DEPARTMENT OF THE ARMY
CHICAGO DISTRICT, U.S. ARMY CORPS OF ENGINEERS
111 NORTH CANAL STREET
CHICAGO IL 60606-7206

REPLY TO
ATTENTION OF

22 AUG 2012

Planning Branch
Environmental Formulation Section

Highland Park Public Library
494 Laurel Avenue
Highland Park, IL 60035
ATTN: govt. publications

Dear Reference Librarian:

Enclosed is an Environmental Assessment on a proposed ecological restoration project at Rosewood Park, Highland Park, Illinois. This documentation was prepared in accordance with the National Environmental Policy Act of 1969 and is being distributed for your review.

The project area is on the southwestern shore of Lake Michigan. Rosewood Park was designed by Jens Jensen and is listed on the National Register of Historic Places. The portions of the park designed by Jens Jensen (carriage bridge, reflecting pool, and surroundings at Upper Rosewood) are excluded from this project footprint. The project area is heavily eroded bluff, ravine and Lake Michigan shoreline on the eastern edge of the park.

The project includes bluff and ravine stabilization, as well as restoration of the beach. Invasive plant species will be removed and native plant communities within the project area will be restored.

Please retain this document as reference material; it should not be circulated, but kept available for public review. Additional copies may be obtained from the office of the Chicago District, U.S. Army Corps of Engineers.

Comments must be received within 30 days and may be sent to Peter Bullock, U.S. Army Corps of Engineers, 111 North Canal Street, 6th Floor, Chicago, Illinois 60606, or by email at peter.y.bullock@usace.army.mil. Questions should be directed to Mr. Bullock at 312/846-5587.

Sincerely,

Susanne J. Davis, P.E.
Chief of Planning Branch

Rosewood Park Coastal Section 506
Great Lakes Fishery & Ecosystem Restoration

Feasibility Study and
Environmental Assessment

August 2012 (AGENCY AND PUBLIC REVIEW DOCUMENT)

Study Partnership

Park District of Highland Park

US Army Corps
of Engineers
Chicago District

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Executive Summary

The Park District of Highland Park has requested that the Chicago District, US Army Corps of Engineers initiate a Feasibility Study under the Section 506 Great Lakes Fishery and Ecosystem Restoration authority to ascertain the feasibility of restoration features to ensure ecological integrity along the southeastern Lake Michigan coast line.

This Feasibility Study has evaluated the feasibility and environmental effects of restoring: coastal habitat, ravine hydraulics and hydrology, riparian habitat, beach & dune, bluff, and savanna communities. The scope of this study addresses the issues of aquatic connectivity, altered hydrology and hydraulics, aquatic species dispersal, invasive species, and native species richness. This Feasibility Study assesses and identifies problems and opportunities, identifies and evaluates measures, and recommends and designs the most cost effective and feasible solution to the ecological problems that are associated with anthropogenic disturbance of the site.

Ten alternative plans, including the No Action Plan, were considered for study implementation:

1) No Action Plan
2) Savanna Restoration
3) Ravine and Savanna Restoration
4) Bluff, Ravine, and Savanna Restoration
5) Stream Restoration 1; Bluff, Ravine, and Savanna Restoration
6) Stream Restoration 1; Beach & Dune, Bluff, Ravine, and Savanna Restoration
7) Stream Restoration 1; Lacustrine Restoration 2; Beach & Dune, Bluff, Ravine, and Savanna Restoration
8) Stream Restoration 1; Lacustrine Restoration 1; Beach & Dune, Bluff, Ravine, and Savanna Restoration

7 produced an annual benefit of 33.6 Net Average Annual Habitat Units over the 7 acre project footprint, and was the only Best Buy Plan that would restore the ecological integrity of the entire site. This plan has a total project cost of approximately $[redacted] (2012 price levels). Thus, the plan that maximizes net NER benefits, is the most cost effective, and provides a best buy, is alternative 7. In keeping with the NER objective of water resource planning, the plan that reasonably maximizes ecosystem benefits compared to costs is selected for implementation unless there are compelling reasons not to do so. Therefore, the NER plan, alternative 7, is also the Preferred Plan.

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1. Study Purpose & Scope

1.1 Report Organization

This Detailed Project Report (DPR) presents the results of the Rosewood Park Coastal Ecosystem Restoration study. The report is structured as follows:

- Feasibility Report & Integrated Environmental Assessment
- Appendix A – Hydrology & Hydraulics Analysis
- Appendix B – Planning
- Appendix C – Civil Design / Cost Engineering (INTENTIONALLY NOT INCLUDED)
- Appendix D –Hazardous, Toxic, and Radioactive Waste (HTRW) Report
- Appendix E – Real Estate Plan (INTENTIONALLY NOT INCLUDED)
- Appendix F – Monitoring Plan
- Appendix G – Coordination, 404b1 Analysis & FONSI

1.2 Study Authority

42 U.S.C. 1962d-22. GREAT LAKES FISHERY AND ECOSYSTEM RESTORATION (SECTION 506)

(a) Findings - Congress finds that—
  (1) the Great Lakes comprise a nationally and internationally significant fishery and ecosystem;
  (2) the Great Lakes fishery and ecosystem should be developed and enhanced in a coordinated manner; and
  (3) the Great Lakes fishery and ecosystem provides a diversity of opportunities, experiences, and beneficial uses.

(b) Definitions - In this section, the following definitions apply:
  (1) Great Lake
    (A) In general- The term "Great Lake" means Lake Superior, Lake Michigan, Lake Huron (including Lake St. Clair), Lake Erie, and Lake Ontario (including the St. Lawrence River to the 45th parallel of latitude).
    (B) Inclusions- The term "Great Lake" includes any connecting channel, historically connected tributary, and basin of a lake specified in subparagraph (A).
  (2) Great Lakes Commission- The term "Great Lakes Commission" means the Great Lakes Commission established by the Great Lakes Basin Compact (82 Stat. 414).
  (3) Great Lakes Fishery Commission- The term "Great Lakes Fishery Commission" has the meaning given the term "Commission" in section 931 of Title 16.
  (4) Great Lakes State- The term "Great Lakes State" means each of the States of Illinois, Indiana, Michigan, Minnesota, Ohio, Pennsylvania, New York, and Wisconsin.

(c) Great Lakes fishery and ecosystem restoration
  (1) Support plan
    (A) In general- Not later than 1 year after December 11, 2000, the

Secretary shall develop a plan for activities of the Corps of Engineers that support the management of Great Lakes fisheries.

(B) Use of existing documents- To the maximum extent practicable, the plan shall make use of and incorporate documents that relate to the Great Lakes and are in existence on December 11, 2000, such as lakewide management plans and remedial action plans.

(C) Cooperation- The Secretary shall develop the plan in cooperation with—

(i) the signatories to the Joint Strategic Plan for Management of the Great Lakes Fisheries; and

(ii) other affected interests.

(2) Reconnaissance studies- Before planning, designing, or constructing a project under paragraph (3), the Secretary shall carry out a reconnaissance study—

(A) to identify methods of restoring the fishery, ecosystem, and beneficial uses of the Great Lakes; and

(B) to determine whether planning of a project under paragraph (3) should proceed.

(3) Projects- The Secretary shall plan, design, and construct projects to support the restoration of the fishery, ecosystem, and beneficial uses of the Great Lakes.

(4) Evaluation program

(A) In general- The Secretary shall develop a program to evaluate the success of the projects carried out under paragraph (3) in meeting fishery and ecosystem restoration goals.

(B) Studies- Evaluations under subparagraph (A) shall be conducted in consultation with the Great Lakes Fishery Commission and appropriate Federal, State, and local agencies.

(d) Cooperative agreements- In carrying out this section, the Secretary may enter into a cooperative agreement with the Great Lakes Commission or any other agency established to facilitate active State participation in management of the Great Lakes.

(e) Relationship to other Great Lakes activities- No activity under this section shall affect the date of completion of any other activity relating to the Great Lakes that is authorized under other law.

(f) Cost sharing

(1) Development of plan- The Federal share of the cost of development of the plan under subsection (c)(1) of this section shall be 65 percent.

(2) Project planning, design, construction, and evaluation- Except for reconnaissance studies, the Federal share of the cost of planning, design, construction, and evaluation of a project under paragraph (3) or (4) of subsection (c) of this section shall be 65 percent.

(3) Non-Federal share

(A) Credit for land, easements, and rights-of-way- The Secretary shall credit the non-Federal interest for the value of any land, easement, right-of-way, dredged material disposal area, or relocation provided for carrying out a project under subsection (c)(3) of this section.

(B) Form- The non-Federal interest may provide up to 100 percent of the non-Federal share required under paragraphs (1) and (2) in the form of services, materials, supplies, or other in-kind contributions.

(4) Operation and maintenance- The operation, maintenance, repair, rehabilitation, and replacement of projects carried out under this section shall be a non-

Federal responsibility.

(5) Non-Federal interests- In accordance with section 1962d-5b of this title, for any project carried out under this section, a non-Federal interest may include a private interest and a nonprofit entity.

(g) Authorization of appropriations

(1) Development of plan- There is authorized to be appropriated for development of the plan under subsection (c)(1) of this section $300,000.

(2) Other activities- There is authorized to be appropriated to carry out paragraphs (2) and (3) of subsection (c) of this section $100,000,000.

1.3 Background & Sponsorship

Rosewood Park was once the estate of U.S. clothier Julius Rosenwald, part owner and leader of Sears, Roebuck and Company. Around 1910, Rosenwald hired famed landscape architect Jens Jensen to design the grounds of his estate (Appendix B). Today, the reflecting pool, carriage bridge, and surroundings at Upper Rosewood are all that remain of his work at the site.

Rosewood Park was acquired by the Park District of Highland Park (PDHP) as two separate parcels. Upper Rosewood Park, which lies on top of the bluff, was obtained in 1928 and contains the majority of the remains of Jens Jensen's landscape design. Lower Rosewood is comprised of beach habitat extending approximately 65 feet from the bluff to Lake Michigan and was obtained by the PDHP in 1945. Rosewood Park is unique in that it preserves beach, bluff, ravine, stream and oak savanna habitat. Topography of the site is a direct result of the Lake Michigan Lobe of the Wisconsin glaciation, and the waxing and waning of those glaciers. Remnants of these geologic events are five moraines, including the Highland Park Moraine which Rosewood Park resides upon.

The Park District of Highland Park has requested that the Chicago District, U.S. Army Corps of Engineers (USACE) initiate a study under Section 506 Great Lakes Fishery and Ecosystem Restoration to ascertain the feasibility of restoration features to ensure the ecological integrity of Rosewood Park. This study evaluates the feasibility and environmental effects of restoring the area with appropriate native beach & dune, bluff, ravine, and oak savanna plant communities. The scope of this study addresses the issues of habitat restoration for native plant community preservation, invasive species, connectivity, and native species richness. This Feasibility Study (FS) will assess and identify problems and opportunities, identify and evaluate measures, and recommend and design the most cost effective and feasible solution to the ecological problems that would be encountered by restoring habitat native to Rosewood Park.

1.4 Study Area

The study area contains approximately 7 acres that are part of the Lake Michigan coastline (Figure 1) and is located in northeastern Illinois within the southeast boundary of Lake County (Figure 2). The proposed project would be located within the Highland Park community, near Rosewood Drive and Sheridan Road. The Rosewood Park Section 506 study area consists of one

ravine (3L), the bluff along the coastline, the savanna habitat atop the bluff, the dune & beach habitat, and the littoral zone of Lake Michigan.

The land bordering the Illinois coast has varied landscape characteristics that were divided into three geomorphic settings by Chrzastowski (1995, 2007); the low lying beach-ridge plain to the north, the bluff coast in the middle, and the Chicago lake plain to the south. The bluff coast zone lies between the City of North Chicago and Winnetka.

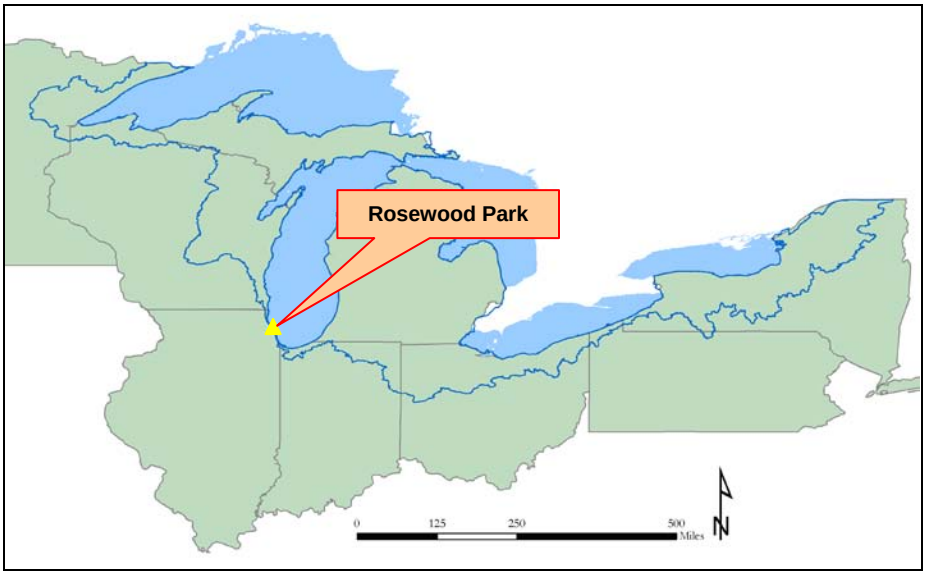

Figure 1. Location of Rosewood Park within the Great Lakes basin.

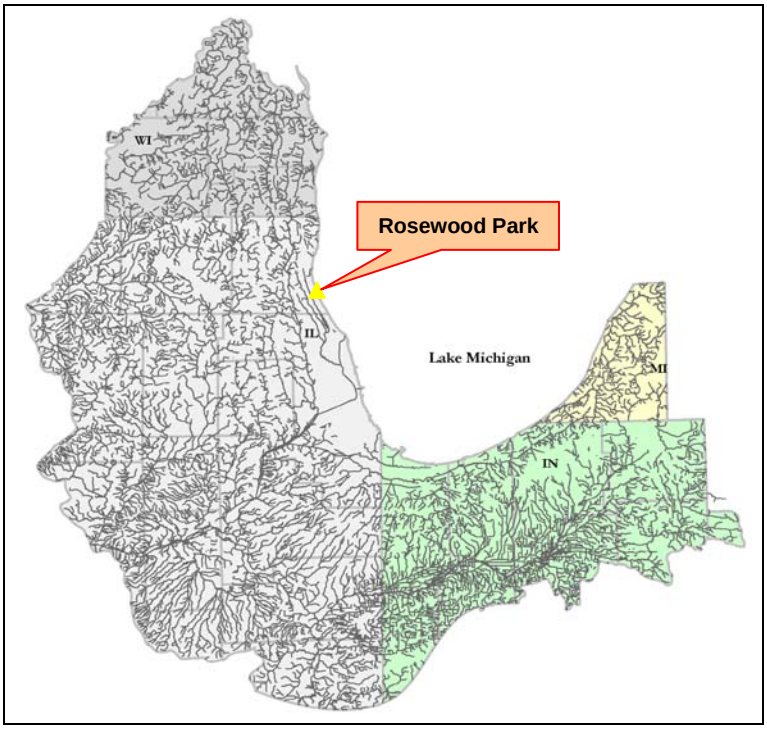

Figure 2. Location of Rosewood Park in northeastern Illinois.

1.5 Pertinent Reports, Studies, & Projects

Reports & Studies

- Highland Park Lakefront Plan. 2006. The community of Highland Park encompasses nearly 10 percent of the Illinois' Lake Michigan shoreline. In 2006, the community created a Lakefront Plan that established a series of long and short term restoration recommendations specific to the following parks in the area: Moraine Park, Central Park, Millard Park, and Rosewood Park. In addition to infrastructure renovations listed in the plan, enhancement of the extensive ravine system was put forth as a primary objective. Ravine improvement was to include bluff and ravine stabilization, habitat restoration, and beach enrichment.

- Rosewood Park Draft Environmental Investigation Report. 2008. Prepared by JJR. The purpose of the report was to identify existing environmental information and reports to assist the regulatory agencies with the permit application review process.

- Rosewood Park Physical Hydraulic Model Study (Highland Park, IL on Lake Michigan). 2008. Prepared by HCCL in consultation with JJR. This report described the three-dimensional hydraulic model testing program and background coastal engineering analyses for the proposed shoreline works at Rosewood Park in the state of Illinois situated on the shore of Lake Michigan. The investigation is in support of technical analyses conducted to assist in the development of Rosewood Park, within the context of the Park District of Highland Park's "Highland Park Lakefront Plan".

- Lakefront Improvement Project: Rosewood Park Schematic Design Report. 2008. Prepared by the Park District of Highland Park. This document presented the Schematic Design of the proposed park, beach, shoreline protection and related environmental and recreational improvements at Rosewood Park along the Lake Michigan shoreline in Highland Park, Illinois.

- Highland Park, IL: Assessment of Littoral Impacts of Proposed Shoreline Works at Central and Rosewood Parks. 2008. Prepared by HCCL in consultation with JJR. This report presented on littoral impacts of proposed shoreline projects at Rosewood Park and Central Park within the Park District of Highland Park on Lake Michigan, Illinois.

- Shore Management Alternatives for Short and Long Term Planning. 1986. Prepared by the City of Highland Park. This report presented an inventory of the Highland Park shore and looked at various management alternatives for the area.

2. Inventory & Forecasting

Consideration of ecosystems within or encompassing a watershed provides a useful organizing tool to approach ecosystem-based restoration planning. Ecosystem restoration projects that are conceived as part of a watershed planning initiative or other regional resources management strategies are likely to more effectively meet ecosystem management goals than those projects and decisions developed independently. Independently developed ecosystem restoration projects, especially those formulated without a system context, partially and temporarily address symptoms of a chronic/systemic problem. The Rosewood Park ravine and coastal restoration project was undertaken as a watershed based planning study for ecosystem restoration purposes. The following chapter outlines the past, present, and future without-project conditions of the ravine and coastal environment, both ecological and human.

2.1 Current Conditions

Topography of the coastal park was formed during the last glaciation, the Wisconsinan. As the glaciers retreated to the north, deposits of glacial till were left behind. The deposited materials were then carved out by precipitation over thousands of years resulting in the ravines that are visible today (Photo 1).

Photo 1. Ravine along the northern boundary of Rosewood Park.

Fish movement between the lake and ravine stream is currently impeded by the presence of a double box culvert (Photo 2). This manmade structure, as well as excess sediment loading from runoff during storm events, has severely reduced the natural stream structure of riffle/pool complexes. Currently, the stream is primarily one long shallow pool with sand and small gravel dominating the substrate.

Photo 2. Box culvert at ravine outfall.

The nearshore lake consists of sand, gravel, and cobble substrates that provide excellent habitat for littoral fishes and invertebrates. However, shoreline stabilization structures such as steel groins (Photo 3) and riprap (Photo 4) limit beach habitat, hinder lacustrine processes, and create aesthetic eyesores.

Photo 3. Steel groins extend perpendicular to the shoreline.

Photo 4. Riprap along the southern shoreline of Rosewood.

The bluff area above the beach has undergone minimal restoration by the PDHP. Restoration measures have included the planting of native grasses and flowers to control erosion and restore the bluff's natural habitat. Although efforts are ongoing, erosion of the bluff area has continued and has been aided by invasive vegetation, unchecked foot traffic, and excessive runoff from impervious surfaces.

