

7.2.4 MONASH AQUATIC & RECREATION CENTRE (MARC) REDEVELOPMENT

Responsible Manager:	Tony Oulton, Manager Active Monash
Responsible Director:	Tanya Scicluna, Director Community Services

RECOMMENDATION

That Council

1. Approves the Preliminary Concept Design for the redevelopment of the Monash Aquatic and Recreation Centre (MARC) as detailed in Attachment A for the purpose of public exhibition and community feedback based on the following recommended project scope and cost estimate of \$83,708,000 excl. GST inclusive of:
 - Best Value Redevelopment Proposition - \$75,760,000 excl. GST
 - Electrification – \$3,538,000 excl. GST
 - New on-grade car parking (120 spaces) - \$3,261,000 excl. GST
 - 500kw PV cells - \$1,149,000 excl. GST
2. Notes that a comprehensive range of redevelopment options for the Monash Aquatic and Recreation Centre (MARC) have been investigated and assessed to determine a best-value redevelopment proposition that responds to the findings of the 2019 MARC Needs Assessment and delivers the highest Benefit Cost Ratio and Return on Investment (ROI)
3. Notes that
 - a) Following the public exhibition period for the Preliminary Concept Design, a Community Consultation Report and a final concept plan will be presented to Council for consideration and endorsement
 - b) Subject to Council's endorsement of the final concept plan for the redevelopment of MARC, detailed design will commence in the 2027/28 FY, and construction will occur over the 2029/30 and 2030/31 FYs (i.e. 2 years)
 - c) Officers will advocate for external funding to undertake improvements at MARC consistent with the Concept Designs for the redevelopment of MARC

INTRODUCTION

This report recommends that Council endorse the preferred redevelopment option for the Monash Aquatic and Recreation Centre (MARC) and publicly exhibit the Preliminary Concept Design, budget, and timelines for community feedback before finalising a redevelopment proposal for Council endorsement in 2027.

The report also outlines the high-level findings of the MARC Feasibility Study, business case and cost plans prepared for various iterations of the preferred redevelopment option on the basis of optimising community benefit and a best value proposition for Council.

BACKGROUND

MARC Needs Assessment

A Needs Assessment was undertaken in 2018 to assess the existing capability of MARC against the needs of the community for aquatic leisure facilities, services, and programs to help guide future decisions by Council about the development and operation MARC into the future.

The findings of the Needs Assessment were presented to Council at its meeting held 26 November 2019, where Council resolved to:

- *note the key findings of the MARC Needs Assessment;*
- *direct officers to undertake a feasibility study to develop and assess options for a significant redevelopment of MARC to provide a unique and landmark water play offering; and,*
- *direct officers to report back on the findings of the feasibility study and a recommended redevelopment proposal that responds to community needs, optimises community benefit, and provides a best value proposition.*

MARC Feasibility

The feasibility on the proposed redevelopment of MARC was interrupted by the impacts of COVID-19 on the operations of the centre and an initial uncertainty regarding the future of aquatic operations. At a Councillor Strategy Briefing in December 2022, Councillors were provided with an update on the MARC Feasibility Study which highlighted:

- Significant variances in attendance, membership data and operating performance (and forecasts) had occurred over the three years prior due to the impacts of COVID-19.
- Impacts of the implementation of the Active Monash Vision and Pricing Strategy and new tiered membership framework and pricing model were unknown due to the impact to operations during COVID.
- Pre-pandemic Quantity Surveyor (QS) Cost Plans were no longer current and did not factor in the significant price escalations post COVID-19.

Consequently, a feasibility ‘refresh’ was undertaken post pandemic and included a range of potential redevelopment options, including a \$100M full-scale redevelopment which intended to deliver ‘a unique and landmark waterplay facility’ in accordance with Council’s resolution.

Officers were subsequently requested to undertake further work to refine the project scope, consider and include:

- An analysis of the Cost Benefit Ratio of developing wet areas over dry areas and vice versa.
- Provide a value for money assessment (Area Schedule Comparison).
- Consideration of operational cost implications associated with each development option, including a ROI assessment for each option.
- The identification of the *best-value redevelopment proposition* for MARC considering community needs, social benefits, value for money, and ROI.

MARC Feasibility Update 2024

At the Councillor Strategy Briefing held 13 August 2024, Councillors were presented with a range of *Aquatics Maintenance and Redevelopment Proposals for MARC*. This report focussed on an

option to renew and upgrade existing plant, limited leisure water upgrade and limited upgrade and renewal to wet change areas and general accessibility.

The report highlighted that this option would not result in any direct revenue generation nor reduce Council's subsidy of operating and maintenance and renewal costs. However, these 'minimum' works (est. \$40M at that time) were considered vital as a minimum to retain existing usage levels and service standards and comply with current accessibility requirements.

As a result, officers were asked to undertake further work to identify a best value option that would address the renewal and ongoing maintenance challenges, respond to community needs, and improve Council's operating position/financial contribution and the longer-term viability of the centre.

Aquatics Service Review 2024/25

An independent Aquatics Service Review was undertaken to assess the current operations of Aquatic Services at Monash including efficiency, cost and value, benchmarking, customer experience, and future opportunities.

The service review was used to test and verify business case/modelling and projections, development priorities and opportunities for the future including the endorsement of expanded contemporary, accessible facilities seen as being critical in ensuring the centre's future viability and capacity to meet demand from population growth (including Suburban Rail Loop Authority population growth forecasts and housing targets).

DISCUSSION

Best Value Proposition

At the 26 November 2019 Council meeting, officers were tasked with determining the best value proposition for the redevelopment of MARC that responds to community needs, optimises community benefit and ROI.

Officers have subsequently completed multiple feasibilities, explored and assessed a range of potential redevelopment options, commissioned technical condition reports from industry experts and undertaken financial assessments of each option (including Benefit Cost and ROI analyses), in order to determine the best value proposition for the redevelopment of MARC.

The business case and financial modelling reports for the best value proposition have been developed in consultation with Council's Finance, Strategic Asset Management (SAM) and Facility Maintenance teams with a clear focus on responding to:

- Deteriorating, end-of-life plant
- Building services that are nearing end of life
- The warm water program pool (WWPP) is smaller than contemporary comparable centres.
- Access around the WWPP is not compliant with the Federal Disability Discrimination Act 1992 (DDA) requirements
- The spa is poorly located in the main pool hall

- Sauna and steam room facilities are small by contemporary standards and are regularly closed for unplanned maintenance
- Health and fitness areas are smaller than contemporary centres and the quality of secondary group fitness spaces are below industry standard. In addition, there is no 24-hour access like other market competitors
- A lack of family change facilities and a low level of change space provision (and quality) throughout the centre is deterring families and multicultural residents
- The provision of accessible change rooms is poor and there are no changing places facilities
- While the wave pool offers a unique experience, it does not offer the variety of contemporary water play options that the community, in particular families with young children, are seeking and that have been successful in more recently developed aquatic centres.
- Reception layout does not maximise customer experience
- The member access door provides significant opportunity for unauthorised access and tailgating creating safety concerns
- Reducing ongoing renewal and increasing maintenance costs
- Determining an investment approach that provides the strongest return and maximum community benefit

MARC has experienced frequent shutdowns over the past few years, largely as a consequence of the age and condition of its assets, including plant and equipment. These issues have led to recurring interruptions in operations and service delivery. Closures have significant implications, diminishing customer satisfaction, affecting revenue generation and undermining customer confidence in the Centre's reliability and service quality. The proposed redevelopment of the Centre is intended to mitigate the risk of these closures and the resulting financial and customer impacts.

The revised Preliminary Concept Design Report dated April 2026, represents the best value proposition for the redevelopment of MARC and is included as **Attachment A** to this report.

The supporting business case for the recommended redevelopment, including benefit cost analysis, 10-year operational financial model, and ROI analysis is detailed in the Financial Operational Model Report included as Confidential Attachment B to this report.

The recommended best value proposition has been developed in response to the MARC Needs Assessment findings, which included the need for:

- *Accessibility improvements throughout the centre*
- *Increased warm water, spa, sauna, and steam spaces.*
- *Increased capacity for learn to swim/multi-purpose pool.*
- *Increased and contemporary children's water play areas*
- *The provision of more multi-purpose rooms, dry programming space, and larger gymnasium.*
- *Increased general, family, and accessible change facilities including accessible changing places facilities*
- *Additional car parking*

The best value redevelopment proposition for MARC estimated to cost \$83.7M responds to these needs and includes:

- *The renewal of pool plant and circulation systems to overcome deterioration (and reduced future maintenance/renewal) current inefficiencies*
- *Full electrification (de-gassing) of the centre and inclusion of new 500kw PV cells*
- *A new at-grade car park with approximately 120 spaces*
- *NEW integrated outdoor change facilities*
- *NEW expansion of warm water facilities (to address demand and financial viability/return)*
- *NEW expanded learn to swim /new programable space (to address demand and financial viability/return)*
- *NEW reconfigured and enhanced dry programmable fitness and gym spaces (to address demand and financial viability/return).*

The best value redevelopment proposition includes a large zero depth splash pad, aquatic play area, toddler pool, and a new flexible program / LTS pool, replacing the existing wave pool. The financial modelling indicates this change delivers an improved benefit cost ratio and return on investment (c.f. retention of the wave pool), as well as providing significant operational improvements and contemporary aquatic play facilities to address community demand.

The financial analysis highlights the new components boost revenue and/or increase operating efficiency, thus enhancing the Centre's financial performance and ROI. The financial modelling includes asset management allowances, corporate overheads, and finance repayment costs to service loan repayments for the capital cost of the recommended redevelopment.

Revised Business Case

The table below summarises MARC's income, expenditure, and net operating results from 2017/18 to 2024/25. It also outlines challenges faced during Covid, as well as ongoing concerns about operational efficiency caused by rising costs and income generation difficulties stemming from the Centre's aging condition and capacity constraints.

	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25
Income	\$7.39M	\$7.43M	\$5.17M	\$2.26M	\$3.47M	\$6.13M	\$7.09M	\$8.09M
Expenses	\$7.41M	\$7.89M	\$7.87M	\$6.84M	\$7.19M	\$9.76M	\$9.64M	\$9.74M
Net	-\$23,909	-457,371	-\$2.7M	-\$4.6M	-\$3.7M	-\$3.6M	-\$2.6M	-\$1.7M
Attendances	822,649	842,608	625,129	300,317	362,868	664,857	740,400	747,705
Net Cost Per User	\$0.03	\$0.54	\$4.32	\$15.32	\$10.20	\$5.41	\$3.51	\$2.22

A financial model has been developed for the recommended best value development proposal based on updated assumptions that align with the components detailed in scope. A sensitivity analysis was also completed for the model to provide a range of forecast estimates including conservative (-10%), base and optimistic (+10%) cases (refer Confidential Attachment B).

A summary of the Financial Operational Model is included in the table below and highlights that the recommended redevelopment of MARC is expected to generate:

- A 55% increase in overall attendances
- \$4.5M in income per annum
- Improve the bottom line by \$2.9M per annum.

Under the recommended redevelopment, the centre is expected to return to an operating surplus of more than \$1.1M per annum excluding depreciation, finance costs, and corporate overheads. The Net Cost per user which measures the cost of the service by the number of patrons improves from costing Council \$2.22 per user in 24/25 to a Net Surplus per user of \$1.10.

Performance Indicator	MARC Redevelopment with Wave Pool Redevelopment 10 Year Average
Additional Visitations	354,935
Additional Revenue	\$4,531,537
Additional Expenditure	\$1,619,440
Operational Performance (Net Result)	\$2,912,098
Depreciation Allowance	\$1,515,200
Asset Management Allowance	\$757,600
Corporate Overheads	\$362,523
Finance Repayment Costs	\$2,360,000
Centre Performance (Net Result)	(\$2,083,225)

A decision to fully electrify the centre (not considered in the financial modelling of the business case) is expected to further improve the operating performance of the centre by up to \$770,000 per annum, thus increasing the net result from +\$2.9M p.a. to +\$3.67M p.a.

Benefit Assessment Model

A Benefit Assessment Model was developed as part of the Business Case that presents the Social and Economic Impact of the best value redevelopment proposition.

Benefit Assessment Model Output	MARC Redevelopment with Wave Pool Redevelopment
Social Impacts	
Average Additional Annual Visitations	354,935
Total Additional Visits (10 years)	3,549,349
Construction Phase Impacts	
Direct Construction and Manufacturing Jobs (FTE)	224
Indirect Construction and Manufacturing Jobs (FTE)	56
Total Employment (FTE)	280
Annual Regional Income (new wages)	\$35,203,062.17
Operational Phase Impacts	
Facility Employment (additional FTE)	5.9
Average Annual Health Benefits	\$816,350
Total Health Benefits (10 Years)	\$8,163,504
Benefit-Cost Analysis	
Benefit Cost Ratio (4% Discount Rate)	1.37

SRLA East Population Impacts

The community infrastructure needs assessment commissioned by the SRLA contained the following population forecasts for the SRL structure plan areas and the broader 1.6km catchment for each station.

2041 SRL Population Forecasts (Source: SRLA Business Case 2021)

Suburb	Structure plan area	Increase	1.6km catchment	Increase	Total forecast	Increase
Clayton	26,900	12,700	40,500	18,000	67,400	30,700
Glen Waverley	11,700	4,600	33,500	10,500	45,200	15,100
Monash	17,900	7,900	21,000	8,600	38,900	16,500
Total	56,500	25,200	95,000	37,100	151,500	62,300

Dwelling Forecast

The forecast dwelling increase for the SRL East Structure Plan areas is 11,400. The adopted forecast dwelling numbers for the SRL East Structure Plan areas are shown in the table below. It should be noted that these dwelling numbers are unchanged from the initial dwelling forecast of the Suburban Rail Loop Business Case 2021.

SRL Dwelling Forecast (Source: SRLA Business Case 2021)

Dwellings	2021	2041	Change	Ave Annual growth rate
Clayton	6,010	11,600	5,590	3.3%
Glen Waverley	3,210	4,710	1,500	1.9%
Monash	3,920	8,270	4,350	3.8%
Total	13,140	24,580	11,440	3%

Housing targets

Plan for Victoria set a housing target for Monash of an additional 69,500 dwellings up to 2051. This housing target was introduced into the Monash Planning Scheme in September 2025.

Whilst the delivery of 69,500 new dwellings would effectively double the number of dwellings in Monash (76,177 dwellings @ 2021 Census), it also requires dwelling construction to occur at nearly three times the current construction rate.

An expert opinion on the impacts of the Suburban Rail Loop (SRL) project on the provision of sport and recreation in Monash noted that the Monash Aquatic and Recreation Centre (MARC) has reached capacity, recording 747,705 attendances in 2024/25.

MARC is a 15-minute drive from SRL East Clayton, 9 minutes from SRL East Monash and 5 minutes from SRL East Glen Waverley Structure Plan Areas. MARC is considered central to the provision of aquatic and leisure services in Monash and beyond. It was also noted that the age of MARC and its limited capacity to meet the key aquatic and leisure market, adversely impacting the Centre's ability to support additional aquatic and leisure participation.

MARC currently does not meet the community's need for dedicated aquatic spaces for learn-to-swim, adequate warm-water pools to cater for the growing rehabilitation/ therapy market, nor sufficient health and wellness facilities (i.e. undersized gym and program spaces).

The centre is therefore unlikely able to accommodate additional attendances and membership generated by the increase in populations projected for the SRL East Monash, SRL East Glen Waverley and SRL East Clayton Structure Plan Areas, without additional warm water program pools, water play spaces, an increase in gym space and additional group fitness rooms.

The recommendation from Council's expert witness in its submission to the SRL East Glen Waverley Structure Plan was to:

"Deliver a redeveloped MARC by providing additional wet and dry program areas and water play, in line with the planning framework. Increase warm water program space, relocate spa, and expand sauna and steam room, expand health and fitness facilities including gym size and additional group fitness rooms, and provide water play. It is located within the SRL East Glen Waverley Precinct Planning Area, on the border of the Structure Plan Area."

Independent Aquatic Services Review

In addition to discussions regarding the long-term sustainability and viability of the Centre, an independent service review was commissioned by officers to review and recommend improvement opportunities for all of Council's Aquatic Services, including MARC.

The service review was conducted between April and June 2025 and proposed a series of recommendations that focused on opportunities to maximise the community benefit of the assets/program offerings and identify operational and investment efficiencies.

The analysis included:

- An assessment of current performance.
- Industry trends and opportunities, including demand/gap assessment of current state of service delivery.
- Identification of management model options which may be attractive for Council to consider at a later date.
- Opportunities to increase the footprint of existing facilities to increase capacity and maximise revenue opportunities.
- Identification of operational and capital efficiencies that could deliver more cost-effective and sustainable outcomes.
- Fees and charges benchmarking.

The service review examined five aspects of the service:

1. Current state
2. Revenue
3. Expenses
4. Capital Investment
5. Engagement

The Service Review highlighted several opportunities to improve the operational performance of the service which are being actively pursued by Active Monash staff and have improved the bottom line independent of the business case prepared for the proposed MARC redevelopment.

Key findings of the Service Review included:

- Management efforts in cost control and increased membership are evident in the improved financial performance post-pandemic.
- Increasing fees could lead to increased revenue between \$217k (low) and \$668k (high).
- Opportunities for demand growth were limited due to facility capacity and capped at \$132k per annum.
- Reductions in overheads between \$1.1M (low) to \$1.9M (high) were possible.
- Lost revenue through planned and unplanned maintenance could be up to \$613k per annum.
- Post redevelopment, MARC profitability increases to \$2.9M.
- Future operational improvements are restricted by the current facility / infrastructure challenges and limitations

It is proposed that a final business case be prepared at the completion of the concept design process to confirm the expected impact of the changes on the centre's operating position and to further consider and determine a preferred service delivery model for Aquatic Services post redevelopment.

Proposed Timelines

Preliminary timelines have been developed in accordance with the draft long-term financial plan, committed Federal funding for the outdoor change rooms, and expected project stages.

Council endorsement of the draft preliminary concept design, scope, budget, and timelines.	28 July 2026 Meeting
Community consultation on the draft preliminary concept design, budget, and timelines for redevelopment.	Aug 2026 – Feb 2027
Finalise project scope, budget, timelines, and Business Case.	Early 2027
Council endorsement of the final scope, budget, and timelines.	Early - Mid 2027
Procure architectural services and award tender	Sept - Oct 2027
Detailed design	Oct 2027 – Sept 2028
Construction tender	Oct 2028 – Mar 2029
Construction period & shutdown	June 2029 – June 2031

Note: The funding agreement with the Federal Government for the Outdoor Change Village will likely require a project variation to meet these timelines.

POLICY IMPLICATIONS

The proposed redevelopment of MARC is consistent with the key commitments of Council and aligns with the Council Plan, Monash Health and Wellbeing Plan, Gender Equity Action Plan, Age Friendly Monash, and the Asset Management Policy.

Councils 26/27 adopted budget highlighted the following annual plan major initiative aligned with the Council Plan Strategic Objective 1: A healthy, safe and connected community:

Complete concept phase design for the proposed redevelopment of the Monash Aquatic and Recreation Centre to better meet the needs of the local community, improve the operational performance of the centre and reduce carbon emissions.

Importantly, the next iteration of the design process will need to incorporate updates from the Environmentally Sustainable Design (ESD) Policy adopted by Council in December 2025 which will require the design to include:

- 5 Star Green Star Buildings certified rating (or other independent certification).
- Net zero carbon emissions from all operational energy use through all electric design and no gas connections.
- Provide a solar PV system with a capacity of at least 25W per square metres of the building footprint, or with a system capacity optimised for expected user demand.
- Consider battery storage in combination with solar PV when building usage predominantly occurs outside daylight hours (e.g. pavilions).

SOCIAL IMPLICATIONS

Key social benefits of redeveloping MARC include:

- a) Enhanced sense of community and community pride, e.g., MARC is an iconic community facility and social meeting space.
- b) Enhanced participation opportunities for all, especially older adults, youth, young children, people with a disability, women, and girls.
- c) Improved community health and well-being and expanded opportunities to participate will contribute to happy and healthier communities.
- d) Improved aquatic education and physical literacy skills development.
- e) Improved flexibility, accessibility, and reduced barriers to participation, i.e. people can *participate in their own way*.

CONSULTATION

Subject to Council approval of the recommended redevelopment option for MARC at the July 2026 Council meeting, officers propose to publicly exhibit the proposed preliminary concept layouts detailed in Attachment A, for community feedback.

Community feedback will be considered in the development of a final concept plan for the redevelopment of MARC that will be presented to Council for endorsement at a future meeting.

HUMAN RIGHTS CONSIDERATIONS

The proposed MARC Redevelopment is expected to positively support human rights by improving access to recreation, health and wellbeing services, enhancing inclusion and accessibility, and providing safer and more equitable facilities for diverse community members. Particular benefits are anticipated for children and young people, people with disability, older adults, women and girls, and culturally diverse communities.

GENDER IMPACT ASSESSMENT

A Gender Impact Assessment will be undertaken as part of this work because this policy/program/service is considered to have a direct and significant impact on the Monash community.

FINANCIAL IMPLICATIONS

Council has included a provisional sum of \$50M in its long-term financial plan across the 2028/29, 2029/30 and 3030/31 financial years to complete the proposed MARC redevelopment.

The current cost estimate to complete the project is \$83.7M for the recommended redevelopment, excluding Council's in-house delivery costs.

The total project cost includes an allowance for preliminaries and margins, design contingency, cost escalation to tender in late 2028/29, and cost escalation during construction. The total cost also includes an allowance for construction contingency, professional fees, authority fees, etc.

The current recommended best value redevelopment cost also includes options to fully electrify the building (\$3.2M), include 500kW PV Cells (\$1.15M), and expand car parking in-site by approximately 120 spaces (\$3.5M). It is recommended that these components be incorporated in the redevelopment scope.

A Federal Grant of \$1.5M announced as part of the 2025 Federal Election has been received towards the delivery of the Outdoor Change Village which has been incorporated into the design and could be delivered as a standalone project or as part of the redevelopment which will cost a total of \$3.5M. It is proposed this project be treated holistically and integrated as a component of the broader redevelopment design and delivery program rather than a discrete external change room project.

Based on the proposed scope and timelines, a total budget of \$83.7M is needed to deliver the project including a potential \$32.2M funding shortfall in capital funding that could be raised through State and Federal advocacy, further borrowings, or land sales.

The business case assumes the project will be primarily funded through Council borrowings, consistent with the provisional allocation of \$50M in Council's Long Term Financial Plan.

Any State and/or Commonwealth grant funding secured would reduce the amount required to be borrowed and, in turn, reduce Council's financing costs. Officers will also investigate the eligibility

of the Open Space Reserve to contribute to eligible elements of the project, subject to legislative and policy requirements.

Council may also consider redirecting up to \$1.2M from the 'Carbon Insetting Program' over three years to support the plant upgrade, including the transition of plant from gas to electricity, consistent with Council's net zero requirement.

In addition, the existing annual renewal allocation for MARC (currently provided for essential asset renewal and lifecycle replacement works) is estimated to provide approximately \$7.6M in avoided or deferred renewal expenditure over 10 years as a result of the redevelopment, noting that Strategic Asset Management's predictive asset renewal modelling indicates to maintain basic current service provision standards Council needs to spend \$26M on MARC over the next 10 years.

Subject to Council endorsement through the annual budget process, these funds could be redirected from Council's non-discretionary renewal program and reallocated to support the MARC capital works program. This approach would reduce the net additional funding requirement for the project and ensure that lifecycle renewal funding is applied to the long-term solution rather than to short-term investment in assets that will be replaced as part of the redevelopment.

The estimated savings will be confirmed at detailed design and staging, including identification of renewal items that can be safely deferred prior to construction, and will be managed to ensure statutory compliance, safety, and continuity of service until MARC closes for the redevelopment.

Advocacy

There are opportunities for potential State and Federal funding through advocacy, election commitments, SRLA and/or grants. Examples of large recent funding contributions to major aquatic facility upgrades include:

Major Federal funding of Aquatic Centres -

- \$20M Wurdi Baierr Aquatic & Rec Centre – (Surf Coast Shire, Stage 1 open)
- \$20M Mordi Aquatic Centre (Kingston, \$87.5 M project under construction)
- \$15M Plumpton Aquatic Centre (Melton)
- \$15M Carnegie Pool Redevelopment (\$75 Million project recently completed)
- \$9.2M Springleaf Ave Rec Centre (Casey)
- \$7.4M Doveton Pool in the Park (Casey)

Major State Government funding of Aquatic Centres -

- \$16.7M Wurdi Baierr Aquatic & Rec Centre – (Surf Coast Shire, Stage 2)

The State Government also made a \$10M low interest loan toward the Carnegie Pool redevelopment.

Election Commitments to Aquatic Facility Infrastructure during the 2022 Election Campaign totalled \$163.5M. It also made a \$68.9M funding commitment for the Canberra Civic Pool replacement.

These funding opportunities provide Council with a critical avenue to secure financial support outside standard grant programs. With the next Victorian State election scheduled for November 2026 and the Federal election to be held on or before May 2028, there is a clear and time-sensitive need for targeted advocacy.

Officers are aware that multiple municipalities are progressing new aquatic facilities and major renewal or redevelopment projects, intensifying competition, and underscoring the importance of early, coordinated, and proactive engagement to position Council strongly for funding consideration.

CONCLUSION

The best value redevelopment preliminary concept for MARC:

- Responds to key community needs as identified in MARC Needs Assessment.
- Delivers a contemporary aquatic play environment and new program/LTS pool, in place of the wave pool which is at end-of-life and under-utilised.
- Is supported by the findings of the financial modelling which assessed a range of development options and considered the financial (capital and operational) and social (community benefit) implications of each option.
- Is considered best value, based on the cost benefit analysis, community and economic benefit assessments, and return on investment potential.

It is recommended Council approve the recommended MARC redevelopment scope, budget and timelines as presented in Attachment A which is inclusive of:

- Best Value Redevelopment Proposition - \$75,760,000 excl. GST
- Electrification – \$3,538,000 excl. GST
- New on-grade car parking (120 spaces) - \$3,261,000 excl. GST
- 500kw PV cells - \$1,149,000 excl. GST

TOTAL PROJECT COST - \$83,708,000 excl. GST*

*Noting there is a current projected capital funding shortfall, officers seek Council's in-principal approval to publicly exhibit the concept layout and undertake a priority advocacy campaign for additional State and Federal funding for the project.

Subject to feedback from community consultation, the scope, budget, and timelines will be revised and re-presented to Council in early 2027 with a view to commencing the procurement of architectural services for detailed design late in 2027.

When completed, the redevelopment of MARC is projected to improve Council's operating result by more than \$30M and reduce planned maintenance costs by at least \$7.43M over ten years. It is also estimated that more than \$2M in operating costs will be saved during construction due to the closure of MARC and member relocation to Clayton Aquatics and Health Club or Oakleigh Recreation Centre.



ATTACHMENT LIST

1. Attachment A - MARC Concept Design Report [**7.2.4.1** - 191 pages]



CONCEPT DESIGN REPORT

2215 MARC Feasibility Study

Prepared for Monash City Council

9th April 2026





Acknowledgment of country

WRA acknowledges the Wurundjeri people of the Kulin nations as the traditional custodians of the land on which our Melbourne office stands, and the Wurundjeri Woi Wurrung and Bunurong People as the traditional custodians of the land on which this project stands.

We acknowledge past and present injustices and seek reconciliation. We consider ourselves blessed to share this land with the oldest living human culture on this planet.

We honour Elders past, present and emerging for their wisdom and knowledge in caring for country and sustaining cultural practices. We are grateful and inspired by their leadership and guidance.

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1 EXECUTIVE SUMMARY

1.1 Project Scope

Williams Ross Architects (WRA) were appointed by Monash City Council (MCC) to test the capacity of the existing Monash Aquatic Recreation Centre (MARC) for redevelopment and renewal.

WRA designed the original MARC facility which opened in 2002. Now over 20 years old, the facility has a range of building and aquatic services and equipment nearing end-of-life. Over the building's life, Council have implemented a quality maintenance program, and have an upcoming 10 year maintenance program estimated at \$10 million.

When it was first opened, MARC was viewed as an industry leader in aquatic and recreation service provision. It continues to have high levels of visitation, and strong support from the local community, however it has reached a point where the centre struggles to meet community expectations of an accessible and inclusive public aquatic facility.

For example:

- except for the warm water pool, no other pool has an accessible ramp;
- the Change Village is too small and has no all-gender facilities, not enough accessible amenities and no compliant Changing Places facility (a new facility type introduced after MARC was completed)
- the warm water program pool is too small by industry standard limiting the programs that can be run
- the facility does not have a water play offering in keeping with contemporary aquatic centres

This study has included review and assessment by BRT Services Engineers and Hydrautech Aquatic Engineers to inform the redevelopment strategy.

1.2 Terms of Reference

This report was prepared for the use of Monash City Council by Williams Ross Architects. No one other than Monash City Council may rely on it and Williams Ross Architects does not accept responsibility to any other user.

Analysis, brief development and design work has been undertaken to Feasibility level only. Subject to these limitations Williams Ross Architects confirms that to the best of its knowledge the content and drawings provided in this report are a fair and reasonable description of proposed facility requirements and a potential development approach at the time of writing.

1.3 Abbreviations

DDA	Disability Discrimination Act
ESD	Environmentally Sustainable Design
LSV	Life Saving Victoria
MARC	Monash Aquatic Recreation Centre
MCC	Monash City Council
NCC	National Construction Code
SRL	Suburban Rail Loop

1.4 Acknowledgements

We acknowledge the input of Monash City Council and the Active Monash Project Working Groups' contribution to developing the brief and staging options for this project.

1.5 Key Findings

The following key findings are informed by the site investigations, existing conditions inspections, consultation with key stakeholders and benchmarking comparable facilities in the market:

1.5.1 Existing Facility Issues

The facility faces several challenges in existing space provision and condition. The issues fall into two main categories as summarised below. The centre is of an age and condition where these issues are compounding.

Facility Maintenance / Operations / Compliance

Many building services are nearing end-of-life and will require replacement in the near future. The building fabric is generally in good condition. There are several compliance upgrades that will be triggered in a major refurbishment which will improve safety and accessibility.

The age and condition of major elements of the facility are impacting operations. For example the aquatic filtration is an older, joined model and nearing end of life. When the centre experiences an issue with the filtration or contaminant in the pools multiple pools are closed. Health regulations have changed over time and modern centres now operate with separate filtration for each pool. The recommendation is to upgrade and separate the MARC pool filtration systems.

Operational and compliance issues also arise from the centres age and the expense in adapting the existing building to new technology or work practices. For example:

- Reception layout does not maximise customer experience
- The member access door provides significant opportunity for unauthorised access and tailgating.
- Staff work space accommodation is cramped

Service Delivery

The service offer at MARC, while innovative when constructed, is now aging and failing to meet both current industry standards and community expectations. This results in lost revenue opportunity and reduced participation rates. The centres' amenities, access and inclusion elements also no longer meet expected standards or expectations. This in particular excludes or deters a range of community members from using the facility.

Other service delivery issues:

- The warm water program pool (WWPP) is smaller than contemporary comparable centres.
- Access around the WWPP is not compliant with the federal Disability Discrimination Act 1992 (DDA) requirements.
- The spa is poorly located in the main pool hall
- Sauna and steam room facilities are small by contemporary standards.

- Health and fitness areas are smaller than contemporary centres and the quality of secondary group fitness spaces are below industry standard. In addition, there is no 24-hour access.
- There is a lack of family change facilities or all-gender change spaces and a low level of change space provision (and quality) throughout the centre.
- The provision of accessible change rooms is poor and there are no changing places facilities.
- While the wave pool offers a unique experience, it does not offer the variety of water play options of more recently developed centres.

1.5.2 Recommended Development Scope

The MARC Redevelopment will be delivered as a single stage of construction requiring the full closure of the centre in 2028 / 2029. It is estimated this construction period may be approximately 2 years.

Staging of works was explored for the project delivery, however this was assessed as undesirable ultimately due to the high level of continual disruption to the community use of the centre, the lengthening of the overall construction program and increased cost. For example a major part of the redevelopment works include the full replacement of pool plant and filtration. This work requires complete closure of aquatic spaces and is best combined with the construction of the new warm water program pool.

The recommendation for a single construction period alleviates concerns about operational disruption, community frustration over lengthy construction periods and safety around construction in an operating site.

Additional optional items were also identified. These have been included as cost options to enhance the core scope:

- Extension to the new staff office to create additional space for 2 x offices and up to 9 staff is a shared workspace
- Demolition of the existing Tennis club and construction on 120 on-grade car spaces
- Full electrification of the site
This involves additional heat pumps to be located at the west side of the site which would require the removal of some car parking.
The additional heat pumps may trigger the need to increase the capacity of the substation.
- Additional solar panels on the existing building and new extensions
- Movable floor in the new program pool

1.5.3 Capital Cost

Council has a 10 year Maintenance Plan for MARC totalling approximately \$9.955M. The total maintenance cost saving from the 10 year Maintenance Plan is approximately \$7.43M excl GST. I

In summary the total capital costs for the MARC redevelopment is **\$75,760,000 exc GST** with a planned maintenance saving of \$7.43M

The table opposite allocates costs to component groups of work as listed. These costs exclude the optional items listed above the costs of which are identified in the detail of the report. Please also refer to the detail cost plan in the appendix

1.5.4 Next Steps

Once approval is provided to progress the project, a Concept Design Finalisation stage is recommended prior tendering for the detail design and documentation of the project. This will provide opportunity for Council to undertake risk mitigation and scope refinement tasks.

It is recommended further design and investigations be undertaken including:

- Review and refine the design brief and spatial arrangements to inform a future tender
- Further consultation to refine the brief and design
- Development of a community engagement plan
- Geotechnical and soil testing
- Site survey and In-ground services investigations
- Further investigation of Authority requirements and applications to inform the overall program

Planning Permit

While a planning permit should not be required as the site is in a Public Use Zone, there are two overlays that will trigger an application to the relevant authority for any building extensions:

- SBO - will require referral to Melbourne Water
- SCO14 and SCO15 will require approval of the relevant authority (SRLA)

Executive Summary

Component Summary	Indicative Project Cost	Maintenance Saving
East Refurbishment (ground)	\$6,918,000	say \$2.038M
• Creche conversion to staff office area • New staff lounge and amenities area • New change amenities area including change village • Ex WWE Treatment Plant • New reception area • New lift and stair • Modify / upgrade localised mechanical plant in affected areas		
New Outdoor Change Village	\$2,276,000	
• New outdoor change village facility and pool store		
West Refurbishment	\$17,515,000	say \$3.95M
• All new Pool Plant Upgrade / Replacement • Learn to swim pool extension with new accessible ramp • Existing indoor 25m pool reduced by 1 lane to accommodate ramp, build new accessible ramp • New group change and first aid room		
New WWE Pool	\$9,314,000	say \$50,000
• Refurbishment of new change amenities areas • New warm water pool (20m x 10m) with ramp • New spa 32m2 • Two saunas 20m2 and 19m2 • Steam room 19m2		
New Zero Depth Splashpad & Ramp to 50m Pool		
• New zero depth splashpad, program pool and toddlers pool (in ex wave pool area) • Accessible ramp added to ex outdoor 50m pool	\$11,221,000	say \$885,000
East Refurbishment (first)	\$7,434,000	say \$500,000
• Undercover access to outdoor changerooms and stairs to L1 – refer to updated plans • Gym expansion 653m2 • Function training zone 86m2 (direct access from gym) • Reformer Pilates room 122m2 • Wellness Room A 67m2 • Wellness Room B 61m2 (operable dividing wall between A & B combined 128m2) • Group fitness room 230m2 (above outdoor change village) • Program room stores • Modify/upgrade localised mechanical plant in affected areas		
MARC Construction Cost Total *inclusive of construction costs / preliminaries,	\$54,652,000 excl GST	
Design, Authorities and Project Management Fees	\$6,980,000	
Escalation to tender in late 2028 / early 2029	\$6,022,000	
Construction Contingency	\$6,066,000	
FF&E / AV and equipment	\$1,435,000	
Sundry costs / contingency	\$605,000	
MARC Total	\$75,760,000 excl GST	



EXISTING CONDITIONS

2 EXISTING CONDITIONS

2.1 Existing Site & Context

MARC is situated on Waverley Road, with the main entry and exit to and from the carpark on Waverley Road. There is a secondary entry / exit off Glenwood Ave - Aquatic Place.

It was opened in 2001, and was arguably the leading community aquatic and leisure centre in Victoria. It was an early representation of the now contemporary mega aquatic centre philosophy, which aims to service the needs of the whole of the community. The existing centre includes:

- 50m outdoor pool
- Indoor aquatic spaces including:
 - 25m pool
 - learn to swim
 - spa
 - warm water pool
 - wave pool with adjacent toddler pool and leisure water
- Health and fitness - strength training and cardio, and 2 group fitness rooms
- Change and amenities
- A quality cafe
- Allied health spaces
- Reception and front of house spaces
- Staff work spaces and meeting room

MARC originally operated a creche on the ground floor, however this has since closed.

The MARC site is built at the junction of 2 major creeks, now a major Melbourne Water easement (40m wide) which runs under the site.

The site is within a Public Use Zone (PUZ6). Parts of the site have an SBO (Special Building Overlay - Land Subject to Inundation). New Specific Controls Overlay (SC014 and SC015) were recently introduced for the Suburban Rail Loop (SRL) project.

A United Energy easement with 66kV/22kV overhead power lines is also indicated on the plan. There can be no buildings or structures within that easement.

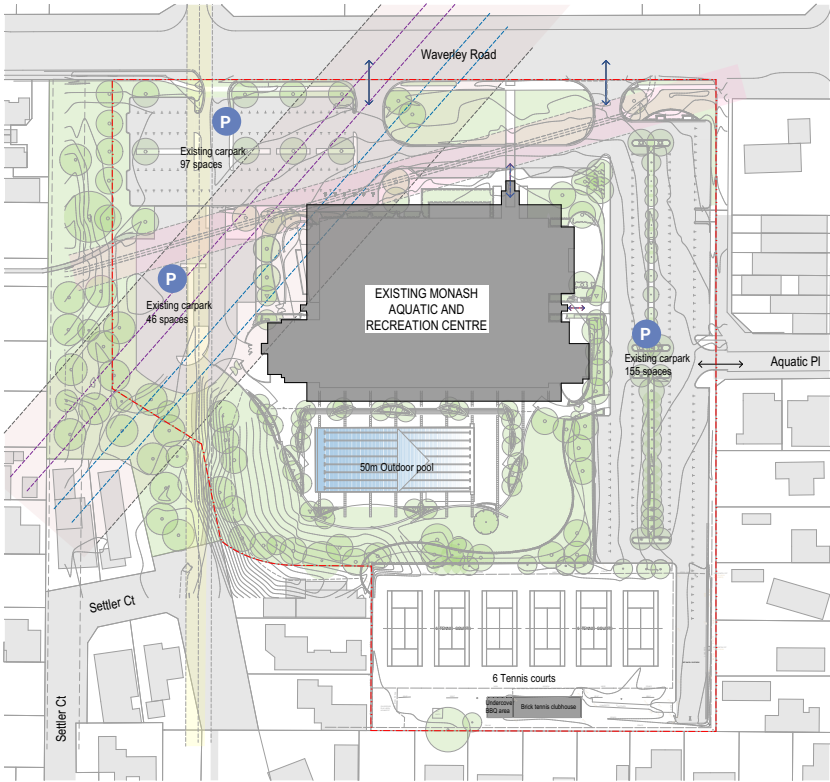
The on-grade car park wraps around the north, east and west of the site.

There is an existing Tennis Club building with 6 x tennis courts to the rear of the site.

The site is predominantly surrounded by low rise residential to the east, west and south.

Legend

- Title boundary
- Power easement
- Melbourne Water easement
- SRL - SO14 & SO15
- Existing building
- Pedestrian access
- Vehicle access
- Existing Tree
- ↔ Access Road
- P Existing Car Parking
- ||||| Pedestrian Crossing



Existing Site Plan

2.2 Existing Conditions & Maintenance

The original Building and Occupancy Permits confirm:

- Building Classification - 9b Assembly Building
- The ground floor occupancy of the building is 1183 persons plus 35 in the childcare (since closed)
- The first floor occupancy of the building is 260 persons
- The total floor area of the facility is 5,800m²
- The existing building is either a Type B construction with fire compartment separation to reduce the compartment to 5,500m² OR a Type A construction. Any expansion to the building footprint will need to confirm the original construction type prior to design. The simplest way to address any issues will be through fire-compartmentalisation of new extensions

2.2.1 Existing Building Fabric

MCC has a 10 year maintenance implementation plan for on-going renewal (refer appendix). This includes building and aquatic services, building fabric and fit-out.

Overall the existing building is in good condition. Finishes are mostly original in the pool hall and foyer spaces. Some renewal has been undertaken in the first floor fitness spaces and recently the gym flooring has been replaced.

The pool hall itself may have some fittings corrosion and condensation due to its age. A detail building fabric assessment was not undertaken with this study.

2.2.2 Existing Building Services

The following is a summary from BRT Services Engineers. Please refer the appendix for their full report

Power

The site power supply comes from a substation located at the eastern end of the building. High Voltage (HV) cables are located inground, running from Waverly Road to the sub-station location at the rear of the plant area.

The sub-station is rated at 1000kVA (1400A). The site measured a maximum demand at 702kVA (980A), and with the recently added heat pumps this will have increased in the order of 200kVA over the previous maximum demand, ie now approximately 900kVA. This leaves 100kVA spare for expansion.

The heat pump installation provides in the order of 50% of the total heat required for the facility.

Solar

The site has recently had 220kW solar PV system installed at the beginning of 2023.

Power Reticulation

Most existing switchboards are now 20 years old and will, in most cases, not be compliant with current regulations. They will also need significant modification to accommodate the new proposed layout and therefore it is proposed that in any areas where there is redevelopment, east of the existing pool hall etc., the switchboards will be upgraded to new boards.

The sub-mains that serve the dry areas of the building can be re-used where appropriate and where power loads permit.

Lighting

The lighting throughout the building has been upgraded to LED. Therefore, in the pool hall and areas where works are not been undertaken, the lighting can remain as is. Due to the reconfiguration of the eastern end of the building it will be unlikely that the existing lighting will suit the new configuration. New lighting will be required, both for the new plant area west of the pool halls and for all new building works east of the pool halls.

