IFC2016016

Shabica & Associates, Inc.
WE BUILD BEACHES

Federal Consistency Coordinator
Illinois Coastal Management Program
Illinois Department of Natural Resources
160 N. LaSalle Street, Suite 700
Chicago, IL 60601

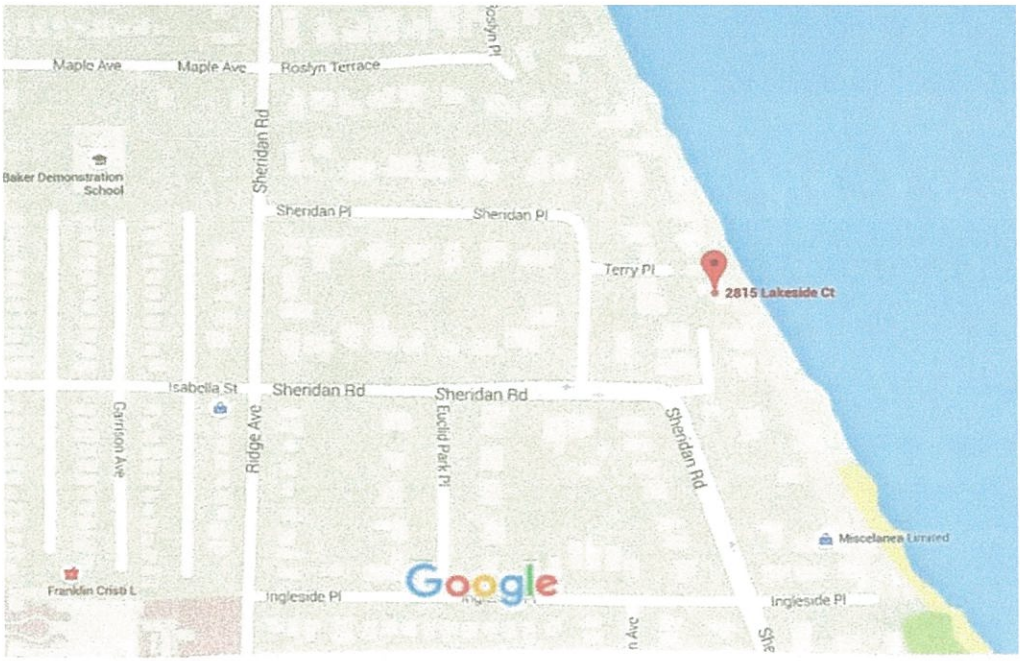
To Whom It May Concern:

May 24, 2016

In compliance with the Illinois Coastal Management Federal Consistency Review Procedures, we provide the following information for a proposed quarrystone breakwater island system for the property located at 2815 Lakeside Court, Evanston, Illinois 60201, owned by the Revelles.

Location of Project

The proposed quarrystone breakwater island system will be built on the lakefront of the property located at 2815 Lakeside Court, Evanston, Illinois 60201, owned by the Revelles.



550 Frontage Road • Suite 3735 • Northfield, Illinois 60093 • Tel 847.446.1436 • info@shabica.com
www.shabica.com

Project Start Date and Duration
Work will not begin until all necessary permits have been received. It is anticipated that the project can begin by May 1, 2017. This work will require approximately 6 weeks to complete.

Extent of Work to be Conducted
The shoreline stabilization will be comprised of the installation of a 78' long (toe to toe) quarrystone breakwater island, a quarrystone revetment 120' long, and placement of premitigational sandfill. The island breakwater will extend to 75' offshore at the lakeward toe. The crest elevation will be 583' with a slope of 1.5:1. The revetment will have a crest elevation of 584' to match the abutting seawall with a slope of 1:1. Approximately 660 tons of clean sand will be placed as required by the IDNR. The proposed system is designed to break local wave energy impacting the seawall and existing boathouse, reduce scour of the lakebed and to help provide safe access to the lake for the homeowners.

Contact Information
All questions pertaining to this project can be submitted to:

Jon Shabica
Shabica & Associates, Inc.
550 Frontage Road, Suite 3735
Northfield, IL 60093
jon@shabica.com
847-446-1436 Tel

The proposed activity complies with Illinois' approved Coastal Management Program and will be conducted in a manner consistent with such policies.

Sincerely,

Jon Shabica
Vice President

2013 Google Earth Photo; see approximate property lines (yellow)
Note: No beach present during all time low lake level

Shabica & Associates, Inc.
WE BUILD BEACHES

Ms. Kathy Chernich
East Section Chief, Regulatory Branch
Chicago District
U.S. Army Corps of Engineers
231 S. LaSalle Street, Suite 1500
Chicago, IL 60604

May 24, 2016

Dear Ms. Chernich:

Please find enclosed a permit application for shore protection for the property located at 2815 Lakeside Court, Evanston, Illinois 60201, owned by the Revelle family. The shoreline stabilization will be comprised of a small, nearshore, quarrystone breakwater island and a quarrystone revetment. The quarrystone breakwater is designed to help reduce incident wave energy and related projectiles from impacting the boathouse. The revetment is designed to reduce wave energy in the area and reduce scour of the lakebed along the seawall toe. A letter of authorization from the north property owner (Jordan Song, 2827 Sheridan Place), is included with this application.

A *Design of Shoreline Erosion Protection* report has been attached to this cover letter as the coastal design specifications component of this permit. All references and figures referred to in the cover letter and the following report can be found in the Appendix.

The proposed activity complies with the approved Illinois Coastal Management Program and will be conducted in a manner consistent with such policies. A letter has been sent requesting a determination from the ICMP under separate cover.

Project Purpose Statement

The Revelles have retained Shabica & Associates (SA) to help protect the property (existing seawall and boathouse) at the Lake Michigan coastline at 2815 Lakeside Court, Evanston, IL. The property currently has an older, steel sheetpile seawall with a walkway above it at elevation 584'. The steel seawall is tipping away from the concrete in areas and the concrete walls are deteriorating due to ongoing wave overtopping and exposure to ice. There is a small concrete boathouse above the seawall that is in disrepair. There is no beach present at this site. Even during extreme low lake levels, there was no stable sandy beach present at this property. During most lake storms, the existing seawall is overtopped by waves. The Revelles simply want a higher level of stormwave protection for their property and safe access to Lake Michigan. While a nearshore breakwater is being proposed, its design purpose is solely to break local wave energy and it is not for the purpose of holding a beach. As this breakwater is relatively low-crested, a revetment is proposed to help protect the seawall and low concrete walkway.

Project Description

The shoreline stabilization will be comprised of the installation of a 78' long (toe to toe) quarrystone breakwater island, a quarrystone revetment 120' long, and placement of premitigational sandfill. The island breakwater will extend to 75' offshore at the lakeward toe. The crest elevation will be 583' with a slope of 1.5:1. The revetment

will have a crest elevation of 584' to match the abutting seawall with a slope of 1:1. Approximately 660 tons of clean sand will be placed as required by the IDNR. The proposed system is designed to break local wave energy impacting the seawall and existing boathouse, reduce scour of the lakebed and to help provide safe access to the lake for the homeowners.

Coastal Geology

This section of coastline has historically lost sand due to large municipal structures such as Gilson Park and Wilmette Harbor as well as ongoing lakebed downcutting especially during prolonged periods of low lake levels. Nearshore sand deposits are minimal to non-existent here (Figure 1, Appendix) and scientists estimate that the rate of lakebed erosion averages 6 inches per year (Nairn, 1997). At the time of the bathymetric survey, there was a section of lakebed with exposed lakebed clay, no sand cover was evident in that location at the time. The net result is similar to the effects of global warming and rising sea level on marine coasts. This includes deeper water nearshore, larger stormwaves and progressively narrower beaches as the nearshore lakebed continues to erode. This has resulted in a cobble beach with minimal sand that is much smaller at historic low lake levels than at higher lake levels of the last decade.

The Illinois Lake Michigan shoreline is considered "sediment starved" by coastal scientists. This is in contrast to East Coast and Gulf Coast open ocean shores where tens of thousands of tons of sand are found in the nearshore system that provide a primary line of defense against stormwaves. On most Great Lakes shores including southern Lake Michigan, natural sand beaches are not able to protect the lakeshore (exceptions may be during very low lake levels like 1964 or 2004-07). Large quantities of sand have been trapped or diverted offshore by municipal structures that extend 900 ft or more into the lake. Today, the main sand supply is wave erosion of the nearshore glacial clay lakebed that contains only about 10% sand (Shabica and Pranschke, 1994). The result is that groins are losing their effectiveness at holding a sandy beach during average to high lake levels. To retain a sand covering of the shallow lakebed (where downcutting is most active) as well as to protect the revetment and bluff toe, SA has designed a nearshore breakwater system to help reduce the amount local wave energy and onsite lakebed downcutting.

Design Options

The site at 2815 Lakeside Court, Evanston has been inspected and options for shore protection were determined using desktop coastal engineering, bathymetric surveys, and more than 3 decades of observations of the shoreline conditions at this site. Given the conditions at this site, it is prudent to engineer and design systems that will anticipate greater lakebed downcutting, higher amounts of erosion, more extreme storm events with larger waves, and potential land erosion.

One of the largest factors in determining the scope of a project is analyzing current lake levels and climactic conditions. Over the past year, larger-than-normal stormwaves have impacted the shoreline of Lake Michigan, despite the lower lake levels that have been seen in the past few years. Currently, Lake Michigan has risen over 4 feet since January of 2013 leading to a significant loss of nearshore sand and above average water levels. Changes in weather patterns and lake levels affect the intensity of storms. Unfortunately, it is not possible to predict future Lake Michigan lake levels and how the changing lake levels will impact the shoreline. The **Illinois State Water Survey, Prairie Research Institute** report on *Potential Impacts of Climate Change on Water Availability*

(http://www.isws.illinois.edu/iswsdocs/wsp/climate_impacts_012808.pdf) states that:

> *"Scientists cannot predict future Illinois climatic conditions with confidence. The historical climate and hydrological records since the nineteenth century show that climate has changed significantly in the past and, even without human interference, could change significantly in the future."*

The Illinois State Water Survey goes on to graph future precipitation models, illustrating conditions that are wetter or drier than previous historic extremes. Either scenario is likely to cause loss of property due to stormwave erosion from either lakebed downcutting and/or larger stormwaves.

