

Courtyards

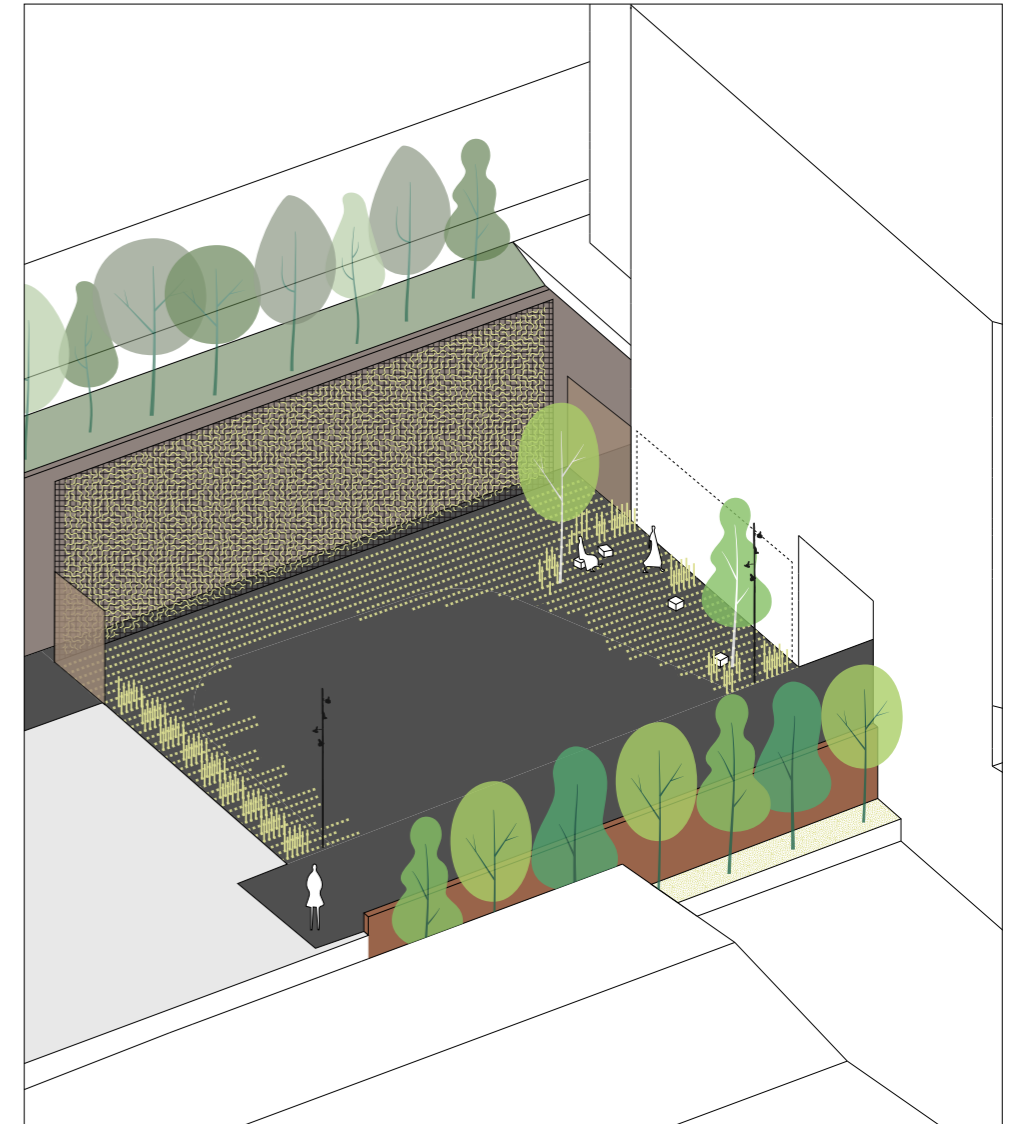
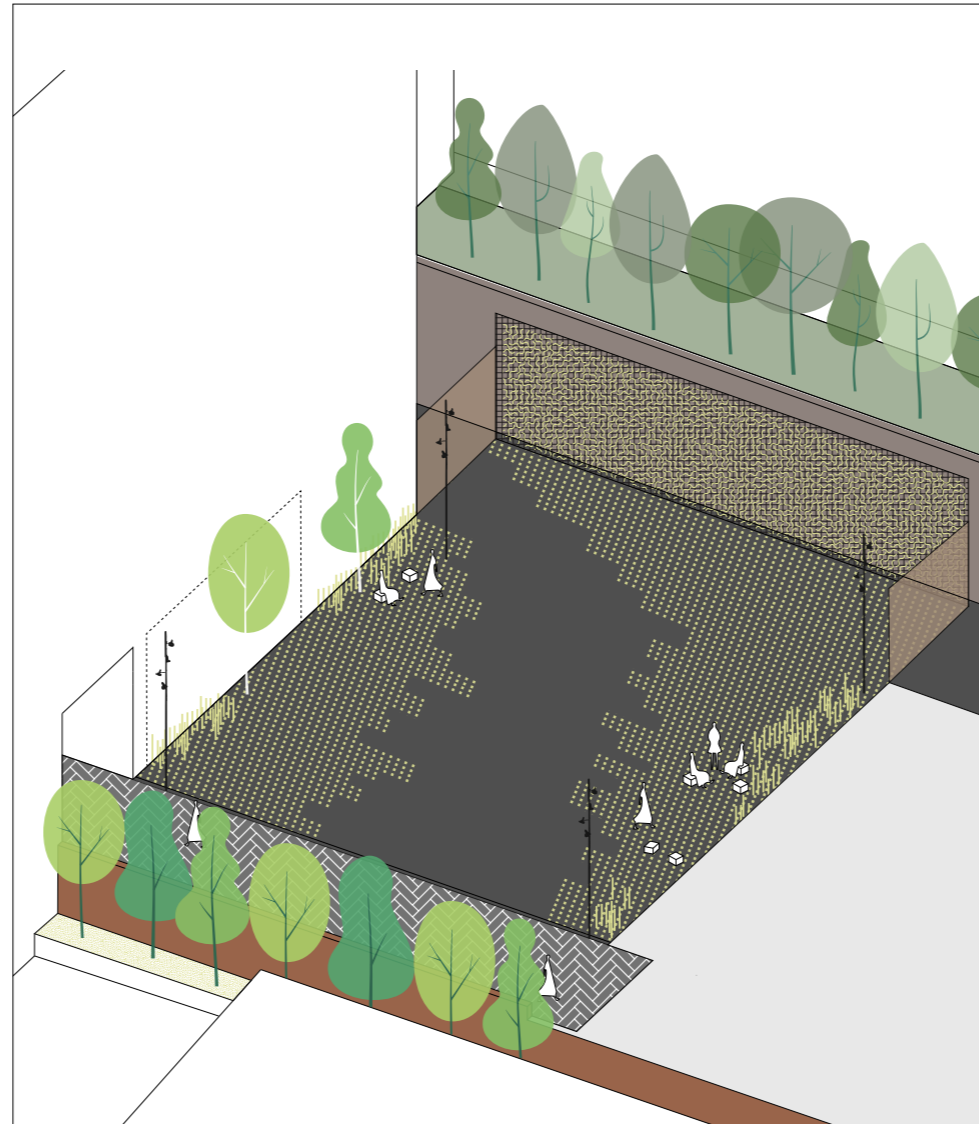
North Courtyard

Providing a mixed-use zone, the northern courtyard will offer spill-out space for PBSA, a public access route to the rehearsal building and suitable access to the service areas. The surfacing will be suitable for HGVs where it is required to allow for access. New planting will be incorporated - where it is not conflicting with vehicle tracking-, in the form of a green wall against the existing listed retaining wall and transitional green paving.

South Courtyard

The Southern courtyard is a mixed-use area, providing a spill-out spaces for PBSA and a zone suitable for HGV overrun required to service the buildings. To create a soft transition throughout the courtyard, new planting will be added along with a green wall in front of the existing listed retaining wall and transitional green paving.

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Please note diagrams on this page show design development, please see plan to the right for final proposal.



