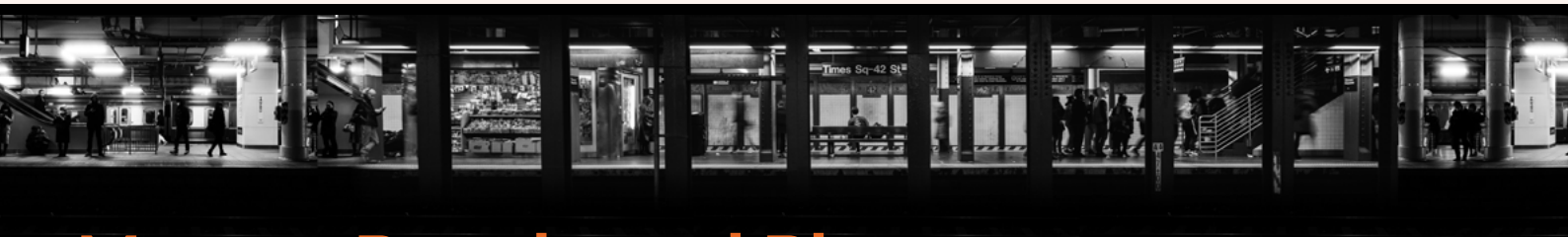
ARCADIS

Design & Consultancy
for natural and
built assets



Metros, People and Places

The case for people-centric station development

The potential is exciting if we can overcome the obstacles

It is time Australia invested in more over station and integrated station development (OSD and ISD). Cities such as Hong Kong and Singapore have applied this model at scale for years, and recently other jurisdictions such as London have fully embraced it, but the pace of activity is slow here. If station development is to realise its full promise in this country, every OSD and ISD project must demonstrate it is possible to deliver a good outcome for all stakeholders.

A quality OSD or ISD also regenerates the entire neighbourhood by attracting more investment, lifting urban amenity and increasing land values.

As demand for public transport increases in line with urban population growth, more stations will be built over the coming decades and existing ones will be upgraded. This presents a great opportunity to maximise returns for their government landowners by using OSD and ISD to transform them from transit points into commercial, residential and recreational hubs that improve liveability.

Stations sit on large blocks in prime locations where development sites are rare, and values are rising. It makes financial sense to sell or lease the air rights to developers who will build on top of and around them. This lifts land value, provides leasing and taxation revenues, and the capital raised can be invested back into the transport system. A quality OSD or ISD also regenerates the entire neighbourhood by attracting more investment, lifting urban amenity and increasing land values.

In addition, there is the civic responsibility aspect. Station developments deliver high quality transport, community, housing and employment options in areas where these are often lacking. This aligns well with government strategic priorities such as promoting public transport usage and providing more affordable housing.

Ultimately OSD and ISD projects acknowledge that the way we are moving around cities is changing. They will prepare our cities for a future where transport infrastructure is more sustainable, connected, and people-focused than it is now.

So, if station development is the perfect vehicle for sustainable high-density development, future-proofs our cities and the business case is compelling, why are there so few in Australia?

The reason lies less with government than with developers. Developing an ISD or OSD is a complex and expensive option because the central element is a station (and therefore, potentially, an active rail service), presenting unique design and engineering challenges. We calculate that, compared to a commercial building with a basement, there is an uplift of 15-35 per cent in design costs due to:

- extended design process
- technical complexity
- need for specialist resources
- systems assurance requirements
- additional stakeholder, interface and project management demands.

These factors not only generate considerable capital and bottom line costs, they create planning obstacles. It can be five years before a development is operational, which drains capital and delays returns. The Australian landscape also presents its own unique obstacles as we have no 'best practice' template to follow. This combined with a small knowledge base and a shortage of specialist expertise and skills have resulted in a lack of OSD and ISD within the Australian market.

In an already risky sector, it is not surprising that developers choose to invest in stand-alone mixed-use buildings. And without private sector buy-in, the business case no longer stacks up for government.

DEFINITIONS

Over station development (OSD): Development on top of or around a station that can be delivered at a different time to the station itself.

Integrated station development: Development on top of or around a station that is delivered at the same time as the station.

Greenfield site: A site where there has never been a station.

Brownfield site: A site where there has previously been a station, or there is one now.

