

PERTH CITY LINK RAIL ALLIANCE

by **Nigel Greenhill**

BACKGROUND

Public transport projects offer multi-dimensional solutions for our environments. Not only do they move vast amounts of commuters in and out of cities and get people to work in an efficient and sustainable way, they also lay the important foundations for the future growth of our cities.

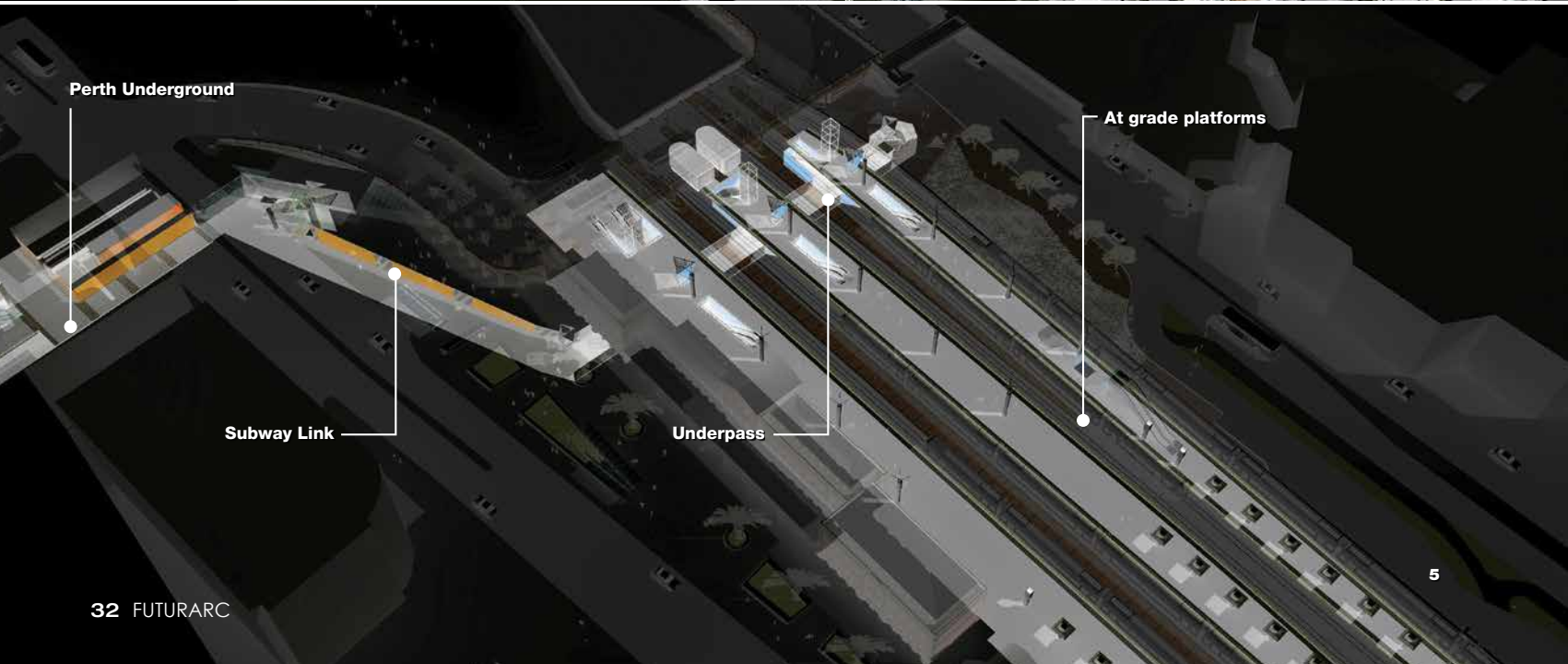
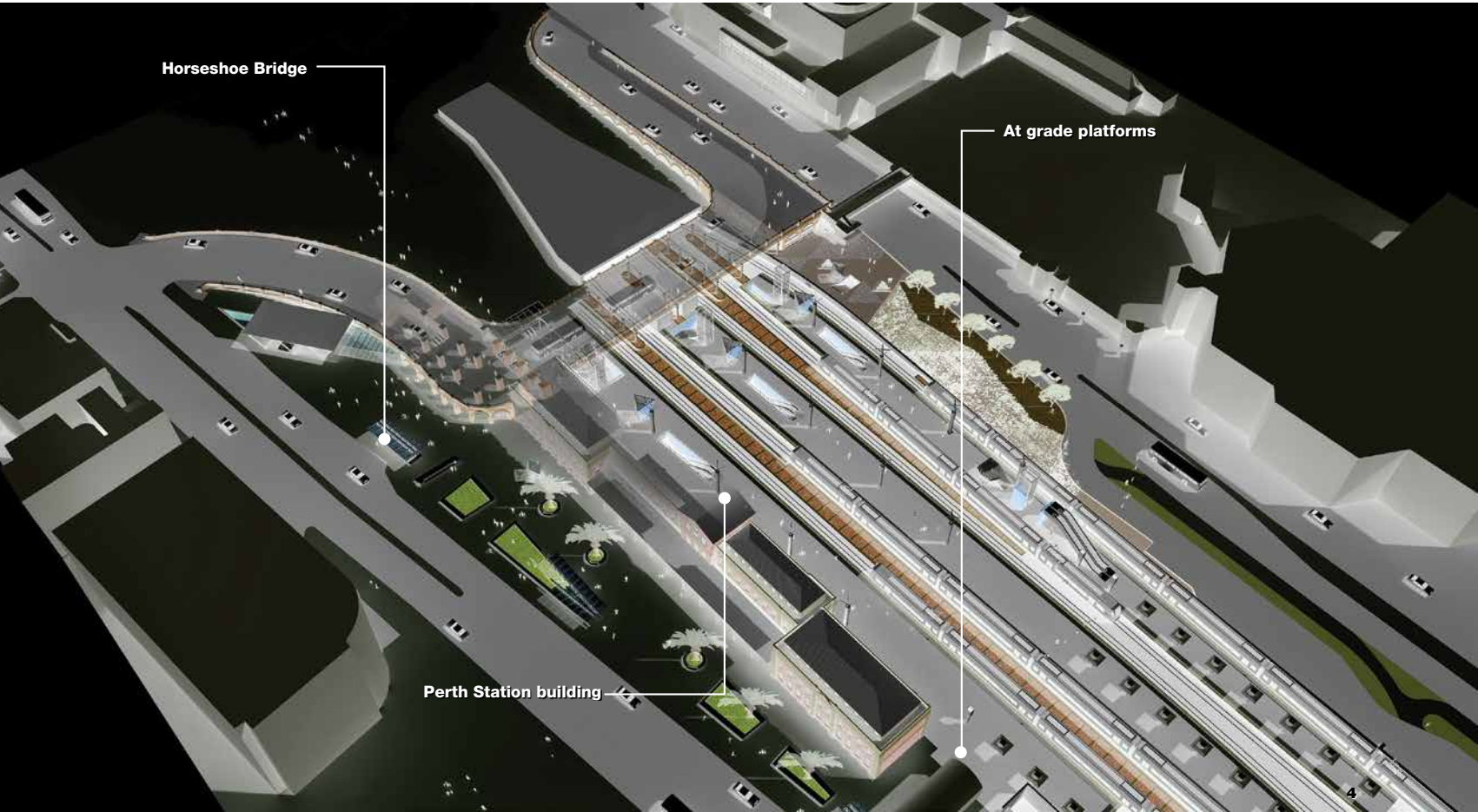
The recent demand for Western Australia's natural resources has fuelled a new wave of population expansion; and the demand for its capital Perth to provide high-end inner city office and mixed-use floor space is now becoming paramount.