2.2 Physical Characteristics

2.2.1 – Climate

Rosewood Park is located within a temperate continental climate zone marked by cold winters, warm humid summers, and the lack of a pronounced dry season. From 1971 to 2000 (Midwestern Regional Climate Center, 2011), temperatures ranged from an average maximum of 77^{o}F to an average minimum of 62^{o}F during the summer months (July and August), while an average maximum of 33^{o}F to an average minimum of 17^{o}F temperatures were observed during the winter months (December and January). Total annual precipitation averaged approximately 37 inches per year from 1971 to 2000, with the majority of precipitation occurring during the spring (April through mid-June) and summer (July through mid-August) months. Average annual snowfall from 1971 to 2000 was 33 inches, with an average accumulation of 10.2 inches in January. The growing season extends from the last spring frost (typically late April) to the first fall frost (typically mid October) and averaged 170 days from 1981 to 2000 (Midwestern Regional Climate Center, 2011).

2.2.2 – Geology & Glacial Stratigraphy

Silurian Age Bedrock – The underlying regional bedrock is Silurian-age dolomite, most likely of the Niagaran Series (Willman 1971). This rock resulted from marine deposition when all of northeastern Illinois and much of the neighboring Great Lakes region was the floor of a tropical sea from about 440 to 410 million years ago.

Wadsworth Till Member – The dominant material in the Illinois coastal zone is a compact, gray, silty and clayey till of the Wadsworth Till Member. The till may contain discontinuous layers of sand and gravel mixed with sand. This till, which is ubiquitous across the coastal zone, was deposited by glacial ice during the most recent (Wisconsinan) glacial episode. The till is exposed along the coastal bluffs, as well as the material first encountered beneath most of the soils in the area. It also occurs beneath the beach sand and on the nearshore lake bottom either beneath the nearshore sand or exposed where sand cover is absent. The cohesion of the till has contributed to the near-vertical bluffs along parts of the coast.

Analysis of the till exposed in the bluffs indicate that a typical sediment size distribution is 48 percent clay, 42 percent silt, and 10 percent sand (Chrzastowski 1995). When bluff erosion occurs, only the sand-size material ultimately remains along the beaches and nearshore. The dominant clay and silt are transported offshore for eventual deposition in deep water (Colman and Foster 1994). The grayish or milky coloration that is common along the Illinois coast following times of large waves results from the suspension of the silt and clay from erosion along the bluffs or across the lake bottom.

The thickness of the till sequence above the bedrock is variable depending on the surficial landscape or lake-bottom topography compared to the subsurface bedrock topography. In general, within the Illinois coastal area, the thickest sequence of till occurs in Lake County where thickness can be 300 to 400-feet.

Highland Park Moraine – Along the coast between North Chicago and Winnetka, the Zion City and Highland Park Moraines dead-end into Lake Michigan. These end moraines formed about 14,000 years ago just prior to glacial ice permanently receding into the Lake Michigan basin. These are thus the youngest end moraines in Illinois. The Highland Park Moraine encompasses the entire study area. Long-term wave erosion along this morainal upland has resulted in bluffs that form the highest and steepest landscape along the Illinois coast. Maximum bluff heights of about 90-feet occur along the southern Highland Park lakeshore.

The bluff slopes range from near vertical to about 45 degrees. There is considerable local variability in slope, and many segments of the bluff slope have been graded or terraced for erosion control along private lakeshore property as well as public lakeshore property. A discontinuous bluff face results from a series of steep-sided, V-shaped ravines that open to the lakeshore. These ravines are cut into the morainal upland and originate as much as one mile inland from the shore. The ravines typically have intermittent streams that discharge to Lake Michigan.

2.2.3 – Soils

Natural soil series within the Rosewood Park study area have been destroyed for the most part. Areas of natural soils are currently present in and along the ravines, on the upland edge and down the bluffs, and along the sandy beaches fed by littoral currents. Natural soil series may be undisturbed in some of the parkland areas.

Beach Sands – Beach sediments along the Illinois coast consist of mixed sand, sandy gravel, and gravel. The primary source for beach sediments is erosion of the coastal bluffs.

Ozaukee – These soils are typically found on ground moraines, in this case the Highland Park moraine. Slopes on the plateaus range from 2 to 6% and in the ravines from 20 to 35%. These soils formed in thin loess and in the underlying loamy dense till. These soils are moderate to well drained and the potential for surface runoff ranges from medium to very high. Permeability is slow. Soils have a perched seasonal high water table at a depth of 1.5 to 3.5 feet for 1 month or more per year in 6 or more out of 10 years. Native vegetation is mixed hardwood forest of northern red oak, American basswood, white ash, and sugar maple. This is the predominant soil series type in the Rosewood Park study area.

2.2.4 – Fluvial Geomorphology & Topography

The Rosewood Park ravine developed as a result of the unique geology of the Highland Park moraine intersecting with the coastline of Lake Michigan. This abrupt intersection formed a bluff as Lake Michigan's waves eroded the front face of the moraine. Rainwater falling on the moraine flowed east over this bluff and gradually carved out the present ravine. Local relief is about 157 feet; a maximum elevation of 725 feet is reached along the crest of the Highland moraine, with the lowest elevation of 568 feet at the bottoms of the ravines and the Lake Michigan interface.

As the ravine continued to deepen and widen overtime, the depth of the stream bed toward the mouth of the ravine began to level off to the level of Lake Michigan. As the slope of the channel flattened out, the speed of water flowing through it slowed. The rate of channel incision and bank slumping declined, but even in mature ravines this process never stops completely; an equilibrium is maintained from sediment/detritus influx equal to the amount discharged. The head of the ravine continues to extend landward until it runs into non-erosive materials or loses its erosive power. Once stable, a diverse ravine specific plant community can then establish, replacing the pioneer species. Roots help to further stabilize ravine slopes by decreasing surface erosion and absorbing ground water. As the ravine further matures and widens, the rate of slumping declines, furthering the abundance of plants and trees. This positive feedback cycle eventually results in a mature ravine capable of supporting a diverse community of fungi, plants, and animals.

2.2.5 – Littoral Processes

The dominant influence by northerly waves results in a net southward littoral transport along the entire Illinois coast. Waves from the southeast can influence a northward movement of beach and nearshore sediment; however, the stronger northerly waves counteract this influence and produce a net southerly transport. The Illinois coast was formerly a single, continuous pathway for the southward transport of littoral sediment. This was part of a large-scale littoral transport cell that originated in Wisconsin at least as far north as Sheboygan and terminated in eastern Indiana along the Indiana Dunes (Chrzastowski et al 1994). Through time, the Illinois coast has experienced considerable reduction in the volume of littoral sediment in transport. Construction of perpendicular structures such as jetties, piers, and small boat harbors formed total or near-total barriers to littoral transport, resulting in the segmentation of a continuous littoral cell into a series of cells. Coastal engineering, particularly in the vicinity of Chicago Harbor, has completely isolated the southern Chicago lakeshore from any littoral sediment supply from the south.

Long-term reduction in the volume of littoral sediment transport has occurred along the bluff coast. In the 1950s, the USACE computed a maximum littoral transport rate along the bluff coast of 57,000-cyd/year (USACE 1953). Dredge records for sand captured at Wilmette Harbor near the south down drift end of the bluff coast suggest that the present-day bluff coast littoral transport is one third or less of what it was in the early 1950s. Only along the southern part of Illinois Beach State Park are present-day littoral transport volumes of about 80,000-cyd/year at or near what likely occurred in the natural setting. This volume of littoral transport is dependent on a sediment supply from erosion along the northern part of the state park shore as well as beach nourishment supplied to the state park shore.

The similarity between the orientation of the Highland Park moraine and that of the bluff coast attests to the youthfulness of this coastline. This coast is in the early stages of being modified by wave processes to reach equilibrium with regional wave dynamics and littoral sediment supply. If no anthropogenic influences were to interfere with the coastal erosion processes, and historical lake levels were maintained, in a thousand years the bluff coast at Rosewood Park would erode landward to an equilibrium position (Rovey & Borucki 1994). During this process, rates of erosion would decrease with time. The final equilibrium position would have been several hundred to several thousand feet landward of the present position.

2.2.6 – Hydrology & Hydraulics

The study area, located within the southwestern Lake Michigan watershed, was primarily covered by upland forests and shrub pine prior to European settlement. As settlers came into the area, they never considered the area advantageous for farming due to the deep ravines, heavy forests, and shoreline location. Beginning in the mid-1800's, settlements began to appear in the area. The area was scarred as brick making stripped the bluffs of its clay deposits and the forests were cleared from extensive logging operations.

Based on data from the USEPA, this project's study area is classified as the Pike-Root watershed, which covers over 410 square miles, stretching from south of Milwaukee to south of Chicago, and includes over 113 miles of Lake Michigan shoreline on the west side of Lake Michigan. In the project vicinity, the watershed extends approximately 0.95 miles inland from the lake. The prominent geological feature of the area is the ravine and bluff system at the interface between the tablelands and lake. The Rosewood Ravine encompasses approximately 64 acres of this watershed or 0.1 square miles.

Originally formed by the erosive forces of storm water interacting with the bluffs, the ravine within the project area is the natural pathway by which tributary stormwater runoff reaches Lake Michigan. It should be recognized that many of the ravines are still in the process of forming and as a result are naturally unstable. The alterations to the hydrologic system due to urbanization; however, have resulted in accelerated erosion and degradation of the ravine system. As a result of the development, the overall volume and peak discharges of storm water runoff have increased due to an increase in impervious surface and the introduction of storm sewer networks, respectively. The increased volume and velocity of the discharge has resulted in the ravine floor incising and the slopes sloughing into the ravine.

2.3 - Biological Resources

The following is a description of the ecotypes that occur within the study area of this project. Dominant vegetation and organisms that inhabit the particular ecotype will be presented to paint a picture that is in context with the restoration alternatives investigated under the purview of this ecosystem restoration study.

2.3.1 – Plant Communities

Ravine – The evolution of the study area's ravines has shaped a unique environment with impressive flora. A multitude of factors contribute to the high diversity of plant species found within the ravine of which include the underlying glacial substrate, close proximity to Lake Michigan, varying slope inclinations and natural instabilities, and presence of groundwater seeps.

The wide range of niches provided by the ravine supports a suite of interesting plant species including graminoids such as long-stalked hummock sedge (*Carex pedunculata*), poverty oat grass (*Danthonia spicata*), and silky wild rye (*Elymus villosus*) and forbs such as wood sandwort (*Moehringia lateriflora*), big leaved aster (*Aster macrophyllus*), white baneberry (*Actaea pachypoda*), yellow pimpernel (*Taenidia integerrima*), turk's cap lily (*Lilium michiganense*), broad-leaved goldenrod (*Solidago flexicaulis*), and spikenard (*Aralia racemosa*). However, high quality areas harboring these conservative species have been significantly reduced because of increased storm water runoff, fire suppression, and exacerbated rates of soil erosion which has caused an increase in bare ground and invasive species establishment – areas are becoming dominated by common buckthorn (*Rhamnus cathartica*), exotic honeysuckles (*Lonicera* spp.),

garlic mustard (*Alliaria petiolata*), black locust (*Robinia pseudoacacia*), and Japanese barberry (*Berberis thunbergii*).

A diverse canopy of trees and shrubs exists within the ravines, allowing various amounts of sunlight over different slope inclinations to reach the ravine's understory. Red oak (*Quercus rubra*), white oak (*Quercus alba*), sugar maple (*Acer saccharum*), blue beech (*Carpinus caroliniana virginiana*) and hop hornbeam (*Ostrya virginiana*) make up the majority of trees, while a diverse shrub strata consists of witch hazel (*Hamamelis virginiana*), alternate-leaved dogwood (*Cornus alternifolia*), round-leaved dogwood (*Cornus rugosa*), and maple-leaved arrow wood (*Viburnum acerifolium*). The ravine's understory, dependant on an open canopy of trees, has suffered from an increasing amount of shade as invasive and opportunistic woody species have become more dominant such as common buckthorn (*Rhamnus cathartica*), glossy buckthorn (*Frangula alnus*), black locust (*Robinia pseudoacacia*), Norway maple (*Acer platanoides*), white mulberry (*Morus alba*), green ash (*Fraxinus lanceolata*), cottonwood (*Populus deltoides*), and basswood (*Tilia americana*).

The ravines are also known for their abundance of spring ephemerals including sharp-leaved hepatica (*Hepatica acutiloba*), early meadow rue (*Thalictrum dioicum*), large-flowered trillium (*Trillium grandiflorum*), red trillium (*Trillium recurvatum*), bellwort (*Uvularia grandiflora*), bloodroot (*Sanguinaria canadensis*), and jack-in-the-pulpit (*Arisaema triphyllum*). Soil erosion, fire suppression, and an increase in invasive species have also significantly impacted populations of spring ephemerals.

Bluff – The unique climate and erosive-prone clay bluff within the study area welcomes an interesting suite of native plants that have evolved to withstand its harsh conditions. The wooded areas on the bluff inhabit species such as eastern white cedar (*Thuja occidentalis*), red oak (*Quercus rubra*), hop hornbeam (*Ostrya virginiana*), common juniper (*Juniperus communis*), golden alexanders (*Zizia aurea*), white baneberry (*Actaea pachypoda*), pale-leaved sunflower (*Helianthus strumosus*), smooth blue aster (*Aster laevis*), wild sarsaparilla (Aralia nudicauli), and common oak sedge (*Carex pensylvanica*).

Just as the ravines have become heavily shaded, the bluffs too have degraded from fire suppression, in turn degrading the rich herbaceous understory which has increased rates of soil erosion. Invasive species such as black locust (*Robinia pseudoacacia),* common buckthorn (*Rhamnus cathartica*), Japanese barberry (*Berberis thunbergii*), and dame's rocket (*Hesperis matronalis*) have established on the bluffs and along with increased rates of soil erosion have decimated remnant bluff communities.

Beach – Much of the study area has little space between the shore of Lake Michigan and the bluff's toe, but in places where enough sand accumulates, small formations of beach communities can be found. Where the beach is disturbed by winter waves and less so by waves of summer, a collection of annual plants begin colonizing the area including winged pigweed (*Cycloloma atriplicifolium*), sand grass (*Triplasis purpurea*), and the state listed seaside spurge (*Chamaesyce polygonifolia*) and sea rocket (*Cakile edentula*). More stable areas further inland,

but still within active moving sand are stands of state listed, dune-forming marram grass (*Ammophila breviligulata*). Since the study area currently contains narrow strips of beach impacted by heavy foot traffic and invasive species such as lyme grass (*Elymus arenarius*), sweet clover (*Melilotus* spp.), and crown vetch (*Securigera varia*) -- less conservative plants are found growing elsewhere on the beach, among them being common milkweed (*Asclepias syriaca*), common evening primrose (*Oenothera biennis*), early goldenrod (*Solidago juncea*), riverbank grape (*Vitis riparia*) and a multitude of non-native species.

2.3.2 – Aquatic Communities

Deep Water – There are no measures presented within this study that directly address repairing communities that exist in the deep waters of Lake Michigan; however, species that occur in the deep waters are presented to put the project into a greater context. Some of the species that primarily are found in the abyssal plains and natural reefs of Lake Michigan do utilize littoral zones as well, such as the lake chub (*Couseuis plumbeus*) and the state endangered longnose sucker (*Catostomus catostomus*).

Fish data collected and specimens vouched at the Illinois Natural History Survey are presented in Table 1. Deep water specimens were collected from both Julian's and the Highland Park reefs. Julian's Reef is 14 miles northeast of Rosewood Park and the Highland Park reef is 3 miles northeast. Julian's Reef substrates include primarily bedrock with rubble, sand and small amounts of silt (Horns 1991), whereas the Highland Park reef consists of bedrock and cobble with its interstitial spaces filled in with sand and silt (Chotkowski & Mardsen 1995). The remaining deep water areas off the coast of Rosewood Park are primarily sand flats.

Littoral Zone – There are measures presented within this study that directly address providing additional structure to increase fish species richness and abundance within the littoral zone of Lake Michigan. Currently, habitat consists of extensive sand flats and minor non-conformities provided by small manmade groins. Species expected to be present within the study area are presented in Table 1. The most common species found along the surf zones of the beaches are the longnose dace (*Rhinichthys cataractae*), emerald shiner (*Notropis atherinoides*) and spottail shiner (*Notropis hudsonius*).

The ravine and outfall were sampled by the PDHP and USACE on the 14 July 2011. No fish species were collected within the ravine, but this was most likely due to the intermittency of the stream. Flow was non-existent and water was restricted to pools. At the outfall of the ravine (downstream of box culvert), two non-native rainbow trout (*Oncorhynchus mykiss*) were collected from the plunge pool.

Table 1. Fishes collected off the coast of Highland Park 1951 - 2004.

Species	Common name	Deep Water	Littoral Zone	Ravine Use**
*Petromyzon marinus**	sea lamprey	X		
*Alosa pseudoharengus**	alewife		X	
*Cyprinus carpio**	common carp		X	
Couesius plumbeus	lake chub	X	X	X
Rhinichthys cataractae	longnose dace		X	X
Pimephales notatus	bluntnose minnow		X	X
Notropis atherinoides	emerald shiner		X	X
Notropis hudsonius	spottail shiner		X	X
Catostomus catostomus	longnose sucker	X	X	X
*Osmerus mordax**	rainbow smelt		X	
*Salmo trutta**	European brown trout	X	X	
Salvelinus namaycush	lake trout	X	X	
Coregonus artedi	lake cisco	X		
Coregonus hoyi	bloater cisco	X		
Lota lota	burbot	X		
Myoxocephalus thompsonii	deepwater sculpin	X		

* non-native species

2.3.2 – Macroinvertebrates

Within the littoral zone of Lake Michigan resides a diverse community of aquatic macroinvertebrates. Depending on the quality of the water, the community may be very diverse with desirable invertebrates from orders such as ephemeroptera and plecoptera comprising the majority of the population; or the community may have an abundance of undesirable species such as those in the order Diptera that are more representative of a degraded site. Although no macroinvertebrate data has been collected within the project footprint, the site is characteristic of other moderately disturbed areas on the edge of Lake Michigan that have been sampled by the Illinois Riverwatch Stream Monitoring Program and verified by the Illinois Natural History Survey.

Millard Park is located approximately two miles north of Rosewood Park and has similar site characteristics. The macroinvertebrate community was sampled at this location in November 2010 (Table 2) and was considered “good” with a Macroinvertebrate Index (MBI) score of 4.47. However, despite this good rating, Ephemeroptera-Plecoptera-Trichoptera (EPT) taxa richness was considered “poor” and the Total Taxa Richness was only deemed “fair”.

Table 2. Macroinvertebrates collected from Millard Park in November 2010 by the Illinois Riverwatch Stream Monitoring Program.

Organism	Number
Dragonfly	1
Broadwinged Damselfly	5
Swimming Mayfly	70
Caddisfly	2
Riffle Beetle	1
Crane Fly	2
Midge	4
Black Fly	16
Left-Handed Snail	2
Total	103
Taxa Sum	9

Terrestrial macroinvertebrates have not been sampled within the project footprint or at a nearby similar site; however, the Illinois Natural Heritage Database was checked for the presence of threatened or endangered species. No terrestrial macroinvertebrates of concern were found occupying the area within the database.

2.3.4 – Herpetofauna Community

The upland forest, with its undulating ravine edges, contains a wide variety of terrestrial wildlife habitat. In and along the ravines, several species of non-poisonous reptiles may exist such as the eastern yellow-bellied racer (*Coluber constrictor flaviventris*), northern water snake (*Nerodia sipedon sipedon*), eastern garter snake (*Thamnophis sirtalis sirtalis*), eastern hog-nosed snake (*Heterodon platirhinos*), western painted turtle (*Chrysemys picta bellii*), western chorus frog (*Pseudacris triseriata triseriata*), eastern gray treefrog (*Hyla versicolor*), and eastern American toad (*Bufo americanus americanus*).

2.3.5 – Avian Community

The City of Highland Park resides within a band of important state natural areas and parks that span Lake County, Illinois. These natural areas serve as crucial foraging and breeding grounds along the Lake Michigan flyway, which is an important migration route for many songbirds. The flyway provides a visual north-south sight line, the coast of Lake Michigan, which the birds have evolved to follow as they undergo migration. During the migration periods, March to May and September to mid-October, more than five million song birds are believed to traverse this flyway.

