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24 AUG 2006

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FEASIBILITY STUDY FOR THE DEVELOPMENT OF AN AQUATIC CENTRE IN THE BREAK O"DAY MUNICIPALITY

David H Brown BSc (Hons). Grad Dip Rec.

23rd September 2005

For Brian Inches

Regards

Mark Anderson

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BREAK O'DAY AQUATIC CENTRE COMMITTEE
FEASIBILITY REPORT

1.0 EXECUTIVE SUMMARY

Today, the requirement of Local Government Authorities to meet regulatory Standards of fiscal management and accountability has brought about a new era of best practice based upon the cost effectiveness, efficiency and competitiveness of the services and facilities they provide to their ratepayers and the general community.

This statement reflects the stance of governments toward a more economic rationalist approach toward the funding and provision of community services and facilities in that there is a greater focus on affordability rather than lifestyle benefits. The affordability can be easily determined through financial records whereas lifestyle benefits are based upon such intangible factors as, quality of experience, gain in knowledge, fitness and health and development of social networks. Furthermore, the ability to swim is an essential element in the enjoyment of many other water-based activities, such as, canoeing, surfing and sailing.

It is unfortunate that these factors which contribute so positively to the quality of life of a community can not be determined in a manner where they can be directly compared with the financial costs associated with a service or facility's management and operation.

The above practice of determining only the affordability of a facility or service will disadvantage any new development proposals as often they have to prove they are financially viable before Council will consider their involvement in funding either their capital or operational costs. Whilst this is a most responsible attitude and one which should be adopted by Council it is also necessary for them to identify and understand the lifestyle benefits which do arise from Council funded recreational and community facilities and services. For example, libraries, sports ovals, parks and areas of open space, hard court areas, playgrounds, community and recreation centres and swimming pools/aquatic centres.

The question raised by the issues above is one of EQUITY – who should have what benefit and at what cost?

This question of equity of provision of and access to facilities and services should be understood by Council and ratepayers if a balanced approach to the development of an indoor heated swimming pool and gymnasium is to be undertaken, as it can be shown that it is an affordable facility providing careful consideration is given to its operating plant and equipment and the type of management structure adopted. It should also be noted that a swimming pool is the most efficient athletic facility available in terms of total users per area, whether sporting or recreational. Where else can you allocate only a few square metres per person for exercise? (2.5 square metres per person)

2.0 SITE, MANAGEMENT AND DESIGN CONSIDERATIONS

It is not practical to divorce the issues surrounding the siting of the proposed indoor heated swimming pool and gymnasium from those concerning its design and management. The site currently proposed by Council for the indoor heated swimming pool and gymnasium is at the recreation ground on the corner of Tully and Young Streets. It is essential that the location chosen for the proposed facility be thoroughly investigated in regard to the following:

2.1 Site Considerations

Site Considerations – do the physical attributes of the site suit the proposed development and its construction? – does the location provide ease of access to essential services, such as, scheme water, power, sewerage, drainage and telecommunications? – does the location enable expansion of the facility without physical disruption or social dislocation of other facilities within its immediate vicinity?

A thorough site survey must anticipate the pros and cons of the site beforehand. This often neglected discipline in the planning and development of buildings is essential in order to take any available advantages, such as, the lay of the land to prepare final levels and, more importantly, to avoid any potential problems, such as, saturated sands, high water tables, expansive clays or solid rock.

In terms of the capital cost of the proposed facility, the cost of excavating the pool basin could blow-out to such an extent that the future of the facility would be seriously threatened. Therefore, a site survey is critical prior to any future development.

2.2 Management Considerations

Management Considerations – does the location ensure maximum exposure and support management of the facility?

It is not only the incorporation of energy efficient design and use of cost effective operating plant that can enable the reduction in operating costs, but also the implementation of appropriate management strategies. The most important being education of swimming pool patrons to adopt the practice of pre-cleansing prior to entering the pool. This would require a change of outdoor clothes for a bathing costume and showering. If bathing caps could be available and their use encouraged this would be another factor which would help significantly to maintain air and water quality and, as a result, the conservation of energy, water and chemicals and assist in reducing the corrosive atmosphere which damages the building fabric.