Water

The water supply to the property is fed from a 150mm main in Waverley Road. A 150mm water tapping feeds an 80mm domestic water line and 150mm fire service.

The domestic water line is more than sufficient to meet the future needs of the facility. There are concerns with the performance of the hot water system, with delivery of hot water subject to an intermittent issue where some zones experience lower than expected temperatures.

BRT recommends as part of the redevelopment that the loops to work areas be upgraded, including new pipework and new thermostatic mixing valves (TMV's) to be used as the temperature control devices for each group of fittings and fixtures.

Sewer

The sewer from the building runs east to a north/south main along the eastern boundary. There may be the need to pump from the west extension back to this location.

Gas

Natural gas is reticulated from a gas meter located at the western end of the building. The gas is predominately used for the HVAC systems and to heat the pool. A small amount of gas is used for the café

Fire Services

The building's wet fire service includes hydrants and hose reels. The hydrant system includes a 100mm fire ring main around the building fed from the 150mm fire service in the street. There is a booster connection located near the entry for the use by the local fire brigade.

A fire test was completed in July 2018 which confirmed that the system can provide 20 l/sec at 385kPa which suggests that the system should be suitable for the future redevelopment

Mechanical Services

The Heating, Ventilation and Air Conditioning (HVAC) system at MARC is a central heating water and chilled water system. Heating water is generated by boilers to provide heat to not only the HVAC equipment but also to heat the pool water bodies

The mechanical plant for the pool halls can essentially be retained. The air distribution into the main pool hall can remain as is. The pool hall HVAC plant will need to be upgraded with new fans (and possibly heating coils) as the current fans are at the end of their useful life.

The rest of the HVAC equipment is 20 years old. The indicative life of HVAC equipment is 20-25 years. So, by the time this redevelopment takes place the HVAC equipment will be at the end of its life. Therefore, other than the pool hall HVAC system, the rest of the mechanical plant will need to be upgraded as new

2.2.3 Existing Aquatic Services

The following is a summary from Hydrautech Aquatic Engineers. Please refer the appendix for their full report

The existing pool water treatment plants feature conventional end-suction pumps connected to less conventional filter cells. Unlike traditional standalone filter vessels, integral filter cells are provided as a part of the building structure. Although this design may offer some space saving advantages, the filter cells themselves are confined spaces which complicates ongoing maintenance (resurfacing) and media replacement.

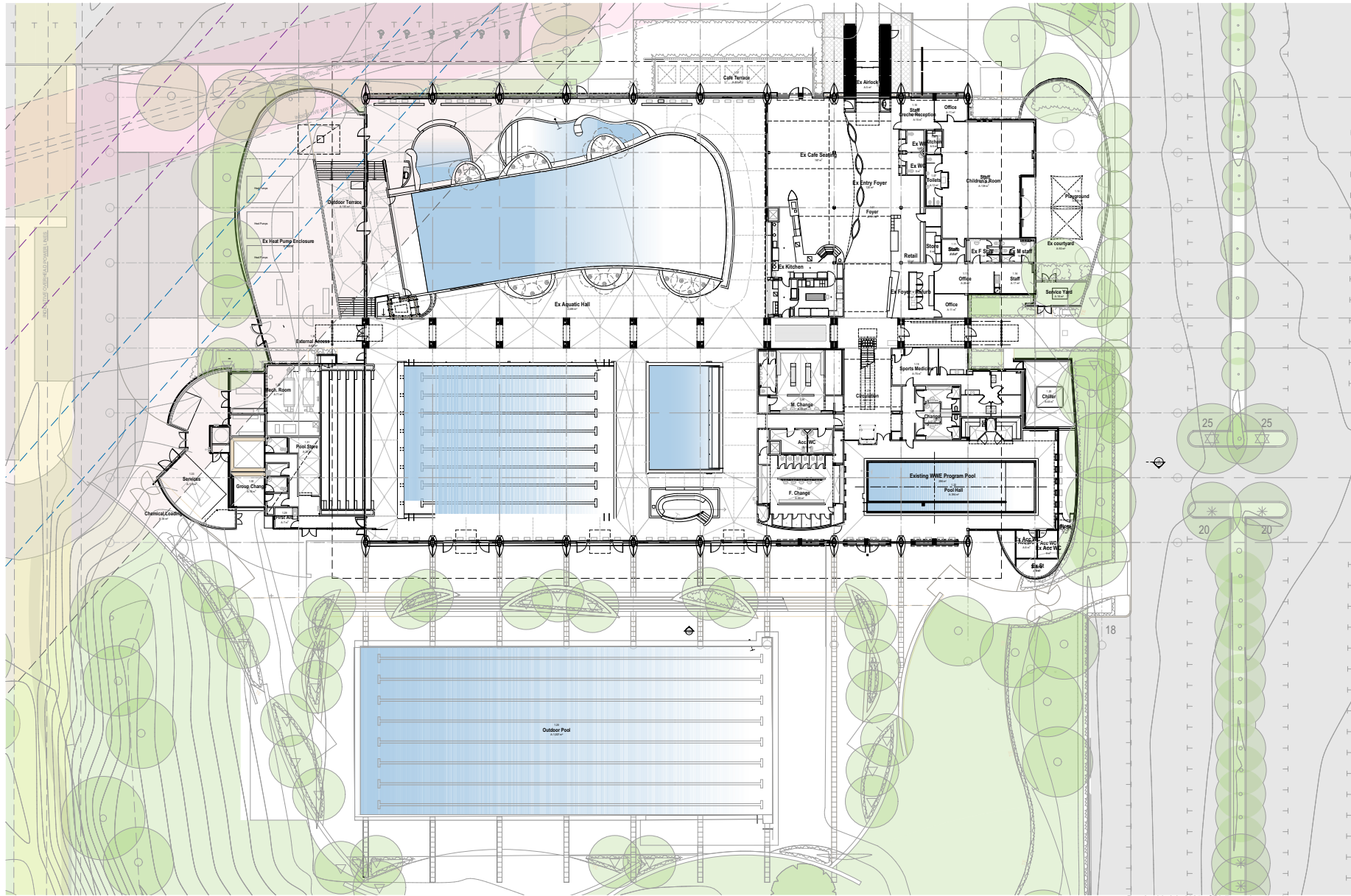
Filter cell technology is not implemented for modern aquatic facilities which will result in ever increasing servicing difficulties, especially for the multi-port valves required for this technology.

4 No. pool water treatment plants are provided to service all of the existing pools as follows;

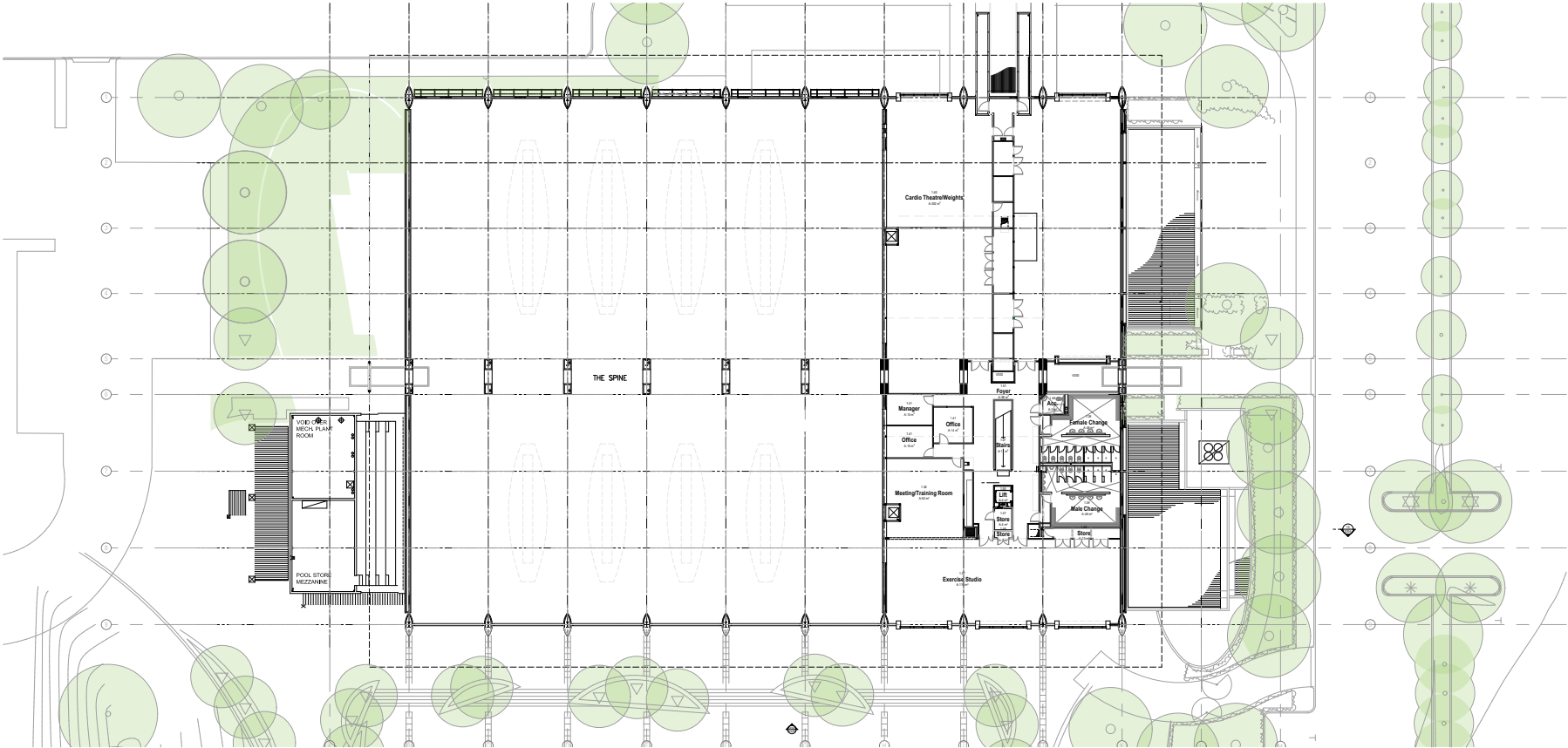
1. Outdoor 50m Pool (1,500m³). 400 m³/hr duty.
2. 25m Pool (714m³) and Learn to Swim Pool (78m³). 364 m³/hr combined duty.
3. Hydrotherapy Pool (162m³) and Spa Pool (20m³). 222 m³/hr combined duty.
4. Wave Pool (450m³) and Toddler Play Pools (47m³). 274 m³/hr combined duty.

Combining pool systems together creates issues including temperature control and cross-contamination risks.

The combined systems have recently resulted in some complications in pool heating due to the installation of the heat pumps.



Rev A - 4th July 2025 - SRL linework updated





DEVELOPMENT PROPOSAL

3 DEVELOPMENT PROPOSAL

3.1 Design Brief & Plans

The Development Proposal was identified through consultation with Monash Active staff and workshops to review plan options. The focus on achieving a cost-effective upgrade of the centre resulted in the overall works being developed as a single stage of works to improve the building operations and efficiency, improve accessibility and improve the offer of services to the community. These are described in the table on the following page.

The floor plans on the following pages illustrate the development scope for refurbishment and extension of the centre. Refer to the Services and Aquatic reports in the appendix for details of renewal.

Additional optional items were also identified including:

- Extension to the new staff office to create additional space for 2 x offices and up to 9 staff is a shared workspace
- Demolition of the existing Tennis club and construction on 120 on-grade car spaces
- Full electrification of the site
This involves additional heat pumps to be located at the west side of the site which would require the removal of some car parking.
The additional heat pumps may trigger the need to increase the capacity of the substation.
- Additional solar panels on the existing building and new extensions
- Moveable floor to new Program / LTS pool

3.1.1 Sustainability

The design, construction and operation of all major renewals, renovations, and upgrades to Council buildings should meet Council's *Environmental Sustainable Design Policy for Council Buildings and Infrastructure 2022*.

The policy establishes a consistent approach for achieving best practice Environmentally Sustainable Design (ESD) outcomes. It calls for major building projects to have a Green Star rating of 5 or 6 stars. Further consideration will need to be given in the next stage of design to the viability of using the GreenStar accreditation process for this project. Targetting a low-energy outcome in an existing aquatic centre may be a better overall outcome for the project.

Apart from determining the accreditation pathway, or not, the MARC Redevelopment should be designed to meet the requirements of the policy. A Sustainability Management Plan (SMP) will be prepared documenting how all ESD objectives, targets and standards will be met, and how the performance outcomes will be achieved.

The key ESD outcomes for the redevelopment include:

- Option to explore full electrification
- Improve mechanical system efficiency
- Improve the aquatic system heating and filtration
- Basement proposed for pool plant pumps to reduce energy
- General refurbishment and retention / re-use of existing building areas
- New warm water pool to be constructed in a high-thermal envelope with air-tightness and double-glazing
- Review and upgrade of existing pool hall building fabric to improve energy efficiency where budget permits

Component Summary	Development Rationale	Challenges being addressed	Benefits
East Refurbishment (ground) - Creche conversion to staff office area including a dedicated office, shared office for 20 - New staff lounge and amenities area including a quiet space - New change amenities area including a change village with 2 x accessible amenities, 1 x Changing Places, a range of all-gender facilities (separate WCs, dry change, showers and larger family change with showers) dedicated male and female amenities, lockers and seats throughout - Ex WWE Treatment Plant - New reception area, retail area, new airlock at the east entry and creation of a fitness foyer - New lift and stair - Modify / upgrade localised mechanical plant in affected areas	- Address accessibility and inclusive change options - Upgrade front of house spaces to improve customer experience - Construct new lift and stair to allow subsequent stages to progress with less disruption and future proof the Gym / Health & Fitness Expansion	Facility Maintenance / Operations / Compliance - Address poor compliance with DDA, access and inclusion regulations - Address staff work space over-crowding Service Delivery - Address customer accessibility and inclusion concerns - Address safety and passive surveillance issues at entry points and reception - Address poor customer interfaces	- Planned maintenance saving - Improved customer and staff spaces - Improved family and patron amenities with inclusive all-gender design additional accessible amenities and a Changing Places facility - Improved public entry points - New reception point improves safety, line of sight across the two entry points and security of the centre
New Outdoor Change Village New outdoor change village facility with all-gender facilities, lockers, seats and pool store	Address inclusive change options and support use of the existing 50m pool	Service Delivery - Address customer accessibility and inclusion concerns - Address lack of change and amenity provision outdoors	- Additional change facilities improving inclusive design of the centre - Reduce reliance on indoor change and amenities for outdoor patrons at peak times
West Refurbishment - Pool Plant Upgrade Replacement - construct a new pool plant with basement, separate filtration for all water bodies - Learn to swim pool extension with new accessible ramp (remove the spa) - Existing indoor 25m pool reduced by 1 lane to accommodate ramp, build new accessible ramp - New group change (2 x spaces for schools) with accessible and all-gender amenities, storage and first aid room. New group change entry to the west	- Address aging plant and filtration issues (ie new design will lessen pool closures) - Address accessibility issues into existing pools - Increase / improve change provision for schools	Facility Maintenance / Operations / Compliance - Address end-of-life and compliance issues with the pool plant and filtration - Address lack of accessibility into existing pools Service Delivery - Address lack of accessibility into existing pools - Address / alleviate demand on LTS pool - Address provision for School groups and improve security and safety for school groups	- Planned maintenance saving - Full replacement of pool plant alleviating current issues, forced pool shut-downs - More energy efficient pool plant - Increase life of the aquatic spaces - Improved accessibility into indoor pools - Improved child safety
New WWE Pool - Expansion of the Change Village including 1 x accessible amenities, 1 x Changing Places accessed directly off the WWE concourse, a range of all-gender facilities (dry change and larger family change with showers) - New warm water pool (20m x 10m) with ramp, concourse showers, spectator seating, space for mobility device 'parking' and storage - New spa 32m2; Two saunas 20m2 and 19m2; Steam room 19m2	Increase Warm Water Program pool water, spas and saunas	Facility Maintenance / Operations / Compliance - Address poor accessibility around existing WWE Service Delivery - Address lack of accessibility into existing pools - Address / alleviate demand on WWE pool - Address under provision of space for warm water therapy and exercise	- Minor planned maintenance saving - Larger (double) and more energy efficient WWE pool = increased revenue and programming - Increased sauna and steam provision - Spa better located with the WWE
New Zero Depth Splashpad & Ramp to 50m Pool - New zero depth splashpad, program pool and toddlers pool (in ex wave pool area) - Accessible ramp added to ex outdoor 50m pool	- Improve leisure offer - Address accessibility issues into existing 50m pool	Facility Maintenance / Operations / Compliance - Remove need for maintenance to wave pool Service Delivery - Address / alleviate demand on WWE and LTS pool - Address lack of accessibility into existing 50m pool - Address under provision of contemporary water play	- Improved accessibility into 50m pool - New, contemporary play features - Additional program pool for overflow, flexibility of programming and increased revenue
East Refurbishment (first) - Undercover access to outdoor changerooms and stairs to L1 – refer to updated plans - Gym expansion 653m2 - Function training zone 86m2 (direct access from gym) - Reformer Pilates room 122m2 - Wellness Room A 67m2 and Wellness Room B 61m2 (operable dividing wall between A & B combined 128m2) - Group fitness room 230m2 (above outdoor change village) - Program room stores - New all-gender Health & Fitness amenities with lockers - Modify/upgrade localised mechanical plant in affected areas	- Increase / improve health & fitness offer to increase individual and group options - Upgrade amenities to be more inclusive and in keeping with expectations	Service Delivery - Address under provision of health and fitness facilities - Address under provision of accessible and inclusion amenities	- Planned maintenance saving - Larger gym = increased revenue - Additional group fitness space - Improved patron amenities with inclusive all-gender design

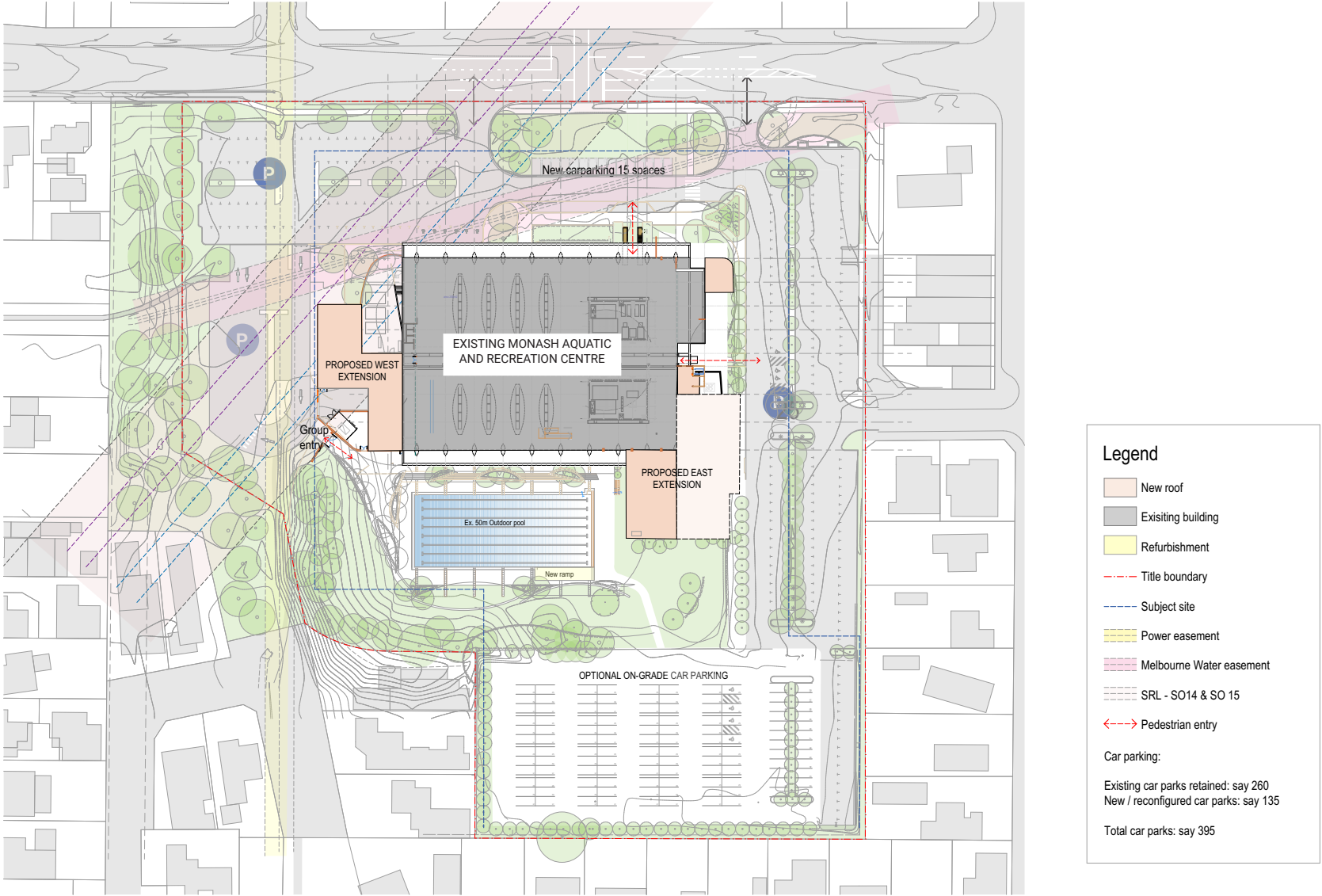
3.1.2 Service & Amenity Improvement Summary

The new development greatly improves on provision of services, amenities and aquatic spaces for the community.

A summary comparing the existing provision to proposed is below for key spaces.

Amenities		Existing	Proposed Development
Unit Numbers - Public			
Changing Places Facility		-	2
Accessible Amenities (toilet and shower)		3	9
All-gender amenities	Toilets	4	17
	Hand Basins	4	18
	Showers	-	15
	Individual Change	-	21 cubicles
Male Amenities	Toilets / urinals	6 / 8	6
	Hand Basins	9	7
	Showers	10	6
Female Amenities	Toilets	11	8
	Hand Basins	9	7
	Showers	10	6
Totals			
Changing Places Facility		-	2
Accessible Amenities (toilet and shower)		3	9
M, F and all-gender	Toilets / urinals	21 / 8	30
	Hand Basins	22	30
	Showers	20	27
	Individual Change	-	21 cubicles

Key Spaces		Existing	Proposed Development
Front of House & Staff			
Cafe (seating and kitchen)		260m ²	260m ²
Reception Area		14m ²	22m ²
Foyer		160m ²	210m ²
Staff Work Spaces		31 total workstations	21 total workstations with an optional extension for an extra 11 desks
Staff Lounge & Amenities		37m ²	115m ² incl toilets and quiet space
Aquatic Spaces			
Aquatic Change Village		200m ²	460m ²
Warm Water Pool (water area incl ramp)		110m ²	220m ²
Saunas		2 x 7m ²	2 x 20m ²
Spa		16m ²	32m ²
Learn to Swim Pool (water area incl ramp)		100m ²	145m ²
New Program Pool (20 x 10m plus ramp)		-	230m ²
Toddler Pool		-	43m ²
Splashpad		-	300m ²
Group Change Area		2 x 17m ² spaces	2 x 45m ² spaces
Health & Fitness Spaces			
Gym Space		300m ²	650m ²
Group Fitness Areas	Group Fitness 1	280m ²	230m ²
	Group Fitness 2	116m ²	86m ²
	Group Fitness 3	75m ²	122m ²
	Group Fitness 4	-	63m ²
	Group Fitness 5	-	63m ²

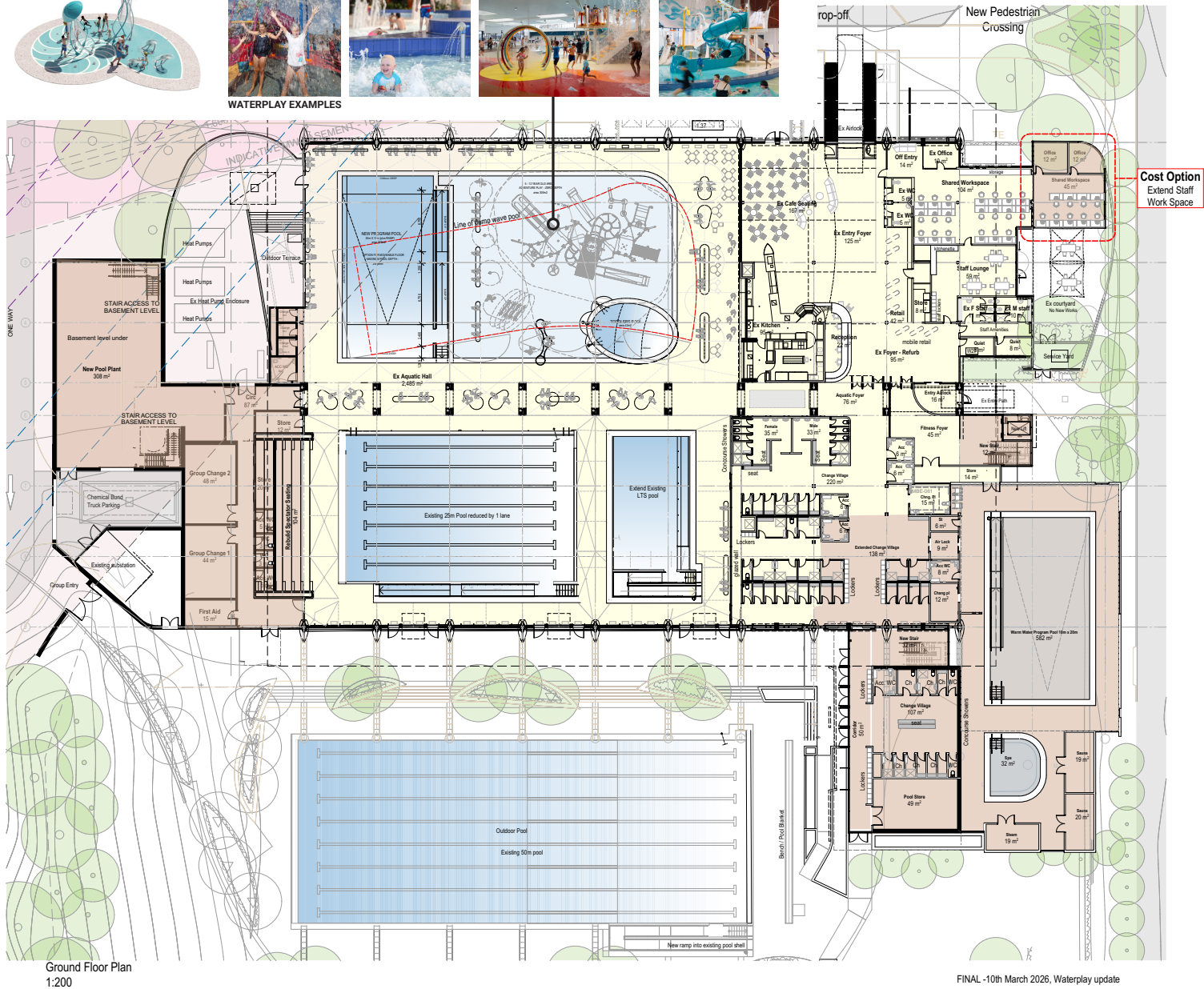
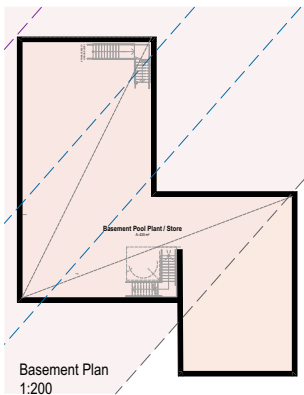




WATERPLAY EXAMPLES

Legend

- New works
- Refurbishment works
- Existing



Ground Floor Plan
1:200

FINAL -10th March 2026, Waterplay update



MARC Feasibility Study

Full Development Scope -
Ground



December 2024
1:200
07

Implementation

3.2 Design Response

The existing MARC facility has a strong presence to Waverley Road with a distinctive architectural design. The existing aquatic hall is highly transparent with a sweeping, singular gesture roof line. The pool hall is book-ended on the east and west with lower forms that are more enclosed and inward looking..

The redevelopment provides an opportunity to renew the eastern facade and entry, creating a more transparent, welcoming and visible entry experience. The greater expanse of glazing increases natural light into the reception and foyer areas and visual connection to the first floor health & fitness areas. In the evening, this entry will improve safety through greater lighting and clear visibility for both patrons and staff.

The formal approach to new works respects the original design response. The new forms sit under the existing roof line to allow the MARC pool hall to retain its presence on the site and the roof to sail across.

The new forms seek to be complementary to the existing centre so as not to compete. Materials and colours are only indicative.



Artist Impression - view across the existing 50m pool to the new east extension



Artist Impression - view of the new east entry and warm water pool extension



IMPLEMENTATION

4 IMPLEMENTATION

4.1 Capital Costs

Turner Townsend Quantity Surveyors have provided a Cost Plan A for the Development Options, as summarised opposite. This cost plan has been informed by detailed cost breakdowns for building services from BRT Services Engineers and aquatic costs from Hydrautech Aquatic Engineers.

Component Summary	Indicative Project Cost
East Refurbishment (ground)	\$6,918,000
- Creche conversion to staff office area - New staff lounge and amenities area - New change amenities area including change village - Ex WWE Treatment Plant - New reception area - New lift and stair - Modify / upgrade localised mechanical plant in affected areas	
New Outdoor Change Village	\$2,276,000
New outdoor change village facility and pool store	
West Refurbishment	\$17,515,000
- All new Pool Plant Upgrade / Replacement - Learn to swim pool extension with new accessible ramp - Existing indoor 25m pool reduced by 1 lane to accommodate ramp, build new accessible ramp - New group change and first aid room	
New WWE Pool	\$9,314,000
- Refurbishment of new change amenities areas - New warm water pool (20m x 10m) with ramp - New spa 32m2 - Two saunas 20m2 and 19m2 - Steam room 19m2	
New Zero Depth Splashpad & Ramp to 50m Pool	
- New zero depth splashpad, program pool and toddlers pool (in ex wave pool area) - Accessible ramp added to ex outdoor 50m pool	\$11,221,000
East Refurbishment (first)	\$7,434,000
- Undercover access to outdoor changerooms and stairs to L1 – refer to updated plans - Gym expansion 653m2 - Function training zone 86m2 (direct access from gym) - Reformer Pilates room 122m2 - Wellness Room A 67m2 - Wellness Room B 61m2 (operable dividing wall between A & B combined 128m2) - Group fitness room 230m2 (above outdoor change village) - Program room stores - Modify/upgrade localised mechanical plant in affected areas	
MARC Construction Cost Total *inclusive of construction costs / preliminaries,	\$54,652,000 excl GST
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FF&E / AV and equipment	\$1,435,000
Sundry costs / contingency	\$605,000
MARC Total	\$75,760,000 excl GST

4.2 Cost Options

- Additional optional items were explored including:
- Extension to the new staff office to create additional space for 2 x offices and up to 9 staff is a shared workspace
 - Demolition of the existing Tennis club and construction on 120 on-grade car spaces
 - Full electrification of the site
This involves additional heat pumps to be located at the west side of the site which would require the removal of some car parking.
The additional heat pumps may trigger the need to increase the capacity of the substation.
 - Additional solar panels on the existing building and new extensions
 - Moveable floor to new Program / LTS pool

Cost Options	Staff Work Space Extension	\$929,000 excl GST
	Demolish Tennis Club & build new on-grade Car Parking (sth, 120 spaces)	\$3,538,000 excl GST
	500kW PV Cells	\$1,149,000 excl GST
	Electrification	\$3,216,000 excl GST
	Moveable floor to new Program / LTS pool	\$3,339,000 excl GST

4.3 10 Year Maintenance Plan

Council has a 10 year Maintenance Plan for MARC totalling approximately \$9.955M.

The Maintenance Plan was reviewed by the consultant team to identify what scope has been allowed for or would be made redundant by the proposed Development Options.

The works were categorised as:

- Mechanical and electrical upgrades
- Aquatic Upgrades
- Building fabric upgrades (ie building and fitting renewal)

The total reduction from the 10 year Maintenance Plan is approximately **\$7.43M excl GST**, broken down as follows:

Components from the 10 yr Maintenance Plan	Maintenance Cost Saving exc GST
Mechanical and electrical planned upgrades	\$1.05M
Aquatic infrastructure planned upgrades	\$4.38M
Building fabric planned upgrades	\$2M
Total Savings - 10 yr Maintenance Plan	\$7.43M

4.4 Delivery

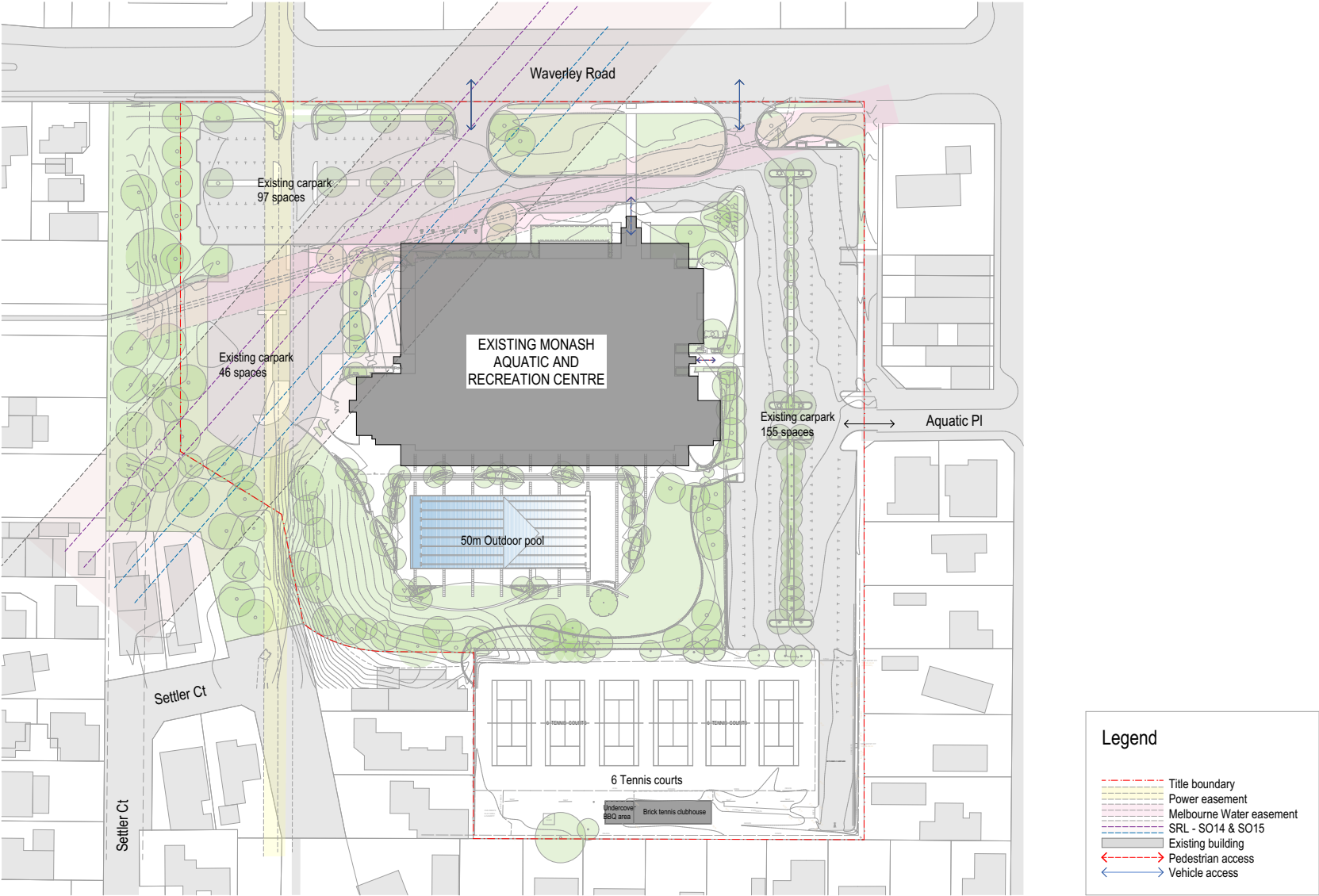
The MARC Redevelopment will be delivered as a single stage of construction requiring the full closure of the centre in 2028 / 2029. It is estimated this construction period may be approximately 2 years.

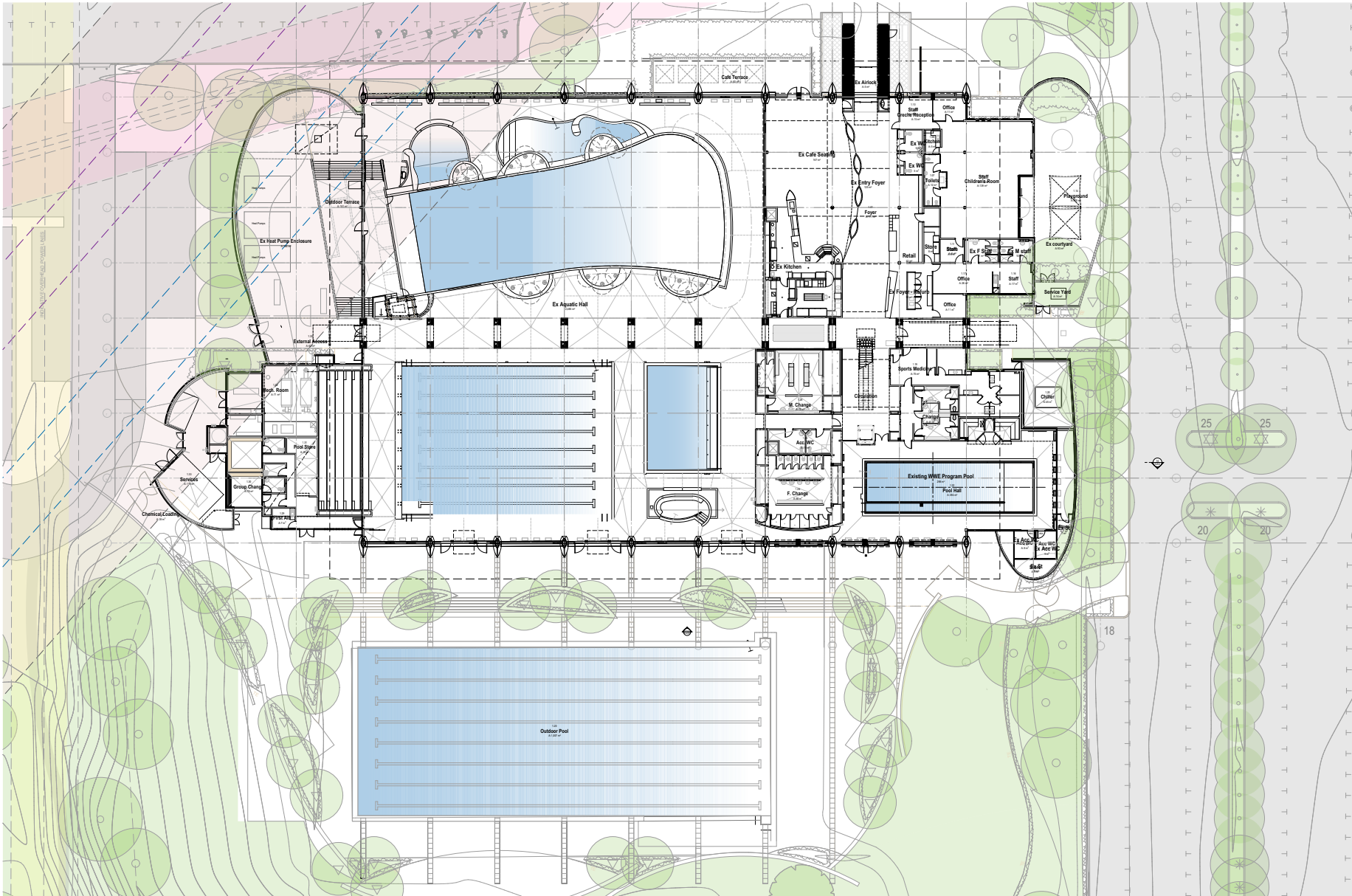
Staging of works was explored for the project delivery, however this was assessed as undesirable ultimately due to the high level of continual disruption to the community use of the centre, the lengthening of the overall construction program and increased cost. For example a major part of the redevelopment works include the full replacement of pool plant and filtration. This work requires complete closure of aquatic spaces and is best combined with the construction of the new warm water program pool.

The recommendation for a single construction period alleviates concerns about operational disruption, community frustration over lengthy construction periods and safety around construction in an operating site.



