Stadium Australia

Building Services Infrastructure Report

Infrastructure NSW (iNSW)

Reference: 255576

Revision: 3

2019-08-29

aurecon

Bringing ideas to life

Document control record

Document prepared by:

Aurecon Australasia Pty Ltd
ABN 54 005 139 873
Level 5, 116 Military Road
Neutral Bay NSW 2089
PO Box 538
Neutral Bay NSW 2089
Australia

T +61 2 9465 5599
F +61 2 9465 5598
E sydney@aurecongroup.com
W aurecongroup.com

Document control						aurecon
Report title		Building Services Infrastructure Report				
Document code			**Project number**		255576	
File path		**P:\BG\255576 Stadium Australia\3.Project Delivery\8.Reports\ALL SERVICES\2019 DA\190807 SEARS**				
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	CO/TG/GR/ PG	OL		OL
2	2019-08-25	For issue	CO/TG/GR/ PG	OL		OL
3	2019-08-29	For issue	CO/TG/GR/ PG	OL		OL
Current revision		**3**				

Approval			
Author signature	Multiple	Approver signature	
Name	CO/TG/GR/PG	Name	Olivier Loyez
Title	Multiple	Title	Associate

Contents

Figures

Tables

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 reviews the main utility provisions currently available to the ANZ Stadium and reviews them against the anticipated demand for the proposed development, namely:

- Electrical power
- Telecommunications
- Water
- Rainwater
- Drainage
- Gas

This reports also references the 'SOPA Infrastructure Engineering and Construction Manual' and its requirements as applicable to the above utilities.

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.

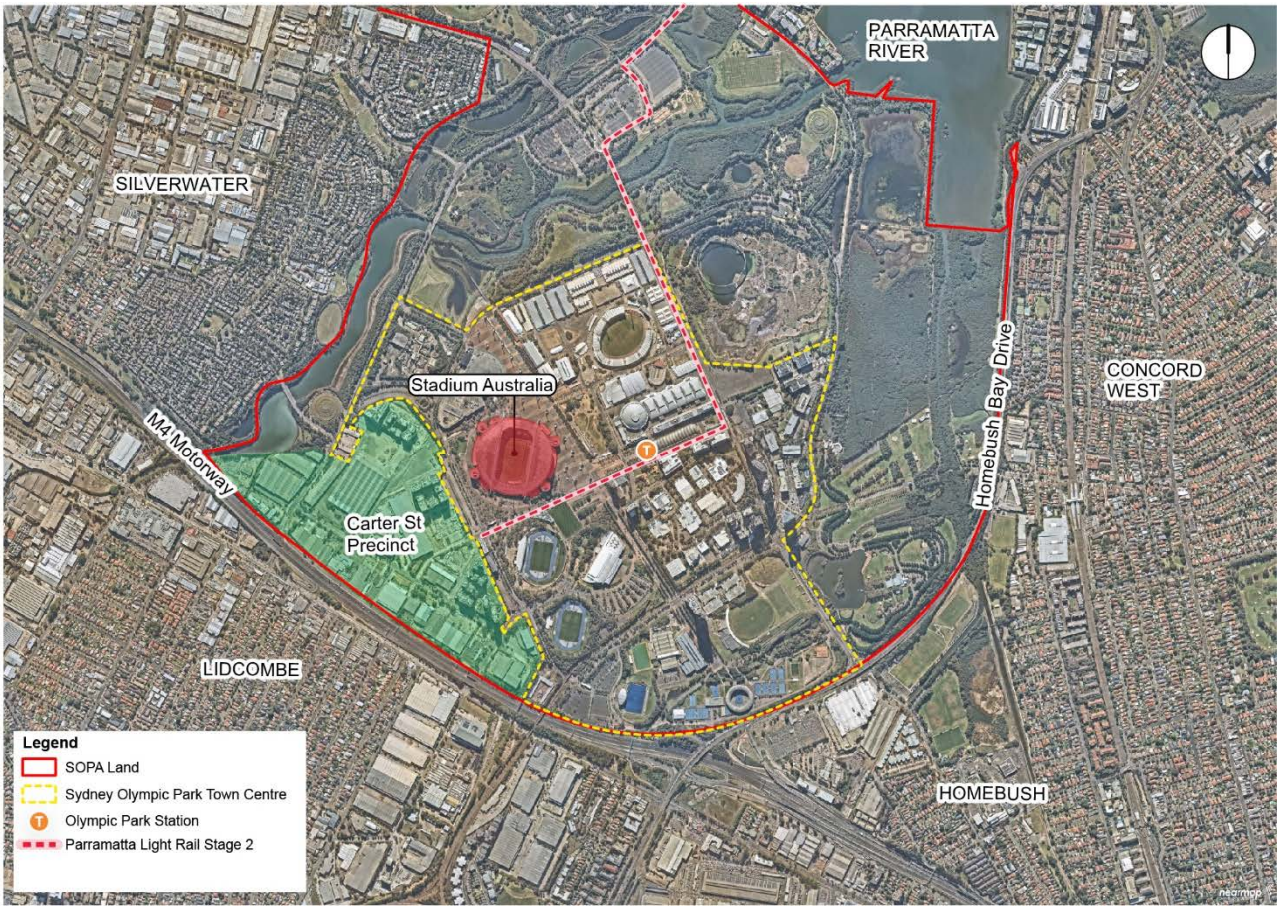

Figure 1 Regional site context

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 (source: external)

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:

SEAR	Comment / Reference
1.Key Issues **Address the relevant provisions, goals and objectives in the following:** ■ **Sydney Olympic Park Infrastructure Engineering and Design Manual**	The 'SOPA Infrastructure Engineering and Construction Manual' has been used as reference to prepare this report, as indicated in the relevant sections: Electrical: section 7.2 Telecommunications: section 8.2 Potable water: section 9.2 Recycled Water: section 10.2 Wastewater: section 11.2 Gas: section 12.2
15. Utilities **The EIS shall:** ■ **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**	The existing capacity and need for augmentation is described in the following sections of this report: Electrical: section 7 Potable Water: section 9 Recycled Water: section 10 Waste water: section 11
■ **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**	Sustainable initiatives are described in a separate ESD Report and an Integrated Water Management Plan (both by Aurecon). They include -use of water efficient fixture and fittings where appropriate -use of recycled water
■ **identify the existing infrastructure on-site and any possible impacts of the construction and operation of the proposed works on this infrastructure.**	The proposed development is limited to the building footprint. The need to augment the existing infrastructure for each utility is discussed in the applicable section of this document: Electrical: section 7 Potable Water: section 9 Recycled Water: section 10 Waste water: section 11

Table 1 SEAR applicable to the project

6 General

The proposed development includes the construction of a new lower bowl as well as the reconfiguration of the North and South stands and associated roof. This results in an overall reduction of seating capacity down to 70,000 seats. At the same time, there is an overall increase in accommodation floor area. Both of those changes will impact the overall demand on the existing infrastructure and this report reviews the existing utility provisions available to the existing stadium against forecasted demand.

This report is based on a desktop study of the existing infrastructure and systems and relies on information provided by other entities such as site surveys, Dial Before You Dig search, as-built information and existing visual non-intrusive services surveys, and preliminary interactions with the utility providers.

Assumptions included within this report, including existing site conditions, existing and proposed infrastructure capacity, and existing and proposed demand will need to be confirmed prior to detailed design and further consultation with the utility authorities.

7 SOPA requirements

The proposed development is located at Sydney Olympic Park and is subject to the Sydney Olympic Park Authority (SOPA) Infrastructure Engineering Design Manual (IECM, 2017).

