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PANOV—SCOTT South Bronte Pump and Pumphouse Replacement

This presentation is made for public exhibition of the Concept Design for the South Bronte Pump and Pumphouse Replacement Project.



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e	South Bronte Ocean Pool
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#### Purpose of this report

The purpose of this report is to share the Concept Design for the Bronte Pool Pump House Upgrade & Pump Replacement with the community. The Concept Design intends to provide a resolution to the conflating issues of the deteriorated structural condition of the existing pump house, ongoing operational issues with the pool pump system, deterioration of the pool lining and Council's obligation to provide a safe working environment for staff and contractors as well as the general public in and around the pump house.

#### Scope of this report

Waverley Council have asked PANOV—SCOTT along with CIVILLE to prepare the Concept Design for a new pump house, new dual pump system, new access stair and associated barriers, and rectification to the existing pool lining.

#### **Project drivers**

Key project drivers are to:

- Satisfy the actions identified in the Bronte Beach and Park Plan of Management for the potential improvement of Bronte Pool and its operation and associated infrastructure,

- Minimise any pump downtime during pool operation, through installation of a robust and reliable pump system with readily available parts should maintenance be required,
- Ensure pump system can operate at low tides,
- Minimise manual operation of the pump system to reduce operational costs and improve WHS risk outcomes,
- Minimise energy use of the pump system,
- Ensure the longevity and resilience of the pump house.
- Improve the safety of the working environment for staff and contractors to and around the Pump House, as well as the general public, and - Improve the safety of pool users.

### Project scope of works

Investigations by the design team, along with resolutions made by Council's Project Control Group have lead to the following scope of works being adopted to sastify the project drivers:

#### - Pump system upgrade

The pump system upgrade should include a duty-assist mode of operation, providing two dry mounted self priming end suction pumps which can operate one at a time, or simultaneously. Other

proposed improvements will reduce regular manual maintenance and reduce the complexity inherent in the existing system, which can lead to increased faults and downtime. The pump system upgrade will also assist in significantly reducing energy use.

#### - Pumphouse upgrade

It has been established through previous investigations that the Bronte Pump House is at the end of its useful life. While this poses a safety risk to the staff and contractors who are required to work in and around the building, it has also been determined that severe wave action during a storm could result in damage to the building and the pump equipment, causing pronlonged closure of the pool while rectification is undertaken, and replacement equipment is sought. Action must be taken to remedy this risk. It has been determined that relocating the pump equipment would introduce further environmental, construction & operation risks and so it is proposed to be replaced in its existing location

## - Stair upgrade

Access to the pump house and southern end of the pool is via an unsafe and non-compliant stair which has an adverse visual impact on the pool's natural setting. A consideration of providing safe access to the pump house must include replacement of this stair, which can also provide an opportunity for

improved public benefit and enhanced visual impact.

# Pool surface rectification

The existing pool surface is deteriorating which creates a risk of scrapes and cuts to swimmers. It has been determined that the removal of the existing surface and making safe of the existing pool structure will present the best outcome to the community, and least risk of ongoing maintenance/replacement costs. This will not result in a prisitine surface, but will improve safety and reduce maintenance.

# Concept Design

This report provides a Concept Design to satisfy the above scope of works, which considers how the conflating requirements of pool infrastructure, worker safety and public access could be resolved in a holistic and co-ordinated way. The identified project drivers are able to be satisfied via development and implementation of this Concept Design, as well as the opportunity for increased public benefit.

The Bronte Pool is utilised and enjoyed by a broad section of the community, on a regular and casual basis, throughout all seasons of the year. It is recognised that prolonged periods of closure of the pool due to required maintenance can have a significant impact on this community.

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Council is considering a number of improvements to allow the ongoing operation and use of the Bronte Pool, in particular how the conflating issues of the deteriorated structural condition of the existing pump house, ongoing operational issues with the pool pump system and Council's obligation to provide a safe working environment for staff and contractors as well as for the general public in and around the pool and pump house, can be resolved.