It would also provide patrons with a more healthy and pleasant pool environment due to the reduction of chloramines and trihalomethanes which foul the pool air and, for the most part, are as a direct result of dissolved solids from the raw water and dirty clothing, body excretions and body oils entering the pool water due to lack of pre-cleansing.

2.3 Design Considerations

Design Considerations – does the location enhance the design and appeal of the facility?

The structure of the facility should reflect how the overall design relates to function and integrates both capital and operating costs to achieve maximum use and efficiency of resources throughout the whole life of the building. In effect, the concept and process of an integrated environmental design, when applied to a building's performance and complex mechanical services, enables solutions to be sought to optimise quality with cost. In the overall scheme this may tend to raise capital costs of the facility, but in return, offer considerable improvements in operating and use efficiencies with subsequent cost savings over the life of the facility. For example, more effective insulation of the building fabric, improved heat recovery systems, double glazing and automation of water treatment processes all add to the capital cost however, over the life of the facility, will provide considerable cost savings.

Important design considerations to reduce both capital and operating costs include reducing water and air volumes and not material specifications as often happens when trying to reduce expenditure. A 10 per cent saving in cubic capacity can reduce initial capital expenditure without even affecting the water surface area furthermore, operating costs will be less every year thereafter. Contrary to general belief, the overall cost of most indoor heated swimming pools is proportional to pool water and airspace volumes, not to water surface areas. In fact, at least 50 per cent of energy consumption will be used for ventilation and space heating, so the need to reduce air space is paramount to reducing operating costs. The reduction of pool water volume without affecting function will also provide considerable savings in operating costs. This combined with heat recovery systems can provide a very cost efficient operation.

In the design of the indoor heated swimming pool and gymnasium consideration has been given to incorporating the most cost efficient operating systems with specific consideration for the type of plant installed to provide pool water and air space heating, air-handling and water circulation, filtration and disinfection. A number of options regarding pool water and air space heating are still under consideration and require further investigation to determine which may best be suited to St Helens.

These include:
a) use of a combined heat and power generation coupled with a heat recovery system which reclaims waste heat from the engine used to power the generator producing electricity to power the complex;
b) electric heat pump combined with solar heating;
c) biomass furnace using waste from the timber industry to heat the pool water and produce steam to power a generator for electricity;
d) direct link to the electricity grid.

The following are automatic choices for inclusion in the design of an energy efficient aquatic centre and gymnasium:
a) automatic monitoring of pool water quality and dosing according to requirements can be effective in reducing the number of backwashes and as a result, conserve energy, chemicals and water;
b) use of insulation throughout the building fabric to reduce heat loss from the pool water and air space.

3.0 MANAGEMENT ISSUES

When considering management issues that which is at the forefront are the costs associated with managing and operating an indoor heated pool.

These costs will vary between pools of similar size and design with comparable plant and equipment due mainly to the number of users entering the facility. For example, the figures below are for an indoor heated pool which has in excess of 200,000 visits per annum. This is not unusual for an urban or regional centre however, this high level of use not only requires a significant number of staff to manage the turnover but also the greater the number of users the greater the organic load with the consequence that more frequent backwashing has to be undertaken with the subsequent loss of heat, water and chemicals and the need to replenish, heat and treat the replacement water. This issue is exacerbated if the guidelines for bather cleanliness are not adhered to.

	Large urban centre	Small regional centre
Annual Income	$612,000	$140,000
Annual Attendance	204,000 visits	40,000 visits
Average cost/visit	$3.00	$3.50
Average operating cost/visit	$4.60	$3.88
Average loss/visit	$1.60	$0.38
Annual Expenditure	$910,000	$165,000
Labour		
Full Time 13	$	
Part Time 8	$	
Casual 35	$	
TOTAL	$591,000 (64.9%)	$ 90,000
Accommodation Expenses		
Gas	$	
Electricity	$	
Water & sewage	$	
Building Maintenance	$	
Ground Maintenance	$	
Security	$	
Building Insurance	$	
TOTAL	$158,000 (17.4%)	$ 40,000
Other Operating Expenses		
Marketing/Promotion	$	
Consumables ie kiosk stock	$	
Bank Charges	$	
Licenses & Fees	$	
Cleaning	$	
Plant/Equipment Maintenance	$	
Chemicals	$	
Armoured Escort Services	$	
TOTAL	$141,000 (15.5%)	$ 30,000

Office expenditure	$ 20,000 (2.2%)	$ 5,000
Net Operating Profit/Loss	($298,000)	($ 25,000)

The above financial figures do not include interest on borrowings or depreciation.