The manual sets standards of performance and design quality for the precinct and is the design, construction and handover specification for all projects within the Sydney Olympic Park and provides the minimum engineering performance requirements for works to be undertaken in the public domain within the Sydney Olympic Park Precinct.

It applies to the design of all elements of public infrastructures and utilities and includes requirements for:

- Stormwater
- Water and Sewer
- Recycled Water
- Gas
- Electrical, Lighting, CCTV
- Communications

The manual's requirements have been reviewed when producing this report and will be incorporated in the design during the detail design stages to come. The full requirements applicable to the above are detailed in the manual and have not been repeated herein as a result.

In accordance with the design manual, all designs shall be submitted to SOPA for approval including all utility connections and public infrastructures.

8 Electrical

8.1 Authority

Ausgrid is the electrical supply Authority for the Stadium.

8.2 Design requirements

The design will be based on:

- The Building Code of Australia National Construction Code

- Applicable Australian standards
- Ausgrid requirements and NSW Service and Installation Rules
- SOPA Infrastructure Engineering and Construction Manual

8.3 Existing infrastructure

The Stadium receives four separately metered low voltage electrical supplies from four Ausgrid owned chamber substations. One substation is located in each quadrant on Level 00, adjacent to the circulation/plant towers. Each substation derives a primary and secondary 11kV feed from two diverse substations: Flemington Zone Substation to the southwest; and Homebush Bay Zone Substation to the northeast. The feeders are not dedicated to the Stadium substations.

The substation arrangement is summarised below.

Back feed ties and redundancy – Ausgrid to confirm in response to preliminary enquiry??

Stadium Quadrant	Stadium Zone (per as-built notation)	Ausgrid Substation Reference	Transformer Configuration	Firm Rating[1]	Primary Feeder
SW	3	S4798	3 x 1500kVA[2]	5500A (3800kVA)	Flemington
NW	4	S4799	3 x 1500kVA[2]	5500A (3800kVA)	Homebush Bay
NE	1	S4800	2 x 1500kVA[3]	2900A (2000kVA)	Homebush Bay
SE	2	S4801	2 x 1500kVA[3]	2900A (2000kVA)	Flemington

Table 2 Stadium substation summary

[1] firm rating is the maximum load which can normally be supported by a multiple transformer substation, for standard installations, and which allows for one transformer being out of service under emergency or maintenance conditions, as defined by Ausgrid's network standard NS109. The firm ratings noted may vary due to the Stadium substations being a non-standard installation – confirmation from Ausgrid is pending.

[2] the transformer configuration noted is taken from Ausgrid GIS data. This is contradicted by as-built documentation for the stadium which shows each of the four substations comprising 2 x 1500kVA transformers. Ausgrid documentation is assumed to be more current and accurate.

[3] substations are sized and provisioned to accommodate a future third 1500kVA transformer

Lighting pylons within the Stadium precinct (bound by Edwin Flack Ave to the east, Qudos Bank Arena and carpark to the north, Olympic Blvd to the east, and Dawn Fraser Ave to the south) and light poles to peripheral roads are fed from the Stadium substations on separately metered supplies. Cable reticulation is via Ausgrid's inground pit and pipe network.

Pedestrian lighting, amenity lighting, feature lighting and power outlets within the precinct are fed from the Stadium main switchboards and are metered separately to the stadium. Cable reticulation is via the private SOPA inground pit and pipe network.

The Stadium currently has two existing gas generators providing back up power and peak load lopping.

8.4 Demand assessment

Logged meter data indicates a historical maximum demand for the Stadium of 5.75MVA, coinciding with the football match between Sydney FC and LA Galaxy on 27th November 2007. The most recent occurrence of the Stadium demand exceeding 5.0MVA coincided with the 2016 NRL Grand Final on 2nd October 2016, with peak demand reaching 5.2MVA.

The maximum demand for the proposed redevelopment is estimated to be between 7.5MVA and 7.8MVA, which equates to a demand increase of 1.75MVA to 2.05MVA. This is preliminary only based on applying typical power densities (VA/m²) to functional areas as documented on current architectural plans, and

estimating bulk loads for systems such as sports lighting, scoreboards and LED ribbon screens. The demand assessment is summarised below.

Stadium Historic Maximum Demand	Stadium Estimated Revised Maximum Demand	Net Increase of Stadium Maximum Demand	Existing Combined Substation Spare Capacity	Residual Substation Spare Capacity After Refurbishment
5.75MVA	7.5MVA to 7.8MVA	1.75MVA to 2.05MVA	TBC pending Ausgrid advice	TBC pending Ausgrid advice

Table 3 Stadium maximum demand summary

The impact on existing Ausgrid infrastructure by increasing the demand by up to 2.05MVA cannot be gauged until Ausgrid provide a response to the preliminary enquiry. If the demand cannot be accommodated, it is expected the additional capacity could be achieved by installing a third 1.5MVA transformer in substations S4800 and S4801.

8.5 Utility interaction

A preliminary enquiry was submitted to Ausgrid on 5th August 2019 to confirm and clarify the following:

- Configuration of each of the existing four substations
- Firm rating of each substation
- Impact on Ausgrid network of increasing the Stadium maximum demand
- Level of redundancy and reliability afforded by the Ausgrid substation
- Remaining serviceable life of substation plant, equipment and switchgear

An initial response was received on 22nd August 2019 advising that Ausgrid require three weeks to provide a response. Technical advice from Ausgrid is yet to be received.

8.6 Initial design considerations

The quantity, location and size of existing substations are not expected to change as part of the works.

External lighting to the new northern and southern public stadium entrances will be designed and installed to minimise light spill. All new lighting schemes will be based on LED luminaires.

Electrical works undertaken in, and interfacing with, the public domain within the Sydney Olympic Park Precinct, will be designed and installed to the requirements of the SOPA Infrastructure Engineering and Construction Manual. It is expected such works will be limited to:

- Selection, design, installation and controls for lighting to the new northern and southern public stadium entrances, including any new façade and landscape lighting within the site boundary
- Selection, design and installation of any inground pits and conduits, including diversion and restoration of existing pits and conduits impacted by the works

8.7 Diversions, temporary works and staging

Electrical works undertaken in, and interfacing with, the public domain within the site boundary, will be undertaken with due consideration of the existing inground services. Diversions of the existing private pit and pipe network to accommodate these works are expected to be minor in nature.

Precinct lighting pylons and street and pedestrian lighting will remain operational during construction. Staging and temporary works will be coordinated with relevant stakeholders to maintain supplies as required.

The proposed works are not expected to impact the existing Ausgrid pit and pipe network.

8.8 Next steps

The following tasks will be undertaken during the design development stages to inform the Stage 2 planning application:

- Progress the electrical services design and coordinate requirements with all stakeholders and design disciplines
- Update and refine the maximum demand assessment, including determining load centres and distribution of these across substations
- Continue dialogue with Ausgrid to determine the impact of increased load on their network, and to verify assumptions and expectations noted above
- Submit a connection application to Ausgrid once the maximum demand assessment is settled
- Determine the extent of precinct services which are required to remain operational during construction, and plan staging and temporary works to maintain supplies where necessary

9 Telecommunications

9.1 Authority

The current known Telecommunications Service Provider authorities connected to the Stadium Australia are as follows:

- Pipe Networks – Stadium Australia connectivity – 1 x 50Mb link
- Telstra – 2 x 1Gb links (set up as an active/standby connection)
- Broadcast backhaul
  - Telstra (DVN and DVN2)
  - nextGen
  - AAPT
  - Satellite uplink
- Mobile Telecommunications Carriers
  - Telstra
  - Optus
  - Vodafone Hutchinson Australia (VHA)
- Emergency Services radio networks
  - Government Radio Network, for emergency services.
- Internal 2 way radio systems for multiple end users.