# Objective of this report

The objective of this report is to provide a Concept Design for Council consideration, which addresses:

- an investigation into options for improving the pool operation, via an upgrade to the pool pump system,
- a series of investigations into the existing pump house structure, which found various elements of the existing construction to be beyond their useful life, and
- Council's obligation to provide improved safety to its workers and subcontractors in and around the pump house and pool

#### **Report overview**

This report takes the following form:

- O1 Background introduces the physical context and provides project background, including detail of previous investigations.
- O2 Assessment of Existing Elements details the existing condition and design requirements for the various elements of the project, being the pool pump system, the pump house, the access stairs and the pool surface.
- O3 Concept Design puts forward a design proposal for each element, which encapsulates and addresses the outcome of investigations made to date.

Bronte Pool is located at the southern end of Bronte Beach. The pool is accessed via the main promenade between Bronte Park and Bronte Beach, as well as from Calga Place via stepped pathways down to the forecourt of the South Bronte Community Change Rooms.

The pumphouse, as shown circled in red adjacent, sits at the southern end of the pool, and is accessed via a set of stairs from the headland path heading south east, or via the pool edge when conditions allow.

Immediately to the north and east of the pool sit intertidal and subtidal rocky reefs and rock platforms. The pool concourse sits at approximately 1.7m AHD and so is subject to inundation at high tides and during inclement weather.

The pool sits below a dramatic sandstone cliffscape to the south and west of the pool, with remnant vegetation atop the headland.

Views to the north are enjoyed across the pool from the upper path and from Calga Place above.



#### LOCATION OF THE BRONTE PUMP HOUSE AT SOUTHERN END OF BRONTE POOL





- View looking south from Bronte Beach towards South Bronte Community & Change Rooms, with the Bronte Pool and pumphouse below the cliff face in the distance to the left of image.
- View looking north from the rocks above the headland path, across Bronte Pool and pumphouse towards Bronte Beach beyond
- View looking north towards Bronte Pool pumphouse from rock platform behind
- View looking south towards Bronte Pool pumphouse from Bronte Pool edge







Subject site without overlay, with  $\operatorname{pump}$  house coloured  $\operatorname{red}$ 

Maps extracted from 'Discover' Waverley Council Interactive Mapping Tool



Subject site with Waverley Local Environment Plan 2012 Land Zoning overlay



R2: Low Density Residential

The land on which the Bronte Pool and pumphouse is located is zoned RE1 Public Recreation, the objectives for which are:

- To enable land to be used for public open space or recreational purposes.
- To provide a range of recreational settings and activities and compatible land uses.
- To protect and enhance the natural environment for recreational purposes.
- To facilitate and manage public access to and along the coastline for all.
- To provide accessible links between and through open spaces.

The Bronte Pool and its surrounds are listed as a heritage item, are located within the South Bronte Headland Landscape Conservation Area and are located adjacent the Bronte Coogee Aquatic Reserve.

The proposed works can be completed without consent (Part 5 of the Environmental Planning and Assessment Act 1979), via preparation of a Review of Environmental Factors and appropriate community consultation.



Subject site circled red, with Bronte Coogee Aquatic Reserve overlay

Map extracted from Department of Primary Industries website



Bronte Coogee Aquatic Reserve



Subject site with Waverley Local Environment Plan 2012 Heritage overlay



Conservation Area - Landscape

General item

# 01 Background:

Bronte Park and Beach Plan of Management



#### 4.4.7. Major Issues

- i. From time to time foxes and other pests require management.
- ii. Planting selection and design in the Park does not currently consider the biodiversity corridor.
- iii. The crib retaining wall in the upper gully needs to be backfilled and planted.
- iv. There is some evidence of soil contamination.
- v. From time to time stormwater quality needs to be managed.
- vi. Weed control is difficult to manage on steep slopes in the Bronte Gully
- vii. Continued and further support to volunteer Bushcare groups.
- viii.Park and pool infrastructure is not currently set up for climate change, being vulnerable to storm and extreme weather damage.
- ix. The entry to the underground stormwater pipe (trapezoid) in the Bronte Gully is not secure, posing a safety risk for people or animals being washed into the pipe.
- x. Some remnant vegetation is in poor condition.
- xi. Tree replacement is currently unplanned.