Appendix A: Architectural Drawings





Rev A - 4th July 2025 - SRL linework updated

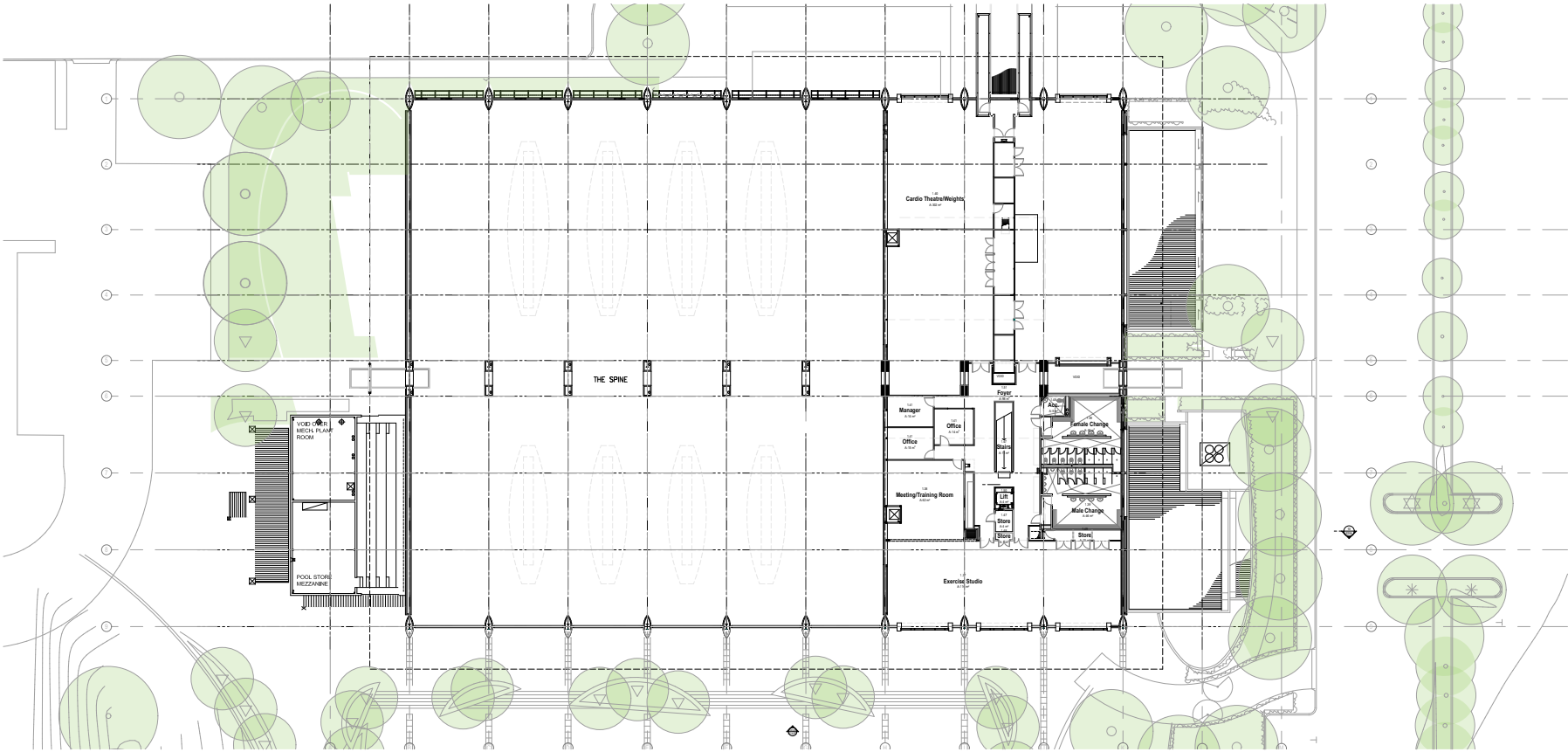


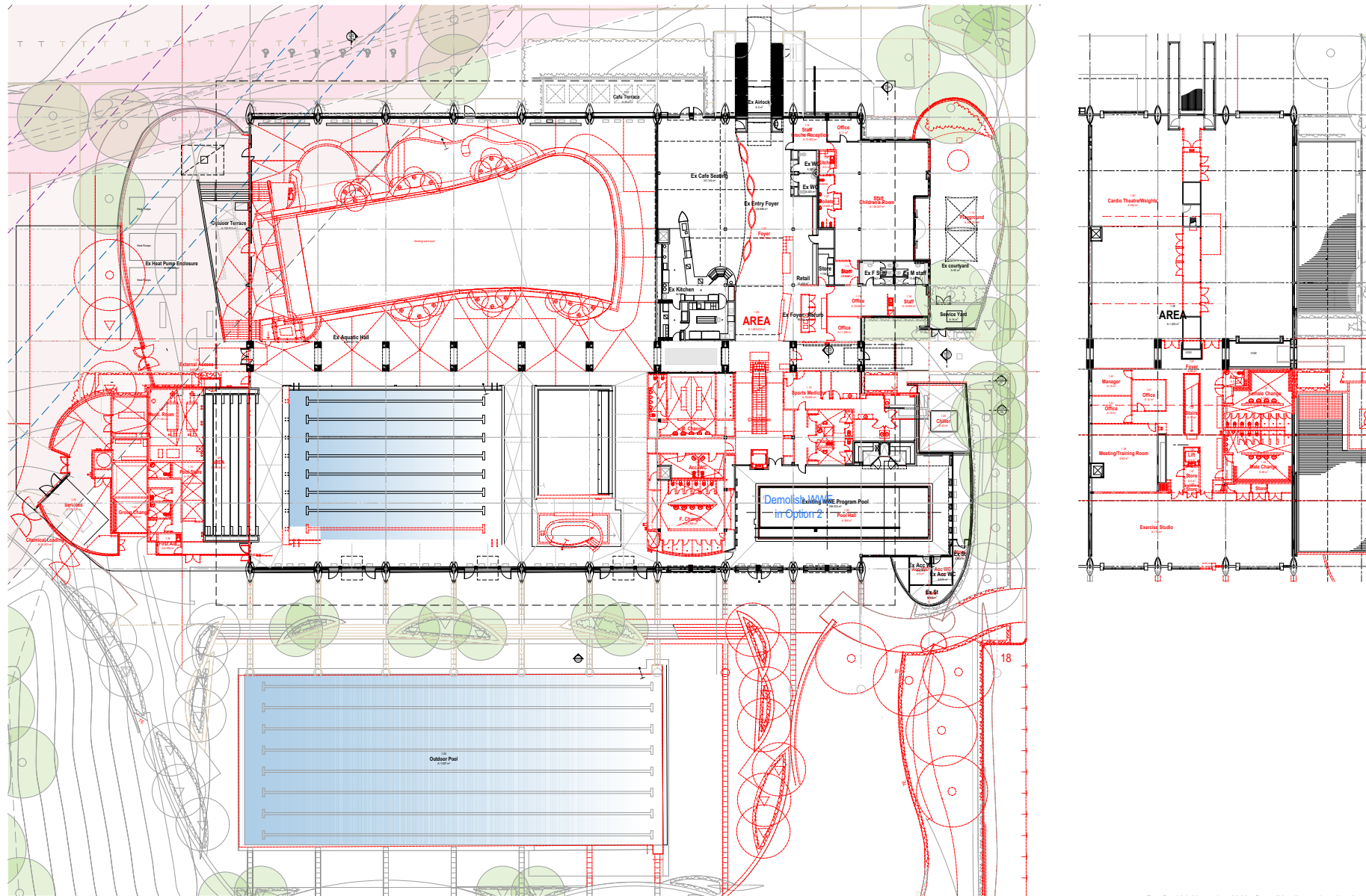
MARC Feasibility Study

Existing Ground Floor Plan



December 2024
1:200
02





Demolition Ground Floor Plan
1:200

Rev B - 18th November 2025 - Demolition linework updated
Rev A - 4th July 2025 - SRL linework updated

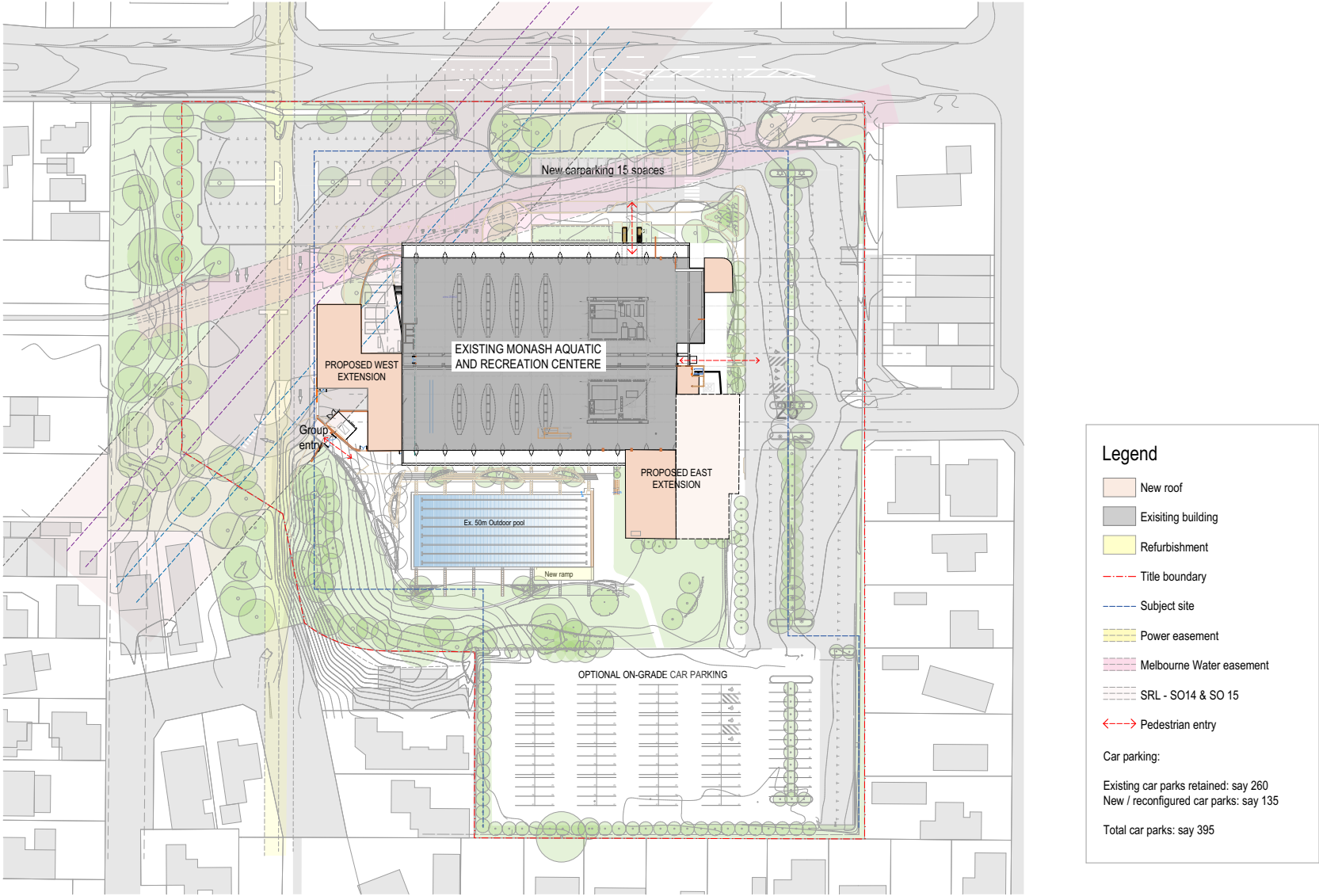


MARC Feasibility Study

Demo Plans

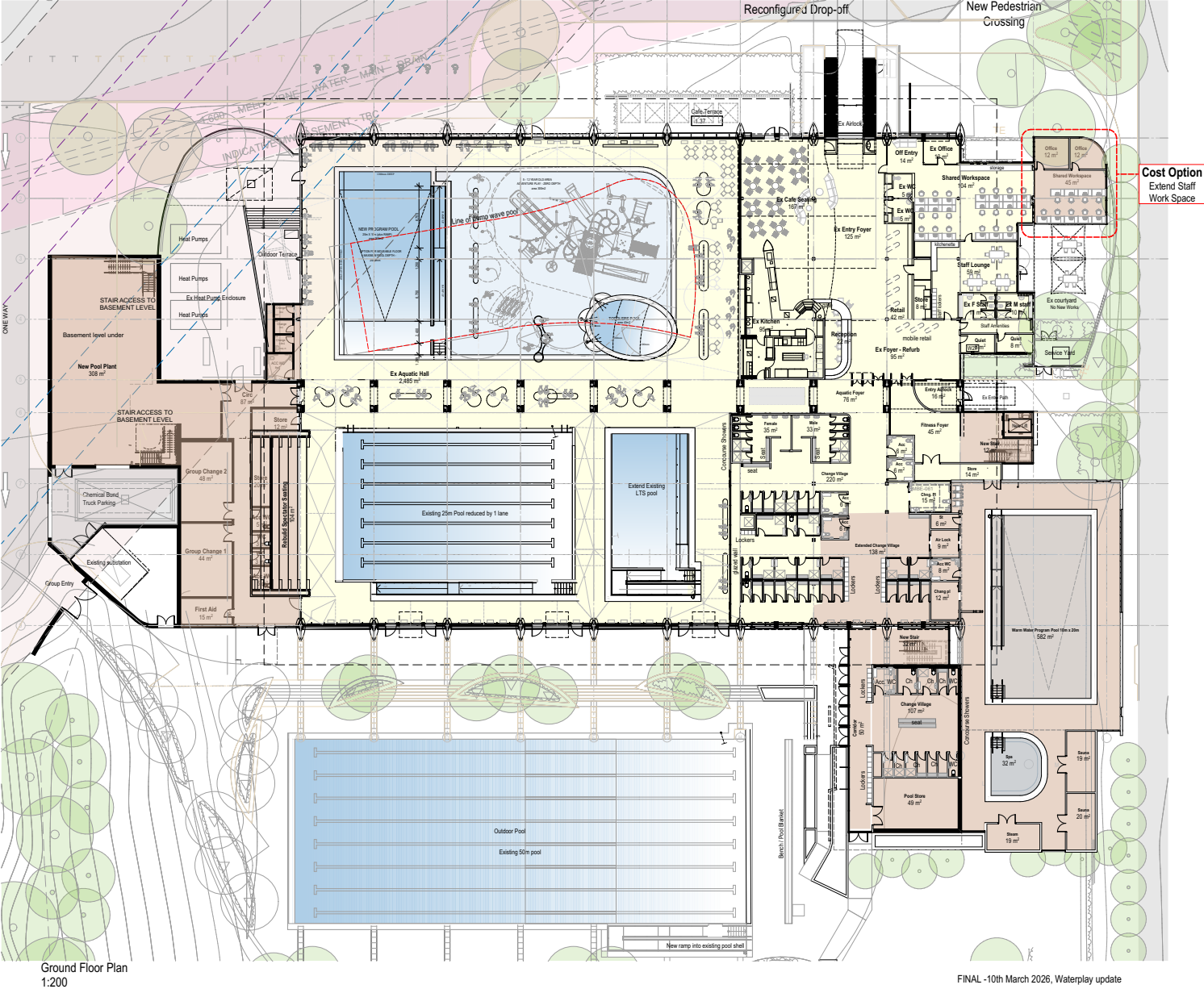
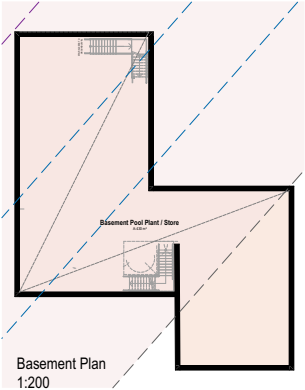


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04



Legend

- New works
- Refurbishment works
- Existing



MARC Feasibility Study

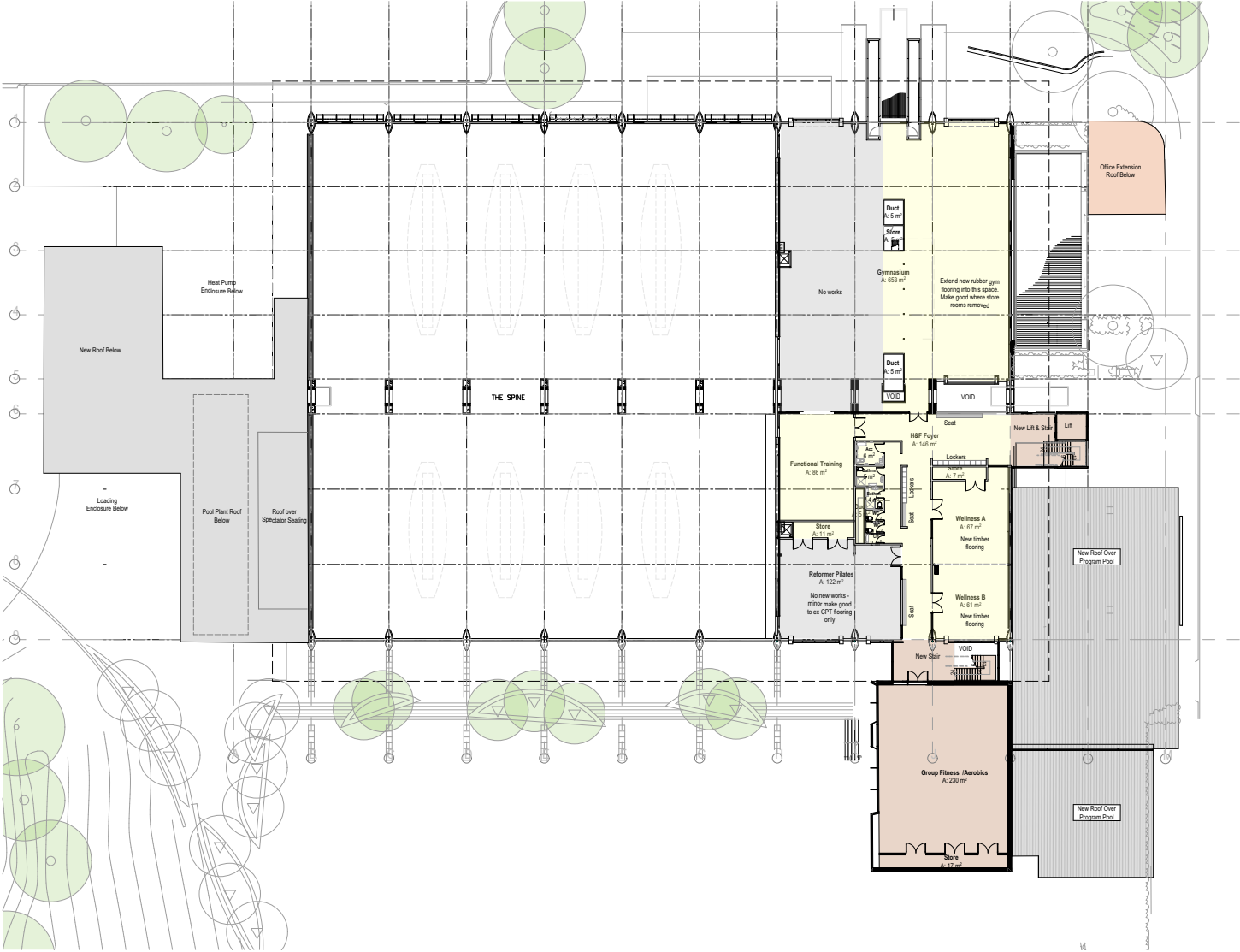
Full Development Scope -
Ground

December 2024
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07

Legend



New works
Refurbishment works
Existing



FINAL -10th March 2026, Waterplay update



MARC Feasibility Study

Full Development Scope -
First



December 2024
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08



Appendix B: Services Report

ENGINEERING
SERVICES

Feasibility Report



Monash Aquatic Recreation Facility **City of Monash**





DOCUMENT REVISION

Stage	Revision	Revision Description	Author	Checked by	Revision Date
FE	00	Feasibility Report – For Review	MQ	ST	25.02.2025

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2.0 Introduction

2.1 The project

City of Monash (COM) is undertaking a review of the Monash Aquatic and Recreation Centre (MARC), with a view to develop costings and a scope of works to upgrade and expand the facility to meet the current demands and expectations of the community.

The intent of this report is to provide:

- high-level review of existing services
- proposed high-level scope of work for each option
- Assessment of heating and cooling system capacities for each stage of proposed works
- Advice on staging to enable continued operation of facility
- Maintenance implications for proposed areas of works

2.2 The Building

MARC is an existing sports and aquatic centre that was design by Williams Ross Architects in the year 2000. The facility was constructed in 2001 and is in the order of 25 years old. The facility is located at 626 Waverley Road, Glen Waverley.

The facility includes the following:

- Indoor 25m lap pool
- Indoor wave pool
- Indoor play pool
- Indoor warm water pool
- Outdoor 50m pool
- Café
- Children Room
- Offices
- Cardio/Weights
- Aerobics
- Studio
- Training/Meeting Rooms

2.3 Overview of Proposed Works

The proposed works has been separated into 3 works packages:

Option 1: Core Works

- Conversion of Children Room to Staff offices and admin area
- Removal of sports medicine offices and creation of Fitness Foyer
- Refurbishment of Aquatic Change rooms
- New pool plant area
- Refurbishment of Group Change area
- New outdoor pool change area
- Decoupling of the aquatic filtration pipework (separate to the scope of this report)

Option 2: Future Core Works

- Extension of Aquatic Change area
- Demolition of existing warm water pool and sauna
- New warm water pool, sauna and spa

Option 3: Additional Works

- Conversion of Aerobics Room into Gym
- Conversion of fitness offices to New Functional Training Room
- New Wellness Rooms
- New Amenities
- Conversion of existing functional Training Room to Reformer Pilates
- Upgrade of end-of-life mechanical equipment



3.0 Existing Services

3.1 Electrical Services

3.1.1 Power

The site power supply comes from a substation located at the eastern end of the building. High Voltage (HV) cables are located inground, running from Waverly Road to the sub-station location at the rear of the plant area.

The sub-station is rated at 1000kVA (1400A). The site has measured a maximum demand at 702kVA (980A) with approximately 300kVA spare for future expansion.

The council has recently added heat pumps to the facility to lower the overall carbon footprint which has added in the order of 200kVA over the previous maximum demand. The heat pump installation provides in the order of 50% of the total heat required for the facility.

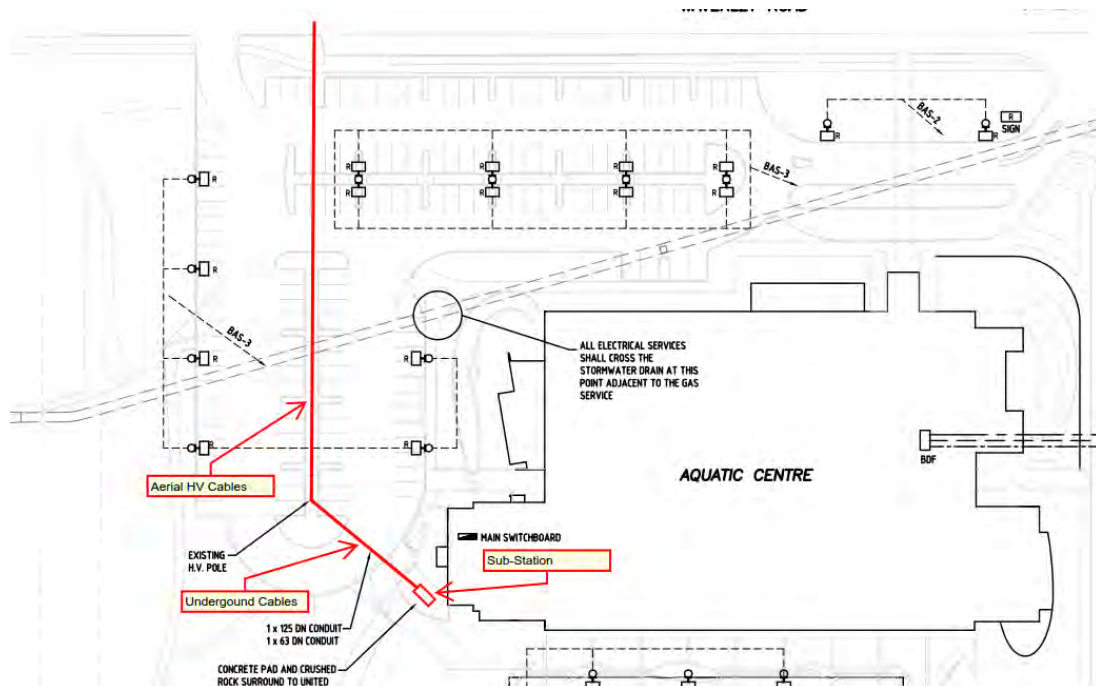


Fig 1 - Incoming Power Supply

3.1.2 Solar

The site has recently had 220kW solar PV system at the beginning of 2023.

3.1.3 Power Reticulation

Most existing switchboards are now 20 years old and will, in most cases, not be compliant with current regulations. They will also need significant modification to accommodate the new proposed layout and therefore it is proposed that in any areas where there is redevelopment, east of the existing pool hall etc., the switchboards will be upgraded to new boards.

The sub-mains that serve the dry areas of the building can be re-used where appropriate and where power loads permit.



3.1.4 Lighting

The lighting throughout the building has been upgrade to LED. Therefore, in the pool hall and areas where works are not been undertaken, the lighting can remain as is. Due to the reconfiguration of the eastern end of the building it will be unlikely that the existing lighting will suit the new configuration. New lighting will be required, both for the new plant area west of the pool halls and for all new building works east of the pool halls.

3.1.5 Fire

The facility has the following fire safety measures:

1. Fire hydrant and hose reels. Further information around the installed system performance is provided below.
2. Fire detection system connected to a Fire Indicator Panel.
3. Building Occupant Warning System (BOWS)
4. Emergency and exit lights

The redevelopment includes an increase to the overall floor area and volume. This will result in a need to re-evaluate all the fire protections services in light of current codes and regulations. The building will most likely come under the 'large isolated building' provisions of the BCA and will need to be assessed accordingly.

In similar buildings, fire engineering has been required to ensure efficient and safe design understanding the unique requirements of a sports and aquatic centre.

3.1.6 Security

The existing facility has both a security system and CCTV system. As the dry area is being significantly redeveloped, the security system will need to be modified and extended to suit the new layouts.

Access control and members system will be significantly affected by the changes and will need to be modified to suit.

3.1.7 Communications

The existing communication cables to the building run from Waverley Road to the north via underground conduits. The incoming cables can be retained and modified to suit the new layout.

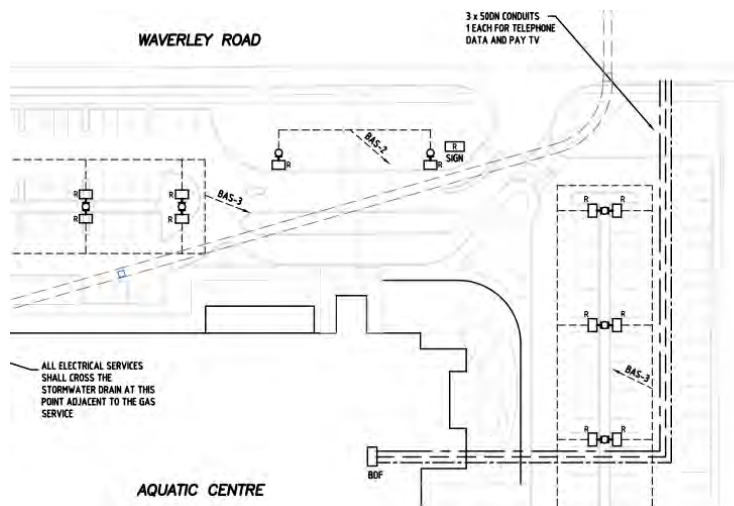


Fig 2 - Incoming communications cabling



3.2 Hydraulic Services

3.2.1 Water

The water supply to the property is fed from a 150mm main in Waverley Road. A 150mm water tapping feeds an 80mm domestic water line and 150mm fire service.

The domestic water line is more than sufficient to meet the future needs of the facility.

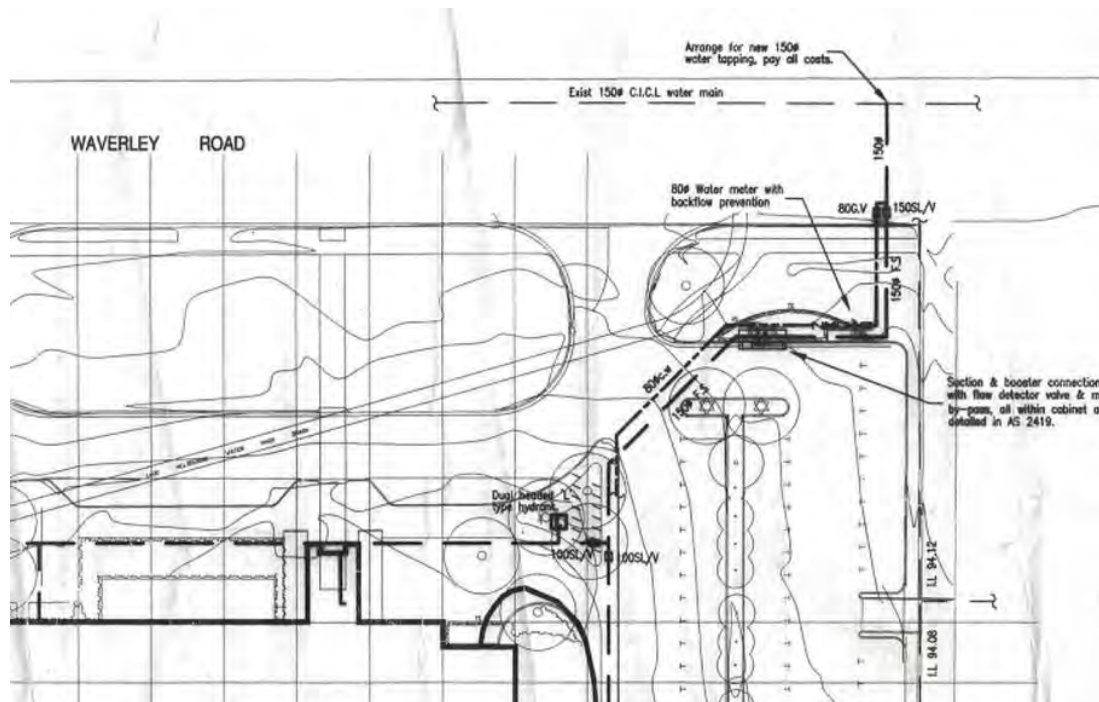


Fig 3 – Water Supply Connection

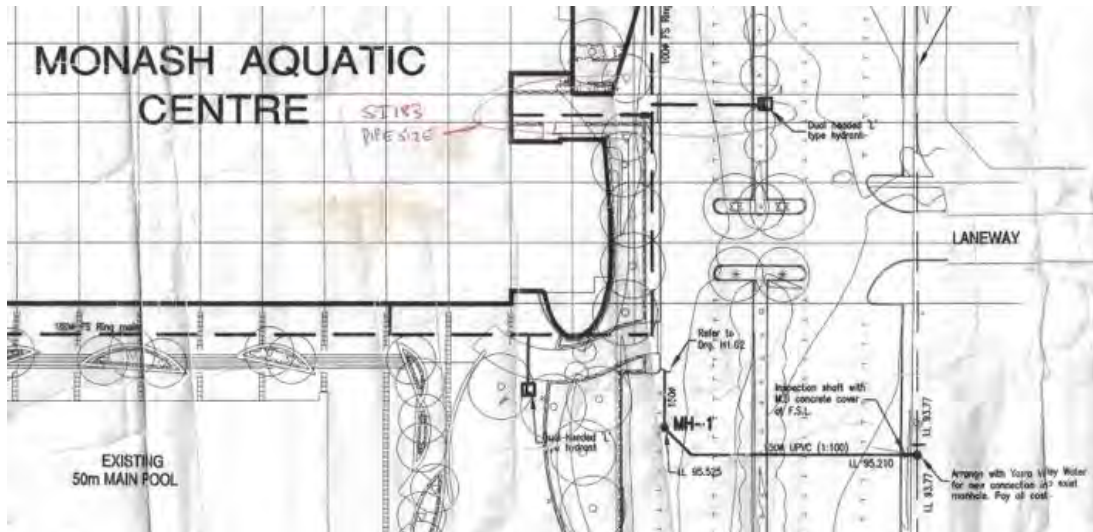
3.2.2 Domestic Hot Water

The domestic hot water is a ring main serviced via the central heating plant. Council has recently upgraded the domestic hot water system to include a Heat Pump and an additional condensing boiler to increase overall capacity and efficiency. This proposed new system will be more than adequate to meet the ends of the proposed redevelopment.

The existing system uses UV disinfectant for the warm water loop..

It is understood that there are concerns with the performance of the hot water system, with delivery of hot water subject to an intermittent issue where some zones experience lower than expected temperatures. BRT do not believe there are capacity issues with current installation, rather there are issues with the existing building pipework reticulation and hot water equipment that warrants further investigation. As a result, BRT would recommend as part of the redevelopment that the loops to work areas be upgraded, including new pipework and new thermostatic mixing valves (TMV's) to be used as the temperature control devices for each group of fittings and fixtures.

The sewer from the building runs east to a north/south main along the eastern boundary. As the majority of the proposed works is at the eastern end of the site, there will be no issue connecting the redeveloped building works to the existing sewer. Detailed analysis of the depth of the proposed plant at the western end of the building will be required, however all the waste will be pool water only and therefore the pumping will not involve solids.



3.2.4 Gas

3.3 Fire Services

3.4 Mechanical Services

The mechanical plant for the pool halls can essentially be retained. The air distribution into the main pool hall can remain as is. The pool hall HVAC plant will need to be upgraded with new fans (and possibly heating coils) as the current fans are at the end of their useful life.



The rest of the HVAC equipment is 20 years old. The indicative life of HVAC equipment is 20-25 years. So, by the time this redevelopment takes place the HVAC equipment will be at the end of its life. Therefore, other than the pool hall HVAC system, the rest of the mechanical plant will need to be upgraded as new.

In addition to the HVAC equipment age, the new spaces will have different heating/cooling demands and therefore may require changes to relevant capacities anyway.

As described in the gas clause above, the facility will have 50% of the maximum demand heat load produced from new heat pumps. Some of these heat pumps provide chilled water as well as heating water and therefore the existing chiller does not need to be replaced as part of the new works.

If there is a desire to ensure that the facility is carbon zero, additional heat pumps will need to be included in the redevelopment to ensure that 100% of the maximum heat demand can be supplied from the heat pumps. At this stage this has not been considered as part of this feasibility report and proposed works

4.0 Proposed Scope of Works

The following provides a summary of proposed services works for each of the 3 options presented. Services works have been separated into required works (minimum services upgrades and modifications to facilitate building works) and optional works (works not necessarily required to facilitate works, but recommended for upgrade given efficiencies of works in the area and equipment is at end of life with an expectation of replacement within the short to medium term).

Sketches of proposed works have been appended to this report:

4.1 Option 1: Core Work

A summary of required works includes:

- Mechanical
 - o Relocation of 2no. Modulex Boilers (750kW), new hot water pumps and modifications to the hot water pipework to reconnect to the existing pipework
 - o New Mechanical Services Switchboard. Recommended to size switchboard for future expansion of heat pumps to facilitate 100% of heating load
 - o New HEX with heating coil to replace AHU-14 (Group Change and amenities)
 - o New Split system AC in First Aid Room
 - o Replace AHU-4 with outside air HEX to new Staff/Admin areas. New VRF AC to Staff/Offices to provide individual temperature control to each space
 - o New AHU-3 and AHU-5 to provide heating and cooling to revised foyer area
 - o New AHU-7 to Fitness Foyer
 - o New HEX with heating coil to replace AHU-9 (Change Village)
 - o Modification to supply air ductwork to existing warm water pool
 - o New AHU-15 to outdoor pool change village
 - o New supply air and exhaust to pool plant areas and outdoor pool store
- Electrical
 - o New Main Switchboard in revised location. Recommended to size switchboard for future expansion of heat pumps to facilitate 100% of heating load
 - o New power and lighting to suit revised areas, including new switchboards
 - o Modified fire detection to suit revised areas
 - o New Lift
 - o Modified security, including intruder detection, CCTV, door access control and members access control
- Hydraulic
 - o Relocation of gas meter and revision of gas pipework
 - o Modification of domestic hot water, cold water and sewer to suit
 - o New sewer pump in pool plant area

A summary of optional works recommended to be included as part of the project includes:

- Mechanical
 - o Refurbish AHU-1 and 2 (air handling to pool hall)
 - o Replace AHU-6 – Kitchen supply air
 - o Replace EF-2 and EF-4 – Kitchen hood and dishwasher hood exhaust fans
 - o Replace EF-3 – Amenities exhaust to staff work area



4.2 Option 2: Core Work

A summary of required works includes:

- Mechanical
 - o Additional New HEX (AHU-9A) – to provide new extended Change Village
 - o New AHU-8 to new warm water pool
- Electrical
 - o New power and lighting to suit revised areas, including new switchboards
 - o New fire detection to suit revised areas
 - o New security, including intruder detection, CCTV, door access control and members access control
- Hydraulic
 - o Modification of domestic hot water, cold water and sewer to suit

4.3 Option 3: Additional Work

A summary of required works includes:

- Mechanical
 - o Replace AHU-11 to provide heating and cooling to revised Gym area
 - o Replace AHU-12 to provide heating and cooling to revised Reformer Pilates area
 - o Replace AHU-13 to provide heating and cooling to Functional Training area
 - o New AHU-16 and AHU-17 to provide heating and cooling to Wellness Rooms
 - o New AHU-18 to provide heating and cooling to Group Room
 - o New exhaust fan to amenities
- Electrical
 - o New power and lighting to suit revised areas, including new switchboards
 - o Modified fire detection to suit revised areas
 - o Modified security, including intruder detection, CCTV, door access control and members access control
- Hydraulic
 - o Modification of domestic hot water, cold water and sewer to suit

A summary of optional works recommended to be included as part of the project includes:

- Mechanical
 - o Replace AHU-10 to provide heating and cooling to revised Gym area

5.0 Central Mechanical Plant Capacity Review

5.1 Central Heating Plant

The centre currently utilises central heating plant to provide:

- airside heating to dry spaces
- airside heating to pool hall
- heating to pool plant

Currently heating is provided by 3no. boilers and 3no. electric heat pump systems:

- 1 x Hunt boiler – 1450kW (25-years old)
- 2 x Modulex 770 internal boilers – 750kW each (recently replaced)
- 2 x 375kW 2-pipe heat pumps and 1 x 270kW 4-pipe heat pumps for a total of 1000kW heating

As part of option 1 works, it is proposed to relocate the 2no. Modulex boilers to a new location, and remove the Hunt heating boiler. These works will retain central heating plant in the order of 2500kW for the facility.



5.1.1 Heating Estimate Per Option

The following table provides a summary of estimated heating demand after each stage. It should be noted that heating remains under the 2500kW central plant, which should remain sufficient for each option.

				Existing	Option 1	Option 2	Option 3
Unit	Works	Existing Location	Proposed	Heating	Heating	Heating	Heating
AHU-1	Option Replace - Stage 1	Wave Pool	Wave Pool	125	125	125	125
AHU-2	Option Replace - Stage 1	25m Pool	25m Pool	125	125	125	125
AHU-3	Replace - Stage 1	Foyer	Foyer	23.3	23.3	23.3	23.3
AHU-4	Delete - Replace with HEX	Creche	Admin	36.2	-	-	-
AHU-5	Replace - Stage 1	Foyer	Foyer	39.1	39.1	39.1	39.1
AHU-6	Option Replace - Stage 1	Kitchen	Kitchen	32.4	32.4	32.4	32.4
AHU-7	Replace - Stage 1	Sports Offices	Fitness Foyer	29.9	29.9	29.9	29.9
AHU-8	Replace stage 2	Warm water pool	Warm water pool	75.6	75.6	75.6	75.6
AHU-9	Replace - Stage 1	Change Village	Change Village	55.2	55.2	55.2	55.2
AHU-9A	New		Change Village	-	-	35	35
AHU-10	Remain	Cardio/Weights	Cardio/Weights	43.2	43.2	43.2	43.2
AHU-11	Remain	Aerobics	Aerobics	43.2	43.2	43.2	43.2
AHU-12	Remain	Exercise Studio	Reformer Pilates	61.2	61.2	61.2	35
AHU-13	Remain	Offices	Functional Training	13.2	13.2	13.2	35
AHU-14	Replace - Stage 1	Group Change	Group Change	17	17	17	17
AHU-15	New		Outdoor Village	-	30	30	30
AHU-16	New		Wellness	-	-	-	20
AHU-17	New		Wellness	-	-	-	20
AHU-18	New		Group Fitness	-	-	-	60
Air side Heating				719.5	713.3	748.3	843.9
Pool Heating				1380	1380	1380	1380
Total Heating Required				2099.5	2093.3	2128.3	2223.9

Table 1: Estimated Building Heating Demand

5.2 Central Cooling Plant

The centre currently utilises central cooling plant to provide airside cooling to dry spaces.

Currently cooling is provided by 2 separate cooling systems:

- 1 x York Chiller – 355kW (25-years old)
- 1 x 4-pipe heat pump - 200kW heating

The total chilled water load for the facility is 555kW.



5.2.1 Cooling Estimate Per Option

The following table provides a summary of estimated cooling demand after each stage. It should be noted that cooling remains under the 555kW central plant, which should remain sufficient for each option.

Unit	Works	Existing Location	Proposed	Existing	Option 1	Option 2	Option 3
				Cooling	Cooling	Cooling	Cooling
AHU-1	Option Replace - Stage 1	Wave Pool	Wave Pool	-	-	-	-
AHU-2	Option Replace - Stage 1	25m Pool	25m Pool	-	-	-	-
AHU-3	Replace - Stage 1	Foyer	Foyer	39.5	39.5	39.5	39.5
AHU-4	Delete - Replace with HEX	Creche	Admin	42	-	-	-
AHU-5	Replace - Stage 1	Foyer	Foyer	54	54	54	54
AHU-6	Option Replace - Stage 1	Kitchen	Kitchen	21	21	21	21
AHU-7	Replace - Stage 1	Sports Offices	Fitness Foyer	16.2	16.2	16.2	16.2
AHU-8	Replace stage 2	Warm water pool	Warm water pool	-	-	-	-
AHU-9	Replace - Stage 1	Change Village	Change Village	-	-	-	-
AHU-9A	New		Change Village	-	-	-	-
AHU-10	Remain	Cardio/Weights	Cardio/Weights	70.2	70.2	70.2	70.2
AHU-11	Remain	Aerobics	Aerobics	64	64	64	64
AHU-12	Remain	Exercise Studio	Reformer Pilates	63	63	63	35
AHU-13	Remain	Offices	Functional Training	17	17	17	35
AHU-14	Replace - Stage 1	Group Change	Group Change	-	-	-	-
AHU-15	New		Outdoor Village	-	-	-	-
AHU-16	New		Wellness	-	-	-	20
AHU-17	New		Wellness	-	-	-	20
AHU-18	New		Group Fitness	-	-	-	63
Air side Cooling				386.9	344.9	344.9	437.9

Table 2: Estimated Building Cooling Demand



6.0 Staging Considerations

The following provides high-level advice for sequencing to both facilitate the required works, as well as minimise downtime of the facility in spaces to remain occupied:

6.1 Option 1: Core Work

Early works:

- Relocation of Site main switchboard to suitable location external to building and building works
- Relocation of gas meter to suitable location external to building and building works

Other staging considerations:

- Construction of new pool plant room to ensure existing boiler arrangement remains in-situ. Once constructed, the relocation, connection and commissioning of the 2no. Modulex boilers can occur prior to decommissioning of the 1450kW Hunt boiler. This approach will maintain 100% heating load for the building through construction.
- Optional works listed (including updating of AHU's for areas not subject to works but located in roof plantrooms where works will be occurring) are recommended to be completed as:
 - o The contractor will have ownership of these spaces
 - o Access is likely to be improved as multiple AHU's will be removed and replaced
 - o Cranage of AHU's can be streamlined at the same time of required works
 - o Replacement works are likely to be required at some point in the short to medium term – given the considerations above costs for replacement works will likely be higher as a maintenance items
- Areas where AHU's are replaced will require spaces to be closed while changeover works occurs
- The location of HEX's and fans for the outdoor store should be located with consideration of the Gym Training space to be installed above.
- Heating hot water pipework considerations for extension to Option 2 and 3 works to minimise destructive works in refurbished change village

6.2 Option 2: Future Core Work

Staging considerations:

- Location of Warm Water air handling plant and Change village extension to be installed in new plant area not over the outdoor change village

6.3 Option 3: Additional Work

Staging considerations:

- Option 3 works (if completed at a separate time to Option 1) may present another time to complete the optional AHU refurbishment/replacement works noted as part of Option 1.



