LVMF & LOCAL TOWNSCAPE VIEWS

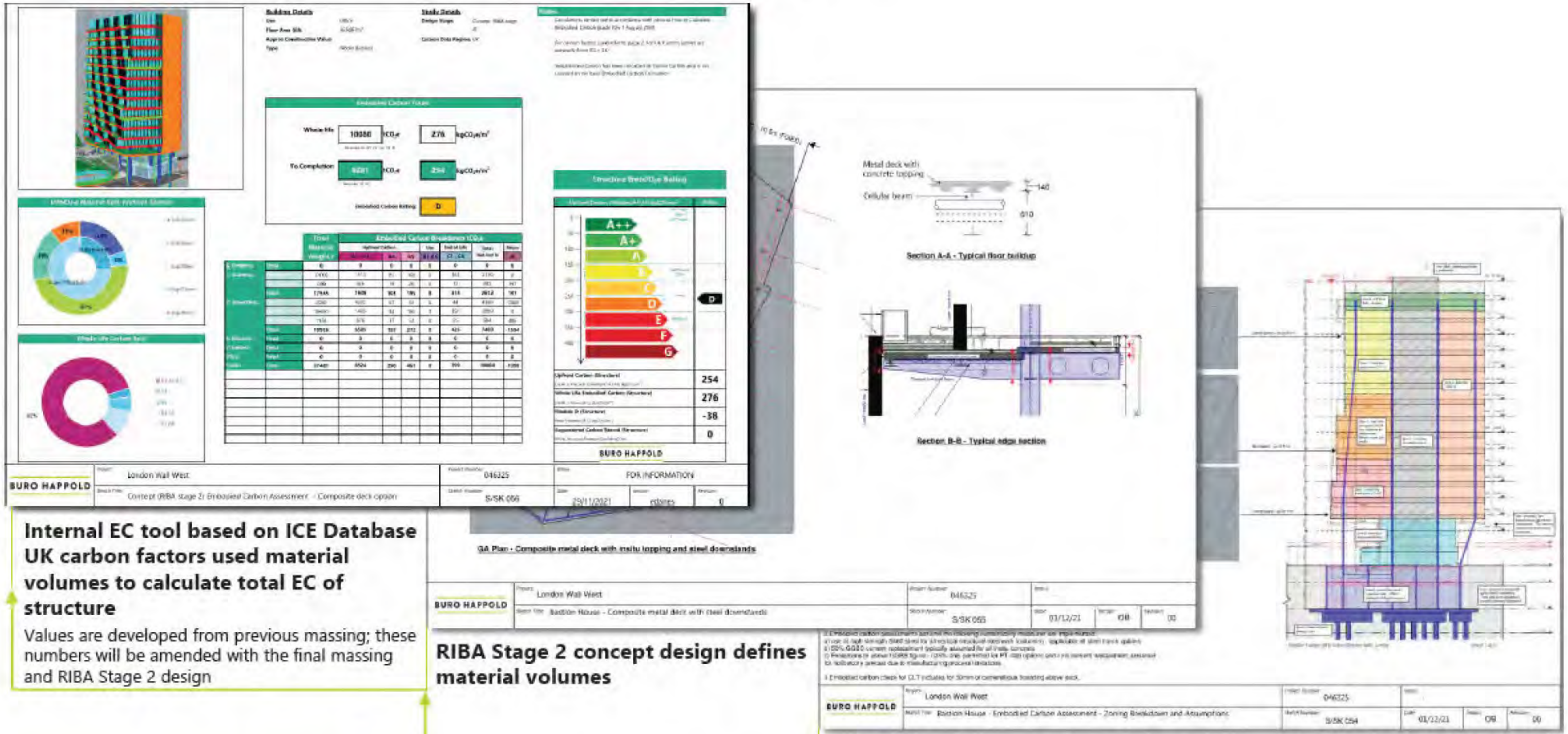
PRESENT

EMBODIED CARBON REDUCTION STRUCTURE

Structural Embodied Carbon Principles

- Lean design principles embedded
  - maintain structural simplicity
  - eliminate transfer structures where possible
  - refine loading criteria, balanced with robustness and adaptability considerations
  - refine and maximise structural utilisation at each design stage
  - optimise structural grid and arrangement, including column position and inclination
- Study materiality and alternative construction methods in early stages to optimise
- Use cement replacement (GGBS) to a high level in concrete
- Use high strength steel to reduce overall steel tonnage
- Explore opportunities for component reuse and engagement with circular economy
- Stay aware to technological and market advancement in manufacturing and material processing in timescale of project design stages

Structural Embodied Carbon Process

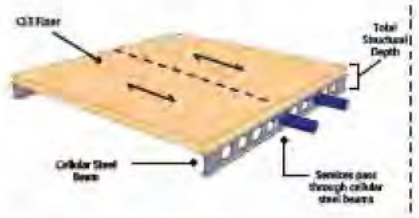
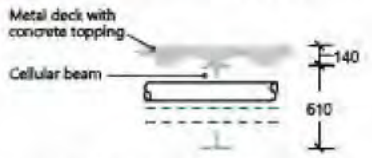
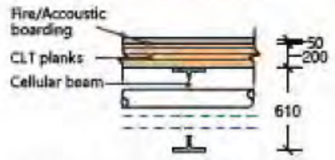
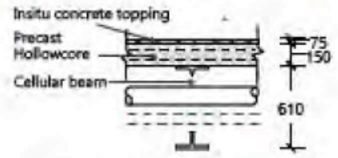
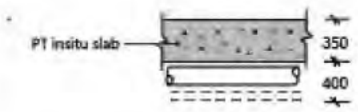


Internal EC tool based on ICE Database UK carbon factors used material volumes to calculate total EC of structure

Values are developed from previous massing; these numbers will be amended with the final massing and RIBA Stage 2 design

RIBA Stage 2 concept design defines material volumes

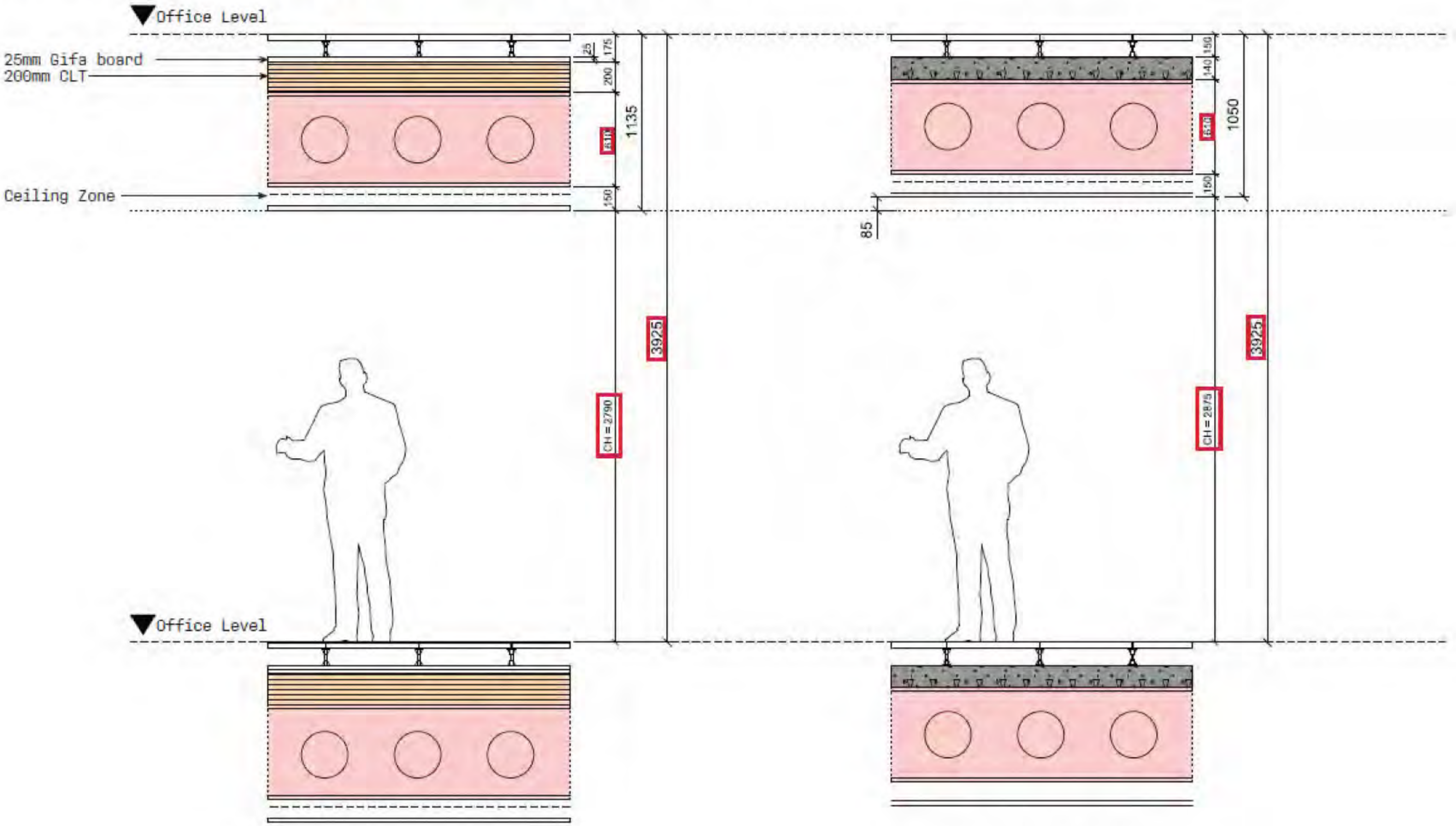
RIBA Stage 2 methodology to complex geometry for EC calculation

ALL BASED ON A BLENDED STRUCTURAL GRID (9m x 9m) - (12m x 12m)	COMPOSITE DECK ON STEEL	CLT SLAB ON ON STEEL DOWNSTAND	PRECAST HOLLOWCORE PLANKS ON STEEL DOWNSTAND	POST-TENSIONED (PT) INSITU CONCRETE FLAT SLAB
				
Slab/frame/MEP section				
Structural / MEP zone	750mm	860mm	835mm	750mm
Typical floorplate weight	310 kg/m²	190 kg/m²	470 kg/m²	880 kg/m²
Load to foundations	Moderate	Light	Moderate	Heavy
Sub+Superstructure Embodied Carbon kgC02e/m2 (A1-A5 Cradle to PC)	254 $kgCO_2e/m^2$	231 $kgCO_2e/m^2$ (90 $kgCO_2e/m2$ stored)	255 $kgCO_2e/m^2$	269 $kgCO_2e/m^2$
Fire Strategy	Steel intumscently painted. Deck inherent fire protection.	CLT boarding protection. Complex Fire Engineered design approach. Insurance risk. Steel intumscently painted	Steel intumscently painted. Deck inherent fire protection.	Slab inherent fire protection.
Vibration Acoustics		Lack of composite action reduces steel vibration design efficiency.		Slab inherent robustness.
Constructability / Complexity		No wet trades on site Easy service fix	Bespoke planks required to form the sawtooth geometry	Site-intensive construction. PT tendon stressing complexities. Post-construction modifications difficult.
Erection Programme		No wet trades on site Easy service fix		Site-intensive construction. Significant insitu concrete works with associated formwork and concrete delivery requirements.
Possible efficiencies?	Increasing structural steel zone to 650mm for lower long-span areas gives carbon and cost savings	Wet surface screed potentially improves vibration performance.		Reducing slab thickness to 300mm for upper short-span areas gives carbon and cost savings
Structure cost (QS input required)	65 kg/m2 average floorplate steelwork weight	65 kg/m2 average floorplate steelwork weight	55 kg/m2 average floorplate steelwork weight	

BURO HAPPOLD	Project: London Wall West	Project Number: 046325	Status: -		
	Sketch Title: Structural system overall comparison	Sketch Number: S/SK 063	Date: 01/12/21	Initials: OB	Revision: 00

TYPICAL OFFICE FLOOR CONSTRUCTION

Bastion House / Rotunda - 610 mm Structural Zone

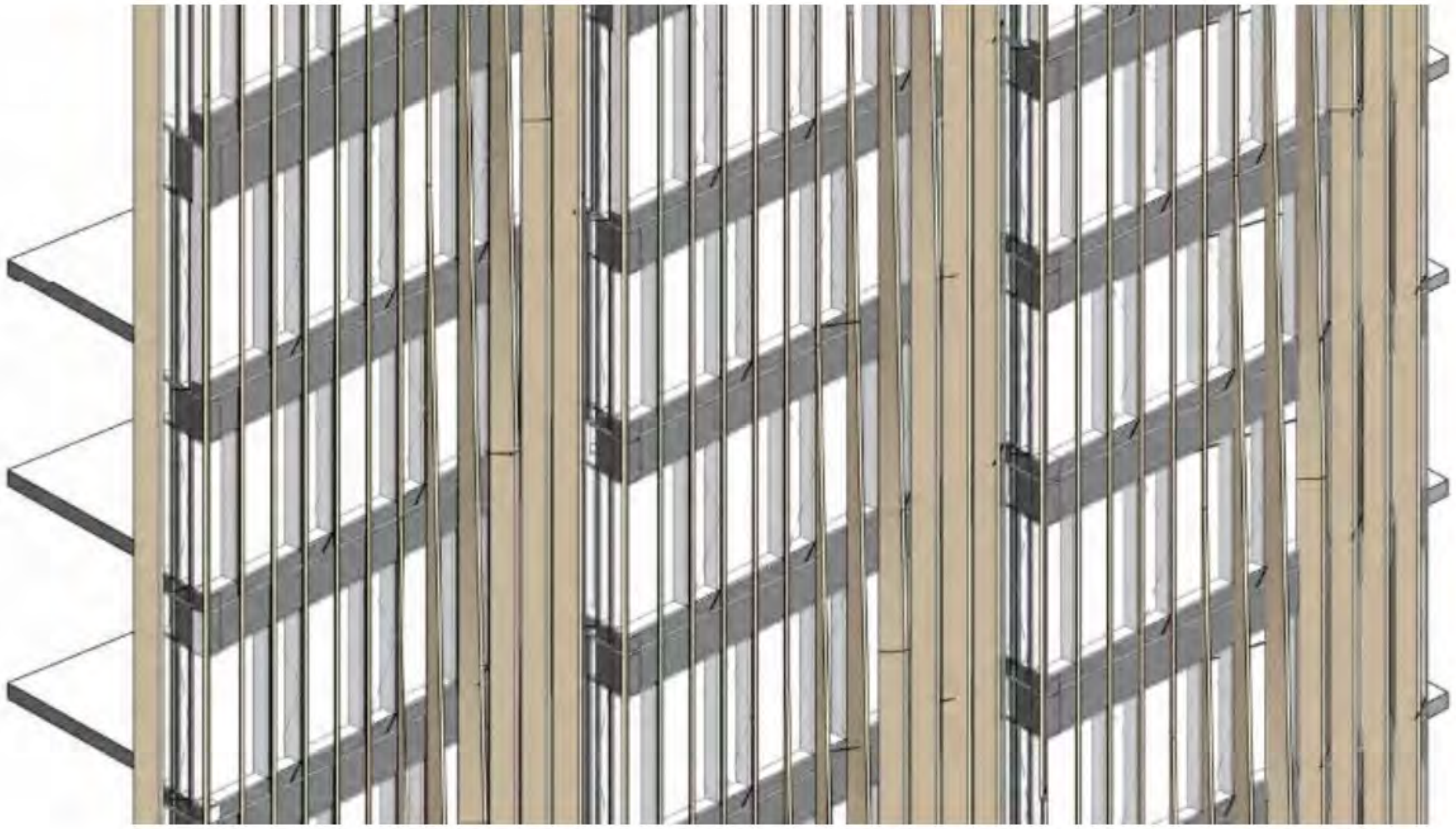


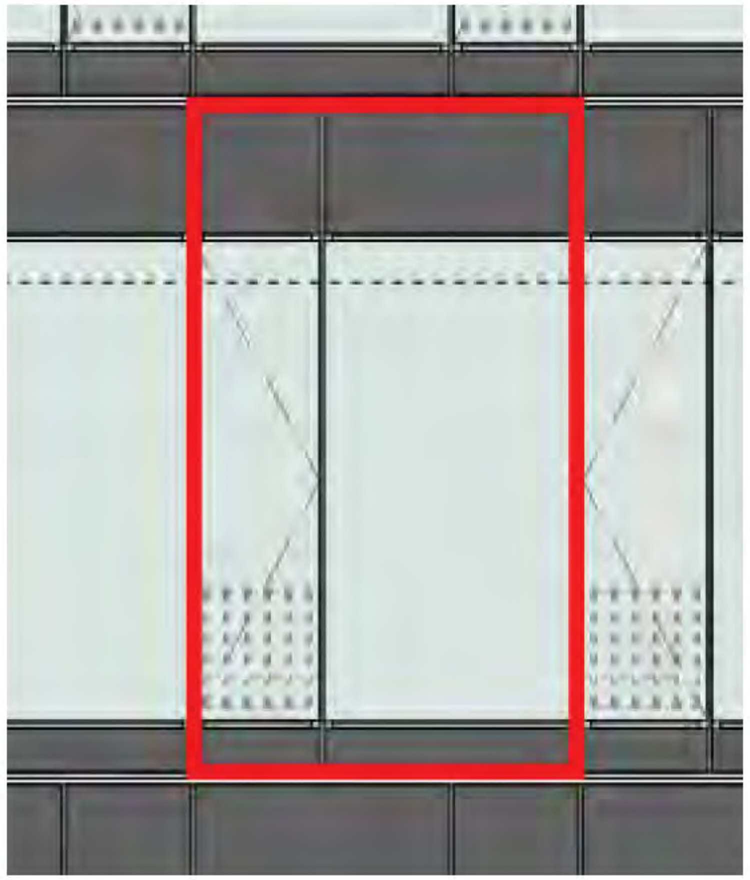
CLT

Composite metal decking

EMBODIED CARBON REDUCTION
FACADE

Husk Façade bay





Typical repetitive Module Assumed 2.25m x 4m with Fins every 0.75m

Note: Internal balustrade not included, a transom has been assumed at 850mm height, reducing the opening vent size

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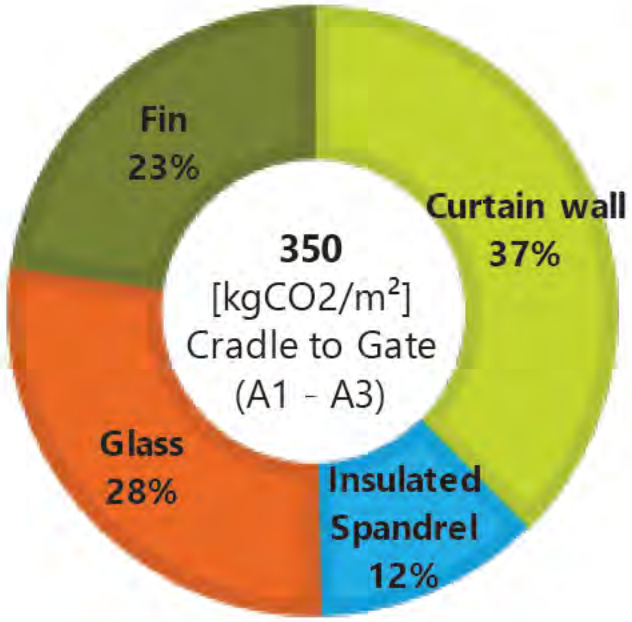
Husk Façade comparison

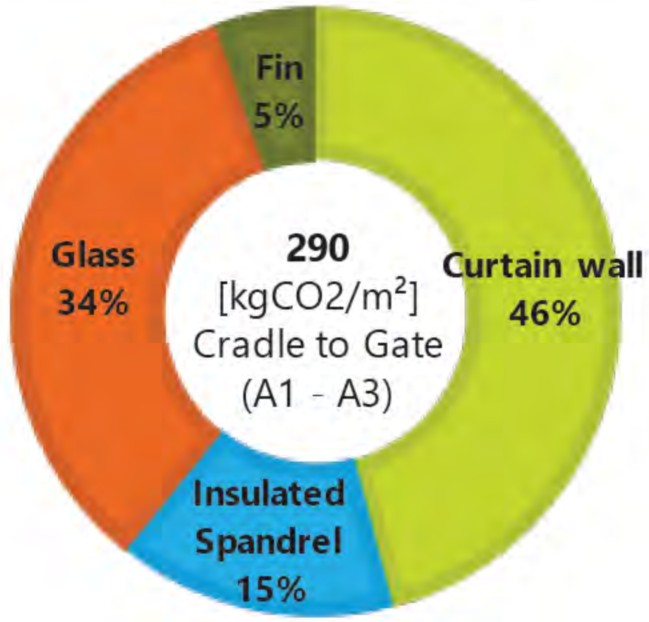
Note: The approximate area for typical unit→ 9 m² (assumed 2.25m x 4m)

Unitized curtain wall with **Aluminium Fin**



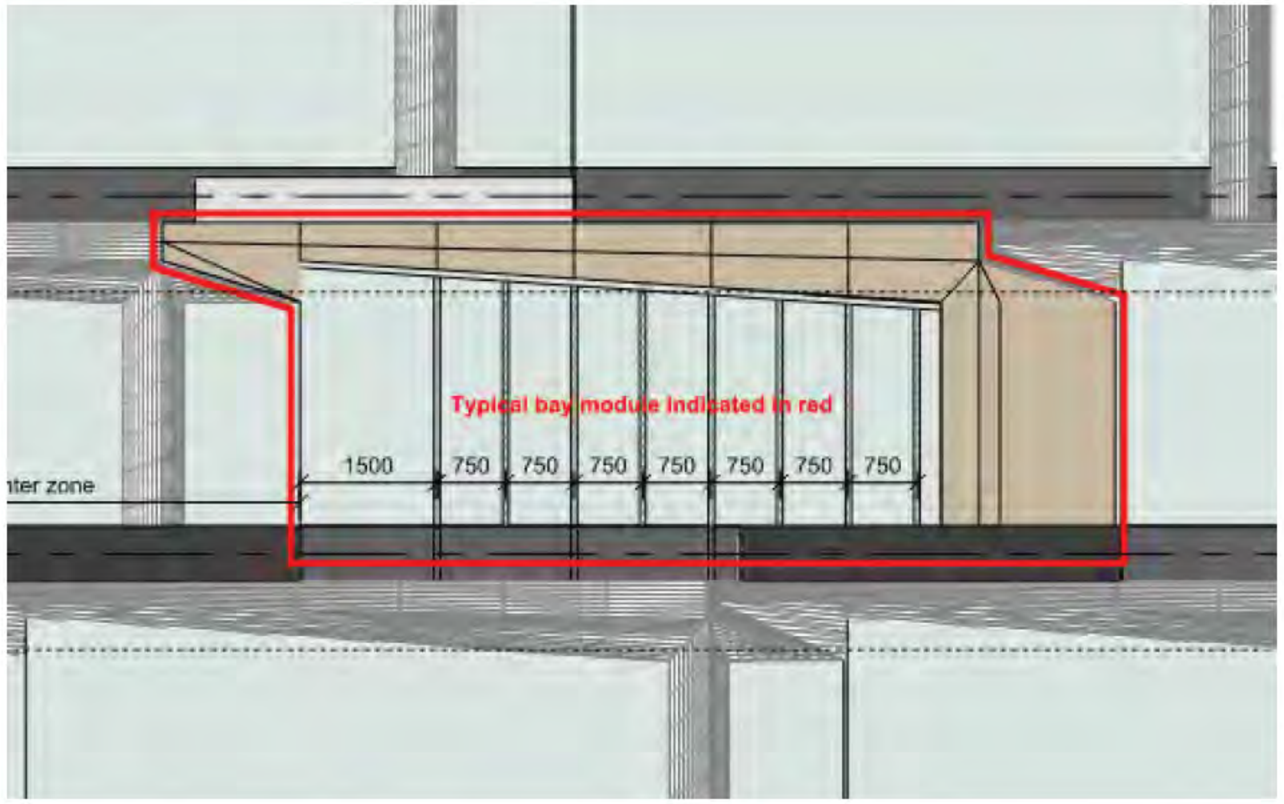
*Approximate **weight/m2→100 kg***

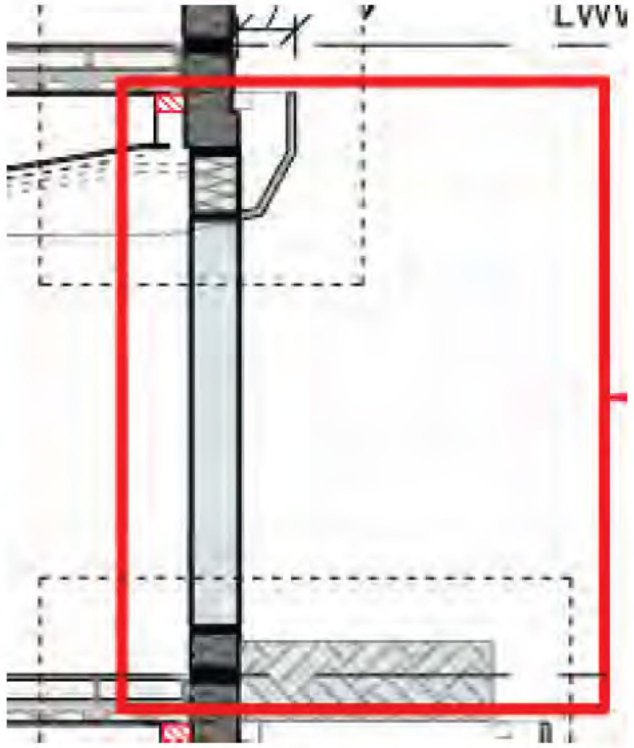
Unitized curtain wall with **GRC Fin**



*Approximate **weight/m2→115 kg***

Inner Façade bay



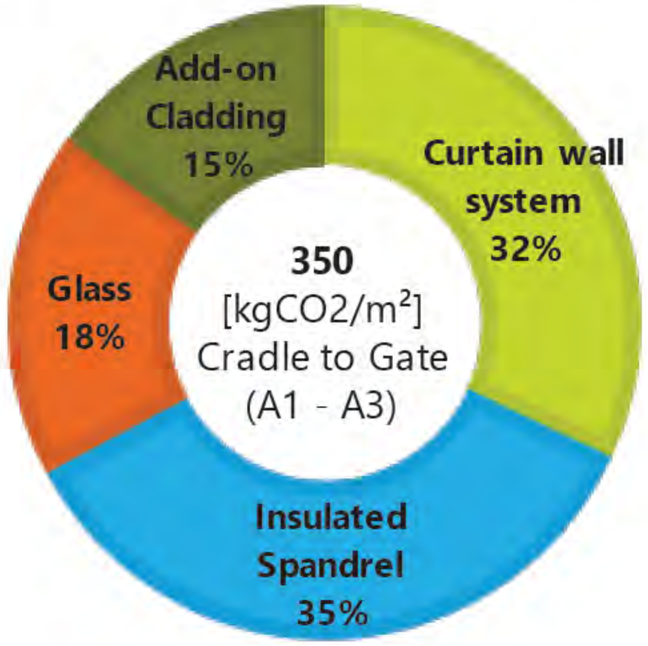


Typical module bay Assumed 2.25m x 4m with Fins every 0.75m

Inner Façade comparison – Curtain Wall

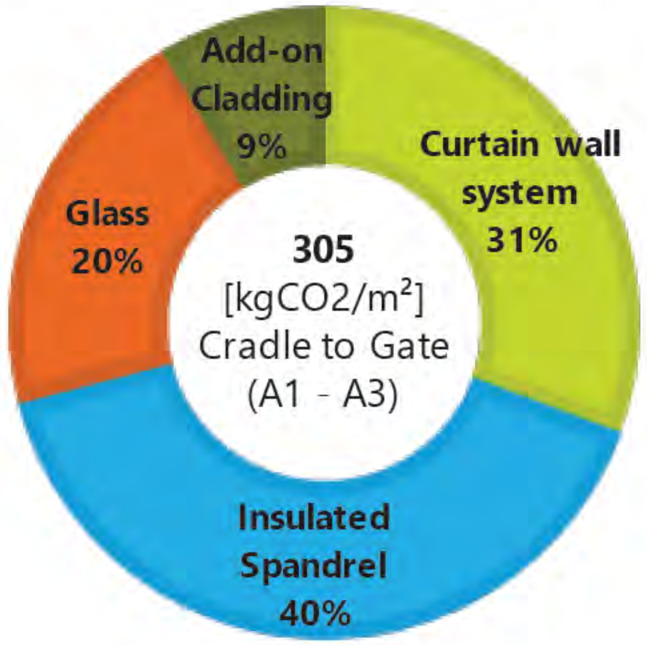
Note: Approximate area for typical Bay→40 m^2
$21m^2$ solid, ***$16m^2$ add-on cladding including metallic coping***

Unitized curtain wall with **Aluminium Cladding**



Approximate ***weight/m2→85 kg***

Unitized curtain wall with **GRC Cladding**

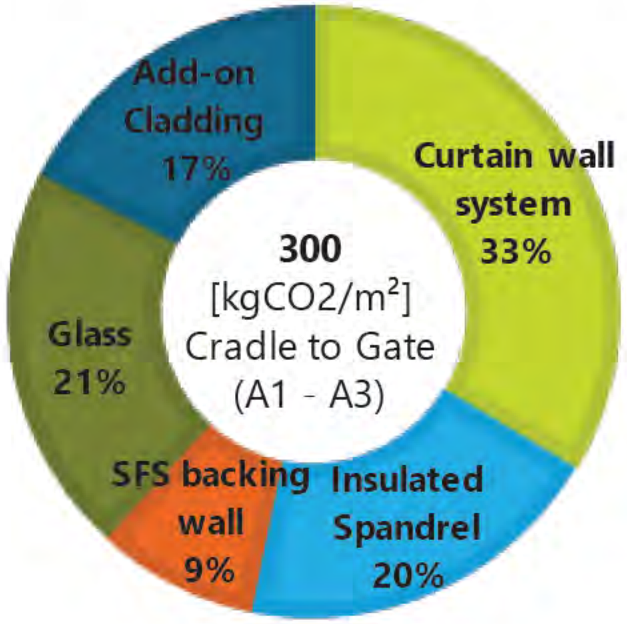


Approximate ***weight/m2→95 kg***

Inner Façade comparison – Window Wall

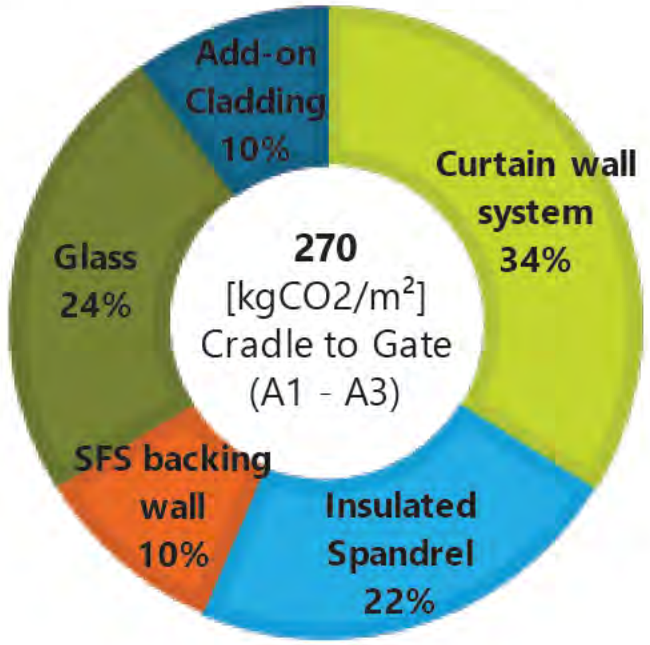
Note: Approximate area for typical Bay→40 m²
*21m² solid, **16m² add-on cladding including metallic coping***
Insulated SFS assumed only behind add-on cladding

