

5.16 Tree strategy - soil volumes

In coordination with Green Blue Urban, tree pit specialists, we have calculated the required soil volume for each tree, as illustrated on the adjacent table.

The Green Blue Urban, Soil Volume Guide v1.1 provides tree pit and soil volume guidance and gives the recommended volumes for species based on canopy size at 25 years.

Trees in connected pits and softscape areas can share soil volumes and therefore it is common practice to reduce soil volume by upto 20% in such instances. Further detail on extent of tree pits is provided on the enclosed technical drawings.

All topsoils must accord with BS 3882:2007 Specification for topsoil

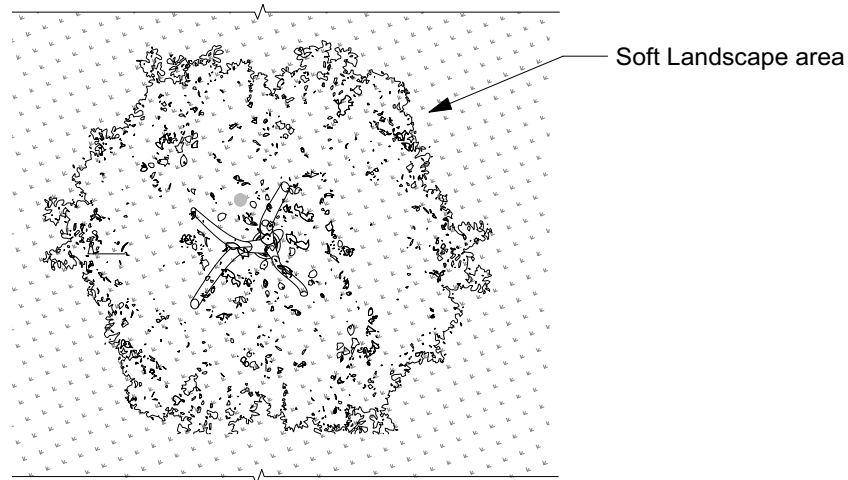
All subsoils must accord with BS 8601:2013 Specification for subsoil

| | Botanical name | Required Soil Volume (cubic volume) |
|---|--------------------------------|-------------------------------------|
|  | Pinus sylvestris | 30 m ³ |
|  | Salix alba* | 47.1 m ³ |
|  | Acer campestre | 23 m ³ |
|  | Pyrus calleryana 'Chanticleer' | 9 m ³ |
|  | Sorbus aucuparia | 7.5 m ³ |
|  | Betula pendula | 11 m ³ |
|  | Amelanchier | 6 m ³ |
|  | Amelanchier lamarckii | 5.4 m ³ |
|  | Corylus colurna | 18 m ³ |
|  | Ulmus 'Dodoens' | 47.1 m ³ |
|  | Alnus x spaethii | 30.2 m ³ |
|  | Acer platanoides 'Cleveland' | 17 m ³ |
|  | Malus sylvestris | 7.5 m ³ |
|  | Euonymous europaeus | n/a |
|  | Tilia Platyphyllos | 188.4 m ³ |
|  | Alnus glutinosa | 30.2 m ³ |

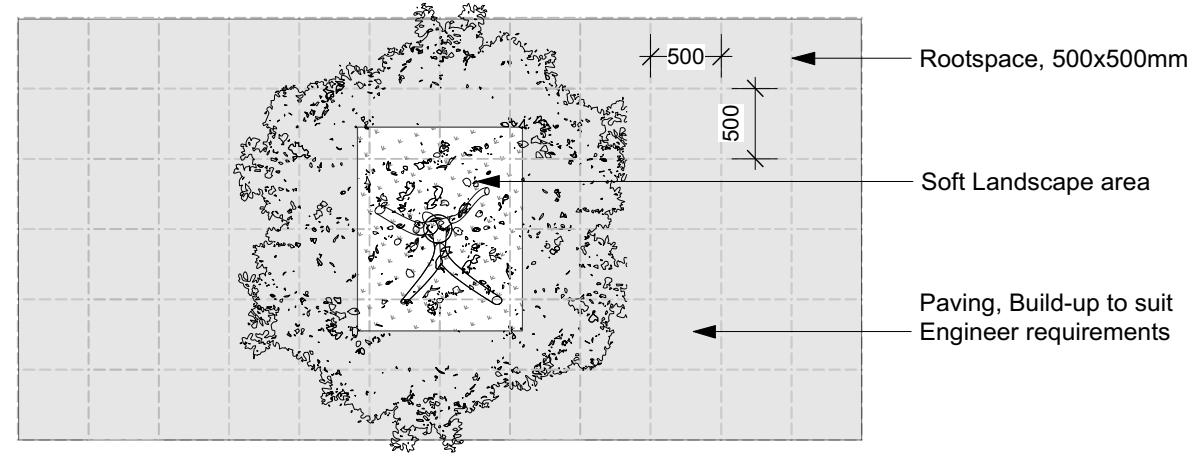
* Soil Volume Calculator provide by GreenBlue Urban, Soil Volume Guide v1.1

5.17 Tree Pit details

Tree pit in soft landscaping

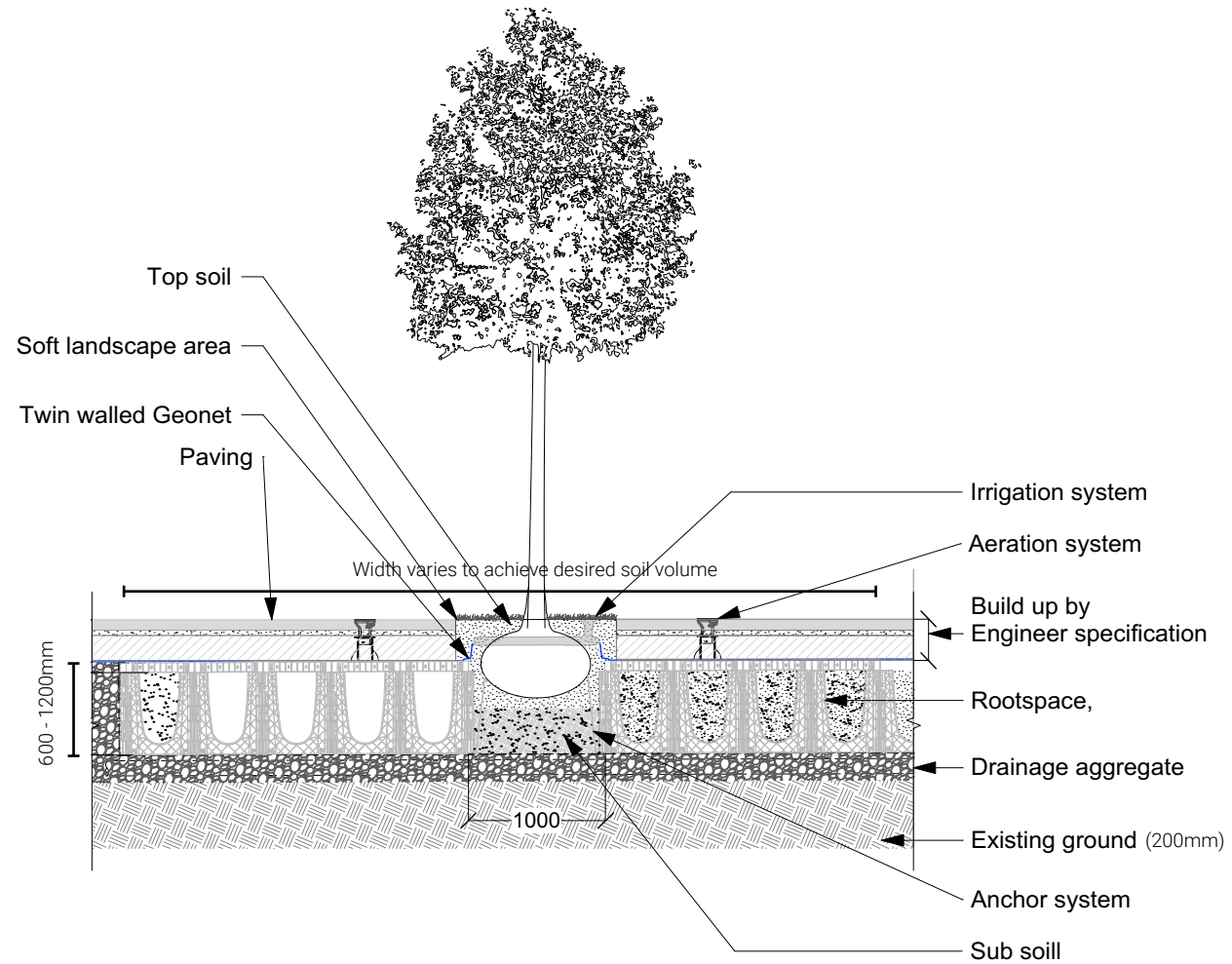
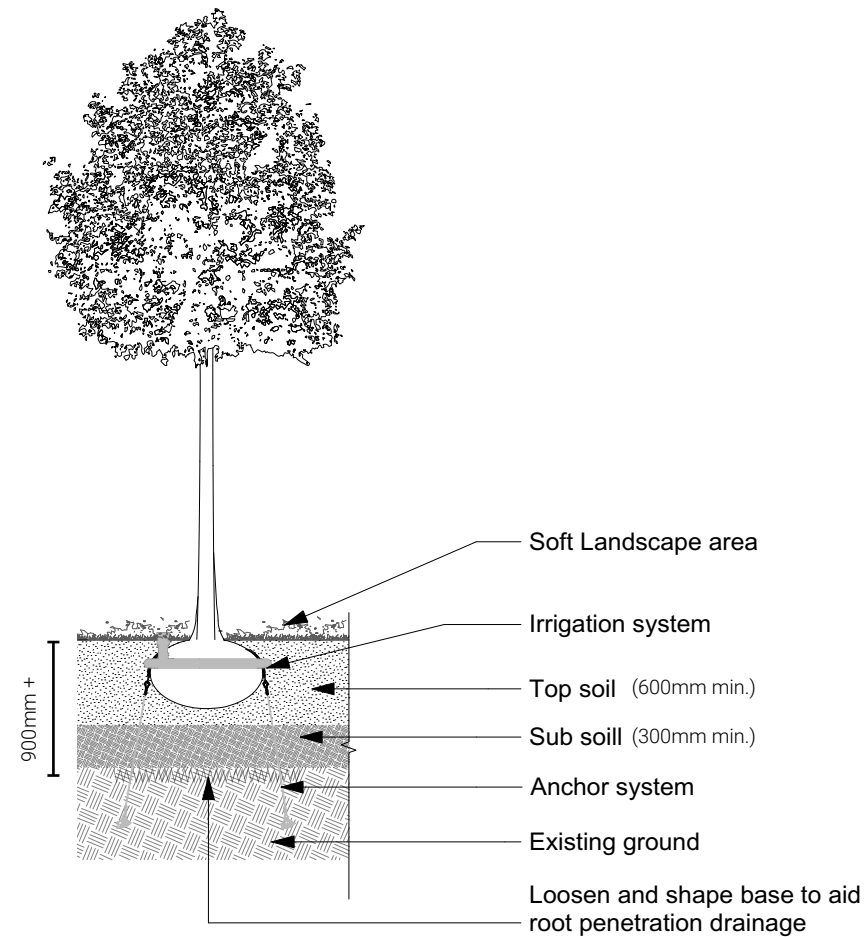


