



GOVERNMENT OF
WESTERN AUSTRALIA

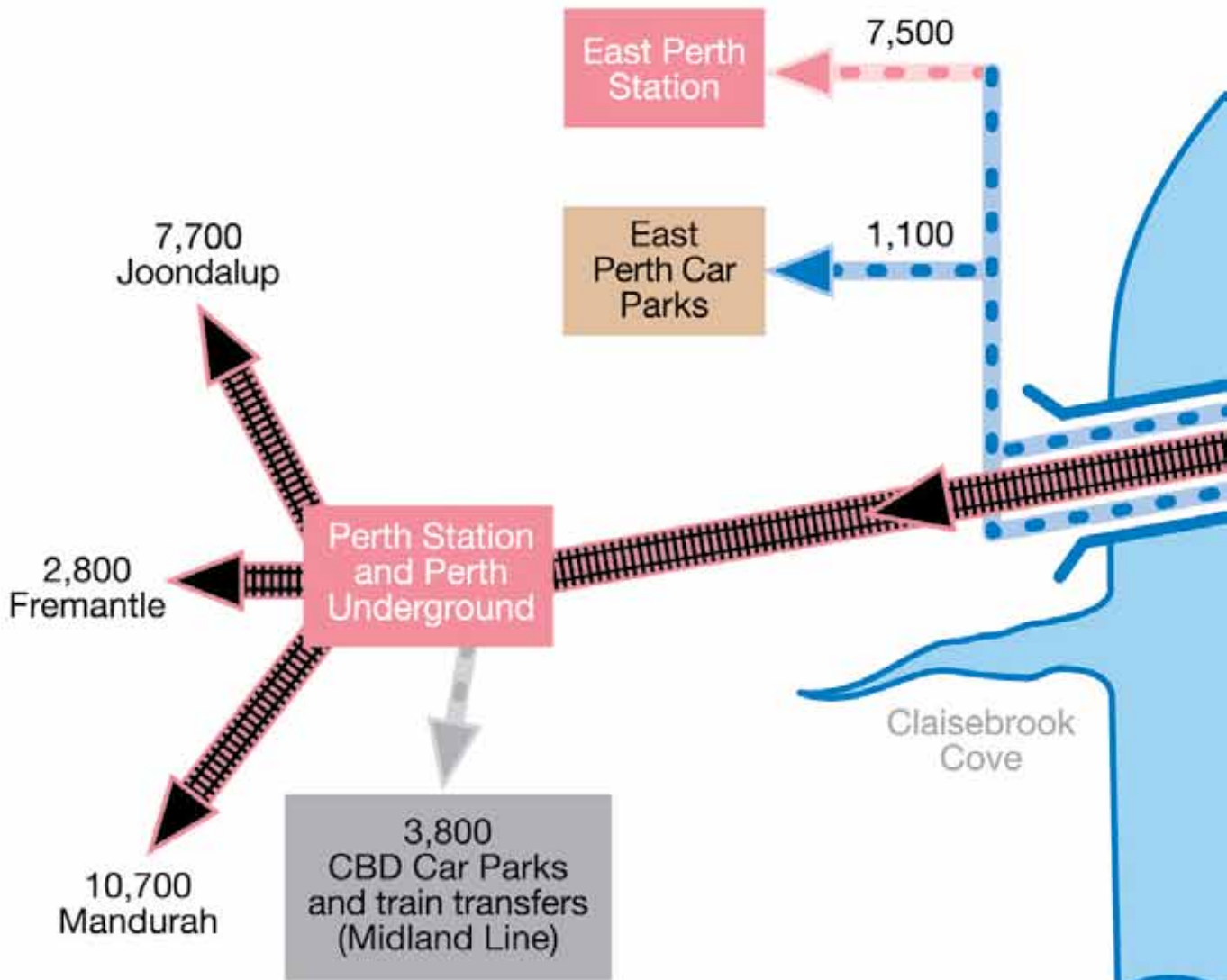
new Perth Stadium Transport Project Definition Plan

December 2012



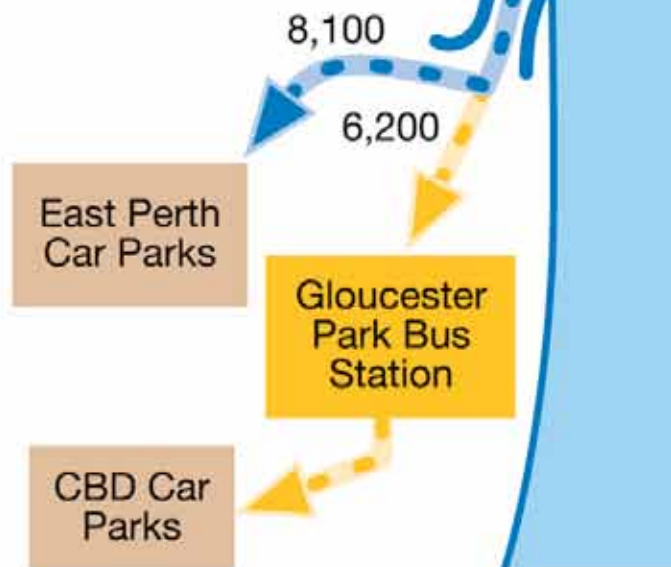
Artist's impression: pedestrian bridge location

