Downers Grove Park District
Downers Grove, Illinois

Community Aquatic Facility Master Plan Study

Prepared By:
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Project #12058

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EXECUTIVE SUMMARY

Downers Grove Park District is considering the construction of an Aquatic Center to serve their community and area residents. Preliminary project criteria have been established by the Board of Commissioners as outlined in the engineering service proposal, “Community Aquatic Master Planning”, dated September 27, 2007. The Park District retained Ramaker & Associates to complete a master plan study for the purpose of providing the construction cost for several facility configurations that can generally conform to three building sites. The facility study criterion is unique, as it includes operable roof panels as a technique to switch an outdoor facility to a natatorium or indoor pool facility. A description of how the roof panels would open and the affect of a changeable building envelope are described in the study report. A precursor to the master plan study included a site evaluation process that yielded a tabulation of factors used to reduce the number of potential building sites from six to three. In addition to the unique building configuration and three proposed site plans, this study report was developed knowing that the facility development and operation would not receive financial support from tax monies generated from the District’s property tax base.

The proposed natatorium program is a mix of recreation, fitness and competition activities in a single site setting along with support areas in a permanent 2-story conventional building core. Components of the building core are described later within the report but include such areas as the lobby, meeting rooms, restaurant, retail space, and locker facilities. Area Aquatic 1 (tallest structures in the middle) includes a 10 meter platform dive pool, water slide complex, spray pad and rock climbing wall. Area Aquatic 2 includes features such as a toddler pool, activity pool, wading pool, therapy pool and competition lap pool. A lazy river is referred to as an alternate for future expansion.

Four brands of operable roof systems were studied for compatibility, cost and operating function. Arqualand, DynaDome, OpenAire and Uni-System roof systems were selected as potential compatible enclosures to cover Aquatic 1 and Aquatic 2. The ability to open the roof presents a means to switch the air handling from a power consuming mechanical mode when the roof is closed to natural ventilation mode when the roof is open. The building core includes locker rooms, staff offices, meeting rooms and retail space. Utility development includes standard service requirements along with study observations on the potential for storm water management structures.

Enterprise information includes quantification of construction costs and revenue sources. Financing and operating the facility without tax funds relies on a creative ownership structure based on a non-profit business entity or an enterprise financed with revenue bonds guaranteed by the Park District. Income would be generated from user fees and leases for retail space. User groups include memberships, daily admission, organized activities and rentals. An extensive staff is needed to operate the facility including a manager, life guards, teachers and building maintenance staff.

The primary product of the study is to compare the cost of a facility with a building core with outdoor
aquatic facilities to a facility configured as a natatorium with operable roof systems. The facility program, as defined for the master plan study, has a footprint of 72,000 square feet (SF). Pool and deck area based patron capacity is equal to 1,965 patrons.

<table>
<thead>
<tr>
<th>Facility Type</th>
<th>Project cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outdoor Facility</td>
<td>$16,098,000</td>
</tr>
<tr>
<td>Natatorium w/ Moveable Roof</td>
<td>$33,571,000</td>
</tr>
</tbody>
</table>

A breakdown of these prices can be found in Appendix 1.

Site development cost for the three sites are as follows:

<table>
<thead>
<tr>
<th>Site</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site 1</td>
<td>$1,490,000</td>
</tr>
<tr>
<td>Site 2</td>
<td>$1,370,000</td>
</tr>
<tr>
<td>Patriots Park</td>
<td>$1,650,000</td>
</tr>
</tbody>
</table>

The project cost includes construction cost, design fees, general contractor fees, construction bonds, and financing costs. The values exclude build-out costs for leased spaces.

Outdoor facilities typically operate during the school summer vacation period, approximately 3 months duration. The cost of the natatorium facility is $17,473,000 higher than the outdoor facility. The additional cost is a subject for continued study to determine the feasibility of operating the facility year around. Project cost for other options are included in the study. These options can be considered by the District during the process of finalizing a development plan for the project.
INTRODUCTION

Aquatic centers are a significant asset for communities, but also present challenges for governmental agencies to obtain funds for construction and revenue sources to sustain the operation of these facilities. The Downers Grove Park District is seeking a creative solution to the physical configuration of a natatorium (indoor aquatic center) along with an enterprise solution that is not dependent on funds from property tax levies. Energy costs for a natatorium are higher as compared to outdoor facilities. The Downers Grove climate and school schedule, much like the rest of the upper Midwestern United States, dictates that public swimming facilities be predominantly outdoors and operate during the months of June, July and August. Contemporary natatoriums provide broader aquatic activities by adding recreation to the traditional competition and educational functions of a lap lane pool. These facilities are constructed with standard building materials typical to their climate and location with added design detail to service a natatorium environment. With these contemporary facilities, come increased capitalization, staff and operating costs. Contemporary facilities are typically developed using capital from general obligation bonds paid off from property tax receipts. Tax receipts are the result of bond referendums approved by the electorate of the municipal corporation. These facilities require intensive program schedules that serve their clientele and create the revenue sources to cover annual operation and maintenance expenses. This brief overview of contemporary public sector natatorium aquatic center development helps set framework for this master plan study. The study provides the development cost for three sites and provides project cost comparisons for the development of an outdoor aquatic center against a natatorium fitted operable roof sections. The operable roof sections are of significant size and expected to offer lower facility operating costs during the summer season. In addition to the unconventional natatorium building configuration, the building is arranged so the structure will be an asset for financing instruments that view the building structure as collateral.

Sites 1, Site 2 and Patriots Park have been evaluated for their suitability and development cost for the proposed aquatic center. Site work estimates for improvements needed to prepare each site for an aquatic center has been calculated and included in the report.