Tree pit in hard landscaping



Notes:

1. Width of rootspace system varies subject to required soil volumes for trees in pits and connected pits
2. Depth of soil volume and rootspace / cellular root grid can vary between 600 & 1200mm to achieve required soil volumes.
3. Refer to soil volume drawings to required soil volumes and extent of tree pit strategy.












5.18 Urban greening

In line with London Plan Policy G5 Urban Greening and with reference to the Urban Greening Factor for London, the proposal is required to achieve a target score of 0.4 for residential projects.

Via an integrated approach to green infrastructure, a number of 'green surface cover' typologies have been included that contribute to the Urban Greening score. They include new trees, hedgerows, soft planting beds, intensive and extensive green roofs, and permeable paving systems.

The scheme achieves a UGF score of 0.55 and is illustrated on the adjacent diagram.

Urban Greening schedule

| Key | Surface cover type | Area | Contribution |
|---|---|------|--------------|
|  | Semi-natural vegetation | 261 | 261 |
|  | Intensive green roof | 210 | 168 |
|  | Trees in connected pit | 2908 | 2325 |
|  | Standard trees planted in pits | 0 | 0 |
|  | Extensive green roof with 80mm min. substrate | 737 | 515.9 |
|  | Flower rich perennial planting | 243 | 170 |
|  | Hedges | 334 | 200 |
|  | Amenity grassland | 942 | 376 |
|  | Permeable paving | 4135 | 413 |
| Total | | | 4431 |
| Urban Greening Factor score | | | 0.4 |



Urban Greening Factor plan

5.19 Biodiversity

In conjunction with Richard Graves Associates, we have designed a plant palette which benefits the local wildlife by providing either a food source for insects or roost potential. Bird and bat boxes are proposed to be attached to larger mature trees.



Example of bat boxes



Example of bird boxes



Example of invertebrate hotel



Example of biodiverse plant palette

5.18.1 Biodiversity Green roofs

The green roof is located adjacent to the First Floor terrace and provides storm water management, a habitat for wildlife and contributes to lowering urban air temperature preventing the heat island effect.

Specification: A biodiverse instant green turf system as supplied by Wildflower Turf or similar approved. The roof turf is made up of 41 UK native wildflowers and grasses, with a minimum of 50% wildflowers.



Green roof diagram

5.18.3 Habitat creation

The diagram below illustrates the proposed locations for bird and bat boxes within the landscape and public realm. All bird / bat boxes located on the site should be coordinated between the architect and ecologist.



Habitat strategy diagram

Key
 Biodiverse green roofs

Key
 Bird boxes
 Bat boxes
 Hibernaculum / bug hotels

*For bird / bat boxes in proposed buildings refer to ecology and architect drawings / reports.

5.18.2 SuDs strategy

Permeable paving and surfaces can be seen in the SuDs strategy diagram below. Proposed is 0.22 ha of permeable surface across the ground floor. As part of the revised proposals, gardens have been increased in size, further increasing the permeable zone.



SuDs strategy diagram

Key
 Soft planting beds
 Permeable paving

5.18.4 Summary

Using the biodiversity metric, the ecologist has calculated a 100% net gain for habitat units and a 100% net gain for hedgerow units.

The scheme delivers 100% biodiversity net gain, well above the 10% target.

For a detailed breakdown of the Biodiversity Net Gain Report, Greggs, Twickenham Residential Oct 22 Issued V0.4, prepared by Richard Gravels Associates

5.20 Green roof specification

A biodiverse extensive green roofs is specified where possible across the scheme, namely Building F, and are co-located with PV / solar panels (where possible) using a 'biosolar' approach.

A minimum of 100mm lightweight growing substrate is required alongside a system, such as Bauder's Flora 3 system (refer to adjacent image), to ensure that plants are appropriate and meet the ecological objectives of the scheme.

The Bauder Flora 3 seed mix includes 65% perennial wildflowers, 20% annuals and 15% grasses.



Bauder Flora 3 Seed mix example

BAUDER FLORA 3 SEED MIX

Establishment and Growth

Typically the mix will produce flowers from April to October starting with species Wild Strawberry and Cowslip, through the summer with Yarrow and Black Knapweed with Lady's Bedstraw flowering later into the autumn. The annuals, biennials and grasses will provide cover and colour in the first season allowing time for the slower growing perennials to establish in later years. The mix has been specified to be drought tolerant with sedum species and low growing perennials.

BioSOLAR

Plants are chosen that do not exceed 40 cm in height to avoid problems with shading of solar panels when the vegetation is used in conjunction with Bauder BioSOLAR. Shade tolerant ground cover plants were specified that will occupy semi-shade microclimates under the panels.

Green roofs are exposed environments subject to wind erosion therefore the mix contains pioneer and ephemeral species such as annuals, biennials and short perennials, which establish quickly from seed and help to stabilise the substrate and prevent wind erosion prior to perennial root systems getting established. A small percentage (typically <15%) of the mix contains non-aggressive grass and sedge species, which will also help to establish and stabilise the substrate.

The seed source is British Provenance (with the exception of sedum species) and suppliers of the mix adopt the Flora Locale Code of Practice for collectors, growers and suppliers of native flora.



(Flora locale is an independent charity. Promoting and advancing the conservation and enhancement of native wild plant populations)

Bauder's Unique Additive Mix

Establishing seed at roof level is difficult, to maximise the germination and establishment of the diverse range of seed used, Bauder has developed a unique blend of seed adhesive, organic nutrients and mycorrhizal fungi to encourage water and nutrient uptake by the developing seedlings.

- The seed mix and additives are combined with a bulking agent which enable the correct sowing rate to be achieved, the adhesive binds the seed to the substrate preventing it from being blown away in windy conditions or washed deep into the substrate and failing to germinate.
- A small quantity of organic slow release fertiliser gives the seed a gentle boost as it establishes. Mycorrhizal fungi increases the root surface area helping the transfer of water and nutrients from the substrate to the developing root system of the plant, enabling the plants to establish quickly.



Bauder Flora 3 Seed mix guide

5.21 Lighting strategy

The external lighting proposed within the development has been designed to E3 classification for 'small town centres or suburban locations' with an upward light output ratio no greater than 15%. The design minimises any disturbance to the local nocturnal wildlife present along the existing 'dark corridor' of the River Crane and prevents nuisance to residents with front-facing windows.

