



MEMORANDUM

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RE Western Sydney Stadium – Fire Engineering Statement

1.0 Introduction

1.1 Project Introduction

This report supports a State Significant Development (SSD) Development Application (DA) submitted to the Minister for Planning pursuant to Part 4 of the Environmental Planning and Assessment Act 1979 (EP&A Act).

The Application (referred to as SSDA16_8175) follows the approval of a Stage 1 SSD DA (SSDA16_7534) in December 2016. The Stage 1 SSDA sets out a Concept Proposal for the redevelopment of the Western Sydney Stadium and future supporting uses. In summary, the Stage 1 Consent includes the following components:

- **Concept Proposal** for the Western Sydney Stadium, including building envelopes, a new 30,000 seat stadium, 500 surface car parking spaces, access, ancillary infrastructure and landscaping; and
- **Detailed works** for staged demolition and removal of the existing stadium and associated infrastructure and the Parramatta Swimming Centre

1.2 Overview of Proposed Development

The proposal relates to a detailed ('Stage 2') DA for the detailed design and construction of the stadium. This SSD DA seeks approval for the following components of the development:

- Detailed design of the stadium, public domain and car parking spaces;
- Construction and use of the 30,000 seat stadium including:
 - General Admission Facilities including bars, food and drink stalls, amenities and viewing areas;
 - A function centre and kitchen facility;
 - Associated Stadium facilities including player and coaching facilities, media and press conference rooms, security and stadium managers facilities;
 - Waste storage and loading dock;
- Construction and embellishment of the public domain including:
 - Outdoor sporting and recreation facilities;

- Public plazas and entertainment areas;
- General landscaping works;
- Provision of up to 500 car parking spaces with vehicle access to the development from O'Connell Street and internal roads for vehicular circulation;
- Provision of signage zones, lighting and other ancillary stadium elements;
- Pedestrian access and footpath upgrades along O'Connell Street; and
- Extension and augmentation of physical infrastructure / utilities as required.

1.3 Background

1.3.1 Stadia Strategy

The stadium is the first project to be delivered under the NSW Government's \$1.6 billion Stadia Strategy, the largest investment in sporting infrastructure since the 2000 Olympics. The new Western Sydney Stadium will:

- Be able to cater for bigger crowds, provide an improved game day experience and bring major benefits to the Western Sydney economy
- Generate approximately 1,200 jobs during construction and between 600 and 900 jobs once operational for sporting event days and major events
- Cater for a range of sporting and community uses within the precinct.

1.3.2 Concept Proposal (SSDA 16_7534)

Infrastructure NSW (iNSW) on behalf of Venues NSW submitted a State Significant Development

Application (SSDA) for the Stage 1 concept proposal and demolition of the existing stadium in July 2016. Consent for the Stage 1 SSDA was granted by the Minister for Planning on 7 December 2016 and includes:

- ❖ a maximum total GFA of approximately 60,000 m² (excluding the playing pitch) for the stadium development, including:
 - additional seating for approximately 10,000 more spectators in a seating bowl with 30,000 seats, including 27,000 general admission seats and 3,000 corporate seats;
 - playing pitch;
 - five levels of premium box/terrace, function/lounge offerings and a number of suite offerings;
 - flood lighting, stadium video screens and other ancillary fittings;
 - additional facilities for team, media, administration and amenity, including:
 - police facility and security office;
 - players changing rooms;
 - ticket gates and ticket boxes;
 - media interview rooms;
 - green room;
 - production suite and joint operation control room;
 - event briefing rooms;
 - hirers office and patron services offices;

- first aid facilities;
- loading docks for deliveries; and
- food, beverage and retail facilities.
- a maximum GFA of approximately 20,000 m2 for future development of ancillary uses within the northern corner of the Site;
- transport, parking and accessibility;
- public domain elements; and
- landscaping elements throughout the Site.

1.3.3 Design Excellence and Project Tender Phase

Since receiving the development consent for Stage 1, Venues NSW have appointed Lendlease as the contractor for the Stage 2 detailed design and the demolition and construction of the stadium. The tender process also served as a competitive design process in accordance with the Director General's Design Excellence Guidelines and Clause 7.10 of the *Parramatta Local Environmental Plan 2011*.