The master plan study assumes that the facility will serve the Downers Grove Park District residents. Residents from adjacent communities, participants in program activities and hosted events may also utilize the facility. The number of people that may utilize the facility can be quantified in a marketing study as part of a future planning element. A long course (50 meter length) competition swimming pool fitted for aquatic sports is included in the program and has the potential to draw interested user groups from greater distances.

Along with the long course swimming pool, the aquatic elements of the facility include several swimming pool types. The different pool types serve different clientele. The recreation pools are configured to serve patrons of all ages. A therapy pool is adaptable to fitness, exercise and therapy activities. Support facilities are needed to make the visit comfortable and appealing to encourage visits with long durations. Locker
and restroom facilities are provided to serve the swimming and spectator patron. Facility operation and building administration spaces in the form of offices, equipment rooms and mechanical rooms are a necessary component for the efficient operation of the facility. Commercial spaces for lease are part of the study parameters. These spaces could be leased to private companies that can provide service to patrons during their visit at the facility. Examples of commercial activities include merchandise store, food service, restaurant and services.

Projects of this scope and size will require several phases of permits and agency approvals. The study lists the agencies that are apparent at this time to have jurisdiction which will require documents preparation and processing according to their agencies procedures.

The study presents information that can be used by the Board of Commissioners and Park District staff to formulate decisions for acting on the proposed aquatic center for the community. Comparison of the outdoor versus natatorium facility configuration, learning about the operational differences between an outdoor aquatic facility and a natatorium with roof sections and the related energy consumption characteristic will help form the decision made in the future regarding this unique and exciting project.
PROJECT CONCEPT, PROGRAM AND COST

The project concept is centered on a concept diagram that identified a mix of recreation, therapy and competition pool activities. This concept diagram was used as the basis for preparing the engineering service proposal and the initial concept development drawings. The areas for the aquatic program and building core have been refined during the development of the master plan study. Concept drawing CP-1 (Appendix 2) is a graphic image of the plan view showing the relative size of the various program areas for the Building Core, Aquatic 1 and Aquatic 2. The addition of a Lazy River is an option for a future outdoor expansion.

One product of this study is to present a comparison between an outdoor facility and a natatorium. Other than the lazy river option, the aquatic program areas as described are the same for the outdoor and natatorium comparison.

The proposed building core is a permanent structure with conventional construction and contains many program areas. The building size increased from 9,100 SF per floor to 22,000 SF per floor in response to balancing the building core requirement with the aquatic and building activity areas listed in the engineering services proposal. The following activity areas are proposed for the building core:

**Lower Level**
- Pool Mechanical Room
- Building Mechanical Room
- Storage Room

**First Level**
- Entrance Lobby and Intake Office
- General (Bather) Locker Facilities
- Retail Space (Coffee Bar/Food Service)
- Spectator/General Use Restrooms
- Aquatic Offices and Storage

**Second Level**
- Multi-Purpose Room
- Comfort area and Restrooms
- Restaurant Service & Kitchen
The proposed aquatic area contains three distinct activity areas. Recreation activities take place in Aquatic 2 area and includes:

- a toddler pool
- activity pool
- wading pool

Aquatic 1 includes a spray pad that is also the base for a climbing wall.

The individual pools offer a destination for differing age groups. Collectively, this selection of pools offers a considerable amount of entertainment for the non-swimmer. While it is expected that the patrons using the facility will be trained swimmers, the very young, elderly patrons and patrons developing their swimming skills will find this area entertaining. Water depths are shallow and the pools are equipped with aquatic features that are either participatory or interactive. All of which create an environment that will engage the user.

The second type of aquatic activities is fitness, exercise and therapy activities which can occur in the multi-function swimming pool titled, “Therapy Pool”. The various training, exercise and treatment possibilities are described in the pool descriptions following this commentary.

The largest aquatic area is dedicated to the long course 50 meter competition pool. The ability to engage in swim competition and swim sports is a unique feature for a facility in this metropolitan area as a natatorium venue. This pool is located the greatest distance from the building core. This is consistent with the general expectation that the majority of users will have a higher level of physical capacity and be expected to not find the distance to support services an inconvenience. This also will allow the boisterous and noise generating activity to be a greater distance from the building core and the more passive recreational and exercise areas of the facility near the building core.

The Lazy River future expansion option consists of a long current channel where bathers ride in inner tubes. The study treats this vessel as an outdoor vessel that would be in operation during the summer season only. The vessel would compliment the recreation pools already listed for the aquatic program. This vessel is described in more detail in the pool descriptions following this commentary.

Spectator seating considered for this project utilizes portable aluminum bleacher sections. Competitive events conducted at the dive pool and competition lap pool would prompt the need for spectator seating. Portable bleachers allow flexibility for the management of the deck space surrounding the dive and competition pool. The bleacher units would be stored in storage rooms when not needed in the active aquatic areas of the facility. The following spectator seating capacities are estimated for three center configuration options:
Aquatic Outdoor and Natatorium Long Course Competition Pool
- Dive Pool: 240
- Competition Pool: 720
- Total: 960

Aquatic Outdoor and Natatorium Short Course Competition Pool
- Dive Pool: 240
- Competition Pool: 440
- Total: 660

Project cost (turn key cost) is the amount of money needed to physically construct the facility, secure financing and start up funds to operate the facility until revenue sources stabilize. Based on the concept developed for this study, comparisons and options for the estimated project costs are listed:

- Building Core Aquatics Program Aquatic 1 & 2 Outdoor: $16,098,000
- Building Core Aquatics Program Aquatic 1 & 2 Natatorium: $33,571,000
- Building Core Aquatics Program Aquatic 1 and 25 meter Aquatic 2: $29,346,000
- Lazy River Option: $3,446,000

Other options and incremental aquatic components:
- Movable Sloped Floor for shallow area of long course competition pool: $3,726,000
- Movable Level Floor for shallow area of long course competition pool: $621,000
- Water Slides and Plunge Pool: $1,029,000
- Dive Tower and Dive Pool: $1,863,000
- Therapy and Exercise Pool: $627,000
- Toddler Pool: $264,000
- Wading Pool and Play Feature: $666,000
- Activity Pool: $337,000
- 50 meter Competition Pool: $3,572,000
AQUATIC PROGRAM DESCRIPTIONS

**Dive Pool**
This pool is a deep water vessel that is associated with deck equipment for competitive diving. This type of deck equipment includes several different dive standards. The dive standards include 2-1 meter diving spring boards, 1-3 meter spring board and 1-10 meter dive platform. The pool is intended to serve competition, competition training and recreation. The District would control the swimmer qualifications necessary for a swimmer to use this pool and its amenities.

