

Lower Makefield Township

Baseline Swimming Pool Feasibility Study

Board of Supervisors

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Township Manager

Mr. Terry S. Fedorchak

Pool Manager

Mr. Brad Sharp

Director of Parks & Recreation

Ms. Donna Liney

Lower Makefield Township

1100 Edgewood Road
Yardley, Pennsylvania 19067-1696

Submitted by:

WALLOVER ARCHITECTS *incorporated*

354 North Prince Street, Suite 110
Lancaster, Pennsylvania 17603
(717) 295-7754
(717) 295-5577 fax

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LOWER MAKEFIELD TOWNSHIP
1100 EDGEWOOD ROAD
YARDLEY, PA 19067

*Baseline Feasibility Study
Final Report*



**LOWER MAKEFIELD TOWNSHIP COMMUNITY POOL COMPLEX
BASELINE RENOVATION FEASIBILITY STUDY**

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EXECUTIVE SUMMARY

Lower Makefield Swimming Pool Renovation Baseline Feasibility Study

The Lower Makefield Swimming Pool complex is the major outdoor summer swimming facility for the Township. This facility has a long history of service for residents of the Township and thousands of swimmers throughout the greater Yardley area. However, the effects of the normal aging process, weather extremes, harsh chemicals, and routine maintenance have combined to create a situation where a program of rehabilitation and renovation must be developed for this facility. Maintaining the vitality of the existing pool complex and its' support facilities is, in our professional opinion, the single most critical issue facing the continued operation and success of the facility.

The public desires aquatic facilities that promote a sense of excitement and fun while being up to date, clean and most importantly, safe. The current physical environment at the pool, while a model of competitive municipal aquatic facilities of the 80's, does not fully meet these criteria. The report identifies a number of options to increase the overall financial, programmatic and operational well being of the community's aquatic recreational program, however without an up-to-date leisure / family oriented aquatic facility, the desired outcome for the Township may not be able to be achieved. Expanding swimming opportunities for resident users depend upon aquatic facilities that will produce a "draw" for Lower Makefield Township.

In order to implement new physical improvements with corresponding programmatic and operational changes, the basic aquatic facilities must first be put in order. While it is desirable to limit expenditures due to code implications, the replacement or renovation of a specific element of the pool without insuring that the remaining systems properly interface with new improvements can be a recipe for disaster. The study identifies the key elements required to insure the continued viability of the Community Swimming Pool complex.

In making any decision regarding the pool, the Township must understand that a substantial portion of the funding necessary for pool upgrades will not be readily apparent to the patrons of the pool. Pumps, heater repairs, water chemistry controllers, piping modifications, and other necessary mechanical system improvements will be the initial elements of the renovation. Code compliance issues do not create the sense of excitement that is now so prevalent in many of the aquatic theme parks or newly designed municipal swimming facilities. The Lower Makefield Community Pool must incorporate current technology and design trends, but in doing so retain the unique nature of the suburban recreation complex that has historically drawn so many residents to the facility. The natural character of the site, its mix of recreational activities with other municipal functions, makes this facility an asset that can benefit all Township residents for many years to come.

In order to offset initial expenditures for the necessary "nuts and bolts", the installation of an integral shallow water - family oriented leisure pool is recommended to provide residents a new and exciting activity. By providing an attraction of this nature, new family memberships can be established while maintaining existing patrons. The natural grades surrounding the pool provide an excellent overview of the facility's major competitive features. The potential for the development of a more accessible concession area that serves element of both the pool and park should be explored. Traditionally this area has not been heavily utilized by the membership. New uses for under utilized portions of the site open up a wide range of possibilities for programming and revenue generation.

The following specific recommendations for remedial work should be considered to be the initial steps for any major renovation of the facility. It should be noted that the recommendations relate primarily to the maintenance of the existing aquatic facilities and ultimately, the addition of new aquatic attractions. If deemed appropriate by the Township, the installation of a water slide(s) may

Lower Makefield Township Community Pool Complex Baseline Renovation Study

Analysis of Existing Conditions

The following analysis of the Lower Makefield Township Community Pool Complex is intended to identify all relevant conditions that effect the continued operation of this facility. The study will outline the major factors affecting the operation of the facility, identify problem areas and be followed by a series of recommendations that will provide the Township with various options for renovation. The elements of the report are as follows:

- **General History and Overview of Main Swimming Pool, Intermediate Pool, Tot Pool and Lap Pool structures**
- **Deficiencies**
 - **Containment Structures**
 - **Filtration, Sanitation Equipment and Recirculation Systems**
 - **Bathhouse Structure**
 - **Site conditions**
- **Recommendations**
- **Estimates of Probable Construction Cost, and**
- **Executive Summary**

We are confident that this facility can be effectively renovated to minimize maintenance costs while continuing to provide a valuable recreational resource for the residents of the Township. This study can be utilized as a catalyst to assist in the preparation of any subsequent grant-in-aid applications from either local or state funding sources. Also, the report should be used for the preparation of a specific scope of work for future pool and bathhouse renovations.

Main Swimming Pool Structures

The original Lower Makefield Township Community Pool Complex was issued for construction in July of 1979 by Charles R. Bauerlein, PE, Recreation Consultants, Inc., of Ambler, Pennsylvania. The bathhouse structure was designed by P. Richard Frantz, AIA of Pottstown, Pennsylvania. The pool was constructed thru the fall and winter of 1979 and placed in operation in the spring of 1980. The original facility consists of three distinct swimming pool elements, a 50-meter "ell" with an integral diving well, an intermediate teaching/recreational pool and an independent tot pool. The complex also was originally developed with a bathhouse, concession and filter building. Ample on-site parking is provided (approximately 191 cars plus short-term pick-up and drop-off areas).

