




Air Quality Assessment
277A, Gray's Inn Road, London

Prepared for:
Regal GI Limited
London

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Date:
June 2014

Project or Issue Number:
UK1119893

Contract No:	UK1119893
Issue:	2
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Date:	June 2014

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Version Control Record				
Issue	Description of Status	Date	Reviewer Initials	Author Initials
1	Final Draft	20.6.14		LV
2	Final	25.6.14	JW	LV

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Executive Summary

ENVIRON UK Ltd. (ENVIRON) has been commissioned by Regal GI Limited, to carry out an air quality assessment to accompany a planning application for the development of 277A Gray's Inn Road. The development proposals include commercial, retail and leisure uses at ground and lower ground level, plus residential units both as town houses and apartments arranged over seven storeys.

The development is located within the London Borough of Camden (LBC). The whole of the borough has been declared an Air Quality Management Area due to potential exceedences of both nitrogen dioxide (NO₂) and fine particulate matter (PM₁₀) National Air Quality Objectives (NAQO). NO₂ concentrations at road side locations close to the proposed development are currently exceeding the NAQO. Thus assurance is required by the council that due consideration has been given to air quality within the design of the proposed development.

During the construction phase, emissions of dust and exhaust gases from construction activities can impact air quality. These will be effectively controlled through the use of suitable mitigation measures implemented through the provision of a dust management plan which would be agreed with LBC prior to the start of construction.

Consideration has been given to air quality within the design of the building to ensure that potential operational impacts will be minimised as far as is practicable.

LBC planning policy requires that the residential elements of the development meets the Code for Sustainable Homes level 4 for the new units and BREEAM New Construction Very Good for the commercial office space. To meet these criteria the development will include low NO_x boilers and a CHP. Exhaust emissions from the CHP will be emitted from the tallest element of the development, from a stack 1 m above the adjacent roof level. A screening assessment has indicated that emissions from the CHP will have a negligible impact on air quality at the nearest location of relevant exposure, which is considered to be the balcony for the residential apartment on the seventh floor.

Additional mitigation measures have been built into the design of the development to further reduce the exposure of future residents to poor air quality. In particular each residential unit will be provided with a mechanical ventilation system which will draw air from the roof top at the rear of the development.

1 Introduction

1.1 Overview

ENVIRON UK Ltd. (ENVIRON) has been commissioned by Regal GI Limited, to carry out an air quality assessment to accompany a planning application for a development at 277A Gray's Inn Road, London. The development proposals include commercial, retail and leisure uses at ground and lower ground level, plus residential units both as town houses and apartments arranged over seven storeys.

The development is located within the London Borough of Camden (LBC). The whole of the borough has been declared an Air Quality Management Area due to potential exceedences of both nitrogen dioxide (NO₂) and fine particulate matter (PM₁₀) National Air Quality Objectives (NAQO). NO₂ concentrations at road side locations on Euston Road to the north of the Proposed Development are currently exceeding the NAQO. Thus assurance is required by the council that due consideration has been given to air quality within the design of the Proposed Development.

1.2 Scope of the Assessment

The proposed development will be car free with no car parking spaces provided for the residential occupants, thus the impact on pollutant emissions from road traffic is considered to be negligible.

However the development will introduce residential receptors into a location where air quality is currently exceeding the annual mean NO₂ air quality objective. Whilst the objectives relate to external air, external concentrations will impact internal air quality. Information is therefore provided on the mitigation measures that have been included within the design of the development to reduce the exposure of residents to high concentrations of external pollutants.

The residential apartments have been designed to meet the Code for Sustainable Homes Level 4. To achieve the required reduction in CO₂ emissions part of the energy requirement of the residential units will be provided by a combined heat and power (CHP) plant unit. CHP plant can emit high levels of oxides of nitrogen, and thus impact local air quality, particularly where emissions arise from short stacks. Potential impacts arising from the CHP have been assessed using the screening tool produced by Environmental Protection UK (EPUK)¹.

Consideration has also been given to the potential for emissions of dust to arise during the construction phase. A qualitative assessment of the risk of dust impacts has been carried out using the Institute of Air Quality Management guidance to identify the appropriate level of mitigation that should be applied to ensure impacts can be effectively mitigated.

In summary, the assessment includes:

- Establishment of baseline air quality;
- Assessment of dust impacts during the construction phase.

¹ <http://iaqm.co.uk/guidance/>

- Assessment of emissions as a result of the proposed energy strategy for the proposed development; and
- Assessment of the mitigation strategy to limit residents exposure to elevated concentrations of air pollutants.

2 Site Description

2.1 Existing Site

The development site, which covers an area 2,853 m², is currently occupied by a warehouse which will be completely demolished as part of the proposed development.

The site is set behind the properties fronting on to Gray's Inn Road to the east and St Chad's Street to the north. Euston Road is located 130 m to the north. Access to the site is from two entrances, one on Gray's Inn Road and the second on St Chad's Street.

To the west the development site is bordered by a residential development comprising four apartment blocks set in landscaped grounds. To the south the site is bordered by a commercial building.

2.2 Proposed Development

The proposed development involves the demolition of the existing building on the site and the construction of 59 residential units with an area of 4,373 m² (GIA). In addition the development will incorporate 923 m² (GIA) commercial space for office use (B1); 76 m² (GIA) retail space for Café (A3) use and 168 m² (GIA) leisure space for Gym (D2) use.

The commercial and retail space will be located within the south section of the site, near the Gray's Inn Road entrance. This area will contain four separate office units, a café gallery, food preparation space and in the middle of the entrance an exhibition area.

The residential accommodation will comprise a mix of town houses with courtyards arranged over three stories, and duplex and single storey apartments arranged in buildings with up to seven storeys.

The proposed development will provide a walkway with green and seating spaces between Gray's Inn Road entrance to the south east and St Chads Street entrance to the north of the site. This will provide good access to the residential units and excellent connectivity between the commercial, retail and residential uses.

No car parking will be provided within the development.

The floor plans of the development are provided in Annex A.

3 Policy Context

3.1 International Legislation and Policy

EU Directive 2008/50/EC² on ambient air quality and cleaner air for Europe (the CAFE directive) sets out the ambient air quality standards for NO₂ and PM₁₀, to be achieved by 1st January 2010 and 2005 respectively. The Air Quality Standards Regulations 2010³ implements the requirements of the Directive into UK legislation.

The Directive contains a series of limit values for the protection of human health and critical levels for the protection of vegetation.

Compliance with the EU Limit Values is mandatory. However, Member States can apply for a time extension for compliance, subject to approval of an action plan by the European Commission. The UK Government applied in autumn 2011 for a time extension for compliance with the NO₂ limit values until 2015 for a number of areas throughout England. However, the UK Government has withdrawn its application for those zones where compliance is not expected until after 2015, which includes central London.

3.2 Local Air Quality Management

Part IV of the Environment Act 1995⁴, requires the UK Government to publish an Air Quality Strategy and local authorities to review, assess and manage air quality within their areas. This is known as Local Air Quality Management (LAQM).

The 2007 Air Quality Strategy⁵ establishes the policy for ambient air quality in the UK. It includes the National Air Quality Objectives (NAQOs) for the protection of human health and vegetation for 11 pollutants. Those NAQOs included as part of LAQM are prescribed in the Air Quality (England) Regulations 2000⁶ and the Air Quality (Amendment) (England) Regulations 2002⁷. Table 3.1 presents the NAQOs for NO₂ and PM₁₀.

The Air Quality Strategy also introduced a new policy framework for tackling fine particles (PM_{2.5}) including an exposure reduction target. This pollutant is not included within LAQM, and therefore has not been considered further in this assessment.

The NAQOs apply to external air where there is relevant exposure to the public over the associated averaging periods within each objective. Guidance is provided within Local Air Quality Management Technical Guidance 2009 (LAQM.TG (09))⁸ issued by Defra for Local

² Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe

³ Air Quality Standards Regulations 2010 – Statutory Instrument 2010 No. 1001

⁴ Secretary of State The Environment Act 1995 part IV Air Quality HMSO

⁵ Department for Environment, Food and Rural Affairs, July 2007, Air Quality Strategy for England, Scotland, Wales and Northern Ireland

⁶ The Air Quality (England) Regulations 2000 (SI 2000 No. 928)

⁷ The Air Quality (England) (Amendment) Regulations 2002 (SI 2002 No. 3043) Department for Environment, Food and Rural Affairs (2009) Local Air Quality Management Technical Guidance LAQM.TG(09)

⁸ Department for Environment, Food and Rural Affairs (2009) Local Air Quality Management Technical Guidance LAQM.TG(09)

Authorities, on where the NAQOs apply. The objectives do not apply in workplace locations, to internal air or where people are unlikely to be regularly exposed (i.e. centre of roadways).

Table 3.1: Objectives included in the Air Quality Regulations (England) 2000 for the Purpose of Local Air Quality Management

Pollutant	Concentrations	Measured As	Date to be achieved by
Nitrogen Dioxide (NO₂)	200 µg/m ³ not to be exceeded more than 18 times per year	1 hour mean	31 December 2005
	40 µg/m ³	Annual mean	31 December 2005
Particles (PM₁₀)	50 µg/m ³ not to be exceeded more than 35 times per year	24 hour mean	31 December 2004
	40 µg/m ³	Annual mean	31 December 2004

It should be noted that the EU Limit Values are numerically the same as the NAQO values but differ in terms of compliance dates, locations where they apply and legal responsibility. The compliance date for the NO₂ Limit Values is 1 January 2010, which is five years later than the date for the NAQO.

The Limit Values are mandatory whereas the NAQOs are policy objectives. Local authorities are not required to achieve them, but have to work towards their achievement. In addition, the Limit Values apply in all locations except: where members of the public do not have access and there is no fixed habitation, on factory premises or at industrial installations, and on the carriageway/central reservation of roads except where there is normally pedestrian access.

Where a local authority's review and assessment of its air quality identifies that air quality is likely to exceed the NAQOs, it must designate these areas as Air Quality Management Areas (AQMA) and draw up an Air Quality Action Plan (AQAP) setting out measures to reduce pollutant concentrations with the aim of meeting the NAQOs.

The LBC latest AQAP for 2013 to 2015⁹ has the following overarching aims;

- Continue to meet the EU objectives for Carbon Monoxide, Sulphur Dioxide, Benzene, 1,3-Butadiene, Lead and PM₁₀.
- Continue to reduce concentrations of PM₁₀; and
- to meet the EU Objective for NO₂.

The plan includes the following key objectives to:

- to encourage reductions in fossil fuel use, the adoption of clean fuels and technology and promote energy efficiency.
- Raise awareness about air quality in Camden and promote lifestyle changes which can help reduce levels of air pollution and exposure to air pollution.

⁹ London Borough of Camden, Camden's Clean Air Action Plan 2013-2015

- Improve the health and well-being of the local population.
- Work in partnership with national and regional bodies, and with local public and private organisations, to foster improvements in air quality.
- Lead by example and reduce NO₂ and PM₁₀ emissions associated with the Council's own buildings and transport services.
- Ensure actions which serve to reduce NO₂ and PM₁₀ emissions complement actions to mitigate CO₂ emissions, and vice-versa.

3.3 Planning Policy

3.3.1 National Planning Policy Framework

The National Planning Policy Framework (NPPF)¹⁰ published in March 2012 sets out the Government's planning policies for England. Planning law requires that applications for planning permission must be determined in accordance with the development plan, unless material considerations indicate otherwise.

The NPPF is also a material consideration in planning decisions. It states that the purpose of the planning system is to contribute to the achievement of sustainable development; and that planning decisions on individual applications must reflect relevant EU obligations and statutory requirements. Specifically, in terms of air quality, it requires the planning system to prevent development from contributing to, or being put at unacceptable risk from unacceptable levels of air pollution.

Planning policies should promote compliance with or contribute towards achievement of EU limit values and NAQOs, taking into account the presence of AQMAs and the cumulative impacts on air quality from individual sites in local areas.

Planning decisions should ensure that new development within an AQMA is consistent with the Local Air Quality Action Plan.

3.3.2 The London Plan, Spatial Development Strategy for Greater London, 2011

The following policies of the London Plan¹¹ are of relevance to this assessment:

- Policy '5.3 - Sustainable design and construction' which states that development proposals should demonstrate that sustainable design standards are integral to the proposal, including its construction and operation, and ensure that they are considered at the beginning of the design process. Major development proposals should meet the minimum standards outlined in the Mayor's supplementary planning guidance and this should be clearly demonstrated within a design and access statement. The standards include measures to achieve other policies in this Plan and the following sustainable design principles:
 - *"minimising carbon dioxide emissions across the site, including the building and services (such as heating and cooling systems);*

¹⁰ Department for Communities and Local Government (March 2012) National Planning Policy Framework

¹¹ Greater London Authority, 2011. The London Plan Spatial Development Strategy for Greater London. London. GLA

- *avoiding internal overheating and contributing to the urban heat island effect;*
- *efficient use of natural resources (including water), including making the most of natural systems both within and around buildings; and*
- *minimising pollution (including noise, air and urban run-off)".*
- Policy '7.14 - Improving air quality' which states that development proposals should:
 - *"minimise increased exposure to existing poor air quality and make provision to address local problems of air quality (particularly within Air Quality Management Areas (AQMAs) and where development is likely to be used by large numbers of those particularly vulnerable to poor air quality (such as children or older people) such as by design solutions, buffer zones or steps to promote greater use of sustainable transport modes through travel plans (see Policy 6.3);*
 - *promote sustainable design and construction to reduce emissions from the demolition and construction of buildings following the best practice guidance in the GLA and London Councils' 'The control of dust and emissions from construction and demolition';*
 - *be at least 'air quality neutral' and not lead to further deterioration of existing poor air quality (such as areas designated as Air Quality Management Areas (AQMAs);*
 - *ensure that where provision needs to be made to reduce emissions from a development, this is usually made on-site. Where it can be demonstrated that on-site provision is impractical or inappropriate, and that it is possible to put in place measures having clearly demonstrated equivalent air quality benefits, planning obligations or planning conditions should be used as appropriate to ensure this, whether on a scheme by scheme basis or through joint area-based approaches; and*
 - *where the development requires a detailed air quality assessment and biomass boilers are included, the assessment should forecast pollutant concentrations. Permission should only be granted if no adverse air quality impacts from the biomass boiler are identified."*

3.3.3 Revised Early Minor Alterations to The London Plan, 2013

In October 2013, the GLA published Revised Early Minor Alterations to the London Plan¹² aimed at ensuring that the London Plan is fully consistent with the NPPF. Paragraph 7.51 which supports Policy 7.14 is to be amended and in summary states the following:

- the introduction of new sensitive receptors in locations where they will be affected by existing sources of air pollution should be avoided;
- where adverse air quality impacts arise from new development mitigation will be required and could include on-site design solution, buffer zones and sustainable travel measures; and
- where on-site measures are impractical or inappropriate, off site mitigation measures can be implemented.

