
The Highway
Car Park

CONTENTS

Public Swimming
St George's Pools, 1969

EXECUTIVE SUMMARY

The feasibility study was undertaken to demonstrate the viability of:

1. The repair, renovation and retrofit of the St George's Leisure Centre, including wet and dry areas.

2. The length of operational time delivered by the proposed investment to the building(s).

3. High quality environmental practice implemented in the municipal context. This was to include leading sustainable pool design, maximising embodied and operational carbon savings and the first Chlorine-free pool in this sector.

4. Significantly lower build and operational costs compared to the current LBTH options for the provision of leisure services in the South West of the borough.

5. The significant savings the retrofit of the Centre delivers, offering opportunities for further investment into improving and expanding the provision of leisure facilities in the South West of the borough.

This feasibility study demonstrates that:

1. The repair and renovation of the pools at St George's, including the full retrofit of M&E plant, is the most environmentally friendly, fastest and most effective way of providing swimming and wellbeing facilities to the local people in Shadwell.

2. The programme proposed by the team would result in a life of over 50 years for the existing building and 30 years for the services.

3. The enhancements would put the Council at the forefront of best municipal environmental practice and result in much reduced running costs.

4. The cost of the scheme (£19m) is significantly lower than the current new-build alternatives proposed by the Council's consultants. The savings made by a retrofit scheme, could therefore be used to build the Wapping Lido (£10m) and afford improvements to the John Orwell Sports Centre (£6m).

   This would provide a broad range of first-class swimming and sports facilities to local people in the south-west of the borough.

5. The rennovation of the pool would take 50 weeks from starting on site and the construction of the Lido 39 weeks.

Main Pool
St George's Swimming Pool, 1969 ©RIBA

Teaching Pool
St George's Swimming Pool, 1969 ©RIBA

THE TEAM

The St George's Steering Committee has worked with the independent Turks' Head Charity to assemble a professional team to compile this study.

The Committee's significant engagement with LBTH developed a good understanding of some of the Council's key concerns with regards to developing, maintaining and managing their leisure portfolio. It is with these in mind that the consultant team have been chosen and have been asked to approach the proposed design.

The professional team:

Piers Gough, Architect
Director
CBE, RIBA, FRIAS, AADip, RA,
D. University of Middlesex
Hon. Fellow Queen Mary University London

CZWG are a London based architectural design practice renowned for characterful and high-quality architecture. The practice has over 45 years of design and technical experience, from inception through to delivery. Piers Gough was a founder member of CZWG in 1975 and lives locally.

Paul Toplis, Structural Engineer
MA, CEng, FIStructE, MICE,
and
Michael Brown, Structural Engineer
MEng, CEng, MIStructE

Price & Myers were established in 1978 and advise on the repair and restoration of historic buildings as well as working with some of the country's leading design teams on outstanding contemporary buildings. Paul is a Partner and has a particular interest in the use of concrete, and a breadth of understanding of the concrete industry including both design and production.

Peter Wray, M&E Building Services Consulting Limited
Managing Director
C ENg, MCIBSE

C&W Partners Ltd was founded in 1994 by Peter Wray as a consultancy offering a full range of design and construction management services on Mechanical, Electrical & Public Health Services in the financial, leisure and healthcare sectors.

Bertram Beanland
Consultant Engineer
BA

Iso Energy works in partnership with businesses and home owners advising on the benefits of renewable installations. Bertie joined isoenergy in 2015 and joined as a member of the consultation team, in an industry where he could continue to apply his environmentally sustainable ideas.

John J P Desmond, Chartered Surveyor, Building Economist
BSc(Bldg Econ), FRICS, MCIArb, FRSA

BWA is a long-established cost consultant at which John was Managing Partner for 35 years. John has over 45 years' experience advising on the economics of development in both the public and private sectors. His expertise covers valuation, costs, project management, programming and facilities consultancy.

Celina Brown, Managing Director

PoolSan is the only genuine chlorine-free range of swimming pool treatments for domestic and commercial swimming pools. Their proven liquid formula combines together natural mineral ions to bring you the future of swimming pool treatments.

The lead members of St George's Steering Committee:
Amanda Day, Caroline Morton and Naomi Shaw are all residents in the borough and were users of the St George's Pool.

Jon Aldenton is an environmentalist and is Chair of the trustees of The Turk's Head Charity.

1. INTRODUCTION AND BACKGROUND

St Georges swimming pools is located on the north side of the Highway, to the east of the gardens and graveyard of the Grade I listed Hawksmoor Church, St-George-in-the-East. The Modernist design of the Leisure Centre provides a sympathetic neighbour to its listed neighbour. The mass of the building provides a buffer to the public park and playground behind it, providing a tranquil environment. The recently refurbished St-George's Town Hall completes the arrangement of civic and public buildings opening onto this successful public place.

The pools at St George's are an outstanding example of architectural excellence designed by Reginald Uren, many of whose other buildings are listed. This one sadly, has not been well maintained. The main pool, a cathedral of swimming, which is 33m in length is structurally in generally good condition. The small pool is structurally sound.

The purpose of this report is to demonstrate the possibility of a full renovation of the existing structure to deliver a high-quality swimming pool and Leiusure Centre, functioning at low-energy cost and improved intensity of use. A simple design has been proposed and there is room for further design development which would be best served by both Council and Public engagement.

The report also explores the cost of such a renovation and the additional opportunities that are subsequently made available.

BACKGROUND - FEASIBILITY
The Mayor and Cabinet of London Borough of Tower Hamlets (LBTH or referred to here as the Council) invited the Save St George's Steering Committee (SGSC) to undertake an independent feasibility study for retrofit and renovation of the St George's Swimming Pools and Leisure Centre.

The St George's Leisure Centre closed in March 2020 with Covid-19 Lockdown rules and has remained closed post Covid-19 restrictions being lifted. SGSC is an independent community-based group, comprising local residents and users of St George's, that formed in 2021 to open dialogue with the Council to fully explore to re-opening of the pool. The campaign's petition to save the pools attracted 3,000 signatures.

At a Cabinet meeting of Tower Hamlets Council on 9 February 2022, the results of a six-week long consultation on the provision of leisure services in the South West of the borough were presented to Members. The feasibility study, prepared by the Council's consultants, on which Members were voting offered two options:
Option 1 – Existing building demolished, new build Leisure Centre with co-located wet and dry facilities; existing non-listed building demolished/locally listed building repurposed
Option 2 – Existing building demolished; new build residential development; leisure centre function moved to John Orwell site and co-located with dry sport provision.
Members voted for Option 1, to fund a new leisure centre on the existing St George's site.

The feasibility report stated,
Given the design of and construction methodology used for the current St George's Leisure Centre, substantive changes to its internal layout were considered impractical. This report does not, therefore, include an option for the refurbishment of that building. The Council has costings from surveys for the refurbishment of the existing building, which estimated that the cost of works to allow the building to reopen were c.£9.9m, to give it up to 5 years additional life would cost a further £3.5m, and to extend its life by up to 20 years would cost an extra £10m. As no design work was required to inform these options, as they were for the refurbishment of the existing building, this option is not set-out in this report.[1]

SGSC disagree with the above statement and objected to a retrofit option not being fairly represented within the Council's feasibility study. Members of the Save St George's Steering Committee present at the Cabinet meeting lobbied the Council to agree to an independent feasibility study. Mayor Biggs agreed and the Council confirmed that it is open to receiving such a study. It is this independent feasibility study for the retrofit and re-opening of the St George's Pools that SGSC presents to the Council in this document.

To ensure that there is no material delay to progressing improvements to provision, this study was completed and submitted to the Council on 31st March 2022.

The Council arranged with GLL (currently contracted to provide the Leisure Management at St George's Leisure Centre) to facilitate a site visit for SGSC and their consultant team. This took place on Monday 14th March 2022.

The Council have not contributed any funds towards the cost of the preparation and delivery of this feasibility study.

BACKGROUND - BUILDING CONDITION
The feasibility study took place after disclosure requests, careful consideration and review of all available reports on the current structure (except for the roof covering which has not been accessed for external survey). Information from management staff with operational experience of St George's Pools and from GLL was obtained. SGSC and the Consultant team refer to the following reports that are in the public realm:

- Summary of reports from 2003-2018 (compiled by SGSC)
- Concrete Investigation for CCLLP, Infrastruct, August 2018
- Structural Assessment Report (Stage 2) of St. George's Leisure Centre. Chamberlain Consulting LLP, September 2018
- Condition Survey & Report for the Mechanical and Electrical Services Installation at St George's Swimming Pool, GDN Support Services, October 2019
- Condition Survey & Report for the Mechanical and Electrical Services Installation at St George's Swimming Pool, GDN Support Services, November 2021

The Council's release of the GDN Conditions Survey and Report in November 2021 of the Mechanical and Electrical Services Installation made it clear that these were beyond reasonable repair. This offered the opportunity to think about a complete retrofit of the existing pool and a vision for a low energy or renewable energy plant.

Current access to the plantroom is deemed too small to accommodate the installation of modern equipment.

Visual surveys were carried out by each member of the consultant team and their recommendations appear in their reports. Further more intrusive surveys will be required, particularly for the roof and concrete structure, before a detailed specification can be produced.

1 St George's and John Orwell Leisure Centre Feasibility Study, London Borough of Tower Hamlets, P4, Nov 2021

1. INTRODUCTION AND BACKGROUND

South Elevation - View from The Highway
St George's Swimming Pool, 1969 ©RIBA

North Elevation - View from car park
St George's Swimming Pool, 1969 ©RIBA

2. SITE ANALYSIS

The Site Analysis provided in the Council's Feasibility Study provides the relevant site information for St George's and John Orwell sites and will not be repeated here - reference pages 9-16 and pages 21-29 of St George's and John Orwell Leisure Feasibility Study. The SGSC Feasibility Study does highlight a further potential site in the leisure provision for the south west of the borough, the proposed Wapping Lido. This is a proposal made by a collaborating local community groups for a naturally heated and treated outdoor swimming pool in Shadwell basin that received planning permission in 2017.

1. St George's Swimming Pool
2. John Orwell Sport Centre
3. Wapping Lido

POOLS CONTEXT

St George's Pools are housed in a rectilinear swimming pool complex which opened in October 1969 and set in the conservation area of St George in the East. They were commissioned by the Metropolitan Borough of Stepney and seen to be a civic statement and a building to inspire – with an aspirational brief to make the pools fit for Olympic swimming and diving training. The inclusion of the swimming pool building in the designated conservation area was an important inclusion in the preservation of the St George in the East setting. This is due in part to the excellence of its design as a 'background' building to the grade I listed church but more particularly because of its relevance and part in the continuity of social history that this site represents.

Historically, St Georges in the East was the first intervention made to clear slum dwelling and improve the lives of residents and workers in this area. In 1881 the Metropolitan Open Spaces Act was passed and the whole of the churchyard was allowed to be opened as a public garden as a result. The vestry of the parish then bought the land east of the churchyard and established gardens that they opened to the public in 1877, the site of much of St George's Gardens today. The scheme was recorded by the Metropolitan Public Gardens Association in 1883 as being exemplary in its conversion from a burial ground. The building is therefore a significant piece in the ensemble of buildings and gardens on this site that characterise a history of urban social, health and well-being policy in England.

The building was purpose-built as a spectator competition pool with spring and static diving boards. It is an iconic building and while the Highway is a main artery to and from the City, St George's Pools sit well in the location overlooking the adjoining playground and church green. In the early 2000's the organisation British Swimming identified 58 swimming pools in England and Wales that were 33 metre length pools. Roughly half of these were built in the 1960s and yet just 12 are still in use. Pools such as St George's are an increasingly rare type of public design that created cathedral-like pools for swimming. St George's was very well used precisely because its size and design allows for so many activities in the same place which gives the pool an energy, vivacity and enduring modernism. The pools make a significant contribution to the social and architectural history of Britain and continues to play an important role in Tower Hamlets today. In summer 2020, 3,000 people signed a petition calling for the pool to reopen. Many of the comments highlighted the architecture of the building and its importance in swimming there.

This feasibility will look at the enhanced provision available at the St George's Leisure Centre, for example a hydro pool and mechanical wall within the main pool to allow for simultaneous diving and swimming activities.

Aerial view of Wapping and Shadwell showing potential for further leisure provision
1 - Existing St Georges Leisure Centre
2 -John Orwell Sports Centre
3 - Location of proposed Wapping Lido

2. SITE ANALYSIS

ST GEORGES LEISURE CENTRE
EXISTING CONDITIONS

CURRENT PROVISION

- 33.3m length, 6 lane, main swimming pool
- 3-level diving boards with depth to 3.7m
- 15m length teaching pool
- inside gym for 33 no. fitness stations
- wet change facilities for each pool: male, female, family/team change
- reception, shop and entrance
- staff areas ad offices
- studio for hire

CONSTRAINTS

- vehicular access from A1023 (The Highway)
- St George's-in-the-East, Grade I listed church
- St George's Gardens, public park including Grade II listed monuments
- proximity of series of Grade II listed buildings
- pollution, noise and volume of traffic on A1023 south of the building
- on-site parking to be reduced to blue-badge spaces
- site proximity to residential buildings
- access to plant room
- neglected repair of concrete and due refurbishment

OPPORTUNITIES

- additional wet facilities, e.g. hydro pool for baby swimming and hydrotherapies
- additional dry facilities, e.g. larger gym, dry changing rooms
- redesigned spectator spaces
- improved simultaneous use of pool by different groups, e.g. diving and swimming lessons
- cafe
- terrace
- new entrance
- better relationship with park and views
- increased cycle use by re-modelling car park and cycle storage
- DDA-compliant access to all areas
- improved pedestrian access to site from north

HERITAGE

Refer to p14 of Site Analysis in Council Consultant's Report.

Aerial view of site of St George's Leisure Centre
221 The Highway, London E1W 3BP

3. STUDY BRIEF

BRIEF FOR THE RENOVATION OF ST GEORGE'S LEISURE CENTRE
An analysis was carried-out for a sustainable renovation to the highest standards, of the structure of the existing St George's Pools and to look at other opportunities across the south west of the borough for the same cost as the Council's consultant's proposal.

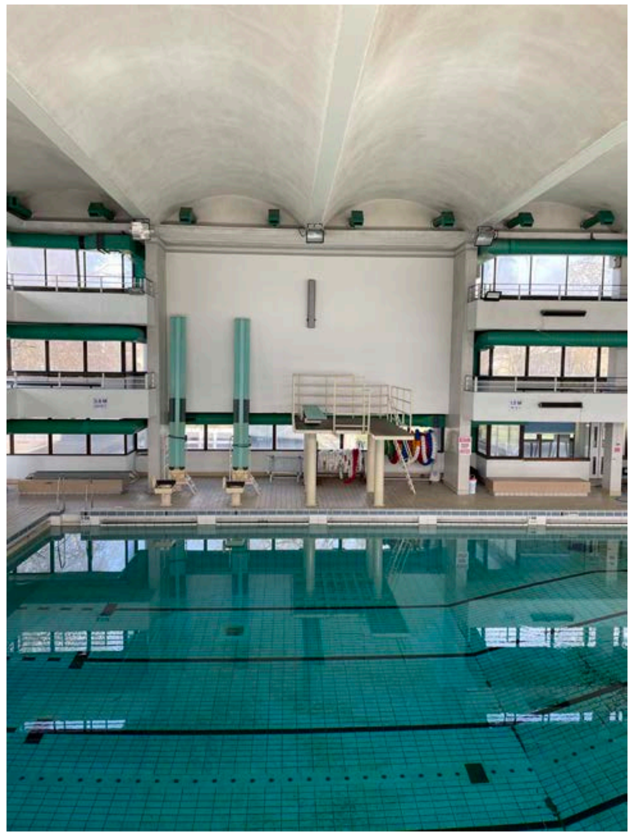
ST GEORGE'S LEISURE CENTRE
The renovation of St George's Leisure Centre is to include:
- a non-chlorinated water system
- increased dry area - for increased revenue
- increased additional wet facilities - for increased revenue
- improved amenities - opportunities to increase revenue
- low running costs
- low-carbon retrofit
- retain views and strong connections with context and local community assets
- mitigate negative impacts of pollutants from The Highway (noise and particulate matter)

Leisure Strategy 2017-27
This study was considered with The Indoor Leisure Facilities Strategy for LBTH 2017-27.

In addition, thought has been given to the increased need for outdoor activities during times of pandemic and a period when the population is recovering from the effects of subsequent national lock-downs.

JOHN ORWELL SPORTS CENTRE
- improved and refurbished internal facilities
- external running track

WAPPING LIDO
- 50m length outdoor pool
- children's outdoor play pool
- natural heat and filtration
- changing rooms
- cafe
- planted landscape with pontoons and bridge



Latent Diving Facilities
St Georges Leisure Centre

Swimming Gala at St George's Pools

4. DESIGN APPRAISAL

4.1 ARCHITECTURAL LAYOUT
CZWG have prepared schematic plans for the proposed design to retrofit St George's Leisure Centre - see following pages.

The proposed design is based on stripping-back to primary structure, re-building a low-energy heating and ventilation system and enclosing in a new envelope. In order to replace and facilitate management of the building's plant, a new access ramp to basement level is created from the car park.

The retrofit design creates a new entrance on ground floor leading to a fully accesible circulation core to all levels. The building is extended on ground floor to the north, providing increased gym and studio areas with a dedicated dry change area. The wet facilities at this level are enhanced with a hydro pool and a fully refurbished wet change area for the traning pool.

The main pool is accessed at first floor level with fully refurbished wet changing room areas. There is a cafe overlooking the park with large roof terraces providing views across the park and gardens towards St George's church. A moveable wall is installed in the pool to facilitate simultaneous use by divers and swimmers - adhering to Swim England's guidance for 25m length lanes and 8m^2 area for diving. The longer length can be restored for swimathons and competitions. A retractable pool cover is to be explored to reduce heat loss through the water surface when the pool is not in use.