**Plunge Pool**
This pool serves as a landing pool for swimmers using the water slides. The proposed concept presents a connecting bridge with the dive pool dive platform stair structure. This bridge allows the dive platform stair to be used for both the platform and waterslide activity.

**Wet Deck (Spray Pool)**
This aquatic feature has floor spray fixtures that serve to entertain young children. The wet play would be inactive when the adjacent rock wall is active.

**Rock Climbing Wall**
This amenity is for people of any age trained to use this structure.

**Toddler Pool**
This pool has a water depth of 8-12” with a beach entry at one end. Low activity water play features are provided to serve toddlers and young children.
Activity Pool
This pool has a water depth ranging 4’ and 5’. The pool is suited to non-competitive water basketball or a water walk. A water walk is a structured water obstacle course with floatables and an overhead cargo net. This pool is suited to taller people for stand up play and light physical activity.

Wading Pool
This pool is the larger version of a toddler pool. A toddler pool has 8-12” deep water. A wading pool has a maximum water depth of 18” and has zero depth or beach entry. The larger wading pool includes a multi-level play feature similar to a playground structure. The feature has interactive water spray components that encourage interaction amongst the participants using the structure.

Therapy Pool
This pool is configured to provide several activity areas each suited to a different purpose for therapy, conditioning or exercise. Swim jets or a BADU jet is for stationary swimming or resistance walking. The deep well is for physical therapy routines while floating in deep water. The current channel provides resistance walking with locations of varying depths which suit the individual’s requirements. This pool is for all ages with supervision.

Competition Pool
The competition pool is an eight lane - 50 meter pool. The pool is fitted with a bulk head which allows two or more activity areas for training, conditioning or other related activities. The 50 meter pool is suited to competition events of a regional or larger service area. Along with competitive swimming training and events, water sports such as water polo can be an activity for both recreation and competitive events. The competition pool can be configured with a movable floor. A movable floor can change the water depth to facilitate different activities. The floor can change the water depth uniformly over a defined area or create a sloped floor to offer a graduated water depth similar to a beach entry pool.

Lazy River
Lazy rivers are swimming pool vessels in the form of a long channel where bathers ride inner tubes in a closed loop. Channel lengths vary according to the size of the facility and patron load design. The water in the pool is energized so a current develops that carries the inner tube along the river course. Lazy rivers can also serve resistance swimmers or walkers. Lazy rivers can be enhanced with interactive water features and submerged water effects.
BUILDING CORE PROGRAM DESCRIPTIONS

1. Lower Level
   A. Pool Mechanical Room contains the water treatment equipment for the swimming pools. Pumps, filters, chemical controllers, pool water heating devices, chemical feed equipment and surge tanks are the types of equipment located in a pool mechanical room. Each pool requires its own independent water process system.
   B. Building Mechanical Room contains the mechanical, electrical, plumbing, fire safety and communication systems.
   C. Storage Room area provides space to hold season equipment and supplies for operating the facility.

2. First Level
   A. Entrance Lobby and Intake Office is the front door for the facility and serves as the first point of contact between the public and facility staff. Admissions, information and walk up program registration activities would be performed at this location. This area would also serve as the single point of entry and exit for normal business operations and security control.
   B. General (Bather) Locker Facilities contain the plumbing fixtures and amenities for bather preparation for the aquatic facility. The Illinois Department of Public Health, Swimming Pool and Beach Bathing Code stipulate minimum requirements for the type and number of plumbing fixtures along with the room finish and performance requirements. Provisions for family change rooms should be included in this program area along with separate men and women locker rooms.
   C. Retail Space program area is available for merchandise sales. The type of merchandise would depend on the results of a marketing study for the proposed aquatic center. It is expected that a minimum level service would include sales of consumables and merchandise consistent with consumers patronizing the facility.
   D. Spectator/General Use Restrooms serve the public that are not using the aquatic facilities. People in street clothes are not permitted to use the bather preparation facilities. These restrooms serve an important function during aquatic events when spectators are permitted to observe the activity.
   E. Aquatic Offices and Storage Rooms provide work areas for staff to conduct administration, operation and management tasks.
3. Second Level

A. Multi-Purpose Room is primarily what the title implies. This program area for the competition swimming pool serves as base camp for visiting swim clubs/teams during swimming meets. Partitions can be utilized to give teams individual spaces to store gear, conduct team or group meetings and lounge during off periods. The center can make this space available to outside groups for meetings, activities and serve as a dining hall.

B. Comfort area and Restrooms serve as overflow space and sanitary facilities for people attending events on the second level of the building.

C. Restaurant Service & Kitchen is a program area dedicated to food preparation for consumption on-site. The menu and associated equipment needed for this program area would be defined as part of a marketing and feasibility study for the facility. The space could be operated by the Park District, leased to an outside contractor or made available for catering companies.
REVENUE AND INCOME PRODUCING OPPORTUNITIES

A successful enterprise requires revenue streams to support annual operating cost and debt retirement. The facility program is focused on aquatics and offers areas for revenue other than user fees for the natatorium.

