Stadium Australia Redevelopment

Integrated Water Management Plan

Infrastructure NSW (iNSW)

2019-08-26

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Document control record

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Document control						aurecon
Report title		Integrated Water Management Plan				
Document code			**Project number**		255576	
File path		**P:\BG\255576 Stadium Australia\3.Project Delivery\8.Reports**				
Client		Infrastructure NSW (iNSW)				
Client contact		Tom Kennedy	**Client reference**			
Rev	**Date**	**Revision details/status**	**Author**	**Reviewer**	**Verifier** (if required)	**Approver**
1	2019-08-16	Draft for review	MM	ZK		MT
2	2019-08-26	Final for SSD	MM	ZK	CA	MT
Current revision		**2**				

Approval			
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1 Introduction

This report supports a State Significant Development (SSD) Development Application (DA) for the refurbishment of Stadium Australia, which is submitted to the Minister for Planning pursuant to Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). Infrastructure NSW is the proponent of the SSD DA.

This report provides an overview of the water demands for the existing stadium as well as the proposed redevelopment. In the interest of minimising potable water use in operation, the stadium redevelopment will seek to implement a number of water efficiency meansures in design as well as maximise the contribution of alternative water sources where applicable.

2 Background

Stadium Australia opened in 1999 for the 2000 Sydney Olympic and Paralympic Games and, at the time, was the largest Olympic Stadium ever built and the second largest stadium in Australia. In March 2018, the NSW Premier announced plans to refurbish Stadium Australia to address deficiencies with the existing infrastructure and ensure that the stadium retains its status as a premier venue within a network of stadia and events infrastructure in NSW.

The NSW Stadia Strategy 2012 provides a vision for the future of stadia within NSW, prioritising investment to achieve the optimal mix of venues to meet community needs and to ensure a vibrant sports and event environment in NSW. A key action of the strategy includes developing Tier 1 stadia and their precincts covering transport, integrated ticketing, spectator experience, facilities for players, media, corporate and restaurant and entertainment provision. Stadium Australis is one of three Tier 1 stadia within NSW, the others being Sydney Football Stadium and the Sydney Cricket Ground.

In order to qualify for Tier 1 status, a stadium is required to include:

- seating capacity greater than 40,000;
- regularly host international sporting events;
- offer extensive corporate facilities, including suites, open-air corporate boxes and other function/dining facilities; and
- be the home ground for sporting teams playing in national competitions.

The refurbishment of Stadium Australia will address deficiencies in the existing infrastructure and improve facilities to be in line with contemporary Australian venue standards. The works ensure the stadium remains a modern, globally competitive venue that achieves the requirements for a Tier 1 stadium. The refurbishment of Stadium Australia addresses the following project objectives:

- transform the stadium into a ‘fan favourite’ destination for experiencing and enjoying sports and entertainment events;
- maximise the direct and indirect economic, social and cultural benefits to NSW from the project, including securing major, economically beneficial events within NSW to ensure the economic sustainability of the stadium into the future;
- deliver a multi-use contemporary rectangular venue that meets the needs of patrons, hirers and other users for rugby, football, concerts and other new forms of entertainment, and reaffirms the status of the stadium as Australia’s largest purpose-built rectangular venue in Australia;
- improve the facility’s sensitivity to the environmental conditions of the site by providing a roof which provides cover to 100% of seats (to the drip line);

- provide new and refurbished corporate areas, members areas and general admission areas to enhance the patron experience;
- promote universal accessibility, safety and security such that the stadium is welcoming, inclusive and safe for all stadium users, including persons requiring universal access;
- promote environmental sustainability and embrace a whole of life approach to operations and maintenance; and
- achieve a high standard of design and reinforce the Stadium's status and identity within the NSW stadia network, and more broadly, nationally and internationally.

3 Site Description

The site is located at 15 Edwin Flack Avenue within the Sydney Olympic Park. It is bound by Edwin Flack Avenue to the west, Dawn Fraser Avenue to the south, Olympic Boulevard to the east and Qudos Bank Arena to the north. The site is located within the City of Parramatta Local Government Area.

The site is legally described as Lot 4000 in DP 1004512 and part of Lot 4001 in DP 1004512. In 2017, the Minister for Sport assigned Venues NSW as the trustee of Stadium Australia under the *Sporting Venues Authorities Act 2008*.

In a broader context, the site forms part of Sydney Olympic Park which is a sporting and economic centre in metropolitan Sydney that covers 680 hectares. Sydney Olympic Park comprises a range of sports and entertainment venues, parklands, and commercial, retail and residential developments. It benefits from convenient access to Homebush Bay Drive, Parramatta Road and the M4 Western Motorway, as well as Olympic Park railway station. The Parramatta Light Rail Stage 2 and Sydney Metro West will also significantly increase accessibility.