7.0 Energy Assessment

The following provides a summary of energy use of the previous four years at the facility:

Year	Power consumption		Gas Consumption	
2024	3,215,516	kWh	10,585	GJ
2023	2,708,658	kWh	23,623	GJ
2022	1,804,250	kWh	29,862	GJ
2021	1,640,563	kWh	18,456	GJ

Table 3: Annual Energy Consumption (bill data)

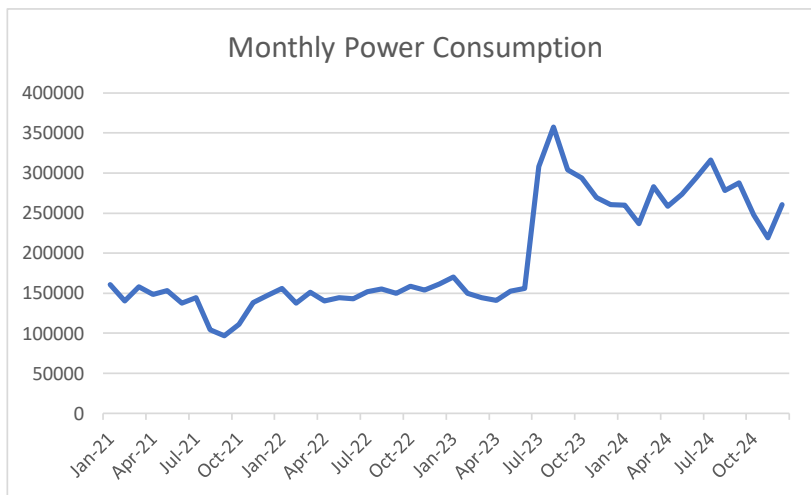


Figure 1: Monthly Consumption (bill data). Power in kWh

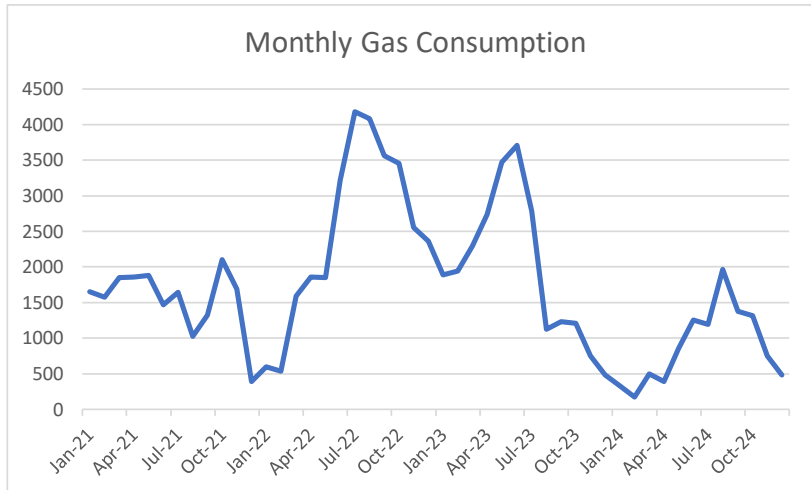


Figure 2: Monthly Consumption (GJ). Gas in GJ

There is several things to note about the data available:

- Data in 2021 is likely to be affected by Covid lockdowns
- The facility has been fitted by a 220kW PV system in 2023 – given the amount of energy used there isn't a clear reduction from this installation (discussed further in the next section)
- The facility had 1000kW heat pumps for heating and a domestic hot water heat pump installed mid-2023. There is a notable jump in power consumption and reduction in gas consumption.

7.1 Estimated Impact of Solar

As noted above, a 220kW solar PV was added to the facility at the start of 2023. For a 220kW system we would expect:

- Maximum power generation of 2000kWh for a non-cloudy summers day.
- Annual generation in the order of 250,000kWh
- Given the annual consumption is in the order of 1 months worth of consumption, it is understandable that no clear reduction is evident in the power consumption
- For the purposes of this analysis, given the amount generated will always be used regardless of works, the energy analysis focuses on authority consumption only.

7.2 Estimation breakdown of consumption for each end use

Using the most recent data (2024), and based off previous experience with end use of energy consumption, it is estimated that energy is consumed within the facility as per the following:

Post heat pumps (2024)				
	Power (kWh)		Gas Consumption (GJ)	
Chiller	90,213	3%	-	0%
Pool hall AHU's	451,063	14%	-	0%
Other AHU's	90,213	3%	-	0%
Power	180,425	6%	-	0%
Lighting	270,638	8%	-	0%
Pool Equipment	721,700	22%	-	0%
Heating	1,411,265	44%	10,585	100%
	3,215,516		10,585	

Table 4: Estimated breakdown for each end use



7.3 Energy Analysis for each option

With regards to an assessment of each option on energy use, the main impact on energy will consist of:

- Increases/decreases of area (addition/reduction in AC, power and lighting)
- Improvements in efficiency in plant (expected to be minimal – 5% for assessment of AHU replacements)

Summary of changes as per the following:

7.3.1 Option 1: Core Work (including optional works)

Main changes include:

- Replacement of AHU's
- Reduction in overall chiller demand
- Increase in VRF use
- Unchanged heating demand (deleted AHU-4, new AHU-15)
- Increase in power and lighting

Option 1:Core Works Energy Assessment (including optional works)				
	Power (kWh)		Gas Consumption (GJ)	
Chiller (-10%)	81,191	3%	-	0%
Pool hall AHU's (-5%)	428,509	13%	-	0%
Other AHU's (AHU.3 to AHU.9 -5%)	87,957	3%	-	0%
Power (+100m2)	183,325	6%	-	0%
Lighting (+100m2)	274,988	9%	-	0%
Pool Equipment (no change)	721,700	23%	-	0%
Heating (no change)	1,411,265	44%	10,585	100%
VRF use (new)	5,413	0.2%	-	0%
	3,194,349		10,585	

Table 5: Option 1 energy assessment

7.4 Option 2: Future Core Work

Main changes from option 1 include:

- Addition AHU-9A
- Replacement of AHU-8
- Unchanged cooling demand
- Slight increase in heating demand



Option 2: Future Core Works				
	Power (kWh)		Gas Consumption (GJ)	
Chiller (unchanged)	81,191	3%	-	0%
Pool hall AHU's (unchanged)	428,509	13%	-	0%
Other AHU's (AHU.8 -5%, additional AHU.9A +5%)	87,957	3%	-	0%
Power (+700m2)	203,953	6%	-	0%
Lighting (+700m2)	305,930	10%	-	0%
Pool Equipment (no change)	721,700	23%	-	0%
Heating (+5%)	1,481,829	46%	11,114	100%
VRF use (unchanged)	5,413	0.2%	-	0%
	3,316,483		11,114	

Table 6: Option 2 Energy Assessment

7.5 Option 3: Additional works

Main changes from option 2 include:

- Replacement of AHU's
- Additional AHU-16, 17 and 18
- Increased cooling demand
- Increased heating demand



Option 3: Additional Works				
	Power (kWh)		Gas Consumption (GJ)	
Chiller (+20%)	97,430	3%	-	0%
Pool hall AHU's (unchanged)	428,509	13%	-	0%
Other AHU's (Level 1 AHU's -5%, new AHU's +10%)	94,554	3%	-	0%
Power (+230m2)	211,494	7%	-	0%
Lighting (+230m2)	317,241	10%	-	0%
Pool Equipment (no change)	721,700	23%	-	0%
Heating (+15%)	1,704,103	53%	12,781	100%
VRF use (unchanged)	5,413	0.2%		
	3,580,444		12,781	

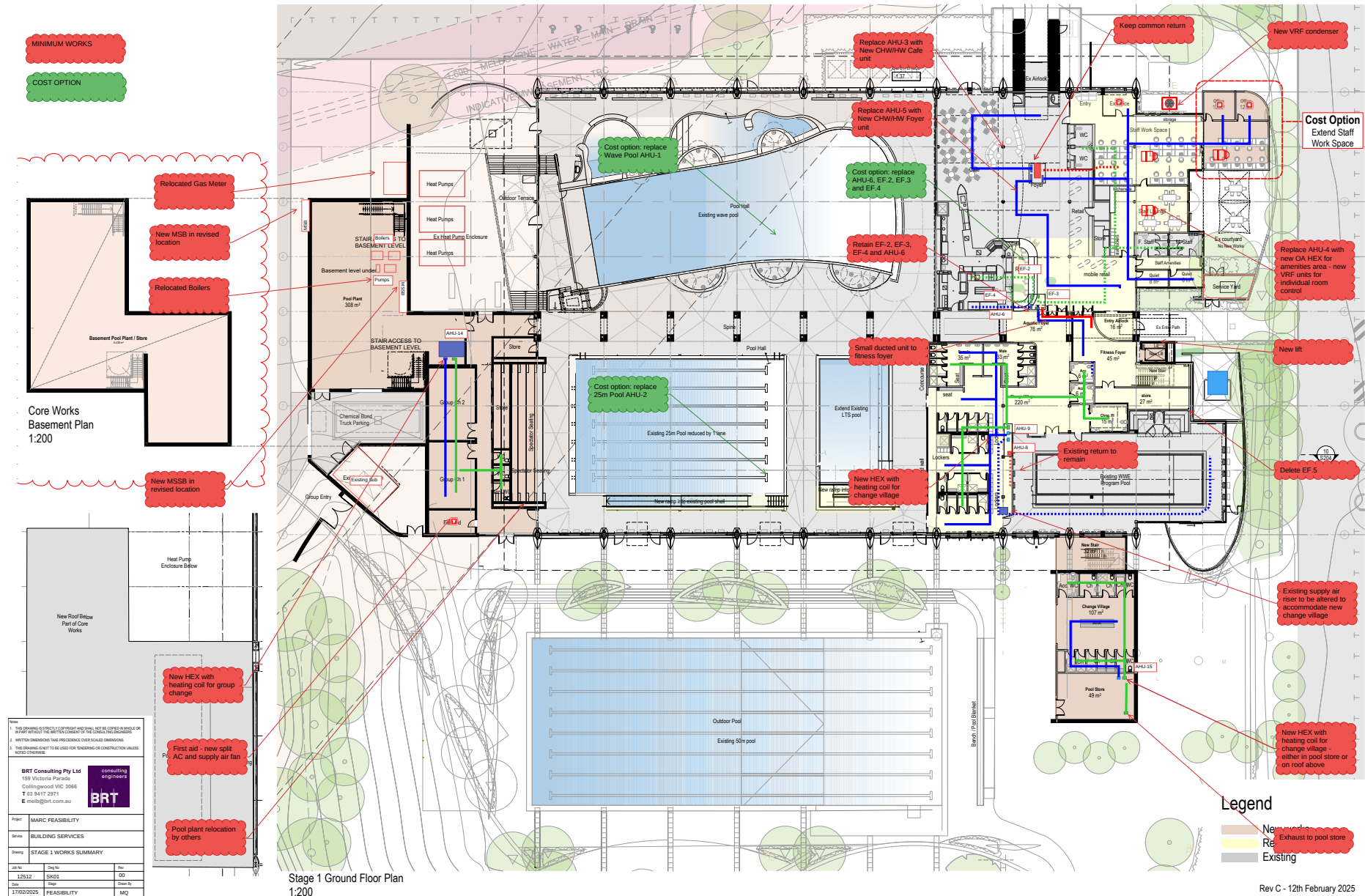
Table 7: Option 3 Energy Assessment

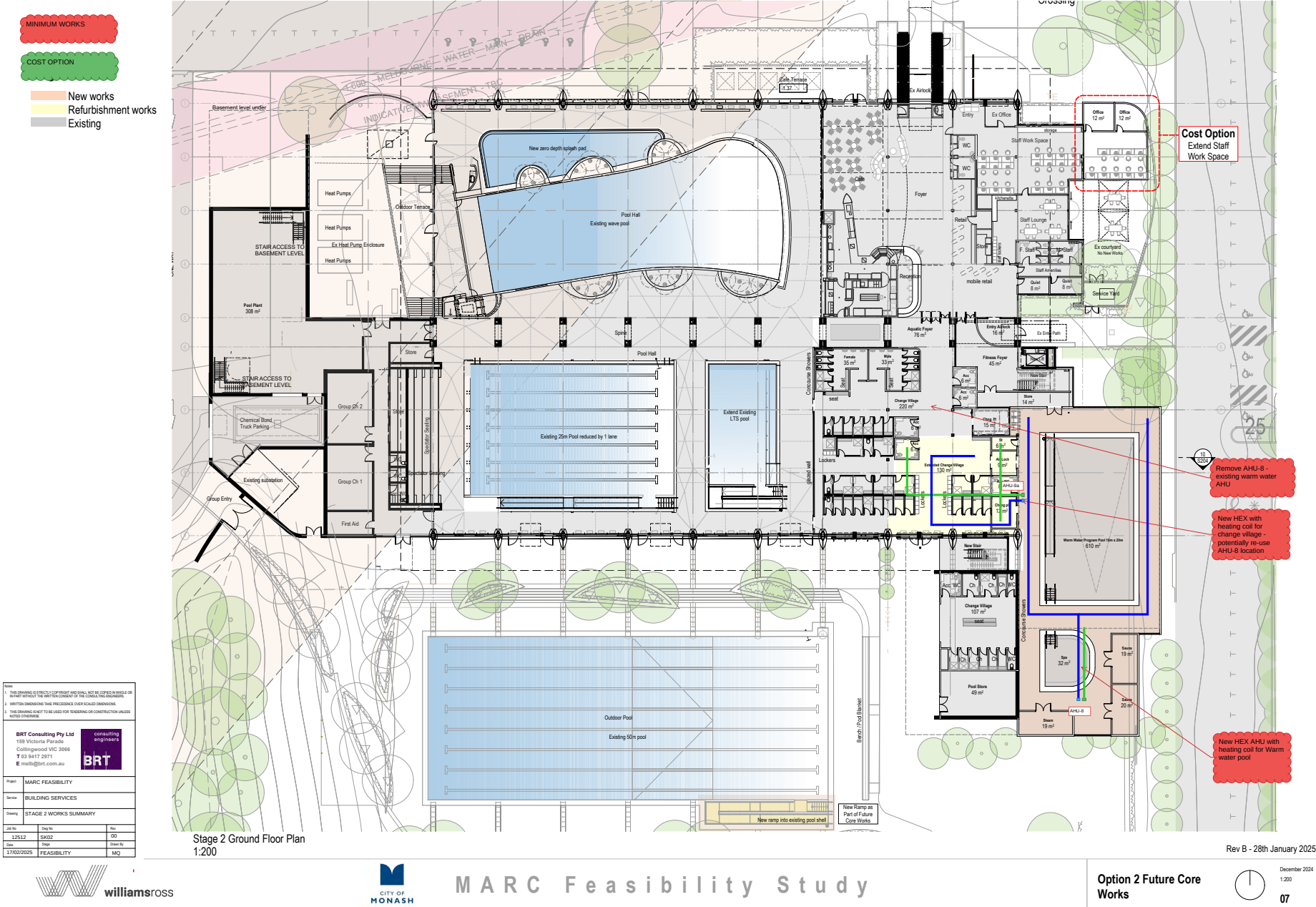
8.0 Review of maintenance schedule

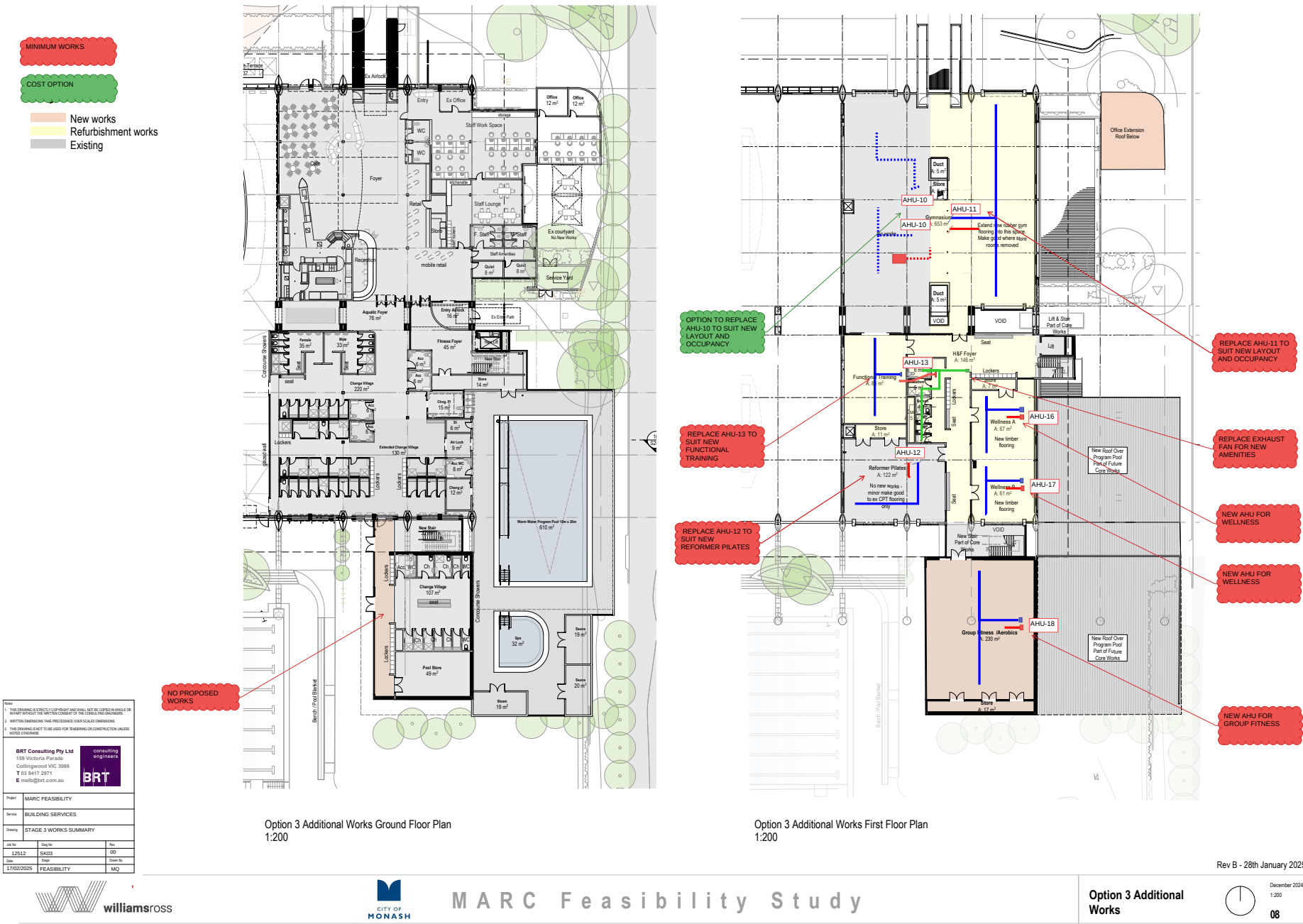
Refer Appendix B for comments regarding maintenance schedule works and cross-over with required works for each option.



Appendix A: Services Mark-Ups









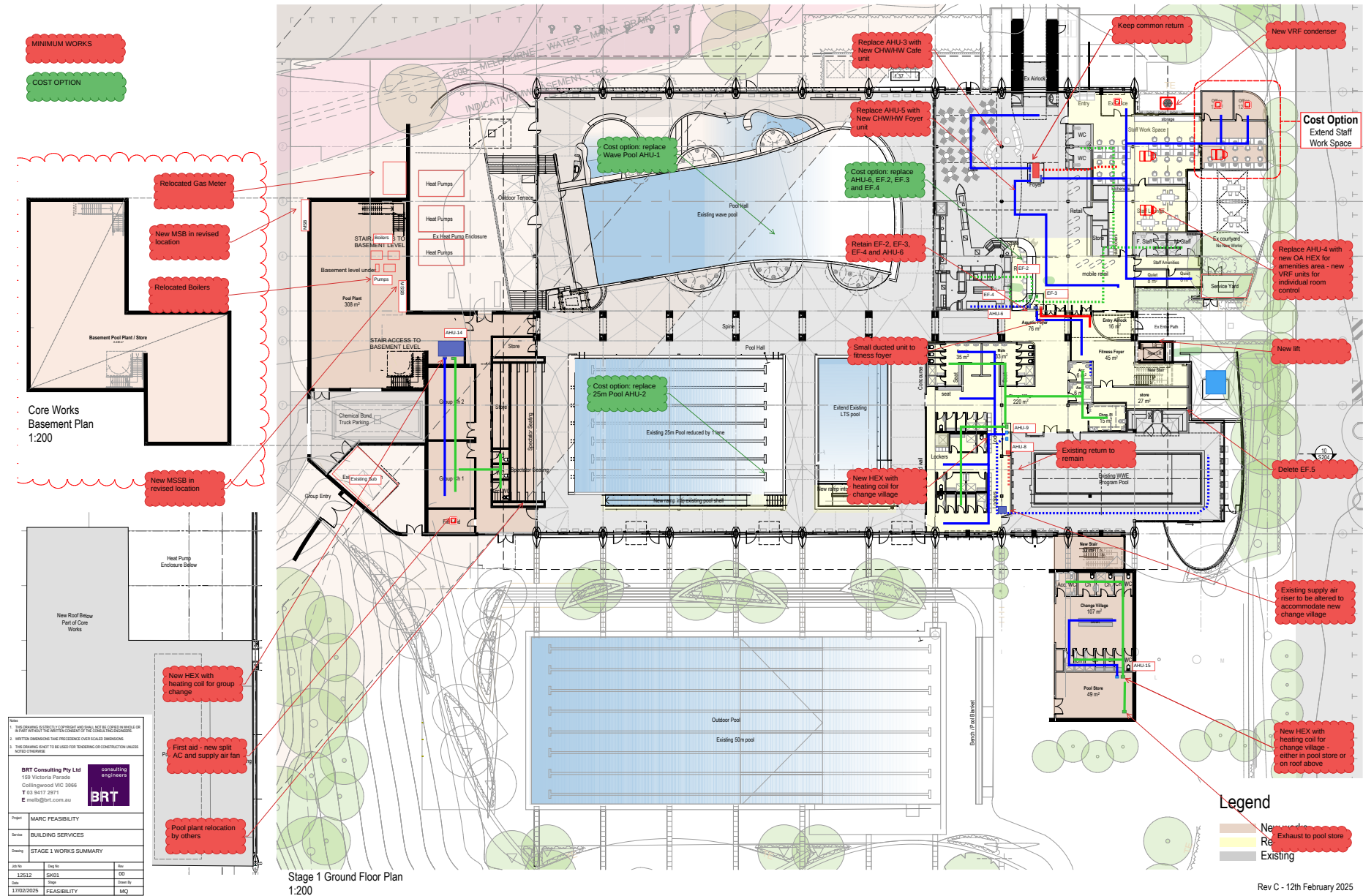
Appendix B: Maintenance Grid Review

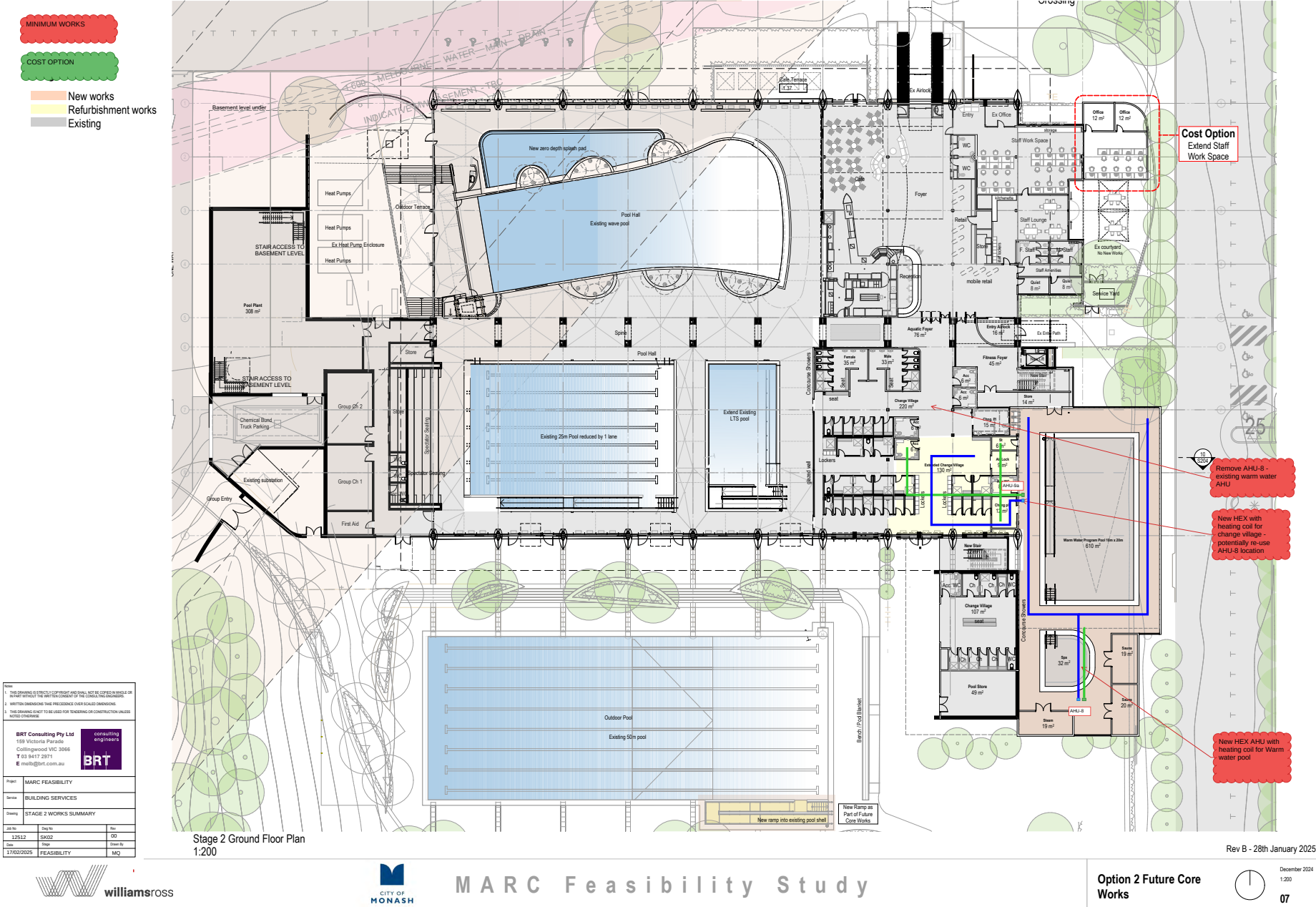
Attachment 7.2.4.1 Attachment A - MARC Concept Design Report

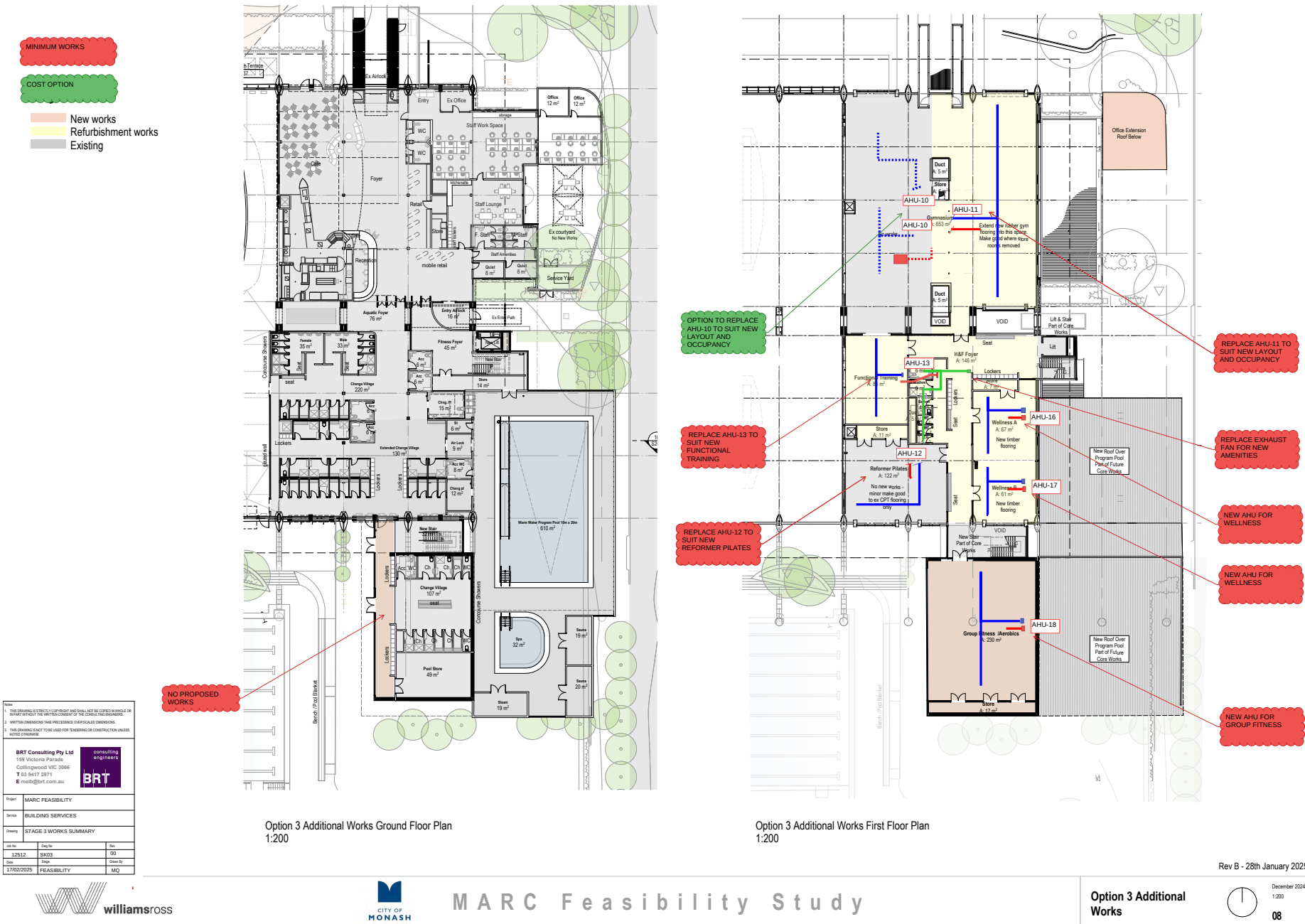
This draft 10 year capex plan is based on very high-level estimates with a tolerance of up to 50% and will get validated by recent condition audit and not

MARIC GRW1 Plant equipment list and upgrade schedule: 2023/24 to n. 03/2023

Council Asset No.	Description	End of Financial Year Upgrade	Scheduled Month	Supply & Install Cost	Expenditure Year	Procurement schedule	Work activity in hours of 8 hours
Item Post						#P#1	
MG00000001	Water Grid Upgrade	2020	May-20	1	0.000000	Completed 2014 on Shared Council's schedule	
MG00000002	Water Chlorine Dosing Pump	2020	May-20	1	0.000000	Original Capex Report 2014	01/1
MG00000003	Water Chlorine Dosing Pump	2020	May-20	1	0.000000	Original Capex Report 2014 not yet due	
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MG00000140	Water Chlorine Dosing						







OPINION OF PROBABLE COST

BRT Consulting Pty Ltd
 159 Victoria Parade
 Collingwood VIC 3066
 T 03 9417 2971
 E melb@brt.com.au



PROJECT NAME: MARC Feasibility
PROJECT NUMBER: 12512
DESIGN STAGE: FE
COST PLAN / REV: 00

BUILDING SERVICES - STAGE 1		Building Works Area 1	
Element Groups	Length/Units m/no.	Rate \$/m/unit	Cost \$
Building Services			
Area		1325	
Replace AHU-3	1	\$ 30,000	\$ 30,000.00
Staff HEX	1	\$ 15,000	\$ 15,000.00
Replace AHU-5	1	\$ 25,000	\$ 25,000.00
Replace AHU-7	1	\$ 15,000	\$ 15,000.00
Replace AHU-9	1	\$ 35,000	\$ 35,000.00
Replace AHU-14	1	\$ 20,000	\$ 20,000.00
New AHU-15	1	\$ 25,000	\$ 25,000.00
VRF - Staff Base works	1	\$ 32,000	\$ 32,000.00
Relocate and provide new MSB	1	\$ 60,000	\$ 60,000.00
Relocate Gas meter	1	\$ 20,000	\$ 20,000.00
Relocate boilers	1	\$ 25,000	\$ 25,000.00
Exhaust Systems - Ducted	1	\$ 10,000	\$ 10,000.00
New Exhaust - outdoor store	1	\$ 10,000	\$ 10,000.00
New exhaust and supply - Pool plant room	1	\$ 40,000	\$ 40,000.00
Automatic Controls BMS	1	\$ 20,000	\$ 20,000.00
Mech Electrical Work	1	\$ 20,000	\$ 20,000.00
MSSB	1	\$ 25,000	\$ 25,000.00
General Power/Lighting (m2)	1325	\$ 150	\$ 198,750.00
TOTAL - STAGE 1			\$ 625,750.00

BUILDING SERVICES - STAGE 1 OPTIONAL WORKS			
Element Groups	Length/Units m/no.	Rate \$/m/unit	Cost \$
Building Services			
Area		0	
Refurbish AHU-1	1	\$ 90,000	\$ 90,000.00
Refurbish AHU-2	1	\$ 90,000	\$ 90,000.00
Replace AHU-6	1	\$ 20,000	\$ 20,000.00
Replace EF-2	1	\$ 10,000	\$ 10,000.00
Replace EF-3	1	\$ 10,000	\$ 10,000.00
Replace EF-4	1	\$ 15,000	\$ 15,000.00
500kW solar	1	\$ 600,000	\$ 600,000.00
Extended Works Space	1	\$ 28,000	\$ 28,000.00

OPINION OF PROBABLE COST

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PROJECT NAME: MARC Feasibility
PROJECT NUMBER: 12512
DESIGN STAGE: FE
COST PLAN / REV: 00

BUILDING SERVICES - STAGE 2		Building Works Area 1	
Element Groups	Length/Units m/no.	Rate \$/m/unit	Cost \$
Building Services			
Area			
Replace AHU-8	1	\$ 100,000	\$ 100,000.00
New AHU-9A	1	\$ 35,000	\$ 35,000.00
General Power/Lighting (m2)	863	\$ 100	\$ 86,300.00
Automatic Controls BMS	1	\$ 10,000	\$ 10,000.00
Mech Electrical Work	1	\$ 10,000	\$ 10,000.00
<u>TOTAL - STAGE 2</u>			\$ 241,300.00

OPINION OF PROBABLE COST

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PROJECT NAME: MARC Feasibility
PROJECT NUMBER: 12512
DESIGN STAGE: FE
COST PLAN / REV: 00

BUILDING SERVICES - STAGE 3		Building Works Area 1	
Element Groups	Length/Units m/no.	Rate \$/m/unit	Cost \$
Building Services			
Area		0	
Replace AHU-11	1	\$ 60,000	\$ 60,000.00
Replace AHU-12	1	\$ 25,000	\$ 25,000.00
Replace AHU-13	1	\$ 25,000	\$ 25,000.00
New AHU-16	1	\$ 20,000	\$ 20,000.00
New AHU-17	1	\$ 20,000	\$ 20,000.00
New AHU-18	1	\$ 60,000	\$ 60,000.00
New Exhaust - outdoor store	1	\$ 10,000	\$ 10,000.00
Automatic Controls BMS	1	\$ 15,000	\$ 15,000.00
Mech Electrical Work	1	\$ 15,000	\$ 15,000.00
General Power/Lighting (m2)	1016	\$ 150	\$ 152,400.00
TOTAL - STAGE 3			\$ 402,400.00

BUILDING SERVICES - STAGE 3 OPTIONAL WORKS			
Element Groups	Length/Units m/no.	Rate \$/m/unit	Cost \$
Building Services			
Area		0	
Replace AHU-10	1	\$ 60,000	\$ 60,000.00



Appendix C: Aquatic Engineering Report



Aquatic Engineering Budget Estimate

Figures \$AUD excluding GST

MARC
December 2024

Reduced Scope Option. Stages 1 and 2

Item	Estimated Pool Water Treatment Contract Value	Estimated Pool Structure Contract Value	Estimated Total Pool Contract Value
Stage 1 Works			
Existing Outdoor 50m Pool. Pool shell structure remains with new access ramp. New 400m3/hr pool water treatment plant.	\$1,240,000	\$360,000	\$1,600,000
Existing Indoor 25m Pool. Pool shell structure remains with 1 No. lane removed and new access ramp. New 280m3/hr pool water treatment plant.	\$868,000	\$420,000	\$1,288,000
Existing Indoor Wave Pool. Pool shell structure remains. New 300m3/hr pool water treatment plant shared with new Splash Pad.	\$930,000	\$0	\$930,000
Existing Learn to Swim Pool. Pool shell structure remains with new access ramp. New 50m3/hr pool water treatment plant.	\$155,000	\$360,000	\$515,000
Existing Warm Water Program Pool. Pool shell structure remains. New 200m3/hr pool water treatment plant and diverted to new Stage 2 Program Pool.	\$620,000	\$0	\$620,000
New Splash Pad. New pool structure adjacent to existing Wave pool. Shared pool water treatment with Wave pool.	\$125,000	\$650,000	\$775,000
Allowance for Splash Pad Water Features.			\$500,000
Stage 1 Total	\$3,938,000	\$1,790,000	\$6,228,000
Stage 2 Works			
New Warm Water Program Pool. New pool shell structure. New 200m3/hr pool water treatment plant provided for Stage 1 existing Program pool utilised.	\$210,000	\$1,230,000	\$1,440,000
New Spa. New pool shell structure. New 90m3/hr pool water treatment plant.	\$279,000	\$195,000	\$474,000
Stage 2 Total	\$489,000	\$1,425,000	\$1,914,000
Stage 1 and 2 Totals	\$4,427,000	\$3,215,000	\$8,142,000

Note: New pool water treatment plants included for existing pools to separate pool systems in accordance with the original brief.
New pool water treatment allowances include for all plant and pipework, however exclude pool plantroom construction.

Concept Design Report

Aquatic Engineering Services

Monash Aquatic and Recreation Centre (MARC)



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HYDRA TECH D E S I G N S

DOCUMENT ISSUE REGISTER

Issue No.	Issue Description	Date of Issue	By
1	Concept design issue.	November 11, 2022	RRW

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1 INTRODUCTION

This Concept Design Report (the report) outlines the Aquatic Engineering scope of work required for the proposed concept design presented for the redevelopment of the Monash Aquatic and Recreation Centre (MARC).

The report outlines the following;

- A summary of the existing pool water treatment plants and configuration of the existing pools.
- A list of the existing and proposed pools included in the proposed concept design.
- Detail of the pool water treatment equipment and associated items / systems included as a basis for the concept design (to inform costing advice and plantroom sizes).
- A concept plantroom layout featuring a centralised location for all pool water treatment systems.

2 EXISTING POOL WATER TREATMENT PLANTS

The existing pool water treatment plants feature conventional end-suction pumps connected to less conventional filter cells.



Typical pool pump configuration with filter cell multi-port valve.



Unlike traditional standalone filter vessels, integral filter cells are provided as a part of the building structure. Although this design may offer some space saving advantages, the filter cells themselves are confined spaces which complicates ongoing maintenance (resurfacing) and media replacement.

Filter cell technology is not implemented for modern aquatic facilities which will result in ever increasing servicing difficulties, especially for the multi-port valves required for this technology.

4 No. pool water treatment plants are provided to service all of the existing pools as follows;

1. Outdoor 50m Pool (1,500m³). 400 m³/hr duty.
2. 25m Pool (714m³) and Learn to Swim Pool (78m³). 364 m³/hr combined duty.
3. Hydrotherapy Pool (162m³) and Spa Pool (20m³). 222 m³/hr combined duty.
4. Wave Pool (450m³) and Toddler Play Pools (47m³). 274 m³/hr combined duty.

Combining pool systems together creates issues including temperature control and cross-contamination risks.

3 NEW POOL WATER TREATMENT PLANTS

The proposed concept design features individual pool water treatment plants for both the existing and new pools as follows;

1. Existing Outdoor 50m Pool (1,500m³). 400 m³/hr duty.
2. Existing 25m Pool (700m³ with lane deletion). 240 m³/hr duty.
3. Existing Wave Pool (450m³). 280 m³/hr combined duty.
4. Existing Learn to Swim Pool (80m³ with ramp added). 50 m³/hr duty.
5. New Warm Water Pool 1 (300m³). 200 m³/hr duty.
6. New Warm Water Pool 2 (300m³). 200 m³/hr duty.
7. New Splash Pad (20m³). 20 m³/hr duty.

The existing site doesn't have a truck bund as required for compliant bulk chemical deliveries.

The proposed concept design includes a truck bund to service the new pool water treatment systems.



4 COMPLIANCE

The following (main) codes, standards and authorities have jurisdiction over the planning, design, documentation and installation of the pool facilities proposed for this project;

ADWG	Australian Drinking Water Guidelines.
AS1023	Low Voltage Switchgear And Control gear - Protection Of Electric Motors.
AS1029	Low Voltage Contactors.
AS1170	Structural Design Actions.
AS1202	AC Motor Starters.
AS1302	Steel Reinforcing Bars for Concrete.
AS1318	Colour And Identification.
AS1345	Identification Of Piping, Conduits.
AS1359	AC Motors - General Requirements.
AS1379	Specification And Supply Concrete.
AS1428	Design For Access And Mobility.
AS1431	Low Voltage Switchgear And Control gear - Control Circuit Devices And Switching Elements.
AS1664.1	Aluminium Structures - Limit State Design.
AS1664.2	Aluminium Structures - Allowable Stress Design.
AS1838	Swimming Pools - Premoulded Fibre-Reinforced Plastics - Design And Fabrication.
AS1900	Flotation Aids For Water Familiarization And Swimming Tuition.
AS1926	Swimming Pool Safety
AS1939	Protection Of Control Boards.