Aquatic 1 and Aquatic 2 program areas offer opportunities to conduct the following activities:

1. Competition event rentals
2. General swimming
3. Special swimming admissions
4. Performance/entertainment shows
5. Swim lessons
6. Club team practice and event rentals
7. Therapy and exercise classes
8. Party and Business event rentals

The Building Core portion of the facility includes program areas for the following activities:

1. Support areas for competitive events
2. Multi purpose room for aquatic and non aquatic event rental
3. Kitchen for leased or catered enterprises
4. Retail space
   a. Coffee shop/food service concessions
   b. Merchandise sales

These income generating activities and others that are considered during the development process can be included in the marketing and feasibility study process. The proposed facility plan offers a variety of income generating areas that can support the enterprise business structure considered for the project.
OPERABLE ROOF SYSTEMS

Natatoriums are typically constructed of conventional building materials tightly sealed and involves energy intensive air management systems. Historically, masonry walls with roof structures consisting of pre-cast concrete or steel form the natatorium envelope. These materials are protected from the humid environment created by swimming pools. Air handlers with heating and air management controls create air suitable for a natatorium. These systems require electric energy to power the fans and petroleum fuels for heating (commonly natural gas). This study highlights the concept of operable clear glazing roof and wall building envelope sections.

Sports facilities susceptible to event cancellations or diminished attendance due to inclement weather incorporate operable building envelope systems as a means to temper the affects of weather. Examples are:

- Miller Park Baseball Stadium, Milwaukee
- Minute Maid Park, Houston, TX
- University of Phoenix Stadium, Phoenix, AZ

Four operable roof manufacturers have been identified and reviewed for the proposed natatoriums: Arqualand, DynaDome, OpenAire and Uni-Systems. Natatoriums or waterpark installations that feature these systems are highlighted on their respective websites. System descriptions along with exhibits presented by each firm are listed following this commentary.

The review of these operable roof building systems determined that all four types can be considered for the proposed natatorium. Based on the development of schematic design, a combination of systems may be considered for design solutions. The following observations have been summarized for these manufacturers:

**Arqualand** offers operable roof simplicity for natatorium programs that have floor area and height characteristics that conform to their system arch. Each arch assembly is fitted with wall height sliding panels that allow natural ventilation when the roof is closed. This system is not suited for the aquatic program as configured for this study. Future configurations that position aquatic programs compatible with this manufacturer’s arch form can be considered. The low height aquatic programs are well suited for this operable arch roof system.

**DynaProducts, DynaDome** system concept has merits for both its fully retractable function and a structural form to accommodate natatorium support systems. The manufacturer has used its past experience with full span moving components and developed moving assemblies that are supported by an external support structure. This configuration reduces the structural requirements of the moving assembly. Their concept provides the span length and sidewall clearance required to clear the Aquatic 2 program as configured for this study. DynaDome’s system is also compatible with Aquatic 1 natatorium configuration.
OpenAire’s project resume list presents a more developed experience level for the natatorium enclosures proposed for this project. Their system differs from the others because the natatorium structure is comprised of a structural frame and fixed panels as the primary assembly. Portions of the roof are configured with panels that open. Wall panels would also be retractable to complement natural ventilation with the retractable roof panels. While this system does not provide a fully retractable system, numerous natatorium structures are in operation and can be used for development of the marketing and feasibility study. This operable roof system is suited for both the Aquatic 1 & 2 natatorium programs.

Uni-System’s project resume is very diverse in the arena of moving systems. Their firm has presented several fully retractable roof configuration concepts for Aquatic 1 & 2 program areas. The base configuration is based on clear span retractable roof sections. Other manufacturers have presented concepts that require fixed primary structural components to support retractable components for the clear span dictated by the aquatic program. Uni-Systems concept design includes the primary support structure as part of the moving assembly. This approach provides the highest level of service as it pertains to creating an outdoor environment when the roof is in the open position.
ARQUALAND

Arqualand’s system consists of a series of arched vaults that typically move on ground level rails. The configuration for the study has a span of 93’ and 20’ tall arch. The system is capable of providing a fully retractable system for natatorium areas requiring less than 93’ of clear width. In the future, schematic design work can consider this roof system for aquatic program areas that are within the manufacturers arch dimensions. Examples of pools that could be covered by this roof system are therapy, wading pools with low height features, tot pools, narrow lap pools and spray pads.

Their roof system can also be considered as a retractable dome over a building structure that provides a ground level width greater than 93’. This configuration could also be considered as part of schematic design and be considered for expanded aquatic program areas with the appropriate building support structure.
DYNA PRODUCTS, DYNADOME TELESCOPING ENCLOSURES

The DynaDome system is a fully retractable system. Their concept for Aquatic 2 area shows a series of external hip shaped arches that support a ridge beam. The movable building sections travel along the underside of the support structure. Their concept images show the building sections in the open and closed position and perspective views. The ridge beam configuration provides a conduit and support structure for mechanical and lighting systems.

Website:  http://www.dynadome.com/spec.htm
OPENAIRE

OpenAire’s roof system offers different shapes and operable configurations. Their standard retractable roof was selected for Aquatic 1 and Aquatic 2 components of this study. This model features a hip shape roof with movable panels covering the upper half of each roof slope. With the roof panels in the open position, nearly 50% of the roof area is open to the sky. This roof system is well suited for both Aquatic areas of the facility. The simple roof form offers economy for purchase and installation. When the roof panels are open, air within the natatorium will easily vent out the top of the enclosure. Additional operable wall panels will assist natural ventilation of the room. This system as compared to the other manufacturers does not provide building sections that are fully retractable. Therefore the environment when the building panels are open would not be fully exposed to the outdoors. (Pictures courtesy of Openaire’s website and are not representative of this project)
UNI-SYSTEMS

Uni-Systems list of past projects is broad in the area of movable building components and devices. Their firm has presented an operable roof system concept for Aquatic 1 and Aquatic 2.