1.3.4 Site Establishment works Modification

A modification application (MOD 1) was made to the Stage 1 DA pursuant to Section 96(2) of the EP&A Act in February 2017. The modification seeks to expand the approved range of site preparation works to include piling and remediation/earthworks, as outlined below:

- Remediation works comprising the excavation and storage of contaminated materials and bulk excavation. Contaminated materials will be stored on site and capped below ground in accordance with the recommendations outlined in the Remedial Action Plan.
- Piling works which will comprise the driving and drilling of concrete piles to establish foundations for the construction of a stadium located within the Stage 1 building envelope

The modification application is currently under assessment by the Department of Planning and Environment (DPE) and is awaiting determination.

1.4 Site Description

The Western Sydney Stadium is located at 11-13 O'Connell Street, within the Parramatta Park on the north-eastern edge of the Parramatta CBD. It is bound to the south and west by the Parramatta Park and the Parramatta River, the Parramatta Leagues Club to the north and O'Connell Street to the east. The Site is located within the City of Parramatta local government area (LGA).

A locational context plan is provided at **Figure 1** below.

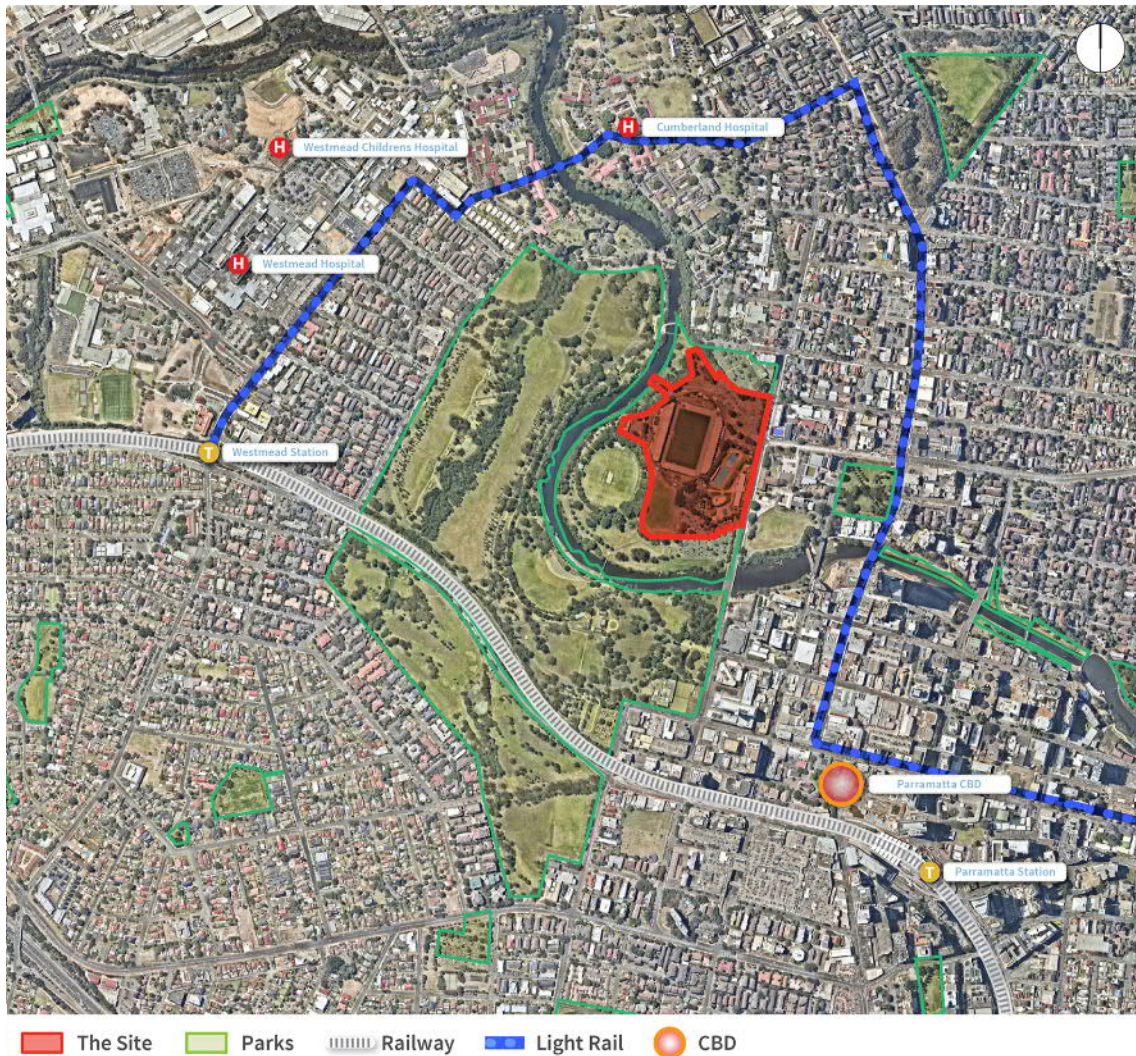


Figure 1 – Site context Plan

The site has an area of approximately 95,000m² and owned by Venues NSW and The Parramatta Park Trust.