¹² Greater London Authority, October 2013. Revised Early Minor Alterations to the London Plan. London. GLA.

3.3.4 Clearing the Air - The Mayor's Air Quality Strategy, 2010

The Mayor of London has set out a detailed air quality strategy¹³ for Greater London in order to deliver the required reductions in PM10 and NO2 concentrations to meet the EU limits. The policies and measures within the strategy are divided into transport and non-transport measures. With regard to the Proposed Development the key policies are as follows:

- Policy '6 - Reducing emissions from construction and demolition sites' which states that the Mayor will work with the London Council to review and update the Best Practice guidance for construction and demolition sites and create supplementary planning guidance to assist implementation;
- Policy '7 - Using the planning process to improve air quality - new developments in London as a minimum shall be 'air quality neutral' which states that the Mayor will encourage boroughs to require emissions assessments to be carried out alongside conventional air quality assessments. Where air quality impacts are predicted to arise from developments these will have to be offset by developer contributions and mitigation measures secured through planning conditions, section 106 agreements or the Community Infrastructure Levy;
- Policy '8 - Maximising the air quality benefits of low to zero carbon energy supply' which states that the Mayor will apply emission limits for both PM and NOx for new biomass boilers and NOx emission limits for Combined Heat and Power Plant (CHPP). Air quality assessments will be required for all developments proposing biomass boilers or CHPPs and operators will be required to provide evidence yearly to demonstrate compliance with the emission limits; and
- Policy '9 - Energy efficient buildings' which states that the Mayor will set CO2 reduction targets for new developments which will be achieved using the Mayor's Energy Hierarchy. These measures will result in reductions of NOx emissions.

3.3.5 Sustainable Design and Construction Supplementary Planning Guidance, 2006

This Supplementary Planning Guidance¹⁴ (SPG) which supports the London Plan, provides the following guidance on air quality in section 2.4.3:

- All new gas boilers should produce low levels of NOx; and
- Developments should take measures to reduce and mitigate exposure to air pollution.

3.3.6 Sustainable Design and Construction Supplementary Planning Guidance, 2014

The Sustainable Design and Construction Supplementary Planning Guidance was published 2014¹⁵. The following guidance on air quality is provided in Section 4:

- developers should design schemes to be air quality neutral;

¹³ Greater London Authority, 2010. Clearing the Air - The Mayors London Air Quality Strategy. London. GLA

¹⁴ Greater London Authority, 2006, Sustainable Design and Construction, The London Plan Supplementary Planning Guidance. London. GLA .

¹⁵ Greater London Authority, 2014. Sustainable Design and Construction Draft Supplementary Planning Guidance. London. GLA.

- developments should be designed to minimise the generation of air pollutants;
- developments should be designed to minimise exposure to poor air quality;
- energy plant, including boilers and CHP plant should meet the relevant emission limits; and
- developers and contractors should follow the relevant guidance on minimising impacts from construction and demolition.

The SPG states that where developers are unable to meet the 'air quality neutral' benchmark, consideration should be given to off-site NO_x and PM₁₀ abatement measures.

3.3.7 The Control of Dust and Emissions During Construction and Demolition Draft Supplementary Planning Guidance, 2013

This draft guidance¹⁶ updates the previous London Council's guidance to control dust and emissions from construction and demolition activities by identifying appropriate levels of mitigation. The methodology proposed is broadly in line with that provided by the Institute for Air Quality Management (see below).

3.3.8 Local Policy

London Borough of Camden Local Development Framework

There are three development policies contained within LBC Local Development Framework¹⁷ which are relevant to air quality:

- Policy DP22 - Promoting sustainable design and construction, requires development to incorporate sustainable design and construction measures to be resilient to climate change and to reduce air pollution.
- Policy DP26 - Managing the impact of development on occupiers and neighbours states that planning permission will only be granted for development that does not cause harm to amenity. Factors that would be considered as potentially impacting amenity include emissions of odour, fumes and dust.
- Policy DP32 - Air quality and Camden's Clear Zone, states that the council will require an air quality assessment for all development which could potentially cause significant harm to air quality, and that mitigation measures will be expected in developments that are located in areas of poor air quality.

3.4 Additional Guidance

3.4.1 Environmental Protection UK Guidance

Environmental Protection UK has produced 'Development Control: Planning for Air Quality (2010 Update)'¹⁸ which provides guidance on when an air quality assessment is required. It also incorporates guidance on operational significance criteria produced by the Institute of Air Quality Management (IAQM).

¹⁶ Greater London Authority, 2013. The Control of Dust and Emissions During Construction and Demolition.

¹⁷ London Borough of Camden, 2010, Local Development Framework

¹⁸ Environmental Protection UK, 2010. Development Control: Planning for Air Quality (2010 Update).

3.4.2 Institute of Air Quality Management Guidance

The IAQM has produced 'Guidance on the assessment of dust from demolition and construction'¹⁹ to assist in the assessment of air quality impacts from construction activities. This guidance is considered to supersede the current London Councils construction dust guidance²⁰ and requires the implementation of a similar level of mitigation as the draft supplementary planning guidance produced by the Mayor of London²¹.

¹⁹ Institute of Air Quality Management, 2014, Guidance on the assessment of dust from demolition and construction.

²⁰ London Councils, 2006. The control of Dust and Emissions from Construction and Demolition: Best Practice Guidance.

²¹ Mayor of London, 2013, The Control of Dust and Emissions During Construction and Demolition, Draft Supplementary Planning Guidance Published for Public Consultation

4 Existing Air Quality

4.1 Air Quality Monitoring

LBC and the London Borough of Islington monitor existing air quality at a number of locations throughout their boroughs. The closest monitoring site to the development site is a diffusion tube site located on Euston Road at Camden Town Hall near the junction with Gower Street, approximately 300 m to the east of the development site.

A summary of the results from those monitoring sites in close proximity to the site is presented in the tables below and their location shown in Figure 4.1.

Table 4.1: Annual mean NO₂ monitoring results µg/m³

Site	Type	Classification	Distance to kerb of nearest road (m)	2008	2009	2010	2011	2012
Euston Road	Automatic Monitor	Roadside	0.5	NR	NR	NR	122	106
Bloomsbury	Automatic Monitor	Urban Background	27	55	54	55	50	55
Camden Town Hall	Diffusion Tube	Roadside	5	93	87	82	93	82
Wakefield Gardens	Diffusion Tube	Urban Background	30	38	39	34	46	39
Tavistock Gardens	Diffusion Tube	Urban Background	25	47	50	52	48	40
Percy Circus	Diffusion Tube	Urban Background	Not given	45	38	40	42	40

Table 4.2: PM₁₀ monitoring results

Site	Classification	Distance to kerb of nearest road (m)	Averaging Period	2008	2009	2010	2011	2012
Bloomsbury	Urban Background	0.5	Annual mean	23	23	18	22	19
			Number of days > 50 µg/m ³	13	15	2	17	10
Shaftesbury Avenue	Roadside	<1	Annual mean	30	30	29	32	29
			Number of days > 50 µg/m ³	30	30	29	27	18

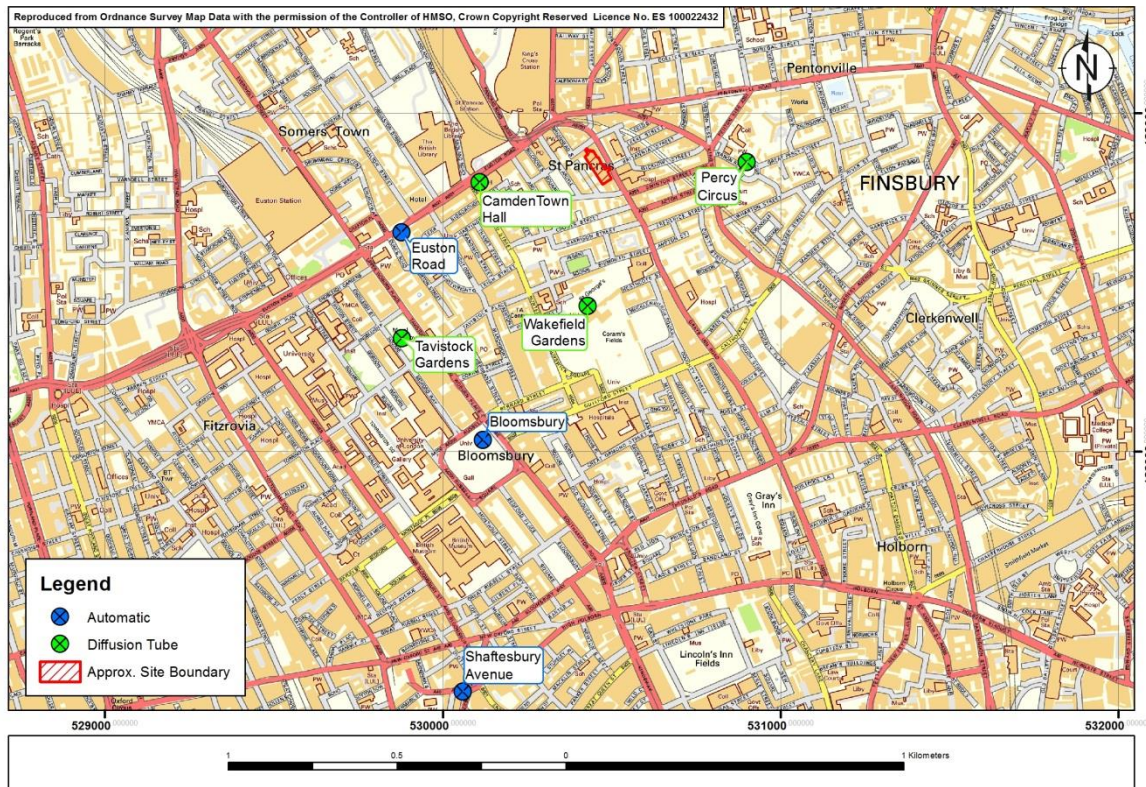


Figure 4.1: Monitoring Site Locations

4.2 Assessment of Monitoring Data

The monitoring data indicates that existing air quality on Euston Road is significantly above the annual mean NO_2 objective which is set at $40 \mu\text{g}/\text{m}^3$. Lower concentrations have been recorded at the Camden Town Hall site, compared with those at the Euston Road automatic site, due to a reduction in traffic flows and the monitor being located further from the roadside. Much lower concentrations persist at the urban background sites, as concentrations decline rapidly away from the main road sites.

The PM_{10} concentrations recorded at both the urban background and roadside sites indicate compliance with the annual mean PM_{10} objective of $40 \mu\text{g}/\text{m}^3$ and the 24 hour objective which is set at $50 \mu\text{g}/\text{m}^3$, but can be exceeded on 35 days per year.

4.3 Air Quality at the Development Site

Pollutant concentrations at the proposed development site would be expected to be slightly above the annual mean NO_2 objective at ground level locations, but not as elevated as those recorded at the Camden Town Hall monitoring site given that the site is set back from the road side and that traffic flows will be significantly lower on Gray's Inn Road compared with Euston Road (according to data in the London Atmospheric Emission Inventory).

Some decrease in concentrations would be expected with height particularly above the main building envelope which is considered to persist to the fourth/fifth floor.

Concentrations of PM_{10} would be expected to meet both the annual mean and 24 hour objective at all locations throughout the site.

5 Construction Phase Impacts

5.1 Introduction

It is inevitable that with any development, construction activities would cause some disturbance to those nearby. Disruption due to construction is a localised phenomenon and is temporary in nature. In general, only people living and working within 100m of construction activities are likely to be seriously impacted by nuisance dust²².

Dust arising from most construction activities tends to be of coarse nature. Deposition of coarse dust can lead to soiling of property including windows, cars, external paintwork and laundry.

The ability of dust particles to remain suspended in the air depends on its shape, size and density. Coarse particles ($>30\mu\text{m}$) tend to be deposited within 100 m of source²³. Finer particles, between $10\text{--}30\mu\text{m}$, are generally deposited within 200 to 500 m of source, while very fine particles ($<10\mu\text{m}$), which remain suspended for longer, can travel up to 1 km from source. The greatest proportion of construction dust is made up of coarse particles, thus the majority of dust emissions are deposited within 100 m of source.

Only a small proportion of the dust generated would be fine in nature (e.g. PM_{10}) which can enter the human respiratory system and result in adverse health effects. High emissions of fine dust typically arise from specialist activities, such as stone finishing. These should be subject to individual emission controls.

Construction effects as a result of the Proposed Development have been assessed using the recent guidance provided by the IAQM. This guidance is considered to supersede the current London Councils construction dust guidance and requires the implementation of a similar level of mitigation as the supplementary planning guidance produced by the Mayor of London.

5.2 Assessment of Impacts

The development will comprise the demolition of the existing warehouse and the construction of the proposed development. The development is located in a densely built up area with numerous receptors within 50m therefore a detailed assessment of potential dust effects is required. No ecological receptors have been identified with 50 m of the site boundary and therefore impacts on ecological receptors have not been considered further.

Using the evaluation criteria within the IAQM's Guidance the potential dust emission magnitude has been identified for each stage of the proposed development as shown in Table 5.1 below.

²² Baughan C J, 1980. Nuisance from Road Construction: A study at the A31 Poulner Lane Diversion, Ringwood. TRRL Supplementary Report 562, from DTLR (1994) Design Manual for Roads and Bridges.