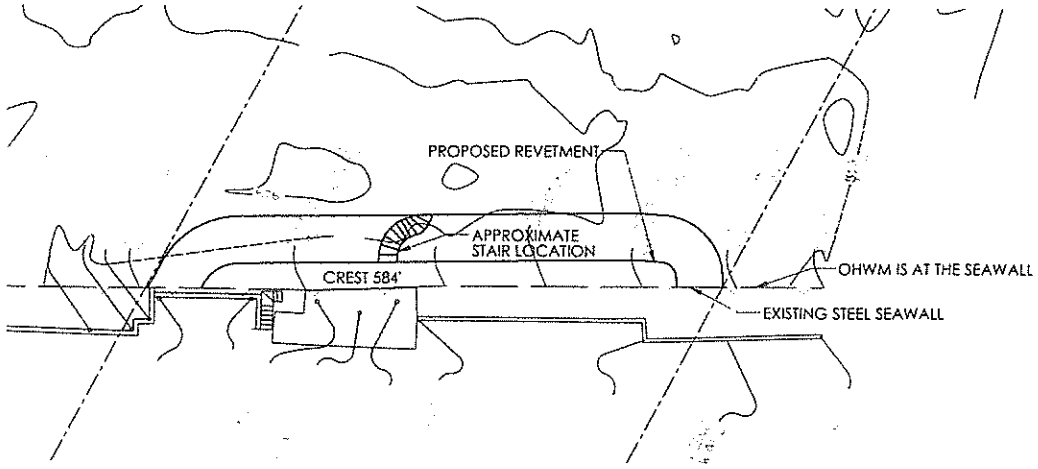
These five options were considered:

OPTION 1
Do Nothing –

The first option of "Do Nothing" results in leaving the currently eroding lakebed in its existing state with stormwaves attacking the seawall, infrastructure and land lakeward of it. The lakefront at this site is vulnerable to lakebed downcutting as well as deterioration of the concrete walkway and boathouse above the seawall due to wave overtopping and icing as well as erosion of the land under the concrete. Continued downcutting of the lakebed will allow larger stormwaves to impact and overtop the existing seawall and will cause increased vulnerability of the seawall and concrete walkway above to failure in the near future.

OPTION 2
Revetment Only –

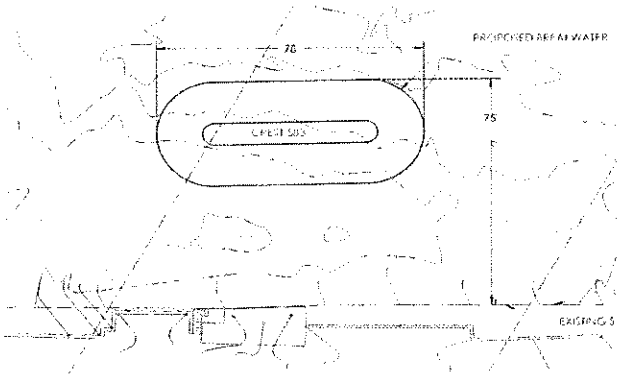
By installing only a revetment, the lakebed will continue to erode. As the boathouse and walkway are at elevation 584', a revetment will not stop wave overtopping during average lake levels and average storms. The surveyed lakebed averages an elevation of 575' which during the design water level of 580' with a storm setup of 2' would produce a wave of approximately 5.6' therefore the upper 3.6 feet of the breaking wave would break over the top of the revetment. This option does not provide proper shore protection for the existing land and infrastructure, nor the lakebed.



Option 2 Revetment Concept

OPTION 3
Breakwater Island Only –

This option includes installing one short shore parallel breakwater island extending to 75' east of the seawall. As this section is very open and does not hold a beach, a breakwater island in these conditions will likely not reduce wave overtopping to have proper protection for the seawall, walkway, boathouse and land. As the existing seawall has a smooth vertical face, sand would be scoured out of this system even with the short breakwater. *See illustration.*



Option 3 Island Breakwater Concept

OPTION 4

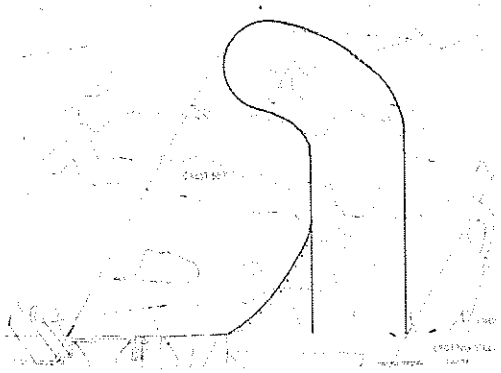
Proposed Option: Quarrystone Revetment and Breakwater Island –

The preferred option is to install a short, quarrystone island breakwater nearshore from the boathouse and a quarrystone revetment along the seawall for the entire length of the property. This option provides a wave break in the form of a low crested breakwater to trip waves as they come in toward shore. Then as a final line of defense, a low crested quarrystone revetment will be constructed abutting the existing seawall with a crest elevation of 584'. This is a good option for providing shore protection and maintaining a walkway at 584' above the seawall. Neither the island breakwater nor the revetment alone will serve to provide a reasonable level of shore protection for the property. Additional, this option helps to preserve the clay lakebed in the shadow of the breakwater.

OPTION 5

Quarrystone Breakwater Beach System –

This option has a shore connected quarrystone breakwater that extends lakeward 125' as the IDNR guidelines allow. This system however would hold a beach and extend further into Lake Michigan. This system is not the best choice for the homeowners.



Option 5 Quarrystone Breakwater Concept

Impact to Littoral Drift System

The proposed plan for this site includes construction of a detached nearshore breakwater, revetment, and placement of mitigational sandfill, as required for permit. The design of the proposed system, including the mitigational sandfill, will help assure no negative impact to the littoral drift system. The existing section of Lake Michigan shoreline at 2815 Lakeside Court is completely engineered. This section of the coastline consists mainly of steel seawalls with an occasional steel groin. Sand mitigation (as required by the IDNR) will be placed on the property with a 20% overfill as required.

The proposed quarrystone breakwater will be located 74' offshore (less than 125' as described in the IDNR permit guidelines). There is no sandy beach in this stretch of shoreline except during extreme low lake levels and only intermittently based on storms. Littoral drift sand will bypass the sand-filled system (plus 20% sand overfill).

IDNR regulations for structures that will retain sand require pre- and post-construction surveys, as well as surveys at the one and five-year intervals. This requirement will help assure that a sand equilibrium is met and that the new project is gaining and losing sand at a similar rate to neighboring properties or mitigation may be required at the owner's expense.

Impact on Public Uses

The revetment will have stairs integrated into it. This will be a benefit to the public if there is a swimmer or boater in distress. As the current shoreline is a steel seawall, there is no access to and from Lake Michigan waters. Fishing will not be impacted negatively, as the underwater area of the quarrystone protection will create an improved fish habitat. Additionally, navigation of water craft will not be impacted, as the proposed structures will not extend further east than existing nearby structures; there is a steel groin 80' north that extends 112' east of the seawall.

Impact on Natural Resources

Quarrystone structures in the nearshore waters of Lake Michigan and sandy beaches improve native species habitat. The LandOwner Resource Centre with support from the Canadian Wildlife Service and the Ontario Ministry of Natural Resources states that, "unstable shorelines can release silt that can choke nearby aquatic habitats." Additionally, underwater structures such as artificial reefs constructed of large boulders and clean riprap material "in large water bodies, such as the Great Lakes . . . are often the best method of creating habitat." As stated above, according to Meadows, et al., 2005, "a nearshore area with 100% sand cover support[s] a species rich community." As the design does not impact the bluff and vegetation, the local terrestrial wildlife will continue to inhabit this property.

Impacts to Water Quality

There are no stormwater outfalls at this site. The project complies with requirements of the USEPA approved Total Maximum Daily Loads (TMDL) target of a water quality concentration limit load allocation (LA) for *E. Coli* bacteria of 126 colony forming units (cfu) per 100 ml. *"Beach slope, beach orientation, embayment and substrate composition are among the physical variables that the beach TMDL suggests have statistically significant correlations with E. Coli concentrations at beaches. Therefore, for any particular shore protection project it is reasonable to assume that one or more of these variables undergoes some degree of alteration and with it, some alteration of E. coli loading to Lake Michigan."* See summary table below:

Site Condition	Existing Shoreline	Proposed Shoreline	TMDL Reduction
Substrate Comp.	Fine sand/silt	Med. to coarse sand	Reduced *E. coli* level
Lakebed Slope	1:50	1:10	More dry beach
Beach Orientation	NE to East	North and South	Reduced *E. coli* transfer
Swash Width	Wide - varies	8 feet	Reduced *E. coli* transfer
Swash Wave Energy	High	70% reduction	Reduced *E. coli* transfer
Embayment	None	Protected	Cladophora may wash up
Grooming	N/A	Yes	Removes Cladophora
Buffer Strip	Yes	Yes	Continued *E. coli* reduction
Wave Energy	Open to seawall	Protected bay north to south	70% Reduced wave height
Long Shore Current	High velocity	Reduced by breakwater	40% Red. current velocity
Dry Beach	None	Small dry beach	Reduced *E. coli* level

Type of Permit
The scope of this project requires an individual permit.

Description and Schedule of Proposed Activity
This project will be completed via marine construction with a barge and crane delivering all materials and equipment to the site. The proposed work will be completed using a backhoe that will work from the lakebed to place the materials unless the lake level prohibits this method of construction. If the water is too deep, some of the work may be completed using machinery from the barge. Work will not begin until all necessary permits have been received. This work will require approximately 6 weeks to complete.

Type and Quantity of Fill/Measures Taken to Avoid Impact/Erosion and Sediment Control Plan
All material will be clean and from inland quarries. Approximately 311 cubic yards of clean quarried stone will be placed to construct the breakwater. Approximately 530 cubic yards of clean sand will be placed as sandfill in and around the system.

The amount of fill to be placed below the Ordinary High Water Mark (581.5 feet, IGLD 1985) is +/- 0.099 acres.

Summary
All of the above described activities and plans will follow IPP terms and conditions. All of the proposed work adheres to the guidelines prescribed by the Illinois Environmental Protection Agency and its Anti-Degradation Assessment. U.S. Fish & Wildlife Service and the Illinois Historic Preservation Association will be updated on all relevant correspondence.

If you have any questions please feel free to call me at the phone number below.

Sincerely.