The concept presents a fully retractable configuration. The open length of Aquatic 2 is 250’ of the 350’ of program area. The retractable concept for Aquatic 1 opens approximately 50% of the length of this program space. The building wall for the water slide flume would need to be permanent and the movable building section design modified accordingly.

Uni-Systems presented many variations on movable building envelope components that can be considered as part of future schematic design work. The different variations would offer solutions for site and programming challenges depending on the circumstances presented at specific sites and program requirements.
OPERABLE ROOF MECHANICAL AND ELECTRICAL SYSTEMS

The research for operable roof systems determined that different types of systems create different opportunities and challenges for the respective systems. Two system types have been identified and presented in this study. One system includes movable building sections that open a facility fully to the outdoors, therefore, titled fully retractable. The other system is comprised of a fixed structure with operable panels or building segments that move to create an open air atmosphere. This system is termed operable panel system for the purposes of describing the mechanical and electrical system concepts.

Mechanical and electrical systems for the fully retractable system would be located in the basement of the natatorium. The space between the building basement walls and the pool vessels provides routes for installing and maintaining the mechanical and electrical systems. Within the pool room pedestals, air distribution louvers and other utility and communication devices would be used. Lighting standards would consist of cantilevered structures with foundations at the outer edges of the pool deck and standard light poles and fixtures in the recreation area where deck space is adequate. Underwater lighting would be required to supplement overhead lighting during a night time schedule.

Mechanical and electrical systems for the operable panel system would be a variation on the fully retractable operable room system concept. The panel system allows lighting and other aerial devices to be supported from the permanent structure.

The natatorium mechanical system would be an energy recovery type system. During periods of high occupancy 100% outside air would be heated and controlled by a building management system. The energy recovery unit would capture heat from the exhaust air which would pre-heat the fresh air entering the energy recovery unit. The building management system would be designed to coordinate the energy recovery unit operation with the occupancy of the building and the position of the operable roof assembly consistent with the climate and operating schedule of the facility.

The lighting for the natatorium would be a combination of overhead lighting, pedestal mounted deck lighting and underwater lighting. Energy efficient fixtures are available for each light configuration. The specific fixture selections for the overhead lighting will depend on the type of operable roof selected for the project. The mounting height and horizontal position will determine the type of fixture required. The lighting controls would be connected to the building management system. The system would be programmed to activate the lights needed for the operating schedule and available ambient light provided from outside when the roof is closed, and the time of day and climate when the roof is open.

More specific system descriptions will be created as the project design progresses. The mechanical and electrical systems for an operable roof will be configured differently than conventional systems. The main difference will be the routing of the distribution systems. The basement space in the natatorium will permit most of the system components to be located under the pool deck. Deck pedestals and similar structures will provide the vertical elements needed to distribute air and supply electrical devices.
OPERABLE ROOF REPLACEMENT AND REPAIR SCHEDULE

Each of operable roof manufacturer representatives stated that the service factor for the moving parts and moving section seals are high quality. Because the material used for the moving parts and seals are reportedly of high quality, the annual costs for repair and maintenance are very low. Once a specific manufacturer or group of manufacturers are identified to potentially supply products, a more specific repair and replacement program can be presented by the manufacturers. For the purpose of this study and creating the concepts for consideration, all of the manufacturer’s present high quality components so annual maintenance costs are expected to be very low.
OFF SEASON AND SUMMER OPERATION COSTS

This portion of the study is the product of the task described in Option C of the engineering services proposal. This is an evaluation of the operating systems required for each of the “Off Season”, non-summer period, and the Summer periods. The result of this evaluation determined that the variations in available operable roof systems and the associated heating and ventilation systems present many variables that need to be defined before a reasonable operating profile can be created. The comparison for the two defined operating periods can be quantified and is included here.

The operable roof and associated expansive clear glazing area offers several energy saving advantages. One aspect of the operable roof is the energy savings realized during the summer months. The study scope included an evaluation of the energy cost savings potential realized during the typical outdoor summer season. The system affected most by the utilization of the operable roof is the ventilation system. During the summer months a conventional natatorium operates ventilation fans to keep the indoor environment suitable for swimming. When the roof is open, natural ventilation eliminates the need to engage the ventilation fans. The estimated annual electrical cost reduction for not using ventilation fans is $23,000. The present worth value using this annual savings amount over a 50 year expected life span of the facility is $500,000. This calculation assumes the time value cost of money is 4%.

The operable roof and associated clear glazing offers other opportunities for energy savings which can be included in a future expanded study of the year-round operations. The spring and fall climate in combination with a heating and ventilation system programmed to complement the operable roof will offer energy savings for the proposed facility. The implementation of this study should be scheduled concurrent to a detailed study of a specific site and operable roof options. Solar attitude and access is a significant factor for quantifying the potential energy savings and is normally site and building design specific. Quantification of the potential savings will complement a future marketing and feasibility study for the proposed project.

The present worth calculation for the annual summer season energy saving is a significant number which supports the innovative approach presented by the District in considering unique building envelope configurations like the operable roof.
SITE SELECTION EVALUATION

A preliminary site evaluation was conducted on six (6) sites initially selected by the Downers Grove Park District (DGPD). These sites were as follows: Site 1, Site 2, Site 3, Site 4, Patriot’s Park and the Walnut Avenue site. Each site was reviewed and given a score based on their specific attributes and initially reported to the Downers Grove Park District (DGPD) in a site rating format. The site rating figure can be found following the site descriptions.