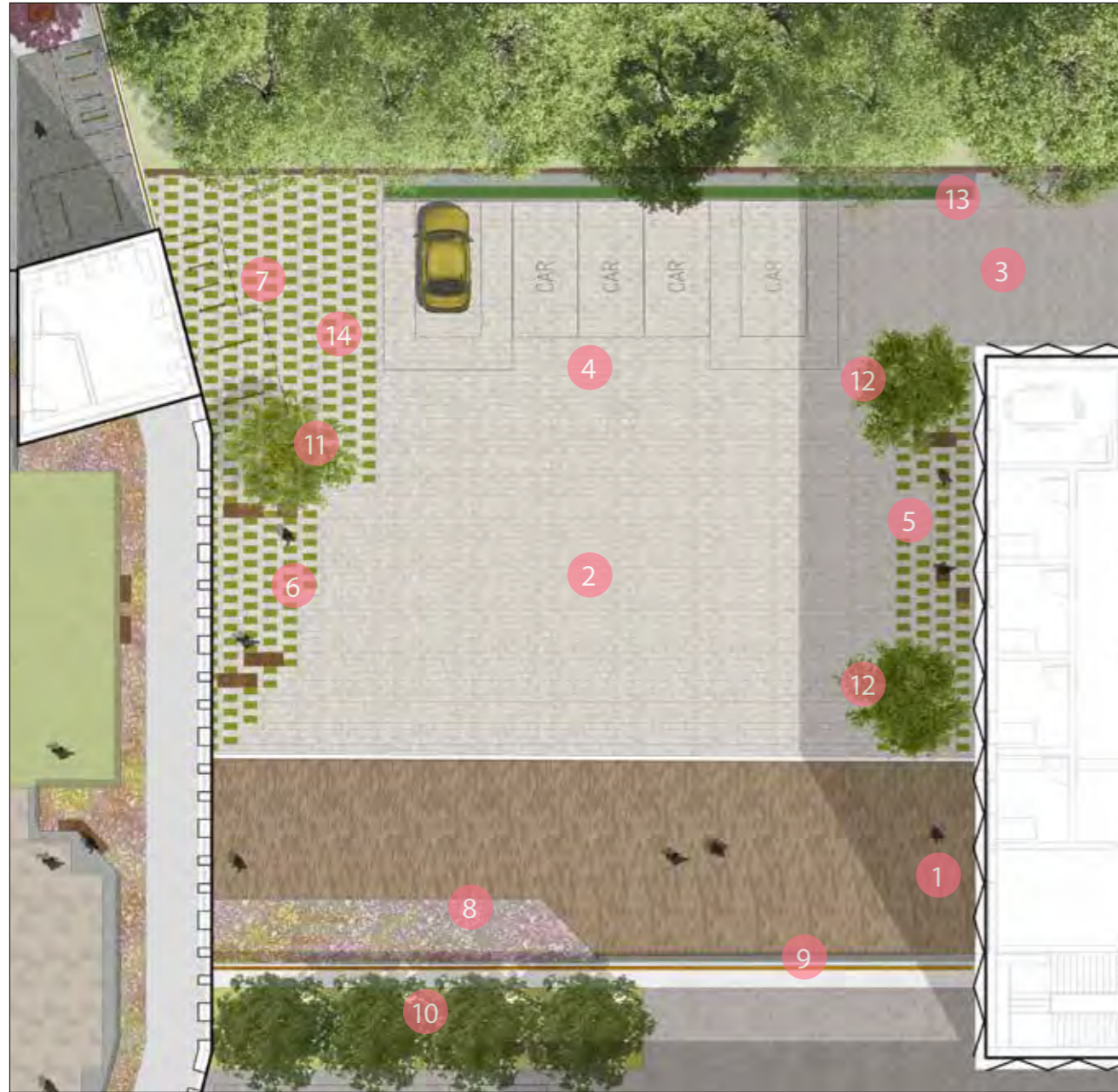
Left top:
Conceptual diagram for North Courtyard (part of the development stage)

Left middle:
Conceptual diagram for South Courtyard (part of the development stage)

Left bottom:
Precedent images illustrating look&feel of the designed spaces

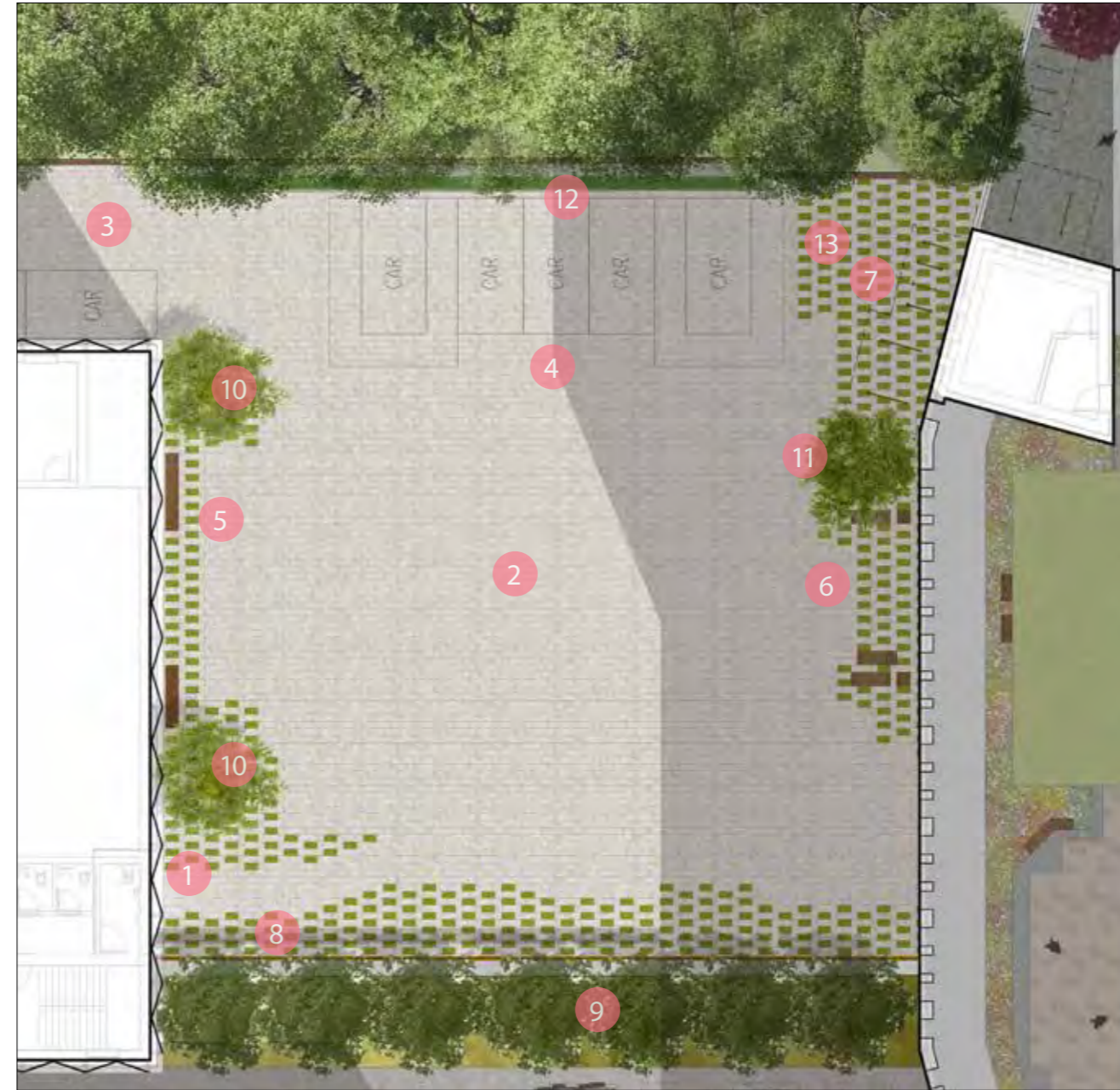
Right:
Illustrative plan showing proposed design for the North Courtyard

Far right:
Illustrative plan showing proposed design for the South Courtyard



North Courtyard: Detailed Area

1. Public entrance to the new Scottish Opera Rehearsal Building
2. Shared space suitable for HGV turning
3. Access to the lane behind new Rehearsal Building
4. Visitor Parking for Scottish Opera and Blue Badge parking for PBSA block
5. Spill out space for Scottish Opera studio rooms
6. Spill out space for PBSA amenity space
7. New visitor parking, including standard and non-standard stands
8. New planting along lower retaining wall
9. Decorative balustrade to the lower retaining wall
10. New tree planting on Level 0 (*Pinus sylvestris*), assisting with visual impact and wind exposure in the courtyard
11. New tree planting (*Fagus sylvatica*)
12. New tree planting (*Carpinus betulus*)
13. Green wall with climbing plants set in front of existing retaining wall
14. Grass pavers to the perimeter areas with minimal chance of vehicle overrun