²³ Arup Environmental/Ove Arup Partners on Behalf of the Department of the Environment (1995) The Environmental Effects of Dust from Surface Mineral Workings

Table 5.1: Dust Emission Magnitude for Each Construction Phase

Activity	Dust Emission Magnitude	Justification
Demolition	Small	The size of the existing warehouse is estimated as less than 20,000 m ³
Earthworks	Small	Development area estimated to be less than 2,500 m ²
Construction	Small	Total building volume less than 25,000 m ³
Trackout	Small	No information has been provided on construction traffic flows, but given the location and confines of the site it is assumed that daily HGV movements will not exceed 10 vehicles

The next stage of the process is to define the sensitivity of the assessment area to dust soiling, human health impacts and ecological receptors. This process combines the sensitivity of the receptor with the distance from the source to determine the overall sensitivity. The sensitivity of the area to dust impacts is provided in Table 5.2.

Table 5.2: Sensitivity of Area to Dust Impacts (taking into account distance to construction activity)

Sensitivity to Dust Soiling	Sensitivity to Human Health Impacts	Sensitivity to Ecological Receptors
High – > 100 residential properties within 20 m of the development site	High – existing PM ₁₀ concentrations estimated to be between 28-32 µg/m ³ , > 100 receptors within 20 m	NA – no ecological receptors sensitive to dust within 50m of the site or within 50m of the route used by construction vehicles for a distance of 500m

The dust emission magnitude determined in Table 5.1 has been combined with the sensitivity assessment in Table 5.2 to define the risk of impacts for each phase of development in the absence of mitigation as shown in Table 5.3.

Table 5.3: Risk of Dust Impacts in the absence of mitigation for each Construction Phase

		Dust Emission Magnitude			
		Demolition (Small)	Earthworks (Small)	Construction (Small)	Trackout (Small)
Sensitivity of the surrounding area	Dust Soiling (High)	Medium	Low	Low	Low
	Human Health (High)	Medium	Low	Low	Low

5.3 Mitigation of Construction Impacts

The control of dust emissions from construction sites relies upon good site management and mitigation techniques to reduce emissions of dust and limit dispersion. A summary of the mitigation measures recommended in the IAQM guidance to reduce impacts from medium risk sites is provided in Table 5.4 and these will be included within the final Construction Management Plan, a draft of which is included within the planning submission. .

Table 5.4: Recommended Dust Mitigation Measures for Medium Risk Sites		
	Highly Recommended	Desirable
Communications	Implement a stakeholder communication plan. Display name and contact details of responsible person for dust issues on Site boundary in addition to head/regional office contact information.	
Dust Management Plan	Develop and implement a Dust Management Plan (DMP), to be approved by the Local Authority.	
Site Management	Record all complaints and incidents in a site log. Take appropriate measures to reduce emissions in a timely manner, and record the measures taken within the log. Make the complaints log available to the Local Authority if requested. Record any exceptional dust incidents on or off site.	
Monitoring	Carry out regular inspections to ensure compliance with the DMP and record results in the site log book. Increase the frequency of inspections during activities with a high potential to create dust or in prolonged dry weather.	Undertake daily on and off site visual inspections where there are nearby receptors.
Preparing and Maintaining the Site	Plan site layout to locate dust generating activities as far as possible from receptors. Use solid screens around dusty activities and around stockpiles. Avoid site runoff of water and mud. Fully enclose the site or specific operations where there is a high potential for dust production and the site is active for an extensive period. Keep site fencing barriers and scaffolding clean using wet methods. Remove dusty materials from site as soon as possible. Minimise emissions from stockpiles by covering, seeding, fencing or damping down.	
Operating Vehicle/Machinery and Sustainable Travel	All vehicles should comply with the standards of the London Low Emission Zone. Ensure vehicles switch off engines when stationary. Avoid use of generators where possible.	Enforce an on-site speed limit of 15 mph on surfaced roads and 10 mph on unsurfaced

	Produce a Construction Logistics Plan to manage the sustainable delivery of materials.	areas. Implement a sustainable travel plan for site workers
Operations	<p>Cutting, grinding or sawing equipment only to be used with suitable dust suppression equipment or techniques.</p> <p>Ensure adequate water supply for effective dust and particulate matter suppression.</p> <p>Use enclosed chutes, conveyors and covered skips.</p> <p>Minimise drop heights of materials.</p> <p>Ensure suitable cleaning material is available at all times to clean up spills.</p>	
Waste Management	Avoid bonfires.	
Measures Specific to Demolition	<p>Ensure effective water suppression is used, preferably through the use of hand held sprays.</p> <p>Avoid explosive blasting.</p> <p>Bag and remove biological debris or damp down material prior to demolition.</p>	Where practical, soft strip inside buildings before demolition of external walls and windows.
Measures Specific to Earthworks		<p>Re-vegetate earthworks and exposed areas/soil stockpiles as soon as practicable.</p> <p>Use hessian, mulch or trackifiers where it is not possible to re-vegetate or cover with topsoil.</p> <p>Only expose small areas of ground or stockpile when working.</p>
Measures Specific to Construction	Ensure aggregates are stored in bunded areas and are not allowed to dry out.	<p>Avoid concrete scabbling where possible.</p> <p>Ensure bulk cement and other fine powder is delivered in tankers and stored in silos with suitable emission control.</p> <p>Smaller supplies of fine powder material to be in sealed containers and stored</p>

		appropriately.
Measures Specific to Trackout	Use water-assisted dust sweepers to clean access and local roads. Avoid dry sweeping of large areas. Ensure vehicles entering and leaving the site are appropriately covered. Inspect on-site haul roads for integrity and repair as necessary. Inspections of haul roads to be recorded in site log, including any remedial action taken. Implement a wheel washing system.	

5.4 Residual Effects

Using the IAQM guidance and on the assumption that appropriate dust mitigation measures are applied commensurate with the risk of potential dust impacts, the potential for residual effects to arise during the construction phase will be reduced to at worst 'slight adverse'.

6 Operational Impacts

6.1 Introduction

The proposal includes ambitious sustainability targets to reduce the development's environmental impact through design and sustainable operation. The following targets are proposed which demonstrate high levels of sustainability:

- To achieve the requirements for Code for Sustainable Homes Level 4 for the residential, with aspirations to improve on the minimum requirements where possible;
- BREEAM New Construction Very Good for the commercial office spaces at Block A;
- A site-wide 40% CO₂ reduction against Part L 2010 Building Regulations, achieved through a combination of passive design, energy efficiency, and Low and Zero Carbon technologies.

To deliver these targets an Energy Strategy has been included as part of the planning submission, produced by the Sustainability and Energy Consultants, ENVIRON.

The strategy first concentrated on delivering energy efficiency measures to make the buildings as efficient as possible. The second stage of the process was to review a number of low or zero carbon technologies to reduce the overall energy consumption and carbon emissions of the development. This process concluded that the inclusion of a gas fired combined heat and power (CHP) unit was the most appropriate technology to meet the heating demand requirements for the residential element and to reduce site wide CO₂ emissions to meet the relevant targets. Air Source Heat Pumps will provide heating and cooling for the commercial spaces at ground and basement levels of Block A, in addition to the specification of photovoltaic panels on appropriate roof spaces.

6.2 Combined Heat and Power Unit

Calculations have been carried out using energy benchmark data to determine the monthly and annual energy profiles for the residential element of the development. From this data, the appropriate size of CHP plant and matched thermal storage has been established.

It has been estimated that the proposed development would require a CHP with a 4 - 9 kWe electrical output and 12 - 20 kWth thermal output to act as the lead heat source to serve all residential units within the development. This system would then be supplemented by high efficiency, low NO_x, gas fired condensing boilers to provide additional heat and hot water, with mains electricity to provide the additional electrical requirement.

Analysis has been carried out to maximise the size of CHP plant that can feasibly be installed within the correct operating parameters of the equipment. An oversized CHP unit or one which is not provided with adequate thermal storage will frequently turn on and off, thus diminishing the performance and reliability of the equipment and potentially resulting in higher emissions of pollutants.

The size of the CHP plant has been calculated based on the thermal base load (primarily domestic hot water) that is available all year round to enable its operation for approximately 5000 hours per year.

To enable the CHP plant to run continuously when it is operating, thermal storage vessels shall be used so that excess CHP capacity can be used to generate hot water for use at a later time, when there is a demand for heat in the building.

It is estimated that the CHP combined with suitably sized thermal storage will provide heat for approximately 60% of the building's thermal energy requirements, with gas fired boilers being used to meet peak demands and provide top up heat in winter months.

6.3 Impact Assessment

At this stage in the design process, the choice of the CHP has yet to be finalised and thus it is not possible to carry out a detailed assessment of impacts. However, information has been obtained from a potential supplier to check the feasibility of the installation. The data used in the assessment below is based on the LoadTracker CHP XRGI 9.

Emissions from the CHP would be emitted from a stack located on the highest point of the roof and at a height of approximately 1 m above roof height.

The screening tool, produced by EPUK²⁴, to assist local authorities in assessing whether impacts from CHPs are likely to give rise to significant air quality impacts, has been used to provide an initial assessment to determine whether the air quality impacts from a CHP would be acceptable at the nearest point of exposure. For the proposed development this is considered to be the balcony provided for the duplex apartment located at sixth and seventh floor level immediately below the CHP flue.

The tool has indicated that at a worst case the operation of the CHP may give rise to an increase in annual mean NO₂ of 0.4 µg/m³ (see Annex B). Using the EPUK/IAQM methodology for assessing the significance of air quality impacts, an increase of this magnitude is considered to be 'imperceptible' and result in a **negligible impact** to air quality. It should be noted that this is a worst case screening assessment, assuming continual operation of the CHP on a 24/7 basis and total conversion of NO_x to NO₂. Actual concentrations would therefore be expected to be lower.

6.4 CHP Operation and Maintenance

Regular planned preventative maintenance by a trained engineer will be carried out at regular service intervals, as recommended by the CHP manufacturer, to ensure the continued correct and efficient operation of the unit.

6.5 Gas CHP Information Request Form

LBC require additional information to be supplied regarding the choice and operation of the CHP to be supplied as part of the planning application, which should be submitted on the Gas CHP information request form. Whilst the majority of the information requested by the form is included within this report, as the choice of CHP is yet to be finalised it is not possible to supply all of the required information at this time. It is therefore recommended that the provision of this information and the completion of the form are secured by an appropriately worded planning condition.

²⁴ <http://iaqm.co.uk/guidance/>

7 Mitigation

There are a number of features of relevance to the development to reduce the exposure of future residents to poor air quality including:

- the development is located away from the roadside, beyond the existing buildings facing out onto Gray's Inn Road and therefore pollutant concentrations will be significantly lower than those at roadside;
- the development will be car free, and will encourage the use of sustainable transport modes through providing secure bicycle storage;
- each residential unit will be fitted with a whole house heat recovery mechanical ventilation system. Each system will comprise a fan unit with filter, heat exchanger and inlet and extract fans. Filtered and pre-heated fresh air will be ducted to living rooms and bedrooms, and extracted from kitchens and bathrooms. In the summer months, the pre-heater will be turned off via a by-pass in the heat exchanger;
- the air inlets for the residential buildings will be located at roof top level where pollutant concentrations would be expected to be lowest;
- exhaust gas emissions from the CHP and boilers will be emitted from combined flues some 1 m above the final roof height i.e. above the seventh floor to ensure adequate dispersion of flue gases and to avoid entrainment into the air intake.

8 Summary and Conclusions

The proposed development will introduce residential receptors into a location where air quality is likely to exceed the air quality objective for annual mean NO₂ at external locations.

During the construction phase, emissions of dust and exhaust gases from construction activities can impact air quality. These will be effectively controlled through the use of suitable mitigation measures implemented through the provision of a dust management plan which would be agreed with LBC prior to the start of construction.

Consideration has been given to air quality within the design of the building to ensure that potential operational impacts will be minimised as far as is practicable.

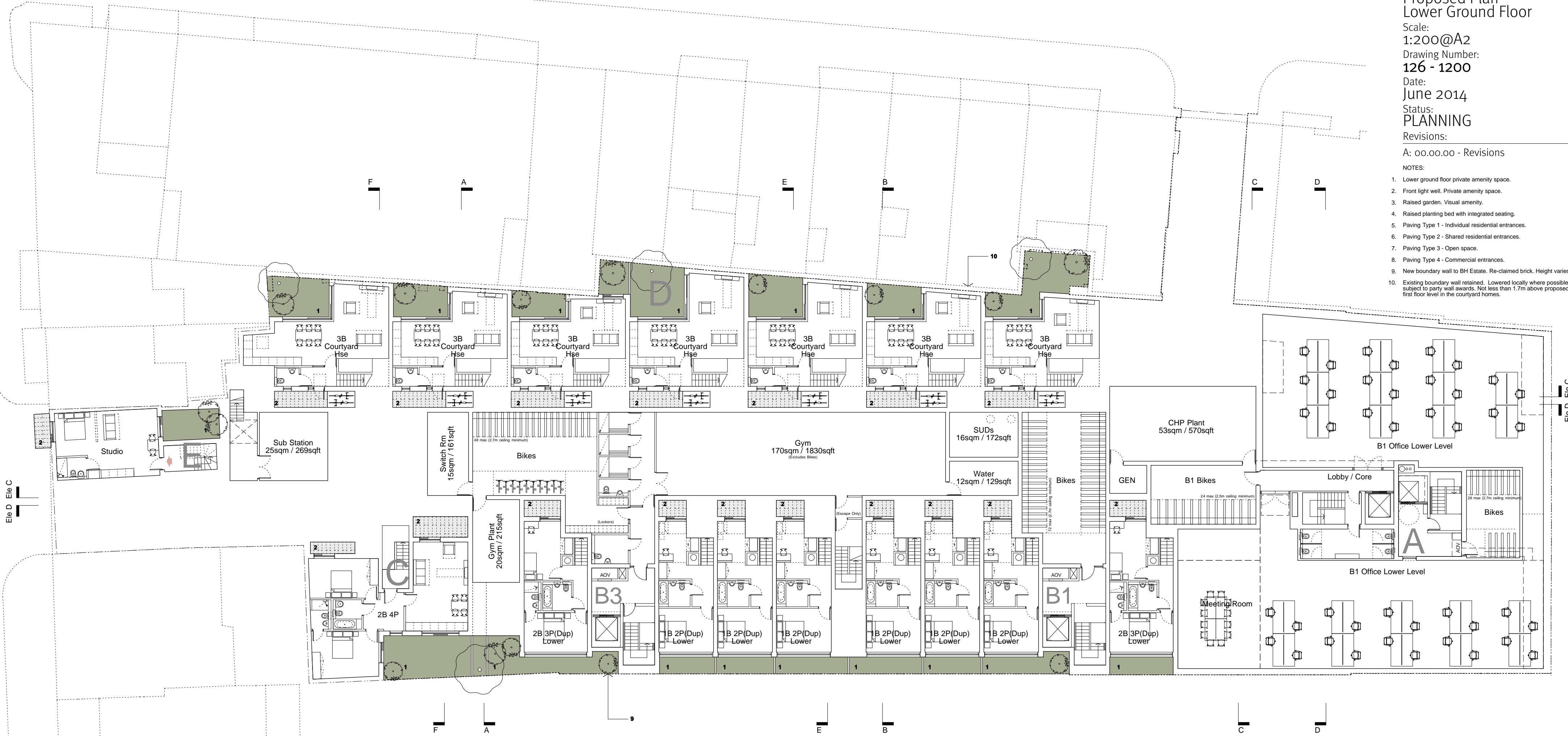
LBC planning policy requires that the residential elements of the development meets the Code for Sustainable Homes level 4 for the new units and BREEAM New Construction Very Good for the commercial office space. To meet these criteria the development will include low NO_x boilers and a CHP. Exhaust emissions from the CHP will be emitted from the tallest element of the development, from a stack 1 m above the adjacent roof level. A screening assessment has indicated that emissions from the CHP will have a negligible impact on air quality at the nearest location of relevant exposure, which is considered to be the balcony for the residential apartment on the seventh floor.