Window wall system with **Aluminium Cladding**



*Approximate **weight/m2→90 kg***

Window wall system with **GRC Cladding**



*Approximate **weight/m2→100 kg***

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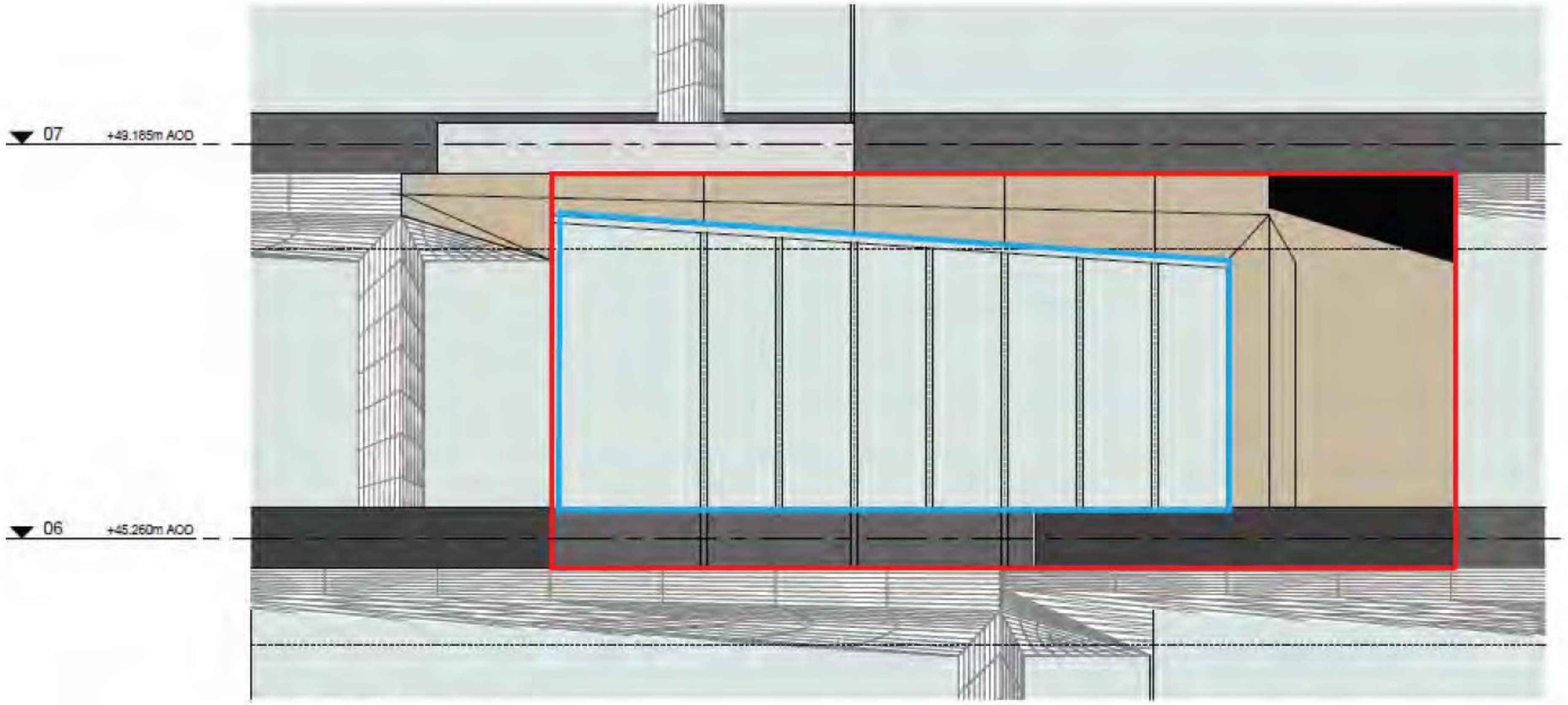
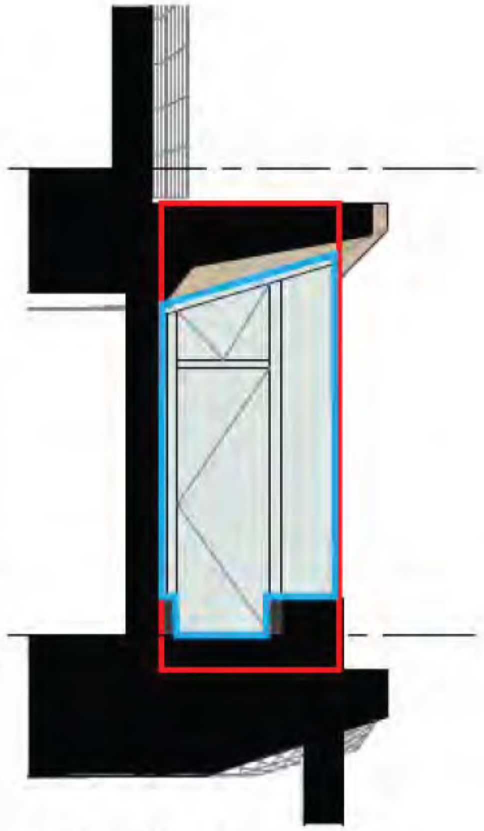
Curtain wall vs Window-Wall

	Option 1: Curtain Wall system	Option 2: Window Wall system
Thermal performance	Main thermal bridges due to aluminium frame. Strategy to minimise frame can be implemented	Multiple thermal weak points due to large quantity of steel (SFS & brackets). Option to minimize impact with thermal breaks at brackets or extra layers of insulation. Window wall system likely required to achieve more stringent U-value targets (internal area loss)
Support Strategy	System installed in front of the primary structure, supported at the top and restrained at the base, Brackets can be either front fixed or installed on top of slab	Base supported glazing with SFS backing wall in correspondence of solid rainscreen fascia. Likelihood of installing large quantities of brackets for rainscreen support.
Weather tightness	Option to prefabricate joints off-site with reduced on-site sealant works.	Joints to be sully sealed on-site. Risk of compromised end-result performances due to poor interface coordination.
Weight	~95kg/m2	~100kg/m2
Installation	Installation does not require scaffolding and is faster compared to option 2 due to higher level of prefabrication. Installation less reliant on on-site workmanship with higher ensured quality.	Installation requires external access through scaffolding or vertical mast climber. More extensive works on-site. Option to prefabricate SFS panels off-site.
Procurement	Less contractor available in the region compared to option 2, especially if unitised curtain wall is preferred over stick solution. Installation package likely to be from unique contractor.	Wall type diffused in the region with multiple contractors optioneering. Installation packages could be broken down into different contractors.
Cost	More fixed price range due to higher prefabrication and reduced installation program	Higher variance due to supply chain constraints and installation program

Inner Facade - Insulated wall/spandrel vs Vision glass ratio



Long Elevation



Reveal elevation

	sqm	%
Long elevation	35	100%
Insulated wall/spandrel	17	**49%**
Vision Glass	18	**51%**

	sqm	%
Reveal (short) elevation	5.8	100%
Insulated wall/spandrel	1.5	**26%**
Vision Glass	4.3	**74%**

	sqm	%
Total area of typical bay	40.8	100%
Insulated wall/spandrel	18.5	**45%**
Vision Glass	22.3	**55%**

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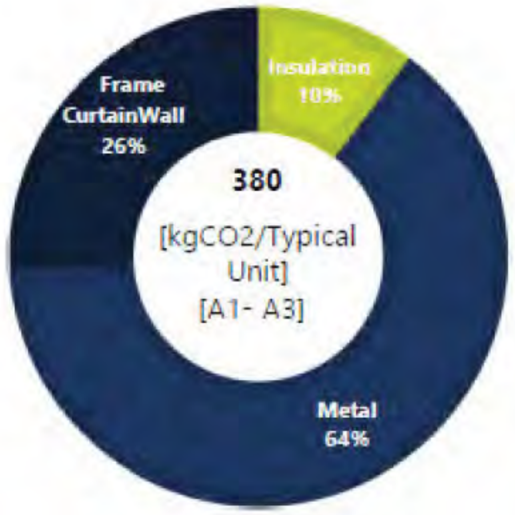
Assessment of embodied carbon of solid wall vs glazed infill panel

Note: The approximate area for typical unit→ 4 m^2 (assumed 1.5m x 2.7m)

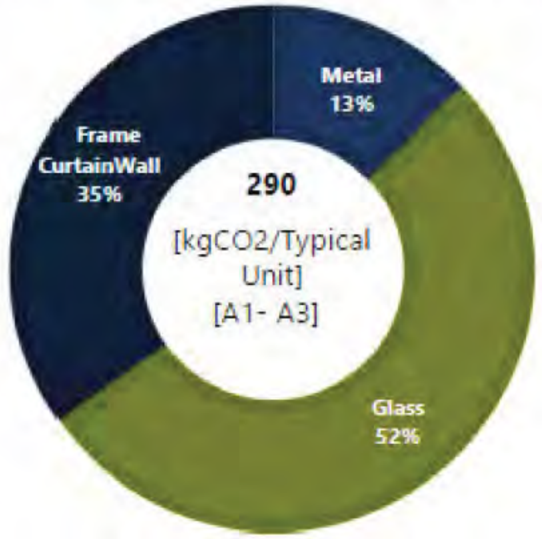
Solid vs Glazed infill panel

Unitized curtain wall with **solid infill** panel



*Approximate **weight per unit→220 kg***

Unitized curtain wall with **glazed infill** panel



*Approximate **weight per unit→450 kg***

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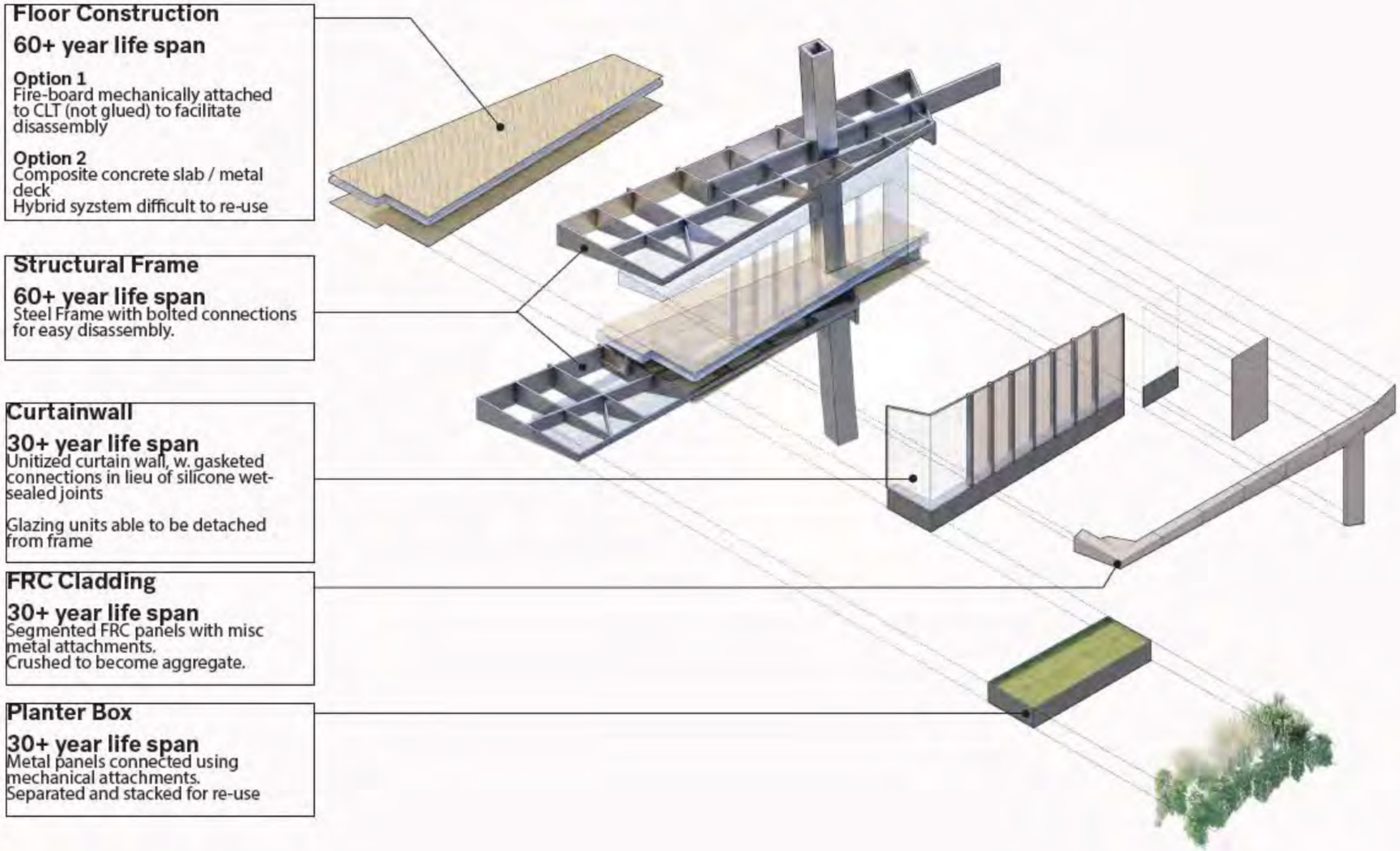
NEAR FUTURE

DESIGN FOR DISASSEMBLY



DESIGN FOR DISSASSEMBLY & FUTURE USES OF COMPONENTS/MATERIALS

Circular Economy Principle 2: Design to eliminate waste (and for ease of maintenance)

Principle	Early uptake of ambitious CE ideas	(Pioneer) CES Documentation
2.1 Longevity, adaptability, flexibility, reusability, recoverability	Build to accommodate change • flexible heights • modular partitions Build for longevity • Durable and robust design • long term maintenance plans	• Disassembly study • Replacement and repair estimates • Scenario modelling demonstrating adaptability • Bill of Materials: Estimated reusable materials (kg/m2) Estimated recyclable materials (kg/m2)
2.2 Design out waste: CD&E waste	• Strategies to minimise CD&E Waste • Preservation of topsoil	• Cut and fill calculations • Buildings as Material Banks information

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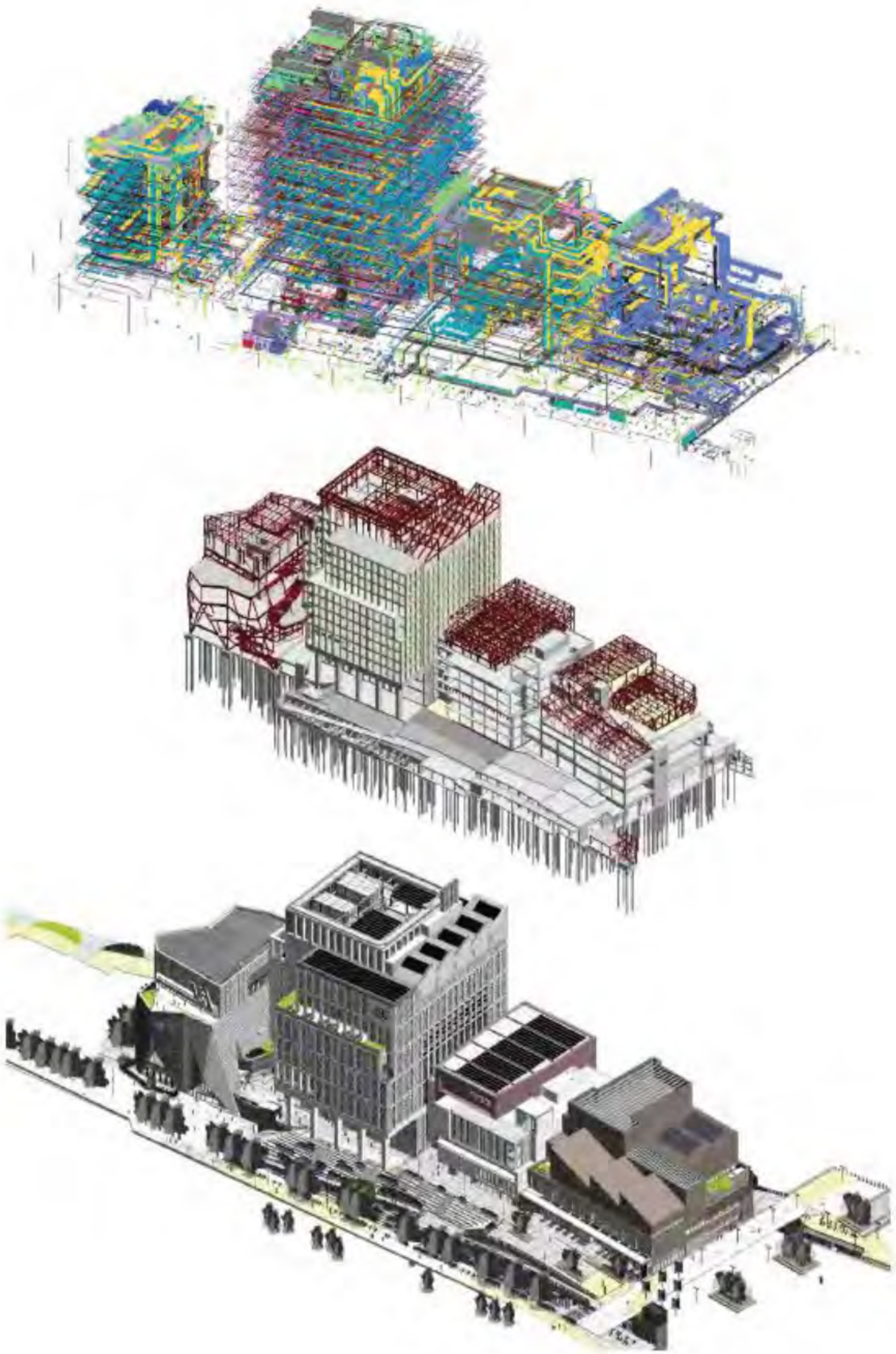
DESIGN FOR DISASSEMBLY

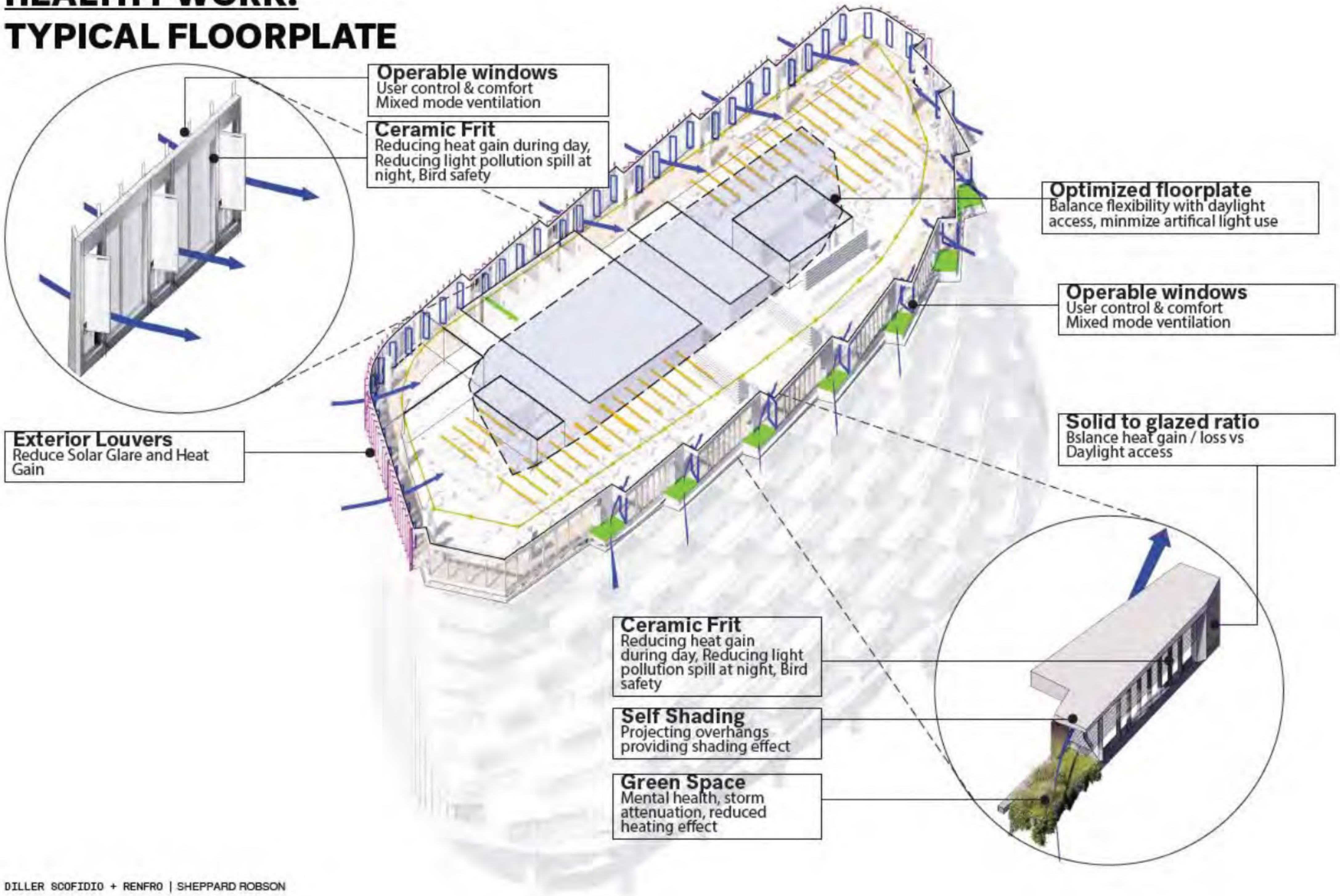
Designed in BIM

- Full inventory of materials
- Traceability of materials
- Materials passport



HEALTHY WORK

HEALTHY WORK:
TYPICAL FLOORPLATE



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DAYLIGHT ASSESSMENT

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Daylighting study

Metrics

A initial daylight glare study has been undertaken to evaluate the performance of the buildings in terms of natural light penetration and potential glare issues. The top and low floor plates of each building have been analysed to illustrate the different daylight levels and glare conditions. Top floors are considered as worst case scenarios in regards of glare and overheating risk.

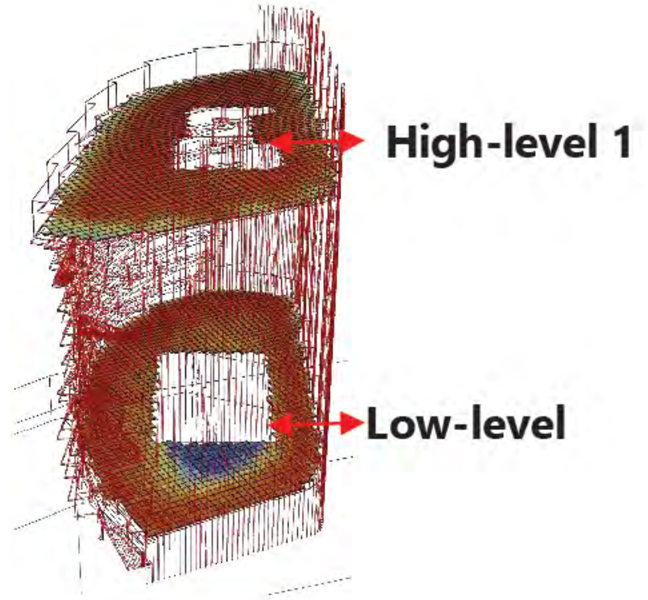
The methodology followed for the analysis was based on the Useful Daylight Illuminance (UDI). Useful Daylight Illuminance (UDI) is defined as the annual occurrence of illuminance across the work-plane that is within a range considered 'useful' by occupants. It is expressed as a percentage of occupied hours. UDI provides a greater detail about daylight distribution.

LOW levels of daylight - Supplementary (UDI-s)	GOOD levels of daylight - Autonomous (UDI-a)	HIGH levels of daylight - Exceeded (UDI-e)
Poor daylight – artificial lighting required <100 lux	Good daylight 100 – 3000 lux	**Excessive daylight – risk of glare and/or overheating** >3000 lux

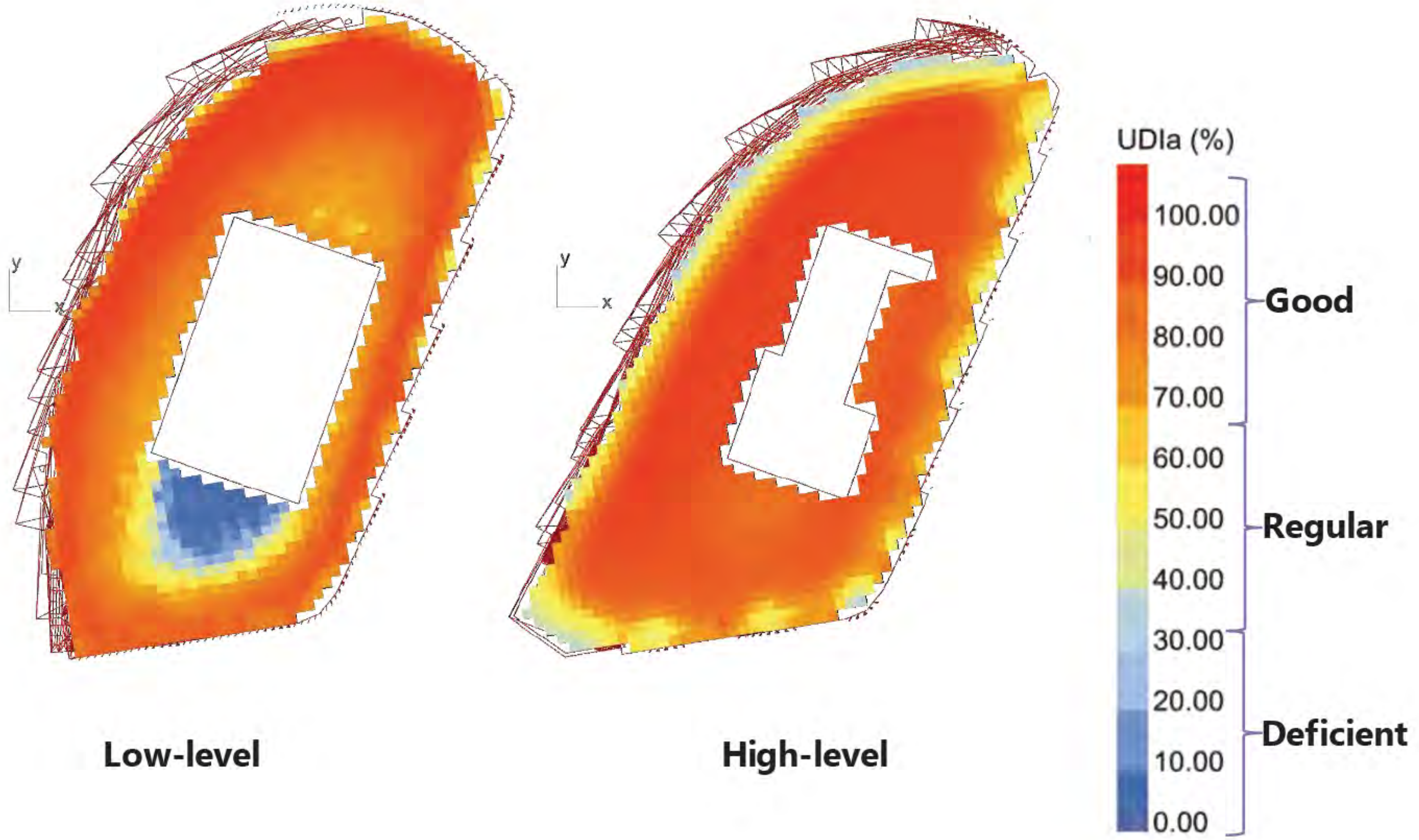
Exceeded (UDI-e) will be used as an initial indicator for glare and overheating risk in both Rotunda and Bastion House buildings.