Excerpts from Bronte Park and Beach Plan

of Management, Part 4 - Site Analysis (above) and Part 6 - The Master Plan and

Action Plan (right)

#### 4.6.1. Major Issues

- i. Accommodation for Parks Staff is not adequate; additional storage space is required for tools and green waste.
- ii. Bin management in the park and upper gully is ad hoc, is labour-intensive with high turnover of bins, with no unobtrusive location for corral, storage and pickup.
- iii. Driveways and turn-around areas are insufficient for the size of trucks servicing the bin area.
- iv. Some picnic shelters are currently in a poor state of repair.
- v. Vehicle access into the park is unsecured, as the gate is typically left open, allowing unauthorised vehicles to access the park.
- vi. There are frequent reports of vandalism and antisocial behaviour in the Bronte Gully.

vii. Maintenance vehicle access to the southern amenities building via the promenade poses a risk to pedestrians.

- viii.Large sections of the irrigation system are not in working order.
- ix. There is a wide spectrum of views about dog use, from too lenient or too strict.
- x. There should be more frequent, more focused maintenance of amenities.
- xi. The location of the pool pump-house is a safety issue for staff who need access via the pool edge.
- xii. Regulation and enforcement of user behaviour in accordance with legislation is difficult with the aging signage, examples include dogs off leash outside of permissable hours, and unlicensed fitness trainers utilising the park.

D2. Monitor	and adapt to the effects of climate change.						
D2.1	Implement the findings of the Bronte Seawall Technical Study:		S	Sustainable Waverley,	ТВС		
	i. Repair and stabilise the seawall as required and develop a long-term repair strategy.			Creating Waverley,			
	ii. Ensure potential damage to the promenade and landward infrastructure by wave overtopping is n	nitigated.		Project Waverley			
	iii. Consider moving the Bronte Pool pump to a more secure location.			,			
F2. Ensure facilities are well-maintained and appropriately serviced.							
F2.2	Maintain the Bronte Baths Pump:		Μ	Clean and Attractive Waverley,	ТВС		
	i. Review the location of the Bronte Bath pump control and relocate it to an area more accessible for			Project Waverley			
	management and maintenance.						
	ii. Replace pipes and other infrastructure as necessary.						
	iii. Consider an automated system to reduce maintenance requirements.						

The Bronte Park and Beach Plan of Managment aims to ensure the values of Bronte Park are retained, particularly its environmental, scenic, recreational, heritage, cultural and social values, while current and future demands are able to be met.

Excerpts from the plan are shown adjacent, noting:

- Part 4 Site Analysis of the Bronte Park and Beach Plan of Management Revision G (POM) identifies the vulnerability of the Bronte Pool infrastructure to storm and extreme weather damage, along with the safety issue of staff access to the pump house.
- Part 6 The Master Plan and Action Plan of the POM requires, in relation to the effects of climate change, the implementation of the findings of the Bronte Seawall Technical Study, which includes mitigation of damage to the pool infrastructure by wave overtopping, and the consideration of relocation of the pool pump.
- Part 6, in relation to the requirement for facilities to be well maintained and serviced, also requires a review of the location of the pump, as well as the overall operation of the system to reduce maintenance requirements and improve serviceability.





Not long following the creation of Brone Park in 1886, Council completed the construction of Bronte Pool in mid 1887. The pool was self-cleansing via a cleft in the breakwater, and operated via private lessee.

The earliest structures around the pool were the women's dressing sheds to the north in 1887, followed by the first swimming club building on the cliffs above the pool in 1904, and the men's dressing sheds also above the pool around 1910 along with a steep stair to descend the cliffs.

The fitting of pumps to both the Bronte and Bondi ocean pools was first raised in 1924, with a pump apparently fitted in the newly constructed pumphouse at Bronte Pool around 1925.

The impact of ocean forces on the structures surrounding the pool was documented as early as 1893. Both the pump and the pumphouse have been upgraded several times through their existence.

While the ongoing recreational use of Bronte Pool by the community is of utmost importance to its heritage status, the built fabric which serves as infrastructure is of little contributory value. The opportunity exists however for the renewed infrastructure to acknowledge for the first time its natural landscape setting.









