

THE  STAR

THE STAR
MOD 13
INTEGRATED WATER
MANAGEMENT
STRATEGY

PREPARED BY UMOW LAI



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THE  STAR

1 EXECUTIVE SUMMARY

Star Entertainment Group Limited (SEGL) has commenced a five-year redevelopment journey to create a landmark, exemplar integrated resort. This proposed redevelopment will occur through the lodgement of two s75W modification applications to the original Major Project Approval (MP08_0098) with the Department of Planning and Environment (the Department).

Modification 14 (Mod 14) was determined in October 2017 and included approval for a range of upgrades to the existing site. These upgrades included the enclosure of the level 3 terrace to facilitate an expansion in gaming floor area and a new bar and restaurants, expansion of the level 3 pre-function space, changes to the Astral Hotel lobby and retail space, and alterations to internal vertical transportation, services and infrastructure, including the harbour heat rejection system.

Mod 13 is a modification to the development as approved under MP08_0098, up to and including Mod 14. This forms the basis for technical impact assessments.

Modification 13, proposes the development of a new Ritz-Carlton Hotel and Residential Tower in the northern portion of the site with associated podium treatment, as well as other transport, retail, food and beverage improvements across the site. It is **Modification 13** that is the subject of this report.

The purpose of this report is to make recommendations regarding the use, conservation, reuse and disposal for the following hydraulic services. This includes an assessment of existing systems and the capacity to extend and interface with proposed development areas;

- Potable and Non Potable Water
- Wastewater Management
- Rainwater / Stormwater Management
- WSUD

The proposed development has been assessed against all relevant standards/guidelines, including the following:

- Sydney Water Regulations
- City of Sydney Stormwater Management Policy
- SEARs Application number MP08_0098 MOD 13, relevant clauses;

12. Drainage and Stormwater

- *Prepare an Integrated Water Management Strategy. This should include water, storm water and wastewater management, including any re-use and disposal requirements, demonstration of water sensitive urban design and any water conservation measures*

The requirements of the following Policies and Guidelines have been incorporated into the proposed development, where relevant;

- Managing Urban Stormwater: Treatment Techniques (OEH)
- Managing Urban Stormwater: Source Control (OEH)
- Managing Urban Stormwater: Soils & Construction (Landcom)
- Technical Guidelines: Bunding & Spill Management (OEH)
- National Water Quality Management Strategy: Australian Guidelines for Fresh and Marine Water Quality (ANZECC/ARMCANZ)
- Using the ANZECC Guideline and Water Quality Objectives in NSW (OEH)
- Approved Methods for the Sampling and Analysis of Water Pollutants in NSW (OEH)

This Integrated Water Management Strategy has identified the following key findings/conclusions and recommendations:

- Water efficient fixtures and fitting selection
- Water meters with BMS connection will be installed at all major water use areas for hot and cold and recycled water services.
- The recycled water system will be extended to the proposed **Modification 13** development areas for public amenity WC flushing.
- The existing site stormwater infrastructure has adequate capacity to drain the proposed new build areas. The catchment area for the site will not change with the proposed development; therefore there will be no increased stormwater flows for the site.
- The existing disused northern stormwater harvesting tank is to be reinstated. New drainage from **Modification 13** areas will be diverted where practical to the reinstated harvesting tank
- Rainwater collected shall be directed to interface with the existing site recycled flushing water distribution system.
- Install new rainwater pumps and filtration equipment at level B4 and interface with the existing site recycled flushing water distribution system
- New building area catchment will be directed to either the northern or southern collection systems, and utilise the existing stormwater quality treatment devices.

2 SITE DESCRIPTION

2.1 SITE LOCATION AND DESCRIPTION

The subject site (the site) is located at 20-80 Pyrmont Street, Pyrmont, which is legally described as Lot 500 in DP1161507, Lot 301 in DP 873212 (SP56913), and Lot 302 in DP873212. The site also accommodates a light rail line (including 'The Star' light rail station) legally described as Lot 211 in DP 870336. The service road to the north of the site, comprising Lot 1 in DP 867854 and Lot 201 in DP 867855, is also part of the proposal under **Modification 13**.