South Courtyard: Detailed Area

1. Entrance to the new Scottish Opera Rehearsal Building
2. Shared space suitable for HGV turning
3. Access to the lane behind new Rehearsal Building
4. Visitor Parking for Scottish Opera and Blue Badge parking for PBSA block
5. Seating area alongside new Rehearsal Building
6. Spill out space for PBSA amenity space
7. New visitor parking, including standard and non-standard stands
8. Decorative balustrade to the lower retaining wall
9. New tree planting on Level 0 (*Pinus sylvestris*), assisting with visual impact and wind exposure in the courtyard
10. New tree planting (*Fagus sylvatica*)
11. New tree planting (*Carpinus betulus*)
12. Green wall with climbing plants set in front of existing retaining wall
13. Grass pavers to the perimeter areas with minimal chance of vehicle overrun

Stepped Landscape

North Steps

The northern steps provide a direct link and primary route between levels for the Scottish Opera site and any future developments to the North. Elements of soft landscape, trees, extended platforms and seating nooks are integrated into the terraced landscape, providing shelter, visual impact and spaces to gather and rest.

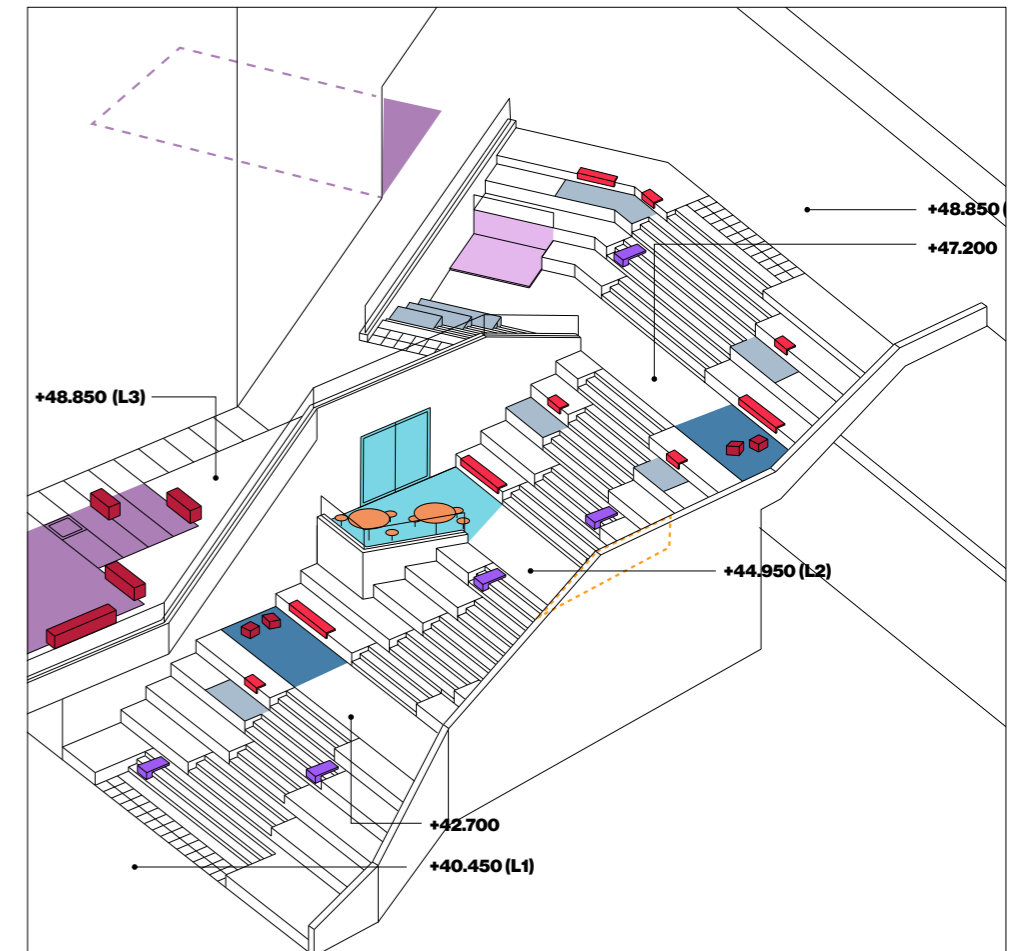
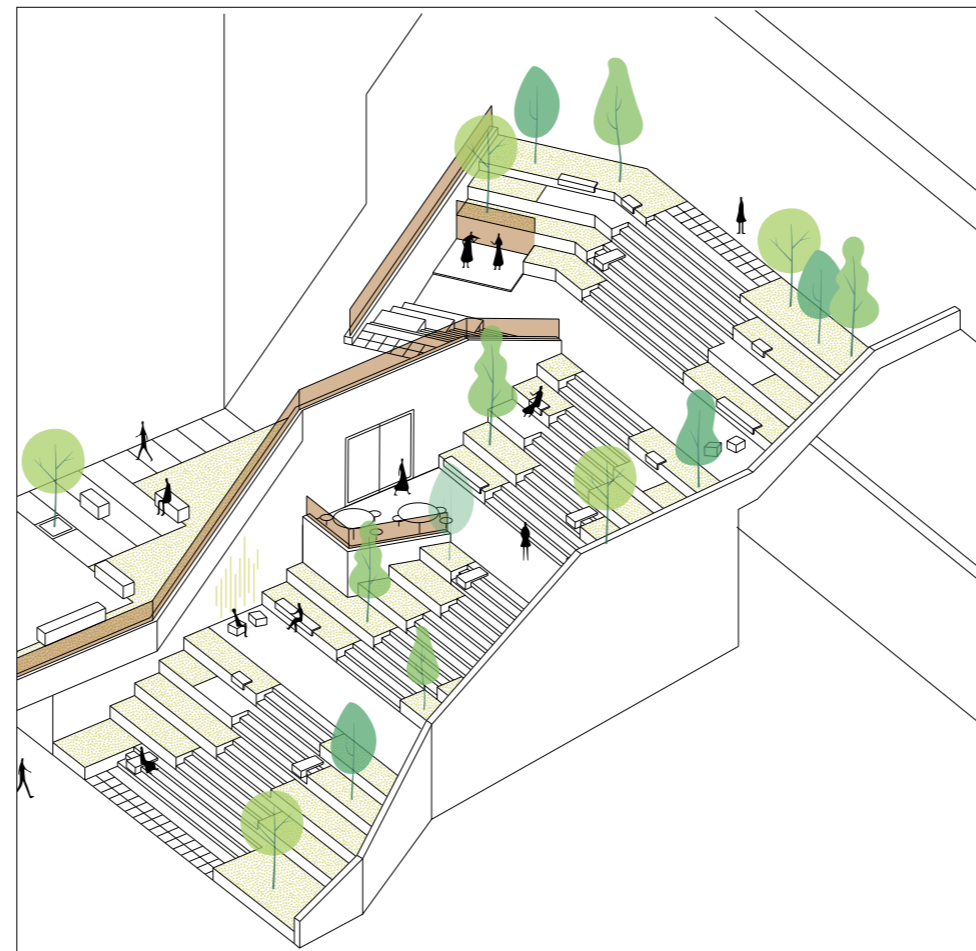
South Steps

The south steps offer a series of spaces and pockets throughout the terraced landscape, providing access from the platform level to the upper levels of the site. Creating a green landscape, both trees and considered planting will be incorporated into the terraces, taking full advantage of the full sun exposure throughout the day. The steps will connect to the PBSA entrance zone via a smaller set of steps.

PBSA plazas

The PBSA plazas located at the top of both the northern and southern steps, provide a connection to the site and the adjacent canal and towpath. Plaza on the south side offers spill-out seating space to the cafe, whilst plaza on the north side has a section of a planted sedum roof.

Please note diagrams on this page show design development, please see plan to the right for final proposal.