Listed below are the key previous investigations, undertaken prior to or in conjunction with and have led to and informed the preparation of this Concept Design:

- Structural review of the Pump House by TOP Consulting Group (2016), which relied solely on visual inspection and concluded that the building is in a critical state of deterioration and recommended reconstruction.
- 2. Bronte Ocean Pool Assessment by Trisley Hydraulic Services (2017) and subsequent pool pump system upgrade (2018) which resulted in improved and automated pump operation and control, and introduction of remote monitoring to the system.
- 3. Waverley Council Storage Facilities Property Condition Asessments & Ten Year Program of Expenditure by Asset Technologies Pacific (2019), which found various elements of the building in 'Poor' to 'Good' condition with an overall useful life of between 3 and 18 years.
- 4. Structural Condition Assessment & Structural Desktop Review by ACOR Consultants (2020), which concluded that the internal walls of the Pump House are not fit for purpose, and that the

external walls and roof may fail in a severe storm.

- 5. Bronte Ocean Pool Pump House Assessment by Civille (2021), which provides a comprehensive investigation into previous studies, tests and works undertaken to the pool, pump house and pump equipment, as well as an overview of the existing systems, and concludes that the existing pump is unable to operate at the lowest tides, is reliant on daily maintenance and long-lead time components, and recommends relocation and upgrade of the pump system to overcome this and other already identified issues.
- 6. Bronte Pool Pump Supply Options by Civille (2021), which investigated the colocation of the pump equipment with other plant in the proposed South Bronte Community & Change Rooms, in line with the recommendations of the Bronte Park and Beach Plan of Management, as well as provided recommendations to improve the nature of the pump system through the introduction of a dual pump system.
- 7. Bronte Pumphouse Options Analysis by PANOV– SCOTT (2021), which provided an analysis of Council's options to repair, encase or reconstruct the existing pump house against various factors including capital expenditure, ongoing maintenance expenditure, fitness for purpose inc

ability to facilitate the improved pump operations, structural engineer's recommendations, lifespan and heritage/scenic qualities.

- 8. Concept Pump Options by Civille (2023) which provided an investigation into possible pump equipment specifications/function, performance and spatial arrangements, which has informed the Concept Design for the pumphouse.
- Bronte Ocean Pool Internal Surface Options Report by Civill (2023) which presented a variety of options to address Council's safety concerns in relation to the existing delaminating pool lining.

The investigations at point 6 & 7 resulted in the following resolutions from Council:

— That the pump equipment should be retained in its current location, to manage environmental impacts and reduce operation risks, and so subsequent investigations have refocused on works to the Pump House in its current location and improvements to the adjacent access stairs, while taking the opportunity to ensure a more reliable pump system is in place to service the pool for the benefit of its users.  That the pumphouse should be reconstructed and a Concept Design prepared.

The outcome of investigations at points 8 & 9 have informed the development of the Concept Design, and those elements are discussed in detail in the following sections of this report.

# 02 Assessment of existing elements: Bronte Pool pump



#### 375mm inlet

- 300mm diameter suction pipe
- Steel mesh basket strainer
- Centrifugal pump
- Non return valve Priming chamber and air release valve
- Vacuum pump
- Pool diffuser outlet
- Pool pump drain intake
- 10 Pumped outlet to ocean
- Valve

Left and above: Section view through existing pump assembly

Photographs left to right: Existing pump assembly, existing strainer and suction pipe over wet well, service access to strainer

#### Pool operation overview

A complete overview of the operation of Bronte Pool is provided by Civille in their report Bronte Ocean Pool - Pump House Assessment, dated 1 March 2021, a summary of which is included in this section.

The existing pump system (pictured above) runs continuously during daylight hours from approximately 5am in the morning until 7.30pm in the evening, circulating fresh seawater into the pool. The pool is also emptied and refilled on a weekly basis during the main swim season.

#### Existing pump system

The components of the existing pump system are described in the above sketch, extracted from Civille's Bronte Ocean Pool - Pump House Assessment, noting this is a surface mounted centrifugal pump with secondary priming pump.

#### Current operation issues

The current pump intake is not able to operate at the lowest tides (approximately 2 hours every day, on some days two such periods), the key reason for which has been established that the inlet into the pump sump is too small, and restricts flows due to the

low hydraulic head at low tide. This has an impact on water quality in the pool.

Recent upgrade works providing the ability for remote operation of various components of the pool pump system have removed the need for manual daily operation of valves and are effective at reducing down time in the pump operations through use of sensors and alarms, however further operational improvements are identified as necessary, including:

- Pump system failure due to clogging of the priming system valve, eq due to seaweed, which requires manual clearing,
- Existing suction inlet strainer which protects the pump from seaweed etc relies on daily manual cleaning, and
- Pump system is reliant on a number of components which can have significant replacement lead times, with the pool possibly being out of operation for more than 6 months, in the event of failure of those components.