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AS2129	Flanges For Pipes, Valves And Fittings.
AS2161.1	Contract For The Supply And Construction Of A Swimming Pool Or Spa
AS2184	Low Voltage Switchgear And Control gear - Moulded Case Circuit Breakers.
AS2312	Guide To The Protection Of Structural Steel Against Atmospheric Corrosion By The Use Of Protective Coatings.
AS2369	Materials For Solar Collectors For Swimming Pool Heating Series.
AS2416	Water Safety Signs And Beach Safety Flags.
AS2419.1	Fire Hydrant Installations. Part 1: System Design, Installation And Commissioning.
AS2535.1	Test Methods For Solar Collectors - Thermal Performance Of Glazed Liquid Heating Collectors.
AS2441	Installation Of Fire Hose Reels.
AS2566.1	Buried Flexible Pipelines – Structural Design.
AS2566.2	Buried Flexible Pipelines – Installation.
AS2610.1	Spa Pools - Public Spas.
AS2610.2	Spa Pools - Private Spas.
AS2818	Guide To Swimming Pool Safety.
AS2865	Confined Spaces.
AS3000	Wiring Rules.
AS3100	Approval And Test Specification - General Requirements For Electrical Equipment.
AS3112	Approval And Test Specification - Plugs And Socket-Outlets.
AS3136	Approval And Test Specification - Electrical Equipment For Spa-Baths And Spa And Swimming Pools.



AS3147	PVC Insulated Cables For Working Voltages Up To 0.6 KV.
AS3191	Electric Flexible Cords.
AS3198	Electric Cables - XPLE Insulated Cables - For Working Voltages 0.6/L KV.
AS3439.1	Low Voltage Switchgear And Control gear Assemblies.
AS3500	National Plumbing And Drainage Code.
AS3600	Concrete Structures.
AS3610	Formwork Code.
AS3633	Private Swimming Pools - Water Quality.
AS3634	Solar Heating Systems For Swimming Pools.
AS3661	Slip Resistance Of Pedestrian Surfaces.
AS3735	Concrete Structures For Retaining Liquids.
AS3780	The Storage And Handling Of Corrosive Substances.
AS3833	The Storage And Handling Of Mixed Classes Dangerous Goods In Packages And Intermediate Bulk Containers.
AS3958.1	Ceramic Tiles – Guide To Installation Of Ceramic Tiles.
AS3958.2	Ceramic Tiles – Guide To The Selection Of a Tiling System.
AS3979	Hydrotherapy Pools.
AS4276	Water Microbiology Series.
AS4586	Slip Resistance Classification Of New Pedestrian Surface Materials.
AS4600	Cold-Formed Steel Structures.
AS4663	Slip Resistance Measurement Of Existing Pedestrian Surfaces.
AS4671	Steel Reinforcing Materials.
AS4685	Playground Equipment.



AS5102.1	Performance Of Household Electrical Appliances - Swimming Pool Pumps-Units - Energy Consumption And Performance
AS5102.2	Performance Of Household Electrical Appliances - Swimming Pool Pumps-Units - Energy Labelling And Minimum Energy Performance Standard Requirements
AS5104	General Principles On The Reliability Of Structures.
AS5200	Technical Specification For Plumbing And Drainage Products - Procedures For Certification Of Plumbing And Drainage Products
AS5601	Gas Installations.
AS60204.1	Safety Of Machinery—Electrical Equipment Machines.
AS6400	Water Efficient Products Rating And Labelling.
AS60227.5	Polyvinyl Chloride Insulated Cables Of Rated Voltages Up To And Including 450/750 V - Flexible Cables (Cords).
AS60335.2.41	Household And Similar Electrical Appliances - Safety - Particular Requirements For Pumps.
AS60335.2.60	Household And Similar Electrical Appliances - Safety - Particular Requirements For Whirlpool Baths And Whirlpool Spas.
AS60529	Degrees Of Protection Provided By Enclosures (IP Code).
AS61558.2.6	Safety Of Power Transformers, Power Supplies, Reactors And Similar Products For Supply Voltages Up To 1,100 V.
AS ISO 13822	Basis For Design Of Structures - Assessment Of Existing Structures.
ASTM C-547	American Society For Testing And Materials. Standard Specification For Mineral Fiber Pipe Insulation.
BCA	Building Code Of Australia.
DDA	Disability (Access to Premises – Buildings) Standards 2010.
DHS	Department Of Human Services Requirements.



EPA	Environmental Protection Authority Requirements.
GSPO	Guidelines for Safe Pool Operation – Royal Life Saving Society.
HB241	Water Management For Public Swimming Pools And Spas.
RLSSA	Royal Life Saving Society of Australia – Guidelines for Safe Pool Operation.
SR178	Public Health and Wellbeing Regulations.
SR13	Health (Legionella) Regulations.
SR79	Plumbing (Water And Energy Savings) Regulations.
SR148	Plumbing Regulations.
WMG	Water Authority Water Metering Guidelines.
VIC	Victoria Health Regulations.
VIC	Victoria Health Pool Water Quality and Operational Guidelines.
VIC	Victoria Government Pool Safety Guidelines and Requirements.
VIC	Victoria Government Pool Safety Register.

4.1 ENVIRONMENT PROTECTION AUTHORITY (EPA)

The EPA has no jurisdiction over the proposed pool water treatment systems as they do not discharge to the environment outside of prescribed requirements. EPA compliance would be necessary for discharges to the environment in connection with a backwash treatment system, grey water treatment system or other waste recycling system used for irrigation.

4.2 LOCAL COUNCIL

The proposed works or initiatives are not expected to contravene planning requirements (as a Council project). The proposed treatment systems comply with Council requirements.



4.3 PUBLIC HEALTH

All public swimming pools must comply with Part 6 Aquatic Facilities, of the Public Health and Wellbeing Regulations.

The proposed pool water treatment systems comply with Public Health Regulations.

5 POOL FILTRATION PUMPS

The pool filtration pumps are often described as the 'heart' of the system as they are responsible for creating flow throughout the pool and the treatment system.

Whilst pumps create the flow, it is important to recognise that all other items in the recirculation system are a natural resistance to such flow.

On this basis, pumps must not only furnish the required flow, they must do so with enough pressure to overcome the resistance of both static and dynamic head, being generally the vertical distance from the pump to the water treatment system (static) and such items as pipework, valves, filters, etc. (dynamic).

The higher the pressure the lower the flow and, conversely, the lower the pressure the higher the flow.

In operational terms, when the filter vessels are dirty the resistance against the flow will be comparatively high and thus the flow will be comparatively low. Cleaning the filters lowers the pressure and increases the flow.

It should also be understood that a pump's power consumption increases as the flow increases. The least amount of power is consumed when the pump discharge valve is completely closed such that the pump is in a 'no-flow' state.

Given that the pool filtration pumps are to be subjected to varying pressure and flow resistance by the filter vessels, pumps of a centrifugal or non-overloading design are preferred. These pumps operate according to their pump curve which ranges from flow at minimum back pressure (maximum flow) to a no-flow state.

Considering that centrifugal pumps are non-overloading, the pump impeller may spin within the pump casing in a no-flow state (for a short period) without adversely affecting the pump. Prolonged operation



at very low or no-flow situations will result in heating the water due to the friction between the impeller and the water - this situation should be avoided at all times. Flow switches are provided as a part of the control system to protect the pumps from no-flow conditions.



Typical commercial pool filtration pumps.

The preferred location for the pool recirculation pumps is below pool concourse (top water level). This location ensures positive (flooded) suction conditions are available for the pumps thus avoiding the use of foot valves in the balance tanks to keep the suction pipes primed (full of water) when the water treatment plant shuts down. Avoiding the installation of foot valves in the balance tanks offers clear advantages in terms of confined space entry and occupational health and safety issues. Further, good quality corrosion resistant foot valves represent a significant cost and require frequent maintenance.

Positive suction conditions assist with pump performance and minimise the potential for cavitation (air entering the suction pipe and mixing with water in the pump casing). Cavitation results in poor pump performance, decreased efficiency and ultimately pump failure.

Recirculation / filtration pumps shall generally comply with the following specific requirements:

The pumps shall be the product of one manufacturer and shall be close coupled, centrifugal, non-overloading, volute type.

The pump motors shall be TEFC, 4 pole, 1450 RPM, 3 phase motors.



The pump casing and impeller material shall be stainless steel grade 316L or zinc-free phosphor bronze. A flushing or cyclonic separator type pressure equalising kit shall be provided for the pumps between the pump discharge and back plate. The pump casing and motor selection shall allow for at least one impeller size upgrade without change to the pump casing or motor. The pump shaft material shall be stainless steel grade 316L. The pump shaft seals shall be mechanical type.

The pump bearings shall be a self-aligning ball or roller type positively located on the shafts. Bearings shall be selected for an operating life of not less than 100,000 hours and fitted with lubricant restraining and dust seals.

The pumps shall be provided with a full pump and motor cast steel base plate and anti-vibration mountings.

The pumps shall be provided with flow switches in the discharge pipework to shut-down the pumps if flow is not established or maintained for a period of 20 seconds after starting or during operation. A delay timer shall be utilised as a part of the PLC programming routine to avoid alarming as a result flow switch “fluttering” in the turbulent flow conditions often present in pump discharge pipework.

Proprietary thermoplastic pool recirculation pumps shall be accepted provided that the same can achieve the specified duty at close to maximum efficiency. Proprietary pool pumps shall be provided with union connections and integral strainer.

The maximum shut-off head (pressure at no flow) for all pumps must not exceed the working pressure of the filter vessels.

Pumps with variable speeds should be selected in preference to single speed pumps to improve efficiency, to reduce maintenance and improve life expectancy of the pumps. Alternatively, with multiple pump installations, single speed pumps may be turned off by the control system out of hours to reduce energy consumption provided that minimum system flows can be achieved to maintain water chemistry and heating requirements.



5.1 SELECTION

Option	Recommendation
Pump Type	Conventional centrifugal pumps recommended for required duty and application. Project specific or proprietary pre-pump strainers constructed from corrosion resistant materials. Modern industry standard.
Variable Speed Drives	Recommended as modern industry standard and best practice. Adds the ability to include a “conservation” mode to assist in saving energy by operating pumps at a slower speed when the pools are not in use.

6 FILTRATION

The removal of suspended solids by filtration is closely related to the function of disinfection by chemical treatment.

Each function however has quite separate and distinct contributions to a healthy pool environment.

The filter system is of some value for its capacity to remove bacteria and disease producing organisms however its primary function is to remove suspended solids, which if not removed, will increase the need for chemical treatment and will also reduce the germ killing and oxidising power of the chemical treatment.

The most apparent filtration principle is that of a screening process whereby contaminants are separated from the water simply because they are too large to pass through the small openings produced in the filter media.

Other types of dirt removal actions involve entrapment within the crevices created by the adjacent particles of the filter media.

Still another process of dirt removal involves the use of a coagulant or flocculent whereby dirt particles are separated by physical and electrochemical attraction.

Two forms of commercial filtration are available for smaller pools as provided for this project; sand filtration and cartridge filtration.



6.1 SAND MEDIA FILTRATION

Sand filtration is defined as depth media filtration whereby suspended solids are removed from the water by a bed of filter media (sand). As the name suggests, the filter media is refined filter sand. Refined glass media may be used as an alternative filter media although the perceived advantages of the glass media must be assessed in connection with verifiable product data and associated costs.

Filter grade sand particles are of irregular shape and have jagged edges which assist in the creation of crevices when the sand is compacted in the filter vessel. The crevices trap the suspended solids as the pool water passes through the filter vessel.

Suspended particles are captured in the filter bed by a combination of two main processes;

1. Gelatinous, mucous-like substances and oils tend to cling to the grains of filter media.
2. Solid particles lodge in the extremely small spaces between the particles of the filter media.



Large commercial sand filters.



Automated Backwash Function.

Sand filter vessels shall generally comply with the following specific requirements;

- NSF 50 or DIN 19643 certification.
- Bobbin wound fibreglass or laminated polyester construction.
- 1200mm media bed depth.
- Rated working pressure of 400 kPa.
- Australian AS2129 Table E flanged inlet and outlet connections with loose backing ring.



- Ø150mm sight glass at top media depth level.
- Minimum 420mm x 320mm lateral manhole.
- Lateral collector system, internal piping manifolds and internal air bleed.
- External manual air bleed.
- Drain valve.
- Inlet and outlet differential pressure gauge indicator plate.

The filter vessels must be supplied with a 5 year manufacturer's warranty which shall include for the structural shell and all components of the filter vessel.

The filter media shall comprise 1 to 2mm gravel for lateral bedding and 0.4 to 0.8mm filter sand to operational level.

A consideration with sand filters is the need to backwash them for cleaning. This process involves the periodical reversing of flow through the filters to flush out contaminants. The water used for this process is drawn from the pool and typically drained to waste although modern facilities recycle the backwash water. The frequency of the backwash process is determined mostly by pressure differential across the filters (the more pressure the dirtier the filter). Backwash water may be recycled for reuse however it must be treated to remove high levels of suspended solids and total dissolved solids (TDS) before either entering back into the pool or for external use.

The advantage of the sand filter backwash system is that the backwash process can be easily automated by incorporating motorised actuators on the filter valves. This arrangement greatly reduces operator involvement and allows for the most efficient programming of filter backwashing. Automatic backwashing is preferred when rainwater harvesting is provided (mostly for new aquatic centres) to co-ordinate and integrate the backwashing operation with the availability of rainwater.

In accordance with Health Guidelines, a minimum of 30 litres per bather needs to be replaced with fresh water to dilute substances that cannot be eliminated by the treatment process. On this basis, the frequency of backwashing the sand filters can be managed such that the backwash water volume aligns with the fresh water is required to accommodate the pool bather load. This can often result in nett-zero water use for the sand filters.



6.2 CARTRIDGE FILTRATION

Cartridge filtration is defined as surface filtration whereby suspended solids are removed from the water by a pervious fabric barrier. The filter fabric can be either spiral wound or pleated to provide increased surface area.

Unlike depth filtration where suspended solids may be progressively removed as water passes through the media, surface filtration provides a single layer of filtration which needs to provide the required degree of filtration on a single pass. This requirement can result in the filter fouling quickly depending on filter area and bather loading.

For pool installations, filter cartridges should be pleated to provide maximum surface area and to extend the operational life cycle. Cartridge filters should also be oversized to increase surface area and to reduce filtration velocity further extending filter cartridge life and improving water quality.

Cartridge filters shall generally comply with the following specific requirements;

- Solid one piece polymer filter housing with clamped access lid.
- Polyester pleated filter cartridges with a minimum surface area of 25m², nominally 30µm.
- Rated working pressure of 350 kPa.
- External manual air bleed.
- Barrel union pipework connections.
- Inlet and outlet differential pressure gauge.

The filter housings must be supplied with a 5 year manufacturer's warranty which shall include for the structural shell and all components of the filter.

The advantage with cartridge filters is that they do not require backwashing. When fouled, the filter cartridges in domestic installations may be cleaned with a hose and replaced. In commercial installation they should be replaced with new cartridges.

Given that the filter cartridges need to be replaced periodically, they are not considered a viable option for larger commercial facilities. Cartridge filters are sized typically for domestic and small commercial applications.

As cartridge filters do not need to be backwashed, they are considered an environmental improvement over depth media filters which either, waste water for backwashing or, require a treatment system to



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recycle the water. As there is no water wasted as a part of the backwash process, the addition of fresh water is minimized which reduces chemical treatment and heat loads. It must be understood that water may need to be replaced to control the level of total dissolved solids (TDS) in the pool water.



Filter Cartridge Housing.



Filter Cartridge.

6.3 PRE-COAT FILTRATION

Precoat filtration may be considered as surface filtration whereby suspended solids are removed from the water by passing the water through a coating of filter media. Traditionally the filter media used is diatomaceous earth (DE) however this media has been largely replaced with Perlite due to health concerns associated with DE.

Precoat filtration is defined as surface filtration as opposed to sand filtration which is defined as depth filtration. The precoat media (similar in texture, size and appearance as talcum powder) provides filtration sieve sizes down to 1 to 2 micron (micron = 1/1000mm). 16/30 grade filter sand may achieve filtration sieve sizes down to 30 to 40 micron (down to 20 micron with the assistance of polyaluminium chloride). The finer level of filtration achieved by precoat filtration provides a corresponding improvement in water clarity by removing most suspended solids and turbidity from the water.

Diatomaceous earth (commonly called DE) is composed of fossil-like skeletons of microscopic water plants called diatoms. The crystalline silica content of the diatomaceous earth media classifies the same as a known carcinogen (that is, the media is a known cancer causing substance).



The use of DE has been discouraged or banned outright by industry management groups due to the self evident issues concerning the use and handling of carcinogenic substances.

Perlite is a generic term for an alternative filter media that is manufactured from volcanic rock. Perlite contains little or no crystalline silica and is considered to be an acceptable filter media alternative to DE although many of the same health precautions may apply.

Unlike a sand filter in which the filter media remains for many years, the precoat media is replaced after every backwash. This is usually a manual and somewhat tedious process which involves the handling of heavy and dangerous products. When the required amount of filter media is added to the incoming water flow, it forms a thin coating on the outside of filter elements. This filter cake forms a microscopic sieve that provides the improved filtration.

Some advanced precoat filters employ a "bump" cycle which bumps the media off the filter elements before recoating the filter elements. This process may be performed several times between backwashes to increase filter backwash intervals. This process however results in keeping the trapped contaminants in the filter for longer periods thus promoting biological fouling.

The backwashed media must be intercepted prior to discharge to the drainage system and be disposed of as hard waste.

Precoat filtration is promoted as requiring less frequent backwashing than conventional sand filtration thus consuming less water. This may be initially perceived as an advantage in terms of water conservation however this benefit is offset operationally by the water that must be drained (bled off) to combat rising TDS (total dissolved solids) levels as a result of circulating essentially the same pool water for extended periods.

It is also necessary to backwash the precoat media to waste after every faecal incident in accordance with Health Guidelines. This requirement can become an onerous operational, time and cost issue when precoat filtration is provided for pools intended for young children.

In accordance with Health Guidelines, a minimum of 30 litres per bather needs to be replaced with fresh water to dilute substances that cannot be eliminated by the treatment process. On this basis, precoat filters offer little advantage with respect to water savings given that a large volume of fresh water is required to accommodate the pool bather load, regardless of the filter backwash requirement.



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Precoat filters typically have a smaller footprint size than alternative media filters however they require circulation space for maintenance. Precoat filters typically require more maintenance than conventional alternatives.



Internal and external view of a UF precoat filter.

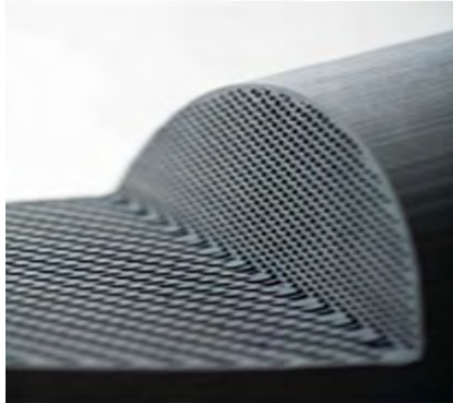
6.4 CERAMIC MEMBRANE FILTRATION

Ceramic Membrane Filters (CMF) are a relatively new technology to be introduced into Australia, however have been utilised in Europe over a number of years. This method of filtration can be considered a hybrid type of filtration between media (sand, DE, glass, etc.) and cartridge filters, with the ceramic membranes taking the place of the filter media or the cartridge, yet still requires backwashing, as with a traditional sand filter.

The CMF membranes are made from Silicon Carbide (SiC) which is heat treated to a temperature of 2,400°C to provide an unlimited lifespan on the membrane itself. The membranes are contained within a Polypropylene (PP) housing and generally arrive onsite as a skid mounted packaged unit requiring connection only to the pool hydraulic pipe work onsite. Although the membranes do come in a variety of pore sizes (3µm, 1µm, 0.1µm and 0.04µm) the membranes typically used for pool filtration is 3µm.



HYDRA TECH DESIGNS



Ceramic Membrane Filtration.

The biggest advantage to this type of filtration method is that the plantroom area which is required for the installation of this type of technology is much less than of that which is required for media filter vessels. Typically, the floor area required is as little as a third of media filtration vessels. The other advantage is that the membrane has an unlimited lifespan and if the membrane ever becomes clogged or blocked, it can simply be “blasted” in a kiln at high temperature to burn out the obstructions and refresh the membrane. This alleviates the need for media changes (or ongoing replenishment in the case of DE) or continual replacement of polyester cartridges.

Another advantage of the CMF is that it consumes less water during its backwash cycle than a media filter. This CMF adopts a combination of pressurised air and water to perform the backwash cycle to each filter. The air is forced through the filter vessel in reverse, as water would normally be, in order to ‘loosen’ any of the suspended solids particles which are lodged in the ‘pores’ of the membrane. This reduces the amount of water required to clean the filter and only a small amount is used to flush the waste from the filter housing. The backwashing on a CMF unit is fully automated and backwash operation is dictated by pressure differential between the inlet and outlet of the filters, or Trans Membrane Pressure (TMP). This method not only reduces the amount of water consumed by the pool water treatment plant, but also reduces the amount of energy (heat) and chemical which is discarded as part of the backwashing process.

The primary disadvantage of CMF is the high capital cost. The initial investment in this form of filtration can be as much as 30% more than sand filtration and similar to that of a DE filtration system. Although this investment can be recovered over the course of the centre's lifecycle, especially as the ongoing costs for this type of system is considerably less than that of other media filters, it can be a considerable extra cost to factor in with the construction of a new water treatment plant.



These types of filters are not completely maintenance free either. They do require periodical “Clean in Place” (CIP). This involves flushing the individual filters with an acid such as citric acid, to clean the membranes and remove any calcification build up in the pores. This is required to be performed by a suitably trained technician. The membranes are also susceptible to blocking due to high calcium levels in the water, so vigilance needs to be observed in maintaining correctly balanced water within the pool system.

6.5 SELECTION

Option	Recommendation
Filtration	Sand media filters. Passes operational risk assessment and Safety in Design requirements. Lowest capital investment of the technologies suitable for a large aquatic centre. Minimal maintenance and operational requirements. Automatic backwashing to be provided to automate the filtration process.
Cost Comparison	Sand Filtration. Base Case 0%. Cartridge Filtration. Not suitable for application. Pre-Coat Filtration. +62% over base case with equivalent redundancy. CMF Filtration. +50% over base case.

7 POOL WATER HEATING

Pool water heating is required to maintain the desired pool water temperatures.

7.1 CONVENTIONAL GAS FIRED BOILERS

The conventional gas fired type boilers are the most common form of pool heating and are typical for pool facilities of this type.

These boilers incorporate a copper finned tube heat exchanger heated by a gas burner. Water is heated by the burners as it passes through the heat exchanger. Fins on the external surface of the heat exchanger increase contact area and improve heat transfer.

Recent improvements to this boiler type include modulating burner control and hot surface ignition. Modulating type burners are capable of modulating the burner flame according to heat load thus



HYDRA TECH DESIGNS

improving efficiency and boiler lifetime. Modulating type burners are especially efficient for applications with varying heat loads.

These boilers range in efficiency typically from 78% to 81%.

A secondary heating water circuit with heat exchanges, modulating valves and controls is required to separate the heating hot water circuit from the pool water to avoid corrosion of the boiler internal components.

7.2 CONDENSING GAS FIRED BOILERS

Condensing boilers incorporate a similar type of primary heating system as conventional boilers however they also incorporate a second stage process that condenses water from the burnt flue gases (from the hydrogen content of the fuel). This secondary process recovers the latent heat from the burnt flue gas.

These boilers have an efficiency typically >94%.



Conventional Gas Fired Boiler.



Condensing Gas Fired Boiler.

7.3 HEAT PUMPS

Commercial pool heat pumps are usually the air-to-water type which use the heat available from the surrounding air to heat the pool water. Heat from the air is transferred to a refrigerant pressurised by a compressor that converts it from a gas to a super-heated liquid. The super-heated liquid is pumped



H Y D R A U T E C H D E S I G N S

through a titanium heat exchanger and transfers its heat to the pool water. The cooled refrigerant turns back to a gas as it returns to the evaporator and the cycle repeats.

Heat pump efficiency is given as a ratio of the electrical energy input to heat output and is called the coefficient of performance or COP. At their most efficient, a pool heat pump can have a COP of around 5. A heat pump operating at a COP of 5 can produce 5kW of output for every 1kW of electrical input. As the ambient temperature drops, so too does the COP which results in heat pumps being less efficient during colder months.

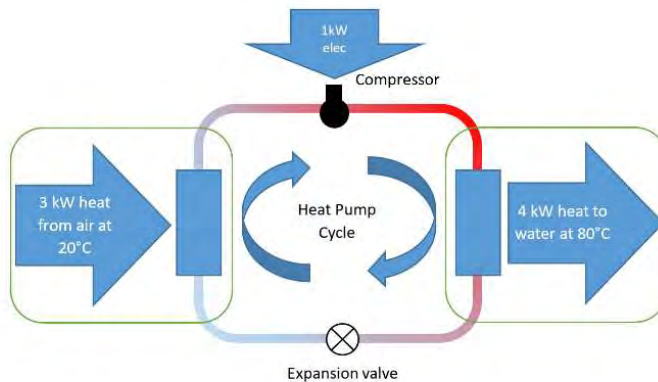
Heat pumps are a good option when electricity usage can be offset with on-site solar photovoltaic panels (solar PV) and if the project is located in a warmer climate.

A hybrid system incorporating both heat pumps and gas fired boilers can also be an efficient and cost effective option. The heat pumps can be used during summer when the ambient air temperature and solar output is high. The boilers can be used for heating during winter when both the ambient air temperature and solar output is low.

Similar to gas fired boilers, a secondary heating water circuit with heat exchanges, modulating valves and controls is required to separate the heating hot water circuit from the pool water to avoid corrosion of the heat pump internal components.



Air to Water Heat Pump.



Heat Pump Cycle.

7.4 SOLAR POOL HEATING

Solar heating makes use of solar energy to heat the water and thus does not consume a fuel. Solar heating is often considered only as a supplementary form of heating due to its seasonal variability and inability to sustain constant heat delivery. For pool facilities, solar heating is usually provided as a boost to conventional gas type boilers to offset fuel consumption.

Solar heating systems for seasonal pools may be given further consideration given that the pools operate when the solar gain is at its highest throughout the year. Many seasonal pools operate with solar heating only.

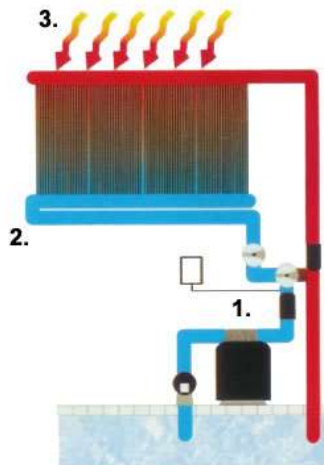
Three distinct technologies exist for solar heating; tube mat collectors, flat plate collectors and evacuated tube collectors.

7.5 TUBE MAT COLLECTORS

Tube mat collectors are the most prevalent form of pool solar heating (especially for domestic pools) as this product offers a relatively low cost namely due to its simplistic design. The system involves the recirculation of pool water through a series of rubber tubes formed into a rubber mat. The mats absorb the solar energy and transfer heat to the pool water as it passes through the tubes.



HYDRA TECH DESIGNS



Tube Mat Collector.

The limitation with this system is the efficiency. A large proportion of the pool water is required to pass through the collector to achieve sufficient heat transfer. This requires a relatively large pump to deliver the required flow through the solar heating system. Although this is not usually an issue for domestic pools given that the full flow of the filtration plant may be passed through the solar collector, for commercial pools where the filtration flow greatly exceeds the required solar flow, a dedicated solar recirculation pump is required. The energy consumption of the solar recirculation pump is minimized by only operating the pump when a solar gain is available. This is achieved by controlling the pump according to temperature sensors in the flow and return pipework.

A further limitation of this system is the thermal efficiency. Heating is achieved by simply heating up the tubes when the solar gain is available. The tubes are affected by ambient temperatures and therefore only provide sufficient heating capacity at times of high temperatures. At night the water in the tubes cools down and is required to be heated above pool water temperature again the following day in order to start the process. This may result in only a minor contribution to the required heat load if the ambient temperature is not sufficiently high enough.

Given that the option for solar heating is being considered for energy efficiency, a system which is not efficient in itself would not be the right option. Although there is merit in the simplicity of the design, there are more advanced solar heating technologies available for commercial applications.

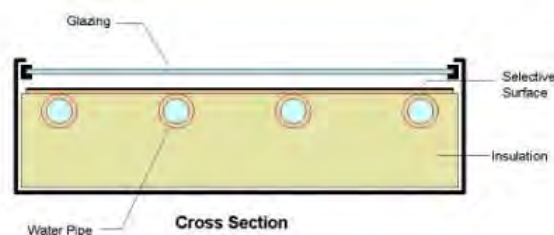


7.6 FLAT PLATE COLLECTORS

Flat plate collectors are used predominantly for domestic hot water heating or other non-corrosive hot water applications.

The flat plate collector consists of a black surface arranged beneath a transparent glazed cover and insulation to the rear and sides. A heat transfer fluid is recirculated through the panel to exchange the heat collected by the panel to the fluid to be heated.

In domestic hot water applications the water itself may be recirculated through the panels. In pool applications where the pool water would corrode the copper pipes normally used in flat plate panels, a fluid (usually fresh water or glycol solution) that is not corrosive is recirculated through the panel and is transferred to the pool water via a heat exchanger.



Flat Plate Collector.

These panels offer improved solar absorption efficiency as compared to the tube mat collector however they are also subject to ambient temperature conditions (although insulated) and reflect a proportion of the solar energy away from the collector by design.

An important advantage with this technology is that due to the improved efficiency, only a low flow is required through the panels as compared to the tube mat collectors. This allows a smaller recirculation pump to be used and hence less energy consumption.

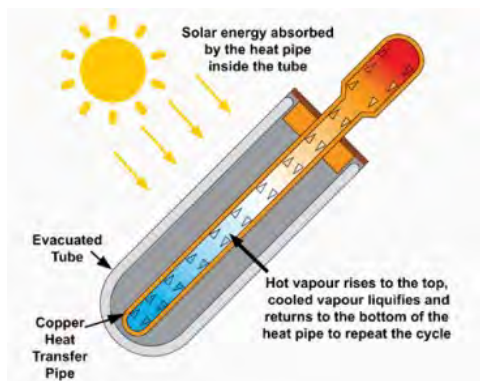
7.7 EVACUATED TUBE COLLECTORS

Evacuated tube collectors utilise a vacuum between an outer translucent glass jacket and an inner heat transfer pipe which exchanges heat to the fluid to be heated.



Several key efficiencies apply to the evacuated tube technology, namely; the cylindrical tube focuses the solar energy to the heat transfer pipe over a much wider solar arc, that is the collector is able to work efficiently for more hours during the day, the collector has minimal reflection and as the name suggests utilises an evacuated tube. Manufacturers claim that an evacuated tube collector will absorb up to 40% more solar energy than a comparably sized flat plate solar collector.

The vacuum in the outer translucent glass jacket protects the inner heat transfer pipe from ambient temperatures. This prevents the inner heat transfer pipe from cooling down in low temperature conditions making this technology ideal for locations, especially Victoria where days of good solar gain may be experienced at low ambient temperatures and be followed by cold nights.



Evacuated Tube Collector.

Similar to the flat panel collector, an important advantage with this technology is that due to the improved efficiency, only a low flow is required through the panels as compared to the tube mat collectors. This allows a smaller recirculation pump to be used and hence less energy consumption.

From a system delivery and efficiency perspective, the evacuated tube collectors are the most expensive however offer the highest efficiency. Flat plate collectors are more expensive than the tube mat collectors and less expensive than the evacuated tube collectors. Essentially, the more efficient, the more expensive. In terms of dollars versus heat energy delivered, the evacuated tube technology is the preferred system.



7.8 SELECTION

Option	Recommendation
Pool Heating	The project mechanical system (designed by the Mechanical Engineer) will be providing the primary heating supply for the pools. This is expected to be via heated hot water supplies generated by all-electric heat pumps. The heating strategy for the project will need to be verified by the project Mechanical Engineer.
Cost Comparison.	N/A.

8 POOL WATER CHEMISTRY

Pool water disinfection is accomplished by introducing a bacteria killing chemical to the water in sufficient strength to almost instantaneously destroy bacteria.

Regardless of the anti-bacterial agent used, the primary goal is the same, to provide uniformly distributed disinfection and oxidation residual of sufficient strength to maintain healthy water.

Quite apart from any disinfection process, the oxidising property of the steriliser attacks many other foreign materials other than bacteria. Many of these materials, if not destroyed by oxidation, would impart undesirable characteristics to the water such as turbidity (cloudy water), colour and odour. This chemical destruction plays an important part in the complete filtration and disinfection process.

Without proper management, pools can become breeding places for water-borne infections and disease producing organisms. This is particularly important as modern pools are characterised by increasingly heavier bather loads and higher operating temperatures.

Criteria for a good disinfecting agent are as follows;

1. The chemical should not be harmful to bathers at the maximum concentration permitted by regulatory standards.
2. The chemical must have a measurable residual.
3. The chemical should be easy to store, sample and apply (liquids preferred to dry chemicals).



4. The chemical should be readily available at a reasonable cost. Usage by other industries in terms of longevity of supply would also support the selection criteria.
5. The chemical should not pose a greater than necessary risk to operational staff in terms of materials handling.
6. The chemical should be compatible with other chemicals used in the pool and not adversely affect the pool structure or fixtures.

8.1 WATER CHLORINATION

In accordance with Health Regulations applicable to pools in Victoria, a minimum of 1.0 mg/L or ppm (part per million) or 0.0001% of chlorine must be maintained in pool water at all times and 3.0 mg/L or ppm or 0.0003% for spas.

Chlorination of water can be achieved through the use of elemental chlorine (usually chlorine gas), sodium hypochlorite, calcium hypochlorite, lithium and/or chlorinated isocyanurates.

In each instance, disinfection is obtained through the formation of hypochlorous acid, a reaction product of any of the above chlorine forms and water.

Hypochlorous acid dissociates from the hypochlorite form according to the pH of the water.

Chlorine present in water with a high pH is less effective as a disinfecting agent and more importantly is not recognised by the water chemistry instruments. In order to maintain effective disinfection control, the pH of the water must also be controlled.

Ammonia and nitrogen containing compounds when present in water will react with chlorine to form chloramines (combined chlorine).

Chlorine in the combined or chloramines form is considerably less active in killing bacteria than the free or uncombined form. Notwithstanding, it should be noted that chloramines, or the combined form of chlorine, will give a positive test when using a standard water test kit.

Shock treatment, which is raising the chlorine residual to between 5-10 ppm, will control algae which may develop at normal chlorine residual levels.

Whilst the need to super chlorinate a well managed pool is comparatively rare, bathers should not be allowed to use the pool if and when it is necessary to raise chlorine levels above normal readings.



Chlorine is consumed when destroying bacteria and when it reacts with metal salts such as iron and manganese. Sunlight, water temperature, bather load, and contaminants in the water will also affect the chlorine demand.

Chlorine may be removed or neutralized in water by the addition of sodium thiosulphate.

8.2 PROPRIETARY BULK DELIVERED SODIUM HYPOCHLORITE 10 – 12%

Sodium hypochlorite (NaOCl – liquid) is a proprietary manufactured chemical and is the most prevalent throughout the pool industry.

Sodium hypochlorite (commonly called hypo) is usually delivered in bulk (1,000 litre containers) by tanker truck (requiring vehicle access) although smaller quantities are available in proprietary 5 and 15 litre containers (mostly for smaller commercial and domestic pools). At the time of delivery, the active chlorine concentration is approximately 10 - 12%. The liquid chemical is stored in chemical tank(s) and is administered in its liquid form by chemical dosing pumps. The stored chemical has a limited storage life although this is not usually an issue provided that the storage facility is located in a plant space away from sunlight and elevated temperatures.

Prolonged usage of sodium hypochlorite necessitates the draining (bleeding off) of water to control the level of TDS (total dissolved solids). The backwashing process required for the filter vessels whereby pool water is used to clean the filter and then wasted (and replenished with fresh water) is usually sufficient for this purpose.

In addition to the chlorine and sodium content, the chemical is stabilized with sodium hydroxide (caustic) which results in the chemical being strongly alkaline (having a high pH).

Sodium hypochlorite is used throughout many industries, is commonly available and is cost effective.

Sodium hypochlorite is classified as a dangerous good and therefore attracts the requirements of the dangerous goods code. Storage facility and delivery design requirements apply. A safety shower and eye wash unit is required adjacent to the storage / delivery location. HAZCHEM signage is required at both the storage facility location and at the property boundary.



HYDRA TECH DESIGNS



Typical sodium hypochlorite storage and dosing facilities.

8.3 CALCIUM HYPOCHLORITE 65%

Calcium hypochlorite ($\text{Ca}(\text{ClO})_2$ – dry) is a proprietary manufactured chemical and is less common than its sodium hypochlorite counterpart in the pool industry.

Calcium hypochlorite is available in dry tablet or a granular form and has an active chlorine concentration of 65%. The dry chemical is usually eroded by a tablet feeder or dissolved to allow the chemical to be administered as a liquid.

The chemical has an extended storage life such that expiry of the chemical is not usually an issue. The chemical being in a dry form does not require the delivery constraints applicable for sodium hypochlorite, however, can introduce manual handling risks dependant on the packaging of the product.

Prolonged usage of calcium hypochlorite will affect the calcium harness of the water and may calcify as a solid in pool pipework and equipment if the required alkalinity and water balance is not maintained. Calcium is further encouraged to solidify when used in conjunction with UV treatment. The backwashing process required for the filter vessels whereby pool water is used to clean the filter and then wasted (and replenished with fresh water) may combat the water hardness issue however the formation of solids in the pool pipework and equipment is likely to cause long term problems.

The filler component used in the production of the calcium hypochlorite tablets is dissolved as a part of the dosing process however may consolidate as a residue on the floor of the pools necessitating increased vacuuming.



An acid based chemical, usually hydrochloric acid (HCl – liquid), is required for pH correction. Carbon dioxide is not suitable for pH correction with calcium hypochlorite due to its reactional affect on alkalinity.

Calcium hypochlorite is commonly available and is relatively expensive to operate, although the initial system installation cost is less than for sodium hypochlorite.

Calcium hypochlorite is a dangerous good however does not attract the same level of safety requirements as sodium hypochlorite. A safety shower and eye wash unit is recommended adjacent to the storage location. HAZCHEM signage is required at both the storage facility location and at the property boundary.

8.4 ON-SITE GENERATED SODIUM HYPOCHLORITE 0.5 – 3%

Sodium hypochlorite generated on site has a similar chemical composition as the proprietary chemical with the exception of concentration (up to 3% versus up to 12%) and is not stabilized with sodium hydroxide (caustic).

The sodium hypochlorite is generated by electrolysis whereby conventional salt (NaCl – sodium chloride) is electrically charged to promote the formation of sodium hypochlorite and hydrogen gas. The small amount of hydrogen gas formed is vented to atmosphere.

The salt is introduced into the generation system in the form of a brine solution (salty water). The salt is manually decanted into the brine tank from proprietary 25kg bags of pool salt. Fresh water is automatically added to makeup the brine solution.

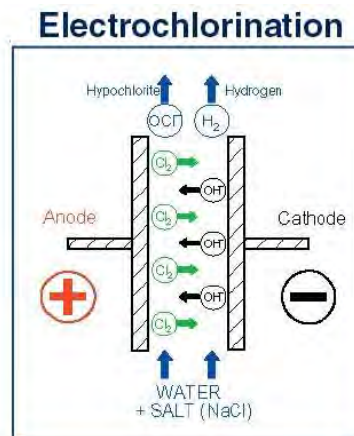
The generated sodium hypochlorite is stored in the same way as the proprietary chemical. Although the generated chemical is weaker in concentration, the storage capacity is only marginally larger than what would be required for the proprietary chemical given that the sodium hypochlorite can be generated on site as required to cater for demand as opposed to having to store a sufficient quantity to supply the chemical demand between deliveries.

The dosing pumps required for the generated chemical are the same by design however are larger in capacity to cater for peak demands. The generated form of sodium hypochlorite is up to 10,000 times the concentration of the chlorinated pool water and is easily capable of sustaining the required chlorine demand. The chemical may also be used for shock dosing.



Four of the most significant advantages applicable for the on-site generation of sodium hypochlorite are as follows;

1. The generated chemical is not stabilized with sodium hydroxide (caustic) and therefore only requires minimal pH correction. This minimizes the usage of the pH correction chemical and greatly assists with maintaining the required pool water chemistry balance.
2. The generated chemical does not attract the requirements of the Dangerous Goods Code. The delivery, handling and storage requirements applicable to the proprietary chemical do not apply. A dedicated truck bund is not required. The raw product (salt) may be delivered without any restrictions.
3. The generated chemical is much safer than the proprietary alternative and eliminates many occupational health and safety Issues.
4. The generated chemical is much cheaper per unit volume as compared to the proprietary alternative.



Sodium hypochlorite generation cells.

In recent years the actual costs of on-site generation has been realised (other than estimates and projections) with respect to membrane replacement and general servicing costs. Operational costs together with decreased costs for the bulk delivered chemical have rendered this option as commercially unviable in recent years.



8.5 SALT CHLORINATION – SODIUM CHLORIDE BASED

Salt chlorination works on the same principle of electro-chlorination as described above for on-site generated sodium hypochlorite however the pool itself provides the salt water necessary for the chlorination process as opposed to a separate brine tank provided as a part of the on-site generated option.

Given that the salt concentration necessary for the electro chlorination process is in the pool itself, the salt level or total dissolved solids (TDS) is higher than other pool chemical treatment options. Typically for conventional pools chlorinated with proprietary sodium hypochlorite, the pool TDS is less than 1,000 mg/L. Salt chlorinated pools have a TDS of approximately 4,000 – 8,000 mg/L. By comparison, the TDS of sea water is approximately 36,000 mg/L.

