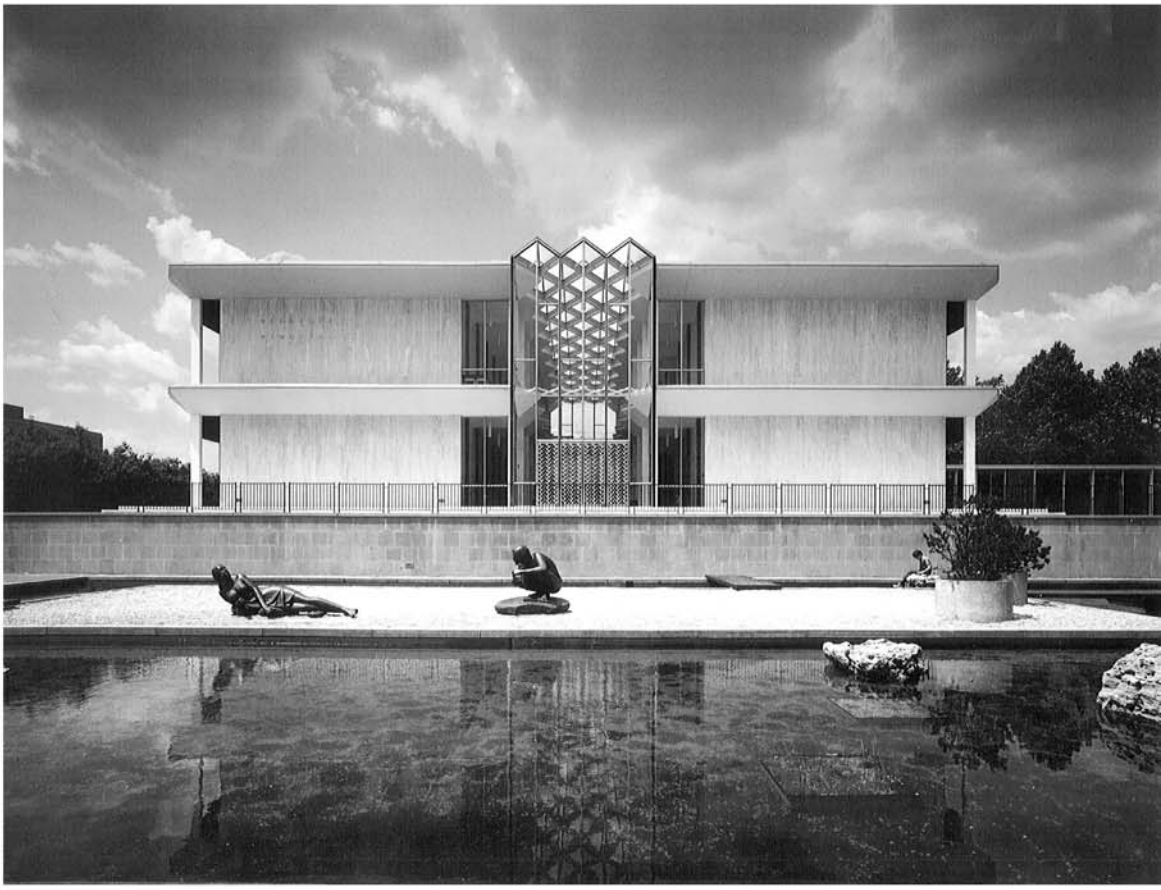
WAYNE STATE UNIVERSITY

McGregor Pond Restoration

Detroit, Michigan

SCHEMATIC DESIGN REPORT

March 3, 2011



QUINN EVANS ARCHITECTS

Quinn Evans Architects
219 1/2 N. Main Street
Ann Arbor, Michigan 48104

WAYNE STATE UNIVERSITY

McGregor Pond Restoration

Detroit, Michigan

SCHEMATIC DESIGN REPORT

March 3, 2011

WSU # 043-146664
QEA # 21100001

QUINN EVANS ARCHITECTS

Quinn Evans Architects
219 1/2 N. Main Street
Ann Arbor, Michigan 48104

Table of Contents

Section I

Executive Summary

Executive Summary

A. Statement of Purpose

The McGregor Memorial Conference Center and adjacent reflecting pool and sculpture court were designed by architect Minoru Yamasaki (1912-86) and constructed in 1957-58. The McGregor Memorial Center earned Yamasaki his second AIA First Honor Award in 1958 and was just recently listed on the National Register of Historic Places in January 2011 as a nationally and internationally recognized building.[1]

Over the decades, various alterations have been made to the McGregor Pond that sits immediately south and west of the McGregor Center. The reflecting pool and sculpture court are generally in poor condition. The concrete pool structure has significant cracking and spalling and has been unable to hold water for many years. Previous renovations have introduced additional landscaping and permanent site improvements around the perimeter of the court that contrast with Yamasaki's original design aesthetic and restrict the free-flowing circulation pattern that was inherent in the initial design. In January 2011, Quinn Evans Architects was retained, together with a team of consultants, to prepare design recommendations for the restoration of the McGregor Pond.

The purpose of this report is to document the results of the team's investigation as well as to provide recommendations for treatment to be undertaken by the university in returning the sculpture court to a functional space. This report includes the following sections:

Section I	Executive Summary: A summary of the project's history, project participants, and a general overview of observed conditions and recommendations for treatment.
Section II	Historical Background: A brief background of the site's materials, construction, and use.
Section III	Existing Conditions: An architectural description and detailed review of the site's existing conditions as observed during field observation and testing.
Section IV	Treatment Recommendations: Recommendations for the preservation and repair of the McGregor Pond.
Section V	Appendices: Supplemental information regarding this study, including cost estimate, relevant reports, as well as existing and new site plan drawings.

[1] Yamasaki, Minoru, *A Life In Architecture,* Art Media Resources, New York, NYU 1979, pg. 43

B. PROJECT TEAM

The project team includes Quinn Evans Architects (QEA) who is the primary contract holder with Wayne State University. QEA was assisted by NTH Consultants, LTD as the team's structural engineer providing analysis and design for the repair and lining of the pool foundation. Northstar Pools, LLC assisted QEA in the examination of the existing pool equipment and recirculation system, and Beckett & Raeder was retained as the landscape architect responsible for the design and recommendations of all plantings and related site improvements.

C. SUMMARY OF RECOMMENDATIONS

The reflecting pool and sculpture court are generally in poor condition. The concrete pool structure has significant cracking and spalling and has been unable to hold water for many years. Previous renovations have introduced additional landscaping and permanent site improvements around the perimeter of the court that contrast with Yamasaki's original design aesthetic and restrict the free-flowing circulation pattern that was inherent in the initial design.

Recommendations for treatment generally include the following:

- Repair and stabilize the existing concrete pond structure in accordance with previous analysis performed by NTH Consultants (see Appendix B).
- Prepare concrete surface and install new polyurea coating inside reflecting pool to prevent future water leakage.
- Replace all plumbing and mechanical components of the existing recirculation system, including skimmers, feeds, return lines, and main drains. Provide new filtration and sanitizing systems. Modify existing fill line to provide automatic fill capability.
- Remove all existing landscaping around the perimeter of the sculpture court. Provide concrete paving in lieu of existing landscape where not original to Yamasaki's design.
- Provide new locust trees and Pachysandra groundcover at existing tree pits.
- Provide eleven (11) aquatic planters with isolated irrigation and drain system.
- Provide new precast island planters with smooth, white cement finish. Plantings must be transplanted on an annual basis.
- Modify existing irrigation system to accommodate the removal of the existing landscape and the addition of aquatic planters. Extend irrigation system to the existing tree pit locations.

- Replace existing island paving with 12” x 12” precast pavers made with white cement and exposed white marble aggregate.
- Remove, clean, and reinstall all granite curbs to accommodate installation of new polyurea coating.
- Replace existing concrete paving along the terrace at the west and south sides of the pond.
- Reconstruct existing concrete ramp at the west end of the sculpture court to meet current barrier free access standards.
- Provide new, historically appropriate trash cans and benches.
- Provide new step lighting along the north and west perimeter retaining walls as well as along both sides of the new concrete ramp.
- Replace existing lamp posts with historically appropriate fixtures.

D. PHASING & COST ESTIMATE

The following is a summary of the estimated cost of construction for all recommendations based on a construction start date in the Summer of 2011:

General Conditions		$83,511
Site Demolition & Earthwork		$47,765
Concrete Repairs		$90,000
Polyurea Coating		$126,500
Pool Equipment & Piping		$119,240
Landscape & Irrigation		$82,330
Misc. Site Improvements		$184,652
Lighting & Electrical		$45,433
Subtotal		$779,436
Contractor’s OH&P	10%	$77,944
Bond	1.5%	$12,861
Contingency	10%	$87,024
Escalation	0%	$0.00
Total Cost of Construction at Award		**$957,265**

Should the total scope of the project need to be adjusted to reduce the total cost of construction, the following components may be individually eliminated without the adverse effect of impacting access to or the repair of the remaining scope (numbers include markups)

Aquatic Planters & Related Drains		-$108,777
All Work at (3) Islands	approx.	- $100,000
Lighting & Electrical		-$62,494
Site Furnishings		-$11,740
Subtotal		-$283,011
Total Revised Cost of Construction		**$674,254**

The above items may also be included in the design documentation, but phased separately for construction in subsequent years; however, infrastructure requirements for the lighting scope and aquatic planters must be installed during the main project in order to avoid additional costs and repairs of previously completed work.