Indoor heated swimming pools in small regional centres, such as, that proposed for St Helens, can manage the above costs in a more effective manner as there are a smaller number of visits and most importantly, paid staff numbers can be significantly reduced because of the support available from volunteers who are more than willing to assist in its operation. The effect of the reduction in the number of visits will also provide a better opportunity to ensure bather cleanliness is observed by patrons at the pool hence assisting in the reducing the organic load introduced to the pool water. These have a cumulative effect of reducing the frequency of backwashing required.

A further issue associated with bather cleanliness is the quality of the pool hall air space. As previously mentioned this air can be heavily polluted as a result of chloramines and trihalomethane not only is the odour unpleasant but it is also costing money in that it greatly reduces the cost effectiveness of any heat recovery system as air has to be continually removed from the building and then reheated. Furthermore, the humidity at approximately 60% is filled with chlorinated water vapour which is very corrosive on the fabric of the building. The latter is a long term cost however, it is not one that can be dismissed.

4.0 MANAGEMENT PLAN

4.1 Management Structure

There are a number of possible management structures which could assist in maintaining costs within budget In terms of lines of responsibility and authority, all appointed staff, contracted services and volunteers used in the management and operation of the indoor heated swimming pool and gymnasium would be directly responsible to a Section Head within Council's administration system, for example, the Community Services Manager. Newly appointed staff should include a full time manager and a part-time assistant manager with possible contracts being let for the cleaning of the facility, maintenance of plant and equipment and operation of the gymnasium. The role of volunteers will be critical to the affordability of the facility. There is much potential for clubs to lease time at the facility, for example, the early morning lap-swimmers, aqua-aerobics, auswim (learn to swim) and other organised activities whereby the club could provide their own qualified lifeguards and use the facility under a key system. It may also be an opportunity for those who do hold the necessary lifeguard qualifications to contract out their services to different clubs. Volunteers may be able to assist in the kiosk or on maintenance duties around the grounds, building and within the plant and equipment area.

The manager's duties should include programming the pool and gymnasium and providing monthly activity reports to Council, marketing and promoting the facility, managing staff including volunteers, ensuring staff training needs are met, supervising pool activities and monitoring water and air quality. The latter duty would be backed-up by an automatic monitoring system. The main hours of attendance for the manager and the assistant manager would be during the weekends from noon to 2100 and after school from 1600 to closing time, possibly 2000.

4.1 Pricing Policy

The most vexing dilemma which confronts all Local Government Authorities and community organisations relates to the level of compensation that Council expects and the user is willing to contribute for the privilege of using the facility.

To establish a pricing policy Council and relevant staff and an elected aquatic centre committee need to know what proportion of expenditure has to be recovered from direct income from the user and determine what level of contribution is perceived to be "reasonable" by the user. The outcome of this process will affect the affordability of the facility.

The pricing policy should:

a) be fair and equitable in its rates and charges;
b) offer maximum opportunity for participation;
c) create positive user attitudes;
d) be cost effective and efficient to implement.

This policy should not focus exclusively on the income producing end but identify and implement measures which can reduce expenditure without effecting either the quality of the facility or the service.

4.2 Marketing, Promotion and Programming

The success of any new facility development will be determined by the capacity of those responsible for its management to understand and implement sensible marketing strategies.

It is important to acknowledge that marketing is not selling but the determination of what the client wants and then to provide the services and programmes which meet those wants.

Selling is product orientated. It is based on designing a product or service which is deemed appropriate, then selling it. Marketing, on the other hand, is client orientated and entails delivering services or programmes that people want and will readily support.

"It should be recognised that people do not buy programmes or services, they buy the expectation of benefits. Only their benefits have a value to the client groups. The physical service or programme is simply a vehicle for the user benefit it conveys."

The above extract has been taken from Dr. J. Crompton's book, "Financing, Managing and Marketing Recreation and Park Resources".