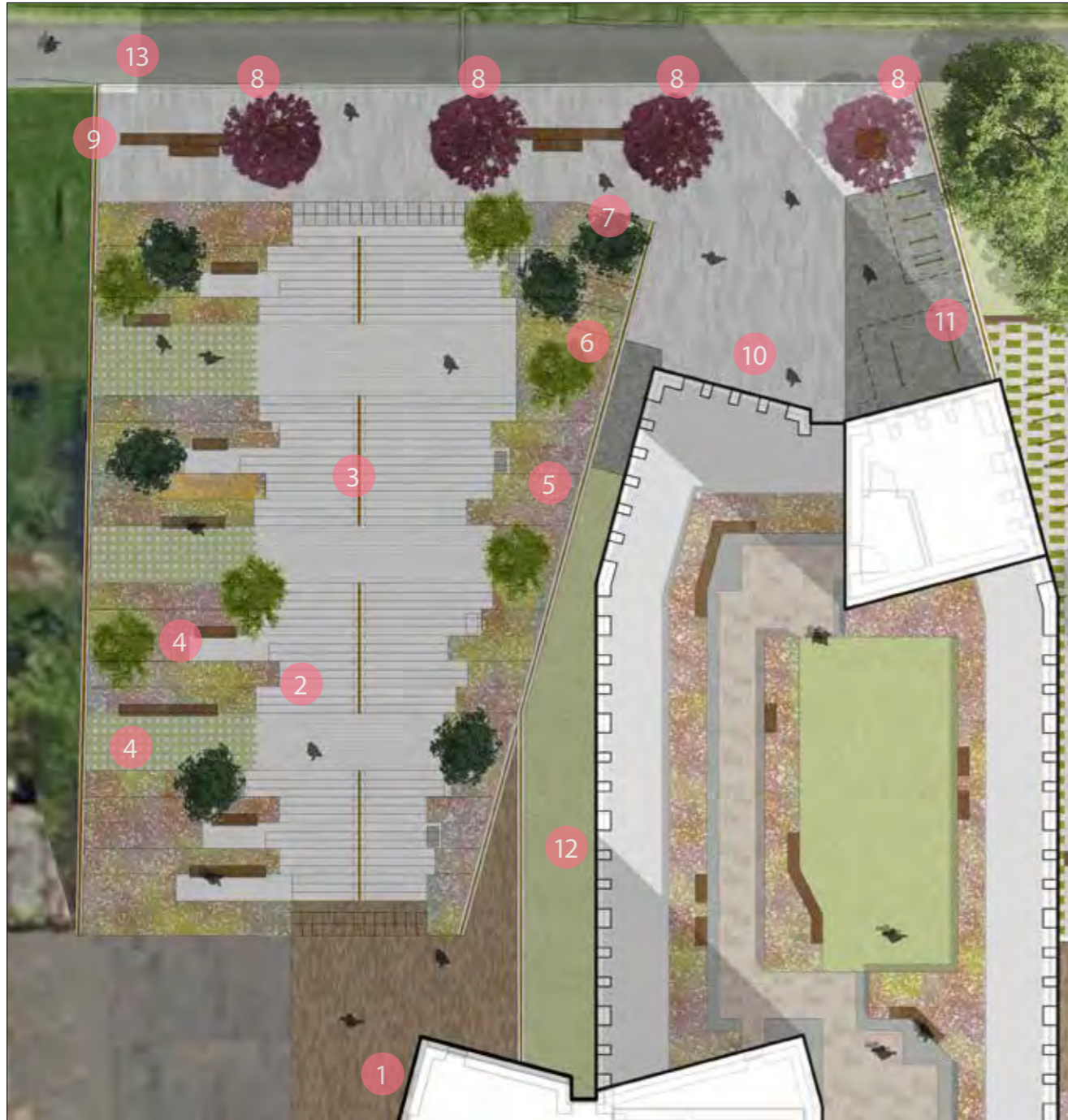
Left top: Conceptual diagram for the look & feel of stepped landscape (part of the development stage)

Left middle: Conceptual diagram for zoning of stepped landscape (part of the development stage)

Left bottom: Precedent images illustrating look&feel of the designed spaces

Right: Illustrative plan showing proposed design for the North Steps

Far right: Illustrative plan showing proposed design for the South Steps



North Steps: Detailed Area

1. Entrance into the pend and L1 courtyard areas
2. Public steps connecting L1 and L3 (towpath)
3. Integrated bike runner to each side of the handrail
4. Seating nooks to the side of the stair landscape with views across Glasgow
5. Shade tolerant planting mix
6. New tree planting (*Fagus sylvatica*)
7. New tree planting (*Carpinus betulus*)
8. New tree planting to canal landscape (*Acer platanoides* 'Royal Red')
9. Rustic log-style benches to canal landscape
10. Entrance to the PBSA block from towpath level
11. New visitor parking, including standard and non-standard stands
12. Green roof with shade tolerant sedum planting mix
13. Towpath



South Steps: Detailed Area

1. Entrance into the pend and L1 courtyard areas
2. Public steps connecting L1 and L3 (towpath)
3. Integrated bike runner to each side of the handrail
4. Seating nooks to the side of the stair landscape with views across Glasgow
5. Planting mix suitable for sun exposure
6. New tree planting (*Betula pendula*)
7. New tree planting (*Betula nigra*)
8. New tree planting (*Crataegus monogyna*)
9. New tree planting to canal landscape (*Acer platanoides* 'Royal Red')
10. Rustic log-style benches to canal landscape
11. Entrance to the PBSA block from towpath level
12. New visitor parking, including standard and non-standard stands
13. Outdoor spill-out area for the cafe
14. Towpath

Canal Landscape

At present the canal landscape offers an existing towpath, trees and soft landscaping. This proposal looks to enhance the landscape and create a connection between the canal and the new development.

The addition of street furniture, such as cycle stands and seating would encourage users to experience the landscape as opposed to just passing by.

Adding access points from the site to the canal and towpath allows for stronger connections and usage of the canal towpath and the various national cycle network connections the canal offers. Creating adjacent plazas to the towpath also offers opportunities for temporary events, markets and gathering spaces.

It should be noted that all proposals for the canal edge are subject to agreement with Scottish Canals.



Left top:
Conceptual sketch for canal
landscape plazas

Left bottom:
Precedent images illustrating
look & feel of the designed
spaces

Right top:
Selection of existing &
proposed species for the
canal landscape

Right bottom:
Comparison of existing &
proposed conditions along the
canal towpath

Existing trees



Goat Willow
(*Salix caprea*)



Downy Birch
(*Betula pubescens*)



Silver Birch
(*Betula pendula*)

Proposed trees (options)



Norway Maple
(*Acer platanoides* 'Royal Red')