Section II

Historical Background

Historical Background

A. History of Construction and Use

The McGregor Memorial Conference Center and adjacent reflecting pool and sculpture court were designed by architect Minoru Yamasaki (1912-86) and constructed in 1957-58. Perhaps best known for his design of the World Trade Center in New York City (1962-1973), Yamasaki's career spanned three decades and included over 250 buildings throughout the United States and internationally. In 1957, Wayne State University hired Yamasaki, Leinweber & Associates to develop a master plan for the Detroit-based campus. Though it was never fully realized to the extent Yamasaki envisioned, it resulted in the design and construction of three buildings in addition to the McGregor Memorial Conference Center. These buildings include the College of Education Building (1960), the Prentis Building (1964), and the Helen DeRoy Lecture Hall (1964), all of which still contribute to the character of the Wayne State campus today. [1]

As Yamasaki's first building for the university, the conference center was a gift from the McGregor Foundation and was therefore dedicated in memory of the fund's founders. Its primary purpose was and still is to serve as a venue for meetings, conferences, and group discussions, and to date, it has drawn internationally known leaders, speakers and experts in nearly every scholarly field.

[1] "Wayne State University's McGregor Memorial Conference Center Among Seven Michigan Sites Added to National Register of Historic Places." Wayne State University, January 5, 2011.

Immediately adjacent the conference center, Yamasaki designed an L-shaped reflecting pool and sculpture court that was intended to be a quiet "oasis" for students to get away from the noise and traffic of the surrounding city. The sculpture court is recessed approximately three feet below the adjacent grade and is confined by buildings on five of its six sides: to the north and west is the McGregor Conference Center, to the East is the Wayne State Alumni House, and to the south is the university's Art Building. The far west side of the L-shaped court is the only open edge that is immediately accessible to the surrounding grade. Stairs near the center of the court provide access to the raised plaza deck which surrounds the McGregor Center while a pair of doors at the southeast corner provides direct access to the adjacent Alumni House.

The original design of the McGregor Pond, as it is currently referred to, allowed for free-flowing circulation around all sides of the sculpture court, including access to the three islands set within the reflecting pool itself. The islands were filled with loose, Vermont white marble chips and were connected to the surrounding terrace by slabs of precast concrete covered in black granite aggregate. White-cement, cylindrical planters containing scotch pines, Japanese Maples, and Cotoneaster were meticulously positioned on each island and have since been augmented with additional bronze sculptures: Giacomo Manzu's *Nymph and Faun* and *Assunta* by Georg Kolbe. A contemporary metal sculpture by Michael Todd was later added to the center island.

The reflecting pool is approximately 22 inches deep and was originally painted black in contrast to the white aggregate used on the islands. Set within the pool were collections of various-sized boulders which still remain today; missing, however, are a series of rectilinear planters that were recessed just below the water line and filled with water lilies and lotus designed by landscape architect Edward Eichstedt.

The terrace that surrounds the sculpture court was paved using Ohio pebbles set in grey cement on concrete slab. A series of lotus trees were planted along the south edge of the pool with relatively short, umbrella-like light fixtures set in-between that provided low-level step lighting along the path. No permanent benches or other site furnishings were included in Yamasaki's original design based on review of historic photographs.

As a tough critic of his own work, Yamasaki selected the McGregor Memorial Conference Center as one of his thirty best designs, reflecting a new aesthetic that diverged from his more International Style approach found in his earlier work. Yamasaki stated that among his goals for the project was "to create a beautiful silhouette against the sky, a richness of texture and form, and a sense of peace and serenity though interior spatial arrangement and sensitive landscaping". The McGregor Memorial Center earned Yamasaki his second AIA First Honor Award in 1958 and was just recently listed on the National Register of Historic Places in January 2011 as a nationally and internationally recognized building.[2]

[2] Yamasaki, Minoru, *A Life In Architecture*, Art Media Resources, New York, NYU 1979, pg. 43

Section III

Existing Conditions

Existing Conditions

A. Scope of Survey

The scope of this report is limited to the sculpture court and L-shaped reflecting pool known as the McGregor Pond, which is immediately adjacent the McGregor Memorial Conference Center, and includes the surrounding, sunken terrace as well as the concrete ramp along the west side of the court. The adjacent buildings and raised plaza deck around the Conference Center were not examined as part of this survey; however, limited investigation was conducted of the pool equipment room located in the basement of the McGregor Center as part of analyzing the pool's existing recirculation system.

Four principal components are reviewed below which include recommendations for adding a new pool liner, repair of the existing pool equipment and recirculation system, restoration of the existing landscape, and replacement of the existing island pavers. Additional site improvement recommendations have also been noted where existing conditions warrant further examination or where such elements may be impacted by the scope of this project.

In June 2010, NTH Consultants was retained independently of Quinn Evans Architects to examine the existing conditions and structural integrity of the pool's concrete structure. A full report and estimated cost of repairs was generated by NTH at that time and are not re-examined in detail as part of this report. For reference, a copy of NTH's structural analysis can be found in Appendix B.

B. Survey Methodology

Conducting an assessment of a historic site requires a multifaceted approach, including review of historic documents, general site observations, "hands-on" material inspections, research into the site's history of maintenance and repair, documenting physical conditions, conversations with the building's management and maintenance staff, consultation with specialists in materials and construction methodology, and general as well as scientific analysis of all findings.

In January 2010, Quinn Evans Architects was retained, together with a team of consultants, to prepare design recommendations for the restoration of the McGregor Pond. Visual observations and photographs of the site were collected. Background information regarding leak repairs was reviewed with onsite staff, and historical information was gathered from various persons associated with the McGregor Center and other Yamasaki projects. Although limited documentation was available in terms of original construction drawings, many historic photographs have been obtained showing the original design aesthetic. Together, such data has provided the basis for this report in

describing the site's historical background, existing conditions, and recommendations for treatment.

An analysis of all field observations has been summarized below and organized according to its general area of scope: Reflecting Pool, Pool Equipment & Recirculation System, Sculpture Islands, and Perimeter Terrace. Recommendations for treatment can be found in Section IV. A cost estimate based on the team's recommendations has also been generated and can be found in the appendix section of this report, together with copies of existing and proposed site plans.

A. EXISTING CONDITIONS

General Observations

The reflecting pool and sculpture court are generally in poor condition. The concrete pool structure has significant cracking and spalling and has been unable to hold water for many years. Previous renovations have introduced additional landscaping and permanent site improvements around the perimeter of the court that contrast with Yamasaki's original design aesthetic and restrict the free-flowing circulation pattern that was inherent in the initial design. A repair project is currently underway along the north wall of the sculpture court involving the stabilization and re-anchoring of all metal guardrails.

Reflecting Pool

As indicated, the concrete foundation is plagued with severe cracking and spalling, leading to water infiltration within the structure and the inability of the pool to hold water. Approximately 11 percent of the foundation floor was previously determined by NTH to contain delaminated concrete or under slab voids. It was also determined that effective construction joints were not incorporated into the original construction and poorly installed water stops that moved during the concrete placement have led to planes of weakness in the concrete.

As more water continues to infiltrate the structure and undergo freeze-thaw cycles with the change in seasons, the cracking and pitting of the structure will remain active. The extent of future cracking and spalling cannot be fully determined without additional analysis of the concrete foundation and base beneath the surface. Given the extent of damage which can be ascertained visually, the level of deterioration below the surface could actually exceed that which was initially determined through sound-hammering of the concrete. In all, the extremely poor condition of the reflecting pool requires further invasive investigation prior to moving forward with any treatment recommendation.

In addition to the significant decay of the structural surface, the original matte-black finish used on the reflecting pool walls and foundation floor has been repainted light blue. The aquatic planters once recessed below the water level have also been removed, leaving only the original limestone boulders set within the reflecting pool area.

Pool Equipment & Recirculation System

Investigation of the existing recirculation lines has been limited due to the cold weather conditions and frozen ground. University staff identified two leak locations that were recently repaired and one leak near bridge #8 that still remains. As part of this survey, Northstar Pools conducted pressure tests of the main drain line which exposed another leak in the system. Given the relatively slow pressure drop during the test, an indistinguishable hairline crack or joint break may be the cause; such damage would not be readily apparent when scoping the interior of the drain lines with a camera. Further invasive investigation is required to determine the leak's location relevant to the existing drains and equipment room.