Daylighting study – Bastion House

Update 2022 12 02



UDIa (autonomous)
% of occupied time between 100 Lux and 3000 Lux



Floor	DF Average %	UDIa Average %
Low level	2.6	74.8
High-level	6.0	77.8

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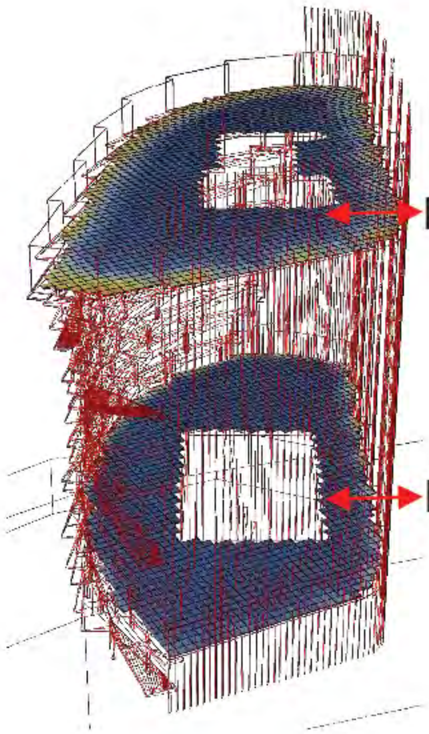
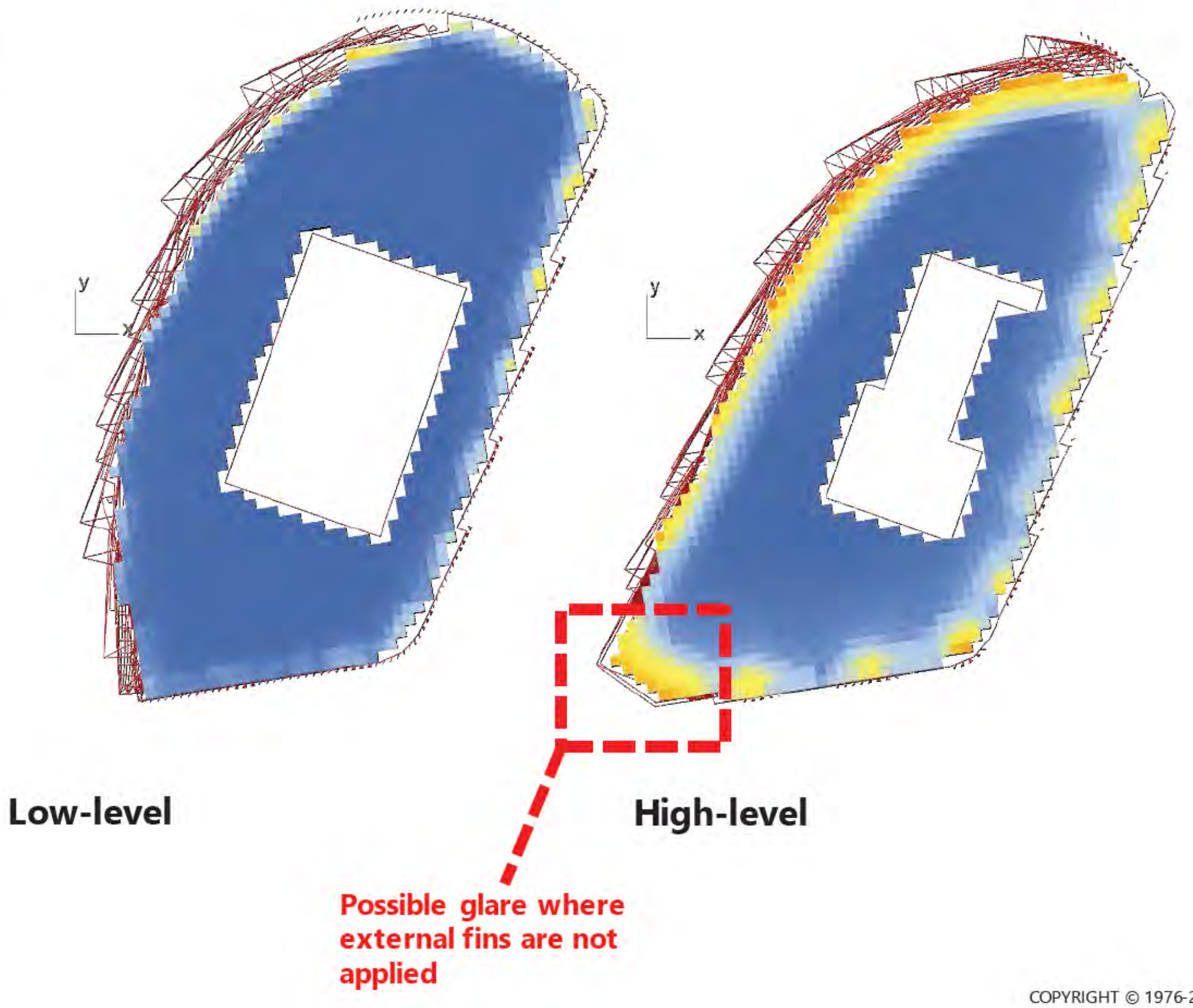
Glare study – Bastion House

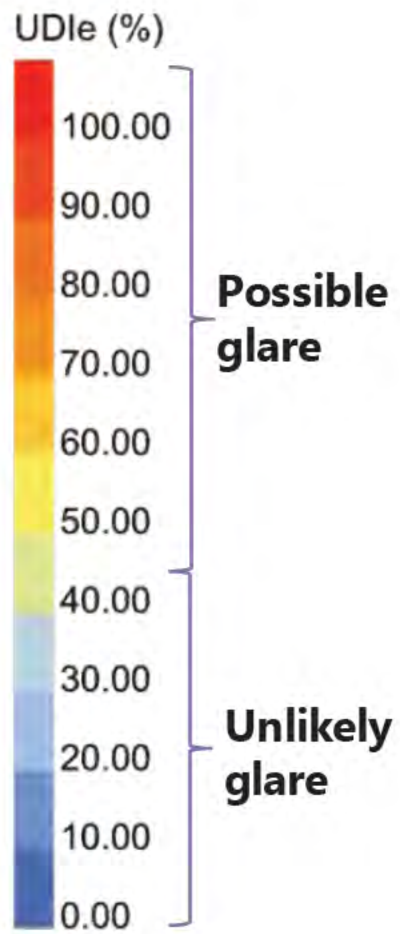
Update 2022 12 02



Floor	UDIe Average %
Low level	3.4
High-level	15

UDIe (exceeded)
% of occupied time above 3000 Lux





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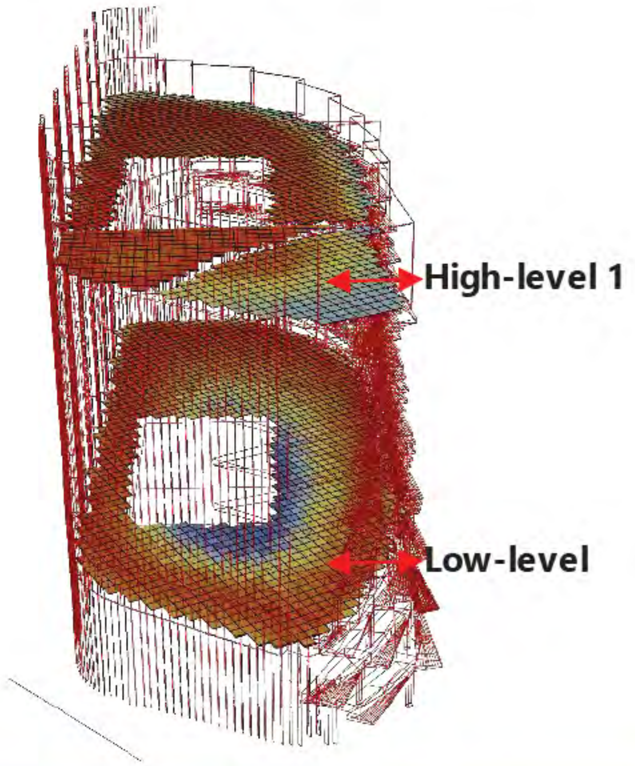
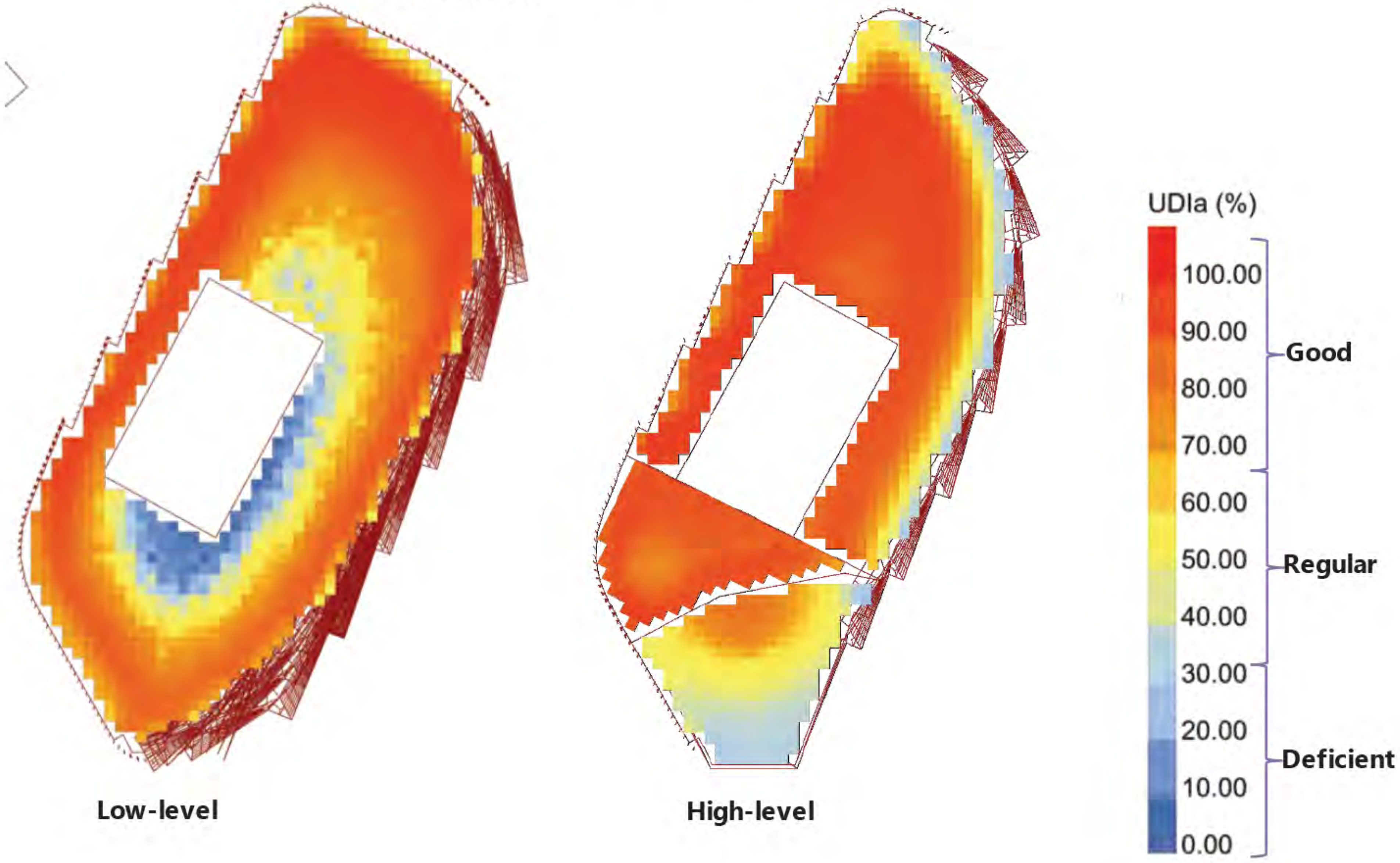
Daylighting study – Rotunda building

Update 2022 12 02



	DF Average %	UDIa Average %
Low level	2.39	69.4
Cultural space	9.3	48.6
Cultural space lobby	3.6	85.1
Office High level	6.4	77.3

UDIa (autonomous)
% of occupied time between 100 Lux and 3000 Lux



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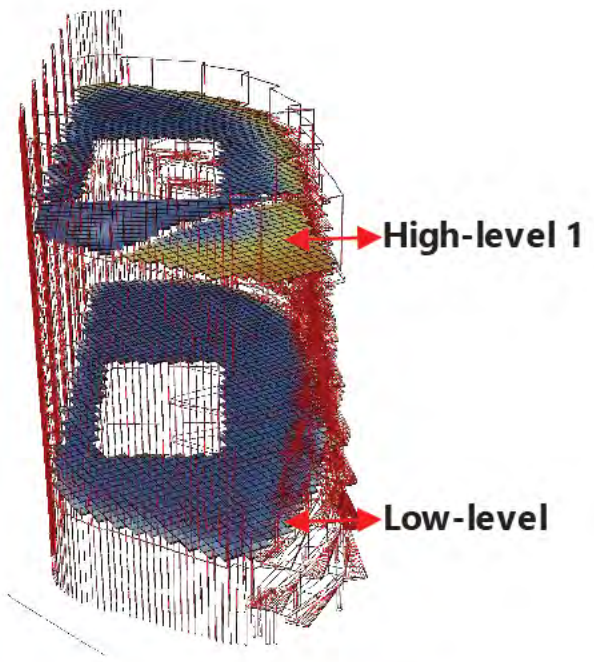
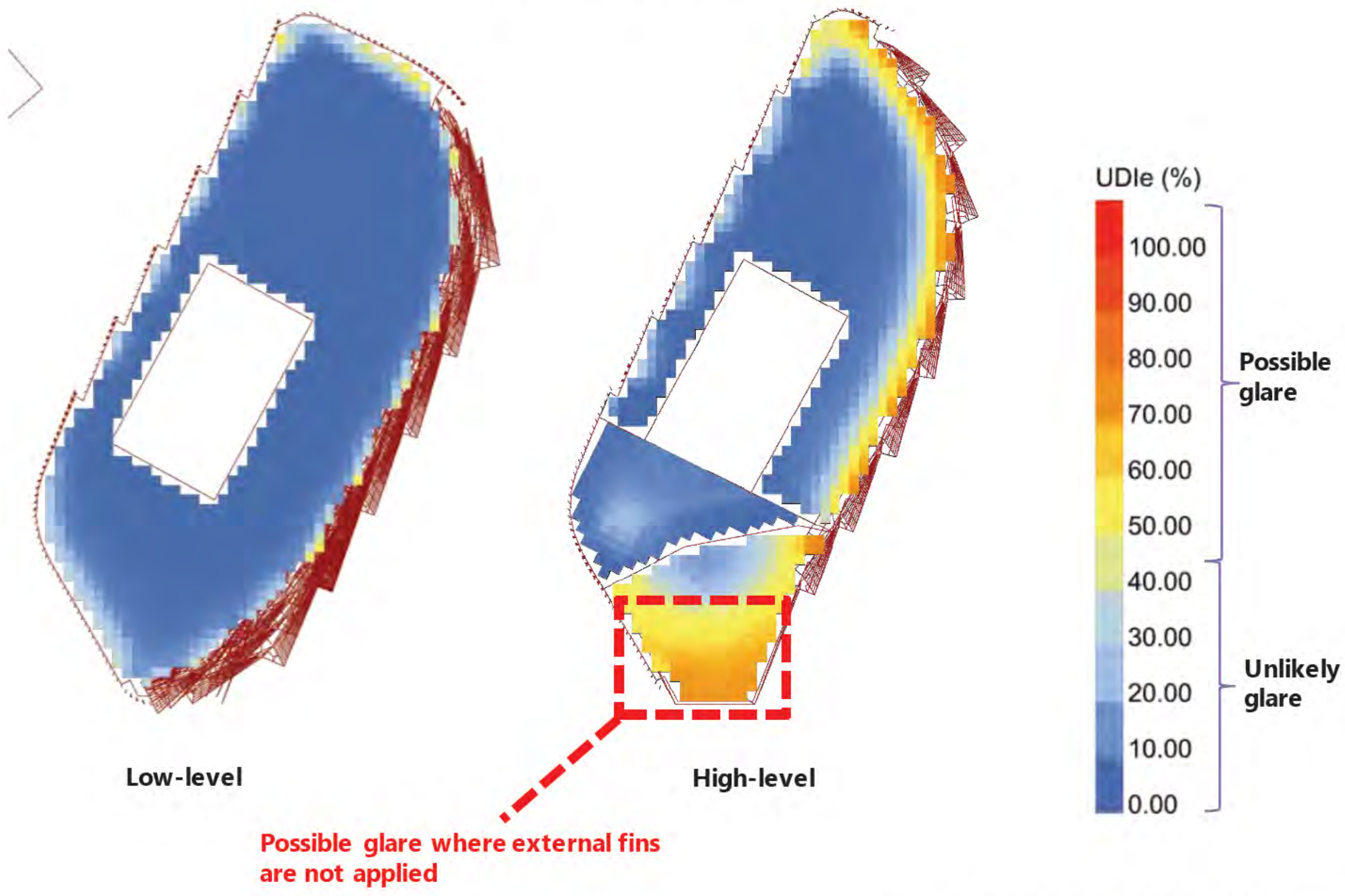
Glare study – Rotunda building

Update 2022 12 02



	UDIe Average %
Low level	3.97
Cultural space	46.9
Cultural space lobby	6.12
Office High level	15.56

UDIe (exceeded)
% of occupied time above 3000 Lux



Conclusions

Bastion House

- Low level, as expected, shows an area with low levels of daylight access, to the south of the core due to the depth of the floor plan. It is recommended to locate spaces with low daylight requirements (meeting rooms) in that area. Glare risk is minimized with the presence of GRC panel on each façade bay.
- High level shows adequate daylight access. There is risk of glare due to the absence of shading on the west façade on that level.
- Daylight results of the floors analysed are compliant with BREEAM He01 credit.

Rotunda Building

- Low level, as expected, shows an area with low levels of daylight access, to the south and east of the core due to the depth of the floor plan. It is recommended to locate spaces with low daylight requirements (meeting rooms) in that area. Glare risk is minimized with the presence of GRC panel on each façade bay.
- High level shows adequate daylight access in the office space and the lobby of the cultural space. There is high risk of glare due to the absence of shading on the south-east façade and the double height glazing on the cultural space.
- Daylight results of the floors analysed are compliant with BREEAM He01 credit. Solar protection in the cultural space south-east façade is recommended.

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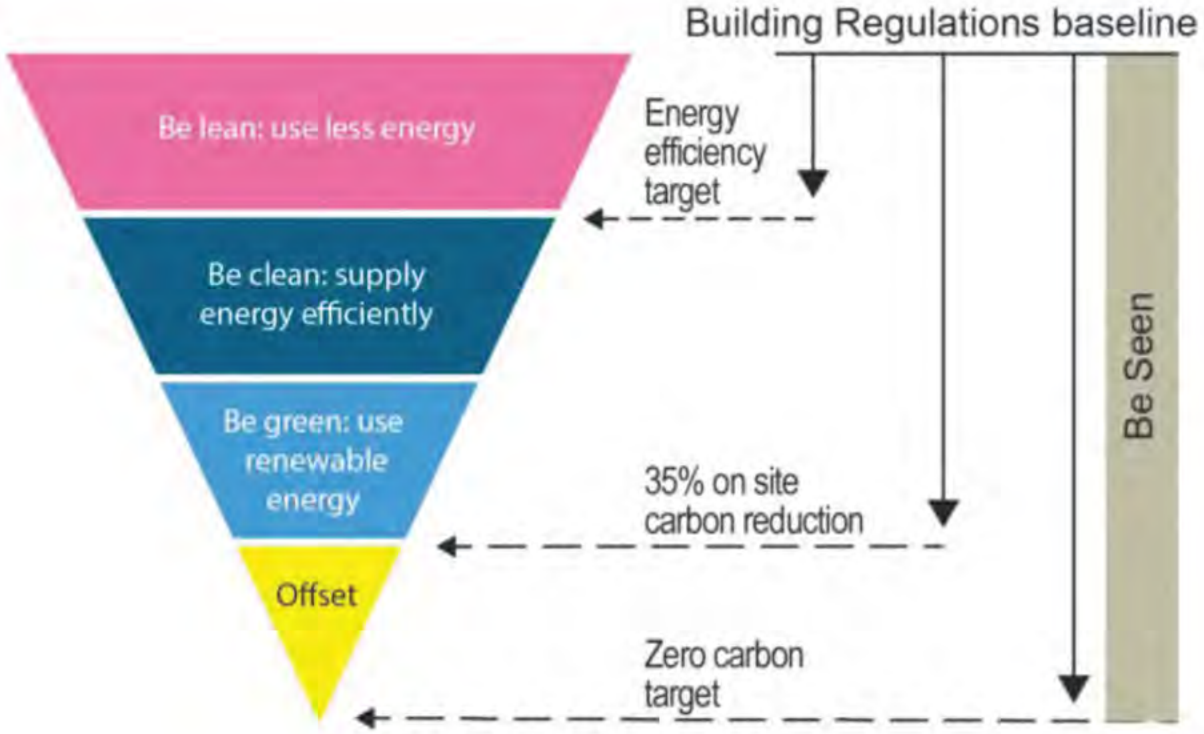
HEAT GAIN/LOSS ANALYSIS

Passive Design

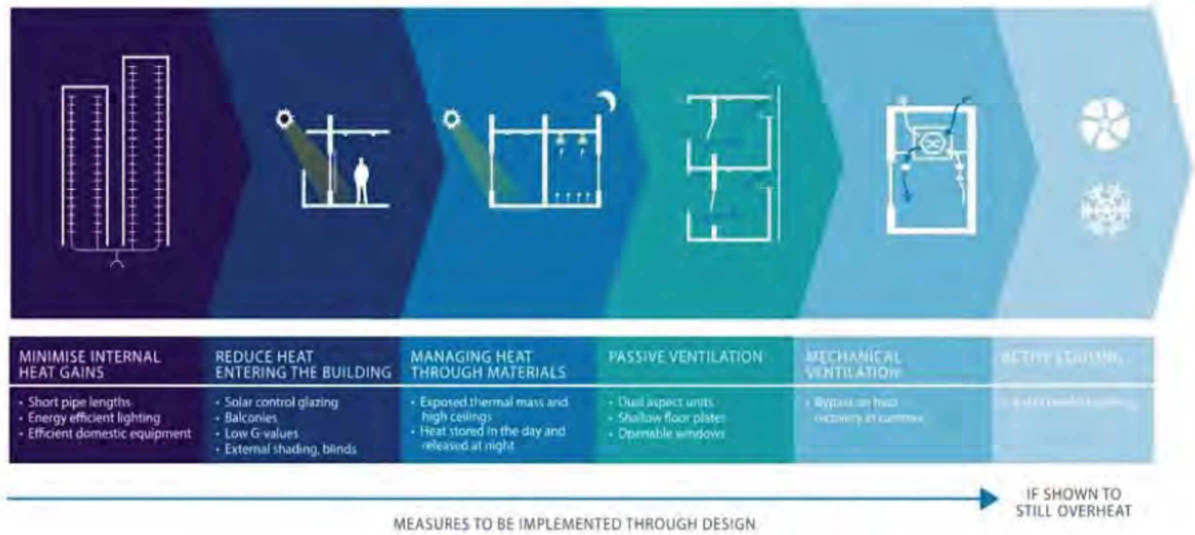
PartL2A New-build:

- 15% for non-domestic from passive measures
- Adopt GLA cooling hierarchy
- Modelling with 2020 weather files
- Optimise daylighting in offices: ADF of 2% and reduce glare risk
- Enhance mixed mode, using a combination of natural and mechanical ventilation
- BREEAM Ene04 credit – Low Carbon Design



Ambitions:

- Exceed 15% target for passive energy
- Exceed ADF of 2% whilst preventing overheating and glare discomfort
- Use modelling to maximise Useful Daylight Illuminance
- 2050 Weather files



PASSIVE SOLAR SHADING

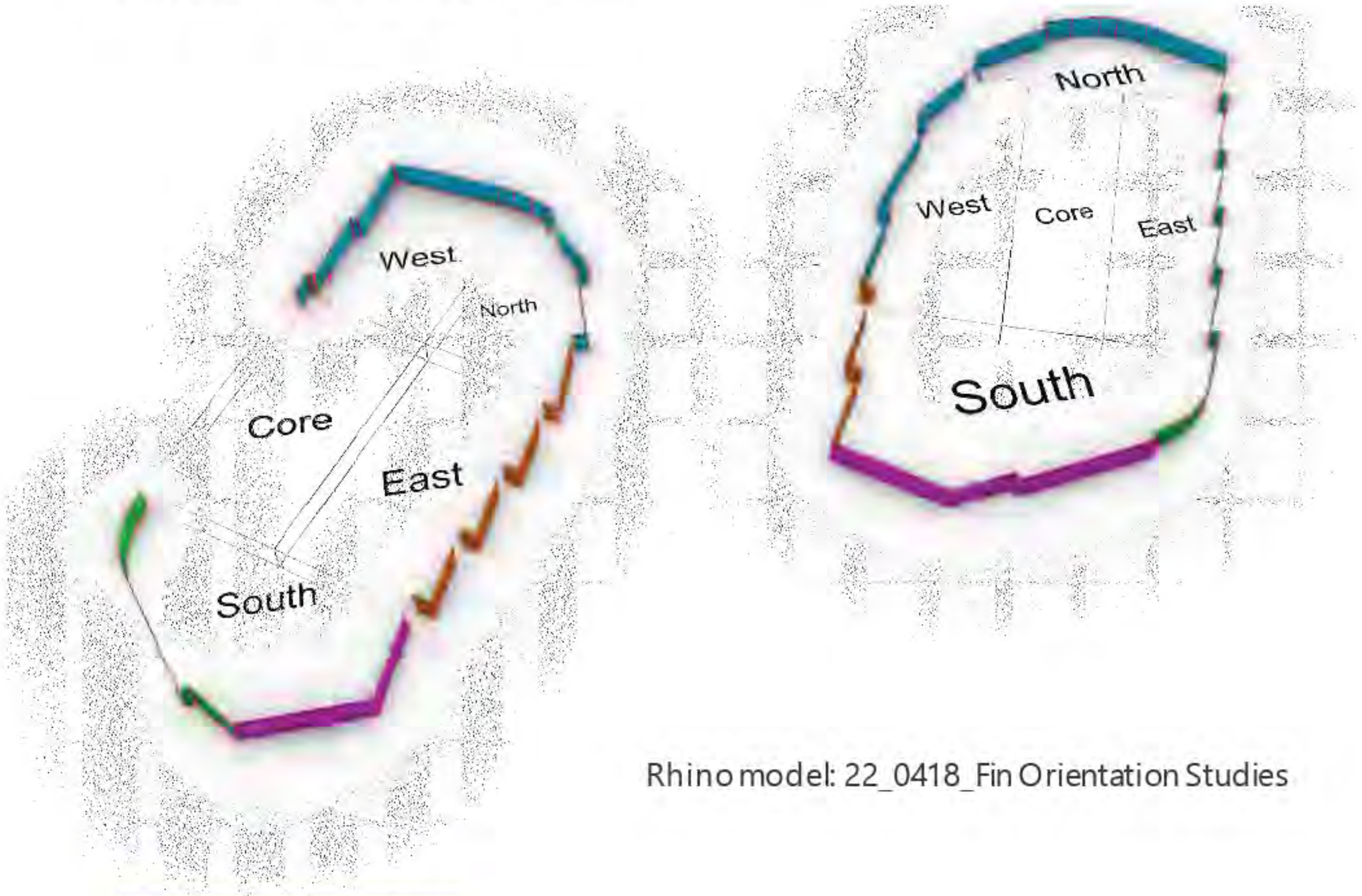
MODELLING SCENARIOS WITH FIN ORIENTATIONS

Modelling input and the solar shading scenarios with fin rotation

Four thermal modelling scenarios have been analysed:

- **Baseline:** No fins
- **Scenario 1:** Fin orientation @90degrees to glazing
- **Scenario 2:** Fin orientation @+45degrees to glazing
- **Scenario 3:** Fin orientation@-45degrees to glazing

Table 1 summarises the thermal properties of glazing to calculate the solar gains and cooling loads.



Rhino model: 22_0418_Fin Orientation Studies

Thermal and solar properties			
Building element	**Inputs**		**Solar transmittance**
External shading orientation	**90**		-
	+45		
	-45		
Glazing	Light transmittance %	**South**	**0.21-0.3**
		South East	**0.3**
		North East	**0.33**
		South West	**0.21**
		North West	**0.33**
		North	**0.33**
Internal Loads for a office open plan	People	0.057	**People/m^2**
	Lighting	6.6	**W/m^2**
	Equipment	7.6	**W/m^2**
	Setpoint	cooling	**24°C**
		heating	**21°C**

Table 1

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IMPACT OF EXTERNAL SHADING ON SOLAR GAINS

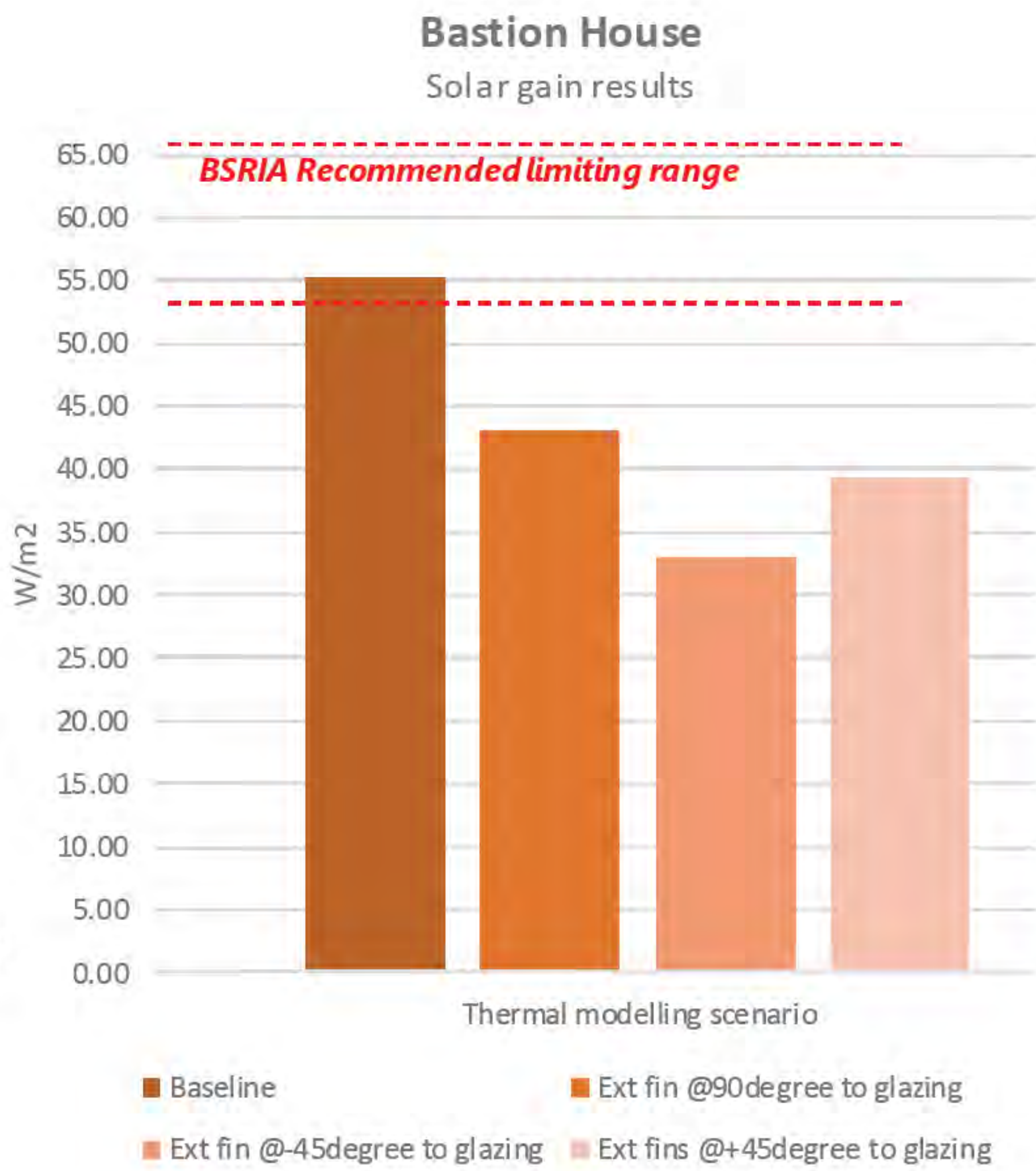
SOLAR GAIN REDUCTION WITH PASSIVE SOLAR SHADING

Table 2_Solar gain reduction with external solar shading
Bastion House - typical open plan office

Thermal Modelling scenario	*Fin rotation*	*Thermal zones with fins*	*Solar gain (W/m2)*	*Solar gain reduction (%)*
Baseline	No fins	South/East/North	55	
Scenario 1	90	South/East/North	43	22%
Scenario 2	-45	South/East/North	33.	40%
Scenario 3	+45	South/East/North	39	29%

Scenario 2 with external fins rotation at-45degree to glazing showed 40% reduction in solar gains.

Solar gain reduction with external fins rotation@-45degree is noticeable by occupants and minimise overheating risk.



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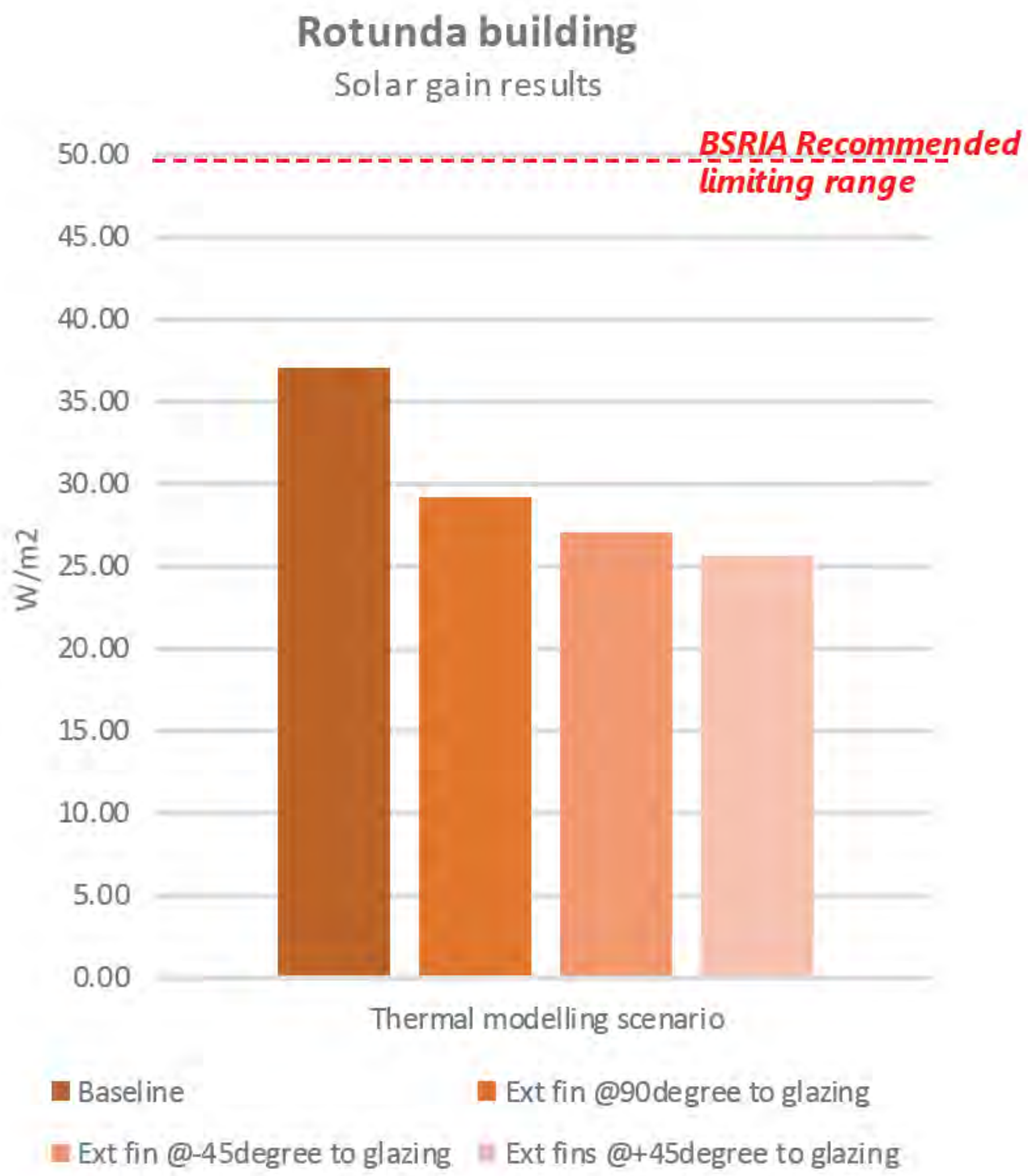
SOLAR GAIN REDUCTION WITH PASSIVE SOLAR SHADING

Table 3_Solar gain reduction with external solar shading
Rotunda building – typical open plan office

Thermal Modelling scenario	*Fin rotation*	*Thermal zones with fins*	*Solar gain (W/m2)*	*Solar gain reduction (%)*
Baseline	No fins	South/West	37	
Scenario 1	90	South/West	29	21%
Scenario 3	-45	South/West	27	27%
Scenario 1	+45	South/West	25	31%

Scenario 3 with external fins rotation at +45degree to glazing showed 31% reduction in solar gains.