A total of sixty species of birds were recorded at Rosewood Park during the 2010 Lakefront bird survey conducted by the Park District of Highland Park (Appendix B). Of these species, the golden-winged warbler (*Vermivora chrysoptera*), red-headed woodpecker (*Melanerpes*

erythrocephalus), and wood thrush (*Hylocichla mustelina*) are listed as species of concern by the National Audubon Society; the common tern is listed as a common declining bird by the National Audubon Society; and the common tern (*Sterna hirundo*) and Forster's tern (*Sterna forsteri*), are listed as endangered in Illinois.

2.3.6 – Mammalian Community

The City of Highland Park provides suitable habitat for common "urban" wildlife species, including whitetail deer (*Odocoileus virginianus*), coyote (*Canis latrans*), raccoon (*Procyon lotor*), possum (*Didelphis marsupialis*), thirteen-lined ground squirrel (*Citellus tridecemlineatus*), gray squirrel (*Sciurus carolinensis*), cottontail rabbit (*Sylvilagus floridanus*), and striped skunk (*Mephitis mephitis*).

2.3.7 – Threatened & Endangered Species

The study area is suburban residential. It contains no habitat likely to be used by Federally threatened or endangered species with the possible exception of migratory avian species. Two species that could possibly occur in the area are the endangered Piping plover (*Charadrius melodus*) and the threatened Pitcher's thistle (*Cirsium pitcheri*). There are no records for these species occurring within or near the project footprint. The critical habitat for the piping plover is wide, open, sandy beaches with very little grass or other vegetation, in which this habitat does not occur within the project footprint, or is the area designated as critical habitat by the USFWS. The critical habitat for the Pitcher's thistle is lakeshore dunes, which do not occur at the project site as well.

State listed species that occur on or near the site include the state endangered common tern (*Sterna hirundo*), Forster's tern (*Sterna forsteri*), marram grass (*Ammophila breviligulata*), false bugbane (*Cimicifuga racemosa*), downy false Solomon's seal (*Polygonatum pubescens*); and the state threatened ground juniper (*Juniperus communis*), and sea rocket (*Cakile edentula*).

Coordination with the U.S. Fish and Wildlife Service (USFWS) and the Illinois Department of Natural Resources (ILDNR) was commenced on 20 July 2010 with a project scoping letter. Upon review of this document, the USFWS concluded that the project is not likely to adversely affect federal or state listed species, and their letter dated 30 August 2010 (Appendix G), precluded the need for further consultation on the Rosewood Park restoration project as required under Section 7 of the Endangered Species Act of 1973, as amended. In a letter dated 29 July 2010 (Appendix G), the ILDNR noted that records of the above state listed plant species were within half a mile of the project site; however, there are no records of these species occurring at the project site. The ILDNR stated that it does not anticipate any adverse impacts to the listed species or sensitive aquatic habitats with the implementation of the proposed project. The intent of the Preferred Plan is to aid in the overall restoration of the Lake Michigan coastal ecosystem.

2.3.8 – Natural Areas

Highland Park is located within the Illinois Beach Resource Rich Area (RRA). This is one of the most ecologically rich and unique areas in Illinois. The predominant landcover in the Illinois Beach RRA is urban/built-up (63%) which makes natural areas located in this area an oasis for migratory birds as well as other wildlife. Twenty-one significant community types occur here, several of which are primary communities – foredunes, beaches, and bluffs – specific to this part of the state. Nearby natural areas included in the Illinois Beach RRA are Ravinia Bluff and Fort Sheridan Bluff.

2.4 - Cultural & Archaeological Resources

2.4.1 – Land Use History

The Highland Park area was settled primarily by people from Ohio and New York State in the early 1840s. The area that now comprises Highland Park was originally two settlements, Port Clinton and St. Johns. The area remained a farming and lake port based community until 1855 when the Chicago and Milwaukee railroad was constructed through the area. The two settlements merged and were incorporated as Highland Park in 1869. The town became a popular area for summer homes with the Chicago elite. Today it remains an upscale bedroom community for Chicago.

2.4.2 – Archaeological & Historic Properties

There are 43 properties and four historic districts listed on the National Register of Historic Places located within Highland Park. Of these, only 8 properties are in the general study area. These are the Florsheim House at 650 Sheridan Road (listed in 1982),Halcyon Hall at 344 Ravine Dr. (listed in 1982) the Jens Jenson House and Studio and the Jens Jenson Summer House Historic District, both at 930-940 Dean (both listed in 1991), Loeb House at 1425 Waverly (listed in 1983), the Mandel House and Coach House at 1237 & 1249 Sheridan Road (listed in 1982), the Pick House at 970 Sheridan Road (listed in 1982), the North Shore Sanitary District Tower on Cary Avenue (listed in 1983), and Rosewood Park on Roger Williams Avenue (listed in 1982). The study area consists of a public utility easement located adjacent to Lake Michigan. The study area has been disturbed by filling, grading, and construction. It contains no intact archaeological material.

Coordination with SHPO was commenced on 20 July 2010 with a project scoping letter. An initial response letter was received from SHPO regarding the project on 3 August 2010 (Appendix G). Further coordination will continue during the 30-day public review and during subsequent phases of the project.

2.4.3 – Social Setting

Highland Park is a primarily white upper middle-class community of about 31,300 inhabitants in an area of approximately 12.5 square miles. In 2006 the median home value was $458,500 and the median household income was $137,700.

2.4.4 – Recreation

The Park District of Highland Park, founded in 1909, operates and manages over 650 acres of land in 44 park areas, and offers approximately 3,000 recreation and seasonal programs. Facilities include an indoor ice arena, tennis and racquetball complex, two recreation centers, a nature center, an 18-hole golf course, driving range, adventure golf, aqua park, indoor pool, beaches, boat launch ramp and a yacht club on Lake Michigan.

2.5 - Hazardous, Toxic, Radioactive Wastes (HTRW)

In order to generate an HTRW report for the Rosewood Park, Highland Park, Illinois Project, three methods were employed:

- Database Review: Review of a database search provided by Environmental Data Resources (EDR) identified no sites on or adjacent to the project. Sites identified within a search radius of the project are not anticipated to interfere with the proposed construction activities for the reasons discussed in detail in Appendix D, such as their location from the project, or inactive or active in good standing status.
- Review of Existing Information: Existing information on this project reviewed grain size analysis, asbestos analysis, and historical maps. Grain size samples revealed few fine sand particles. The asbestos analysis found no asbestos fibers in any of the samples. Historical maps revealed the construction and installation of steel groins.
- Site Visit: A site visit revealed no additional HTRW concerns at the project site. Damaged concrete blocks and a large box culvert were observed along the ravine. Low sand levels, large stones, and steel groins were visible on the lower level of Rosewood Park. No debris was found on or adjacent to the project site.

No HTRW investigation can wholly eliminate uncertainty regarding the potential for HTRW associated with a project area. Performance of the HTRW investigation is intended to reduce, but not eliminate, uncertainty regarding the potential for HTRW in connection with a project area. As a result of this HTRW analysis, USACE has concluded that there is sufficient information to demonstrate that the work proposed for the Rosewood Park, Highland Park, IL site has little potential for encountering HTRW or non-HTRW contamination. For the full HTRW report please refer to Appendix D.

2.6 - Habitat Assessment Methodology

Many methods are available to measure ecosystem function and structure and to predict future conditions of those resources based on differing scenarios. Habitat models developed for individual species may have limitations when used to assess ecosystem restoration problems and restoration objectives. They do not consider communities of organisms and typically consider habitat in isolation from its ecosystem context. The assessment methodology chosen for this study is community based and meets the needs of the study goals, objectives, and level of detail. The assessment methodology, or Habitat Suitability Index (HSI), focuses on native species richness and function of plant and fish communities. This HSI was developed to assess the ecological value of the proposed future without-project condition and any proposed management measures for the Rosewood Park restoration project. This index is based on how native species of plants and fish will respond to a given condition and will be quantified through use of the native fish species richness, qualitative habitat evaluation index, and floristic quality assessment. There was no weighting per community type since each part of the coastal ecosystem is just as important as the other.

2.6.1 – Fish Species Richness & Abundance

This portion of the assessment uses fish species richness (R), which is the total number of native fish species. An assessment was done utilizing the Fishes of the Chicago Region database, which is primarily comprised of fish collection vouchers stowed at the Field Museum of Natural History and the Illinois Natural History Survey from 1895 – 2004. One hundred and fifty six (156) fish collections were queried from the whole coast line of Lake County, IL and from two small streams just north of the study in Kenosha County, WI (Table 3).

Table 3. Projected Fish Species Richness for Ravine and Lacustrine Habitat Restoration.

Species	Ravine R	Lacustrine R		Species	Ravine R	Lacustrine R
Acipenser fulvescens		1		*Luxilus cornutus*	1	
Ambloplites rupestris	1	1		*Micropterus dolomieu*	1	1
Ameiurus melas	1			*Micropterus salmoides*	1	1
Ameiurus natalis	1			*Moxostoma erythrurum*	1	
Ameiurus nebulosus				*Moxostoma anisurum*		1
Anguilla rostrata				*Moxostoma macrolepidotum*		1
Catostomus catostomus	1	1		*Myoxocephalus thompsonii*		1
Catostomus commersonii	1	1		*Notemigonus crysoleucas*	1	
Coregonus artedi		1		*Notropis atherinoides*	1	1
Coregonus clupeaformis		1		*Notropis dorsalis*	1	
Coregonus hoyi		1		*Notropis heterodon*		
Cottus bairdii	1	1		*Notropis heterolepis*		
Cottus cognatus		1		*Notropis hudsonius*	1	1
Couesius plumbeus	1	1		*Notropis stramineus*	1	1
Culaea inconstans	1	1		*Noturus gyrinus*		
Dorosoma cepedianum		1		*Perca flavescens*		1
Erimyzon sucetta				*Percopsis omiscomaycus*		1
Esox americanus	1			*Phoxinus erythrogaster*		
Esox lucius		1		*Pimephales notatus*	1	1
Etheostoma exile				*Pimephales promelas*	1	1
Etheostoma microperca				*Pomoxis annularis*		1
Etheostoma nigrum	1			*Prosopium cylindraceum*		1
Fundulus diaphanus	1	1		*Pungitius pungitius*	1	1
Gasterosteus aculeatus	1	1		*Rhinichthys cataractae*	1	1
Lepomis cyanellus	1	1		*Rhinichthys obtusus*	1	
Lepomis gibbosus	1	1		*Salvelinus namaycush*		1
Lepomis macrochirus	1	1		*Semotilus atromaculatus*	1	
Lota lota	1	1		*Umbra limi*	1	
				Total Species Richness, R	**32**	**36**

It was determined from these historic collections that about 32 native species have in the past utilized ravine stream habitat and about 36 native species could potentially use restored lacustrine habitat. Several species were listed but not counted, such as blacknose shiner, since the chance of recolonization is unlikely.

2.6.2 – Qualitative Habitat Evaluation Index (QHEI)

The QHEI developed by the Ohio Environmental Protection Agency was employed to assess the physical ravine stream habitat quality of Rosewood Park. The site was assessed from a river right descending perspective. The QHEI consists of eight sections with a maximum total of 100 points:

- Characterization of substrate types and the effects of siltation
- Characterization of in-stream cover
- Characterization of channel morphology
- Characterization of the riparian zone and bank erosion
- Assessment of the pool / glide & riffle / run
- Gradient
- Shade

- Channel incision

2.6.3 – Floristic Quality Assessment (FQA)

The determination of "quality" with respect to plant assemblages has been the subject of much research and development since the mid 1970's. Quality, as used in this study, is essentially an assessment of the degree to which native plant species are present within defined plant communities. Plants are exceptional indicators of short and long term disturbance in terms of habitat function and structure. Out of the approximate 2,500 plant species known to occur in the Chicago Region, around one-third was not present before European colonization. Non-native species did not evolve within the same environmental conditions as the native species, and their persistence indicates a certain degree of functional disablement. Numerically describing the quality of an area using vegetation reflects the level of disturbance to the biological integrity of the site. In the Chicago Region, there is one commonly used approach that attempts to describe plant community quality with a simple numerical metric, which is the FQA (Swink and Wilhelm, 1979). This assessment tool was designed to be used as an all inclusive method, not just as a way to identify high quality sites. The FQA was originally developed for the Chicago Region, but has since been developed for regions and states throughout North America. This method has been extensively studied and shows great promise as a quick and easily understood method of assessing the quality of plant communities.

Based on species inventory, the FQA generates two essential metrics: the Mean C, which is the average coefficient of conservatism for a site, and the Floristic Quality Index (FQI), which is derived by multiplying Mean C by the square root of the number of native species inventoried,

$$FQI = \overline{C}\sqrt{N}$$

where C is the coefficient of conservatism and N is the species richness. The FQI, therefore, is a function of both conservatism (function) and species richness (structure). Typically, larger sites have a greater number of habitat types and likely will have greater species richness. Generally, both mean C and FQI values are considered in the evaluation of an area or landscape unit. Based on statistical analysis of previous studies, the FQI shows a significant positive relationship to species richness (Ervin et al., 2006) and as such the Mean C value represents the more comparable and accurate metric.

The FQA method assesses the sensitivity of individual plant species that inhabit an area and specifically excludes the use of "indicator" species. The concept of species "conservatism" refers to the fundamental character of native plant species to display varying degrees of tolerance to disturbance, as well as varying degrees of fidelity to specific habitat types. The theory is based on the extent to which the habitat is healthy and the extent to which it is inhabited by conservative species. As a result, each native species has been assigned a coefficient of conservatism (C), ranging from 0 to 10. Coefficient of conservatism values are assigned to species within a predefined geographic area by Swink and Wilhelm (1979). A 0 is

assigned to species that are highly tolerant to disturbance and are considered general in their habitat distribution and a 10 is assigned to species with a very low tolerance to disturbance and displays a very specific relationship to a certain habitat type. The following descriptions of categories were used to assign coefficients of conservatism to native plant species:

- 0-3 Wide range of ecological tolerance and found in a variety of conditions
- 4-6 Mid range of ecological tolerance and a smaller variety of conditions
- 7-8 Low range of ecological tolerance and associated with advanced successional state
- 9-10 Very low range of ecological tolerance and niche specific

It has been demonstrated that sites with Mean C and FQI values less than 2.8 and 20 respectively, as surveyed during the growing season, are degraded or derelict plant communities. Sites with Mean C values that approach 3.2 are considered to be moderately disturbed, but have potential for habitat restoration and recovery, at least to some degree. Such areas usually have a more diverse component of conservative species than ever could be recreated in a de novo effort. When site inventories yield Mean C values greater than 3.4 or higher, one can be confident that there is sufficient native character present for the area to be at least regionally noteworthy—such landscapes are essentially irreplaceable in terms of their unique composition of remnant biodiversity. Sites with Mean C and FQI values greater than 4.0 and 50, respectively, are rare and indicate highly significant natural areas of statewide importance.

With an active land management plan and time, the mean C and FQI values will reflect the extent to which conservative species are being recruited and the floristic quality is improving. In this way, the FQA method can be used to assess restoration management decisions, as well as to document floristic changes (positive or negative) in the landscape over time.

2.6.4 – Habitat Suitability Index

Habitat outputs for the future without and future with project conditions were estimated over the entire 50 year period of analysis. In order to restore the ecosystem within the project site, both ecosystem function and structure were addressed through the three methods described above. These predicted benefits are resultant of the measures described in Section 3.1. The following were used for the HSI:

- Stream Restoration (Options 1-3) HSI = (R_R/3.2 + QHEI/10)/2
- Lacustrine Restoration (Option 1-3) HSI = (R_L/3.6)
- Beach & Dune Restoration HSI = Mean C
- Dune HSI = Mean C
- Bluff HSI = Mean C
- Ravine HSI = Mean C
- Savanna HSI = Mean C

where R_L = lacustrine species richness, R_R = ravine species richness, and mean C = coefficient of native plant conservatism. Total habitat outputs, in terms of habitat units (HUs) were calculated by multiplying the affected area times the habitat suitability index:

$$HUs = A(HSI)$$

where A is the affected habitat area expressed in acres.

2.7 - Future Without-Project Conditions

The future without project condition, in general, is expected to further decline for lacustrine, beach & dune, bluff, ravine, and savanna habitat within the Rosewood Park study area (Table 4). The PDHP would likely continue small vegetation management and plantings; however, the ability to remedy the coastal and ravine hydraulics and extensive invasive species issues is unlikely.

The lake, beach, and dune habitat will continue to suffer the effects caused by recreation, residential and industrial development which has had a major influence on the physical structure of coastal habitat and the littoral processes that created and sustained these habitats. This has allowed invasive non-native species to colonize these altered areas that are no longer suitable for native species life requisites. The non-Federal sponsor does not have the ability to provide features that would naturalize the littoral drift once again by trapping sand that is currently being sequestered by manmade structures up-drift. Habitat structure and function along the coast will remain unstable, preventing many floral and faunal species from utilizing the area and providing conditions for weedy and invasive species to remain dominant and increase in abundance as time progresses. The reliance on ineffective groins will prevent ecological rebound, in which case, would cause further degradation to ecologically significant patches within the study area. Overall, biological diversity would remain low within the lake and dunes because of the lack of sand trapping ability, lack of physical habitat structure, and the instability of the littoral drift.

The bluff along the entire Rosewood Park coast is in need of a holistic invasive species removal and native plant reestablishment. Without a Federal project, this needed activity cannot be accomplished effectively across the two mile stretch. Small patches are being restored by the PDHP, but their ability to perform a wholesale bluff restoration is not possible due to funding constraints and work force ability. The continuation of allowing large patches of invasive species to be present would prevent ecological rebound and in some cases would cause further degradation in ecologically significant patches along the bluff within the study area. Overall, biological diversity would remain low along the bluffs because of the lack of habitat complexity and stability that native plants would provide.

The ravine will remain fragmented from the lake and greatly affected by excessive and unnatural urban runoff. Habitat diversity in the ravine will remain low, preventing many floral

and faunal species from utilizing the area and providing conditions for weedy and invasive species to remain dominant and increase in abundance as time progresses. The continuation of maintaining the ravine as a drainage conduit will prevent ecological rebound, in which case, would cause further degradation in ecologically significant patches within the study area. Overall, biological diversity would remain low within the ravine because of the lack of channel complexity and stability, which is caused by impaired hydraulic function and the presence of manmade structures.

Table 4. Future-without project conditions per habitat type.

Code	Description	QHEI	R	Mean C	HSI'	AAHSI	Acres	AAHUs
SR	Stream	43	6		3.1	4.7	0.3	0.8
L	Lacustrine		11		3.1	1.3	0.5	1.5
BD	Beach & Dune			1.5	1.5	1.4	1.1	1.4
BF	Bluff			2.5	2.5	0.3	1.7	3.9
RV	Ravine			3.7	3.7	0.8	2.3	8.1
SV	Savanna			2	2	2.2	1.8	3.2

2.8 Problems & Opportunities

Many reports and studies have described the existing problems of the Great Lakes in terms of ecological disruption. These included descriptions of historic and current conditions that may be used as guidelines for problem identification and restoration techniques. Also, there is concern by state agencies and environmental groups that past and continued uses of the Great Lakes will lead to continued water quality problems, as well as significant losses in both globally rare habitats and biological diversity.

The primary loss of natural habitat within the Great Lakes, and Lake Michigan in particular, is attributed to converting natural coastlines and tributaries from beach, ridge, marsh, savanna and prairie into industrial, urban, and recreational lands. Most of the habitat destruction and decline has resulted directly from channelization, dredging, damming, loss of bankside vegetation, sedimentation, eutrophication, increased spring flooding, exaggerated summer low flows, toxic contamination, and armoring shorelines.