While two of the three issues above can be partially addressed through further upgrades to the system, and Council's purchase and storage of back-up equipment & components, related operational issues which are not able to be addressed in this manner include:



- Provision of safe access to the pump house by staff during high tides, when filters or valves require manual cleaning or operation,
- Reliance on multiple components, and the complexity this brings to the system, such as use of a priming pump for operation of main centrifugal pump - this is more likely to cause failure of pumping system through introduction of air,
- Reliance on single pump rather than duty-assist arrangement which provides a back-up pump if one were to fail thus avoiding pump down time, reduces energy use and achieves improved and variable flow rates, and
- The whole pool pump system is an ageing system which will require replacement in the near future.

#### WHS & Related issues

Civille have provided an operational issues risk assessment in the aforementioned report, in relation to the operation of the current pool pump system, in its current location. In relation to WHS for Council's operation and maintenance team and their contractors, this assessment highlights:

 Unsafe conditions (including the existing stair) for staff to attend site to clear blockages during high tide, resulting in pump not being in operation for

3-4 hours until tide recedes and access is safe. - Should staff access pump house in unsafe conditions, risk of serious injury. - Requirement for staff to attend site daily to undertake manual clearing of strainer basket, presenting an increased WHS safety risk and reliance on maintenance for the ongoing operation of the pool. Resolution to retain existing location of pool pump

basis.



With regard to D2.1 and F2.2 of the Bronte Park and Beach Plan of Management, as well as the quantum of work required to satisfy the outstanding operational issues and the condition and physical limitations of the existing pool pump house, Civille was engaged to investigate whether the pool pump equipment should remain in its current location, or to be located in an alternate location where issues of resilience and access can readily be resolved. This investigation is outlined in their report Bronte Ocean Pool - Pump Upgrade Concept Design Options Report.

The investigation concluded that the existing pump house location was preferred as it had the least environmental impacts to the marine environment, and the least uncertainties over operation, such as sand ingress, and it was resolved to proceed on this

# **O2** Assessment of existing elements: Bronte Pool pumphouse





### Existing pump house construction

The existing Bronte Pump House consists of multiple layers of construction:

- The inner skin of reinforced concrete was constructed in the early 1920's, to an unknown structural design. Its condition is noted as irreparable in various studies referenced in this report.
- The outer skin and roof, also of reinforced concrete, was constructed circa 1998 to encase and/or replace the existing structure.
- It is unknown if the outer skin was designed as an independent structure, or to act as a composite structure, relying on the inner skin to achieve its design capacity.

Contributing to the earlier decision to proceed with reconstruction of the pumphouse, is the inability to determine the design capacity of the existing structure, and therefore its capacity - when augmented - to counter wave and hydrostatic forces.

# Structural engineer's assessment

Acor Consultants prepared the following condition assessment of each element of the existing pumphouse built fabric, during earlier investigations: Outer skin condition assessment:

- Cracking, concrete spalling and corroded exposed reinforcing bar ends were determined during visual inspection by Acor.
- Unknown structural capacity, in relation to extent to which outer skin has been designed to rely on inner skin for structural integrity.
- The extent of deterioriation of the existing concrete and reinforcment is yet to be determined via hammer test and sample testing for chloride and carbonation, noting 50% of northern facade previously found to be drummy.
- M16-300 chemical anchors dowelled into existing slab/rock below the pump house may be an inadequate embedment for higher peak stresses expected.
- Lap length between anchors & wall reinforcement is also inadequate.
- Method for repair to the outer skin can be established, however, subject to testing noted above, this work is likely to be extensive.

Inner skin condition assessment:

 Severe concrete spalling was evident during visual inspection by Acor, with large sections of concrete beginning to delaminate, voids found in the wall where concrete has spalled and delaminated, and extensive cracking determined during visual inspection.

- There is no historic structural design information for this element, and it is unknown if it has been relied upon in relation to the structural design of the outer skin.
- Extent of deterioriation requires removal and replacement of entire existing inner skin - in its current condition it is not fit for purpose.

