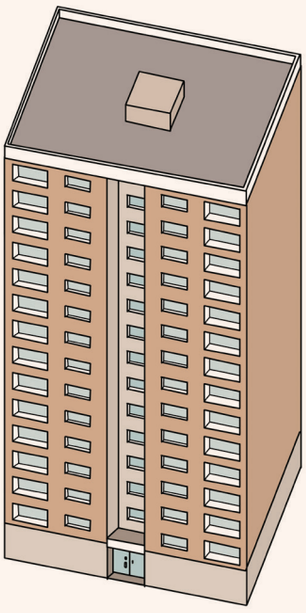
72 Homes

Typical technical considerations

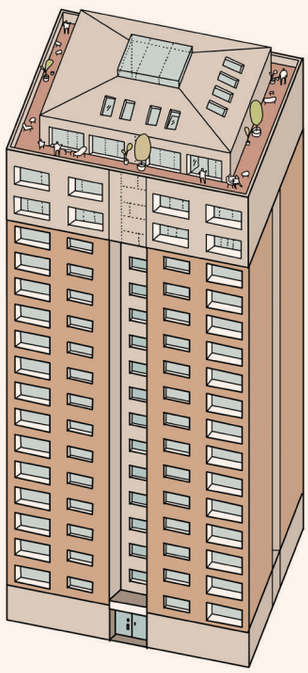
- Strong concrete frame construction;
- Flat roof;
- Services are typically centrally located buried within the plan;
- Often have plant equipment on top, which might restrict development on those blocks.

Typical solution

- Multiple modules custom made to suit site;
- Extend existing staircase and lift.



Before



After

Typical Typology 7: Small Flatted Block with Single Core

Numerous small flatted blocks are dispersed around the borough. Many of these are post-war blocks, however, some more contemporary examples have also been included. Whilst the form of construction and structural considerations for these will vary, access is typically from a single core, and therefore the approach to rooftop development on these buildings will be similar, as the building proportions tend to be similar.

91 Potential Buildings Identified for Rooftop Development

equivalent to

20% of identified properties

21,510m²
rooftop space identified

equivalent to

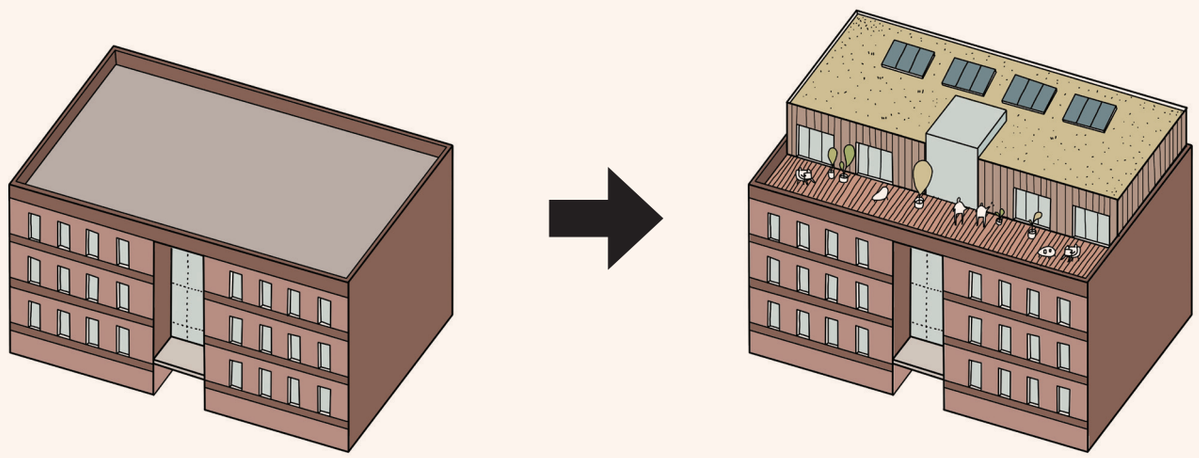
269 Homes

Typical technical considerations

- Strong concrete frame construction;
- Flat roof;
- Services are typically centrally located buried within the plan;

Typical solution

- Multiple modules custom made to suit site;
- Extend existing lift and staircase



Before **After**

Typical Typology 8: Miscellaneous

A substantial number of sites do not fall into any of the above typologies. These are comprised of heterogeneous building types ranging from public houses, to prominent irregularly shaped corner sites, to space above existing purpose built retail and commercial uses as well as converted factory buildings.