Jon Shabica
Vice President

C: IDNR, Water Resources (Casey)
IEPA (Heacock)
U.S. Fish & Wildlife Service
Illinois Historic Preservation Agency (Haaker)
Revelle

DESIGN OF SHORELINE EROSION PROTECTION

Introduction

The following report summarizes assumptions and design criteria for a quarrystone breakwater and sandfill to provide a higher level of shore protection for the property located at 2815 Shoreline Court, Evanston. The design is based on the drawings included in the permit application to the U.S. Army Corps of Engineers dated May XX, 2016.

The site lies within a fully-engineered section of urban lakeshore that is typically protected with steel sheetpile groins and seawalls. This section of coast is sand-starved due to municipal structures (littoral barriers) constructed over the past 100 years that extend east past the littoral zone and reduce sand bypass, as well as armoring of the shoreline reducing erosion of the glacial clay bluffs. According to the Illinois State Geological Survey, there is almost no sand moving along this section of coast. All structures in the area have been steadily losing their effectiveness at holding beach sand. This problem is exacerbated by lakebed erosion. In many cases where all the sand has been lost, the adjacent bluffs have begun to erode. To provide adequate protection for the upland property, solutions have typically been of two types: breakwater- or groin-anchored beaches to protect the bluffs, or a lower-cost system with a lower level of protection in the form of quarrystone revetments placed against the toe of the bluff that prevents stormwave erosion but at the expense of the beach and pedestrian access.

Project Description

The proposed design includes designing a quarrystone island breakwater and revetment. The project will include sandfill mitigation that fulfills the IDNR permitting requirements. While the seawall at this site continues to provide shore protection for the property, it is deteriorating and lakebed downcutting could undermine the integrity of the structure. Now that the lake level is rising, stormwaves cause overtopping of the seawall, severe icing problems and impacts to the property, as well as cause deeper water in the nearshore. The breakwater is designed to help reduce wave energy and impacts to the seawall and boathouse, as well as provide safe access to the water for the homeowners.

Summary Specifications

Using the Army Corps of Engineers Shore Protection Manual (1984), performance of nearby prototypes and other sources, the following specifications were developed for this site (elevations are based on IGLD 1985):

Breakwater Specifications	
Breakwater Crest Elevation:	583 ft
Toe of Breakwater:	573 ft
Crest Width:	7 ft
Average Armor Size:	4 tons
"B" Stone	600 - 1000 lbs
Slope:	1:1.5
Tons/linear ft:	13.5 tons

Assumptions	
• Design High Water (DHW):	582.5 ft *
• Design Water Level:	580.0 ft
• Design Low Water (DLW):	577.5 ft *
• Existing clay till elevation at groin toe:	573.0 ft
• 20-yr lakebed erosion at toe of groin:	3 ft**
• Design wave height:	Hs = 9 ft

- Nearshore Slope: 1:50
- Design Wave Period (T): 9.5 s **
- Depth at Structure Toe DHW (Ds): 9.5'
- Design Deepwater Wave (Ho): 18.0'
- Design Wave Length (Lo): 501.8'
- Stone Porosity: 37%

* DHW includes 2 ft storm setup, DLW is equivalent to Low Water Datum
** Resio & Vincent, 1976

Shoreline/Bathymetry

Bathymetric surveying was performed on June 3, 2015. More than 6 survey lines with data points stored at a horizontal spacing of 7 feet were completed in the project area and on adjacent properties (minimum of 3 survey lines per 100 feet of lot frontage). The survey data points were taken to approximately 900 feet east from the existing shoreline. The shoreline portion of survey was performed using a robotic total station, with control established by GPS observations. The water portion of the survey is performed from a boat using a single beam echo sounder (Hydrolite TM) tied in with a Trimble R8 receiver. All data points are collected in NAVD88 datum and then converted to IGLD85.

Water Levels

The following table summarizes water level data representing daily highest extremes measured at Calumet Harbor, Illinois, approximately 24 miles to the south of Evanston. Note: Low water datum LWD = 577.5 ft (IGLD 1985).

Lake Level	LWD	IGLD 1985
Record High	+5.5	583.0
Record Low	-1.4	576.1

Project Supporting Data

To help facilitate project review, Shabica & Associates offers the following supporting data based on standard coastal engineering practices:

1. **Sediment transport around structure**

   The structure is designed to lie within the surf zone (zone of breaking waves), therefore allowing sediment transport around the structure. The range of breaking wave heights is from 8.3 ft based on a 6-second wave with a wave length of 184 ft (using 1/25 Lo) to 18 ft based on a 9.9-second wave with a wave length of 501.8 ft (Resio and Vincent, 1976). The commonly accepted zone of sediment transport is to 18 ft (depth of closure) in this section of Lake Michigan, which is a function of the design wave parameters. Based on this data, once the structure has been filled with sand, it will continue to bypass littoral drift sand. Survey monitoring will be conducted, as required by the IDNR, to assure that the system performs as designed.

   The IDNR requires sandfill in areas where sediment will be trapped by the new system. Sand volume quantities have been calculated as shown in the permit drawings. As required by the IDNR, a 20% overfill will be added to the calculated volume. Additionally, the new pre- and post-construction monitoring will be performed and submitted to the IDNR to verify the impacts to the system.

2. **Effect on Adjacent Shorelines**

   A wave diffraction diagram (Figure 2, Appendix) has been overlain on the proposed shore protection

system. Using a refracted incident wave angle of 90 degrees (USACE, Shore Protection Manual), with average and design waves, there will be a decrease in wave energy on adjacent properties. The wave diffraction pattern shows that the coefficient of diffraction (K) reduces the wave energy to a distance of about ½ the wave length downdrift and does not have an impact further downdrift. For the average 6-second wave, that distance of reduced wave energy is about 90 ft and for the design wave, the protected distance is about 250 ft. This protected area close to the structure has diminished wave energy that will in turn reduce erosion in the area.

3. **Wave Reduction in Rubble-Mound Structures**
The Iribarren number (ξ), or surf similarity number, is used to determine the wave reflection coefficient. For rubble-mound structures, wave reflection (and wave energy) is reduced by one half or more (0.2 to 0.53) (Figure 3, Appendix). For example, a wave reflection of 0.25 means that the wave energy is reduced by 75%. The range of wave reflection for beaches peaks at about 0.44. The range for plane slopes, however, quickly rises to 0.5 and peaks at .91. This illustrates that rubble-mound structures reduce wave energy almost as well as beaches.

Lakebed Erosion
Lakebed erosion, active in water depths of 10 ft or less, is a design component of this plan. This section of Evanston lakeshore is considered sediment-starved. Sand deposits were measured near this site (Isabella Street, Evanston) from the backshore to a depth of 15 ft. Sand deposits were thin to non-existent for the entire profile (Shabica & Pranschke, 1994). Also, the site is underlain by highly-erodable, cohesive glacial clay-till. This condition increases the rate of irreversible lakebed erosion that causes deepening of the water and larger waves to impact the shoreline. According to Robert Nairn, approximately 200 m^3 of sand cover per meter of lakeshore (out to a depth of 4 m) is necessary to protect the underlying cohesive profile from lakebed erosion under most conditions. Sand and coarser sediments represent typically less than 15% of the material eroding from the lakebed and bluffs.

Using the historic rate of lakebed downcutting of 0.15 ft/yr, an irreversible lowering of the nearshore lakebed clay of approximately 3.0 ft over a 20-year period is predicted in unprotected areas. With the breakwater and sandfill installed, the lakebed erosion will be reduced.

Stone Stability, Armorstone
The proposed quarrystone breakwater has two layers of 2 – 5 ton armorstone built on a 1:1.5 slope (special placement). Overtopping of the structure is expected during storms and higher water levels. Design conditions include:

* Lakeward breakwater crest elevation 0.5 ft above DHW, 5.5 ft above DLW
* Depth-limited breaking waves will break on the stone breakwater and sand beach
* Depth at the toe of the structure is 7.5 ft (575.0) at design high water
* Incident wave directions: NE, E and SE
* Wave period for DHW T = 9.9 seconds
* Wave period for average conditions T = 6 seconds

Quartzite armorstone is recommended as it is highly durable and is locally available in most gradations under 6 tons. Hudson's formula was used to estimate armorstone size. An armorstone of 4.5 tons is predicted for 2-layer random placement armorstone based on the design conditions. Based on prototype function in this area, the armorstone gradation selected for this project is 3 – 5 tons.

Sand Calculations

Sand quantities are calculated based on desktop coastal engineering using the assumption that sand placed will hold an 11:1 angle of repose starting at the base elevation at the center of the breakwater system gap. The base elevation used is taken from the most recent topography/bathymetry and then modified in some circumstances if the sand elevation has deflated or should be deflating based on conditions such as lake level change and storms. The assumed lakebed is only modified if the project should call for more sand than that based on the survey.

Three dimensional geometric shapes are determined to calculate the volume to be filled with sand. Once the shapes are determined and volume calculated, the volume is multiplied by 1.25 tons/cubic yard and then multiplied by 20% for the overfill volume.

As soon as the stone and/or steel shore protection structures have been built, the predetermined quantity of sand is placed in the system and spread to a stable angle. If at the time of construction, it appears that the system will hold more sand than was permitted, the USACE and IDNR will be notified that additional sand will be brought in to fill the system. This can occur is there is substantial loss of sand in the time between the survey/permit submission and the time of construction. The post-construction profile is not necessarily the long-term sand profile. Once the sand is placed many factors alter the sand including: lake level, storms, slugs of sand in the littoral system, wind, and adjacent structures. As on all beaches, the sand profile can change on a daily basis as evidenced by the loss of 9 feet of sand at a Winnetka site during the Halloween storm of 2014.

Project Monitoring

As the performance of shore protection structures cannot be predicted with absolute certainty, the shore protection system for 2815 Lakeside Court, Evanston, will be inspected as required by IDNR guidelines. This includes topographic and hydrographic surveys beginning at an elevation of 581.5 feet (IGLD 1985) and progressing to 300 feet lakeward of the lakeward end of the project within the north and south property lines. Additionally, all structures should be inspected to assure that they continue to meet design specifications.