#### Roof condition assessment:

- Corrosion stains as well as 1mm wide cracks evident on roof, which may be indicative of concrete spalling, along with corroded exposed reinforcing bar ends on edge of roof slab determined during visual inspection by Acor.
- Structural capacity of the roof is inadequate due to use of non-ductile F81 steel reinforcing mesh in the roof slab.

### Resolution to reconstruct the pumphouse

On the basis of Acor Consultants' recommendation that the pump house be reconstructed, along with other considerations, Council resolved to reconstruct the pumphouse.

Elements to be retained include the existing wet well, from which the pump draws water, the location of the existing intake pipe from the ocean and pipework to and from the pool to the equipment location.









Above: Plan view of existing pump house which shows the original 1920's fabric in red, and the 1998 additional concrete skin shown in green

Right: Photographs detailing the deterioration of the outer concrete skin (4 from left), inner concrete skin (middle 4) and roof structure (4 from right)

# **O2** Assessment of existing elements: Stair and railings







#### Existing stairs, railings and access

Though primarily for use of Council staff and subcontractors to access the pump house during pool/pump operations and maintenance, the existing timber and concrete stair which winds down the cliff face from the headland path to the pool concourse is also accessible by the public during fair weather conditions.

Despite the addition of non-slip stair nosings, the stair is non-compliant in the number, size and consistency of risers and treads as well as the steepness of the stair, its various balustrade styles and and general lack of handrails and tactile ground surface indicators. The timber components are in a deteriorated state.

The existing stair also directs the public towards the pumphouse rather than towards the pool, which presents a conflict at certain times and provides a poorer experience when arriving at the pool.

Historically, Council have sought to ameliorate an issue of public safety whereby swimmers attempt to jump into the pool from the adjacent cliff face. Along the upper walkway, the original arris rail barrier has therefore been augmented with palings to increase the height of the barrier and reduce its permeability, while a further barrier of barbed wire on steel staunchions has been installed along the cliff edge to deter swimmers from jumping into the pool from the top of the cliff.

This barrier is not only unsightly and materially impacts on its heritage setting with unsympathetic materials, but provides its own public safety risk. Additional paling barriers have been installed around the stairway, projecting over the pool and providing an adverse visual impact on the pool's natural setting.

In addition to the barriers, warning signs have been installed at the top and bottom of the stair, and lockable gates can prevent public access to the stair from the top and bottom.

#### WHS & Public safety considerations

While improved accessibility to the pool pump system was not able to be satisfied through the relocation of the equipment, the Concept Design must consider how access to the pump house in its current location can be improved.

During inclement weather, the requirements of a SWMS (Safe Work Method Statement) are implemented, specifically that staff are prevented from descending to the pump house until such time as the tide recedes and/or inclement weather passes. A reduced requirement for staff to attend the pump house is foreshadowed via proposed improvements to the pump system.

Public access is similarly prevented through use of the gates during periods of wave inundation and large swell.

#### Resolution to reconstruct the stair

While the reconstruction of the stair presents some challenges - including its enlarged footprint to achieve compliance with building codes - it has been resolved that this element should form part of the Concept Design. A new stair is able to improve WHS and public safety considerations, in conjunction with improvements to other elements outlined in this report.

The issue of access to/jumping from the cliff face can be considered through an alternate route for the stair, which travels away from the point of access, rather than towards it, and through augmenting existing landscape and/or barrier on the cliff face to reduce ease of climbing.

It is acknowledged that the white painted timber elements of railings and balustrades are a much loved feature of the Bronte Pool precinct.





Far left: Plan view of existing stair

Left to right: Photographs demonstrating the extent of screening & barbed wire barricades to deter climbing on and jumping from the cliff face into the pool; signage indicating the same; inconsistent construction & non-compliant stair elements pose a safety risk

# 02 Assessment of existing elements: Bronte Pool surface







### Existing pool surface

The existing Bronte Pool surface, which was installed in 2016, is deteriorating and has resulted in a patchy surface with larger areas where the underlying slab is visible.

The composition of the pool structure is relevant to the performance of its surfacing, however there is little information on the method of construction and subsequent upgrades to the pool that have taken place over the past 120 years. It is likely that the pool walls and base consist of several layers reflecting additional concrete that has been added during various upgrade and repair works. That the structure is unlikely to be homogeneous may be a cause of the pool surface deterioration.