Natural coastal topography has been altered, and as in most modifications to systems this large, the effects are difficult to repair in terms of ecological function. In terms of natural landscape restoration, however, goals are quite achievable. The following are resource problems that have been identified to exist at Rosewood Park Coastal:

- Erosional conditions caused by improperly placed infrastructure
- Instability of coastal communities (ravine, bluff, dune, beach, lake) caused by:
- Infestation of invasive woody and herbaceous species
- Manmade structures
- Stormwater runoff and sediment loading

- Fragmentation of ravine from Lake Michigan

This project affords the opportunity not only to address issues associated with the above-stated problems, but it also continues the movement to establish coastal refuges within the southwestern Lake Michigan basin. This project can provide a vital piece to the large-scale Great Lakes restoration area by providing a significant quantity of valuable habitat for a multitude of locally rare species, aquatic species, and migratory and resident bird species.

The following are specific opportunities that this potential project affords:

- Reduce fragmentation of habitats by eradicating non-native and invasive vegetation
- Increase the natural habitat mosaic through the planting of successive plant communities
- Improve site hydraulics with the removal of manmade structures
- Restore lacustrine processes with the removal of manmade structures and the creation of naturalistic wavebreaks
- Increase refuge within the western Lake Michigan basin for aquatic species and wildlife
- Increase high quality refuge and feeding habitat for migratory birds
- Provide a vital piece to the large-scale Great Lakes restoration area

2.9 Goals, Objectives & Constraints

The primary goal of this Feasibility Study is to determine a cost effective restoration plan, whether it be the No Action Plan or a plan with recommended restoration activities. Since the site is rather diverse in geomorphic features, the plan must account for how the system functions as a whole.

Project Goal

The goal of this proposed project is to stabilize coastal communities, including ravine, restore historical native plant communities along Lake Michigan, and restore fish habitat at Rosewood Park.

Federal and Non-Federal Objectives

The Federal (USACE) and non-Federal sponsors' goals and objectives for water resources implementation studies establish the overall goals for this study. The specific objectives were derived from the identification of the study problems and opportunities and are discussed in the subsequent sections.

The USACE also has a national objective for ecosystem restoration in response to legislation and administration policy. This objective is to contribute to the nation's ecosystems or National Ecosystem Restoration (NER) by restoring degraded ecosystem structure, function, and

dynamic processes to a less degraded, more natural condition. Contributions to NER are increases in ecosystem value and productivity and are measured in non-monetary units such as acres of linear feet of habitat, function, average annual habitat units, or increased species number or diversity.

The non-Federal sponsor has ecosystem restoration objectives that partner well with the NER objectives stated above. Their general goals for ecosystem restoration are to restore and increase aquatic and terrestrial habitats, to improve ecological functions within the site, and to support sustainable populations of diverse and valuable plant and animal species. Specifically, this study aims to protect, enhance, naturalize, and restore coastal ecosystems.

Ecosystem Objectives

- Eliminate infrastructure from the beach and daylight ravine outfall culvert to reduce erosional influence and promote healthy littoral processes
- Stabilize bluff, ravine, dune, and beach communities to reduce erosion and sedimentation into Lake Michigan
- Remove non-native/invasive species which are degrading native plant communities
- Improve habitat for endangered/threatened coastal species
- Restore fish habitat

Constraints

Planning constraints are items of consideration that limit the planning process and are used along with the objectives in the formulation and evaluation of solutions. The establishment of planning constraints is done in concert with the entire study team and in cooperation with stakeholders. A list of planning constraints follows.

Opportunities are limited by:

- Highly impaired littoral drift processes
- Unnatural discharge of urban runoff from watershed development with impervious surfaces

Any measures/alternative implemented should:

- Avoid adverse impacts to the hydrology, hydraulics, and erosional process of the ravine
- Avoid adverse impacts to the littoral drift of Lake Michigan
- Avoid adverse impacts to the state listed species present on site
- Avoid measures with high operation and maintenance costs

3. Plan Formulation

The formulation, evaluation, and comparison of alternative plans comprise the third, fourth, and fifth steps of the Corps' planning process. These steps are often referred to collectively as plan formulation. Plan formulation is an iterative process that involves cycling through these steps to develop a reasonable range of alternatives, and then narrow those plans down to a final plan, which is feasible for implementation. Plan formulation for ecosystem restoration (ER) presents a challenge because alternatives have non-monetary benefits. To facilitate the plan formulation process, the methodology outlined in the Corps' Engineering Circular 1105-2-404, "Planning Civil Works Projects under the Environmental Operating Principles, "1 May 2003 was used. The steps in the methodology are summarized below:

1. Identify a primary project purpose. For this portion of the study, ER is identified as the primary process.
2. Formulate management measures to achieve planning objectives and avoid planning constraints, where measures are the building blocks of alternative plans.
3. Identify and select those sites most beneficial for ecological restoration.
4. Formulate, evaluate, and compare an array of alternatives to achieve the primary purpose (ER) and identify cost effective plans.
5. Perform an incremental cost assessment on the cost effective plans to determine the NER plan.

3.1 Measure Identification

The following measures are based on a collaborative effort between the USACE and the PDHP. Measures were developed with the intent to restore habitat structure in a sustainable fashion taking into account the dynamic range of surface water processes and habitat succession. Herein, these measures will be further evaluated for implementation feasibility under the USACE 506 Authority.

<u>Restoration Measures</u>

SR1 – Stream Restoration – Option 1

This measure is not combinable with SR2 or SR3. This measure seeks to completely address stream hydraulics and hydrology, stream and lake connectivity, channel downcutting, aquatic species dispersal, and sediment and stormwater loading. This measure seeks to completely remove 4 degraded concrete weirs upstream of the current parking lot, which are preventing the upstream dispersal of aquatic species as well as inhibiting the functionality of natural stream hydraulics (i.e. boulder/cobble riffles). A sufficient number of boulder/cobble riffles already exist upstream of the parking lot to regulate stormwater influxes, allow for sediment accretion and deposition within the ravine, repair channel downcutting, and increase ravine stabilization. Plantings along the riparian zone would cover approximately 0.2 acres.

This measure also includes the complete removal the box culvert which is inhibiting the upstream dispersal of aquatic species by fragmenting the flow of the ravine mouth to the lake. Initially, the 220 linear feet culvert would be removed. River rock (mixture of gravel [diameter: 0.08 – 0.63 in], pebbles [diameter: 0.67 – 2.52 in], and cobble [diameter: 2.56 – 10.08 in]) would be placed along the length of the newly opened channel to recreate the streambed. Two boulder/cobble riffles would be constructed within the new channel to maintain stream hydraulics, provide aquatic species habitat, reduce sediment loading, and to restore natural riffle/pool complexes. Finally, the streambank would be contoured through light grading and native vegetation would be planted for bank stabilization (approximately 0.08 acres).

SR2 – Stream Restoration – Option 2

This measure is not combinable with SR1 or SR3. This measure seeks to completely address stream hydraulics and hydrology, stream and lake connectivity, channel downcutting, aquatic species dispersal, and sediment and stormwater loading. This measure seeks to completely remove 4 degraded concrete weirs upstream of the current parking lot, which are preventing the upstream dispersal of aquatic species as well as inhibiting the functionality of natural stream hydraulics (i.e. boulder/cobble riffles). A sufficient number of boulder/cobble riffles already exist upstream of the parking lot to regulate stormwater influxes, allow for sediment accretion and deposition within the ravine, repair channel downcutting, and increase ravine stabilization. Plantings along the riparian zone would cover approximately 0.2 acres.

SR3 – Stream Restoration – Option 3

This measure is not combinable with SR1 or SR2. This measure includes the complete removal the box culvert which is inhibiting the upstream dispersal of aquatic species by fragmenting the flow of the ravine mouth to the lake. Initially, the 220 linear feet culvert would be removed. River rock (mixture of gravel [diameter: 0.08 – 0.63 in], pebbles [diameter: 0.67 – 2.52 in], and cobble [diameter: 2.56 – 10.08 in]) would be placed along the length of the newly opened channel to recreate the streambed. Two boulder/cobble riffles would be constructed within the new channel to maintain stream hydraulics, provide aquatic species habitat, reduce sediment loading, and to restore natural riffle/pool complexes. Finally, the streambank would be contoured through light grading and native vegetation would be planted for bank stabilization (approximately 0.08 acres).

L1 – Lacustrine Restoration – Option 1

This measure is not combinable with L2 or L3. This measure seeks to mitigate shoreline and bluff recession due to the interruption of local long shore sediment transport by constructing a series of nearshore breakwaters. The four steel groins north of the fishing pier at Rosewood Park will be removed and replaced with a series of beach cells (5 beach cells) constructed nearshore. Beach cells will be composed of limestone riprap and will be prefilled with 120% of

the estimated stable volume upon construction. Sheet piling will be used to stabilize 3 of the 5 beach cells. This measure is the configuration designed by the local sponsors.

L2 – Lacustrine Restoration – Option 2

This measure is not combinable with L1 or L3. This measure seeks to mitigate shoreline and bluff recession due to the interruption of local long shore sediment transport by constructing a series of nearshore breakwaters. The four steel groins north of the fishing pier at Rosewood Park will be removed and replaced with five nearshore breakwaters constructed approximately 150 feet offshore. Breakwaters will be composed of limestone riprap and will be prefilled with 120% of the estimated stable volume upon construction.

L3 – Lacustrine Restoration – Option 3

This measure is not combinable with L1 or L2. This measure seeks to mitigate shoreline and bluff recession; however, natural lacustrine processes such as sediment transport will not be addressed. Limestone riprap will be placed around the four steel groins located north of the fishing pier at Rosewood Park, and prefilled with 120% of the estimated stable volume upon construction. Placement of the boulder will create more aesthetically pleasing structures; however, limited aquatic species habitat would be created.

BD – Beach and Dune Restoration

This measure seeks to restore beach and foredune habitat through beach nourishment, removal of invasive and opportunistic woody vegetation and planting of native species known to occupy foredune habitats. Restoration would cover approximately 1.10 acres of beach and dune habitat. Selective shrub and tree clearance includes, but is not limited to, common buckthorn (*Rhamnus cathartica*), glossy buckthorn (*Frangula alnus*), European highbush cranberry (*Viburnum opulus*), black locust (*Robinia pseudoacacia*), staghorn sumac (*Rhus typhina*), Norway maple (*Acer platanoides*), gray dogwood (*Cornus racemosa*), white mulberry (*Morus alba*), green ash (*Fraxinus lanceolata*), cottonwood (*Populus deltoides*), and basswood (*Tilia americana*). Native species of local genotype that are known to inhabit foredune communities will be planted (seeds and plugs). Follow up will include the removal of invasive herbaceous species by spot application of herbicide over 5 years. This measure also includes the complete removal of the asphalt walkway.

BF – Bluff Restoration

This measure seeks to restore the bluff vegetative community through the selective removal of invasive and opportunistic woody vegetation shading the bluff understory and planting of native species that are known to occupy lakeshore bluffs. Restoration would cover approximately 1.74 acres of bluff habitat. Selective shrub and tree clearance includes, but is not limited to, common buckthorn (*Rhamnus cathartica*), glossy buckthorn (*Frangula alnus*), European highbush cranberry (*Viburnum opulus*), black locust (*Robinia pseudoacacia*), staghorn

sumac (*Rhus typhina*), Norway maple (*Acer platanoides*), gray dogwood (*Cornus racemosa*), white mulberry (*Morus alba*), green ash (*Fraxinus lanceolata*), cottonwood (*Populus deltoides*), and basswood (*Tilia americana*). Native species of local genotype that are known to inhabit the lakeshore bluff communities will be planted (seeds and plugs). This measure also includes the removal of invasive herbaceous species by spot application of herbicide over 5 years. In addition, a prescribed burn would be incorporated for 3 of the 5 years.

RV – Ravine Restoration

This measure seeks to restore the ravine vegetative community through the selective removal invasive and opportunistic woody vegetation shading the ravine's understory and planting of native species that are known to occupy lakeshore ravines. Restoration would cover approximately 2.27 acres of ravine habitat. Selective shrub and tree clearance includes, but is not limited to, common buckthorn (*Rhamnus cathartica*), glossy buckthorn (*Frangula alnus*), European highbush cranberry (*Viburnum opulus*), black locust (*Robinia pseudoacacia*), Japanese barberry (*Berberis thunbergii*), Norway maple (*Acer platanoides*), gray dogwood (*Cornus racemosa*), white mulberry (*Morus alba*), green ash (*Fraxinus lanceolata*), cottonwood (*Populus deltoides*), and basswood (*Tilia americana*). Native species of local genotype that are known to inhabit the lakeshore ravine communities will be planted with plugs only within the ravine bottom. Following selective clearance, all stumps will be swabbed with herbicide. This measure also includes the removal of invasive herbaceous species by spot application of herbicide over 5 years. In addition, a prescribed burn would be incorporated for 3 of the 5 years.

SV – Savanna Restoration

This measure seeks to restore the savanna vegetative community through selective removal of invasive and opportunistic woody vegetation shading the savanna's herbaceous understory and planting of native species that are known to occupy savanna habitat. Restoration would cover approximately 1.83 acres of savanna habitat. Selective shrub and tree clearance includes, but is not limited to, common buckthorn (*Rhamnus cathartica*), glossy buckthorn (*Frangula alnus*), European highbush cranberry (*Viburnum opulus*), black locust (*Robinia pseudoacacia*), Japanese barberry (*Berberis thunbergii*), Norway maple (*Acer platanoides*), gray dogwood (*Cornus racemosa*), white mulberry (*Morus alba*), green ash (*Fraxinus lanceolata*), cottonwood (*Populus deltoides*), and basswood (*Tilia americ*ana). Native species of local genotype that are known to inhabit the lakeshore savanna communities will be planted (seeds and plugs). Following selective clearance, all stumps will be swabbed with herbicide. This measure also includes the removal of invasive herbaceous species by spot application of herbicide over 5 years. In addition, a prescribed burn would be incorporated for 3 of the 5 years.

3.2 Measure Costs and Assumptions

Detailed discussion on planning level feature costs is presented in Appendix C – Cost Engineering. Conceptual, planning level cost estimates were prepared for measures/features that were identified by the study team in conjunction with the non-Federal sponsors. These cost estimates do not represent complete project construction cost estimates, but rather individual measures of work or components of the entire project. The measures were used to provide an economic basis for the development of project alternatives. Once the project alternatives have gone through the plan formulation process and additional design information developed for the recommended plan, a more detailed and reliable cost estimate was performed (Appendix C). Estimates were developed using cost information from previous studies, lump sum and unit prices, and for plant, labor, and material methods. Planning level unit costs were placed into a matrix to utilize the different costs for each measure of work (Table 5).

Table 5. Planning level cost per habitat unit and average cost for each measure.
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Cost Annualization: Annualizing costs is a method whereby the project costs are discounted to a base year then amortized over the period of analysis. The base year for this project was determined to be the year in which the first phase of the project is to be completed (calendar year 2013). Costs that occur prior to this year need to be compounded to the base year, while those occurring after the base year need to be discounted to the base year. The period of analysis for the Section 506 project is 50 years. Discounting to the base year is the present value method. Costs are compounded or converted to present value for the base year then amortized over the 50-year period of analysis to give the annual cost. Discount rate was determined by the appropriate Economic Guidance Memorandum 08-01, Federal Interest Rates for Corps of Engineers Projects. The method shown in the above table does this for each measure. The individual measures of the project have the construction period spread out over 1 to 5-years, depending on magnitude or redundancy. Each year of every measure is either compounded or discounted to the base year. Calculation of the measures Average Annual Cost (AA Cost) is completed by multiplying the present value to the 50-year amortization factor.

Real Estate: An Initial Value Estimate (IVE) of the lands necessary to implement measures for this ecosystem project was included in the Average Annual costs per measure. The IVE provided by the real estate section determined various preliminary numbers to accomplish plan formulation. This number is preliminary and does not constitute the gross appraisal.

Planning Level O&M Costs: The maintenance costs for the stone breakwaters, beach nourishment, and plantings for every year within the 50-year period, is estimated to be approximately $[redacted].

Costs for LERRDs: The non-Federal sponsor's estimated land, easement, right-of-way, relocation, and disposal area (LERRDs) value is $[redacted]. Credit was applied to the footprint that the restoration would directly affect by preserving the unique ravine, bluff, dune, and beach habitat.

Pre-construction, Engineering and Design Costs. Standards were used for this cost element to conservatively reflect further work to be completed on the recommended plan. This cost includes any required future sampling, testing, and modeling, as well as more typical design analysis activities. The following standard percentages were used:

- Plans & Specifications –6.5 %
- Construction Management – 7.5%
- Engineering & Design During Construction – 3%
- Project Management – 1.5%

3.3 Measure Habitat Benefits

The evaluation of habitat benefits is a comparison of the with-project and without-project conditions for each measure. Environmental outputs are the desired or anticipated measurable products or results of restoration measures and plans. The term "outputs" is often used interchangeably with "benefits" or "habitat units (HUs)." Ecosystem restoration proposals may possess multiple output categories, as well as other effects that may need to be considered, but the evaluation must at least address cost and an output category that has been determined to represent reasonable ecosystem restoration benefits. A comparison of the future without-project and future with-project HUs was performed in order to determine if a measure, or group of measures, will actually have beneficial effects to the Rosewood Park ecosystem (Table 6). The measures for this study were evaluated with the HSI methodology described in Section 2.6. The HSI took into consideration the effects to plant communities within the beach & dune, bluff, ravine, and savanna habitats. The HSI took into consideration the effects to fish communities within the lacustrine and ravine stream habitats.

Table 6. Habitat units to be gained through implementation of the measures described in Section 3.1 versus habitat units without project (Table 4). Average annual (Δ AAHUs) and net average annual habitat units (Net AAHUs) are based on average of Mean C and HUs projected over 50 year time period.

Code	Description	QHEI	R	Mean C	HSI'	AAHSI	Acres	AAHUs	NAAHUs
SR1	Stream	64.5	30.0		7.9	6.8	0.3	1.9	1.1
SR2	Stream	49.5	17.0		5.1	4.8	0.2	1.0	0.2
SR3	Stream	49.5	17.0		5.1	4.8	0.1	0.5	0.0
L1	Lacustrine		36.0		10.0	9.0	0.5	4.5	3.1
L2	Lacustrine		30.0		8.3	7.6	0.5	3.8	2.3
L3	Lacustrine		20.0		5.6	5.3	0.4	2.1	0.7
BD	Beach & Dune			4.0	4.0	4.1	1.1	4.5	3.0
BF	Bluff			4.1	4.1	6.5	1.7	11.1	7.2
RV	Ravine			4.1	4.1	8.7	2.3	20.0	12.0
SV	Savanna			3.7	3.7	6.2	1.8	11.2	8.0

*Mean C is the Coefficient of Conservatism; HSI is the Habitat Suitability Index score; HUs is the Habitat Units; ΔAAHUs is the Change in Average Annual Habitat Units; Net AAHUs is the Net Average Annual Habitat Units.

3.4 Alternative Combinations

Eleven measures including the No Action plan were input into the IWR-planning suite in terms of costs and benefits shown in Table 6. There were three stream restoration measures (SR#) that were not combinable with each other, but were combinable with all other measures for additive benefits. Similarly, there were three lacustrine restoration measures (L#) that were not combinable with each other, but were combinable with all other measures for additive benefits. All of the measures (excluding the No Action) were combinable for additive benefits. A total of 256 alternative plans were generated, including the no action plan, from various combinations of the eleven measures. All alternative plans, including the no action plan, moved forward to the cost effective and incremental cost analysis step in the following sections.

