

Bass Coast Shire Council

BASS COAST AQUATIC & LEISURE CENTRE

TECHNICAL REVIEW



Document History

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Executive Summary

The Bass Coast Aquatic and Leisure Centre (BCALC)....**TBC**....

1 Introduction

This technical review of the Bass Coast Aquatic & Leisure Centre (BCALC) was commissioned by Bass Coast Shire Council as part of an overall strategic review of the Council's aquatic facilities.

The BCALC is a combined indoor aquatic facility and leisure centre consisting of basketball / netball hall, gymnasium and associated amenities. The basketball / netball hall, gymnasium and associated amenities are not part of this review.

The BCALC was built circa late 1970's / early 1980's, is located at 41 Wentworth Rd, and is operated by the YMCA under a management contract.

2 Purpose

Bass Coast Shire Council currently has under consideration various strategic options of aquatic facilities within the Shire, but finalization of these options is some years away. In the interim there is a need to provide greater clarity at BCALC around the pools and plant with respect to their remaining asset life and any likely remedial costs over say the next 10 year period.

The purpose of the review is to inspect the pools and associated plant and equipment to assess:

- remaining life of the pool assets;
- likely remedial works and capital replacement costs required over the next 10 years;
- associated safety or compliance issues.

The review will focus on pool structural issues, pool plant and pipework, chemical storage and handling, disinfection systems, pool heating, and pool tiling.

3 Scope of Review

The scope of services is:

- a) Meet with Council representatives on site to discuss technical issues and background history;
- b) Review previous audit reports as received from Council;

- c) Inspect pool shells including pool water depths, skimmer boxes, joints and tiling;
- d) Inspect pool filtration plant and pipework, including an assessment of bather capacity / pool turnover rates;
- e) Inspect pool heating system;
- f) Inspect water treatment and chemical systems /storage;
- g) Inspect structural aspects of the pools, including laser levels of the pool coping, and underwater inspection;
- h) Safety and compliance issues compared to current aquatic standards;
- i) Assessment of findings and identify key remedial works;
- j) Determine likely future capital replacement costs;
- k) Identify any future investigative works;
- l) Prepare draft and final reports.

The review is based on the following:

- a) The review will be based on visual inspection. The pool will be full at the time of inspection and this precludes testing of the pool concrete, etc.
- b) Field testing is not anticipated at this stage but can be included later if found warranted. Typically, field testing e.g. concrete testing, becomes warranted when there is other visual evidence and the testing can be appropriately targeted.
- c) Assessment of safety and compliance issues will focus on primary issues relevant to the purpose of the review; this review is not to be considered a full safety audit as these typically require specialist auditors.

4 Facility Description

Pools

The BCALC is an indoor pool facility comprising a 25m and Toddlers pool, both within a single pool hall.

For the purposes of this report the deep end of the pool is west.



Image 1. Pool Hall. View looking west (W) towards deep end.

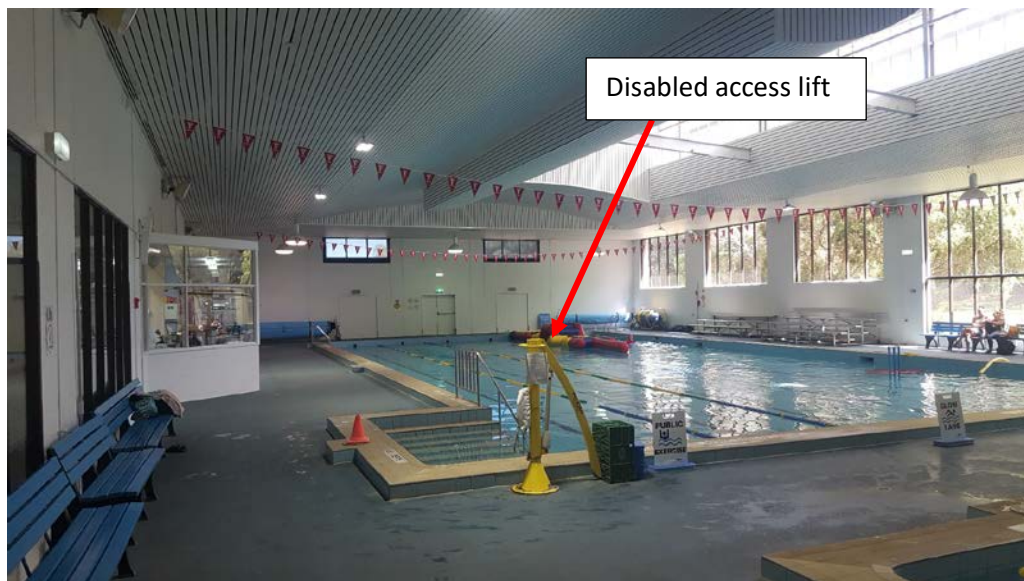


Image 2. Pool Hall. View looking W towards deep end.



Image 3. Toddlers pool. Looking north (N).

Pool Filtration & Heating Plant

A large plantroom is located off the concourse and houses:

- pool water treatment plant,
- pool water heating system
- pool hall air handling unit (AHU) ventilation system

The treatment plant is a typical system from this era comprising pressure sand filters, sodium hypochlorite dosing for disinfection, and hydrochloric acid dosing for pH control.

The toddlers pool takes a side-stream (using a booster pump) from the main pool plant filtered water return (FWR) pipe. Thus, one treatment system serves both pools. This was a common approach but is now known to leave the toddlers pool with potentially adverse water quality issues, particularly on high use days. Also refer Section 7.3.

The pool water is heated by two gas-fired boilers, running a closed loop system through a heat exchanger.

5 Site Inspection

The site inspection was carried out on 23 January 2018.

The YMCA manager Mr Glenn Marsham provided valuable input particularly on the technical history of the facility.

6 Pools

6.1 25m Pool

6.1.1 General

The 25m pool appears in good condition with no obvious visual defects.

There is a recessed step entry at the shallow end with a disabled access lift nearby. See **Image 2 and 4**.