The locational context of the Site is shown in **Figure 1**, whilst the site boundaries and existing site features are shown in **Figure 2.**

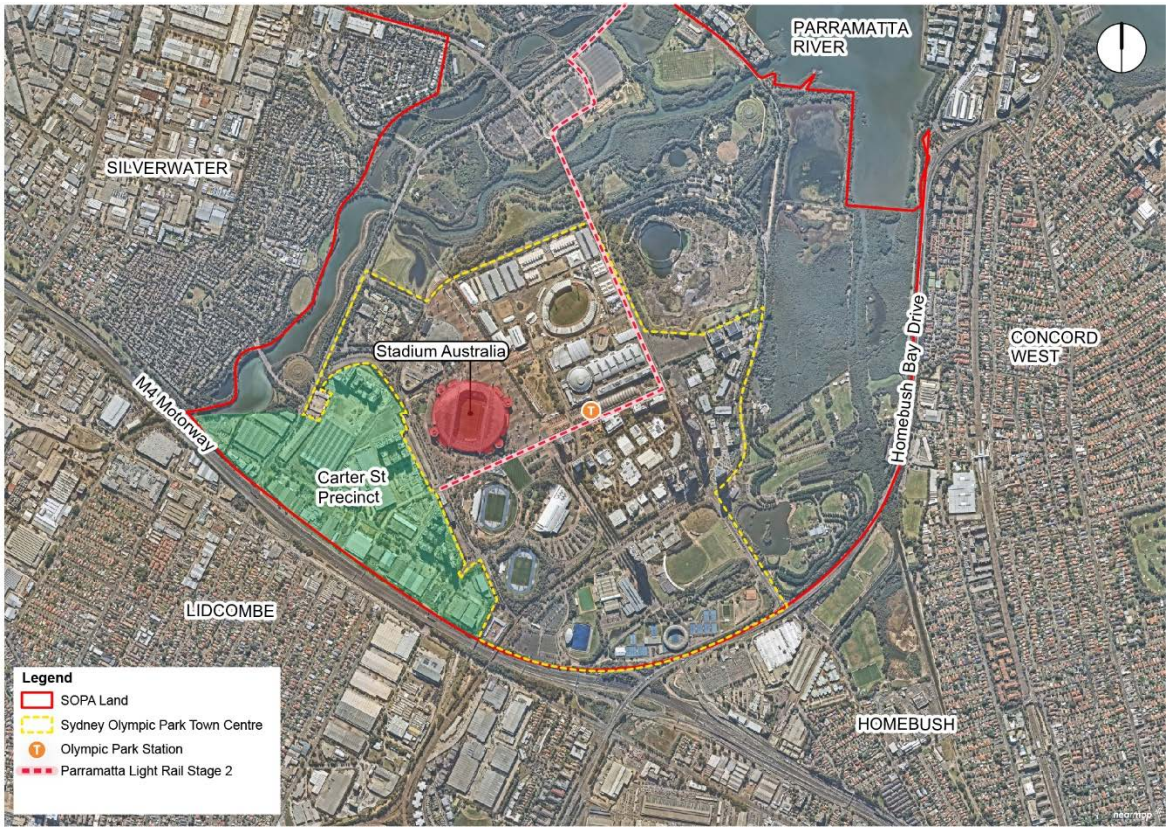

Figure 1 Regional Context of site

Figure 2 Site area and local context

4 Overview of Proposed Development

In March 2018 the NSW Government announced its commitment to refurbish the existing Stadium Australia and retain its status as a premier venue within a network of stadia and events infrastructure in NSW. This comprises the following:

- Reconfiguring the field of play to a permanent rectangular configuration.
- Redeveloping the lower and middle seating bowl to locate seating closer to the field and increase the pitch (steepness) of the seating bowl, which has the effect of reducing the capacity to approximately 70,000 seats (plus up to 20,000 persons on the field during concerts).
- Providing 100% drip-line roof coverage to all permanent seats by replacing the northern and southern sections of the roof and extending the existing eastern and western sections of the roof.
- Providing a new northern and southern public stadium entrance, including a new stadium facade and double-height concourse
- Renewing the food and beverage concessions, bathrooms, team facilities including new gender neutral changerooms, members and corporate facilities, press and broadcast facilities, and back of house areas.
- Providing new signage, high-definition video replay screens, LED lighting, and other functional improvements.
- Retaining the public domain areas surrounding the stadium that deliver a range of publicly accessible, event and operational areas, with minor works for tree removal.

Part of the existing stadium forecourt will be used as a construction compound during the construction phase and reinstated following the completion of works and prior to commencement of stadium operations.