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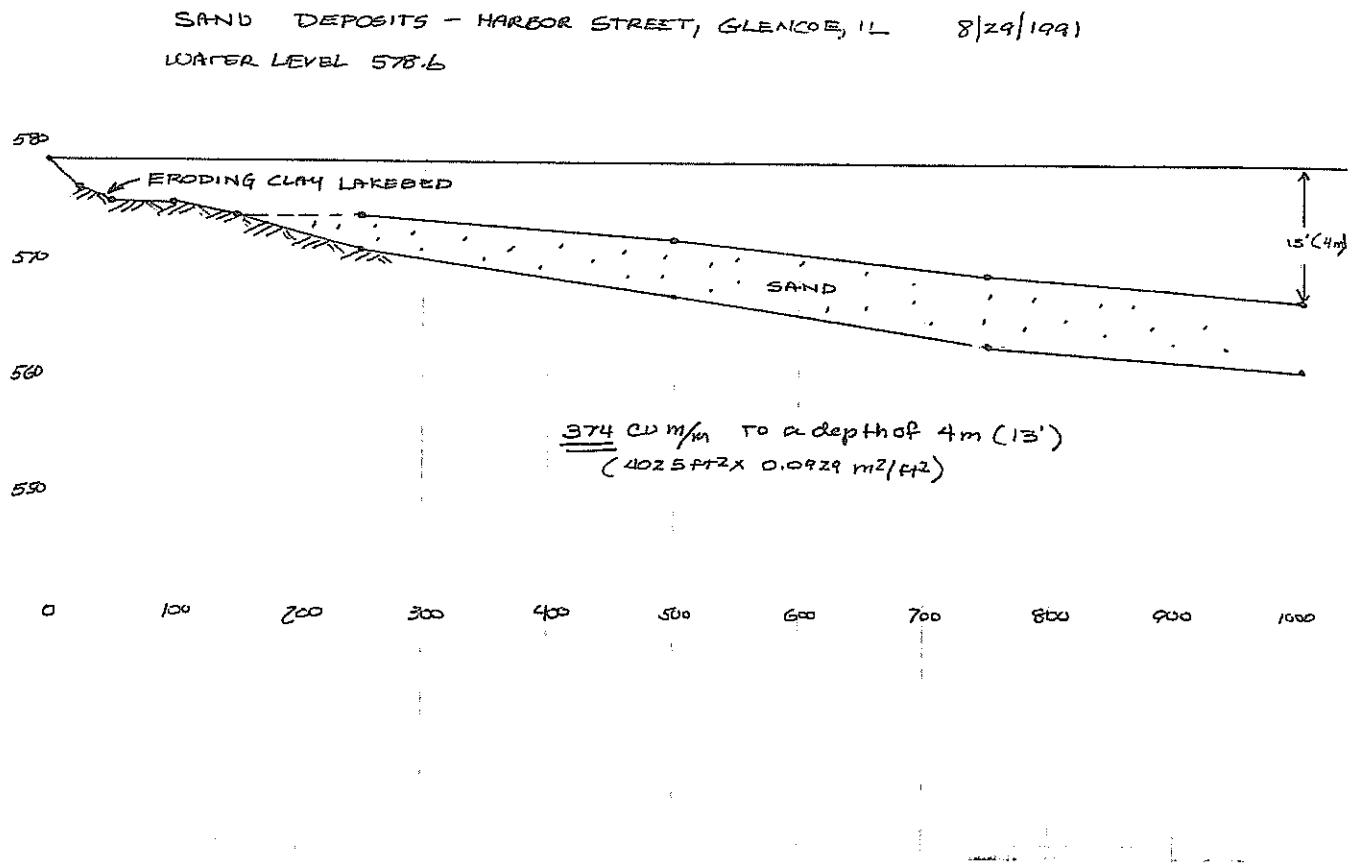
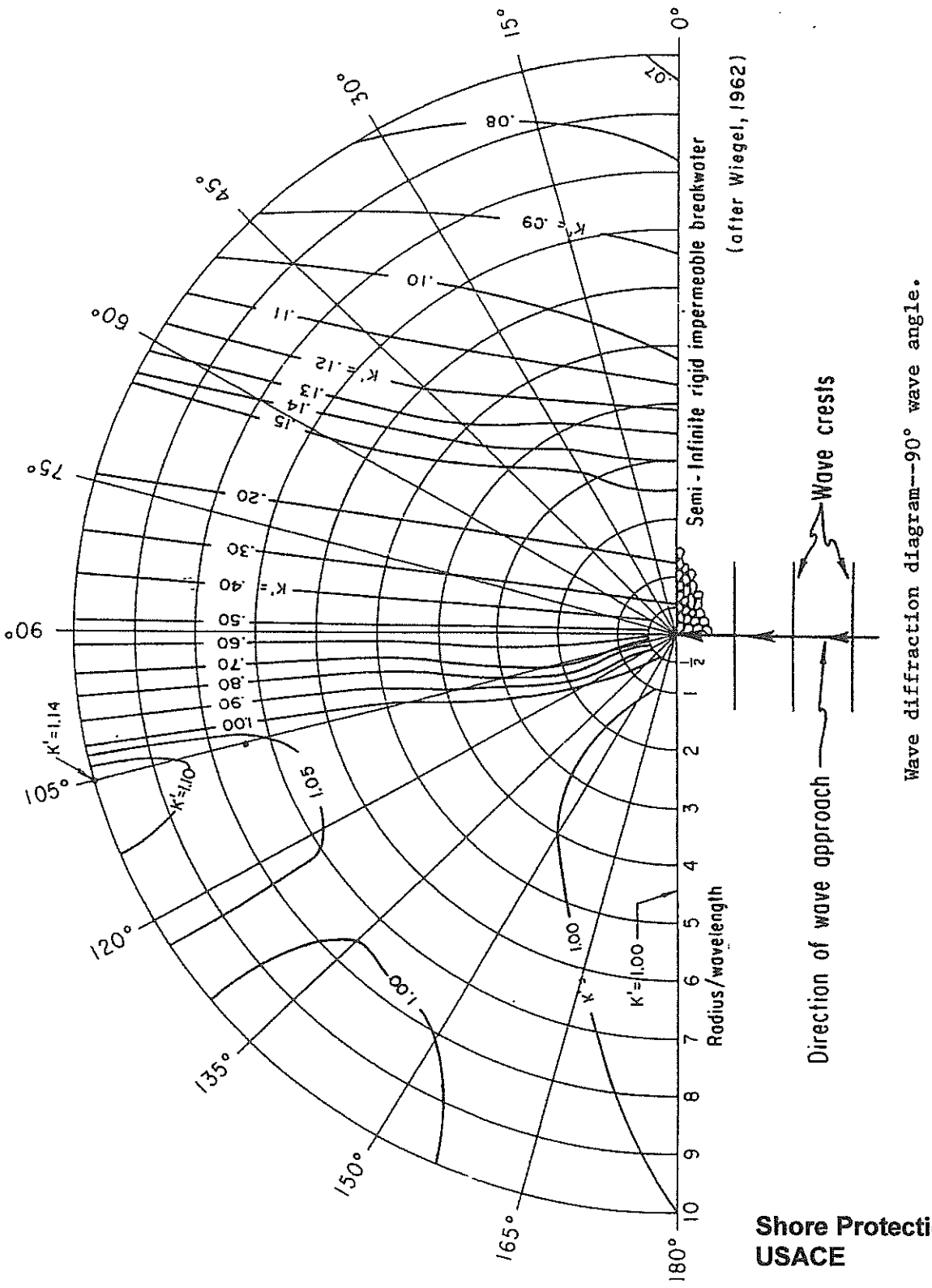
US Army Corps of Engineers, 1984, *Shore Protection Manual*, Coastal Engineering Research Center, Vicksburg, Mississippi.

FIGURE 1



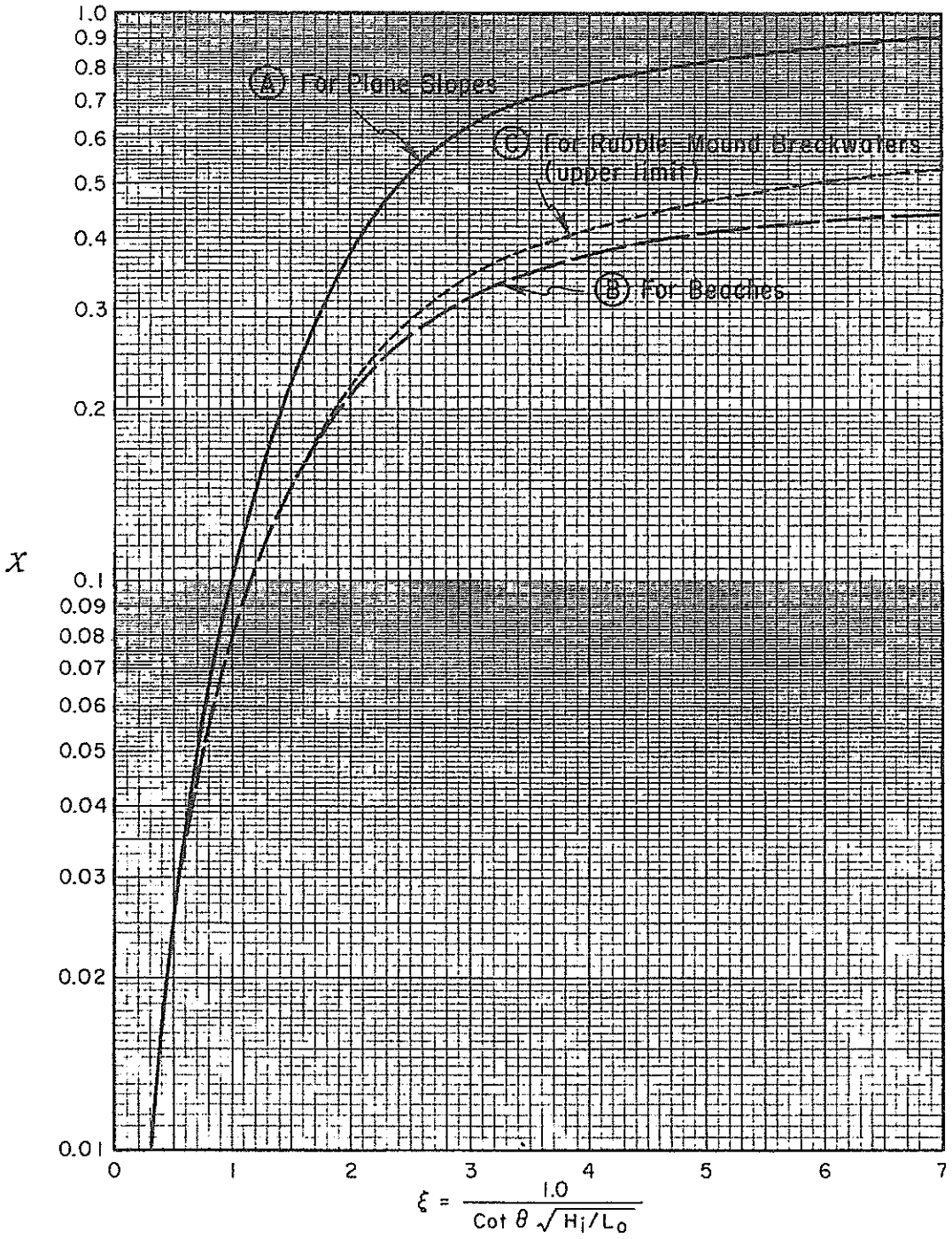
Typical cross-section of Glencoe lakebed and sand cover
(From Shabica et al., 1991)