In the fall of 1994, a second intermediate competition / lap swimming pool was constructed. The pool is a 25-meter by 25-yard fully competitive structure with a new bathhouse/storage/filter building. The building is constructed of similar materials and aesthetic appearance to the original buildings. The pool as built, is "shotcrete" construction (pneumatically placed concrete) and features a Paddock stainless steel recirculating gutter system and a plaster and tile finish. The new pool was originally designed by Pickering,

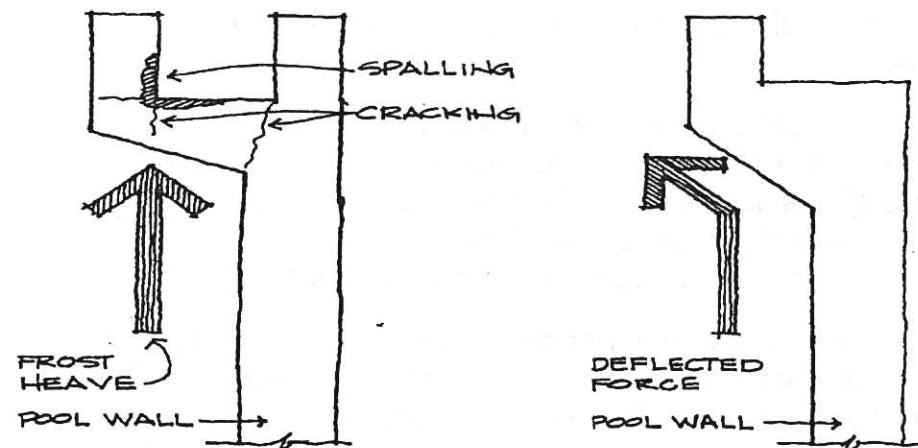
well is a modified hopper shape and does not comply with NCAA or current state design standards. The depth at the diving board plummet is approximately 12'-0" and is not sufficient for a 3 meter diving stand. (currently the required depth is 13') At the time of the original construction, the NCAA standards were adopted, however there was not complete agreement as to accepted design standards during that time period. No unassisted handicapped access is available to any of the pool structures.

The top of the pool wall is finished with a pre-cast slotted roll out bull nose coping. The coping is in fair to good condition for its age. This condition is typical for the main and original intermediate pools. The tot pool is finished with a tile skum ring and standard bullnose concrete swimming pool coping. The interior of the gutter trough was not accessible for examination as the grates were grouted in place or in some instances fixed in place with sealant.

The pool manager, Mr. Brad Sharp indicated that water loss in the main 50-meter pool is constant and if left unattended will stop at the base of the bullnose coping. This would indicate that the water loss is in the pool overflow gutter system. In our professional opinion the major reason for the water loss in the pool gutter is the design and profile of the pool beam. RCI has historically designed pool gutter/beams with a bottom slope of the beam structure of approximately 24 degrees or less.

Normally this slope is maintained at a 45 degree or steeper angle. This greater slope allows the rear of the pool wall to deflect upward soil pressures or frost heave. The "flatter" slope allows frost to affect the top of the wall with increased pressure and associated movement causing cracks at the joint of the vertical wall and pool beam. This cracking permits water to migrate from the gutter return trough to the earth behind the pool wall. With the water loss stopping at the base of the coping, it would clearly indicate that water loss is within the overflow gutter and not in any of the underground piping.

Over time the constant migration of chlorinated water will create deterioration of reinforcing steel and the detail will ultimately fail. We believe it is this situation that has caused the failure of the rear of the concrete gutter at the main and possibly the intermediate pools. Without significant restorative work, this condition will continue to deteriorate and cause further water loss problems.



GUTTER AS CONSTRUCTED:

OPTIONAL BEAM CONFIGURATION:

gutter lip should in most cases prevent introduction of storm water into the pool filtration system.

Ramp structures exist on site, however the slope of the interconnecting ramps are greater than the recommended slope for ramp construction, therefore ADA compliance is not met with the existing configuration. Numerous cracks and small grade changes exist throughout the paved areas. Although minimal, these represent potential tripping hazards for the patrons.

The new intermediate pool has a water surface area of 6,173 SF with a volume of 205,325 Gallons (27,450 CF x 7.48 gal/CF). This pool is of "shotcrete" construction and is also actively leaking. The water loss stops as soon as the water level in the pool clears the lower edge of the gutter. It would appear that a leak has developed between the interface between the concrete pool beam and the stainless steel gutter.

In some instances when a rollout gutter is utilized, the rear wall of the pool beam is not at an elevation above the static water level in the pool. If a leak develops between the gutter and concrete shell, there is not sufficient height at the rear of the pool beam to retain the pool water within the shell of the pool. Therefore, water leaks between the pool wall and the bottom of the concrete pool decks. This leak should be located in the spring and repaired with an appropriate non-shrink grout and sealant. While a nuisance, this type of leak can be found with dye testing and resolved with the appropriate patching medium.

The overall condition of the lap pool appears sound except as noted with only minor cosmetic defects in the plaster finish. Some stress cracking the corners is evident and the plaster does have some mottling visible on the bottom of the pool. Impurities in the original plaster mix or improper sequestering of minerals during the curing process can be the source of the "mottling". While unsightly, this condition does not have any long-term implications regarding the watertight integrity of the pool structure. In general, the lap pool appears to be in good condition for an outdoor pool with seven full seasons of use.