The site is irregular in shape and is illustrated in **Figure 2** below.



Figure 2 – Site Aerial Plan

1.5 Reference Documents

The following documents have been used in preparation of this statement:

- BCA Report by Steve Watson & Partners, R1.0 dated 10 February 2017
- Drawings by Populus

2.0 Fire Safety Engineering Design

The fire safety engineering for the stadium will be in line with the Environmental Planning and Assessment Act plus the associated legislation. The design will be principally based on the International Fire Engineering Guidelines (IFEG), National Construction

2.1.1 Design Parameters

The Fire Safety Design measures that form the basis of the fire engineering strategy are as follows. The fire safety measures specified within this section are those essential to the key performance based design aspect of this project. However, they are not intended to reflect all of the required fire safety measures for the whole stadium.

Table 1 – Key Fire Safety Design Measures

Categories	Key measures
Fire Resistance and Compartmentation	The exposed steel rakers and part of the columns supporting these beneath the main bowl are not proposed to be provided with applied fire protection in accordance with the BCA DtS provisions. A performance solution will be provided to support this. In the bowl area, a partial fabric roof is proposed to provide weather protection to the seats. The roof covering is proposed to be a light weight fabric structure. The product will be Sergeferrari - Preconstraint TX30, or equivalent. A performance solution is proposed to justify the use of this alternative material. Areas beneath the seating will be enclosed in fire resistance construction if used for storage. A minimum 30 minutes fire resistant construction is proposed. For the standalone catering amenities, pods and retail areas on the North, East and South of the outer stadium, these will be treated as separate buildings to the main stadium and western concourse areas via a performance solution. For these areas considered as separate buildings, the structural fire resistance will be designed to be structurally separate from the overall building structure unless the structures achieve the more onerous recommended fire ratings.
Means of Egress	The means of escape design will utilise a combination of enclosed and open fire stairs. The widths of the escape routes will be designed such that occupants will be able to complete their evacuation within a movement time of approximately 8 minutes. This is in accordance with the 'Green Guide', but will be addressed as a non-compliance to the BCA DtS provisions. There will be extended travel distance to exits and between exits in various locations around the site, however, as the evacuation will largely be dictated by queuing times these extended travel distances will be addressed by performance based assessments. The means of escape routes for the stadium will be provided to support the entire population evacuating in a single phase. This will allow the effective evacuation of the entire facility which has been considered to minimise crowd management requirements of the operator.
Automatic Fire Detection and Alarm	The stadium will be provided with automatic smoke detection and alarm in all fully enclosed areas. It is proposed to omit smoke detectors in the external bowl area. To prevent a false alarm from adversely impacting on the operations continuity of the stadium, it is proposed to adopt a double knock fire alarm cause and effect as below: On activation of the first smoke detector, the whole stadium goes into an investigation period where only the staff are alerted. This allows staff to investigate the authenticity of an alarm prior to taking the appropriate actions, e.g. evacuating the whole stadium. The investigation period is to be confirmed although a period of up to 10 minutes is considered.