Canal Landscape: Existing conditions

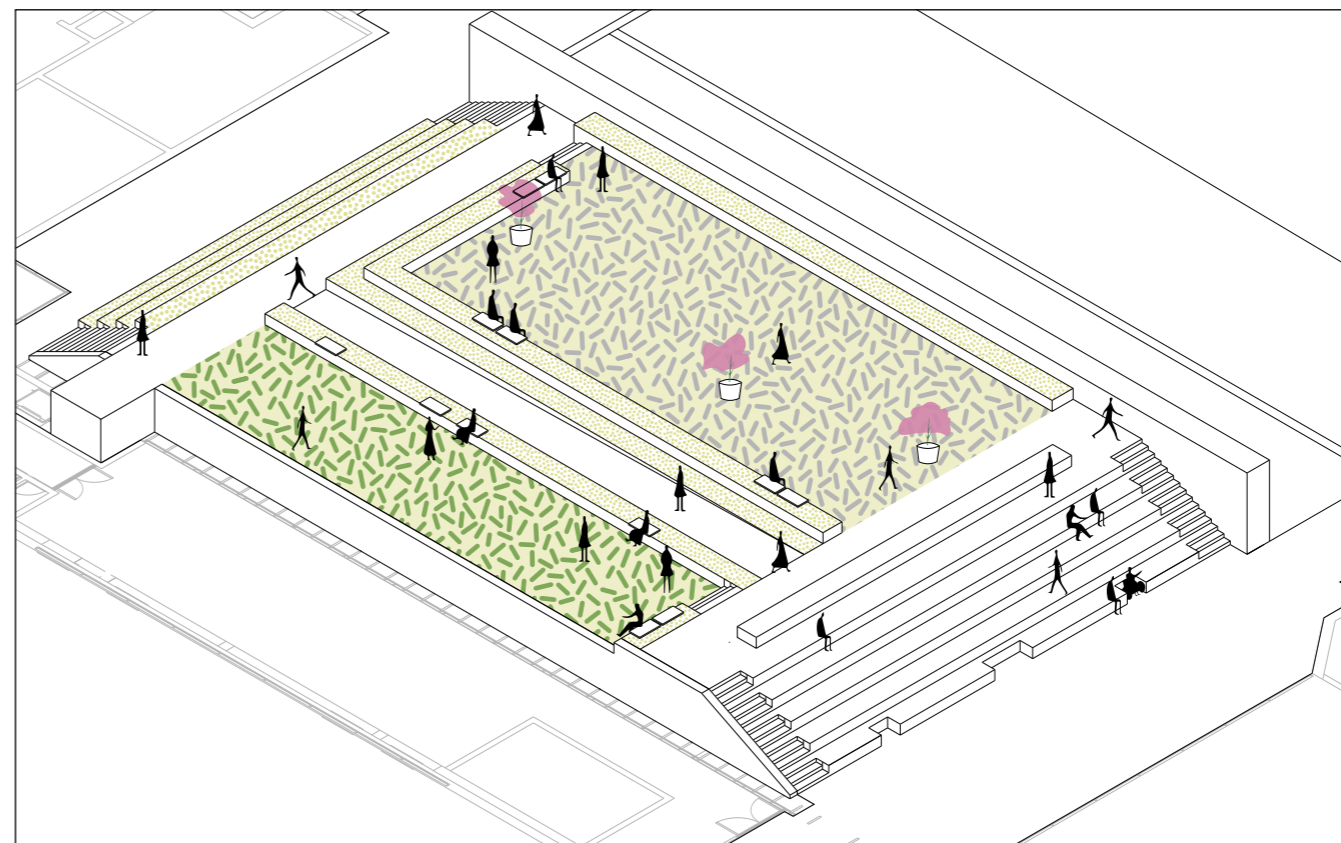


Canal Landscape: Proposed conditions

Walled Garden

The walled garden is a hidden gem in an urban setting. A space to be discovered, and to be enjoyed by all.

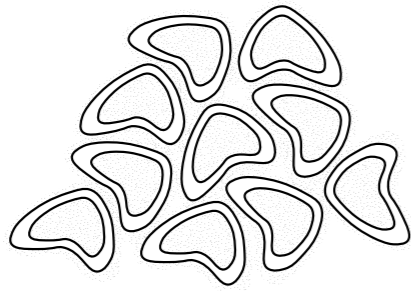
The garden comprises a few key zones, including spaces to rest, play, discover, and connect with nature. Terraced planters with integrated seating provide ample rest spots to take in the views of the surrounding city. Highlighted with bespoke feature paving, two key areas within the garden offer the opportunity for event spaces and spill-out areas. The southern steps down from the walled garden act as an outdoor theatre, providing seating for future events and shows.



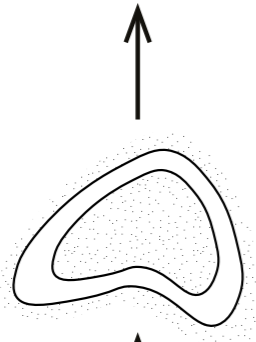
Left top:
Conceptual diagram for the
Walled Garden

Left bottom:
Conceptual visuals for the
walled garden spaces

The final abstract shape represented in the paving. The clustered effect representing the masses of people.



Translating the shape into the



Abstracting the footprints



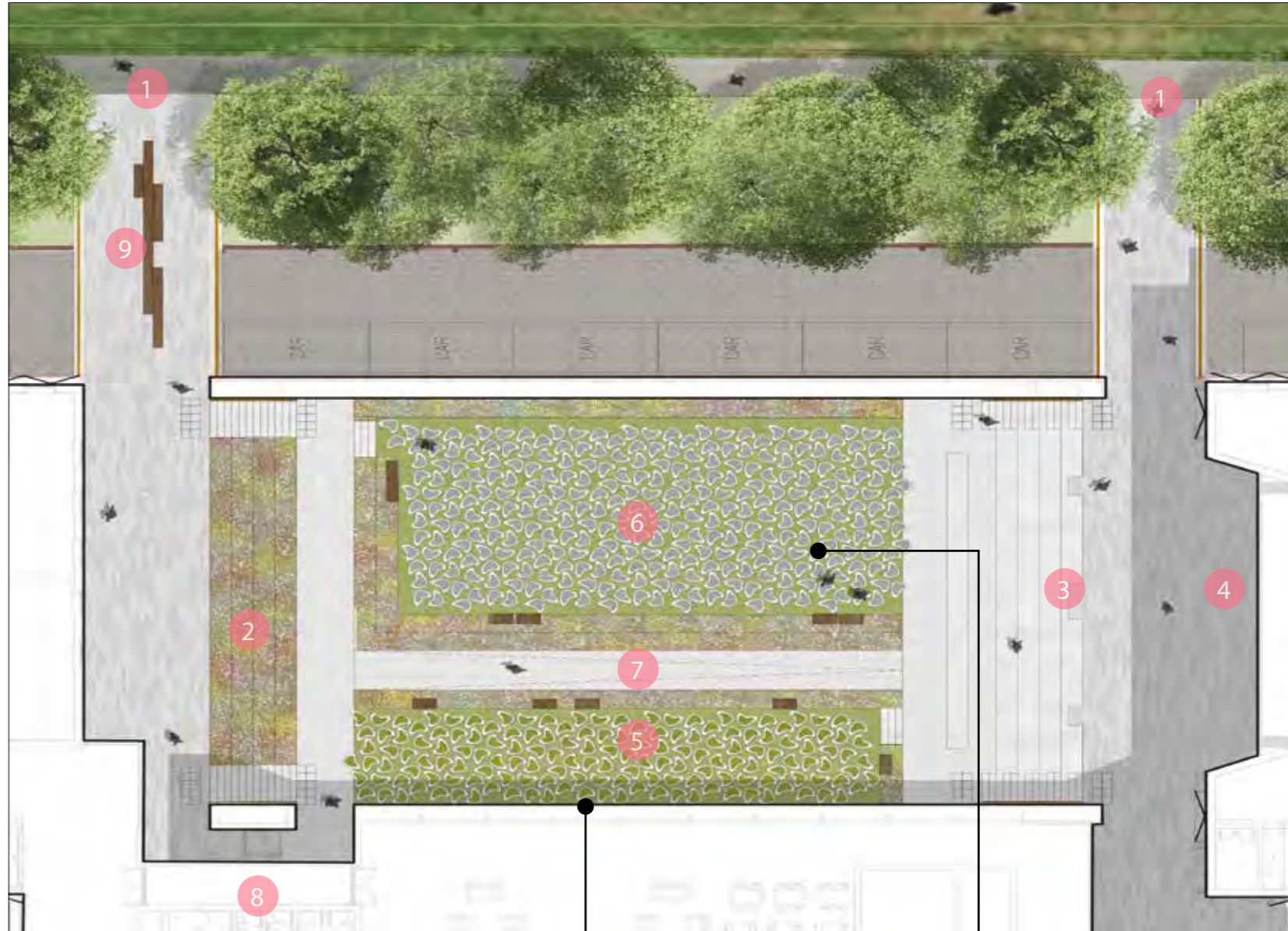
Beginning with the individual theatre goers footprints.



Right: Sketches showing evolution of the design for the paving pattern

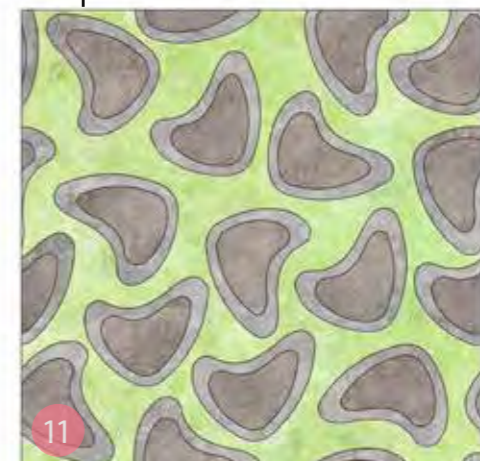
Far right: Illustrative plan showing proposed design for the Walled Garden

Right bottom: Illustrative representation of the two paving mixes for smaller and larger areas of the garden



Walled Garden: Detailed Area

1. Entrance onto new bridges from towpath, connecting to the walled garden & pavilions
2. Tiered planting area facing north pavilion
3. Amphitheatre with seating steps facing south pavilion
4. Area for pop-up performances
5. Smaller garden area adjacent to the cafe pavilion
6. Larger garden area, with paving suitable for temporary events & marquees
7. Accessible route between two sides of the garden
8. Lift access onto walled garden level
9. Rustic log-style bench
10. Bespoke paving pattern for smaller garden area



PBSA Roof Terraces

The roof terraces will provide a shared green space for PBSA users. Offering space for play -with featured ball game areas-, rest and gathering. The space will provide additional soft landscaping with the introduction of raised planters and considered planting, softening the rooftop landscape.