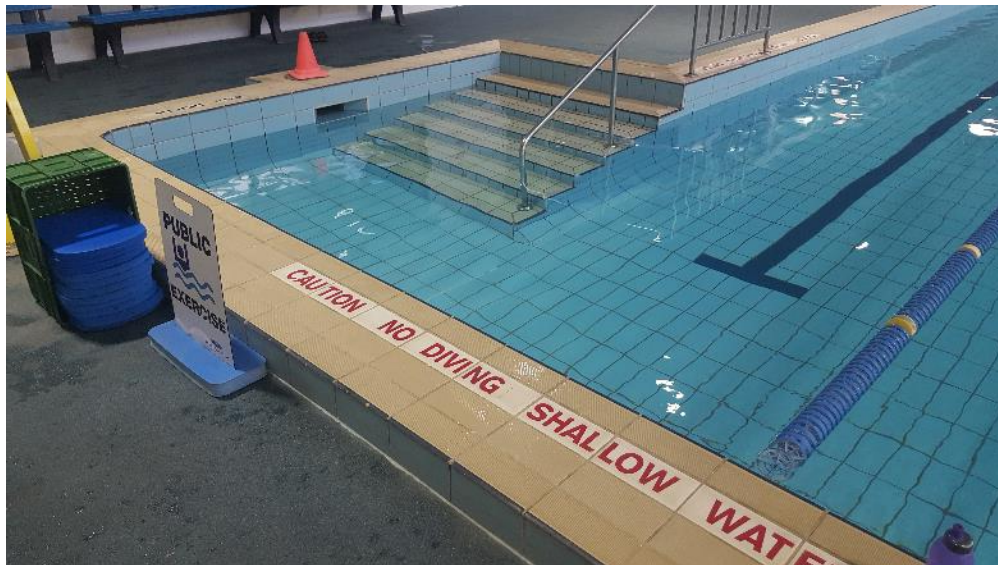


Image 4. Step entry at shallow end.

Operations personnel advised that leaks from the pool and pipework were not an issue so far as they were aware.

Key pool dimensions were measured and are provided in **Table 1**. The calculated pool volume in Table 1 assume a constant floor grade from maximum to minimum depths.

Table 1

25m Pool - Dimensions and Volume

	Length	Width	Depth Measured max (m)	Depth Signs (m)	Depth Measured min. (m)	Depth Signs (m)	Total Volume (m ³)
25m Pool	25	13	1.6	1.6	0.8	0.8	390

6.1.2 Water Distribution in Pool

Filtered water return (FWR) back into the pool is via seven (7), by 40mm dia floor nozzles located centrally along the pool. See **Image 5**.

Soiled water collection is via 7 No skimmer boxes. These are not evenly spaced around the pool with 3 on one long side and 4 on the opposite side. See **Images 7 & 8**.

Use of skimmer boxes in public pools was used on a few pools in this era but they are not common. Indeed, the NSW Dept. of Health Swimming Pool and Spa Advisory Document states they are unsuitable for public pools.

They are a constraint on the effectiveness of the water treatment system as they provide only a series of single collection points as opposed a continuous collection system such as a wet deck or gutter.

While adequate for this 10-year timeframe, in any major redevelopment of BCALC the replacement of skimmer boxes with a wet deck arrangement is strongly recommended.

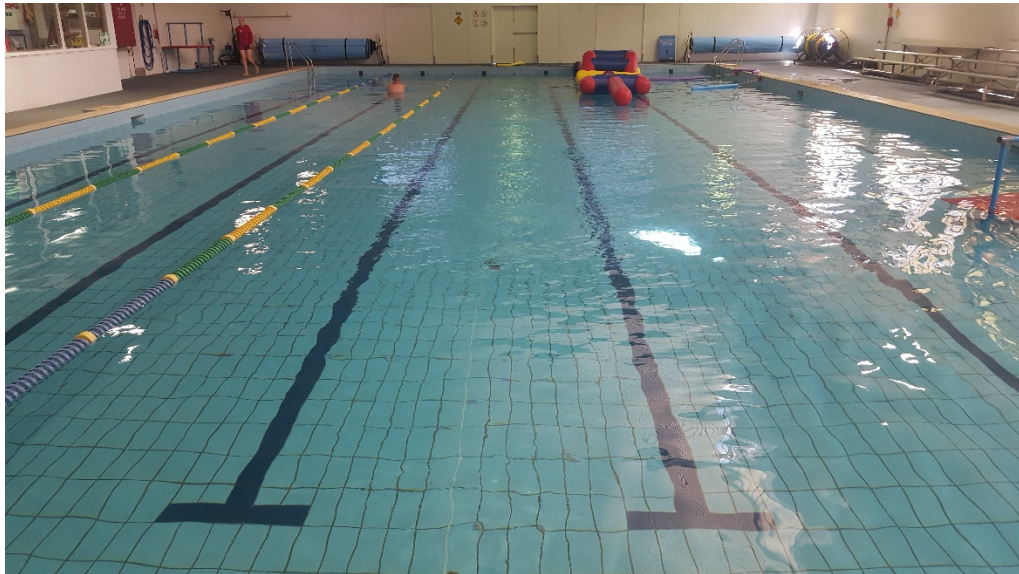


Image 5. Central FWR nozzles along pool centreline. Looking W.

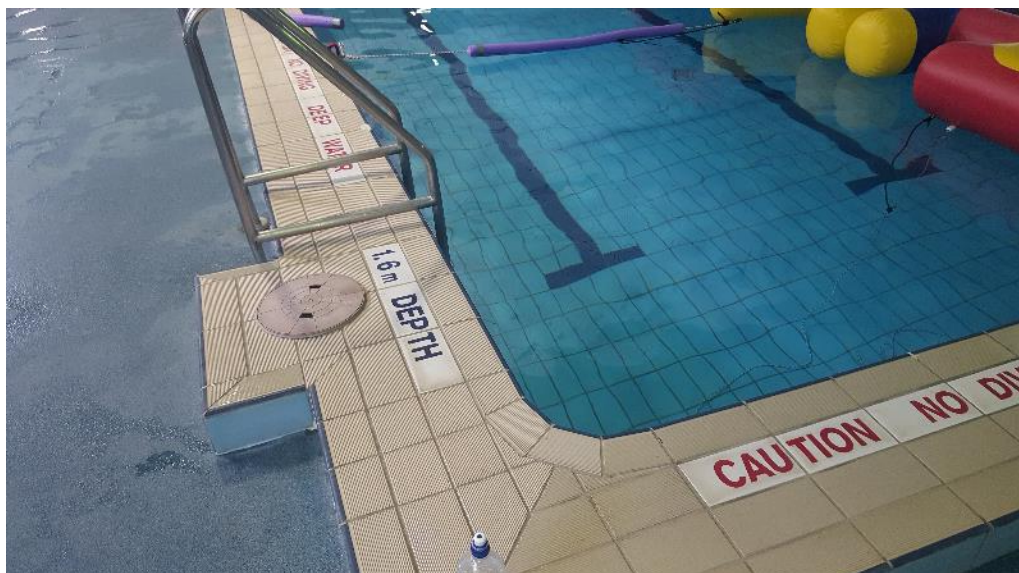


Image 6. Skimmer box at deep end.