36 Potential Buildings Identified for Rooftop Development

equivalent to

8% of identified properties

12,321m²

rooftop space identified

equivalent to

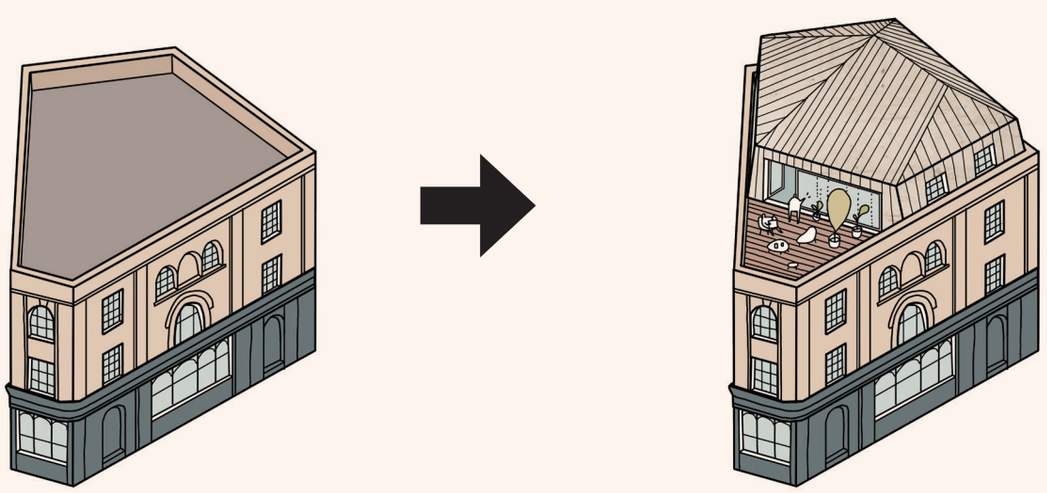
154 Homes

Typical technical considerations

- Likely to be of masonry construction
- A variety of rooftypes;
- Services will be varied, and may be a more complex especially if mixed-use;

Typical solution

- The solutions for this type will be heteregeneous and are likely to require bespoke designs;
- May be more suited to on-site construction depending on existing building type;
- Extend existing lift and staircase or reconfigure existing layout



Before

After

Technical Design Considerations

Like any brownfield site rooftop development sites come with various design and technical constraints that need to be overcome. These need to be considered following identification of suitable sites following an assessment of their capacity which takes into account planning constraints. The issues that need to be considered include those relating to structure, access, fire safety, maintenance, acoustics, services, sustainable technology, and construction methods. Whilst these considerations are clearly challenges when it comes to the viability of rooftop development, many of the constraints are typical of any other refurbishment or conversion projects.

Delivery of pre-fabricated pod construction to Wilmot Place by Apex Airspace Development Ltd

Example of external lift addition from HTA Design Berlin Study Trip, September 2015.

Structural considerations

The capacity of existing buildings to support additional loading will be a primary factor in determining the feasibility of delivering rooftop development, and each site will have unique conditions. The original structural loading of buildings will not typically have capacity for significant extra loadings, however the ultimate capacity to take additional loadings will be dependent on the typology of the existing building. Additional loads would typically need to be distributed across the existing structure, to enable the structure to accommodate it without creating further structural challenges. The chosen method of proposed construction is likely to be influenced by the structural constraints, and more lightweight structures might typically be chosen for rooftop developments. The feasibility of any strengthening measures which may be required to the existing structure will need to be assessed by a structural engineer.

Access, Height and Fire Safety

When building on top of an existing building, access to the new accommodation via the existing vertical circulation routes (stairs and lifts) is likely to be the most cost-effective solution. Existing stairs are likely to form the main means of escape in the event of fire, and for fire-fighting by the local Fire Brigade, with fire-fighting lifts necessary in accommodation above 18m above fire-access level. However, this may vary dependent on the existing (different) building use(s).

Proximity to the final exit will be a consideration, as this impacts on travel distances, which would influence the amount of accommodation that can be served. The use of open deck access between accommodation and stair/core can extend travel distances and may assist in increasing the number of accommodation units that can be provided.

Where it is not practical or possible to extend the existing stairwell (and/or lift) it may be possible to provide access via an independent stair/lift shaft on the outside of the building.

The feasibility of adding extra accommodation to the top of existing structures may depend on the building height as different categories of building height have different Building Regulation requirements. Adding roof top accommodation could move a building into the next category, creating the need for new considerations in relation to means of escape and smoke ventilation, fire-fighting provisions, the need for dry or wet risers, fire resistance of elements of structure and other building elements, and the possible need for sprinklers.