The site is bounded by Pirrama Road to the north-east, Jones Bay Road to the north-west, Pyrmont Street to the south-west, Union Street to the south and Edward Street to the east. The location and configuration of the site is shown in Error! Reference source not found. below.

The site is leased by SEGL from the Independent Liquor and Gaming Authority (ILGA). SEGL is a leading operator of integrated resorts that appeal to both local and international visitors. SEGL is the operator of The Star Sydney (The Star), with a casino licence to operate a casino through to the year 2093.

The site has a total area of 39,206 m² (excluding Lot 1 in DP 867854 and Lot 201 in DP 867855 to the north), and is occupied by the existing integrated resort which includes a multi-storey entertainment facility, gaming areas, retail spaces, multiple restaurants and bars, the Sydney Lyric Theatre, 480 hotel rooms/serviced apartments across three towers, and basement parking.



Figure 1 – Aerial Image of the Subject Site (base map source: maps.six.nsw.gov.au)

2.2 LEGAL DESCRIPTION AND OWNERSHIP

The site comprises the following lots as shown in the **Table 1** below.

Table 1 – Legal Description and Ownership

Details	Uses	Ownership
Lot 211 in DP 870336	The Light Rail Corridor	Owned by Rail Corporation New South Wales
Lot 500 in DP 1161507	The Star site	Owned by the ILGA, leased by SEGL
Lot 301 in DP 873212	Astral Hotel	Owned by the ILGA, leased by SEGL
Lot 302 in DP 873212	Astral Residences divided into strata (Strata Plan - SP 56913);	Stratum owned by the ILGA, leased by SEGL
Lot 1 in DP 867854	Service road	Owned by the ILGA, leased by SEGL
Lot 201 in DP 867855	Service road	Owned by the ILGA, leased by SEGL