The higher concentrations of TDS applicable to salt chlorinated pools would not be permitted for pools provided for world class competition given that the increased TDS affects water density and as such influences the swimmers performance. In accordance with FINA regulations, world records would not be acknowledged in a salt chlorinated pool. This issue would only be applicable to venues with 50m completion pools likely to host World Championships or the Olympic Games.

Chemical storage is not necessary with this option and therefore offers clear advantages in terms of avoiding dangerous goods handling. The amount of storage required for salt, however, is increased due to the greater concentration of salt required for this method. This may also introduce manual handling issues with the loading of the salt into the pool system.

An initial loading of salt into the pool is required to achieve the required 4,000 – 8,000 mg/L TDS. Adding salt as a part of ongoing operation is required to maintain the required salt levels.

8.6 SALT CHLORINATION – MAGNESIUM CHLORIDE BASED

Salt chlorination using magnesium chloride works on the same principle as conventional sodium chloride in terms of chlorine generation by electro-chlorination.

The use of magnesium chloride is promoted as offering some therapeutic benefits although there is no evidence to support this when used for pool disinfection. Any perceived benefits associated with the addition of magnesium may be achieved by the addition of magnesium sulphate (bath salts) irrespective of the disinfection process.



The use of magnesium chloride is promoted through proprietary pool systems including “Magnapool”. These systems are usually laced with misleading information designed to attract unsuspecting customers. These systems typically include agreements that place onerous conditions on chemical purchases. A requirement to use “special” proprietary chemicals encourages price fixing and greatly reduces operational flexibility. Companies that offer proprietary systems that cannot be replicated with competitive technologies and commercially available equipment should be avoided.

The tangible benefits offered by these proprietary pool systems are mostly achieved through improved filtration capacities and filter media selection. These benefits should be included as a part of good pool design practice regardless of the disinfection process.

8.7 CHLORINE GAS

In terms of pure water chemistry, chlorine gas is the most efficient chlorination chemical for swimming pools. Despite its high efficiency, chlorine gas is an extremely dangerous chemical and fails many levels of operational risk assessments.

System failures that have resulted in chlorine gas leaks, pool shut-downs and the hospitalisation of patrons and staff are well documented.

Specialist industries that use chlorine gas employ technicians specifically trained to handle chlorine gas. In addition to this, the regulatory requirements for the installation, operation and maintenance of liquefied chlorine gas systems are quite onerous and can add significant cost to the project. The use of chlorine gas is not conducive to aquatic facility operations.

8.8 pH CORRECTION

The addition of chlorine results in an increase of pH in the pool water which needs to be counteracted by an acid that is dosed into the pool water to maintain a pH close to neutral (7.2 to 7.6 pH is ideal). A neutral pH can be achieved through the use of carbon dioxide (CO₂), hydrochloric acid (HCl – liquid acid) or sodium bisulphate (NaHSO – dry acid).

Traditionally CO₂ has been used as the primary bulk stored chemical used for pH control for aquatic centres. When CO₂ is mixed with water, carbonic acid is formed which provides the acid to reduce the pH of pool water.

HCl is a liquid acid chemical which can be used directly to lower and control the pH level of pool water. HCl is used extensively across the aquatic industry, although it's not commonly stored in bulk (more



than 1,000 litres) and is not often used as the primary source of pH control. HCl is used mostly as a maintenance chemical (used if CO₂ can't sufficiently reduce the pH) or as a backup chemical if there is a disruption or other issue with CO₂ supply.

Traditionally HCl has not been used as the primary chemical for pH control as it couldn't be delivered in sufficient quantities which required unacceptable levels of manual handling (decanting chemical from smaller containers).

More recently HCl has become available for bulk delivery (nominally 1,000 litres) which eliminates the manual handling issues and presents a far superior chemical for pH control in terms of both pure water chemistry and operational cost. This availability has also coincided with increasing costs of CO₂ supply which further promotes the use of HCl for pH control.

HCl can be delivered and transferred directly to onsite storage tanks with no direct contact by the pool operator in the same method as liquid chlorine.

In terms of materials handling and safety precautions, the requirements that apply to Sodium Hypochlorite (NaOCl - liquid chlorine) also apply to HCl. Both chemicals are classified as Class 8 (corrosive) Dangerous Goods and attract the same requirements in terms of safety controls and compliance with AS3780 – The Storage and Handling of Corrosive Substances.

8.9 SUPPLEMENTARY DISINFECTION TREATMENT OPTIONS

Supplementary disinfection treatment options are usually incorporated for improved water disinfection/water polishing requirements.

Although chlorine is the only disinfection method required by regulation, supplementary treatment is often incorporated for commercial aquatic facilities to improve water quality/clarity, to cater for higher bather loads and to combat the affects this has on the chlorine residual present in the pool.

Most commercial aquatic centres throughout Australia have supplementary disinfection in the form of either UV or Ozone.

Supplementary treatment in the form of UV or Ozone greatly diminishes the presence of chloramines in water. Chloramines are created by a reaction between free chlorine and organic or nitrogenous matter (from the bather load) and are the source of the odour usually associated with chlorinated swimming pools (especially heated indoor pools). Further, the use of chlorine alone often results in the



need for increased chlorine concentrations to achieve breakpoint chlorination whereby the free chlorine concentration equals the total chlorine concentration, that is – no chloramines.

Another by-product of the reaction between free chlorine and organic or nitrogenous matter is the formation of trichloramines. Trichloramines have a pungent odour and is responsible for various complaints. If the free chlorine residual is maintained too high, that is over 3.0 ppm, the trichloramine level will become noticeable and bathers will complain of sore eyes.

The use of supplementary disinfection treatments allows the primary bacterial kill to be performed by the water treatment plant thus leaving the chlorine to provide only the residual disinfection at the minimum required level in the pool itself.

8.10 ULTRA-VIOLET (UV) DISINFECTION

Germicidal (bacterial) control is achieved by UV-C radiation generated by an inert mercury vapour low or medium pressure lamp. The mercury vapour, when disturbed by electron impact, emits UV-C radiation across the wave length spectrum, with concentrations at 254 nm to achieve ultimate bacterial kill. UV radiation at this wave length, together with an intensity $>40\text{mWsec/cm}^2$, is extremely effective as a disinfection agent. The UV lamp is housed within a quartz sleeve within a stainless steel chamber and is fully controlled by the water treatment system.

Germicidal destruction provided by UV greatly diminishes the presence of chloramines in water although free chlorine destruction is also experienced resulting in an increased chlorine demand.

UV systems should incorporate both free and total chlorine control interfaces to proportionally adjust the output of the UV unit; that is as the difference between the two readings increases (the measurement of chloramines); the UV intensity should proportionally increase. When the chloramine levels are reduced to an acceptable level, the UV intensity should proportionally decrease to minimise free chlorine destruction.



Typical medium pressure UV unit.

8.11 OZONE DISINFECTION

Ozone is an energy-rich modification of oxygen. In concentrated form it is a noticeably blue gas that is approximately 1.5 times heavier than air. Ozone is highly toxic. Concentrations in excess of 10 g/m³ are life threatening.

A strong characteristic of ozone is the smell, which is perceptible even at concentrations as low as 1 in 500,000. Ozone can often be detected after powerful flashes of lightening or near frequently used photo copying machines.

Ozone can be used to oxidise many chemical compounds and is utilised for the treatment and disinfection of other processes including drinking water, process water and sewage treatment.

A significant advantage of ozone as a disinfectant and oxidant is that it decomposes into oxygen, which is already present in water.

Ozone in a gaseous state has a half-life of between 30 to 40 minutes depending on temperature. When dissolved in water, its half-life is reduced to a few minutes.



Ozone is typically generated by corona discharge in an ozone column whereby air is charged by a high voltage electrode in connection with cooling water which flows through the outer jacket of the ozone column and acts as the earth for the electric charge. The sparking affect from the electrode to the column splits the O^2 oxygen molecule into a combination of O^2 and O^1 molecules. The unstable O^1 molecules are attracted to the O^2 molecules to form O^3 , ozone. Using common air as the input gas mixture, it is possible to reach concentrations of approximately 20-35 g/ozone/m³.

Necessary conditions for the generation of ozone are dry air free of particulates and a satisfactory means of eliminating heat.

Ozone is typically generated in a partial vacuum to ensure that ozone cannot leak from the generator in the event of pipework failure. Under normal operating conditions ozone is safe and can be maintained without incident.

Ozone is mixed and reacted with the water in a contact vessel and then removed from the water stream by activated carbon. This process requires additional plant space. In addition to the disinfection properties of ozone, the effect of the ozone reaction and carbon filtration provides other benefits that result in excellent water quality.

Ozone may be configured in a side stream arrangement whereby a lower turnover is passed through the ozone system. This arrangement offers the benefits of ozone treatment whilst minimizing the ozone system size and destruction of chlorine.

Ozone also micro-flocs the water, which is the ozone reaction, assists with water clarity and is often observed as a blue hue providing water quality of the highest standard.



Typical ozone generator(s).

8.12 DRY CHEMICAL FEEDER

Typically dry chemicals are managed manually (moved around on a trolley) with the chemical bags opened and the chemicals manually added to the pool balance tanks via the access hatches located in the pool concourse area. This method is not acceptable from a manual handling perspective.

A dry chemical feeder located in the plantroom utilising a vacuum lifter (to lift the dry bags) eliminates the need to lift the dry chemical bags and automates the delivery of water mixed chemicals to the relevant balance tank without needing to access the pool concourse. This design allows the dry chemical feeding to be performed at any time (not out of hours to access the concourse access hatches).



8.13 SELECTION

Chlorination	
Option	Recommendation
Sodium Hypochlorite (NaOCl)	Bulk delivered sodium hypochlorite (NaOCl) is the most practical and cost-effective option for a large aquatic facility. Recent cost increases with on-site generation systems renders this technology unviable. Delivery truck bund required.
Cost Comparison.	Proprietary bulk delivered sodium hypochlorite. Base Case %0. On-site generated sodium hypochlorite. +325% above base case initial capital cost.

pH Correction	
Option	Recommendation
Hydrochloric Acid (HCl)	Bulk delivered hydrochloric acid (HCl) for pH correction is the most practical and cost-effective option for a large aquatic facility. Delivery truck bund required (shared with Sodium Hypochlorite bund).
Cost Comparison.	Bulk delivered hydrochloric acid (HCl). Base Case %0. Carbon dioxide. 42:1 cost ratio effectiveness.

Supplementary Disinfection	
Option	Recommendation
UV	Suited to application and operational environment. Will reduce chloramines (chlorine odour). May be integrated without significant spatial increase. Justifiable cost. Industry standard for commercial aquatic facilities. Provision of automatic Total Chlorine control will enable control of UV units to maximise efficiency and lamp life and minimise unnecessary operation of the units when pools are not in use, which will reduce energy demands and unnecessary chemical usage.



9 POOL EDGE TYPES AND ENTRIES

There are two predominant pool edge types available; wet deck and skimmer.

9.1 WET DECK

Wet deck edged pools are preferred to older style raised wall pools as they offer an improved method of water return from the surface of the pool. Wave motion caused by water rebounding off raised perimeter walls is not preferred as the wave motion can affect (slow) swimming. Wave motion is greatly reduced with a wet deck pool as waves cannot rebound and are drained away through the wet deck grating. Wet deck pools are often referred to as "fast" pools for this reason.

In addition to the "fast" pool advantages, wet deck edge types are also employed for their aesthetic appeal. Having the water level at the same level of the surrounding concourse may be considered a more attractive design to a skimmer edged pool.

Wet deck edged pools offer improved soiled water collection as the water is skimmed from the entire pool perimeter as compared to skimmer pools which collect only from the skimmer locations.

The Agrob Buchtal Weisbaden pool edge tile provides an elevated water level above the surrounding concourse and features an integral low-profile wet deck trench. This design offers an attractive finish however is not considered cost effective for larger pools.

By design, wet deck pools cannot retain water displaced by bather load as the pool water level cannot rise above the level of the surrounding concourse. This arrangement necessitates a balance tank. A balance tank is usually integrated into the pool structure although may sometimes be provided in the form of a proprietary tank for smaller pools. The balance tank accepts water displaced by bather load; supplies water for make-up and provides buffer storage for pool system backwashing. The balance tank is usually approximately 10% to 15% of the pool water volume. The balance tank must be located at the same level or below the pool.



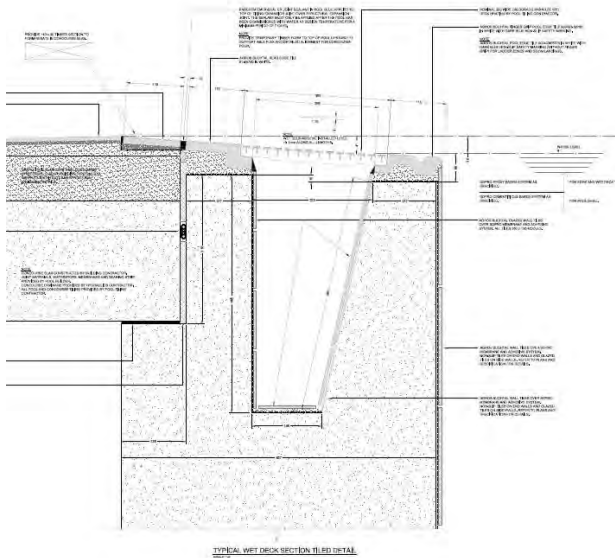
HYDRA TECH DESIGNS



Traditional Wet Deck Pool Edge.



Weisbaden Wet Deck Pool Edge.



Typical Wet Deck Section

9.2 SKIMMER

Skimmer pools are associated mostly with domestic type pools having a skimmer box as the method of soiled water collection from the pool.

Unlike wet deck edged pools, the water level is maintained below the concourse level (nominally 150 to 200mm below) such that bather load and backwash retention can be provided in the pool itself.



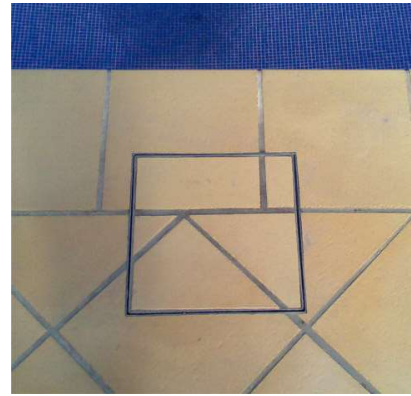
HYDRA TECH DESIGNS

Skimmer type pools offer limited soiled water collection from the pool (being only able to draw soiled water from the skimmer locations) as compared to wet deck edged pools which collect soiled water from the entire pool perimeter. Additional skimmer boxes can be provided to improve soiled water collection.

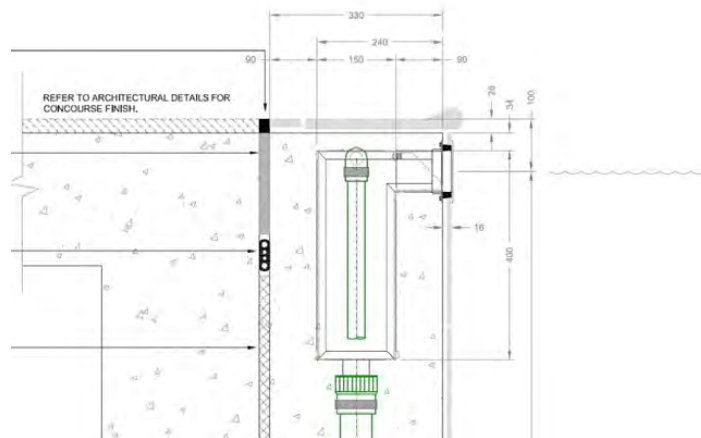
Skimmer boxes are often associated with the deck lids required for access to the strainer basket housed in the skimmer body. Modern variations on the skimmer design allow the strainer basket to be accessed through the throat of the skimmer such that the characteristic deck lids are not required (providing a clean pool concourse).



Traditional Skimmer Pool Edge.



Tile Filled Skimmer Access.



Project Specific Skimmer Design in accordance with AS1926.3



9.3 SELECTION

Option	Recommendation
Pool Edge Types.	Wet deck pool edges throughout as modern industry standard and best practice design.

10 POOL STRUCTURES

The most prevalent form of commercial pool construction worldwide is steel reinforced concrete. This method of construction has been used throughout the pool industry across Australia for circa 100 years.

In more recent years, pre-engineered panel type pools have emerged initially as temporary pools for specific events, however these pools have developed to offer permanent pool structures as alternatives to conventional concrete pool structures.

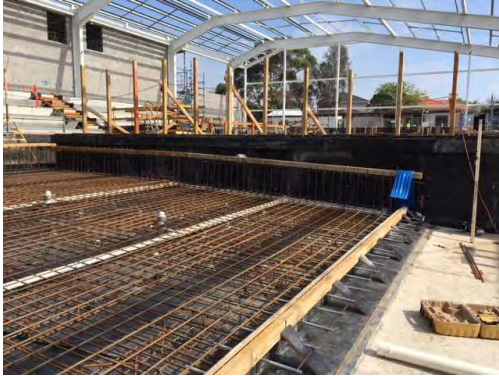
10.1 STEEL REINFORCED CONCRETE POOL CONSTRUCTION

Commercial steel reinforced concrete pool structures are typically constructed using rigid formwork (box-and-pour) methods which allow large pool shapes to be formed on site according to the required pool design. Spray concrete methods may be employed for smaller and domestic pools however limitations apply relating to concrete mix design (capable of spraying) and special consideration is required for waterproofing and sealing of penetrations.

Strength and watertightness is achieved predominantly by the concrete mix design and the design of the steel reinforcement. Concrete strengths of 40 mPa are typically employed for commercial pools.



H Y D R A U T E C H D E S I G N S



Concrete Pool Construction in Progress.

All pool structures are defined as water retaining structures and therefore must comply with the requirements of AS3600 - Concrete Structures and AS3735 - Concrete Structures for Retaining Liquids.

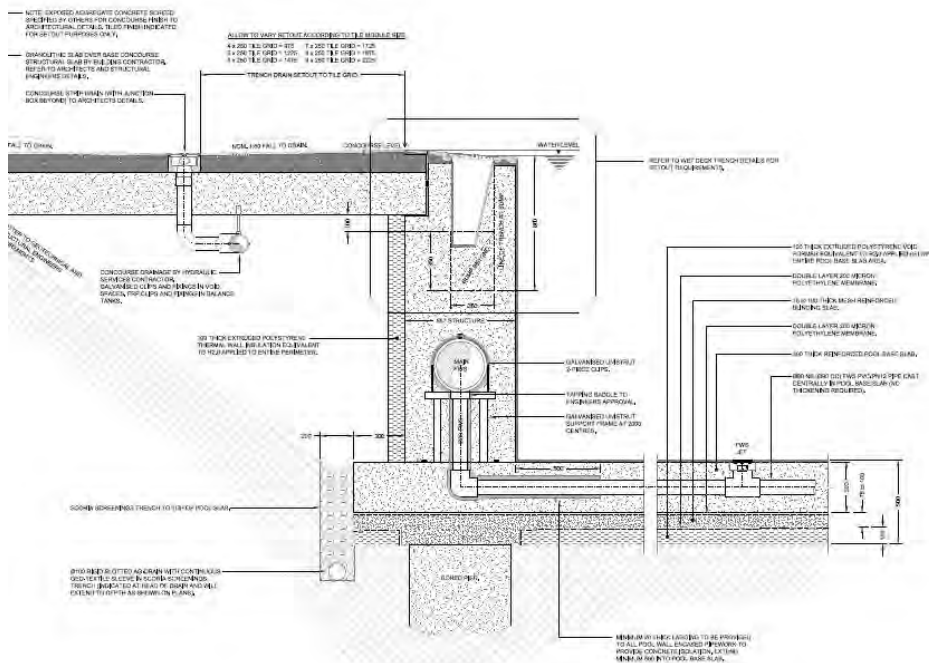
Pools of concrete construction are typically capable of supporting loads of the adjoining structure (pool concourse slabs) and the loads imposed by construction equipment (cranes, boom lifts etc) during construction.

Concrete pool construction is generally considered the most durable form of construction, providing an operational life equal to the overall building life. Concrete pool construction is generally favoured when good quality concrete materials and experienced concrete contractors are available for the project construction.

A concrete pool structure allows the pool pipework to be wholly contained within the pool shell such that the energy emitted from the pool pipework is contained within the pool system.



HYDRA TECH DESIGNS



Typical Section of Reinforced Concrete Pool.

10.2 MODULAR TYPE POOLS

Modular sectional panel type pools involve the erection and joining of prefabricated steel panel sections which are bolted together to form the pool shell.

The panel sections are pre-engineered and manufactured according to the pool design. The pool shell is constructed on a reinforced concrete base and lined with a membrane liner.

Modular pools are favoured in areas where conventional concrete construction may be hindered by the availability of good quality concrete materials and suitably experienced commercial pool builders.

Modular pools offer the ability to build pools in existing venues for specific events. Hydrautech Designs was engaged to provide water treatment and construction advice for the 2007 World Swimming Championships in Melbourne. This event involved the construction of two 50m FINA Competition



HYDRA TECH DESIGNS

Pools; one in Rod Laver Arena and one in Vodafone Arena (now Melbourne Arena). This arrangement utilised the seating capacity of the existing venues and was an ideal application for modular pools.

Sectional pools also offer the ability to construct pools in locations where it would not be practical to utilise conventional concrete methods. Modular pools may be constructed in high-rise buildings where access may be hindered or the pool may need to be constructed after completion of the base structure.



Modular Sectional Panel Type Pools.

Sectional pools are typically not capable of supporting external vertical or lateral loads and therefore a secondary structure may be required to support the adjoining structure (pool concourse slabs) and the loads imposed by construction equipment (cranes, boom lifts etc) during construction. This requirement should be considered when comparing sectional pools to conventional construction methods (if applicable).

Sectional pools require careful control of panel assembly and application of the pool liner. Failure of the waterproof barrier may result in pool water making contact with the rear of the unprotected panel which may result in corrosion and ultimate failure.

Particular attention is required to the contact of dissimilar metals which can result in galvanic corrosion in the presence of pool water which acts as an electrolyte.



H Y D R A U T E C H D E S I G N S



Examples of Corrosion and Panel Failure.

Other considerations with sectional pools include thermal loss from the stainless steel pool shell, maintenance of the pool liner and limitations on internal finishes (no tiles).



In accordance with the Section J - Energy Efficiency requirements of the National Construction Code (NCC) incorporating the Building Code of Australia (BCA), the pool shell is required to be thermally insulated. This is very difficult to achieve with a modular pool on account of the folded sections and braces that act as thermal bridges. In order to properly thermally insulate a modular pool in accordance with the standard, each panel and brace would need to be insulated with thermal pads provided below the fixings to prevent conduction of heat to the supporting structure.

Careful consideration needs to be given to the warranty conditions offered with modular pools. Limitations may apply with respect to the pool liner in terms of water quality and shorter warranty periods for the liner. The pool panels may be warranted for a longer period of time however the liner may only be warranted for a short period of time which affects the overall warranty value for the complete pool. A condition of the warranty may be to empty the pool each year to allow inspection by the manufacturer. This condition is clearly inefficient in terms of cost and energy efficiency. The disruption to operation also needs to be considered.

10.3 SELECTION

Option	Recommendation
Pool Structure	Fully formed cast-insitu concrete construction integrated with building structure. Insulated pool walls to minimise heat loss and increase building and plant efficiency. 15 year warranty limitation applicable to Modular type pools not suitable for a permanent installation.
Cost comparison.	Fully formed cast-insitu concrete construction. Base case 0%. Modular sectional construction. Base case +/- 5% (similar cost).



HYDRAUTEC DESIGNS

11 POOL TILING

Pool tiles provide an aesthetic and durable finish to pool surfaces. Certified pool tiles provide a verifiable compliant slip resistance and wear rating.

It is essential that specialist preparation products, certified pool tiles and grouts are used for swimming pool applications and environments.



Sopro specialised pool tiling preparation and adhesive products.

A waterproof membrane shall be provided for all tiled pool surfaces including wet deck trenches. The membrane provides a waterproof barrier and isolation between the pool structure and the tiled surface to prevent delamination of the tiled surface as a result of concrete shrinkage. Membranes not protected by a tiled surface shall be protected by an additional surface barrier to protect the membrane integrity.



HYDRA TECH DESIGNS

The following tolerances should be applied for all tiled concrete pool construction;

Wet deck levels	+1mm	-1mm
Alignment of pool walls before tiling	+10mm	-0mm
Alignment of pool walls after tiling	+3mm	-3mm
Length of pools after tiling	+10mm	-0mm
Width of pools after tiling	+10mm	-0mm
Pool depths after tiling	+10mm	-0mm

For compliance with relevant standards and the Guidelines for Safe Pool Operation, pool floor tiles must be non-slip rated for water depth less than 1.6m and have contrasting edge strips at abrupt changes of depth and at step nosings and landings.



11.1 SELECTION

Option	Recommendation
Pool Tiling	Fully tiled with AGROB BUCHTAL or approved equivalent pool tiles.



12 POOL BLANKETS

Pool blankets represent a significant advantage in terms of heat retention, energy efficiency, water conservation, condensation minimisation and reduction in mechanical system output.

Pool blankets also provide protection of building surfaces and significantly extend the required frequency of building maintenance (painting steelwork, replacing corroded components etc).



Examples of integrated pool blankets.

Cost analysis for pool blankets indicate that a pay-pack period of less than 5 years is achievable (stated as under one year by some manufacturers). Typical pool blanket analysis does not always include for staff costs associated with the application and removal of the pool blanket(s).

Pool blankets for indoor commercial aquatic facilities may not always be effective given that the air space is controlled and maintained above pool water temperature, typically 1°C above pool water temperature to minimise heat loss and condensation. The pools may also be irregular in shape which can be problematic for blanket storage and handling.



The 2019 edition of the National Construction Code (NCC) incorporating the Building Code of Australia (BCA) introduced the requirement under Section J - Energy Efficiency, for all pools and spas to be provided with pool blankets with a minimum R-Value of 0.05 when they are heated by either a gas heater or a heat pump or a combination of the two.

The Deemed-to-Satisfy requirement is to have a pool blanket for all pools and spas. It may be possible under a Performance Solution to design out pool blankets if the mechanical air management system can demonstrate that an equivalent R-Value can be maintained by a thermal air blanket as a part of an Open Balance or equivalent mechanical system.

12.1 SELECTION

Option	Recommendation
Pool Blankets	Pool blankets are required for Deemed-to-Satisfy compliance.



13 RAINWATER HARVESTING

Rainwater harvesting can be a valuable resource to offset water consumption for pool water make-up.

It is important to acknowledge that the backwash water discharge also represents the volume of fresh water that is required to replenish the water lost as a part of the backwashing process. Rainwater may be harvested, treated and delivered to the pool systems to offset the consumption of mains water.

There must be sufficient access to the stormwater system and space available for rainwater storage in order to realise the full potential of this initiative. Diverting downpipes to a rainwater storage tank is easily managed when designing a new aquatic facility.

Usually rainwater tank size is determined by the reuse consumption as compared to the peak and monthly rainfall events, that is the storage should have sufficient capacity to store the harvested rainwater and provide a buffer for the reuse application such that all of the rainwater can be captured as the rainwater is used.

For pool applications, the fresh water demand will be in excess of the available harvested rainwater supply, that is the rainwater will be continually drawn down at a rate higher than the rainfall fill rate. This situation allows the rainwater tank to be sized such that it is capable of accepting peak rainfall events only, not average monthly yields.

This results in the rainwater harvesting tank being much smaller than it would otherwise be if sized for irrigation purposes which needs to allow for wet-weather storage.

13.1 RAINWATER HARVESTING FOR POOL WATER MAKE-UP

Given that backwash water cannot be used for pool water make-up without treatment for TDS as described in the next section, the most efficient reuse option for rainwater (which doesn't need to be treated for TDS) is for pool water make-up.

For compliance with local regulations, specific treatment requirements and risk assessments need to be established for the reuse of rainwater for swimming pools.

A valuable attribute of rainwater is its low TDS. The addition of treated rainwater, typically having a TDS lower than mains water, assists with maintaining a low TDS and thus minimizes the necessity to bleed water from the pool.



The advantage of rainwater harvesting for aquatic facilities is that the pool systems have a fresh water demand all year round and typically have expansive roof catchments to harvest rainwater.

Roof catchments are preferred in isolation to avoid pollutants including hydrocarbons, suspended solids and other contaminants that may enter the stormwater system by surface entry points.

13.2 SELECTION

Option	Recommendation
Rainwater Harvesting for Pool Make-up	Should be adopted. Accepted as industry standard practice for new aquatic facilities where rainwater harvesting can be designed in as an integral part of the building. Minimal operational costs. This option will be dependent on the accessibility and practicality of connecting and diverting existing downpipes.

14 BACKWASH WATER TREATMENT PLANT AND HEAT RECOVERY

The filters used to clean the swimming pool water require periodical cleaning. This cleaning process involves the reversal of flow through the filters to liberate and wash away particles entrapped by the filter media. As the name suggests, this process is referred to as “backwashing”. The backwashing process consumes a large volume of water which is traditionally drained to waste. A trade waste charge is also applied by the governing water authority for the disposal of the backwash water.

With treatment, an opportunity exists to recycle the backwash water for non-potable water uses. The reuse opportunities include namely pool water make-up, irrigation (conditional) and sanitary flushing.

14.1 RECYCLING OF BACKWASH WATER FOR POOL WATER MAKE-UP

Backwash water is not suitable for pool water make-up without treatment. The elevated level of total dissolved solids (TDS) in the treated backwash water (as compared to mains water or rainwater) renders this water source unviable for pool make-up (without treatment) given that water would need to be dumped in order to control TDS thus defeating the purpose of water reuse.

For compliance with EPA Publication 464 – Use of Reclaimed Water, backwash water must be treated to comply with Class A when used for processes which include direct human contact. Class A is the



highest quality standard for treated wastewater and defines the treatment level for unrestricted access; that is without any stringent controls to prevent human contact.

Wastewater Treatment Classes may be defined as follows;

Class	<i>E.coli</i> org / 100mL	Turbidity NTU	Biochemical Oxygen Demand (BOD5) mg/L	Suspended Solids (SS) mg/L	pH
A	<10	<2	<10	<5	6 – 9
B	<100	N/A	<20	<30	6 – 9
C	<1000	N/A	<20	<30	6 – 9
D	<10000	N/A	<20	<30	6 – 9

Dissolved solids are more difficult to remove than suspended solids as they cannot be physically removed from the water by conventional filtration processes.

The degree of dissolved solids can generally be classified according to the conductivity of the water. The conductivity is determined mostly by dissolved elements in water and is commonly in the order of 1.5 times the value of TDS.

Sodium salts are predominantly the highest contributors to conductivity and consequently TDS in water (especially pool water). Total Organic Carbon (TOC), metals and chemicals also contribute to the conductivity of the water and provide a measurable value that can be used to assess the quality of water; essentially the lower the conductivity, the purer the water.

Conductivity may be considered the benchmark when assessing water quality and is normally a figure provided as the criteria for a required water supply quality (expressed in μS , microsiemens). Typically Melbourne water has a conductivity of $\sim 70\mu\text{S}$, whereas some other major Australian cities can be $>300\mu\text{S}$. Some process plants may require water quality down to $<5\mu\text{S}$.

In addition to bather load and evaporation, the main contributor to TDS in pool water is typically the chemical used for residual chlorination.

Most of the pools are chlorinated with sodium hypochlorite (12% liquid chlorine). Being sodium based, this chemical is the biggest contributor to the level of TDS in the pool water.



For compliance with industry guidelines, pool water treatment systems should maintain TDS levels below 1,000 to 2,000 mg/L. TDS levels maintained beyond the upper limit may result in increased turbidity (cloudy pool water), scale formation, corrosion and decreased disinfection efficiency.

Given that pool water treatment systems essentially recirculate the same water in a closed loop, the TDS of the pool water steadily increases over time. The addition of fresh water (mains water or rainwater) to compensate for backwash losses, bather load and evaporation reduces the TDS given that fresh water has a lower TDS than the pool water.

Reintroducing treated backwash water into the pool without additional treatment for TDS will significantly increase the pool water TDS. The TDS will also be increased by the reduction of fresh water dilution as the fresh water demand is reduced by the reuse of treated backwash water.

TDS is the limiting factor in terms of treatment requirements. If the TDS of the source water is too high, the level of treatment required to lower the TDS may be prohibitive. TDS may be reduced by Reverse Osmosis (RO). RO is a membrane process in which solutions are desalted using high hydraulic pressure. In the RO process salt ions and other contaminants are excluded or rejected by a semi-permeable membrane through which only pure water can pass under very high pressure. RO technology is commonly used for process plants, sea water desalination and in ultra-pure water systems.

The RO process consumes relatively high levels of energy to achieve the high pressure required and produces a super-saline reject stream which needs to be discharged to the authority drainage connection as trade waste. The trade waste discharge of the reject stream may also attract a high discharge fee if the maximum sodium limit for discharge into authority drainage systems is exceeded. Issues also arise with chemical addition to counteract the extraction of metals and elements from pipework and equipment downstream of the RO system.

Advances in membrane technology and the reduced level of TDS removal required for pool water treatment systems (backwash water at <2,000 mg/L TDS as compared to sea water at 35,000 mg/L TDS) has resulted in energy consumption improvements with RO treatment.

RO technology may be considered as an efficient form of treatment for larger aquatic facilities that discharge high volumes of backwash water across multiple pools with large storage capacities for the raw backwash water. Larger storage capacities provide the buffering necessary to allow the RO system itself to be reduced in size.



An important attribute of the backwash water is its heat capacity. Treating the backwash water for delivery back into the pool has the advantage of retaining the residual heat in the backwash water and hence offsets the heat energy requirement provided that treatment occurs shortly after the backwash cycle.

An added advantage of RO for TDS control is also the removal of all other chemical parameters including combined chlorine (or chloramines). Backwash water treated with RO and recycled back into the pool assists with combined chlorine control and may even negate the use of supplementary treatment in the form of ozone or UV for this purpose.

This initiative offers the most efficient method of backwash water reuse in terms of facilitating the installation of the plant equipment necessary. That is, all of the work and installation requirements are confined to the existing backwash tanks and plant spaces.

14.2 RECYCLING OF BACKWASH WATER FOR SANITARY FLUSHING

The reuse of treated backwash water for sanitary flushing is not as dependant on TDS as compared to pool make-up. The treatment requirement for this end use is less intensive predominantly due to the water being flushed to the sanitary drainage system and therefore not recycled beyond its initial use.

Notwithstanding, treated backwash water with elevated TDS may be corrosive to the flushing devices. The internal mechanisms of most modern flushing devices are plastic and are not affected by high TDS although metal pins, springs and rubber seals may require replacement at intervals shorter than would normally be expected. The serviceable components of the flushing devices are relatively inexpensive, easy to install and may be considered as a minor issue when compared to the benefit of using recycled water.

Treatment requirements applicable to backwash water for sanitary flushing including suspended solids, chemical and colour removal are more easily resolved than treatment for TDS.

Suspended Solids (SS), by definition, are solids that are suspended in water and therefore may be filtered out by physical separation. SS present in backwash water are predominantly sand fines and fine dirt particles.

For compliance with EPA Publication 464 – Use of Reclaimed Water, backwash water must be treated to comply with Class A when used for sanitary flushing. Class A is the highest quality standard for



treated wastewater and defines the treatment level for unrestricted access; that is without any stringent controls to prevent human contact.

Wastewater Treatment Classes may be defined as follows;

Class	<i>E.coli</i> org / 100mL	Turbidity NTU	Biochemical Oxygen Demand (BOD5) mg/L	Suspended Solids (SS) mg/L	pH
A	<10	<2	<10	<5	6 – 9
B	<100	N/A	<20	<30	6 – 9
C	<1000	N/A	<20	<30	6 – 9
D	<10000	N/A	<20	<30	6 – 9

The use of treated backwash water for sanitary flushing offers the advantage of maintaining a recycled water demand at all times as compared to irrigation use which varies seasonally. This demand provides improved system efficiency and overall water savings considering the relatively consistent year round availability of backwash water.

The most limiting factor when considering this initiative is the water supply connections to the sanitary flushing devices themselves. The sanitary flushing devices are currently supplied with potable water. This arrangement is consistent with conventional plumbing design although new environmentally sustainable developments of this type may include a third pipe system whereby the sanitary flushing devices are connected separately to a non-potable water supply.

Re-plumbing the water supply to each of the fixtures such that they are disconnected from the potable water supply and connected to a separate recycled water supply will not be possible without significant re-work and interruption to the existing facility.

More importantly, each point of connection must be thoroughly investigated to verify that only the sanitary flushing devices are supplied with recycled water. The potential exists for a cross-connection to be made such that non-potable recycled water may be supplied to potable water fixtures. This investigation, in areas, may involve the complete removal of wall and ceiling cladding.



It may be considered an advantage to install the recycled water pipework for the toilet cisterns in visible and accessible locations. This arrangement would greatly simplify installation and also provide an excellent opportunity to promote the water conservation initiatives implemented.

In conjunction with the use of backwash water for pool water make-up, the reject water stream from the RO treatment process may be used for sanitary flushing. This water stream complies with the requirements outlined in this section and offers a reuse opportunity for the reject water that would otherwise be drained to waste. The corrosive effects when using reject water are greatly increased with this super-saline solution.

Importantly, recycling backwash water for sanitary flushing makes no use of the heat capacity of the backwash water.

This outcome is further supported by the issue that fresh water is deemed acceptable for use by sanitary fixtures however is considered less favourably when used for swimming pools. This position is upheld by the water authorities who impose restrictions on fresh water use for swimming pools.

14.3 RECYCLING OF BACKWASH WATER FOR IRRIGATION

Although TDS must be considered when assessing the suitability of backwash water for irrigation, the treatment requirements for this end use are less intensive as compared to pool water make-up.

Treatment requirements applicable to backwash water for irrigation including suspended solids, chemical and colour removal are more easily resolved than treatment for TDS.

Suspended Solids (SS), by definition, are solids that are suspended in water and therefore may be filtered out by physical separation. SS present in backwash water are predominantly sand fines and fine dirt particles.

A key benefit for treated backwash water reuse for irrigation is the compatible water usage pattern at peak periods. That is, the peak irrigation demand in summer is matched by an elevated discharge of backwash water as a result of increased bather load and evaporation.

For compliance with EPA Publication 464 – Use of Reclaimed Water, backwash water must be treated to comply with Class A when used for processes which include direct human contact. Class A is the highest quality standard for treated wastewater and defines the treatment level for unrestricted access; that is without any stringent controls to prevent human contact.



Wastewater Treatment Classes may be defined as follows;

Class	<i>E.coli</i> org / 100mL	Turbidity NTU	Biochemical Oxygen Demand (BOD5) mg/L	Suspended Solids (SS) mg/L	pH
A	<10	<2	<10	<5	6 – 9
B	<100	N/A	<20	<30	6 – 9
C	<1000	N/A	<20	<30	6 – 9
D	<10000	N/A	<20	<30	6 – 9

As defined by EPA Publication 168 – Guidelines for Wastewater Irrigation, treated backwash water quality under normal operating conditions and without treatment for TDS will span the upper limit of Class 3. Class 3 is compatible with plant life of moderate to high salt tolerance. Publication 168 provides a list of some suitable plant species according to irrigation water classification.

Salinity Classes may be defined as follows;

Class	Total Dissolved Solids (TDS) mg/L	Electrical Conductivity (EC) μ S
1	0 – 175	0 – 270
2	175 – 500	270-780
3	500 – 1500	780 – 2340
4	1500 – 3500	2340 – 5470
5	>3500	>5470

It is important to understand that if a dedicated irrigation site is selected, a site specific Land Capability Assessment (LCA) will be required. A LCA is a separate report in itself which details the soil structure of the intended irrigation site and determines if the recycled water quality is suitable according to application rates and other variables including rainfall, plant types and soil permeability. Measures that may be required to maintain soil and foliage health are also detailed.



In our experience, the application of gypsum (calcium sulphate) may be used to counteract the effects of sustained irrigation with treated backwash water (subject to LCA findings).

The use of treated backwash water off-site must be approached with caution given that the prevailing soil conditions, plant species, ground water conditions, drainage characteristics (both overland and sub-surface) and application rates are not known.

Providing that the treated backwash water is not used excessively in concentrated areas, irrigation of general parkland with the treated backwash water should be acceptable. Further, given that the treated backwash water would need to be transported by water truck to sites, it is not likely that any one concentrated area will be irrigated in large quantities.

Growing plants and evaporation remove water from the soil and thus the concentration of salts in the soil increase. Unless soil water is replenished, plants will die from the effects of salt toxicity and insufficient water.

It is important to understand that the major salination problems associated with irrigation are not usually attributable to salts contained in the applied irrigation water.

Clearing of native trees and shrubs on a vast scale and their replacement by shallow-rooted plants has caused water tables to rise markedly even in areas where there has been no irrigation. When saline groundwater rises to within 1.5 metres of the surface, the salt is likely to be concentrated by evaporation. Salts may also be transported laterally by groundwater and brought to the surface at a lower elevation, sometimes a long way from the irrigated land.

If the water deficit is frequently replenished, plant roots near the soil surface will have a constant supply of water with a salt concentration similar to that of the irrigation water.

The water needed to transport salt from the root zone is called the leaching requirement. This concept excludes the effect of rainfall and prevailing drainage conditions however is a useful guide to understanding the salt balance in the root zone. In water deficit irrigation, crop yields are more affected by the salinity of the irrigation water than by the salinity of soil water in the lower root zone, particularly if leaching is sufficient.

The amount of water required for leaching depends on the salt tolerance of the vegetation and the salt concentration in the irrigation water.



Salt concentration tends to increase with soil depth. The aim of irrigation is to supply enough water at the right time for plant growth and to maintain a tolerable level of salts particularly in the upper root zone. The leaching requirement is often met by rainfall in southern parts of the state. Salt is also removed from the soil solution by precipitation of calcium, magnesium, carbonate, bicarbonate and sulphate ions to form slightly soluble gypsum or carbonates.

Leaching is not necessary at every irrigation site. Moderately salt tolerant plants can be irrigated up to 7 times with Class 3 salinity water without significant yield loss. Inefficient irrigation uses more water than is necessary for plant growth and leaching. The quality of drainage water is usually poor as a result.