Ensuring the best community outcomes to minimise delays

Transport hubs are an intrinsic part of the built environment and the impact of underdevelopment within this sector cannot be underestimated. Delayed or cancelled projects are a significant strategic risk, with all the attendant cost implications. However, these risks can be reduced as clients and industry stakeholders adopt proven approaches to mitigating this risk.

Extensive consultation

Station developments have more stakeholder groups than the average commercial development, including local government departments, local community groups, adjacent property owner and the media. Winning them over is the best risk management strategy, and that means understanding the market. What are the local issues? How can the design address them? A comprehensive, strategic stakeholder management plan that involves extensive, genuine community consultation is the only way to find out.

Being responsive is important, and the design team plays a part in this. Arcadis attends stakeholder consultation meetings so we can address concerns in our design and position our client as being responsive to community concerns.

None of this is possible without a strong vision. It is important to enter the consultation phase with not only a functional plan for how people will use the development, but a clear vision for how it will transform the locality, backed up by facts, examples and visuals.

Sympathetic design

Many design factors can help to minimise the risk of delays and extra costs and optimise the development's attractiveness to stakeholders.

Holistic approach: The ROI (return on investment) and the community benefit are both optimised by a whole-of-site approach, ideally building around the station as well as over it so elements such as green space and community facilities can be included. Here, a greenfield ISD has the advantage compared to activating an existing station, where the footprint is constrained.

Flexible design: Many iterations and changes are to be expected—the preliminary design of an OSD during the Stage 1 design phase is rarely identical to the OSD that is constructed. With embedded flexibility, the design can be more easily reworked following the various reviews.

Station developments are designed and built to last for 100 years, and the best will evolve into landmarks that anchor a neighbourhood and influence its built form for decades

Neighbourhood integration: A successful design integrates with the local built environment and is true to the area's wider master plan. This may involve extra costs—for example, the pedestrianisation of road frontages will involve modifying roads, traffic signals and roundabouts—but these are an investment in a successful outcome.

Customer Experience: Travellers, shoppers and other customers will support a ground plan that promotes ease of navigation by linking functional spaces in an intuitive way. In principal, access points and movement inside station buildings should be so logical so that no signage is required. This is a key element of customer centric design.

Enough parking: Communities and councils want onsite parking because it addresses concerns about street parking, and residential developers know residential and retail units with parking are more saleable. There is also the need to adapt car parking design for the predicted increased use of Connected and Automated Vehicles (CAV), which State Governments are integrating into their transport planning. In this interim time as cities are still navigating how they will adopt and integrate CAV into their transport system, parking is still a desirable asset to have onsite. However, metro stations often do not have enough suitable space to build abundant parking and whilst vertical parking is one solution, this build cost is twice as much per unit as a standard car park. Therefore, tactics to future proof and maximise this space are necessary strategies to consider during the planning stages.

Futureproofing: To create a sustainable building that the community regards as an asset and is willing to support, designers must think beyond immediate functionality and consider its future role. Anticipating market needs is challenging, but it is a great opportunity to create a legacy building. Station developments are designed and built to last for 100 years, and the best will evolve into landmarks that anchor a neighbourhood and influence its built form for decades.

Accepting compromise

With every station development, there is a tension between the developer making money, the transport operator servicing customers, and the local community having its needs met. This tension needs to be understood, balanced and managed to achieve a win:win for everyone, so every OSD and ISD project team and their client must be prepared to compromise within the bounds of what is feasible and allowable. From the number of affordable housing units to the size of the services shaft, most things need to be up for negotiation.

Minimising disruption

With any large-scale urban development, project managers aim to minimise inconvenience to people living and working in the vicinity. An OSD or ISD is subject to additional pressures because an operational station is involved. The goal is to progress the development while keeping rail operations going and addressing safety concerns. The busier the station, the harder and more costly this is. The price of being unsuccessful can be high in terms of frustrated travellers and damaged relationships, so a disruption minimisation strategy is important.

- Keep line and platform closures to a minimum with work schedules that avoid peak hours.
- Phase construction so work areas can be progressively blocked off from rail operations.
- Use design for manufactured assembly (DfMA) so beams, columns, lattice slabs and other key components are prefabricated offsite before onsite installation.
- Find innovative ways to overcome safety issues without compromising project delivery.