All major carriers are available to the site. An NBNCo search indicates that the site is serviced by Fibre to the Building (FTTB) technology.

9.2 Design requirements

The future design will be based on:

- The Building Code of Australia and referenced applicable standards
- SOPA Infrastructure Engineering and Construction Manual

9.3 Existing infrastructure

The existing infrastructure on site consists of the following:

The Main Computer Room (CTER-A, Computer Terminal Equipment Room – A) and communications nodes have remained in the same positions as per the original installation. CTER-A is located in the south west corner on Level 00.

Ricoh, who provide onsite active system support to Stadium Australia IT, are located in TSER-A (Telecommunications Service Equipment Room) adjacent CTER-A on Level 00. Currently Stadium Australia only have backup servers located in this room as Ricoh have been previously using it as a data centre for other Clients, however Ricoh are currently winding back their onsite presence, freeing up TSER-A for use by others.

CTER-B is located on Level 00 in the south eastern corner. However, is not currently used by Stadium Australia as part of their core network.

The stadium is broken up into four (4) quadrants, with each quadrant served by facilities located inside the quadrant boundaries. General ICT systems typically do not cross quadrant boundaries unless absolutely required to as part of their connectivity requirements.

- The existing backbone is a mix of multimode optical fibre (OM1) and single mode optical fibre (OS1)
- The 2-way radio system is the digital MotoTRBO from Motorola.
- Two large LED video replay screens are provided at either end of the stadium. The screens are Panasonic LED screens, using P22 with Dual Inline Package (DIP) LED video technology.
- The OB cabling has evolved from Triax camera cable to a mix of Triax and SMPTE hybrid optical fibre and copper cabling.

9.4 Demand assessment

The existing site is managed by the Stadium Australia IT group and it is expected that they will continue to manage the site corporate requirements going forward.

Subject to who the patron technology package is managed by in the new Stadium Australia, this may require additional service provider connectivity to support these services.

For the televised broadcaster backhaul connectivity, this is typically managed directly by the broadcasters and the relevant service providers. It is expected that they would continue to manage their respective connectivity requirements.

Further discussions will be required with the radio broadcasters regarding their preferred backhaul method. As of 31 January 2018, Telstra are no longer provisioning new ISDN connections for new customers, and from 30 June 2018 for existing customers. The expected disconnection date for all ISDN services will be from June 2019 until June 2021 in line with the NBN cut over dates. Based on initial discussions with various outlet representatives, the expectation is that the radio broadcasters will transition to Audio over Internet based solutions once ISDN is no longer available. Clarification will be required around whether this will be provided by the Stadium Australia, or if each broadcaster will provide their own internet connection.

Demand calculations will be undertaken as part of the detail design.

9.5 Utility interaction

The following utility interactions will be required for project.

Enabling Works

Enabling works on site will consist of relocating and redirecting any services that currently run through the Stadium areas to be demolished and surrounding areas that will form part of the civil works. Particular care will need to be taken around any civil works that will impact on the finish ground levels, including where soil will be removed and then reinstated potentially exposing inground pit and pipe work to be retained. Once an indicative Civil works scope is developed, this should be reviewed against the inground survey and Dial Before You Dig data to confirm if any existing services that are to be maintained are not impacted on.

Service Provider Connectivity

It is expected that all existing communications rooms will be re-used and reconfigured as required, and existing site connections to be maintained during Stadium Australia works.

Broadcast Backhaul

It is expected that all existing communications rooms will be re-used and reconfigured as required, and existing site connections to be maintained during Stadium Australia works.

The satellite uplink position will need to be reviewed with the televised broadcasters to confirm the preferred position on site. Generally, this is located in a position with clear view of the northern sky, in a compound that can be fenced off from the general public.

Confirmation is required regarding the radio broadcaster backhaul requirements.

Mobile Carriers

The extent of the existing mobile carrier assets will need to be determined in conjunction with Stadium Australia as there may be contractual obligations regarding decommissioning and relocation of services hosted on the Stadium Australia. Should existing carrier assets within the Stadium Australia areas outside of the stadium precinct, temporary services will be provided prior to demolition to ensure coverage within areas adjacent to the stadium is not impacted by the redevelopment.

Emergency Services Radio Network coverage

The Emergency Services radio network coverage for emergency services is to be reviewed with the various representatives (Government Radio Network, Fire & Rescue NSW, St John's Ambulance, and NSW Police) to confirm whether there are existing services provided as part of the Stadium Australia.

9.6 Initial design assessment

The initial design assessment should take into account the following considerations. Note that a capacity /availability check has not been completed for the works proposed below.

Service Provider Connectivity

Existing site connections to be maintained during Stadium Australia works.

Broadcast Backhaul

Existing site connections are to be maintained during Stadium Australia works

The satellite uplink position will need to be reviewed with the televised broadcasters to confirm the preferred position on site. Generally, this is located in a position with clear view of the northern sky, in a compound that can be fenced off from the general public.

Confirmation is required regarding the radio broadcaster backhaul requirements.

Mobile Carrier

Subject to the extent of the existing coverage provided as part of the Stadium Australia, consideration will be given to the new Stadium Australia providing both macro coverage for the surrounding precinct, and In Building Coverage for the patron inside the stadium. This is of particular relevance given the upcoming rollout of 5G services which increases requirements for smaller cell base station coverage.

Capacity to support multiple mobile carriers on site should be provided in the lead in conduits. Dedicated support facilities for a Distributed Antenna System within the stadium as well as macro base station support should also be provided.

9.7 Diversions, temporary works and staging

The following works will be required for diversions, temporary, and staging.

Service Provider Connectivity

Existing site connections to be maintained during Stadium Australia works.

Broadcast Backhaul

Existing site connections to be maintained during Stadium Australia works.

The satellite uplink position will need to be reviewed with the televised broadcasters to confirm the preferred position on site. Generally, this is located in a position with clear view of the northern sky, in a compound that can be fenced off from the general public.

Confirmation is required regarding the radio broadcaster backhaul requirements.

Mobile Carrier

Coordination will be required with the mobile carriers supported from this facility regarding decommissioning the exiting base stations where needed, and whether temporary macro base stations are required to be implemented until the new Stadium Australia is completed.

Emergency Services Radio Network coverage

Subject to feedback from the relevant emergency services radio network representatives on the project scope and impact on their systems, they may need to be relocated to support coverage during the project works.

9.8 Next steps

Moving forward, the following steps should be taken with respect to the Telecommunications scope of works.

Service Provider Connectivity

The existing site connections are to be maintained during Stadium Australia works.

Broadcaster Backhaul

The existing site connections are to be maintained during Stadium Australia works.

The satellite uplink position will need to be reviewed with the televised broadcasters to confirm the preferred position on site. Generally, this is located in a position with clear view of the northern sky, in a compound that can be fenced off from the general public.

Confirmation is required regarding the radio broadcaster backhaul requirements.

Mobile Carrier

The mobile carriers will need to be engaged to confirm if the existing base stations located on Stadium Australia are currently in use.

Consideration should also be given to beginning preliminary discussions around what allowance should be made in the new stadium for both macro coverage around the site and In Building Coverage for stadium patrons.

Emergency Services Radio Network coverage

The Emergency Services radio network coverage for emergency services should be reviewed with the various representatives to confirm what assets are currently on site and may be impacted by the works.