Image 7. Pool concourse on N side. Looking W.



Image 8. Pool concourse on S side. Looking E.

6.1.3 Pool Structure

Measurements were taken at the four corners of the pool to check for the level of the concrete shell. This showed the pool to be level with only a few millimetres difference between each corner. Thus, it can be assumed that the pool footings and foundation remain sound.

6.1.4 Underwater Inspection

6.1.4.1 Tiling

Tiling was inspected from underwater and were found to be in good order, particularly given the age of the pool.

Tapping the tiles at selected locations found no drummy tiles. There are some cracked and chipped tiles but nothing unexpected. Normal maintenance programs should be sufficient to maintain the tiles for the 10-year period.

6.1.4.2 Joints

There are five (5) transverse and one (1) longitudinal (along centreline) construction joints in the tiling and these are in reasonable order. Sealant was missing from say 10% - 15% of the total joint length. This percentage is not unexpected. These joints will continue to demand ongoing maintenance and sealant replacement.

The tile mortar joints are in good condition.

6.1.4.3 Fixtures underwater

There is a bottom drain pit at the deep end of the pool. This has a large perforated stainless-steel cover, in good condition with no obvious protrusions that could be a risk to swimmers.

There are two (2) hydrostatic relief valves in the deep end and similarly these appear in good condition with no obvious protrusion that could be a risk to swimmers. The functionality of the valves cannot be assessed for obvious reasons.

Stairs and handrails into the pool are also generally in good condition but was noted that there is some minor rust appearing on one of the steps from a fixing bolt. This should be attended to when the pool is next drained for maintenance.

6.2 Toddlers Pool

6.2.1 General

The Toddlers also appears in good condition with no obvious visual defects.

Leaks from the pool and pipework were not reported to be an issue.

The calculated pool volume in **Table 2** are based on measured depths.

Table 2
Toddlers Pool - Dimensions and Volume

	Length	Width	Depth Measured max (m)	Depth Signs (m)	Depth Measured min. (m)	Total Volume (m ³)
Toddlers Pool	4	4	0.55	0.6	0.55	9

6.2.2 Water Distribution in Pool

Filtered water return (FWR) back into the pool is via three (3), by 20mm dia side wall along the eastern side wall of the pool.

Soiled water collection is via 1 No skimmer box on the opposite wall to the FWR nozzles. There is a floor drain under the perforated stainless-steel plate in the floor.

The pool is quite small at 4m square and thus water distribution is not expected to be an issue and in fact with such a small volume, the movement of bathers will enhance the distribution.

6.2.3 Pool Structure

The pool structure appears satisfactory with no signs of settlement or misalignment.

6.2.4 Tiling and Joints

Both tiling and joints appeared in reasonable condition.

6.3 Concourse

6.3.1 Floor covering

The concourse floor covering appears to be an applied rubber-type coating. The age of this coating unknown. Overall it is in good condition with only a few minor areas where there has been loss of coating. Typically, these types of floors would have a design life of say 5 to 10 years, but this can be very dependent on slab preparation and installation workmanship.

While it appears that it should suffice for the 10 years it is likely to need patch repairs as the end of this period draws closer.

6.3.2 Concourse Floor Drainage

The concourse floor drainage system comprises individual floor drains located around the pool and in a line central between the pool and pool hall. This is a typical arrangement and should not present any problems within the next 10 years. See **Image 10**.

6.3.3 Column bases

The main steel columns of the pool hall are showing signs of rust where they penetrate through the concourse floor slab. See **Images 11 & 12**. Corrosion at this location is not unusual for pool hall columns and demands attention before the rust starts to penetrate below the slab level and becomes even more difficult to remedy. The corrosion here appears still to be minor to moderate but remedial works and preventative maintenance are recommended to be undertaken in the short term. A proviso is that if the BCALC strategy plan determines that this pool hall will have new structure then there is no longer any need for this short term remedial work.

Remedial works will comprise removal of rust and removal of say top 1cm of slab around the column to check for rust. Given that the masonry walls butt into the columns, severely limiting work access, this will not be a straightforward procedure. A proprietary protective coating should then be applied, and this should be robust and able to accommodate that this is a site application and will need to cover old rust. A mastic-based product may be the most suitable.



Image 9. Pool concourse on S side at deep end. Looking W.

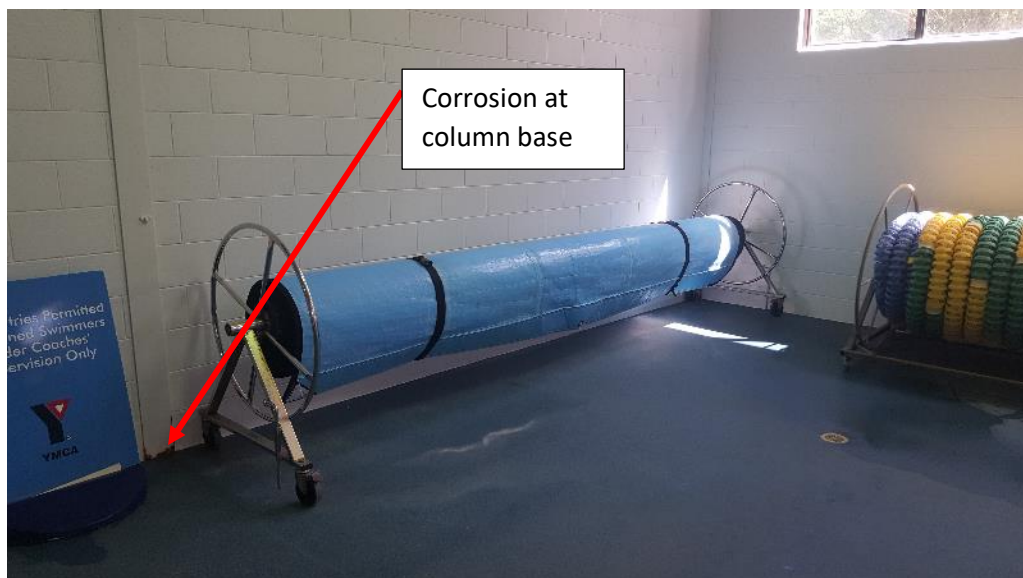


Image 11. Pool hall NW corner.