Tackling common challenges for government agencies and developers

Lack of competitive tension

Construction costs are rising. Our 2019 International Construction Costs Report shows that cost pressures are increasing year-on-year tender prices by up to five per cent in Sydney and Melbourne. This is due to several factors, most of which arise from Australia's infrastructure boom—NSW alone has well over 700 significant capital projects underway. The soaring demand for a limited number of market players is impacting procurement costs as:

- There is a battle to attract experienced construction specialist and project managers, which has escalated costs.
- There is more work than there are available resources, so contractors can pick and choose projects—some major state infrastructure projects have received single bids or even no bids.
- The demand for construction materials is robust, pushing up prices.
- There is more wariness in the market about risk-sharing, and less willingness to accept previous arrangements and the resulting cost premium.

These external factors are impossible to control, but they can be anticipated and managed. For example, with the boom unlikely to subside and station development projects taking years to complete after the initial feasibility study has commenced, escalation in trade costs is a real risk and should be factored into feasibilities.

There is also scope for governments to consider a collaborative contracting model to address the lack of market competition by attracting more private sector bids. This idea was outlined in an industry action plan from the NSW Government in 2018 , which also recommended a partnership-based approach to risk allocation. While these initiatives would take time to flow through to the market, they have merit.

Complying with multiple standards

Planning and designing a station development requires familiarity with a raft of national and state standards and review processes, far more than with a commercial tower development. These include the relevant Australian Standards, Authorised Engineering Organisation (AEO) requirements in NSW, QR and TMR in Queensland, VicTrack/MTM in Victoriaand Architectural Design Review Panels.

Having a detailed understanding of the planning process and responding appropriately to key interest parties can go a long way towards controlling OSD and ISD costs. Keeping up to date with these requirements and with legislative and regulatory changes is essential, and so is ensuring the project team has the required skills. The alternative is to engage external consultants with specialist expertise, which will cost less than dealing with the fallout from a non-compliant submission.

Multi-contractor interfacing

OSDs and ISDs have many more moving parts than the average stand-alone commercial building. At any one time, there can be dozens of contractors working on different aspects of the development, each with their own contract and milestone dates. They often rely on the input of other contractors but work separately. For example, we can be advancing our design without knowing what the line-wide contractor's design will look like. Or we can be designing a station without knowing the tunnel design when there are tunnel safety considerations that impact our design.

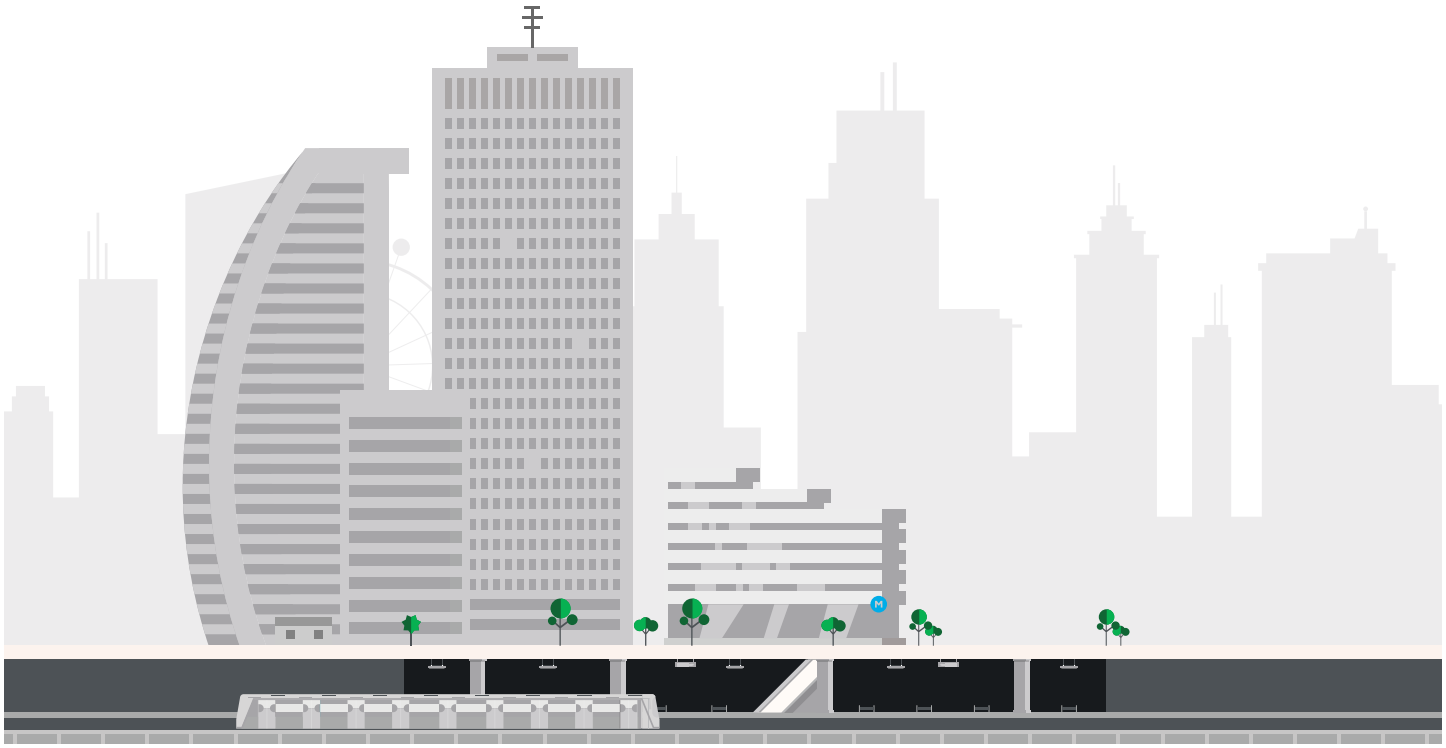
In our experience, the best approach is to be flexible, so we can be prepared to incorporate design changes arising from the work of other contractors, and collaborative, so we can minimise delays. We find digital design tools such as building information modelling (BIM) are a great support for collaborative approaches.