	On activation of a second smoke detector, or when the investigation period lapses, the stadium will go into full evacuation mode. Separately, on activation of a fire sprinkler head, the stadium will go into full evacuation directly. Note a full evacuation covers the whole of the stadium, including the amenities and catering areas. Based on the large areas of the stadium, a performance solution is proposed on the audibility to be achieved by the fire alarm system. Suitable strobes or other visual warning devices will be provided where necessary to supplement areas without BCA DtS alarm audibility. The stadium will be provided with a live annunciation broadcast system for the purposes of management in a fire.
Fire Suppression System	Generally sprinklers will be provided throughout the stadium. However, in areas where the sprinklers are unlikely to operate, or be of limited benefit a fire engineering solution to omit these is proposed. Sprinklers will be provided throughout the Level 0 back of house areas and the western stand. Sprinklers are not proposed in the amenities blocks due to the limited fire loads, or in the main external areas of the bowl. Localised fire suppression will be provided to provide protection to the cooking areas within the food pods located around the Level 1 concourse areas.
Fire Fighting Equipment	A FIP will be provided for the Fire Brigade at the security room to allow management of any fire fighting operations. Fire hydrants will be provided throughout the main stadium bowl and western stair. Fire hydrants in the bowl will be positioned so that coverage to all areas of the bowl can be achieved within 2 hose lengths. All other areas will have coverage within a single hose length. Fire hydrants will not be provided where pods are less than 500 m² in area, separated by at least 6 m from adjacent pods and the main bowl. – Note: currently there are some pods, east and north that are greater than 500 m² in area, which aren't currently provided which would require a fire hydrant to cover these areas. A grade 1 water supply will be provided to both the fire hydrant and sprinkler systems. This will provide additional redundancy in the operation of these systems. Perimeter vehicle access will be provided to allow fire vehicle access around the facility. Not all areas will strictly comply with the BCA DtS provisions and a fire engineering solution is proposed to support this.
Smoke Hazard Management	The Western stand will be provided with a mechanical smoke control system to maintain a clear layer for a fire at any level in the building. The smoke exhaust will be provided by two smoke exhaust fans located above the north and south cores in the western stand. The open design of the roof will allow smoke to vent from the bowl for a fire in this area. This will allow smoke to vent from the stadium without the need for mechanical smoke exhaust system.
Management in Use Plans	Management in use plans will need to be developed to ensure the effective operation of the fire strategy, this will include general house keeping as well

as requirements for staff to ensure effective investigation of a fire alarm prior to evacuation to the venue occurring.

While there are management requirements placed on the facility the fire strategy is undeveloped to support the day to day staff activities that will already be in place to allow the operation of the venue.

2.1.2 Key Fire Engineering Performance Solutions

The table below shows the potential performance solutions applicable to the stadium anticipated at this stage. These solutions are also subject to discussions with the key stakeholders, e.g. Fire and Rescue NSW.

Table 2 - Non-compliances with DtS Provisions requiring an Alternative Solution

#	Non-Compliance	BCA DtS Provisions	Performance Requirements	Proposed Alternative Solution
1.	Structural Fire Resistance	C1.1 Type of Construction	CP1, CP2	The exposed steel rakers and part of the columns supporting them beneath the main bowl are not proposed to be provided with applied fire protection in accordance with the BCA DtS provisions. Inherently there will be structural redundancy from a fire safety perspective as the structure is designed for high dynamic loads which are not necessary to be considered as part of the structural response in a fire. No additional measures over the base design are anticipated at this stage. Other areas of the structure including the western stand structure are assumed to be provided with applied fire protection to meet the BCA DtS provisions.
2.	Non-Combustible Construction	Spec C1.1 Structural Fire Resistance	CP2, CP4	The roof covering is proposed to be provided with a lightweight fabric structure above the main bowl. The product will be Skytop FGT-1000, or equivalent The proposed fabrics will perform in a manner that can be supported through fire engineering without further measures or sprinklers beneath the canopy. We require further technical data on the fabric performance to carry out the analysis.
3.	Perimeter Vehicle Access	C2.4	CP9	Some areas of the building are greater than 18 m from the vehicle roadway (to the south and east), and less than 6 m from the building. A fire engineering solution will be developed based on good signage and suitable fire vehicle parking positions being available around the perimeter of the stadium as well as the steps leading from the main concourse to the surrounding street level
4	Fire Isolated Exits	D1.3	DP5 and EP2.2	The central western stand stair is an open stair connecting four storeys which would need to be fire separated to meet DtS provisions. However, with the