Solar gain reduction with external fins rotation@+45degree is noticeable by occupants and minimise overheating risk.



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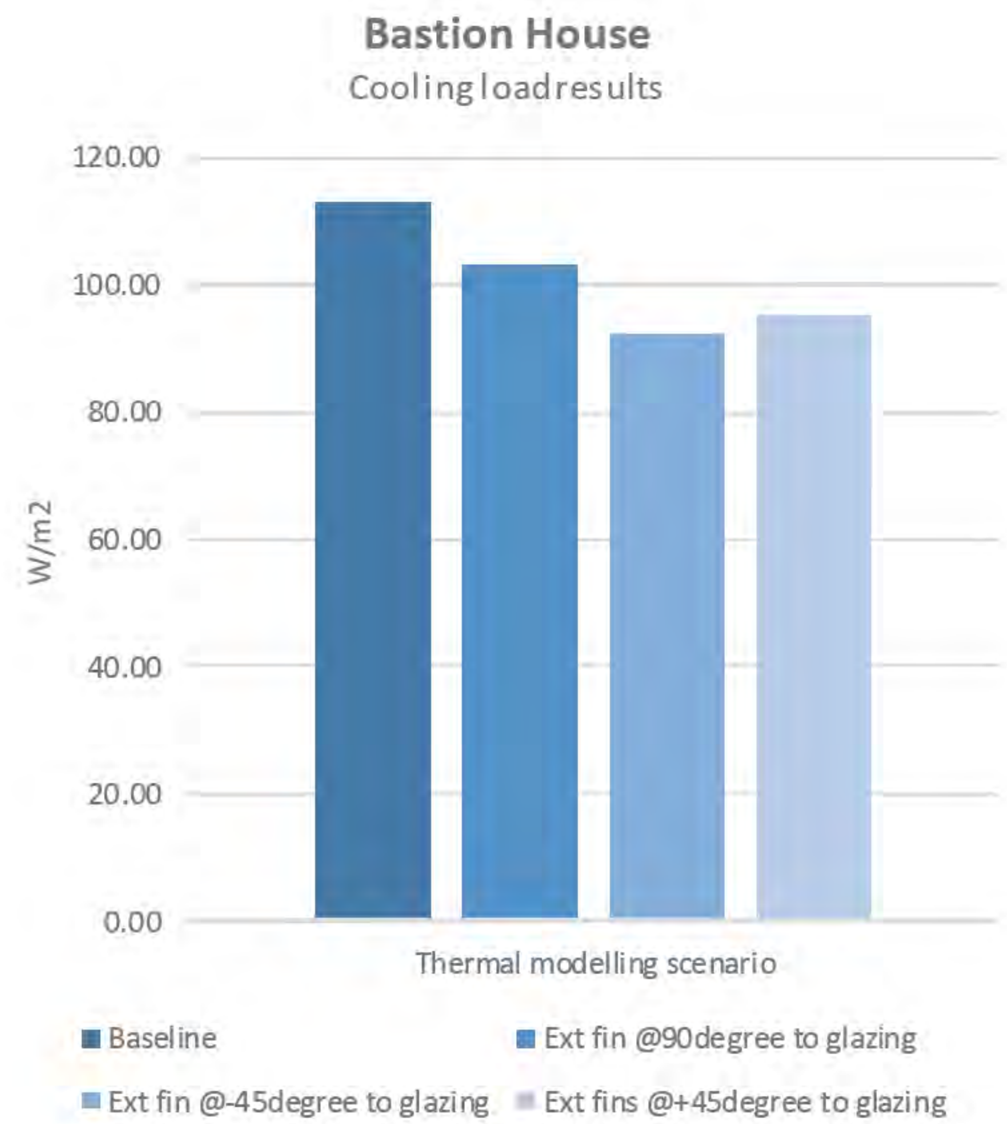
IMPACT OF EXTERNAL SHADING ON COOLING LOADS

COOLING LOAD REDUCTION WITH PASSIVE SOLAR SHADING

Table 4_Cooling load reduction with external solar shading
Bastion House - typical open plan office

Thermal Modelling scenario	***Fin rotation***	***Thermal zones with fins***	***Cooling load (W/m2)***	***Cooling load reduction (%)***
Baseline	No fins	South/East/North	113	
Scenario 1	90	South/East/North	103	**9%**
Scenario 2	-45	South/East/North	92	**18%**
Scenario 3	+45	South/East/North	95	**16%**

Scenario 2 with external fins rotation at -45degree to glazing showed 18% reduction in cooling loads.

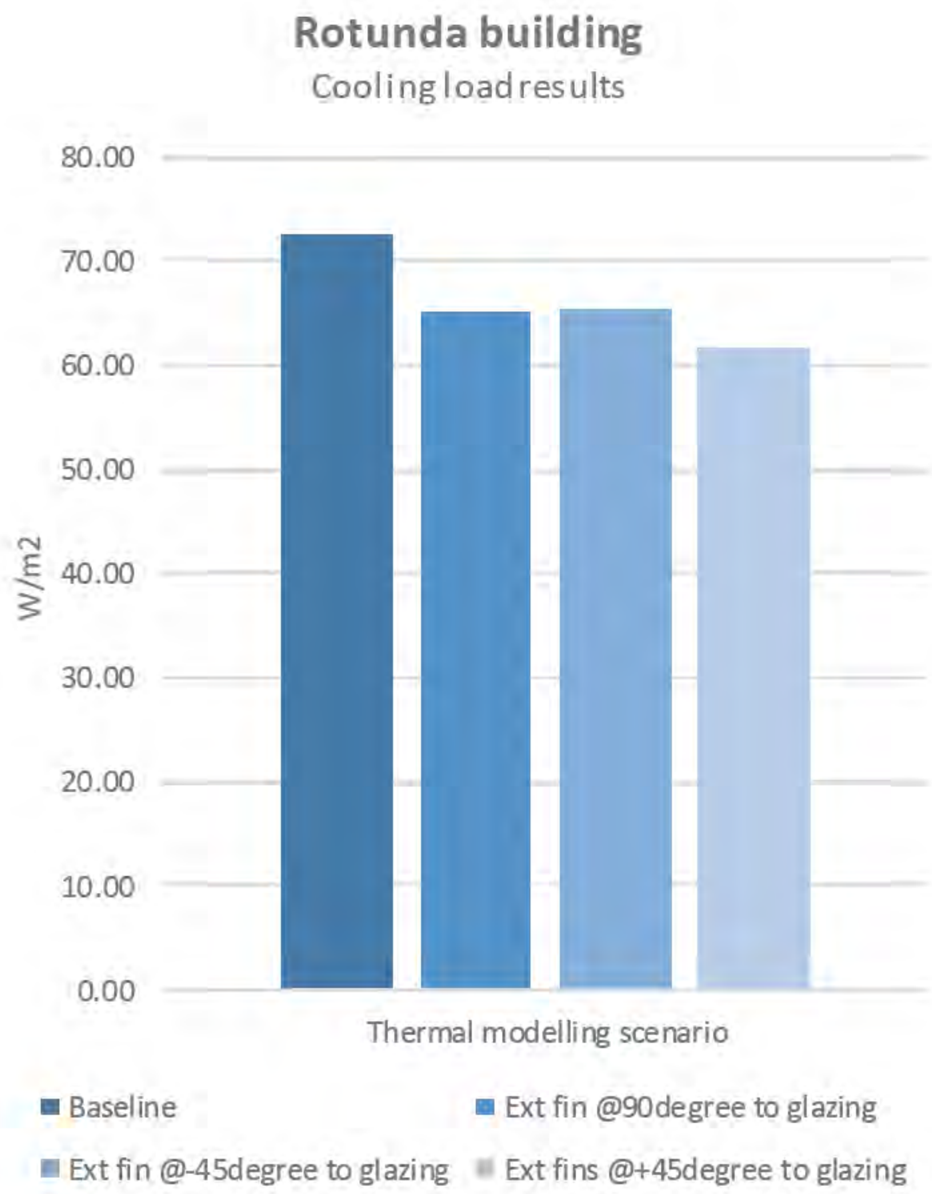


Cooling load reduction with passive solar shading

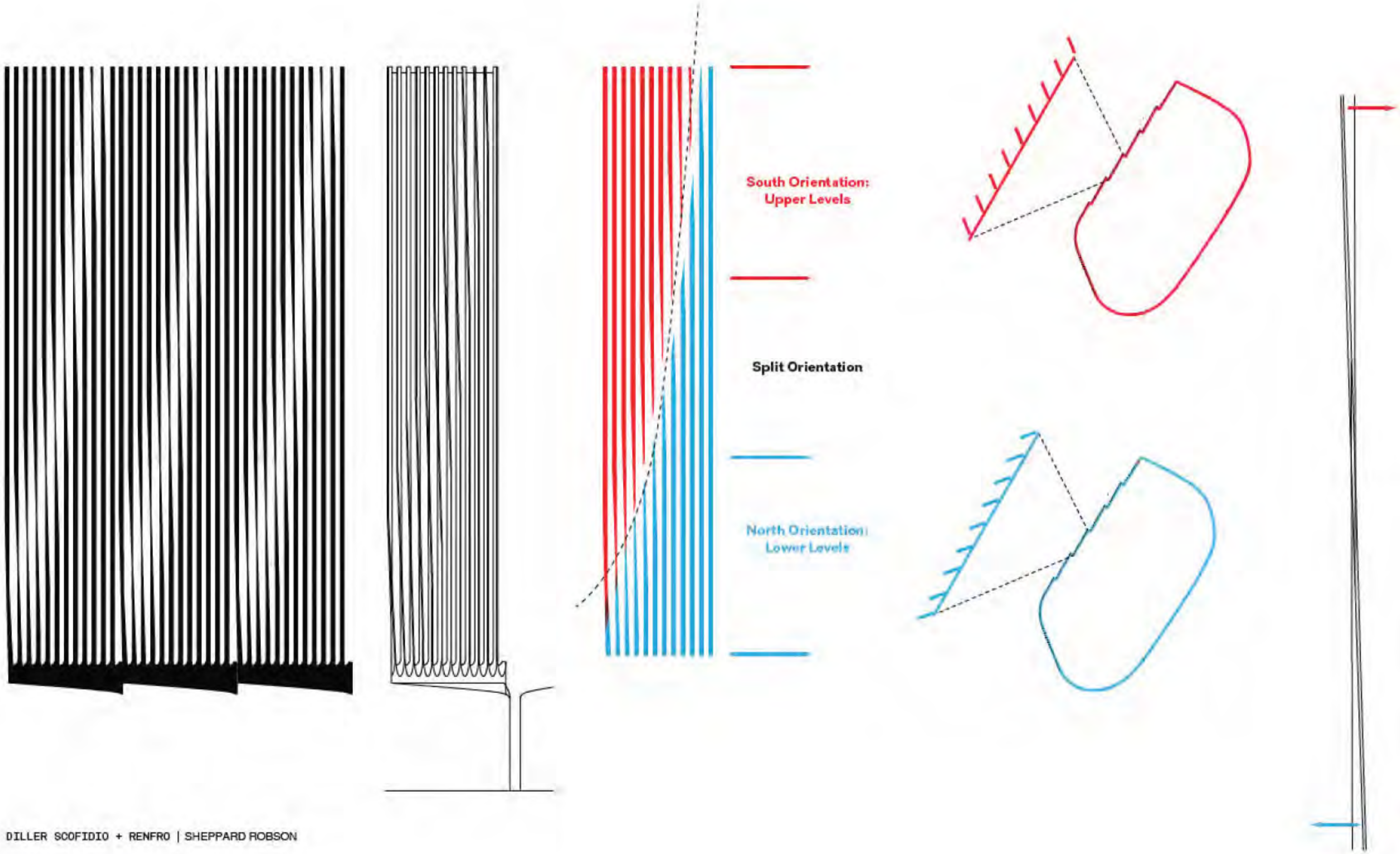
Table 5_Cooling reduction with external solar shading
Rotunda building – typical open plan office

Thermal Modelling scenario	*Fin rotation*	*Thermal zones with fins*	*Cooling load (W/m2)*	*Cooling load reduction (%)*
Baseline	No fins	South/West	73	
Scenario 1	90	South/West	65	10%
Scenario 2	-45	South/West	65	10%
Scenario 3	+45	South/West	61	15%

Scenario 3 with external fins rotation at +45degree to glazing showed 15% reduction in cooling loads.



Husk Louver Orientation



DILLER SCOFIDIO + RENFRO | SHEPPARD ROBSON

MIXED MODE VENTILATION & OPERATIONAL ENERGY SAVINGS

Comparison of energy saving with hybrid ventilation system

Table 2

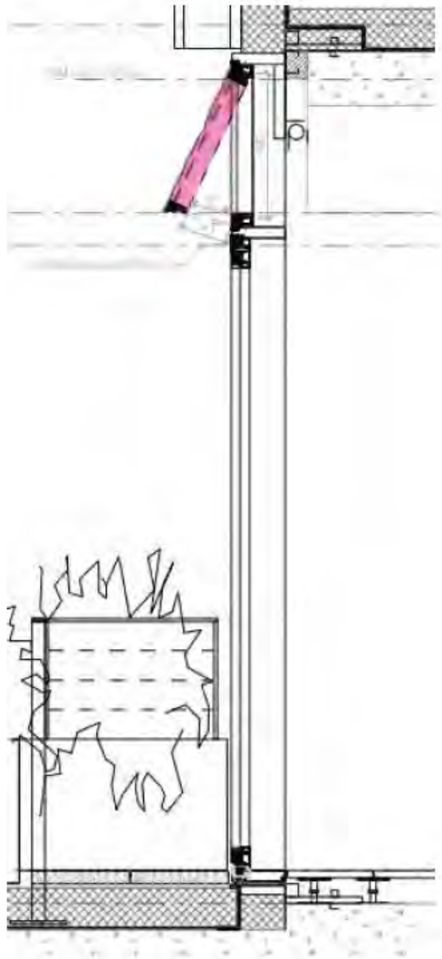
Representative open plan office – Bastion House (Level 06)				
Option	**Indicative annual electrical consumption typical floor (MWh)**	**Annual energy savings (%)**	**Improvement[3]**	**Comments**
Base case – (Façade with no openings)	26.2 MWh	-	-	Fully sealed façade as worst case scenario in terms of higher comfort cooling and fan energy
Scenario 1 (pink vents above the door)[4]	22.8 MWh	**13%** (energy reduction from base scenario)	Moderate	*Internal or external balustrade in terms of energy calculations has a negligible impact.*
Scenario 2 (Orange side-hung doors)	22.4 MWh	**15%** (energy reduction from base scenario)	Moderate	*Internal or external balustrade in terms of energy calculations has a negligible impact.*
Scenario 3 (façade with green openings and fins)	24.3 MWh	**7%** (energy reduction from base scenario)	Low	The result demonstrated low saving with introducing the narrow 32 vents. The study demonstrated the air flow entering in the room is limited due to external fins and due to a constrained front clearance free ventilation area also obstructed by the fins.

[3] Mixed mode ventilation improvement through provision of openable windows within the main office spaces to minimise the need for comfort cooling and to reduce the mechanical ventilation fan power.
[4] The pink vents above the door are an adequate solution to reduce comfort cooling and fan energy without including the doors below based on the assessment.

The energy saving results are not cumulative, each scenario includes exclusively one type of window as described in table 2 to understand the comparable energy reduction against a fully sealed façade solution.

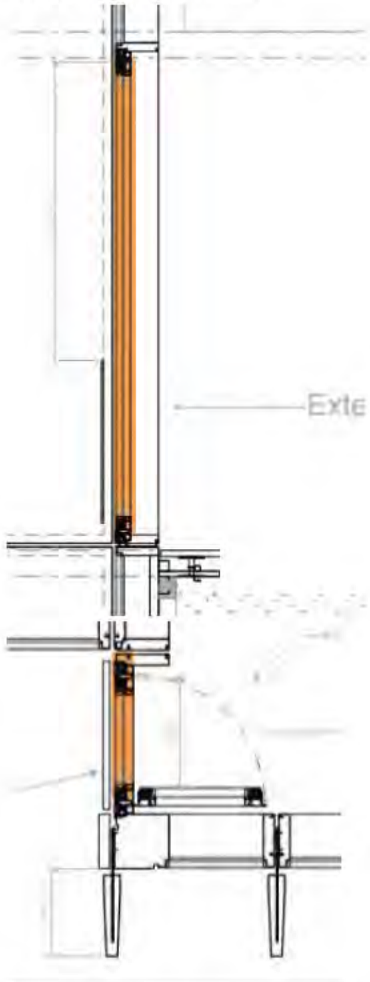
Bastion House – façade and openable vent optioneering

Scenario 1



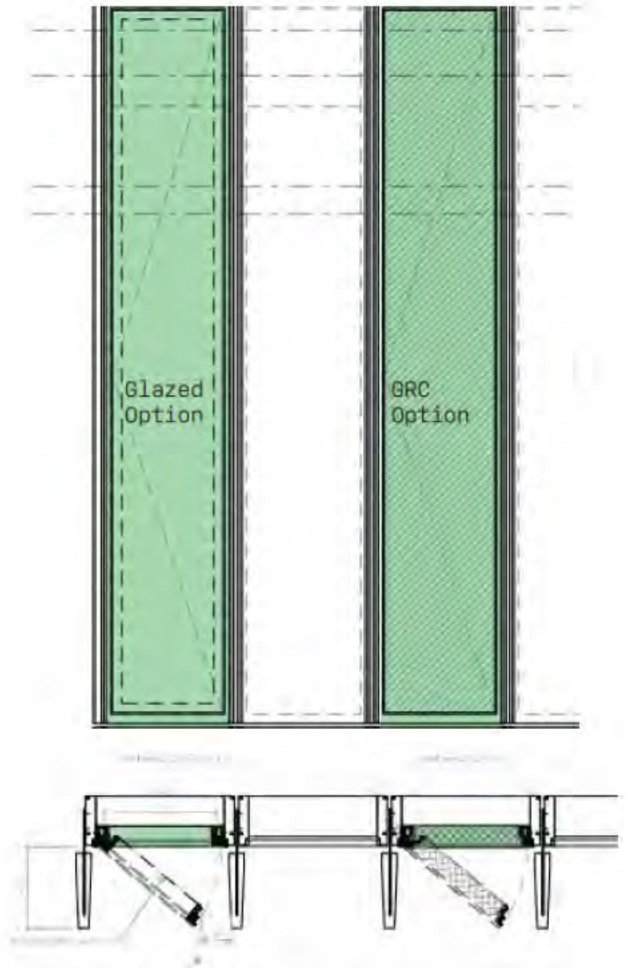
- Vent size: 740x1295mm
- Restrictor length 210mm
- Total free area: 0.30sqm
- Top hung/Outward opening

Scenario 2



- Vent size: 560x2705mm
- Restrictor length: 211mm
- Total free area: 0.86sqm
- Side hung/Inward opening @90deg

Scenario 3



- Vent size: 630x3890mm
- Restrictor length: 135mm
- Fin depth: 400mm
- Front clearance: 0.567sqm
- Side hung/outward opening

Hybrid ventilation system

- In this study, the potential of hybrid system in providing thermal comfort for workers is assessed for the present weather file TRY_2020High50, and its electricity energy consumption is predicted.
- Mixed mode ventilation with openable façade vents have been simulated to estimate the % energy saving.
- Cooling and heating supplied by terminal units assumed in core zones, auxiliary ventilation assumed 15 l/s/p
- Internal loads across open plan offices are based on BCO 2019, with a total load of 35 (W/m² NIA)*
- A representative typical open plan office of Bastion House is assessed.

* Occupancy based on 1 per 8m², and assuming lighting power density 6 W/m² and small power 80W per workstation

Heating		
Fuel	-	electricity
Generator (Bastion House)	-	ASHP - Air to Air Heat Pump
Heating Seasonal Efficiency	Kw/Kw	3.2
Heat Recovery	%	80
Emitter Supply air diffuser	°C	Winter set-point 20°C
LTHW Pumping	-	Variable pumping flow rate
Cooling		
Fuel	-	electricity
Generator	-	Air cooled chillers
Cooling Seasonal Efficiency	Kw/Kw	4.6
Emitter Supply air diffuser	°C	Summer set-point 26°C
Fan coil units - SFP	W/l/s	0.3
Ventilation		
AHU system		Centralised full fresh air
Office infiltration	ach	Summer: 0.05 Winter: 0.10
Office Mechanical Ventilation	l/s/p	15
Central AHU SFP	W/l/s	1.6
Heat Recovery Efficiency	%	85%
Vent. Control	-	Valves on floor, temp and CO2 sensors on floor
Ventilation strategy	-	Hybrid ventilation strategy

Table 3

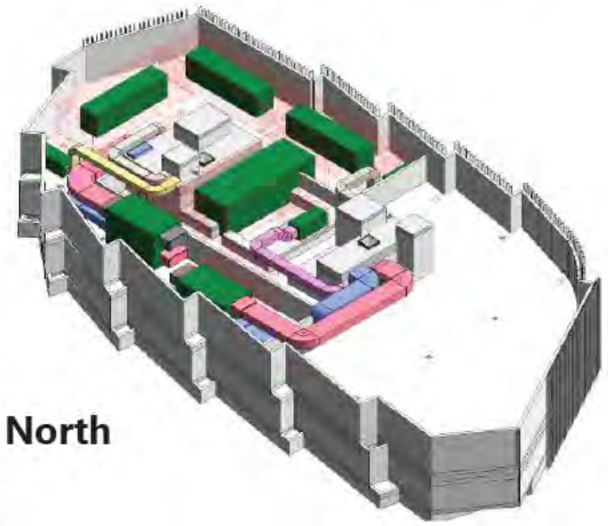
Summary table – Operational Energy Savings with Hybrid Ventilation of a typical open plan office

Table 8

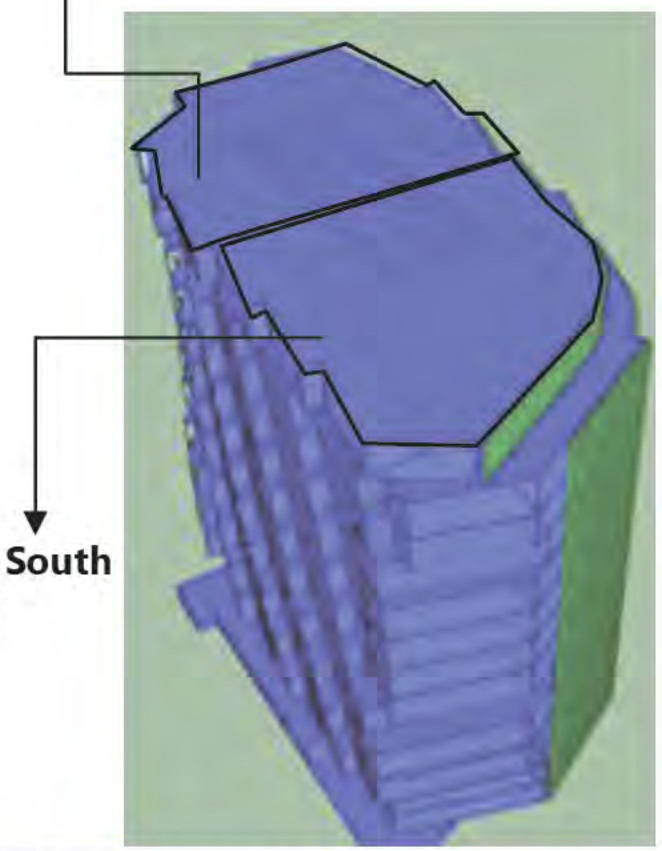
Representative open plan office – Bastion House (Level 06)				
Scenario	**Indicative annual electrical consumption typical floor (MWh)**	**Annual energy savings (%)**	**Improvement**	**Comments**
Base case – (Façade with no openings)	26.2 MWh	-	-	Fully sealed façade as worst case scenario in terms of higher comfort cooling and fan energy
Scenario 1 (pink vents above the door)	22.8 MWh	**13%** (energy reduction from base scenario)	Moderate	*Internal or external balustrade in terms of energy calculations has a negligible impact.*
Scenario 2 (Orange side-hung doors)	22.4 MWh	**15%** (energy reduction from base scenario)	Moderate	*Internal or external balustrade in terms of energy calculations has a negligible impact.*
Scenario 3 (façade with green openings and fins)	24.3 MWh	**7%** (energy reduction from base scenario)	Low	The result demonstrated low saving with introducing the narrow 32 vents. The study demonstrated the air flow entering in the room is limited due to external fins and due to a constrained front clearance free ventilation area also obstructed by the fins. 

HVAC model assumptions – Bastion House and Rotunda

Full load ASHP and centralised ventilation



AHU 1 North offices



AHU 2 South offices

	Units	System (Bastion House)	System (Rotunda building)
NCM System	-	Centralised full fresh air (15 l/s/p)	Centralised full fresh air (15 l/s/p)
Heating			
Fuel	-	electricity	electricity
Generator	-	ASHP	ASHP
Emitter	-	Trench heaters/Supply Air diffuser/Rads BoH	Trench heaters/Supply Air diffuser/Rads BoH
Heating SCOP	Kw/Kw	SCOP 3.2	SCOP 3.2
LTHW Pumping	-	Variable pumping flow rate	Variable pumping flow rate
Cooling			
Fuel	-	electricity	electricity
Generator	-	Chillers	Chillers
Emitter	-	Supply air diffuser	Supply air diffuser
Cooling Seasonal Efficiency	Kw/Kw	**SEER 4.6 (only cooling mode)**	**SEER 4.6**
Terminal Unit SFP	W/l/s	**0.25 for fan coil units**	**0.25 for fan coil units**
System control	-	Central Time control	Central Time control
		Optimum start/stop control	Optimum start/stop control
		Local temperature control	Local temperature control
		Weather Compensation Control	Weather Compensation Control
System metering	-	Extensive to meet BREEAM outstanding credits, all mech plant, and all floors for tenants anyway.	
Ventilation			
AHU system		centralised system	centralised system
Local extract rate	ACH	4 ach for BoH and 6 ach for WC	4 ach for BoH and 6 ach for WC
Central AHU SFP	W/l/s	**1.6**	**1.6**
Heat Recovery Efficiency	%	85% typically, we can push for even higher from good manufacturers	
Duct air leakage standard	-	DW 144 < 3%	
AHU air leakage standard	-	DW 144 < 3%	
Vent. control	- -	temp and CO_2 sensors on floor	

SEER Chiller 5.5

SFP < 0.15

SFP 1.2

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New-build operational energy prediction – interim results

Summary table

Bastion House and Rotunda	
Energy End Use	New-build kWh/m2
Chilled Water Production	9.8
Hot Water: Energy used by heat generators for space heating or imported hot water for space heating	30.6
Domestic Hot Water (heating, trace heating, and pumping)	4.6
Fan & pumps energy	4.1
Landlord and tenant area lighting (exclude car parks)	11.1
Landlord and tenant area power	33.4
Lifts (excluding lift motor room ventilation and cooling)	5.2
Total Energy all end uses	**99**

RENEWABLES

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Renewable Energy

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BREEAM

Minimum Requirements by BREEAM Rating Level

Step change credits to achieve Excellent

Step change credits to achieve Outstanding

BREEAM Item	Very Good	Excellent	Outstanding
Man 03 Responsible construction practices	None	One credit (responsible construction management)	Two credits (responsible construction management)
Man 04 Commissioning and handover	One credit (commissioning-test schedule and responsibilities)		
Man 04 Commissioning and handover	Criterion 11 (Building User Guide)		
Man 05 Aftercare	None	One credit (commissioning-implementation)	
Ene 01 Reduction of energy use and carbon emissions	None	Four credits (Energy performance or Prediction of operational energy consumption*)	Six credits (Energy performance) and Four credits (Prediction of operational energy consumption*)
Ene 02 Energy monitoring	One credit(First sub-metering credit)		
Wat 01 Water consumption	One credit		Two credits
Wat 02 Water monitoring	Criterion 1 only		
Mat 03 Responsible sourcing of construction products	Criterion 1 only		
Wst 01 Construction waste management	None		One credit
Wst 03 Operational waste	None	One credit	

Influenced by design

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Current BREEAM Strategy

- **Targeted credits - Baseline** – These credits included requirements that are either inherent in the site or align with industry standard practice, as well as those agreed by the project team.
- **Targeted credits – Medium Risk** – To achieve a Outstanding rating all of the additional medium risk credits need to be targeted. These are credits that are recommended for the project but can be technically challenging and require careful management.
- **Potential Credits** – These credits are technically challenging and are currently outside the scope of the development, however some of the credits could be targeted at a later stage.

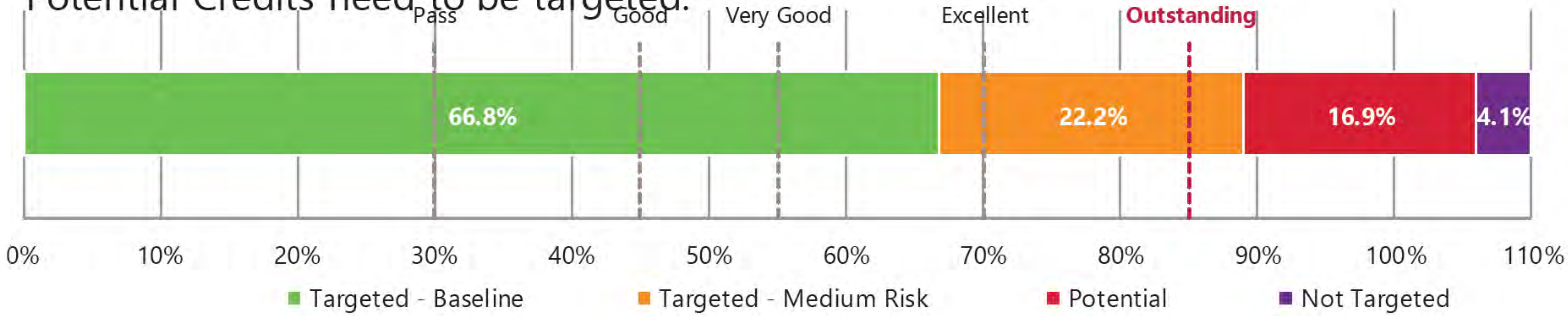
BREEAM SCORE SUMMARY						
	Offices – Shell & Core		Assembly & Leisure – Shell Only		Retail – Shell Only	
MINIMUM REQUIRED	85.00%	Outstanding	85.00%	Outstanding	85.00%	Outstanding
TARGETED - BASELINE	66.8%	Very Good	66.4%	Very Good	63.2%	Very Good
TARGETED - MEDIUM RISK	89.0%	Outstanding	91.0%	Outstanding	86.0%	Outstanding
POTENTIAL	105.9%	Outstanding	102.0%	Outstanding	102.0%	Outstanding

London West Wall- BREEAM NC 2018- Office - Shell and Core

- BREEAM Outstanding is currently being targeted through Baseline/ Medium risk credits (89.4%) for the Assessment 1 (Office Shell and Core).
- A safety margin of 5% is required above the 85% required for an 'Outstanding' rating, to allow for credits lost during construction. Therefore some additional Potential Credits need to be targeted.