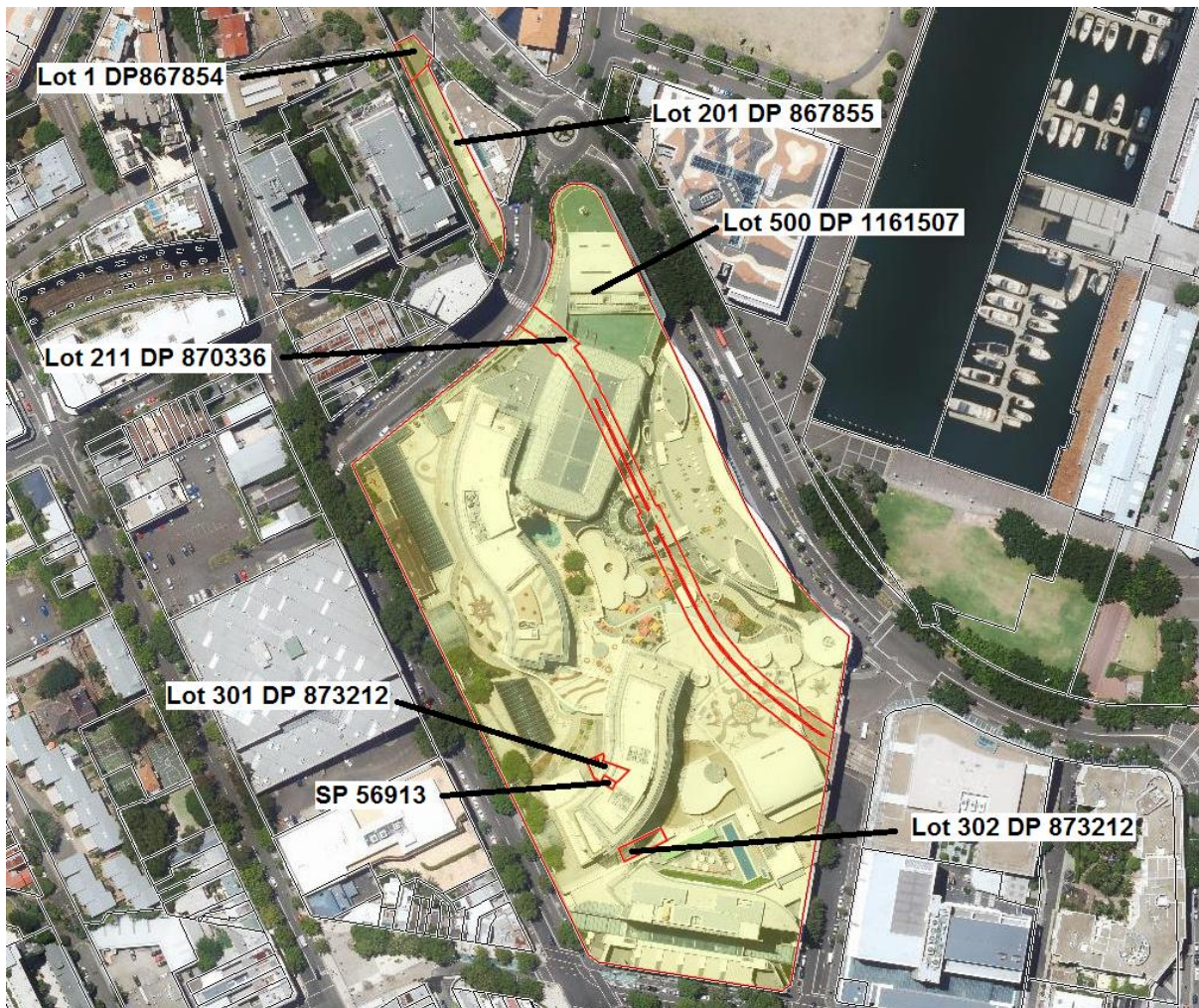


Figure 2 – Legal Description of the site (base map source: maps.six.nsw.gov.au)

3 DESCRIPTION OF MOD 13 IMPROVEMENTS

New Ritz-Carlton Hotel and Residential Tower

- Demolition of part of the existing building in the northern portion of the site, including part of the Pirrama Road façade and part of the Jones Bay Road façade.
- Construction of a new Tower, 237.0 metres AHD (approximate, 234 metres from Pirrama Road);
- Residential uses across 35 levels, comprising:
 - A residential vehicular drop off lobby on Level B2
 - A residential lobby on Level 00 to be accessed from Jones Bay Road;
 - Residential communal space on Level 07 to be accessed via Level 08; and
 - 204 residential apartments located from Levels 05 to 06 and from Levels 08 to 38, featuring one-bedroom, two-bedroom and three-bedroom unit types (Note – no Level 13)
- Hotel uses across 31 levels, comprising:
 - A hotel arrival lobby on Level B2 to be accessed from the new Ritz-Carlton porte-cochere along Pirrama Road;
 - A hotel Sky Lobby for guest check-in on Level 39 and 40, featuring a restaurant, bar and lounge;
 - 220 hotel rooms located from Level 42 to 58 and from Level 60 to 61
 - A hotel spa and gym on Level 07
 - A VIP link to the Sovereign Room on Level 04 and 04 Mezzanine
 - A Ritz-Carlton Club lounge and terrace on Level 59
 - Hotel staff end-of-trip facilities on Level B3
 - Hotel staff arrival point on Level 00
 - Hotel back-of-house and plant on Level B2, 02, 03, 05, 41 and 42
- A Neighbourhood Centre consisting of the following proposed uses including street level cafe, library, learning / innovation hub, multipurpose function centre, practice rooms (functional use to be finalised in conjunction with a neighbourhood panel)
- A new car-parking stacker system below the new porte-cochere of the Ritz-Carlton Hotel, with a total capacity of 221 spaces, to serve the new hotel and apartments
- Vertical transport associated with the tower and podium; and
- A new drop-off / pick up area (short-term parking) on Jones Bay Road for the proposed apartments.