In addition to the swimming facilities, the site features extensive shaded grass lawn areas adjacent to the existing pool. Extensive site lighting is provided for evening and night usage. One unique feature of the facility is that the pool and related buildings are located within a large Township park. The site is well suited for the intended usage. A Leathers Playground structure, tennis, baseball, softball, and a variety of turf sports can be performed at the site. All pool related support facilities (buildings, concessions, etc.) are located on site at an elevation between that of the main pool and the intermediate pool. The entire pool site is enclosed with an 8' high chain link fence. Several gates for access to the pool and deck area are incorporated into the fencing.

Deficiencies

The following outline of deficiencies and shortfalls is provided to concisely identify the extent of the renovation facing the complex. It should be noted that the pool complex is extensive in its size and complexity. The amount of water surface area for a community of Lower

- Concrete decks slope toward pool gutter system
- Sealant at pool coping compromised in 5% to 10% of perimeter length

Tot Pool

- Piping returns may not be sufficient for required turnover rate
- Single main drain - No anti-vortex drain cover
- Suction lines in wall surface not covered by grates (grating may have been removed for winterization)
- Feature element (24"x24" cube) potential hazard in tot pool, spray feature of limited impact or play value
- Concrete decks even, control joint sealant needs replaced
- Ceramic tile in fair condition
- Minor stress cracking in bottom of tot pool

Competition /Lap Pool

- Water loss at interface between stainless steel gutter and concrete shell
- Joint between Plaster and Stainless Steel gutter requires recaulking
- Minor stress cracking in plaster finish at corners of pool
- Plaster discolored (not uncommon)
- No deck drainage system
- Target and Lane markings not in compliance with NCAA or USS standards (cosmetic)

Recirculation, Filtration, Sanitation & Heating Systems:

General comments:

The recirculation piping systems are highly elaborate and interrelated between the independent pool structures for the original pool development. The complexity of the piping layout and the interconnection between surge tanks and recirculation piping is potentially problematic. To the best of our knowledge no ground water migration into the filtered water system has occurred, but if a failure of a line or valve were to occur, the filter system may be subject to contamination from ground water. No underdrain systems are noted on the original architectural drawings, therefore any ground water at or below the bottom of the main pool should not be introduced into the recirculation system. The overall piping scheme in the main filter room is highly complicated and not an efficient design. The extensive number of fittings greatly reduces the overall efficiency of the pumps and generates higher operating head pressures for the overall system. Simplification would be appropriate and desirable.

Furthermore, under current code and practice, interconnection of independent swimming pools is also not recommended. The common surge/balance tank for the main pool and the training pool can potentially co-mingle two distinct functions and use patterns. An evaluation of the empty vessel prior to opening in the spring should be performed. As noted, the demand for sanitation can be vastly different for each individual pool.

The ongoing problems with the heating system are in the process of being analyzed in greater detail than this study can provide. Moore Engineering, Inc. of Lancaster, with the assistance of **WALLOVER ARCHITECTS** is reviewing the operational characteristics of each of the heating plants. The nature of the damage within the heaters indicates that insufficient flow of pool water through the heat exchangers may be allowing the individual

- Intermediate Pool Operational data for filter unit - (1) Neptune Benson NB 48SRF-4, 48" diameter, 12.6 SF filter area, max flow at 20 GPM/SF – 252 GPM, operational flow rate 189 GPM/SF w/ total flow capacity 189 GPM @ 15 GPM/SF filter area
- Tot Pool Operational data for filter unit - (1) Baker Hydro, 36" diameter, 4.9 SF filter area, max flow at 98 GPM/SF – 252 GPM, operational flow rate 74 GPM/SF w/ total flow capacity 74 GPM @ 15 GPM/SF filter area
- Main 50 M pool: (2) 15 HP, 208/230/460V, 3 phase pumps with new impellers to be reinstalled in spring. Pump operation to be verified for operational performance with heating units (Moore Engineers report)
- Intermediate Pool: (1) 7.5 HP, 208/230/460V, 3 phase pump. Pump operation to be verified for operational performance with heating unit (Moore Engineers report)
- Tot Pool: (1) 2 HP, 230/115V, 1 phase pump. Pump operation to be verified for operational performance with heating units (Moore Engineers report)
- Gas chlorine sanitation system potentially dangerous and highly acidic requiring extensive use of pH buffering agents such as soda ash – this system is being replaced and will be bid in early February 2002
- The gas disinfectant system currently in use for the 50-meter, intermediate, and tot pools at the facility does meet Section 11.1 of the Public Bathing Place Manual. However, the potential for the accidental release of chlorine gas is a concern that should be addressed. The Township has issued a directive that the transition from elemental gas Chlorine (Cl₂) to liquid chlorine, Sodium Hypochlorite (NaOCl) be initiated prior to the 2002 swimming season. (This work is under way with projected bidding in early February, 2002.)
- Automatic water chemistry control system for original pools in need of updating, the new competition/lap pool in good operating order and condition with only minor maintenance issues

Site Conditions:

- No deck drainage system exists around any of the pool containment structures, this is in direct violation of the **PBPM**, which requires one deck drain for every 400 Square feet of deck area or a continuous trench drain
- Ramps interconnecting areas of the site are in excess of ADA guidelines (> 5% slope)
- No railings provided for ramp assemblies
- Concession area and outdoor dining not efficient and remote from main swimming areas, no parental control possible between tot pool and concession area

Pool Decks and Deck Equipment Notes:

The condition of the surrounding pool deck work is in fair to good condition. Limited amounts of spalling, settlement and cracking of the concrete decks was observed. The pool decks show little evidence of settlement but if water loss continues around the main 50-meter pool, this situation can change. The original design of the pool wall provides adequate support for the concrete decks around the pool perimeters. The majority of the deckwork does not have sufficient deficiencies to warrant complete replacement around the perimeter of the pools except for the pitch of the decks towards the pool. This must be addressed as storm water runoff enters the pools directly. The Township has performed some ongoing repairs to the decks.