#### Civil engineer's assessment

Civille conducted an inspection and assessment of the existing pool surface and concluded that approximately 15% of the pool surface has been lost from the pool base.

In addition, cracked, 'drummy' or delaminated render was observed, including on the base of the pool where pressure relief holes have been drilled to relieve the render of upward pressure from seawater

travelling through voids and fissures in the concrete structure.

Where the concrete walls have become exposed, they appear to be in good condition with no significant cracking or holes. Similarly the pool base is in good condition with some minor surface roughness and fine aggregate loss.

#### Likely causes of deterioration

The causes of deterioration to the surface are likely to include pressure and abrasive forces exerted during weekly cleaning, wave loading on the pool structure, updward pressure from seawater travelling beneath the pool structure and possible inadequate surface preparation prior to application of the surface.

Given cracks in the pool surface were sealed prior to installation of the surface in 2016, it is evident that the ongoing processing of weathering and movement means repair of cracks will always be temporary and need to be repeated on a regular basis.

#### Resolution to remove the surface

A number of options were prepared to address and improve on the current pool surface condition, and presented in the Bronte Ocean Pool Internal

Surface Options Report prepared by Civille in July 2023. These were listed for consideration against the project objectives and constraints, and included taking no action at this time, removing the render, installing a new surface guoting and improving the stability of the concrete structure via partial reconstruction of the pool.

The report acknowledged that no option is able to meet the objectives of a surface that remains in a pristine condition with minimal ongoing maintenance.

It was resolved that removal of the current surface render is best able to address the current risk to pool users of cuts and scrapes on the damaged surface, to reduce the current maintenance burden associated with the deteriorating render and for the pool to remain a functioning asset to the community. Further, the construction period - when the pool would be out of service - is able to be minimised.

Far left: Plan view of pool showing extent of surface loss in red Left to right: Photographs showing a loose piece of 15mm thick surface render with partial coating of adhesive; an example of delaminating surface render on the pool wall; an example of substantial surface render loss on the pool base





### Replacement pump system considerations

A dual end-suction self priming pump system has been selected to address the earlier acknowledged issues, in particular Civille's recommendation to install a duty-assist pump arrangement such that if one pump were to fail, there is always a second pump available for operating the pool circulation system. The operation of the pump system will be more energy efficient, by utilising two pumps which provide the ability for variable flow rate, depending on pool usage and by installing a Variable Frequency Drive to control the speed of the pump.

Self priming end suction pumps have the advantage of being able to be surface mounted (which allows for ready access during times of maintenance) and the system is able to use the existing wet well with only minor modifications.

A basket strainer will be fitted to each pump inlet for screening of seaweed and larger particulates prior to seawater entering the pump to prevent clogging of the pump operation.

While the pump is self priming, the pump does have the potential to lose prime and may require occasional manual priming, requiring staff to attend site. A secondary priming pump such as the existing arrangement has been avoided to remove complexity from the system (and therefore possible failure) and as it would require additional maintenance and operational cost.

While the pump technology is far superior to the existing, the proposed pump system is in general terms most similar to the existing arrangement, the operation of which is familiar, and which allows expertise and procedures which already exist within Council's operations and maintenance team to be reapplied as necessary.

### Spatial considerations

The spatial requirement for a dual pump system will inevitably be greater than for a single pump system such as that which exists, resulting in the requirement for a larger pumphouse.

Other physical constraints which have been considered include the location of existing pipes and penetrations to and from the pool and ocean, and the deep wet well.

The proposed pump selection and arrangement of equipment must also have regard for the location of necessary curtilage to the pumphouse for service access, and to maintain space for the new stair and general public access.

While detail design considerations around the pumphouse are discussed in the next section, it should be noted that the Concept Pump Arrangement foreshadows the use of the narrow section of concrete which currently exists between the pumphouse and the ocean, to accommodate the necessary increase in size of the pumphouse, to preserve curtilage for service access, as well as space for the new stair and to maximise the public open space around the pool and pumphouse. Above: Concept pump arrangement showing dual surface mounted end suction pumps with strainer baskets, noting a nominal building envelope to accommodate this arrangement is shown. The existing pumphouse is shown dashed in red. While the proposed pumphouse is required to be larger than the existing, it is proposed that it adopts a slender proportion, with splayed walls that relate to its natural and built context, and rounded corners to reduce its visual impact. The additional footprint largely occupies the unused strip of concrete between the existing pumphouse and the ocean, while the north west-facing splay offers a small increase in public open space between the pumphouse and the pool.