Two main area drains are located beneath bridges #4 and #6. Without existing drawings showing the precise location of the recirculation lines, it is assumed that the main line runs due south from the equipment room beneath the McGregor plaza deck where it enters the court below the foundation slab. The line then branches off east and west just north of the sculpture islands before heading south to each of the two drains. Isolating the branch that leads to the equipment room will help determine if the leak is below the McGregor plaza deck or beneath the concrete foundation of the pool. Given the current, frozen state of the ground, retesting of the main drains should occur following the next thaw cycle.

Pressure tests were also attempted at the skimmer and return lines; however, the presence of ice blocking the lines impeded these additional tests. Several skimmers were observed to be in poor condition with many clogged or filled with debris. All recirculation lines could potentially be filled with ice at some point within the system, thus causing false readings for any pressure test conducted during the winter season while the ground is still frozen.

In addition to the two main drains, two overflow drains were also located beneath bridges #3 and #8. These are isolated drains that feed directly into the sewer system and are not integrated with the re-circulating water of the pool. Cracking of the concrete base was observed at both overflow drains.

An existing, manual fill connection is located at the northeast corner of the L-shaped court. This connection runs north into the tunnel just below the existing Breezeway and was observed to contain the proper “air gap” required for backflow prevention to the primary water source. A sanitizing system does not currently exist for the pool.

Based on current findings, the existing mechanical (pump and filter) and plumbing components are in poor condition and deficient by today’s standards for maintaining proper recirculation.

Sculpture Islands

Three rectilinear sculpture islands are located within the reflecting pool, each connected to the terrace and each other by means of a precast bridge finished with exposed black-granite aggregate. The bridges are generally in good condition, with only a few showing signs of slight

bowing across the long spans. Diamond Grey Granite curbs quarried from Minnesota are grout set around the perimeter of the islands and run approximately four feet in length. Cracking was identified in only five of these stones at the time of the survey.

Although originally covered with a loose aggregate fill of Vermont white marble chips set approximately one inch below the curb, the islands have since been paved with 18" x 18" concrete flags with exposed orange and brown pebble aggregate. Grout joints are clearly visible between slabs, leading to a "concrete paving" type of appearance and the flags are set level with the adjacent granite curbs.

Seven, cylindrical planters are recessed into the sculpture islands with no existing plant life. Three of these planters are located on Island #3 with two planters located on both Islands #1 and #2. All seven planters are made of white cement with an exposed white aggregate finish. Based on their size and finish, these planters do not appear to be the original planters used in Yamasaki's design. Although little documentation is available, the original "stone urns" appear taller with a smooth, white cement finish in lieu of the exposed aggregate surface that is present today. The arrangement of the planters also differs from the original construction.

Four bronze sculptures currently sit on the islands which have been added over the decades since the sculpture court was originally completed. Giacomo Manzu's *Nymph and Faun* sit atop a long, rectilinear, white marble base that rises approximately three inches above the paving on Island #1. Georg Kolbe's *Assunta* is located at the southern end of Island #3 and sits atop a taller, square marble pedestal. Both marble bases exhibit significant deterioration at the corner joints with some staining from runoff of the bronze patina. A contemporary metal sculpture by Michael Todd has also been added to the center island.

Perimeter Terrace

The majority of the terrace to the south and west of the reflecting pool is concrete paving scored in 8’ x 8’ sections. Seven trees are staggered along the south side set in square tree pits with little groundcover. The low, decorative lighting that once existed between these trees has since been replaced with tall lamp posts; permanently-set, exposed-aggregate, concrete benches and trash receptacles have also been added. Heaving and cracking of the concrete was particularly noted in the southwest area between the Art Building and the base of the adjacent ramp.

A continuous buffer of large shrubs and groundcover about 10 feet deep extends the full length of the south terrace immediately adjacent the Art Building. Another landscape buffer extends along the west side in-between the sunken terrace and the concrete ramp that leads to the adjacent grade outside the court. All remaining edges of the L-shaped court are filled with various shrubs and groundcover for the full depth of the original walkway. Trees have been planted at the northern most end of the L-shaped court, immediately south of the Breezeway. Aside from the tree pits along the south side, all planting areas along the terrace were originally concrete walkways.

An existing stair extends from Island #2 to the McGregor plaza deck above, crossing over the landscape buffer to the north. The granite treads are generally in good condition with

exception of the first and second treads from the bottom which require repair or replacement. Edges of the concrete landing have also deteriorated and spalled. Beneath the landing was originally a recessed platform and steps set within the concrete walkway to allow passage beneath the low stair. Today, this area is filled with soil and groundcover, making passage below the landing difficult. At 4'–11", the clearance beneath the landing does not meet code.

Three mechanical units and an electrical meter have been installed within the landscape buffer immediately east of the McGregor plaza on the northern wing of the court.

Concrete Ramp

An existing 5' wide, concrete ramp extends from the west side of the perimeter terrace to the finish grade outside the court. The ramp is generally in good condition; however, the ramp does not meet current accessibility requirements for compliance with the American Disabilities Act. Although the slope and width comply with current regulations, the 46' run exceeds the maximum allowable length (30') before requiring an intermediate 5' landing. Handrails are also required on both sides of the ramp; none are provided.

Continuous, metal guardrails extend along both sides of the ramp. These rails are painted black and were observed to be stable. The stone copings beneath the guardrails have considerable damage at each mortar joint where the guardrails are anchored into the retaining wall below. Additionally, several stone panels along the sides of the retaining walls were observed to be cracked and/or missing. One location in particular was observed to be in-filled with painted foam board. Many

of the mortar joints between the Mankato stone have deteriorated and opened. This condition was particularly prevalent near the lower landing of the ramp and southern-most retaining wall next to the Art Building. Isolated locations of displacement and patched stone were also noted along the ramp.

Section IV

Treatment Recommendations

Treatment Recommendations

A. APPROACH TO TREATMENT

The goal of the following recommendations is to maintain the architectural integrity of the McGregor Pond while engaging in preservation treatments that will lead to clean and stabilized conditions around the site. Because of the historical significance of the McGregor Center, recommended treatments have been developed in accordance with The Secretary of the Interior's Standards for the Rehabilitation of Historic Buildings. All treatment recommendations are based on data gathered from limited architectural inspections that have been previously analyzed and documented under the Existing Conditions section of this report.

A cost estimate has been included as part of this report in Appendix A and has been summarized in the Executive Summary.

B. TREATMENT RECOMMENDATIONS

Concrete Repairs

Further testing of the concrete foundation is recommended to verify the stability and integrity of the existing pool structure prior to finalizing any treatment recommendations. A Ground Penetrating Radar survey has been proposed and tentatively scheduled for March 2, 2011, pending favorable weather conditions. This survey will provide a more accurate reading of any under-slab voids or areas that may require additional repair. In addition to the GPR survey, several core samples should also be collected to verify the concrete ingredients, aggregates, mixture ratios, and structural integrity.

Should the GPR survey and core samples reveal no additional areas that warrant concern, repairs should be undertaken to patch and repair all voids, cracks, and other surface deteriorations in accordance with NTH's previous assessment (see Appendix B).

Pool Liner

Several key factors were analyzed in determining treatments to seal the existing concrete foundation following the necessary repairs, including 1) the elasticity of a product to accommodate the existing structure which is prone to cracking; 2) the ability of a treatment to handle cold temperatures and exposure to UV radiation; 3) the estimated cost; 4) anticipated lifespan and available warranties, 5) maintenance/repair in the event of future cracking; and 6) the aesthetic look and color.

Potential options for lining the existing pool structure include the following:

1. EPDM – Ethylene Propylene Dien Monomer - a synthetic rubber sheet membrane that is thermoset or permanently hardened by cooling.

2. Elastomeric Liquid Rubber – a spray-applied, single component polyurethane coating that bonds directly to the substrate.

3. Polyurea – a spray-applied elastomeric coating that bonds directly to the substrate.

4. Reconstruction - the complete demolition and replacement of the existing concrete structure with a new steel-reinforced, monolithic gunite/shotcrete structure.

These options, together with their estimated costs, were previously detailed and reviewed with Wayne State University on February 16, 2011. A copy of this report is located in Appendix C for reference.

Following discussion with Wayne State University, the Polyurea coating was selected by the Owner based on QEA's recommendation. The new coating has excellent elongation properties ranging from 450% to 1000% and will provide a seamless installation that bonds directly to the substrate, thus preventing water infiltration behind the coating.

Once repaired, the concrete surface will require additional surface preparation to accommodate the installation of the Polyurea coating.

Pool Equipment & Recirculation System

Based on the current conditions outlined in Section III of this report, the existing plumbing/recirculation lines and pump are deficient by today's standards and should be replaced in their entirety in order to provide adequate recirculation and sanitization of the pool water. The following modifications are recommended:

- Replace existing feeds and returns utilizing 6" suction and 4" returns; a borderline design would consist of 4" suction and 3" returns.
- Increase the number of skimmers to 14-16 and revise the location of all skimmers to accommodate a prevailing westerly wind.
- Revise locations of returns to be every 20'-25' instead of 36'.
- Provide new filter units.
- Provide new sanitizing system.
- Provide new filtration pump with plumbing that could provide a GPM (gallons per minute) rating of 280 to 360 GPM to offer a turnover rate of the entire volume of water within 6 to 8 hours. The current motor can generate approximately 170 GPM.