Figure 3 Indicative photomontage of proposed stadium

5 Secretary's Environmental Assessment Requirements

The Department of Planning, Industry and Environment (DPIE) has issued Secretary's Environmental Assessment Requirements (SEARs) to the applicant for the preparation of an Environmental Impact Statement for the proposed development. This report has been prepared having regard to the relevant SEARs as follows:

Table 1 SEARS requirements for Water

SEAR	Comment / Reference
15. Utilities	
▪ address the existing capacity of the site to service the development and any augmentation requirements for utilities, including arrangements for electrical network requirements, drinking water, waste water and recycled water	Strategies for conserving drinking water and using recycled water are covered in this report. Refer to Infrastructure Management Plan (Hydraulics chapter for further details of augmentation requirements for utilities)
▪ outline any sustainability initiatives that will minimise/reduce the demand for drinking water, including any alternative water supply and end uses of drinking and non-drinking water, and demonstrate water sensitive urban design principles are used and identify any proposed water conservation measures	Strategies that improve efficiency are detailed in chapter 9. Strategies to replace water demands with alternative water are detailed in chapter 10.
*Note **SEAR 14. Water and Drainage** is addressed in the Stormwater Management Report*	

6 Water Management

6.1 Regional Context

Water is a limited natural resource, and as our cities and region expand create new and increased demands for water, it is critical that water conservation measures are planned and implemented across Sydney, to support drought resilience and water security.

Sydney experienced a severe drought between 1996 and 2010. Water levels in Warragamba Dam dropped to 32% in 2006 (Source: Sydney Water). Currently, more than 85% of Greater Sydney's water supply relies on rain. This means that The Greater Sydney Region still faces risk of short supply during prolonged droughts. New developments are responsible for taking steps to contribute to the state-wide strategy set out in *The NSW Government's 2017 Metropolitan Water Plan.* Two key actions apply to what the stadium can control in its design and operation:

1. Water recycling re-uses water that was otherwise destined to be sent to waste and re-purposes it for new functions.
2. Water efficiency makes sure we're all using water wisely and making every drop count.

6.2 Stadium Water Strategy

Strategies and actions to improve the management of water and reduce overall water consumption will be considered throughout the design and construction of the proposed redevelopment.

This chapter sets out the water balance and the key initiatives for best practice water management implemented for the Stadium.

Water balance is the process of determining the ongoing water demands and alternative water sources that contribute to the overall flow of water in and out of the building. While a detailed breakdown of water consumption cannot be meaningfully estimated at this early stage in the project, a high-level summary of the expected annual usage is set out in part 7.2.

The water management strategy for Stadium Australia is summarised below:

Figure 4 Summary of water strategy

6.3 Impact of Redevelopment

Overall, the operational water consumption of the proposed redeveloped stadium will not exceed that of the existing stadium. This is due to a decrease in overall seating capacity plus an upgrade to amenities to achieve a higher level of water efficiency.

7 Initial Water Balance Assessment

7.1 Existing water demand

Water consumption for the existing facility has been obtained from the Operator, Venues Live, and is depicted in figure 4.

This data indicates an annual demand of 24,193 kL of potable water and 27,209kL non potable water.