FIGURE 2



Shore Protection Manual
USACE

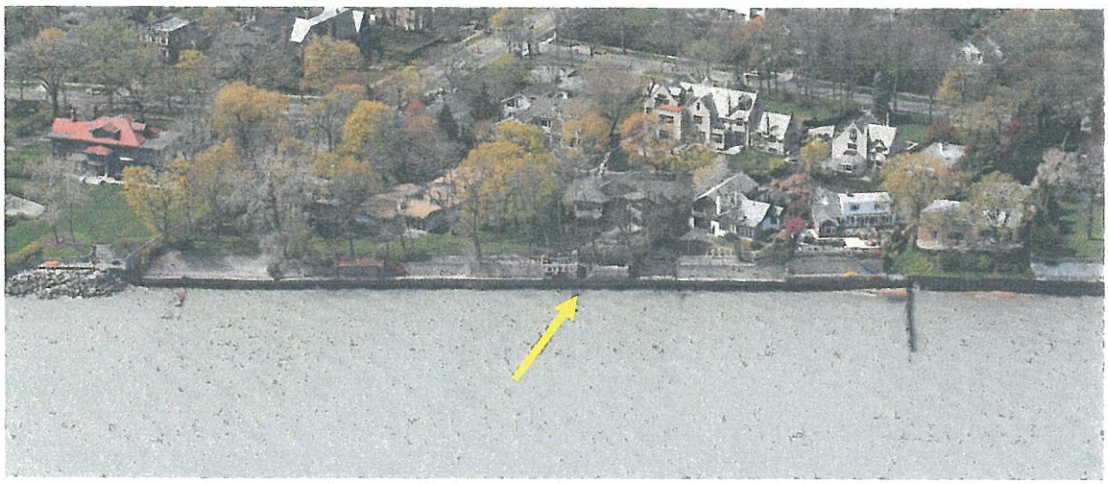
FIGURE 3



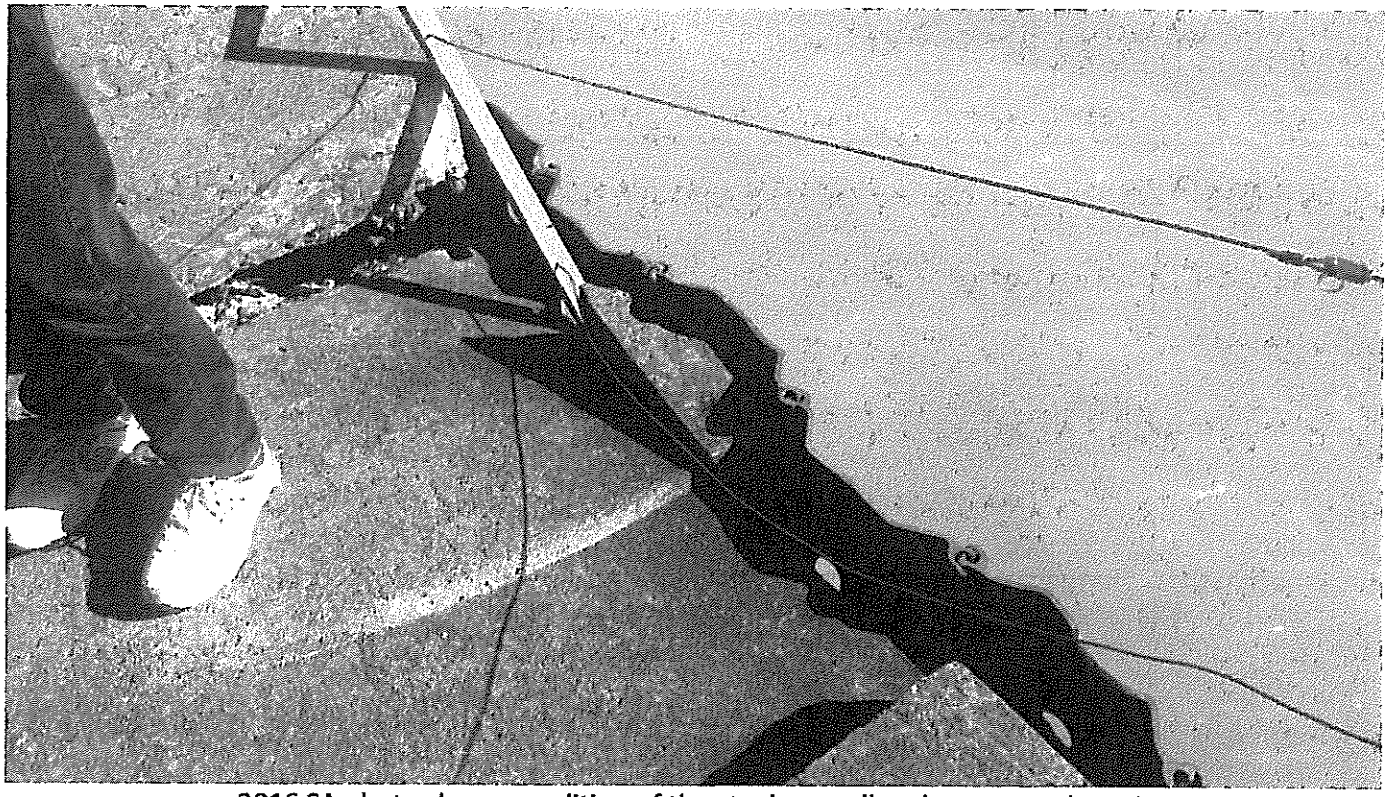
Wave reflection coefficients for slopes, beaches, and rubble-mound breakwaters as a function of the surf similarity parameter ξ .

Shore Protection Manual
USACE

2013 Google Earth Photo; see approximate property lines (yellow)
Note: No beach present during all time low lake level



2012 USACE Aerial Photo, yellow arrow identifies the site



2016 SA photo shows condition of the steel seawall and concrete above it

JOINT APPLICATION FORM FOR ILLINOIS

ITEMS 1 AND 2 FOR AGENCY USE

1. Application Number	2. Date Received

3. and 4. (SEE SPECIAL INSTRUCTIONS) NAME, MAILING ADDRESS AND TELEPHONE NUMBERS

3a. Applicant's Name:	3b. Co-Applicant/Property Owner Name (if needed or if different from applicant):	4. Authorized Agent (an agent is not required):
William & Eleanor Revelle Company Name (if any) : To be completed Address: 2815 Lakeside Court Evanston, IL 60201	Company Name (if any): Address: Email Address:	Jon Shabica Company Name (if any): Shabica & Associates, Inc. Address: 550 Frontage Road Suite 3735 Northfield, IL 60093 Email Address:
Applicant's Phone Nos. w/area code Business: Residence: Cell: Fax:	Applicant's Phone Nos. w/area code Business: Residence: Cell: Fax:	Agent's Phone Nos. w/area code Business: Residence: Cell: Fax:

STATEMENT OF AUTHORIZATION

I hereby authorize, Shabica & Associates, Inc. to act in my behalf as my agent in the processing of this application and to furnish, upon request, supplemental information in support of this permit application.

Applicant's Signature — 4/26/16 Date

5. ADJOINING PROPERTY OWNERS (Upstream and Downstream of the water body and within Visual Reach of Project)

Name	Mailing Address	Phone No. w/area code
a. see attached vicinity map		
b.		
c.		
d.		

6. PROJECT TITLE:
Offshore Quarrystone Breakwater

7. PROJECT LOCATION:
Lakefront at 2815 Lakeside Court, Evanston IL

LATITUDE: 42.06955 °N LONGITUDE: -87.67817 °W	UTMs Northing: 4657798.89 Easting: 16T443897.91				
STREET, ROAD, OR OTHER DESCRIPTIVE LOCATION	LEGAL DESCRIPT	QUARTER	SECTION	TOWNSHIP NO.	RANGE
Lakefront at 2815 Lakeside Court, Evanston IL		SE	35	42N	13E

☒ IN OR ☐ NEAR CITY OF TOWN (check appropriate box) Municipality Name Evanston	WATERWAY Lake Michigan	RIVER MILE (if applicable)

COUNTY	STATE	ZIP CODE
Cook	IL	60201

Revised 2010

☐ Corps of Engineers ☐ IL Dep't of Natural Resources ☐ IL Environmental Protection Agency ☐ Applicant's Copy

8. PROJECT DESCRIPTION (Include all features):

The shoreline stabilization will be comprised of the installation of a 78' long (toe to toe) quarrystone breakwater island, a quarrystone revetment 120' long, and placement of premitigational sandfill. The island breakwater will extend to 75' offshore at the lakeward toe. No work will be done further than 125' east of the seawall. The crest elevation will be 583' with a slope of 1.5:1. The revetment will have a crest elevation of 584' to match the abutting seawall with a slope of 1:1. Approximately 660 tons of clean sand will be placed as required by the IDNR.

9. PURPOSE AND NEED OF PROJECT:

Shore Protection

COMPLETE THE FOLLOWING FOUR BLOCKS IF DREDGED AND/OR FILL MATERIAL IS TO BE DISCHARGED

10. REASON(S) FOR DISCHARGE:

To protect the property from Lake Michigan stormwaves

11. TYPE(S) OF MATERIAL BEING DISCHARGED AND THE AMOUNT OF EACH TYPE IN CUBIC YARDS FOR WATERWAYS:

TYPE: Stone / Sand

AMOUNT IN CUBIC YARDS:

311 / 530

12. SURFACE AREA IN ACRES OF WETLANDS OR OTHER WATERS FILLED (See Instructions)

0.099

13. DESCRIPTION OF AVOIDANCE, MINIMIZATION AND COMPENSATION (See instructions)

This is a small system to protect the property. Other options were reviewed.