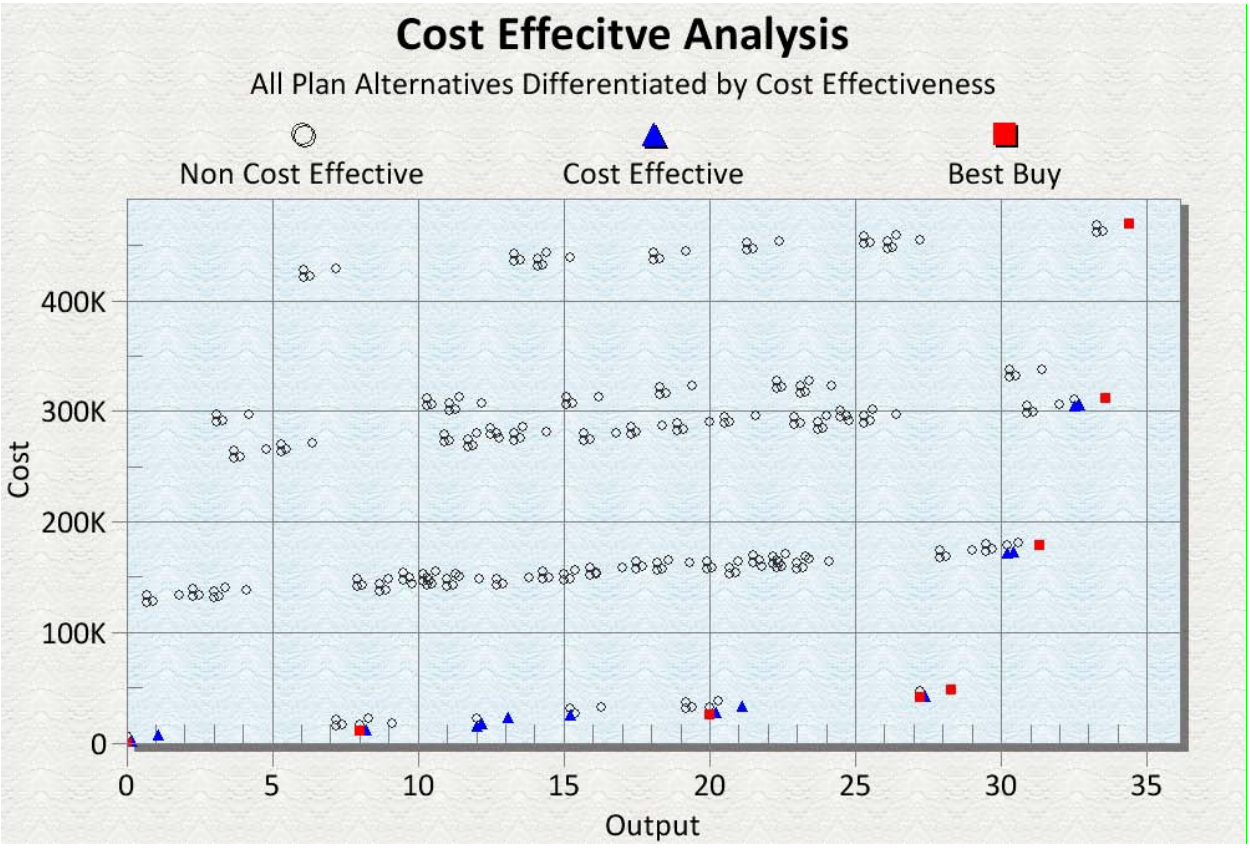

Figure 3. All generated alternative plans differentiated by cost effectiveness.

3.5 Cost Effectiveness / Incremental Cost Analysis

Cost effectiveness and incremental cost analysis (CE/ICA) are two distinct analyses that must be conducted to evaluate the effects of alternative plans according to USACE policy. First, it must be shown through cost effectiveness analysis that a restoration plan's output cannot be produced more cost effectively by another alternative. *Cost effective* means that, for a given level of non-monetary output, no other plan costs less and no other plan yields more output at a lower cost. Subsequently, through incremental cost analysis, a variety of alternatives and various-sized alternatives are evaluated to arrive at a "best" level of output within the limits of both the sponsor's and the USACE's capabilities.

The subset of cost effective plans are examined sequentially (by increasing scale and increment of output) to ascertain which plans are most efficient in the production of environmental benefits. Those most efficient plans are called "best buys." As a group of measures, they provide the greatest increase in output for the least increases in cost. They have the lowest incremental costs per unit of output. In most analyses, there will be a series of best buy plans, in which the relationship between the quantity of outputs and the unit cost is evident. As the scale of best buy plans increases (in terms of output produced), average costs per unit of output and incremental costs per unit of output will increase as well. The incremental analysis by itself will not point to the selection of any single plan. The results of the incremental analysis

must be synthesized with other decision-making criteria (i.e., significance of outputs, acceptability, completeness, effectiveness, risk and uncertainty, reasonableness of costs) to help the study team select and recommend a particular plan.

The USACE's Institute for Water Resources (IWR) developed procedures and software to assist in conducting CE/ICA. The IWR Report 94-PS-2, *Cost Effectiveness Analysis for Environmental Planning: Nine EASY Steps*; IWR Report 95-R-1, *Evaluation of Environmental Investments Procedures Manual Interim: Cost Effectiveness and Incremental Cost Analyses*; and IWR Report 98-R-1, *Making More Informed Decisions in Your Watershed When Dollars Aren't Enough* were utilized as guidance for this study. The Windows-based IWR-PLAN Decision Support Software Beta Version was used as the tool for this CE/ICA analyses.

3.5.1 Cost Effectiveness

The cost effectiveness analysis was used to ensure that certain options would be screened out if they produced the same amount or less output at a greater cost than other options with a lesser cost. Two-hundred fifty-six (256) alternative plans were analyzed for cost effectiveness. Of the 256 alternatives generated, 22 cost effective options were identified (Table 7 and Figure 4), including the No Action Plan.

Table 7. Identified cost effective alternatives with respective net average annual habitat units (outputs), cost per habitat unit, and total annualized cost.
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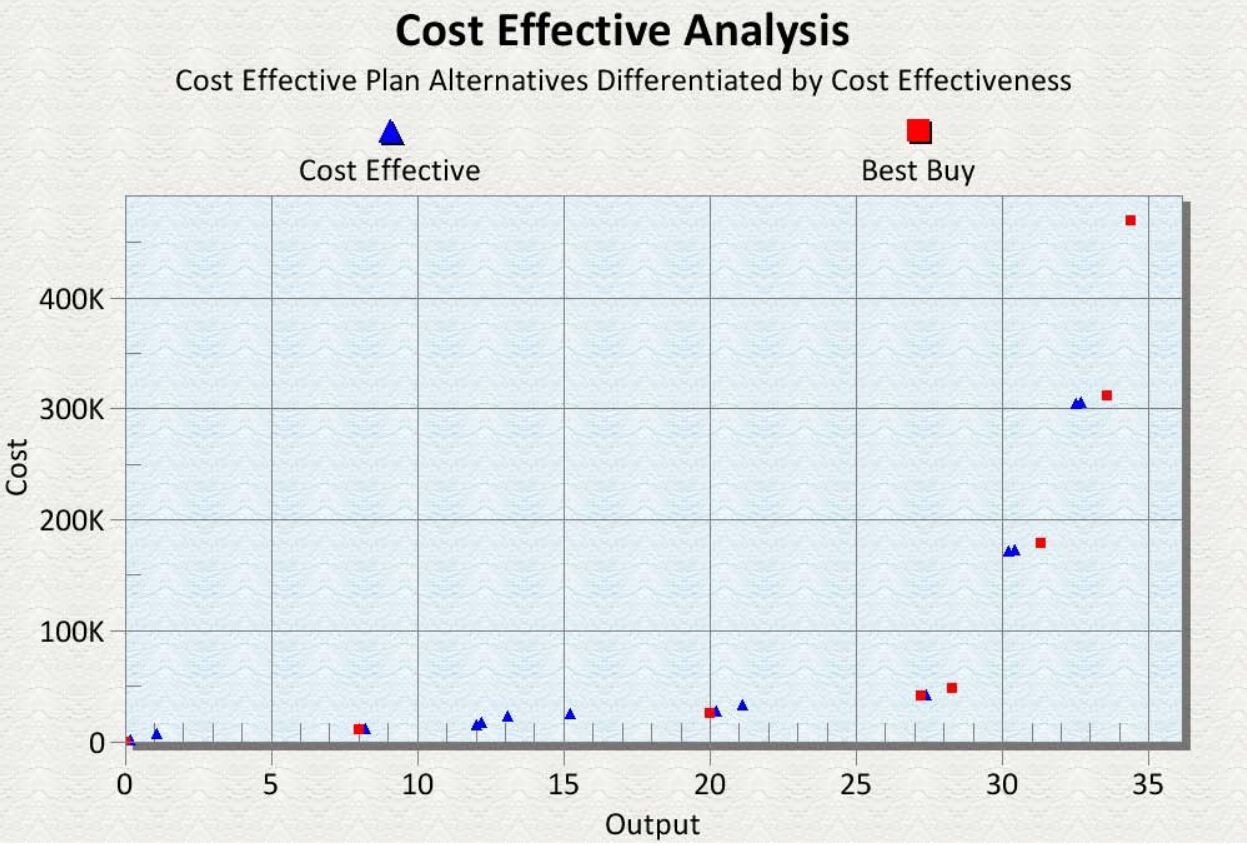

Figure 4. Cost effective and Best buy plans differentiated by cost effectiveness.

3.5.2 Incremental Cost Analysis

The incremental cost, incremental habitat units, and incremental cost per habitat unit of advancing to each successive cost effective output level was calculated by the IWR-plan. The objectives of the incremental cost analysis are to provide information to assist in determining whether the additional output provided by each successive cost effective plan is worth the additional cost that must be incurred for implementation; that is, to assist in determining the scale of the recommended plan. This incremental cost analysis has identified 8 alternative plans that would be considered as best buys, including the no action plan, for study implementation (Table 8 and Figure 5).

Table 8. Incremental costs and benefits for the best buy alternatives.
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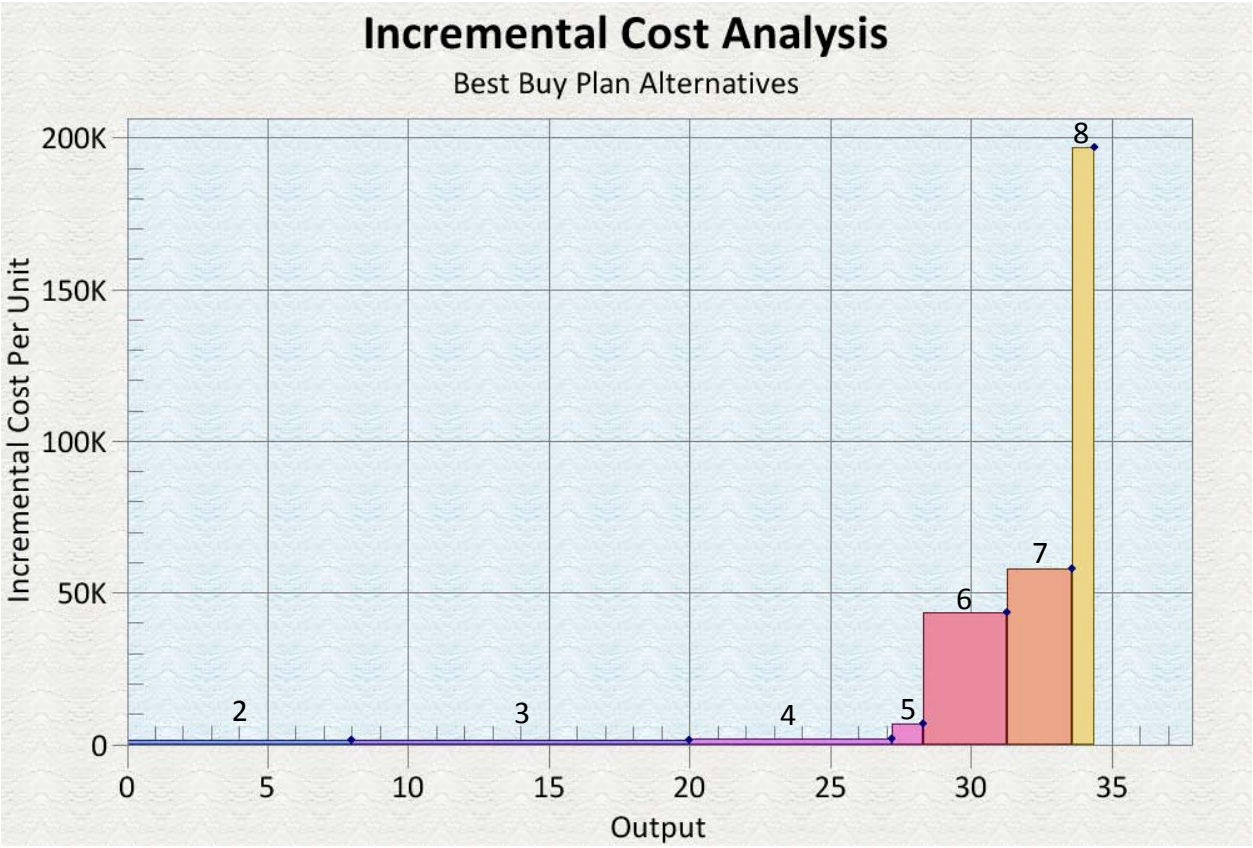

Figure 5. Incremental cost and cumulative benefit analysis of best buy plan alternatives.

3.6 Significance of Ecosystem Outputs

Because of the challenge of dealing with non-monetized benefits, the concept of output significance plays an important role in ecosystem restoration evaluation. Along with information from cost effectiveness and incremental cost analyses, information on the significance of ecosystem outputs will help determine whether the proposed environmental investment is worth its cost and whether a particular alternative should be recommended. Statements of significance provide qualitative information to help decision makers evaluate whether the value of the resources of any given restoration alternative are worth the costs incurred to produce them. The significance of the Rosewood Park restoration and preservation outputs are herein recognized in terms of institutional, public, and/or technical importance.

Institutional Recognition

Significance based on institutional recognition means that the importance of an environmental resource is acknowledged in the laws, adopted plans, and other policy statements of public agencies, tribes, or private groups. Sources of institutional recognition include public laws,

executive orders, rules and regulations, treaties, and other policy statements of the Federal Government; plans, laws, resolutions, and other policy statements of states with jurisdiction in the planning area; laws, plans, codes, ordinances, and other policy statements of regional and local public entities with jurisdiction in the planning area; and charters, bylaws, and other policy statements of private groups. This project is recognized institutionally through a variety of laws and executive orders including:

Clean Water Act – Restore the chemical and biological integrity of the Nation's waters. Restoration of native plant communities as well as stream hydraulics will not only improve habitat diversity, but also biogeochemical processes important in the filtering of precipitation and runoff. This in turn will mean the return of higher quality groundwater to Lake Michigan.

Endangered Species Act of 1973 – All Federal departments and agencies shall seek to conserve endangered species and threatened species. The purpose of the act is to provide a means whereby the ecosystems upon which endangered and threatened species depend may be conserved and to provide a program for the conservation of such endangered and threatened species. Although no Federally listed species have been recorded from the project site, restoration features would be beneficial to Federally listed species and would promote their future use of the site.

Fish and Wildlife Conservation Act of 1980 – All Federal departments and agencies to the extent practicable and consistent with the agencies authorities should conserve and promote conservation of non-game fish and wildlife, and their habitats. Restoring the vegetative structure and increasing the native plant growth of the bluff, ravine, dune, and beach habitats will enhance the habitat diversity of the system. Removal of unnatural habitats would reduce the abundance ratio of exotic to native species. In addition, removal of manmade structures which currently impede aquatic species dispersal would increase availability of high quality habitat. All habitat improvements will benefit plants, invertebrates, fish, birds, amphibians, reptiles and other wildlife.

EO 11514 Protection and Enhancement of Environmental Quality – The Federal Government shall provide leadership in protecting and enhancing the quality of the Nation's environment to sustain and enrich human life. Improving the quality of Rosewood Park will help to restore the unique Highland Park Bluff-Lake Michigan interface, an area that once had many environmental treasures.

EO 11990 Protection of Wetlands – Each agency shall provide leadership and shall take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands. This project will restore ravine, bluff, dune, beach and lacustrine communities, while protecting adjacent high quality habitats.

EO 13112 Invasive Species – Prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts that invasive species cause. Proposed measures for the restoration of Rosewood Park include removal of

woody and herbaceous invasive species to prevent further dispersal and encroachment throughout the site and into other areas.

EO 13186 Responsibilities of Federal Agencies to Protect Migratory Birds – Federal agencies shall restore or enhance the habitat of migratory birds and prevent or abate pollution or detrimental alteration of the environment for migratory birds. According to the Chicago Region Audubon Society, the western shoreline of Lake Michigan is the only globally significant portion of migratory flyway in North America. It is critically important because of the paucity of available habitat to rest and refuel through the heavily urbanized corridor of Milwaukee, Chicago, and northwest Indiana. There are over 200 species of neotropical migrants and the numbers during the heaviest nights of migration have been reported to be up to 30 million birds. This project located along the coast of Lake Michigan will restore native plant diversity thus providing better forage and shelter to numerous migratory bird species utilizing this important flyway.

Executive Order 13340 - Identified the Great Lakes as a national treasure and defined a Federal policy to support local and regional efforts to restore and protect the Great Lakes ecosystem through the establishment of regional collaboration. A number of activities have been accomplished by Federal agencies working in partnership with state, tribal and local governments in response to the Executive Order. The USACE has been a major participant in these activities. The Executive Order established the Great Lakes Interagency Task Force. The Task Force worked with the governors of the eight Great Lakes states, mayors, and tribal leaders to establish the Great Lakes Regional Collaboration. The initial goal of the Collaboration was to develop a "strategy for the protection and restoration of the Great Lakes" within 1 year. The Collaboration developed the strategy by using teams consisting of 1,500 stakeholders for the following eight priority issues identified by the Great Lakes governors and mayors with items in bold relative to this project:

1. Toxic contaminants
2. Non-point source pollution
3. **Coastal health**
4. **Habitat/species**
5. Contaminated sediments/AOCs
6. Indicators/information
7. Sustainable development
8. **Invasive species**

Public Recognition

Public recognition means that some segment of the general public recognizes the importance of an environmental resource, as evidenced by people engaged in activities that reflect an interest or concern for that particular resource. Such activities may involve membership in an organization, financial contributions to resource-related efforts, and providing volunteer labor and correspondence regarding the importance of the resource.

Rosewood Park is part of the Highland Park Lakefront Plan which was set forth in 2006. Goals of the plan include renovation of infrastructure, bluff and ravine stabilization, habitat

restoration, and beach nourishment at four Highland Park parks (e.g. Rosewood, Moraine, Central, and Millard).

The park has historical recognition as the former estate of U.S. clothier Julius Rosenwald, part owner and leader of Sears, Roebuck and Company. Famed landscape architect Jens Jensen was hired by Rosenwald to landscape the estate. Today, a reflecting pool, the surrounding at Upper Rosewood, and carriage bridge are all that remain of his work at the site.

There is a significant level of support for ecological restoration along the southwestern coast of Lake Michigan, expressed through International, regional, state, and local groups. The project is formally recognized by the internationally recognized organization, Trout Unlimited. As an advocate for the restoration of Rosewood Park, members of Trout Unlimited support work to the Lake Michigan coastal ravine systems which provide spawning and nursery habitat for native aquatic species as well as sport fish (e.g. trout).

In addition, the project has been recognized by at least two regional organizations, the Alliance for the Great Lakes and the Lake Michigan Watershed Ecosystem Partnership (LMWEP). These two organizations released a report in 2009 qualitatively identifying stresses and opportunities for restoration in Illinois' Lake Michigan watershed. In the report, ravine 3L or the Rosewood ravine was one of the highest ranking ravines for erosion potential (3 out of 47; 98.8 out of 100 risk of erosion score).