Services Infrastructure

The capacity of existing services infrastructure to supply additional demand needs to be investigated, and planning for additional capacity (where needed) should be put in place early in the development process. This includes electricity, gas, water, telecommunications and refuse storage facilities.

Two options are possible in the case of roof space development: providing separate services or extend (or add to) the existing systems and services.

There are significant benefits to be gained in utilising existing drainage systems. On larger projects with a new configuration of accommodation over an existing layout, connecting to existing soil stacks will need to be factored in if designing alternative layouts and the impact of additional accommodation will need to be considered to ensure capacity is not exceeded. New systems may need to be located on the exterior of the building (possibly

in enclosed ducts) and may require additional below-ground drainage.

Where there are a significant number of service elements located at or around roof level on existing buildings, these may play a role in determining the feasibility of utilising the roof space for additional accommodation. Those with prohibitive services on the roof have been excluded from this study, as re-providing, moving, altering or re-routing can be costly. Typical elements which may need to be taken into consideration are: M&E plant/rooms/enclosures; lift over-runs; stair/stepped access ways; chimneys, gas-flues, ventilation shafts; rooflights/ automatic-opening smoke vents; services routes; lightning conductors; man-safe lines, fixing points; aerials and satellite dishes; telecom masts/relay equipment; PV panels; CCTV systems; window/ façade cleaning cradle/track; rainwater gutters and outlets; SVP's; and, the provision of green roofs.

Sound

Internal and external noise levels need to be considered and acoustic separation needs to be provided between the existing dwellings beneath.

Access for Maintenance Purposes

Safe access for cleaning or maintaining the existing building as well as the new structure requires consideration.

Renewable Energy and Green Roofs

The ability for the new roof to support renewable energy (e.g. through provision of photovoltaic panels) should be considered. It could be an important component in demonstrating energy efficiency and it could save residents money. The addition of a green roof to all or part of the roof area will help to reduce the amount of drainage, and will help to get planning permission.

Construction Method

Rooftop additions can be prefabricated in a number of ways and using a number of construction techniques, reducing the impact of construction on existing residents and buildings. Off-site manufacturing is a growing area of interest in relation to residential accommodation and it could play a significant role in the delivery of roof top development.

Modular elements can be constructed using a variety of commonly used construction materials: concrete, steel and timber. Typically a factory will construct a structural frame, install wiring, and plumbing, fix the internal linings, add lighting, and other services, apply paint finish and then crane the module onto a truck for delivery. Upon reaching the construction site the module is then craned into position. It is entirely possible for a module to leave the factory in the morning and be installed on site in the afternoon.

Most modules are supplied weatherproof and with windows installed. This is to ensure that they are secure and weathertight. The entrance door to the module can be locked to prevent workmen from entering it, as modules are often fully finished internally.

All modular structural methods are suitable for use on rooftop extensions, with the caveat that the additional loading on the structure beneath will be a determining factor. Timber or light-gauge steel modules are likely to be the most suitable solution for weak structures.

There are transport restrictions that apply to modules, with a width of 4.2m considered as a normal maximum and 3.6m as a helpful 'normal' dimension. These widths are to the outside of the structure and any packaging. Going beyond the 4.2 dimension leads to the need for an escorted delivery which increases costs.

Legal Considerations

The legal constraints of any potential opportunity need to be carefully understood. Land ownership, tenure, licences, covenants, easements, and rights of way need to be assessed and understood prior to commencement of significant design work.

Construction of ‘Wilmot Place’ Rooftop Development by Apex Airspace Development

Providing Affordable homes for London

The issue of an undersupply of new homes, twinned with an increasing challenge of affordability provides a real challenge for all involved in determining the how and what of new supply. Even when new supply has been identified, there remains a real factor of how that can be translated into affordable homes.

Evidence from this research suggests that potentially a third of the roof space capacity is owned by local authorities or housing related organisations, equating to a potential 60,000 number of new homes. Translating the value of the roof space appears to be a viable way in which new affordable homes could be generated. Based on this research, the value of publicly owned roof space across Greater London could be conservatively calculated to be in the order of £54 billion.

We are aware that Apex Airspace Development are in conversation with a range of housing players, such as Lambeth & Southwark HA, Westway HA, Arhag HA, LB Hillingdon, LB Harrow, Croydon Churches HA and others, to explore how funds from rooftop development could deliver real benefits for these organisations. The key benefits of the approach are listed on the following page.