Complex structural engineering

The engineering design requirements for building over or adjacent to a station are far more extensive than those for even the tallest commercial tower. We estimate the additional technical complexity adds up to 35 per cent to the final cost.

- **Load bearing:** Transfer slabs between station and over station development add significant cost if column and structural layouts are not rationalised, so it is advisable to eliminate them by finding ways to reduce the load-bearing requirements through load transfer or size reduction.
- **Tunnels:** Traditional construction methods might not be feasible for building over tunnels because of concerns about their capacity to carry gravity loads, so it is worth exploring other approaches. These could be more expensive but will increase the number of floors that can be built.
- **Utilities:** For a brownfield OSD, connectivity between the station, the new buildings and the surrounding public space will drive reconfiguration of the existing mechanical, fire and electrical systems. If pedestrian traffic is increased because of the OSD and a new public realm, the systems will need to be upgraded to carry additional loads and there will be more testing—for example, to ensure there are no stray currents from the station running up and down the OSD.
- **Vibration:** Minimising the impact of the railway's vibration on the rest of a station development is essential for a successful outcome, so it is worth investing time in getting an optimal result. Isolating the vibration may mean modifying the track form (the cheapest option), strengthening the building with bearings or taking a different approach to mounting walls and ceilings. At the far end of the cost scale, it will involve isolating the entire building structure from the tracks. The high costs involved make it worth considering whether the issue can be addressed by the transport operator though track realignment and maintenance.
- **Fire and blast safety:** The regulatory context around fire safety for a new building that involves a station is far more extensive than for one without, and the fire management strategy must cover the entire integrated development. A new requirement for metro stations in NSW, for example, is that they must have blast mitigation measures. This adds significant costs in the form of thicker structural beams and slabs, steel-encased and heavily enforced columns, blast-resistant glazing elements and testing and certification of internal finishes. This is highly specialised area of expertise and we strongly advise engaging a blast engineer.
- **Expecting the unexpected:** Our experience shows that unexpected challenges will almost always arise. While our station developments do not have the same level of heritage challenges as in the UK, Australia is not short of surprises. For example, at the Central Station precinct development in Sydney, skeletal remains were unearthed so work had to stop. It turned out the original station was built over a graveyard 100 years previously and not all the remains had been removed.

Having a detailed understanding of the planning process and responding appropriately to key interest parties can go a long way towards controlling OSD and ISD costs.



Learning from local and international experience

Other jurisdictions—particularly in Asia—have either embraced station development for years or have begun to, but Australia has little local experience to draw on. So there is much for Australia to learn from overseas ISDs and OSDs when planning our own.

While every station development is different, there are common challenges that travel across borders. Learning from international examples can save time and money by providing proven solutions to our own challenges.