10 Potable Water

10.1 Authority

The potable water service provider throughout the area is Sydney Water. Contact via the Sydney Water Tap In system has been undertaken and it is not anticipated that any diversions or amplification will be required.

10.2 Design requirements

As part of the existing infrastructure review the potable water supply has been reviewed against:

- SOPA Infrastructure Engineering and Construction Manual
- WSA–03 Water Supply Code of Australia
- AS/NZ 3500.1 Plumbing and Drainage – Water services
- Sydney Water Standards and Requirements

Based on the information at hand, the existing water system appears to have been designed in accordance, and compliant with the above standards.

10.3 Existing infrastructure

The existing authority's infrastructure in vicinity of the site has been identified based on Dial Before You Dig (DBYD) records, desktop review of available site services information, discussion with the current facilities manager and visual site inspection.

Records indicate the presence of potable water mains within Edwin Flack Avenue and Olympic Boulevard around the existing Stadium Australia. The existing water infrastructure surrounding the site includes the following:

- 1 x DN250 mm DICL water main along Edwin Flack Avenue;
- 1 x DN200/250 mm DICL water main along Olympic Boulevard

The site is connected to:

- 1 x DN200 mm water connection for Stadium in the south west corner of the site and authority water meter located in the pump and meter plantroom within Level 0 at the north eastern corner of the Stadium;

Further investigations will be undertaken during detail design phase to confirm the exact layout and depths of the infrastructure described above. It is noted that the above only considers Sydney Water infrastructure. Other potable water infrastructure may exist that has not been identified from the DBYD information.

The Stadium Australia site is supplied with potable water from the authority water main located in Edwin Flack Avenue. A 200mm authority connection extends from the 250mm Sydney Water main to a point adjacent to the entrance tunnel where a 150mm diameter branch is taken to the fire brigade suction point. The main continues via a 200mm diameter piped system to the pump and meter plantroom within 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 the dual booster pumps to a 50,000 litre combined fire hydrant and potable cold water storage tank located in the level 7 plantroom east stand and a 25,000 litre potable water storage tank on the west stand.

Pending detailed design, the reuse of the existing water connections is proposed.

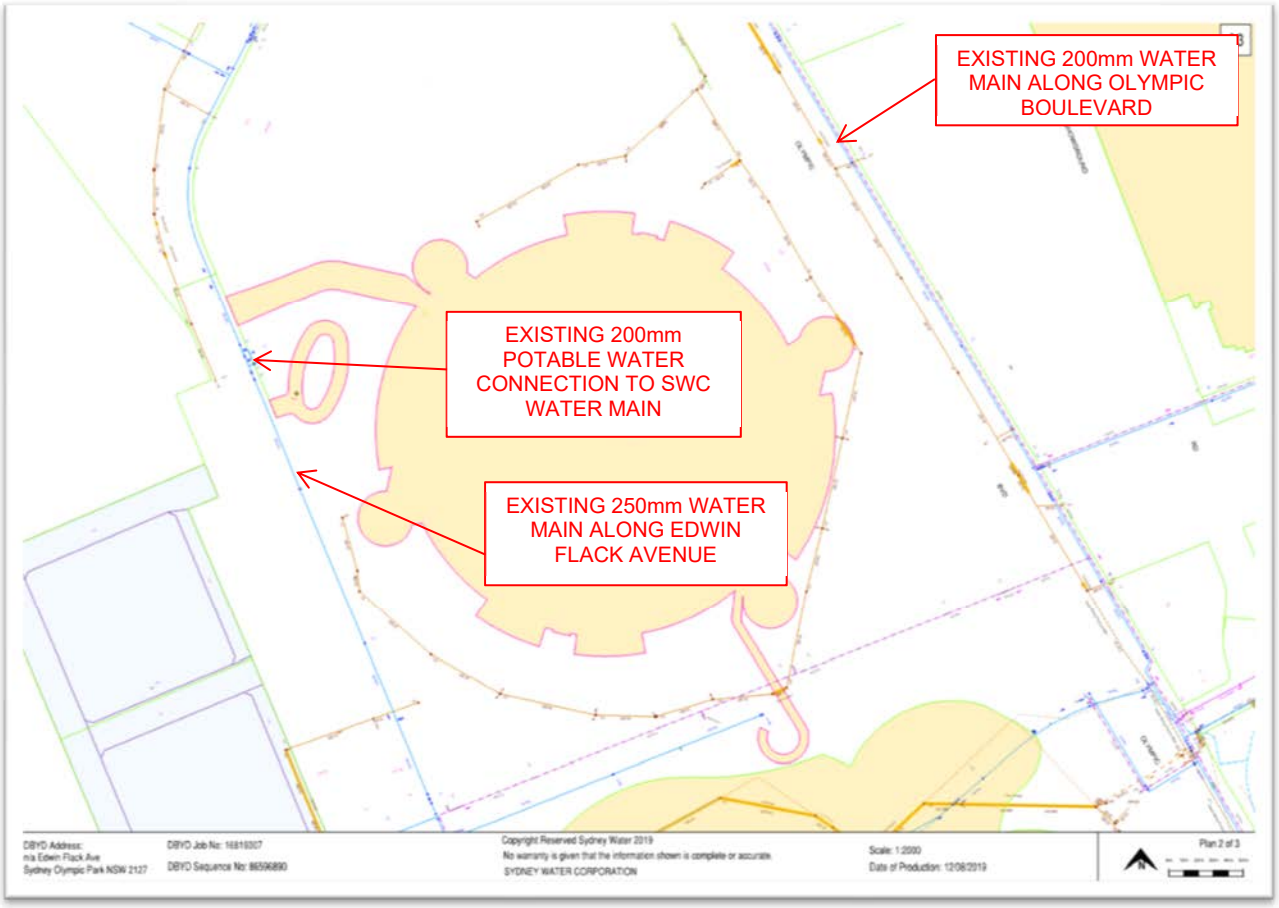

Figure 4 Sydney Water Potable Water diagram

10.4 Demand assessment

The demand assessment for the future stadium has been based on the figures below. It should be noted that the site non-potable (sanitary flushing systems) are fed via the recycled water system:

- 70,000 Seats (plus up to 20,000 persons on the field during concerts)
- Up to 3,500 Staff
- 3-hour event time (average)
- Allowance of 5 L/pp

The estimated Water Maximum demand is estimated to be between 15-20 l/s Potable Simultaneous Demand (PSD).

The average day potable water usage is estimated to be 350-450 kl/average daily event.

10.5 Utility interaction

The project has reviewed the *SOPA Infrastructure Engineering and Construction Manual* and can confirm that the design requirements stated within the document have or will be meet. The main section of the Manual is Section 4.4 Water and Sewer.

The project is currently liaising with Sydney Water and further Sydney Water involvement will be required during the design stages. Via a Sydney Water Services Coordinator, a Section 73 will need to be undertaken.

A pressure and flow enquiry have been lodged with Sydney Water to confirm all flows and pressures available for the potable water main in Edwin Flack Avenue (this information has yet to be received).

10.6 Initial design assessment

The Water Supply Code of Australia – Sydney Water Edition (SWC, 2014) suggests a minimum DN150mm pipe size for industrial and commercial developments. The sizing required for the development will be based on the Maximum demand and will need to be approved by Sydney Water.

Based on reduction of seats and the use of minimum 4-star WELS rated or better sanitary ware and tapware throughout the stadium it is anticipated that the maximum day demand will decrease as a result of the proposed development and relative to the existing demand. The existing potable water supply from the Sydney Water infrastructure along Edwin Flack Avenue via a 1 x 200mm domestic water site connection is expected to have sufficient capacity to service the proposed development as a result.