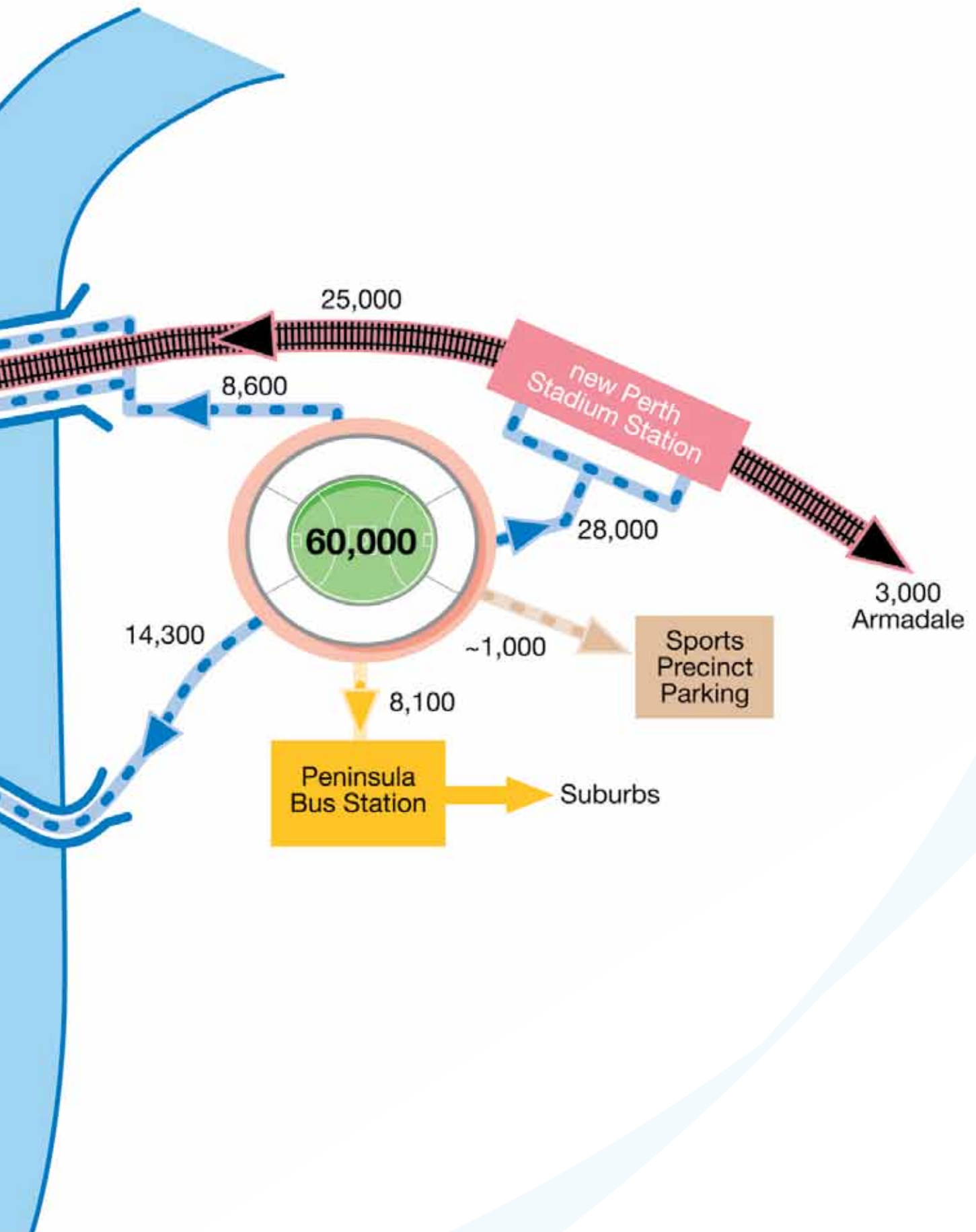
transport solution for the new Perth Stadium



Clearing the new Perth Stadium within one hour

- Pedestrian
- On Rail
- On Bus
- Car







Artist's impression:
new Perth Stadium Station

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key features

Passengers first. Integrated approach.

Multiple mode options. Capacity for growth.

The new Perth Stadium presents a unique opportunity for the Public Transport Authority (PTA) to concurrently develop the transport solution within the precinct, rather than retrofit it into a constrained space.

The Transport Project Definition Plan (PDP) has been guided by the new Perth Stadium Master Plan (released in August 2012), which provides a framework for the new Perth Stadium development within a Sports Precinct on the Burswood Peninsula, extending over the northern portion of the existing golf course. The Master Plan presented a multi-modal transport strategy, largely driven by public bus and rail transport, with limited onsite parking but access to extensive public parking facilities in East Perth and the Perth CBD via new and existing pedestrian linkages.

Drawing from the new Perth Stadium's 'fan first' philosophy, the Transport PDP reflects passenger behaviour, needs and demands to create a 'passenger first' transport solution.

This will be achieved through a \$298 million (July 2012 prices) integrated train, bus and pedestrian approach to provide spectators with multiple options. This will support a cultural shift of reliance on cars and move, within an hour of an event finishing, up to 50,000 people, or 83 per cent of a capacity crowd.

By applying the 'tentacles of movement' philosophy, as outlined in the Master Plan, spectators are dispersed, rather than surging together in one direction, ensuring fast and safe transfers and reducing the impacts on nearby residential and environmental areas.