Integrated seating areas will be provided to offer additional gathering, meeting and resting points across the terraces.

The spaces will be mirrored across the two PBSA buildings to allow maximum greening of the rooftop sites.



Left:
Precedent Studies reflecting
look and feel of PBSA Roof
Terraces



PBSA roof terrace: Detailed Area

(applicable for both blocks)

1. Accessible paved zone with opportunities for seating and outdoor cooking
2. Multifunctional lawn space, suitable for outdoor games e.g. petanque
3. Raised planters with integrates benches
4. Maintenance area

Right:
Illustrative plans showing
proposed design for PBSA
terraces

9.6 Sustainability

The Energy and Sustainability strategies for the proposed New Rotterdam Wharf development have been developed to fulfil the energy and sustainability requirements set out in the Glasgow City Development Plan, including;

- National Planning Policy Framework 4 (2021)
- Glasgow City Development Plan (2017)
- City Development Plan Supplementary Guidance
- Building Standards Section 6 and Section 7

Energy Efficient Design

The energy strategies have focused on measures to minimise CO2 emissions and adapt to climate change, and will meet the requirements of Section 7 Gold standard for emissions.

Passive design measures have been proposed which include highly efficient fabric, natural ventilation, efficient mechanical ventilation with heat recovery, and high efficiency lighting. A key part of the decarbonisation strategy is that no fossil fuels such as natural gas will be used on site, with only electricity used as fuel.

The largest energy loads - hot water in the PBSA and heating in the Scottish Opera building – are being serviced by high efficiency Air Source Heat Pumps (ASHP). Solar PV is proposed on appropriate areas of roof to offset some of the electrical loads and reduce the CO2 emissions of the site.

The building's energy usage will be monitored with a comprehensive set of energy sub-meters. Further, occupants will also be able to monitor and manage their energy usage to help encourage active reduction in energy demand.

To minimise the risk of overheating passive design measures such as openable windows and external shading elements have been incorporated and detailed overheating risk analysis has been undertaken for the development to lower risk of overheating now and in future.

Resource Management

The intention is to source materials responsibly and reduce embodied carbon impacts by specifying low carbon and locally sourced material options where possible. All the timber will be FSC certified and legally sourced. The management, disposal and recycling of waste generated during the construction and operational phases will be

managed efficiently and meet targets set in the City Development Plan (CDP). The development aims to promote a circular economy approach that improves resource efficiency and innovation to keep products and materials at their highest use for as long as possible.

Health and Wellbeing

The health and wellbeing of occupants has been prioritised as part of the sustainability strategies for the development. A noise impact assessment has been carried out and recommendations made to lower the impact of the development on the surrounding area and minimise discomfort for residents; both residents of the new PBSA blocks and nearby existing residences such as Spiers Wharf.

Sophisticated Daylight and Wind studies have been carried out for the scheme and used to inform the form and orientation of the buildings. This has ensured that the effect on neighbouring premises is minimal and in many cases will improve local climate, particularly wind patterns around Spiers Wharf. Planting and landscape designs have been tailored to respond to this analysis to maximise the benefits of the new development.

Landscape Design

In addition to promoting comfortable microclimates, the landscape proposals aim to enhance the ecological benefits of the site by creating outdoor spaces which positively contribute to biodiversity through species-rich planting, and increased provision of higher quality outdoor spaces. This shall be met through:

- Standard trees
- Roof garden
- Rain gardens
- Planted areas around the site
- Physical connections to the nearby canal
- Permeable paving

Water Efficiency and Flood Risk

The development is aiming to reduce mains water consumption. This reduction will be achieved by specifying low flow and low flush fittings, providing water metering, a leak detection system, and flow control devices.

A Flood Risk Assessment has been completed for the development and confirms the site as low-risk from all types of flooding.

A surface water drainage strategy has been developed using best practice and using a combination of Sustainable Drainage Systems (SUDS), including green roofs, raingardens, and permeable/porous pavement. Sustainable Travel

The development will provide both cycle and car parking in line with the requirements in the CDP Supplementary Guidance (SG) 8. This will include Electric Vehicle charging spaces and cyclist facilities in the Scottish Opera building. Connections will be established to nearby cycle, walking and wheeling pathways. The development is located close to amenities, including public transport facilities, promoting the idea of Local Living and the 20-minute neighbourhood.

9.7 Environmental Analysis

Throughout the design of the New Rotterdam Wharf development, considerations of energy efficiency in the building and system design have been paramount.

A holistic design approach has been taken, tailored to meet the guidance and principles set out in Supplementary Guidance SG1 (Part 2 Section 1 Sustainable Development). Various tools and approaches have been used to ensure energy efficient design, including detailed studies to optimise and balance the competing needs of daylight and overheating risk, and use of a well-established energy hierarchy to prioritise the most impactful and best value energy reduction measures. The potential impact on surrounding buildings has also been considered via a daylight and sunlight assessment and external CFD modelling to ensure no unacceptable overshadowing or unforeseen wind patterns are introduced to the area.

In response to Glasgow City Development Plan CDP1 and CDP5 + SG1 and SG5 + National Planning Framework 4 Policy 1, Policy 2 and Policy 11 Environmental analysis studies have been carried out to inform the overarching design principles for the new development. This has included sophisticated daylight modelling, analysis of comfort and summertime temperatures and detailed computational fluid dynamics (CFD) modelling of wind patterns.

Daylight and sunlight analysis

Glazing ratios have been optimised to balance good daylight and occupant wellbeing with efficient thermal performance and avoiding excessive solar gain in summer months that can lead to overheating as the effects of climate change become apparent.

The interior daylighting for studio flats was examined and the results were highly positive in terms of interior daylighting. No rooms studied failed the daylighting recommendations from the National Annex of BE EN 17037:2018. Care has been taken with the arrangement of spaces and locating studios of different sizes. Further detail on this is given in the 'Daylight and Sunlight Report'

Careful consideration has been given to placement of different types of accommodation. Larger studios with kitchens, which benefit from higher daylight levels, are placed on southern façades. This, coupled with the placing of smaller studios on northern façades, allow them to reach the recommended daylight illuminances. The façade design influenced by this daylighting analysis was tested in the overheating risk assessment and found to be compatible with a low overheating risk.

The impact on daylight to surrounding properties was also studied and found to be negligible. Further details are set out in the attached document 'Daylight and Sunlight Report'.

Wind Microclimate Report

CFD modelling of the changes to wind patterns as a result of the development has shown that the development does not have an adverse effect on the surrounding area. In fact, it has a beneficial effect on Speirs Wharf by providing shelter and reducing wind speeds. Furthermore, no downdraught effect was recorded in the model. Refer to Wind Microclimate Report for further details.

There is some channelling effect to the north-west of the development. However, any risk of discomfort for passers-by in the reasonable worst-case scenario of strong wind from the south-west can be mitigated by careful landscaping. A further simulation has been run with a more careful rendition of the geometry of the area, which is stepped. This is already enough to considerably reduce wind speed in the area.

Considering that the complete landscaping will also include some soft elements, such as small trees, bushes, etc. our studies have deemed this to be sufficient to considerably reduce potential discomfort in this area.

Noise Impact Assessment

As part of the noise impact assessment, an environmental noise survey was required to establish the existing ambient noise levels in the vicinity of the nearby noise sensitive receptor.

To establish baseline noise conditions, a set of short-term spot measurements and a long-term noise survey were carried out on-site. Results of the representative existing ambient noise levels and background noise levels are used to set out targets

in compliance with relevant planning conditions and guidance.

The representative existing ambient noise levels on-site were found to be:

- 52 dBA – Daytime (07:00 to 23:00)
- 46 dBA – Night-time (23:00 to 07:00)

The representative existing background noise levels on-site were found to be:

- 44 dBA – Daytime (07:00 to 23:00)
- 38 dBA – Night-time (23:00 to 07:00)

Façade elements (windows and external walls) need to provide appropriate noise reduction to meet the BS 8233:2014 indoor ambient noise level limits. Façade noise levels have been predicted by using 3D acoustic modelling software. The outcomes have been used to assess required acoustic specification of the façade elements. Good practice is to design noise emissions such that the combined noise from all new primary items of plant equipment result in a "low impact" at the nearby noise sensitive receptor when assessed in accordance with BS 4142:2014+A1:2019.