10.7 Diversions, temporary works and staging

It is not anticipated that any major authority diversions or an upgrade of existing potable water main will be required. The works will not require any temporary or Staged Authority works.

10.8 Next steps

Next steps in progressing the delivery of potable water infrastructure consist of the following:

1. Submit application to Sydney Water to obtain a Section 73 Compliance Certificate;
2. Sydney Water to issue Notice of Requirements (NOR); and
3. Detailed design to be progressed based on the NOR and submitted to Sydney Water for approval.

11 Recycled water

11.1 Authority

The recycled water service provider throughout the area is Sydney Olympic Park Authority. It is not anticipated that any diversions or amplification will be required.

11.2 Design requirements

As part of the existing infrastructure review the recycled water supply has been reviewed against;

- SOPA Infrastructure Engineering and Construction Manual
- WSA–03 Water Supply Code of Australia
- AS/NZ 3500.1 Plumbing and Drainage – Water services
- Sydney Water Standards and Requirements

The existing water system appears to have been designed in accordance, and appear to be compliant with the above standards

11.3 Existing infrastructure

The existing authority's infrastructure in vicinity of the site has been identified based on Dial Before You Dig (DBYD) records, desktop review of available site services information, discussion with the current facilities manager and visual site inspection.

Records indicate the presence of recycled water (WRAMS) mains within Edwin Flack Avenue and Olympic Boulevard around the existing Stadium Australia. The existing water infrastructure surrounding the site includes the following:

- 1 x DN300 mm DICL recycled water main along Dawn Fraser Avenue;
- 1 x DN300 mm DICL recycled water main along Olympic Boulevard;
- 1 x DN200 mm recycled water connection point in Dawn Fraser Avenue;

Further investigations will be undertaken during detail design phase to confirm the exact layout and depths of the infrastructure described above. It is noted that the above only considers SOPA infrastructure. Whilst unlikely, other recycled water infrastructure may exist that has not been identified from the DBYD information.

The Stadium Australia site is supplied with recycled water from the WRAMS water main located in Dawn Fraser Avenue. The purpose of the recycled water system is to supply water to all water closet cisterns and urinal cisterns only.

The connection point to Sydney Olympic Park's main is in Dawn Fraser Avenue opposite Core 4 Zone 2 and consist of a 200mm diameter valve and incoming main of 250mm diameter extends to the pump and meter plantroom within Level 0 at the south west corner of the Stadium.

The recycled water passes through authority meter then through two water filters in parallel and eventually through triplex booster pumps to a 50,000 litre storage tanks in the level 7 plantrooms of the east and west stands.

Pending detailed design, the reuse of the existing water connections is proposed.

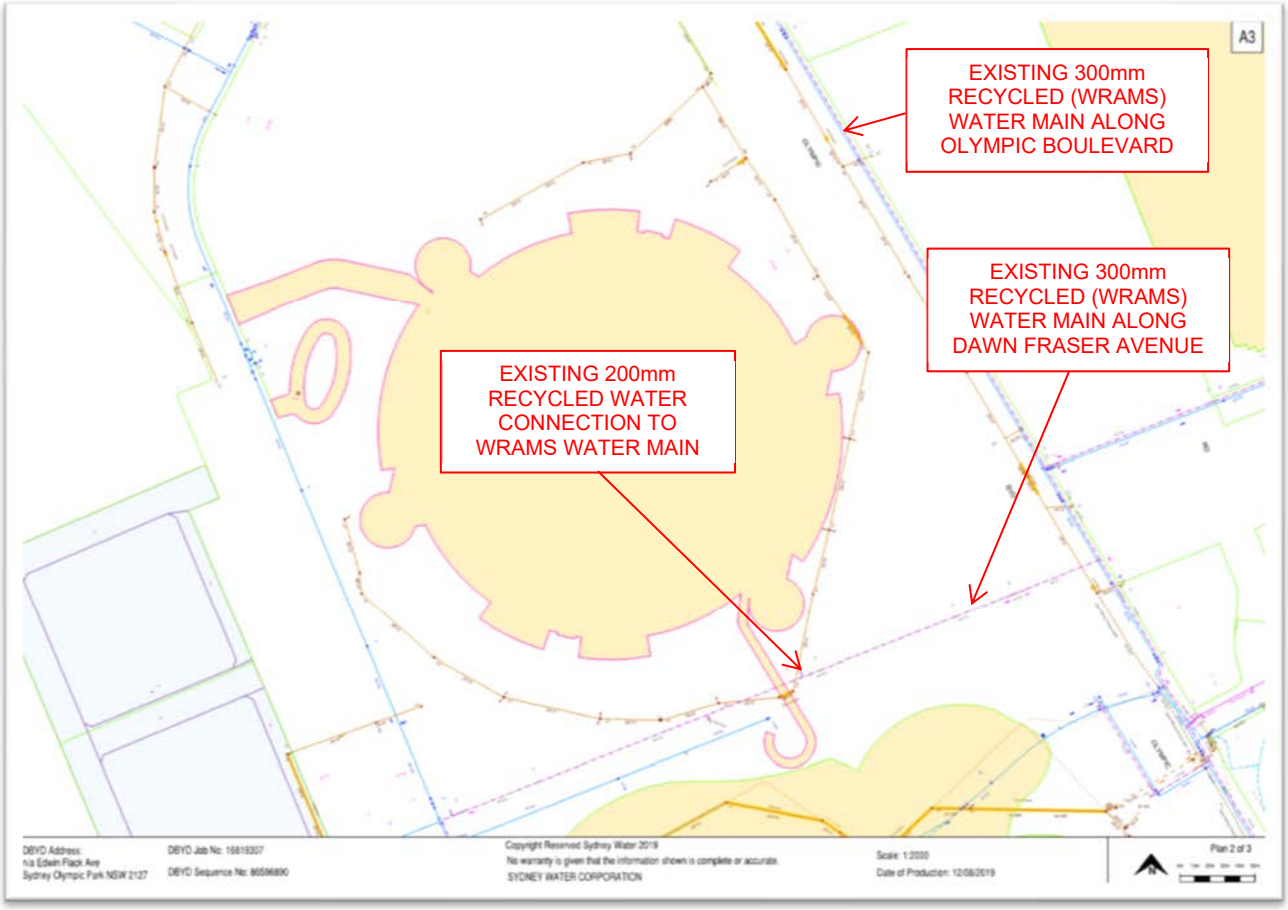

Figure 5 Sydney Water Recycled Water (WRAMS) diagram

11.4 Demand assessment

The demand assessment for the future stadium has been based on the figures below:

- 70,000 Seats (plus up to 20,000 persons on the field during concerts)
- Up to 3,500 Staff
- 3-hour event time (average)
- 9 L/pp (2 x flushes/pp)

The estimated Recycled Water Maximum demand is 25-35 l/s Potable Simultaneous Demand (PSD).

The average day recycled water usage is estimated to be 700-800 kl/average daily event.

11.5 Utility interaction

The project has reviewed the *SOPA Infrastructure Engineering and Construction Manual* and can confirm that the design requirements stated within the document have or will be meet. The main section of the Manual is Section 4.5 Recycled Water

The project is currently liaising with Sydney Water and further Sydney Water involvement will be required during the design stages. Via a Sydney Water Services Coordinator, a Section 73 will need to be undertaken.

A pressure and flow enquiry have been lodged with Sydney Water to confirm all flows and pressures available for the recycled water main in Dawn Fraser Avenue (this information has yet to be received).