Technical Recognition

Technical recognition means that the resource qualifies as significant based on its "technical" merits, which are based on scientific knowledge or judgment of critical resource characteristics. Whether a resource is determined to be significant may of course vary based on differences across geographical areas and spatial scale. While technical significance of a resource may depend on whether a local, regional, or national perspective is undertaken, typically a watershed or larger (e.g., ecosystem, landscape, or ecoregion) context should be considered. Technical significance should be described in terms of one or more of the following criteria or concepts: scarcity, representation, status and trends, connectivity, limiting habitat, and biodiversity.

Scarcity is a measure of a resource's relative abundance within a specified geographic range. Generally, scientists consider a habitat or ecosystem to be rare if it occupies a narrow geographic range (i.e., limited to a few locations) or occurs in small groupings. Unique resources, unlike any others found within a specified range, may also be considered significant, as well as resources that are threatened by interference from both human and natural causes. Scarcity is represented at Rosewood Park by the presence of significant and unusual topographic features including beach, foredune, bluff, and ravine habitat. Rosewood Park lies within the Illinois Beach Resource Rich Area (RRA) which has the second highest percentage of urban/built-up acreage (63%). Only 24% of the RRA contains natural habitats such as forest, wetland, and grassland. This narrow band of habitats is comprised of beaches, sand dunes,

swales, marshes, sand prairies, savannas, and oak forests that occur along the coast of Illinois as a result of the gradual lowering of Lake Michigan. The Illinois Beach RRA is one of the most biologically diverse areas in the state with more than 650 species of plants having been identified from this area.

Representation is a measure of a resource's ability to exemplify the natural habitat or ecosystems within a specified range. The presence of a large number and percentage of native species, and the absence of exotic species, implies representation as does the presence of undisturbed habitat. Although the study area has been highly disturbed from anthropogenic activities, Rosewood Park is representative of a southwestern Lake Michigan ravine-lake interface. This project would restore connectivity between the ravine and lake, upstream aquatic species dispersal, and a diverse array of rare and conservative plant species. This project would repair the ravine-lake interface to a representative form, and to once again provide habitat for ravine species as well as refuge for lacustrine species.

Status and Trends of Rosewood Park describe a once highly functional lacustrine habitat that has become degraded primarily due to effects of urbanization from the ever expanding Chicago metropolitan area. However, Rosewood Park is part of the Illinois Beach RRA which is one of the most ecologically rich and unique areas in Illinois. This RRA is comprised of a diverse array of habitats that were created because of its proximity to the shores of Lake Michigan. Rosewood Park contains many of these unique habitats one of which is the notable bluff habitat. With implementation of the proposed project, Rosewood Park's distinctive habitats may be restored to their former excellence and provide beneficial outputs to terrestrial and aquatic wildlife.

Connectivity of Rosewood Park to other natural areas and bluff/ravine habitats is crucial for fish species as well as migratory birds. Highland Park, where Rosewood Park resides, contains one-third of the state of Illinois' lakeshore ravines. As part of Highland Park's Lakefront Plan, restoration of bluff and ravine habitat from three additional coastal parks (Moraine, Central, and Millard) is or will be occurring within the decade. In addition, the USACE is currently conducting a feasibility study that aims at restoring 8 main ravines and several small unnamed ravines, along with their associated watersheds, in the town of Fort Sheridan located just north of the Rosewood project site. Extensive restoration of the areas coasts will provide connected high quality habitat for wildlife, especially migrant birds which follow the coastline route. In addition, Rosewood Park is located within the Illinois Beach RRA which encompasses 49,172 acres stretching from the Cook County to Lake County. Included within the Illinois Beach RRA is Illinois Beach State Park, North Dunes, and Spring Bluff, three nature preserves that provide critical habitat to wildlife and form a habitat corridor with the parks located in Highland Park.

Limiting Habitat exists at Rosewood Park. Once restored, site conditions could support state rare, threatened, and endangered species such as common tern (*Sterna hirundo*), Forster's tern (*Sterna forsteri*), marram grass (*Ammophila breviligulata*), ground juniper (*Juniperus communis*), and sea rocket (*Cakile edentula*).

Biodiversity within the Chicago Region is in decline due to the replacement of a number of high quality species that have links throughout the food web and ecosystem, with species that have few or no users in the system. As more species are lost, a cascade effect results in the loss of the species that are dependent on the ones immediately affected by the problem. Through the restoration of ravine hydraulics and hydrology, ravine-lake connectivity, lacustrine habitat, native plant community richness, water quality, and nutrient cycling; species diversity would increase logarithmically along with existing populations of fish, amphibians, and other species.

Budget Guidance

The purpose of the Rosewood Park restoration project would be to preserve the site's native plant, aquatic, and wildlife species which are currently threatened by non-native and invasive species. The proposal meets GL Regional Collaboration goals. The USACE has criteria for selecting projects for implementation with the following criteria and numerical scores being assigned to a project based upon the site meeting the requirements identified in the Corps Budget guidance (EC 11-2-194):

- Habitat Scarcity – Score of 18/25
- Connectivity - Score of 18/25
- Special Status Species – Score of 5/10
- Hydrologic Character – Score of 15/20
- Geomorphic Condition – Score of 15/20
- Plan Recognition – Score of 5/10
- Self Sustaining – Score of 20/20
- Nationally Significant – Y
- Regionally Significant – Y

3.6.2 Acceptability, Completeness, Effectiveness, and Efficiency

Acceptability, completeness, effectiveness, and efficiency are the four evaluation criteria specified that USACE uses in the screening of alternative plans. Alternatives considered in any planning study, not just ecosystem restoration studies, should meet minimum subjective standards of these criteria in order to qualify for further consideration and comparison with other plans.

Acceptability - An ecosystem restoration plan should be acceptable to state and Federal resource agencies and local governments. There should be evidence of broad-based public consensus and support for the plan. A recommended plan must be acceptable to the non-Federal cost-sharing partner. However, this does not mean that the recommended plan must be the locally preferred plan.

The No Action plan alternative plan is not acceptable to local Federal and State agencies' representatives, nor is it in congruence with the non-Federal sponsor's mission to restore

acquired lands. The No Action plan does not accomplish goals of restoring green space for ecological recovery and recreation. Alternative 7 is the most acceptable plan to Federal, State, and local agencies since maximum benefits from restoration are achieved in a cost effective manner.

Completeness - A plan must provide and account for all necessary investments or other actions needed to ensure the realization of the planned restoration outputs. This may require relating the plan to other types of public or private plans if these plans are crucial to the outcome of the restoration objective. Real estate, operations and maintenance, monitoring, and sponsorship factors must be considered. Where there is uncertainty concerning the functioning of certain restoration features and an adaptive management plan has been proposed it must be accounted for in the plan.

Alternative 7 is the most complete alternative plan in that it addresses all of the resource problems identified at Rosewood Park (Section 2.8): erosional conditions caused by improperly placed infrastructure; instability of coastal communities caused by infestation of invasive woody and herbaceous species, manmade structures, stormwater runoff and sediment loading, and fragmentation of ravine habitat from Lake Michigan. The mission of the non-Federal sponsor and active environmental groups within Highland Park is to acquire and hold lands containing forests, prairies, wetlands, and associated plant communities or lands capable of being restored to such natural conditions for the purpose of protecting and preserving the flora, fauna, and scenic beauty for the education, pleasure, and recreation of its citizens. Selecting a lesser plan than alternative 7 would cause issues for the non-Federal sponsor in terms of having the funding and ability to restore these necessary components of the entire site's ecosystem.

Efficiency - An ecosystem restoration plan must make a significant contribution to addressing the specified restoration problems or opportunities (i.e. restore important ecosystem structure or function to some meaningful degree).

Alternative 7 addresses the identified resource problems and meets all of the planning objectives in Section 2.8. The other alternative plans only meet a portion of the identified resource problems and do not effectively meet the needs of the non-Federal sponsor.

Effectiveness – An ecosystem restoration plan must represent a cost-effective means of addressing the restoration problem or opportunity. It must be determined that the plan's restoration outputs cannot be produced more cost effectively by another agency or institution.

The cost effectiveness of each alternative was analyzed using IWR-Plan software. Two-hundred fifty-six alternative combinations were analyzed for cost effectiveness. Of these, 22 cost effective combinations were identified (Table 7 and Figure 4), including the no action plan. Only cost effective combinations moved on to the final stages of the planning process, thusly any of the Best Buy plans are considered cost effective.

3.6.3 Risk and Uncertainty

When the costs and outputs of alternative restoration plans are uncertain and/or there are substantive risks that outcomes will not be achieved, which may often be the case, the selection of a recommended alternative becomes more complex. It is essential to document the assumptions made and uncertainties encountered during the course of planning analyses. Restoration of some types of ecosystems may have relatively low risk. For example, removal of drainage tiles to restore hydrology to a wetland area. Other activities may have higher associated risks such as restoration of coastal marsh in an area subject to hurricanes. When identifying the NER plan the associated risk and uncertainty of achieving the proposed level of outputs must be considered. For example, if two plans have similar outputs but one plan costs slightly more, according to cost effectiveness guidelines, the more expensive plan would be dropped from further consideration. However, it might be possible that, due to uncertainties beyond the control or knowledge of the planning team, the slightly more expensive plan will actually produce greater ecological output than originally estimated, in effect qualifying it as a cost effective plan. But without taking into account the uncertainty inherent in the estimate of outputs, that plan would have been excluded from further consideration.

Complete eradication of invasive species always presents a certain level of risk and uncertainty as the chances of reinvasion are likely to occur without proper management; increasingly so when native species have not yet established. Changes in nutrient cycling processes and soil chemistry due to unnatural surface water introductions, with a changed chemical composition, further increases uncertainty with invasive species removal. Measures that prevent further degradation to soils and measures that alleviate altered soil chemistry legacies, which therefore alleviate the invisibility of the ecosystem, should lessen the risk and uncertainty associated with invasive species removal.

Placement of lacustrine structures presents a certain level of risk and uncertainty as lake levels fluctuate temporally. Hydraulic performance was assessed for a 10-year lake level with a 20-year wave and a 20-year lake level with a 10-year wave, as recommended for coastal projects having a 50-year design economic lifetime.

3.7 Selection of Ecosystem Restoration Plan

When selecting a single alternative plan for recommendation from those that have been considered, the criteria used to select the NER plan include all the evaluation criteria discussed above. Selecting the NER plan requires careful consideration of the plan that meets planning objectives and constraints and reasonably maximizes environmental benefits while passing tests of cost effectiveness and incremental cost analyses, significance of outputs, acceptability, completeness, efficiency, and effectiveness. Additional factors to consider include the following items.

Partnership Context

This restoration project was planned in cooperation with the USFWS and USEPA, which had a review role during the planning and design analysis. As the Section 506 authority intends, the recommended plan would restore and preserve ecosystems in congruence with the Council on Lakes Committee. This restoration project makes a significant contribution to regional, national, and international programs that include the North American Waterfowl Management Plan and Lake-wide Management Plans. This plan included an opportunity for open comment to ensure all stakeholder parties have had equal contribution.

Reasonableness of Costs

All costs associated with a plan were considered and tests of cost effectiveness and incremental cost analysis have been satisfied for the alternatives analyzed. The cost estimates were based on current ecosystem restoration projects of the like that are in construction.

Having established confidence in the estimated implementation costs, the remaining test of reasonableness is to assess the value of the resource to be improved based on the cost to implement the improvement. The importance of the Great Lakes in terms of habitat and human uses has been documented through numerous sources. The importance of the Great Lakes to the nation was established through Executive Order 13340. As previously noted, the Great Lakes is one of the world's largest bodies of freshwater, providing drinking water, food, recreation, and aesthetics for about 32 million people.

In terms of non-monetary values, the ecosystem of Rosewood Park and its importance to the region is emphasized by the institutional significance of being surveyed by the Illinois Natural Areas Inventory. Observation of fish and plant ecology in the immediate area classifies this site as critical habitat for rare and conservative flora (e.g. state listed marram grass) and fauna, inclusive of resident and migratory birds. These analyses conclude that restoration and preservation measures are well worth the investment.

The NER/Preferred Plan

The plan that reasonably maximizes net national ecosystem restoration benefits, consistent with the Federal objective, is identified as the NER plan. All alternatives (1 through 8) were deemed "cost effective" and "best buy" plans in terms of costs per benefit. Upon review of the cost effective and incremental cost analysis data (Figure 5, Table 8), two significant break points in the incremental cost analysis were identified. The significant break points were between alternative plans 4 and 6 and alternative plans 7 and 8; therefore, alternative plans 4, 6, and 7 were considered to be primary contenders for the preferred plan.

Alternative 4 includes the restoration of bluff, ravine, and savanna habitat through the removal of invasive vegetation and the planting of native species. Alternative 4 was considered significant since implementation of this plan would have increased the overall habitat unit

outputs by 7.2 points. Although benefits would have increased with the implementation of alternative 4, this plan was not chosen as the preferred plan since it would not have restored the entire site. Implementation of alternative 4 would have only addressed 1 of the 5 resource problems identified at Rosewood Park (Section 2.8): instability of coastal communities caused by infestation of invasive woody and herbaceous species. Since alternative 4 did not holistically address the resource problems identified at the project site, it was not chosen as the preferred alternative.

Alternative 6 included the restoration of beach & dune, bluff, ravine, savanna, and stream habitat through the removal of invasive vegetation, planting of native species, and removal of double box culvert and degraded weirs from the stream habitat. Implementation of alternative 6 would have produced 31.3 habitat units overall in comparison to alternative 4 which would have only produced 27.2 habitat units. Although alternative 6 increased the overall habitat unit outputs, it only fully addressed 3 of the 5 resource problems identified at Rosewood Park (Section 2.8): instability of coastal communities caused by infestation of invasive woody and herbaceous species, stormwater runoff and sediment loading, and fragmentation of ravine habitat from Lake Michigan. The remaining 2 resource problems, erosional conditions caused by improperly placed infrastructure and instability of coastal communities caused by manmade structures, were only addressed in the stream habitat and not in the lacustrine habitat. Since alternative 6 did not fully address the resource problems identified at the project site, it was not chosen as the preferred alternative.

Alternative 7 included the restoration of beach & dune, bluff, ravine, savanna, stream, and lacustrine habitat through the removal of steel groins and replacement with more naturalistic wave breaks, removal of box culvert and degraded weirs from stream habitat, removal of invasive vegetation, and planting of native species. Alternative 7 only increased the number of overall habitat units produced by 2.3 points from alternative 6; however, alternative 7 addressed all of the resource problems in all the habitat types identified at Rosewood Park (Section 2.8): erosional conditions caused by improperly placed infrastructure, instability of coastal communities caused by infestation of invasive woody and herbaceous species, manmade structures, stormwater runoff and sediment loading, and fragmentation of ravine habitat from Lake Michigan.

Alternative 7 produces annual benefits of 33.6 net AAHUS over the approximately 7 acre project footprint, and was the only best buy plan that addressed all of the resource problems identified at Rosewood Park. Thus, the plan that maximizes net NER benefits, is the most cost effective, and provides a best buy, is alternative 7. In keeping with the NER objective of water resources planning, the plan that reasonably maximizes ecosystem benefits compared to costs is selected for implementation unless there are compelling reasons not to do so. Therefore, the NER plan, Alternative 7, is also the preferred plan.

4. Description of Preferred Plan

4.1 Plan Components

The Preferred Plan (Figure 6) addresses the identified resource problems so that the ecological integrity of Rosewood Park and to a larger extent the southeastern coast of Lake Michigan, can be loosely returned to its pre-anthropogenic structure and function. The study area is comprised of lacustrine, ravine, beach & dune, bluff, and savanna communities which are currently under a high degree of pressure from invasive species within the site. In addition, manmade structures have impaired stream hydraulics and hydrology, stream mouth and lake connectivity, natural lacustrine processes, and aquatic species dispersal within the study area. Without implementation of the Preferred Plan, this parcel of highly unique habitats (e.g. coastal bluff, oak savanna, coastal ravine, etc.) will become skewed resulting in a shift towards a highly disturbed community with habitats dominated by invasive species such as common buckthorn (*Rhamnus cathartica*), glossy buckthorn (*Frangula alnus*), European highbush cranberry (*Viburnum opulus*), black locust (*Robinia pseudoacacia*), staghorn sumac (*Rhus typhina*), Norway maple (*Acer platanoides*), gray dogwood (*Cornus racemosa*), white mulberry (*Morus alba*), green ash (*Fraxinus lanceolata*), cottonwood (*Populus deltoides*), and basswood (*Tilia americana*). Lacustrine and stream communities will also become further degraded from continued discontinuity, increasing channel incision, and further loss of species diversity without implementation of the Preferred Plan. However, with implementation of the Preferred Plan, Rosewood Park will become harmonized causing a shift towards a more desirable state, with a restored ravine/lacustrine system and the colonization of native plant species specific to foredune, bluff, riparian, and savanna communities.

The Preferred Plan includes restoring the connectivity of the ravine mouth to its outlet, Lake Michigan. The ravine is currently unstable due to the increased volume of water (primarily stormwater runoff) it must handle as a result of a plethora of impervious surfaces within the Highland Park area. The increased surface flow exacerbates stream downcutting which causes the lower banks adjacent to the stream to become steeper and eventually slump inward. Slumping of the banks then threatens the native trees and herbaceous growth which make the ravines such an ecological significance (Weiland, 2009; Shabica et al., 2010). Restoration will include the complete removal of the box culvert and instream weirs which are adding to the incision of the ravine channel, impeding upstream aquatic species dispersal, and connectivity of the stream mouth with its outlet Lake Michigan. A sufficient number of natural occurring riffles currently exist within the ravine upstream of the box culvert, such that construction of additional riffles is not warranted. The daylighted channel; however, will have a streambed of gravel/pebble/cobble placed as well as two cobble/boulder riffles constructed to repair stream mouth hydraulics. Restoration of the daylighted channel will also include a light grading of the streambanks to return appropriate bank slopes as well as plantings of native riparian vegetation to promote bank stabilization.

Lacustrine restoration is also addressed within the Preferred Plan. The lacustrine habitat is currently threatened by intense urbanization, loss of beach habitat, and increased stormwater runoff. Without proper coastal stabilization at Rosewood Park the following would likely occur or continue to occur: inhibited lacustrine sediment transport, further loss of beach habitat, erosion of the bluff toe resulting in bluff failure, and colonization of degraded and disturbed habitats by invasive species (Shabica et al., 2010). With implementation of the Preferred Plan, the four steel groins would be completely removed and replaced with limestone riprap and glacial boulder lined wavebreaks. Foredune and beach habitat would be restored through beach nourishment, removal of invasive species, and planting of native grasses. Over time, the more natural wavebreaks would promote lacustrine sediment transport, protect the bluff toe from further erosion, encourage the formation of pocket beaches, and provide increased aquatic species habitat.

The final measures of the Preferred Plan include restoration of bluff, ravine, and savanna habitat. These habitats unique to the Lake Michigan coast line have become degraded over time primarily due to anthropogenic activities (e.g. urbanization). Plant communities within these habitats have become degraded from the colonization of invasive and non-native plant species as well as the suppression of a natural fire regime. Targeted invasive species to be removed and/or cleared during implementation of the Preferred Plan include common buckthorn (*Rhamnus cathartica*), glossy buckthorn (*Frangula alnus*), European highbush cranberry (*Viburnum opulus*), black locust (*Robinia pseudoacacia*), staghorn sumac (*Rhus typhina*), Norway maple (*Acer platanoides*), gray dogwood (*Cornus racemosa*), white mulberry (*Morus alba*), green ash (*Fraxinus lanceolata*), cottonwood (*Populus deltoides*), and basswood (*Tilia americana*) as well as other species. Common buckthorn (*Rhamnus cathartica*) and glossy buckthorn (*Rhamnus frangula*) are trees and shrubs native to much of Europe and western Asia and are considered as highly invasive exotics in the U.S. Both species have an affinity for disturbed, open, and moist habitats within their native ranges. Through eradication of these species as well as others, resulting benefits will include the reversal or prevention of their impacts which include changes in soil nitrogen, alteration of native understory species abundance, decline in native tree seedling density, and effects on wildlife that may not be able to use the invasive species for habitat or foraging (Frappier et al., 2003; Knight et al., 2007). Through eradication of these invasive and non-native species, native plant diversity within the bluff, ravine, and savanna habitats is expected to increase.