Level 07

- A 'Ribbon' at Level 07 connecting the new Hotel and Residential Tower to the existing building along Pirrama Road, comprising:
 - Two pools and associated pool decks (one for the new Hotel, one for The Star); and
 - Two food and beverage premises with associated store rooms and facilities;
- Lift access from the Level 05 Terrace to Level 07;
- Residential communal open space associated with the new residential apartments, comprising pool and landscaped terrace at the base of the Tower adjacent to Jones Bay Road;
- Gym and associated change rooms and facilities for the residents;

- Gym and associated change rooms and facilities for hotel guests; and
- Landscaping treatments.

Level 05 Sky Terrace

- Three food and beverage outlets with external areas;
- Completion of the Vertical Transportation drum to connect with Level 05 Sky Terrace;
- Designated event spaces on the Terrace; and
- Landscaping treatment.

Level 05 Astral Hotel Pool and Spa Recreational Facility Upgrade

- New pool deck, pool, spa, gym and amenities upgrade for Astral Hotel and Residences.

Tower to Sovereign Link by Escalator and Lift

- Link from the Tower (across Level 04 and Level 04 Mezzanine) to the Sovereign Resort and MUEF at Level 03, connected via Lift G4, Lift VIP 1 and escalators.
- Extension of the lift service to stop at Level 00, 01 and 05 in addition to Level 3, 4 and 4M.

Level 03 Sovereign Column Façade Treatment along Pirrama Road

- New glazed detail to enclose exposed Level 03 Sovereign columns along the Pirrama Road façade.

Various reconfiguration works around Vertical Drum Level 00 to L5

- Revolving door at L00 main entrance landing Pirrama Road end
- Sliding door at L00 landing at stairs from Light Rail
- Reconfiguring of existing L1 and 2 void edge
- New escalators from L2 to L3 due to revised landing at Level 3
- Infill of L2 atrium void to main entrance at Pirrama Road

Façade Integration Works

- Upgrades to the Pirrama Road and Jones Bay Road façades to integrate the new Ritz Carlton Hotel and Residential Tower with the existing building.

Infrastructure Upgrades

- A new plant room located within the podium over Levels 03, 04, 05 and 06 of the proposed Hotel and Residential Tower;
- Relocation of the current Level 03 cooling towers (adjacent to the MUEF) to the Level 09 plant room above the Level 06 plantroom adjacent to the Astral Hotel;
- New capstone microturbine units and associated flues in the proposed plant room at Level 03 between the Darling Hotel and the Astral Residence Tower;
- New capstone microturbine units and associated flues in the new Level 03 plant room at the base of the Tower;
- Relocation of the existing main switch-room to the new plant room on Level 02, south of the demolition cut line;

- Relocation of the existing data recovery centre to the new plant room on Level B1 of the Darling Hotel;
- Relocation of diesel generator flues to the side of the new Level 09 plantroom, adjacent to Astral Hotel

Level B2 Transport Interchange

- Upgrades to the Event Centre Loading Dock;
- Entry into Basement car stacker for the Tower apartments and Ritz-Carlton Hotel;
- New commuter bike parking and hire bike system;
- Upgrade of finishes to light rail station surrounds (but not within Light Rail corridor) and removal of existing wall barrier to the Pirrama Road frontage;
- Upgraded taxi-rank arrangements;
- Designated Star coach parking along Service Road in front of Light Rail station; and
- Realignment of kerbs and line-marking.
- Note – no works within the Light Rail corridor

Transport Improvements – Other Locations

- Reconfiguration of existing median strips on Jones Bay Road and addition of new median strip on Pyrmont Street, with associated line-marking to enable a new right-hand turning lane into the Astral Hotel Porte-Cochere;
- New Pyrmont Street carpark entry and exit, associated line marking, changes to internal circulation, and reconstruction of the pedestrian footpath along Pyrmont Street; and
- Relocation of existing feeder taxi-rank from Jones Bay Road to the Level B2 transport interchange.