BREEAM New Construction Ratings Benchmarks

>30%	PASS	★☆☆☆☆
>45%	GOOD	★★☆☆☆
>55%	VERY GOOD	★★★☆☆
>70%	EXCELLENT	★★★★☆
>85%	OUTSTANDING	★★★★★



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NABERS UK

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NABERS UK – Rating
LWW high-level preassessment

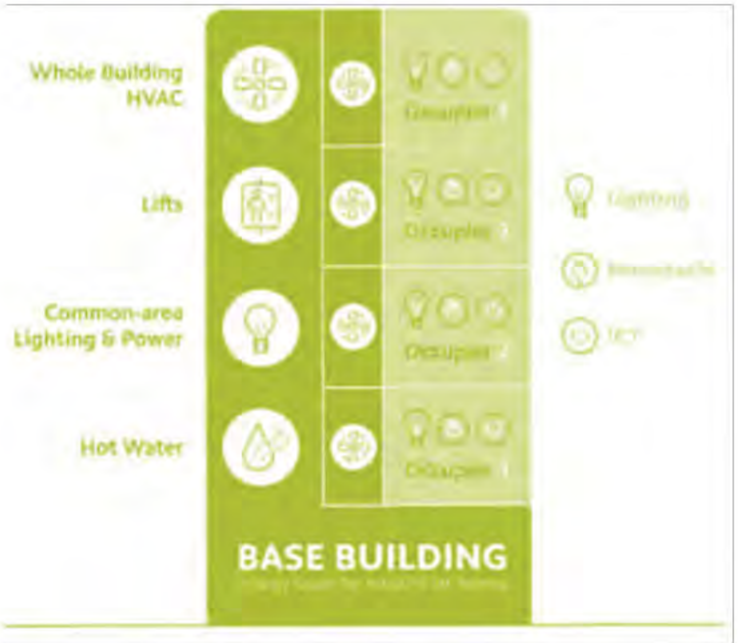


Table 1: Energy performance targets for buildings targeting net zero carbon for operational energy

		Interim Targets			Paris Proof Target
Scope	Metric	2020-2025	2025-2030	2030-2035	2035-2050
Whole building energy	kWh_e/m^2 (NLA) / year	160	115	90	70
	kWh_e/m^2 (GIA) / year	130	90	70	55
	DEC rating	D90	C65	B50	B40
Base building energy	kWh_e/m^2 (NLA) / year	90	70	55	35
	kWh_e/m^2 (GIA) / year	70	55	45	30
	NABERS UK star rating	4.5	5	5.5	6
Tenant energy	kWh_e/m^2 (NLA) / year	70	45	35	35

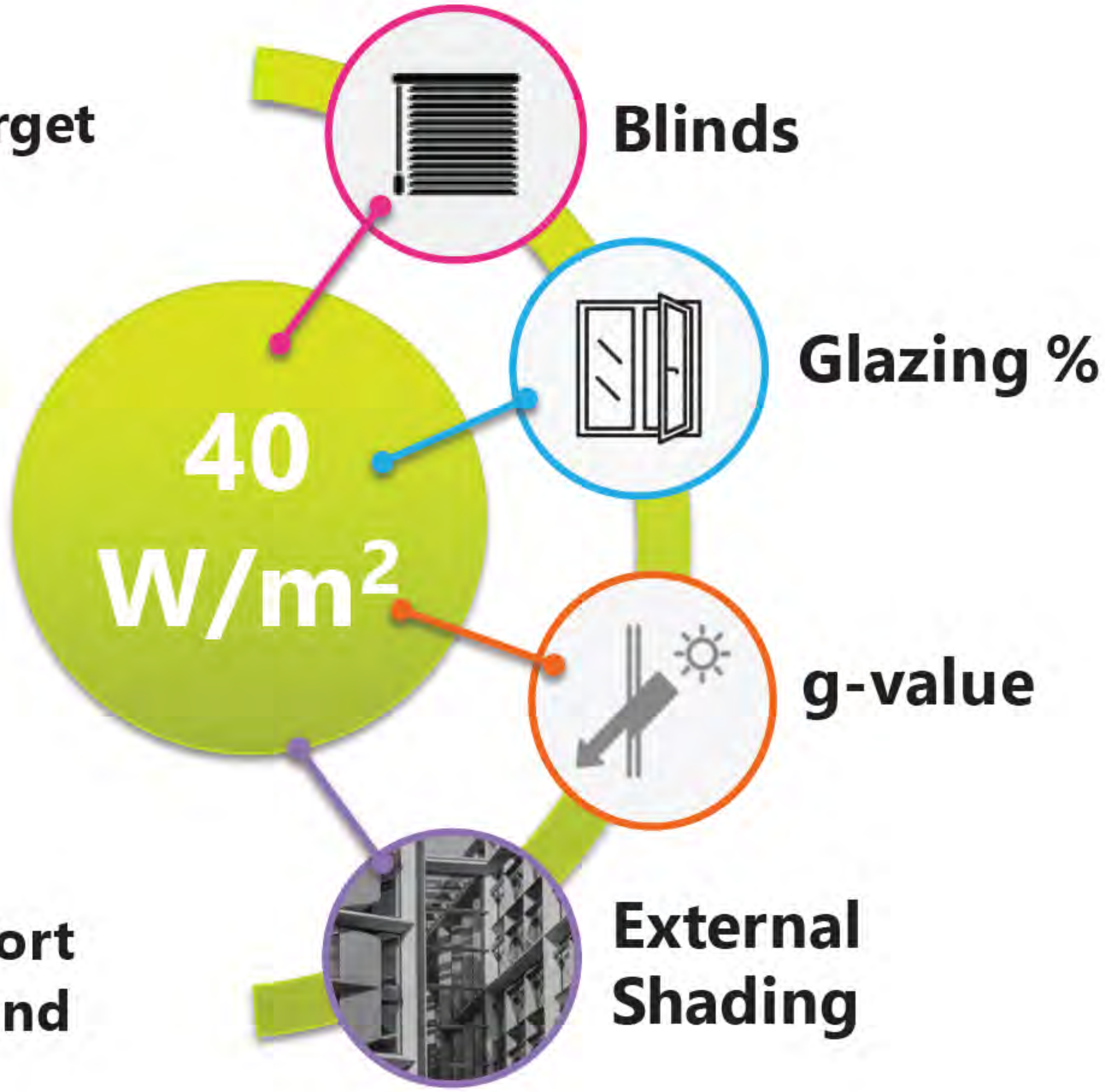
NLA = net lettable area GIA = gross internal area

Architectural Implications

Solar Gain Target

\+

Daylighting
View out
Thermal comfort
Heating Demand



Actions:

Design being optimised for compliance with solar gain target of max 40 W/m2.

Strategies being considered:

- Optimise façade fin rotation
- Analyse solar Factor of glass (providing compliance with WELL requirements on VLT)

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WELL

WELL standard

The development aims to achieve a 'WELL-enabled' status through adopting the WELL strategies for the shell and core aspect of the development.

The WELL Standard is a comprehensive scheme that requires intervention at the design, fit-out and operational stages.

As the end user of the office spaces is currently unknown, the development adopts a 'WELL-enabled' approach in aims to be WELL-ready, if the future tenant(s) choose to pursue the full WELL certification. All preconditions and design-inherent strategies that would require early design stage intervention have been assessed

Preassessment status

	Yes	Maybe	No
Optimizations	42	58	5

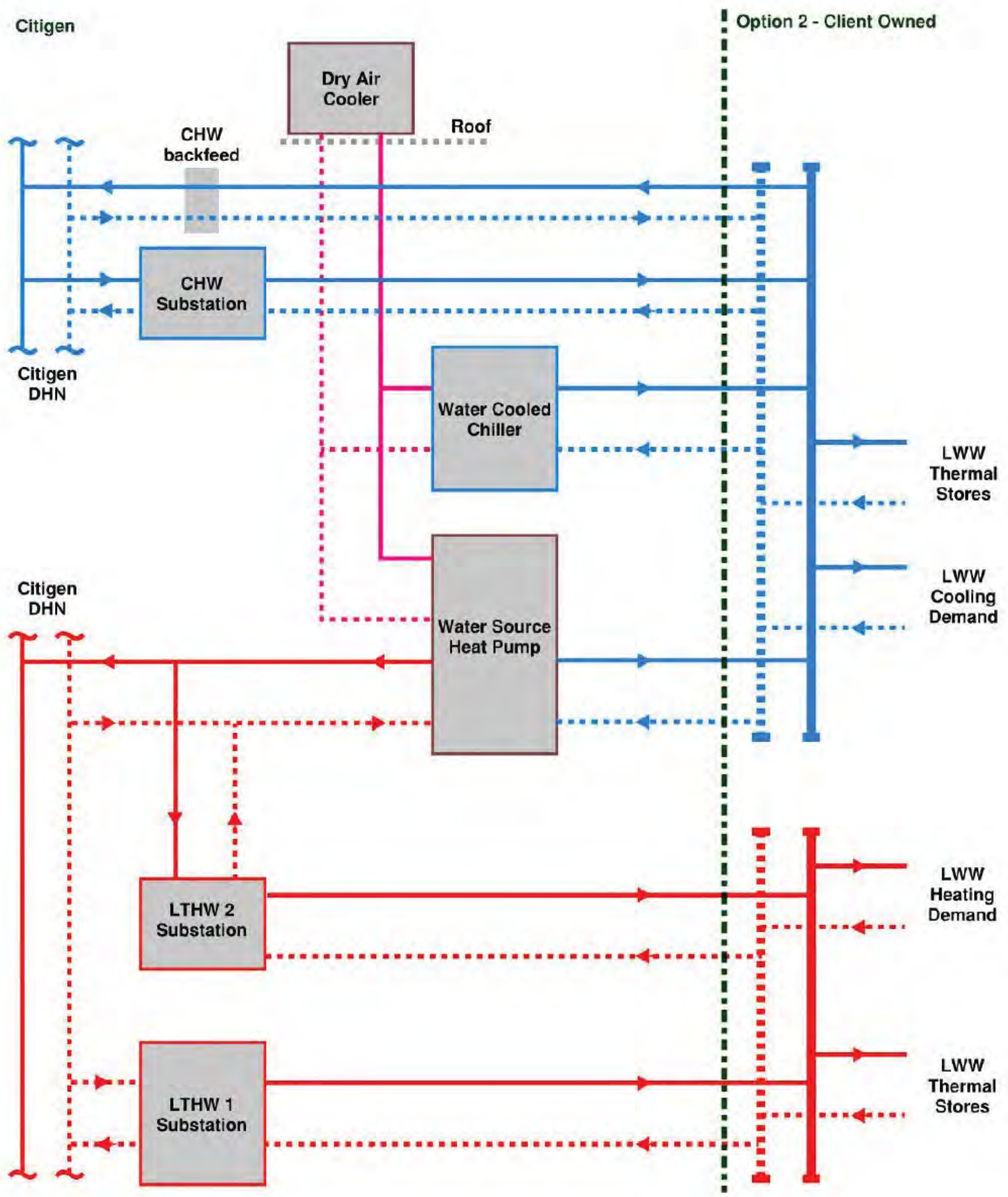
Level of certification	Total points achieved
Bronze	40
Silver	50
Gold	60
Platinum	80

ENERGY STRATEGY

Energy Strategy
Strategic Option

Water source heat pump (WSHP) and water-cooled chiller (WCC) with back-feed to Citigen

- Connection to Citigen for both heating and cooling
- Uses roof space for heat rejection equipment
- Supports de-carbonisation of the Citigen network, initial estimates of up to 3%.
- Development becomes an exporter of heat via the ability to backfeed rather than reject heat from cooling equipment.



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Energy Strategy

Strategic Option

	Current Available Capacities (MW)	Estimated Peak Simultaneous Loads (MW)	Estimated Annual Energy Use (MWh)
Heating	4.8	2.6	1068
Cooling	2.8	2.3	1059

Current Building Load Estimates

Loads will primarily on building environment with some basic assumptions for domestic hot water use.

Option	Backfeeding to Citigen (MWh)	Estimated Carbon Reduction (tCO_2/a)	Citigen Decarbonisation Achieved
Optimum	1680	753	4.2%

Decarbonisation Metrics

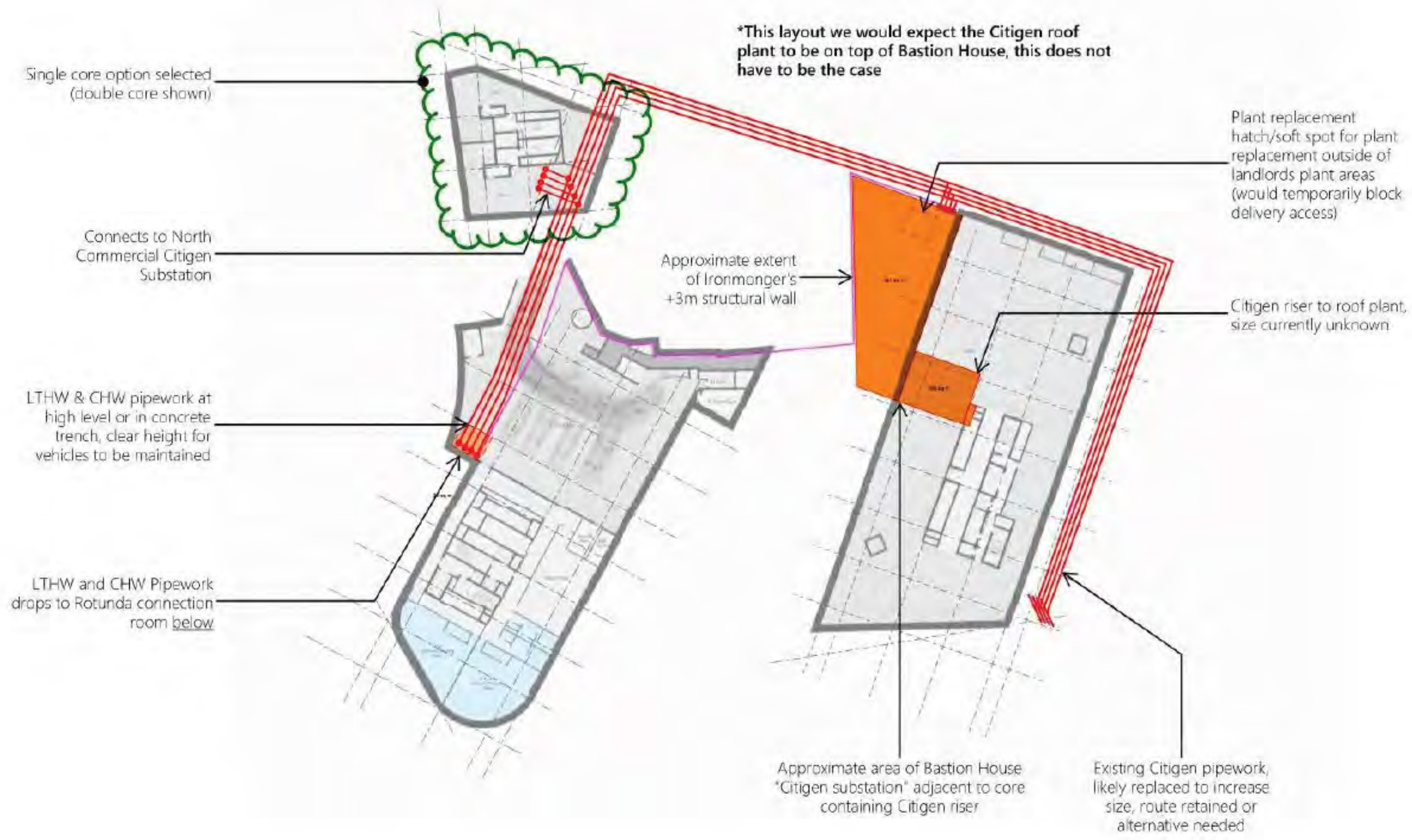
40 GWh/a is approximately the annual heat production of entire Citigen network. Using SAP 10.2 carbon factor 0.448 kgCO2/kWh and the above heat load gives 17938 tCO2/a (tonnes of CO2 per annum) as the total carbon emission from the heat production of the Citigen network.

Energy Strategy

Strategic Option - Centralised

Rotunda Basement Level

Lower Ground & Bastion House Basement

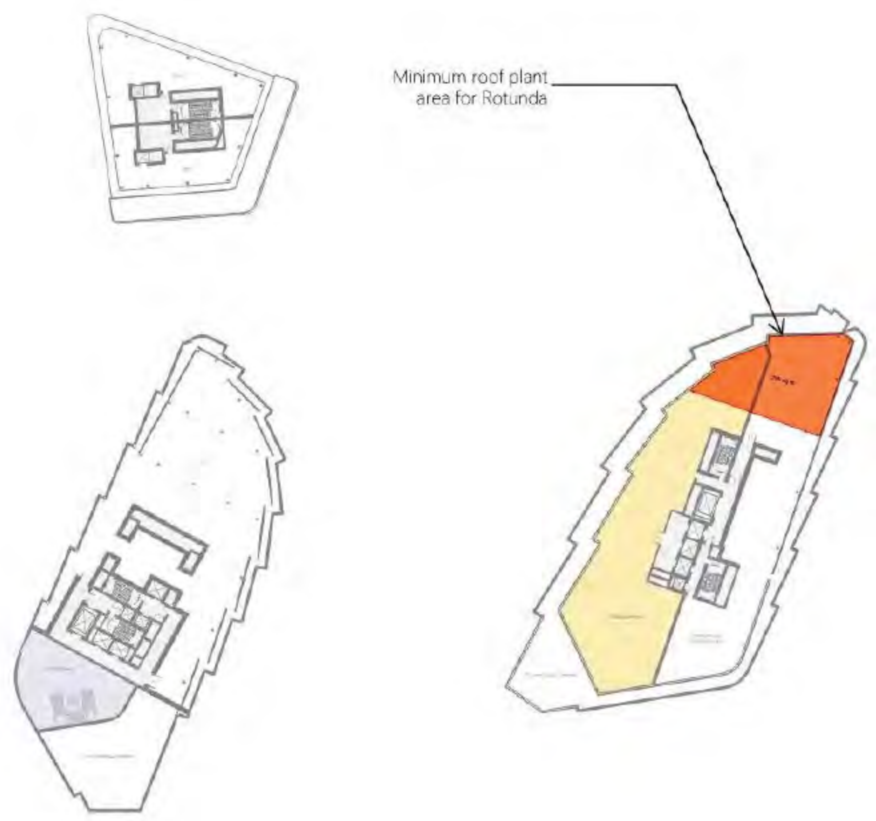


Energy Strategy

Strategic Option - Centralised

Ground Floor

Roof Level



CLIMATE RESILIENCE

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Climate Change Resilience and Adaptation in EIA Workshop

London Wall West

046325

24th November 2021

Purpose of workshop

The purpose of this workshop is to:

- Summarise guidance relating to climate change resilience and adaptation in EIA;
- Outline the approach being used for the inclusion of climate change resilience and adaptation in the London Wall West EIA.
- Provide details of the UKCP18 climate change projections for the proposed development;
- Identify key climate change hazards and risks for the project; and
- Identify and develop appropriate mitigation measures to increase climate change resilience of the project.

Town and Country Planning (Environmental Impact Assessment) Regulations 2017

The 2017 EIA Regulations introduced a requirement to consider climate change within the EIA process for the first time, stating the following in Schedule 4:

*"A description of the likely significant effects of the development on the environment resulting from, inter alia… the impact of the project on climate (for example the nature and magnitude of greenhouse gas emissions) and **the vulnerability of the project to climate change**".*

STATUTORY INSTRUMENTS

2017 No. 571

TOWN AND COUNTRY PLANNING

The Town and Country Planning (Environmental Impact Assessment) Regulations 2017

Made - - - -	*18th April 2017*
Laid before Parliament	*19th April 2017*
Coming into force - -	*16th May 2017*

CONTENTS

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Environmental Impact Assessment Guide to Climate Change Resilience and Adaptation (IEMA, 2020)

IEMA released an updated version of their guidance on the inclusion of climate change resilience and adaptation in EIA in June 2020.

This guidance suggests that there are two strands that need separate treatment:

- **Climate change resilience –** the risks of changes in the climate to the project. This needs to be assessed as part of the design and is best reported in the analysis of alternatives section of the ES. It is also better suited to a risk assessment rather than a traditional EIA 'determination of significance'
- **In-combination climate effects –** the extent to which climate change exacerbates or ameliorates the effects of the project on the environment. This is best analysed in the existing chapters and is suited to using traditional significance criteria from the respective chapter.

IEMA Transforming the world to sustainability

Environmental Impact Assessment Guide to: Climate Change Resilience & Adaptation

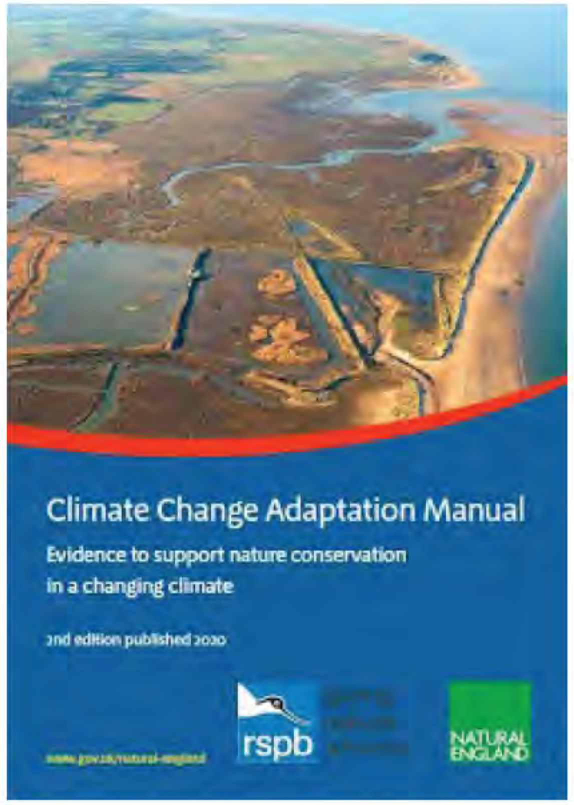
In-combination climate effects

- In-combination climate effects should be including within each ES technical chapter;
- The assessment of these effects should be completed by each technical specialist;
- The chapter template will include a section on these ‘in-combination’ climate change impacts; and
- Appropriate Met Office UKCP18 climate projections should be used to inform this section of the ES chapter.

Potential sources of information

There are various pieces of specialist topic-specific climate change resilience and/or adaptation guidance available, including the following:

- Natural England and RSPB Climate Change Adaptation Manual (NE751);
- Environment Agency Climate change impacts and adaptation;
- Historic England Climate Change Adaptation Report;
- Historic Environment Scotland A Guide To Climate Change Impacts;
- Landscape Institute Climate and Biodiversity Action Plan; and
- UK Climate Change Risk Assessment 2017.



Climate change resilience risk assessment

- In line with the IEMA (2020) guidance, a climate change resilience risk assessment shall be developed for the proposed development;
- This should be appended to the 'Alternatives and Design Evolution' chapter of the ES;
- The aims of the risk assessment are to:
  - Identify the key risks to the proposed development as a result of climate change; and
  - Put into place mitigation measures to improve the resilience of the proposed development.

Probability of a risk occurring

- The assessment of the probability of a risk occurring should include consideration of available climate projections data for the project.
- The following probability criteria have been adapted from the criteria used in Highways England EIA developments.

Score	Description (probability and frequency of occurrence)
1	The event occurs very rarely during the lifetime of the projects (60 years). For example, once every 60 years (1 event).
2	The event occurs limited number of times during the lifetime of the project (60 years). For example, once every 20 years (3 events).
3	The event occurs a moderate number of times during the lifetime of the project (60 years) For example, once every 5 years (12 events).
4	The event occurs several times during the lifetime of the project (60 years). For example, once every two years (30 events).
5	The event occurs multiple times during the lifetime of the project (60 years). For example, annually (60 events).

Consequence of a risk occurring

- The consequence rating should take into account the following:
  - The acceptability of any disruption in use if the project fails;
  - Its capital value if it had to be replaced;
  - Its impact on neighbours;
  - The vulnerability of the project element or receptor; and
  - If there are dependencies within any interconnected network of nationally important assets on the new development.
- The following consequence criteria have been adapted from the Canadian Public Infrastructure Engineering Vulnerability Committee (PIEVC) climate change risk assessment methodology.

Score	Description
1	Very low/unlikely/rare/measurable change
2	Low/seldom/marginal/change in serviceability
3	Occasional loss of some capacity
4	Moderate loss of some capacity
5	Likely regular/loss of capacity and loss of some function
6	Major/likely/critical loss of function
7	Extreme/frequent/continuous/loss of asset

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Risk rating

The risk rating is determined by multiplying the probability rating by the consequence rating.

- Ratings between 1-6 are deemed low risk.
- Ratings between 7-20 are deemed to be medium risk.
- Ratings between 21-35 are deemed to be high risk.

	Probability					
Consequence		**1**	**2**	**3**	**4**	**5**
	1	1	2	3	4	5
	2	2	4	6	8	10
	3	3	6	9	12	15
	4	4	8	12	16	18
	5	5	10	15	20	25
	6	6	12	18	24	30
	7	7	14	21	28	35

(yellow)	Low risk
(orange)	Medium risk
(red)	High risk

Potential climate change risks (adapted from C40 Cities)

Extreme precipitation

Storm and wind

Extreme cold temperatures

Extreme hot temperatures

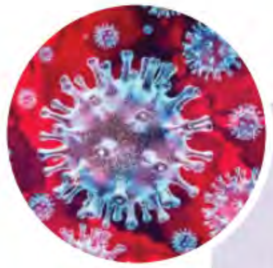
Water scarcity

Wild fire

Flood and sea level rise

Chemical change

Mass movement



Biological hazards

Insect infestation

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Baseline climate data - 1981-2010 averages (Hampstead)

Month	Maximum temperature (°C)	Minimum temperature (°C)	Days of air frost (days)	Sunshine (hours)	Rainfall (mm)	Days of rainfall ≥1 mm (days)	Monthly mean wind speed at 10 m (knots)
January	7.12	1.96	8.57	57.54	64.66	12.01	–
February	7.44	1.72	9.5	76.42	46.61	9.68	–
March	10.52	3.52	3.97	107.13	48.89	10.19	–
April	13.33	5	1.47	151.59	51.47	9.87	–
May	16.8	8	0.07	192.23	58.04	9.48	–
June	19.88	10.91	0	190.98	54.17	8.98	–
July	22.36	13.18	0	199.87	50.35	8.49	–
August	22.02	13.12	0	192.95	64.43	8.87	–
September	18.79	11.02	0	140.75	56.94	8.76	–
October	14.59	8.1	0.33	109.94	77.68	10.97	–
November	10.28	4.75	2.93	69.41	68.32	11.42	–
December	7.38	2.5	7.73	51.61	62.92	11.41	–
Annual	14.25	7.01	34.57	1540.42	704.48	120.13	–

Baseline risks

Risk	Is it relevant for the proposed development?	Probability rating (1-5)	Consequence rating (1-7)	Risk rating
Rain storm	Yes	5	1	5
Monsoon	No – not relevant to the UK	N/A	N/A	N/A
Heavy snow	Yes	2	2	4
Fog	Yes	5	1	5
Hail	Yes	4	1	4
Severe wind	Yes	4	3	12
Tornado	No – not relevant to the UK	N/A	N/A	N/A
Hurricane	No – not relevant to the UK	N/A	N/A	N/A
Extra tropical storm	Yes	3	4	12
Tropical storm	No – not relevant to the UK	N/A	N/A	N/A
Storm surge	No – not relevant to the UK	N/A	N/A	N/A
Lightning	Yes	4	1	4

Baseline risks

Risk	Is it relevant for the proposed development?	Probability rating (1-5)	Consequence rating (1-7)	Risk rating
Extreme winter conditions	Yes	4	3	12
Cold wave	Yes	4	3	12
Extreme cold days	Yes	4	3	12
Heat waves	Yes	3	5	15
Extreme hot days	Yes	3	4	12
Drought	Yes	3	4	12
Forest fires	No – Unlikely as the site does not have heavy tree cover	N/A	N/A	N/A
Land fires	Yes	1	6	6

Baseline risks

Risk	Is it relevant for the proposed development?	Probability rating (1-5)	Consequence rating (1-7)	Risk rating
Flash / surface flood	Yes	2	6	12
River flood	Yes	1	6	6
Coastal flood	Yes	1	6	6
Groundwater flood	Yes	2	6	12
Permanent inundation	Yes	1	6	6
Salt water intrusion	No – The site is located away from the coast	N/A	N/A	N/A
Ocean acidification	No – The site is located away from the coast	N/A	N/A	N/A
Landslide	No – Not likely given the terrain of the site	N/A	N/A	N/A
Avalanche	No – Not likely given the terrain of the site	N/A	N/A	N/A
Rock fall	No – Not likely given the terrain of the site	N/A	N/A	N/A
Subsidence	Yes	1	6	6

Baseline risks

Risk	Is it relevant for the proposed development?	Probability rating (1-5)	Consequence rating (1-7)	Risk rating
Water-borne disease	Yes	1	3	3
Vector borne disease	Yes	1	4	4
Air-borne disease	Yes	1	3	3
Insect infestation	Yes	1	3	3

UKCP18 climate projections - general trends

- A move towards warmer, wetter winters and hotter, drier summers. However, natural variations mean that some cold winters, some dry winters, some cool summers and some wet summers will still occur;
- UKCP18 projections show that there is more warming in the summer than in the winter;
- A decrease in both falling and lying snow across the UK relative to the 1981-2000 baseline;
- An increase in near surface wind speeds over the UK for the second half of the 21st century for the winter season when more significant effects of wind are experienced. This is accompanied by an increase in frequency of winter storms over the UK. However, the increase in wind speeds is modest compared to interannual variability; and
- Global sea level has risen over the 20th century and will continue to rise over the coming centuries. The amount of sea level rise depends on the location around the UK and increases with higher emissions scenarios.

UKCP18 climate projections

- The following UKCP18 climate projections have been identified for the proposed development. As per the IEMA (2020) guidance, the RCP8.5 scenario has been selected as the worst case scenario.

Season	Variable	Time Period	Projected Change At		
			10th percentile	50th percentile	90th percentile
Winter	Mean temperature (°C)	2020s (2020 -2039)	-1 to 0	0 to 1	1 to 2
		2040s (2040 – 2059)	0 to 1	1 to 2	2 to 3
		2060s (2060 - 2079	0 to 1	2 to 3	4 to 5
		2080s (2080 – 2099)	1 to 2	3 to 4	5 to 6
	Mean precipitation change (%)	2020s (2020 -2039)	-10 to 0	0 to 10	20 to 30
		2040s (2040 – 2059)	-10 to 0	10 to 20	20 to 30
		2060s (2060 - 2079	-10 to 0	10 to 20	30 to 40
		2080s (2080 – 2099)	0 to 10	20 to 30	40 to 50
Summer	Mean temperature (°C)	2020s (2020 -2039)	0 to 1	1 to 2	2 to 3
		2040s (2040 – 2059)	0 to 1	2 to 3	4 to 5
		2060s (2060 - 2079	1 to 2	3 to 4	6 to 7
		2080s (2080 – 2099)	2 to 3	5 to 6	8+
	Mean precipitation change (%)	2020s (2020 -2039)	-40 to -30	-10 to 0	10 to 20
		2040s (2040 – 2059)	-50 to -40	-30 to -20	0 to 10
		2060s (2060 – 2079	-50 to -40	-30 to -20	0 to 10
		2080s (2080 – 2099)	-80 to -70	-40 to -30	-10 to 0

Identification and evaluation of risks – Extreme precipitation

Risk	Is it relevant for the proposed development?	Probability rating (1-5)	Consequence rating (1-7)	Risk rating	Mitigation needed?
Rain storm	Yes	5	1	5	No
Monsoon	No – not relevant to the UK	N/A	N/A	N/A	N/A
Heavy snow	Yes	2	2	4	No
Fog	Yes	5	1	5	No
Hail	Yes	5	1	5	No

Mitigation measures

BURO HAPPOLD

Identification and evaluation of risks – Storm and wind

Risk	Is it relevant for the proposed development?	Probability rating (1-5)	Consequence rating (1-7)	Risk rating	Mitigation needed?
Severe wind	Yes	4	3	12	Yes
Tornado	No – not relevant to the UK	N/A	N/A	N/A	N/A
Hurricane	No – not relevant to the UK	N/A	N/A	N/A	N/A
Extra tropical storm	Yes	3	4	12	Yes
Tropical storm	No – not relevant to the UK	N/A	N/A	N/A	N/A
Storm surge	No – not relevant to the UK	N/A	N/A	N/A	N/A
Lightning	Yes	4	1	4	No

Mitigation measures
Wind microclimate chapter of the ES – specific mitigation measures picked up through this.