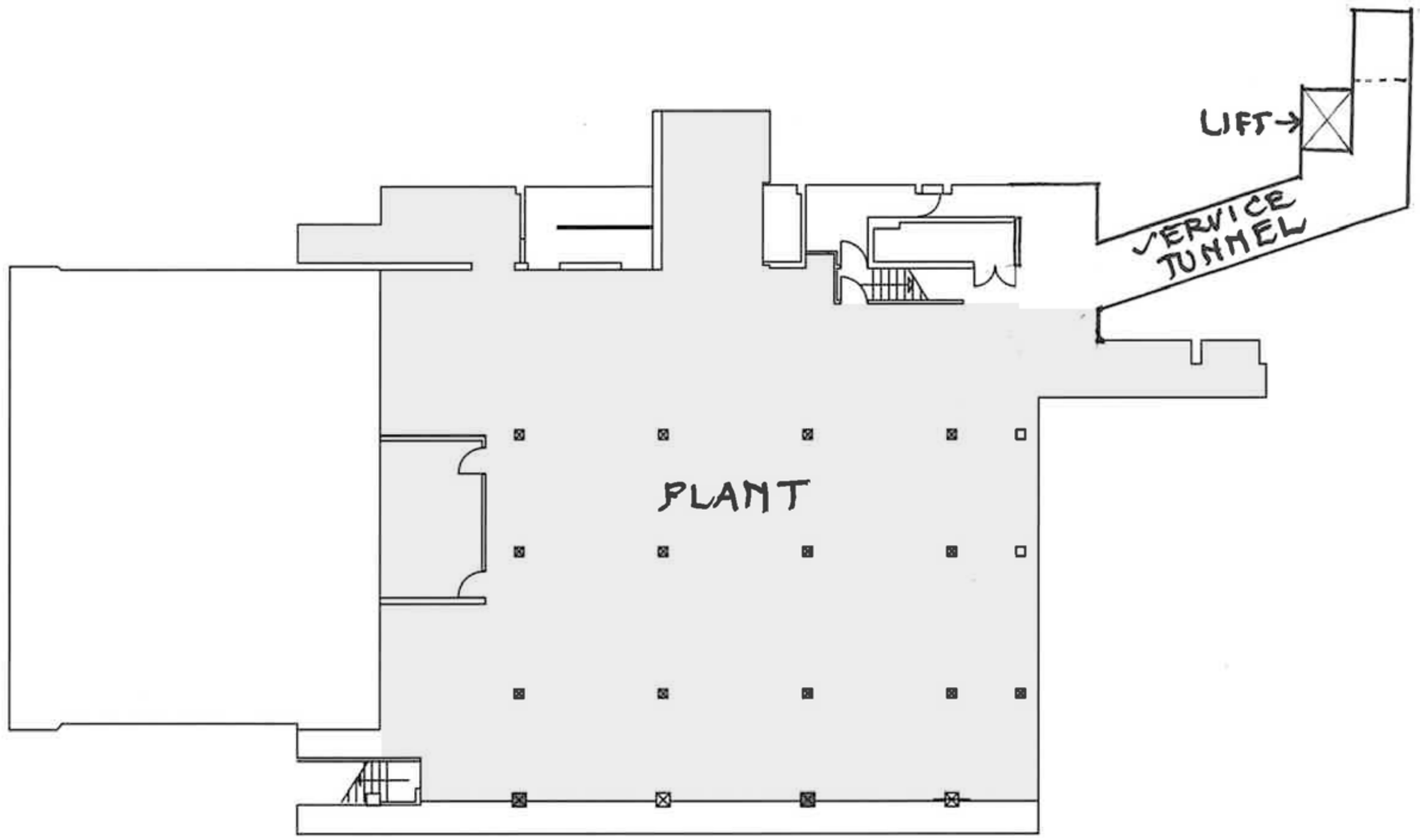
Ther upper levels are proposed to be re-instated as viewing galleries with re-built balconies and flat roof in this area. The glazing on these floors continue to provide natural light to the pool and will be replaced with anti-glare, double-glazed units.

The extension to the rear of the centre prioritises the pedesttrian and encourages engagement with existing public facilities in St George's park and garden. Limited vehicular access is maintained from the road.

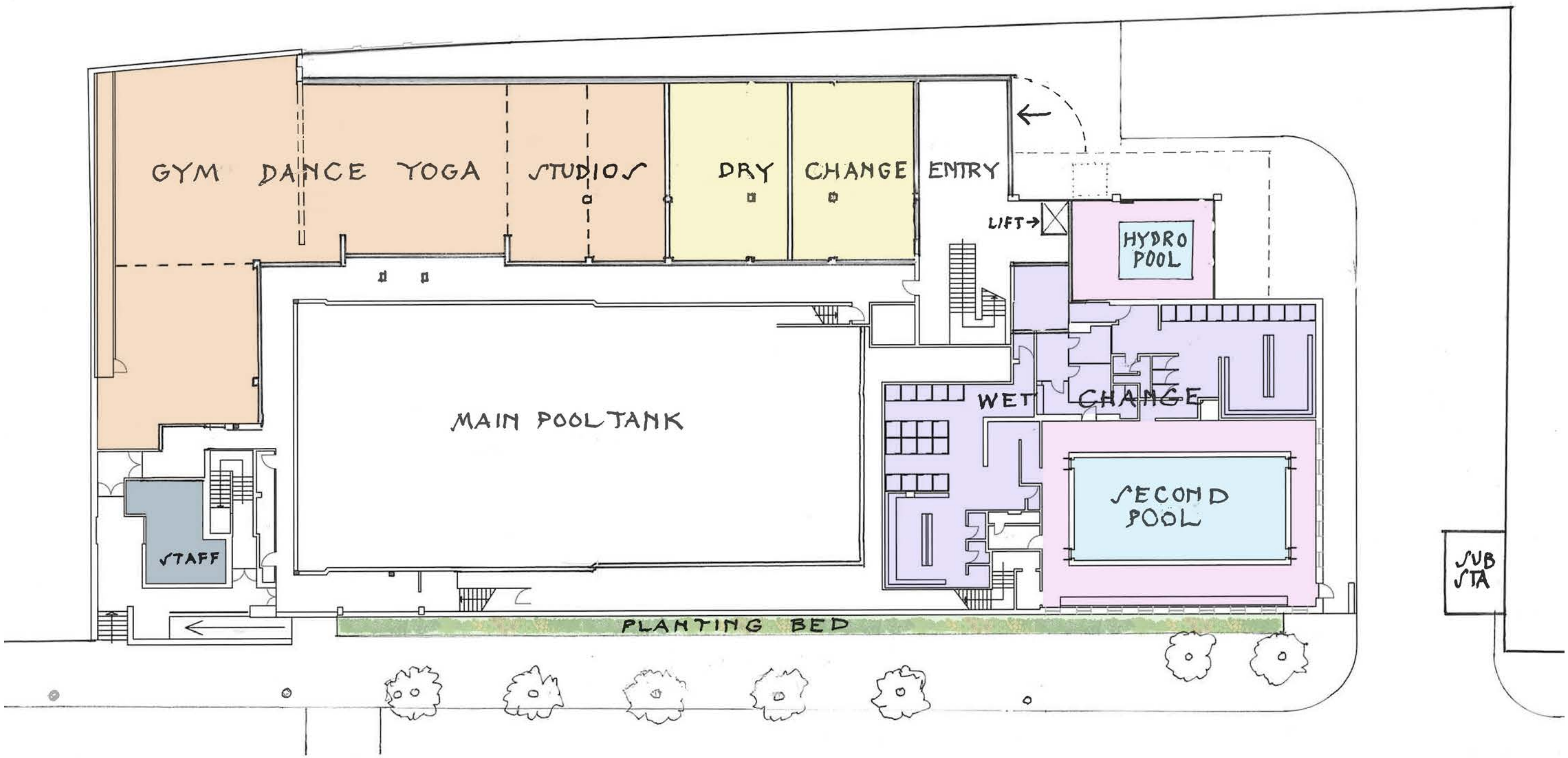
The large areas of existing plain brick facade are proposed to have fitted robust green walls, planted with evergreen survivors in high pollutant levels. It has been proven that active green walls reduce ambient noise levels, particulate matter and in some cases temperature. A large sign of a diving figure will hang from the south facade, informing all who pass of the green, clean credentials of this leading retrofit LBTH pool.

AREAS
The rearrangement of the existing building layout allows for:
- a family cafe (also available for party hire) and 200m^2 external terrace
- additional fitness stations to approx 80 no.
- new studios available for class exercise
- hydrotherapy pool
- increased use of existing main pool with mechanical wall (separate diving and swimming)

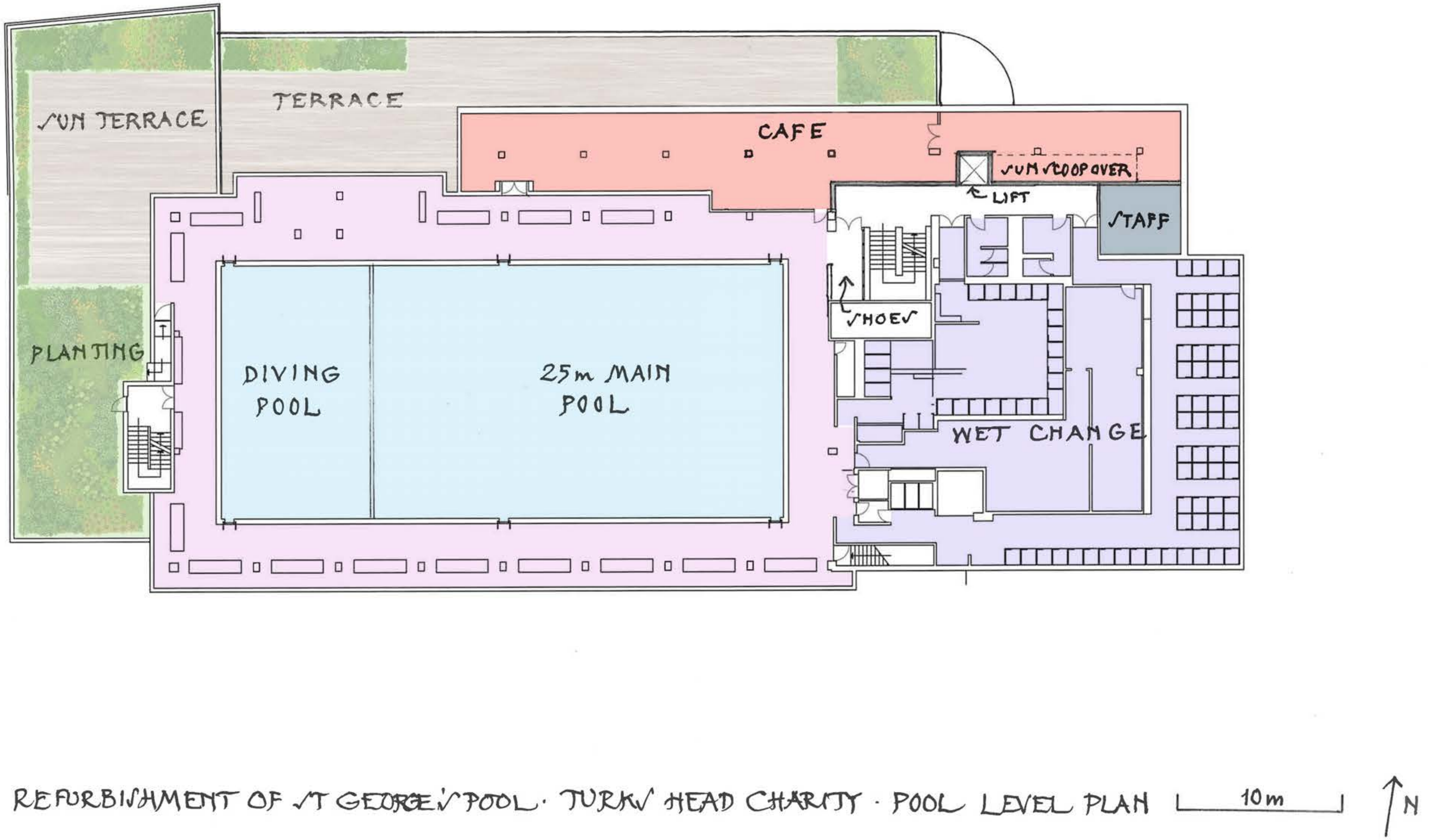
Level	Use	Area m^2 retrofit
Basement		
	Lobby	40
	Plant / Storage / Management Areas	460
Ground Floor		
	Entrance	105
	Wet Change incl. WCs	130
	Hydro Pool	45
	Small Pool	175
	Dry Change incl. WCs	165
	Gym / Dance / Yoga Studios	460
	Staff Room	25
First Floor		
	Lobby and Shoe Change	40
	Wet Change incl. WCs	415
	33.3m Length, 6 Lane Pool with surround and Diving Area	920
	Café including back of house	195
	Staff Room	20
Upper Floors		
	Lobbies	40
	Viewing Balconies	480
	GIA Footprint	3,715
	Other general circulation	35
	Total GIA	3,750



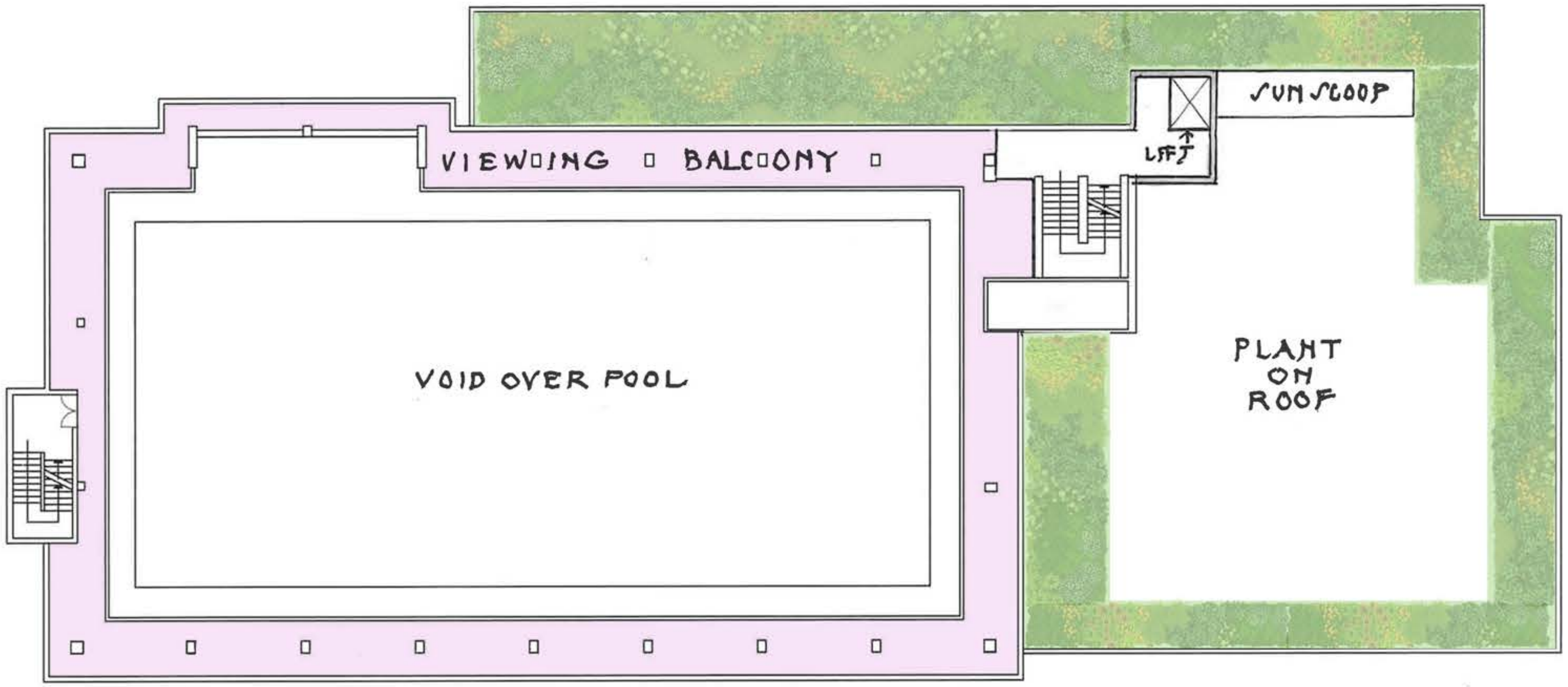
REFURBISHMENT OF ST GEORGE'S POOL · TURK'S HEAD CHARITY · BASEMENT PLAN · 10m ↑N