The DGPD used this initial evaluation to narrow down the selection process to three (3) sites. These sites were Site 1, Site 2 and Patriot’s Park. A second round of evaluations was conducted on these three sites; this time looking in more detail into possible construction costs associated with each of them. For the development of the cost analysis, site layout conceptual plans were developed to extract the necessary preliminary quantities on which the cost analysis is based. Assumptions such as possible utility routings, pipeline sizing, pavement section composition, etc. were necessary as well. However, these assumptions were based on sound engineering judgment and experiences from past and similar projects.

Site 1:

This site is located in one of the main population centers of Downers Grove. It is also located on the east side of Downers Grove; closer to adjacent municipalities with little or no existing facilities of the type proposed. All basic utilities needed for this project can be found on-site or along adjacent streets and the site is not located near any known environmentally sensitive areas. The size of the site provides DGPD the capacity and flexibility needed for this project and future expansions; including the possible alternate of a lazy river addition.

Although some land acquisition needs to take place, the site requires very little demolition and preparation work for the proposed project. In addition, the parcels to be acquired are relatively small and should not represent a significant cost burden to the overall project. This site is in our opinion the most favorable of the sites evaluated. A list of general Pros and Cons of this site is provided below:

Pros...
- Location... near residential areas or adjacent municipalities of interest
- Accessibility
- Sufficient site capacity for parking and future expansions
- Surrounding land use
- Utility availability
- Gentle topography
- No obvious environmental concerns
• Minimum acquisition costs
• Expectations of a relatively effortless site review and permitting process

Site 2:

Although not centrally located within the community, this site is easily accessible from surrounding streets. For the development of this project DGPD expects the need to purchase adjacent land. Most of the basic service utilities are available on site. The addition of a lazy river alternate will require additional land for both building and parking. A list of general Pros and Cons of this site is provided below:

Pros...
• Accessibility
• Surrounding land use
• Utility availability

Cons...
• Not near major residential areas or adjacent municipalities of interest
• Land acquisition cost
• Limited site capacity
• Impact to existing facilities
• Limited expansion potential
• Possibility of wetlands related permitting

Site 3:

Although its location gives it great accessibility, this site is not currently owned by the DGPD, and will require a considerable amount of fill material due to elevation differential with adjacent streets. This site also contains a wetland area that could present regulatory obstacles to any development proposed for the site. The size of the parcel is a disadvantage of this site, as it is likely that a parking structure will be required to provide the parking capacity needed. Unless additional land is acquired, the addition of the lazy river alternate is not feasible due to the increased building size and consequent need for additional parking. This evaluation classifies this site as the least favorable for the proposed project. A list of general Pros and Cons of this site is provided below:

Pros...
• Surrounding land use
• Utility availability
• No demolition required
Cons...
- Not near residential areas or adjacent municipalities of interest
- Acquisition cost
- Access to site unclear
- Limited site capacity
- No expansion potential (without land acquisition)
- Likelihood of wetlands related permitting and/or mitigation
- Topography—Considerable haul-in fill costs are likely
- Will require parking structure

Site 4:

From an engineering standpoint, this site is the most favorable for the development of this project. The site currently includes an existing retail development, all basic service utilities, more than enough land area to fit the proposed building and parking area, and additional land area for future expansion. The alternate addition of a lazy river facility to the proposed project will fit with no major obstacles on this site. As a re-development project, it is also expected that the regulatory review and permitting process will be less complicated and time consuming.

Having said that, this property is not currently owned by the DGPD and will require extensive demolition to prepare it for the proposed project. In addition, the funds required to purchase this property makes this site one of the least favorable for the development of the proposed project. A list of general Pros and Cons of this site is provided below:

Pros...
- Accessibility
- Sufficient site capacity for parking and future expansions
- Surrounding land use
- Utility availability
- No obvious environmental concerns
- Expectations of a relatively effortless site review and permitting process

Cons...
- High acquisition cost
- Likelihood of high demolition costs
- Not near residential areas or adjacent municipalities of interest
Patriot's Park:

The location of this site was described by the DGPD as a good site location due to its accessibility and proximity to adjacent municipalities with little or no existing facilities of the type proposed. The possibility of intergovernmental cooperation and outside patronage makes this site location the most attractive. Although this site is surrounded by residential areas, an existing facility of similar use is located next to the subject site. This is seen as an advantage, as neighbor opposition to the proposed project is less expected. This site is currently owned by DGPD. This site is partially wooded and does not contain any structures that would require demolition. The topography of the site is moderate. Sanitary sewer is available on-site and other basic service utilities are available from 55th Street. These utilities will have to be brought in to the site. Stormwater detention is currently available on-site and could serve the proposed project with some modifications or addition to the existing.

The overall land area available for development seems to be sufficient for the proposed building and associated parking (approximately 400 spaces). However, these areas are not adjacent to one another. A possible layout for this development considers a bridge across an existing drainage way and an access road approximately 800 feet long connecting the site with the existing parking area east of the pond. The current distribution of land will allow the construction of 150 to 200 surface parking spaces adjacent to the proposed building. The remainder of the required parking could be provided by expanding the east parking area. This will replace an existing park and picnic area. The car-to-building walking distance for patrons will be in excess of 800 feet. An alternate option of development for this site will consider the construction of a multilevel parking structure adjacent to the building to accommodate the required parking. This will represent a major increase in cost of development and could increase the potential for neighbor opposition to the project.

Site capacity is the main limiting factor for development of this site. The most convenient development option for patrons will result in considerable construction costs and structures that will not necessarily be compatible with the rest of the park, thus increasing the potential for neighbor discontent. On the other hand, the most aesthetic and cost efficient option of development for this site could present some inconvenience to patrons visiting the site during peak use hours; due to limited parking capacity adjacent to the facility.