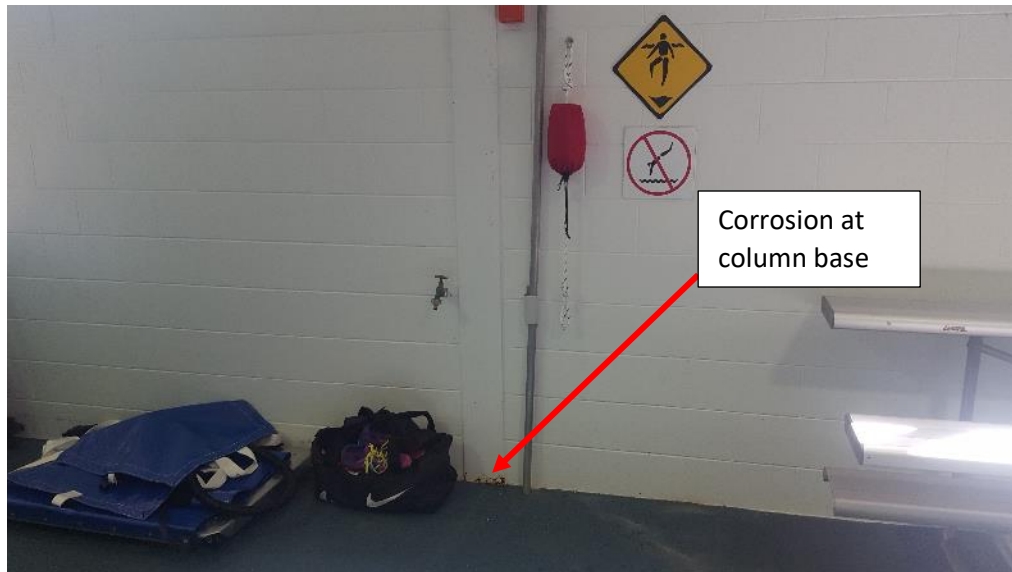


Image 12. Pool Hall. Looking N, near spectator seating.



Image 13. Pool Hall, S side. Looking SE at Plantroom door

7 Water Treatment Plant and Pipework

7.1 Filters and Pumps

A bank of three (3) WaterCo pressure sand filters provides the filtration for the 25m pool. Refer **Table 3**. These are fibreglass construction. The age of the filters is not known but they appear in good condition.

Table 3
Pool Filters

Make / Model	No of filters	Nameplate flowrate (m3/hr)	Sand area (m2)
WaterCo Micron Side Mount - SM1200J	3	40.74 (each)	1.13 (each)

There is a dedicated pool circulation pump for each filter. Refer **Table 4**.

Table 4
Pool Pumps

Make / Model	No of Pumps	Nameplate flowrate (m3/hr)	Nameplate Head (m)	Nameplate power (kW))
WaterCo Hydrostorm Plus 300	3	36.3	23	2.37

See **Images 14, 15 & 16** for general views.

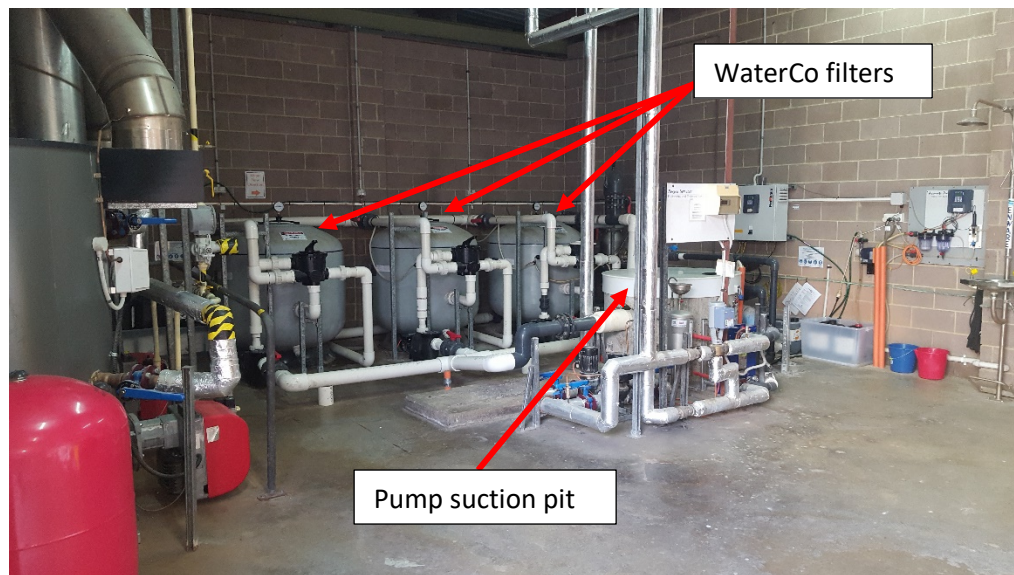


Image 14. General view of plantroom. Looking NW.