REFURBISHMENT OF ST GEORGE'S POOL · TURK'S HEAD CHARITY · GROUND FLOOR PLAN 10m N



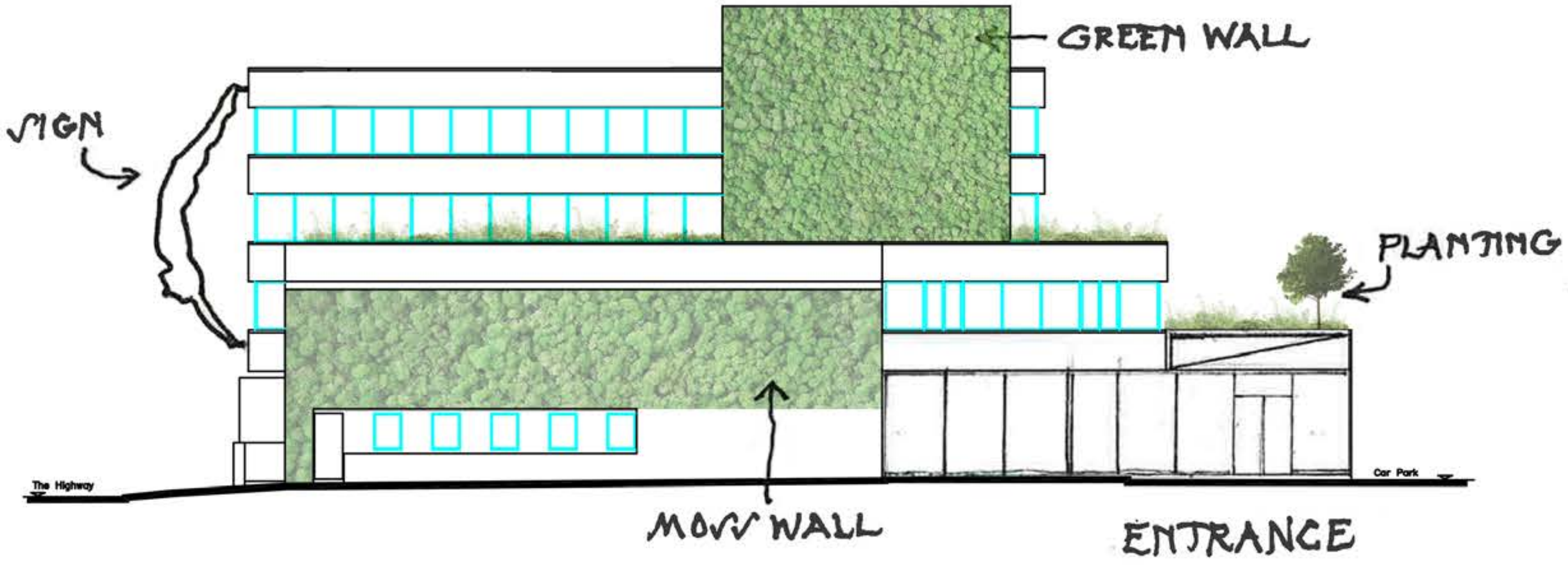
REFURBISHMENT OF ST GEORGE'S POOL · TURKS HEAD CHARITY · POOL LEVEL PLAN



REFURBISHMENT OF ST GEORGE'S POOL · TURK'S HEAD CHARITY · 1ST & 2ND FLOOR PLAN · 10m N

REFURBISHMENT OF ST GEORGE'S POOL · TURK'S HEAD CHARITY · SOUTH ELEVATION

10m



REFURBISHMENT OF ST GEORGE'S POOL · TURK'S HEAD CHARITY · EAST ELEVATION · 10m

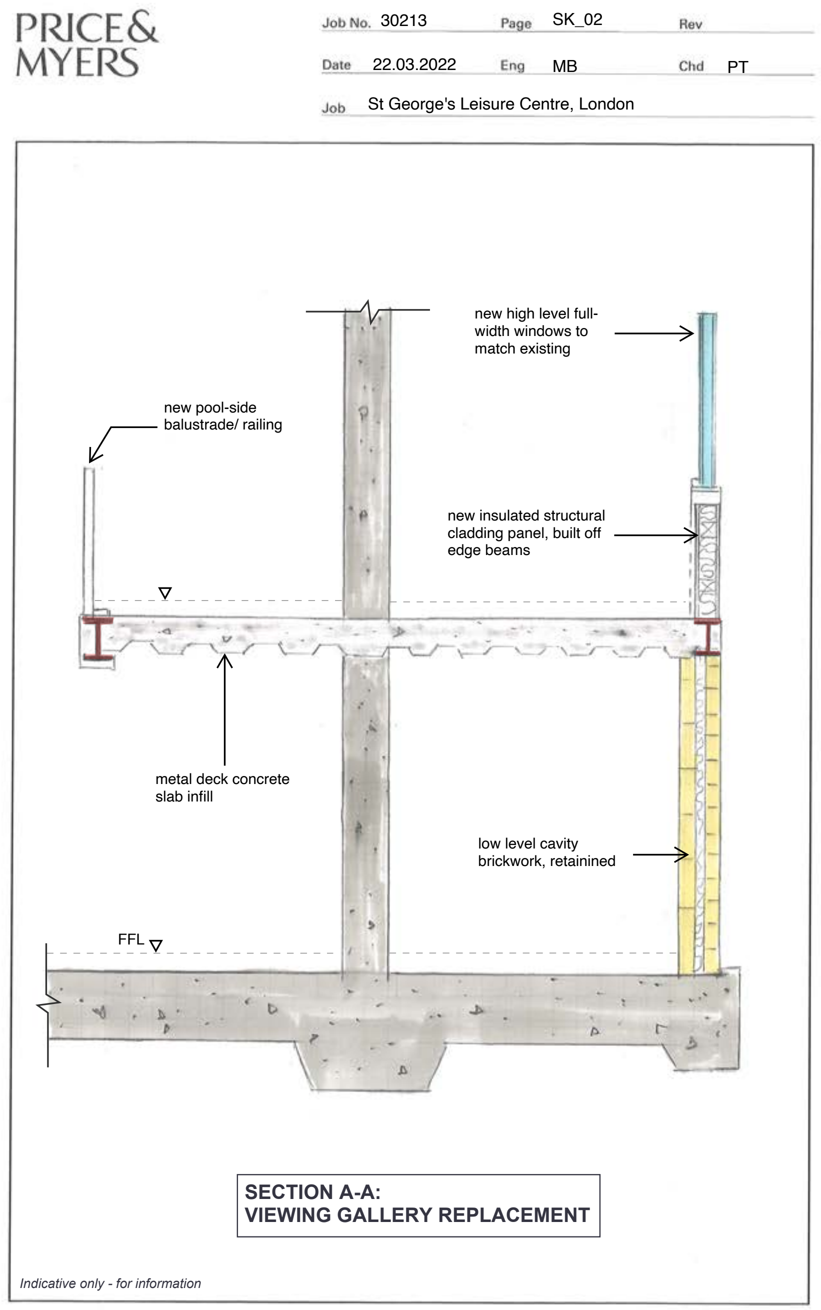
4. DESIGN APPRAISAL

4.2 STRUCTURE
Price and Myers full report - Appendix A

The structural strategy is as follows:
1. strip-back to primary structure - including the removal of cladding, roof, windows and surface finishes
2. execute a detailed survey of concrete structure throughout
3. make concrete repairs locally
4. apply new specialist membrane to main pool and overlay tiles throughout
5. re-make galleries using metal deck with concrete slab infill
6. replace external envelope on gallery floors

The Structural Engineer's initial assessment of the structure is that it can likely be made good for a further **50 years**. The following recommendations are made to facilitate this:

- repair spalling and previously poorly executed repair work- see CC LLP recommendations from 2018 report
- use waterproof resin repair agent to mend fissures and gaps in concrete pool box, as specified by concrete specialist
- execute full CCTV camera survey of drainage at ground floor
- once basement is cleared-out, full survey of whole floor required and local repairs made where necessary
- once main pool is stripped-out, full concrete survey is required and local repairs made where necessary



Indicative section proposing the replacement of concrete viewing galleries with metal deck filled with concrete
Price & Myers Structural Inspection Report, Appendix A

4. DESIGN APPRAISAL

4.3 CARBON REVIEW

Industry professionals and UK construction bodies have developed performance targets to align with the future legislative horizon as they set out a challenging but achievable trajectory to realise the significant reductions necessary by 2030 and in order to have a realistic prospect of achieving net zero carbon for the whole UK building stock by 2050. For example, the RIBA 2030 Climate Challenge[2] singles-out the existing building stock as a primary means by which to reduce energy use and operational carbon emissions:

- *Prioritise the retention, reuse and re-purposing of existing buildings where possible and where retrofit upgrades make carbon sense from a whole life perspective.*

Likewise the embodied energy and carbon emissions can be reduced:

- *Prioritise the refurbishment and retrofit of existing buildings where possible.*

EMBODIED

Embodied carbon in existing structure is calculated by Price & Myers Structural Engineers in their diagram on P15 of their report and opposite. Option 3 describes the proposed retrofit scheme.

OPERATIONAL ENERGY

Iso Energy has advised on low-carbon energy - see their full report Appendix B.

The heating and hot water loads of the property could be covered by a twin 250kW air source heat pump connected into a 3,000 litre domestic hot water tank and a 5,000 litre heating buffer tank. The air source heat pump units will be located on the outside of the building., either at high level on the flat roof of the teaching pool, subject to structural design, or in the car park to the rear.

The electricity provision will be assisted by solar panels, installed on the flat roof of the teaching pool - the benefits of the solar panels outweigh the benefits of the skylights in terms of electricity expenditure. This area could hold approximately 124 panels, totalling 45.8kW. This has the capacity to provide 41,000kWh of electricity per year.

Considering the site as a whole, it is worth consolidating the energy plants for the pool and the building to maximise the value of the investment in heat pump and solar infrastructure. Heat would then be distributed to the various circuits from the main basement plant room.

BEHAVIOURAL

Other measures to consider re: reduction on resource expenditure

- covering pools between use to retain heat
- motion-activated lights
- stop-taps/showers
- gym-station generating low-level electricity
- grey-water recycling

2 RIBA 2030 Climate Challenge (V2), RIBA 2021, www.architecture.com/2030challenge

For this scheme three options have been considered.

Option 1 – Complete demolition and removal of the existing super and substructure, constructing a like-for-like structure on the same site for the same scale and purpose. This includes the construction of a new basement and retaining structure, new foundations, and new superstructure.

Embodied Carbon – 528 $kgCO_2/m^2$

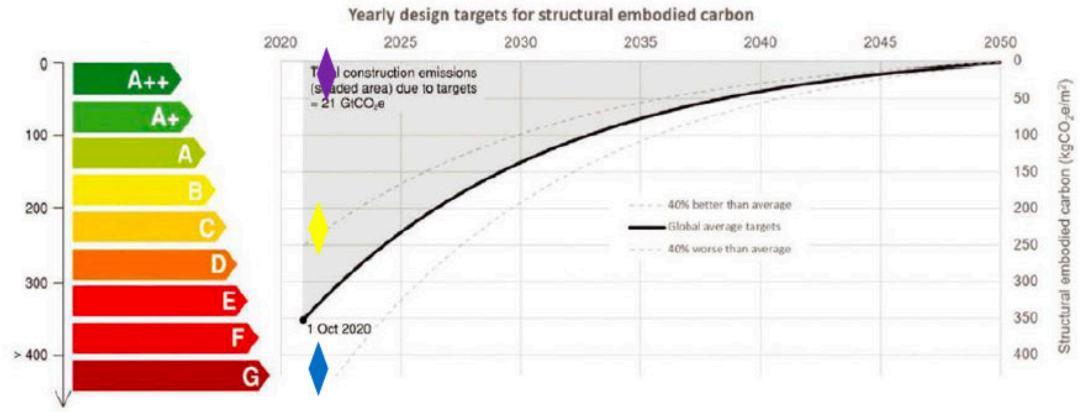
Option 2 – Demolition of the existing structure to ground level only. For this option, the existing foundations, basement, and basement retaining structure are maintained. A new superstructure is built above this, replacing the existing superstructure like-for-like.

Embodied Carbon – 245 $kgCO_2/m^2$

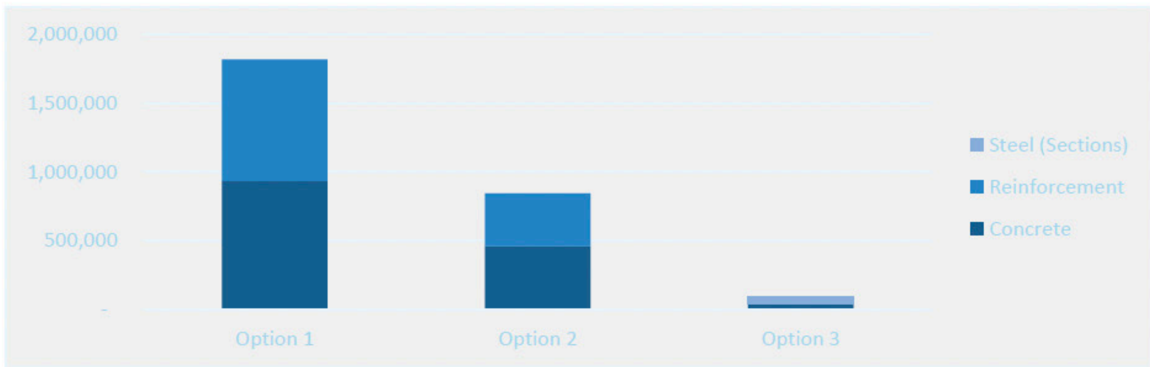
Option 3 – Replace the existing walkways at levels 1 and 2 and the reflective rood sections. As highlighted in section 3 of this report, complete structural replacement of walkways would be the most suitable option; these appear beyond repair. In this option only the existing walkways are replaced, maintaining all other existing super and substructure.

Embodied Carbon – 32 $kgCO_2/m^2$

Below shoes how the schemes analysed compare with the industry wide targets set by IStructE. As a practice P&M have set their own target of < 300$kgCO_2/m^2$ for 2021 reducing by 10% every year, to reach 150$kgCO_2/m^2$ by 2030, in line with Net-Zero targets.



The chart below shows the raw total embodied carbon values for each option.



Building Option Embodied Energy Comparison
Price & Myers Structural Inspection Report, p14

4. DESIGN APPRAISAL

4.4 MECHANICAL AND ELECTRICAL SERVICES ENGINEERING
C&W Engineer's full report - Appendix C

In line with the London Plan to aim to reach Zero Carbon by 2030[3], the use of natural gas as a primary heat source, is ruled out. There is limited external area available at St George's Centre to support ground source heat pumps therefore air source heat pumps are the only option. The approach will be to utilise Heat Pumps as the primary heat source for heating within the building and hot water generation. The incoming power supply will likely need to be updated.

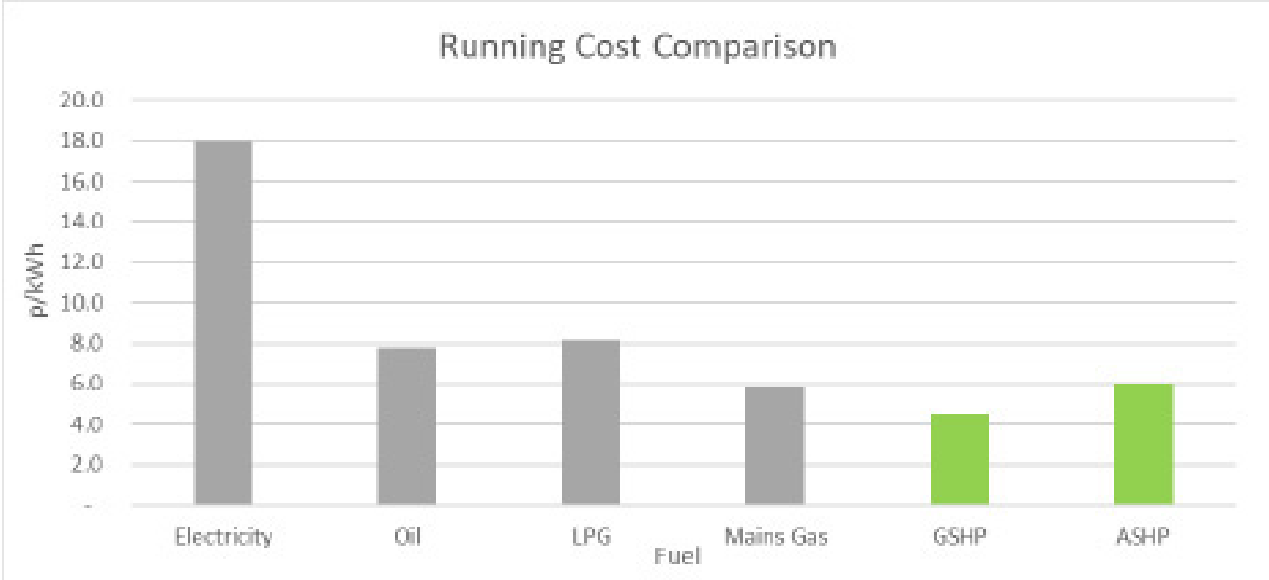
In developing the services design the following are to be researched for inclusion, where viable. In considering options, whole-life costs rather than initial capital costs should be compared.

- Alternative methods for pool water filtration and reduction of chlorine use.
- Use of back-wash pool water for use in grey water system
- Heat recovery from back-wash pool water.
- How to reduce water usage.
- Decentralising main air handling plants from basement to First Floor roof level to provide greater zonal control, improved heat recovery, smaller electric motors to distribute air and smaller duct sizes.
- Raising Pool area RH levels.
- Mixed mode ventilation methods for various areas, including natural.
- Reducing the condensation rate from the pool water surface.
- Separate heating system to deal with building fabric heat losses
- Use of LED lighting throughout with automatic control, where appropriate.
- Maximise the installation of Photovoltaic (PV) panels together with battery storage, if justified.