				provision of the north west and south west protected stairs and provision of a smoke exhaust system within the western concourse accommodation of a fire engineering solution is proposed for the stair to remain open to the corridor at all four levels.
5	Exit Travel Distances	D1.4	DP4 and EP2.2	Travel distances of greater than 20 m to a point of choice and 40 m to an exit will be supported. Travel distances of up to 30 m to a point of choice and 60 m to an exit will be supportable for the internal areas, such as the western stand. Travel distances of up to 80 m to an exit will be supportable in the main seating bowl and from the pitch as these will be largely open air spaces.
6	Distance Between Alternative Exits	D1.5	DP4 and EP2.2	The travel distances between alternative exits may exceed 60 m in some areas. The exact length and location of these has not yet been determined. Travel distances between exits of up to 160 m and 100 m are anticipated to be supportable with a fire engineering solution in the bowl and western stand respectively through the openings in the main stadium and provision of smoke exhaust in the western stand.
7	Dimension of Exits and Paths of Travel to Exits	D1.6	DP5 and EP2.2	The width of escape routes will be determined based on a performance based approach considering the flow of occupants. An increased queuing time of up to approximately 8 minutes in accordance with the 'green guide' is proposed for the main seating area within the stadium. Means of escape from the western stand will be subject to a fire engineering solution, but with a shorter nominal movement time due to the occupants being in a largely enclosed space, different from the occupants in the bowl.
8	Travel by non-fire-Isolated Stairway	D1.9		Travel distance from the furthest point on Level 04 to an open space on Level 01 via a non-fire rated Stair 03 exceeds 80 m. The extended travel distances via non-fire-isolated stairway in western stand are expected to be supported based on provision of smoke exhaust in western stand.
9	Non-required escalator	D1.12		The escalator next to Stair 03 connects 4 storeys (Level 01 to Level 04). A maximum of 3 storeys is permitted in a sprinkler protected building. A performance based solution will be developed based provision of smoke exhaust system with smoke baffles within Western stand for the escalator to remain connected to all four levels. Assessment will also consider present of low density of fuel load and provision of sprinkler protection in the vicinity of escalator.
10	Fire Hydrants	E1.3	EP1.3	A fire engineering solution to support fire hydrant coverage to the open spectator stands and the pitch

				with two lengths of hose will be developed based on the open nature of the stand. Other internal areas should be designed to comply with hydrant coverage achieved within 30 m of hydrant outlets.
11	Fire Hose Reels	E1.4	EP1.1	Full fire hose reel coverage will not be achieved to all areas of the seating bowl or on the pitch. A fire engineering solution will be developed based on a standard 36 m hose reel being provided at vomitories to aid first aid fire fighting. This is based on the limited fire loads in the seating bowl and pitch and the high levels of management available. Our experience is that FRNSW are against the use of 50 m hose reels and would like rather a consistent hose reel length, however the option of providing 50 m hose reels instead of 36 m hose reels will be discussed with FRNSW.
12	Sprinklers	E1.5	EP1.4	Sprinklers will generally be provided throughout. However the following fire engineering solutions are proposed to support their omission in certain areas. A fire engineering solution to support omission of the sprinklers beneath the main bowl lightweight roof is proposed. This will be based on the fabric used for the roof and the relative height of the roof above seating as well as open nature of the space. Retail and Toilet pods detached from the main bowl i.e. those on the south, east and the food outlets on the north. It is proposed to omit sprinklers from these pods on the basis of them being treated as separate buildings and local suppression being provided over cooking facilities within the pods as appropriate. There will also be a separate fire engineering solution developed to support no sprinkler protection to the amenities pods to the north, but in the proximity of the main bowl. This fire engineering solution will be based on the provision of smoke detection throughout the space and the limited fire loads in the area. This would limit the potential use of vending machines in this particular area.
13	Smoke Hazard Management	E2.2	EP2.2	A fire engineering solution will be developed to support rationalised smoke exhaust rates from the western stand. This will be based on first principles analysis. A fire engineering solution will also be developed to omit the provision of smoke exhaust throughout the main bowl area and from the northern amenities blocks. This will be based on the open nature of the spaces and limited fire loads. In areas such as the loading dock where smoke detectors could result in spurious fire alarms a fire engineering solution will be developed to support

				omission of smoke detection in these areas on the basis of sprinklers being provided and operating as a form of heat detection. The fire indicator panel is proposed to be located near the entrance to the loading dock at Level 0, which is not the main entrance. A fire engineering solution to support the location of the fire control centre in the loading dock will be developed based on the provision of suitable signage and fire vehicle access to the area.
14	Sound System and Intercommunication System for Emergency Purposes	E4.9	EP4.9	It is not possible for all areas within the main bowl, on the pitch and within the external concourse to achieve the STI levels for a fully compliant SSISEP system. A fire engineering solution will be developed to support the STI levels not being achieved based on the provision of suitable strobes or other visual warning devices being provided in areas where the STI level is not achieved.
15	Separation of adjacent Buildings			The catering and amenities pods to the south, east and the outer catering pods on the north are proposed to be treated as separate buildings to the main stadium and western concourse areas. A fire engineering solution will be developed to support the pods being treated as separate building based on them being located at least 6 m away from the main bowl and each other. Any columns from the main bowl that are within the pods will not be clad with combustible materials and will be provided with applied fire protection to determined with a performance based solution, including an appropriate height above the pods if necessary.

Based on our preliminary review of the design, the proposed Alternative Solutions can be supported by performance based fire safety engineering.

If you require any further information at this stage, please do not hesitate to contact me.

Yours sincerely



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