Additional mitigation measures have been built into the design of the development to further reduce the exposure of future residents to poor air quality. In particular each residential unit will be provided with a mechanical ventilation system which will draw air from the roof top of the development.

Annex A: Plans

Project:
277a Grays Inn Road
Drawing:
Proposed Plan
Lower Ground Floor
Scale:
1:200@A2
Drawing Number:
126 - 1200
Date:
June 2014
Status:
PLANNING
Revisions:

- A: 00.00.00 - Revisions
- NOTES:
1. Lower ground floor private amenity space.
 2. Front light well. Private amenity space.
 3. Raised garden. Visual amenity.
 4. Raised planting bed with integrated seating.
 5. Paving Type 1 - Individual residential entrances.
 6. Paving Type 2 - Shared residential entrances.
 7. Paving Type 3 - Open space.
 8. Paving Type 4 - Commercial entrances.
 9. New boundary wall to BH Estate. Re-claimed brick. Height varies.
 10. Existing boundary wall retained. Lowered locally where possible subject to party wall awards. Not less than 1.7m above proposed first floor level in the courtyard homes.



Project:
277a Grays Inn Road
Drawing:
Proposed Plan
Ground Floor
Scale:
1:200@A2
Drawing Number:
126 - 1201
Date:
June 2014
Status:
PLANNING
Revisions:
A: 00.00.00 - Revisions

- NOTES:
3. Raised garden. Visual amenity.
 4. Raised planting bed with integrated seating.
 5. Paving Type 1 - Individual residential entrances.
 6. Paving Type 2 - Shared residential entrances.
 7. Paving Type 3 - Open space.
 8. Paving Type 4 - Commercial entrances.
 9. New boundary wall to BH Estate. Re-claimed brick. Height varies.
 10. Existing boundary wall retained. Lowered locally where possible subject to party wall awards. Not less than 1.7m above proposed first floor level in the courtyard homes.
 11. Terrace.
 12. Balcony.
 13. Green Roof - Bio diverse & Sedum





Project:
277a Grays Inn Road
Drawing:
Proposed Plan
Second Floor
Scale:
1:200@A2
Drawing Number:
126 - 1203
Date:
June 2014
Status:
PLANNING
Revisions:

A: 00.00.00 - Revisions

- NOTES:
3. Raised garden. Visual amenity.
 4. Raised planting bed with integrated seating.
 5. Paving Type 1 - Individual residential entrances.
 6. Paving Type 2 - Shared residential entrances.
 7. Paving Type 3 - Open space.
 8. Paving Type 4 - Commercial entrances.
 9. New boundary wall to BH Estate. Re-claimed brick. Height varies.
 10. Existing boundary wall retained. Lowered locally where possible subject to party wall awards. Not less than 1.7m above proposed first floor level in the courtyard homes.
 11. Terrace.
 12. Balcony.
 13. Green Roof - Bio diverse & Sedum

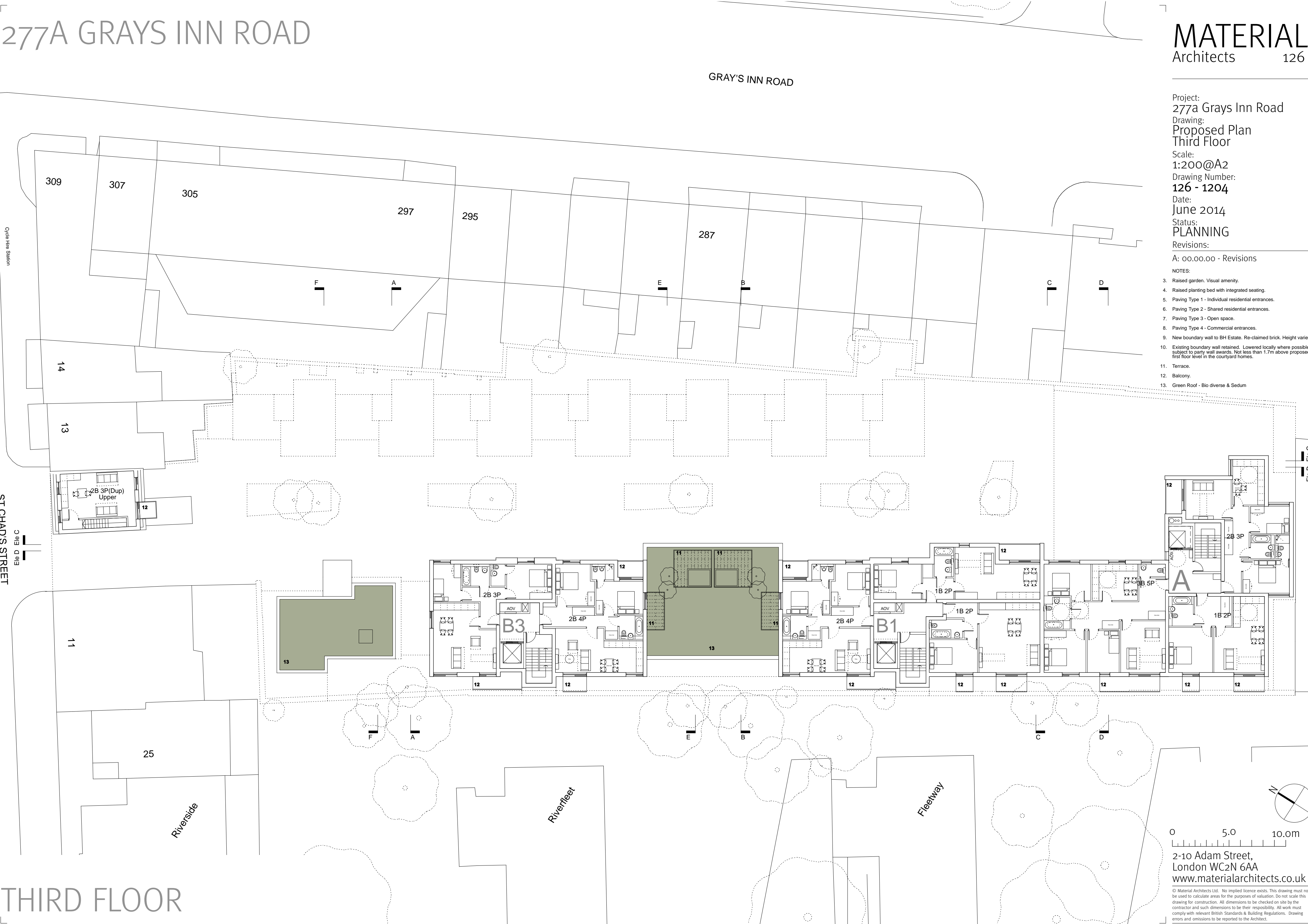


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Project:
277a Grays Inn Road
Drawing:
Proposed Plan
Third Floor
Scale:
1:200@A2
Drawing Number:
126 - 1204
Date:
June 2014
Status:
PLANNING
Revisions:
A: 00.00.00 - Revisions

- NOTES:
3. Raised garden. Visual amenity.
 4. Raised planting bed with integrated seating.
 5. Paving Type 1 - Individual residential entrances.
 6. Paving Type 2 - Shared residential entrances.
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 8. Paving Type 4 - Commercial entrances.
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 11. Terrace.
 12. Balcony.
 13. Green Roof - Bio diverse & Sedum



Project:
277a Grays Inn Road
Drawing:
Proposed Plan
Fifth Floor

Scale:
1:200@A2
Drawing Number:
126 - 1206

Date:
June 2014

Status:
PLANNING

Revisions:

A: 00.00.00 - Revisions

- NOTES:
3. Raised garden. Visual amenity.
 4. Raised planting bed with integrated seating.
 5. Paving Type 1 - Individual residential entrances.
 6. Paving Type 2 - Shared residential entrances.
 7. Paving Type 3 - Open space.
 8. Paving Type 4 - Commercial entrances.
 9. New boundary wall to BH Estate. Re-claimed brick. Height varies.
 10. Existing boundary wall retained. Lowered locally where possible subject to party wall awards. Not less than 1.7m above proposed first floor level in the courtyard homes.
 11. Terrace.
 12. Balcony.
 13. Green Roof - Bio diverse & Sedum



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Project:
277a Grays Inn Road

Drawing:
Proposed Plan
Sixth Floor

Scale:
1:200@A2

Drawing Number:
126 - 1207

Date:
June 2014

Status:
PLANNING

Revisions: _____

A: 00.00.00 - Revisions

NOTES:

- Raised garden. Visual amenity.
- Raised planting bed with integrated seating.
- Paving Type 1 - Individual residential entrances.
- Paving Type 2 - Shared residential entrances.
- Paving Type 3 - Open space.
- Paving Type 4 - Commercial entrances.
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- Existing boundary wall retained. Lowered locally where possible subject to party wall awards. Not less than 1.7m above proposed first floor level in the courtyard homes.
- Terrace.
- Balcony.
- Green Roof - Bio diverse & Sedum

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ST CHAD'S STREET

SIXTH FLOOR

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Project:
277a Grays Inn Road
Drawing:
Proposed Plan
Seventh Floor