- Number of plumbing fixtures inadequate to meet current code requirements in both men' and women's' dressing areas
- Exterior fascia, soffits and siding require repainting or replacement in areas of delamination
- Windows in fair to good condition, limited natural lighting or proper ventilation in dressing rooms
- Clerestories in fair to good condition, glazing and louvers in fair to good condition, new glazing would improve overall appearance of dressing rooms and the overall exterior appearance of the building in general
- Concession area appears to be cramped, poor service flow
- Concession area only serves the main pool, access to the remainder of the park limited, expanded service window for non-swimmers desirable
- Repainting of interior recommended
- Windows and screening should be improved
- Combination of commercial and residential equipment - a review of practices and menu should be undertaken internally to determine extent of desired additional space

ADAAG Compliance: Deficiencies

Bathhouse

- New lap pool building fully complaint
- Minor revisions required but may be mitigated by competition/lap pool filter building
Door opening widths and thresholds require adjustment
- Water cooler and plumbing fixture heights require adjustment (may be sufficiently addressed by new bathhouse)

Swimming Pools

- No accessible ramps or ADA compliant means to access the Tot, Intermediate, Competitive lap or 50 Meter Pools
- No lifting mechanism or transfer tiers on site to assist physically challenged individuals

POOL VOLUMES

The specific volumes of water for the pools within the facility are as follows: (It should be noted that the volumes were calculated based upon existing construction drawings dated July of 1979, prepared by Recreation Consultants, Inc. Ambler, Pennsylvania. Field investigation indicates that the main pool, intermediate pool and tot pool were constructed as indicated on the contract documents. It is suggested that for the purposes of renovation, the calculated volumes from the original documents be utilized for the verification of filtration equipment capacities. This will allow for an additional margin of safety in maintaining adequate recirculation flow.

Pool Volumes:

Main 50 Meter Competitive Pool Structure: (1979 structure)

Area:	9,500 Square Feet - (water surface area)
Water Volume	7.48 gal./c.f. x 60,303 CF = 451,066 Gallons

	2,700 S.F./15 S.F./patron =	180 occupants
Tot Pool:	The existing tot pool consists of shallow area, therefore, the allowable area is based upon 15 S.F./patron. Section 3.31 Public Bathing Place Manual)	
	1,175 S.F./15 S.F./patron =	78 occupants
Competitive Pool:	The existing intermediate pool consists of shallow area, therefore, the allowable area is based upon 15 S.F./patron. Section 3.31 Public Bathing Place Manual)	
	6,173 S.F./15 S.F./patron =	412 occupants
Total User Load:	Combined occupancy:	1,300 occupants

Deck Area: (Excess Lounging (deck) Allowance is calculated by dividing the allowable occupancy of the pool area by 0.25. This figure is multiplied by 50 S.F./person to determine the required excess deck area for the facility. Section 3.3.4 Public Bathing Place Manual)

Maximum Allowable Occupancy:
 1,300 occupants/0.25 = 5,200 patrons
 (5,200 -1,300) x 50 S.F./patron = 195,000 S.F. required area of excess lounging area to allow for maximum occupancy. (4.47 acres) Any excess area over 195,000 S.F. cannot be used in determining the number of patrons permitted into the pool area. As this figure is not a reasonable occupancy for this pool, it is recommended that the actual water surface area occupancy calculations be used for this facility.

Concrete paved deck area:	26,133/50 SF/Patron =	523 occupants
Grass lawn area:	70,577/50 SF/Patron =	1,411 occupants
Subtotal:		1,934 occupants

Maximum allowable occupancy for the pool and site: 3,234 occupants

It should be noted that it is not recommended that the maximum allowable occupancy be utilized by Lower Makefield's Recreation Department as this number of patrons would require a major increase in staffing and supervision. This figure is provided for informational purposes only. Furthermore, attendance figures provided by the Township indicate that actual attendance is far below the allowable occupancy of the pool. Water surface area should be utilized to determine the desirable occupancy load for the facility.

Total Recommended User Loads: 1, 300 occupants

Plumbing Fixture Requirements:

With the current occupancy of the pool, the available number of toilet fixtures in both the men's and women's restrooms does not meet the required plumbing fixture count. No handicapped accessible shower or restroom facilities are available in either dressing area. As this is an existing structure, the Department of Environmental Resources may not require additional fixtures to be added to the building. The space requirements of the existing floor plan will readily accept accessible units with modification. A small addition to the building (both male and female) may be the most appropriate and least disruptive means to accommodate ADA regulations.

new addition may prove to be the most appropriate means to resolve any handicapped issues facing the facility.