Strategic and Financial Benefits

Key Strategic and Financial Benefits of Rooftop Development

Strategic

- Delivery of much needed new homes supply to meet London's housing needs
- Enhancing asset value and use of existing properties
- Creation of new funding stream to assist affordable housing delivery
- Innovative – use of offsite homes manufacture to speed delivery and reduce disruption to occupants
- Green – potential opportunity for use of renewable energies to reduce energy consumption

Financial

- Creation of significant windfall payment for freeholder, linked to market value of the new apartment(s)
- Reduction of maintenance burden for freeholders/ leaseholders
- Improvement to the kerb appeal of properties through associated improvements to façade and elevations
- Creation of new ground rent income for freeholders

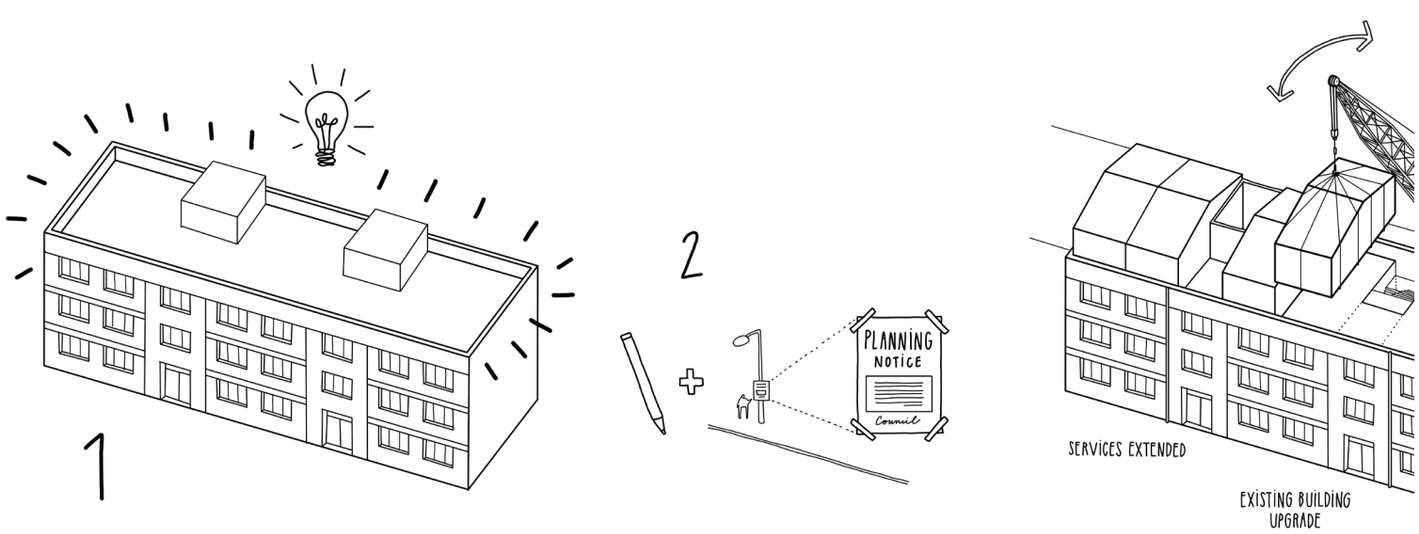
Typical Modular Layouts

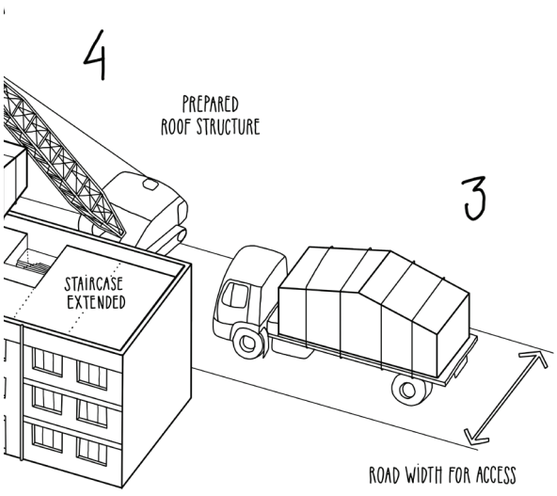
Typical 1 Bedroom Layout

Typical 2 Bedroom Layout

The Development Process

The development process is not dissimilar to a typical development process. The process begins with identification of a potential rooftop site, and negotiations with the relevant site owner(s). The initial design process terminates in gaining a planning consent. Following this a prefabricated module can be transported and installed on site within a matter of a week. The steps have been simply broken down and explained through the following diagram.