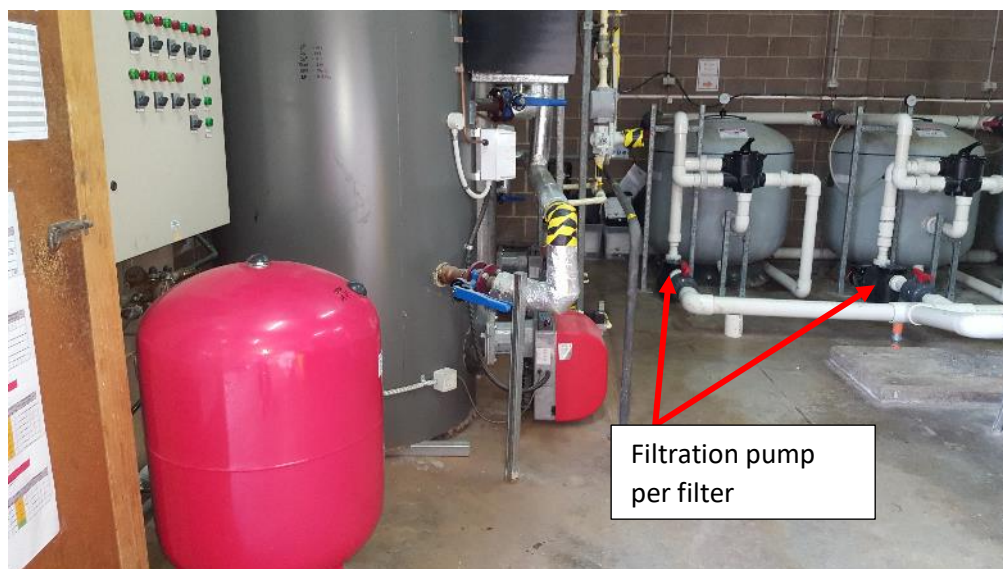
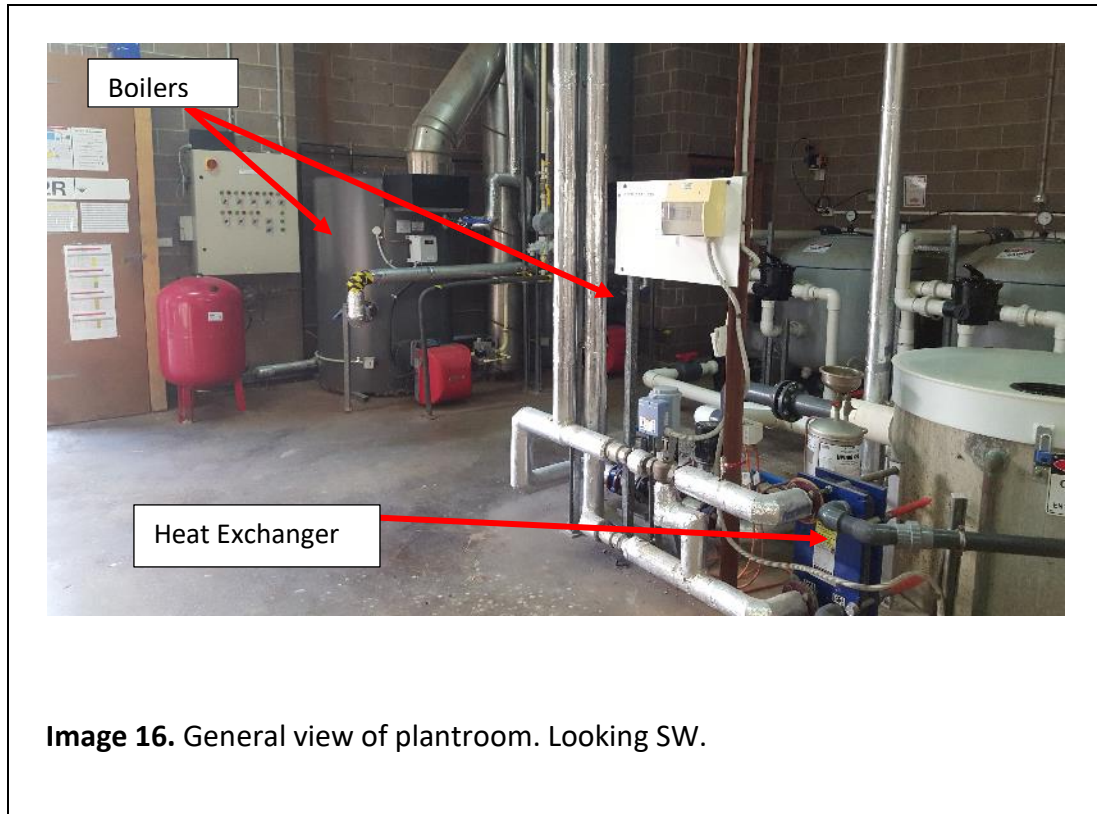


Image 15. General view of plantroom. Looking W



7.2 Toddlers Pool System

The Toddlers pool system runs as a slip-stream supply from the main pool. A tee connection draws from the main pool FWR pipe (after UV treatment and disinfection / pH dosing) and a small booster pump delivers it to the Toddlers pool.

The booster pump is near new with 2017 stamped on the name plate.

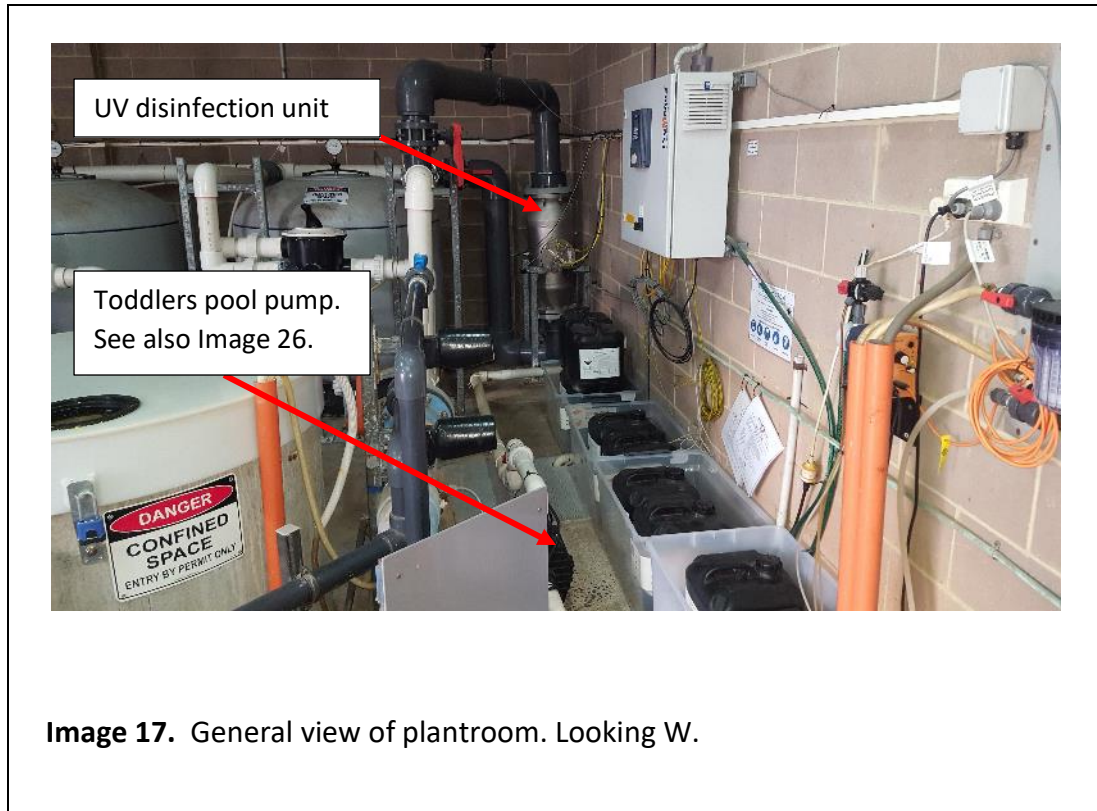


Table 5
Toddlers Pool Pump

Make / Model	No of Pumps	Nameplate flowrate (m³/hr)	Nameplate Head (m)	Nameplate power (kW))
Astrapool FX140	1	Not stated	Not stated	2.83

7.3 Combined Treatment Systems

Both pools are on one common treatment system. This was typical of the era, with the Toddlers pool piggy-backing off the main pool treatment system.