Site Wide Landscape and Public Domain Upgrades

- Upgrades to street frontages along Pirrama Road (for the Hotel Porte Cochere) and Jones Bay Road (for the residential entry);
- Upgrades to street frontage to Pyrmont Street, due to new car parking entry; and
- Upgrade to the entry forecourt of SELS building at the corner of Jones Bay Road and Pyrmont Street. (Note: no works within SELS building is proposed)

Level 00 - Restaurant Street

- Creation of a new destination Restaurant Street by:
 - Incorporating existing Balla & Black Food and Beverage premises on Level 00; and
 - Converting existing retail shops into new Food and Beverage tenancies

Pirrama Road and Jones Bay Road - Food and Beverage tenancies

- A revised food and beverage tenancy at the existing Pizzaperta outlet along Pirrama Road;
- A new food & beverage tenancy at the Marquee street entry; and
- A small café outlet adjacent to the residential lift lobby at Jones Bay Road.
- A new food & beverage tenancy accessed off existing walkway from Jones Bay Road

Food and Beverage – Other Locations

- Reconfiguration of Harvest Buffet, including new escalators from Level 00 Food Court to Level 01; and
- Refurbishment of Bistro 80 into the interim Century tenancy. (Note: The Century tenancy post construction is proposed to be at the Jones Bay end of L00 – Restaurant Street)

Darling Hotel Corners

- Upgrade of the corner plaza at the Union/Edward Street property entry to accommodate:
 - A new food and Beverage premises on Level 01 and 02;
 - A new entry foyer leading to the Food Court;
 - A relocated awning enclosure at street level;
- Upgrade of the corner plaza at the Union/Pyrmont Street property entry to accommodate:
 - A new awning enclosure at for the existing café;
 - New revolving door at entry to Darling Hotel
 - Eight (8) luxury display cases at Darling Hotel car park entry; and
 - Two car display areas at Darling Hotel car park entry.

Site-Wide Acoustic Strategy

- A site-wide acoustic monitoring strategy applied to assess impact of potential noise generating sources in Mod13.

Site-Wide Lighting Strategy

- A site-wide lighting strategy integrating and improving the existing lighting across the precinct, with new lighting the proposed Tower, Podium and Ribbon, including:
 - Internal lighting of Hotel and Residential spaces;
 - Illuminated highlights at the Sky Lobby and Club Lounge levels;
 - Integrated lighting on the eastern and western vertical façade slots and angled roof profile;
 - Podium external illumination from awnings, and under retail and lobby colonnades;
 - Landscape lighting on Level 07 open terraces and pool decks;
 - Feature lighting accentuating the wing-like profile of the Ribbon and vertical element;
 - Internal and external lighting to Food and Beverage outlet at Union/Edward Street corner;
 - Façade LED lighting to the heritage SELS Building

Special Lighting Events

- Approval for fifty-three (53) Special Lighting Events per year for the use of permanent installation of moving projector lights on the rooftop of the Astral Hotel

Signage Upgrades

- Consolidation of existing signage approvals and new signage, including:
 - Approved signs
 - Wayfinding signs;
 - Business identification (including for Food and Beverage outlets); and
 - Signage on the Tower and Podium.

Stormwater upgrades

- Stormwater upgrade works, including increased pit inlets and pipe capacities at the low points along Pymont Street and Edward Street.

4 INTEGRATED WATER MANAGEMENT STRATEGY

This Integrated Water Management Strategy for the **Modification 13** development considers conservation, reuse, disposal and treatment of water, stormwater and wastewater systems.

This includes an assessment of existing systems and the capacity to extend and interface with proposed development areas.

Both this Water Management Strategy and the *Hydraulic Infrastructure Report* (Appendix BB) should be read in conjunction. These reports address the requirements of SEAR's to prepare an Integrated Water Management Strategy.