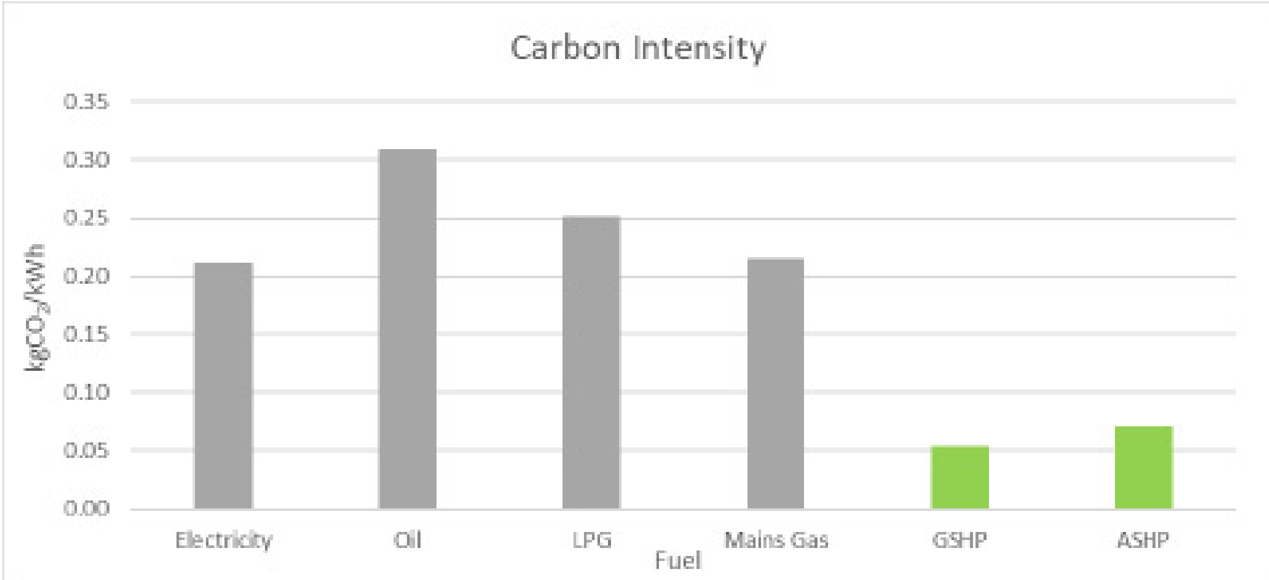
A comprehensive Building Management System (BMS) is to be incorporated which will not only control and monitor equipment and system but record energy consumptions and historical data logging. Graphical representation of the various systems shall make for ease of interfacing with the Users and Maintenance Team. Metering of the Utility supplies and all plant items is an essential function in order to monitor and control operational costs and energy targets.

3 Analysis of a Net Zero 2030 Target for Greater London; Element Energy Ltd for GLA, Jan 2022

4.5 CLEAN ENERGY
Ios-Energy's full report - Appendix B



Running Cost Comparison, GSHP not an option on this site, ASHP is preferred option
Iso Energy Report, p6



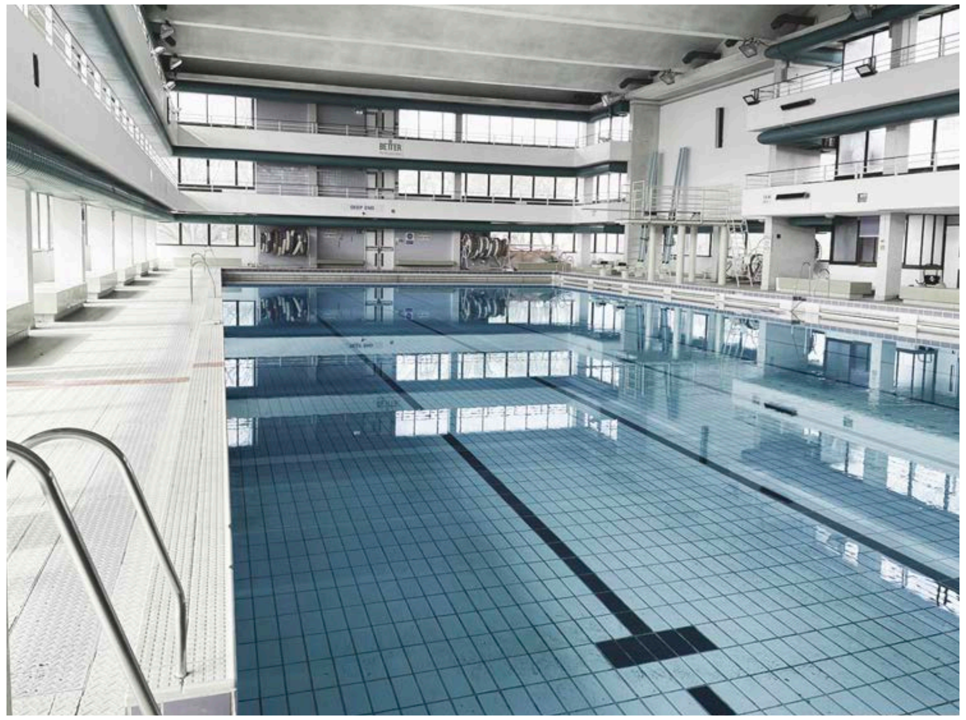
Carbon Cost Comparison demonstrating ASHP as preferred option
Iso Energy Report, p7

4. DESIGN APPRAISAL

4.6 CLEAN WATER
https://www.poolsanuk.com/

POOLSAN
A non-chlorinated water cleaning system is better for the conservation of the concrete structure, maintenance of the pool pipes (non-corrosive) and has the following health advantages:

- The only genuine 100% chlorine-free swimming experience
- Hypo Allergenic - does not cause eye irritations, ear infections, asthmatic attacks, inflame psoriasis, eczema or other skin irritations
- Odourless - no more chlorine smells or residue
- Non Toxic - does not bleach hair or costumes
- Controls bacteria, algae and fungi - solution works solely on breaking these down
- Longer lasting - up to 3 times longer than chlorine
- Simple to use - switching from chlorine is made easy
- Can swim after 15 minutes of dosage - allows you to immediately enjoy the pool
- Natural water softener - physically softer water
- Promotes sparkling crystal clear water
- Ozone, environmentally and user friendly
- Proven in long term trials



St George's Main Pool
PoolSan photomontage

5. COST APPRAISAL

BWA full Budget Estimate - Appendix D

The total spend predicted on the new facility at the St George's Leisure Centre site is **£35 million**, according to the Council's consultants. This sum has been included in the Council's forthcoming budgets.

The estimated costs of full renovation of St George's Leisure Centre is **£19 million.**

The predicted construction cost of The Wapping Lido is **£10 million**, including improvements to Shadwell Basin.

The remaining budget to spend on improvements at the John Orwell Sports Centre is **£6 million.**

St George's Retrofit		
	area	construction budget
Refurbishment Costs	3,500	
Building works		£7,000,000
M&E works		£6,000,000
New Build Costs	250	
New Gym		£500,000
Prelims / Contingencies		£3,000,000
Subtotal	**3,750**	**£16,500,000**
		Or £4,500/m^2
Professional Fees		£2,500,000
TOTAL		**£19,000,000**

Summary of budget costs of proposed retrofit design for St George's Leisure Centre
figures exclude VAT, furniture and equipment, inflation
BWA Report, March 2022

6. ENHANCED FACILITIES IN THE SOUTH-WEST OF THE BOROUGH

Renovation of St George's Leisure Centre

The John Orwell Sports Centre improvements

The Wapping Lido and improvements to Shadwell Basin

6. ENHANCED FACILITIES IN THE SOUTH-WEST OF THE BOROUGH

ST GEORGE'S LEISURE CENTRE

1. Large gym facility
The former laundry with a new ground floor extension and adaptations can provide an 80-station gym with a free weights area and studio space together with a dry changing suite. It will generate substantial additional revenue for the centre.

2. Chlorine-free swimming and renewable energy
The services need replacing, including the pipework. This provides the opportunity to replace the plant with heating supplied by air source heat pumps and roof mounted photovoltaic panels with battery storage. This would make the pools the first municipal pools to be powered entirely by renewable energy, with fuel bills slashed to very modest levels. At the same time, chlorine-free treatment of the water would prevent chlorination and make the pools much more attractive to users. The PoolSan ionisation system uses filtration and maintenance regimes similar to chlorine treatment, but avoids the smell and pollution caused by chlorine. It is currently in use at many hotel pools in London and throughout the public pools of Norway. Its use will attract considerable numbers of additional swimmers.

3. Hydrotherapy pool
Alongside the teaching pool on the ground floor, a hydrotherapy pool, much needed locally, would provide a service to disabled people, baby swimming, mental health and meet local needs. It could earn substantial extra income for the centre.

4. New café and full accessibility
A new café adjacent to the pool, overlooking the park, with a sun deck on top of the former laundry, would be much more attractive to visitors and could be leased to a local food operator with extended opening hours. The cost plan includes a larger lift extending to all floors and access to the pools for disabled people.

5. Diving
The opportunity exists to install a removable pool wall at the 25m mark to allow for simultaneous swimming and diving.

JOHN ORWELL SPORTS CENTRE

1. Running track
There is space around the existing sports pitches to install an athletics track. This would be a useful facility in the south-west corner of the borough.

2. Additional sports halls
Subject to further consultation there is room within the budget and on the ground for additional sports facilities, such as a weights room and dance studio.

3. Renewable energy
In order to reduce running costs an investigation into the potential of renewable energy on the site needs to be undertaken.

6. ENHANCED FACILITIES IN THE SOUTH-WEST OF THE BOROUGH

THE WAPPING LIDO

The Lido would be Britain's first natural heated, naturally treated swimming pool in the heart of the East End. Since Tower Beach, by Tower Bridge, closed in 1971 and the Victoria Park Lido in 1986, east-enders have lacked an outdoor pool. Working together, the Shadwell Basin Outdoor Activity Centre and the Turk's Head Charity, have devised a scheme that meets that need in an exciting and sustainable way. The proposal is to build the first all year use, outdoor, sustainably heated and naturally filtered swimming pool in the UK. This is part of a wider proposal to regenerate part of the Shadwell Basin. The aim is to improve the ecology, water quality and biodiversity of the basin. These proposals will benefit the existing users and provide improved amenity and local residents the first Natural, Olympic length swimming pool of its kind in the country.

Brussels Wharf, where the lido will be situated is a neglected and under-utilised area of Wapping. There is a continuing problem of alcohol and drug use on the Wharf and around the Old Shadwell Basin Lock. There is a lack of public facilities in the vicinity and the local residents' perception of the site is that it has the feel of an area that has been left behind whilst the rest of Wapping has moved on. There is an on-going problem of unauthorised public swimming in the dock which is increasingly bringing bathers into conflict with the Shadwell Basin Outdoor Activity Centre. For example, when children are out sailing, a safety boat needs to be present at all times. This presents a health and safety issue both for the legitimate users and the unauthorised swimmers. A safety support vessel speeding to the rescue of a capsized vessel runs the risk of hitting a swimmer, resulting is a high risk of serious injury or death to unauthorised bather. The Lido will create a safe, enjoyable swimming environment within the basin.

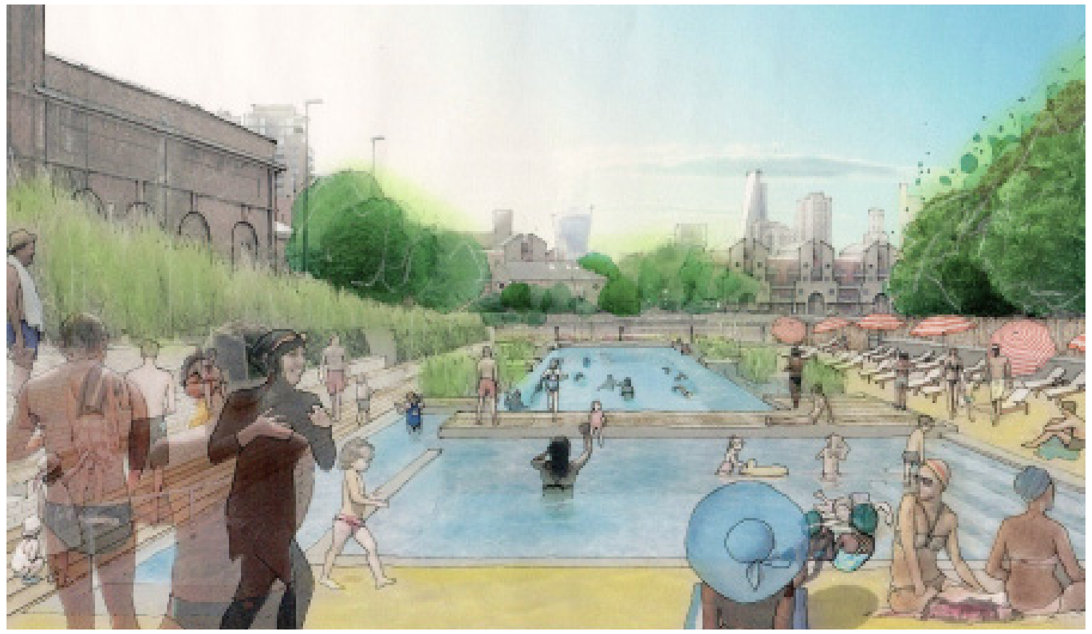
The Lido was granted planning permission in 2017 but as yet only the first phase - the water polo court, has been built. In the officer's report for the planning application, they stated that while "it is recognised that the location of the Lido in Shadwell Basin is to the south west of the borough and close to the long-established St Georges Pool, the two swimming facilities clearly offer quite different and complimentary facilities. The proposed 50m Lido with disabled access and potential for use as a training facility will clearly complement the existing facility provided by St Georges 33m indoor pool."

In light of the rapid increases in energy costs, comments from the Council's Culture and Sport service action plan for the leisure estate, indicated that a naturally heated lido is sustainable. The Swimming Provision in Borough Service Action Plan Stated the following:

"A Lido is one of the options that is being considered but no decision on lido provision in the borough has been made at this point. It should be noted that a lido is not an equivalent leisure centre space for swimming provision. Lidos particularly appeal to adult fitness swimmers and do not meet the wider needs of school and family swimming, especially as a learning to swim environment."

The Lido includes a separate pool for young swimmers, most suitable for local school groups.

The Wapping Lido site is equally well served by pedestrian and cycle routes, 100 bus route and the overground line (the nearest station is Wapping).



Artist's impression of proposed Wapping Lido at Butler's Wharf

7. NEXT STEPS

Once a decision is taken regarding retention of the existing pool, a professional team would need to be appointed.

The Save St George's Pool group, the Turk's Head Charity and its partner organisation The Shadwell Basin Project are keen to play a collaborative part in progressing the design and commissioning of the works.

The extent to which they are involved is the Council's decision but we would urge a co-operative approach given what these partners know and can contribute.

CONTACT

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North Elevation, view from St George's Gardens
St George's Leisure Centre, 2022

8. APPENDICES

APPENDIX A - Price & Myers Structural Report

APPENDIX B - Iso Energy Report

APPENDIX C - C&W Partners M&E Report

APPENDIX D - BWA Budget Estimate

PRICE&
MYERS

St George's Leisure Centre
21 The Highway, London, E1W

Structural Inspection Report

Prepared by: Michael Brown MEng CEng MIStructE – Structural Engineer
Reviewed by: Paul Toplis MA CEng FIStructE MICE – Consultant
Job Number: 30213

Date	Revision	Notes/Amendments/Issue Purpose
March 2022	1	For Information

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Note:

This report has been prepared for The Turks Head Charity and their advisors, for the purposes noted in Section 1, using the information available to us at the time. It should not be relied upon by anyone else or used for any other purpose. This report is confidential to our Client; it should only be shown to others with their permission. We retain copyright of this report which should only be reproduced with our permission.

Contents

1 Introduction

Price & Myers visited St George's Leisure Centre on behalf of The Turks Head Charity (client) on 14th March, 2022. The purpose of the inspection was to review the current condition of the existing building, and to advise on its suitability for refurbishment. The areas of the building considered to be of most 'concern' were inspected. No finishes were removed, no floorboards were lifted, and no intrusive assessments were carried out. As structural engineers we are unable to advise on issues related to water ingress and building services unless there are obvious structural implications.

Over the years, a series of inspections and reports have been prepared for the London Borough of Tower Hamlets to advise on the building's current condition. As part of this document, the findings of those reports have been reviewed and commented on.

2 Description of Existing Structure

The existing building is an in-situ reinforced concrete framed structure built in 1965 and designed by the renowned modernist architect Reginald Uren. The frame itself is formed over five levels, comprising full-height columns supporting entire floor slabs, and some partial mezzanine/ viewing gallery floor slabs. The ground floor appears to be solid in-situ concrete, and the upper gallery floors around the pool enclosure at first and second floor levels are assumed to be of similar construction.

Internally, it has two swimming pools. The main pool is suspended over a reinforced concrete basement plantroom, and a smaller pool, to the east of the plot, sits directly at ground level.

The main pool roof is a long-spanning concrete barrel-vault, supported on the main columns. The rest of the roof area, including the mezzanine levels, appears to be a concrete 'hy-rib' system. The system uses galvanised permanent shuttering, incorporating mesh and rolled ribs with poured in-situ concrete.

At ground to first floor, the external envelope is brick. Stretcher bond coursing is noted, suggesting the external wall is of cavity-construction. Above ground floor, the main pool hall elevations have continuous band windows with reinforced concrete upstand spandrel walls. Externally, these are faced with mosaic tiles and internally lined with woodwool slabs. The single storey section of the building containing the small pool is brickwork with isolated windows.