An alternate, less expensive and less intrusive appoach may be implemented whereby the existing recirculation lines are retained while adding new filtration and sanitizing systems. The sanitizing system would have to run at high levels, increasing the chemical

treatment of the water, to compensate for the recirculation deficiencies inherent in the existing layout. However, the increased level of sanitizers can lead to a highly corrosive environment, resulting in adverse affects on the existing copper plumbing, the polyurea coating, and any aquatic plants it amy come in connect. Such higher chemical levels will require additional and regular maintenance to ensure proper balance of the pH and Alkalinity levels.

Additional pressure testing following the next thaw cycle may reveal that the existing piping remains intact without additional deterioration; however, based on the recent leaks that have already surfaced, future leaks cannot be ruled out in the event the existing recirculation lines are not replaced. Repairing such future leaks may require accessing the existing lines buried beneath the concrete foundation floor, thus impacting previously repaired concrete and polyurea coating. Future leaks may also require the removal of the terrace paving or excavation beneath the McGregor plaza deck.

Winterization

The following measures are recommended for handling the reflecting pool during the off-season.

- Blow out the entire recirculation system with a compressor and cap/plug all plumbing lines located in the pool structure. This process should include the use of RV antifreeze fluid placed into the lines to account for any trapped water locations. A company providing this service should guarantee that the plumbing lines should have no freeze breaks over the period that the pool is closed.
- The mechanical components, i.e. motor, filter, and sanitizer, should be checked for wear & tear at this time and have their freeze plugs removed to allow any standing water to drain out.
- Water should remain in the pool structure to provide a thermal protection mass. Retaining the water during the off-season will help prevent thermal movement of the concrete structure and potential deterioration of the polyurea coating.

Landscaping

The project team recommends that all landscaping be removed and/or replaced to reflect Yamasaki's original design intent. This recommendation includes the removal of all shrubs, trees, and groundcover along the perimeter terrace where no landscaping was initially installed. All tree pits along the south terrace of the pond should be retained with the following additions:

- Replace the original Locust trees with seven (7) new trees Locust trees. New trees would be 5"caliper.
- Reinstall the original Pachysandra at base of Locust trees. The seven planter cutouts will require a total of twelve hundred (1,200) plants (48 plants per flat).
- Provide irrigation to the Locust trees and Pachysandra. This will require connecting an irrigation line from each of the planter cutouts to the existing

irrigation system within the planting bed along the north wall of the Art Building. The existing irrigation system would then be modified based on servicing the Locust trees and Pachysandra.

New island planters should be provided that reflects the original scale and texture of the existing "stone urns". These planters should be approximately 30 inches tall and made of white cement with a smooth finish to contrast with the texture of the surrounding paving. Each planter should be prepared with drainage stone and an appropriate planting soil mix. Plantings should consist of grasses and small trees which must be transplanted on an annual basis. Seasonal watering must be completed by university staff with no irrigation system installed.

Finally, the project team recommends that new aquatic planters be installed to reflect the existing design aesthic of the reflecting pool. This recommendation would consist of the following:

- Install eleven (11) self contained aquatic planters within pond.
- Planters shall be 3'X4' and approximately 2 ½' in height. Planters shall be constructed of aluminum with powdercoat finish resembling the final Polyurea finish.
- Install isolated drainage lines and irrigation lines to new planters. Drainage and irrigation lines to be installed beneath pool base and connected to existing systems.
- Provide, install, and maintain forty four (44) aquatic plants, such as Rushes, Water Lilies, and Lotus (species and variety to be confirmed).

Reflecting Pool Islands

The primary goal of the island paving design is to reestablish the scale, texture, color, and monolithic appearance of Yamasaki's original intent. While matching the original white marble, loose-fill aggregate would provide the most historically appropriate appearance, the inherent maintenance and containment issues that arise from a loose-fill condition prompt alternate considerations. QEA recommends that a white cement precast paver or stone flag with exposed white marble aggregate be used for the island paving. The paver size should be approximately 12" x 12" and reflect PCI standards for exposed aggregate 106 R-M or 114 R-M. The pavers shall be set on approximately 4 inches of compacted gravel base with a 1 inch sand setting bed. Paver joints should not exceed 1/8".

All granite curbs along the perimeter of the islands shall be carefully removed, cleaned, and re-installed after installation of the polyurea coating. Curbs shall be set with stainless steel pins to ensure proper anchorage with the new coating. Curbs which are currently cracked should be repaired using an epoxy adhesive.

All sculptures will be removed during construction for cleaning by the university and reset in their existing locations. QEA does not recommend the reinstallation of the

existing marble base on Island #1. A new marble pedestal to match the existing is recommended for Island #3

Terrace Site Improvements

The existing concrete ramp is generally in good condition; however, the ramp does not meet current accessibility requirements for compliance with the American Disabilities Act. The following is recommended:

- Remove the existing concrete slab and east retaining wall in their entirety.
- Provide new concrete ramp with intermediate 5 foot landing.
- Rebuild east retaining wall and guardrail to conceal the new change in slope.
- Provide new handrails to meet accessibility requirements.
- Repair/replace all stone copings along both sides of the ramp.
- Repair/replace all deteriorated Mankato stone veneer.
- Repoint all open joints along the existing retaining wall to remain.

Additional recommended treatments for the perimeter terrace include the following:

- Remove all existing concrete paving in addition to the existing landscaping.
- Provide new concrete paving along all sides of the terrace.
- Replace existing damaged, marble treads at base of stairs leading to McGregor plaza deck.
- Repair damaged concrete landing at stair.
- Provide new concrete steps and recessed landing below stair landing to accommodate code requirements for head clearances.
- Remove existing concrete trash cans and provide new trash cans which are more historically appropriate in terms of their finish. Locate trash cans in the southwest and southeast corners.
- Provide new step lighting along the north and west perimeter Mankato retaining walls.
- Replace existing lamp posts with historically appropriate fixtures.

Appendix A

Cost Estimate

COST ESTIMATE

Wayne State University
McGregor Pond Restoration
Detroit, Michigan

Prepared for:

Quinn Evans Architects
219½ North Main Street
Ann Arbor, Michigan 48104
734-663-5888
Fax 734-663-5044

February 24, 2011

Prepared by:

R.W. Brown & Associates
404 Pine Street, S.E., Suite 202
Vienna, Virginia 22180-4871
703-255-2580
Fax 703-255-4927

COST ESTIMATE

Project: Wayne State University - McGregor Pond Restoration, Detroit, Michigan	Page 1
Architect: Quinn Evans Architects	RWB Job # 11-24-A
Estimated by: R.W. Brown & Associates	2/24/11

NOTES

1 Unit costs include subcontractors' overhead and profit, except electrical, which is noted as separate line items at the end of their respective sections.

2 Unit prices, provided by suppliers, subcontractors, and past experience, reflect standard construction methods and materials. Sales tax and labor burden are included in the unit prices of each item. Labor prices are based on wage scale conditions but do not reflect overtime.

3 This estimate is based on drawings dated February 2011.

4 The total cost is based on a construction start of Spring 2011.

5 Exclusions:

Architectural and Engineering Fees
Hazardous material abatement (if required)
Furnishings or equipment not itemized in the estimate

COST ESTIMATE

Project: Wayne State University - McGregor Pond Restoration, Detroit, Michigan	Page 2
Architect: Quinn Evans Architects	RWB Job # 11-24-A
Estimated by: R.W. Brown & Associates	2/24/11

Recapitulation

		Building Cost
DIV 1/GENERAL REQUIREMENTS	12%	83,511
DIV 2/SITE WORK		138,629
DIV 3/CONCRETE		161,122
DIV 4/MASONRY		95,719
DIV 5/METALS		8,317
DIV 6/WOOD & PLASTICS		-
DIV 7/THERMAL & MOISTURE PROTECTION		126,500
DIV 8/DOORS & WINDOWS		-
DIV 9/FINISHES		966
DIV 10/SPECIALTIES		-
DIV 11/EQUIPMENT		-
DIV 12/FURNISHINGS		-
DIV 13/SPECIAL CONSTRUCTION		-
DIV 14/CONVEYING		-
DIV 15/PLUMBING		119,240
DIV 15/HVAC		-
DIV 15/FIRE PROTECTION		-
DIV 16/ELECTRICAL		45,433
SUBTOTAL		779,436
GENERAL CONTRACTOR'S OH&P @	10%	77,944
SUBTOTAL		857,380
BOND @	1.5%	12,861
SUBTOTAL		870,240
DESIGN/CONSTRUCTION CONTINGENCY @	10%	87,024
SUBTOTAL		957,265
ESCALATION @	0.00%	-
TOTAL		**$957,265**