Scale:
1:200@A2
Drawing Number:
126 - 1208

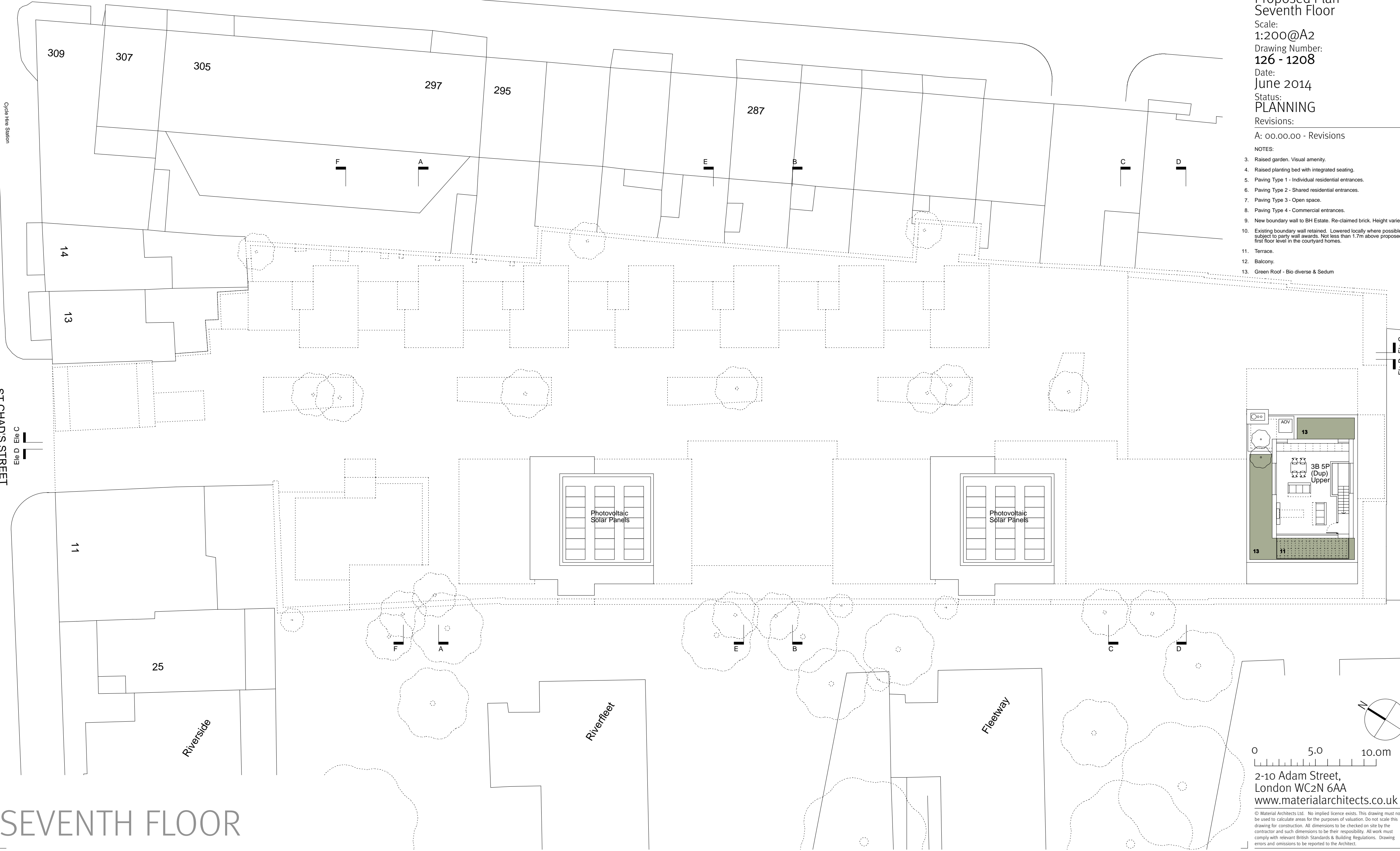
Date:
June 2014

Status:
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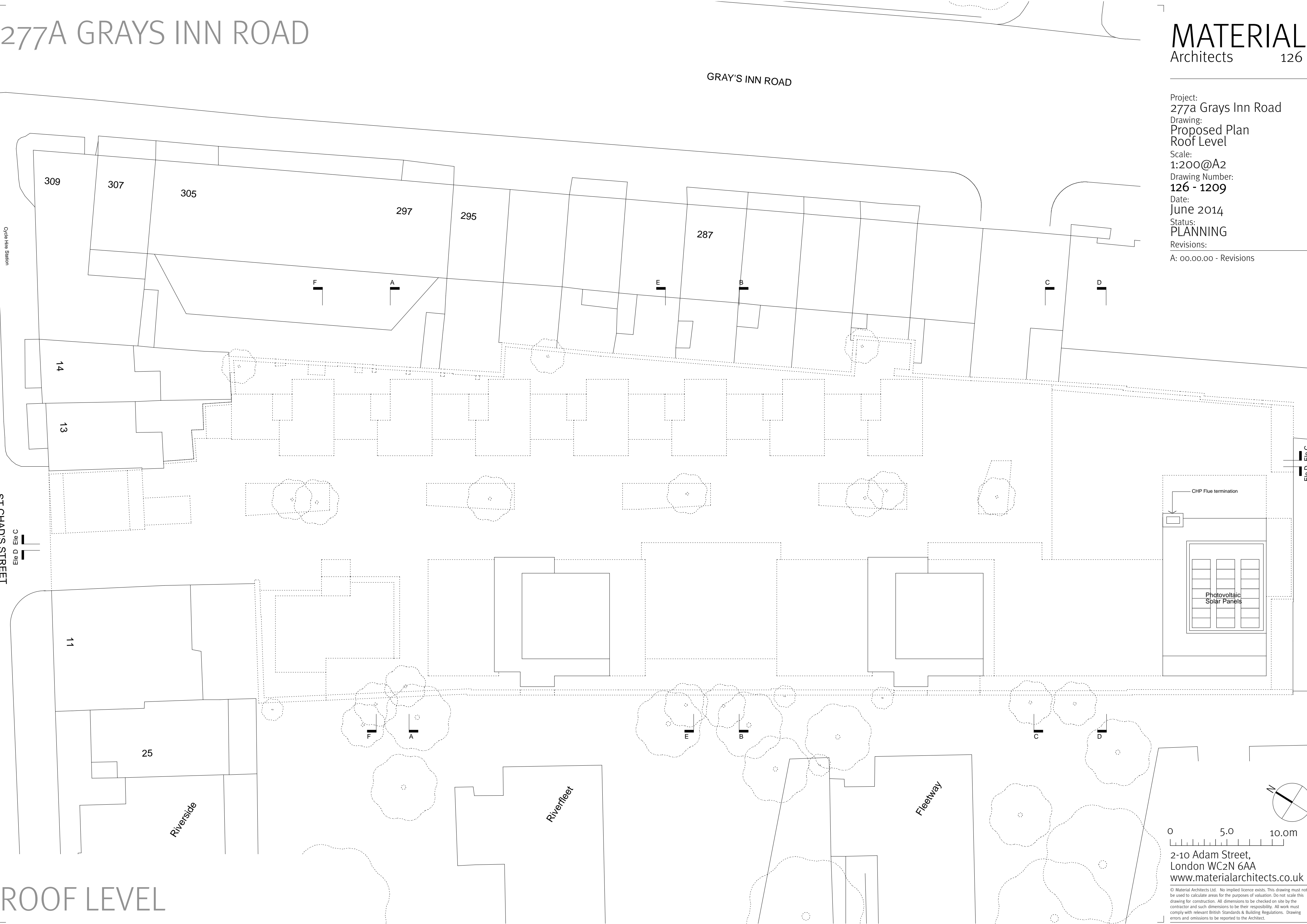
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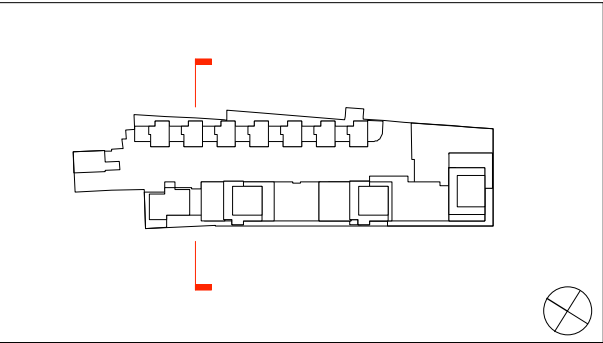
A: 00.00.00 - Revisions

- NOTES:
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 4. Raised planting bed with integrated seating.
 5. Paving Type 1 - Individual residential entrances.
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 11. Terrace.
 12. Balcony.
 13. Green Roof - Bio diverse & Sedum

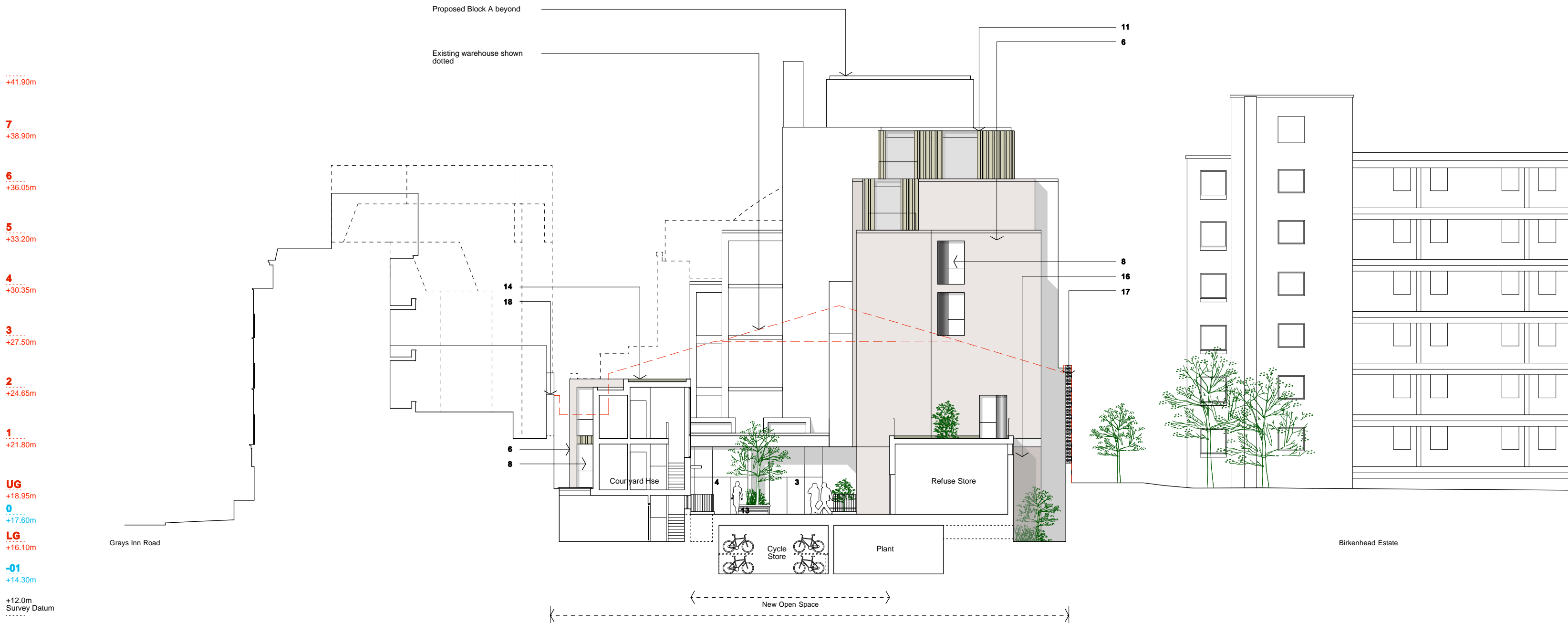


Project:
277a Grays Inn Road
Drawing:
Proposed Plan
Roof Level
Scale:
1:200@A2
Drawing Number:
126 - 1209
Date:
June 2014
Status:
PLANNING
Revisions:
A: 00.00.00 - Revisions





Project:
277a Grays Inn Road
Drawing:
Proposed
Section A
Scale:
1:200@A2
Drawing Number:
126 - 1301
Date:
June 2014
Status:
PLANNING
Revisions:
A: 00.00.00 - Revisions



- NOTES:
1. Residential Entrance - Individual dwelling.
 2. Residential Entrance - Communal
 3. B1 Entrance.
 4. Cafe / Gallery Entrance
 5. Proposed new facing brick TYPE 1. Stock brick in running bond with flush mortar joints generally. Standard size, colour and type to be agreed.
 6. Proposed new facing brick TYPE 2. Stock brick in running bond with flush mortar joints generally. Standard size, colour and type to be agreed.
 7. Re-used, reclaimed brick from the existing building.
 8. Anodised aluminium thermally broken double glazed windows and doors.
 9. Painted steel balcony / balustrade
 10. Glass balustrade.
 11. Anodised aluminium cladding.
 12. Refuse / Recycling store with anodized aluminium access doors.
 13. Raised planting beds.
 14. Bio-Diverse green roof.
 15. Concrete fascia.
 16. Re-used, reclaimed bricks at ground & lower ground floor.
 17. New boundary wall. Re-used bricks, reclaimed from the existing warehouse. Varying heights.
 18. Existing boundary warehouse wall, lowered locally where possible. Not lower than +23.5m (1.7m above proposed 1st floor level in the courtyard houses)



Mixed stock facing brick - contrasting tones.
Architect: PRP Architects



Deep brick reveals with aluminium windows & panels.
Architect: Hawkins/Brown



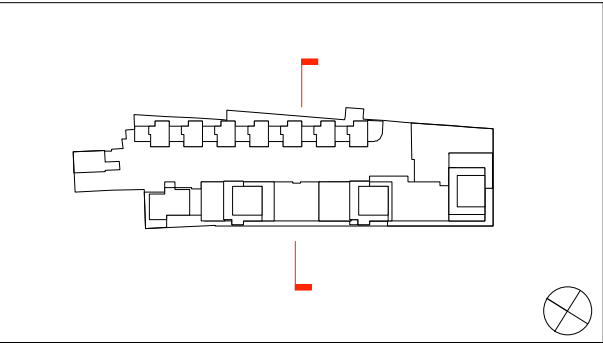
Varying reveals to articulate forms and massing.
Architect: Panter Hudspith



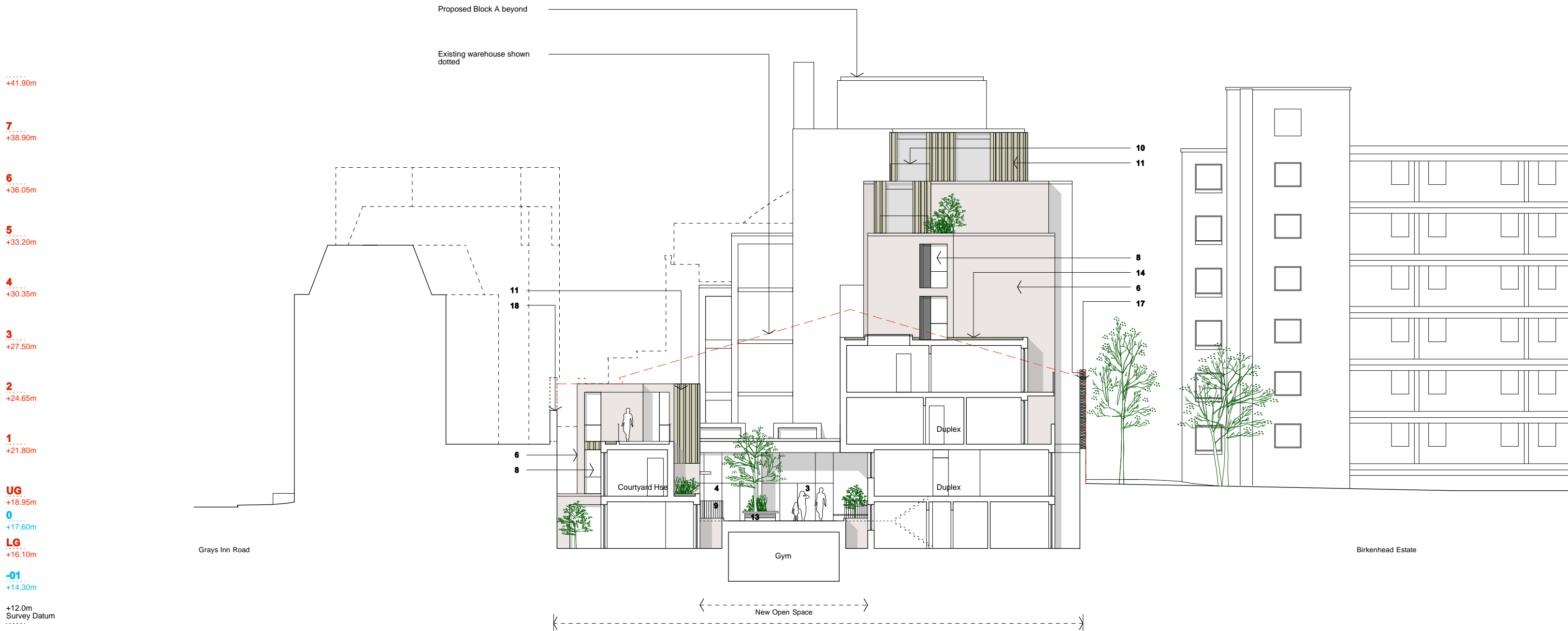
Stepping & recessed massing
Architect: Allies and Morrison



Lightweight, complementary upper storeys.
Architect: Duggan Morris



Project:
277a Grays Inn Road
Drawing:
Proposed
Section B
Scale:
1:200@A2
Drawing Number:
126 - 1302
Date:
June 2014
Status:
PLANNING
Revisions:
A: 00.00.00 - Revisions