The road and car park lighting illuminance will comply with BS5489-1:2013 code of practice for outdoor car parks and a quiet traffic flow of P6 lighting class. All vehicle and pedestrian routes are outside the 5m buffer zone along the river.

Along the riverfront, a 5m buffer zone restricts the amount of light spill reaching the sensitive 'dark corridor' of the River Crane. This ensures the development has the absolute minimum impact on wildlife. The 5m wide buffer zone will be heavily planted and have a 1.5m high hedge with 600mm tall woven willow trellis to the southern face to prevent any light spill from the development onto the River Crane. As excessive lighting can damage bat foraging, the minimal use, low-level light bollards and external lighting are directed away from the river.

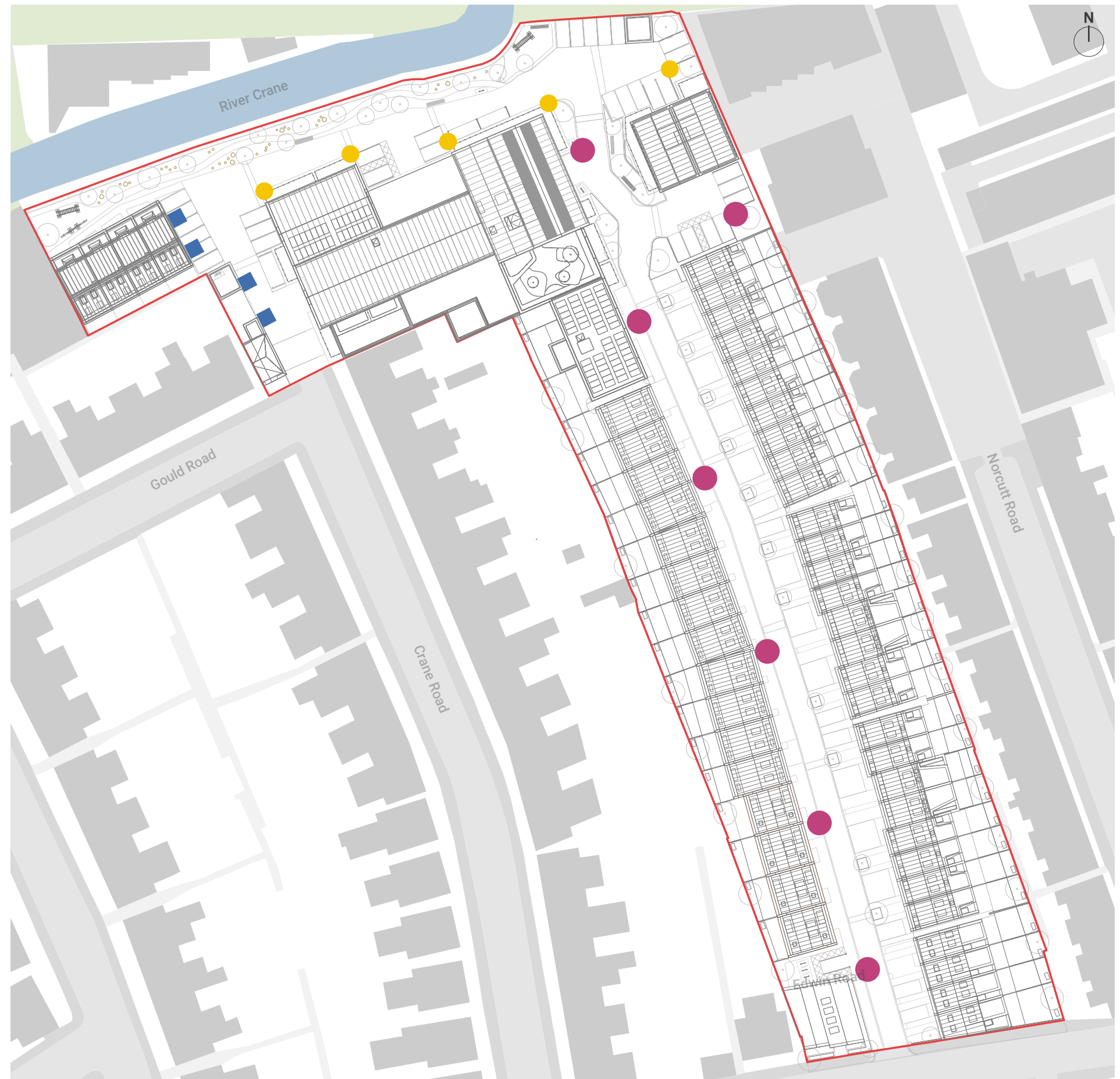
The lighting will be designed in line with the Exterior Lighting Assessment by Desco. A full analysis of the lux levels around the river has been undertaken and has been submitted in a separate report as part of this application. This ensures the proposals are suitable for the location and do not effect the existing 'dark corridor'.

Key design measures of proposed external luminaries:

- LED lamps with no UV emissions (minimising disturbance to bats and ensuring insects are not attracted away from neighbouring habitats)
- Integrated reflectors, louvres and diffusers (controlling the direction and spread of light and avoiding unnecessary light spill and upward light pollution)
- Located so the illuminance between lighting drops below 1 lux (encouraging bats to fly between and prevent the formation of a 'light barrier')
- No uplighting proposed (avoiding illuminating bat foraging and commuting habitats)



Precedent image for light column



Plan indicating lighting locations

Key

- LED column lighting
- LED wall mounted luminaire
- Dark skies light column

5.22 Management & maintenance

5.22.1 Maintenance

The primary aim is to manage the landscape spaces so that they thrive and are able to continue to provide their green infrastructure functions, including cultural ecosystem services, such as providing sense of place and amenity.

The following key factors will need to be addressed in order to sustain high-quality external spaces:

- Safety
- Cleanliness
- Repair and replacement
- Horticulture health
- Hard surfaces
- Playable space
- Delivery

5.22.2 Safety & security

A safe environment is one that is accessible to all. As well as adopting 'Secured by Design' principles in the design of the landscaped areas, long-term management and maintenance of the landscape proposals will be required.

Well-maintained places are less likely to suffer from crime as they are more likely to be used, thus increased presence will deter antisocial behaviour. Passive surveillance will be encouraged with landscaping, enabling clear visibility along main pedestrian routes.

Private gardens are enclosed with 1.2m walls and accessed via secured gates.

5.22.3 Cleanliness

Cleanliness is the principal indication of the quality of management of the landscape design. It will be important to maintain the cleanliness of the landscape with regular collection and removal of leaves, debris and litter.

5.22.4 Repairs & replacement

The need for repair and replacement of finishes will be mitigated by the use of appropriate and durable materials. Nevertheless, in the long-term, a degree of maintenance and replacement is unavoidable.

5.22.5 Horticulture health

The health and general condition of planted areas, including trees, shrubs and perennial plants and lawns, is clearly indicative of the level of care and attention a place receives.

Planting, including any replacements to dead or dying material, will be maintained in accordance with a Landscape Maintenance Specification.

Trees, climbers and shrubs will undergo inspections, which will provide informative pruning to ensure appropriate habit and form, monitor health of trees and the removal of dead, dying or diseased branches as required.

Once established, the removal of stakes / guying systems will be required where necessary. Shrub beds will receive ongoing maintenance to ensure weed-free conditions through combined techniques of hand weed removal, chemical-free herbicides, cultivation and mulching.

Until fully established, new trees and shrubs will require adequate watering. An irrigation system will be required for establishment of plants and trees and for ongoing watering during prolonged periods of drought.

5.22.6 Hard surfaces

Seasonal maintenance of fallen leaves, snow and de-icing is required, and combined use of herbicides and hands to remove weeds that grow within paving or other hard surface joints.

5.22.7 Delivery

Delivery of the landscape scheme will be by appropriately skilled and experienced contractors and specialist contractors, in accordance with BS3936:1992, BS4043:1989 and BS4428:1989 (or subsequent superseding equivalent) and current arboricultural best practice, working to tight specifications and fully resolved designs.

Particular attention will be paid to the sourcing of both hard and soft landscape material, and the customising of specifications and workmanship to best suit these materials, which will be locally sourced where possible.

The landscape construction contract will include 12-months post-practical completion establishment maintenance before handing over to the ongoing management team.

5.22.8 Water

Planting is generally intended to be suitable for minimal watering. Irrigation in the public realm is carried out manually with a hosepipe during establishment and then as required.

A separate irrigation system is required on the podium with a drip line fed through the planting beds to irrigate the softscape planting beds.

5.22.9 Lighting & electrical

For security lighting and lux levels, please refer to the MEP design report.

Introduction

Context

Design process

Design response

Landscape

6.0 Technical design

Access

Appendices

6.1 Transport & parking

Car parking

The scheme provides a total of 101 car parking spaces accessed via the new one way street.