To enable a marketing strategy to be developed there has to be an understanding of the client groups which will visit the facility. As a basis for this understanding information has been gathered from urban and larger regional towns where indoor heated swimming pools in conjunction with a fitness centre of a similar size as that proposed have been developed and operating for at least 5 years. Whilst this may not appear relevant to a small regional centre, such as, St Helens, there are a number of significant elements both in the operational costs, user profiles and usage patterns

which can be identified and used as a base for considering the likely financial impact of the proposed development and what marketing strategies should be developed

The breakdown of the attendance figures from the facilities investigated closely paralleled studies undertaken in 1987 and 1995 by the Victorian Department of Sport and Recreation. The findings of these studies are reported below however, they are significant as such information provides useful data regarding the utilisation of indoor heated swimming pools and ancillary facilities assists in identifying market opportunities.

Sex of Users			51.6% female	48.4% male
Age	<10 years	10.5%		
	11 – 15	10.0%		
	16 – 20	10.8%		
Sub-total		**31.3%**		
	21 – 25	14.0%		
	26 – 35	26.9%		
	36 – 40	10.0%		
Sub-total		**50.9%**		
	41 – 60	14.0%		
	>65 years	3.8%		
Sub-total		**17.8%**		
Time of Day				
	< 0900	**13.2%**		
	0900 – 1030	11.7%		
	1030 – Noon	9.5%		
	Noon – 1600	**23.2%**		
	1600 – 1800	**21.1%**		
	1800 – 2000	**17.4%**		
	> 2000	3.9%		

From the data available 86% arrived by motor vehicle with 75% visiting at least once per week and 84% staying for a period of up to 90 minutes.

The majority of visits were for lap swimming 47%, with training for sport at 6%, and recreation at 21% and the remaining 26% being involved in lessons, such as, auswim (learn to swim programme), aqua-aerobics and other unspecified activities.

4.3 Evaluation

It is important to understand the need for evaluation as being an integral component of all planning processes as it provides relevant and valid information upon which informed decisions can be made.

An evaluation should be used to determine the success of management policies and actions in achieving the stated objects. It provides the feedback necessary to adjust the "ends" and "means" to changing circumstances. This would include measurements on the efficiency and effectiveness of four key areas:

a) fiscal arrangement
b) management system
c) service delivery
d) facility capabilities

In concluding, the evaluation process should not be viewed as a nebulous, academic exercise but as one to be undertaken as an integral component of the planning and decision-making process. This will enable an efficient and effective service to be established.

5.0 FINANCIAL MANAGEMENT

The financial management of the indoor heated swimming pool is best considered within two sections, the first which refers to Capital Expenditure; and secondly that which refers to Recurrent Expenditure.

a) Capital Expenditure
The future development of the facility is entirely dependent upon securing sufficient capital through one or a combination of the following sources :-

* Council's Budget
* Council Loan Capacity
* Council Overdraft Facilities
* State and Federal Government Grants
* Community Organisations providing fund raising and voluntary work
* Industry and Corporate Sponsorship
* Public Agencies – asthma foundation

b) Recurrent Expenditure
The points made in **Section 4.0 "Management Plan"** will determine the Operational Profit/Loss.

An assessment of various management practices at other centres will enable a greater understanding of the implications of any proposed management structure and plan. These investigations will have financial and functional implications on both the management and design of the facility.

6.0 DESIGN ISSUES

Design and management issues should be considered together and not in isolation to ensure that the management and operation of the facility can be accomplished in an efficient and effective manner and without compromising the opportunities for skill development or comfort and safety of the participant.

In the design of any facility it is important that it displays an ambience and atmosphere to attract people.

In designing the indoor heated swimming pool and gymnasium it is important to establish design criteria that:

a) recognise the different needs of different people which may be determined by age, gender, financial resources, skill level, habit, uncommitted time and so forth.

b) analyse what people do at the facility, in terms of the areas required for arrival, changing, playing, walking, looking, socialising, spectating, meeting and leaving.

These basic accomplishments provide the framework for establishing a functional relationship between the various activity areas, such as:

a) maintenance and management needs
b) technical and functional needs

6.1 Design

The best facilities, able to be managed economically and flexibly come out of a dialogue between the client body and an experienced design team which includes members with practical experience in the operation and maintenance of an indoor heated swimming pool and gymnasium.

The full benefits of good construction can only be realised within the framework of good design.