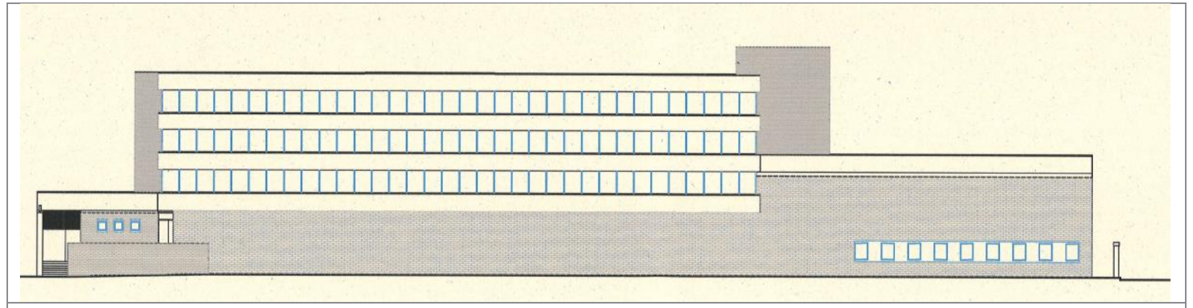


Figure 1 - Building elevation from street level, lifted from Chamberlain Consulting LLP report of 2018.

3 Observations / Discussions

In-depth analysis of the concrete degradation has been covered by specialists as part of reports and inspections over the years. These observations relate to items noted during the inspection. The overall building envelope at high level has a clear waterproofing defect causing water ingress. The perimeter sections of roof internally were noticeably damp/ humid with evidence of dripping water from the soffits. Water ingress over time has also caused rusting of the 'hy-rib' floor slabs within the lower-level viewing gallery spaces.

The internal areas of the building have been left unmaintained for some years which has added to the continued degradation. The areas noted below are considered the most critical:

Basement - Plant Room below Main Pool

Looking at the underside of the pool box, it is clear there is some local seepage of pool water through the concrete - most likely through the original construction joints. This was most noticeable at the junction of the pool where the suspended concrete slab thickened, at a location about two thirds down its length, to accommodate the deeper section of the pool. Overall, the concrete soffit looked in good condition. There was no evidence of rebar staining or large, structurally concerning areas of spalled/ cracked concrete.

The warm environment in the plant space and the use of pool chemical treatments, has resulted in some spalling of the concrete both on soffits and in columns. Water ingress and/or chloride attack has caused the embedded rebar to rust and thus the area around to expand and burst. This combined with poor control of concrete cover leads to insufficient protection to the embedded steel and so break-off of concrete.

The basement floor itself was mixed in condition. There were some isolated areas where standing water had obviously caused staining to the floor. This was noticeable mostly around drainage, manhole and gully points where drainage had once backed-up. Noticeable areas of the salt/ debris deposition were also evident. Water ingress has caused surface delamination to the painted floor with some more severe areas of concrete spalling. In one particular area, the concrete surround of a manhole cover had spalled to the point where the entire section of floor had to be broken out, and replaced with a temporary metal plate. Noticeable 'bulges' in the floor were also evident. It is not clear the exact cause of this, but judging by the location, it's possible that failed drainage runs below the slab may be swelling, causing the soil under to 'lift' the slab up. The basement room itself did not feel humid nor damp, suggesting that the overall waterproofing and general low-level external envelope had not been compromised.

Figure 2 - locally damaged sections of basement floor slab requiring break-out and reinstatement

Figure 3 - seepage through concrete pool box at construction joints requiring treatment

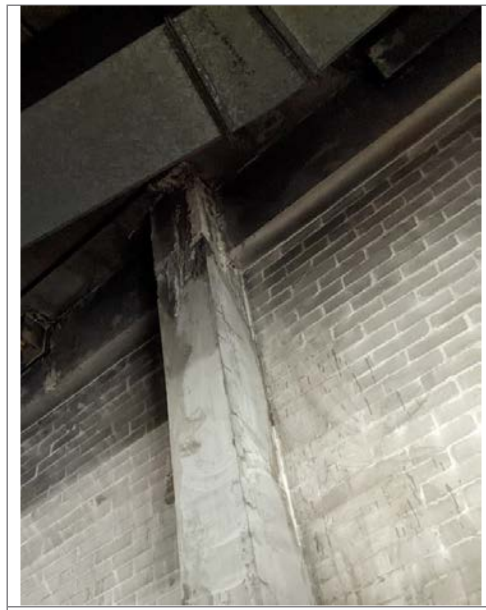


Figure 4 - example of previous, poorly repaired concrete column, basement level

Figure 5 - example water seepage through construction joints Combined with poorly repaired concrete slab

In the areas where concrete has spalled, this can be repaired by exposing the corroded rebar, wire-brush cleaning, and making good the surround with a repair grout/ agent. Repair work has been done in the past it seems, but the workmanship looks of poor quality where a properly bonded repair agent has not been used, resulting in further localised cracking. More specifics are raised in Chamberlain Consulting LLP report of 2018.

Where the concrete pool box has failed, this can be repaired locally by injecting a waterproofing resin repair agent into the concrete to fill propagating gaps or fissures in the concrete section. A specialist will be able to advise on suitable products.

In terms of the basement floor, it would be prudent to undertake a full CCTV survey to understand the drainage layout and condition. This would help establish the cause of the uplift/ bulge in the basement slab. In terms of making good, it is advised that the entire floor is properly condition surveyed once the area is stripped out of plant equipment. Areas of locally cracked concrete can be repaired using a repair/ coating system. Corroded elements of rebar can be repaired by wire brushing, to remove delaminated rust layer, and protected using a blackjack paint coating. More damaged sections of the floor may need to be broken back locally and made good by resin fixing dowel bars and reinstating with new reinforced concrete.

Main Pool Hall

The main pool side floor area was found to be in fair condition. Structurally, there is not much to comment on, with all primary structural members effectively covered behind finishes. Some tiles were found to be cracked with individual 'shedding' of tiles evident. Cracked and lifted tiles were also seen in the pool.

The areas where the various finishes had failed was not consistent and so not thought to be part of a wider structural frame issue. More likely over time, chlorinated, or relatively damp conditions, have combined with stagnant water ingress to cause local failure of the finishes and/or backing mortar.

Figure 6 - main pool hall

Figure 7 - main pool base tiles cracked/ lifted. Pool base requires local concrete repair with new membrane.

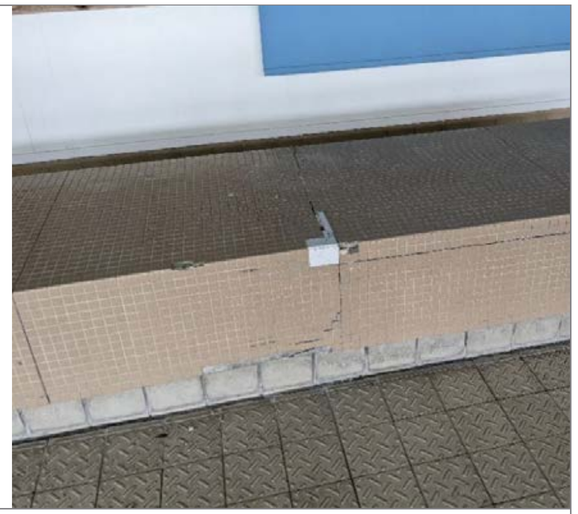


Figure 8 - mosaic tiling finishes on concrete benches cracked. Backing mortar most likely failed/ damaged behind.

The pool itself would benefit from a complete strip of all finishes, and a more detailed survey. It is anticipated that initial repair work would comprise local resin injection to fill cracks, and repair coating to surface-damaged concrete. Following this, a new specialist membrane would be installed with new tiling overlaid.

Viewing Galleries

The viewing gallery levels were in variable condition. Where the adjacent external cladding boards had failed, infiltrating rainwater had caused significant local damage. At the second-floor level, all the original plaster wall finishes have been removed exposing woodwool lining to the concrete spandrel panels. In nearly all areas where this had occurred, the concrete was seen to be in poor condition with rusting embedded steel fixings, conduits, etc. This confirms the findings of the Chamberlain Consulting report who made reference to the known degradation properties of woodchip concrete sandwich panels; loss of fines to concrete resulting in exposed and corroded reinforcement.

The first floor was in better condition, as the internal plasterboard lining had remained providing an element of protection. As elsewhere however, the window cill waterproofing had been damaged allowing for direct penetrating of rainwater, causing staining and damages to internal finishes.

The ceilings to the higher-level viewing gallery spaces were seen to be in poor condition. Large areas were affected, most likely resulting from the humid interior environment, and/ or penetrating water through the roof above. The underside of the 'hy-rib' slabs were visible; the soffit of the trays was noticeably corroded, with local sections of concrete spalled or cracked. Where they remained, the plasterboard ceilings were sagging, presumably where water had ponded above, further emphasising that the roof locally has some leaks. This should be further investigated.

Figure 9 - soffit of the viewing gallery/ roof hy-rib slab, heavily corroded and in need of complete replacement.

Figure 10 - viewing gallery areas, woodwall concrete spandrel panel deterioration.

The mezzanine structures that form the gallery spaces are thought to be independent structures, formed from a grillage of beams and infill 'hy-rib' slabs. It would therefore be possible to replace these levels without compromising the main structural frame. They could be carefully broken out and replaced with a better suited galvanised steel frame with metal deck-concrete floors. This could easily be retrofitted, and fixed back to the inboard-set main columns. A schematic sketch is shown in the Appendix A in terms of a possible arrangement.

External Envelope

The walls are thought to be an in-situ concrete structure tied back to the floor slabs. The inside face was cast against wood wool slabs as insulation and plasterboard, the exterior face being rendered with the mosaic tiles applied. As noted when inspecting the viewing gallery spaces, the concrete spandrel panels from the inside were seen as well weathered with reinforcement showing signs of deterioration.

From the limited external walkaround inspection, the low-level brickwork looked in good condition with minimal signs of cracking, mortar degradation. At higher-level, the external mosaic facing tiles were seen to be 'shelling', with some individual tiles missing. This is presumably from local failure, potentially due to water ingress, damaging the backing mortar causing surface delamination. This is mostly local to areas at joints and corners where thermal and building movements occur.

Figure 11 - view of spandrel panels internally in need of complete replacement.

Figure 12 - missing/ delaminated external facing mosaic tiling.

Given the suggestion to replace the structure to the viewing gallery floors, it would make sense to also replace/ overclad the entire higher-level envelope to ensure watertightness. As part of the break-out, the spandrel panels could be 'punched-out' and replaced with a much more suitable lightweight proprietary insulated framing system. Knocking these panels out (if done carefully), would not be seen as a compromise to the stability of the structural frame.

Where the limited external defects were noted, it would be possible to make good the brickwork by stitching any local cracks with helifix dowel bars and repointing. Where the mosaic tiling had failed, it's suggested that this be removed, exposing the structure behind, make good the outer using a suitable cementitious repair agent and reclad with properly bonded tiling with new mortar.

4 Concrete Degradation

For context, the reasons behind concrete degradation over time can be summarised as:

- Carbonation - a natural process in the concrete, which contains calcium oxide, absorbing carbon dioxide from the atmosphere to form calcium carbonate resulting in a loss of alkalinity in the concrete. This alkalinity protects the steel reinforcement from rusting and so when carbonation reaches the steel it starts to rust. The expansion of the steel as it rusts causes the concrete cover to fall off - spalling, and the loss of steel will affect the strength of the element.
- Chloride attack - can cause rusting of the steel even in alkaline environment if the chlorine is free to move within pore water in the concrete. Rusting of steel due to chlorides may well be concentrated at any cracks with the electrolytic process able to remove a large portion of steel from a local area and so have more potential to lead to loss of element strength than rusting as a result of carbonation
- Sulfate attack in concrete causes concrete deterioration due to the expansive growth of ettringite or thaumasite within a concrete surface, often leading to the formation of surface-parallel cracks infilled with sulfate reaction products.

5 Previous Inspections/ Reports

Through the years, a series of inspections and reports have been prepared for the London Borough of Tower Hamlets to advise on the building's current condition. A brief commentary surmising the findings follows.

2003 Report – As recorded in the 2017 Chamberlain Consulting Report

This report concluded that there was no evidence from testing that the concrete contained either high alumina cement or alkali reactive aggregate - two possible risks to concrete durability.

Carbonation was measured and generally recorded as about 5mm with a maximum value of 15mm being noted apparently within the plantroom.

The summary suggested that the chloride content of the concrete was less than 0.4% by mass of cement except in the plantroom area where the maximum was 1.9%. The measured sulphate content was about 0.45% by mass of cement

The chemical analysis suggested that the concrete contained an average of 342kg/m^3 of cement.

Martech Ltd Targeted concrete condition report 2007– As recorded in the 2017 Chamberlain Consulting Report

This report followed up the 2003 investigation and Chamberlain Consulting's summary includes a table of carbonation test results, these were carried out generally within the plantroom and training pool areas.

Ref	Description	Carbonation depth	Cover	Notes
TA1	Column – at spall	unclear	30	Heavily corroded
TA2	Column	10 - 15	38	Clean and passive
TA3	Beam	5 - 10	10	Clean
TA5	Soffit	10 - 15	13	
TA6	Beam	10 - 15	28	Clean and passive
TA7	Column	5 - 10	54	Clean and passive
TA8	Column	<5	42	Clean and passive
TA9	Soffit	15 - 20	10	Surface corrosion
TA10	Column	<5	30	Clean and passive
TA12	Soffit	20	10	Surface corrosion
TA13	Column	<5	30	Clean and passive
TA14	Soffit – at spall	15 - 20	13	Heavily corroded
TA15	Beam – at spall	>30	15	Heavily corroded
TA17	Column	35 - 40	45	Clean and passive
TA18	Beam	<5	29	Clean and passive

This showed several areas where carbonation had reached the steel reinforcement; when the alkalinity of the concrete is reduced this will in particular allow chloride corrosion to progress more quickly. There is also a summary of chloride testing split into the basement and lower gallery, training pool, levels.

Basement	Chloride Content %		
	Minimum	Maximum	Mean
Column	0.15	1.73	0.82
Beam	0.17	1.01	0.59
Soffit	0.30	0.40	0.35

Lower Gallery	Chloride Content %		
	Minimum	Maximum	Mean
Column	0.08	0.23	0.15
Beam	0.17	2.75	0.97
Soffit	0.19	0.34	0.24

These figures are based on an assumed cement content of 14%, approximately 336kg/m^3.

Infrastruct Report 2018

Testing for carbonation is summarised where full information was available - so not all test results are shown, the dimensions are all in mm. Note - the reference numbers do not match those of the 2007 report.
All external testing - where the concrete is covered by tiling showed negligible carbonation.

Ref	Description	Carbonation depth	Cover horizontal	Cover vertical
TA2	Second floor gallery floor	14		57
TA3	Second floor gallery parapet	12	37	31
TA4	Second floor gallery column	3	63	59
TA6	Second floor gallery column	4	61	69
TA9	Second floor gallery parapet	2	31	37
TA10	Second floor gallery parapet	28	51	56
TA11	Second floor gallery column	14	74	58
TA12	Second floor gallery floor	18	68	65
TA13	Second floor gallery floor	9	63	67
TA14	Second floor gallery external wall	2	62	45
TA15	Second floor gallery column	2	54	52
TA17	Second floor gallery parapet	34	31	41
TA20	First floor gallery column	8	21	63
TA21	First floor gallery column	0	50	54
TA22	First floor gallery parapet	55	49	54
TA23	First floor gallery floor	3	76	79
TA29	Second floor gallery internal wall roof	2	34	41

This shows that apart from within the perimeter parapets the depth of carbonation is quite limited and therefore most of the concrete still has a lifetime of another 50 years before this would be a cause for concern. It should be possible to identify the local areas where this is a problem and remove and replace the concrete that has been carbonated.

The chemical analysis of the concrete included testing for chlorides and sulphates showed that the proportion present was as follows:
Maximum chloride content 0.27% by mass of cement and only 0.07% for any external samples.
Maximum sulphate content 0.55% by mass of cement

The chemical analysis suggested that the concrete contained 705 kg/m^3 of cement.

The report concludes:
"In summary the chemical results do not highlight any areas of the structure that are at a heightened risk of corrosion or sulphate attack"

Commentary on Reports

The 2007 report clearly recommended that concrete repairs were required and this work could have formed part of the 2008 refurbishment noted in the Building Services report. The Chamberlain Consulting report of 2018 considers that only two repairs were made to columns within the basement. Clearly the reports have made clear however that the pool environment, in particular the presence of chlorides that are commonly used in pool maintenance could be detrimental to the concrete building structure.

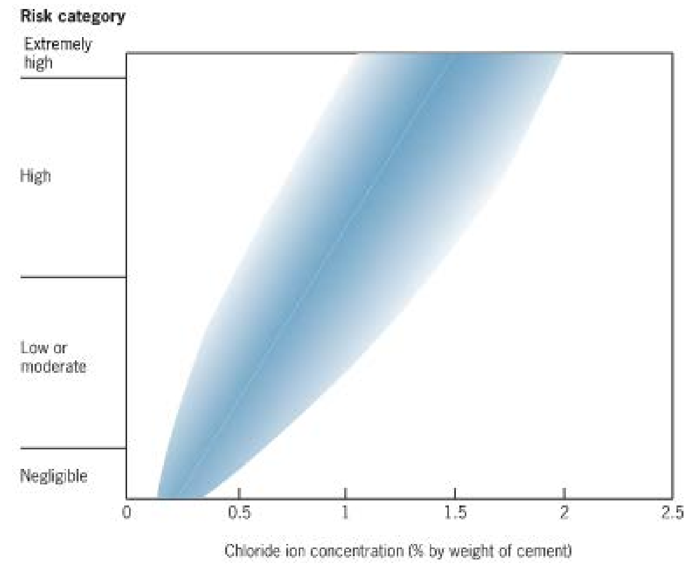


Figure 5 Estimated risk of steel reinforcement corrosion associated with ingressed chloride in the absence of carbonation

Figure - Graph lifted 2018 Infrastruct Report (BRE Digest 444)

The 2018 Infrastruct Report includes, as its figure 6, the above Figure 5 from BRE Digest 444. From this it can be seen the risk of chloride corrosion is expected to be low or negligible within the upper areas of the building where chloride content is low with only two measured concentrations of 0.27%. However it also makes clear that for the lower areas of the pool where testing was carried out in the early 2000s the risk of corrosion is likely to be at least moderate and potentially high.