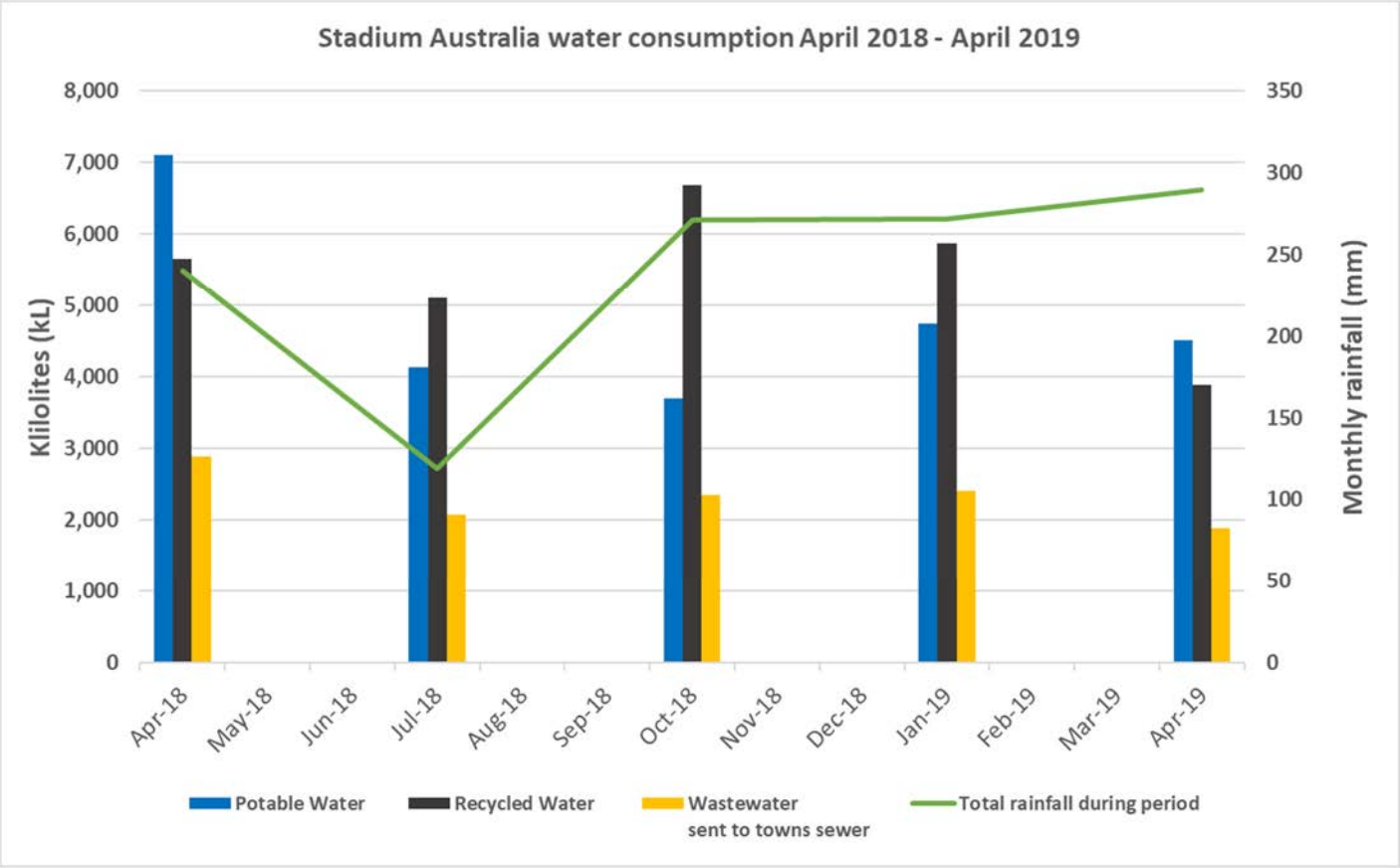

Figure 5 Operational consumption and rainfall data for 2018 – 2019

7.2 Stadium water demands

Table 2 includes a breakdown of the various water demands of the stadium proposed development.

Current water consumption data from the existing stadium detailed in section 7.1 has been used to inform expected water usage and a demand analysis was conducted in order to gain an understanding of the contribution of each end use.

Table 2 Water Demands for the Stadium

Demand	Description	Source	Expected % end use
Event day Amenities – flush fixtures	Toilets & Urinals used during event times	Recycled Water (WRAMs)	**18%**
Event day Amenities - taps	Handwashing for spectators and showers for players and event staff	Town mains (Potable water)	**28%**
Non-event – flush fixtures	Toilet usage of stadium general staff during non-event days	Recycled Water (WRAMs)	**2%**
Non-event – taps/kitchen	Handwashing and showers for staff, miscellaneous	Town mains (Potable water)	**3%**
Kitchen (Events)	Water for consumption including food preparation and dishwashers	Town mains (Potable water)	**14%**
Heat Rejection Water	Cooling Towers	Town mains (Potable water)	**14%**
Irrigation*	To maintain sports pitch	Rainwater captured from roof (treated on site) Top-up from town mains (potable) (if necessary)	**21%**
TOTAL WATER DEMANDS (kL/year)			**55 716**
TOTAL POTABLE (kL/year)			**24 193**
TOTAL NON-POTABLE (ALTERNATE) (kL/year)			**31 523**
% ALTERNATE			**57%**

Estimating the water demand for a stadium is highly dependent on visitor numbers as well as the time spent at the facility by visitors. For a project such as Stadium Australia, water consumed on a regular (non-event) day is expected to be only a fraction of water consumed during events (5-10%) To add to this, visitor numbers can fluctuate significantly each week month and year. The proposed redevelopment will represent a lower operational water demand when compared to the existing assuming a like for like occupancy. This is due to the following:

- Upgrade of amenities to improve efficient of WCs, urinals, taps, showers
- Retention of existing alternative water services to serve flushing and irrigation

8 Water Supply Overview

8.1 Existing Services

8.1.1 Potable Water supply

The Potable water supply for the stadium (Figure 6) currently is served from Sydney Water's main in Edwin Flack Avenue in the south west corner of the site and consist of a 200mm diameter valve and extends to a point adjacent to core 4 zone 4 where 150mm diameter branch is taken to the fire brigade suction point located in the entrance tunnel. The main continues to the pump and meter plantroom on level 0 at the north eastern corner of the Stadium.