Key features of the responsive and robust transport solution, to be delivered by late-2017, include:

Dedicated train services

- Six-platform Stadium Station for specific destinations for easy transfers.
- Nearby stowage for up to 117 railcars to keep a continuous flow of trains following events.
- Additional stowage between Great Eastern Highway and Victoria Park Station for 24 railcars for full capacity events.





- Upgraded East Perth Station to accommodate the additional number of passengers on event days.
- Various enhancements to network systems and infrastructure in and around Perth Station.

Complementary bus services

- Dedicated new Perth Stadium bus facility able to load up to 20 buses at any given time to service suburban areas without rail services.
- CBD bus shuttle from Nelson Avenue in East Perth, enabling spectators to access more than 40,000 inner city car bays.

Bridge entry

- A new Swan River pedestrian bridge between the Peninsula and East Perth will take pressure off Windan Bridge and divert pedestrians away from East Perth's high-density residential area.
- It will improve connections between the two areas and attract locals and visitors to the precinct outside of event days.

Enhancing existing infrastructure

- Extension of, and additional lane to Victoria Park Drive road bridge over expanded rail network.
- Improvement of Great Eastern Highway and Victoria Park Drive intersection to accommodate increased bus and vehicle movement.
- Coach, taxi and ACROD drop-off facility near the new Perth Stadium.

Without public transport, moving 50,000 people by cars would need:

- 20,000 cars.
- 50 hectares of ground level parking, costing \$150 million.
- 12.5 hectares for a multi-storey car park, costing up to \$650 million.



evolution of the transport solution

In September 2012, Cabinet endorsed the new Perth Stadium Project Definition Plan. It included a framework to guide the new Perth Stadium's development within a Sports Precinct, supported by an integrated public transport system.

The identified transport strategy included major transport infrastructure, such as:

- new Perth Stadium Station to replace the existing Belmont Park Station.
- pedestrian bridge across the Swan River.
- bus hub facility south of the new Perth Stadium, known as the Peninsula Bus Station.
- pedestrian bridge across Victoria Park Drive for access between the new Perth Stadium and southern entry of the new Perth Stadium Station.
- extending Victoria Park Drive road bridge across the new Perth Stadium Station.

In developing the Transport PDP, the PTA refined the transport requirements, which has seen some initial transport concepts modified. The proposed modifications do not result in any significant impact on the overall transport strategy, nor the final cost.

The changes proposed include:

- replacing the pedestrian bridge over Victoria Park Drive with an underpass, which still achieves a safe separation of pedestrians and vehicles;
- realigning the Peninsula Bus Station to a location further from the river foreshore and orientated on a north-west south-east axis. This minimises the potential impact on the Swan River and facilitates improved access onto Victoria Park Drive; and
- redesigning a section of the Swan River pedestrian bridge on the new Perth Stadium side, as the initial concept is no longer required to separate pedestrians from the bus hub, due to the Peninsula Bus Station relocation.





LEGEND
— Master Plan Area
- - - Sports Precinct Plan Area

0 100 200 300 400 500m

The New Perth Stadium – Master Plan aerial

executive summary

The new Perth Stadium (Stadium) Project Definition Plan (PDP), that was endorsed by Cabinet in September 2012, highlighted that the transport requirements would be addressed in a separate Transport PDP to be submitted to Cabinet before the end of 2012.

The new Perth Stadium PDP included a Master Plan which provided a framework to guide the development of the stadium within a sports precinct supported by an integrated transport system.

This PDP therefore covers the rail, bus, road and pedestrian investments that will be constructed to ensure the new Perth Stadium operates as a world class venue, with commensurate facilities for access and egress from events. It has been prepared by the PTA in concert with Main Roads Western Australia and the Department of Transport by an experienced project team that prepared the Master Plans for the New MetroRail Project completed in late 2007, and the Perth City Link Project, which is now | well into a successful implementation phase. The Project team also included expertise from within government and the private sector.

A fundamental objective in the preparation of this PDP was to deliver a set of operating plans and infrastructure requirements, and their cost, which provide a high degree of certainty to achieve required objectives, and conversely, the risk of non-performance would be as low as reasonably possible. A high degree of Project Definition in the final planning phases is critical to successful implementation. A highly defined scope of works not only greatly reduces future uncertainty, but it also provides the soundest basis for the preparation of credible estimates.

Cost estimates, which are based on a highly defined scope of works, provide the best insurance against future cost “blow-outs”, as cost blow-outs are most likely to be caused by changes in scope.

The most complex issues in preparation of this PDP were those associated with the passenger railway. Provision of good, safe and reliable railway services depends on integrating a number of electrical, electronic, structural and civil engineering disciplines into an effective and reliable system.

Preparation of this PDP adopted the following sequence used in preparing Master Plans that preceded the successful delivery of recent, major rail projects in Perth.

- Quantification and clarification of patronage demand and its drivers.
- Preparation of operating plans to handle the demand.
- Definition of infrastructure and rollingstock requirements to satisfy the operating plan.
- Preparation and testing of concept designs for the infrastructure required.
- Consultation with stakeholders to ensure functionality and adequacy of infrastructure.
- Risk analysis.
- Finally, and only after all of the above, estimate the cost of the operating and infrastructure plans that have been produced.