11.6 Initial design assessment

The Water Supply Code of Australia – Sydney Water Edition (SWC, 2014) suggests a minimum DN150mm pipe size for industrial and commercial developments. The sizing required for the development will be based on the Maximum demand and will need to be approved by Sydney Water.

Based on reduction of seats and the use of more efficient sanitary ware and tapware throughout the stadium it is anticipated that the maximum day demand will decrease as a result of the proposed development. The existing recycled water supply from the Sydney Water infrastructure along Dawn Fraser Avenue via a 1 x 200mm recycled water site connection should have sufficient capacity to service the proposed development.

11.7 Diversions, temporary works and staging

It is not anticipated that any major authority diversions or an upgrade of existing recycled water main will be required. The works will not require any temporary or Staged Authority works.

11.8 Next steps

Next steps in progressing the delivery of recycled water infrastructure consist of the following:

1. Submit application to Sydney Water to obtain a Section 73 Compliance Certificate;
2. Sydney Water to issue Notice of Requirements (NOR); and
3. Detailed design to be progressed based on the NOR and submitted to Sydney Water for approval.

12 Wastewater – Sewer

12.1 Authority

The wastewater (Sewer) service provider in this area is Sydney Water. Contact via the Sydney Water Tap In system has been undertaken and it is not anticipated that any diversions or amplification will be required.

12.2 Design requirements

As part of the existing infrastructure review the sanitary drainage (sewer) system has been reviewed against;

- SOPA Infrastructure Engineering and Construction Manual
- WSA–03 Water Supply Code of Australia
- AS/NZ 3500.1 Plumbing and Drainage – Water services
- Sydney Water Standards and Requirements

The existing sanitary drainage system appears to have been designed in accordance, and appear to be compliant with the above standards

12.3 Existing infrastructure

The existing local wastewater infrastructure near the site has been identified based on Dial Before You Dig (DBYD) records, desktop review of available site services information, discussion with the current facilities manager and visual site inspection.

These records indicate the presence of various wastewater infrastructure in the vicinity of the Stadium site including:

- DN225mm up to DN300 VC sewer main surrounds the Stadium from west to east along its northern and southern faces - depth approximately from 1m to 6.4m;
- Private wastewater infrastructure throughout the site;
- Private grease waste system;

Current system consists of various fully vented modified system stacks collecting soil and waste from all wet areas and fixtures throughout the Stadium and discharging them underground via ten separate connections to Sydney Water's sewer system. Areas located below the authority sewer invert level (all fixtures at level 0) are being pumped out via six separate sewer pumping station.

It is not anticipated that any major authority diversions will be required. The works will not require any temporary or Staged Authority works.

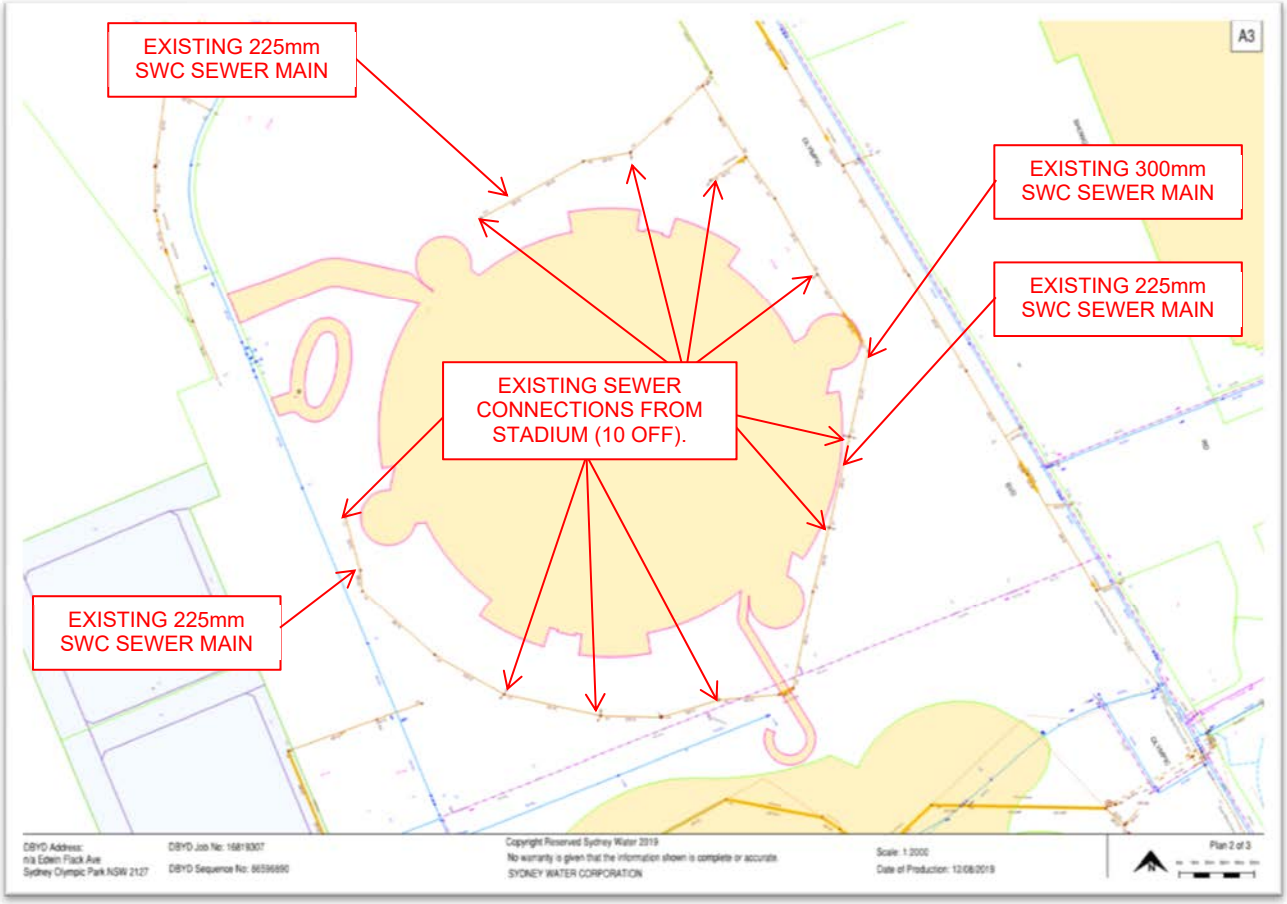

Figure 6 Sydney Water Sewer diagram

12.4 Demand assessment

A wastewater demand has been estimated, based on the stadium visitor and staff populations, event duration and quantity of sanitary fixtures. This figure has been based on fixture unit loadings (AS3500).

The current sewer discharge estimate is 5,000-5,500 sewer loading units.

12.5 Utility interaction

The project has reviewed the *SOPA Infrastructure Engineering and Construction Manual* and can confirm that the design requirements stated within the document have or will be meet. The main section of the Manual is Section 4.4 Water and Sewer

The project is currently liaising with Sydney Water and further Sydney Water involvement will be required during the design stages. Via a Sydney Water Services Coordinator, a Section 73 will need to be undertaken.

A sewerage service diagram for the site has been received from Sydney Water.

12.6 Initial design assessment

The Sewerage Code of Australia – Sydney Water Edition (SWC, 2014) suggests a minimum DN225mm pipe size for industrial lots larger than 300m2 and other complexes where large flows may be expected. This sizing will need to be confirmed with Sydney Water and developed through the design process.

It is anticipated that the wastewater from the development will decrease as a result of the proposed development and will be discharged through ten separate existing connections as for the current stadium into the existing network utility DN225 - DN300mm wastewater mains.