The code deficiencies identified herein are substantial in nature and must be addressed in any future work. The remedial work is not required at the present time, as the Township's pool is not subject to these improvements until such time as a major renovation of the facility occurs. Upon initiating pool renovations, the pool and bathhouse must be brought into compliance with the code in order to obtain a new bathing place permit. The local regional headquarters for the Department of Environmental Resources is:

Regional Environmental Health Specialist
SOUTHEASTERN DISTRICT

Gary A. Schultz
Reading State Office Building
625 Cherry Street - Room 442
Reading Pennsylvania 19602-1187
(610) 378-4352
(610) 378-3748 (FAX)

This is the point of contact office for state review and approval of any proposed work. It is recommended that a preliminary meeting be held with the regional office upon defining the scope of work for the Project. Maintaining close contact with these offices can prove most valuable in obtaining prompt review and approval of contract documents.

RECOMMENDATIONS – General Issues

Original Containment Structures (Resurfacing and Painting)

Conditions present at Lower Makefield's Lower Makefield Township Community Pool Complex warrant the development of a comprehensive renovation program for the main pool containment structures, filtration systems, recirculation systems for the original pools, deck modifications and bathhouse alterations and/or additions. The condition of the concrete containment structures are in very good condition for a facility of its age. This speaks clearly of the community's efforts in providing proper maintenance and upkeep. The issues that require attention are not a result of poor service, rather they are a direct result of the age of the complex.

As previously noted, the structural integrity of the containment structure is quite good for a pool of its age and use. In order to protect the existing concrete structure, resurfacing of the interior floor and wall surfaces should be a high priority in any renovation program. The irregularities in the concrete surface are related to age and the effects of chlorinated water on concrete surfaces. Sandblasting, resurfacing and repainting will extend the useful life of the containment vessels significantly.

Replastering of the 50-Meter pool can also be evaluated. Eliminating the need to repaint annually or semi-annually can be a major consideration. A winter/safety cover combined with extending filter system operation until the first frost can have a profound impact on spring cleaning. Some communities have been able to remove a winter cover and start up the filters without having to drain and clean in the spring. There are numerous schools of

The installation of a single or double channel, stainless steel recirculating gutter system would have the following benefits for the Lower Makefield Township Community Pool Complex:

1. Ease of cleaning and general maintenance are greatly enhanced with this system. The water line of the pool is in contact with stainless steel minimizing a skum ring. Cleaning is easily performed with a 3M Scotch Brite pad. A continuous grate is required for the gutter. This assembly can reduce the chance of tripping when exiting the pool and assist in keeping debris out of the gutter channel. No loose parts are exposed to minimize the potential for vandalism.
2. Constant skimming during quiescent and full load periods is maintained. Integral surge weirs allow the gutter to operate with 80% of the required flow rate in the channel (20% through the main drain) to maintain higher water quality during quiescent periods. In-pool surge capacity is achieved by allowing the second channel within the gutter to handle any sudden surge within the main pool tank reducing the potential for flooding of the balancing tank or the filter. In addition, filtered water is returned to the pool at 3' intervals around the perimeter of the pool providing an even distribution of finished water, thus increasing sanitation.
3. The installation of the stainless steel gutter system will eliminate the current problem of water loss through the existing concrete gutter trough and underground piping. The stainless steel gutter is not adversely effected by the effects of winter freeze/thaw conditions further reducing ongoing maintenance.
4. All existing return piping below grade (except the main drain assembly) can be abandoned. All wall inlets can be permanently sealed eliminating the potential for costly repair should a line fail. A total of two main recirculation lines from the gutter (one (1) main gutter suction, and one (1) gutter filtered water return) are required to operate the system. The potential for future deck removal can be minimized by installing the new gutter assembly and associated piping.
5. The existing water level can easily be increased to 5' at the starting blocks that will allow for safe competitive swimming activities. By utilizing a roll-out deck level gutter system, this increase in depth can be accomplished. The installation will require minimal demolition to install the new gutter.

The scope of work to install a stainless steel gutter system would entail the removal of the existing concrete deck edge coping, a portion of the existing concrete wall and the existing pool beam. This work is best completed by utilizing a horizontal rail saw. This process, while costly, does produce a smooth horizontal cut on which to install the required stainless steel plating, anchor bolts, setting angle assembly, and gutter system. This methodology is recommended for older pools as far less vibration and construction impact forces are exerted on the original containment structure.

New NSF approved high rate pressure sand filter plants can produce excellent results without the need for excessive maintenance time. For ease of maintenance and long life, the use of a high rate pressure sand filter system will provide the Township excellent service. This type of system can be installed within the existing filter building to protect the unit from the elements. Most exposed elements of the filter are PVC construction and require minimal work to maintain. The filter operates at a rate of 15 to 20 GPM/SF of filter surface area and produces excellent water quality. This type of filter with a properly designed filtration rate is capable of providing water quality close to that of Diatomaceous earth filtration without the problems associated with the disposal of diatomaceous earth.

It is highly recommended that the future filter system selected should be sized for a maximum filtration rate of four (4) hours to a minimum of six (6) hour turnover rate (at 15 GPM/SF) to insure the highest water quality for the patrons of the pool. The filtration rates should be sized according to the programmed function, i.e.; heavy use pools should have the most rapid turnover rate. By cleaning the water at elevated rates, it has been found that chemical consumption can be minimized because aggressive filtration reduces the need to increase disinfection when short term bathing loads increase.

New commercial horizontal fiberglass filters offer an inexpensive alternative to carbon or stainless steel filter vessels. We have examined a number of filters on the market and can recommend their use as the new horizontal design provides for a far more efficient distribution of filter bed and media within the filter tank. The filters can be easily ganged, have larger influent and discharge fittings (allowing for slower water velocities within the system), and provide for efficient and simple operation. As the cost for these systems are less than the carbon steel or stainless steel high rate sand systems, Lower Makefield Township should explore this option.