This is distributed as follows:

- 29 private spaces on drive (of which 4 are accessible)
- 16 integrated garage spaces
- 20 allocated spaces below podium (of which 2 are accessible)
- 35 allocated surface spaces (of which 4 are accessible)
- 1 allocated accessible space for the E use class building
- 1 public on-street car club space on Edwin Road (not included in the total)

All surface and below podium spaces will be allocated to a specific dwelling. Accessible spaces are included within this allocation and are provided in close proximity to the accessible apartments or on the accessible house type driveway. All future residents will not be permitted CPZ permits via S106.

Cycle parking

In compliance with the London Plan 2021 the scheme provides a total of 234 residential cycle spaces, 6 visitor cycle spaces and 8 use class E cycle spaces.

These are broken down as follows:

- 50 spaces at 1.5 spaces per dwelling for all 1 beds
- 166 spaces at 2 per dwelling for all 2 bed+
- 18 additional spaces within residential
- 6 spaces at 1 per 40 dwellings for short stay visitors within the landscape
- 8 spaces for the E use class building

Houses have secure cycle storage within internal garages or in external stores, and apartments have dedicated cycle stores within each building in the form of two tier cycle racks.

The E use class office is provided with a secure external store and a number of sheffield stands within the public realm for visitors.

The proposals include several improvements to the transport offering of the existing site. The residential development will provide an internal road, linking the existing site access along Gould Road and Edwin Road, to the north and south respectively and facilitating both pedestrian and vehicle flow through the site. Given the low traffic volumes, low speeds and residential nature of the site, a less formal shared-surface street scene is proposed. The removal of the existing site access gates and internal shared surface facilitates pedestrian accessibility through the site and enhances connectivity to the River Crane to the north.

Both the E use class element and residential element of the site provide a level of car and cycle parking which is compliant with local parking standards, prevents overspill parking, and encourages adoption of sustainable and green travel. The development is well placed for public transport, with several bus routes and rail connections within reasonable walking distance of the site (PTAL 2 rating).

The proposal includes a car club space within immediate proximity of the development, providing a further transport offering. As a borough, Richmond upon Thames advocates car clubs as an alternative to private motor car, promoting their integration across the council website. The new car club bay facilitated by the development would not be exclusively for the use of residents at the site, and would thus provide a communal benefit for surrounding residential properties. The implementation of the car club bay would be agreed with the developer, car club provider and Local Authority, as a condition of consent.



Parking and transport diagram

6.2 Refuse, recycling & servicing strategy

The new internal road will enable all refuse collection, residential deliveries and maintenance vehicles access to collect from within the site. The two-way access road ensures that all service vehicles will be able to access and egress the site in a forward gear.

Storage for wheelie bins is located within defined private stores for each house along the mews street. For the apartments and the houses adjacent to the river, shared refuse and recycling stores are provided, which meet the council's required drag distances and collection volumes.

The refuse storage provision is based on the London Borough of Richmond Upon Thames Refuse and Recycling Storage Requirements supplementary planning document and allows for the following storage provision:

Waste

Houses / developments with individual refuse containers:

- Storage capacity of 240 litres for refuse per household of three bedrooms or fewer
- Storage capacity of 360 litres for refuse per household of more than three bedrooms

Developments using communal refuse storage containers:

- Storage capacity of 70 litres per bedroom. This requirement relates to communal waste containers.

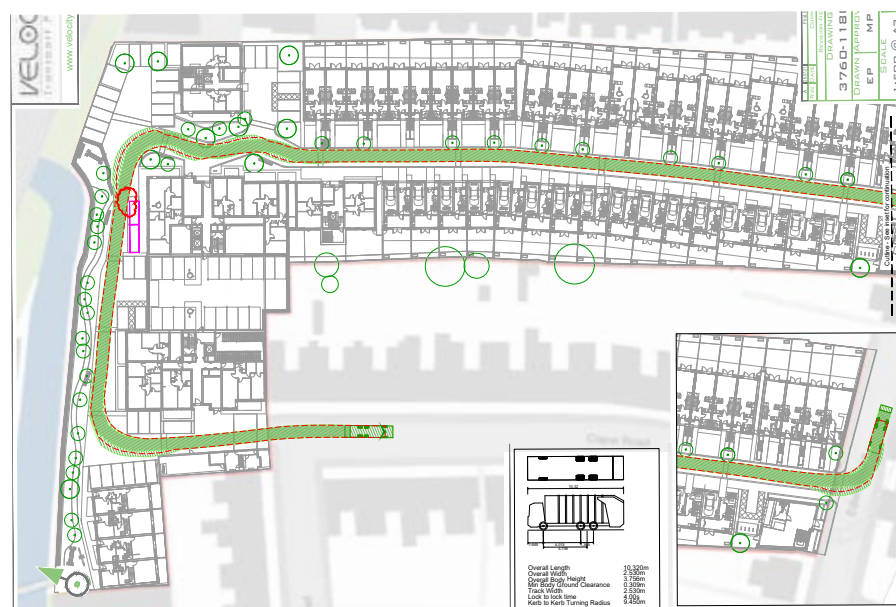
Recycling

Houses and developments of up to two units:

- Storage capacity for two 55 litre recycling boxes.

Space must be provided so that the boxes can be presented within the property boundary and be visible from the kerbside on collection day.

| Number of households served by bin area | Mixed paper, card and carton recycling bins | Mixed container recycling bins | Total recycling bins |
|---|---|--------------------------------|----------------------|
| 3 to 5 | 1x 240L | 1x 240L | 2x 240L |
| 7 to 8 | 1x 360L | 1x 360L | 2x 360L |
| 9 to 11 | 2x 240L | 2x 240L | 4x 240L |
| 12 to 17 | 2x 360L | 2x 360L | 4x 360L |
| 18 to 25 | 1x 1100L | 1x 1100L | 2x 1100L |
| 26 to 45 | 2x 1100L | 2x 1100L | 4x 1100L |
| 46 to 70 | 3x 1100L | 3x 1100L | 6x 1100L |



Refuse vehicle tracking diagram



Refuse store locations and refuse vehicle tracking diagram

6.3 Mechanical, electrical & public health

The following summary is provided by Desco. For a full understanding of the proposed MEP strategy please refer to the separate 'Energy Strategy' and 'Utilities Connection Report' submitted alongside this application.

"Following the disconnection of existing services and the demolition of the existing buildings on the site, new incoming services will be installed to serve the new development, including the installation of a new substation.

The services strategy for the site has been developed to meet the both London Plan targets and compliance with building regulations. The key overall targets focus on energy efficiency, CO2 emissions, water conservation and sustainable drainage. In summary, the proposed development incorporates a number of improvements which combine to demonstrate a high degree of sustainability and an improvement in reducing the site wide carbon emissions by at least 35% more than the building regulations compliance target.

Heating and hot water generation to the residential apartment buildings shall be provided through the use of Low Zero Carbon Technologies (LZC). A centralised reversible air source heat pump and condenser water loop will be installed, distributed to each apartment. The centralised plant comprises 2No. 200kW reversible air source heat pumps, a dry air cooler, thermal store, pressurisation unit and circulation pumps.

Individual heat pumps connected to the condenser water loop in each apartment, provide hot water generation via hot water storage cylinders and heating via fan assisted radiators. The heat pumps shall have both a heating and cooling facility, the latter being utilised to reduce the risk of overheating.

The townhouses will be served by standalone split air source heat pump systems to provide both heating and tempered cooling and hot water via hot water storage cylinders.

Mechanical Ventilation to both the apartments and townhouses, will utilise System 4 Mechanical Ventilation with Heat Recovery (MVHR), see figure 3. As detailed in the overheating report, the MVHR units will provide elevated air change rates/ summertime boost in the townhouses, to prevent the risk of overheating occurring within all habitable rooms. During periods outside of high external ambient temperatures the ventilation systems will operate using trickle/boost facilities in order to meet the ventilation criteria set out in approved document Part F.

Potable water will be supplied to each apartment via a central storage tank and cold water booster set, to ensure adequate water pressures at each outlet. Potable water to each of the townhouses, will be fed directly from the new mains water supply from Thames Water. Landlord's water supplies will be provided to bin stores and irrigation points.

From a fire and life safety perspective, please refer to the separate fire statement submitted alongside this application. Smoke extract ventilation shall be provided to the apartment block corridors as defined in fire report. Dry risers will be installed in each core of each apartment block. Smoke/Heat detection will be installed throughout each dwelling. A standby generator or secondary Electrical supply for fire fighting and smoke vent equipment will be installed, to be confirmed by fire strategy.

Metered mains Low Voltage (LV) electrical distribution and containment will distribute to all landlord services and apartments. The Landlord LV distribution will serve common area lighting, small power, lifts, mechanical services, door and main gate entry, Satellite/TV/DAB distribution systems. The common area lighting will comprise

LED lighting and escape lighting. The common area small power will distribute to cleaners sockets and equipment. In the apartment buildings Satellite/TV/DAB outlets will be installed, there will also be a Video/audio door and main gate entry system installed in each apartment.