COST ESTIMATE

Project: Wayne State University - McGregor Pond Restoration, Detroit, Michigan	Page 3
Architect: Quinn Evans Architects	RWB Job # 11-24-A
Estimated by: R.W. Brown & Associates	2/24/11

DIVISION 2/SITE WORK

Item	Quantity	Unit	Material & Equipment Unit	Total Material	Labor Unit	Total Labor	Total Cost	Group Total
SITE DEMOLITION								
REMOVE CONCRETE WALK	6,921	SF	0.51	3,530	1.06	7,336	10,866	
REMOVE UNIT PAVERS	4,622	SF	0.40	1,849	0.98	4,530	6,378	
REMOVE/SALVAGE STONE EDGE/COPING	1,068	LF	1.00	1,068	8.00	8,544	9,612	
REMOVE TRASH CANS - PRECAST	3	EA	8.00	24	60.00	180	204	
REMOVE BENCHES	6	EA	10.00	60	125.00	750	810	
REMOVE/STORE STONE BRIDGES	7	EA	100.00	700	260.00	1,820	2,520	
CUT OPENINGS FOR STEP LIGHTS	19	EA	12.00	228	90.00	1,710	1,938	
REMOVE PLANTERS	7	EA	8.00	56	60.00	420	476	
MISCELLANEOUS DEMOLITION	1	LS	250.00	250	500.00	500	750	
LOAD & HAUL DEBRIS	130	CY	28.00	3,640	35.00	4,550	8,190	
								41,744
EARTHWORK & GRADING								
REMOVE SHRUBS	250	EA	4.00	1,000	16.00	4,000	5,000	
STRIP/HAUL TOPSOIL	68	CY	8.50	578	6.50	442	1,020	
								6,020
SITE IMPROVEMENTS								
PRECAST PLANTERS	7	EA	870.00	6,090	200.00	1,400	7,490	
BENCHES	9	EA	735.00	6,615	-	-	6,615	
TRASH CANS	3	EA	640.00	1,920	-	-	1,920	
								16,025
IRRIGATION								
IRRIGATION AT TREES	1	LS	-	-	-	-	4,000	
IRRIGATION AT AQUATICS	1	LS	-	-	-	-	13,040	
								17,040
LANDSCAPING								
5" CALIPER LOCUST TREES	1	LS	-	-	-	-	9,800.00	
PACHYSANDRA	1	LS	-	-	-	-	3,600.00	
ISLAND PLANTER PREP	1	LS	-	-	-	-	1,400.00	
ISLAND PLANTER PLANTS	1	LS	-	-	-	-	1,200.00	
AQUATIC PLANTERS	1	LS	-	-	-	-	38,500.00	
AQUATIC PLANTS	1	LS	-	-	-	-	3,300.00	
								57,800
TOTAL DIVISION 2/SITE WORK								**138,629**

COST ESTIMATE

Project: Wayne State University - McGregor Pond Restoration, Detroit, Michigan	Page 4
Architect: Quinn Evans Architects	RWB Job # 11-24-A
Estimated by: R.W. Brown & Associates	2/24/11

DIVISION 3/CONCRETE

Item	Quantity	Unit	Material & Equipment Unit	Total Material	Labor Unit	Total Labor	Total Cost	Group Total
EXCAVATION								
EARTH EXCAVATION	38	CY	12.00	456	16.00	608	1,064	
BACKFILL EARTH	22	CY	9.65	212	13.00	286	498	
								1,562
FORMWORK								
WALL FORMS	224	SF	2.15	482	3.50	784	1,266	
RISER FORMS	30	LF	3.40	102	7.30	219	321	
								1,587
REINFORCING								
REBARS	0.9	TON	960.00	864	900.00	810	1,674	
WWM	10,750	SF	0.37	3,978	0.22	2,365	6,343	
								8,017
CONCRETE REPAIRS								
CONCRETE REPAIRS	1	LS	-	-	-	-	75,000	
CONCRETE WORK @ AQUATICS	1	LS	-	-	-	-	15,000	
								90,000
CONCRETE PLACEMENT								
POUR CONCRETE SLAB ON GRADE	146	CY	132.00	19,272	52.00	7,592	26,864	
POUR CONCRETE WALLS	4	CY	132.00	528	58.00	232	760	
PUMP CONCRETE	150	CY	14.00	2,100	8.50	1,275	3,375	
FINE GRADE SLAB	9,450	SF	-	-	0.22	2,079	2,079	
SCREEDS	9,450	SF	0.16	1,512	0.28	2,646	4,158	
GRAVEL UNDER SLAB	91	TON	36.00	3,276	21.00	1,911	5,187	
VAPOR BARRIER	12,000	SF	0.09	1,080	0.12	1,440	2,520	
PATCH CONCRETE LANDING	66	SF	6.00	396	11.00	726	1,122	
BROOM FINISH	9,450	SF	0.05	473	1.12	10,584	11,057	
CURE & PROTECT	9,450	SF	0.16	1,512	0.14	1,323	2,835	
								59,957
TOTAL DIVISION 3/CONCRETE								**161,122**

COST ESTIMATE

Project: Wayne State University - McGregor Pond Restoration, Detroit, Michigan	Page 4
Architect: Quinn Evans Architects	RWB Job # 11-24-A
Estimated by: R.W. Brown & Associates	2/24/11

DIVISION 4/MASONRY

Item	Quantity	Unit	Material & Equipment Unit	Total Material	Labor Unit	Total Labor	Total Cost	Group Total
UNIT MASONRY								
CLEAN/REINSTALL COPING/POOL EDGE	1,068	LF	4.50	4,806	10.00	10,680	15,486	
CLEAN MANKATO STONE	2,207	SF	0.30	662	2.50	5,518	6,180	
INSTALL MANKATO STONE VENEER	386	SF	1.40	540	8.75	3,378	3,918	
NEW & REPLACEMENT STONE	240	SF	28.00	6,720	5.00	1,200	7,920	
MARBLE PEDESTAL	1	EA	-	-	540.00	540	540	
UNIT PAVERS - PRECAST/MARBLE	4,622	SF	6.50	30,043	6.00	27,732	57,775	
MARBLE TREADS	2	EA	150.00	300	120.00	240	540	
REINSTALL STONE BRIDGES	7	EA	220.00	1,540	260.00	1,820	3,360	
TOTAL DIVISION 4/MASONRY								**95,719**

DIVISION 5/METALS

Item	Quantity	Unit	Material & Equipment Unit	Total Material	Labor Unit	Total Labor	Total Cost	Group Total
MISCELLANEOUS METALS								
ORNAMENTAL GUARDRAIL	46	LF	120.00	5,520	16.00	736	6,256	
HANDRAILS	92	LF	14.50	1,334	7.90	727	2,061	
TOTAL DIVISION 5/METALS								**8,317**

DIVISION 7/THERMAL & MOISTURE PROTECTION

Item	Quantity	Unit	Material & Equipment Unit	Total Material	Labor Unit	Total Labor	Total Cost	Group Total
POOL LINING								
POLYUREA COATING & SURFACE PREP	11,500	SF	11.00	126,500	-	-	126,500	
TOTAL DIVISION 7/THERMAL & MOISTURE PROTECTION								**126,500**

DIVISION 9/FINISHES

Item	Quantity	Unit	Material & Equipment Unit	Total Material	Labor Unit	Total Labor	Total Cost	Group Total
PAINTING								
PAINT CONCRETE BRIDGE SOFFIT	168	SF	0.25	42	5.50	924	966	
TOTAL DIVISION 9/FINISHES								**966**

COST ESTIMATE

Project: Wayne State University - McGregor Pond Restoration, Detroit, Michigan	Page 5
Architect: Quinn Evans Architects	RWB Job # 11-24-A
Estimated by: R.W. Brown & Associates	2/24/11

DIVISION 15/MECHANICAL - PLUMBING

Item	Quantity	Unit	Material Unit	Total Material	Labor Unit	Total Labor	Total Cost	Group Total
PLUMBING								
POOL EQUIPMENT, PIPING, & STARTUP	1	LS	-	-	-	-	110,000	
NEW DRAINS TO AQUATIC PLANTERS	1	LS	-	-	-	-	9,240	
								119,240
TOTAL DIVISION 15/MECHANICAL - PLUMBING								**119,240**