14. Date activity is proposed to commence: May 2017

Date activity is expected to be completed: June 2017

15. Is any portion of the activity for which authorization is sought now complete? Yes [ ] No [X]

NOTE: If answer is "YES" give reasons in the Project Description and Remarks section. Indicate the existing work on drawings.

Month and Year the activity was completed

16. List all approvals or certification and denials received from other Federal, interstate, state, or local agencies for structures, construction, discharges or other activities described in this application.

Issuing Agency	Type of Approval	Identification No.	Date of Application	Date of Approval	Date of Denial

17. CONSENT TO ENTER PROPERTY LISTED IN PART 7 ABOVE IS HEREBY GRANTED. Yes [X] No

18. APPLICATION VERIFICATION (SEE SPECIAL INSTRUCTIONS)

Application is hereby made for the activities described herein. I certify that I am familiar with the information contained in the application, and that to the best c[illegible] certify that I possess the authority to undertake the proposed activit[illegible]

/ Signature of Applicant or Authorized Agent — 5/24/16 Date

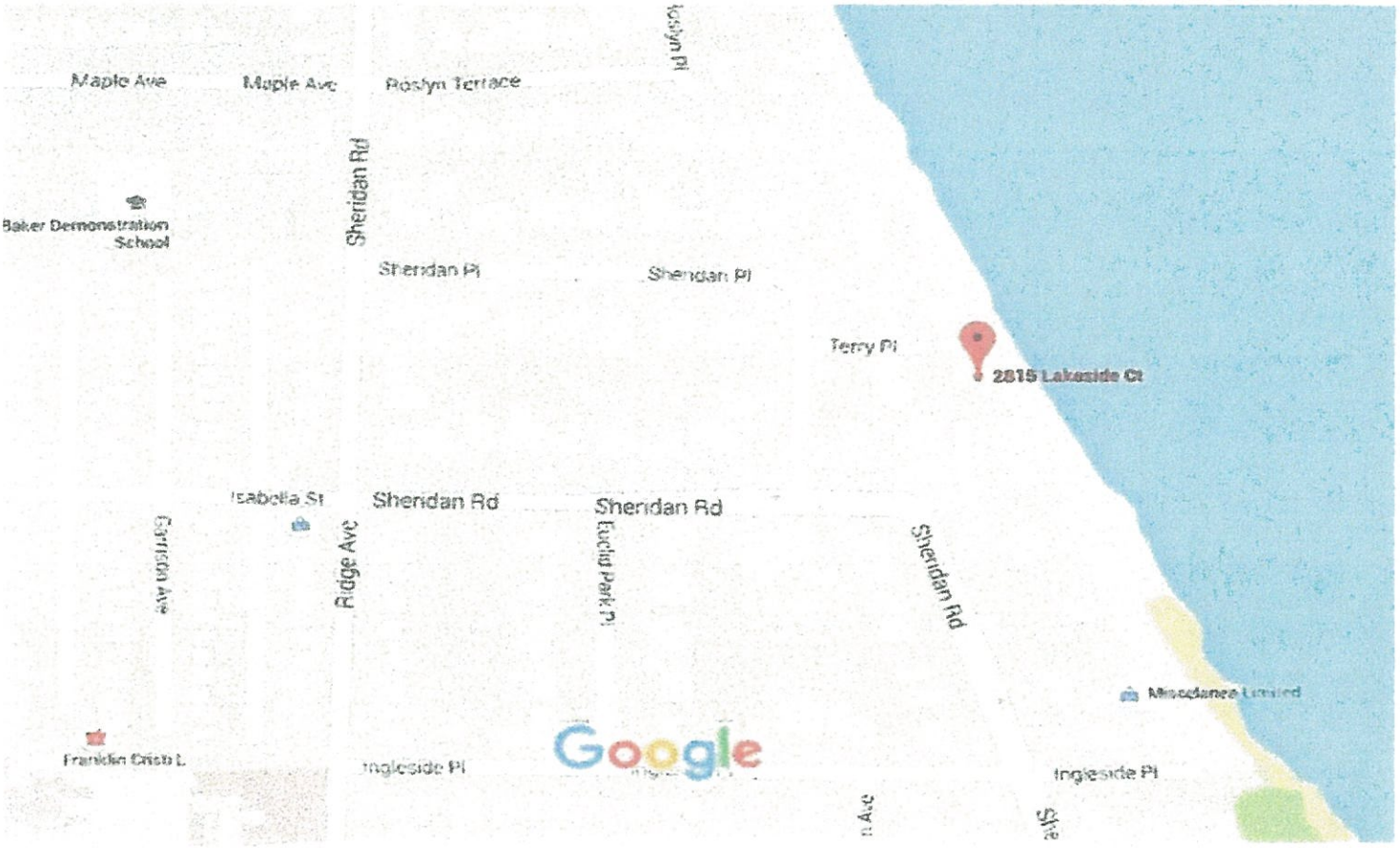
Signature of Applicant or Authorized Agent — Date

Signature of Applicant or Authorized Agent — Date

[ ] Corps of Engineers Revised 2010 [ ] IL Dep't of Natural Resources [ ] IL Environmental Protection Agency [ ] Applicant's Copy

SEE INSTRUCTIONS FOR ADDRESS

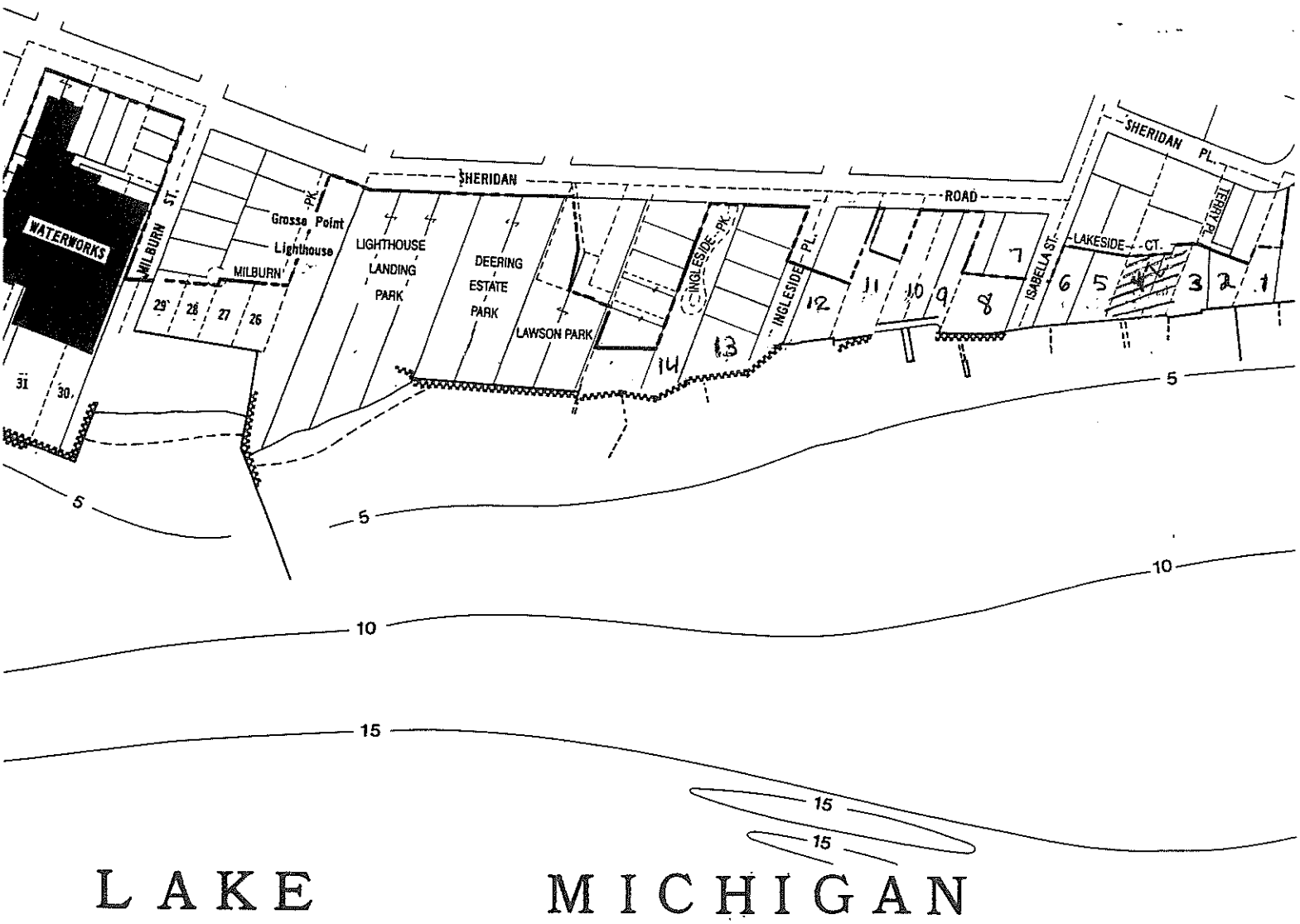
Vicinity Map



Offshore Quarrystone Breakwater

2815 Lakeside Court
Evanston, IL 60201

EVANSTON



LAKE MICHIGAN

COVERAGE OF THE LAKEBED BELOW THE OHWM IS 0.099 ACRES

LAKE MICHIGAN

WATER LEVEL = 579.8+/-

(6-3-15) IGLD85

572

573

574

575

576

78'

75'

24.5'

PROPOSED BREAKWATER

CREST 583'

SANDFILL AREA

PROPOSED REVETMENT

BEACH

APPROXIMATE STAIR LOCATION

CREST 584'

OHWM IS AT THE SEAWALL

EXISTING STEEL SEAWALL

T-STEEL 584.09 CONC 583.18

CONC 583.82

CONC 583.78

CONC 583.50

T-STEEL 584.01 CONC 583.38

T-STEEL 584.11 CONC 584.24

T-STEEL SHEETING

T-STEEL 584.00 CONC 583.93

T-STEEL 584.03 CONC 584.10

T-STEEL 583.95 CONC 584.01

PATIO 590.2

PATIO 590.4

PATIO 592.4

CONCRETE BEACH HOUSE

PATIO 592.3

TOP 591.55 TOE 584.00

TOP 591.75 TOE 583.75

CONC. WALL

TOP 591.75 TOE 583.76

2827 SHERIDAN PLACE

2815 LAKESIDE COURT

2809 LAKESIDE COURT

20'