6.2 Construction

Since the construction of the first major sport and recreation and aquatic facilities in the early seventies, much valuable experience has been gained on their performance over time. Many facilities have failed miserably to cope with the demands placed upon them. The lessons are very clear. Many of these facilities have deteriorated very quickly and have failed to retain their initial appearance due to inappropriate use of materials and poor detailing and construction, producing liabilities for management with high recurring costs for maintenance and operation.

The essential ingredients which need to be considered, if good construction is to be achieved, are :-

a) Building Elements

Facilities should be capable of being built simply and effectively and as such these elements should form an integral part of the design process.

b) Finishes and Materials

Finishes are undoubtedly one of the main elements in any sport and recreation or aquatic facility creating the "tone" of the building. They are the first line ambassador for the facility, quickly stating its quality, ambience and style of management.

Poor or inappropriate quality of finishes will soon become an eyesore with the result that maintenance costs will escalate. The rapid visual deterioration of a facility will also affect the users and subsequently the income that can be generated.

c) Workmanship

Good workmanship is achieved through a clear definition of the standards required and aided by good information.

d) Contract Documentation

An essential process in the construction sequence which when properly undertaken with detailed drawings and specifications for each specific area of

the development ensures good competition on pricing as the contractors know exactly what is required and do not have to cost for an "unknown risk".
Good documentation allows competitive and comparable tenders to be sought.

7.0 FUNCTIONAL AND FINANCIAL IMPLICATIONS

The following building components represent some of the many aspects which may be included within the development of the complex:

7.1 FOYER/MANAGEMENT CENTRE

7.1.1 Functional Implications

To provide a centre for management which can service all the facilities at the complex in an efficient and effective manner.

To facilitate this function it is essential that two major components be considered as the key elements in the design process. It should be recognised that these factors can be mutually exclusive and counter-productive if attention to such detail has been overlooked.

The first component relates to the atmosphere and ambience that should be reflected by the structure, that is, it should not only provide a pleasant and welcoming outlook to the prospective user but also an air of expectation and excitement. It should not appear as a dark and daunting or austere symbol of social and civic order.

Therefore, the entrance foyer is the prospective users first point of contact and as such it should entice people in by offering glimpses of the fun or activity to be had within the structure. The majority of people will not be inspired by an old-fashioned or unsophisticated facility.

The second component relates to the physical management and administration of the complex and the need for controls to supervise and assist people within the building. The control of human movement can best be affected by the use of gates and channels however, this would unacceptable in the context of the preceding paragraph which seeks to attract users to the complex.

As such, a careful balance between these components must be sought in the design of the complex and in particular, the foyer.

7.1.2 Financial Implications

The provision of a centre for management and a reception area which is pleasant, interesting and inviting is essential to the viability of the complex. It is not the area where "short-cuts" should be made for the advantage of saving a few dollars.

7.2 INDOOR HEATED SWIMMING POOL

7.2.1 Functional Implications

To provide an all-year round swimming and recreational facility which has the capacity to meet the needs of a wide range of user groups.

An indoor heated swimming pool is one of the most expensive facilities in cost/square metre terms to provide and this may also apply to it's operation therefore careful consideration has to be given to the design as well as it's management. It is of the

utmost importance that design priorities are established before final drawings are commenced. For example, probably the majority of future users will use the complex as a swimming centre, and as such, the design must reflect this situation. These are the priorities and should be funded accordingly. There is no advantage in having an architectural edifice with a pool which has poor air and water quality, as it will not attract the users.

The design of "good" complex should use the pool hall as the main feature to the foyer and social area thus facilitating a sense of participation even without being directly involved within the pool hall area.

7.2.2 Financial Implications
It is not inconceivable that an indoor heated swimming pool could be affordable, provided it has the support of ancillary facilities which are well supported and commercially priced, such as, kiosk, fitness assessment centre with gymnasium, sauna, spa and solarium.

7.3 SOCIAL AREA
7.3.1 Functional Implications
The design and location of a social area with kiosk or vending machines should afford the maximum viewing area possible within and outside the building.

7.3.2 Financial Implications
It can provide another source of income to assist maintain and operate the complex.

7.4 FITNESS ASSESSMENT CENTRE/GYMNASIUM
7.4.1 Functional Implications
Commercial facilities such as, gymnasiums, spas, saunas and the like offer the potential to earn income which can be used to subsidise the operation of the complex.