Land degradation caused by water logging and salt accumulation can be expected where higher leaching requirements for very saline waters cannot be met due to restricted soil drainage.

Under natural conditions, the water table rises and falls in response to infiltration of rainfall. Groundwater transmission may be extremely slow and its quality is affected by the nature of the materials through which it passes. Some natural groundwater may contain high levels of dissolved salts and may not be suitable for irrigation.

Irrigation of carefully selected and well managed sites which are relatively small and isolated is unlikely to modify the regional groundwater balance.

Soil is not simply a physical medium supporting vegetation, complex bio-chemical systems exist in which organic and inorganic matter is constantly transformed and recycled. Soils influence vegetation; vegetation influences the soil.

Although there is an opportunity for irrigation, this initiative is not considered viable as all of the available treated backwash water may be used internally to offset potable water consumption.

Recycled water use for irrigation may not be considered as an efficient end use especially when this water may be used internally to offset potable water consumption.



14.4 SELECTION

Option	Recommendation
Backwash Water Recycling	Use of recycled backwash water for sanitary flushing could be cost prohibitive with the need to install a 'third pipe' system to the building and ensure the necessary safeguards are in place to avoid cross-connections and contamination of the potable water supply, which would need to be provided as a backup to the recycled water supply. Use of the recycled backwash water for sanitary flushing will, however, ensure there is a continuous demand and use for the recycled water, which would fluctuate if only used for irrigation. Treatment of backwash water can be viable for the irrigation of the surrounding landscape subject to the commissioning and results of a Land Capability Assessment (LCA). The use of sodium tolerate vegetation, together with the use of 'Gypsum' (calcium sulphate), reduces the amount of treatment required for the re-use of this water as irrigation water, reduces the impact the higher TDS levels of the water have on the area to be irrigated and reduces the amount of energy required to treat the water. If TDS is required to be reduced for the re-use of this water, RO will need to be implemented which results in higher capital and energy costs, but does enable the recycled water to then be used as pool make-up as well. Recovery of heat from backwash water for the pre-heating of pool make-up water should be adopted.

15 POOL FURNITURE, FIXTURES AND EQUIPMENT (FF&E)

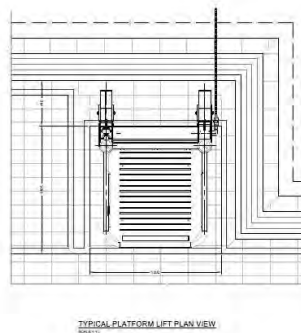
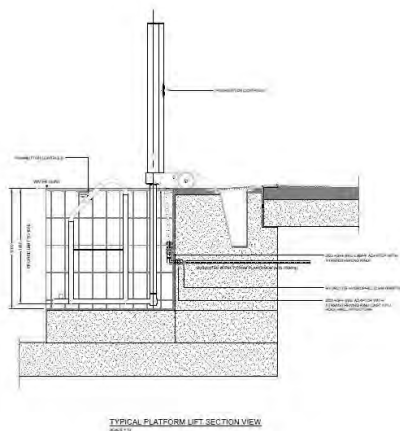
The following sections include the FF&E items proposed for the pools. Some items are required for compliance and to utilise the function of the pools. Others items are recommended to assist with storage and/or operation of the pools.



HYDRA TECH DESIGNS

15.1 PLATFORM LIFT - OPTION

LM10 Platform Lifts featuring hydraulic operation are preferred for their compliance, reliability, ease of use and ability to be built into the pool structure as a fully integrated design. Hydraulic operation avoids electrical items in the pool zone which have proven to be problematic on previous projects.



LM10 Platform Lift.



HYDRA TECH DESIGNS

15.1.1 SELECTION

Item	Recommendation
Pool Access / Platform Lifts.	Fixed built-in ramps include din concept design. Possible option for SR Smith LM10 Platform Lift.

15.2 STARTING BLOCKS

The following starting blocks are preferred for their compliance with FINA standards, quality, ease of use, familiarity with users and compatibility with pool headwalls and timing systems.

Starting blocks with removable track starts (wedge at the back of the block) and backstroke bars are favoured to provide maximum functionality.



Starting Blocks.

15.2.1 SELECTION

Item	Recommendation
Starting Blocks	Malmsten, SR Smith or approved equivalent.



HYDRA TECH DESIGNS

15.3 LANE ROPE STORAGE

Lane rope storage vaults are preferred to avoid the use and storage of large lane rope reels.

Void spaces below the pool concourse require specialist design.



Lane Rope Storage Vaults.

15.3.1 SELECTION

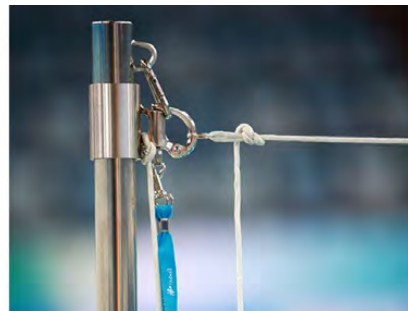
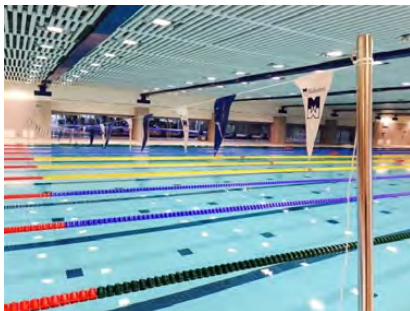
Item	Recommendation
Lane Ropes	Aqueas Storage Vaults or approved equivalent..



HYDRA TECH DESIGNS

15.4 METALWORK ITEMS

All metalwork items shall be specifically designed and manufactured for swimming pool use. All stainless-steel items shall be 316L grade and electropolished.



Typical Metalwork Items.



15.4.1 SELECTION

Item	Recommendation
Metalwork	Malmsten, SR Smith or approved equivalent to project specific manufacture.

15.5 CLIENT SUPPLIED ITEMS

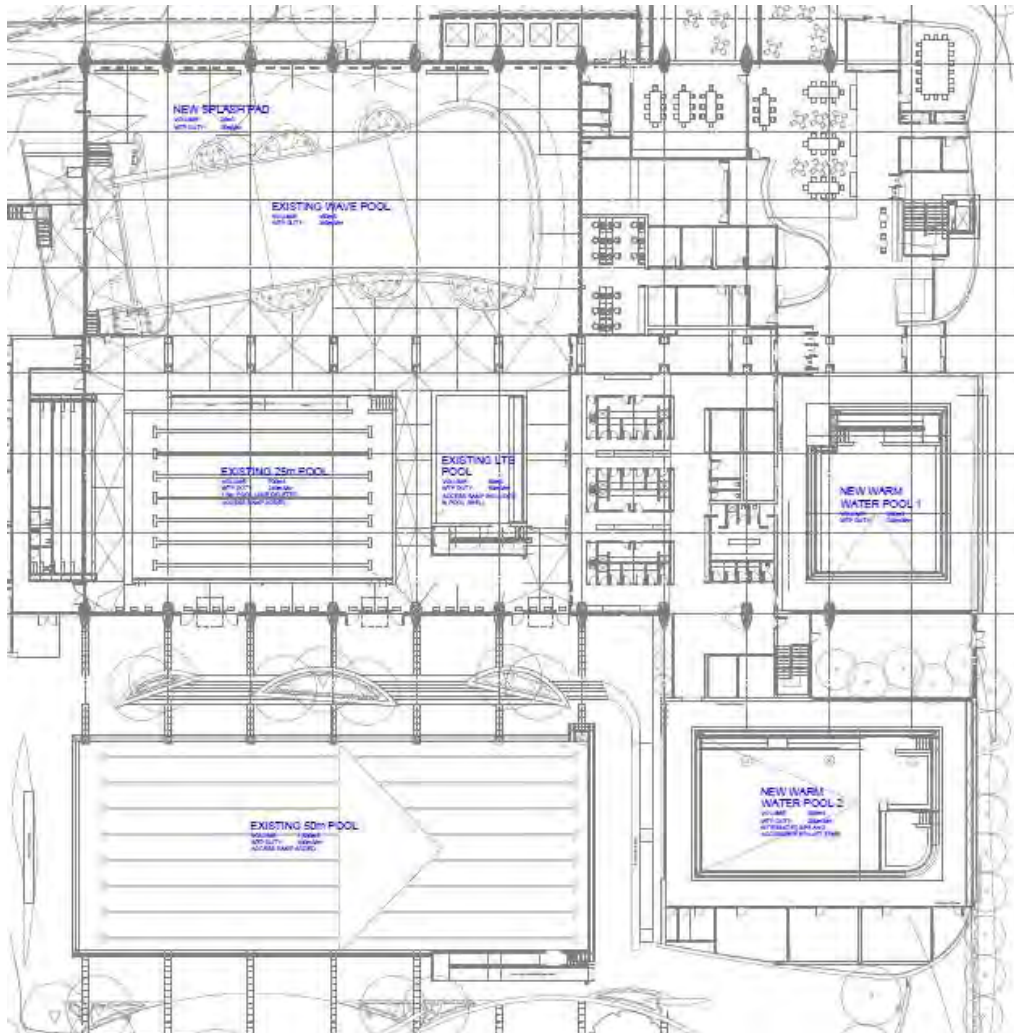
The following loose FF&E items are not typically included in the Aquatic Engineering package as they are not built-in and can be purchased separately from the contract (however can be included in the Aquatic scope if preferred by the client).

1. Swimming aids including kick-boards and noodles.
2. Water polo ball(s).
3. Time clock(s).
4. Timing systems including touch-pads, speakers and cabling.
5. Scoreboard and/or related AV equipment.
6. Marshalling items (chairs, bell, hand-flags).
7. Aquatic Centre branded floor mats, banners and related items.



16 CONCEPT DESIGN - POOLS

The image below indicates the concept pool designs with volumes and plant duties.

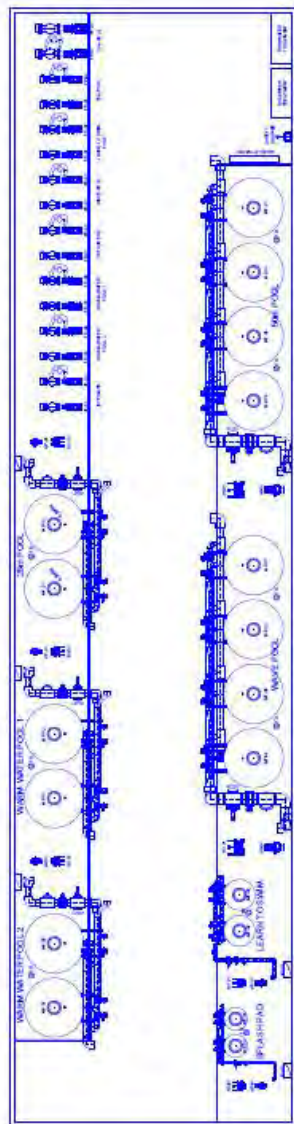




HYDRA TECH DESIGNS

17 CONCEPT DESIGN – BASEMENT PLANTROOM

The image below indicates the concept design for the basement plantroom. This is a concept design only and has been prepared to ensure that the proposed pool water treatment systems as outlined in this report can be accommodated in the allocated plant space.



The basement plant space includes all pumps and filters.

This arrangement provides the most efficient design by not having to pump the pool water from pool level up to filters at a higher concourse level.

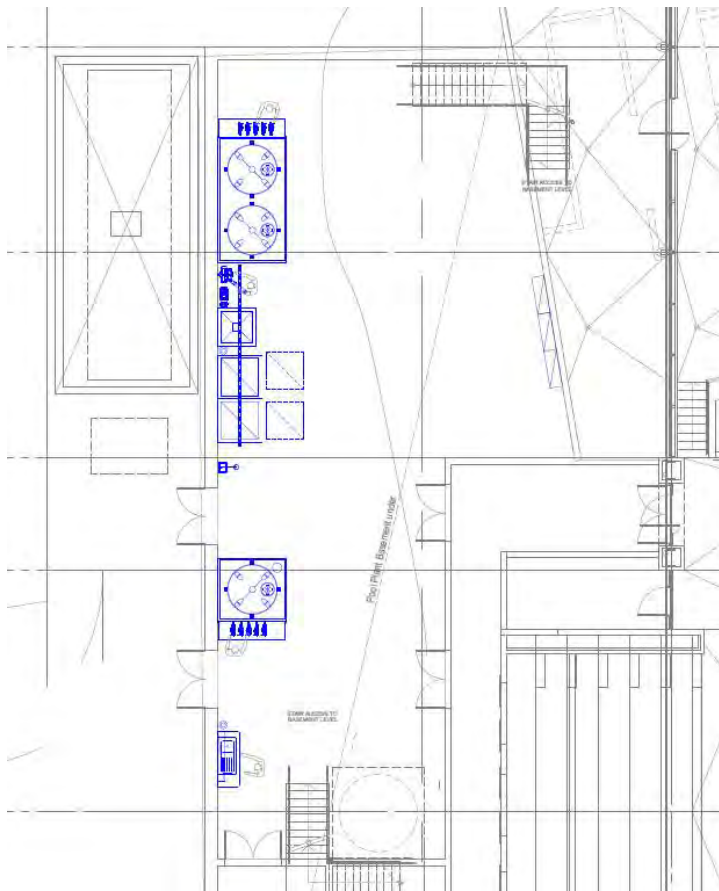
Accepting $\text{Work} = \text{Energy} = \text{Force} \times \text{Distance}$, pumping the water up one level represents a significant energy requirement over the operational life of the facility.

This design also avoids locating the largest plant space required for the pool water treatment systems at ground level where building space is more valued.



18 CONCEPT DESIGN – GROUND LEVEL PLANTROOM

The image below indicates the concept design for the ground level plantroom. This is a concept design only and has been prepared to ensure that the proposed pool water treatment systems as outlined in this report can be accommodated in the allocated plant space.



The ground level plant space includes all equipment, controls and chemical storages that require frequent and easy access.

All electrical switchboards and water sensitive components are located at ground level.

All water chemistry instruments that require daily access are located at ground level.



Appendix D: MARC 10 Year Maintenance Plan

This draft 10 year capex plan is based on very high-level \$estimates with a tolerance of up to 50% and not yet validated by recent condition audit and not indexed.					
MARC DRAFT Plant equipment list and upgrade schedule: 2023/24 to 2032/33					
Council Asset No.	Description	End of Financial year Upgrade	Scheduled Month	Supply & Install Cost	Expenditure Year
25m Pool					
				Expenditure	Financial Year
Concourse Drainage	Stormwater grated drains	2023	TBC	\$ 25,000	2023/24
Car Parking	Car Park resheet and line marking	2023	TBC	\$ 350,000	2023/24
MCC04204	Exhaust Fan 2	2024	TBC	\$ 5,000	2024/25
MCC04176	Heating Water Pump 2 - Low Temp	2024	TBC	\$ 10,000	2024/25
Facade Shopfronts	Replace Aluminium door frames	2024	TBC	\$ 90,000	2024/25
First Floor Changerooms	Refurbishment (Original Budget \$300k PA)	2025	TBC	\$ 50,000	2024/25
First Floor Changerooms	Refurbishment (Original Budget \$300k PA)	2025	TBC	\$ 250	2025/26
Emergency Call System	Replace Nurse Call System	2025		\$ 31,430	2024/25
50m pool emergency gate exits		2026		\$ 20,000	2025/26
Equipment (Gym)	Renewals	2029	TBC	\$ 600,000	2029/30
Appliances	Renewals	2030	TBC	\$ 100,000	2030/31
Tennis Club area	Demolish and return to open space	2031	TBC	\$ 500,000	2031/32
MCC04077	Exhaust Fan 10	2032	TBC	\$ 5,000	2032/33
MCC05074	Fire Damper 1	2032	TBC	\$ 5,000	2032/33
MCC04049	Fire Damper 2	2032	TBC	\$ 5,000	2032/33
MCC05140	Fire Damper 3	2032	TBC	\$ 5,000	2032/33
MCC05073	Fire Damper 4	2032	TBC	\$ 5,000	2032/33
MCC05019	Fire Damper 5	2032	TBC	\$ 5,000	2032/33
MCC05109	Fire Damper 6	2032	TBC	\$ 5,000	2032/33
MCC05016	Fire Damper 7	2032	TBC	\$ 5,000	2032/33
MCC05178	Fire Damper 8	2032	TBC	\$ 5,000	2032/33
MCC05146	Fire Damper 9	2032	TBC	\$ 5,000	2032/33
Roofing	Renewal and repair to roof cladding and rain water g	2032	TBC	\$ 600,000	2032/33
Fencing	Renewal	2032	TBC	\$ 120,000	2032/33
Landscaping	Refurbishments	2032	TBC	\$ 150,000	2032/33
50m Pool				\$ -	
General				\$ -	
WWE				\$ -	
Wave Pool				\$ -	
Mechanical Plant/HVAC equipment list and upgrade schedule				\$ -	
External Works				\$ -	N/a
Shade Sail renewals	Replacement of Shade Sails			\$ 100,000	2026/27
Internal Water Bodies				\$ -	N/a
Internal Fit out Work				\$ -	N/a
Services				\$ -	
Condition and Compliance works					
				\$ 2,801,680	

Attachment 7.2.4.1 Attachment A - MARC Concept Design Report

This draft 10 year capex plan is based on very high-level \$estimates with a tolerance of up to 50% and not yet validated by recent condition audit and not indexed.

MARC DRAFT Plant equipment list and upgrade schedule: 2023/24 to 2032/33

Council Asset No.	Description	End of Financial year Upgrade	Scheduled Month	Supply & Install Cost	Expenditure Year
25m Pool					

BRT MECH PROPOSAL					
MCC04214	Air Handling Unit 1	2026	TBC	\$ 45,000	2026/27
MCC04216	Air Handling Unit10	2026	TBC	\$ 30,000	2026/27
MCC04205	Air Handling Unit 11	2026	TBC	\$ 30,000	2026/27
MCC04185	Air Handling Unit 12	2026	TBC	\$ 30,000	2026/27
MCC04193	Air Handling Unit 13	2026	TBC	\$ 30,000	2026/27
MCC04074	Air Handling Unit 14	2026	TBC	\$ 30,000	2026/27
MCC04183	Air Handling Unit 2	2026	TBC	\$ 45,000	2026/27
MCC04188	Air Handling Unit 3	2026	TBC	\$ 30,000	2026/27
MCC04201	Air Handling Unit 4	2026	TBC	\$ 30,000	2026/27
MCC04202	Air Handling Unit 5	2026	TBC	\$ 30,000	2026/27
MCC04212	Air Handling Unit 6	2026	TBC	\$ 30,000	2026/27
MCC04207	Air Handling Unit 7	2026	TBC	\$ 30,000	2026/27
MCC04181	Air Handling Unit 8	2026	TBC	\$ 30,000	2026/27
MCC04187	Air Handling Unit 9	2026	TBC	\$ 30,000	2026/27
	Heating Water Coil 1 - Low Temp	2026	TBC	\$ 16,000	2026/27
	HC-1	2026	TBC	\$ 16,000	2026/27
MCC04096	HC-2	2026	TBC	\$ 16,000	2026/27
	Heating Water Coil 2 - Low Temp	2026	TBC	\$ 16,000	2026/27
Part A	Heat Reclaim Chilled Water Coil 1	2026	TBC	\$ 16,000	2026/27
Part A	Heat Reclaim Chilled Water Coil 2	2026	TBC	\$ 16,000	2026/27
MCC04119	Exhaust Fan 1	2026	TBC	\$ 5,000	2026/27
MCC04111	Exhaust Fan 11	2026	TBC	\$ 5,000	2026/27
MCC04190	Exhaust Fan 13	2026	TBC	\$ 5,000	2026/27
MCC04195	Exhaust Fan 3	2026	TBC	\$ 5,000	2026/27
MCC04186	Exhaust Fan 4 - KEF	2026	TBC	\$ 5,000	2026/27
	Exhaust Fan 5	2026	TBC	\$ 5,000	2026/27
MCC04218	Exhaust Fan 6	2026	TBC	\$ 5,000	2026/27
MCC04221	Exhaust Fan 7	2026	TBC	\$ 5,000	2026/27
MCC04154	Exhaust Fan 8	2026	TBC	\$ 5,000	2026/27
MCC04145	Exhaust Fan 9	2026	TBC	\$ 5,000	2026/27
	Fan SF-15	2026	TBC	\$ 5,000	2026/27
MCC04177	Chilled Water Pump 2 - Heat Reclaim	2026	TBC	\$ 10,000	2026/27
MCC04211	Heating Water Pump 1 - Medium Temp	2026	TBC	\$ 10,000	2026/27
MCC04184	Return Air Fan 12	2026	TBC	\$ 5,000	2026/27
MCC04182	Return Air Fan 2	2026	TBC	\$ 45,000	2026/27
MCC04189	Return Air Fan 8	2026	TBC	\$ 5,000	2026/27
MCC05127	Mechanical Services Switch Board 1	2026	TBC	\$ 30,000	2026/27
MCC04200	Return Air Fan 1	2026	TBC	\$ 45,000	2026/27
MCC04208	Return Air Fan 10	2026	TBC	\$ 5,000	2026/27
MCC04206	Return Air Fan 11	2026	TBC	\$ 5,000	2026/27
MCC04215	Return Air Fan 3	2026	TBC	\$ 5,000	2026/27
MCC04209	Return Air Fan 4	2026	TBC	\$ 5,000	2026/27
MCC04203	Return Air Fan 5	2026	TBC	\$ 5,000	2026/27
MCC05280	Main Switchboard Systems 1 & 2	2028	TBC	\$ 258,000	2028/29
BRT MECH PROPOSAL SAVING FROM MAINTENANCE				\$ 1,034,000	

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MARC DRAFT Plant equipment list and upgrade schedule: 2023/24 to 2032/33

Council Asset No.	Description	End of Financial year Upgrade	Scheduled Month	Supply & Install Cost	Expenditure Year
25m Pool					

AQUATIC RENEWAL PROPOSAL					
MCC05362	25m Chlorine Dosing Pump	2022	TBC	\$ 5,640	2024/25
MCC05240	WWE Spa Heating Modulating Motor	2022	TBC	\$ 3,900	2024/25
MCC05346	WP Heating Modulating Motor	2022	TBC	\$ 5,130	2024/25
MCC05402	WP Hot Water Pump	2022	Jul-21	\$ 5,370	2024/25
MCC05376	25m UV Unit & Control Cabinet 6KW	2023	TBC	\$ 55,040	2025/26
MCC05377	25m Heating Modulating Motor	2023	Mar-20	\$ 3,460	2024/25
MCC05371	25m Makeup solenoid valve	2023	Mar-20	\$ 835	2023/24
MCC05383	25m Circulation Pump No.1	2023	TBC	\$ 9,000	2024/25
MCC05342	25m Circulation Pump No.2	2023	TBC	\$ 9,000	2024/25
MCC05323	WWE UV Unit & Control Cabinet 4KW	2023	TBC	\$ 53,655	2024/25
MCC05400	WP UV Unit & Control Cabinet	2023	TBC	\$ 56,400	2024/25
MCC05247	WP Blower	2023	TBC	\$ 4,560	2024/25
MCC05355	WP Feature Pump No. 1 - Play Pool	2023	Jul-19	\$ 3,840	2030/31
MCC05358	WP Feature Pump No. 2 - Frog Feature	2023	Jul-19	\$ 3,840	2030/31
MCC05375	50m Feature Pump	2024	May-21	\$ 5,400	2023/24
C4462	50m Actuated Heating Mod Valve	2024	TBC	\$ 5,000	2024/25
Hypochlorite tank and Bund renewal	Hypochlorite Tank Bund & Hypochlorite Tank (B022	2024	TBC	\$ 18,565	2024/25
MCC05387	50m Actuated Heating Mod Valve	2025	TBC	\$ 9,950	2025/26
MCC05365	50m Makeup valve	2025	May-21	\$ 900	2024/25
MCC05258	50m Plant Submersible Flood Pump	2025	Sep-19	\$ 2,130	2024/25
MCC05367	WWE Makeup solenoid valve	2025	Feb-20	\$ 835	2024/25
MCC05268	WP Sump Pump Control Panel	2025	TBC	\$ 5,040	2024/25
MCC05393	WP Circulation Pump No.2	2025	TBC	\$ 9,000	2024/25
MCC05264	WP Circulation Pump No.1	2025	TBC	\$ 9,000	2024/25
25 Metre Pool	Tiling and Stainless Steel renewal and shell repairs	2025	TBC	\$ 150,000	2024/25
MCC05356	50m Circulation Pump No.1	2026	TBC	\$ 10,800	2026/27
MCC05249	50m Circulation Pump No.2	2026	TBC	\$ 10,800	2026/27
MCC05250	WP Multiport Valve	2026	TBC	\$ 24,000	2026/27
MCC05274	25m Multiport Valve	2027	TBC	\$ 24,000	2027/28
MCC05364	50m Multi Port Valve	2027	TBC	\$ 24,000	2026/27
MCC05394	WP Filtration Switchboard	2027	TBC	\$ 57,600	2027/28
MCC05361	WP Wave Machine Switchboard	2027	TBC	\$ 54,000	2027/28
MCC05389	WP Wave Machine Fan	2027	TBC	\$ 114,000	2026/27
Wave Pool compressor	Replacement	2027	TBC	\$ 30,000	2027/28
Water reticulation and valves	Repairs and replacements	2027	TBC	\$ 500,000	2027/28
MCC05386	WWE Multi Port Valve	2028	TBC	\$ 24,000	2028/29
MCC05320	WWE Acid Dosing Skid	2028	TBC	\$ 720	2028/29
MCC05271	WP Wave Actuators	2028	TBC	\$ 12,000	2027/28
Sauna	Complete refurbishment	2028	TBC	\$ 80,000	2028/29
MCC05273	Hypochlorite Tank	2029	TBC	\$ 7,800	2029/30
MCC05270	WWE Filters	2029	TBC	\$ 100,000	2029/30
N/A	50m Flow Switch No 2	2030	Sep-19	\$ 1,080	2030/31
MCC05248	50m Pump Heating 50m	2030	Sep-19	\$ 5,400	2030/31
MCC05388	50m Pump Backwash	2030	Sep-19	\$ 4,200	2030/31
MCC05372	50m Chlorine Dosing Pump	2030	Sep-19	\$ 5,640	2030/31
MCC05392	Main Hypochlorite Bund	2030	TBC	\$ 15,600	2030/31
MCC05349	WWE Heating Pump	2030	Feb-20	\$ 3,240	2030/31
MCC05241	WWE Jet Pump	2030	Feb-20	\$ 3,600	2030/31
MCC05370	WWE Pool Heating Pump	2030	Feb-20	\$ 3,840	2030/31
N/A	WWE Chemical Reticulation	2030	Feb-20	\$ 7,800	2030/31
MCC05347	WP Feature Pump	2030	Jul-19	\$ 3,840	2030/31
MCC05263	WP Circ Pump Suction Strainer No. 1	2030	Jul-19	\$ 9,600	2030/31
MCC05334	WP Circ Pump Suction Strainer No. 2	2030	Jul-19	\$ 9,600	2030/31
MCC03406	WP Air Compressor	2030	Jun-19	\$ 21,000	2030/31
50m Pool Shell	Painting of pool and pool shell & tiling repairs	2030	TBC	\$ 135,000	2030/31
Leisure Pool	Tiling and Stainless Steel renewal and shell repairs	2030	TBC	\$ 75,000	2030/31
Spa	Tiling and Stainless Steel renewal and shell repairs	2030	TBC	\$ 30,000	2030/31
Warm Water Pool	Tiling and Stainless Steel renewal and shell repairs	2030	TBC	\$ 175,000	2030/31

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MARC DRAFT Plant equipment list and upgrade schedule: 2023/24 to 2032/33

Council Asset No.	Description	End of Financial year Upgrade	Scheduled Month	Supply & Install Cost	Expenditure Year
25m Pool					
MCC05325	25m UV Strainer	2031	TBC	\$ 10,200	2031/32
MCC05316	WWE UV Strainer	2031	TBC	\$ 9,000	2031/32
MCC05324	WP UV Strainer	2031	TBC	\$ 9,000	2031/32
50m Pool Concourse	Renewal and structural repairs	2031	TBC	\$ 400,000	2031/32
N/A	25m Electrical Retic	2032	TBC	\$ 54,000	2032/33
MCC05230	WWE Blower	2032	Feb-20	\$ 4,560	2032/33
N/A	WWE Hydraulic Reticulation	2032	TBC	\$ 54,000	2032/33
N/A	WWE Electrical Reticulation	2032	TBC	\$ 24,000	2032/33
N/A	WP Hydraulic Reticulation	2032	TBC	\$ 102,000	2032/33
N/A	WP Electrical Reticulation	2032	TBC	\$ 66,000	2032/33
MCC05315	WP Filters	2032	TBC	\$ 30,000	2032/33
MCC05269	25m Filters	2033	TBC	\$ 360,000	2033/34
N/A	25m Hydraulic Retic	2033	TBC	\$ 78,000	2033/34
MCC05265	50m Filters	2033	TBC	\$ 100,000	2033/34
N/A	50m Hydraulic Reticulation	2033	TBC	\$ 66,000	2033/34
N/A	50m Electrical Reticulation	2033	TBC	\$ 54,000	2033/34
N/A	50m Chemical Reticulation	2033	Sep-19	\$ 7,800	2033/34
MCC05326	WWE Circulation Pump no.1	2033	Jan-22	\$ 9,000	2033/34
AQUATIC RENEWAL PROPOSAL				\$ 3,456,210	

ARCHITECTURAL RENEWAL PROPOSAL

Lift Replacement Design		2024		\$ 25,000	2024/25
Steam Room Window Replacement		2024		\$ 15,000	2024/25
Concourse surfacing	Surface treatments engineering/scope	2025	TBC	\$ 25,000	2024/25
Concourse surfacing	Surface treatments	2025	TBC	\$ 425,000	2025/26
Café	Refurbishments	2026	TBC	\$ 250,000	2025/26
Lift	Replacement	2026	TBC	\$ 200,000	2025/26
Replace WWP Doors		2026		\$ 15,000	2025/26
Fittings and fixtures	Renewals	2027	TBC	\$ 200,000	2027/28
Reception	Refurbishments	2027	TBC	\$ 150,000	2027/28
Ground Floor Changeroom	Refurbishment	2028	TBC	\$ 350,000	2028/29
Office work areas	Refurbishments	2028	TBC	\$ 350,000	2028/29
ARCHITECTURAL RENEWAL PROPOSAL				\$ 2,005,000	



Appendix E: Cost Plan A



Summary

Mar2026 Scope Staged - R1

Williams Ross
Monash Aquatic Redevelopment

making the **difference**

Summary



Turner & Townsend

Williams Ross Monash Aquatic Redevelopment			Mar2026 Scope Staged - R1		
Item	Description	Quantity	Unit	Rate	Total (AUD)
1	Monash Aquatic & Recreation Centre				
2	Indicative Cost Plan				
3	17/03/2026				
4					
5	CLARIFICATIONS / EXCLUSIONS				0
6					
7	MARC Stage 1 - Core Works				
8	- East Ground Floor Refurbishment	843	m2		9,990,000
9	- New staff lounge and amenities				
10	- New change amenities area including change village				
11	- New outdoor change village facility and pool store	376	m2		3,183,000
12	- New reception area				
13	- New lift and stair				
14	- Modify / upgrade localised mechanical plant in affected areas				
15	- New pool plant upgrade / replacement				
16	- Learn to swim pool extension with new ramp				
17	- New ramp to existing indoor 25m pool				
18	- West - Pool Plant, pool treatment, group change & first aid	2,397	m2		24,274,000
19	Subtotal - STAGE 1	3,616	m2		37,447,000
20					
21	MARC Stage 2 - Future Core Works				
22	- Stage 1 Works	3,616	m2		37,447,000
23	- Extension of new change amenities areas				
24	- New warm water pool with ramp	862	m2		12,963,000
25	- New spa				
26	- Two saunas				
27	- Steam room				
28	- New zero depth splashpad area, New program pool and new toddler pool	1,272	m2		15,457,000
29	- Accessible ramps added to outdoor pools				
30	Subtotal - STAGE 2	5,750	m2		65,867,000
31					
32	MARC Stage 3 - Discrete Bolt-on Stage				

17 Mar 2026

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Revision: 1 - Initial



Detail

Mar2026 Scope Staged - R1

Williams Ross
Monash Aquatic Redevelopment

making the **difference**

Detail



Turner & Townsend

**Williams Ross
Monash Aquatic Redevelopment**

Mar2026 Scope Staged - R1

Item	Description	Quantity	Unit	Rate	Total (AUD)
	CLARIFICATIONS / EXCLUSIONS - Elemental Summary				
5.1	CLARIFICATIONS				
5.2	Cost plan has been updated to today's rates.				
5.3	<u>Cost Plan is based on the following Information:</u>				
5.4	MARC staged drawings from Williams Ross received 8/02/2024				
5.5	- Original Option 6 Architectural drawing received 3/07/2023				
5.6	Updated drawings from Williams Ross for reduced scope option received 4/12/2024				
5.7	Updated Core works option from Williams Ross received 2/03/2026				
5.8	ASSUMPTION				
5.9	Cost plan is based on a competitive tender to four or more suitably sized and qualified contractors.				
5.10	Assumes retain existing structure and refurbish with new extensions as shown.				
5.11	Piled foundations allowance based on piling max 3m deep.				
5.12	EXCLUSIONS				
5.13	GST				
5.14	Upgrade or provision of authority services infrastructure external to the site				
5.15	Land, legal, marketing and finance costs				
5.16	Relocation / Decanting Costs				
5.17	Staging Costs				
5.18	Adverse soil conditions				
5.19	Blinds, Curtains or Drapes				
5.20	Diversion / relocation of existing inground services beyond allowance				
5.21	Office Equipment costs				
5.22	Public Art				
5.23	Asbestos & other hazardous materials removal				
5.24	Council internal costs				
5.25	Active IT and telephone equipment				
5.26	Planning professional fees and permit fees				
5.27	No works to adjoining roads				
5.28	Fire Sprinklers				
5.29	Requirements of a 'large isolated' building under building code				

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Williams Ross Monash Aquatic Redevelopment		Mar2026 Scope Staged - R1			
5.30	Heat pumps / electrification works				
5.31	Items noted as excluded in the detail of the cost plan				
	Total - CLARIFICATIONS / EXCLUSIONS				0

Detail



Turner & Townsend

Williams Ross
Monash Aquatic Redevelopment

Mar2026 Scope Staged - R1

Item	Description	Quantity	Unit	Rate	Total (AUD)
	- East Ground Floor Refurbishment - Elemental Summary				
8.1	<u>Ground Floor</u>				
8.2	Building Works	843	m2		3,827,005
8.3	Existing Pool Hall				N/A
8.4					
8.5	<u>First Floor</u>				
8.6	Building Works				N/A
8.7					
8.8	Services				684,220
8.9	Miscellaneous				143,520
8.10	ESD Initiatives	3	%		139,642
8.11	SUBTOTAL - BUILDING WORKS	843	m2	5,687.29	4,794,388
8.12					
8.13	Aquatic works				682,000
8.14	Demolition/ rectification				Excluded
8.15	External works and services				266,759
8.16					
8.17	CONSTRUCTION COST	843	m2	6,812.75	5,743,147
8.18					
8.19	Preliminaries & Margin	Allow			861,472
8.20	Design Contingency	5	%		287,000
8.21	Cost Escalation to tender in late 2028/29	3.5% pa			603,017
8.22	Cost Escalation during construction	3% pa		2yr	253,364
8.23					
8.24	SUB TOTAL	843	m2	9,190.98	7,748,000
8.25					
8.26	Construction Contingency	10	%		774,000
8.27	Professional Fee Allowance	10	%		774,000
8.28	Authority Fees & Charges	1.5	%		117,000
8.29	Loose Furniture and Equipment	Allow			300,000
8.30	AV / IT equipment	Allow			200,000

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Williams Ross Monash Aquatic Redevelopment		Mar2026 Scope Staged - R1			
8.31	- Gym Equipment [assumed leased]				Excluded
8.32	Council Internal Costs				Excluded
8.33	Sundry project costs / contingency on Misc costs	1	%		77,000
8.34	Legal, permits, marketing and other professional fees				Excluded
8.35					
8.36	PROJECT TOTAL (EXCLUDING GST)				9,990,000
	Total - - East Ground Floor Refurbishment				9,990,000

Detail



Turner & Townsend

Williams Ross
Monash Aquatic Redevelopment

Mar2026 Scope Staged - R1

Item	Description	Quantity	Unit	Rate	Total (AUD)
	- East Ground Floor Refurbishment				
	Building Works				
8.2.1	<u>East Facility - new extension</u>				
8.2.2	New lift shaft	13	m2		150,000
8.2.3	- new lift	1	no	100,000.00	100,000
8.2.4					
8.2.5	<u>East Facility - refurbishment</u>				
8.2.6	Ex office	11	m2	1,500.00	16,245
8.2.7	Foyer / retail	94	m2	2,500.00	235,900
8.2.8	- extra for retail fitments		Allow		60,000
8.2.9	Staff work space	117	m2	2,500.00	291,675
8.2.10	Staff lounge	59	m2	2,500.00	148,175
8.2.11	- extra for kitchenette		Allow		30,000
8.2.12	Staff amenities: F + M		note		excluded
8.2.13	Staff amenities corridor	11	m2	2,000.00	22,460
8.2.14	Quiet rooms x 2	16	m2	2,500.00	40,000
8.2.15	Reception	24	m2	3,500.00	84,350
8.2.16	- reception desk		Allow		60,000
8.2.17	Allow for turnstiles		Allow		150,000
8.2.18	Aquatic foyer	76	m2	2,500.00	190,000
8.2.19	Entry airlock	16	m2	5,500.00	88,000
8.2.20	Fitness foyer	45	m2	2,500.00	112,500
8.2.21	New staircase	19	m2	2,500.00	46,800
8.2.22	- new stair	1	no	80,000.00	80,000
8.2.23	Store	27	m2	1,200.00	32,400
8.2.24	Change village	220	m2	4,500.00	990,000
8.2.25	Acc WC	12	m2	6,500.00	78,000
8.2.26	Changing places	15	m2	7,500.00	112,500
8.2.27	Male + Female amenities	68	m2	6,000.00	408,000
8.2.28	- extra for lockers		Allow		100,000
8.2.29					

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Williams Ross

Mar2026 Scope Staged - R1

Monash Aquatic Redevelopment

Item	Description	Quantity	Unit	Rate	Total (AUD)
	- East Ground Floor Refurbishment				
8.2.30	<u>Miscellaneous</u>				
8.2.31	Allow for connection to existing fitout / building		Allow		200,000
	Total - Building Works				3,827,005
	Services				
8.8.1	<u>Services</u>				
8.8.2	Allowance'-As per the email received on 17/02/2025 by Samuel Thorn (BRT Consulting Pty Ltd)				671,575
8.8.3	Allow for fire sprinkler system and fire detection for new dry areas	843	m2		Excluded
8.8.4	Allow to extend fire detection system	843	m2	15.00	12,645
	Total - Services				684,220
	Miscellaneous				
8.9.1	Allowance for piled foundations	28	m2	350.00	9,800
8.9.2	Allowance for AV infrastructure	843	m2	40.00	33,720
8.9.3	Allowance for signage		item		100,000
	Total - Miscellaneous				143,520
	Aquatic works				
8.13.1	<u>Aquatic</u>				
8.13.2	Existing WWP - As per the email received on 13/12/2024 by Ross Weight (Hydrautech Designs Consulting Engineers)	1	Item	682,000.00	682,000
	Total - Aquatic works				682,000
	Demolition/ rectification				
8.14.1	Demolish existing east entry portion of building [Ground Floor]	981	m2		Excluded
8.14.2	Demolish walled playground - East	132	m2		Excluded
8.14.3	Demolish Chiller yard - East	45	m2		Excluded
	Total - Demolition/ rectification				0
	External works and services				
8.15.1	External works				

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Williams Ross
Monash Aquatic Redevelopment

Mar2026 Scope Staged - R1

Item	Description	Quantity	Unit	Rate	Total (AUD)
	- East Ground Floor Refurbishment				
8.15.2	Site Preparation	1		5,000.00	5,000
8.15.3	Allow for earthworks	1		15,000.00	15,000
8.15.4					
8.15.5	<u>Terraces</u>				
8.15.6	Staff (outdoor)				Excluded
8.15.7	Cafe Terrace (Outdoor)				Excluded
8.15.8	<u>Landscaping</u>				
8.15.9	Garden	129	m2	150.00	19,350
8.15.10	Soft landscaping allowance	1		100,000.00	100,000
8.15.11	New external paths / pavements				Excluded
8.15.12	<u>Car Park</u>				
8.15.13	New Car Park - North - 15 spaces	204	m2	270.00	55,080
8.15.14	<u>Services</u>				
8.15.15	Allow for modifications to existing external services	1		72,329	72,329
8.15.16	Allow for significant rainwater collection / site detention system				Excluded
	Total - External works and services				266,759
	Total - - East Ground Floor Refurbishment				9,990,000

Detail



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Williams Ross
Monash Aquatic Redevelopment

Mar2026 Scope Staged - R1

Item	Description	Quantity	Unit	Rate	Total (AUD)
	- New outdoor change village facility and pool store - Elemental Summary				
11.1	<u>Ground Floor</u>				
11.2	Building Works	188	m2		1,066,000
11.3	Existing Pool Hall				N/A
11.4					
11.5	<u>First Floor</u>				
11.6	Building Works	188	m2		380,000
11.7					
11.8	Services				N/A
11.9	Miscellaneous				100,840
11.10	ESD Initiatives	3	%		46,405
11.11	SUBTOTAL - BUILDING WORKS	376	m2	4,237.35	1,593,245
11.12					
11.13	Aquatic works				N/A
11.14	Demolition/ rectification				8,470
11.15	External works and services				295,680
11.16					
11.17	CONSTRUCTION COST	376	m2	5,046.26	1,897,395
11.18					
11.19	Preliminaries & Margin	Allow			284,609
11.20	Design Contingency	5	%		94,000
11.21	Cost Escalation to tender in late 2028/29	3.5% pa			199,150
11.22	Cost Escalation during construction	3% pa		2yr	83,845
11.23					
11.24	SUB TOTAL	376	m2	6,805.85	2,559,000
11.25					
11.26	Construction Contingency	10	%		255,000
11.27	Professional Fee Allowance	10	%		255,000
11.28	Authority Fees & Charges	1.5	%		39,000
11.29	Loose Furniture and Equipment	Allow			50,000
11.30	AV / IT equipment	Allow			Excluded