As such, if the combined plant noise rating was below the representative background noise level, then a low impact is likely.

Similarly, for the combined noise emissions from emergency plant equipment, the noise rating level limit should be no greater than 10 dB above the representative background noise level at the nearest noise sensitive receptor.

It was found that daytime plant noise emissions are expected to comply with the proposed noise rating level limit and therefore represent a low impact at the nearest noise sensitive receptor.

Night-time plant noise emissions and daytime emergency plant noise emissions will be kept within the proposed noise rating level limit by being provided with a degree of acoustic intervention. This will include high performance acoustic enclosures for emergency generators and pump sets and either attenuating screens or acoustic louvred enclosures for heat pumps.

9.8 Fire Service Access

To inform the development of the site and assess its viability, a tracking of fire vehicles was carried out covering the four courtyards resulting on the proposed development.

Fig 1 represents the tracking diagram of a tender vehicle accessing the Northeast courtyard at level 1 from Sawmillfield St.

Fig 2 represents the tracking diagram of a tender vehicle accessing the Southeast courtyard at level 1 from Corn St.

Fig 3 represents the tracking diagram of a tender vehicle accessing the Northwest courtyard at level 0 from Edington St.

Fig 4 represents the tracking diagram of a tender vehicle accessing the Southwest courtyard at level 0 from Corn St.

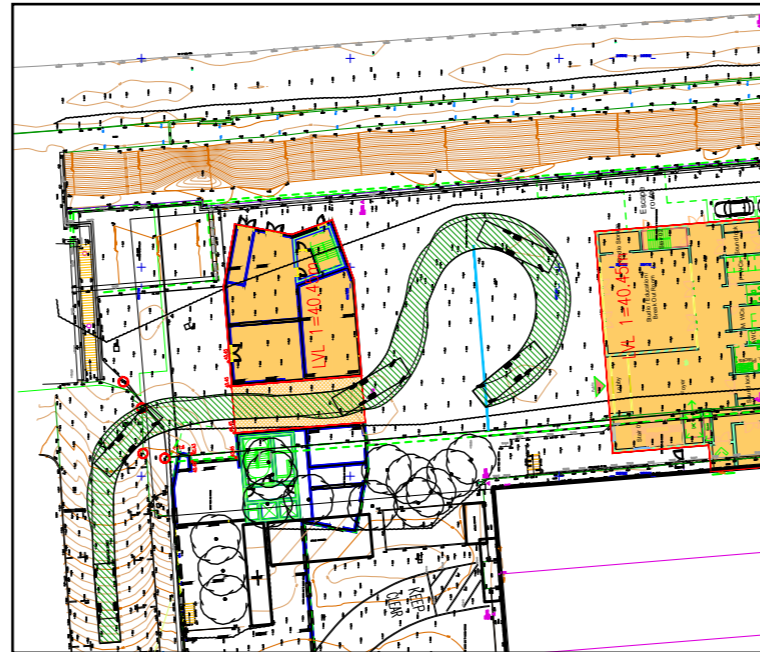


Fig 1



Fig 2

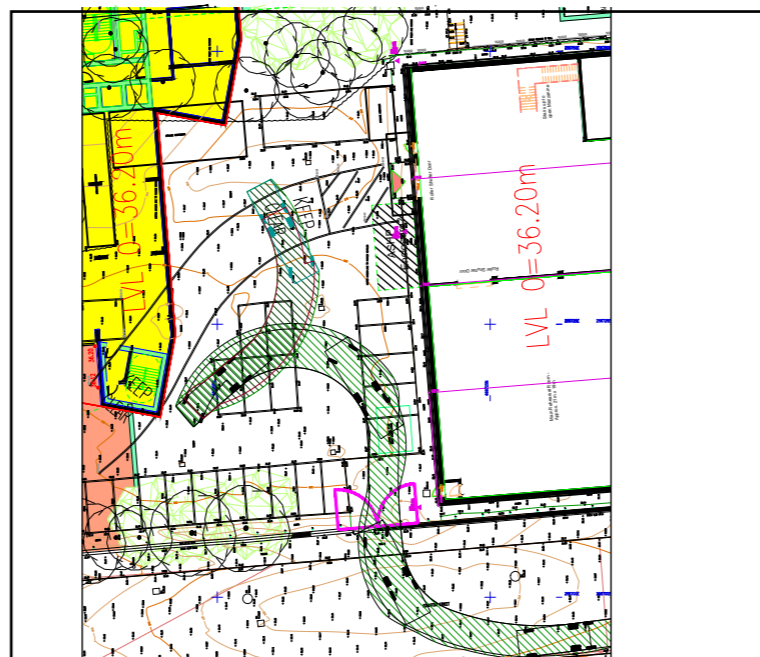


Fig 3

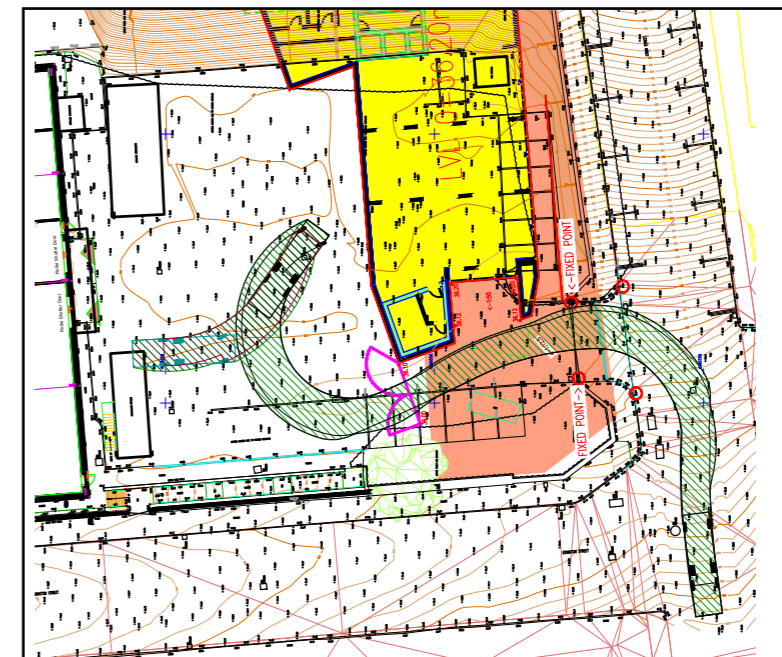


Fig 4

9.9 Service Access

To inform the development of the site and assess its viability, a tracking of service vehicles was carried out covering the four courtyards resulting on the proposed development.

Fig 1 represents the tracking diagram of a refuse vehicle accessing the Northeast courtyard at level 1 from Sawmillfield St.

Fig 2 represents the tracking diagram of a HGV vehicle accessing the Southeast courtyard at level 1 from Corn St.

Fig 3 represents the tracking diagram of a HGV vehicle accessing the Northwest courtyard at level 0 from Edington St.

Fig 4 represents the tracking diagram of a tender vehicle accessing the Southwest courtyard at level 0 from Corn St.