An alternate to add a lazy river to the proposed building has also been studied for this site. This option will increase the developed area footprint; which may have the following impacts to the site:

- Increased building footprint
- Increased parking capacity requirements
- Increased water and sanitary sewer demand

A list of general Pros and Cons of this site is provided below:
Pros...
- Location... near residential areas or adjacent municipalities of interest
- Surrounding land use
- Accessibility
- Utility availability
- Little demolition required
- Moderate topography

Cons...
- Developable area distribution
- Limited expansion potential (without land acquisition)
- Possible improvements to the pond shore may be needed
- Possible need for wetland related permitting and/or mitigation
- Access to site requires bridge or culvert crossing construction.

In conclusion, the development of this site for the proposed facility, although with certain land constraints, is feasible. It could be achieved within a reasonable construction budget; provided the remote parking area option is acceptable. However, the inclusion of the lazy river alternate to the scope will require acquisition of additional land.

Walnut Avenue Property:

From the beginning, this site was found to be inappropriate for the proposed development; and disqualified for further evaluation. In early reviews, it was determined that the parcel in question does not provide enough land area to fit the proposed building and required site elements (parking, landscaping and detention). The site is also surrounded by environmentally sensitive lands, not available for development that could present regulatory obstacles to any development proposed for the site. To the south, there is another nearby parcel owned by DGPD and available for development. This parcel could be used to house most of the parking area and required stormwater detention. However, this detached parking arrangement will be a significant deterrent to patrons; since the walking distance from the parking to the building will be between 400 feet to 900 feet. A list of general Pros and Cons of this site is provided below:

Pros...
- Utility availability
- No demolition required

Cons...
- Inadequate site capacity
• Not near residential areas or adjacent municipalities of interest
• No expansion potential (without land acquisition)
• Likelihood of complications regarding environmental related permitting
• Possible layout options present inconvenience to prospect patrons

Out of the six (6) sites above, only three (3) were selected for cost analysis: Site 1, Site 2 and Patriot’s Park. A more detailed schedule of estimated construction costs for these three (3) sites is located in Appendix 3.
### Downers Grove Park District- Site Evaluation Matrix for Community Aquatic Facility Master Planning

<table>
<thead>
<tr>
<th>Review Criteria</th>
<th>Max Score</th>
<th>Site 1</th>
<th>Site 2</th>
<th>Site 3</th>
<th>Site 4</th>
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</tbody>
</table>

**Note:**
1. Rating from 1 to 100; 1 being the worst and 100 being the best. For some items, such as wetlands, the rating will describe the level of difficulty to secure necessary permits or work around site-specific issues (i.e. wetlands, zoning, stormwater management, etc.). For these, a rating of 1 will represent the highest level of difficulty.

2. Per the Village's Zoning Ordinance (Municipal Code ch. 29), the parking requirements will be determined by the square footage of pool area @ 10 spaces per every 1,000 SF of water area (approx. 230 spaces).
UNDERGROUND STORMWATER DETENTION

Underground stormwater detention is another option available to sites with space limitations or safety issues to consider. Conventional detention ponds are often viewed as aesthetically unpleasant, unsafe to children and spatially inefficient. These issues are more apparent in projects involving schools, parks or small sites where space is scarce. There are two main variations of these types of systems: (1) detention with surface release and (2) detention with infiltration release. Both of these options have operational and structural differences; and their application depends on several site specific factors that should be considered by the Engineer or design professional.

Underground detention systems with surface release are nothing more than interconnected pipes acting as storage tanks with an outfall structure controlling the release of runoff at a pre-determined rate. These pipe systems can be constructed of plastic, concrete or corrugated metal (see example sketch below).

These systems are usually sealed systems, which only allow intake through surface inlets and discharge through the outfall structure. These systems are often recommended for sites with low potential for infiltration or high water tables. For high water table applications, special anchoring may be required to prevent buoyancy.

Underground detention systems with infiltration release, by definition, consider infiltration as a way of runoff release. These systems can be constructed just like the system described above; but using perforated piping instead of full wall piping. Systems such as Stormtech™ and StormChamber™ are arches or half-pipes specially designed for this type of application; usually at a fraction of the cost of a typical full pipe underground system. These systems are less vulnerable to buoyancy since they allow ground water to flow in and out unrestricted. This is also a disadvantage since during high water table conditions the storage capacity of the system may be compromised.
The general pros and cons of using this type of detention system can be summarized as follows:

Pros...

• Allow maximum use of available land.
• Reduce health and safety concerns associated with standing water.
• Improved aesthetics

Cons...

• Cost. For a typical 1 to 2-acre commercial site (5,000 to 7,000 CF storage required) the cost of installing these systems can fluctuate between $50,000 and $70,000 ($10/CF). Half pipe or arch systems usually cost between 40% and 50% less.
• Do not incorporate water quality measures. These have to be implemented downstream of the system.
• Maintenance. These systems must be inspected and maintained regularly to ensure proper operation. Siltation and trash must be removed regularly.
• Access. May require personnel trained and certified to enter confined spaces.

Based on our preliminary analysis of the three (3) selected sites for further review, no significant site issues were found that would present major obstacles to the installation of either one of these systems. Out of the three, Patriot’s Park is the only site with apparent potential for a high water table. If upon further analysis, the use of underground detention is selected, it is likely that a conventional full-pipe system (with special anchoring) will be recommended for this site.