DIVISION 16/ELECTRICAL

Item	Quantity	Unit	Material & Equipment Unit	Total Material	Labor Unit	Total Labor	Total Cost	Group Total
ELECTRICAL DEMOLITION								
REMOVE POLE LIGHT FIXTURES & BRANCH WIRING	6	EA	210.00	1,260	260.00	1,560	2,820	
								2,820
EQUIPMENT & LIGHT FIXTURES								
PANEL MODIFICATIONS - ALLOW	1	LS	800.00	800	600.00	600	1,400	
LIGHT POLES W/FOUNDATIONS	6	EA	1,120.00	6,720	350.00	2,100	8,820	
POLE LIGHT FIXTURES	6	EA	580.00	3,480	125.00	750	4,230	
STEP LIGHT FIXTURES	19	EA	415.00	7,885	110.00	2,090	9,975	
TERMINATIONS	2	EA	78.00	156	90.00	180	336	
BRANCH CONDUIT & WIRE	770	LF	4.75	3,658	8.60	6,622	10,280	
								35,041
SUBTOTAL								37,861
SUBCONTRACTOR'S OH & P @	20%							7,572
TOTAL DIVISION 16/ELECTRICAL								**45,433**

Appendix B

NTH Structural Analysis

NTH Consultants, Ltd.
Infrastructure Engineering
and Environmental Services

41780 Six Mile Road
Northville, MI 48168-3459
248.553.6300
248.324.5178 Fax

Mr. James R. Sears
Associate Vice President
Wayne State University
Facilities Planning & Management
5454 Cass Avenue
Detroit, Michigan 48202

June 29, 2010
NTH Project No. 62-100411-00

RE: Trial Rehabilitation of the Yamasaki Fountain
Wayne State University
Detroit, Michigan

Dear Mr. Sears:

As we have discussed, NTH Consultants Ltd. (NTH) has been conducting a trial rehabilitation of the concrete floor and walls of the Yamasaki Fountain to confirm the feasibility of rehabilitation, and to develop budgets for construction time and costs.

REPORT ON FINDINGS TO DATE

The following conditions have been identified:

1. The floor of the fountain has been sounded to determine the location of delaminated concrete and/or voids below the concrete floor. Approximately 11 percent (1,350 sf.) of the floor has either delaminated concrete or under slab voids.

2. The total surface area of the fountain including floor and walls is approximately 15,465 sf.

3. The poor condition of the concrete appears to be related to construction joints that do not accommodate expansion and poorly installed water stops that moved during concrete placement, both resulting in planes of weakness in the concrete.

4. There are approximately 228 lineal feet of construction joints that should be reconstructed and detailed to create effective expansion joints. This should be done regardless of the final fountain rehabilitation method.

5. The existing fountain concrete may be rehabilitated by removing the delaminated concrete and failed water stops, installing effective expansion joints, sealing concrete cracks with elastomeric sealant, filling the under slab voids with expanding grout and applying a waterproofing coating such as the liquid rubber membrane noted below.

6. An alternate fountain rehabilitation would include installation of effective expansion joints, filling under slab voids with expanding grout and lining the fountain with a 60-mil EPDM membrane or a liquid applied rubber membrane. Removal of delaminated concrete will not be required for this alternate.

7. A representative of Firestone Building Products has visited the subject Fountain and confirmed that their 60-mil EPDM liner may be fully adhered to the existing painted surface of the concrete with only minimal surface preparation in limited areas where the paint is not well bonded to the concrete. In the event that the liquid applied rubber membrane is used, a similar determination regarding surface preparation will be required.

PRELIMINARY CONSTRUCTION BUDGET

1. Installation of 228 lineal feet of expansion joints.....$25,000
2. Removal and replacement of delaminated concrete.....$34,000
3. Fully adhered 60-mil EPDM liner.....$116,000
4. Liquid applied rubber membrane liner (alternate to EPDM).....($15,500)
5. Grouting voids below fountain floor.....$15,000

A fountain plan and details and an estimate of the construction time will be prepared, once you have reviewed and commented on our findings to date.

Sincerely,

NTH Consultants, Ltd.

Sharmyn Elliott
Senior Vice President

Christopher E. Campbell, P.E., RRC
Vice President

SE/CEC/kg

Appendix C

Pool Liner Analysis

16 February 2011

MEMORANDUM

From: RICHARD B. HESS

To: RUHTAB SAHOTA

QUINN EVANS
ARCHITECTS

219½ N. MAIN STREET
ANN ARBOR, MI 48104
734 663 5888

RE: **McGregor Pond Renovation Project**
Wayne State University
Detroit, Michigan
WSU PN# 043-179582-2
QEA PN# 21100001

Subject: Pond Liner Options

QEA, NTH, and Northstar Pools have assembled the following pond lining options for review during today's conference call with WSU.

Several key factors were analyzed in determining treatments, including 1) the elasticity of a product to accommodate the existing structure which is prone to cracking; 2) the ability of a treatment to handle cold temperatures and exposure to UV radiation; 3) the estimated cost; 4) anticipated lifespan and available warranties, 5) maintenance/repair in the event of future cracking; and 6) the aesthetic look and color.

Estimates have been identified as approximate sf costs for material and labor of the coating application only and do not include concrete repairs, demolition, work on adjacent site elements, piping, contingencies, or contractor markups. Approx. surface area: 15,500 sf.

OPTION 1: **EPDM - Ethylene Propylene Diene Monomer (e.g. Pondgard by Firestone)**

$2.50 to $3.50/sf

EPDM is a synthetic rubber sheet membrane that is thermoset or permanently hardened by cooling.

PROS:

- Existing structure remains (surface preparation and crack repairs required, but less extensive than for spray-applied coatings).
- Elongation: 300% to 500%; can withstand substrate cracks up to 1/4 inch, possibly greater.
- Ultraviolet Radiation (UV) resistant.
- Twenty year warranties are common for standard EPDMs.
- Does not require replacement of pool piping and associated equipment that is currently in *good* condition.

CONS:

- Least appealing in terms of the aesthetic look; may wrinkle over time.
- Failed or poorly installed seams can allow water infiltration behind the membrane.
- More susceptible to damage (tears) when exposed.
- Concrete repairs: estimated at $75,000.

OPTION 2: **Elastomeric Liquid Rubber (e.g. Permaflex by Sani-Tred)**

$5.00 to $6.00/sf

Permaflex is a spray-applied, single component polyurethane coating that bonds directly to the substrate.

PROS:

- Existing structure remains.
- Seamless installation; bonds directly to substrate preventing water infiltration behind coating.
- Elongation: 500%; can withstand substrate cracks up to 1/8 inch.
- Lifetime warranty (Permaflex)
- Does not require replacement of pool piping and associated equipment that is currently in *good* condition.

CONS:

- Permaflex is not UV resistant (Permaflex-AL is UV resistant but not recommended for below water line applications).
- More extensive surface preparation required of the existing substrate than for EPDM.
- More susceptible to cracking than the EPDM.
- Concrete repairs: estimated at $75,000.

OPTION 3: **Polyurea (e.g. DragonKote, VersaFlex)**

$6.00 to $12.00/sf

Polyurea is a spray-applied elastomeric coating that bonds directly to the substrate.

PROS:

- Existing structure remains.
- Seamless installation; bonds directly to substrate preventing water infiltration behind coating.
- Elongation: 450% to 1000%; can withstand substrate cracks up to 1/8 inch, possibly up to 1/4 inch.
- Ultraviolet Radiation (UV) resistant.
- 10 year warranty (Versaflex).
- Does not require replacement of pool piping and associated equipment that is currently in *good* condition.

CONS:

- More extensive surface preparation required of the existing substrate than for EPDM.
- More susceptible to cracking than the EPDM.
- Concrete repairs: estimated at $75,000.

OPTION 4: **Monolithic Gunite/Shotcrete Reconstruction**

$20.00+/sf structure only

Complete demolition and replacement of the existing concrete structure with a new steel-reinforced, monolithic gunite/shotcrete structure.

PROS:

- Addresses the cracking/water leakage at its source by rebuilding the structure rather than applying a surface liner.
- Potentially less cracking in the future if properly maintained.
- Provides opportunity to replace all deteriorated piping.
- 10 year warranties are common.

CONS:

- Replacement of structure will require the complete demolition of the existing structure as well as the replacement of all associated equipment and site elements, including piping, drains, copings, and adjacent paving surfaces, resulting in a substantial increase in project scope and cost (not included in the $20/sf est.).
- Longer design and construction schedule required.
- Although a monolithic gunite structure is less prone to cracking than standard concrete, hairline cracks are still possible.

SEE ATTACHED PHOTOS

QUINN EVANS
ARCHITECTS

Photo 1: Permaflex Project – Before Repair and Application of Elastomeric Liquid Rubber.

Photo 2: Permaflex Project – After Installation of Elastomeric Liquid Rubber Coating.