12.7 Diversions, temporary works and staging

It is not anticipated that any major authority diversions or an upgrade of existing sewer will be required. The works will not require any temporary or Staged Authority works.

12.8 Next steps

Next steps in progressing the delivery of waste water infrastructure consist of the following:

1. Submit application to Sydney Water to obtain a Section 73 Compliance Certificate;
2. Sydney Water to issue Notice of Requirements (NOR);
3. Discuss trade waste licencing requirements with Sydney Water; and
4. Detailed design to be progressed based on the NOR and submitted to Sydney Water for approval.

13 Natural gas

13.1 Authority

The area is currently serviced with natural gas by Jemena. Limited contact with Jemena has occurred. It is not anticipated that any diversions or amplification will be required.

13.2 Design requirements

Existing natural gas supply has been reviewed against SOPA Infrastructure Engineering and Construction Manual.

Existing natural gas system appears that has been designed in accordance and is compliant with the following standards:

- AS/NZ 5601.1 Gas Installations – General Installations
- AS/NZ 4645 Gas Distribution Networks
- Jemena Standards and Requirements

Evidence shall be provided that the design of the new works has been approved by Jemena.

13.3 Existing infrastructure

The existing Jemena infrastructure near the site has been identified based on Dial Before You Dig (DBYD) records, desktop review of available site services information, discussion with the current facilities manager and visual site inspection.

These records indicate the presence of Jemena infrastructure in the vicinity of the Stadium site including:

- DN150mm secondary steel main running along Olympic Boulevard east to the Stadium;
- Private gas infrastructure throughout the site

Other gas infrastructure may exist that has not been identified from these information sources.

The DN100mm (1050kPa) gas system extends into the Stadium from Olympic Boulevard into the gas meter room located on level 0 Zone 1 south east corner of the stadium. The main control valve is at the site boundary on Olympic Boulevard. The pressure is 1050kPa into the meter room where a series of regulators reduce the pressure to 200 kPa.

From the meter room the gas service splits into two 150mm diameter 200 kPa gas mains which rise to the plantrooms on the level 7 east and west stands. The pressure is reduced again and then 100 kPa gas mains travel down both sides of the stadium and along the floor levels to each kitchen and concession where they are reduced to 7 kPa.

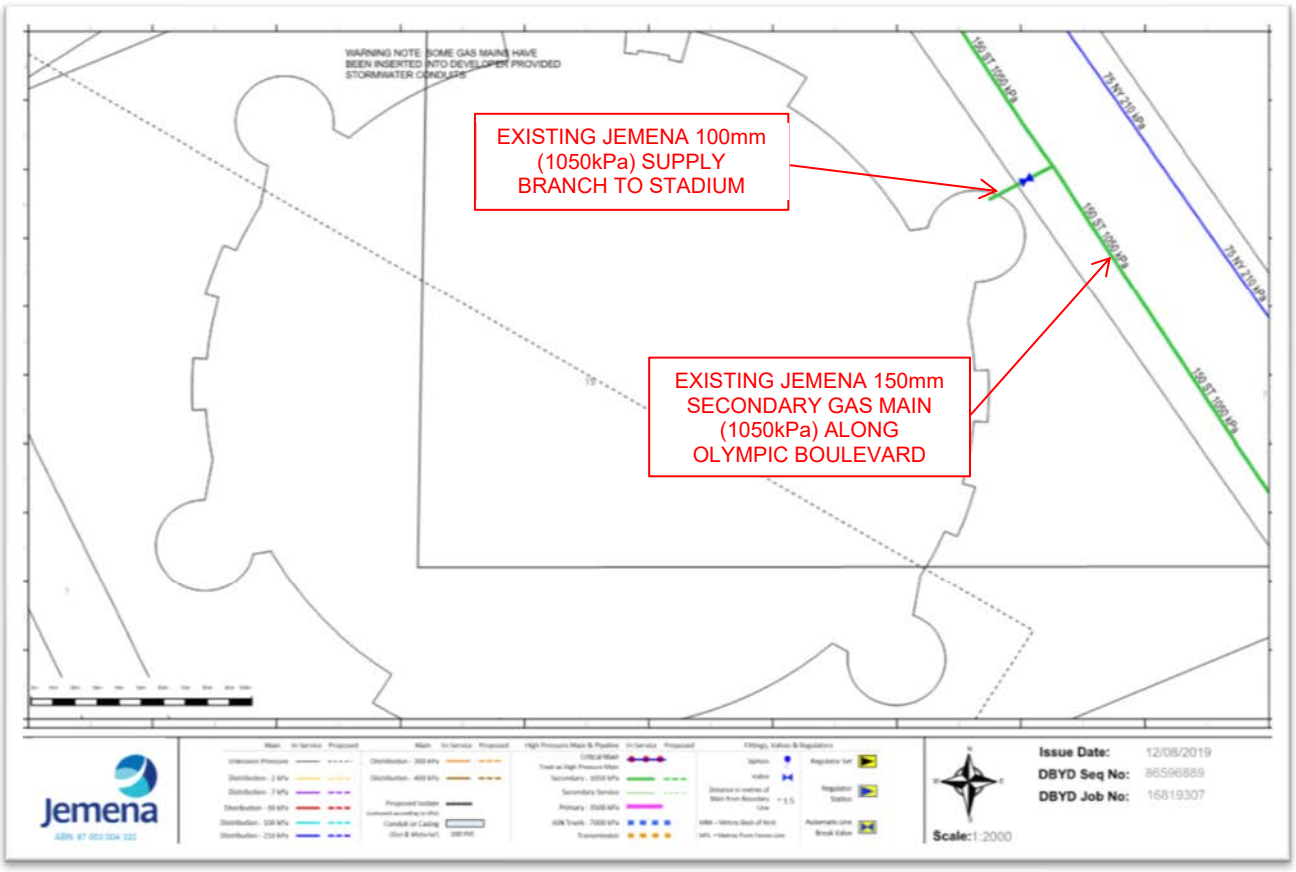

Figure 7 Jemena gas diagram

13.4 Demand assessment

A preliminary additional demand figure for the development has been estimated to be between 10,000 and 15,000 MJ/hr based on (un-diversified):