4.1 POTABLE WATER SYSTEM

4.1.1 Demand Assessment

Potable water demands for the existing and proposed Mod 14 & Mod 13 developments have been modelled and are noted below;

Demand	Existing Site Demand	Existing + Mod 14 Demand	Existing + Mod 14 + Mod 13 Demand
Peak Demand	29 l/s	34 l/s	45 l/s
Avg. Daily Consumption	2,800 KL	3,600 KL	4,100 KL

A new water main connection is proposed to meet the increased demand associated with the Mod 14 & Mod 13 developments. The proposed 150mm main connection will extend from the Pirrama Road 250mm SWC water main

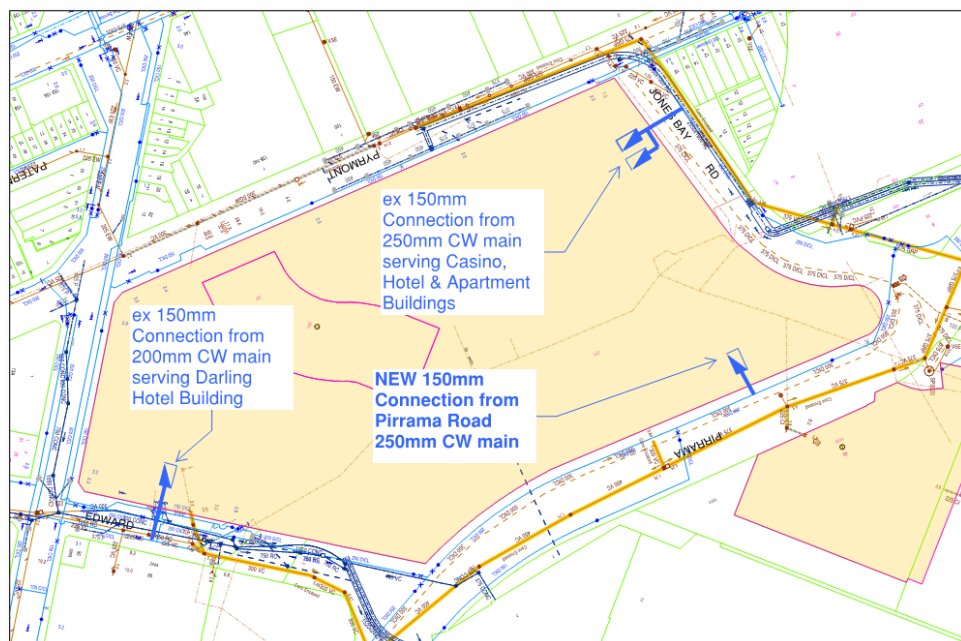


Figure 3 Proposed Connection to Authority Water Mains

Refer to *The Star Mod 13 Hydraulic Infrastructure Management Plan* for details of infrastructure requirements.

4.1.2 Water Conservation Strategies

Water conservation strategies to be implemented for the site include;

- Water efficient fixtures and fitting selection
- Extension of the existing site Recycled Water system to new development areas
- Collection of rainwater from roof areas and treatment for reuse
- Water meters with BMS connection will be installed at all major water use areas for hot and cold and recycled water services.

4.1.3 Water Efficient Fixtures and Fittings

Potable cold water consumption for the proposed development can be further reduced via the installation of water efficient fixtures and tapware.

Fixtures and tapware selections for the proposed development will be selected to meet the following criteria;

- 6 star WELS rated self closing tapware for public hand basins;
- 4 star WELS rated faucets for hotel & serviced apartments
- 4 star WELS rated dual flush WC's with 9 & 4.5 litre flush volumes;
- 6 star WELS rated Urinal flushing that has individual automatic flush control;

4.2 RECYCLED WATER SYSTEM

4.2.1 Existing Recycled Water System

As part of the most recent major site development, known as Project Star, a Grey Water Treatment Plant (GWTP) was installed to treat grease waste drainage after it had passed through the grease arrestor. The recycled grey water is then used for WC flushing for the public toilets.

The Recycled Water Treatment plant is located on the eastern perimeter of Level B3, either side of the Pirrama Road carpark entry driveway.