4
PREPARED
ROOF STRUCTURE
3
STAIRCASE
EXTENDED
ROAD WIDTH FOR ACCESS


5

Conclusion

This report is based on research that identifies 475 potential rooftop development sites across the borough of Camden, which provide a total of 198,660m^2 of rooftop space. We estimate that this could provide at least an additional 2,485 homes for the borough of Camden. This figure represents a very substantial 28% of the borough's housing target set by the London Plan which needs to be accommodated between 2015-2025.

We recognise that the individual boroughs are unique, however the inner London boroughs have a similar mix of building typlogies and open space, and therefore we estimate that the 'potential rooftop development density' can therefore be applied across the inner London Boroughs. For Camden we have found that this potential density is 1.14 homes per hectare, which therefore would enable the creation of 38,394 new homes across inner London.

Whilst the typical design solutions reviewed in the report respond to the most common typlogies in the Borough of Camden, other studies, including those reviewed from the NLA New Ideas for London, demonstrate how typical suburban typlogies found in outer London could also be adapted to enable rooftop development that would allow the creation of additional new homes. Using the same 'potential rooftop development density' we estimate this could therefore enable the creation of 179,126 new homes across the whole of Greater London. The outer London Boroughs have greater potential for increases in height, due to the existing looser grain and pattern of development.

The estimated number of 179,126 new homes across the whole of London equates to approximately 42% of the total 10 year London-wide housing target as set out in the London Plan. We would suggest that the significant potential for rooftop development can therefore no longer be ignored.

References

[1] Mayor of London, Housing in London, 2015, p. 81.

[2] Quod in partnership with Shelter, February 2016, When Brownfield isn't Enough: Strategic Options for London's Growth, p. 4.

[3] DCLG and Mayor of London, Consultation on Upward Extensions in London, February 2016.

[4] This date is used as it was only from 2007 that associated documents could be viewed with planning applications submitted.

[5] Class B, Town and Country Planning (General Permitted Development) (England) Order 2015.

[6] New Ideas for Housing, NLA Insight Study, New London Architecture, 2015

[7] http://www.standard.co.uk/news/mayor/zac-goldsmith-add-two-storeys-on-public-buildings-to-help-solve-london-housing-crisis-a3189821.html

[8] http://www.dailymail.co.uk/news/article-3561979/Homeowners-building-instead-lifting-new-storeys-house-crane.html

[9] http://www.telegraph.co.uk/business/2016/03/27/deceptively-big-ideas-for-small-spaces/

[10] Mayor's Housing SPG, March 2016, paragraph 1.2.56

[11] Wilson, Foster and Barton, Empty Housing England Briefing Paper, Number 3012, 5 May 2016.

[12] Empty Homes National Campaigning Charity, Empty Homes in England, Autumn 2015, p.6

[12] Camden Local Plan Submission Draft, 2016, Policy G1 'Delivery and location of growth'

[13] Camden Local Plan Submission Draft, 2016, paragraph 2.21, p.23
targets for Kings Cross 1,900; Euston 2,800-3800; Tottenham Court Road 500; Holborn 200; West Hampstead Interchange 800.

[14] The Camden Local Plan Submission Draft states that the 3,050 new homes will consist of 450 new council for rent homes and 650 replacement council rented homes, intermediate housing (300) and 1650 new and replacement private homes. It is not clear how many are replacement homes in this instance.

[15] Camden Local Plan Submission Draft, 2016, paragraph 3.9, p. 44

[16] London Borough of Camden, Camden Character Study, 2016, p. 34

[17] https://camden.gov.uk/ccm/content/housing/housing-and-the-environment/insulating-our-housing-stock/

[18] https://camden.gov.uk/ccm/content/housing/council-tenants-and-leaseholders/housing-repairs/major-repair-work/estate-regeneration/about-estate-regeneration

[19] http://www.neighbourhood.statistics.gov.uk/

[20] London Borough of Camden, Camden Character Study, June 2015, p 20

[21] According to the Borough's Open Space, Sport and Recreation Study, Final Report, June 2014, 588.8ha of open space exists within the borough. The total area of the Borough is approximately 2180ha and as such 27% of the borough is open space.

[22] London Borough of Camden, Camden Character Study, June 2015, p.25

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APEX
AIRSPACE
DEVELOPMENT