If advice from BRE Digest 444 was to be followed then a regular series of maintenance inspections of a concrete structure would be planned to allow an accurate picture of the risks to be established. This has not happened and the Infrastruct 2018 report has no commentary on the basement concrete – although the Chamberlain Consulting report notes that previous concrete repairs are of poor quality.

There are some confusing comments about poor control of concrete cover in the Chamberlain Consulting report – but no commentary on the quality of the original concrete construction. In fact the recorded concrete cover where noted would appear generally to be at least that which would have been recommended when the pool was built. In the pool area there are some areas of low cover 10 to 15mm was noted but elsewhere actual covers recorded in the reports are generally more than 30mm. Achieving this cover and the use of concrete made with around 350kg/m^3 of cement indicates that the original construction was of good quality. It may well have benefited from the supervisory regime of the 1960s when the presence of a Clerk of Works on site to review the quality of work and check it against the design specification was quite common.

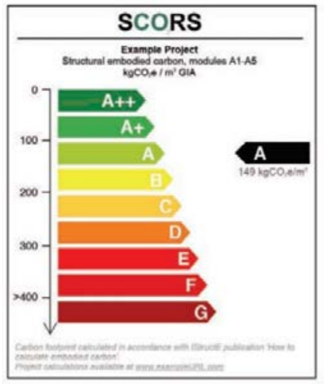
All the reports expect that the building can be maintained with targeted local repairs combined perhaps with the use of corrosion inhibitors and perhaps better control of any chlorides used for pool maintenance. A degree of concern about chloride corrosion however perhaps ought to be noted. For the sort of damp and fairly aggressive environment, current design practice for concrete with around 340 kg/m^3 of OPC would be to have a cover of 45mm for a 50 year design life or 60mm for a 100 year design life; more than the cover recorded in the basement.

6 Embodied Carbon considerations

It is important to consider the environmental implications when considering the direction to go with these schemes. As an industry we are directly responsible for a significant proportion of global carbon dioxide emissions and being able to calculate and report embodied carbon accurately is a crucial step in being able to tackle the problem.

This embodied carbon is measured in $kgCO_2e$ and is standard across all industries. In an effort to standardise this measurement in relation to performance and size of the project, this value is given per unit area: $kgCO_2e/m^2$. The unit area is measured as the gross internal area of the structure.

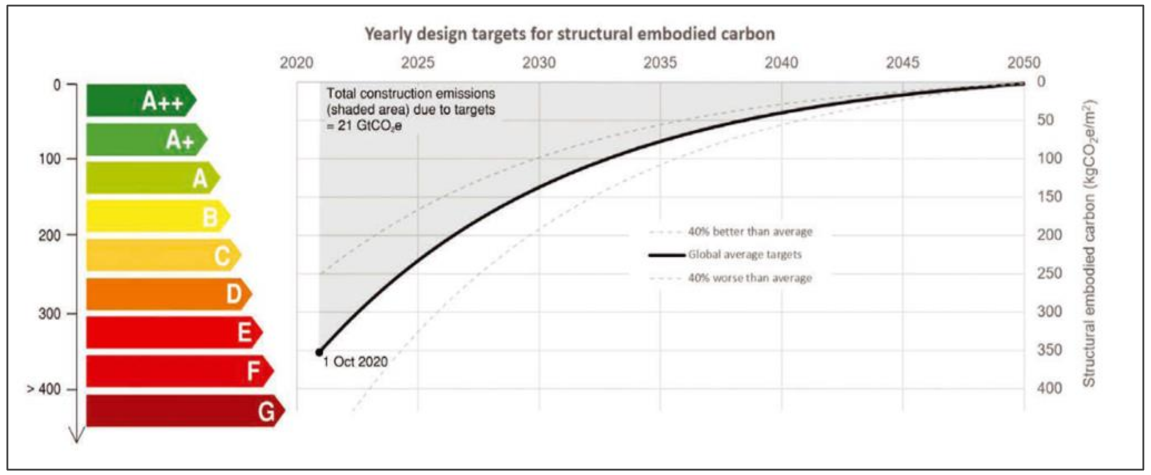
The SCORS system is used by structural engineers, industry wide to gauge where their project falls in terms of embodied carbon.



This system provides standard measure to rate an option by. Considering the structural components of a project from cradle to completion.

This includes the embodied carbon of the primary structure, superstructure plus substructure, calculated in accordance with the IStructE guidance document How to calculate embodied carbon.

The below figure shows the industry targets set by IStructE for embodied carbon. This curve is designed to achieve 'net-zero' by 2050, with a target of 150 $kgCO_2e/m^2$ for all structures by 2030, and the area under the graph is 21 $GTCO_2e$, which is the allowance of additional carbon the atmosphere can tolerate from the global construction industry if limiting temperature rises to 1.5°C.



For this scheme three options have been considered.

Option 1 – Complete demolition and removal of the existing super and substructure, constructing a like-for-like structure on the same site for the same scale and purpose. This includes the construction of a new basement and retaining structure, new foundations, and new superstructure.

Embodied Carbon – 528 $kgCO_2/m^2$

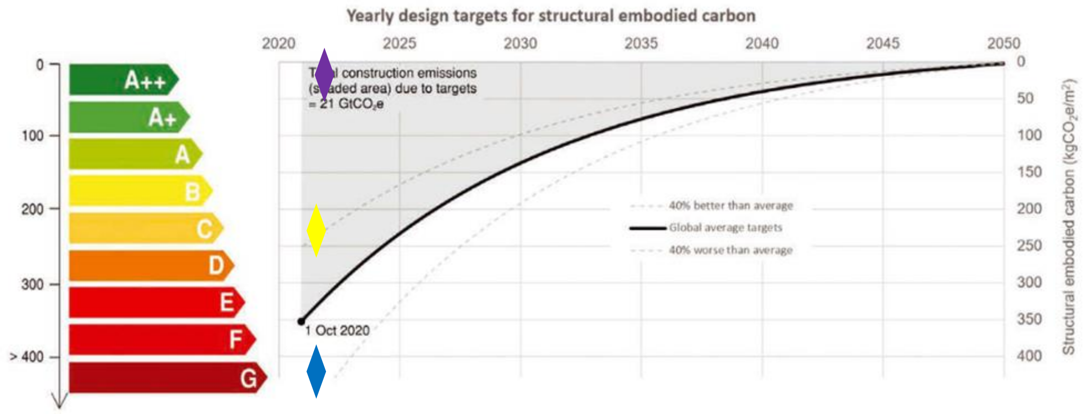
Option 2 – Demolition of the existing structure to ground level only. For this option, the existing foundations, basement, and basement retaining structure are maintained. A new superstructure is built above this, replacing the existing superstructure like-for-like.

Embodied Carbon – 245 $kgCO_2/m^2$

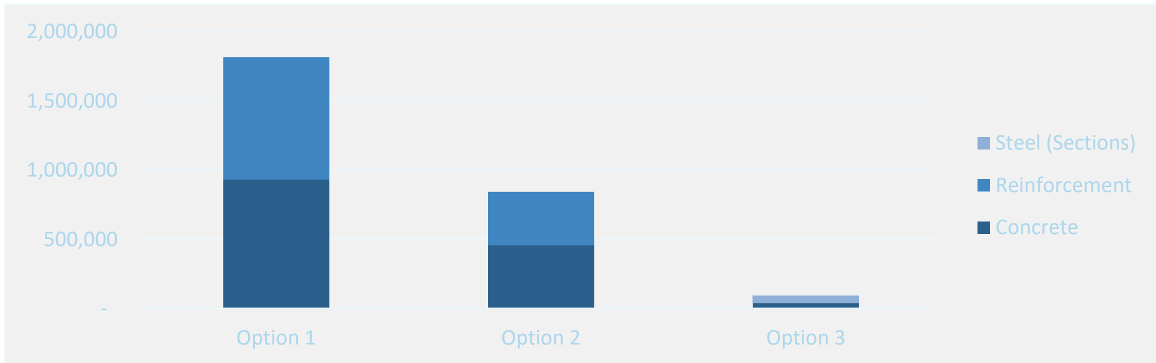
Option 3 – Replace the existing walkways at levels 1 and 2 and the reflective rood sections. As highlighted in section 3 of this report, complete structural replacement of walkways would be the most suitable option; these appear beyond repair. In this option only the existing walkways are replaced, maintaining all other existing super and substructure.

Embodied Carbon – 32 $kgCO_2/m^2$

Below shoes how the schemes analysed compare with the industry wide targets set by IStructE. As a practice P&M have set their own target of < 300$kgCO_2/m^2$ for 2021 reducing by 10% every year, to reach 150$kgCO_2/m^2$ by 2030, in line with Net-Zero targets.



The chart below shows the raw total embodied carbon values for each option.



7 Recommendations/ Conclusions

The defects observed as part of our site visit were mostly cosmetic, and representative of the building's age and lack of maintenance. Poor original detailing, lack of regular maintenance and life-expired materials have all led to the building's current state.

In reviewing findings from prior reports, it appears previously noted defects have worsened in the last two years while the building has been closed. Proper maintenance strategies are key for a building of this type given the operational environments.

The conclusion from our inspection, and the existing reports based on intrusive investigations, is that the main structural frame can be retained and repaired to have a design life of a further 50 years if well maintained. While no intrusive investigations were carried out, there is nothing to suggest that the structural frame cannot be retained as part of a repurposing effort.

Key structural works to make the building fit for use again would include:

- local repair to concrete surfaces
- specialist resin injection to retrospectively make the key concrete elements watertight
- rebuilding of the perimeter viewing gallery floor and roof areas

These works, combined with a complete overhaul of the external envelope including roof cladding and a new pool level membrane, would go a long way to addressing the structural key issues.

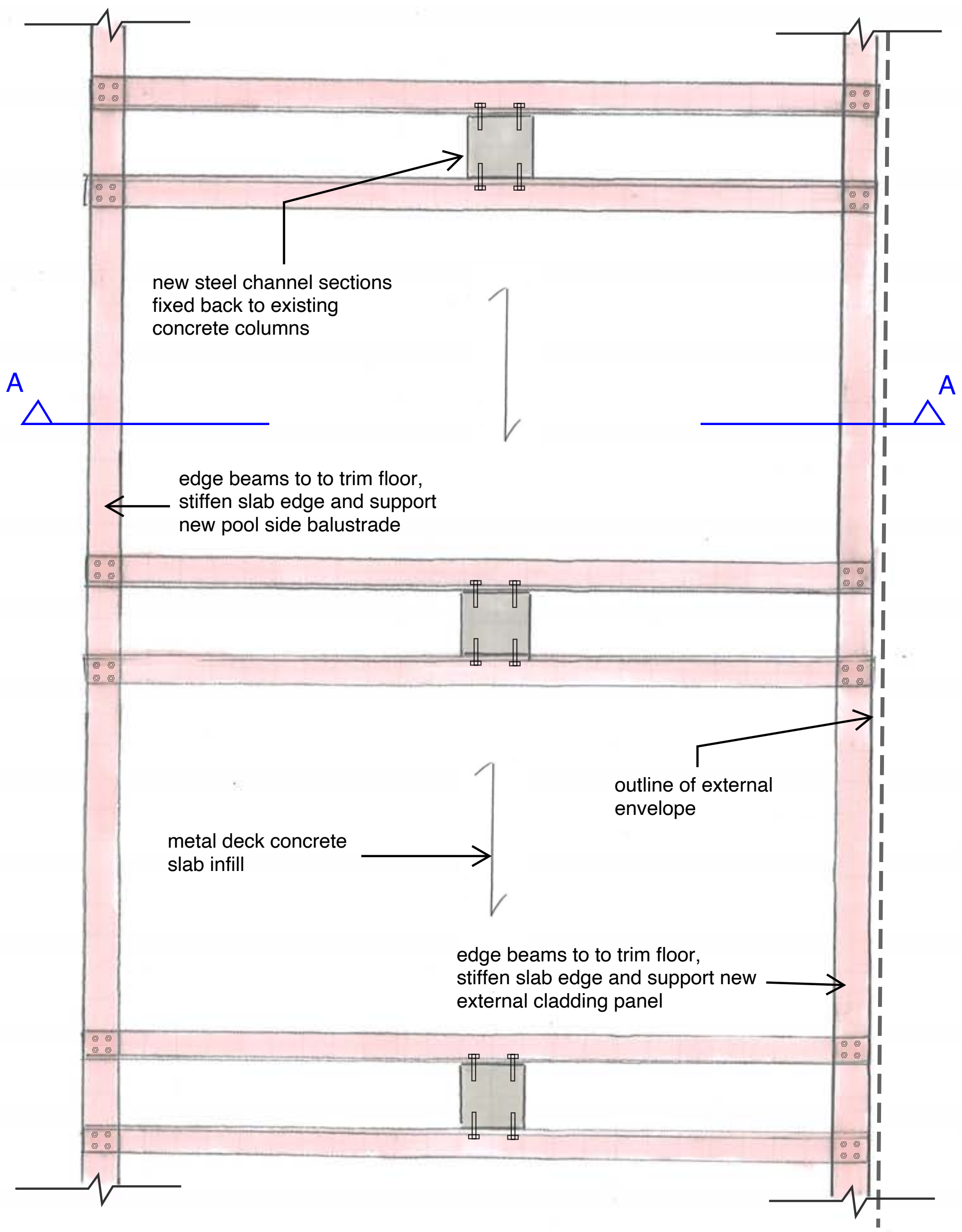
Notwithstanding all the above, much more testing/ surveying, including the strip-out of the finishes to expose the key structural elements (most of which are concealed), ought to be fully considered before the building is considered structurally 'unworthy'.

Appendix A

Replacement viewing gallery floor and roof areas, Proposed structural repairs strategy

PRICE& MYERS

Job No. 30213 | Page SK_01 | Rev
Date 22.03.2022 | Eng MB | Chd PT
Job St George's Leisure Centre, London

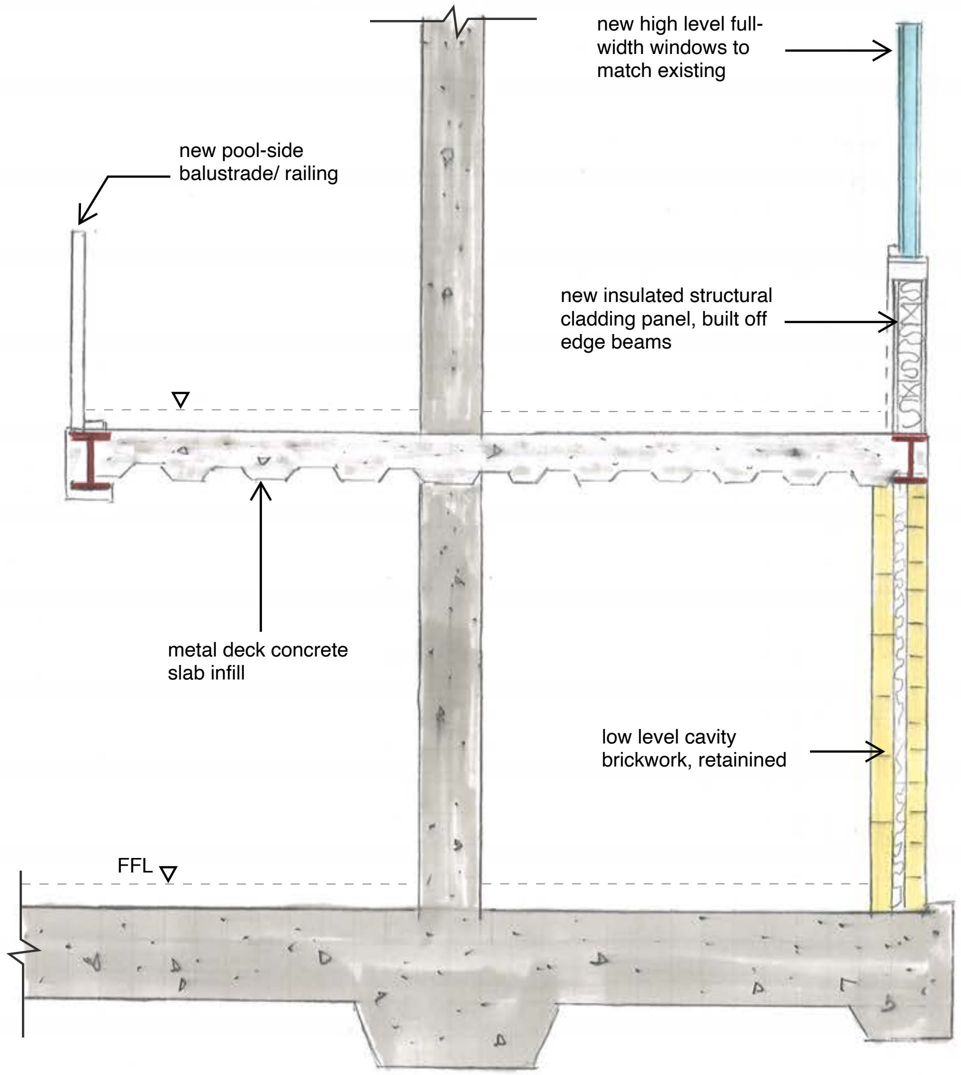


VIEWING GALLERY REPLACEMENT
STRUCUTRAL LAYOUT (PLAN)

Indicative only - for information

PRICE& MYERS

Job No. 30213 | Page SK_02 | Rev
Date 22.03.2022 | Eng MB | Chd PT
Job St George's Leisure Centre, London



SECTION A-A:
VIEWING GALLERY REPLACEMENT

Indicative only - for information

The Stables
Meath Green Lane
Horley
Surrey
RH6 8JA
T: 01293 821345
E: energy@iso.co.uk
www.isoenergy.co.uk

Potential project costs and return on investment consultation document

Mr John Desmond
St George's Leisure Centre
221 The Highway
London

E1W 3BP

Project Name: E1W 3BP - St George's Leisure Centre

Please note: This is not a quotation, it is a document for discussion.