The potable water passes through authority water meter then through backflow prevention device and water filters and eventually through dual booster pumps to a 50,000 litre combined fire hydrant and potable cold water storage tank in the level 7 plantroom east stand and 25,000 litre potable water storage tank on the west stand.

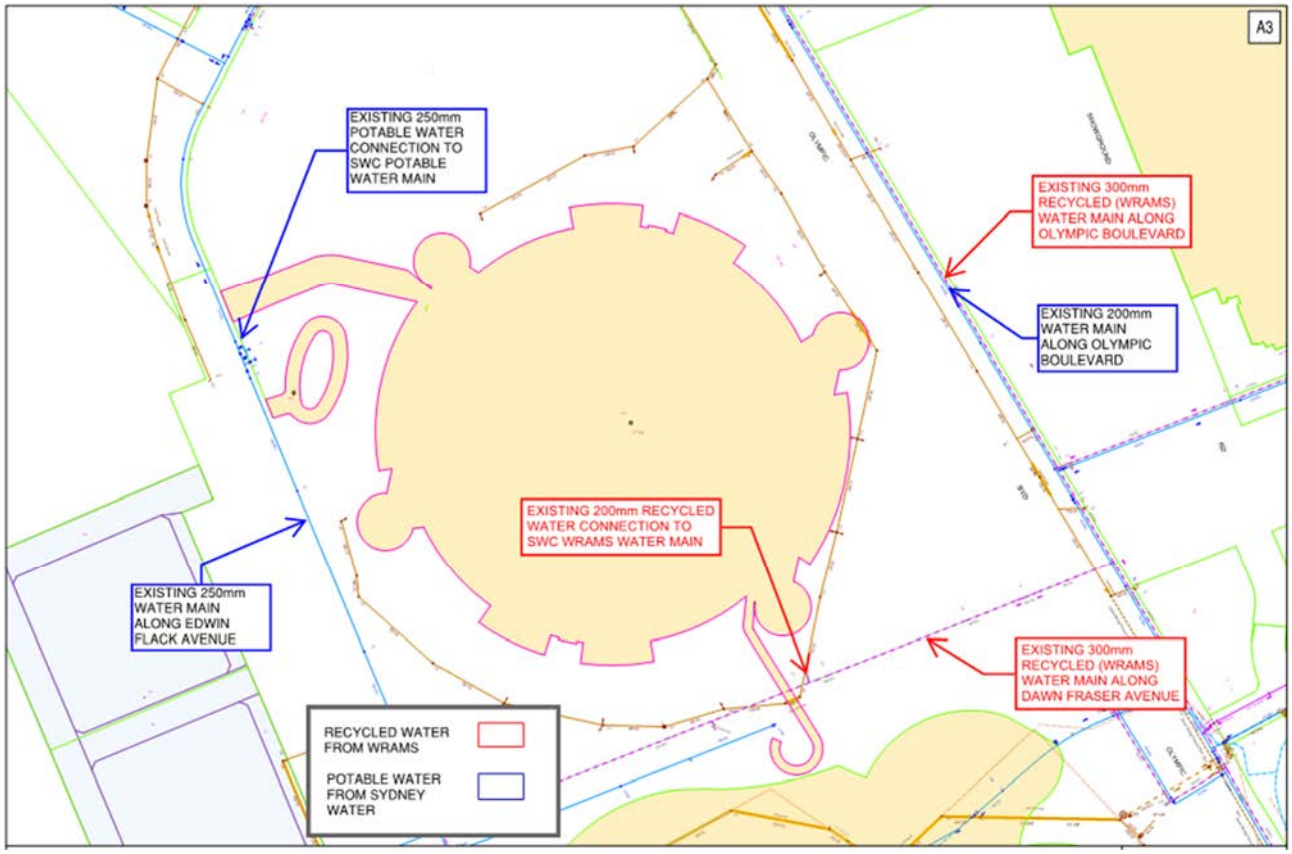

Figure 6 Recycled and Potable Water Supply to the Stadium

8.1.2 Recycled water supply - Water Reclamation and Management Scheme (WRAMS)

A non-potable flushing system also serves the stadium (depicted in Figure 6 above and Figure 7 below), supplied from the Sydney Olympic Park Water Reclamation and Management System (SOPA WRAMS).

WRAMS saves more than 850 million litres of potable water annually by avoiding its use for non-drinking purposes. In addition, the sewer-mining function of WRAMS treats approximately 550 million litres of sewage each year, which would otherwise be discharged to ocean outfalls.