The sloped roof will assist in reducing the impacts of wave inundation, while also providing a pleasing form which is seen in the round and which relates to the surrounding topography.

The proposed pumphouse will employ a material palette which is low maintenance and which responds to its natural landscape setting - a grey concrete base anchors the pumphouse to the pool concourse, with the walls above being a sand coloured concrete akin to the surrounding sandstone cliffs.

A large door is provided into the south western side of the pumphouse for daily access, with a second door facing the pool for additional access as required. This might double as a community signboard or recess for art and cultural interpretation. Doors will be detailed to withstand likely wave action.



Concept site plan - at level of pool concourse & pumphouse

2M @ A3

While the existing stair has 22 non-compliant risers, a new stair would require up to 29 risers, depending at which point along the headland path that the stair descends from. To minimise the additional height, and therefore length for stair, the stair descends earlier along the path than the existing.

This has the further benefit of directing the first run of the stair away from the pool before turning back towards the pool and arriving at a comfortable distance from the pool edge. This enhances the experience of using the stair as well as placing the mid landing away from the sandstone cliff face, which reduces the requirement for the current level of screening at this location.

The stair arrangement takes the majority of the stair's bulk away from the pool, and so presents as a reduction in visual impact, improved again by the reduced requirement for screening.

Compliant stair tread, riser and landing dimensions as well as provision of compliant balustrades and handrails will ensure the stair meets current safety standards, will adopting the current material language of painted white timber which exists around the pool.

An efficient structural solution with minimal rock cutting is envisaged.



**03 Concept design:** Views



Reference photograph across Bronte Pool towards existing pumphouse and stair (above) and similar view of proposed pumphouse and stair (right) using 3D terrestrial scan survey of immediate context as base for modelling software.

The proposed pumphouse adopts a slender proportion, with splayed walls that relate to its natural and built context, and rounded corners to reduce its visual impact.

The sloped roof will assist in reducing the impacts of wave inundation, while also providing a pleasing form which is seen in the round and which relates to the surrounding topography.

The proposed pumphouse will employ a material palette which is low maintenance and which responds to its natural landscape setting - a grey concrete base anchors the pumphouse to the pool concourse, with the walls above being a sand coloured concrete akin to the surrounding sandstone cliffs.





Reference photograph along Bronte Pool seawall towards existing pumphouse and stair (above) and similar view of proposed pumphouse and stair (right) using 3D terrestrial scan survey of immediate context as base for modelling software.

The proposed pumphouse adopts a slender proportion, with splayed walls that relate to its natural and built context, and rounded corners to reduce its visual impact.

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**03 Concept design:** Views



Reference photograph from in Bronte Pool when empty towards existing pumphouse and stair (above) and similar view of proposed pumphouse and stair (right) using 3D terrestrial scan survey of immediate context as base for modelling software.

The proposed pumphouse adopts a slender proportion, with splayed walls that relate to its natural and built context, and rounded corners to reduce its visual impact.

The sloped roof will assist in reducing the impacts of wave inundation, while also providing a pleasing form which is seen in the round and which relates to the surrounding topography.

The proposed pumphouse will employ a material palette which is low maintenance and which responds to its natural landscape setting - a grey concrete base anchors the pumphouse to the pool concourse, with the walls above being a sand coloured concrete akin to the surrounding sandstone cliffs.



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View from the ocean towards existing pumphouse and stair (above) and proposed pumphouse and stair (right) using 3D terrestrial scan survey of immediate context as base for modelling software



The proposed pumphouse adopts a slender proportion, with splayed walls that relate to its natural and built context, and rounded corners to reduce its visual impact.

The sloped roof will assist in reducing the impacts of wave inundation, while also providing a pleasing form which is seen in the round and which relates to the surrounding topography.

The proposed pumphouse will employ a material palette which is low maintenance and which responds to its natural landscape setting - a grey concrete base anchors the pumphouse to the pool concourse, with the walls above being a sand coloured concrete akin to the surrounding sandstone cliffs.