The sustainable success of the projects we highlight in this paper relies on integration and connection with the local community (i.e. their social value) and connectivity with other transport modes, something that has not always happened with station developments in Sydney. If the social value is ignored and the transport modes are not integrated, the development is not likely to succeed in the long run.

Given the significance of these projects, the planning requests, political environment and consultation with the public cannot be underestimated. The key to this is to respect the planning approval process and engage with planning departments early.

If the social value is ignored and the transport modes are not integrated, the development is not likely to succeed in the long run

Leveraging international expertise

Globally, Arcadis works with transport authorities in some of the world's largest cities to reimagine stations as vibrant hubs. Leveraging our global expertise, our deep bank of knowledge covers international best practice examples as well as the many local and international station developments Arcadis has worked on

One of the global tools we use is the Arcadis MODex , a benchmarking index that scores transportation-related developments for the integration of four elements: connectivity, urban environment, social placemaking and economic development.

They provide inspiring examples of what we might aspire to in Australia as we begin realising the untapped potential of our own station assets.

Arcadis Case Studies

Mei Foo Station – Mass Transit Railway Hong Kong

In Hong Kong, an island where space is at a premium and land is highly expensive, the concurrent development of their rapid underground transport system with ISD has been a natural fit for some time. A corporatised public company, Mass Transit Railway (MTR), builds high rise blocks and malls above and next to MTR stations to fund the construction of more transport infrastructure. The complex interchange had to be built within a public park situated between tunnels for the Mass Transit Railway and a major highway. Another high performer on the Arcadis MODex, Hong Kong University station is one example.

UK—London Bridge Station

Arcadis was the Lead Design Organisation, in a 50:50 Joint Venture with WSP, on one of the UK's most complex and ambitious rail station redevelopments, London Bridge Station. It is the fourth busiest station in the UK, so it was impossible to close the whole station and the upgrade was undertaken while it continued to handle up to 52 million passenger journeys a year. This was achieved through the phased demolition of old platforms and the arches below then bringing them back into use on a staged basis. This £1bn upgrade created new platforms for more trains, a new street-level concourse that is two-thirds larger than it was before, creating a destination for local people and passengers and ultimately, a bigger and better station for passengers.

UK—Crossrail 2—Wimbledon Station

Crossrail 2 will link national rail networks and run through Greater London. One of the planned stops is Wimbledon Station, a key interchange that is slated for large-scale redevelopment, which includes redeveloping parts of the town centre. The design team viewed the station as an urban connector and used MODe principles to design the hub and pinpoint focus areas. The new mixed use ISD will support local businesses and fuel economic growth, attracting more jobs and housing to the area.

Australia—Sydney Metro

With 31 stations and 66 kilometres of new metro rail to be delivered by 2024 , Sydney Metro is Australia's biggest public transport project. Arcadis and joint venture partner Mott MacDonald are joint lead designers in the METRON consortium, which won the Underground Station Design and Technical Services contract as part of the Sydney Metro City & Southwest project. This state-significant project includes a 30-kilometre extension of metro rail from the city's north west, under Sydney Harbour and through new CBD stations.