This is distributed via 300mm diameter incoming supply. The system consists of water meter assembly, booster pumps, two recycled water rising mains supplying two separate 38,000 litre recycled water storage tanks located at level 7 and reticulation pipework system to all toilet's and urinal's flushing cisterns.

Figure 7 Photograph of existing WRAMS recycled water connection

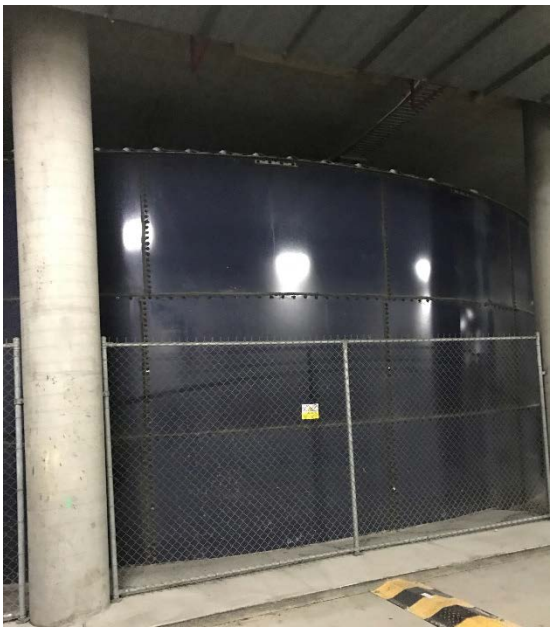

Figure 8 Photograph of rainwater storage tank

8.1.3 Rainwater capture and reuse

The stadium is currently served by 4 x 500kL rainwater tanks that collect water from the Stadium roof and feed into the irrigation pump, which serves sprinklers on the field. Rainwater is collected from the East and West side of the roof, each tank collects rainwater from an area of roughly 6,100m^2, with 24,400 m^2 total roof space being captured in total (Shown in Figure 9)

Given that rain is unpredictable in terms of frequency, intensity and duration, the irrigation system is also served with potable mains water for top up if required during dry periods (during which irrigation demands are expected to be higher).