Prepared by: Bertram Beanland
On: 23th March 2022
Reviewed by: Edward Howes

Introduction

Further to our site visit and subsequent analysis of the information that you provided, we are writing to provide a possible outline solution for the heating, hot water and pool requirements at your client's property. These initial suggestions should be seen as a starting point and subject to change as plans develop. It is difficult to predict exactly at this stage what the total costs of this project may be so please be aware that all estimates are just that – estimates and subject to revision as the project scope becomes clearer. We have broken down likely costs into materials and labour. For transparency, we have also tried to include all the costs we believe you are likely to incur including those not directly under the scope of isoenergy.

All items are shown without including VAT as the applicable rate of VAT depends on your circumstances. However, it is likely to be 20% for commercial properties.

We are happy for our scope to be extended or constrained depending on your other contractors' requirements.

The overall site requirement is potentially three-fold as follows:

1. To provide spatial heating to the building
2. To provide domestic hot water (DHW) as above
3. To provide indoor swimming pool water heating

This document outlines our proposed solution to these requirements.

Background and Broad Concepts

The property is a leisure centre in an urban environment with an approximate internal area of 3000m², heated by dedicated gas-fired boiler plant. It is understood that the heating distribution is via a mix of blown ducted air or radiators in a few rooms.

It is recommended that the heating system in the building be addressed to maximise the efficiency of any system that is put in to heat the space.

We have analysed the property and we estimate that the property will have a peak thermal load of approximately 270kW for space heating and DHW with an annual energy consumption of about 650,000kWh for heating and hot water.

The pools would require and additional 230kW as they are uncovered. If they were covered when not in use, the maintenance heat load would drop to around 140kW. As it stands, we estimate the pools annual energy consumption to be around 1,100,000kWh.

Proposed Heating Solution

Ground source heat pumps have been immediately discounted as an option due to the considerable lack of outside space to locate any collector array.

Therefore, at this stage, and for further discussion, we recommend the following possible scenario:
The heating and hot water loads of the property could be covered by a twin 250kW air source heat pump connected into a 3,000 litre domestic hot water tank and a 5,000 litre heating buffer tank.

At this stage we have assumed that the air source heat pump units will be located on the outside of the building. Either at high level on the flat roofs, subject to structural design or in the car park to the rear.

The acoustic output of the units needs to be taken into consideration.

Potential system costs in the region of £280,000-£350,000.

Proposed Electrical Solution

As the majority of the roof above the pool is curved, there is no ability to cover this area with solar panels.

The only option therefore is to use the flat roof to the right hand side outlined in red below.
There appear to be sky lights on this roof, so these will need to be removed to allow for solar panels to be installed.

If the are outlined in red can be used, then approximately 124 panels could cover that space totalling 45.8kW.
This has the capacity to provide 41,000kWh of electricity per year.

The weight of this array would be between 8-10 tonnes.

Potential system costs in the region of £55,000-£60,000.

Considering the site as a whole, it is worth consolidating the energy plants for the pool and the building to maximise the value of the investment in heat pump and solar infrastructure. Heat would then be distributed to the various circuits from the main basement plantroom.

In summary, the factors influencing the design in this case include, the availability of sufficient electrical capacity, the required swimming times, the availability of a suitable location for all the plant, the volume of DHW storage required, and optimising any potential to access government grants or subsidies.

Who are isoenergy?

isoenergy is one of the most respected renewable and sustainable energy practitioners in the UK with very specific experience with commercial properties. The company is technology and brand independent and is therefore able to make recommendations on technology deployment in a completely unbiased way. All the installation personnel are directly employed ensuring complete control over quality and reassurance over site safety is provided by our CHAS compliance.

Our company is MCS accredited in multiple technologies and works to ensure that, where grant or subsidy potential exists, only MCS accredited hardware is specified as this is frequently the baseline for funding eligibility. In addition, the company has experience in assisting with funding applications and with the preparation of sustainability statements in support of both planning consent applications. isoenergy also carries full PI insurance in support of both the design and installation of renewable energy systems.

We deliver a complete turn-key solution against most sustainable energy requirements. The fact that our systems are designed, specified, installed and commissioned by our in-house teams ensures that we can take complete responsibility for the outcome. Our policy is to present full project costs with no hidden extras and to only work with hardware suppliers who can provide the quality that these long-term energy investments demand. Whilst other providers (and hardware manufacturers) may offer lower specification solutions, our proposals are based on our very significant experience working with urban properties, mixed heating emitter circuits and air source collectors and the unique circumstances that each provides when renewable and sustainable energy systems are being considered.

National Coverage

isoenergy operates nationally out of two offices.

Head Office

The Stables
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Surrey
RH6 8JA

T: 01293 821345
E: energy@iso.co.uk

Western Office

Unit 59 Basepoint Business Centre
Oakfield Close
Tewkesbury Business Park
Tewkesbury
GL20 8SD

T: 01293 827702
E: energy@iso.co.uk

Other topics to consider

1. The running costs and carbon emissions of the system installed depends on the efficiency of the system which, in turn, depends on:
   a. The size of the ASHP evaporator and noise levels.
   b. The quality of the equipment chosen.
   c. The adequacy of the installation of the buffer tanks and other plant room equipment.
   d. The size and suitability of the “heat emitters” in the property. We have extensive experience of retro-fitting renewable energy systems into old properties with existing radiators as well as into new build houses with underfloor heating systems. We are well-placed to advise what will work and what will be efficient.

2. Tariff selection – It is important to ensure that you are on the cheapest tariff for electricity once a heat pump is installed. The complete change to the heating paradigm with the heat pump always on, is more efficient than cycling the building twice in each twenty-four hour period but ensuring you are on the most cost-effective tariff for your electricity will have a significant effect on overall running costs.

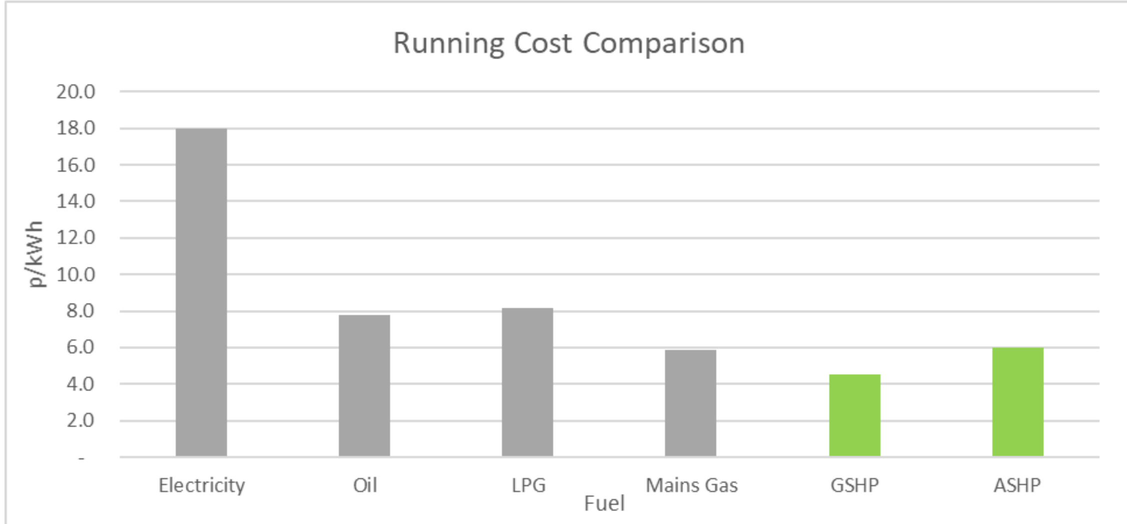
3. Lighting – Low energy lighting systems, specifically LED, should be considered where appropriate. These incur significantly lower running costs (up to a 90% reduction on normal incandescent or halogen bulbs) and put out little heat to the back, which is especially important in insulated roof spaces in period properties as this reduces fire-risk. Low energy lighting will reduce electricity costs faster than any other option including insulation.

4. Insulation levels in the building may not be up to current regulations; it is advised that all available steps should be taken to improve the insulation levels wherever possible. We recommend installing the highest levels of insulation available as this represents the best possible value for money when preparing any house for a renewable energy solution.

Running cost comparison

The following table shows the approximate costs of various forms of fuel. A note of warning is in order: fuel costs can vary by large amounts over short periods of time and always depend on the agreements that you have been able to negotiate and may also depend on your usage and region of the country.

	Price	Unit cost / kWh	Efficiency	**Cost / kWh**
Electricity cost	18 p/kWh	18 p/kWh	100%	**18 p/kWh**
Heating oil	60 p/litre	6.2 p/kWh	80%	**7.8 p/kWh**
LPG	60 p/kg	6.9 p/kWh	85%	**8.1 p/kWh**
Natural gas	5.0 p/kWh	5.0 p/kWh	85%	**5.9 p/kWh**
GSHP	18 p/kWh	18 p/kWh	400% (SPF=4.0)	**4.5 p/kWh**
ASHP	18 p/kWh	18 p/kWh	300% (SPF=3.0)	**6.0 p/kWh**



Based on these numbers, the following running cost comparison is predicated:

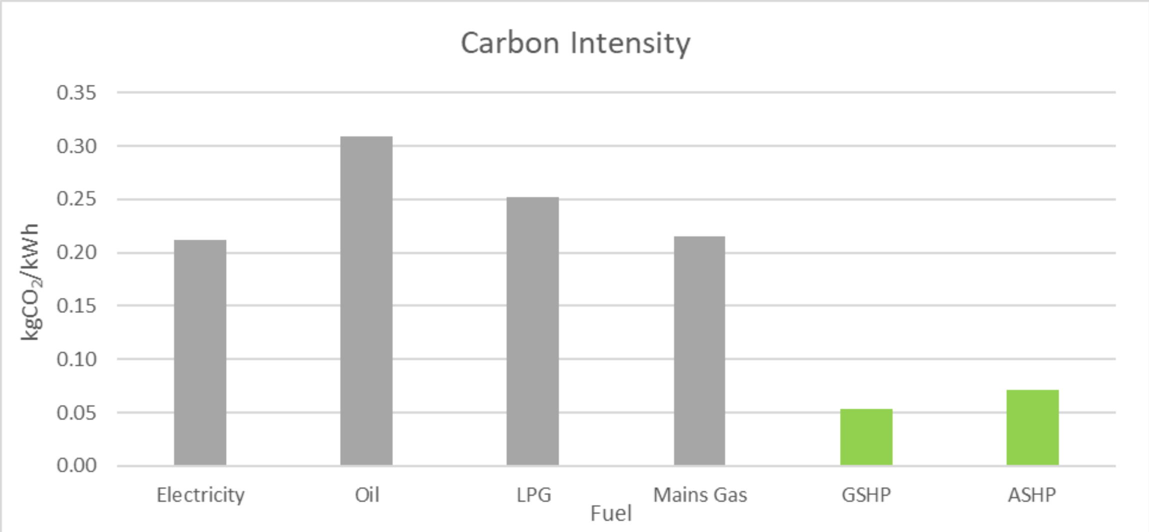
Annual Energy Usage (kWh)	**Heat Pump Running Cost***
1,750,000	£ 153,000

*based on 25p/unit purchase price for electricity

Carbon Dioxide Reduction

In addition to the running cost comparisons shown above, the carbon footprint of a heat pump system will be significantly lower than a conventional fossil-fuel system. The following table shows the carbon intensity of a variety of domestic heating fuels:

	Conversion Factor (kg CO_2 / kWh)	Efficiency	**Carbon Intensity (kg CO_2 / kWh)**
Electricity	0.21233	100%	**0.21233**
Oil	0.24677	80%	**0.30846**
LPG	0.21449	85%	**0.25234**
Mains Gas	0.18316	85%	**0.21548**
GSHP	0.21233	400% (SPF=4.0)	**0.05308**
ASHP	0.21233	300% (SPF=3.0)	**0.07078**



This includes an allowance for the fact that electricity is considered to be a "dirtier" fuel due to transmission losses, etc. Figures have been taken from government conversion factors for company reporting of greenhouse gas emissions: https://www.gov.uk/government/collections/government-conversion-factors-for-company-reporting.

Based on these numbers, the following reduction in CO_2 emission levels is predicted:

Annual Energy Usage (kWh)	Alternative Carbon Emissions ($kgCO_2$/year)	Heat Pump Carbon Emissions ($kgCO_2$/year)	Potential Reduction ($kgCO_2$/year)
1,750,000	377,094	123,859	253,235 (67%)

Summary

I trust that the above is of some help as a starting point. At this early stage, we have erred on the side of caution and some items could well be over-specified. If you are interested in proceeding further, we will produce a full quotation after further analysis and detailed discussions on options and your client's specific requirements.

Please let us know if you have any questions, comments or if you would like to meet again to progress to the next stage.

I look forward to hearing from you.

Yours sincerely,

Bertram Beanland
isoenergy

Appendix

Key Design Factors That We Include in Our Costing

isoenergy endeavours to provide a fully inclusive service with all costs shown. Our clients can be assured that there are no hidden extras or additional equipment or works that have been "omitted" or should have been included. We try to provide the best solution possible, one that will be inexpensive to run and will last and perform beyond expectations.

When installing renewable energy systems the long term performance and running costs are critical. A poor quality solution or a poorly designed or installed system will cost many times more to run than a well designed and installed system. High quality equipment and small design details can make a big difference.

For this reason isoenergy only install the highest quality solutions and we pay great attention to each individual design. Our engineering expertise and our knowledge of installation design is unsurpassed in the UK.

Our clients can be assured that their installation will be designed and installed to the highest of standards and perform as designed to give years of service at the lowest possible running cost.

Engineering Design

Our design process includes calculating pressure losses and flow rates. These are critical design points of a successful installation and if not correctly calculated are the area where most systems fail.

If the flow rates are insufficient or the pressure losses too great the system will not work as intended. To correct this, the circulation pumps will need to be increased in size, and therefore the running costs will be greater.

We spend as much time as necessary to ensure that our designs are as efficient as practically possible. Included in our design costs are Computer Aided Design (CAD) layouts of Piping and Instrumentation Diagrams (P&ID) for the Plant room, ground array, electrical schematics and controls. These drawings are delivered at an early stage and included with our installation packs on completion. We allow for a specified number of design revisions of the system within the quotation. Changes at the client's request, resulting in the need for additional drawings to be issued, will incur an additional hourly fee subject to account manager's discretion.

Heat Pumps

Before recommending or selling a manufacturer's heat pump, we will have tested it in our own working test centre. We have test facilities for six different machines at any time and our preferred machines are:

- Chosen for robustness of technology (for example we favour Copeland compressors because of their robust design and excellent performance).
- Chosen to be suitable for the installation tailored to each client and matched to UK climatic conditions.
- Selected independently from heat pump manufacturer's recommendations as we rely on our experience not the manufacturer's figures.

Ground Loops for Ground Source Heat Pumps (GSHP)

A critical element of a successful GSHP installation is the ground loop design and construction.

Often deficiencies in this area manifest themselves after three or four years of use. Too small or too compacted a ground array and the ground will cool and eventually freeze due to over extraction. Almost equally important is the flow through the pipes. Design criteria need to include pressure losses and the turbulence in the pipes which effects collector performance and the size of the circulation pump.

Our ground array designs include the highest quality manifolds which include individual loop isolation, individual flow meters and individual balancing valves. These ensure optimal efficiency from the collector array by maximising performance of the ground loops and minimising circulation pumping capacity and operational cost.

Circulation Fluid - Glycol

First the collector array is flushed with a biocide to sterilise the system. Then the ground array is charged with a glycol/water mixture (the glycol may also be referred to as antifreeze) to which we add a bacterial growth inhibiter to maximise the life of the glycol. Some glycols can be harmful to river and ground water in the event of a leak of accidental discharge. For this reason, we only use non-toxic, biodegradable glycol which is not a notifiable chemical and which is therefore of no immediate concern to the Environment Agency should there be a leak or accidental discharge. This glycol is more expensive but this is in keeping with our commitment to the environment to use products with low or zero environmental impact.

Upon commissioning we provide pressure test certification which is included in the system installation information pack.

Evaporator Sizing - Air Source Heat Pumps (ASHP)

When selecting an ASHP the size of the evaporator is critical, although this can be the most expensive component in a heat pump. Large evaporators are expensive but, this is not an area to compromise on.

The larger the evaporator the less energy is being extracted per sq.cm. The larger the area, the less often the heat pump will need to defrost.

We only select air-source devices which have well balanced evaporator to extraction ratios resulting in enhanced performance in the UK winter climatic conditions where air temperatures are not generally too low but where humidity is generally high.

Hot Water Tanks and Buffer Cylinders

- The hot water tanks we use are to our own specifications and are designed for optimised heat pump or solar thermal system compatibility and efficiency of recovery.
- All heat pump systems should include a buffer cylinder to optimise efficiency by improving control over the number of compressor starts per hour. Compressors take a high current draw when starting so electrical consumption is minimised if the number of starts per hour is regulated.