Perth's CBD growth had been constrained to the north by the city at grade rail corridor, a significant infrastructure set down a century ago. This rail-corridor has recently been 'buried' underground to allow the city to expand over the top, and by doing so creates new development opportunities and public spaces connecting the city north to the suburb of Northbridge and the Cultural Precinct. This plan, however, is contingent on the Perth Station being substantially re-configured by building new platforms and to provide a direct underground link (the new underpass) from Perth Station to the Perth Underground (PUG).

1 Triangular skylight opening and daylight articulate changes in direction and passenger flow



2 Source: Metropolitan Redevelopment Authority



PROJECTS



CHALLENGES AND HERITAGE

The reconfiguration of Perth Station involves many constraints, challenges and opportunities in having to work with layers of history both above and below ground. Prior to this project, Perth Station was somewhat spread out: it grew organically (as have most stations of this typology) as its needs gradually expanded over the past 100 years. The reconfigured Perth Station would be more compact and consolidated, offering direct connections between transferring platforms, greater intermodal transport flows (train, bus, taxi), non-transit pedestrian links, and a new architectural identity that responds positively to its immediate urban context.

Another major aspect of the project is the heritage interface. The underpass passes directly under the Perth Station building and in close proximity to the road bridge called the Horseshoe Bridge. Both of these are heritage-listed buildings/structures. The position of the underpass, stairs, lifts and escalators is greatly influenced by the existing foundations. Hence its alignment and impact on each platform's circulation had to be reconciled. In addition, the nature and depth of the underpinning structure under the building impacted on available public headroom of the underpass.

A balance between economy, construction risk mitigation and architectural space, therefore, had to be established.

THE DESIGN

The underpass is a 'dog-leg' link that provides a seamless connection between the underground and at grade stations, and replaces the original timber footbridge, which was previously the only means of linking the platforms.

The approach to the architecture of the link was to provide clear and direct routes, as well as articulated spaces of colour and texture, punctuated with

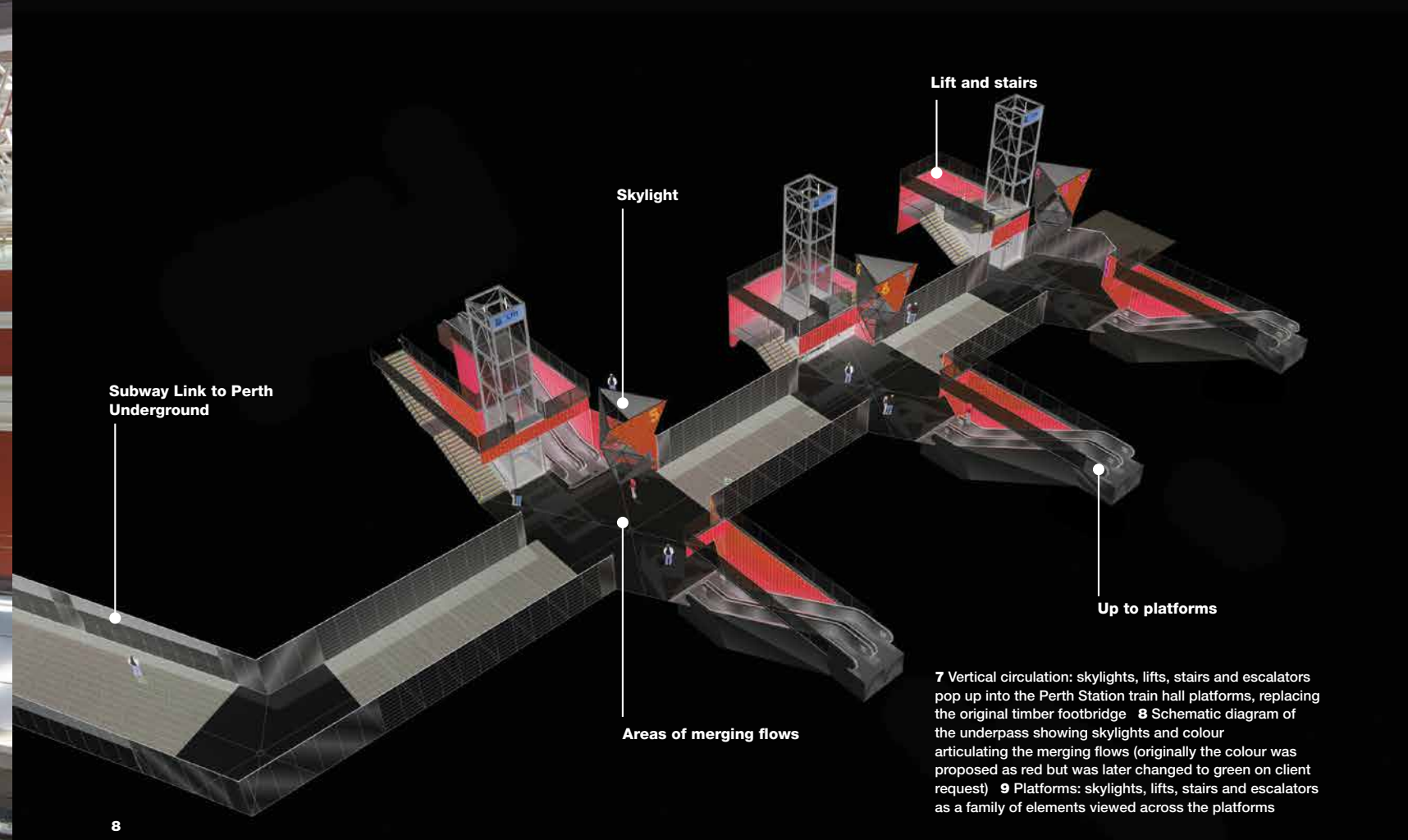
daylight where possible. Changes in direction needed to be spacious, clear, uncluttered, and adequately sized to suit pedestrian flow.