This arrangement does present potential water quality problems in the Toddlers pool. There is an improved understanding these days that pools with distinct functions require dedicated treatment plants to better meet differing bather loads. Shallower pools require lower turnover times with Toddlers pools requiring the lowest. In new facilities Toddler pools are recommended to have a dedicated treatment system.

In parallel, it has also been recognised that turnover times for all types of pools should be reduced generally.

The continuation of the current arrangement at BCALC will be satisfactory for the 10-year time frame but it does place added responsibility on staff to regularly monitor the water quality in the Toddlers pool, particularly on high use days.

With the current arrangement, any contamination in the Toddlers pool has the potential to enter the main pool unless the Toddlers pool is isolated quickly. Here, isolation of the Toddlers pool soiled water before it enters the pump suction pit does not seem possible (actual valving arrangements should be established by others) and thus the entire treatment system may need to be shut down in order to deal with the contamination.

Should any major redevelopment of BCALC transpire then it is strongly recommended that the Toddlers pool be provided with a dedicated treatment system.

7.4 Turnover times & flowrates

The Required circulation flowrate has been calculated below using the NSW Health Dept. Swimming Pool and Spa Advisory Document. Refer **Table 6**.

Although a NSW Health Dept. document, not Victorian, it is often used as a reference for other States in the absence of local prescriptive guidelines.

This document sets out two approaches:

- a) PWTAG (1999) – Pool Water Treatment Advisory Group (UK based).
- b) Stevenson & Assoc. (NSW based)

PWTAG provides a minimum circulation rate based on pool depth and Maximum Instantaneous Bather Load (MIBL).

Stevenson is a simpler approach that provides a maximum turnover period based on pool depth alone.

In the absence of definitive flow rate data, the Available circulation flowrates for this assessment are based on a review of nameplate capacities of the filters and pumps, and estimates based on pipe diameter, and nozzle diameters into the pool, together with typical pumped flow velocities.

It is important to note the pump nameplate head and nameplate flowrate cannot be used directly in these assessments, i.e. the pump curves show that at the above maximum flowrate of 36.3m³/hr (605 l/min) the pump will only deliver 7.5m Head, and vica versa at 23m Head, maximum flowrate is only 140 l/min. The actual flow rate is a function of system head which is determined from a hydraulic analysis.

Considering the above, with pipe diameters and typical flow velocities, for the purposes of this assessment a flowrate of **100m³/hr** has been adopted as the Available flowrate.

Table 6
REQUIRED Treatment Plant Capacity

		REQUIRED flowrate (m ³ /hr)	
		PWTAG method	Stevenson method
25m	m ³ /hr	378	443
Toddlers	m ³ /hr	43	30
Total adopted (PWTAG)		421	

There is clearly a large discrepancy between the Required capacity (421 m³/hr) and the Available capacity (100 m³/hr). This Available capacity equates to a turnover period of approximately 4 hrs (which is the maximum recommended turnover period for older outdoor pools set by NSW Health Dept. Swimming Pool and Spa Advisory Document (see excerpt below).

This lack of capacity would likely impact on days of high bather numbers. Thus it can be expected that higher demands would be placed on staff to manage water quality on these days. Although the automatic dosing system, together with the UV unit, will certainly aid a prompt system response to adverse water quality issues.

A comment is warranted regarding 'Required' turnover rates. This is not a definitive requirement as such, as can be seen by the differing calculations and outcomes from different authorities. Ultimately it is a calculation based on the pollution load i.e. the number of bathers in the pools at any one time. Other factors are the probability of specific types of contamination (e.g. faecal from toddlers), and the response time of the disinfection system. In this context, there is some latitude in assessing Required flowrates on existing pools and this is acknowledged in NSW Health Dept. Swimming Pool and Spa Advisory Document. Although it is written for older outdoor pools, the same principles apply.

7.2.8 Upgrading existing outdoor pools

Upgrading and refurbishing of existing outdoor pools often presents a dilemma for pool owners, particularly local councils with limited funding. Where it is not possible to upgrade to this Advisory Document, but funds are available to effect some improvements, attempts should be made to upgrade to the most economically feasible optimum design configuration. The following issues should be considered:

n Turnover should not be longer than 4 hours for depths less than 3 metres for a swimming pool and longer than 30 minutes for a spa pool

n Strategies should be developed to compensate for the lack of turnover. Such strategies could include:

- a) A risk management plan to ensure that possible public health risks are minimised*
- b) Full automation of disinfection and pH processes*
- c) Limiting bather numbers*
- d) Elevation of minimum disinfectant concentrations*
- e) Improving filtration.*

7.5 Chemical Treatment and Storage

Sodium hypochlorite is used for disinfection and hydrochloric acid for pH control. The treatment control system is automatically controlled by a Prominent system which is a well-known and reputable brand. The system is reported to be operating well. See **Image 18**.



Image 18. Automatic dosing control system

The Sodium Hypochlorite storage tank is in a small separate room adjacent to the plantroom. While there is a large viewing window from the plantroom, the actual access door to this room is external from the outside as this is for the filling operation. See **Images 19, 20 & 21**.

The tank volume is 950 litres. The bund is of masonry construction with a solid plastic liner which measures 1.5m x 1.35m x 1.0m deep. Thus, the bund volume calculates to 2m³, well above the minimum for the tank size.

There is an emergency shower and eyewash immediately outside the Hypochlorite storage room. This operated satisfactorily.



Image 19. Sodium hypochlorite tank storage room. External access door / fill point.



Image 20. Sodium hypochlorite tank storage room. Viewing glass.