New York—Grand Central Station East Side Access

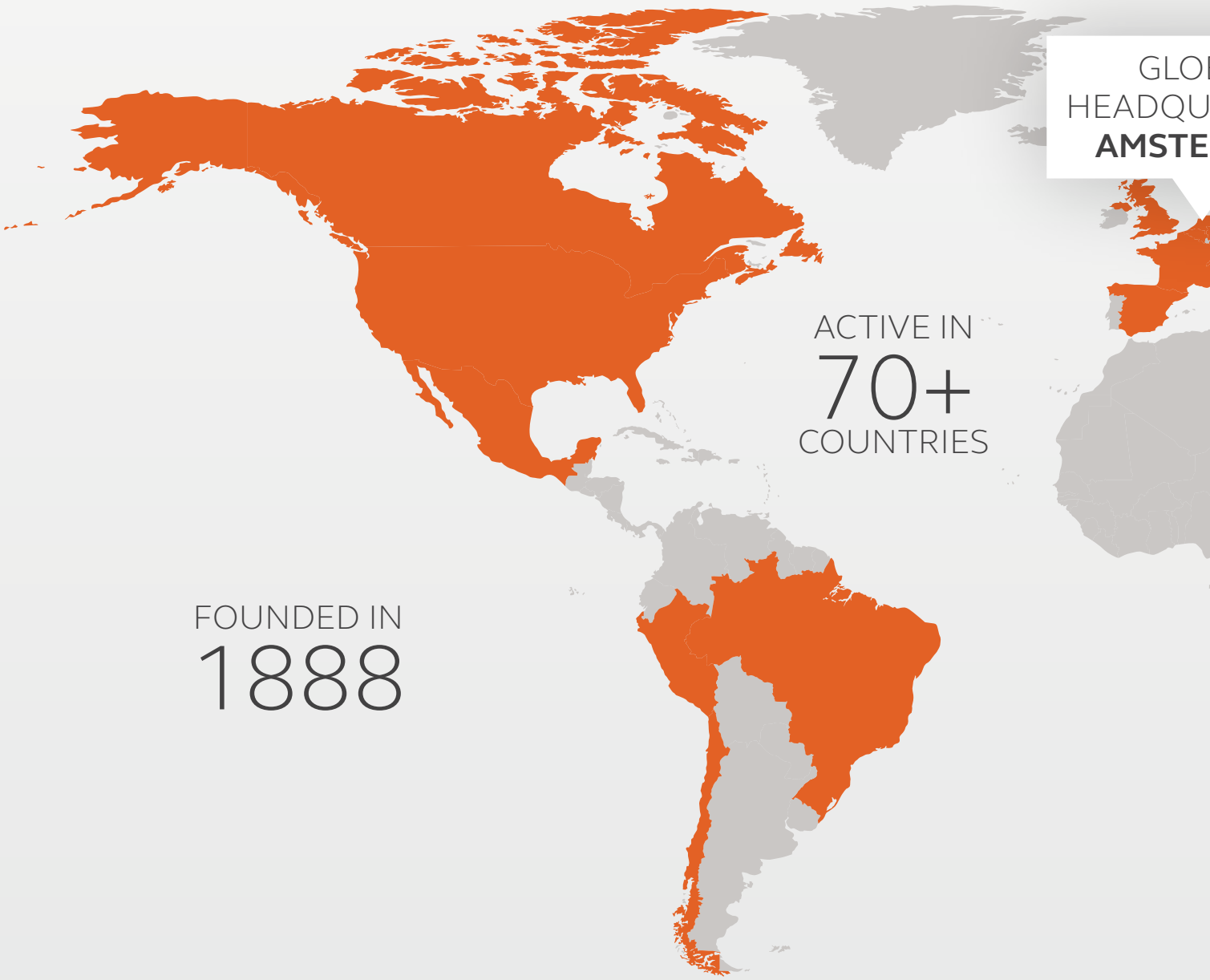
Grand Central Station achieved the highest score in the Arcadis MODex . This landmark development was built in 1913, extensively restored and renovated in 1988, and its development continues, with the East Side Access project due for completion in 2022. Grand Central is not only socially appealing to local residents, it attracts tourists as a destination. Fully embedded in its high density Manhattan location, it is easy to navigate, with public art and green spaces, and has had a ripple effect on the prosperity and investment of its surrounding areas.

So far, Arcadis has worked with the government to produce the reference design for four stations and undertake the detailed design Barangaroo and Victoria Cross Station. This has provided us with invaluable insights into different perspectives that we can apply to other OSD projects.

We have developed a variety of integrated OSD and station designs for Sydney Metro:

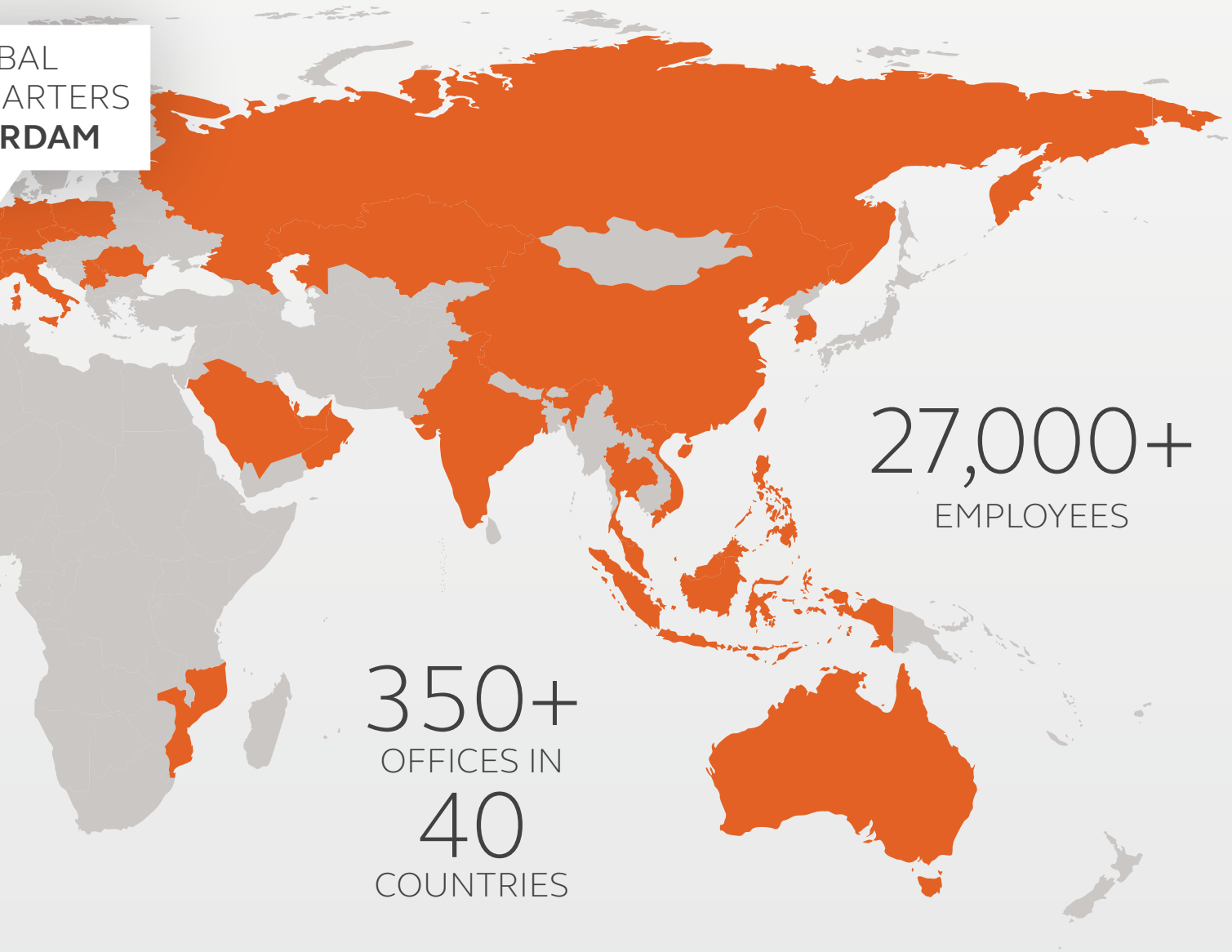
- OSD directly above the station, where there is direct integration into the vertical plan, with all the rail alignment directly under the OSD
- OSD adjacent to the station, where there is direct integration into the horizontal plan, with all the rail alignment offset from the OSD
- OSD that is completely separate from the station.

Between them, the developments include retail and commercial space, car parking, improvements to the public domain, a recreation precinct and hotels.



GLOBAL EXPERTISE, FOR LOCAL PROJECTS

Working together to improve quality of life.



Arcadis has over 27,000 employees working across 70 countries around the world. Together, we have one purpose. To use our global expertise to deliver sustainable, efficient outcomes that improve the quality of life for our local communities.

Contact Us

John Merrick
Senior Technical Director Buildings – NSW
T +61 (0) 2 8907 8210
E john.merrick@arcadis.com

Joyce Lee
Buildings Business Manager – NSW
T +61 (0) 2 8907 8202
E joyce.lee@arcadis.com

Matthew Mackey
National Director – Cost & Commercial
T +61 (0) 7 5503 4834
E matthew.mackey@arcadis.com

Daniel Hamad
Director Cost & Commercial
T +61 (0) 2 8907 8221
E daniel.hamad@arcadis.com

Arcadis Australia Pacific is a leader in built and natural asset design and management. From major road and rail infrastructure to innovative waste, water, residential, retail and heritage projects, we strive to create smart, sustainable solutions for our valued clients.

Find out more:

www.arcadis.com/au
@arcadis_australia_pacific
arcadis australia pacific
@ArcadisGlobal
facebook.com/ArcadisGlobal

Scan me to discover more about people-centric mobility

Arcadis. Improving quality of life.