Mixed stock facing brick - contrasting tones.
Architect: Trevor Horne



Deep brick reveals with aluminium windows & panels.
Architect: Hawkins/Brown



Varying reveals to articulate forms and massing.
Architect: Panter Hudspith

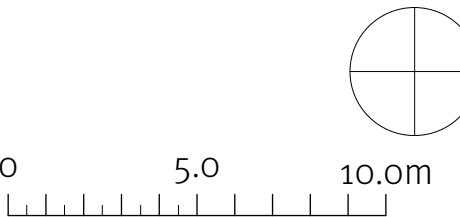


Stepping & recessed massing
Architect: Allies and Morrison



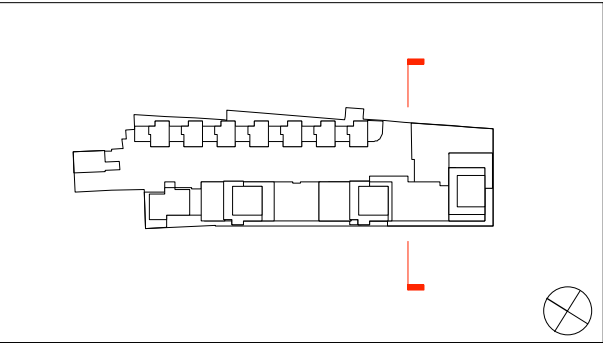
Lightweight, complementary upper storeys.
Architect: Duggan Morris

- NOTES:
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 13. Raised planting beds.
 14. Bio-Diverse green roof.
 15. Concrete fascia.
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 18. Existing boundary warehouse wall, lower locally where possible. Not lower than +23.5m (1.7m above proposed 1st floor level)
 19. Rear lower ground courtyard (private)

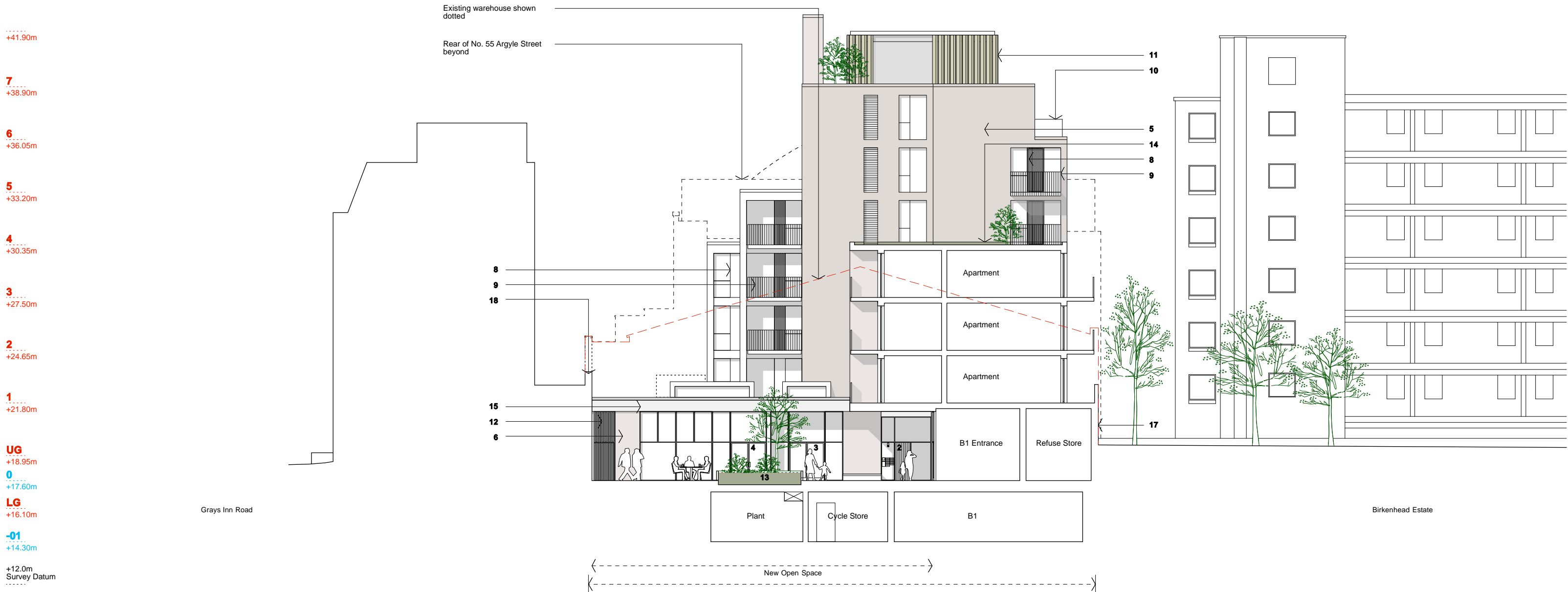


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Project:
277a Grays Inn Road
Drawing:
Proposed
Section C
Scale:
1:200@A2
Drawing Number:
126 - 1303
Date:
June 2014
Status:
PLANNING
Revisions:
A: 00.00.00 - Revisions



Planting and seating to external open space



Glazed shopfront to cafe / gallery

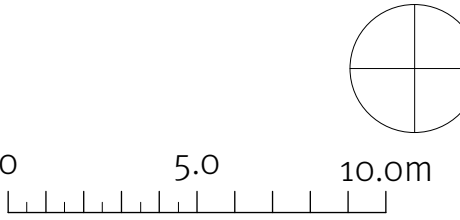


Varying reveals to articulate forms and massing.
Architect: Panter Hudspith



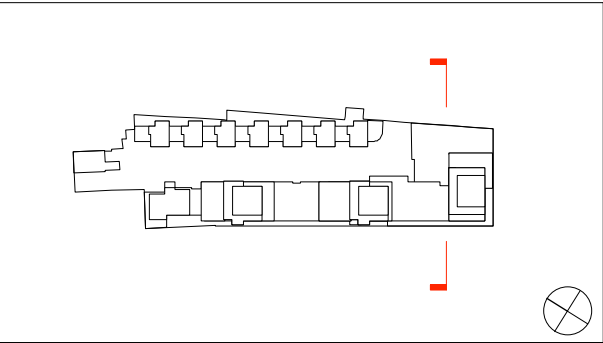
Stepping & recessed massing
Architect: Allies and Morrison

- NOTES:
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 19. Rear lower ground courtyard (private)



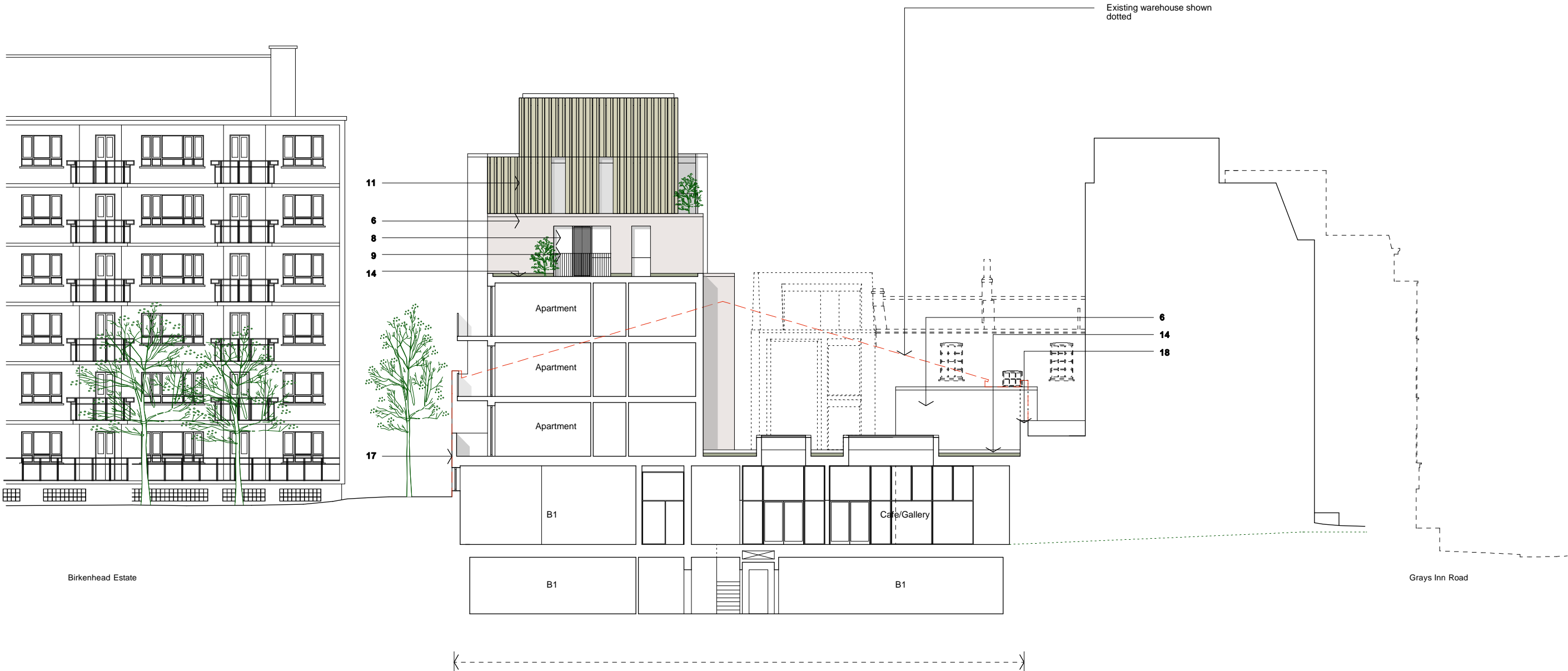
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Project:
277a Grays Inn Road
Drawing:
Proposed
Section D
Scale:
1:200@A2
Drawing Number:
126 - 1304
Date:
June 2014
Status:
PLANNING
Revisions:
A: 00.00.00 - Revisions

7
+38.90m
6
+36.05m
5
+33.20m
4
+30.35m
3
+27.50m
2
+24.65m
1
+21.80m
UG
+18.95m
0
+17.60m
LG
+16.10m
-01
+14.30m
+12.0m
Survey Datum



- NOTES:
1. Residential Entrance - Individual dwelling.
 2. Residential Entrance - Communal
 3. B1 Entrance.
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 19. Rear lower ground courtyard (private)



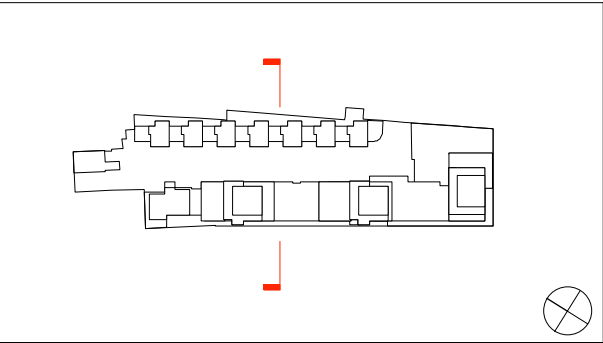
Private gardens to rear of ground floor dwellings.
Architect: FCB Studios



Green roofs provide visual amenity to both neighbouring and new occupants.
Architect: HawkinsBrown

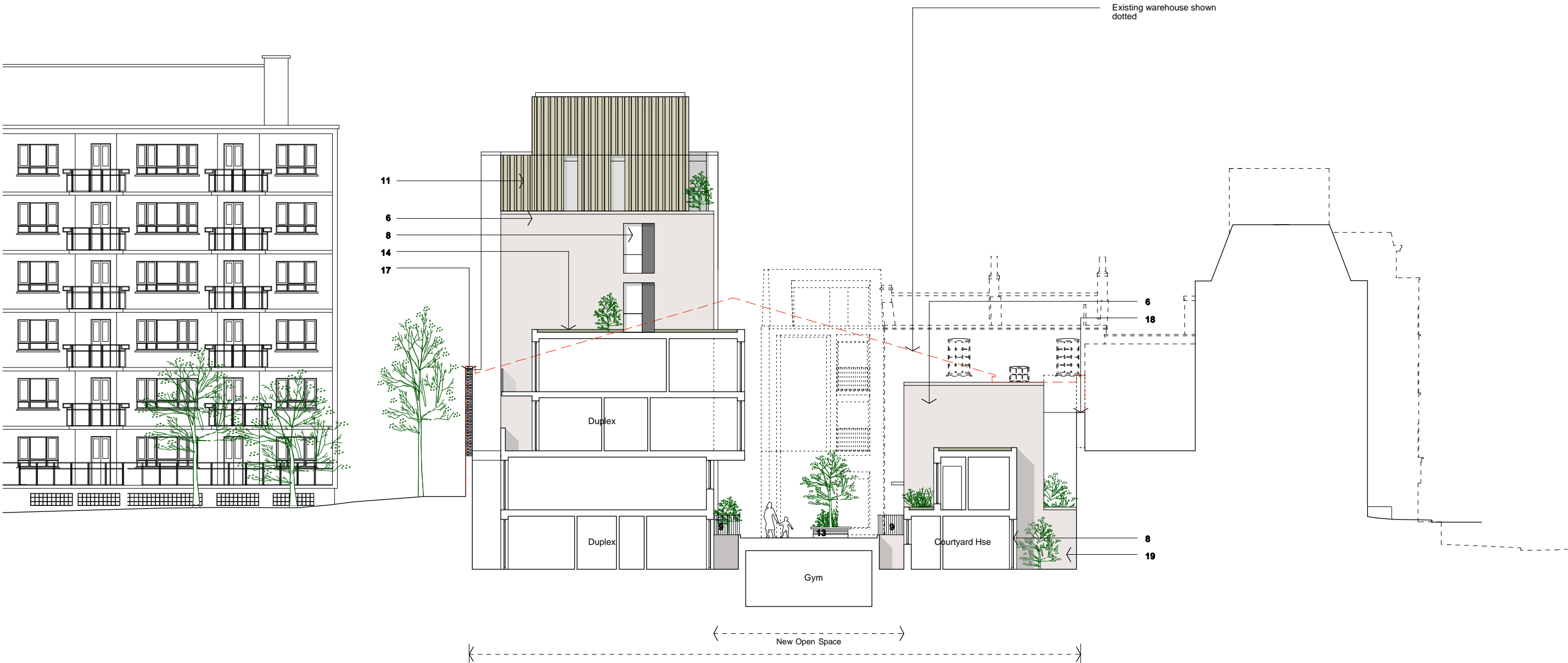


Lightweight, complementary upper storeys.
Architect: Duggan Morris



Project:
277a Grays Inn Road
Drawing:
Proposed
Section E
Scale:
1:200@A2
Drawing Number:
126 - 1305
Date:
June 2014
Status:
PLANNING
Revisions:
A: 00.00.00 - Revisions