Recreational features have not been proposed as part of this project, because of the ecosystem restoration component as well as the significant number of recreational amenities that are already offered by the PDHP at Rosewood Park.

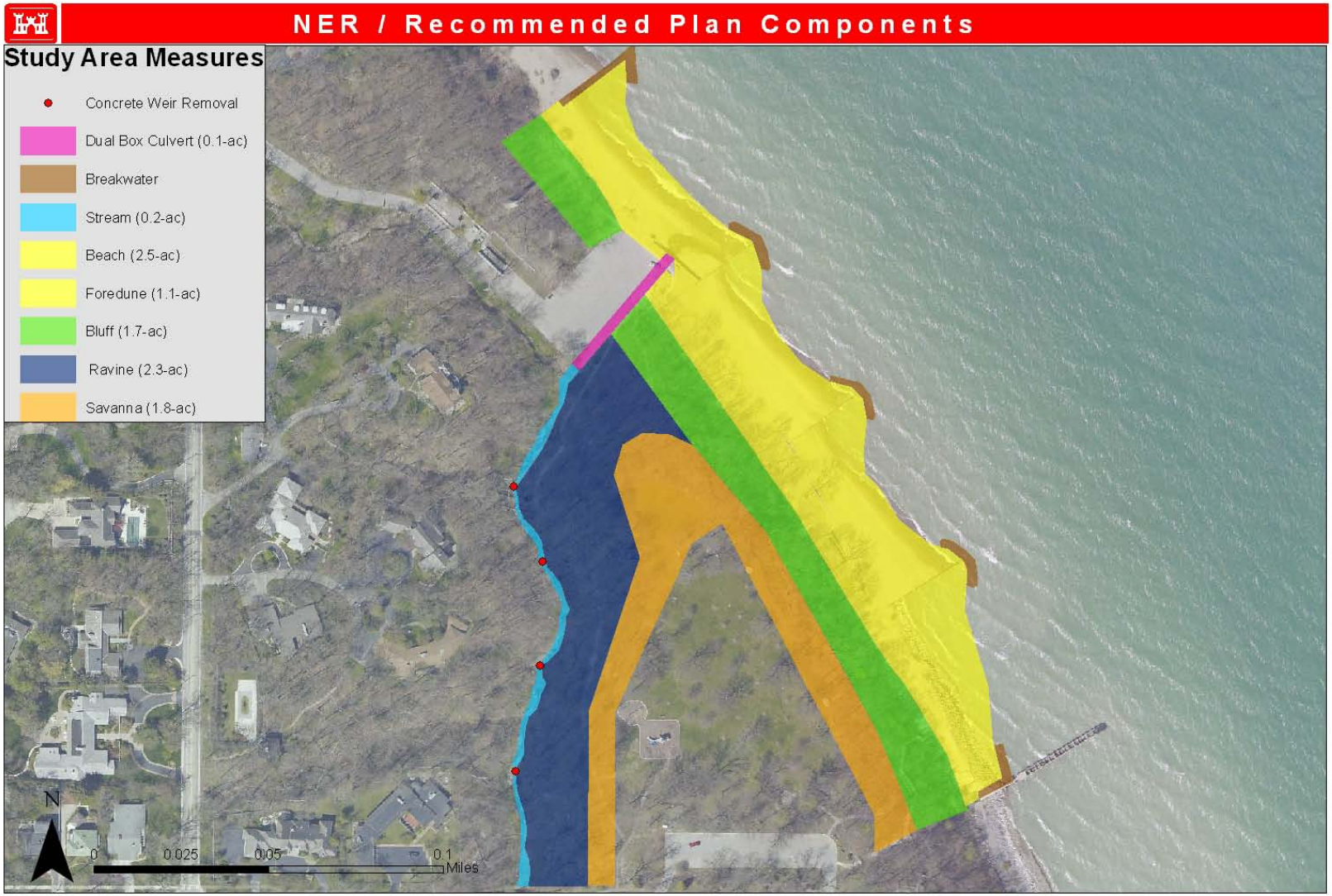

Figure 6. Schematic for the Rosewood Park Preferred Plan.

4.2 Plans & Specifications

The plans and specifications for this project are 30% complete.

4.3 Monitoring & Adaptive Management Plan

Section 2039 of WRDA 2007 directs the Secretary to ensure that when conducting a feasibility study for a project (or a component of a project) for ecosystem restoration that the recommended project includes a plan for monitoring the success of the ecosystem restoration. Within a period of ten years from completion of construction of an ecosystem restoration project, monitoring shall be a cost-shared project cost.

A five year monitoring plan following completion of construction will be implemented for Rosewood Park.

4.4 Real Estate

The Real Estate Plan for the project site was developed by the Detroit District's Real Estate Division. The Real Estate Plan is included as Appendix E, which was reviewed and approved through a formal ATR and the gross appraisal was approved by Division. The current non-Federal LERRDs credit is estimated at $[redacted].

4.5 Operation and Maintenance

The O&M costs of the project are estimated to total an annual cost of $[redacted] with a 4.875% interest rate over 50-years. Maintenance includes periodic application of spot-treatment herbicide to prevent non-native and exotic species colonization, as well as periodic selective tree removal to maintain openness of the canopy. Throughout the life of the project, additional fill may be needed to maintain beach features, lacustrine wavebreaks, and stream riffles. A detailed O&M Manual containing all the duties will be provided to the non-Federal sponsor after construction is closed out.

4.6 Division of Responsibilities

<u>Financial Data</u>

As established in PL99-662, as amended, project costs are shared with the non-Federal sponsor in accordance with project outputs. Project elements providing aquatic ecosystem restoration benefits are cost shared based on the cost sharing provisions in Section 506 of the 2000 WRDA. Section 506 requires non-Federal interests to pay 35 percent of the cost of the project assigned to aquatic ecosystem restoration during construction and to provide all land, easements, rights-of-way, relocations, and disposal areas (LERRDs).

The Park District of Highland Park has agreed to serve as the local cost-sharing sponsor for the Rosewood Park ecosystem restoration project. The cost-sharing requirements and provisions will be formalized with the signing of the Project Partnership Agreement (PPA) between the local sponsor and USACE prior to initiation of contract award activities. In this agreement, the local sponsor will agree to pay 35 percent of the total project costs. Based on the cost-sharing requirements, the total project cost and pertinent cost-sharing information for the restoration project are summarized in Tables 9 and 10.

Table 9. Breakdown of total project costs.
INTENTIONALLY REMOVED

Table 10. Cost sharing breakout in 1000's.
INTENTIONALLY REMOVED

Federal Responsibilities - The estimated Federal cost share of the project is about $[redacted]. The USACE would contract for construction, overall supervision during construction, prepare an operation and maintenance manual, and participate in a portion of the post construction monitoring.

Non-Federal Responsibilities – A PPA will be required from the nonfederal sponsor, under which the sponsor will agree to:

1. Provide 35 percent of the separable project costs allocated to environmental restoration as further specified below
    a) Provide the non-Federal share of all complete planning and design work upon execution of the PPA
    b) Provide all lands, easements, and rights-of-way, including suitable borrow and dredged or excavated material disposal areas, and perform or ensure the performance of all relocations determined by the government to be necessary for the construction and O&M of the project
    c) Provide or pay to the government the cost of providing all features required for the construction and O&M of the project
    d) Provide, during construction, any additional costs as necessary to make its total contribution equal to 35 percent of the separable project costs allocated to environmental restoration
2. Contribute all project costs in excess of the Federal Statutory limitation of $5,000,000
3. For so long as the project remains authorized, operate, maintain, repair, replace, and rehabilitate the completed project or the functional portion of the project at no cost to the government in accordance with applicable federal and state laws and any specific directions prescribed by the government
4. Give the government a right to enter, at reasonable times and in a reasonable manner, upon land that the local sponsor owns or controls for access to the project for the purpose of inspection and, if necessary, for the purpose of completing, operating, maintaining, repairing, replacing, or rehabilitating the project
5. Assume responsibility for operation, maintenance, repair, replacement, and rehabilitation (OMRR&R) of the project or completed functional portions of the project, including mitigation features, without cost to the government in a manner compatible with the project's authorized purpose and in accordance with applicable federal and state laws and specific directions prescribed by the government in the OMRR&R manual and any subsequent amendments thereto

6. Comply with Section 221 of Public Law (P.L.) 91-611, Flood Control Act of 1970, as amended, and Section 103 of the WRDA of 1986, as amended, which provides that the Secretary of the Army shall not commence the construction of any water resource project or separable element thereof until the nonfederal sponsor has entered into a written agreement to furnish its required cooperation for the project or separable element
7. Hold and save the United States free from damages due to construction of or subsequent maintenance of the project except those damages due to the fault or negligence of the United States or its contractors
8. Keep and maintain books, records, documents, and other evidence pertaining to costs and expenses incurred pursuant to the project to the extent and in such detail as will properly reflect total project costs
9. Perform or cause to be performed such investigations for hazardous substances that are determined necessary to identify the existence and extent of any hazardous substances regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 *U.S. Code* 9601 through 9675, that may exist in, on, or under lands, easements, or rights-of-way necessary for the construction, and O&M of the project, except that the nonfederal sponsor shall not perform investigations of lands, easements, or rights-of-way that the government determines to be subject to navigation servitude without prior written direction by the government
10. Assume complete financial responsibility for all necessary cleanup and response costs for CERCLA-regulated material located in, on, or under lands, easements, or rights-of-way that the government determines necessary for the construction and O&M of the project
11. To the maximum extent practicable, conduct OMRR&R of the project in a manner that will not cause liability to arise under CERCLA
12. Prevent future encroachment or modifications that might interfere with proper functioning of the project
13. Comply with the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, P.L. 91-646, as amended in Title IV of the Surface Transportation and Uniform Relocation Assistance Act of 1987, P.L. 100-17, and the uniform regulation contained in Part 24 of Title 49, *Code of Federal Regulations* (CFR), in acquiring lands, easements, and rights-of-way for construction and subsequent O&M of the project, and inform all affected persons of applicable benefits, policies, and procedures in connection with said acts
14. Comply with all applicable federal and state laws and regulations, including Section 601 of Title VI of the Civil Rights Act of 1964, P.L. 88-352, and Department of Defense Directive 5500.11 issued pursuant thereto and published in 32 CFR, Part 300, as well as Army Regulation 600-7 entitled "Non-Discrimination on the Basis of Handicap in Programs and Activities Assisted or Conducted by the Department of the Army"
15. Provide 35 percent of that portion of the total cultural resource preservation, mitigation, and data recovery costs attributable to environmental restoration that are in excess of 1 percent of the total amount authorized to be appropriated for environmental restoration
16. Do not use federal funds to meet the nonfederal sponsor's share of total project costs unless the federal granting agency verifies in writing that the expenditure of such funds is expressly authorized by statute

Financial Capability of Sponsor

The Park District of Highland Park provided a letter of intent in which it stated it is prepared to negotiate a Project Partnership Agreement and meet its obligations. The letter clearly indicates that the PDHP understands the local requirements including the O&M necessary after completion of the project.

5. Environmental Assessment

This assessment involves the identification of direct, indirect and cumulative environmental effects to the current conditions stemming from the No Action and the Preferred Plan:

For the most part, No Action would result in the continued degradation of Rosewood Park's plant and bird communities. The Preferred Plan, Alternative 7, would significantly improve habitat for birds, mammals, amphibians, and other fauna that depend on the bluff-lacustrine interface. Invasive species removal and recovery of the native seed bank would significantly improve the floristic quality of the site as well.

5.1 Direct & Indirect Effects of Alternative Plans

5.1.1 Physical Characteristics

Climate – The minor scale of the Preferred Plan would not be able to affect the regional climate. The increase in acreage of natural plant communities would increase evapotranspiration in a minor way, but still not great enough to affect weather patterns or rainfall within the region. No significant adverse effects are expected as a result of implementing the Preferred Plan.

Geology & Glacial Stratigraphy – Neither the No Action Alternative or the Preferred Plan would adversely affect geology or glacial stratigraphy. All of the proposed features under the Preferred Plan are too small in scale to affect local geology and glacial stratigraphy.

Soils – Implementation of the Preferred Plan would result in beneficial effects to natural soils within the watershed. Currently at the study site, natural soils for the most part have already been destroyed. Only those soils along the ravine, upland edge and down the bluff, the beach, and some of the parkland are considered intact with the exception of disruption to their A horizons due to years of tilling, fertilization, carbon stripping, and overwatering. Through the reestablishment of groundwater hydrology, returning native plant communities, and the return of mycorrihizzal fungi/bacterial interactions, overtime the A horizons of these soils would heal, thusly feeding back to diversify the native plant and animal assemblages of those restored soils. Since the Preferred Plan would be implemented in a fashion as to facilitate the return of natural soil structure, no significant adverse affects resultant from implementing the Preferred Plan are expected.

Fluvial Geomorphology & Topography – Implementation of the Preferred Plan would result in beneficial effects to fluvial geomorphology and natural topography within the project area limits. Removal of the adverse affects associated with the 4 degraded concrete weirs and box culvert would restore sediment transport and critical hydraulic parameters within the project reach. Fluvialgeomorphic processes would be further restored by removing buckthorn thickets that cause banks to unravel and unnaturally erode. Topography would be manipulated in the

daylighted stream portion as well as for beach and dune habitat. However, this light contouring will help achieve the proper hydrogeomorphic setting for the proposed native plant communities. Therefore, no adverse affects to fluvial geomorphology and topography are expected resulting from the implementation of the Preferred Plan.

Littoral Processes – The No Action Alternative would continue to prevent natural lacustrine processes. Implementation of the Preferred Plan would remove the steel groins which are inhibiting littoral drift, and replace with nearshore breakwaters that would promote lacustrine processes, provide aquatic species habitat, and protect the bluff toe from erosion. While the nature of the proposed nearshore breakwaters is to trap sediment and stabilize beach fill, the amount of littoral drift that will enter the proposed beach cells at Rosewood Park under certain climatic conditions are expected to be small in comparison to the overall longshore sediment transport in the area. The proposed structures at Rosewood Park as part of the Preferred Plan are considered relatively unobtrusive in terms of their extension into the littoral transport zone of Lake Michigan. Major structures to the north such as Waukegan Harbor and the Great Lakes Naval Station are examples of large littoral barriers which greatly reduce downdrift transport. The IDNR document titled "Guidelines for the Submittal of Application for Illinois Department of Natural Resources, Office of Water Resources Permits for Shore Protection Projects in Lake Michigan" states "To ensure that these types of project will not trap sand moving along the shoreline (littoral drift), the project should include the placement of clean sand in an amount equal to 120% of its potential capacity to retain sand." In accordance with the permit, the nearshore breakwaters at Rosewood Park will be backfilled to 120%; therefore, no significant adverse affects from implementing the Preferred Plan are expected.

Hydrology & Hydraulics – Removal of deteriorating concrete weirs as part of implementation of the Preferred Plan, would have minimal effects to local hydrology. The weirs are unnatural and are already so degraded that they are not maintaining flow within the stream as originally intended. Removal of the weirs would return the ravine to a more naturalistic flow with series of riffles and pools leading to the mouth of the stream.

Stream hydraulics would benefit with the implementation of the Preferred Plan. Currently, the homogenous habitat and unnaturalistic concrete weirs disallow for proper hydraulics to support a diverse and native stream community. By removing the degraded manmade structures, daylighting the stream, and increasing channel roughness (i.e. cobble riffles), the proper hydraulics would be restored to the stream community resulting in an increase in aquatic species richness and abundance. Sediment transport and stream geomorphology would be positively affected downstream of implemented riffles. With the addition of riffles, sediment transport would likely decrease downstream by flow being decreased allowing sediment deposition to occur within pools. Since the Preferred Plan would be implemented in a fashion to attenuate flood waters and to provide the proper channel roughness for stream organisms, no significant adverse affects resultant from implementing the Preferred Plan are expected.

5.1.2 Biological Resources

General Study Area Habitat – The project area encompasses approximately 7 acres along the southwestern coast of Lake Michigan. The current habitat types that exist are lacustrine, stream, ravine, beach & dune, bluff, and savanna. An increase in ecological integrity is expected of the restoration as it will increase species diversity throughout project site. The preferred plan would not have any adverse effects on the current habitat.

The National Oceanic and Atmospheric Administration (NOAA) has produced a series of Environmental Sensitivity Index (ESI) maps for the Lake Michigan Shorelines of Indiana and Illinois http://epa.gov/glnpo/lakemich/esi/index.html. The ESI maps include information for three main components: shoreline habitats, sensitive biological resources, and human use resources.

The classification of coastal habitat designated by the NOAA for purposes of oil spill cleanup is: MIXED SAND AND GRAVEL BEACHES ESI = 5

- These beaches are composed of a wide range of mixtures of sand and gravel (greater than 10 percent of each).
- Because of the mixed sediment sizes, there may be zones of pure sand, pebbles, or cobbles.
- Where the beach is depositional, there can be multiple berms from the different water levels generated during storms.
- Where the beach is stable or erosional, the sediments are a jumble of grain sizes with the gravel scattered over a relatively wide, flat surface.
- These beaches may be used by migrating shorebirds.
- Mixed sand and gravel beaches are common throughout the study area, comprising 14.7 percent of the shoreline.

PREDICTED OIL BEHAVIOR

- Small oil spills will be deposited at the high-water line.
- Large spills will spread across the entire beachface.
- Oil penetration into the beach sediments may be up to 50 cm; however, the sand fraction can be quite mobile, and oil behavior is much like on a sand beach if the sand fraction exceeds about 40 percent.
- Burial of oil may be deep at and above the swash line, where oil tends to persist, particularly where beaches are only intermittently exposed to waves.
- On more sheltered beaches, extensive pavements of asphalted sediments can form if there is no removal of heavy oil accumulations, because most of the oil remains on the surface.
- Once formed, these pavements are very stable and can persist for many years.

- Biological impacts are likely to be low, except for when the beaches are being used by shorebirds for resting and foraging.

Plant Communities – The Preferred Plan would ultimately improve native floristic species richness and abundance of the restored areas by removing invasive species and seeding areas with native vegetation exhibiting local genotypes.

Aquatic Communities – Without implementation of the preferred plan, the abundance of non-native fishes and/or tolerant species would remain the same or slightly increase. With implementation of the preferred plan the total abundance of non-native fishes and/or species tolerant to environmental stressors such as common carp would decrease, while the total abundance of native fishes such as sand shiner (*Notropis stramineus*), longnose dace (*Rhinichthys cataractae*), and river chub (*Nocomis micropogon*) would increase. Overall, the preferred plan would not have any adverse effects to the study area's fish population, but would instead increase species richness and abundance through improved stream hydraulics from placement of instream cobble riffles and the removal of manmade structures. It is expected that the aquatic habitat provided by this project will benefit fishes within a 25-mile radius of the project site.

Macroinvertebrates – The lack of instream habitat and hydraulics currently limits the ability of the Rosewood Park ravine stream to support a diverse aquatic macroinvertebrate community. Without implementation of the preferred plan the aquatic macroinvertebrate community would continue to lack diversity and be composed primarily of those species characteristic of a degraded stream system. With implementation of the Preferred Plan the aquatic macroinvertebrate community of Rosewood Park would increase in species richness and abundance due to restored hydraulics resultant from the placement of instream cobble riffles.

The terrestrial macroinvertebrate community has not been thoroughly studied at the Rosewood Park study area. However, the implementation of the Preferred Plan and the restoration of native plant communities and heterogenous habitat; the terrestrial macroinvertebrate community would be expected to benefit with an increase in species richness and abundance.