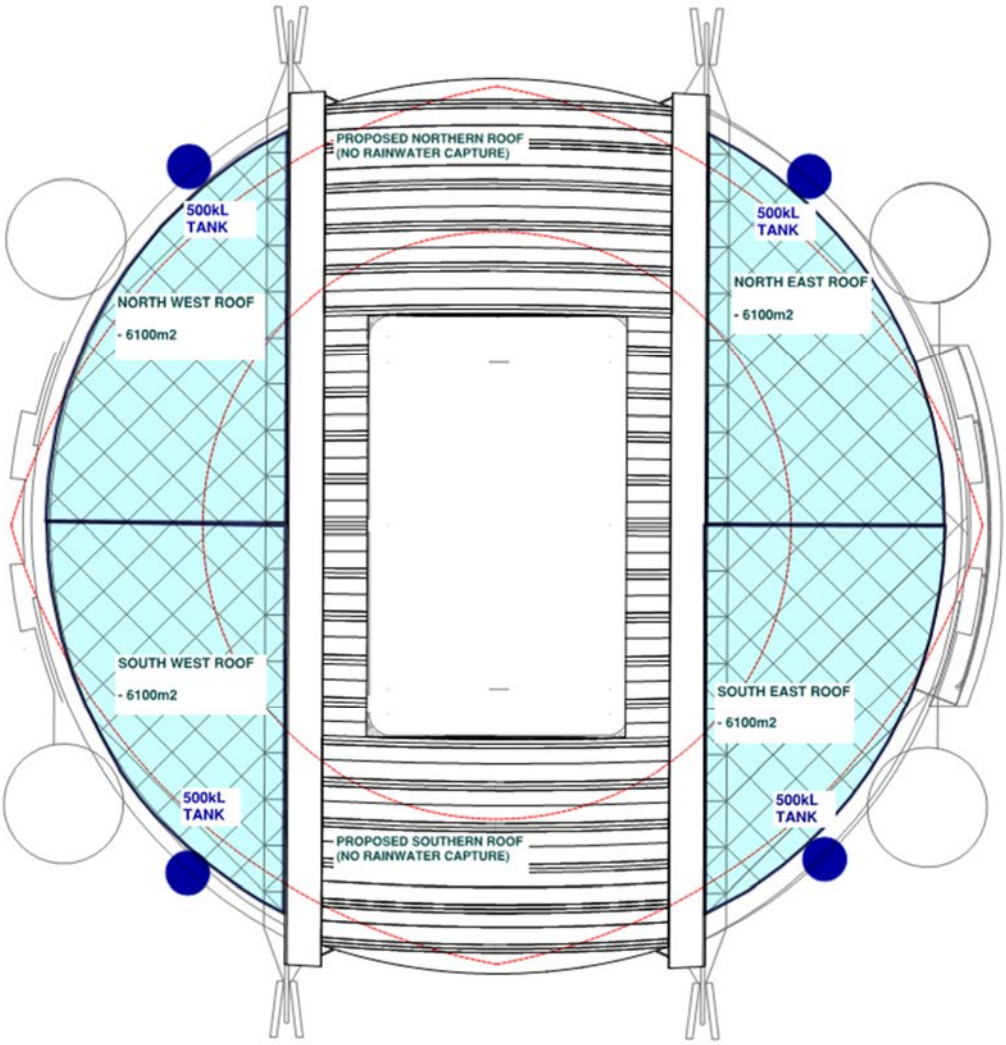

Figure 9 schematic overview of rainwater tank location (not to scale)

8.2 Proposed Services

A series of potable mains water risers connecting into existing mains shall be located throughout the stadium within plant rooms and services risers to deliver potable water throughout in accordance with AS 3500 part 1: Water Services.

The existing cold-water booster pumps will boost the cold water system during periods of peak demand.

8.2.1 Water Storage

The existing potable water and recycled water storage are in good condition. The proposal for these tanks will be to maintain and reuse them.

8.2.2 Metering

All water services extensions to wet areas will incorporate a water meter in line with Best Practice metering e.g. Green Star.

8.2.3 Leak monitoring systems

If required, a leak monitoring system could be incorporated with the water metering system.

8.2.4 Flushing Water System

A series of water risers shall be located throughout the stadium within plant rooms and services risers to deliver water throughout for toilet and urinal flushing purposes in accordance with AS 3500 Part 1: Water for sanitary flushing.

9 Water Efficiency

9.1 Sustainability Targets for Water Conservation

The proposed development has used the Green Star - *Design & As Built v1.2* tool as a point of reference to determine appropriate prescriptive water saving measures.

As such several practical measures have been implemented in the design to minimise reliance on potable water. This includes efficiency initiatives as described below, as well as a rainwater recapture system as set out in section 4.

9.1.1 Fixture Efficiency

New sanitary fittings and fixtures will be selected with water efficiency performance in line with best practice standards defined within Green Star. The WELS rating scheme applies to toilets, taps, showers and urinals. The project will implement the following WELS targets for new fittings and fixtures:

Taps	5 Star
Urinals	5 Star
Toilet	4 Star
Dishwashers	5 Star
Showers	3 Star
Washing Machine	4.5 Star

9.1.2 Heat Rejection Water

The stadium is currently served by an existing water-cooled chiller (refer to mechanical chapter of Infrastructure Management Plan). It may be necessary to install new water-cooled chillers in a central plant to supplement existing chilled water distribution, serving the proposed stadium. Cooling towers serve air condition systems with chilled water by rejecting heat to the atmosphere by cooling a water stream to a lower temperature. The tower takes the heat from the water stream and rejects it to the air stream and cooling is partly achieved through the evaporation of a portion of the water.

The chiller plant will provide an efficient cooling source and improve the experience and comfort of the facility; however, it is expected that significant water will be required for the water-cooled chiller. Further detailed analysis into mechanical design and cooling capacity will be required in order to understand the system best suited to the proposed redevelopment and the associated water demands.

10 Alternative Water Sources

10.1 Rainwater Demands

Rain water captured from the roof area will provide a sustainable water source for landscape irrigation to maintain the Stadium Pitch, as detailed in section 8.1.3. To ensure the water is of a high quality, the water is first treated, the process of which is detailed in 10.2

Demands for the pitch irrigation are in the order of 143 kL per cycle, the duration and frequency of these cycles will be subject to weather conditions and event schedule, however the current tank capacity can store enough water to serve 14 cycles of irrigation.

This service is expected to significantly reduce potable water reliance, although top-up water is supplied from mains water in dry period where rainwater alone cannot meet the irrigation requirement.

10.2 Rainwater treatment for irrigation

Rainwater harvested from the roof travels down a pipe into a storage tank or pit. Dense sediment will settle at the bottom of the tank. A float switch triggers the operation of the system to commence pumping or a pressure drop inline indicates the need to treat and transfer water instantaneously.

Filtration consists of at least two stages. Removal of coarse solids to 100 micron, then fine solids of 1-5 micron; via a cartridge, bag or screen filter prior to disinfection.

UV disinfection will be used following the filtration, which uses certain wavelengths of ultra violet light to destroy micro-organisms (bacteria, virus, and cysts such as cryptosporidium and giardia), in the water.

The treatment steps are summarised in Figure 8.