7
+38.90m
6
+36.05m
5
+33.20m
4
+30.35m
3
+27.50m
2
+24.65m
1
+21.80m
UG
+18.95m
0
+17.60m
LG
+16.10m
-01
+14.30m
+12.0m
Survey Datum



- NOTES:
1. Residential Entrance - Individual dwelling.
 2. Residential Entrance - Communal
 3. B1 Entrance.
 4. Cafe / Gallery Entrance
 5. Proposed new facing brick TYPE 1. Stock brick in running bond with flush mortar joints generally. Standard size, colour and type to be agreed.
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 9. Painted steel balcony / balustrade
 10. Glass balustrade.
 11. Anodised aluminium cladding.
 12. Refuse / Recycling store with anodised aluminium access doors.
 13. Raised planting beds.
 14. Bio-Diverse green roof.
 15. Concrete fascia.
 16. Re-used, reclaimed bricks at ground & lower ground floor.
 17. New boundary wall. Re-used bricks, reclaimed from the existing warehouse. Varying heights.
 18. Existing boundary warehouse wall, lower locally where possible. Not lower than +23.5m (1.7m above proposed 1st floor level)
 19. Rear lower ground courtyard (private)



Projecting balconies - Flat steel section balustrades.
Architect: Tony Fretton



Green roofs provide visual amenity to both neighbouring and new occupants.
Architect: HawkinsBrown

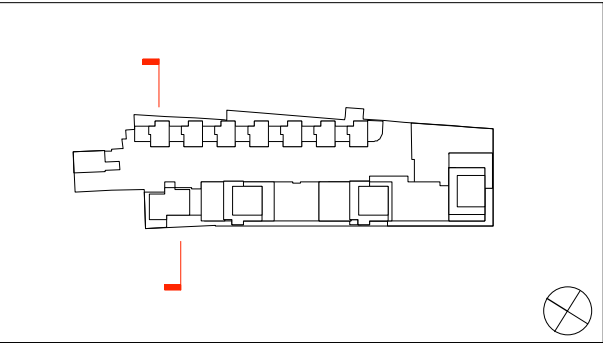


Lightweight, complementary upper storeys.
Architect: Duggan Morris



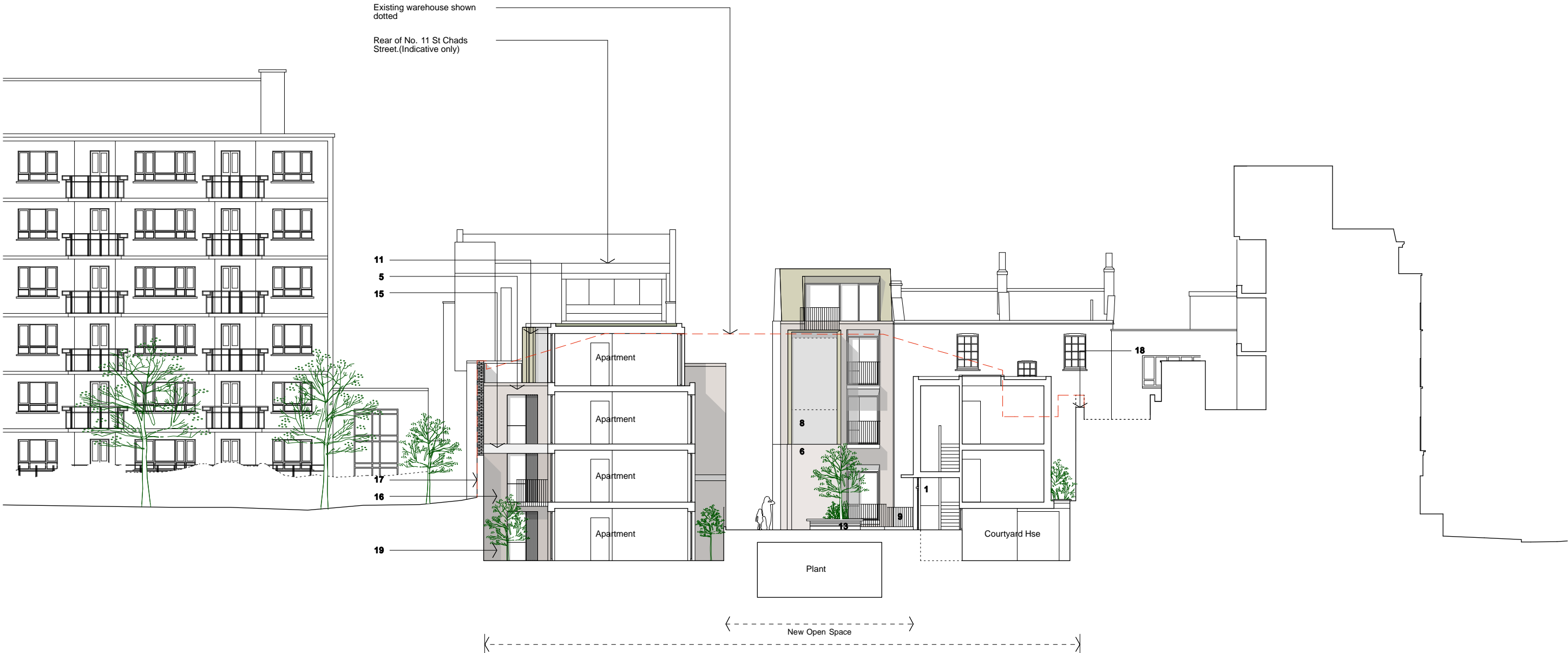
Subservient mass to the rear of an existing terrace.
Architect: Peter Barber





Project:
277a Grays Inn Road
Drawing:
Proposed
Section F
Scale:
1:200@A2
Drawing Number:
126 - 1306
Date:
June 2014
Status:
PLANNING
Revisions:
A: 00.00.00 - Revisions

7
+38.90m
6
+36.05m
5
+33.20m
4
+30.35m
3
+27.50m
2
+24.65m
1
+21.80m
UG
+18.95m
0
+17.60m
LG
+16.10m
-01
+14.30m
+12.0m
Survey Datum



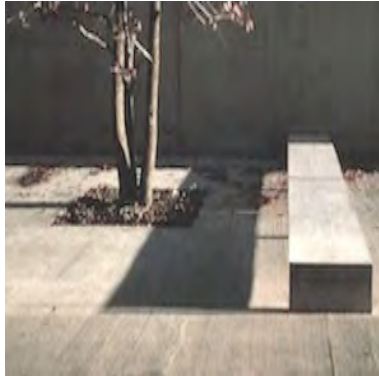
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 19. Rear lower ground courtyard (private)



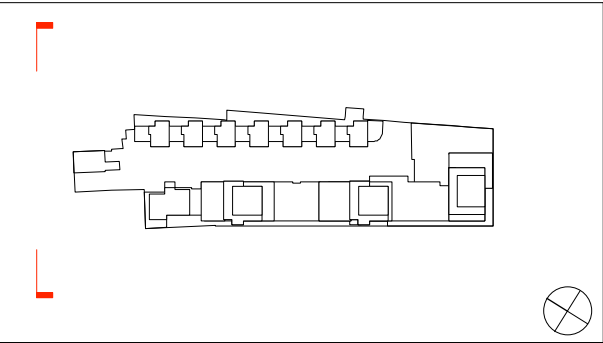
Projecting balconies - Flat steel section balustrades.
Architect: Tony Fretton



Private gardens to rear of ground floor dwellings.
Architect: FCB Studios



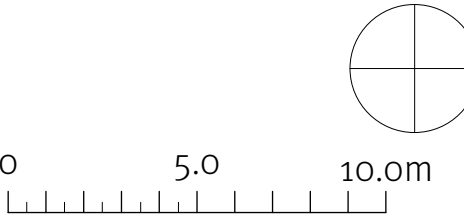
Planting and seating to external open space



+41.90m
7
+38.90m
6
+36.05m
5
+33.20m
4
+30.35m
3
+27.50m
2
+24.65m
1
+21.80m
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0
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-01
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+12.0m
Survey Datum

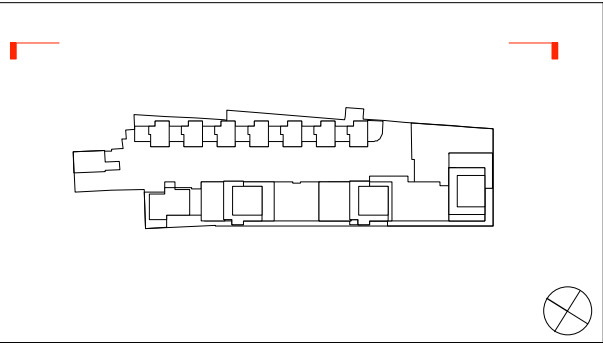


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 12. Refuse / Recycling store with anodized aluminium access doors.
 13. Raised planting beds.
 14. Bio-Diverse green roof.
 15. Concrete fascia.
 16. Re-used, reclaimed bricks at ground & lower ground floor.



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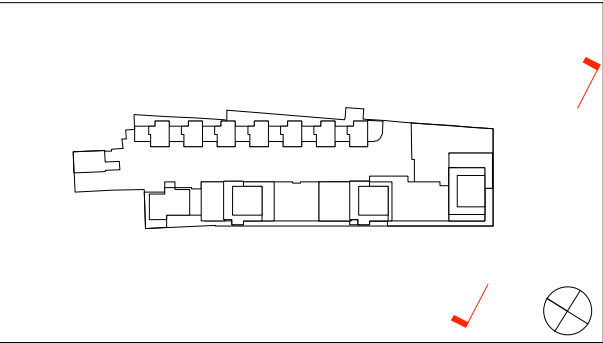
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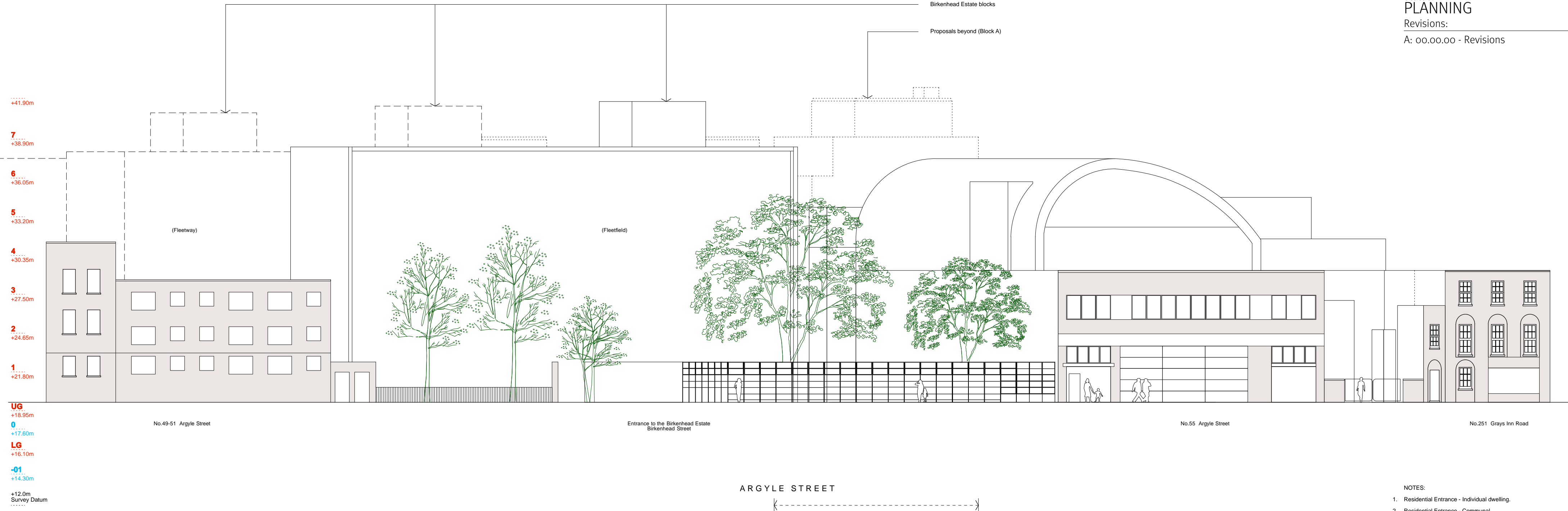
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277a Grays Inn Road
Drawing:
Proposed
East Elevation
Scale:
1:200@A2
Drawing Number:
126 - 1402
Date:
June 2014
Status:
PLANNING
Revisions:
A: 00.00.00 - Revisions



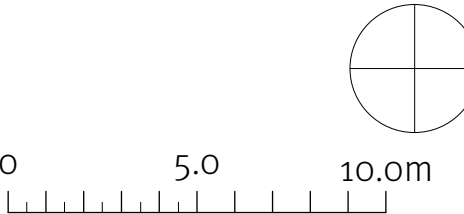
- NOTES:
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 10. Glass balustrade.
 11. Anodised aluminium cladding.
 12. Refuse / Recycling store with anodized aluminium access doors.
 13. Raised planting beds.



Project:
277a Grays Inn Road
Drawing:
Proposed
South Elevation
Scale:
1:200@A2
Drawing Number:
126 - 1403
Date:
June 2014
Status:
PLANNING
Revisions:
A: 00.00.00 - Revisions

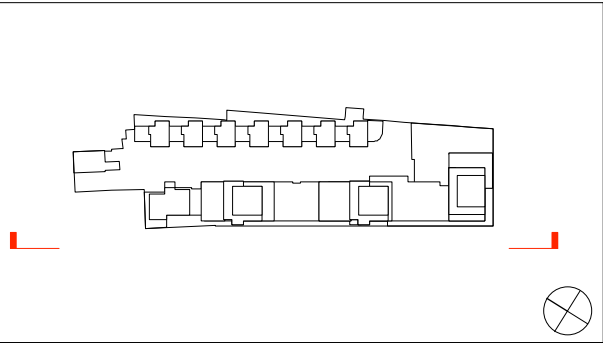


- NOTES:
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 4. Cafe / Gallery Entrance
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 10. Glass balustrade.
 11. Anodised aluminium cladding.
 12. Refuse / Recycling store with anodized aluminium access doors.
 13. Raised planting beds.