Figure 4 Existing RW Treatment Plant Level B3

Typically, grey water is made up of the wastewater from showers, baths, spas, hand basins, laundry tubs, washing machines, dishwashers and kitchen sinks. Grey water does not include water from toilets.

An existing a 50 kL/ Hour Dissolved Air Flocculation (DAF) unit treats all the wastes from the commercial kitchens. It is a consistent source of pre-treated waste and produces approximately 180 kL/day.

The treated waste water from the DAF unit is intercepted and diverted to a 70,000 litre buffer tank and is transferred to the grey water treatment plant, which consists of rotary screens, aeration chambers, bioreactors, membrane cassette trains, transfer pumps, holding tanks and delivery pumps.

The capacity of the recycled water holding tanks is 80,000 litres and has domestic water backup supply from both the Edward Street and Jones Bay water mains.

The flushing water is proportionally dosed with a blue non-toxic cleaning additive at the recycled water storage tank.

The recycled water reticulates to public amenities throughout the existing facility.

4.2.2 Extension of Recycled Water System to Mod 13

The recycled water system will be extended to the proposed Mod 13 development areas for public amenity WC flushing.

Electronic pulse water meters are installed on all toilet blocks with BMS connected points; however these meters are not currently monitored by a meter data logging or BMS system.

A Water Monitoring System (WMS) will be installed and all existing and new recycled water meters will be connected to the WMS. This will facilitate monitoring for water use patterns, identify leak detection and assist with water conservation strategies.

4.3 STORMWATER

4.3.1 Demand Assessment

The catchment area for the site will not change with the proposed development; therefore there will be no increased stormwater flows for the site. Flow rates for the three existing catchment areas are;

Catchment Zone	Catchment Area	ARI 20yr 5 Min 206 mm/hr	ARI 100yr 5 min 266 mm/hr
Northern Seawater Conduit	11,815m ²	676 l/s	872 l/s
Southern Seawater Conduit	21,720m ²	1,243 l/s	1,604 l/s
Edward Street	5,671m ²	325 l/s	419 l/s

The existing site stormwater infrastructure has adequate capacity to drain the proposed new build areas.

Stormwater Infrastructure augmentation works have been recommended in the **MOD 13 Flood Impact Assessment Report**. The proposed Stormwater works will address local flooding and overland flow issues around the site.

4.3.2 Design Criteria

Stormwater drainage to all new development areas, and modifications to the existing stormwater drainage system will be designed to the following criteria;

- To the installation requirements of Australian/New Zealand Standard 3500 - Plumbing and Drainage;
- Designed to a 1 in 100 ARI storm intensity of 5 minutes using the rational method of the Australian Rainfall & Runoff and the Experimental Building Station – Department of Housing and Construction – design notes.
- Overflows to be provide to all new roof and podium areas to cater for the blockage of the stormwater drainage system;
- New main distribution pipework shall be sized with a spare capacity of 30%;
- Pipework maintenance access to be avoided from high access areas and sensitive gaming areas;
- Pipework to be acoustically lagged in noise sensitive areas;
- New pipework shall be constructed from High Density Polyethylene (HDPE);
- All new rainwater outlets shall be of bronze construction and incorporate a puddle flange and membrane clamp;
- Maintenance access to be provided without the need for destruction of building elements.

4.3.3 WSUD

The Northern and Edward Street catchments feature silt arrestors that are incorporated into the harvesting tanks. The southern discharge features silt arrestors prior to discharge to the seawater conduit.

All carpark drainage is collected via a two separate stormwater pump systems. One in the Edward street catchment and the other services the rest of the carpark. Each features an oil separator at the collection sump.

New building area catchment will be directed to either the northern or southern collection systems, and utilise the existing stormwater quality treatment devices. The capacity of these quality treatment systems is adequate for the proposed development.

The new carpark excavation will be provided with a collection sump and pump out. This will also feature a silt arrestor and oil separation device.