Special attention was paid to define the requirements to meet passenger demand and ensure the infrastructure, particularly for rail, would be driven by, and be responsive to a robust operational plan.

An innovative Operating Plan has been produced, which was led by overseas experts, who have specialised in the movement by rail of large crowds attending major sporting events in the UK.

The final infrastructure outcomes of the Transport PDP are entirely consistent with the transport requirements articulated in the Stadium Master Plan endorsed by Cabinet in September 2012. There are some minor differences in detail and these are:

- The pedestrian bridge across Victoria Park Drive has been replaced with an underpass.
- The bus hub has been realigned and reconfigured.
- The bus hub is more compact and minimises impact on the River and Stadium facilities.

- The access from the bus hub to Victoria Park Drive has been improved.
- The scale of the connection between the Stadium and the pedestrian bridge over the River has been reduced.

Project Definition Outcomes

Demand

Great emphasis was placed on defining the nature and magnitude of the travel demand the Stadium will create.

With respect to the railway, this was an iterative process between the traffic task, the operational plan to satisfy that task, the limited capacity of existing infrastructure, and the additional supporting infrastructure to make it all work.

The pedestrian linkages shown in **Figure 1**, resulting from extensive modelling were valuable in defining the transport problem caused by the limited car accessibility to the Peninsula, as well as demonstrating the opportunity for a more sustainable public transport solution.



Pedestrian Networks

The existing pedestrian linkage between the Burswood Peninsula and the closest major centre of parking concentration and public transport services – namely the City of Perth – is restricted to the pedestrian paths attached to the existing rail and road bridges across the Swan River.

These pedestrian facilities across the river are inadequate to cope with the anticipated demand. Firstly, there is insufficient capacity. Secondly, the landing on the East Perth side adjacent to the old East Perth Power Station is too far north to give the best walking access to the car parks they would want to walk to in East Perth. It is also not an ideal position for the commencement of a bus shuttle service to the major car parking in the Perth CBD compared to a site further south.

Finally, the existing landing point in East Perth north of the Claisebrook Cove would concentrate movement southward through the residential developments and entertainment facilities in East Perth around Claisebrook Cove.

Given these facilities are inadequate, and that a dedicated pedestrian bridge is required, a number of landing sites on the East Perth side of the river from Claisebrook Cove to Trinity College were considered. The optimum site was found to be adjacent to Gloucester Park, on Nelson Avenue, south of Nile Street towards Trinity College (**Figure 1**). This landing point will provide the following advantages over other options as shown in **Figure 2** and **Figure 3**.