Individual LV electrical supplies shall be provided to each of the town houses, with meters installed in line with the local DNO's requirements. Like the apartment buildings Satellite/TV/DAB outlets will be installed in the houses.

In both the townhouses and apartments, distributing from the dedicated electrical consumer unit for the dwelling, small power circuits serving socket outlets, kitchen equipment, MVHR and heat pumps, fan assisted radiators will be provided. LED downlights will be installed throughout the dwellings. A BT and or other supplier, fibre network will be provided to serve all apartments and townhouses, with fibre termination points installed in all dwellings.

Site wide, a CCTV system shall be installed at main points of entry to the site and each apartment building. External lighting shall be installed throughout the site as set out in the external lighting report.

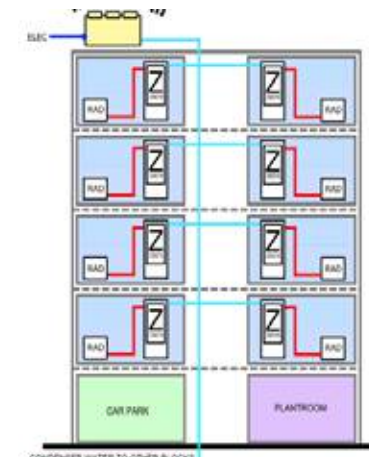
The E use class building facing onto Edwin Road will be built as a shell and core build, with capped off incoming services and below ground drainage connections. It is envisaged that the E use class building when fitted out will be served by a VRF simultaneous heating and cooling system, with mechanical ventilation with heat recovery to provide the fresh air requirements to the building. Lighting will be installed throughout the building, with adequate provision for small power and data throughout.



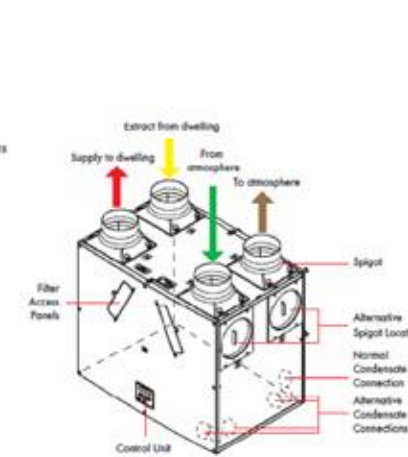
Apartment block system illustration



Apartment block system illustration

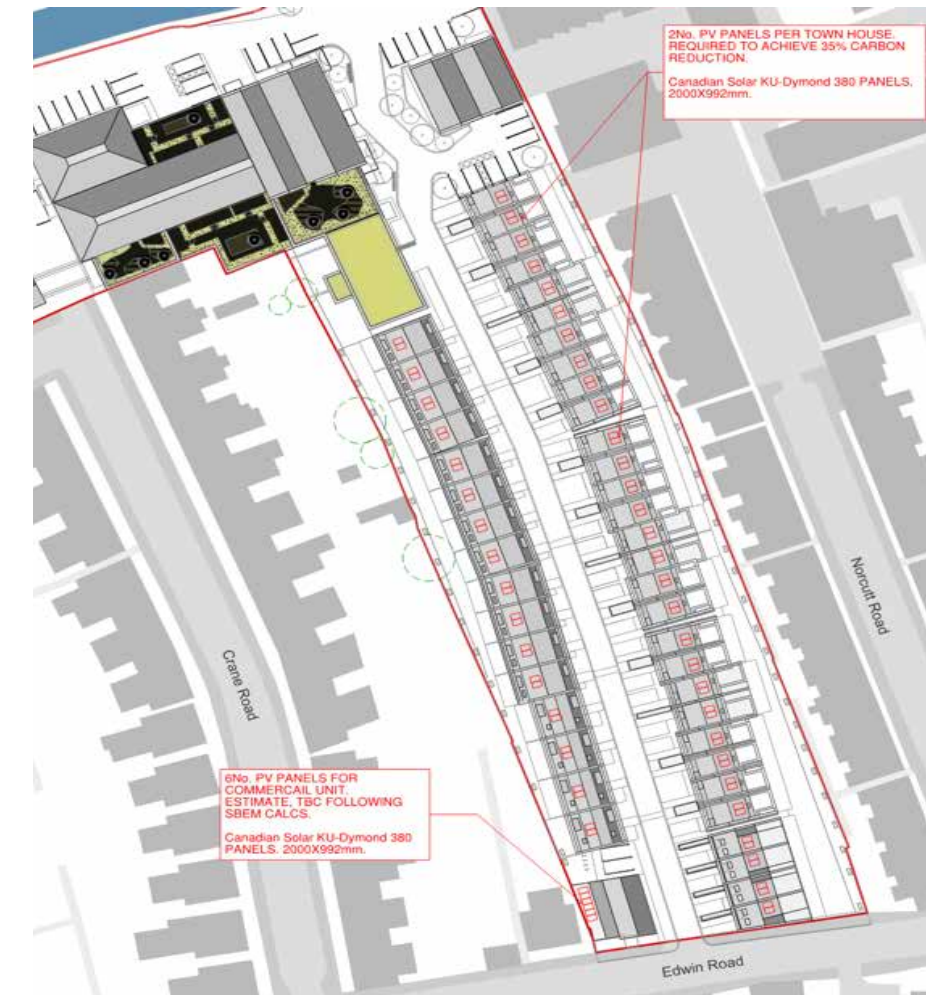


Apartment building system illustration



MVHR unit

As detailed in the site wide Energy Strategy report, it is proposed Photovoltaic cells will be installed to the roof of each townhouse and use class E building identified on the site plan below. The provision of photovoltaic cells shown is to ensure the site wide carbon emissions improvement is maximised."



Photovoltaic panel locations

6.4 Overheating mitigation

The following summary is provided by Desco. For a full understanding of the proposed overheating mitigation strategy please refer to the separate 'Overheating Report' submitted alongside this application.

"An overheating analysis of all the habitable rooms in the residential apartments and townhouses was carried out to demonstrate the predicted thermal performance and the predicted temperatures that occupants using the building will expect. Please refer to the overheating report for all results.

The analysis has been based on CIBSE Technical Memorandum 59 (TM59) 'Design methodology for the assessment of overheating risk in homes'.

The criteria is as follows:

1. For all habitable rooms the number of hours during which ΔT is greater than or equal to one degree (K) during the period May to September inclusive shall not be more than 3 percent of occupied hours.
2. In bedrooms the room temperature shall not exceed 26°C for more than 1% of annual hours, between the hours of 10PM and 7AM.
3. For Homes with restricted window openings, the CIBSE fixed temperature test must be followed, i.e. all occupied rooms should not exceed 26°C for more than 3% of annual occupied hours.

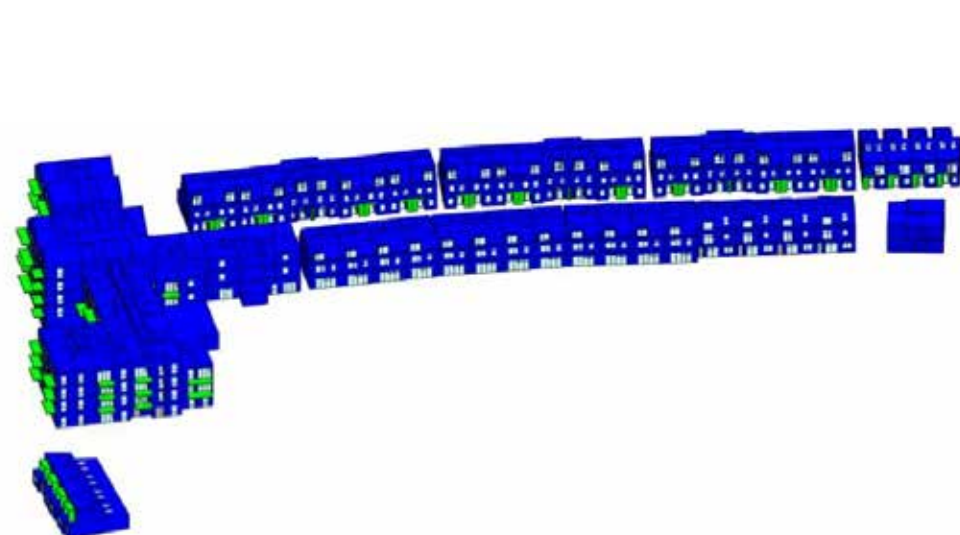
The overheating report concentrates on 3 alternative methods to prevent overheating and comply with the set criteria.

- Natural ventilation through use of openable windows.
- Enhanced mechanical ventilation with summertime boost.
- Tempered cooling to all bedrooms and Living Rooms.