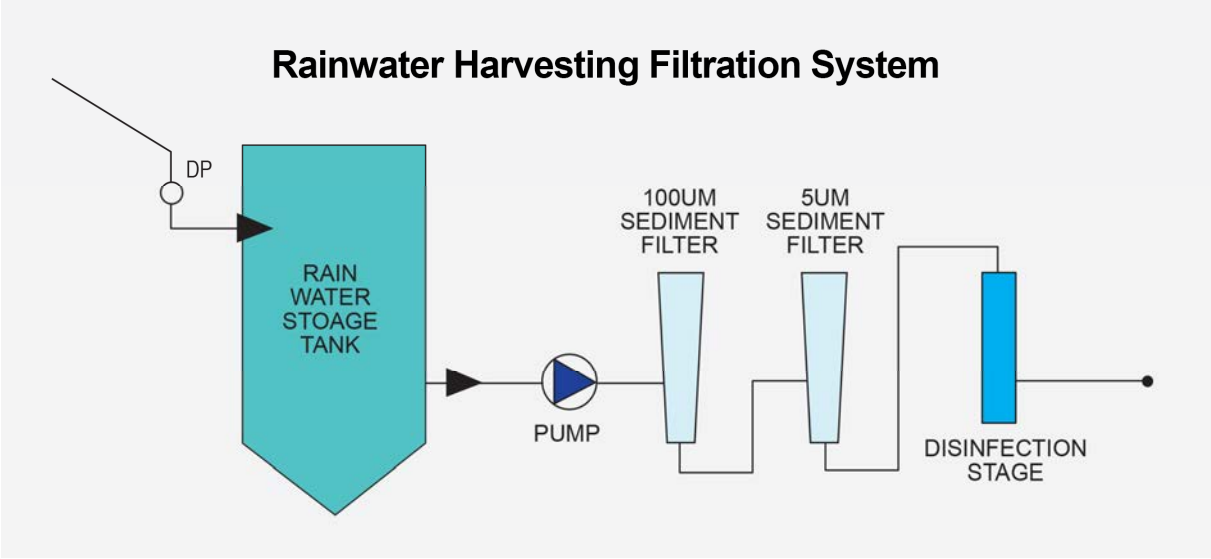

Figure 7 Rainwater treatment process

10.3 Water Reclamation and Management Scheme

The stadium also is currently served with reticulated water from Sydney Olympic Park's Water Reclamation and Management Scheme (WRAMS) as detailed in section 8.1.2.

The WRAMS is Australia's first large-scale urban water treatment scheme, which recycles water from sewage and stormwater to supply various applications across Sydney Olympic Park and in the suburb of Newington.

WRAMS water is reticulated directly to the stadium and serves amenities for flushing of WCs and urinals.

11 Ongoing Monitoring

Digital Water metering is to be provided to monitor consumption and may include an automatic leak detection system. Separate metering is to be provided for all major uses, to be defined as the design develops, as well as separate meters for mains water and for reclaimed rainwater.

12 Discharge

12.1 Discharge to Sewer

The proposed redevelopment will retain the connection to the existing Sydney Water sewer located on the site. The expected sewer discharge quantities will be based on the current figures (or a reduction on these), with no significant changes expected due to retention of most existing landscape & hardscape.

12.2 Stormwater

Stormwater treatment measures have been implemented to ensure runoff in the surrounding environment is of a high quality.

This has been detailed in a separate report. Refer to Stormwater Management Report.

13 Conclusion

In summary, the proposed redevelopment will not have a negative impact on water management and consumption compared to the existing Stadium. The seating capacity will be reduced and given the overall demand is driven largely by event day visitor amenity use, it can be expected that the new stadium will not exceed current usage rates. Furthermore, the Redevelopment will be an opportunity to upgrade fixtures and metering in line with current best practice design for water efficiency.

The Stadium is served by two different alternative water sources, being on site rainwater and reclaimed water from the Sydney Olympic Park district system (WRAMS) which is reticulated directly to the stadium and connected to flush fixtures. It is proposed that these are maintained and continue to serve the stadium with non-potable water, reducing reliance from potable sources which are to be conserved as much as possible.

13.1 Summary of Mitigation Measures

Based on the findings and recommendations of this report, the following measures are suggested to mitigate the identified impacts of the proposed works.

Mitigation Measure	Indicative Timing
1. **Maintain existing connection to alternative water supplied to the stadium (reclaimed water and rainwater collected from roof)**	To be implemented during design and construction
2. **All upgraded amenities to install efficient fixtures**	To be implemented during design and construction
3. **Install separate metering for distinct uses for all new water supply to ensure water consumption can be understood and manager by the Operator**	To be implemented during design and construction

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