Identification and evaluation of risks – Extreme cold temperature

Risk	Is it relevant for the proposed development?	Probability rating (1-5)	Consequence rating (1-7)	Risk rating	Mitigation needed?
Extreme winter conditions	Yes	3	3	9	Yes
Cold wave	Yes	3	3	9	Yes
Extreme cold days	Yes	3	3	9	Yes

Mitigation measures
Insulation - U values provided by BH

Identification and evaluation of risks – Extreme hot temperatures

Risk	Is it relevant for the proposed development?	Probability rating (1-5)	Consequence rating (1-7)	Risk rating	Mitigation needed?
Heat waves	Yes	4	5	20	Yes
Extreme hot days	Yes	4	4	16	Yes

Mitigation measures
Overheating analysis being undertaken – 2050 - Solar shading - Solar coating

Identification and evaluation of risks – Water scarcity

Risk	Is it relevant for the proposed development?	Probability rating (1-5)	Consequence rating (1-7)	Risk rating	Mitigation needed?
Drought	Yes	4	4	16	Yes

Mitigation measures
Low flow sanitaryware – target dictated by BREEAM Green biodiverse rooves – planting spec to try and reduce drought risk (drought resilient species) (may be a need for irrigation to reduce risk of fire) – drip fed system? Rainwater harvesting Rain gardens along the edge of the street to pick up rain water

BURO HAPPOLD

Identification and evaluation of risks – Wild fire

Risk	Is it relevant for the proposed development?	Probability rating (1-5)	Consequence rating (1-7)	Risk rating	Mitigation needed?
Forest fire	No – Unlikely as the site does not have heavy tree cover	N/A	N/A	N/A	N/A
Land fire	Yes	1	6	6	N/A

Mitigation measures

Identification and evaluation of risks – Flood and sea level rise

Risk	Is it relevant for the proposed development?	Probability rating (1-5)	Consequence rating (1-7)	Risk rating	Mitigation needed?
Flash / surface flood	Yes	3	6	18	Yes
River flood	Yes	2	6	12	Yes
Coastal flood	Yes	2	6	12	Yes
Groundwater flood	Yes	2	6	12	Yes
Permanent inundation	Yes	1	6	6	No

Mitigation measures
Flood risk assessment Attenuation to restrict surface water to equivalent greenfield, with allowance for increased rainfall – through drainage strategy

BURO HAPPOLD

Identification and evaluation of risks – Chemical change

Risk	Is it relevant for the proposed development?	Probability rating (1-5)	Consequence rating (1-7)	Risk rating	Mitigation needed?
Salt water intrusion	No – The site is located away from the coast	N/A	N/A	N/A	N/A
Ocean acidification	No – The site is located away from the coast	N/A	N/A	N/A	N/A

Mitigation measures

Identification and evaluation of risks – Mass movement

Risk	Is it relevant for the proposed development?	Probability rating (1-5)	Consequence rating (1-7)	Risk rating	Mitigation needed?
Landslide	No – Not likely given the terrain of the site	N/A	N/A	N/A	N/A
Avalanche	No – Not likely given the terrain of the site	N/A	N/A	N/A	N/A
Rock fall	No – Not likely given the terrain of the site	N/A	N/A	N/A	N/A
Subsidence	Yes	1	6	6	No

Mitigation measures

Identification and evaluation of risks – Biological hazards

Risk	Is it relevant for the proposed development?	Probability rating (1-5)	Consequence rating (1-7)	Risk rating	Mitigation needed?
Water-borne disease	Yes	2	3	6	No
Vector borne disease	Yes	1	4	4	No
Air-borne disease	Yes	3	3	9	Yes

Mitigation measures
Air-borne disease – appropriate ventilation Indoor air quality monitoring

Identification and evaluation of risks – Insect infestation

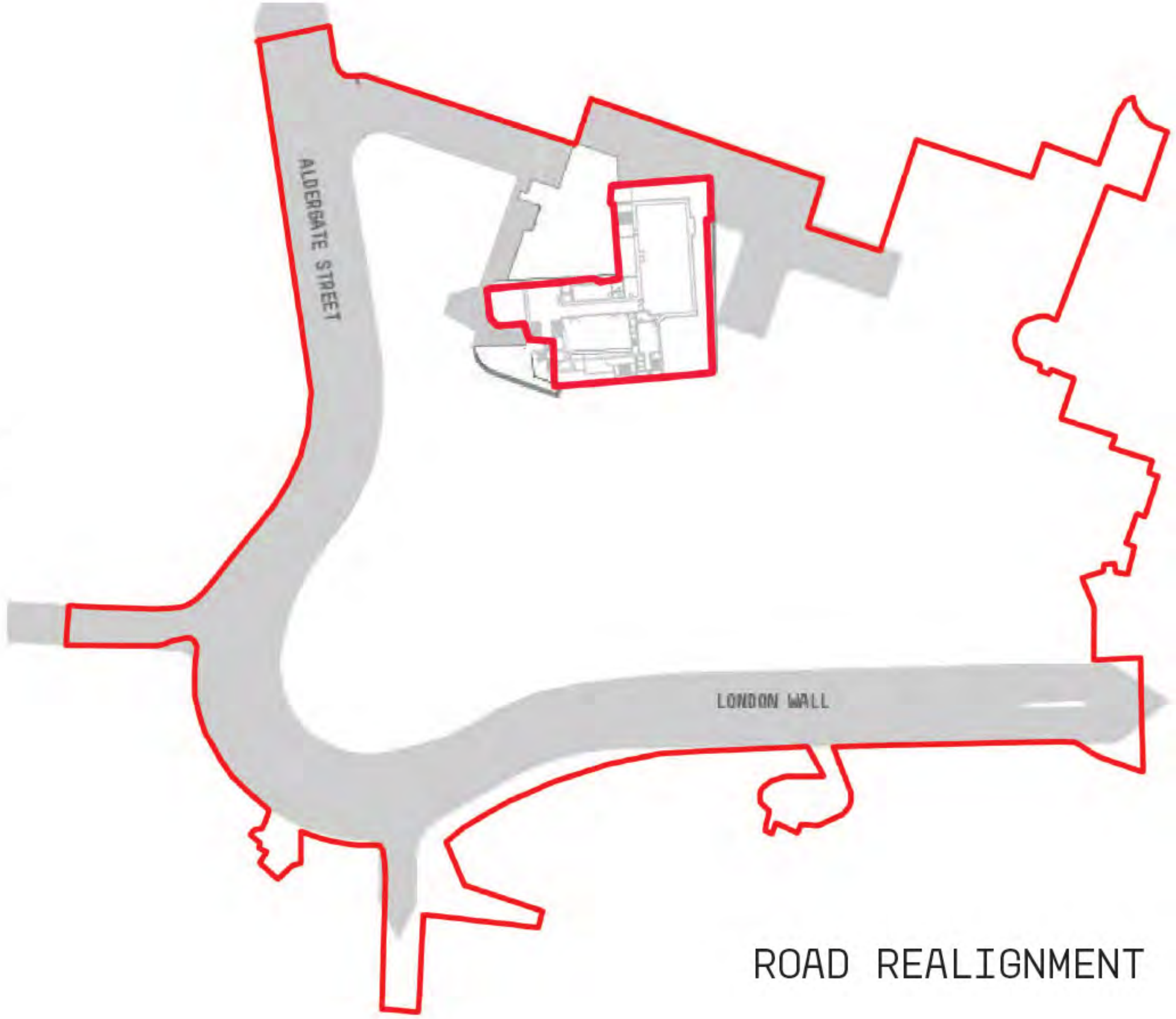
Risk	Is it relevant for the proposed development?	Probability rating (1-5)	Consequence rating (1-7)	Risk rating	Mitigation needed?
Insect infestation	Yes	2	3	6	No

Mitigation measures

HIGHWAYS

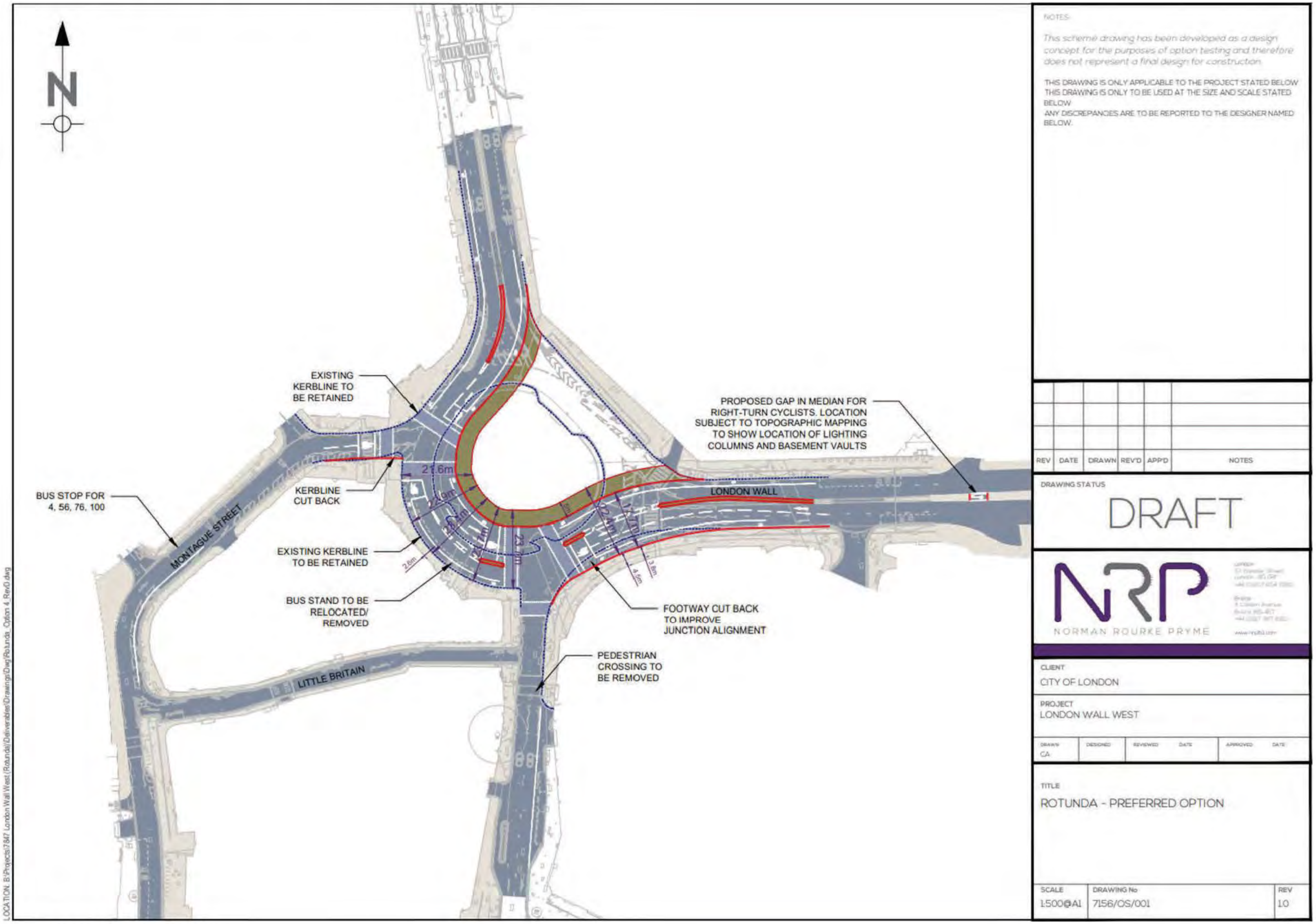
HIGHWAYS - PROPOSED LAYOUT CHANGE

EXISTING ROADS

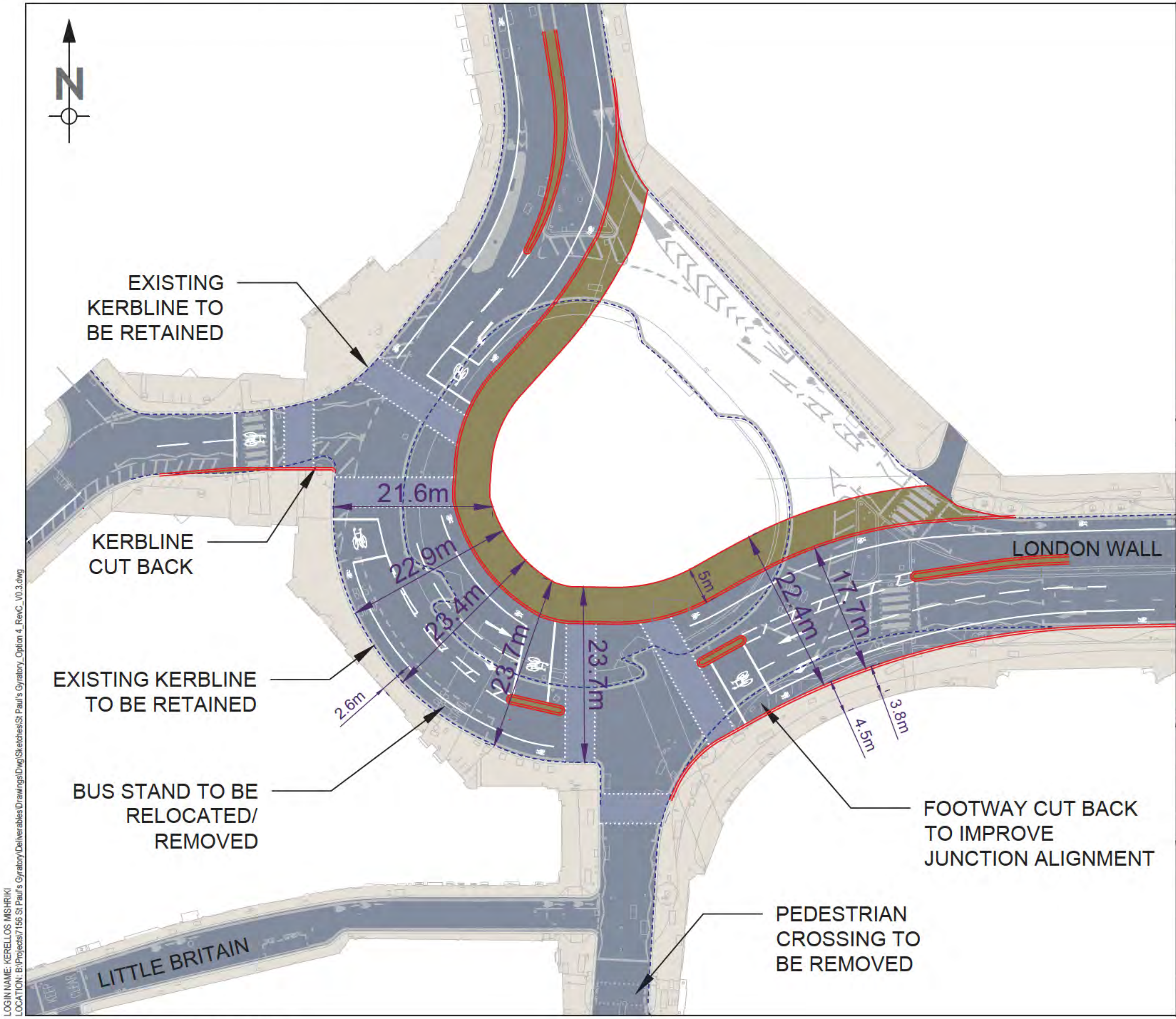


ROAD REALIGNMENT

HIGHWAYS - PROPOSED LAYOUT CHANGE



HIGHWAYS - PROPOSED LAYOUT CHANGE



NOTES:

This scheme drawing has been developed as a design concept for the purposes of option testing and therefore does not represent a final design for construction.

THIS DRAWING IS ONLY APPLICABLE TO THE PROJECT STATED BELOW.
THIS DRAWING IS ONLY TO BE USED AT THE SIZE AND SCALE STATED BELOW.
ANY DISCREPANCIES ARE TO BE REPORTED TO THE DESIGNER NAMED BELOW.

KEY

- CARRIAGEWAY
- EXISTING FOOTWAY
- NEW FOOTWAY
- EXISTING KERBLINE TO BE MOVED
- PROPOSED KERBLINE

REV	DATE	DRAWN	REV'D	APP'D	NOTES
B	MAY 21	CA			MPROVE JUNCT ON AL GNMENT
C	JUN 21	KM			CYCLE LANES ADDED

DRAWING STATUS

DRAFT

NORMAN ROURKE PRYME

ondon
57 Webber Street,
ondon, S 1 0R
44 (0)207 654 7280

Br stol
4 Colston Avenue,
Br stol, BS1 4ST
44 (0)117 387 8910

www.nrpltd.com

CLIENT
CITY OF LONDON

PROJECT
ST PAUL'S GYRATORY

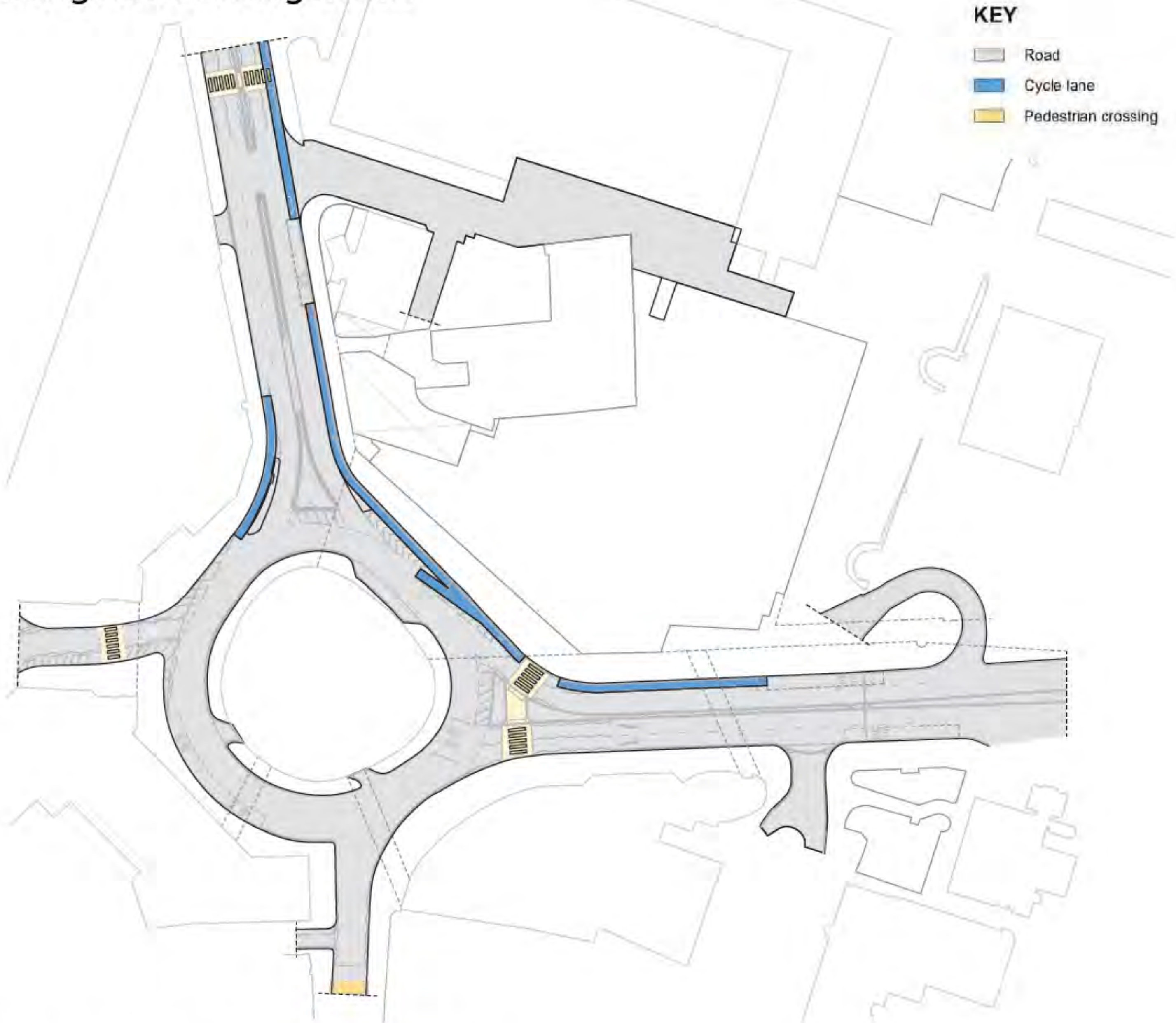
DRAWN	DESIGNED	REVIEWED	DATE	APPROVED	DATE
CA	CA		MAY 21		MAY 21

TITLE
ROTUNDA - OPTION A1

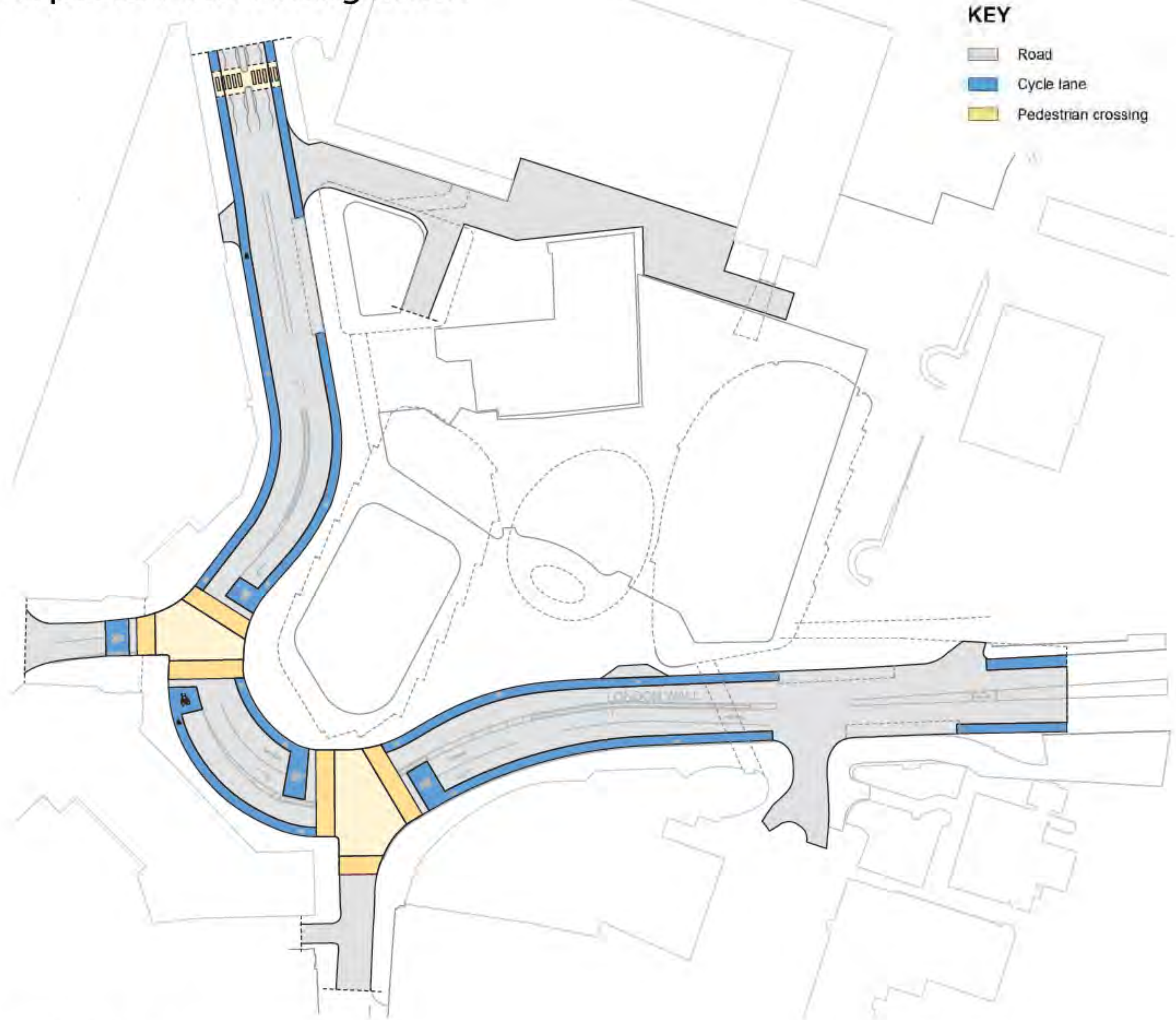
SCALE	DRAWING No	REV
1:500@A3	7156/OS/XXX	C

BENEFITS FOR PEDESTRIANS AND CYCLISTS

Existing Road Arrangement



Proposed Road Arrangement



Benefits of the proposed layout:

Manageable impact on network capacity
Traffic signal control improves conditions for people cycling
Removal of zebra crossings smooth traffic flows in the AM peak
Design better caters for pedestrian desire lines
Improved streetscape by removing tunnel on north-east corner

Pedestrians:

Controlled pedestrian crossings replacing zebras
All-red phase for traffic allowing clear, simpler crossing
Generous footways (minimum 5m wide along northern Rotunda kerbline)
Permeable public realm

Cyclists:

Simpler junction to navigate
2m wide dedicated cycle lanes
Advanced stop lines (ASLs) at signalised junction
Investigating right turn access into site from WB London Wall

TRAFFIC MODELLING AND ENGAGEMENT

Next Steps:

- Further feasibility testing of the recommended design options and associated design revisions, including traffic modelling and Healthy Streets assessments
- Continued engagement with Transport for London in relation to traffic modelling and impact on bus services
- Commercial negotiations with the developers of 81 Newgate Street regarding the extent of the financial contribution to enable the delivery of "King Edward Square"
- Continued engagement with the development team at London Wall West
- Engagement with residents, businesses and groups representing groups who share protected characteristics
- Complete Equality Impact and CoLAG Assessments for each of the options
- Preparation of a Gateway 4 report, recommending one option to Members to be progressed to Gateway 5.

Engagement with TfL Network Performance:

- Engagement with TfL Network Performance team on Rotunda junction since 2018
- C4M highway alignment – TfL review of Future Base and Proposed LinSig models
- Update LWW highway alignment included in St. Paul's modelling expectation document, signed off by TfL Network Performance

TRAFFIC MODELLING

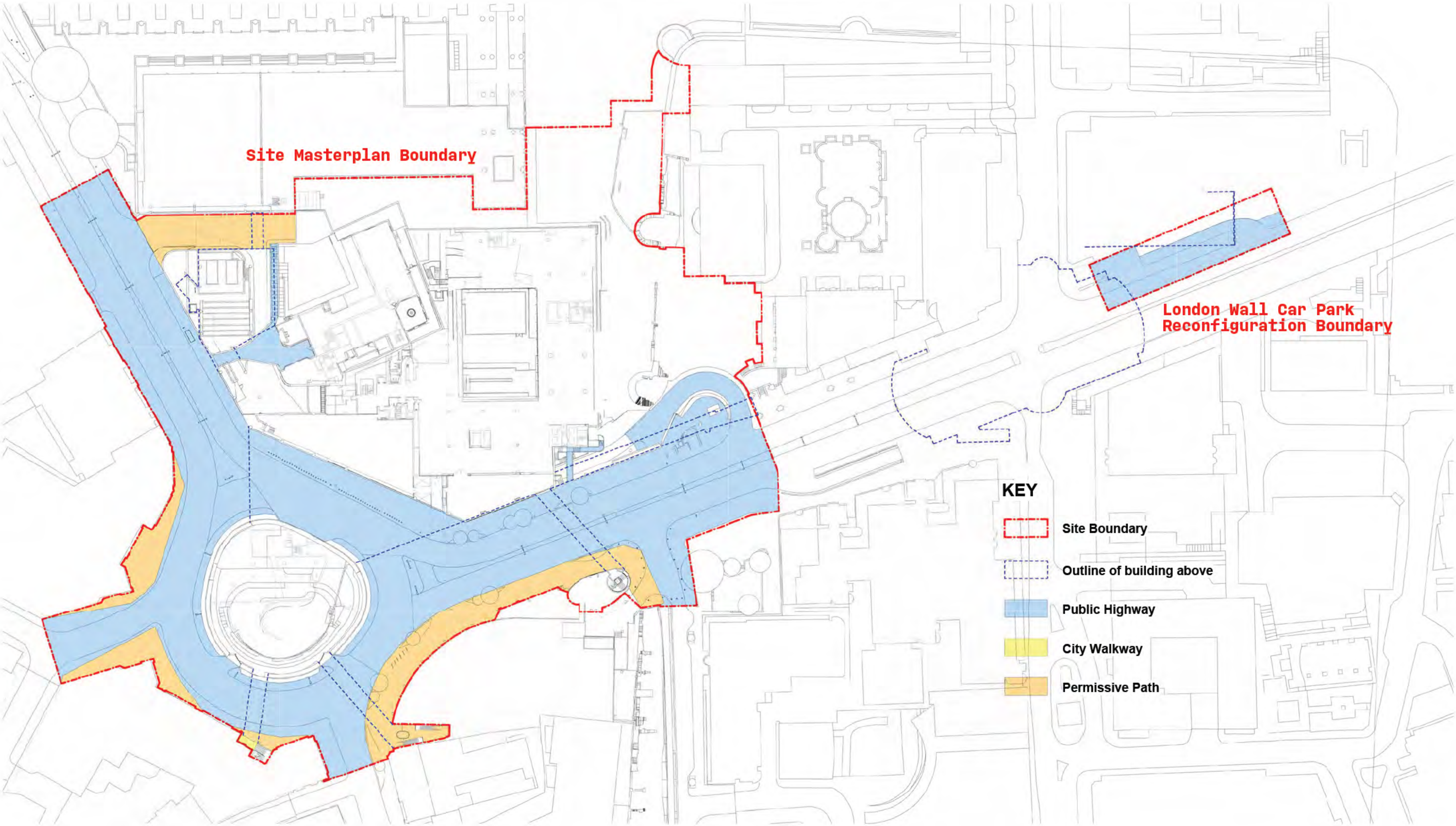
- Traffic modelling approach using LinSig agreed with TfL in 2019
- Model updated with March 2022 traffic flows
- Future base model developed and being audited by TfL

DEGREES OF SATURATION COMPARING EXISTING TO FUTURE (PROPOSED)