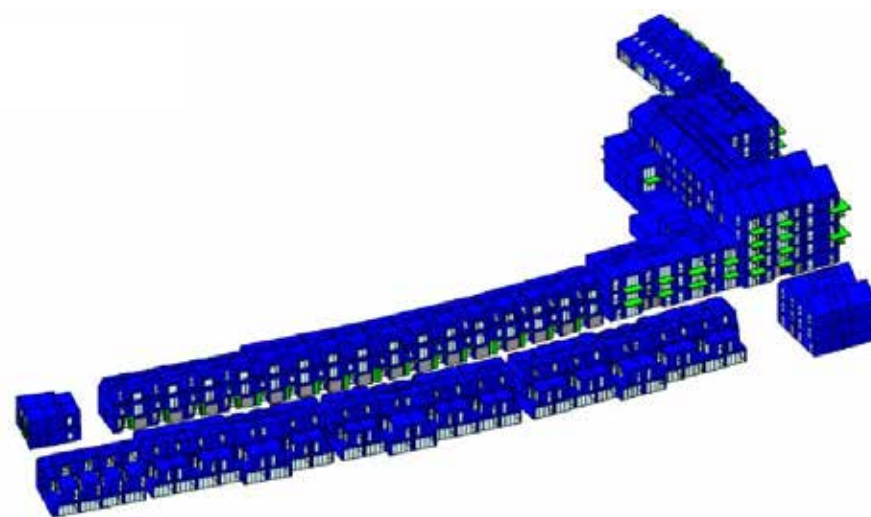
The GLA additionally require the building to be tested against three different weather files Design Summer Year (DSY)1, DSY2 and DSY3 weather files in line with TM49. DSY1 represents a typical summer year, DSY 02 and 03 do not represent typical summer time temperature and weather profiles, they are historic and the theory is that these profiles will become more typical and therefore these weather files should be used in the building simulation models overheating analysis so that a means of mitigating the overheating risk can be considered.

The results from the analysis show that applying cooling to bedrooms and living rooms is the most effective method in overcoming the risk of overheating, as 491 out of 491 spaces pass the criteria specified in CIBSE TM59 using DSY01 & 02. For the iteration where openable windows were utilised in the dwellings, this resulted in the majority of rooms passing and those rooms that failed were marginal failures. Further solar shading and reducing the percentage of glazing may provide sufficient enough improvement to ensure the overheating criteria is met.

Acoustic constraints have also been considered as part of the accompanying overheating assessment."



View looking east



View looking west

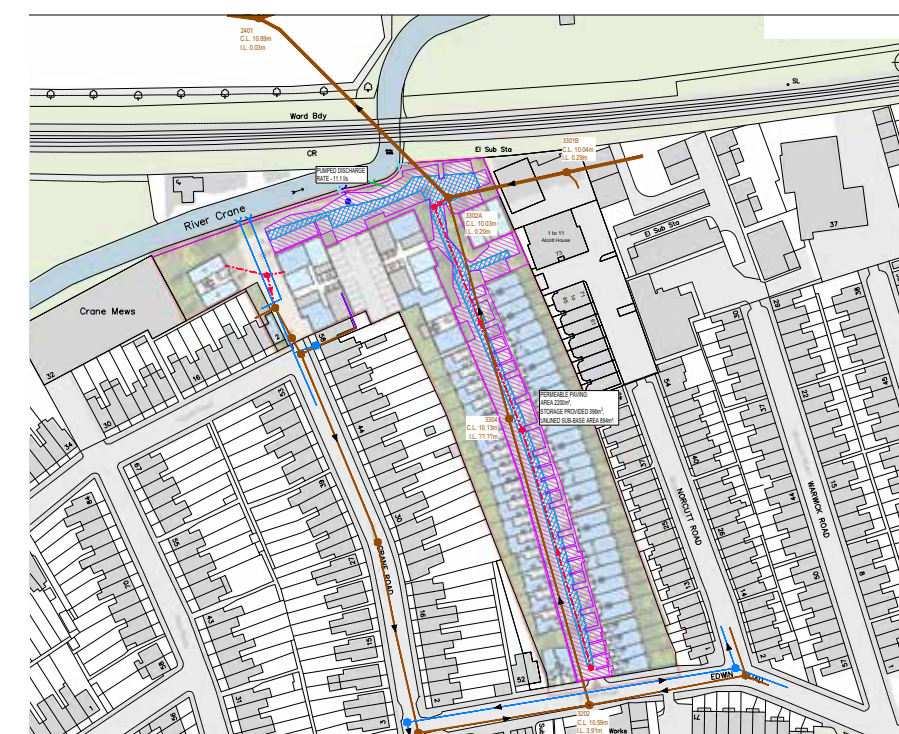
6.5 Flood risk & drainage

The following summary is provided by Waterman Infrastructure & Environment Ltd. For a full understanding of the flood risk and drainage please refer to the separate 'Flood Risk Assessment' submitted alongside this application.

Environment Agency (EA) mapping indicates that the site is predominantly located within Flood Zone 1, denoting a low probability of flooding from fluvial flooding, with a small area along the northern boundary directly adjacent to the River Crane, located within Flood Zone 2, denoting a medium probability of fluvial flooding. The EA have provided modelled fluvial flood levels for the site which when compared to the detailed topographic survey, confirm that the bank levels along the River Crane would not be overtopped during the 1 in 1000 year flood event. The risk of flooding from pluvial, groundwater and artificial sources has also been assessed and found to be low.

To preserve access to the River Crane for maintenance, a minimum offset of 8m would be provided from the river to any proposed buildings, providing a significant betterment over the existing situation. All street furniture that falls within this offset would be removable to allow access as and when required.

Surface water runoff would discharge through a combination of infiltration and pumped outfall to the River Crane. Discharge to the River Crane would be restricted to the 1 in 100 year greenfield rate. A minimum attenuation volume of 650m³ would be provided to restrict discharge to this rate, including an allowance for the future impacts of climate change. This would be provided in the sub-base layer of the proposed permeable paving. Foul flows from the site would discharge by gravity to the Thames Water sewer network.



Permeable surface areas

6.6 Structures

The following summary is provided by Waterman Infrastructure & Environment Ltd. For a full understanding of the structure please refer to the separate structural drawings submitted alongside this application.

"For the Building F structure Waterman have undertaken an assessment of all the available structural options for the superstructure frame considering the criteria including: flexibility, economics, contractor preference, programme, services integration, and buildability.

Excluding the uppermost floor, an RC flat slab solution was the most cost effective and the most appropriate solution for this project, offering a number of advantages to the scheme, including:

- Free horizontal distribution of services across the exposed soffits
- Inherent thermal mass and fire protection together with good acoustic properties
- Locally sourced recycled aggregates can be specified

The pitched roofs lend themselves to lightweight pre-fabricated steel trusses supported off steel posts to frame out the upper floor without extending up the RC superstructure.

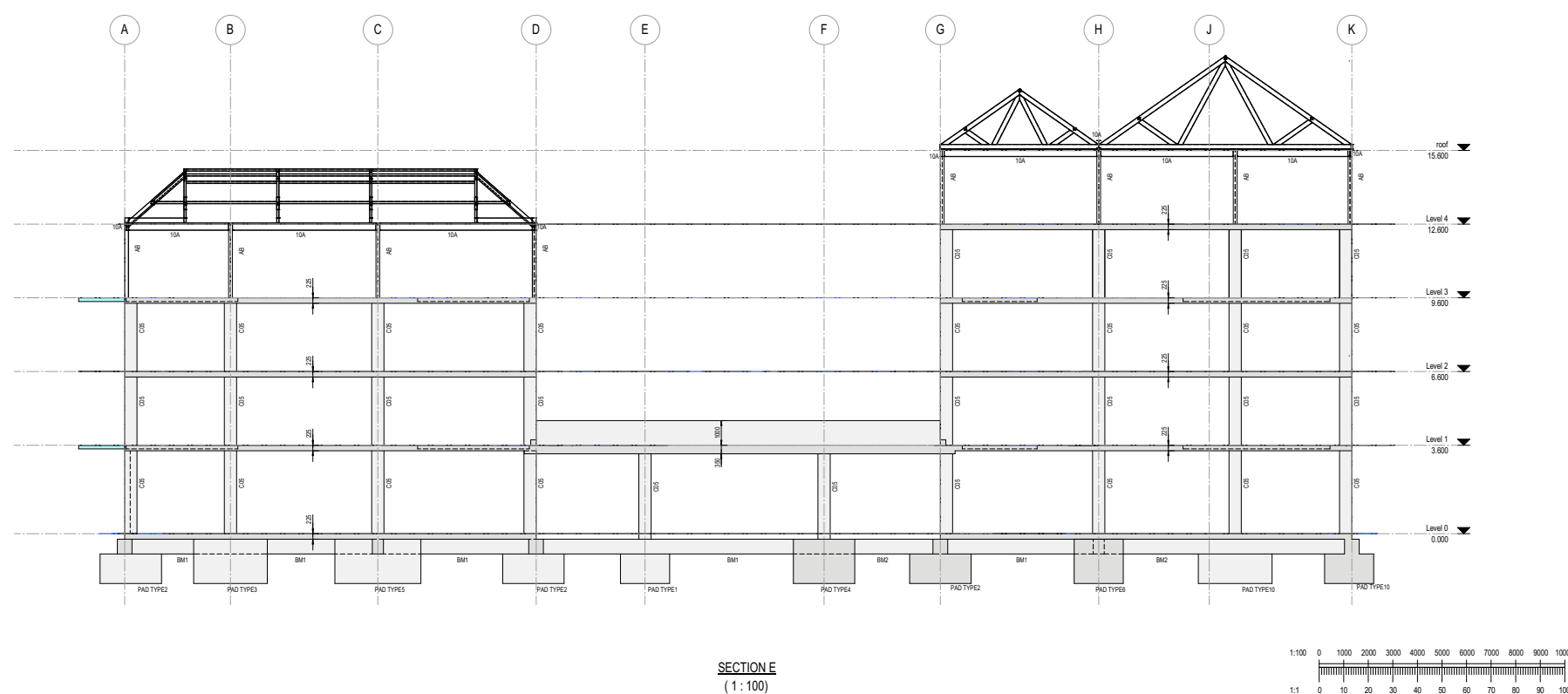
For the foundations, the Geotechnical Investigation has confirmed the presence of gravel at a depth of approximately 1.0m b.g.l. Initial structural loading calculations suggest that shallow reinforced concrete pad foundations can be designed to bear on to the gravel and spread the loads from the columns and core walls.