Refer to the following reports for further details of proposed Stormwater Infrastructure and WSUD considerations;

- **Mod 13 Hydraulic Infrastructure Management Plan** This Report describes;
 - The building's existing internal storm water infrastructure
 - Points of discharge
 - Stormwater quality treatment
 - Stormwater demand assessment
 - Proposed Infrastructure Works
 - Groundwater collection system

- **Mod 13 Flood Assessment Report** This Report describes;
 - Catchment and external stormwater
 - Flood modelling
 - Proposed Stormwater works on Pymont Street and Edward Sreet
 - Climate Change sensitivity
 - Flood planning levels

- **Mod 13 Geotechnical Assessment** This Report describes;
 - Site ground conditions
 - Groundwater monitoring during construction
 - Historical groundwater occurrence and quality
 - Strategy for assessment of construction dewatering
 - Strategy for assessment of long term site dewatering

4.3.4 Rainwater Harvesting

The existing 225 kL northern rainwater harvesting tank, which is currently not in use, is to be recommissioned. Rainwater collected shall be directed to interface with the existing site recycled flushing water distribution system.

The tank is located below the Star Event Centre Loading Dock and spans from level B4 – B1

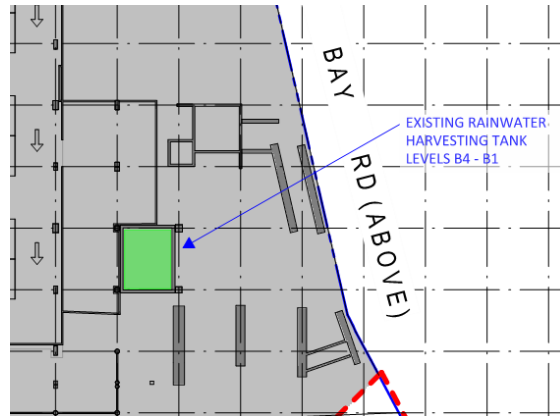


Figure 5 Existing RW Treatment Plant Level B3

Rainwater is to be collected from all new roof areas and directed where practical to the northern rainwater harvesting tank.

5 CONCLUSION

The proposed Hydraulic Services associated with the Integrated Water Management Strategy will be designed and constructed in accordance with;

- Plumbing Code of Australia
- Relevant Australian Standards
- Sydney Water Regulations
- Jemena Natural Gas Regulations
- City of Sydney Stormwater Management Policy

The SEARs Application, number MP08_0098 MOD 13, relevant clause;

12. Drainage and Stormwater

- *Prepare an Integrated Water Management Strategy. This should include water, storm water and wastewater management, including any re-use and disposal requirements, demonstration of water sensitive urban design and any water conservation measures*

Is addressed by this report, in conjunction with the Hydraulic Infrastructure Report (Appendix BB).

This Integrated Water Management Strategy has identified the following key findings/conclusions and recommendations:

- Water efficient fixtures and fitting selection
- Water meters with BMS connection will be installed at all major water use areas for hot and cold and recycled water services.
- The recycled water system will be extended to the proposed Mod 13 development areas for public amenity WC flushing.
- The existing site stormwater infrastructure has adequate capacity to drain the proposed new build areas. The catchment area for the site will not change with the proposed development; therefore there will be no increased stormwater flows for the site.
- The existing disused northern stormwater harvesting tank is to be reinstated. New drainage from MOD 13 areas will be diverted where practical to the reinstated harvesting tank
- Rainwater collected shall be directed to interface with the existing site recycled flushing water distribution system.
- Install new rainwater pumps and filtration equipment at level B4 and interface with the existing site recycled flushing water distribution system
- New building area catchment will be directed to either the northern or southern collection systems, and utilise the existing stormwater quality treatment devices.

The Mod 13 development will facilitate a limited environmental impact on the existing development and surrounding locality by improving the site's Water Management Strategies. This will be achieved by a reduction of stormwater runoff from the site, greater use of captured rainwater within Mod 13, expansion of the existing recycled water distribution to Mod 13, and more robust water use monitoring and leak detection.