QUINN EVANS
ARCHITECTS

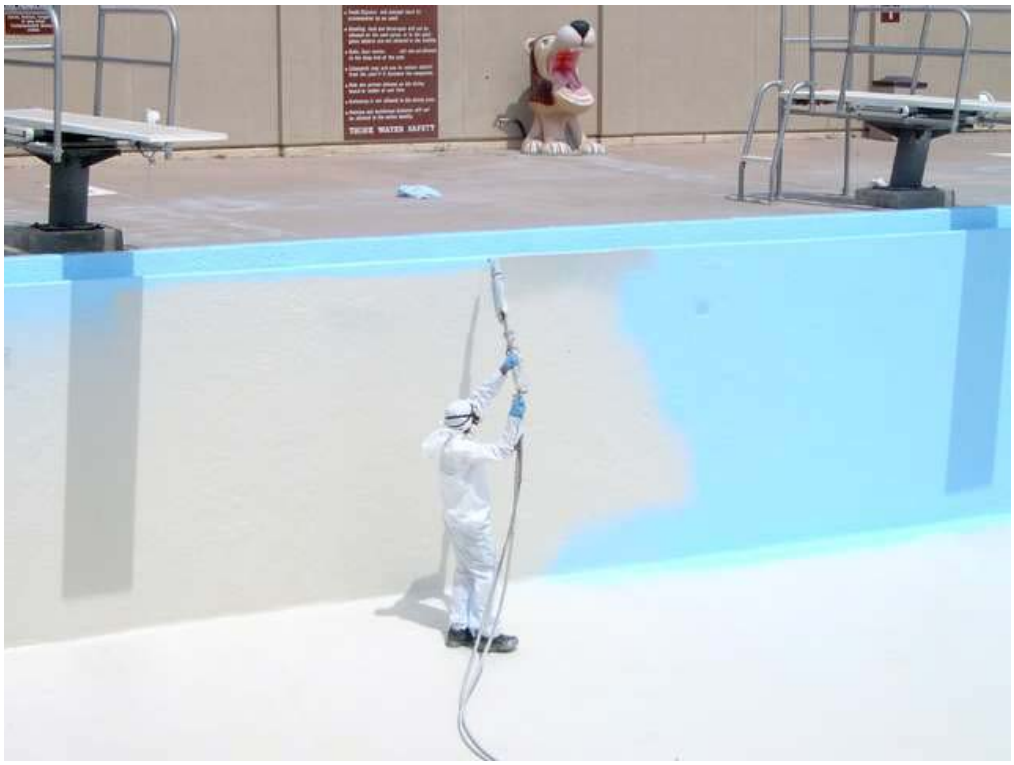


Photo 3: Permaflex Project – Installation of Elastomeric Liquid Rubber Coating

Photo 4: Permaflex Project – After Installation of Elastomeric Liquid Rubber Coating

QUINN EVANS
ARCHITECTS

Photo 5: Versaflex Project –Installation of Polyurea Coating at Dolphin Tank

Photo 6: Versaflex Project –Finished Installation of Polyurea Coating at Dolphin Tank

QUINN EVANS
ARCHITECTS

Photo 7: Versaflex Project –Installation of Polyurea Coating at Water Feature

Photo 8: Versaflex Project – Finished Installation of Polyurea Coating at Killer Whales Tank

EPDM Application; Pond Gard by Firestone.

Landscape Design/Build
www.landscapedesign-build.com DECEMBER 2006
SUPPLEMENT TO LANDSCAPE MANAGEMENT

Battling the Elements

Design-build professionals overcome harsh weather to create a multi-level water feature

By Paul Oliveira / Contributor

During the hustle and bustle of the workday, employees appreciate a relaxing and peaceful area outside to take a break or enjoy lunch. With that in mind, Gentex Corp. decided to include a water feature at its new headquarters in Zeeland, MI. The main outer wall of the cafeteria and conference center is primarily glass and would have looked out onto an empty, uninspiring space. The company knew a water feature designed to surround the building's two outdoor patios, cafeteria and conference center would be welcomed by its 2,200 employees who work in the headquarters and nearby facilities.

Gentex brought in Landscape Design Services of Holland, MI, to develop a multi-level water feature design.

"Because the water feature was going to be located in a very visible area, it was important to Gentex to have a calming and aesthetically pleasing view for their employees," says Rick Timmer, vice president of Landscape Design Services. "Gentex has water features at two other locations and recognizes the importance of providing employees with a serene environment."

For additional design insight, Timmer reached out to local design and supply company, EasyPro

WHETHER THE PROJECT is a small backyard pond or a multi-acre water hazard on a golf course, water features have the ability to transform otherwise mundane environments into appealing and scenic landscapes.

1 Crew members installed aluminum termination bars 2 in. apart, below grade to conceal the liner. **2** Three 4-ft. manholes were created to carry water back to the reservoir, which then traveled to the pumps under the waterfalls. **3** EPDM liners were specified for the project because of their performance and flexibility in extreme temperatures.

Pond Products, a division of Stoney Creek, Inc., Grant, MI.

"When we were approached with this project, I knew that we could create something unique that the employees would enjoy for many years," says Dave Ouwinga, vice president of EasyPro Pond Products.

The design

The water feature was designed to have three levels. The first was a 60-x-25 ft. upper pond. Water from the upper pond would then flow into a 110-x-30 ft. middle pond before falling into a 220-x-40 ft. lower pond on either side of a wooden bridge. Also included in the design were two dramatic waterfalls using 200 tons of rock.

While preparing the water feature design, Landscape Design Services also worked with EasyPro Pond Products on a liner referral. The total square footage of the pond surface was about 18,000 sq. ft., but the project needed 5,000 sq. ft. of extra liner for the concrete walls, waterfall spillways and pond edges. Ouwinga recommended 45-mil PondGard Rubber Liners from Firestone Specialty Products. The liners are made of flexible EPDM rubber, making them suited for shaping around pond contours. They also resist punctures and will not crack or split in down to -40° F.

Installation challenges

The Landscape Design Services crew began working on the project in late fall of 2005, when the average temperature in Zeeland ranges from the low 40s during the day, to the teens at night. With a typical installation, liners are installed in the pond and under waterfalls first to ensure that water drains properly into the ponds. Knowing that they would not be able to get the pond finished before winter, and not wanting the liner to sit exposed, Landscape Design Services took a different approach and installed the waterfalls first. The crew began the project by digging a small portion of the pond surrounding the waterfalls, enabling them to

THE FINISHED pond and waterfalls provide Gentex Corp. employees with a relaxing view from the company's cafeteria and conference rooms.

continue work through the early winter months.

A 10-x-12-ft. bunker was poured underground behind each waterfall, which drew water from three 4-ft. manholes at the bottom of the ponds with 12-in. intake pipes. These pipes carried the water back to the reservoir and, through the use of gravity, the water traveled to the pumps installed under the waterfalls, pushing the water through. After the waterfalls were completed in the early winter, the job was put on hold due to extremely cold and damp weather conditions.

In the spring of 2006, the crew excavated the pond and installed approximately 680 sq. ft. of flexible PVC pipe for the plumbing system. Two motors were installed to pump a steady water supply to the waterfalls, while another motor supplied the upper pond. Each motor has a 950-gal.-per-minute capacity, allowing for greater energy savings in the short and long term.

The crew then laid the liner, seaming the panels with Firestone QuickPrime Plus, QuickSeam Tape and 6-in. Batten Cover Strips to ensure the pond would resist leaking at the seams. Because Gentex did not want the liner to appear above the water level, the crew installed aluminum termination bars below grade, anchoring into the concrete every 4 in. around the edge of the deep pond facing the building. Then, 3 in. to 5 in. of small, lightly colored stones and larger rocks were added in the shallow pond to conceal the liner there as well.

Completed in May 2006, the water feature was landscaped with various shrubs, small and large trees, wild grasses and plants to enhance its aesthetic appeal. The water feature received great reviews from Gentex employees and others visiting the headquarters.

"We are extremely pleased with the work of Landscape Design Services and EasyPro Pond Products, because they designed and implemented a plan for exactly what we were looking for, and we now have a beautiful water feature with a durable liner that will last us for many years to come," says Jeff Sluiter, facilities maintenance supervisor for Gentex. ■

Oliveira is Systems Manager for Firestone Specialty Products, Indianapolis, IN.

Firestone
SPECIALTY PRODUCTS

THE LEADER IN LINING

To ensure the life and longevity of your water feature project, choose a name you can trust.