Promotions, such as, "Healthy Lifestyles" and community involvement in personal and/or club programmes adds much weight to the need for these facilities within the complex. There is often expertise and experience locally, to operate and run programmes for these facilities.

7.4.2 Financial Implications
The potential income generating capacity of these areas has been shown in many private and public centres as being commercially viable.

The employment of both supervised and "key operated" systems of management within this area can ensure that a net operating profit would be achieved. Alternatively, these facilities could be leased out to private enterprise at a commercial rate.

7.5 CRECHE/PLAYGROUND
7.5.1 Functional Implications

A well planned and interesting creche/playground which has a paid supervisor will offer the support to all the other facilities within the complex as it will afford the

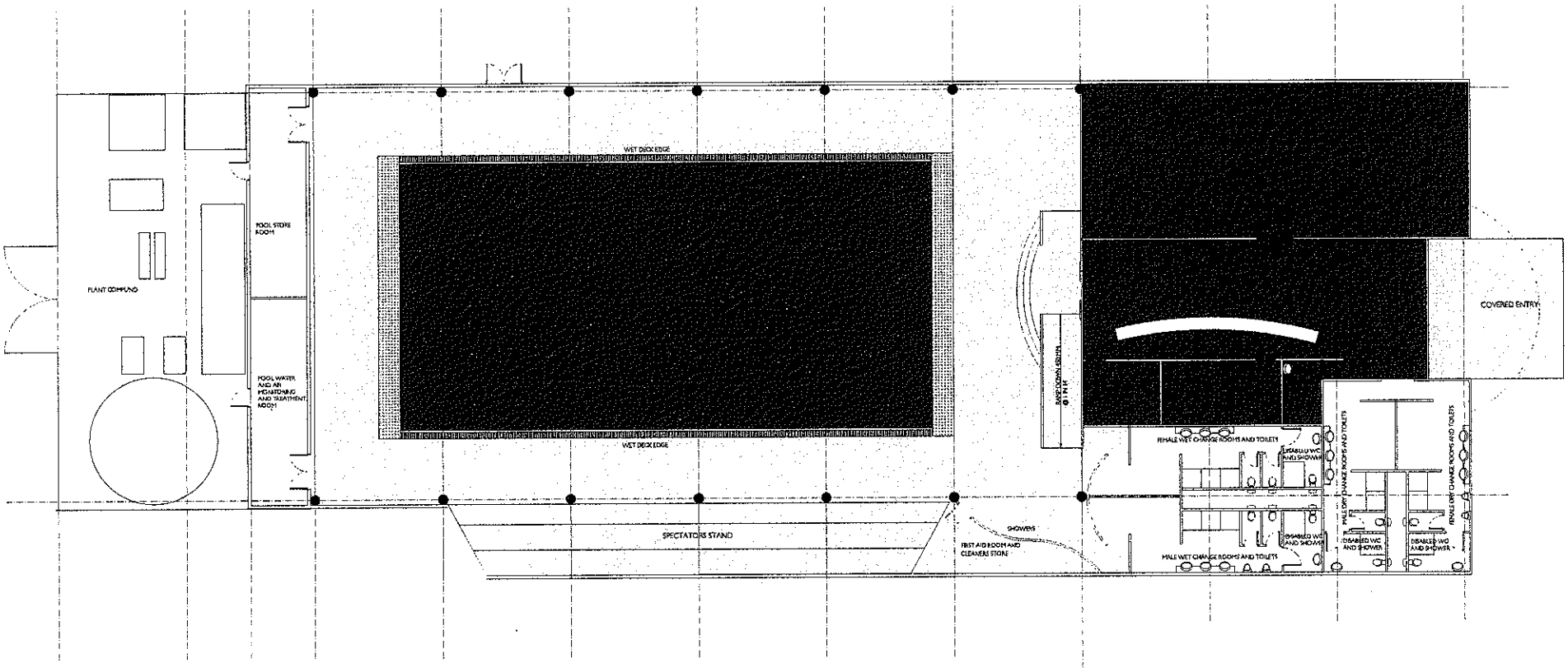
opportunity for many young mothers (or fathers) to participate in recreational activities that may have been denied them due to the lack of such a facility.