For the terraced housing the intent is to utilise simple and repetitive structural solutions. The foundations are mass concrete strip foundations, the walls are load bearing masonry, the ground floors are beam and buildings and the upper floors and roof are timber. Limited steel beams are required to trim stair openings and form the mansard roof profiles.

The E use class building follows the same strategy and construction as the terraced housing but with a pitched roof as opposed to mansard."



Proposed 3D structural frame



Emerging structural design

6.7 Sustainability strategy

The following summary is provided by Sol Environment and Desco. For a full understanding of the proposed overheating mitigation strategy please refer to the separate 'BREEM Assessment' and 'Sustainability Checklist' submitted alongside this application.

"The proposals for the E use class building seek to achieve high standards of sustainable design by achieving a BREEM Excellent rating with a targeted score of 75.23%. The development endeavours to promote environmental sustainability through land use, improved biodiversity, sustainable building practices, utilising clean and renewable sources of energy, designing buildings which are energy and water efficient, ensuring good resource and waste management, material selection, responsible sourcing of materials and reducing the risk of pollution and flooding as a result of the development.

The sustainability of the development will be achieved through:

- Building design – fresh air, daylight, non-polluting materials good fabric performance;
- Resource efficiency – less energy use, low carbon, water and waste minimisation; and
- Healthier, safer community – green travel, communal spaces, access to local amenities, security of site and buildings.

Building Design

An initial Passive Design Analysis and Low Zero Carbon Feasibility Study (LZC) has been carried out as part of the planning process. This identifies the opportunities for incorporating passive design measures such as high-performance building fabric with enhanced u-values to all elements, air tightness and low thermal bridging, maximised daylighting and passive solar gain in order to reduce the total heating and cooling demand of the building. Renewable energies will be specified in accordance with the recommendations of the LZC Study to ensure clean, green energy is provided to the building where feasible. The LZC currently recommends the use of high efficiency photovoltaic panels delivering the building's electricity together with air source heat pumps to provide heating, cooling and hot water generation (part of tenant fit out).

The project will endeavour to use materials with a low environmental impact (including embodied carbon) over the full life cycle of the building by careful selection of materials and constructions. A life cycle analysis of the building has been completed with option appraisals to enable the design team to understand the environmental impact of each decision or material selection. A more detailed life cycle analysis will be completed at Technical Design to review further construction options and their impact on the embodied carbon over the life cycle of the building.

Materials will be specified which are robust and durable to cater for their level of use and exposure. Externally the building will predominantly be faced with brick which provides a robust and easily maintainable finish. Materials will be sourced in accordance with the project sustainable procurement plan. All timber products used on the project will be legally harvested and traded with Chain of Custody certification (e.g. FSC, PEFC). All non-timber products will be sought to be from suppliers/manufacturers with Environmental Management System (EMS) certification (e.g. ISO 14001, BES 6001). Where appropriate, materials will be sourced that are made and/or supplied locally.

The use of materials with a high recycled content will be considered where viable such as crushed concrete to be used for hardcore.

Resource Efficiency

The building will be designed to minimise operational energy demand and reduce carbon dioxide emissions by adopting the energy hierarchy of the Be Lean - Be Clean - Be Green approach as set out within the London Plan to achieve a minimum overall 35% reduction in carbon emissions over the Building Regulations Part L 2013 and meet the BREEM 'Excellent' minimum requirements for Issue Ene01.

The consumption of potable water for sanitary use in buildings from all sources will be reduced by at least 50% over a baseline building through the use of water efficient components, including the specification of low flush toilets and low flow rates for taps/showers.

External landscaping and planting will be designed such that it relies solely on precipitation, during all seasons of the year.

Water consumption will be monitored and managed in order to encourage reductions in use. In order to reduce the risk of undetected leaks, a leak detection system will be installed on the mains water supply within the buildings and between the buildings and the utilities meter. Flow control devices will be fitted to the water supply to each sanitary area to minimise water loss from leaking taps or appliances.

The proposal will aim to minimise the materials needed in construction and the amount of demolition, excavation and construction waste to landfill through the promotion of resource efficiency via effective management and the reduction of waste.

A pre-demolition audit will be prepared covering the existing buildings, structures or hard surfaces to be removed to determine if refurbishment, reuse or recycling is feasible.

The 'Waste Hierarchy', as shown below, will be adopted to maximise the use of existing materials and resources and minimise waste generated which will be limited to 3.4m³ or 3.2tonnes per 100m² of gross internal floor area:

- Reduce – first priority is to reduce the amount of waste produced through design, construction methods and minimising over ordering
- Re-use – any materials to be reused where feasible either on site (preferable) or off-site
- Recycle – where materials cannot be recycled on site, a suitable waste management contractor will be employed to ensure any waste which is able to be recycled, is recycled off-site. Suppliers with 'take-back' schemes will be selected where available
- Resource Recovery – for energy generation processes – fuel, heat and power
- Disposal – will be limited to any hazardous waste or materials which cannot be recycled

Waste minimisation will also be promoted during the use of the development through the provision of suitable recyclable and general waste storage areas. A minimum of 2m² per 1000m² of NIFA will be provided for the storage of recyclable waste to the E use class building.

Health and Well-being

The E use class building will be designed with the health and well-being of its occupants in mind. The proposed design includes generous amounts of glazing and floor to ceiling heights to ensure areas are provided with a uniform and good standard of natural light, as well as an adequate view out. This will reduce the reliance on artificial lighting.

Commercial occupiers also have access to the landscaped outdoor amenity along the river, along with the heavily planted shrub bordered areas around the building itself, promoting a healthier life style and sustainable modes of travel. The E use class space is also proposed as affordable at 80% market rate.

The development will endeavour to provide a safe and secure place to live and work. The local Designing Out Crime Officers have been consulted and their recommendations will be incorporated into the design.

6.8 Fire strategy

The following summary is provided by Hoare Lea. For a full understanding of the proposed fire strategy please refer to the separate fire statement submitted alongside this application.

"The proposed development will follow the principles of current guidance and meet the functional requirements of the Building Regulations (2010).

Apartment buildings will adopt a 'defend-in-place' evacuation strategy, where only the occupants of the apartment of the fire origin will evacuate initially. Occupants in other apartments will remain in place, separated by a high level of compartmentalisation, unless advised otherwise by the fire service. The standalone office unit facing Edwin Road will adopt a simultaneous evacuation strategy. It is proposed to provide all habitable areas within the residential premises in Block F with a residential sprinkler system, which should be designed and installed in accordance with BS 9251:2014. It is not proposed to provide the remaining apartment buildings or dwelling houses with sprinkler protection as they are below 11m in height. Furthermore, the office premises are not proposed to be provided with sprinkler protection due to their size. The sprinkler provision to the covered car park in Block F will be assessed in detail during the next design stage.