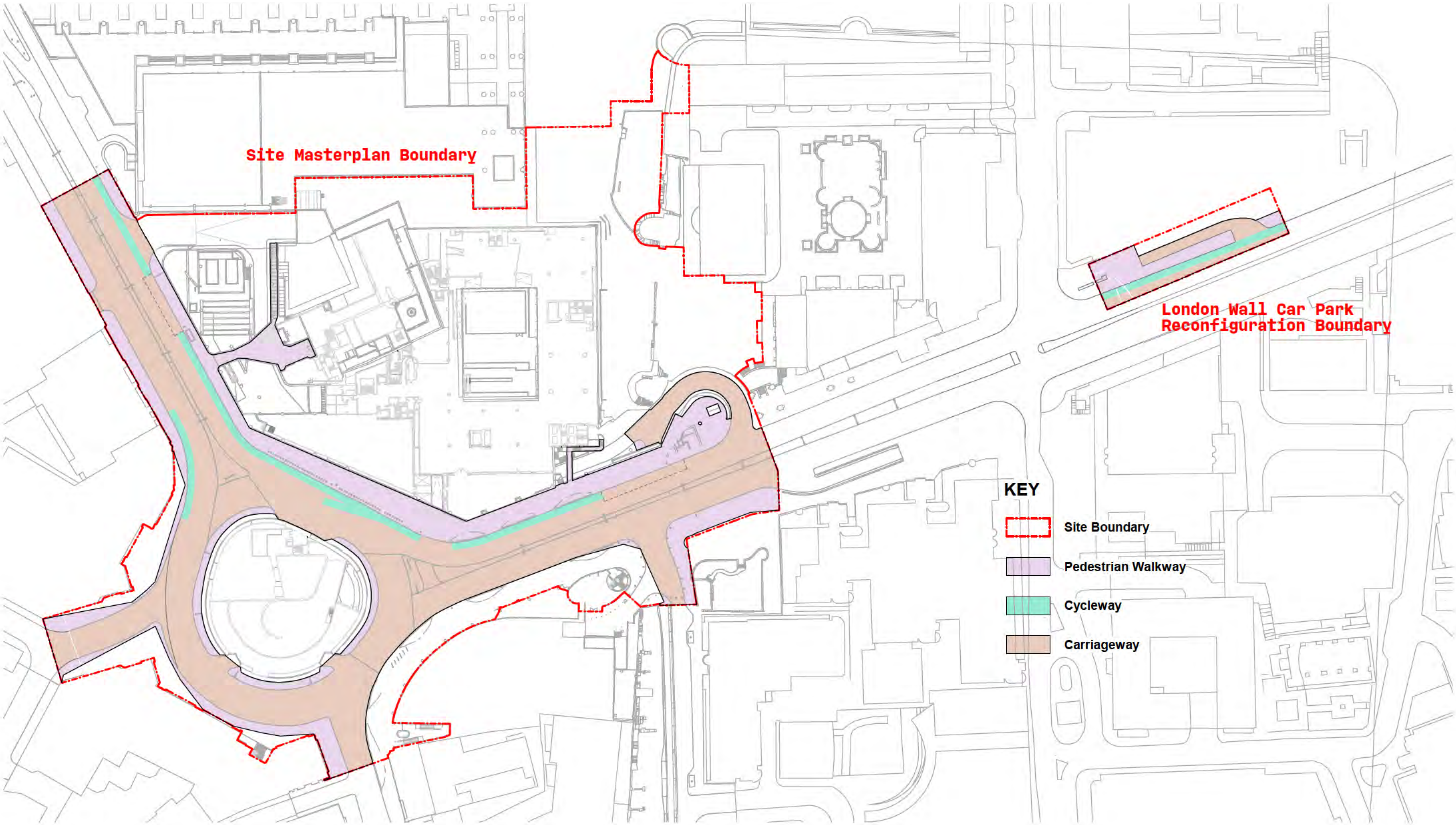
TABLE 3.1: DEGREES OF SATURATION – AM PEAK

JUNCTION	APPROACH	LINSIG LANE	FUTURE BASE DOS (%)	PROPOSED DOS (%)	MARCH 2022 FLOWS DOS (%)
Aldersgate Street (north)/ Montague Street/ London Wall	Aldersgate Street (north) SB	J3:1/2	93%	96%	75%
	London Wall NB	J3:10/2	N/A	46%	28%
	Montague Street EB	J3:2/1+2	81%	95%	72%
London Wall/ Aldersgate Street (south)	London Wall SB right-turn	J3:11/3	N/A	64%	67%
	London Wall SB left-turn	J3:11/2	N/A	45%	30%
	London Wall WB left-turn	J3:5/2	87%	82%	90%
	London Wall WB ahead	J3:5/3	49%	61%	50%

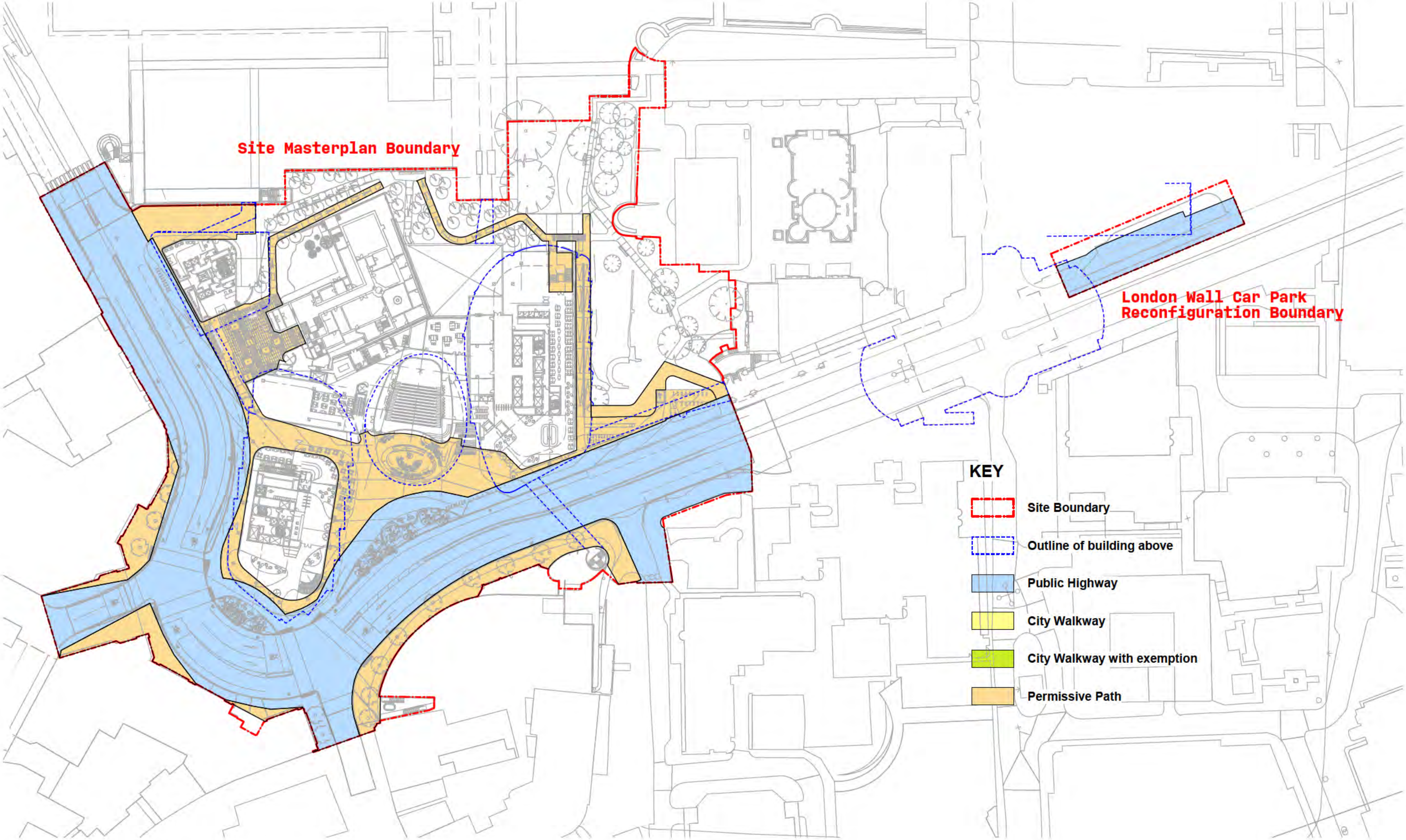
EXISTING PUBLIC REALM EXTENT WITHIN SITE MASTERPLAN BOUNDARY
UPPER GROUND LEVEL



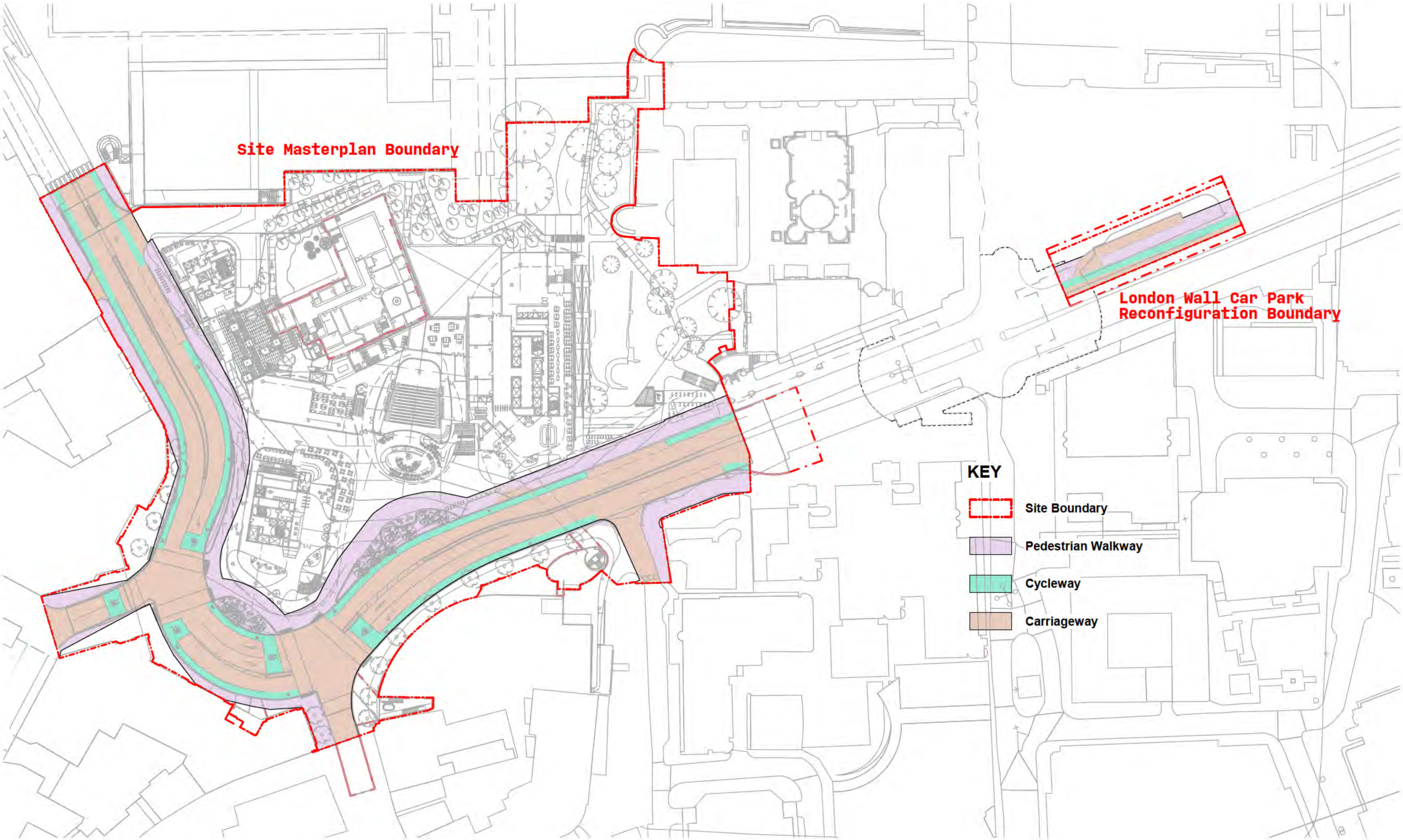
EXISTING PUBLIC HIGHWAY BREAKDOWN
UPPER GROUND LEVEL



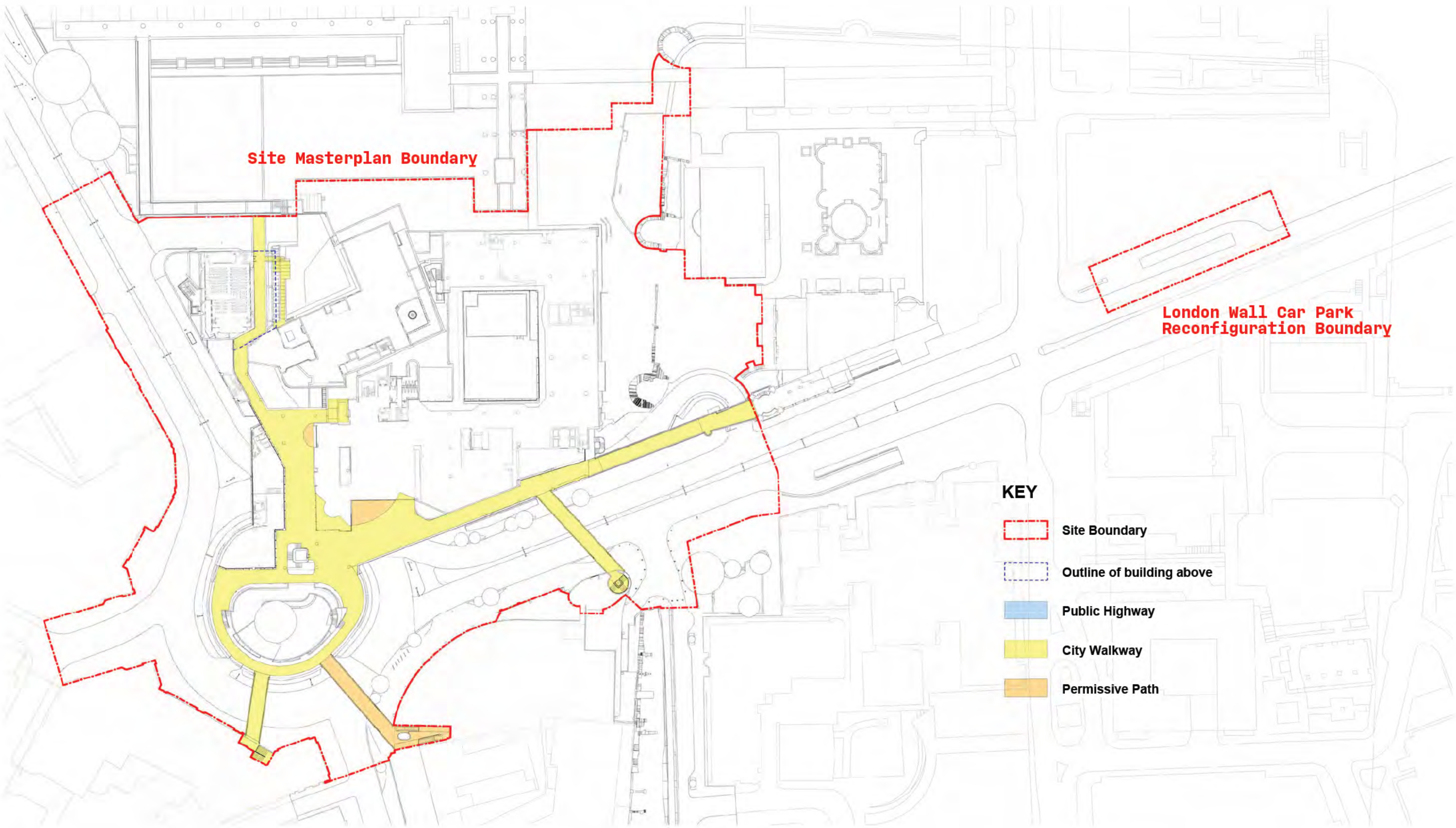
PROPOSED PUBLIC REALM EXTENT WITHIN SITE MASTERPLAN BOUNDARY
UPPER GROUND LEVEL



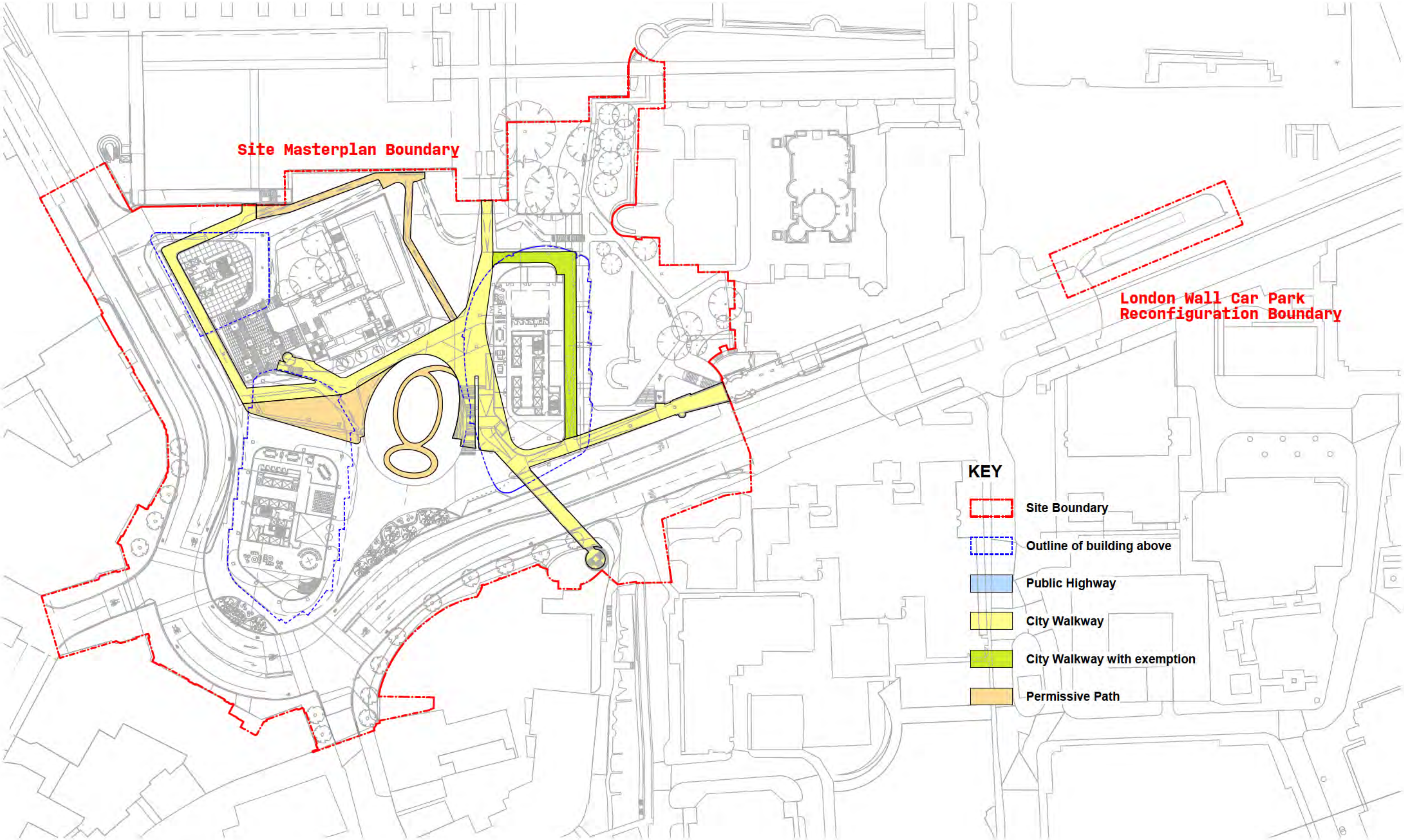
PROPOSED PUBLIC HIGHWAY BREAKDOWN
UPPER GROUND LEVEL



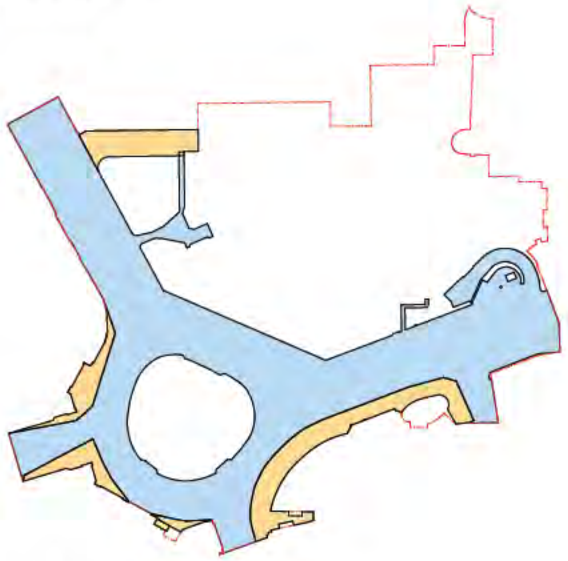
EXISTING PUBLIC REALM EXTENT WITHIN SITE MASTERPLAN BOUNDARY PODIUM LEVEL

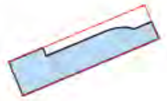


PROPOSED PUBLIC REALM EXTENT WITHIN SITE MASTERPLAN BOUNDRAY
PODIUM LEVEL



Existing





Ground Level

Public Highway : 9,482 sqm
Permissive Path : 1,830 sqm
City Walkway: 12 sqm

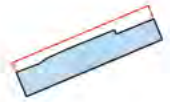
Total : 11,324sqm

Podium Level

Permissive Path : 272 sqm
City Walkway: 2,186 sqm

Total : 2,458 sqm

Proposed

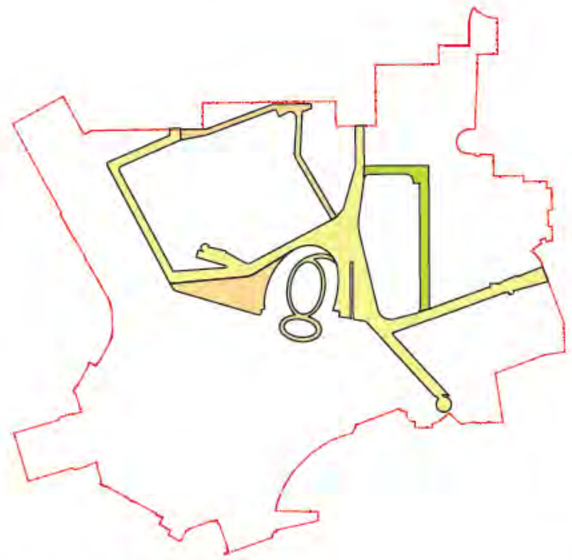


Ground Level

Public Highway : 9,009 sqm
Permissive Path : 4,485 sqm

Total : 13,494 sqm

Area Gain/Loss
-473 sqm
+2,655 sqm



Podium Level

Permissive Path : 710 sqm
City Walkway: 1,961 sqm

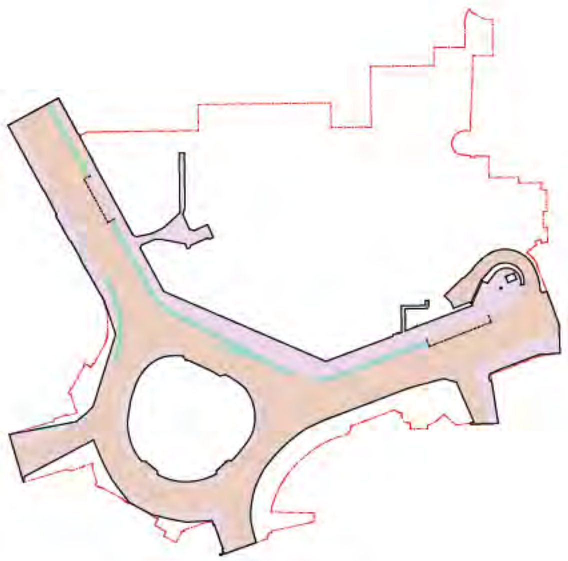
Total : 2,671 sqm

Area Gain/Loss
+438 sqm
-225 sqm

Area Comparison

			Existing extent of public realm within Site Masterplan Boundary		Proposed extent of public realm within Site Masterplan Boundary		Area Difference	Area Gain/Loss
			m2	ft2	m2	ft2	m2	%
Ground Level	Public Highway		9,482	102,064	9,009	96,972	-473	-5.0%
	Permissive Path		1,830	19,698	4,485	48,281	2,655	145.1%
	City Walkway		12	129	0	0	-12	-100.0%
	Total		**11,324**	**121,892**	**13,494**	**145,254**	**2,170**	**19.2%**
Podium Level	Public Highway		0	0	0	0	0	N/A
	Permissive Path		272	2,928	710	7,642	438	161.0%
	City Walkway		2,186	23,530	1,961	21,108	-225	-10.3%
	Total		**2,458**	**26,458**	**2,671**	**28,751**	**213**	**8.7%**
Ground + Podium Level Total	Public Highway		9,482	102,064	9,009	96,972	-473	-5.0%
	Permissive Path		2,102	22,626	5,195	55,924	3,093	147.2%
	City Walkway		2,198	23,659	1,961	21,108	-237	-10.8%
	Total		**13,782**	**148,349**	**16,165**	**174,004**	**2,383**	**17.3%**

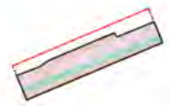
PUBLIC HIGHWAY BREAKDOWN COMPARISION




Carriageway : 6,030sqm
Cycleway : 537sqm
Pedestrian Walkway : 2,995sqm

Total : 9,562sqm

Existing Ground Level

		Area Gain/Loss
Carriageway	4,887sqm	-1,143 sqm
Cycleway	1,227sqm	+690 sqm
Pedestrian Walkway	2,895sqm	-100 sqm

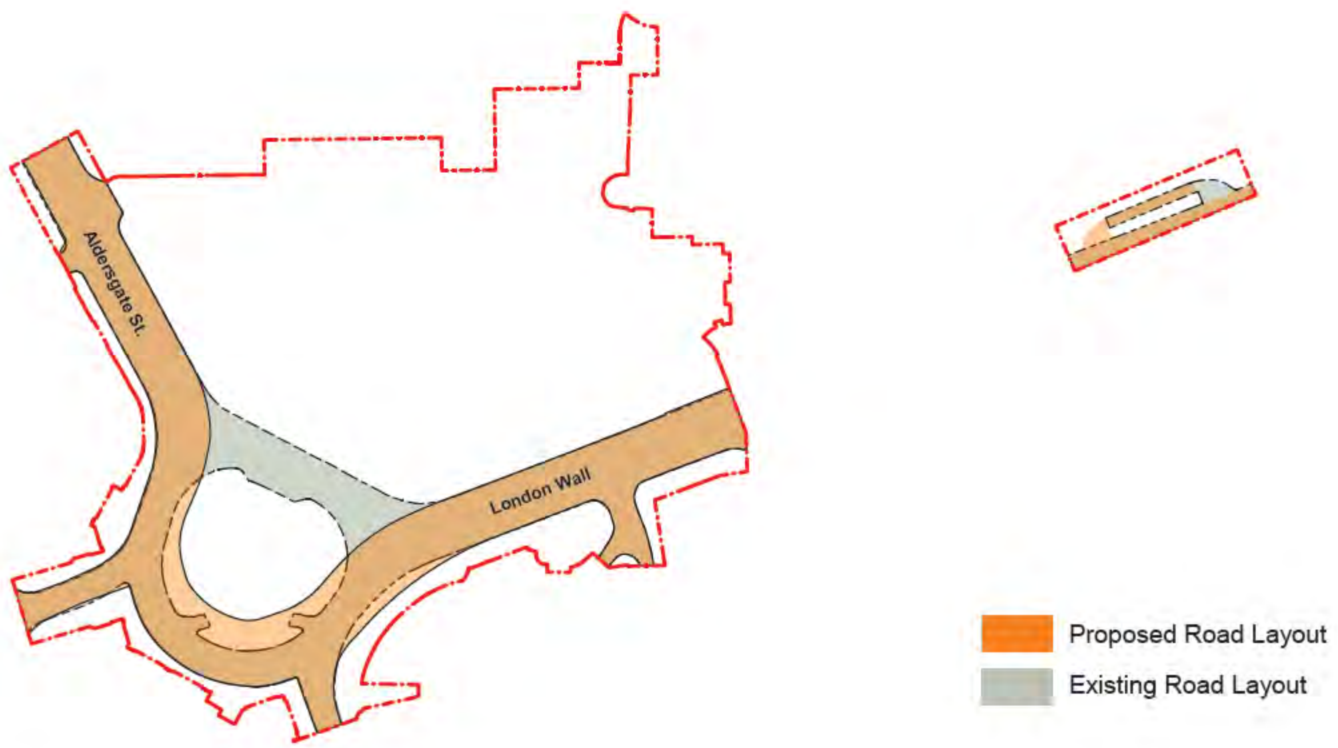
Total : 9,009sqm

Proposed Ground Level

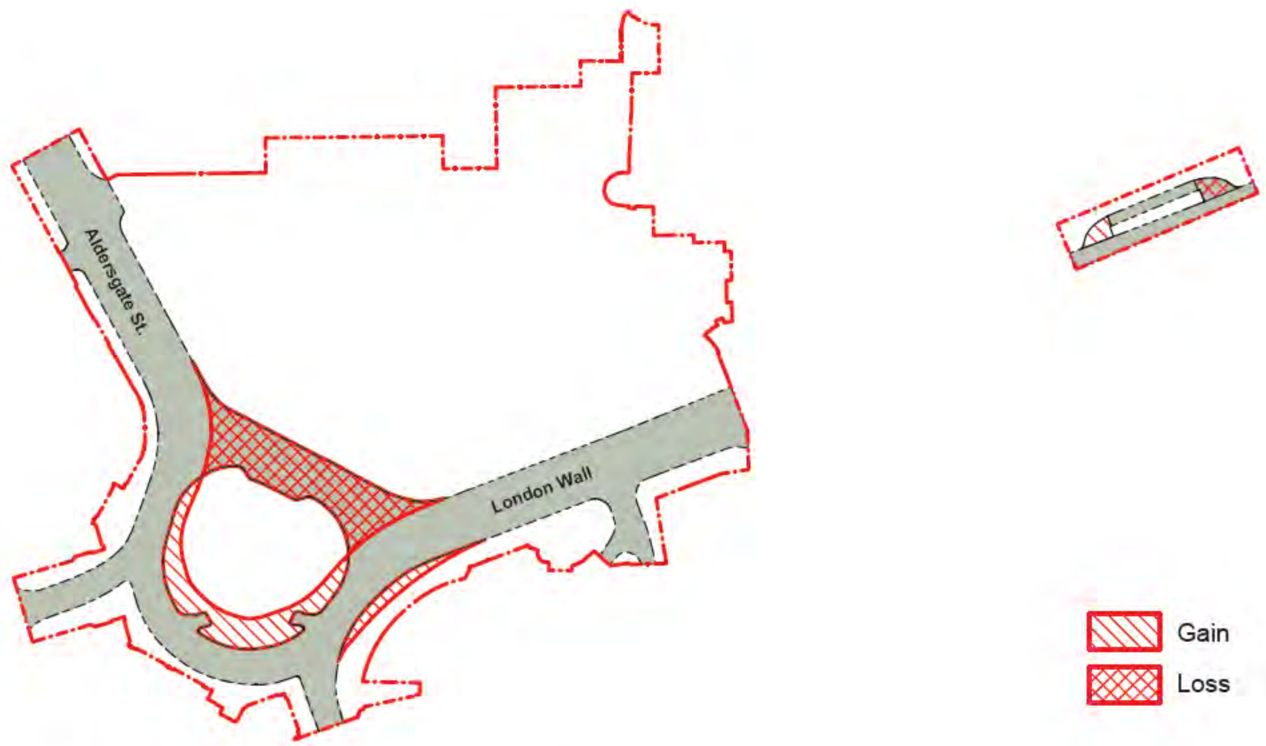
Area Comparison

		Existing Public Highway Breakdown		Proposed Public Highway Breakdown		Area Difference	Area Gain/Loss
		m2	ft2	m2	ft2	m2	%
Ground Level	Carriageway	6,030	64,906	4,887	52,603	-1143	-19.0%
	Cycleway	537	5,784	1,227	13,205	689	128.3%
	Pedestrian Walkway	2,995	32,239	2,895	31,162	-100	-3.3%
	Total	**9,562**	**102,928**	**9,009**	**96,969**	**-554**	**-5.8%**