Preliminary stormwater calculations are required to determine approximate storage volumes for detention. These are required in order to estimate the approximate cost of such system for any of these sites. We can, however, provide a very rough estimate of cost based on past project experience. This, of course, does not consider current fluctuations in oil prices, which also affects the cost of materials and labor. An 8-acre development will require detention storage for approximately 45,000 cubic feet (CF) of detention storage. An underground detention system for such site will cost between $380,000 and $450,000. A conventional above-ground detention pond will cost between $70,000 and $120,000.
### PROJECT DEVELOPMENT SCHEDULE

<table>
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<tr>
<th>Activity</th>
<th>Duration</th>
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<tr>
<td>Marketing and Feasibility Study</td>
<td>4 months</td>
</tr>
<tr>
<td>Project Concept Design and Business Plan</td>
<td>3 months</td>
</tr>
<tr>
<td>Project Financing and Implementation</td>
<td>2 months</td>
</tr>
<tr>
<td>Develop Construction and Permitting Documents</td>
<td>6 months</td>
</tr>
<tr>
<td>Project Procurement</td>
<td>2 months</td>
</tr>
<tr>
<td>Project Construction</td>
<td>18 months</td>
</tr>
<tr>
<td>Facility start up and orientation</td>
<td>1 month</td>
</tr>
<tr>
<td>Project Development Period</td>
<td>36 months</td>
</tr>
</tbody>
</table>
MARKET POSITION

A market analysis is not a part of this study. However, in order to have an introduction to the local and regional facilities, a listing of aquatic facilities is included following this description. The listing and general location map provides baseline information on the type and location of facilities local to Downers Grove. The category of long course or short course competition venues with significant spectator seating capacity in the Midwest is listed. This category is important as the proposed Aquatic 1 and 2 natatorium program approaches the venues considered suitable for hosting competitive events.
REGULATORY AGENCY AND CODE REQUIREMENTS

The regulatory agencies that have jurisdiction for the facility are typical for commercial and municipal development. The swimming pool use adds additional regulatory review by the department of health, both at the state and county.

Facility Development Regulatory Agencies and service coverage

Village of Downers Grove
Community Development Department:
Municipal Zoning
Building, Mechanical, Electrical and Plumbing Codes
Storm water management plan

Department of Public Works:
Water and Storm Sewer
Street access permits

Downers Grove Sanitary District:
Sanitary sewer service extension or improvements

DuPage County
Department of Health, Environmental Health Services:
Swimming Pool Construction Permit

State of Illinois
Department of Health:
Swimming Pool and Beach code
Construction Permitting

Other agencies may have jurisdiction depending on the site selected for development. The agencies may include ILEPA, and local municipal districts.
CONCLUSION

Creating a conceptual building configuration that incorporates DGPD’s preliminary aquatic program, operable roof system and the associated support facilities on three building sites is the product of this study. The building footprint has developed in a manner consistent with the layout provided for the study parameters. The building core area, aquatic areas and the operable roof system duty is increased to create a balanced assembly for the aquatic program. The preliminary development cost incorporates building configurations that assume the building could be redeveloped for a different function to increase the collateral value of the proposed asset and accommodate the mechanical systems required for a natatorium with operable roof assemblies. The information provided in this study will allow the District to quantify the development cost which can be used for completing feasibility, marketing and more detailed aquatic programming studies for an enterprise business plan. Within these future tasks, more detailed energy savings analysis can be completed that can be realized from operable roof systems. The unique approach to this project has merit and further study is needed to refine the program to determine the feasibility of implementation.
APPENDIX 1

Cost Breakdown

(Revised)
# COST BREAKDOWN

## Outdoor

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<tr>
<th>Description</th>
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<td>Building Core</td>
<td>$4,653,000</td>
</tr>
<tr>
<td>Core Building Aquatic Program*</td>
<td>$1,537,000</td>
</tr>
<tr>
<td><strong>Aquatic 1</strong></td>
<td></td>
</tr>
<tr>
<td>Spray Pad/Rock Climbing Wall.</td>
<td>$138,000</td>
</tr>
<tr>
<td>Water Slides and Plunge Pool.</td>
<td>$1,029,000</td>
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<tr>
<td>Dive Tower and Dive Pool</td>
<td>$1,863,000</td>
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<tr>
<td>Pool Surrounding Improvements</td>
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<tr>
<td><strong>Aquatic 2</strong></td>
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</tr>
<tr>
<td>Toddler Pool</td>
<td>$264,000</td>
</tr>
<tr>
<td>Activity Pool</td>
<td>$337,000</td>
</tr>
<tr>
<td>Wading Pool and Play Feature</td>
<td>$666,000</td>
</tr>
<tr>
<td>Therapy and Exercise Pool</td>
<td>$627,000</td>
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<tr>
<td>50-meter Competition Pool</td>
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<tr>
<td>Pool Surrounding Improvements</td>
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<td><strong>Total</strong></td>
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## Natatorium

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Plumbing...................................................................................................................... ................ $256,000
Fire and Security ............................................................................................................. ............ $972,000
Total.......................................................................................................................... .................... $33,580,000

Operable Roof Breakout**
Aquatic 1 Natatorium .....................................................................................................................$2,070,000
Aquatic 2 Natatorium .....................................................................................................................$8,280,000

Additional Features/Options
Lazy River ..................................................................................................................... ...................$3,446,000
Movable Sloped Floor for shallow area of long course competition pool ...................................$3,726,000
Movable Level Floor for shallow area of long course competition pool......................................... $621,000

Note: Totals do not agree due to string calculation formula differences prior to rounding up function.

*Includes finished spaces for administration, spectator restrooms and general purpose room. This space compliments and supports the a 50-meter competition pool for hosting competitive swim events.

**Roof breakout value is for assembly cost above the foundation or supporting building walls.
APPENDIX 2

Concept Plan CP-1
APPENDIX 3

Unit Costs for Site Work Estimates
## Downers Grove Community Aquatic Facility Master Plan Study

### Table of Estimated Costs

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**Notes:**

- **Site:** 1120 Dallas Street, Sauk City, Wisconsin 53583
- **Voice:** 608-634-4100  Fax: 608-643-7999
- **Web:** http://www.ramaker.com

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