Sanitation System (liquid chlorine conversion for the 50-M, Intermediate & Tot pool)

As more information becomes available regarding chlorination of commercial swimming facilities, alternative sanitizing systems are becoming more common. While the widely utilized Sodium Hypochlorite, NaOCl, (liquid chlorine) is relatively inexpensive at the present time, new regulations regarding the transport and delivery of liquid chlorine will increase its cost in the near future. With an available free chlorine content of 10% to 16% (12% is the most common form) and a short shelf life, Sodium Hypochlorite remains a viable option for many municipal swimming pools based upon cost and ease of delivery. Safety issues when handling liquid chlorine must not be overlooked as improper handling and mixing can cause serious injury under the right circumstances.

When used with CO₂ to buffer pH, no corrosive effects are encountered in mechanical rooms or mechanical systems. Liquid Chlorine's high base composition requires the use of acid to reduce the base level (pH) to a range of 7.2 to 7.6 and a minimum residual chlorine level of 0.4ppm.

Calcium Hypochlorite provides sufficient chlorine (65% available free chlorine) to act as a sanitizing (oxidizing) agent, however, the carrier element, Calcium, does have the potential to increase the total alkalinity of the pool water over time. This problem can be addressed and should not be viewed as a sufficient reason to disregard erosion feed chlorine systems

one renovation Project, the State *may* require that the entire site be brought into code compliance. A three year window must be maintained between projects to avoid the perception that the work being undertaken is circumventing the requirements of the applicable codes. By scheduling work in smaller segments, the Township may be permitted to correct problem areas on a limited basis while ultimately bringing the entire site into compliance with all applicable codes.

- Replace concrete deckwork around the pool perimeter (currently approximately 15'-6" feet wide from edge of pool) with a 12' wide concrete deck to produce a uniform appearance, proper drainage, and a suitably textured and level surface to eliminate the potential for slipping and tripping. [50-Meter pool and original intermediate pool]
- 1. If a curb/gutter option is selected, the limits of deck removal may be reduced to 4 to 6 feet of deck depending upon the extent of demolition required to install the new work.
- Install ceramic tile safety graphics, or install recessed permanent graphics on decks in accordance with Section 6.1.5 of the Public Bathing Place Manual and install additional depth markers as per Section 6.1.1.
- Install new lifeguard chairs (8 units) to meet the requirements of the P.B.P.M. (Section 6.3.1, 6.3.2). Install new ladders and a new handicapped walk-in ramp with appropriate handrails (incorporate with zero depth access).

Bathhouse Renovations (general comments)

The overall visual and physical condition of the original bathhouse structure and filter building, the concession building and the new competition pool support buildings are generally sound. The first impression one receives is that of a well maintained but aging complex. The combined buildings are well placed on the site but not architecturally significant. Design plays a critical role in providing an atmosphere of fun and relaxation. Monotones do not generally excite the senses, nor is brown a color that most kids respond to in a favorable light. In any future building improvement project aesthetics should be a high priority. ***The Township is marketing a product and service, accordingly that product must be enticing in order to attract the largest possible number of patrons.***

The severely limited floor area for dressing and corresponding lack of restroom facilities are problems that will require attention in the future. It should be noted that the current facility is capable of maintaining adequate access to the building support function, but as the complex undergoes renovation, it is anticipated that the daily use patterns will increase and that annual memberships and daily attendance will grow. As such, the size of the existing support facilities will require attention from the Township.

The following items should be considered in future renovation programming:

- Provide a minimum of two additional ADA accessible family (unisex) dressing/shower/restrooms to supplement the existing building thereby avoiding extensive renovations of the existing bathhouse (including shower, lavatories, waterclosets, urinals, dressing benches and lockers)
- Increase the size and food service capacity of the concession area and offer fixed shaded seating with an unobstructed view of the tot/intermediate pool areas

the water surface will remain available for competition, diving, exercise and general recreational swimming, a leisure component with a water surface area of 4,000 to 4,500 square feet would attract and serve a significant population of the Township.

ADA Access Ramp for Main 50-Meter Pool

The design and installation of an ADA accessible ramp into the 50-meter pool is a desirable feature. A ramp will serve not only physically challenged individuals, but it can open the pool for a wide variety of elderly and therapeutic activities. As a significant area of the 50-meter pool will range from 3-1/2 to 4 feet in depth, exercise programs can be established. A readily accessible, heated pool will only serve to increase opportunities for elderly segments of the community to utilize the pool.

While ramps are not features currently required by the ADA regulations, (lifts and transfer tiers are acceptable forms of access), the image that a well designed access ramp present to the public is testament to the Municipality's commitment to the need of all of its residents.

A ramp will also provide an opportunity to invite public/private cooperation in the health field as summer therapy programs can be established. Orthopedic, occupational and physical therapy, and gerontology practices may all wish to utilize time in a heated facility. Ramp access will encourage this type of usage and as the water surface becomes more accessible, opportunities for revenue generation will be created. Public/private cooperation is a potential revenue stream that should not be overlooked. Scheduling downtime with meaningful use can build good will within the community while adding revenue into the operating budget.