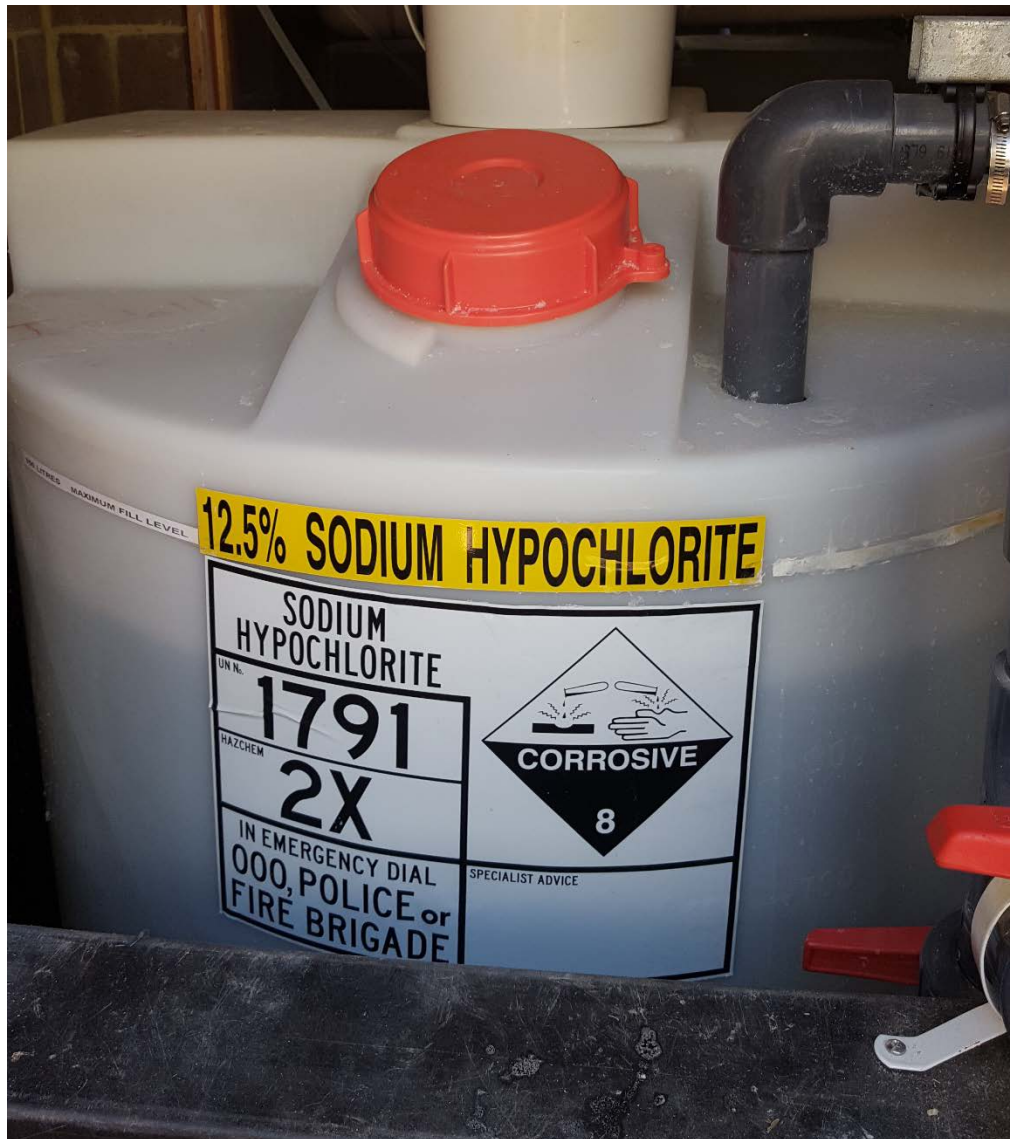


Image 21. Sodium hypochlorite tank and bund. View from external access door..

The hydrochloric acid is stored in the plantroom in several 15 litre containers on the floor beneath the dosing controllers. It is well away from the sodium hypochlorite as is necessary and required for safety (mixed together they form toxic chlorine gas). Each pair of

containers is housed within a larger plastic container which serves as the necessary bund for spill containment. See **Image 26**.

There is a second emergency shower and eyewash immediately adjacent to the hydrochloric acid storage and inside the door from the concourse.

7.6 UV Disinfection

A new ultraviolet disinfection system was installed about 2 years ago. See **Image 17**. This is reported to have made a significant improvement in the water quality and has helped offset some of the older design issues such as skimmer boxes and low turnover rates.

It is a Prominent unit with a 450mm long x 300mm dia main treatment cylinder. It can be expected to provide satisfactory service for at least the next decade.

7.7 Pipework

The pipework in the plantroom is predominantly PVC pressure pipe. This is a typical material for these facilities and can be expected to last for the next 10 years.

The pool pipework underneath the concourse and around the pools is not accessible but is logically presumed to also be PVC. Provided it is supported adequately with allowance for differential movement, then this pipework can be expected to provide satisfactory service for at least the next decade.

7.8 Pump Suction Pit / Balance tank

A pump suction pit is located central in the plantroom. See **Images 14 & 17**. The soiled water from the skimmer boxes drains here by gravity and the three circulation pumps draw from here to deliver to the treatment system.

The pit is a 1.2m dia reinforced concrete pipe, projects about 1m above the floor about 2m below which is consistent with the pool depth (given that the plantroom floor level is 2 steps below the concourse level.)

While the volume of this pit is very small, there is less need for a larger volume 'balance tank' at BCALC since the other benefit, after cost, of skimmer boxes is that (within narrow limits i.e not many bathers) the pool effectively serves as its own balance tank.

If a major redevelopment is envisaged, then it is highly recommended that a balance tank be installed along with a continuous soiled water collection system (e.g. wet deck).

A make-up water supply is provided into this pump suction pit.

8 Pool Water Heating System

8.1 General

The pools are heated by two (2) dedicated gas fired boilers and use a heat exchanger (HEX) to heat a slip-stream flow, that is then fed back into the filtered water return flow. See **Images 22, 23, 24 & 25**.

The pool water HEX operates on a closed pumped loop to the boilers. [There is also a separate heating loop to the pool hall air handling unit.]