Critical junctures where passenger-merging flows occur at the base of stairs and escalators with the underpass are spaces that needed to be opened up to accommodate circulation flow. These circulation nodes incorporate splayed corners which respond better to pedestrian movement, strongly influencing a 'triangular diagrid' geometry which underscored the design planning and ceiling design. The circulation nodes contrast the rest of the underpass and are highlighted by the use of different materials, colour, texture, and spatial volume.

Skylights were introduced to reinforce these with natural light and to provide visual connections between below and above-ground spaces. The architecture of these skylights follows the geometry of the circulation flow. The resultant sculptural forms being 'origami' expressions of metal and glass, continue the underground architectural language up into the platforms above and forming a contrasting but complementary architecture within the heritage context.

2 Rail corridor dividing Perth's CBD from Northbridge and the Cultural Precinct (c.2004)
3 The City Link master plan 4 At grade Perth Station: heritage context
5 Perth Underground to Perth Station connection 6 Skylights: triangular geometric ceiling in the underpass opens up to the skylight and provides natural ventilation

PROJECTS



Lift and stairs

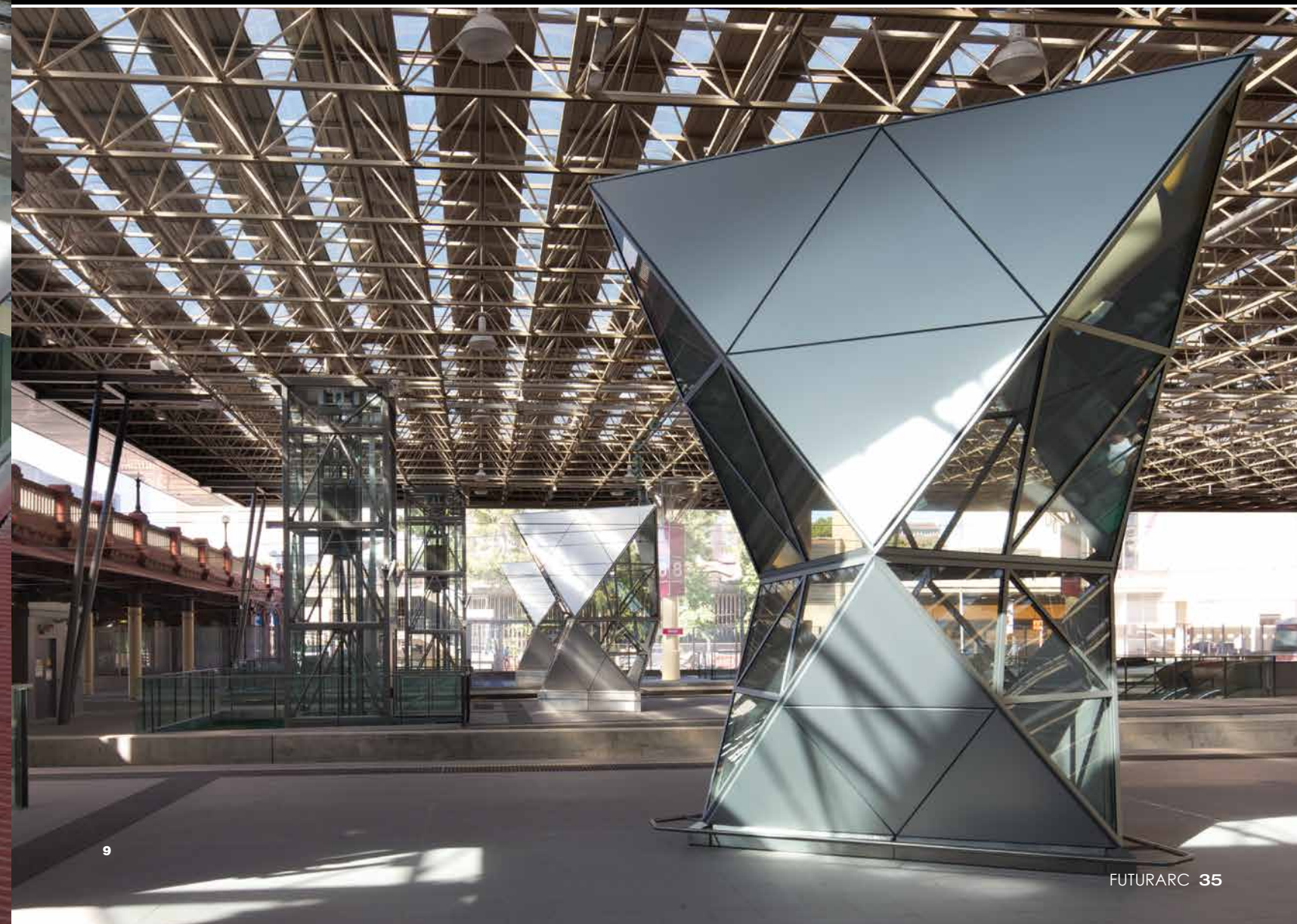
Skylight

Subway Link to Perth Underground

Up to platforms

Areas of merging flows

7 Vertical circulation: skylights, lifts, stairs and escalators pop up into the Perth Station train hall platforms, replacing the original timber footbridge 8 Schematic diagram of the underpass showing skylights and colour articulating the merging flows (originally the colour was proposed as red but was later changed to green on client request) 9 Platforms: skylights, lifts, stairs and escalators as a family of elements viewed across the platforms





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DAYLIGHT, NATURAL VENTILATION AND WEATHER PROTECTION

The skylights are functional structures that provide daylight and air to the spaces below ground, and are emblematic of their function by expressing this in an architectural manner. Functionally, they could have taken any form, yet the triangular expression is appropriate to relate to the underground geometry. By expressing the movement patterns between the two stations, they inform passengers on the platforms above of the underground circulation network below.