The design of the resources within this area must be ensure that safety comes before "excitement" and that interest can be maintained by adaptable and challenging equipment.

The size and siting of this facility within the complex are most important and must be carefully researched.

7.5.2 Financial Implications

The financial implications to the overall affordability of the complex can be immense however, this is not soley dependent upon the provision of such a facility or play equipment but more importantly upon sound and imaginative management practices. Facilities, such as, the creche and playground are merely the tools not the driving force or the creator of income.



REVISION Nº	DATE	DETAILS

INDOOR AQUATIC CENTRE
BREAK O'DAY COUNCIL

FLOOR PLAN

Williams & Associates Pty. Ltd. Architects

SCALE

DATE 14/3/2005

PROJECT No. 2.2005

POOL OPTION – 25 m x 6 LANE POOL

Facility	25m x 6 Lane Pool (12.5m)	Area	Cost/m²	Total Cost	Additional Costs
Pool Hall including First Aid Room	Pool Basin 36.0m x 19.4m	698m²	$1,250/m²	$872,000	site preparation service connections fees contingencies preliminaries first aid kit & bed Allow $180,000
Fitness Centre	18.0m x 7.4m	133.2m²	$1,200/m²	$159,840	Equipment Allow $50,000
Lobby, Reception, Staff Room & Kiosk Managers Office,	16.0m x 8.8m	140.8m²	$1,200/m²	$168,960	Equipment Allow $15,000
Covered Entry	6.4m x 6.5m	41.6m²	$ 800/m²	$ 33,280	
Change Rooms	7m x 9m + 7m x 9m	126.0m²	$1,150/m²	$144,900	
Store Room	7.7m x 2.7m	20.8m²	$ 800/m²	$ 16,632	
Plant Room – pool water and air monitoring and treatment and electrical equipment	11.6m x 2.7m	31.3m²	$ 800/m²	$ 25,056	switchboard heat pump dehumidification heat exchanger auto monitors Allow $155,000
Plant Compound – concrete floor with roof and chain mesh fence to house filters & pumps	19.2 x 8.8	169.0m²	$ 400/m²	$ 67,584	filtration chemical control circulation Allow $210,000
TOTAL COST				**$1,488,252**	**$610,000**

WATER TREATMENT

The following design criteria have been determined for treatment of the pool water at the aquatic centre based upon a maximum of 1000 visits per week:

* the treatment system must be capable of producing an excellent quality of water and maintain this quality in all parts of the pools, at all times, under a variety of bathing loads;
* plant must be of excellent quality, adequate size, efficient and easy to operate and maintain;
* automatic controls should be used wherever feasible, particularly for chemical parameter monitoring and control, backwashing and maintaining level of pool water;
* the system should take cognisance of latest guidelines and developments in the water treatment industry;
* the system should incorporate all the necessary safety features.

FILTRATION

Clarity of pool water is critical as the bottom of the pool must be clearly visible to prevent drownings, bather discomfort and avoid compromising the disinfection process. In terms of nepholometric turbidity units, 0.6 NTU or less is required from the system and its operation.

There shall be sufficient filter capacity to cope with the design circulation rate and turnover period.

The following filtration design is based on the UK figures for maximum bathing load, an approximation of them gives 2.0 m^2/person in water less than 1 metre in depth and 2.5 m^2/person in water over 1 metre in depth (actual figure 2.4 m^2/person)

Maximum Bathing Load	= 300m^2 @ 2.0m^2/per person =	150 bathers
TOTAL		**= 150 bathers**

Based on the maximum bathing loads the Turnover Rate for water greater than 1.0 metre should be every 2.5 hours.

Main Pool Volume	312 m^2 x avg depth of 1.3m	**= 405 m^3 +/10%**
Turnover Rate	Main Pool	**= 2.5 hours**
	405 m^3 in 2.5 hours	**= 162 m^3/hr**
Filtration Velocity	**= 20 m^3/hr**	
Filtration Rate	**= 20 m^3/hr/sq.m of filter area** (medium rate)	
Filter Area	**= 10 m^3 with 1m mixed medium sand bed depth**	
Filters Required	**= 3 @ 1.2 diameter x 3.15 long** (18.0 m^2/filter bed area)	

The volume of water given for the Main Pool is an estimation and until such time as the pool floor slopes are determined, the above is as a guide only.