The boiler and HEX details are:

Table 7

Pool Water Heating Boilers

Boiler Make / Model	No of Boilers	Nameplate power
Parsons	2	

Table 8

Heat Exchanger (HEX)

HEX Make / Model	No of HEX	Nameplate power	Material
Sondex	1		Titanium

The two boilers and HEX are quite new, all being installed in 2015. Their design life can thus be expected to exceed the 10-year time frame being considered for this review.



Image 22. Gas Boiler.



Image 23. Gas boiler and flue / heating loop pipework arrangement.

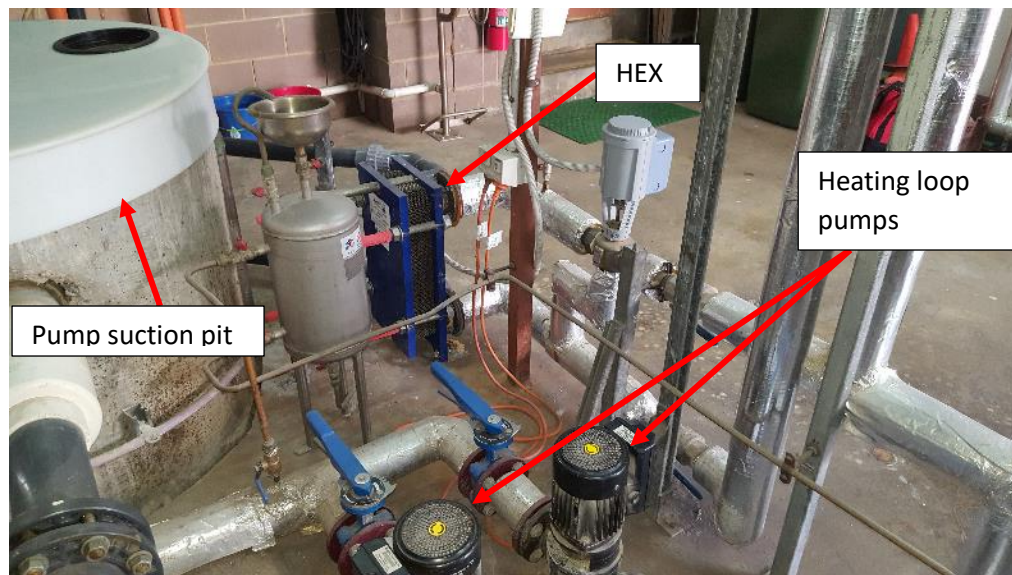


Image 24. Pump pit, heating loop pumps and HEX



Image 25. Pump suction pit and HEX

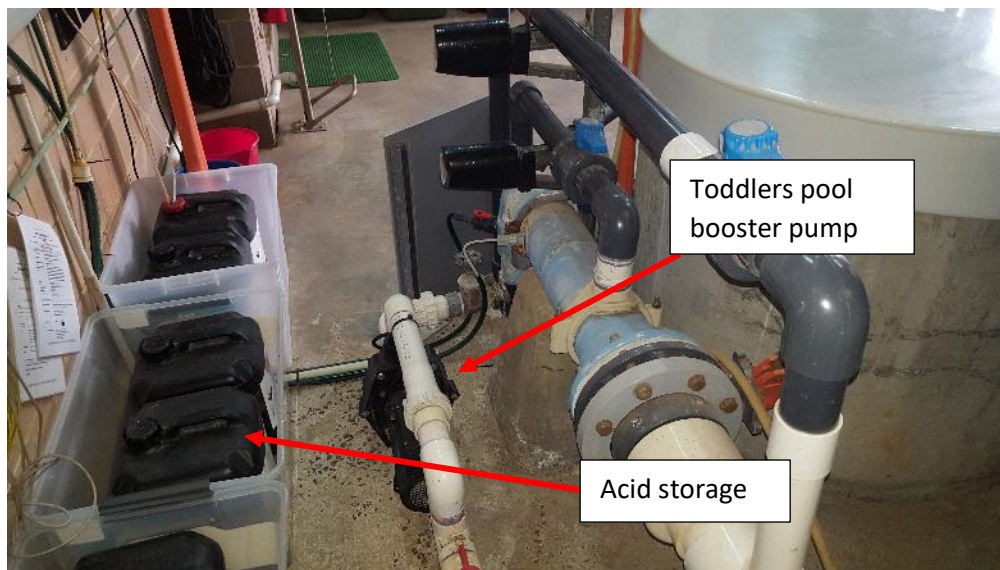


Image 26. Toddlers Pool booster pump and acid storage

9 Conclusions and Recommendations

The review finds that overall the pools and pool equipment are in good to very good condition and are well placed to continue satisfactory operation for the notional 10-year period.

The equipment has been well maintained and recent replacement of key mechanical items such as the boilers and heat exchangers have added to the reliability of the system.

The near new UV disinfection unit has made a significant improvement to the water quality which has helped offset the high filtration turnover times relative to current industry standards.

The pool shells appear in good condition and there are no indications of any potential structural concerns that would have a significant impact within the next decade. On this basis no destructive investigative works are considered warranted.

Likewise, the pool tiling in both pools is in good condition for its age, and normal maintenance regimes should be sufficient for it to last the 10 years.

Ongoing maintenance programs to the standard observed will in my opinion be adequate to maintain satisfactory operation for the next decade .

There is no equipment that in my opinion presents an imminent risk of failure to the extent that special funds should be set aside for future replacement. However, a major equipment failure / replacement within this period cannot be precluded and it remains prudent to maintain a sinking fund for such a contingency, as for any such facility.

Other than set out in the report or detailed below there are no obvious safety or compliance issues of a significant nature or that require urgent attention.

There are some points to note from the review and these are set out below. They are particularly relevant to any further redevelopment plans for the pool.

1. The two pools are served by one treatment system. This is no longer recommended for new public pool facilities. In any new development the Toddlers pool should be provided with its own dedicated system.
2. The turnover times of the current treatment system are well above current guidelines. For a new redevelopment, a higher capacity treatment plant is strongly recommended.
3. The skimmer boxes on both pools present a constraint to the proper collection of soiled surface water. Again, while satisfactory for the present, in any new

development a wet deck arrangement is strongly recommended. This will also mean that a new (and larger) balance tank will need fitted into the system.

4. Pool Hall Columns: Rust at the base of the main columns will need rectification in the short term if the pool hall is to be retained for the longer term (i.e. greater than 10 years).
5. Concourse surfacing: Normal periodic maintenance will be required, but the level of maintenance can be expected to increase over time.

10 Closure

Should you have any queries regarding this report, please contact JWC Engineers.

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