The skylights are open at the top, and this is made possible as the existing space frame roof over provides protection from rain. This allows them to function as ventilation stacks, enabling the subway to 'breathe' naturally and permitting the underpass ceiling height to be increased to maximise the volume of the public spaces and reduce reliance on mechanical ductwork and associated maintenance.

With the construction of new platforms to the north and the underpass adjacent to the Horseshoe Bridge, the existing roof was extended to provide improved weather protection and a means of providing a new architectural expression. With the edge of the existing roof 'propped' with 'V' columns, bolt-on steel cantilevers wrapped in metal cladding were added, providing an elegant edge to the roof eaves.

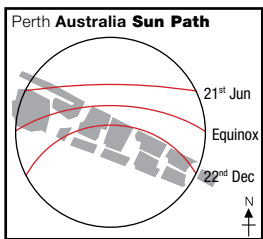
SUMMARY

The project is a rare opportunity to articulate underground spaces positively with sustainable measures. The inclusion of daylight and natural ventilation as fundamental concepts to reinforce and articulate the passenger circulation within the underpass was established at the beginning of the project and carried successfully through to delivery.

PROJECTS

PROJECT DATA

Project Name
Perth City Link Rail Alliance
Location
Perth, Western Australia
Completion Date
19 December 2013
Site Area
30,336 square metres
Gross Floor Area
10,632 square metres (new works)
Number of Rooms
N/A
Building Height
N/A
Client/Owner
Public Transport Authority of Western Australia
Architecture Firm
GreenhillLi Pte Ltd
Principal Architects
Li Sau Kei; Nigel Greenhill
Architectural Team
Shawn Ng; Susann Stein; Eric Sim; Jansen Lara; Zheng Xinjia; Khin Thida Kyaw
Main Contractor
John Holland
Mechanical & Electrical Engineers
GHD; MHM Engineering
Civil & Structural Engineer
GHD
Images/Photos
GreenhillLi Pte Ltd



10 Roof: new cantilever to existing space frame roof provides weather protection over the Horseshoe Bridge and new platforms **11** Cutaway schematic showing the underpass directly under the Perth Station building **12** Subway Link: a gentle up-sloping walkway viewed from the Perth Underground looking towards the underpass. Careful planning of the Link to accommodate a 2.25-metre level change between stations avoided the requirement for a series of ramps and landings (which would have been detrimental to passenger flow over the long distance). Instead, a gentle 3-percent gradient sloping walkway was possible, which offers a seamless circulation route.