Stainless Steel Gutter System

While identified as a needed renovation, the costs associated with this component of the renovation program makes it a major capital expenditure. The installation of a new gutter system can permanently resolve a number of nagging issues. As indicated, installation cost is a major consideration but the elimination of all of the perimeter in-ground piping removes a significant problem associated with outdoor pools. Pipe repair is highly time consuming, costly and not a final solution to aging pools unless all piping is removed and replaced in a single operation.

The following considerations are somewhat unique to the Lower Makefield Pool complex. If properly installed, a stainless steel gutter can effectively resolve these issues and produce a pool that can provide another 25 years of service.

- The current gutter design is prone to deterioration and will only become more problematic as the affects of time and temperature act upon the existing concrete surfaces
- All existing below grade piping, except the main drain lines, can be abandoned
- The water level in the pool can be adjusted to provide adequate depth for competition at the shallow end of the 50-meter course
- The depth of water at the plummet of the diving boards can be increased, and
- A new curb drain assembly can be designed to permanently resolve the deck drain issue

*Pool gutter demolition: 500 LF x \$ 90/LF =	\$ 45,000
Plaster pool option: 12,800 SF x \$5.25/SF =	\$ 67,200
*Stainless Steel Gutter System (Neptune Benson) 500 LF x \$215/LF =	\$ 107,500
*Piping Allowance: (connection to existing filtration) =	\$ 12,500
Concrete/tile curb: 500 LF x \$30.65/LF =	\$ 15,325
Deck Equipment: (Lump Sum allowance) =	\$ 40,000
Equipment Installation Allowance: (30% of hard costs) =	\$ 13,200
Deck demolition: (partial) 2,675 SF x \$1.25/SF =	\$ 3,350
Concrete decks: 2,675 SF x \$3.75/SF =	\$ 10,050

Subtotal: \$ 314,125

Contractor's Overhead and Profit: 20% = \$ 62,825

Total estimated cost of construction: \$ 376,950

Construction Contingency: 10% = \$ 37,695

Assumptions for deck equipment:

ramp rails (2 sets), 10 access ladders, 5 lifeguard stations, 1 meter & 3 meter diving stand, starting blocks anchors for 14 lanes of competition, recall, backstroke stanchions, etc.

ADA Ramp Construction

Concrete shell demolition: allowance =	\$ 2,750
Pool ramp construction: 352 SF x \$95/SF =	\$ 30,875
Ceramic tile surface: 150 SF x \$12.50/SF =	\$ 1,875
Concrete deck demolition: 625 SF x \$1.25/SF =	\$ 800
Concrete deck replacement: 625 SF x \$3.75/SF =	\$ 2,350
Rail goods: allowance 110 LF =	\$ 8,250

Subtotal: \$ 46,900

Contractor's Overhead and Profit: 20% = \$ 9,380

Total estimated cost of construction: \$ 56,280

Construction contingency (10%) \$ 5,630

Intermediate Pool: rehabilitation costs

Main tank area: 2,700 SF (original 1979 swimming pool)

*Pool gutter demolition: 210 LF x \$ 90/LF =	\$ 30,350
Sandblasting concrete shell: w/o finish 3,420 SF x \$1.25/SF =	\$ 18,900
Plaster Finish Pool Construction: 7,268 SF x \$4.50/SF =	\$ 4,275
*Stainless Steel Gutter System (Neptune Benson) 210 LF x \$190/LF =	\$ 39,900
*Piping Allowance: (connection to existing filtration) =	\$ 8,500
Deck Equipment: (Lump Sum allowance) =	\$ 6,500
Equipment Installation Allowance: (30% of hard costs) =	\$ 1,950
New Filter tanks and media: (Based upon 4 hr turnover rate)	
Existing Filter demolition: allowance	\$ 5,500
2 high rate sand filter units @ \$18,850 =	\$ 37,700
Pumps and Piping Allowance: =	\$ 15,000
Sanitation & Chemistry Control Allowance: =	\$ 8,500
Filter System & Sanitation Installation Allowance: =	\$ 22,000
Deck demolition: 1,950 SF x \$1.25/SF =	\$ 2,450
Concrete decks: 1,950 SF x \$3.75/SF =	\$ 7,300

Pumps & Piping Allowance: =	\$ 5,500
Piping run allowance: (5 runs @ \$1,200/run) =	\$ 6,000
Main drain Allowance: =	\$ 1,500
Concrete decks: 1,100 SF x \$3.75/SF =	\$ 4,125
Subtotal:	\$ 77,075
Contractor's Overhead and Profit: 20% =	\$ 15,425
Total estimated cost of construction:	\$ 92,500
Construction Contingency: 10% =	\$ 9,250

SUPPORT BUILDING (S) CONSTRUCTION: (interior & exterior renovations, inc. demolition, painting, limited trim replacement, hardware improvement, new flooring, upgraded lighting, new food service equipment (if user demands warrant improvement), upgraded plumbing fixtures, ADA compliant restroom equipment, no site furnishings and interior FF&E). This work is not listed in any specific order of priority, however the Township should address ADA issues as soon as possible to avoid any potential liability for con-compliant spaces or facilities.