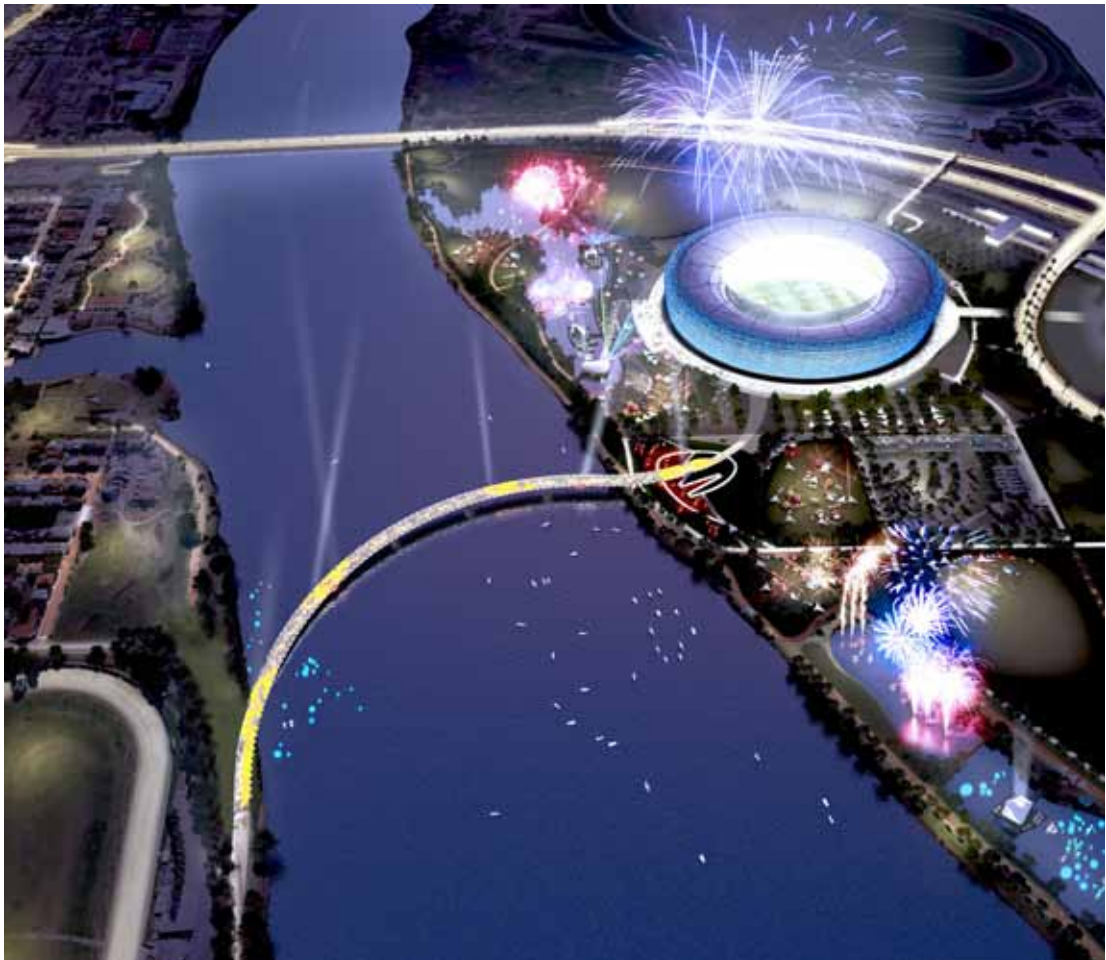


Figure 1: Pedestrian bridge options – preferred East Perth access location



Figure 2: Pedestrian bridge options – pedestrian movement modelling: No bridge option



Figure 3: Pedestrian bridge options – pedestrian movement modelling: Causeway location option

The preferred pedestrian bridge location will:

- greatly increase the area within walking distance of the Stadium, from East Perth Station in the north, to the new Riverside development in the south, and west beyond Plain Street.
- dilute the number of people crossing at any one point and ease the pressure on roads and pedestrian facilities on Claisebrook Cove and surrounding areas.
- provide an ideal launching site for a City bus shuttle service.
- provide the residents of East Perth, and the new Riverside development with the most convenient access to the Burswood Peninsula and the attractions located there including the Stadium.

For the purposes of a comparative analysis of the alternative Swan River crossing scenarios, the pedestrian numbers forecast in the modelling have been reallocated to those alternative options, highlighting the expected movement patterns and additional travel times associated with each proposal. The ability for large numbers of pedestrians to cross the Swan River is considered critical. Therefore in the alternative scenarios, it has been assumed that the existing crossing facilities would be upgraded to meet the demand requirements.

If the new pedestrian bridge is located at the optimum site, modelling of pedestrian movement shows that approximately 22,900 people will cross the river in the hour immediately following an event at the stadium to access parking and public transport.

About 8,600 people would cross the Windan / Goongoongup Bridges – 7,500 to the East Perth Station, and 1,100 to car parks in and around the general station area.

Approximately 14,300 people would use the new pedestrian bridge. Of these, 8,100 people will be attracted to about 3,200 parking bays in East Perth within walking distance of the Stadium. A further 6,200 people will use the new bridge to access shuttle buses connecting to more than 40,000 public and private car parking spaces located in the Perth CBD.

Making use of existing CBD parking is logical as most events at the new Stadium will coincide with the low use periods for those parking venues, so the solution is a win / win outcome. Even if it was viable to provide parking on the Peninsula for the 14,300 people who would use the new pedestrian bridge, it would require a multi deck facility, conservatively estimated to cost \$120 million well over twice the projected cost of the proposed pedestrian bridge.

Rail Operating Plan

Existing data on football club membership, combined with historical travel usage from Subiaco, and restrictions on accessibility by car, provide a good basis to predict travel demand for the Stadium. Subsequent modelling, which included a number of factors, including constraints and opportunities, shows that rail will be required to transport 28,000 people from a station adjacent to the Stadium, in the one hour immediately following a major event. A further 7,500 people will be accommodated by rail services operating from the East Perth Station, located within a 25-minute walk utilising pedestrian facilities on the existing road and rail bridges across the river between the Stadium and East Perth Station.

Of the 28,000 people who will catch trains at the new Stadium Station in the first hour after an event, some 3,000 will use services heading south towards Armadale, whilst the remaining 25,000 will travel across the river towards Perth.

Moving 25,000 people by rail from the new Perth Stadium Station across the Swan River towards Perth in one hour is a challenging task.

Currently there are two tracks on the Goongoonup Railway Bridge over the Swan River – an up mainline for trains from Armadale Station to Perth Station, and a down mainline from Perth Station to Armadale Station. The allowed signalling headway, (safe interval between trains) is three minutes on each mainline.

The present signalling on the up main would allow a maximum of twenty trains to operate from the new Stadium Station to Perth in one hour, and a 70/30 per cent mix of six-car/four-car trains, could move around 19,000 people.

Reduction of the signalling headway on the up main from Burswood Station to Perth Station to two minutes would theoretically allow the passage of up to thirty trains, with a potential throughput of up to 28,500 people in one hour. However that assumes a perfect operation.

Because the signalling headway between trains on a single line is a limiting factor, increasing the size of trains is one method of maximising passenger throughput. For that reason the opportunity to operate nine-car trains as shuttles between the stadium and Perth Station was given serious consideration. It was found that nine-car shuttles can be accommodated in Perth Station by changing the

docking facilities for the Australind and the Thornlie Station service, along with modifications to Platform 5, which is the main platform adjoining Wellington Street. Another option is to increase the length of the island Platforms 6/7, which requires modifications to the supports of the Barrack Street Bridge.

However operational consideration of the nine-car shuttle concept showed that it would not provide the optimum use of either rolling stock or infrastructure in moving the size of the crowd anticipated within one hour. Specific draw backs are a time delay of up to eight minutes to turn back a train at Perth Station and similarly at Burswood Station. Also, it was found that a nine-car shuttle would not provide the most efficient use of the two tracks between Perth Station and the Stadium.