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11.31	- Gym Equipment [assumed leased]				Excluded
11.32	Council Internal Costs				Excluded
11.33	Sundry project costs / contingency on Misc costs	1	%		25,000
11.34	Legal, permits, marketing and other professional fees				Excluded
11.35					
11.36	PROJECT TOTAL (EXCLUDING GST)				3,183,000
	Total - - New outdoor change village facility and pool store				3,183,000

Detail



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Williams Ross
Monash Aquatic Redevelopment

Mar2026 Scope Staged - R1

Item	Description	Quantity	Unit	Rate	Total (AUD)
	- New outdoor change village facility and pool store				
	Building Works				
11.2.1	<u>East Facility - new extension</u>				
11.2.2	New staircase extension	32	m2	3,500.00	112,000
11.2.3	- new stair	1	no	90,000.00	90,000
11.2.4	New change village to WWP	107	m2	6,000.00	642,000
11.2.5	New pool storage	49	m2	3,000.00	147,000
11.2.6					
11.2.7	<u>Miscellaneous</u>				
11.2.8	Allow for connection to existing fitout / building		Allow		75,000
	Total - Building Works				1,066,000
	Building Works				
11.6.1	Foyer / stair / void	32	m2	3,000.00	96,000
11.6.2	New level 1 slab for future aerobics and store	156	m2	1,500.00	234,000
11.6.3	<u>Miscellaneous</u>				
11.6.4	Allow for connection to existing building		item		50,000
	Total - Building Works				380,000
	Miscellaneous				
11.9.1	Allowance for piled foundations	188	m2	350.00	65,800
11.9.2	Allowance for AV infrastructure	376	m2	40.00	15,040
11.9.3	Allowance for signage		item		20,000
	Total - Miscellaneous				100,840
	Demolition/ rectification				
11.14.1	Demolish existing landscaping	242	m2	35.00	8,470
	Total - Demolition/ rectification				8,470
	External works and services				
11.15.1	External works				

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Williams Ross
Monash Aquatic Redevelopment

Mar2026 Scope Staged - R1

Item	Description	Quantity	Unit	Rate	Total (AUD)
	- New outdoor change village facility and pool store				
11.15.2	Site Preparation	1	item	2,420.00	2,420
11.15.3	Allow for earthworks	1	item	29,040.00	29,040
11.15.4					
11.15.5	<u>Terraces</u>				
11.15.6	Staff (outdoor)				Excluded
11.15.7	Cafe Terrace (Outdoor)				Excluded
11.15.8	<u>Landscaping</u>				
11.15.9	Soft landscaping allowance	1	item	50,000.00	50,000
11.15.10	New external paths / pavements	1	item	50,000.00	50,000
11.15.11	<u>Services</u>				
11.15.12	Allow for modifications to existing external services	1	item	65,000	65,000
11.15.13	Opinion of Costs - 17/02/2025				
11.15.14	New AHU-15	1	item		25,000
11.15.15	New Exhaust - Outdoor Store	1	item		10,000
11.15.16	General Power / Lighting (m2)	376	m2	150.00	56,400
11.15.17	BWIC				7,820
	Total - External works and services				295,680
	Total - - New outdoor change village facility and pool store				3,183,000

Detail



Williams Ross	Mar2026 Scope Staged - R1
Monash Aquatic Redevelopment	

Item	Description	Quantity	Unit	Rate	Total (AUD)
18.1	- West - Pool Plant, pool treatment, group change & first aid - Elemental Summary				
	<u>Ground Floor</u>				
18.2	Building Works	1,070	m2		4,081,380
18.3	Existing Pool Hall	1,376	m2		2,339,600
18.4					
18.5	<u>First Floor</u>				
18.6	Building Works				N/A
18.7					
18.8	Services				904,589
18.9	Miscellaneous				407,350
18.10	ESD Initiatives	3	%		231,988
18.11	SUBTOTAL - BUILDING WORKS	2,446	m2	3,256.30	7,964,907
18.12					
18.13	Aquatic works				4,423,600
18.14	Demolition/ rectification				195,700
18.15	External works and services				2,011,551
18.16					
18.17	CONSTRUCTION COST	2,446	m2	5,967.19	14,595,758
18.18					
18.19	Preliminaries & Margin	Allow			2,189,364
18.20	Design Contingency	5	%		730,000
18.21	Cost Escalation to tender in late 2028/29	3.5% pa			1,532,573
18.22	Cost Escalation during construction	3% pa		2yr	643,306
18.23					
18.24	SUB TOTAL	2,446	m2	8,050.29	19,691,000
18.25					
18.26	Construction Contingency	10	%		1,970,000
18.27	Professional Fee Allowance	10	%		1,970,000
18.28	Authority Fees & Charges	1.5	%		296,000
18.29	Loose Furniture and Equipment	Allow			50,000
18.30	AV / IT equipment	Allow			100,000

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Williams Ross Monash Aquatic Redevelopment		Mar2026 Scope Staged - R1			
18.31	- Gym Equipment [assumed leased]				Excluded
18.32	Council Internal Costs				Excluded
18.33	Sundry project costs / contingency on Misc costs	1	%		197,000
18.34	Legal, permits, marketing and other professional fees				Excluded
18.35					
18.36	PROJECT TOTAL (EXCLUDING GST)				24,274,000
	Total - - West - Pool Plant, pool treatment, group change & first aid				24,274,000

Detail



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Williams Ross
Monash Aquatic Redevelopment

Mar2026 Scope Staged - R1

Item	Description	Quantity	Unit	Rate	Total (AUD)
	- West - Pool Plant, pool treatment, group change & first aid				
	Building Works				
18.2.1	<u>West facility</u>				
18.2.2	Pool Plant - Ground Floor	308	m2	3,000.00	924,000
18.2.3	Pool Plant - Basement	430	m2	3,600.00	1,548,000
18.2.4	- Extra for stairs	2	no	30,000.00	60,000
18.2.5	Grossing	63	m2	3,000.00	189,000
18.2.6	Circulation	87	m2	3,000.00	261,000
18.2.7	First Aid	15	m2	3,600.00	54,000
18.2.8	Store	20	m2	3,000.00	60,000
18.2.9	WC	3	m2	6,000.00	18,000
18.2.10	WC	3	m2	6,000.00	18,000
18.2.11	Acc WC	5	m2	6,500.00	32,500
18.2.12	Group Change	48	m2	4,500.00	216,000
18.2.13	Group Change	44	m2	4,500.00	198,000
18.2.14	Store	12	m2	3,000.00	36,000
18.2.15					
18.2.16	<u>Miscellaneous</u>				
18.2.17	Allow for connection to existing building		Allow		100,000
18.2.18					
18.2.19	<u>Mar2026 additions</u>				
18.2.20	Acc WC	5	m2	6,500.00	32,500
18.2.21	Change Cubicles	10	m2	4,500.00	44,100
18.2.22	Acc WC	8	m2	6,500.00	52,000
18.2.23	Circulation	10	m2	4,000.00	38,280
18.2.24	Allow for works to existing facade to facilitate extension	Allow			200,000
	Total - Building Works				4,081,380
	Existing Pool Hall				
18.3.1	Make good to Pool Hall 1 (North part) after new splash pad				Stage 2
18.3.2	Allow for make good to Spine area	201	m2	1,800.00	361,800

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Williams Ross	Mar2026 Scope Staged - R1
Monash Aquatic Redevelopment	

Item	Description	Quantity	Unit	Rate	Total (AUD)
	- West - Pool Plant, pool treatment, group change & first aid				
18.3.3	Make good to Pool Hall 2 (Southpart) - patch where spa removed, new ramp to LTS	1,071	m2	1,800.00	1,927,800
18.3.4	New GRC spectator seating - linear	2	no	4,000.00	8,000
18.3.5	New GRC spectator seating - shaped	7	no	6,000.00	42,000
	Total - Existing Pool Hall				2,339,600
	Services				
18.8.1	<u>Services</u>				
18.8.2	Allowance'-As per the email received on 17/02/2025 by BRT Consulting Pty Ltd	Allow			210,100
18.8.3	Allow for modifications to sewer at the south east corner	1	Item	70,000.00	70,000
18.8.4	Allow for fire sprinkler system and fire detection for new dry areas	1,021	m2	75.00	76,575
18.8.5	Allow to extend fire detection system	2,397	m2	15.00	35,955
18.8.6	General Power / Lighting (m2)	2,397	m2	180.00	431,460
18.8.7	BWIC		item		80,499
	Total - Services				904,589
	Miscellaneous				
18.9.1	Allowance for piled foundations	1,021	m2	350.00	357,350
18.9.2	Allowance for AV infrastructure	2,397	m2		Excluded
18.9.3	Allowance for signage		item		50,000
	Total - Miscellaneous				407,350
	Aquatic works				
18.13.1	<u>Aquatic</u>				
18.13.2	<u>Existing pool modifications</u>				
18.13.3	Indoor 25m pool - new treatment plant	1	item		1,545,600
18.13.4	New ramp to existing indoor 25m pool within the existing shell	38	m2		Included
18.13.5	Indoor LTS pool - new treatment plant	1	item		618,000
18.13.6	New ramp to existing LTS pool	26	m2		Included
18.13.7	Allow for pool equipment		item		60,000
18.13.8	Builders works (excavation, etc)		item		200,000

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Williams Ross Monash Aquatic Redevelopment			Mar2026 Scope Staged - R1		
Item	Description	Quantity	Unit	Rate	Total (AUD)
18.13.9	- West - Pool Plant, pool treatment, group change & first aid				
18.13.10	<u>Existing 50m outdoor pool</u>				
18.13.11	Pool shell structure remains with access ramp. New 400m3/hr pool water treatment plant	Allow			1,920,000
18.13.12					
18.13.13	<u>Demolition</u>				
18.13.14	Demolish finishes and prep 25m indoor pool lane for new ramp construction		item		40,000
18.13.15	Demolish spa (adj LTS pool)		item		40,000
	Total - Aquatic works				4,423,600
	Demolition/ rectification				
18.14.1	<u>External</u>				
18.14.2	Demolish west portion of building incl inground structures [Ground Floor]	319	m2	300.00	95,700
18.14.3	Demolish Walled Garden-West	428	m2	100.00	42,800
18.14.4	Demolish entry to chiller yard	64	m2	100.00	6,400
18.14.5	Scrap off footpath (concrete pavement)	803	m2	25.00	20,075
18.14.6	Demolish truck bund	18	m2	100.00	1,750
18.14.7	Scrap off road pavement (Parking)	228	m2	35.00	7,975
18.14.8	Demolish trees - assume large sized	12	no	1,500.00	18,000
18.14.9	Demolish trees - assume medium sized	3	no	1,000.00	3,000
	Total - Demolition/ rectification				195,700
	External works and services				
18.15.1	External works				
18.15.2	Site Preparation	1	Item	16,010.00	16,010
18.15.3	Allow for earthworks	1	item	104,065.00	104,065
18.15.4	Allow for contamination soil removal - basement pool plant only	1	item	450,000.00	450,000
18.15.5					
18.15.6	<u>Landscaping</u>				
18.15.7	Soft landscaping allowance	1		100,000.00	100,000

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Williams Ross
Monash Aquatic Redevelopment

Mar2026 Scope Staged - R1

Item	Description	Quantity	Unit	Rate	Total (AUD)
	- West - Pool Plant, pool treatment, group change & first aid				
18.15.8	New external paths / pavements	1		120,000.00	120,000
18.15.9	<u>West bund / service yard</u>				
18.15.10	Truck Bund	45	m2	450.00	20,250
18.15.11	Service Yard	535	m2	2,000.00	1,070,000
18.15.12	<u>Services</u>				
18.15.13	Allow for modifications to existing external services	1		131,226	131,226
	Total - External works and services				2,011,551
	Total - - West - Pool Plant, pool treatment, group change & first aid				24,274,000

Detail



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Williams Ross
Monash Aquatic Redevelopment

Mar2026 Scope Staged - R1

Item	Description	Quantity	Unit	Rate	Total (AUD)
	- New warm water pool with ramp - Elemental Summary				
24.1	<u>Ground Floor</u>				
24.2	Building Works	862	m2	5,078.91	4,378,023
24.3	Existing Pool Hall				N/A
24.4					
24.5	<u>First Floor</u>				
24.6	Building Works				N/A
24.7					
24.8	Services				266,295
24.9	Miscellaneous				321,680
24.10	ESD Initiatives	3	%		148,980
24.11	SUBTOTAL - BUILDING WORKS	862	m2	5,933.85	5,114,977
24.12					
24.13	Aquatic works				2,235,400
24.14	Demolition/ rectification				202,809
24.15	External works and services				207,897
24.16					
24.17	CONSTRUCTION COST	862	m2	9,003.58	7,761,083
24.18					
24.19	Preliminaries & Margin	Allow			1,164,162
24.20	Design Contingency	5	%		389,000
24.21	Cost Escalation to tender in late 2028/29	3.5% pa			814,996
24.22	Cost Escalation during construction	3% pa		2yr	342,758
24.23					
24.24	SUB TOTAL	862	m2	12,148.49	10,472,000
24.25					
24.26	Construction Contingency	10	%		1,047,000
24.27	Professional Fee Allowance	10	%		1,047,000
24.28	Authority Fees & Charges	1.5	%		158,000
24.29	Loose Furniture and Equipment	Allow			60,000
24.30	AV / IT equipment	Allow			75,000

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Williams Ross Monash Aquatic Redevelopment		Mar2026 Scope Staged - R1			
24.31	- Gym Equipment [assumed leased]				Excluded
24.32	Council Internal Costs				Excluded
24.33	Sundry project costs / contingency on Misc costs	1	%		104,000
24.34	Legal, permits, marketing and other professional fees				Excluded
24.35					
24.36	PROJECT TOTAL (EXCLUDING GST)				12,963,000
	Total - - New warm water pool with ramp				12,963,000

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Williams Ross

Mar2026 Scope Staged - R1

Monash Aquatic Redevelopment

Item	Description	Quantity	Unit	Rate	Total (AUD)
	- New warm water pool with ramp				
	Building Works				
24.2.1	<u>East Facility - Refurbishment</u>				
24.2.2	Air Lock	9	m2	5,000.00	45,000
24.2.3	Changing Places	12	m2	7,500.00	90,000
24.2.4	Acc WC	8	m2	6,500.00	52,000
24.2.5	Store	6	m2	1,200.00	7,200
24.2.6	Change Village - existing: make good works only for connection to extended change village				Stage 1
24.2.7	Extra Acc WC to change village	12	m2	6,500.00	78,000
24.2.8	Extended Change Village	130	m2	4,000.00	520,000
24.2.9	- extra for lockers		Allow		150,000
24.2.10	Store - refurbish reduced size	14	m2	1,500.00	21,000
24.2.11					
24.2.12	<u>East Facility - New Build</u>				
24.2.13	Steam	20	m2	3,000.00	60,000
24.2.14	Sauna	19	m2	3,000.00	57,000
24.2.15	Sauna	19	m2	3,000.00	57,000
24.2.16	- Sauna & steam room fitouts	3	no	150,000.00	450,000
24.2.17	New warm Water pool hall - East	610	m2	4,000.00	2,440,000
24.2.18	- Allow for concourse showers		item		15,000
24.2.19					
24.2.20	<u>Miscellaneous</u>				
24.2.21	Allow for connection to existing building		Allow		100,000
24.2.22	Allow for modification of NEW change village / Pool Store building facade from external to internal wall		Allow		40,000
24.2.23	Infill existing WWE program pool & spa with new slab for extended change village	106	m2	1,200.00	127,020
24.2.24	Allow for additional structure to make good retained portion of existing WW program pool hall [over extended change village]	106	m2	650.00	68,803
	Total - Building Works				4,378,023
	Services				
24.8.1	<u>Services</u>				

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Williams Ross Monash Aquatic Redevelopment			Mar2026 Scope Staged - R1		
Item	Description	Quantity	Unit	Rate	Total (AUD)
	- New warm water pool with ramp				
24.8.2	Allowance'-As per the email received on 17/02/2025 by BRT Consulting Pty Ltd	Allow			253,365
24.8.3	Allow for fire sprinkler system and fire detection for new dry areas	862	m2		Excluded
24.8.4	Allow to extend fire detection system	862	m2	15.00	12,930
	Total - Services				266,295
	Miscellaneous				
24.9.1	Allowance for piled foundations	668	m2	400.00	267,200
24.9.2	Allowance for AV infrastructure	862	m2	40.00	34,480
24.9.3	Allowance for signage		item		20,000
	Total - Miscellaneous				321,680
	Aquatic works				
24.13.1	<u>Aquatic</u>				
24.13.2	New WWP - As per the email received on 13/12/2024 by Ross Weight (Hydrautech Designs Consulting Engineers)	1	Item		1,584,000
24.13.3	New spa - As per the email received on 13/12/2024 by Ross Weight (Hydrautech Designs Consulting Engineers)	1	Item		521,400
24.13.4	Builders works (excavation, etc)		item		30,000
24.13.5	Allowance for piled foundations to new WWP		item		100,000
	Total - Aquatic works				2,235,400
	Demolition/ rectification				
24.14.1	Demolish existing east entry portion of building [Ground Floor- refurb areas]	191	m2	200.00	38,200
24.14.2	Scrap off garden bed and prepare for new surface/ garden	161	m2	25.00	4,025
24.14.3	Demolish timber edging	37	m	25.00	925
24.14.4	Demolish trees - assume large sized	19	no	1,500.00	28,500
24.14.5					
24.14.6	Demolish existing WWE program pool and spa		Allow		50,000
24.14.7	Demolish existing finishes, fitments, services to existing WWE program pool hall	323	m2	150.00	48,459
24.14.8	- Assume retain existing structure to extent of extended change village		note		Excluded
24.14.9	Demolish structure, facade and slab etc to location of new WWP hall	218	m2	150.00	32,700

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Item	Description	Quantity	Unit	Rate	Total (AUD)
	- New warm water pool with ramp				
	Total - Demolition/ rectification				202,809
	External works and services				
24.15.1	External works				
24.15.2	Site Preparation	1		6,710.00	6,710
24.15.3	Allow for earthworks	1		43,615.00	43,615
24.15.4					
24.15.5	<u>Landscaping</u>				
24.15.6	Soft landscaping allowance	1		100,000.00	100,000
24.15.7	<u>Services</u>				
24.15.8	Allow for modifications to existing external services	1		57,572	57,572
24.15.9	Allow for significant rainwater collection / site detention system		Allow		Stage 1
	Total - External works and services				207,897
	Total - - New warm water pool with ramp				12,963,000

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Williams Ross
Monash Aquatic Redevelopment

Mar2026 Scope Staged - R1

Item	Description	Quantity	Unit	Rate	Total (AUD)
28.1	- New zero depth splashpad area, New program pool and new toddler pool - Elemental Summary				
28.1	<u>Ground Floor</u>				
28.2	Building Works				N/A
28.3	Existing Pool Hall	1,272	m2		2,449,100
28.4					
28.5	<u>First Floor</u>				
28.6	Building Works				N/A
28.7					
28.8	Services				20,988
28.9	Miscellaneous				2,000
28.10	ESD Initiatives	3	%		74,163
28.11	SUBTOTAL - BUILDING WORKS	1,272	m2	2,001.77	2,546,251
28.12					
28.13	Aquatic works				6,592,000
28.14	Demolition/ rectification				0
28.15	External works and services				212,616
28.16					
28.17	CONSTRUCTION COST	1,272	m2	7,351.31	9,350,867
28.18					
28.19	Preliminaries & Margin	Allow			1,402,630
28.20	Design Contingency	5	%		468,000
28.21	Cost Escalation to tender in late 2028/29	3.5% pa			981,881
28.22	Cost Escalation during construction	3% pa		2yr	412,622
28.23					
28.24	SUB TOTAL	1,272	m2	9,918.24	12,616,000
28.25					
28.26	Construction Contingency	10	%		1,262,000
28.27	Professional Fee Allowance	10	%		1,262,000
28.28	Authority Fees & Charges	1.5	%		190,000
28.29	Loose Furniture and Equipment	Allow			Excluded
28.30	AV / IT equipment	Allow			Excluded

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28.31	- Gym Equipment [assumed leased]				Excluded
28.32	Council Internal Costs				Excluded
28.33	Sundry project costs / contingency on Misc costs	1	%		127,000
28.34	Legal, permits, marketing and other professional fees				Excluded
28.35					
28.36	PROJECT TOTAL (EXCLUDING GST)				15,457,000
	Total - - New zero depth splashpad area, New program pool and new toddler pool				15,457,000

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Williams Ross
Monash Aquatic Redevelopment

Mar2026 Scope Staged - R1

Item	Description	Quantity	Unit	Rate	Total (AUD)
	- New zero depth splashpad area, New program pool and new toddler pool				
	Existing Pool Hall				
28.3.1	Make good to Pool Hall 1 (North part) after new splash pad	1,272	m2	1,800.00	2,289,600
28.3.2	Allow for make good to Spine area				Stage 1
28.3.3	Make good to Pool Hall 2 (Southpart) - patch where spa removed, new ramp to LTS				Stage 1
28.3.4	New GRC spectator seating - linear	37	m	2,500.00	93,500
28.3.5	New GRC spectator seating - shaped	11	no	6,000.00	66,000
	Total - Existing Pool Hall				2,449,100
	Services				
28.8.1	<u>Services</u>				
28.8.2	Allow for fire sprinkler system and fire detection for new dry areas	1,272	m2		Excluded
28.8.3	Allow to extend fire detection system	1,272	m2	15.00	19,080
28.8.4	BWIC		item		1,908
	Total - Services				20,988
	Miscellaneous				
28.9.1	Allowance for piled foundations				Excluded
28.9.2	Allowance for AV infrastructure	1,272	m2		Excluded
28.9.3	Allowance for signage		item		2,000
	Total - Miscellaneous				2,000
	Aquatic works				
28.13.1	<u>Aquatic</u>				
28.13.2	Splash Pad - As per the email received on 13/12/2024 by Ross Weight (Hydrautech Designs Consulting Engineers)	1	Item	2,000,000.00	2,000,000
28.13.3	- Allow for water features [no allowance for water play equipment - tipping bucket type]	1	item	650,000.00	650,000
28.13.4	New Program Pool 20m x 10m incl ramp	1	item	2,736,000.00	2,736,000
28.13.5	Toddler Pool	1	item	430,000.00	430,000
28.13.6	- extra for features to toddler pool	1	item	75,000.00	75,000
28.13.7	<u>Existing pool modifications</u>				

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Williams Ross Monash Aquatic Redevelopment			Mar2026 Scope Staged - R1		
Item	Description	Quantity	Unit	Rate	Total (AUD)
	- New zero depth splashpad area, New program pool and new toddler pool				
28.13.8	Indoor 25m pool - new treatment plant	1	item		Stage 1
28.13.9	New ramp to existing indoor 25m pool within the existing shell	38	m2		Stage 1
28.13.10	Indoor LTS pool - new treatment plant	1	item		Stage 1
28.13.11	New ramp to existing LTS pool	26	m2		Stage 1
28.13.12	Outdoor 50m pool - new treatment plant				Excluded
28.13.13	New ramp to outdoor 50m pool	46	m2		396,000
28.13.14	Wave pool - new treatment plant	1	item		N/A
28.13.15	Allow for pool equipment		item		Stage 1
28.13.16	Builders works (excavation, etc)		item		100,000
28.13.17					
28.13.18	<u>Demolition</u>				
28.13.19	Demolish finishes and prep 25m indoor pool lane for new ramp construction		item		Stage 1
28.13.20	Demolish spa (adj LTS pool)		item		Stage 1
28.13.21	Demolish shallow leisure water pools (adj wave pool)		item		75,000
28.13.22	Demolition for new 50m pool ramp works		item		30,000
28.13.23	Demolish existing wave pool and plant as required for new splashpad & program pool		item		100,000
	Total - Aquatic works				6,592,000
	External works and services				
28.15.1	External works				
28.15.2	Site Preparation	1	Item	12,616.00	12,616
28.15.3					
28.15.4	<u>Landscaping</u>				
28.15.5	Make good external concourse around 50m pool	1	Item	100,000.00	100,000
28.15.6	<u>Services</u>				
28.15.7	Allow for modifications to existing external services	1	PROV SUM	100,000	100,000
	Total - External works and services				212,616
	Total - - New zero depth splashpad area, New program pool and new toddler pool				15,457,000

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Item	Description	Quantity	Unit	Rate	Total (AUD)
	- Outdoor Change corridor and First Floor Health & Fitness Works - Elemental Summary				
35.1	<u>Ground Floor</u>				
35.2	Building Works	52	m2		409,800
35.3	Existing Pool Hall				N/A
35.4					
35.5	<u>First Floor</u>				
35.6	Building Works	1,450	m2		4,490,540
35.7					
35.8	Services				531,170
35.9	Miscellaneous				108,480
35.10	ESD Initiatives	3	%		166,200
35.11	SUBTOTAL - BUILDING WORKS	1,502	m2	3,799.06	5,706,190
35.12					
35.13	Aquatic works				N/A
35.14	Demolition/ rectification				295,530
35.15	External works and services				193,445
35.16					
35.17	CONSTRUCTION COST	1,502	m2	4,124.61	6,195,165
35.18					
35.19	Preliminaries & Margin	Allow			929,275
35.20	Design Contingency	5	%		309,000
35.21	Cost Escalation to tender in late 2028/29	3.5% pa			108,349
35.22	Cost Escalation during construction	3% pa		2yr	46,212
35.23					
35.24	SUB TOTAL	1,502	m2	5,051.93	7,588,000
35.25					
35.26	Construction Contingency	10	%		758,000
35.27	Professional Fee Allowance	10	%		758,000
35.28	Authority Fees & Charges	1.5	%		114,000
35.29	Loose Furniture and Equipment	Allow			300,000
35.30	AV / IT equipment	Allow			300,000

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Williams Ross Monash Aquatic Redevelopment		Mar2026 Scope Staged - R1			
35.31	- Gym Equipment [assumed leased]				Excluded
35.32	Council Internal Costs				Excluded
35.33	Sundry project costs / contingency on Misc costs	1	%		75,000
35.34	Legal, permits, marketing and other professional fees				Excluded
35.35					
35.36	PROJECT TOTAL (EXCLUDING GST)				9,893,000
	Total - - Outdoor Change corridor and First Floor Health & Fitness Works				9,893,000

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Williams Ross	Mar2026 Scope Staged - R1
Monash Aquatic Redevelopment	

Item	Description	Quantity	Unit	Rate	Total (AUD)
	- Outdoor Change corridor and First Floor Health & Fitness Works				
	Building Works				
35.2.1	<u>Outdoor Change Pavilion</u>				
35.2.2	New locker corridor	52	m2	4,000.00	209,800
35.2.3	- allow for lockers		Allow		100,000
35.2.4					
35.2.5	<u>Miscellaneous</u>				
35.2.6	Allow for connection to existing fitout / building		Allow		100,000
	Total - Building Works				409,800
	Building Works				
35.6.1	<u>East Facility - Refurbishment</u>				
35.6.2	Reformer pilates	122	m2	2,700.00	329,400
35.6.3	ACC	6	m2	6,500.00	39,000
35.6.4	Change & Amenities	15	m2	5,500.00	82,500
35.6.5	Store to reformer	11	m2	2,500.00	27,500
35.6.6	Foyer/ Circulation	146	m2	2,500.00	365,000
35.6.7	Wellness A & B	128	m2	2,700.00	345,600
35.6.8	Store to wellness A	7	m2	2,500.00	17,500
35.6.9	Functional Training	86	m2	2,500.00	215,000
35.6.10	Gym	653	m2	2,700.00	1,763,100
35.6.11	Store to gymnasium	5	m2	2,500.00	12,500
35.6.12	Duct	15	m2	2,500.00	37,500
35.6.13	<u>Outdoor Change Pavilion</u>				
35.6.14	Group fitness / aerobices	230	m2	3,600.00	828,000
35.6.15	Store	17	m2	2,500.00	42,500
35.6.16	Circulation	9	m2	2,500.00	22,500
35.6.17	New slab over locker corridor	52	m2	1,200.00	62,940
35.6.18	<u>Miscellaneous</u>				
35.6.19	Allow for connection to existing building		item		300,000

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Williams Ross Monash Aquatic Redevelopment			Mar2026 Scope Staged - R1		
Item	Description	Quantity	Unit	Rate	Total (AUD)
	- Outdoor Change corridor and First Floor Health & Fitness Works				
	Total - Building Works				4,490,540
	Services				
35.8.1	<u>Services</u>				
35.8.2	Allowance'-As per the email received on 17/02/2025 by BRT Consulting Pty Ltd	Allow			508,640
35.8.3	Allow for fire sprinkler system and fire detection for new dry areas	1,502	m2		Excluded
35.8.4	Allow to extend fire detection system	1,502	m2	15.00	22,530
	Total - Services				531,170
	Miscellaneous				
35.9.1	Allowance for piled foundations	52	m2	450.00	23,400
35.9.2	Allowance for AV infrastructure	1,502	m2	40.00	60,080
35.9.3	Allowance for signage		item		25,000
	Total - Miscellaneous				108,480
	Demolition/ rectification				
35.14.1	Demolish existing east entry portion of building [First Floor]	1,441	m2	150.00	216,150
35.14.2	Demolish walled playground - East	201	m2	100.00	20,100
35.14.3	Demolish roof to outdoor change pavilion constructed in Stage 1 - assume L1 slab built in Stage 1	247	m2	240.00	59,280
	Total - Demolition/ rectification				295,530
	External works and services				
35.15.1	External works				
35.15.2	Site Preparation	1		5,000.00	5,000
35.15.3	Allow for earthworks	1		12,000.00	12,000
35.15.4					
35.15.5	<u>Terraces</u>				
35.15.6	Staff (outdoor)				Excluded
35.15.7	Cafe Terrace (Outdoor)				Excluded
35.15.8	<u>Landscaping</u>				

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Item	Description	Quantity	Unit	Rate	Total (AUD)
	- Outdoor Change corridor and First Floor Health & Fitness Works				
35.15.9	Garden				Excluded
35.15.10	Soft landscaping allowance	1		30,000.00	30,000
35.15.11	New external paths / pavements				Excluded
35.15.12	<u>Car Park</u>				
35.15.13	New Car Park - North - 15 spaces				Excluded
35.15.14	<u>Services</u>				
35.15.15	Allow for modifications to existing external services	1		146,445	146,445
35.15.16	Allow for significant rainwater collection / site detention system				Excluded
	Total - External works and services				193,445
	Total - - Outdoor Change corridor and First Floor Health & Fitness Works				9,893,000

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Williams Ross
Monash Aquatic Redevelopment

Mar2026 Scope Staged - R1

Item	Description	Quantity	Unit	Rate	Total (AUD)
	OPTION - Staff Work Space Extension - Elemental Summary				
46.1	<u>Ground Floor</u>				
46.2	Building Works	69	m2		397,490
46.3	Existing Pool Hall				N/A
46.4					
46.5	<u>First Floor</u>				
46.6	Building Works				N/A
46.7					
46.8	Services				N/A
46.9	Miscellaneous				1,000
46.10	ESD Initiatives	3	%		11,955
46.11	SUBTOTAL - BUILDING WORKS				410,445
46.12					
46.13	Aquatic works				N/A
46.14	Demolition/ rectification				18,280
46.15	External works and services				76,835
46.16					
46.17	CONSTRUCTION COST				505,560
46.18					
46.19	Preliminaries & Margin	Allow			75,834
46.20	Design Contingency	5	%		26,000
46.21	Cost Escalation to tender in late 2028/29	3.5% pa			53,147
46.22	Cost Escalation during construction	3% pa		2yr	22,459
46.23					
46.24	SUB TOTAL				683,000
46.25					
46.26	Construction Contingency	10	%		69,000
46.27	Professional Fee Allowance	10	%		69,000
46.28	Authority Fees & Charges	1.5	%		11,000
46.29	Loose Furniture and Equipment	Allow			50,000
46.30	AV / IT equipment	Allow			40,000

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Williams Ross Monash Aquatic Redevelopment		Mar2026 Scope Staged - R1			
46.31	- Gym Equipment [assumed leased]				Excluded
46.32	Council Internal Costs				Excluded
46.33	Sundry project costs / contingency on Misc costs	1	%		7,000
46.34	Legal, permits, marketing and other professional fees				Excluded
46.35					
46.36	PROJECT TOTAL (EXCLUDING GST)				929,000
	Total - OPTION - Staff Work Space Extension				929,000

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Williams Ross Monash Aquatic Redevelopment			Mar2026 Scope Staged - R1		
Item	Description	Quantity	Unit	Rate	Total (AUD)
	OPTION - Staff Work Space Extension				
	Building Works				
46.2.1	<u>East Facility - new extension</u>				
46.2.2	Staff work space	45	m2	4,500.00	203,490
46.2.3	Staff office	24	m2	4,500.00	108,000
46.2.4	Services per BRT	Allow			36,000
46.2.5	<u>Miscellaneous</u>				
46.2.6	Allow for connection to existing building		Allow		50,000
	Total - Building Works				397,490
	Miscellaneous				
46.9.1	Allowance for signage	1			1,000
	Total - Miscellaneous				1,000
	Demolition/ rectification				
46.14.1	Demolish walled playground - East	69	m2	120.00	8,280
46.14.2	Sundry demolition	Allow			10,000
	Total - Demolition/ rectification				18,280
	External works and services				
46.15.1	External works				
46.15.2	Site Preparation	69	m2	15.00	1,035
46.15.3	Allow for earthworks	69	m2		12,000
46.15.4					
46.15.5	<u>Landscaping</u>				
46.15.6	Soft landscaping allowance	1		50,000.00	50,000
46.15.7	<u>Services</u>				
46.15.8	Allow for modifications to existing external services	1		13,800	13,800
	Total - External works and services				76,835
	Total - OPTION - Staff Work Space Extension				929,000

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Item	Description	Quantity	Unit	Rate	Total (AUD)
	OPTION - New Car Parking (Sth 120 spaces) - Elemental Summary				
47.1	<u>Ground Floor</u>				
47.2	Building Works				N/A
47.3	Existing Pool Hall				N/A
47.4					
47.5	<u>First Floor</u>				
47.6	Building Works				N/A
47.7					
47.8	Services				N/A
47.9	Miscellaneous				60,000
47.10	ESD Initiatives	3	%		1,800
47.11	SUBTOTAL - BUILDING WORKS				61,800
47.12					
47.13	Aquatic works				N/A
47.14	Demolition/ rectification				206,845
47.15	External works and services				1,870,930
47.16					
47.17	CONSTRUCTION COST				2,139,575
47.18					
47.19	Preliminaries & Margin	Allow			320,936
47.20	Design Contingency	5	%		107,000
47.21	Cost Escalation to tender in late 2028/29	3.5% pa			224,657
47.22	Cost Escalation during construction	3% pa		2yr	94,832
47.23					
47.24	SUB TOTAL				2,887,000
47.25					
47.26	Construction Contingency	10	%		289,000
47.27	Professional Fee Allowance	10	%		289,000
47.28	Authority Fees & Charges	1.5	%		44,000
47.29	Loose Furniture and Equipment	Allow			Excluded
47.30	AV / IT equipment	Allow			Excluded

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47.31	- Gym Equipment [assumed leased]				Excluded
47.32	Council Internal Costs				Excluded
47.33	Sundry project costs / contingency on Misc costs	1	%		29,000
47.34	Legal, permits, marketing and other professional fees				Excluded
47.35					
47.36	PROJECT TOTAL (EXCLUDING GST)				3,538,000
	Total - OPTION - New Car Parking (Sth 120 spaces)				3,538,000

Detail



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Williams Ross
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Item	Description	Quantity	Unit	Rate	Total (AUD)
	OPTION - New Car Parking (Sth 120 spaces)				
	Miscellaneous				
47.9.1	Allowance for signage	1	item		60,000
	Total - Miscellaneous				60,000
	Demolition/ rectification				
47.14.1	<u>External</u>				
47.14.2	Scrap off footpath (concrete pavement)	57	m2	25.00	1,425
47.14.3	Scrap off garden bed and prepare for new surface/ garden	1,174	m2	25.00	29,350
47.14.4	Scrap off tennis court	3,782	m2	35.00	132,370
47.14.5	Demolish tennis club house incl undercover BBQ area	191	m2	200.00	38,200
47.14.6	Demolish fence (high woven wire)	275	m	20.00	5,500
	Total - Demolition/ rectification				206,845
	External works and services				
47.15.1	External works				
47.15.2	<u>Landscaping</u>				
47.15.3	Soft landscaping allowance	1		100,000.00	100,000
47.15.4	New external paths / pavements	1		100,000.00	100,000
47.15.5	<u>Car Park</u>				
47.15.6	New Car Park - South - 120 spaces	4,489	m2	220.00	987,580
47.15.7	Integration of new carpark with existing	Allow			10,000
47.15.8	<u>Services</u>				
47.15.9	Allow for modifications to existing external services	1		673,350	673,350
	Total - External works and services				1,870,930
	Total - OPTION - New Car Parking (Sth 120 spaces)				3,538,000

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Item	Description	Quantity	Unit	Rate	Total (AUD)
	OPTION - 500kW PV Cells - Elemental Summary				
48.1	<u>Ground Floor</u>				
48.2	Building Works				N/A
48.3	Existing Pool Hall				N/A
48.4					
48.5	<u>First Floor</u>				
48.6	Building Works				N/A
48.7					
48.8	Services				N/A
48.9	OPTION - 500kW PV Cells				660,000
48.10	BWIC	5	%		33,000
48.11	SUBTOTAL - BUILDING WORKS				693,000
48.12					
48.13	Aquatic works				N/A
48.14					
48.15	CONSTRUCTION COST				693,000
48.16					
48.17	Preliminaries & Margin	Allow			103,950
48.18	Design Contingency	5	%		35,000
48.19	Cost Escalation to tender in late 2028/29	3.5% pa			72,796
48.20	Cost Escalation during construction	3% pa		2yr	31,254
48.21					
48.22	SUB TOTAL				936,000
48.23					
48.24	Construction Contingency	10	%		94,000
48.25	Professional Fee Allowance	10	%		94,000
48.26	Authority Fees & Charges	1.5	%		15,000
48.27	Loose Furniture and Equipment	Allow			Excluded
48.28	AV / IT equipment	Allow			Excluded
48.29	- Gym Equipment [assumed leased]				Excluded
48.30	Council Internal Costs				Excluded

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48.31	Sundry project costs / contingency on Misc costs	1	%		10,000
48.32	Legal, permits, marketing and other professional fees				Excluded
48.33					
48.34	PROJECT TOTAL (EXCLUDING GST)				1,149,000
	Total - OPTION - 500kW PV Cells				1,149,000

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Item	Description	Quantity	Unit	Rate	Total (AUD)
	OPTION - 500kW PV Cells				
	OPTION - 500kW PV Cells				
48.9.1	Services per BRT 17/02/2025				
48.9.2	500kw solar system	Allow			660,000
	Total - OPTION - 500kW PV Cells				660,000
	Total - OPTION - 500kW PV Cells				1,149,000

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Mar2026 Scope Staged - R1

Item	Description	Quantity	Unit	Rate	Total (AUD)
	OPTION - Electrification - Elemental Summary				
49.1	<u>Ground Floor</u>				
49.2	Building Works				N/A
49.3	Existing Pool Hall				N/A
49.4					
49.5	<u>First Floor</u>				
49.6	Building Works				N/A
49.7					
49.8	Services				N/A
49.9	Building Services - Heat Pump				1,727,000
49.10	BWIC	5	%		86,350
49.11	SUBTOTAL - BUILDING WORKS				1,813,350
49.12					
49.13	Aquatic works				N/A
49.14	Demolition/ rectification				25,000
49.15	External works and services				105,000
49.16					
49.17	CONSTRUCTION COST				1,943,350
49.18					
49.19	Preliminaries & Margin	Allow			291,503
49.20	Design Contingency	5	%		98,000
49.21	Cost Escalation to tender in late 2028/29	3.5% pa			204,125
49.22	Cost Escalation during construction	3% pa		2yr	86,023
49.23					
49.24	SUB TOTAL				2,623,000
49.25					
49.26	Construction Contingency	10	%		263,000
49.27	Professional Fee Allowance	10	%		263,000
49.28	Authority Fees & Charges	1.5	%		40,000
49.29	Loose Furniture and Equipment	Allow			Excluded
49.30	AV / IT equipment	Allow			Excluded

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49.31	- Gym Equipment [assumed leased]				Excluded
49.32	Council Internal Costs				Excluded
49.33	Sundry project costs / contingency on Misc costs	1	%		27,000
49.34	Legal, permits, marketing and other professional fees				Excluded
49.35					
49.36	PROJECT TOTAL (EXCLUDING GST)				3,216,000
	Total - OPTION - Electrification				3,216,000

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Item	Description	Quantity	Unit	Rate	Total (AUD)
	OPTION - Electrification				
	Building Services - Heat Pump				
49.9.1	Engineers Estimate Dated 12 March 2025				
49.9.2	New Sub-station (estimate unknown until application is made)	1	item	275,000.00	275,000
49.9.3	MSB upgrade				Included in Stage 1
49.9.4	MSSB upgrade				Included in Stage 1
49.9.5	Heat Pumps - 1500kW	1	item	990,000.00	990,000
49.9.6	Pipework and pumps	1	item	110,000.00	110,000
49.9.7	Electric Boiler (if gas boiler kept)	1	item	220,000.00	220,000
49.9.8	Automatic Controls BMS	1	item	110,000.00	110,000
49.9.9	Mech Electrical Work	1	item	22,000.00	22,000
49.9.10	Total - Building Services - Heat Pump				1,727,000
	Total - Building Services - Heat Pump				3,454,000
	Demolition/ rectification				
49.14.1	Demolish existing heat pump fencing	Allow			10,000
49.14.2	Sundry demolition	Allow			15,000
	Total - Demolition/ rectification				25,000
	External works and services				
49.15.1	External Works				
49.15.2	Allow to extend existing outdoor heat pump area	Allow			15,000
49.15.3	New acoustic fence				50,000
49.15.4	Landscaping				
49.15.5	Hard and soft landscaping allowance	1	item	15,000.00	15,000
49.15.6	Services				
49.15.7	Allow to relocate existing services	1	item	25,000.00	25,000
	Total - External works and services				105,000
	Total - OPTION - Electrification				3,216,000

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