Specializing in:

Commercial & Residential Water Features

Golf Course Ponds & Lakes

Streams & Waterfalls

Reservoirs & Canals

Constructed Wetlands

Stormwater Management Solutions

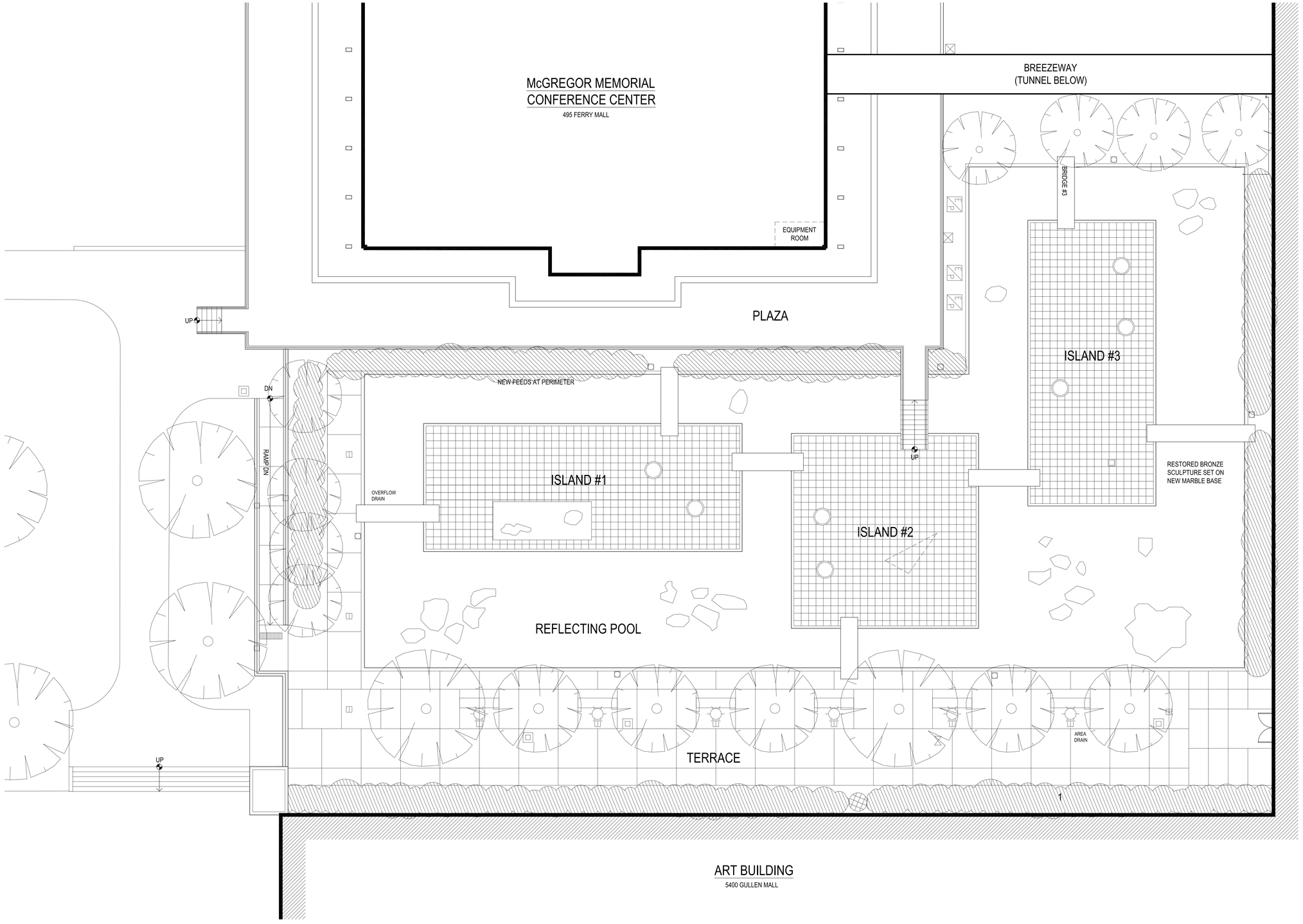
Firestone
Pond Gard
EPDM GEOMEMBRANE
Protecting Our Natural Resources™

Firestone
MultiLiner
RPP GEOMEMBRANE

310 East 96th Street | Indianapolis, IN 46240 | **T** 800-428-4442 | **F** 317-575-7002 | www.firestonesp.com

Appendix D

Drawings



N

0 4 8 16 32

SCALE: 1" = 8'-0"

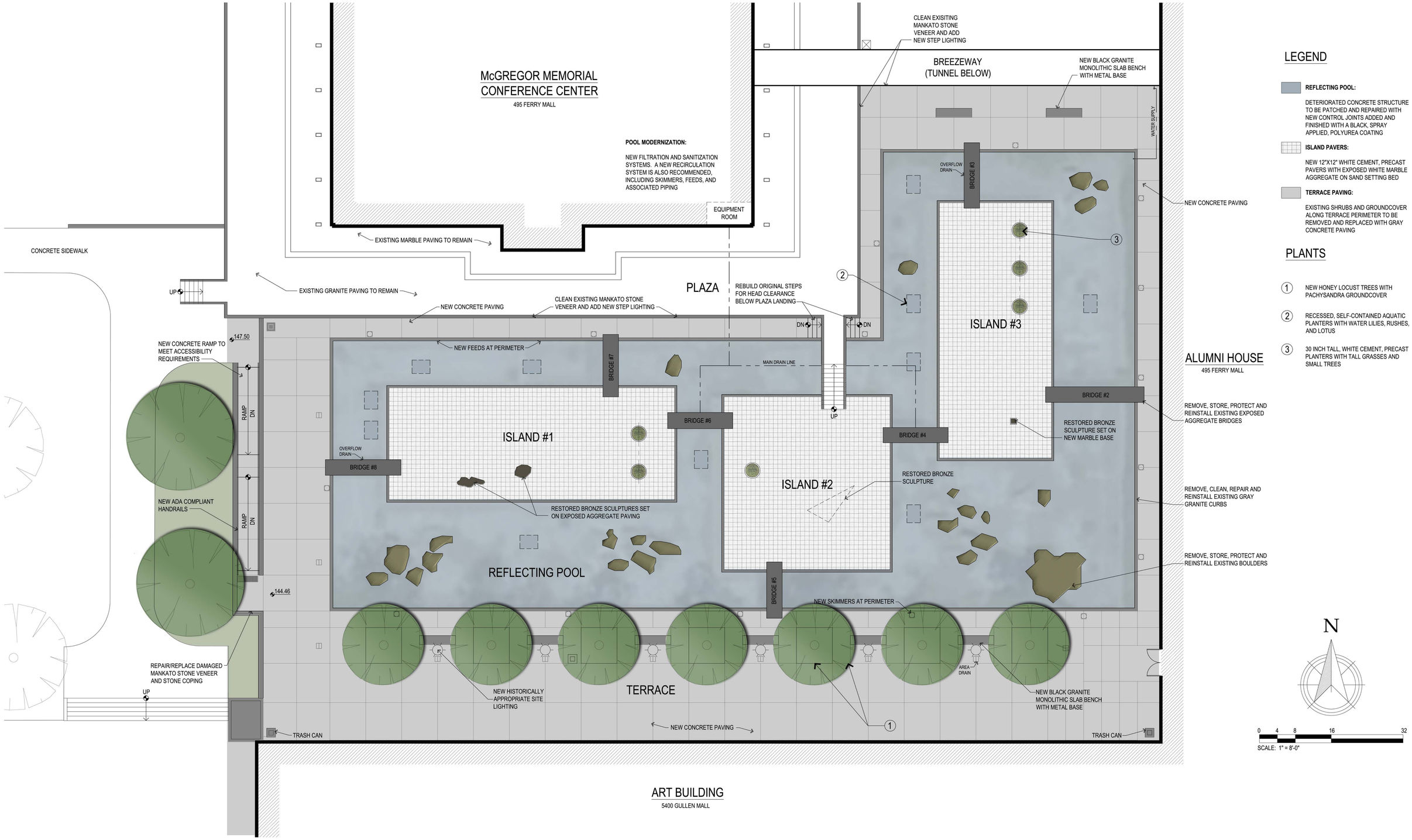
EXISTING SITE PLAN

QUINN EVANS ARCHITECTS

WAYNE STATE UNIVERSITY

MCGREGOR POND RESTORATION
MCGREGOR MEMORIAL CONFERENCE CENTER
QEA #: 2110001
WSU #: 043-179582-2

SITE PLAN
MARCH 3, 2011



LEGEND

REFLECTING POOL:

DETERIORATED CONCRETE STRUCTURE TO BE PATCHED AND REPAIRED WITH NEW CONTROL JOINTS ADDED AND FINISHED WITH A BLACK, SPRAY APPLIED, POLYUREA COATING

ISLAND PAVERS:

NEW 12"X12" WHITE CEMENT, PRECAST PAVERS WITH EXPOSED WHITE MARBLE AGGREGATE ON SAND SETTING BED

TERRACE PAVING:

EXISTING SHRUBS AND GROUNDCOVER ALONG TERRACE PERIMETER TO BE REMOVED AND REPLACED WITH GRAY CONCRETE PAVING

PLANTS

1. NEW HONEY LOCUST TREES WITH PACHYSANDRA GROUNDCOVER
2. RECESSED, SELF-CONTAINED AQUATIC PLANTERS WITH WATER LILIES, RUSHES, AND LOTUS
3. 30 INCH TALL, WHITE CEMENT, PRECAST PLANTERS WITH TALL GRASSES AND SMALL TREES

SCHEMATIC DESIGN SITE PLAN

QUINN EVANS ARCHITECTS

WAYNE STATE UNIVERSITY

MCGREGOR POND RESTORATION
MCGREGOR MEMORIAL CONFERENCE CENTER
QEA #: 21100001
WSU #: 043-179582-2

SITE PLAN
MARCH 3, 2011