SCALE

	NAME	DATE
DRAWN	SN	4/29/16
CHECKED	JS	5/17/16

COMMENTS:

DIMENSIONS ARE IN FEET
TOLERANCES: +.5', -1'
ALL ELEVATIONS IN IGLD 1985

Project Location:
2815 LAKESIDE CT, EVANSTON

Shabica & Associates, Inc.
550 Frontage Rd., Suite 3735
Northfield, Illinois 60093
847-446-1436
www.shabica.com

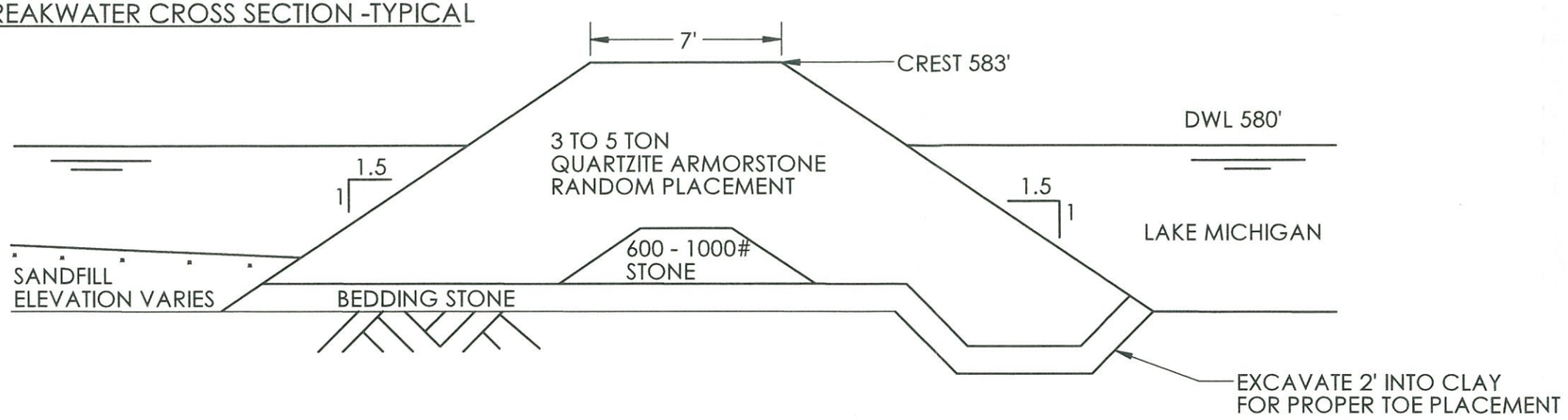
SIZE B

PLAN VIEW OVER BATHYMETRY

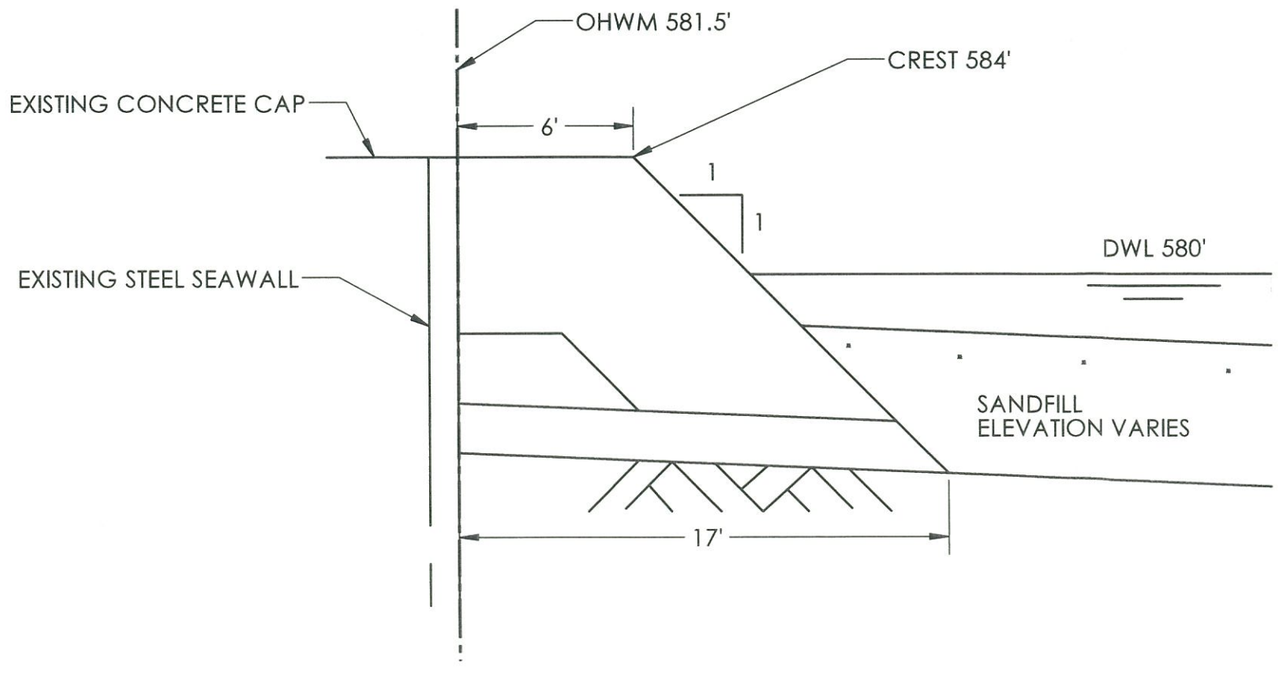
REV

SHEET 1 OF 4

BREAKWATER CROSS SECTION -TYPICAL



REVETMENT CROSS SECTION -TYPICAL



5'
SCALE

	NAME	DATE
DRAWN	SN	4/29/16
CHECKED	JS	5/17/16

Project Location:
2815 LAKESIDE CT, EVANSTON

COMMENTS:

DIMENSIONS ARE IN FEET
TOLERANCES: +.5', -1'
ALL ELEVATIONS IN
IGLD 1985

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550 Frontage Rd., Suite 3735
Northfield, Illinois 60093
847-446-1436
www.shabica.com

SIZE B

REV

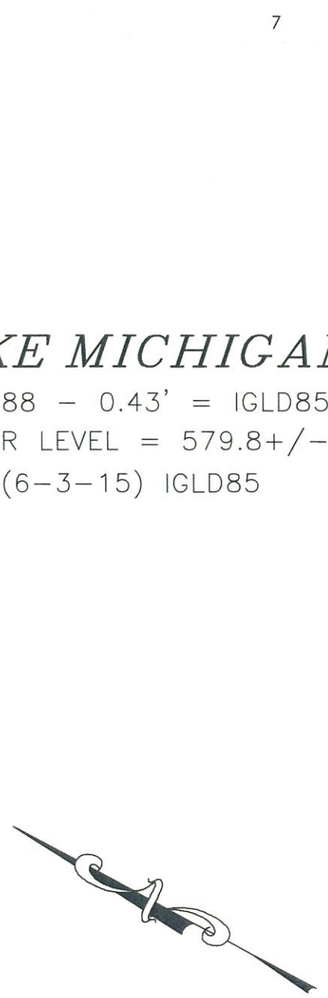
CROSS SECTIONS

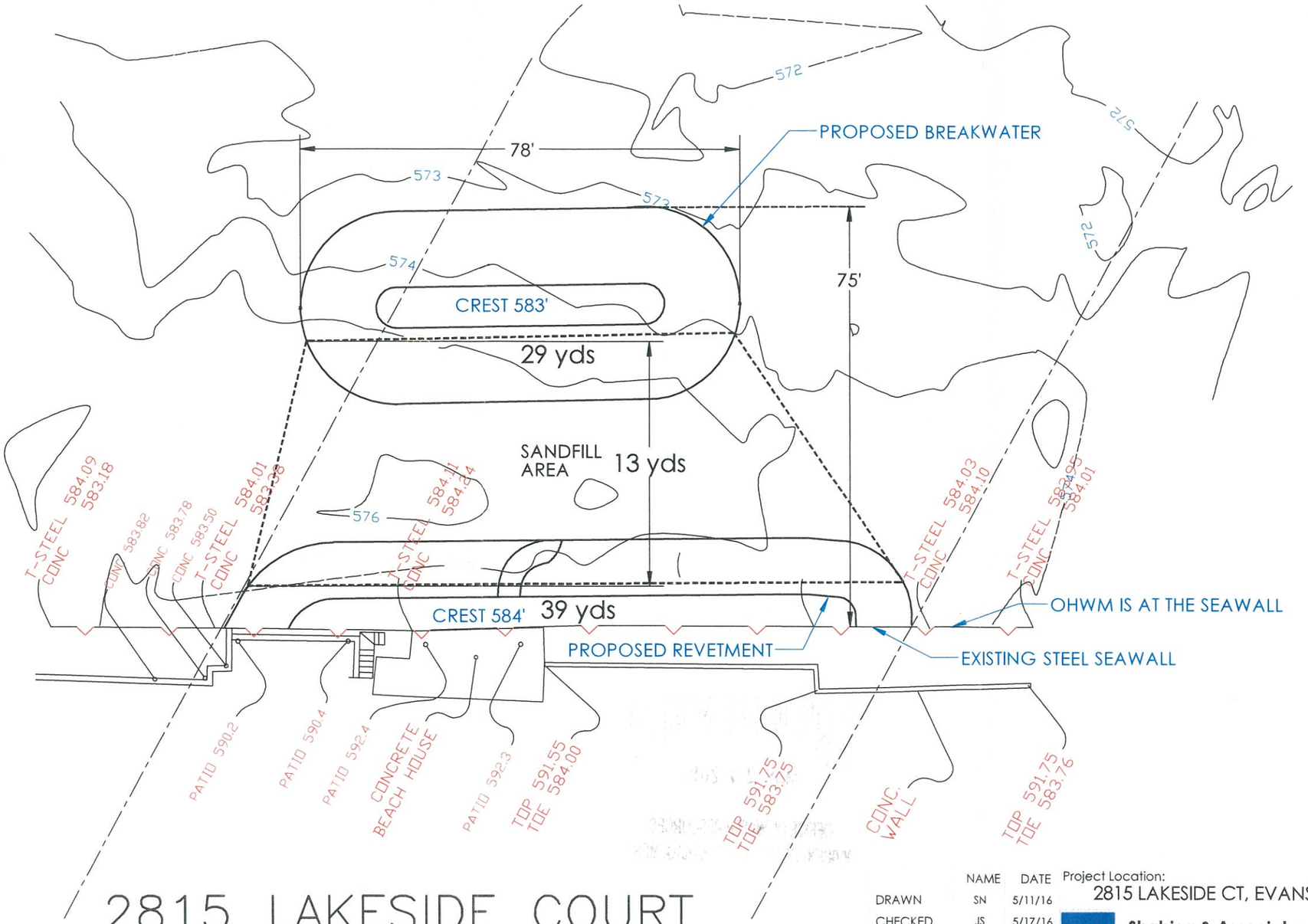
LAKE MICHIGAN

(NAVD88 – 0.43' = IGLD85)