Plant Room Installation and Plumbing Materials

- Pipework is sized for efficiency and is normally completed in copper and or steel, which is the most efficient and durable pipework but which is significantly more expensive than plastic equivalents.
- We normally install filling units.
- There is a wide selection of other components: pumps, expansion vessels, etc. that are sized and selected to suit each individual scheme, we always endeavour to specify the most efficient equipment practical, especially circulation pumps which will inevitably cost more to purchase but much less to run in the long term compared to cheaper alternatives.
- Isolation valves and filter ball valves are installed throughout the system for built-in serviceability. Commissioning valves on the flow and return of each unit, and G3 kits, expansion vessels, filters, etc. are included in the price.

System Control

- The key requirement for maximum efficiency is proper control of complex systems.
- We aim to configure the system for optimal performance. This is undertaken at commissioning stage. We suggest a ‘bedding in period’ to check the system has settled and is working efficiently. If a maintenance contract is taken out with us, we normally schedule a service visit within three-months of commissioning.

Commissioning and Training

- Upon completion of installation and commissioning we will schedule a training session with you, during which we will explain the components of the system to you, how to use it efficiently and what to do when you wish to adjust settings.
- To assist you and for future maintenance and as part of our Health and Safety requirements we label our plant room components and pipe work and provide valve lists.
- We take you through the user and maintenance manuals. We normally only plan for one training session in our quotations. If you feel it necessary we can arrange further, chargeable training sessions, particularly for large commercial projects.

Project Management

Like all good installation companies we employ a project management team to ensure proper planning, smooth installation, delivery and commissioning.

Microgeneration Certification Scheme (MCS)

The MCS is an internationally recognised quality assurance scheme which demonstrates the quality and

reliability of approved products and installers by satisfying rigorous and tested standards.

The MCS was designed with input from product and installer representatives and it demonstrates the quality and competency of installation and design. iso**energy** is certified as an MCS installer in multiple technologies. Details are available upon request.

Installation Pack

Installation packs are issued after the final stage payment is made and include:

- Final CAD drawings and P&ID layouts as actually built.
- Operation and Maintenance manuals for the relevant principal products and controller and diagrams including how to clean a filter ball valve.
- We include a full valve list and details of the components used including serial numbers.
- Certificates relating to the installation.

Pipework Insulation

It is essential that all new plant room pipework be insulated to meet the current MCS standards and building regulations. We routinely work with three types of insulation:

- silver Isover insulation used in commercial plant rooms.
- black Armaflex code 0 25mm insulation used on the cooling side.
- grey Climaflex generic insulation for heating /hot water side.

While iso**energy** can provide services to insulate pipework, insulation services can frequently be procured locally at lower cost. Unless otherwise stated, iso**energy** will take responsibility for all brine-side insulation where the quality is critical to the protection of the fabric of the building or to the protection of other wet services in the path of the collector array and flow and return trenching.

Advice on the insulation of the pipework on the delivery side of the heat pump can be provided upon request. Similarly, a quotation for iso**energy** to carry out these works can also be provided upon request.

The philosophy of high quality pipework insulation should be carried across to all distribution circuits where access makes this possible. Minimising losses in both heating and DHW distribution is an essential part of any energy reduction strategy. Heat losses in DHW secondary return circuits, in particular, are frequently underestimated.

Insulation

Insulation is the most important part of any heating system. The more the better when it comes to the interior walls of your property. It is sometimes economically appropriate for insulation to be carried out by a specialist contractor. In this event, it is vital that industry standards are met including those set out in MIS 3005 v5.0.

Energy Assessment

We undertake Energy Assessments based on the estimated annual use, whether your property is existing, or new build. We assess how much energy is required from renewable sources and compare this against gas, electricity or oil dependent upon what is available.

In line with MCS requirements we will advise on how efficient the proposed system will be and ensure that it meets your energy requirements.

Maintenance and Warranty

If a maintenance contract is taken out, we may return within 3 months of commissioning the system to ensure that it is running efficiently. Manufacturers’ warranties are fully supported. Should you require a maintenance agreement please let us know.

Health and Safety

In accordance with Constructor Design and Management regulations our engineers all carry the appropriate Construction Skills Certificate Scheme (CSCS) cards. We undertake Risk Assessment Method statements and can provide these upon request for larger commercial projects.

Legionella

Legionella is a naturally occurring bacteria living in water. Legionnaire’s Disease occurs when droplets of contaminated water are inhaled. The risk is significant when the temperature of water is kept between 20 and 45 degrees and is reduced when water is heated above these temperatures. We ensure that our systems are legionella compliant in their design.

Permitted Development and Planning Permission

Ground Source Heat Pumps

The installation of a ground source heat pump or a water source heat pump on domestic premises is usually considered to be permitted development, not needing an application for planning permission.

If you live in a listed building or a conservation area you should contact your council to check on local requirements.

Air Source Heat Pumps

From 1st December 2011 the installation of an air source heat pump on domestic premises is considered to be permitted development, not needing an application for planning permission, provided ALL the limits and conditions listed below are met.

These permitted development rights apply to the installation, alteration or replacement of an air source heat pump on a house or block of flats, or within the curtilage (garden or grounds) of a house or block of flats, including on a building within that curtilage. A block of flats must consist wholly of flats (e.g. should not also contain commercial premises).

Limits to be met:

- Development is permitted only if the air source heat pump installation complies with the Microgeneration Certification Scheme Planning Standards (MCS 020) or equivalent standards.
- The volume of the air source heat pump's outdoor compressor unit (including housing) must not exceed $0.6m^3$.
- Only the first installation of an air source heat pump would be permitted development, and only if there is no existing wind turbine on a building or within the curtilage of that property. Additional wind turbines or air source heat pumps at the same property requires an application for planning permission.
- All parts of the air source heat pump must be at least one metre from the property boundary.
- Installations on pitched roofs are not permitted development. If installed on a flat roof all parts of the air source heat pump must be at least one metre from the external edge of that roof.
- Permitted development rights do not apply for installations within the curtilage of a Listed Building or within a site designated as a Scheduled Monument.
- On land within a Conservation Area or World Heritage Site the air source heat pump must not be installed on a wall or roof which fronts a highway or be nearer to any highway which bounds the property than any part of the building.
- On land that is not within a Conservation Area or World Heritage Site, the air source heat pump must not be installed on a wall if that wall fronts a highway and any part of that wall is above the level of the ground storey.

In addition, the following conditions must also be met. The air source heat pump must be:

- Used solely for heating purposes.
- Removed as soon as reasonably practicable when it is no longer needed for microgeneration.
- Sited, so far as is practicable, to minimise its effect on the external appearance of the building and its effect on the amenity of the area.

You may wish to discuss with the Local Planning Authority for your area whether all of these limits and conditions will be met.

If you believe you need planning permission it is your responsibility to check and obtain it. isoenergy will however, arrange building control consent for the work we undertake.

How Your Personal Information Will Be Used

By requesting isoenergy provide this document it is necessary for isoenergy to hold some personal information about you and your property. isoenergy will use the data for the purposes of providing this and future estimates or quotations. The data collected may also be used for marketing our services to you that we feel are relevant. Your data will not be passed on to any third party except where it is necessary to fulfil the request you have made (e.g. to obtain a price for drilling boreholes or digging trenching).

The information you provide to us is stored in our Customer Relationship Management system located on a secure server and will be kept as long as needed. Full details of how isoenergy handles your data and information on your rights regarding this data, please visit our website. www.isoenergy.co.uk/privacy

Using Your Project as a Case Study

At isoenergy we pride ourselves on our reputation and are delighted when customers recommend us to others. To help with this, we will normally produce a case study for our website and case study packs for each place we work. If you would rather us not use your property as a reference site please let us know and we can either change the name of the building to anonymise it or not produce a case study at all. In addition to producing a case study, we may ask to use your site as a reference site.

Mechanical & Electrical
Building Services
Consultancy

Peter Wray Consulting Limited

St. GEORGES POOL

221 THE HIGHWAY

LONDON, E1W 3BP

OPINION ON THE CONDITION OF THE EXISTING

MECHANICAL, ELECTRICAL & PUBLIC HEALTH SERVICES

INSTALLED

AND

APPROACH TO BE TAKEN ON ANY REFURBISHMENT PLAN

23rd MARCH 2022

Revision.

Ref: 4033/MEP/PW

Peter Wray Consulting Limited
35B St John's Road
Oakley
Hampshire
RG23 7JP

Tel: 07715702227

St GEORGES POOL

221 THE HIGHWAY

CONTENTS

1.0 INTRODUCTON

I have been invited by The Turks Head Charity to give my opinion on the condition of the existing Mechanical, Electrical and Public Health Services installed at St Georges Pool and to suggest the approach to be taken on any refurbishment plan.
A cursory visit was made to the building on the 14th March 2022. At the time the majority of the systems were non-operational and had not been for several years.
The original systems installed date back to 1965 although I understand partial refurbishments were undertaken in the early 1980's and in 2008.

2.0 BACKGROUND

Back in 2019 the London Borough of Tower Hamlets commissioned Logic (UK) Ltd to undertake a detailed condition survey of the installed building systems, including the pool equipment and automatic controls. The actual survey was carried out by GDN Support Services and specialists on the pool and automatic controls. The initial survey was followed up in July 2021 but it is apparent that no remedial or preventative maintenance had been undertaken in the intervening period.
The report prepared by GDN Support Services, dated November 2021, is very thorough and, with a few exceptions, concludes that the services are no longer worth saving. Having seen the condition this is a view with which I totally agree and support. In any case most of the plant and systems are well beyond their economic life and their energy performances ratings fall far short of current standards, let alone the standards we must now achieve in the age of zero carbon.

My opinion is therefore that all the plants and systems need to be stripped out completely and re-cycle all the scrap materials, where possible. This applies to the pool pipework, filtration plant and foul drainage.

3.0 APPROACH TO SERVICES DESIGN UNDER REFURBISHMENT PLAN

Any major refurbishment to the building will now be subject to the aims of The London Plan, 2021 and the latest standard under Approved Document L, covering conservation of fuel and energy**.**
I understand that the preferred refurbishment plan is to strip back the building to the concrete superstructure to enable essential remedial works to the concrete. This will provide the opportunity install new wall claddings, windows and roof coverings to minimise the thermal loads on the building.
Early collaboration is required between the Architect and Services Consultant to optimise the selection of the cladding components/system given that the building orientation cannot be changed.
Computer modelling of the building will need to be undertaken to highlight risks of over-heating in summertime.

Computer modelling will also be required to highlight risks of cold bridging and interstitial condensation with the building fabric.
Recognising that The Highways is one of the most polluted roads in London concentrate all air intakes into the building on the northern elevation.

4.0 ENERGY TARGETS

The aim must be to substantially reduce the operating costs that the Pool has generated in the past.
From the outset the Services Installations must be designed to achieve the lowest operating cost commercially achievable**.**

5.0 PRIMARY HEAT SOURCE

In line with the London Plan to aim to reach Zero Carbon, the use of natural gas as a primary heat source, is ruled out. Therefore, the design approach will be to utilise Heat Pumps as the primary heat source for heating within the building and hot water generation.
As a rough guide I believe the load on the existing gas boiler plant is around 400 to 500kW's. To produce the equivalent with Heat Pumps the electrical capacity on the building will increase by 150kW's.
This will probably mean that the incoming power supply will need to be uprated.
There is limited external area available to support ground source heat pumps therefore air source heat pumps are the only option in this case. The units will need to be sited on the First-Floor roof areas.

6.0 ENERGY AND UTILITY CONSERVATION

In developing the services design the following are to be researched for inclusion, where viable. In considering options, whole-life costs rather than initial capital costs should be compared.

- Alternative methods for pool water filtration and reduction of chlorine use.
- Use of back-wash pool water for use in grey water system
- Heat recovery from back-wash pool water.
- How to reduce water usage.
- Decentralising main air handling plants from basement to First Floor roof level to provide greater zonal control, improved heat recovery, smaller electric motors to distribute air and smaller duct sizes.
- Raising Pool area RH levels.
- Mixed mode ventilation methods for various areas, including natural.
- Reducing the condensation rate from the pool water surface.
- Separate heating system to deal with building fabric heat losses
- Use of LED lighting throughout with automatic control, where appropriate.
- Maximise the installation of Photovoltaic (PV) panels together with battery storage, if justified.

7.0 BUILDING MANAGEMENT SYSTEM

A comprehensive Building Management System (BMS) is to be incorporated which will not only control and monitor equipment and system but record energy consumptions and historical data logging.
Graphical representation of the various systems shall make for ease of interfacing with the Users and Maintenance Team.
Metering of the Utility supplies and all plant items is an essential function in order to monitor and control operational costs and energy targets.

8.0 SERVICING STRATEGY

From the outset the services design must give careful consideration to servicing strategy for the building and equipment. All plants and equipment must be easily accessed with safe working areas.
Planned preventative maintenance schedules should be agreed at the earliest opportunity.
Currently the basement plant areas are difficult to access to carryout routine maintenance and refurbishment works. Any refurbishment plan is to include a new services access tunnel.

Prepared by Peter Wray
23rd March 2022

Referenced document, not included
GDN Support Services Condition Survey & Report
Referenced 21012-CSR-101a, dated November 2021

APPENDIX D - BWA BUDGET ESTIMATE

BUDGET ESTIMATE

for the

REFURBISHMENT OF ST GEORGES POOL

THE HIGHWAY

LONDON E1W 3BP

for the

TURKS HEAD CHARITY

Project Mangers | Construction Cost Consultants

March 2022

ST GEORGES POOL REFURBISHMENT

Existing Gross Floor Area approx.	3,500 m^2	38,000 SF
New build	250 m^2	2,700 SF

SUMMARY

Cost Centre	£'000	Comment
Refurbishment Costs		
• **Building Works**	7,000	See elemental costs analysis over
• **M&E Works**	6,000	See analysis over
New Build Costs		
• **New Gym (250m^2) extension**	500	250m^2 @ **£2,500 /m^2**
Contractors Preliminaries	1,500	See analysis over. Based on a **50 week** programme
Contingencies	1,500	**10%** construction contingencies
SUB TOTAL	**16,500**	Or **£4,500 /m^2** GFA
Professional Fees	2,500	Allow **15%**
TOTAL	**19,000**	

NB. The above costs are current as at **March 2022** and **EXCLUDE** any allowances for:

1) VAT
2) Furniture and Equipment
3) Inflation

REFURBISHMENT BUILDING WORKS COST ANALYSIS

Element	£'000	Brief Specification of Works	
• **Demolition**	600	Strip out changing rooms, tiling, existing M&E, plant	
• **Asbestos removal**	200	Provisional Allowance **£200K**	
• **Concrete repairs to frame**	500	Provisional Sum confirmed with structural engineer	
• **Roofs**	600	Strip and apply new covering Increase insulation	
• **External walls/ windows / External Doors**	2,300	Strip external mosaics/ windows New cladding New green wall New entrances	**£'000** 150 1,750 200 200
• **New changing facilities (750m2)**	800	Partitions, vinyl flooring, suspended ceilings, tiling, lockers, mirrors, WC's, showers	
• **Pool tiling**	400	Overhaul / replace existing tiling Replace tiling to pool circulation areas	
• **Redecoration**	200	Internally	
• **Signage**	100	Provisional Sum	
• **Reception / Offices (50 m^2)**	100	Partitions/ Doors / New Counter etc.	
• **New café (200 m^2)**	200	Including equipment	
• **Gym**	400	Fit out new gym including sun terrace **excludes** equipment	
• **New Hydro pool 6m x 5m**	250	Provisional Sum	
• **New Passenger Lift**	150	To connect all floors incl. new enclosure	
• **External Works**	100	Provisional Allowance	
• **Drainage**	100	Provisional Allowance	
TOTAL	**£ 7,000 or £2,000 /m^2**		

NB. For **EXCLUSIONS** see Summary

REFURBISHMENT – MECHANICAL / ELECTRICAL / PLUMBING COST ANALYSIS

Element	£'000	Brief Specification of Works
• **Mechanical**	1,600	New heat pumps New supply and extract ventilation Comfort cooling to gym
• **BMS**	200	New BMS system
• **Filtration**	400	New filtration to main, children's and hydro pool
• **Plumbing**	350	Hot and cold water + wastes to all changing areas, café etc.
• **Electrical**	1,200	New mains and submains panels New power outlets New LED lights
• **Drainage**	300	Replace including backwash etc.
• **Life safety**	200	New fire alarms / smoke detectors
• **Communications**	100	Public address system
• **New utilities**	300	Upgrade substation, new water mains
• **Photo Voltaic Panels**	200	Provisional Allowance
• **Security**	200	CCTV, Intruder alarm
• **Main Contractors overhead and profit**	500	Allow **10%**
• **Builders work**	450	Provisional Allowance incl. new access tunnel to basement plant
TOTAL	**£6,000 OR £1,700 /m^2**	

ANALYSIS OF PRELIMINARIES COSTS

Based on a 50 week contract programme

Cost Centre	£'000	Comment	
• **Staff**	550		**£/week**
		Contractors Manager	2,000
		Site Agent (2 No)	3,000
		QS	1,500
		Planner	500
		M&E	1,500
		Gateman	1,000
		Labourers (3 No)	1,500
			£11,000
• **Site Accommodation**	100	**£2,000 /** week portakabins	
• **Security**	100	**£2,000 /** week 24/7	
• **Temporary electrics, tools, etc.**	100	**£2,000 /** week	
• **Office equipment / printing etc.**	50	**£1,000 /** week	
• **Scaffolding externally**	200	Provisional Allowance	
• **Scaffolding internally**	150	Provisional Allowance	
• **Insurances**	50	Provisional Allowance	
• **H&S incl. fire extinguishers etc.**	50	**£1,000 /** week	
• **Cleaning on completion**	50	Provisional Allowance	
• **Skips (10 per week)**	100	**£2,000 /** week	
TOTAL	**£1,500 or £30,000 / week**		

BWA

21.03.2022