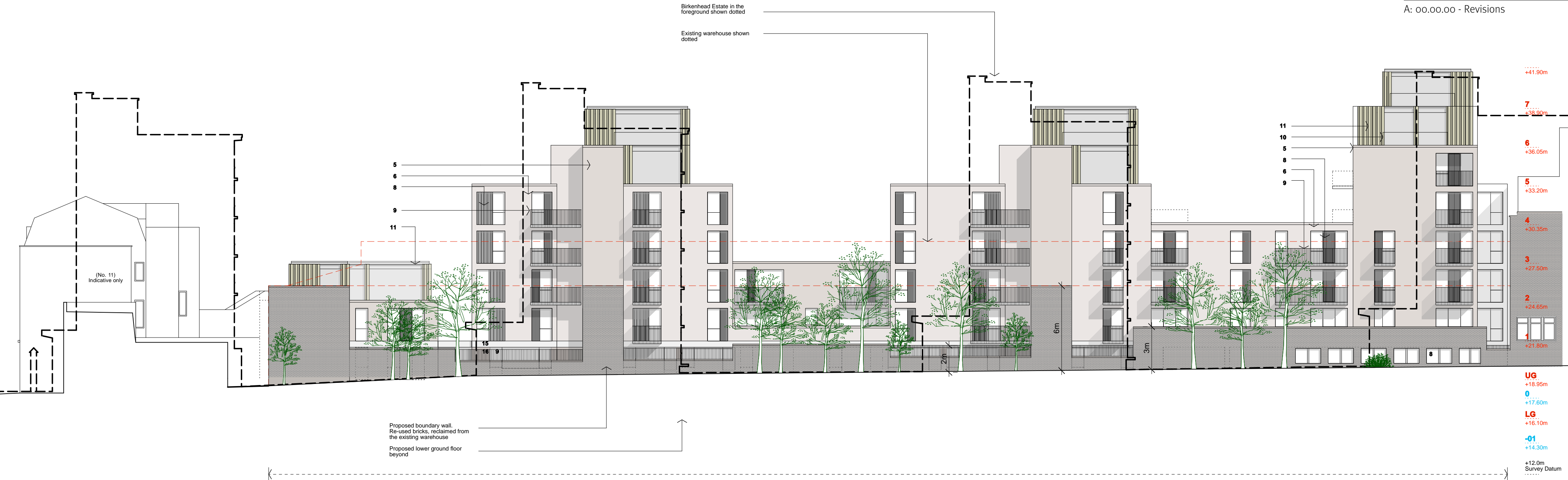


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Project:
277a Grays Inn Road
Drawing:
Proposed
West Elevation
Scale:
1:200@A2
Drawing Number:
126 - 1404
Date:
June 2014
Status:
PLANNING
Revisions:
A: 00.00.00 - Revisions



Windows and balconies with integral screening.
Architect: Allies & Morrison



Varying reveals to articulate forms and massing.
Architect: Panter Hudspith



Upper storey flats glazed to the north and south with private terraces.



Lightweight, complementary upper storeys.
Architect: Duggan Morris

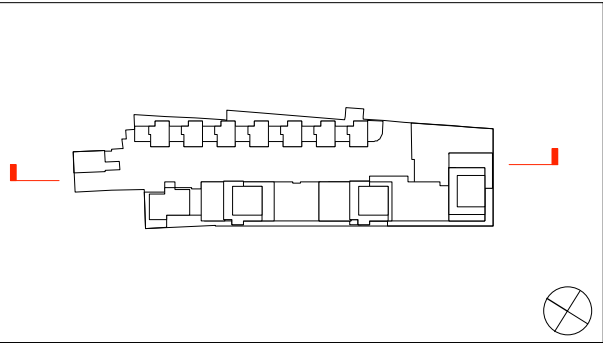


Projecting balconies - Flat steel section balustrades.
Architect: Tony Fretton

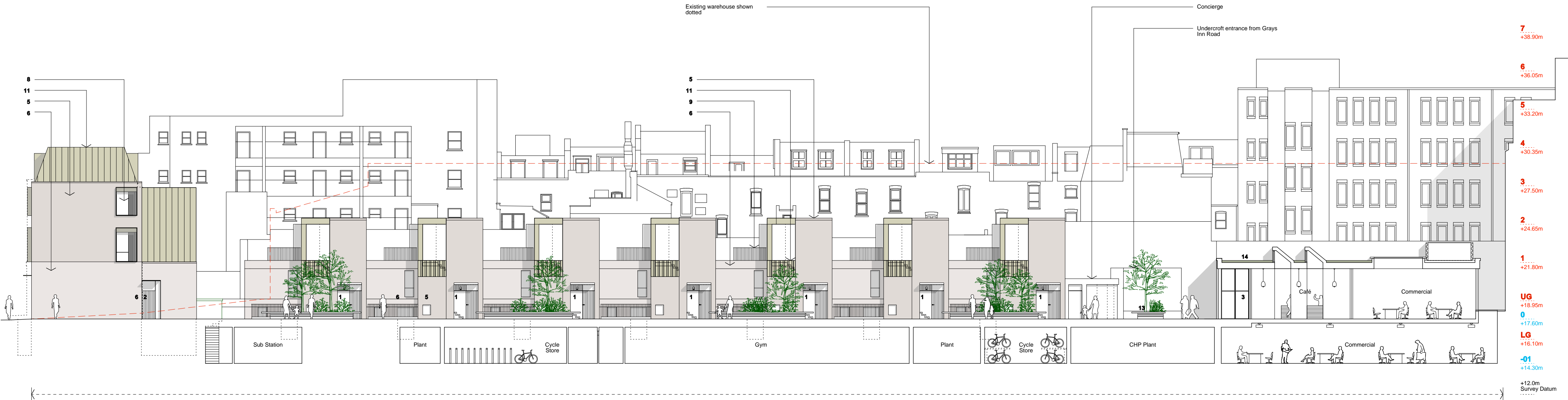


NOTES:

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11. Anodised aluminium cladding.
12. Refuse / Recycling store with anodised aluminium access doors.
13. Raised planting beds.
14. Bio-Diverse green roof.
15. Concrete fascia.
16. Re-used, reclaimed bricks at ground & lower ground floor.



Project:
277a Grays Inn Road
Drawing:
Proposed
Elevation C
Scale:
1:200@A2
Drawing Number:
126 - 1405
Date:
June 2014
Status:
PLANNING
Revisions:
A: 00.00.00 - Revisions



Contemporary terrace/courtyard housing.
Architect: FCB Studios



Private rear amenity space.
Architect: FCB Studio



Subservient mass to the rear of an existing terrace.
Architect: Peter Barber

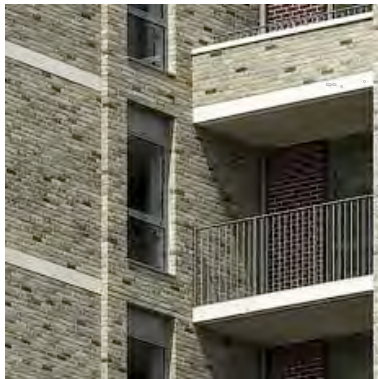
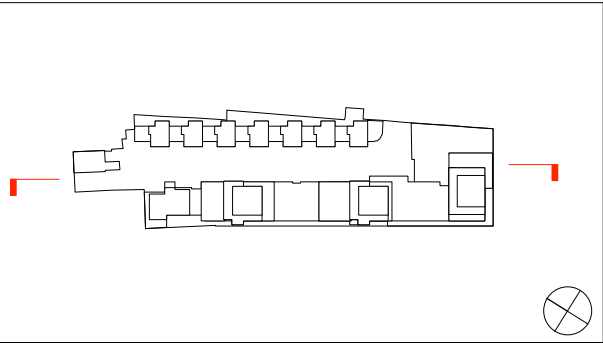


Large high level windows to maximise
daylight penetration.
Architect: Peter Barber

NOTES:

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11. Anodised aluminium cladding.
12. Refuse / Recycling store with anodised aluminium access doors.
13. Raised planting beds.
14. Bio-Diverse green roof.

Project:
277a Grays Inn Road
Drawing:
Proposed
Elevation D
Scale:
1:200@A2
Drawing Number:
126 - 1406
Date:
June 2014
Status:
PLANNING
Revisions:
A: 00.00.00 - Revisions



Mixed stock facing brick - contrasting tones.
Architect: PRP Architects



Deep brick reveals with aluminium windows & panels.
Architect: Hawkins/Brown



Varying reveals to articulate forms and massing.
Architect: Panter Hudspeth



Stepping & recessed massing
Architect: Allies & Morrison



Lightweight, complementary upper storeys.
Architect: Duggan Morris

NOTES:

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13. Raised planting beds.
14. Bio-Diverse green roof.

Annex B: CHP Assessment

You can record details of your CHP Here:

277 Gray's Inn Road

Additional comments:

This tool is in 4 Sections. Please complete each section as required by entering information in the yellow cells.

Yellow cells will appear as you make your selections.

If you wish to change your selections part way through, it is recommended you clear the contents from yellow cells manually as only yellow cells are used in the calculations.

You can also click the Clear AQ Tool Button on the right (you must have macros enabled - see Info on Macros)

CHP AQ Tool v1.3

Info on Macros:

This tool used Macros to clear cells but they are not required for calculations. Macros may have been automatically disabled and will need to be enabled to use the Clear buttons. Please contact your IT department or use the Help functions.

Your Notes:

Section 1

Help Column

Select CHP Technology	Gas Engine	Select Type of CHP from Drop Down Menu. Gas Engine is same as Internal Combustion Engine
Select Engine Type	Spark Ignition	
Select Fuel Type	Natural Gas	
Select to specify ELV or use assumptions based on Power Output Range of Gas Engine CHP (kWe)	Using installation specific data or have an ELV	Select from Drop down list. If compliance with an ELV can be guaranteed, inputting the ELV will ensure the most reliable result. If no ELV is available, impact will be estimated based on the review of UK CHP emissions
	Please go to Section 2	

Section 2

For users wishing to input installation specific information on Exhaust flow-rate and/or NOx in-stack concentrations.

Please complete the yellow cells as they appear based on your choices.

Enter the Power Output of your CHP (kWe)	9	Enter a number from 1 to 20000 kWe (20MWe)
Please select which data you wish to provide	ELV (Actual or Ref conditions)	Select from Drop Down List. Choose emission factor, tonnes/year, or Emission Limit Value
How is the concentration expressed?	Concentration (mg/Nm3) @ Ref Conditions - Dry	Ref conditions assumed as 273K, 101.3KPa, 11% O2, Dry
Enter Concentration at Ref (Nmg/m3)	100	
How is the flow rate expressed? You can use tool defaults if you don't know the flow rate.	Flow rate unknown - use default assumptions	Ref conditions assumed as STP (273K, 101.3KPa), 11% O2, Dry Gas
	0.0	
This default exhaust flow-rate (as a function of KWe) is estimated from a review of the prevalent Internal	0.0	This parameter is needed to calculate the installation-specific NOx emission rate, if you have installation-specific NOx in-
	110.0	
Summary of Installation Specific Flow Rate and Concentration:		
Flow Rate (m3/sec)	0.01	
NOx Emission Concentration (mg/m3)	69.5	

Section 3: Determination of Emissions factors and Emissions based on Section 1 or 2

You can record details of your CHP Here:

277 Gray's Inn Road

Additional comments:

CHP AQ Tool v1.3

Your Notes:

Based on sections 1 or 2, the following are calculated for the CHP

NOx Emission Factor (grams/kWh)	Installation specific data selected	
NOx Emission Rate (grams/second/kWe Output)	Installation specific data selected	
NOx Emission Rate (g/sec)	0.00	Based on the installation specific information provided in Section 2.
Annual Emissions NOx (tonnes/year)	0.02	Based on the installation specific information provided in Section 2.
Please go to Section 4 Air Quality Impacts Calculator.		

Section 4: Air Quality Impacts Calculator

This calculator is based on LAQM.TG(09) Industrial Nomograms for NO₂. The CHP screening tool calculates only with the annual mean NO₂ impact, and is based on the relevant nomograms for industrial sources in LAQM.TG(09) – Figures 5.2 and 5.3 - which in turn are based on ADMS2 dispersion modelling runs for both tall stacks and near-ground level releases (i.e. when a nearby building renders the effective stack height as less than 10 m). The result of the Excel-based spreadsheet is the maximum, annual mean ground level NO₂ concentration; therefore, re-iterative runs of the tool would be necessary to derive a minimum permissible stack height to achieve a given ground level NO₂ concentration.

Please complete the yellow cells as they appear based on your choices.

If you wish to change your selections part way through, it is recommended you clear the contents from yellow cells manually as only yellow cells are used in the calculations. You can also click the Clear Impacts tool on the right. (you must have macros enabled - see Note: Info on Macros)

Enter Stack Height (m)	23.5	If your stack height is more than 10m you may enter building information below. If your stack height is <10m (i.e. Ground Level/Fugitive) then building height is not applicable.
Enter Building Height (m). This the height of the dominant large building near the stack. It can be the building on which the stack sits.	22.5	Enter height of the tallest building within 5 stack heights of the stack. If no building then leave blank or enter 0.
Enter Stack Diameter (m)	0.5	Enter Stack Diameter between 0.5m and 11.9m. Leaving blank assumes a short stack/fugitive source.

Calculated Effective Stack Height (m). This method for calculating the effective stack height is consistent with that as set out in LAQM.TG(09)	1.66	
---	------	--

A short stack/ground level source will be assumed by impacts calculator.

The effective stack height is less than 10m, a low stack height will be assumed. Therefore you need to enter the distance to the nearest receptor (m)	11	Enter the distance to nearest receptor between 1 and 200m
---	----	---

Results

CHP Tonnes NOx per Annum (based on Sections 1,2 or 3)	0.02	The tool includes all the assumptions/limitations inherent in LAQM.TG(09) i.e. a 10 – 25 m/s efflux velocity
Estimated Maximum Annual Mean NO ₂ Contribution from CHP (ug/m ³), or Contribution from CHP at nearest receptor (ug/m ³) for short stacks	0.40	The CHP screening tool does not take account of background NO ₂ level; it calculates only the contribution of the stack to the maximum NO ₂ annual mean concentration at the worst-case location. This locations will be different for varying stack heights and diameters.

The result from this tool is conservative, and errs on the side of caution. Only ground level impacts are considered. It is likely that the application of a detailed dispersion model using installation-specific values for exit velocity, volumetric flow-rate and flue gas temperature, and local meteorological data, would give a lower result.