WATER LEVEL = 579.8+/–

(6–3–15) IGLD85





2815 LAKESIDE COURT

20'
SCALE

	NAME	DATE
DRAWN	SN	5/11/16
CHECKED	JS	5/17/16

Project Location:
2815 LAKESIDE CT, EVANSTON

COMMENTS:

DIMENSIONS ARE IN FEET
TOLERANCES: +.5', -1'
ALL ELEVATIONS IN IGLD 1985

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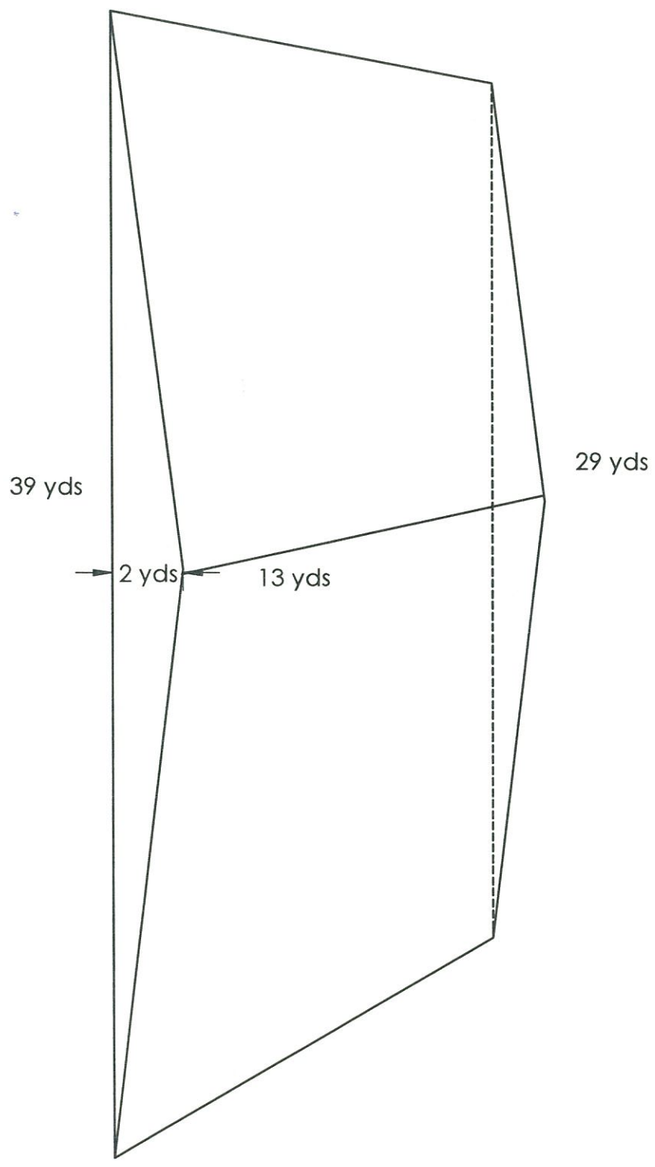
SIZE B

REV

SAND PLAN VIEW

SHEET 3 OF 4



$$\frac{\left(\frac{29\text{ yds} + 39\text{ yds}}{2\text{ yds}}\right)}{2\text{ yds}} \times 13\text{ yds} \times 2\text{ yds} = 442\text{ yds}$$

442 yds x 1.25 yds/ton = 552 tons

552 tons x 20% = 110 tons overfill

552 tons + 110 tons = 660 tons

Place 660 tons of Clean Sand

PROPRIETARY AND CONFIDENTIAL

THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF SHABICA & ASSOCIATES. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF SHABICA & ASSOCIATES IS PROHIBITED.

	NAME	DATE
DRAWN	SN	5/11/16
CHECKED	JS	5/17/16

COMMENTS:

DIMENSIONS ARE IN FEET
TOLERANCES: +.5', -1'
ALL ELEVATIONS IN IGLD 1985

Project Location:
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www.shabica.com

SIZE B

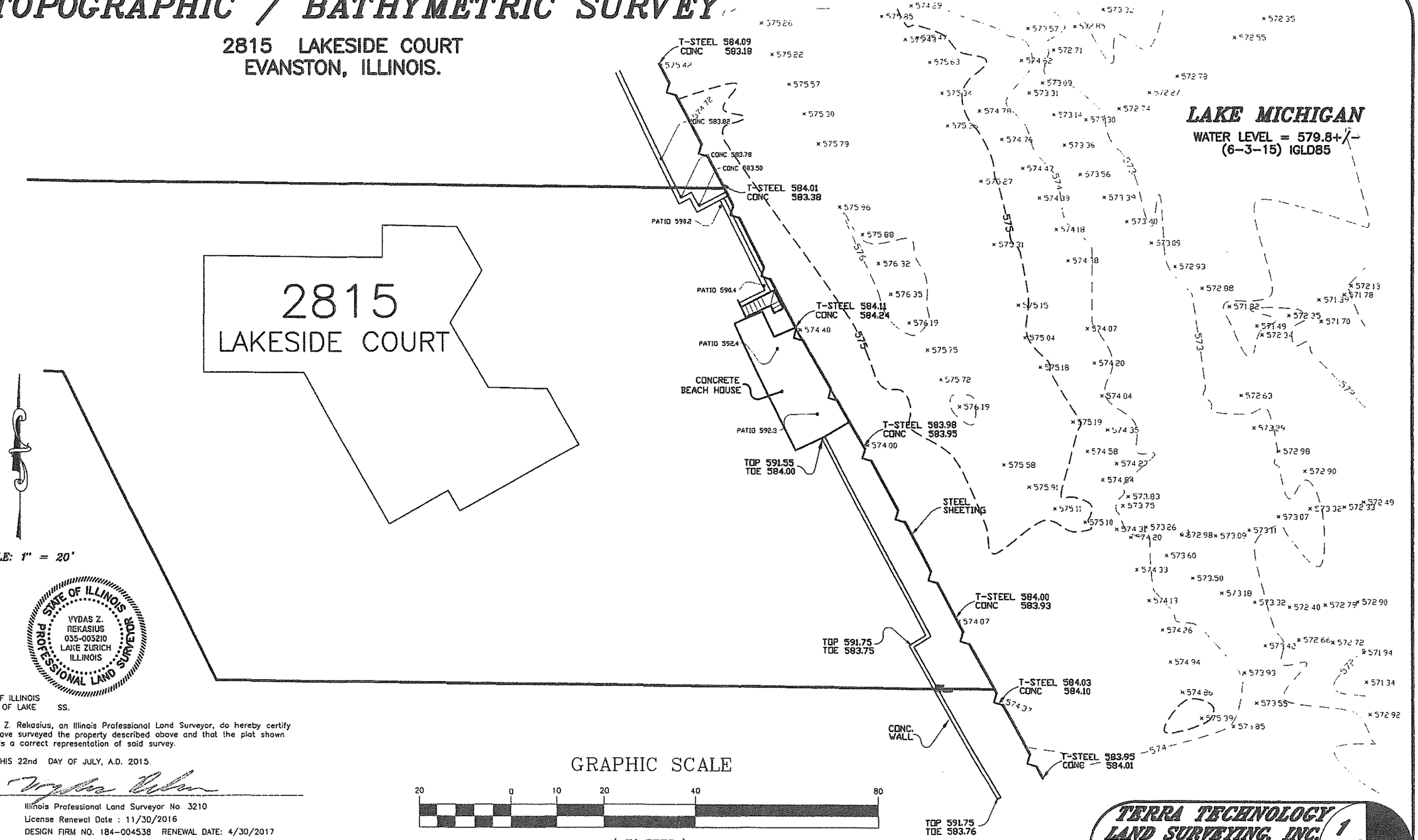
REV

SAND CALCULATIONS

SHEET 4 OF 4

TOPOGRAPHIC / BATHYMETRIC SURVEY

2815 LAKESIDE COURT
EVANSTON, ILLINOIS.



SCALE: 1" = 20'

STATE OF ILLINOIS
VYDAS Z. REKASIUS
035-003210
LAKE ZURICH
ILLINOIS
PROFESSIONAL LAND SURVEYOR

STATE OF ILLINOIS
COUNTY OF LAKE SS.

I, Vydas Z. Rekasius, an Illinois Professional Land Surveyor, do hereby certify that I have surveyed the property described above and that the plat shown hereon is a correct representation of said survey.

DATED THIS 22nd DAY OF JULY, A.D. 2015.

BY: _____

Illinois Professional Land Surveyor No. 3210
License Renewal Date : 11/30/2016
DESIGN FIRM NO. 184-004538 RENEWAL DATE: 4/30/2017

BOUNDARY LINES SHOWN HEREON ARE AS PER SURVEY AS PROVIDED BY CLIENT.

GRAPHIC SCALE

20 0 10 20 40 80

(IN FEET)
1 inch = 20 ft.

TERRA TECHNOLOGY
LAND SURVEYING, INC.
24198 ROSE AVE. LAKE ZURICH, ILLINOIS 60047
PHONE: (847) 540-8606 E-MAIL: TTLS1@SBCGLOBAL.NET

JOB NO. : 15-0028 SURVEY DATE : 6/3/2015
DWG FILE: DATA/15/0028/SITE-EVANSTON-10.DWG

1 OF 1