In general, the greater the filtration velocity the lower the filtration efficiency. Therefore, the filtration system should be based on the design maximum bathing loads.
Horizontal flow filters with multi-grade sand bed have several advantages.

Backwash flow rate should not exceed 30 $m^3/hr/m^2$ of filter area.
Filters shall be fitted with air scouring capacity which is capable of delivering the recommended rate of $32m^3/hr/m^2$ at 0.35 bar
Automatic air venting valve shall be fitted and a safe, manual quick air release mechanism.
A flow meter shall be fitted to indicate plant flow and backwash rates.
Pressure gauges shall be fitted which indicate pressure at the top and bottom of the filters
Sight glass shall be provided to allow visual inspection of effluent water
An automatic chemical dosing pump shall be connected to continuously supply coagulant best suited to the operational pH.
Filtration system designed to enable filtered water from one filter to be used to backwash another.

CIRCULATION
The turnover rate for the Main Pool where the depth exceeds one metre shall be of 2.5 hours.

It is recommended that 100% of water removed shall be via surface water draw-off supported by a balance tank of appropriate size which is automated to maintain the water level in the pools.

The surface water shall be removed by a level-deck system (Wet Deck) through a grid cover into a perimeter channel. The water entering the channel shall be removed by a positive withdrawal mechanism and flow into a balance tank fitted with a probe system operating a control valve on the suction pipe work. Thus make-up water is drawn automatically into the pool with no possibility of air getting into the system. A "High" and "Low" water level alarm system and a water level tube indicator for visual inspections to be incorporated in the balance tank.

The minimum depth for water above the foot valve shall be one metre to ensure that it remains flooded at all times. This may be provided by a sump.

Inlets to the pool should ensure that each takes its required proportion of flow. There shall be enough inlets to ensure that the velocity of the water entering the pool does not exceed 2.0m/s. This rate may be reduced to as low as 0.5m/s in shallow areas or in the vicinity of steps to a rate which does not create turbulence.

Inlets to the Main Pool shall be along the bottom of the pool with a positive withdrawal of water through surface outlets. Supplementary inlets along the walls may be required to ensure effective mixing of the pool water at all times

Circulation pumps shall be sufficient in number and size to achieve the required pool turnover period. A standby pumping capacity should be available to continue function at full flow should the main system be "off". The pumping system should be capable of reduced flow rates when appropriate.

Lint strainers (mesh 3mm-5mm) shall be fitted to the suction side of each independent pump and at the balance tank on the suction side of the pumps.

natural tile surface. Surfaces to avoid include polyurethane non-slip surfaces and ceramic tiles.

PLANT ROOM & PLANT COMPOUND
size and location of plant room
access for plant replacement/refurbishment
access for chemical deliveries
special storage areas for chemicals
plant layout for ease of operation and maintenance
wash water and drainage facilities
health and safety requirements
electrical requirements
interface and co-ordination with other building elements
plant room environment relating to temperature, humidity, ventilation and noise.

POOL HALL
ventilation - 10L of ventilation air per second per square metre of pool hall floor area
heating - pool hall 28-30C

WATER QUALITY - INSTRUMENTATION, CHEMICAL DOSING AND CONTROL AND MONITORING

Pre-Filter Chlorination – a chlorinator manually adjusted to sustain the desirable level of free chlorine residual prior to filtration. Operation by main pump discharge pressure injecting into balance tanks

Post-Filter Chlorination – a chlorinator automatically controlled to maintain the agreed free chlorine residual in the pool complete with self-tuning controller and capable of being indexed to take up disinfection.

Chlorine Residual Analysis – an amperometric free chlorine analyser complete with sample pump, measuring cell, digital display and re-transmission with alarms compatible with the automatic chlorinator.

Calcium Hypochlorite & P.A.C. Dosing – preparation and injection package for calcium hypochlorite including pump, 500L tank and mixer arranged to stop/start by command from pH monitor & Controller.

Water Turbidity – a flow through analyser with multi range sensor and calibration cube. Suit installation for multiple ample points (selectable) and provide digital display and re-transmission.

OPTIONAL
Remote Monitoring – supply of data logger and modem and service charge.