Nevertheless the option to run nine-car trains as a service through Perth Station must be retained for the longer term. This will depend on patronage demand and extension of platform lengths on the lines where the trains would operate. The Joondalup and Mandurah Lines are lines on which longer trains will be required beyond 2023.



Figure 4: Artist's impression: new Perth Stadium Station

However, the lengths of the platforms at the new Perth Stadium Station have been fixed to accommodate nine-car trains. This is a prudent investment to enable better crowd control with a higher margin of safety, for greater passenger amenity, and for ultimate use by longer trains.

Further evaluation found that the most cost effective, optimal plan to move 25,000 people from the Stadium towards Perth Station in one hour, which will provide the most efficient use of signalling headways, track occupancy, and rolling stock utilisation, is as follows:

- Introduce bi-directional operations on the down main from the Stadium to Mclver for trains operating from the central Stadium platform to Joondalup and Fremantle.
- Run six-car Joondalup bound trains from the Stadium carrying 7,700 people in one hour through Perth without stopping.
- Run four-car Fremantle bound trains from the Stadium carrying 2,800 people in one hour through Perth without stopping.
- Replace the shuttle concept with six-car trains that will drop off 14,500 people on Platform 6 in Perth Station, of which 10,700 (74 per cent) will transfer to the Mandurah Line. Those trains will then proceed immediately to Leederville Station where they will be turned back to Perth Underground to bolster the service to Mandurah Station.
- Restrict trains from the Stadium from stopping at Claisebrook and Mclver stations.
- Improve, and adapt signalling arrangements between the existing Burswood and Perth stations.

Research had shown that whilst trying to move 27 trains in one hour on the up mainline to Perth Station would be difficult, there was ample capacity on the down mainline which had to accommodate only four trains from Perth Station to Armadale Station within the same period.

The excess capacity on the down mainline will be used to run 13 trains (to Joondalup and Fremantle lines), from the central platform at the stadium towards Perth counter to the normal movement on that line as far as Mclver, before crossing over to the up mainline from Midland Station to Perth Station. This will provide the shortest pathway, with least switching of tracks for the trains bound for the Joondalup and Fremantle lines. This “bi-directional running”, a procedure sometimes inaccurately described as “wrong way running”, is used every day on sections between adjacent stations where there is only one track. It was used for over 100 years between Claisebrook Station and Belmont Station, until the Goongoonup Bridge was commissioned in 1993.

The need to transfer 10,700 people bound for the Mandurah Line in Perth Station can be avoided in the future when the current spur line from Kenwick Station to Thornlie Station is extended to join the Mandurah Line to a junction at Cockburn Central Station. However, this is a longer term consideration and it is not part of this project.

Bus Operating Plan

Twenty bus stands for loading passengers, with twenty four adjacent stands for waiting buses, will be provided directly adjacent to the new Stadium to move 8,100 people within one hour from the Peninsula to suburban locations, many of these being the large bus hubs at centres not served by rail, or rail / bus feeders – centres such as Ellenbrook, Mirrabooka, Morley and Booragoon. Facilities for a further 58 waiting buses will be provided nearby.

Eight bus stands for loading passengers will be provided on the northern side of the river, alongside Gloucester Park in Nelson Avenue, to move 6,200 people on a shuttle service from Gloucester Park along a route bounded by Adelaide and St. George’s Terraces, Milligan and Wellington streets, linking users to over 40,000 major public and private parking facilities adjacent to that route **(See Figure 5)**.