ROAD LAYOUT - AREA GAIN & LOSS STUDY

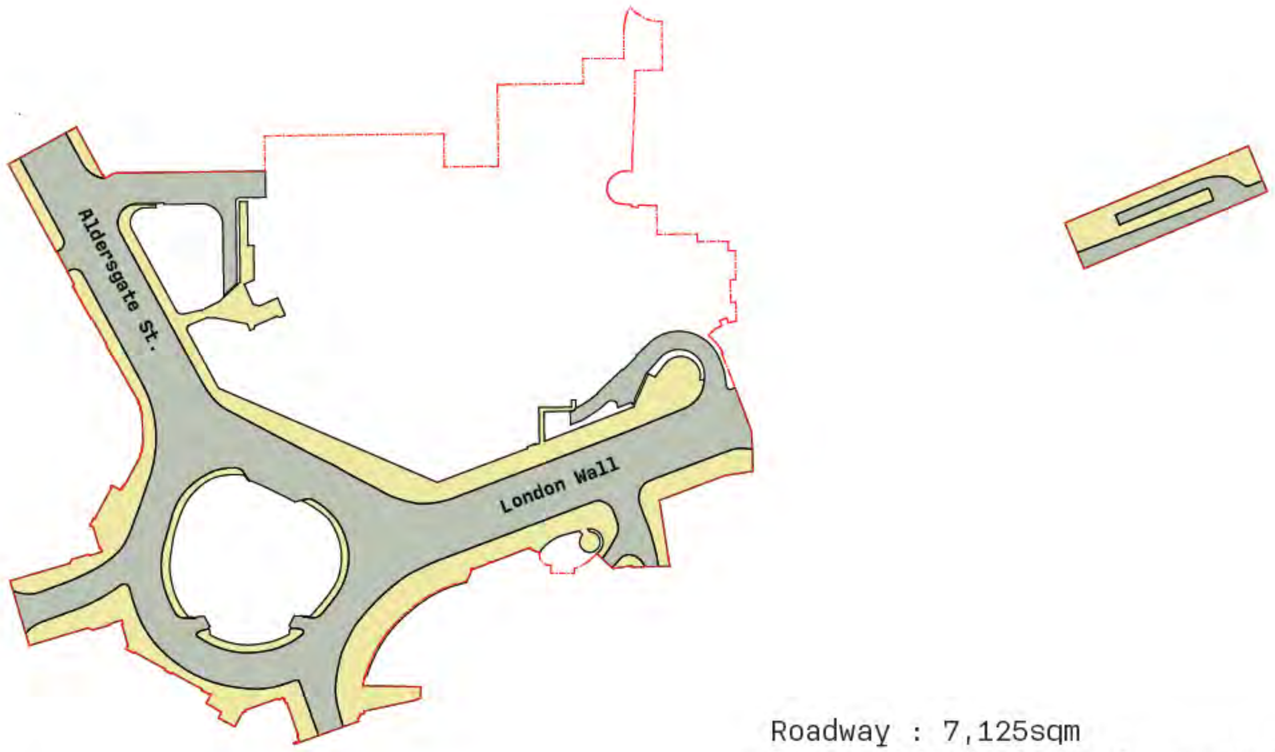


Ground Level Road Layouts Overlaid



Existing Road Layout at Ground Level

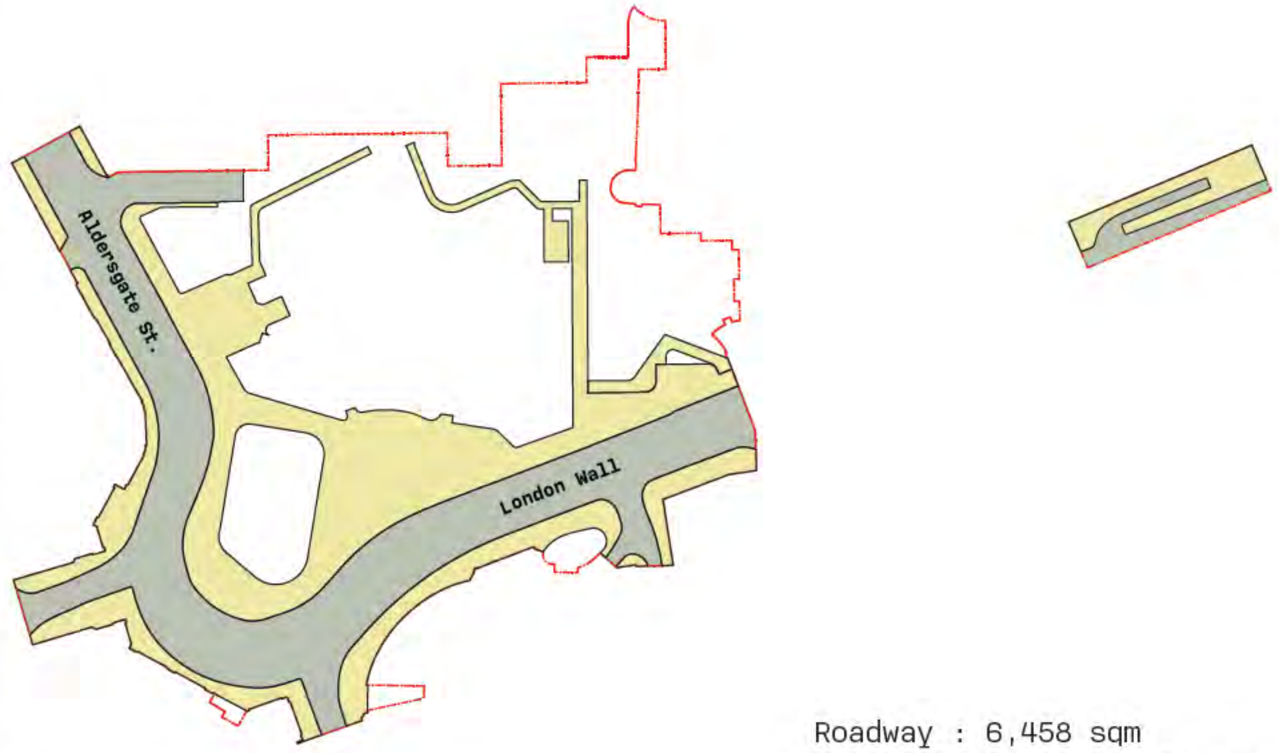
PAVEMENT/PEDESTRIAN AREA AND ROADWAY COMPARISION



Existing Ground Level

Roadway : 7,125sqm
Pavement/Pedestrian Area : 4,619sqm

Total : 11,744sqm



Proposed Ground Level

Roadway : 6,458 sqm
Pavement/Pedestrian Area : 7,300 sqm

Total : 13,758 sqm

Pavement/Pedestrian Area Roadway

CHANGES TO HIGHWAY ACCESS - CAR PARK ENTRANCE
OPTION 3

Key considerations

- Utilising the existing car park exit ramp onto London Wall outside 88 Wood Street
- Direction of traffic on the car park ramp would be reversed
- Vehicles would approach the entrance via de eastbound carriageway in Lane 2
- A gap in the central reservation would be created and existing carriageway lane widths amended to create a right-hand turning pocket for 2 vehicles
- Vehicles to wait on this pocket for a clear gap in the westbound traffic to enter the car park

CHANGES TO HIGHWAY ACCESS - CAR PARK ENTRANCE
OPTION 3

Key considerations

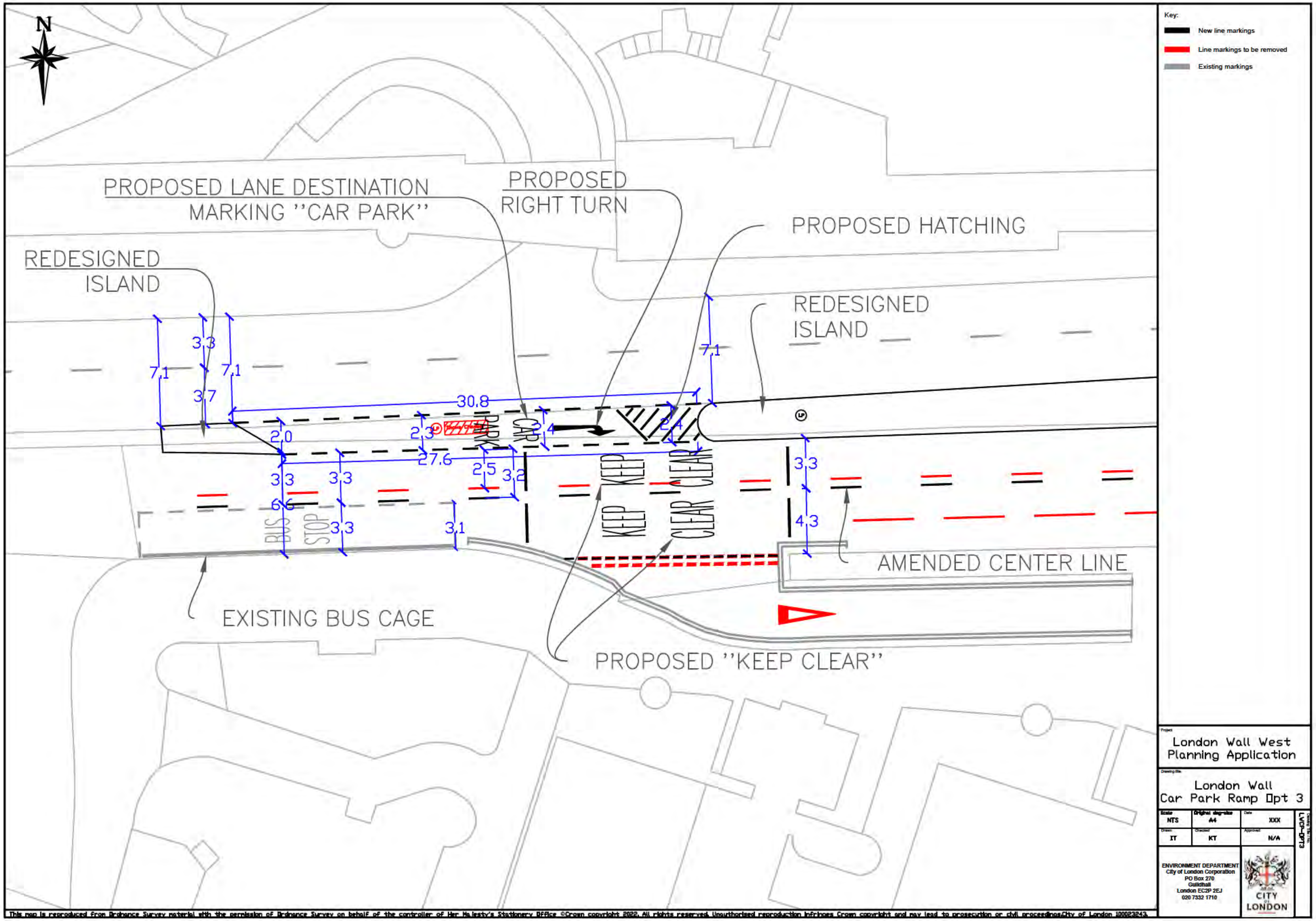
- A gap in traffic is guaranteed because the traffic signals at the Wood Street junction include an 'all-red' phase for pedestrians, so no traffic would be passing through the junction for a fixed time every cycle of the traffic signals upstream

- The geometry of the ramp is such that a left hand turn for vehicles from London Wall onto the ramp cannot be made without striking the wall, but cyclists could use it and then cycle through the LW Car Park to use the new cycle parking hub.

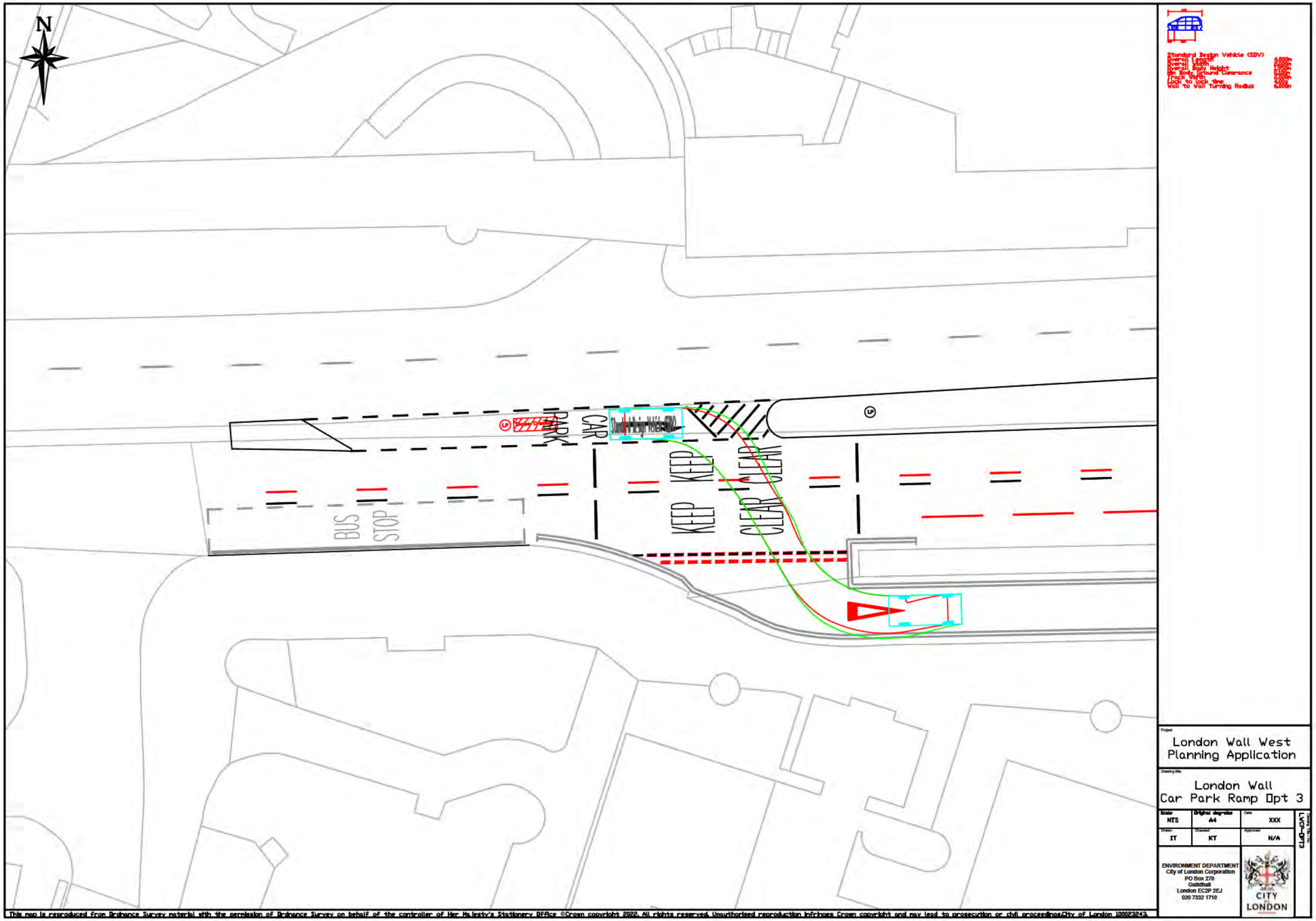
- There is no scope to adjust the car park ramp wall due to the Pipe Subway which runs behind the car park wall on the south side

It is possible that the Highway Authority would not support this option as it relies on a vehicle entering the offside lane to enter the turning pocket, however, with the whole City being a 20mph zone, of all the Options, Option 3 is considered to be the most realistically deliverable in terms of road safety and scale of structural intervention required for the car park.

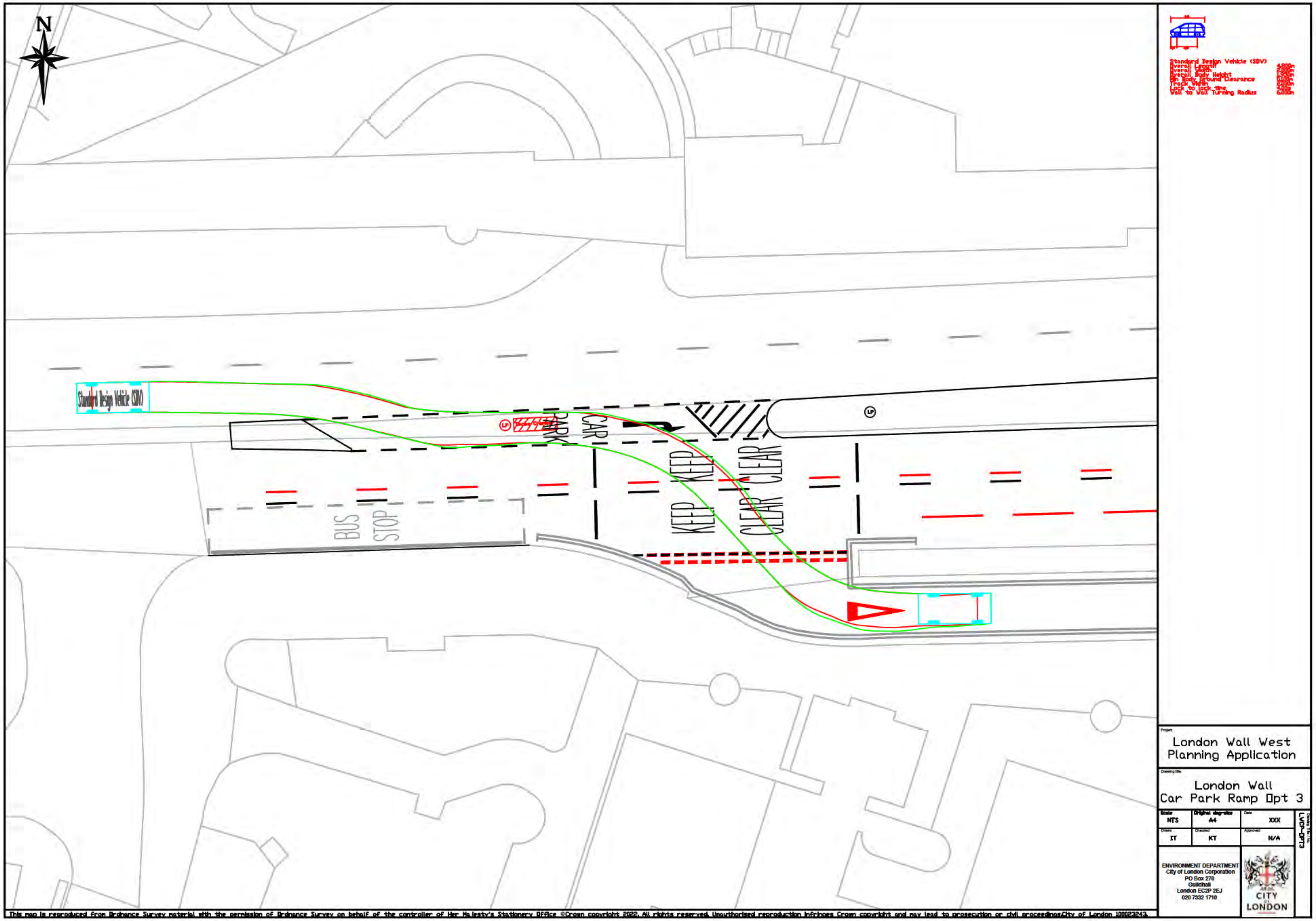
CHANGES TO HIGHWAY ACCESS - CAR PARK ENTRANCE
OPTION 3



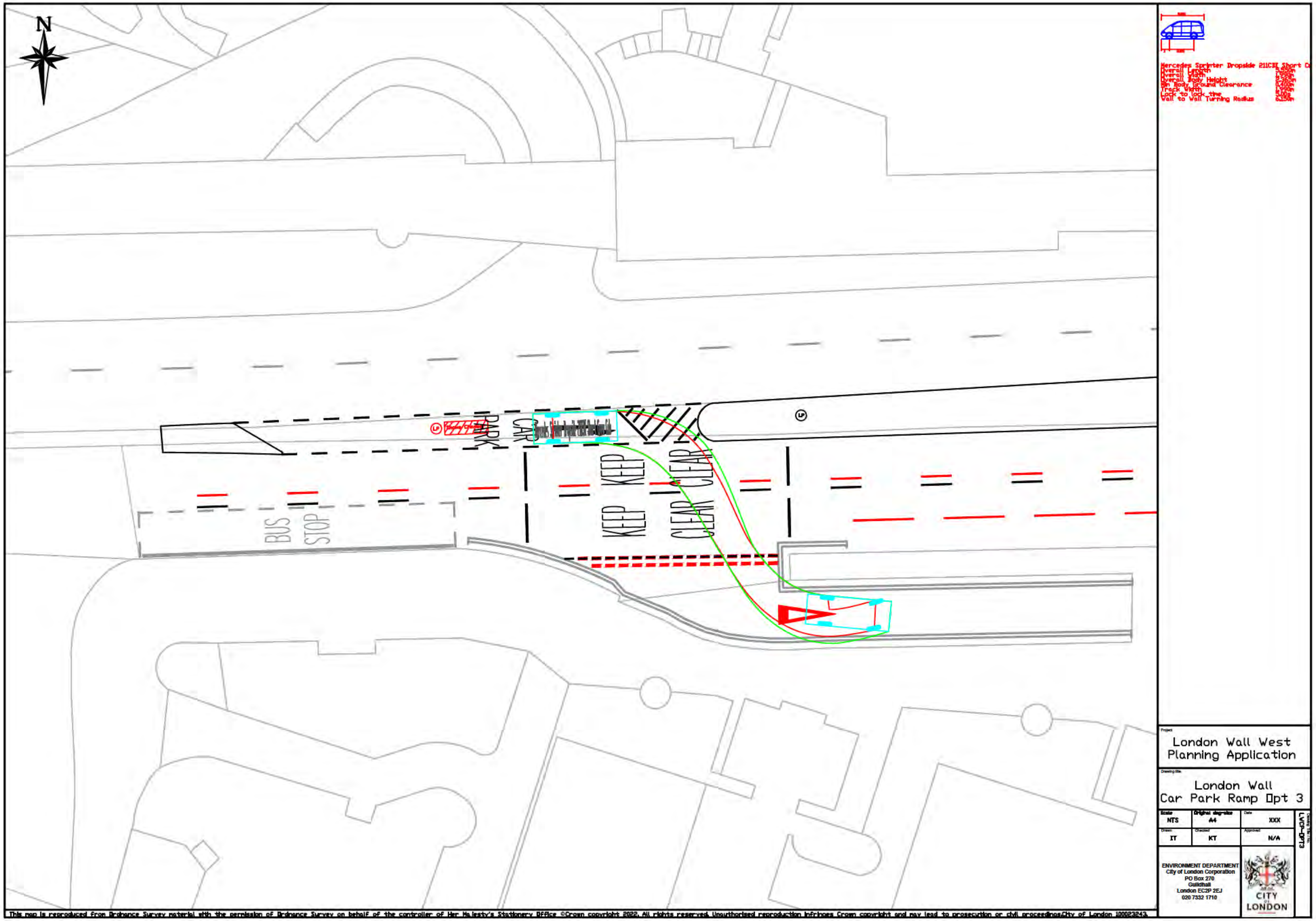
CHANGES TO HIGHWAY ACCESS - CAR PARK ENTRANCE
OPTION 3 - TRACKING STANDARD DESIGN VEHICLE 1



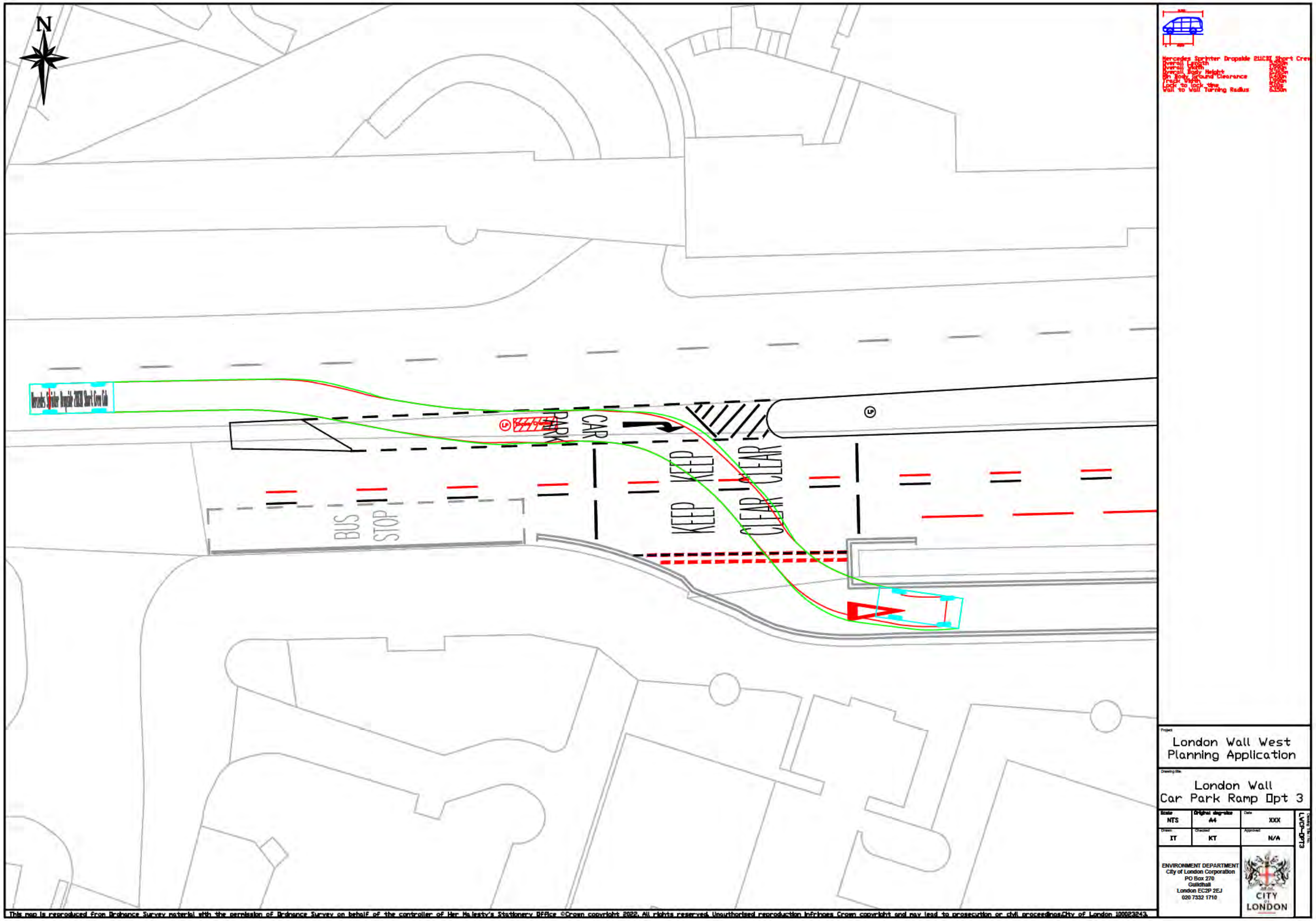
CHANGES TO HIGHWAY ACCESS - CAR PARK ENTRANCE
OPTION 3 - TRACKING STANDARD DESIGN VEHICLE 2



CHANGES TO HIGHWAY ACCESS - CAR PARK ENTRANCE
OPTION 3 - TRACKING VAN 1



CHANGES TO HIGHWAY ACCESS - CAR PARK ENTRANCE
OPTION 3 - TRACKING VAN 2



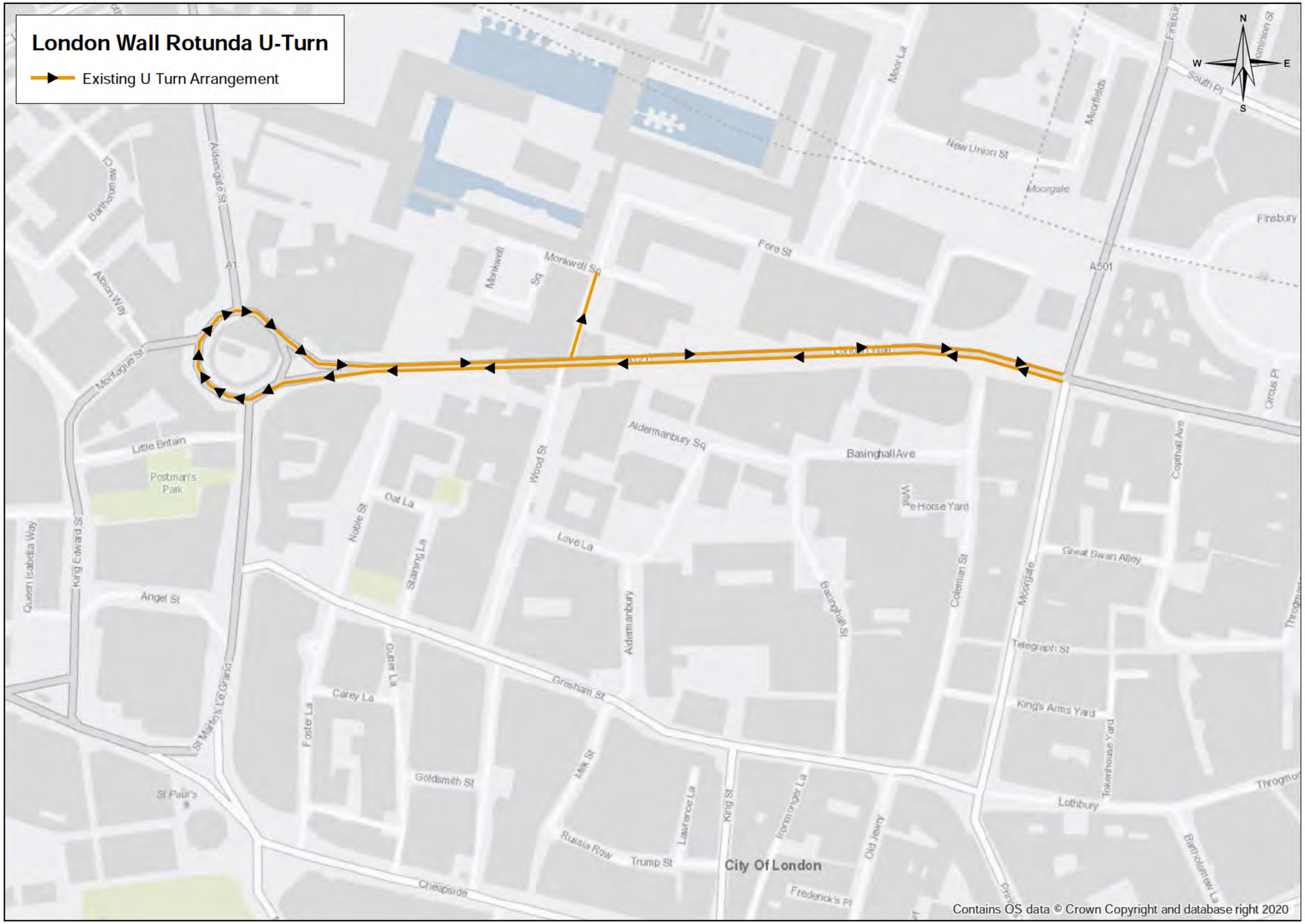
CHANGES TO HIGHWAY ACCESS - CAR PARK ENTRANCE OPTION 3
STRUCTURAL IMPLICATIONS

Key considerations

- Arrangement appears to have no impact on ramp arrangement or adjacent structural retaining walls
- Possible clash of vehicles and wall line as turning into the head of the ramp. Potential to flatten the head of the existing ramp and extend the flat zone by breaking out a short length of railing and upstand
- Turning zone in the central road area requires breakout of raised pavement area. Movement joint to drop at this location
- Turning zone coincides with existing pavement light required for smoke ventilation. Pavement light to be lowered and set into the primary slab.

Site investigations will be required in subsequent design phases in order to verify above assumptions/interpretations

CHANGES TO HIGHWAY ACCESS - EXISTING U-TURN ARRANGEMENT



CHANGES TO HIGHWAY ACCESS - U-TURN REASSIGNMENT