- Kitchen Appliances
- Domestic Hot Water
- Mechanical Heating Plant

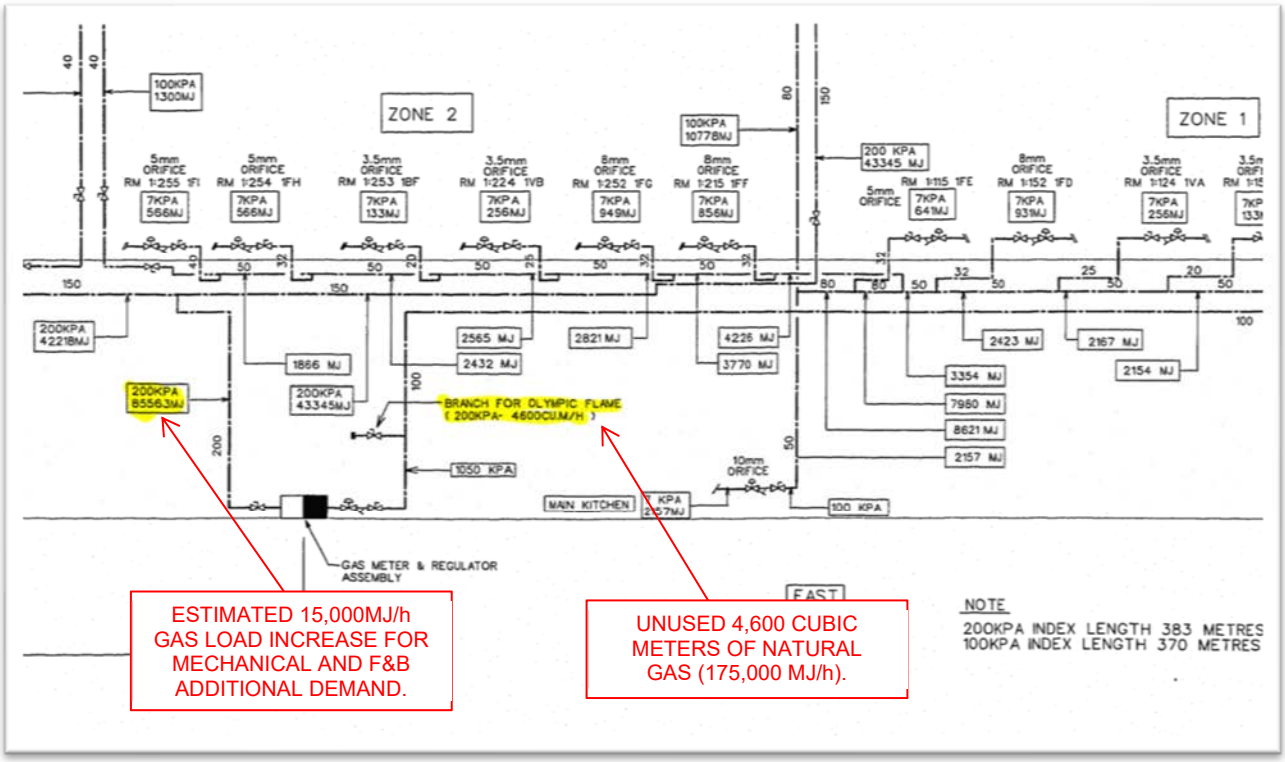

Figure 8 Existing Stadium Natural Gas demand and capacity

13.5 Utility interaction

The project has reviewed the *SOPA Infrastructure Engineering and Construction Manual* and can confirm that the design requirements stated within the document have or will be meet. The main section of the Manual is Section 4.7 Gas.

Currently no direct interaction with Jemena has been undertaken for the development. It is anticipated that existing mains connection and existing infrastructure will remain and be reused, it is also expected that the site natural gas usage will not significantly increase and will be lower than the main 2000 Olympic opening design and the reuse of the existing system will be accepted by Jemena.

13.6 Initial design assessment

It is anticipated that the project will be supplied with gas via the existing connection to Olympic Boulevard.

The existing natural gas infrastructure within the site has been identified from DBYD information.

Further consultation with Jemena is required to confirm the existing network layout and existing capacity.

13.7 Diversions, temporary works and staging

It is not anticipated that any major authority diversions will be required. The works will not require any temporary or Staged Authority works.

13.8 Next steps

Next steps in progressing the delivery of gas infrastructure consist of the following:

1. Undertake site investigations to confirm the layout and extent of existing services (including non-Jemena infrastructure);
2. Submit application for supply to Jemena at relevant stage as required to facilitate construction;

14 Fire services

Fire services provision to the Stadium are considered to be part of the building design and as such there is no Fire Services infrastructure serving the building.

We are offering commentary with regards to fire services in the section below for reference and completeness only.

14.1 Authority

Existing Authorities Infrastructure

Currently the existing stadium is served by the existing Sydney Water Corporation (SWC) water mains located in Edwin Flack Avenue. The general information in relation to these Sydney Water mains is as follows:

Location	Size	Performance	Comment
Edwin Flack Avenue	Dia 300mm	MPF:	■ Existing connection including condition to be confirmed during construction

Table 4 Existing Authority's infrastructure - fire services

The existing Sydney Water water main located in Edwin Flack Avenue is considered suitable to form part of a Dual Water Supply for the fire services serving the development.

We understand that F&R.NSW will need the fire services to be connected to a potable water supply and not a recycled water supply. This remains subject to confirmation and acceptance by SWC and SOPA.

14.2 Existing infrastructure (Internal)

The existing 150mm connection to the 300mm Towns Main located in Edwin Flack Avenue currently servicing the Stadium would appear to have sufficient capacity to be the primary water for the fire services systems servicing the Stadium Australian.

Unless supported by a FER, the existing fire sprinkler booster assembly servicing the fire system will need to be modified to incorporate a new fire brigade booster assembly near the main entrance from Edwin Flack Avenue, which shall replace the existing booster assembly located at the entrance to the loading dock.

Subject to final hydraulic calculations, the existing 125,000L water storage tank, located on Level 0 is considered to be of sufficient capacity to account for the fire sprinkler demand and the extra over demand anticipated from a possible wall wetting system. Final effective capacity remains subject to confirmation to suit final design.

14.3 Demand assessment

The following flow rates are anticipated as minimum requirements, with a maximum anticipated simultaneous flow rate of 30 L/sec made up as follows:

a) Sprinkler System Ordinary Hazard (0H3) 25 L/sec

b) Wall Wetting System (allowance extra over from the sprinkler demand) 5.0 L/sec

The stadium is served by an existing system. Whilst a Statement of Available Pressure & Flow from Sydney Water has not been received yet and based on the existing capacity, it is anticipated that the existing Sydney Water mains currently servicing the stadium can be used to serve the Stadium.

14.4 Utility interaction

The existing connections to SWC water supply in Edwin Flack Avenue is expected to remain.

All flows and pressures available for the water mains in Edwin Flack Avenue will be confirmed by the Fire Flow Statement once received.

14.5 Next steps

The following are anticipated for the project in terms of fire service water infrastructure:

1. Undertake a further detailed survey investigation study including underground services investigation to confirm all existing services location, size and the like.
2. Once the design of the stadium has been sufficiently developed, determine the existing services that will need relocation and or altered.
5. Undertake final design of the incoming infrastructure including hydraulic calculation to confirm final systems design requirements and confirm all new pipe sizes.

15 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
The increased electrical demand may necessitate augmentation of the Ausgrid network and infrastructure. In this case, design by a Level 3 ASP will be required. Staging and temporary works will need to be developed in liaison with Ausgrid.	During design development
Once an indicative Civil works scope is developed, this should be reviewed against the inground survey and Dial Before You Dig data to confirm if any existing Carrier and service provider connectivity that are to be maintained are not impacted on.	Prior to civil works commencement
Emergency Services Radio Network coverage to be reviewed with the various representatives.	Prior to works commencing.
Mobile Carriers infrastructure located on Stadium to be confirmed with Carriers if still in use.	Prior to works commencing.
Broadcaster backhaul connections to be maintained, satellite uplink position to be reviewed with broadcasters to confirm the preferred position on site	Prior to works commencing.

Table 5 Mitigation measures

Document prepared by

Aurecon Australasia Pty Ltd
ABN 54 005 139 873
Level 5, 116 Military Road
Neutral Bay NSW 2089
PO Box 538
Neutral Bay NSW 2089
Australia

T +61 2 9465 5599
F +61 2 9465 5598
E sydney@aurecongroup.com
W aurecongroup.com

aurecon

Bringing ideas to life

Aurecon offices are located in:
Angola, Australia, Botswana, China, Ghana, Hong Kong, Indonesia, Kenya, Lesotho, Mozambique, Namibia, New Zealand, Nigeria, Philippines, Qatar, Rwanda, Singapore, South Africa, Swaziland, Tanzania, Thailand, Uganda, United Arab Emirates, Vietnam, Zambia,