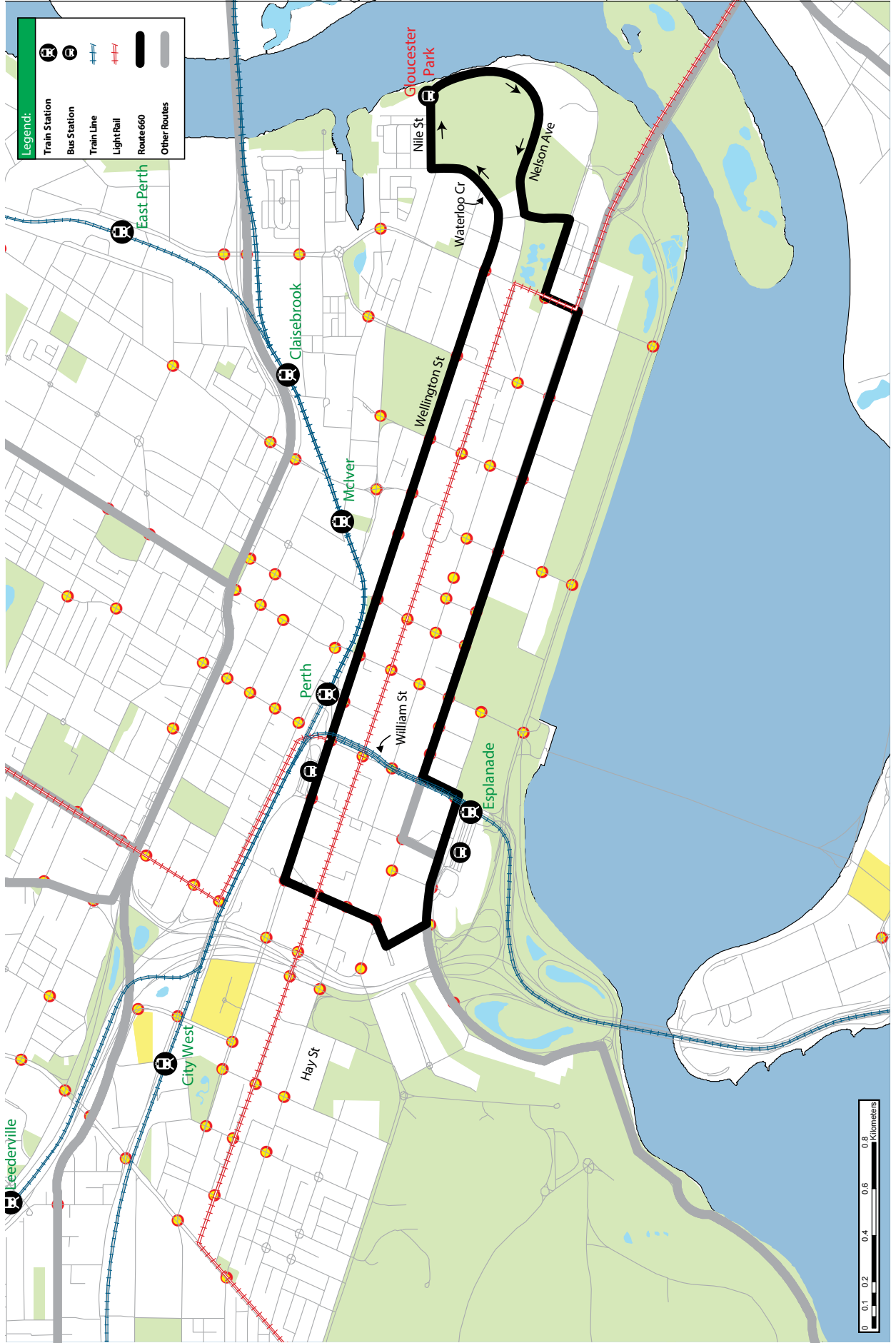


Figure 5: CBD shuttle bus route

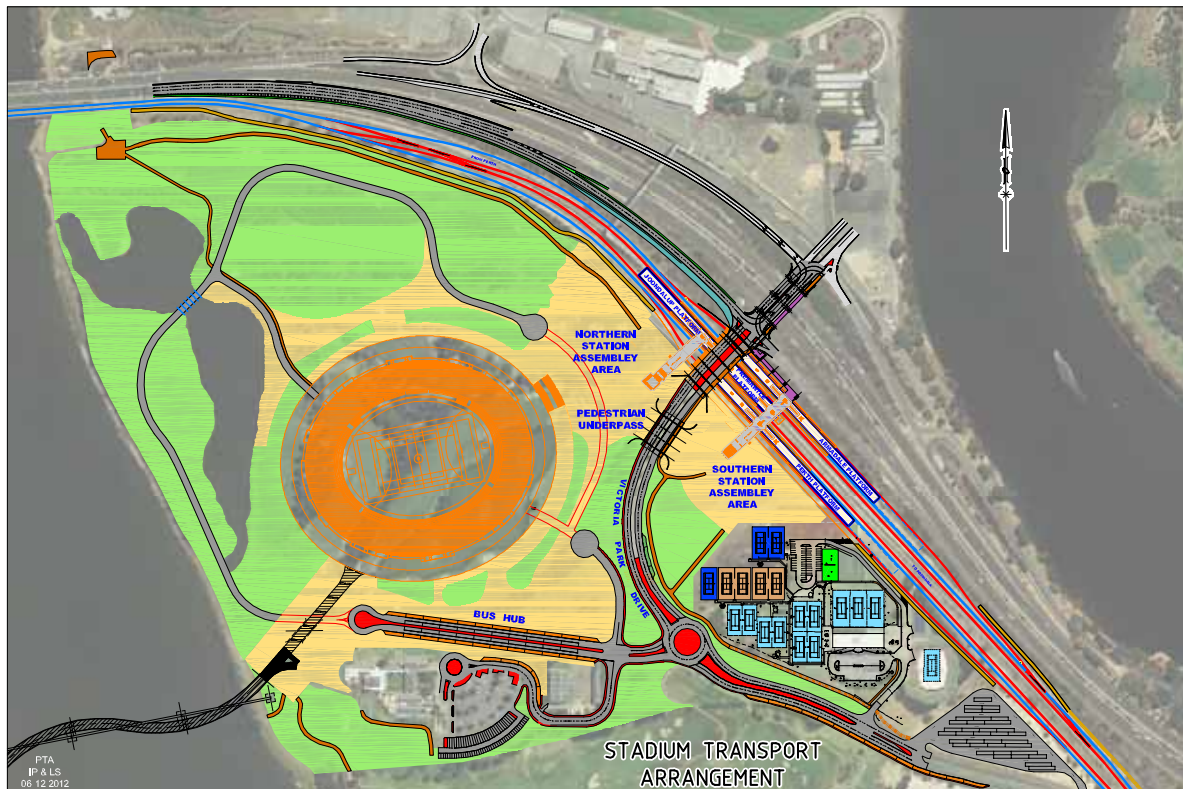


Figure 6: Transport infrastructure layout

Infrastructure

The infrastructure layout to meet the transport operating requirements for the new Perth Stadium is shown in **Figure 6**. The details are as follows:

- A new railway station at Belmont Park with three island platforms accommodating six platform faces, together with stowage for up to 117 individual railcars.
- Additional railcar stowage facilities between Great Eastern Highway and Victoria Park station for 24 individual railcars.
- Additional infrastructure at East Perth station commensurate with the traffic task attributable to traffic created by the stadium.
- Amendments and enhancements to railway signalling and infrastructure between the Swan River and Perth Station.
- Minor additions to the railway infrastructure at Perth Station.
- A major pedestrian bridge across the Swan River linking Burswood to East Perth.
- New bus facilities adjacent to the Stadium for up to twenty buses loading passengers at any given time.
- Bus and pedestrian facilities at Gloucester Park to accommodate up to six loading buses.
- Bus layover facilities at locations near the stadium allowing rapid 'call up' of buses.
- A major rebuild of the Victoria Park Drive road bridge across the railway at Burswood which will include a major extension to the length and provision of an additional traffic lane.
- Improvements to the intersection of Great Eastern Highway and Victoria Park Drive.
- Additional pedestrian facilities for public transport users between the podium level of the Stadium, the railway station and the pedestrian bridge.

Importance Of Rigour

A high level of rigour was applied in defining the requirements of key infrastructure elements, which account for 76 per cent of the estimated cost notably:

- Site works and services (eight per cent of the total cost).
- The railway requirements including the layout of station platforms and tracks adjacent to the new stadium, and the station concept design (50 per cent of the total cost).
- The functional requirements and aesthetics of the pedestrian bridge that is proposed between the stadium and East Perth (18 per cent of the total cost).

Definition of the railway layout associated with the new Perth Stadium Station has been completed to the stage of a final design that could (with proper documentation) be used to tender for construction. A very high degree of definition was necessary to ensure conformance of the platform layout and train stowage, with the operational requirements to satisfy the projected demand. The track layout also became the basis of the station concept. Finalisation of the track layout was essential to enable the concept design of the Victoria Park Drive Bridge extension and widening (See Figure 6).

A station concept design has been produced which responds to the projected high level of usage in defining the passenger marshalling and station access infrastructure.

Site work and staging plans would not be possible without the accurate definition of the final railway infrastructure and Victoria Park Drive bridge layouts. This was in turn necessary to derive the funding requirements for the forward works package, details of which are included in this summary.

Extensive work done in preparation of the PDP shows that the cost of the proposed pedestrian bridge between the Stadium and East Perth (See Appendix 1), is likely to be up to **\$54,120,000**, which is **marginally** higher than the \$53,200,000 anticipated in June 2011.

Cost Estimates

Capital – total costs

Table 1 summarises the cost of the works developed in the Transport Project definition Plan. It also shows the escalated cost assuming construction starts in 2014 and is completed in 2017.

Transport Costs to Support the new Perth Stadium	\$'000 July 2012	\$'000 Escalated
Cost of Transport Infrastructure	283,800	
Project Director's Allowance 5%	14,200	
TOTAL WORKS COST	298,000	339,251

Table 1: Estimated transport infrastructure costs



Project Management

In addition to the capital work cost, the project budget will include the costs required by the PTA to manage the project. Funding for further planning development including consultancy support up to July 2013 is already included in approved budgets. A further \$19,390,000 is required by PTA and Main Roads WA from July 2013 for project management tasks to complete the new Perth Stadium Transport Project.

Staging

Although there is some flexibility in the timing of the delivery of works at Victoria Park, East Perth, Gloucester Park, Beckenham, Claisebrook and the proposed new pedestrian bridge, the following work packages on the Burswood Peninsula, present the most significant staging and interface risk.

- Pre-construction site works.
- Western Power cable relocation.
- Railway infrastructure.
- new Perth Stadium Station.
- Victoria Park Drive Bridge works.

Cashflow

Outturn costs of \$339 million shown in **Appendix 2** are based upon an indicative program that has utilised a conservatively staged delivery of the Project where this approach does not pose significant risks to the project objectives.

new Perth Stadium Transport Project Definition Plan Appendices



Appendix 1

Transport facilities to be funded by the Government

	Cost Area	Capital, Design & Tendering Costs (\$)
1	Site Works & Services	25,000,000
2	Environmental	8,000,000
3	Railway & Stations	149,250,000
4	Road works on the Peninsula	10,830,000
5	Bus Infrastructure	12,700,000
6	Swan River – New Pedestrian Bridge	54,120,000
7	Existing Pedestrian Footbridge	4,300,000
8	Relocate tennis courts	2,000,000
9	Windan and Goongoonup Bridge – Pedestrians	1,100,000
10	Stadium Precinct Transport works	16,500,000
	Sub total	283,800,000
	Project Director's Allowance 5 %	14,200,000
	Grand Total to Procure – Un-escalated (July 2012 prices)	298,000,000
	Escalation	41,251,000
	Grand Total to Procure – Escalated	339,251,000

Appendix 2

Indicative cashflow

Year	Escalation	Base cost cash flow (\$m)	Escalated cash flow (\$m)	Escalated Project Management (\$m)
2012/13	2.00%	21.900	22.338	0
2013/14	3.10%	37.170	39.089	3.975
2014/15	3.70%	35.301	38.497	4.120
2015/16	4.30%	85.072	96.763	4.300
2016/17	4.80%	98.899	117.889	4.505
2017/18	5.30%	19.658	24.675	2.490
TOTAL		298.000	339.251	19.390



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