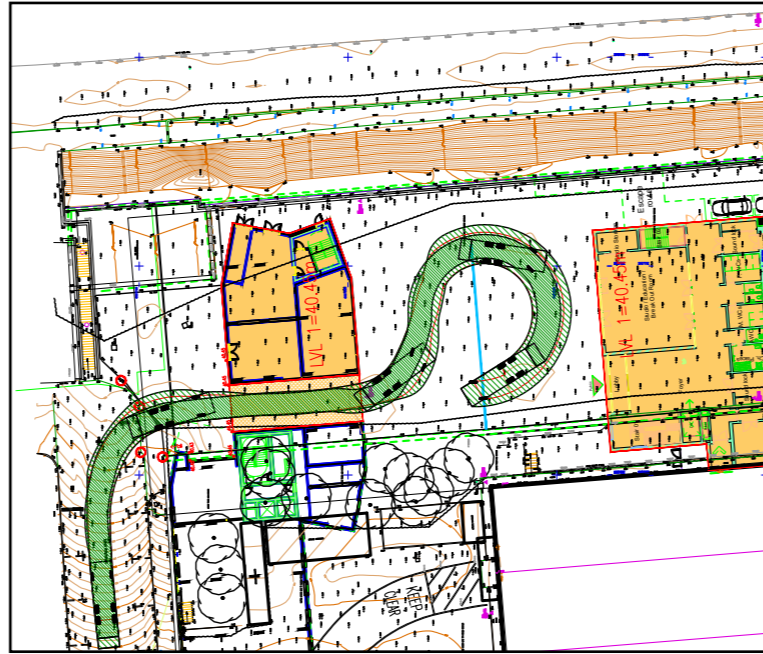


Fig 1



Fig 2

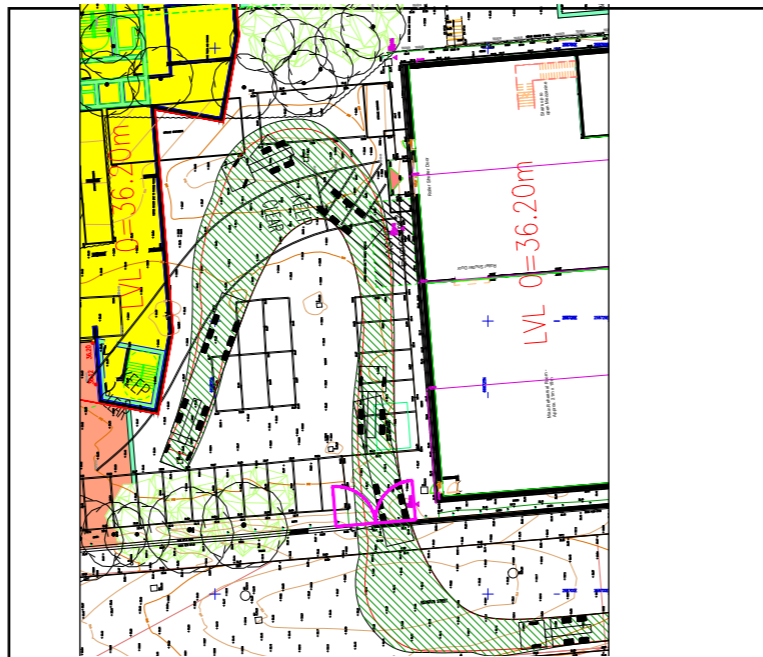


Fig 3

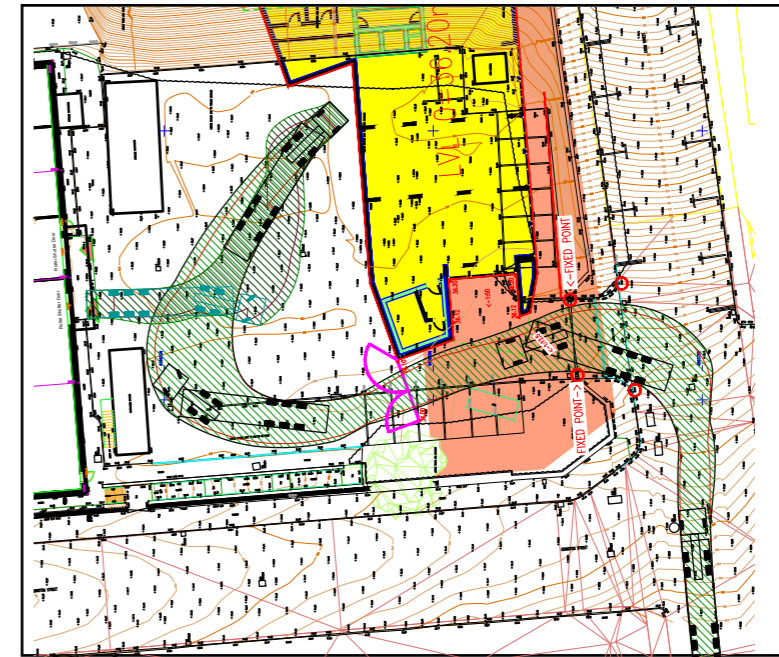


Fig 4

The developed site will have new, separate foul and surface water systems.

Both Scottish Water and Scottish Canals have been consulted and agree, in principle, with strategy going forward. i.e. to route all foul to the public sewers around the frontage of the site.

For surface water, the only areas that can feasibly connect to the canal are the PBSA roofs. All other areas are below canal water level and will therefore drain to the combined sewers via attenuation.

Scottish Water will consider a surface water connection to the combined sewers provided a volume "betterment" is offered from that of the predeveloped site. Scottish Canals will consider connection of all new roof areas to the canal provided design is in accordance with the "MGSDP Sustainably Drain Glasgow" Document compiled by four-storey NGIWMS Project Group.

The principle of above ground storage i.e. Green/Blue Roofs in this case, is also in accordance with Glasgow City Council's Water Environment Guide SG8.

Foul Water Drainage Proposals

The only new wastewater generated by the development will be from toilets, sinks and the proposed laundry. The new foul drainage from the RRRG will be routed north and south, at the upper platform level, and connect to the public combined sewers in Corn Street and Sawmillfield Street. The existing sewer in Sawmillfield Street is 375mm diameter and just over 3m in depth. The diameter of the existing sewer in Corn Street is unknown however, the upstream section is 390mm diameter and therefore this will be the minimum diameter at the new connection point.

The depth of the existing sewers at the connection points is unknown. However, no issues are anticipated with tie in invert levels due to the fall in the existing road levels to the west of the site.

Surface Water Drainage Proposals

The preferred option is to drain the additional RRRG yard areas (upper platform) to the combined sewer. However, a betterment should be made to the volume of surface water currently entering the combined sewer.

The surface water strategy can be summarised as follows:

- 1) The existing SOEPS roof and hardstanding on the low-level platform currently drains to the combined sewer with no attenuation.
- 2) The existing high level concrete slab has no formal drainage system as it was originally the ground slab for the previous Depot building at the site. However, in times of exceedance, run off flows onto the low-level platform by spilling over the retaining wall and also by spilling at the northwest corner, of the high platform, at the level of 40m aod.
- 3) Once developed, hardstanding plus the new RRRG roof, on the high-level platform, will drain to the combined sewers via attenuation. The opportunity will also be taken to attenuate run off from the existing low-level yards and this will reduce impact on the combined sewers. The restriction in surface water flow will be achieved by using a flow control device at the downstream end of the system.
- 4) The roof area of the new the multi-story PBSA blocks will drain to the canal via a "Blue roof" or "Blue roof/Green roof" systems in accordance with the "MGSDP Sustainably Drain Glasgow" Guide. It is not considered feasible to drain the new RRRG roof to the canal due to pitched roof profiles and the proposal to make the roof an event space with complex landscaping.
- 5) Roof water from the PBSA blocks will be suspended beneath the Level 3 slabs at a level of approx. 48.8m aod which is compatible with the canal tow path level. Once external, pipework will be suspended beneath a new link bridge then buried beneath the tow path and penetrate through the canal side wall. The detail of the canal outfall will be discussed in more detail with Scottish Canals but will likely be submerged with a nonreturn valve fitted. There will be 2no. new outfalls in total (1no. for each PBSA block roof).

9.11 Utilities

The existing Scottish Opera building has utility connections for Electricity, Gas, Water and Telecoms.

Electrical supplies

The electrical incomer is served from an existing SPEN substation located in the Southern service yard. The proposed location of the South PBSA block As part of the new development this substation will be removed and a new substation will be installed in an alternative location within the South service yard. A new incomer will be installed to serve the upgraded Scottish Opera building, and any other power supplies to other buildings will be diverted to the new substation

Each of the new PBSA blocks will have a dedicated substation. New substations will be installed within the ground floor of each building, with access for maintenance through the services yards.

Water supplies

There is an existing water connection serving the Scottish Opera building which enters from the West side of the building. As part of the redevelopment a new metered water connection will be provided to the upgraded Scottish Opera building.

The PBSA blocks will each have new independent metered water supplies installed as part of the development.

Natural Gas supplies

There is an existing natural gas connection serving the Scottish Opera building which enters from the West side of the building and serves gas fired boilers generating heat and hot water. As part of the decarbonisation strategy no new gas supplies will be installed. The new Scottish Opera building will be served by electric heat pumps, as will the PBSA blocks.

Telecoms

The existing Scottish Opera building has an existing telecoms connection serving the production studios. As part of the new development, new telecoms connections will be provided to each of the three new buildings.