Main Office /First Aid improvements: (renovation)	
1,350 SF x \$45/SF Allowance:	\$ 60,750
Bathhouse improvements: (renovation)	
1,222 SF x \$60/SF Allowance:	\$ 73,325
Concession Improvements: (renovation and new)	
758 SF x \$60/SF Allowance (renovation):	\$ 45,500
550 SF x \$105/SF Allowance (new including kitchen equip.):	\$ 57,750
Family changing area: (new, including new tot pool filter room space)	
750 SF x \$95/SF Allowance:	\$ 71,250
Storage building: (new)	
2,000 SF x \$55/SF Allowance: (masonry & woof frame)	\$ 110,000
Existing storage shed limited demolition Allowance:	\$ 7,500

Cost savings: PVC piping vs. stainless steel gutter

In the event the stainless steel gutter system is not selected for consideration, a cost savings of 25% to 30% for recirculation system expenses may be realized in the initial construction. Concrete gutter relining with PVC membrane and installation of new coping and gutter grating can generate cost savings. The in-ground piping (schedule 80 PVC minimum wall thickness) can also be an effective means to renovate an existing swimming pool structure. However, below deck piping is subject to settlement and movement as has been the case at the existing facility and surface applied membranes can fail. In addition, extensive core drilling of the sidewalls of the existing pool must be performed to insert new suction and filtered water inlets. The potential savings for each pool are as follows:

	PVC	SS gutter	Savings (30% indicated)
Main 50 Meter Pool:	\$ 327,450	vs. \$ 376,950	(\$ 49,500 potential savings)
Intermediate Pool:	\$ 232,975	vs. \$ 256,600	(\$ 23,625 potential savings)

below the swimming pool containment structure. By draining the pool, the ground beneath the pool will freeze and cause movement of the concrete structure. This movement will ultimately cause cracks and or deteriorate control joints. A winter cover will minimize the effects of debris entering the pool over the winter and potentially staining the pool finish. Reinforced nylon covers are highly recommended as a means to maintain a pool's finish surfaces but also as a safety element by eliminating the possibility of accidental entry to an unobserved pool structure. As Lower Makefield has always utilized these practices in winterizing the pools, the good overall conditions of the complex can be attributed to the Township's proactive policies.

Proper winterization will save a substantial sum of money over the life of the pool complex. By draining domestic waterlines and properly installing anti-freeze agents in the plumbing system, deterioration of utilities and the surrounding building surfaces can be greatly reduced. All filter systems should be completely drained and major lines should have at least one valve removed or unbolted from the system at the lowest point in a line to eliminate the potential of damage from expanding ice. These practices cost money in man-hours, but can save substantial dollars in eliminating repairs in the spring prior to startup. It should be anticipated that two individuals would need approximately two to three working days to properly winterize a facility.

Depending upon the pool surface, annual spring cleaning with a solution of mild detergents will greatly extend the life of the pool finish. Acid washing greatly erodes plaster surfaces. A standard plastered pool finish will provide a five to eight year life expectancy. If the water chemistry is maintained in a neutral state and spring cleaning is not too aggressive, this period can be extended to up to ten years. This is not the norm, but with an aggressive maintenance policy individual facilities can provide greater performance. Most pool finish failures observed are a direct result of over aggressive cleaning and poor water quality. New quartz modified finishes can extend the life of the finish far beyond the more commonly utilized calcium based marble and cement plaster. However, these finishes are approximately 50% higher in first cost.

Pump motors should provide a minimum of ten to fifteen years of operation without the need for replacement or overhauling. The pump volute assembly should be capable of reaching the 25-year expectancy. Dual pump systems, while initially more expensive, can eliminate entirely or substantially minimize future expenses for the first 25 years of operation. Chemical feed pumps and other related support systems are more prone to more frequent replacement. Here again, with proper cleaning and normal routine maintenance, water treatment equipment has been observed operating well beyond fifteen years.

As for the term of financing of a new municipal facility, the period of 20-year amortizing period is quite common. If a community is committed to the investment in public aquatic recreation and will develop and maintain a proper policy of upkeep and regular maintenance, a 25-year bond of term for a municipal loan is not unreasonable. Communities should recognize that at the ten, twenty and thirty year mark refinishing of the cosmetic surfaces of the pool is warranted and assist in protecting the municipality's investment. If painting of the pool surface is selected, this must be undertaken on a three to four cycle. If the substrate of the pool's containment structure is allowed to deteriorate due to lack of maintenance, painting may become an annual expense.

recreational needs while enabling the Township to maintain a fiscally sound policy towards its aging infrastructure.

In our professional opinion, this facility is well worth the effort! While seriously undersized, the bathhouse building is substantially constructed and with the appropriate renovation techniques should provide an additional 25 years of service. The pools require attention and a considerable amount of work, but the basic construction techniques are sound and suitable for currently available techniques for renovation. Properly skilled contractors are critical to the success of the restorative work. By combining substantial products with proper construction techniques, the pool's useful life can be significantly extended for Lower Makefield Township's continued use.

While phasing can minimize the initial financial impact of a large project, the Township should understand that the overall cost of construction will be higher due to the effects of inflation and multiple contractor start-up. Coordination and overhead expenses. It should be noted however that by staggering needed work, the facility will begin to age at varying rates. This can lead to constant long-term maintenance expenses, but with proactive upkeep this can be minimized. Furthermore, lower first cost solutions generally result in higher operational and maintenance costs. Utilizing high quality products and installation techniques will result in less restorative work for staff and lower operation expenses.

The Lower Makefield Township Community Pool Complex can *and* will, be the linchpin for establishing new life at the Community Park and a positive benefit for all Township residents. Careful analysis of the facility by the Township is the first step in the course of action necessary to restore this fine recreational facility. This study will hopefully be the spark that initiates this process.

CONCEPT MASTER PLAN FOR LOWER MAKEFIELD TOWNSHIP

21-FEBRUARY-02

WALLOVER ARCHITECTS *incorporated*