Travel distances in a residential common corridor should be limited to 7.5m, as per recommendations in BS 9991:2015. The travel distances from any apartment in Block F to the ventilated protected lobby door will be limited to a maximum of 7.5m based on the provision of a residential sprinkler system and a 1.5m² free area natural shaft to provide smoke ventilation to the common corridor. The individual apartments in Block F are designed to adopt an protected entrance hall design. If the apartments do not achieve the recommendations outlined in guidance, a fire engineered solution will be required, which may include Computational Fluid Dynamics (CFD) modelling. Blocks A & E are proposed to be designed as small single stair buildings as per standard guidance. The flats in this arrangement are designed as to have a protected entrance hall. The covered car park will be designed to achieve 2.5% minimum aggregate free vent area on the walls of the car park, split equally across two opposing walls. Travel distances within the car park should be limited to 18m and 45m for single direction and multiple directions respectively. Final exits and protected escape routes should be located such that these distances are maintained. The standalone office building is proposed to be designed as a small two-storey premises, with an open accommodation stair. The recommendations in guidance are largely adhered to, however the floor area of the first floor is marginally exceeds the maximum recommended in guidance. A fire engineered solution, including the provision of L2 automatic fire detection and alarm system and limited travel distances of 27m and 18m on the Ground floor and First floor respectively is proposed to justify the increase in floor area. This is subject to discussion and approval with the Statutory Authorities. As Blocks F, A & E in the proposed development are more than 5m but less than 18m in height loadbearing elements of structure are required to achieve 60 minutes fire resistance. Every wall separating individual dwelling houses should be separated by 60 minutes fire resistance.

The office building is less than 5m in height, therefore the loadbearing elements of structure are required to achieve 30 minutes fire resistance. Initial assessment of the external fire spread conditions of the proposed development appears to satisfy the necessary conditions. Where protection is required on external façades the protection should achieve the same fire resistance as the elements of structure. Façades that are adjacent to the site boundary should be constructed of fire resisting material achieving the same resistance as the elements of structure.

The buildings do not have a storey that exceeds 18m in height. Either the external walls should satisfy the performance criteria described in BRE report BR135 or the external wall surface should be in accordance with Diagram 40 of Approved

Document B (Figure 17 of BS9991: 2015) for surface spread of fame classification. In addition, cavity barriers in any external wall cavity are required in accordance with Section 9 of the Approved Document.

In practice, it may be necessary for external surfaces to achieve a Class 0 (National Classification) or Class B-s3, d2 or better (European Classification) surface spread of fame classification to avoid the walls contributing to the space separation (unprotected areas) calculations. As Block F is less than 18m in height it is not proposed to install a firefighting shaft, but to install a dry rising fire main in each of the staircases in Block F as to ensure all points on the floor plates are within 45m, on a route suitable for laying hose.

Where dry riser inlets are provided, the Fire Service should have access within 18m and sight of the inlet port.

Blocks A & E, the car park, dwelling houses and the standalone office building are proposed to be accessible by emergency service vehicles. All points on the floor plates of the respective buildings should be maintained within 45m of pump appliance access or provide sufficient perimeter access. Existing hydrants should be available within 100m of the buildings or alternatively new ones should be provided within 90m of the development and located not more than 90m apart."

6.9 Cleaning & maintenance

The current proposal is for all windows and doors to be cleaned from ground or podium level via long reach pole, or cleaned by residents from the inside via balconies or tilt and turn openings. The maximum height of the buildings is below 25 meters, well inside the reach of a long reach pole system.

In Building F large 13 person lifts are provided to facilitate plant replacement. Safe access is provided into the pitched roof of the taller building via a stair and coffin style hatch.

The health and safety aspects of maintaining the building will be planned to ensure the risks involved are managed from start to finish and this information is communicated effectively to those who need to know.



Example of long reach pole system

6.10 Acoustics

The following summary is provided by Paragon Acoustic Consultants Ltd. For a full understanding of the acoustics please refer to the separate acoustic reports 'Environmental Noise Survey and Limiting Noise Levels' and 'Environmental Noise Assessment' submitted alongside this application.

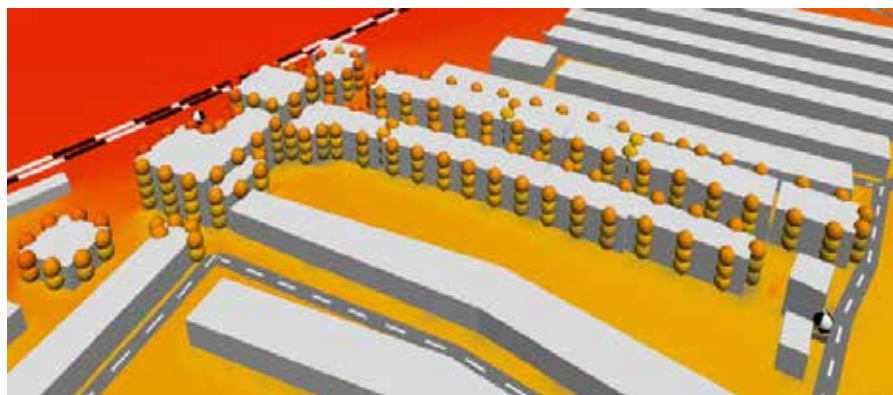
"Environmental noise surveys have been undertaken at the site to assess the noise climate around the proposed development due to transportation noise sources that include events such as train noise, neighbouring uses, aircraft overflights and vehicular traffic.

Using the noise data acquired at the site an acoustic 3D model has been produced to allow quantification of the noise impinging on the façades of all proposed properties.

Internal noise criteria for the proposed dwellings has been established based on sources of guidance such as World Health Organisation (WHO) document "Guidelines for Community Noise" and BS 8233:2014: "Guidance on sound insulation and noise reduction for buildings" both for the daytime and the night-time periods.

Using the predictions of noise impinging on the façades of proposed dwellings the broadband façade and glazing acoustic performance has been established for living areas and bedroom areas. In addition, the LAFmax events of transient noise during the night have been considered.

In addition to the background noise levels impacting on the proposed development an assessment has been made of limiting noise levels that will be required for any new mechanical plant associated with the proposed site so as to protect the amenity of existing residential dwellings in the vicinity."



Example CadnaA Acoustic modelling software



Introduction

Context

Design process

Design response

Landscape

Technical design

7.0 Access

Appendices

7.1 Access principles

An inclusive environment considers people's diversity, having the capacity to break down barriers and mitigate exclusion. Moreover, inclusive environments often achieve superior solutions that are of benefit to everyone.

This section consists of the Access Statement that relates to the proposals for the Greggs Bakery site and supports the drawings prepared for this planning scheme. The aim is to provide a clear description of how the users of the proposed development will access, and be guided through the building and the site, without discrimination or limitation.

It considers, but is not limited to, the access and circulation needs of a wide range of people including parents with children, the elderly and disabled people.

The term 'inclusive design' relates as much to the design process as to the final product and just as equally to management, operation and information, bonding user experience with professional expertise. An Access Statement is work in progress and as such evolves throughout the design and construction period. This Access section deals with the design, up to planning, and the aspirations of the design for its development and final realisation through the construction process.

13 of the residential dwellings have been identified as wheelchair user M4(3) dwellings in accordance with the requirement of a 10% provision (4 of these are three-bedroom houses along the mews street; the other 9 are apartments at a variety of floor levels). All accessible apartments at first floor and above are served by two lifts. These units are designed specifically for ease of use for visually impaired, ambulant disabled people and wheelchair users, and provide a balanced mix of unit sizes and tenure.

7.2 Legislation, standards & guidance

Policies, legislation and guidance followed in the preparation of the Access Statement:

- London Borough of Richmond upon Thames planning policies on inclusive design and access and relevant housing policies including Design for maximum access (1999)
- Building Regulations, Approved Documents M 2015 and K 2013 (hereafter referred to as AD M and AD K)
- Part B/BS 9999:2017
- The London Plan 2021
- Supplementary Planning Guidance
- Technical Housing Standards- Nationally Described Space Standard March 2015
- Requirements and implications of the Equality Act 2010
- British Standards BS 8300-1:2018, BS 8300-2:2018, BS EN 81-70:2018
- CIBSE standards A3.1 - 7
- The Human Rights Act 1998
- Equality Act 2010

7.3 Consultation

A two-day public exhibition was held at the Crane Community Centre (3rd December 2018) and the Twickenham United Reformed Church (5th December 2018). Members of the design team were present to discuss the proposals and answer any questions. This included both the architectural team and transport consultant who were able to advise on access requirements.

Across both days, 105 residents, stakeholders and interested parties attended. The scheme presented was a mixture of 118 private and affordable houses and apartments, including 52 three bed houses and 66 apartments. It included many of the features presented in the final design such as a shared surface approach and the same access points.

A more recent public consultation of the revised scheme was held at the Twickenham United Reformed Church as detailed earlier in this report (19th March 2022). 71 local residents, stakeholders and interested parties attended.

The access arrangements were generally well received with provision for lifts, accessible/adaptable houses and flats, and a step free approach to all buildings were highlighted as positive. It was also mentioned that the move from an industrial use on the site to residential with a commercial element will improve the traffic issues within the area.

Some concern was raised on the traffic entrance points at Edwin Road and Crane Road and the potential for conflict with pedestrians. These have since been reviewed by our transport consultant and amendments have been made to ensure adequate visibility splays and sense of pedestrian priority including one way shared surface street system and changes in surface textures to encourage traffic calming.