Herpetofauna Community – The Preferred Plan would not have any adverse effects to the herpetofauna assemblage of Rosewood Park. With implementation of the Preferred Plan which includes native plant community restoration along the ravine stream and the addition of instream habitat; aquatic reptiles and amphibians would benefit through an increase in food and refuge.

Avian Community – The No Action Alternative would have potential negative effects to the avian community of Rosewood Park. The No Action Alternative would foster the continued degradation of habitat by non-native and invasive vegetation, thereby making the area less desirable for resident and migratory bird populations that utilize the area. With implementation of the Preferred Plan migratory and resident bird species habitat would be

restored and improved with the removal of invasive species and by allowing the rare and conservative plant species to recover through seeding and planting. Natural refuges would be restored for those species utilizing the Lake Michigan Flyway as part of the Preferred Plan. According to the Chicago Region Audubon Society, the western shoreline of Lake Michigan is the only globally significant portion of migratory flyway in North America. It is critically important because of the paucity of available habitat to rest and refuel through the heavily urbanized corridor of Milwaukee, Chicago, and northwest Indiana. There are over 200 species of neotropical migrants and the numbers during the heaviest nights of migration have been reported to be up to 30 million birds. Therefore, implementation of the Preferred Plan would directly benefit the resident and migratory bird assemblage at Rosewood Park.

Mammalian Community – The Preferred Plan would not have any adverse effects to the mammal assemblage of Rosewood Park. The mammal assemblage is expected to benefit through the restoration of the project area. With the removal of invasive vegetation and successional woody species, an increase in desirable mammal abundance would occur.

Threatened & Endangered Species – The No Action Alternative would support the continued degradation of the site which would in turn prevent the colonization of any endangered or threatened species. Implementation of the Preferred Plan would only benefit endangered or threatened species if they colonize the project site. Restoration features would directly increase the quality of the habitat present at Rosewood Park; hence, encouraging habitation of the area by state listed species such the common tern (*Sterna hirundo*), Forster's tern (*Sterna forsteri*), marram grass (*Ammophila breviligulata*), false bugbane (*Cimicifuga racemosa*), downy false Solomon's seal (*Polygonatum pubescens*), ground juniper (*Juniperus communis*), and sea rocket (*Cakile edentula*).

Coordination with the U.S. FWS and the Illinois Department of Natural Resources (IDNR) was commenced on 20 July 2010 with a project scoping letter. Upon review of this document, the U.S. FWS concluded that the project is not likely to adversely affect federal or state listed species, and their letter dated 30 August 2010 (Appendix G), precluded the need for further consultation on the Rosewood Park restoration project as required under Section 7 of the Endangered Species Act of 1973, as amended. In a letter dated 29 July 2010 (Appendix G), the IDNR noted that records of the above state listed plant species were within half a mile of the project site; however, there are no records of these species occurring at the project site. The IDNR stated that it does not anticipate any adverse impacts to the listed species or sensitive aquatic habitats with the implementation of the proposed project. The intent of the Preferred Plan is to aid in the overall restoration of the Lake Michigan coastal ecosystem.

Natural Areas – The No Action Alternative would have adverse effects on nearby natural areas by providing a propagule source for non-native and invasive species, allowing them to spread to adjacent high quality habitats. The Preferred Plan would only have beneficial effects to surrounding natural areas and adjacent high quality areas. Through restoration of the site, high quality habitat would be available to migratory birds as well as other wildlife. In addition, significant communities such as foredunes, beaches, and bluffs would be restored.

5.1.3 Cultural & Archaeological Resources

Land Use – Implementation of the Preferred Plan would result in beneficial effects to land use within the watershed. The Preferred Plan would be implemented in a fashion as to return land use to its natural condition, no significant adverse effects resultant from implementing the Preferred Plan are expected.

Archaeological & Historic Properties – The project site has been highly disturbed in the past and no prehistoric archaeological sites or cultural material has ever been found. Since no intact archaeological sites are present on the site, the No Action Alternative and the Preferred Plan alternative would have no adverse effects.

Rosewood Park itself was listed as a historic property by the National Register of Historic Places in 1982. Rosewood Park was once the estate of U.S. clothier Julius Rosenwald, part owner and leader of Sears, Roebuck and Company. Famed landscape architect Jens Jensen was hired by Rosenwald to landscape the estate. All that remains today of Jensen's work is a reflecting pool, the surrounding at Upper Rosewood, and carriage. Project measures would not threaten the integrity of the remaining features of Jensen's work. At Upper Rosewood, restoration will be restricted to the savanna habitat surrounding the park area, and will not occur in the park area itself which was designed by Jensen and still contains the reflecting pool. Restoration features are planned within the stream habitat for which the carriage bridge spans; however, measures include only the removal of concrete weirs, invasive and non-native species removal, and planting of native species. The carriage bridge itself will not be part of any restoration measure and will not be adversely affected by the implementation of this project.

Coordination with SHPO was commenced on 20 July 2010 with a project scoping letter. An initial response letter was received from SHPO regarding the project on 3 August 2010 (Appendix G). Further coordination will occur during the 30-day public review and throughout subsequent phases of the project.

Social Impacts – During construction, increased traffic congestion would be localized and intermittent. Employment could increase slightly during construction, and the region's labor force should provide the necessary workers. Noise levels would be increased during construction from passing trucks. Any aesthetic impacts would be negligible and temporary. The project would have no significant adverse effect on human health or welfare, municipal or private water supplies, recreational or commercial fisheries, property values or aesthetic values.

Recreation – Currently recreational features and amenities offered at Rosewood Park include fishing, swimming, hiking, playgrounds, and picnic areas. The No Action Plan and Preferred Plan would not have any long-term adverse effects to recreation. Implementation of the Preferred Plan would be planned so as to minimize interference between recreational opportunities and construction activities related to the project. Any impacts to recreational opportunities from construction of the Preferred Plan would be temporary.

Environmental Justice – The project would not have an adverse effect on any low-income populations or minority populations. Any change in area use resulting from the project will not disproportionally affect one group of the local population more than another. Therefore, the residents of Highland Park would not be adversely affected (with regard to health, income, recreational opportunities, or overall quality of life) by the proposed project.
A database search of the EPA EJView mapping tool (Accessed 19 December 2011), revealed that within the portion of Highland Park containing the Rosewood Park project site, 0-10% of the population is considered below the poverty line and 0-10% of the population is considered as a minority. Since the overall project and the selected Preferred Plan is considered ecosystem restoration and will only benefit the surrounding environment and communities, no adverse effects to any minority populations and/or low income populations are expected.

5.1.4 Hazardous, Toxic, & Radioactive Wastes

In order to generate an HTRW report for the Rosewood Park, Highland Park, Illinois Project, three methods were employed:

- Database Review: Review of a database search provided by Environmental Data Resources (EDR) identified no sites on or adjacent to the project. Sites identified within a search radius of the project are not anticipated to interfere with the proposed construction activities for the reasons discussed in detail in Appendix D, such as their location from the project, or inactive or active in good standing status.
- Review of Existing Information: Existing information on this project reviewed grain size analysis, asbestos analysis, and historical maps. Grain size samples revealed few fine sand particles. The asbestos analysis found no asbestos fibers in any of the samples. Historical maps revealed the construction and installation of steel groins.
- Site Visit: A site visit revealed no additional HTRW concerns at the project site. Damaged concrete blocks and a large box culvert were observed along the ravine. Low sand levels, large stones, and steel groins were visible on the lower level of Rosewood Park. No debris was found on or adjacent to the project site.

No HTRW investigation can wholly eliminate uncertainty regarding the potential for HTRW associated with a project area. Performance of the HTRW investigation is intended to reduce, but not eliminate, uncertainty regarding the potential for HTRW in connection with a project area. As a result of this HTRW analysis, USACE has concluded that there is sufficient information to demonstrate that the work proposed for the Rosewood Park, Highland Park, IL site has little potential for encountering HTRW or non-HTRW contamination. For the full HTRW report please refer to Appendix D.

5.1.5 17 Points of Environmental Quality

The 17 points are defined by Section 122 of Rivers, Harbors & Flood Control Act of 1970 (P.L. 91-611) from (ER 1105-2-240 of 13 July 1978). The 17 points include noise, displacement of people, aesthetic values, community cohesion, desirable community growth, tax revenues,

property values, public facilities, public services, desirable regional growth, employment, business and industrial activity, displacement of farms, man-made resources, natural resources, air and water. Impacts to these identified points are not expected. All of these are discussed below.

Noise – Noise may be temporarily increased within the project area due to the presence of machinery used during construction. However, this would be a temporary increase that would extend only through the construction phase of the project.

Displacement of People – The project area is located within a park owned by the Park District of Highland Park. Therefore, none of the alternative plans would displace any local residents within the city of the study area.

Aesthetic Values – None of the alternative plans would reduce aesthetic values of the site or surrounding area. Aesthetic values would actually benefit from the construction of this project, since habitat within the project area would be restored to its native state.

Community Cohesion – None of the alternative plans would disrupt community cohesion. Community cohesion would be expected to benefit from the construction of this project, since restoration of the project area would provide additional conducive recreational activities (e.g. hiking and birding) for citizens of the surrounding communities to enjoy for years to come.

Desirable Community Growth – Over the past decade Highland Park has seen a 5.1% decrease in population; however, this declining trend was also observed in the metropolitan area of Chicago (6.9% decline) of which Highland Park is a suburb. None of the alternative plans associated with the restoration of Highland Park would adversely affect community growth.

Desirable Regional Growth – Over the past decade Highland Park has seen a 5.1% decrease in population; however, this declining trend was also observed in the metropolitan area of Chicago (6.9% decline) of which Highland Park is a suburb. None of the alternative plans associated with the restoration of Highland Park would adversely affect community growth.

Tax Revenues – None of the alternative plans would adversely or beneficially affect tax revenues.

Property Values – None of the alternative plans would have adverse affects on property values, but implementation of the plans has the potential to increase surrounding land values since the aesthetics would improve through project restoration measures.

Public Facilities – None of the alternative plans would adversely affect public facilities. Project construction would be planned so as to minimize any disturbance to public facilities located at Rosewood Park. In addition, any disturbance to public facilities would be minimal and temporary.

Public Services – None of the alternative plans would adversely affect public services. Project construction would be planned so as to minimize any disturbance to public services located at Rosewood Park. For example, construction would not begin until after beach season had ended so as not to disrupt access to the swim beach. In addition, any disturbance to public services offered at Rosewood Park would be minimal and temporary.

Employment – None of the alternative plans would adversely affect employment. Employment may actually benefit from the implementation of this project, since construction workers would be needed for the restoration.

Business and Industrial Activity – None of the alternative plans would adversely affect local commerce. Local commerce within the surrounding communities may actually benefit from the implementation of this project, since restoration of the project site would directly benefit Rosewood Park and compatible recreational activities such as birding and hiking. Visitors enjoying these amenities would most likely visit surrounding communities for hotels and dining opportunities which would benefit local commerce.

Displacement of Farms – None of the alternative plans would adversely affect farmland since restoration does not occur on agricultural fields.

Man-made Resources – None of the alternative plans would adversely affect man-made resources.

Natural Resources – The No Action Alternative allows for the continued degradation of native species, rare communities, and significant habitats. Natural resources would actually benefit from implementation of the Preferred Plan. Growth of native vegetation communities would be encouraged through the removal of non-native and invasive species from savanna, ravine, bluff, dune, and beach habitats. Connectivity of stream and lacustrine habitats as well as dispersal of aquatic species would be restored with the removal of manmade structures. The Preferred Plan would also support natural lacustrine processes with the removal of the steel groins and the placement of more natural shore protection structures.

Air – None of the alternative plans would adversely affect air quality. Due to the short duration and unpolluted nature of the restoration project, it is assumed that the project is below the de minimis level of PM 100 tons per year. As a reference, other Chicago District projects that are much larger in scale and earthwork have GCA well below the PM 100 tons per year.

Water – None of the alternative plans would adversely affect water quality. Water quality would actually benefit from the implementation of this project, since the placement of cobble riffles would reduce downstream sediment loading.

5.2 Cumulative Effects

Consideration of cumulative effects requires a broader perspective than examining just the direct and indirect effects of a proposed action. It requires that reasonably foreseeable future impacts be assessed in the context of past and present effects to the important resource. Often it requires consideration of a larger geographic area than just the immediate "project" area. One of the most important aspects of cumulative effects assessment is that it requires consideration of how actions by others (including those actions completely unrelated to the proposed action) have and will affect the same resources. In assessing cumulative effects, the key determinant of importance or significance is whether the incremental effect of the proposed action will alter the sustainability of resources when added to other present and reasonably foreseeable future actions.

Cumulative environmental effects for the proposed ecosystem restoration project were assessed in accordance with guidance provided by the President's Council on Environmental Quality (USEPA, EPA 315-R-99-002, May 1999). This guidance provides an eleven-step process for identifying and evaluating cumulative effects in NEPA analyses.

The overall cumulative impact of the Rosewood Park ecosystem restoration project is considered to be beneficial environmentally, socially, and economically. The restoration and preservation of approximately 7 acres of ravine, bluff, lacustrine, beach and dune, and savanna habitat will contribute to the overall preservation of habitat within Highland Park and to a larger degree, the Chicago Region.

Scoping

In this environmental assessment, the cumulative effects issues and assessment goals are established, the spatial and temporal boundaries are determined, and the reasonably foreseeable future actions are identified. Cumulative effects are assessed to determine if the sustainability of any of the resources is adversely affected with the goal of determining the incremental impact to key resources that would occur should the proposal be permitted.

The spatial boundary for the assessment has been broadened to consider effects beyond the footprint of Rosewood Park. The spatial boundary being considered is normally in the general area of the proposed ecological restoration; however, this area may be expanded on a case-by-case basis if some particular resource condition necessitates broadening the boundary.

The temporal boundaries considered are:

- Past – 1833 because this is the approximate time that the surrounding landscape was changed from its natural state.
- Present – 2012 when the decision is being made on the beneficial ecological restoration.

- Future – 2062, the year used for determining project life end, although the ecological restoration should last until a geologic event disturbs the area.

Projecting the reasonably foreseeable future actions is difficult at best. Clearly, the proposed action (ecological restoration) is reasonably foreseeable; however, the actions by others that may affect the same resources are not as clear. Projections of those actions must rely on judgment as to what are reasonable based on existing trends and where available, projections from qualified sources. Reasonably foreseeable does not include unfounded or speculative projections. In this case, reasonably foreseeable future actions include:

- Sowing of native plants to return plant communities across the landscape
- Stable growth in both population and water consumption near the study area
- Continued increase in tourism/recreation in the open spaces of the region
- Continued application of environmental requirements such as the Clean Water Act
- Implementation of various programs and projects to deal with runoff and waste water pollution and to restore degraded environments
- Community will increasingly value not only the open space but the biodiversity as well
- Improvement to nearby natural areas such as Ravinia Bluff and Fort Sheridan Bluff

5.2.1 Cumulative Effects on Resources

Physcial Characteristics

The Preferred Plan seeks to restore as well as preserve savanna, bluff, riverine, beach and dune, and lacustrine habitats. Implementing the preferred plan would significantly improve critical interrelationships between hydrology and the site's flora and fauna. Cumulatively, beneficial effects are expected. For example, a more natural hydrology will be restored to the ravine stream through the removal of the manmade hydrologic features (box culvert and concrete weirs) and the construction of cobble/boulder riffles. In addition, lacustrine habitat along the southwestern Lake Michigan coast line would benefit from the implementation of the Preferred Plan. Removal of the steel groyne erosion control structures and construction of the more naturalistic wavebreaks will promote the return of natural lacustrine processes such as littoral drift.

Biological Resources

The Preferred Plan seeks to restore as well as preserve savanna, bluff, riverine, beach and dune, and lacustrine habitats. Implementation of the preferred plan would allow for increased scales of habitat heterogeneity. Cumulatively, beneficial effects are expected. For example, implementation of the Preferred Plan would improve ecological function and specie richness within savanna, bluff, ravine, and beach & dune plant communities through the removal of invasive and non-native species and the planting of native species known to occur within these community types. Through the removal of manmade hydrologic features (box culvert and

concrete weirs) and the construction of cobble/boulder riffles within the ravine stream, aquatic species will benefit with increased habitat and the removal of impediments to upstream dispersal. In addition, lacustrine habitat along the southeastern Lake Michigan coast line would benefit from the implementation of the Preferred Plan. Removal of the steel groyne erosion control structures and construction of the more naturalistic wave breaks will increase habitat available to aquatic species as well as increase beach and foredune habitat available for colonization by state listed species such as marram grass (*Ammophila breviligulata*). Overall, the current conditions of ecological function and diversity would improve throughout the project area.

Cultural & Archaeological Resources

Implementing the preferred plan would not impact any cultural or historic properties. Rosewood Park itself was listed as a historic property by the National Register of Historic Places in 1982. Rosewood Park was once the estate of U.S. clothier Julius Rosenwald, part owner and leader of Sears, Roebuck and Company. Famed landscape architect Jens Jensen was hired by Rosenwald to landscape the estate. All that remains today of Jensen's work is a reflecting pool, the surrounding at Upper Rosewood, and carriage. Project measures would not threaten the integrity of the remaining features of Jensen's work. At Upper Rosewood, restoration will be restricted to the savanna habitat surrounding the park area, and will not occur in the park area itself which was designed by Jensen and still contains the reflecting pool. Restoration features are planned within the stream habitat for which the carriage bridge spans; however, measures include only the removal of concrete weirs, invasive and non-native species removal, and planting of native species. The carriage bridge itself will not be part of any restoration measure and will not be adversely affected by the implementation of this project. Therefore, cumulatively, adverse and beneficial effects are not expected. The current conditions of cultural or archaeological resources would remain intact.

Coordination with SHPO was commenced on 20 July 2010 with a project scoping letter. An initial response letter was received from SHPO regarding the project on 3 August 2010 (Appendix G). Further coordination will occur during the 30-day public review and during subsequent phases of the project.

Hazardous, Toxic, & Radioactive Wastes

In order to generate an HTRW report for the Rosewood Park, Highland Park, Illinois Project, three methods were employed:

- Database Review: Review of a database search provided by Environmental Data Resources (EDR) identified no sites on or adjacent to the project. Sites identified within a search radius of the project are not anticipated to interfere with the proposed construction activities for the reasons discussed in detail in Appendix D, such as their location from the project, or inactive or active in good standing status.

- Review of Existing Information: Existing information on this project reviewed grain size analysis, asbestos analysis, and historical maps. Grain size samples revealed few fine sand particles. The asbestos analysis found no asbestos fibers in any of the samples. Historical maps revealed the construction and installation of steel groins.
- Site Visit: A site visit revealed no additional HTRW concerns at the project site. Damaged concrete blocks and a large box culvert were observed along the ravine. Low sand levels, large stones, and steel groins were visible on the lower level of Rosewood Park. No debris was found on or adjacent to the project site.

No HTRW investigation can wholly eliminate uncertainty regarding the potential for HTRW associated with a project area. Performance of the HTRW investigation is intended to reduce, but not eliminate, uncertainty regarding the potential for HTRW in connection with a project area. As a result of this HTRW analysis, USACE has concluded that there is sufficient information to demonstrate that the work proposed for the Rosewood Park, Highland Park, IL site has little potential for encountering HTRW or non-HTRW contamination. For the full HTRW report please refer to Appendix D.

5.2.2 Cumulative Effects Summary

Along with direct and indirect effects, cumulative effects of the proposed restoration were assessed following the guidance provided by the President's Council on Environmental Quality. There have been numerous effects to resources from past and present actions, and reasonably foreseeable future actions can also be expected to produce both beneficial and adverse effects. In this context, the increments of effects from the proposed ecological restoration are relatively minor. Assessment of cumulative effects did reveal that long-term sustainability of any of the resources would be beneficially affected. Based on the expectation of continued sustainability of all resources, cumulative effects are not considered significant.

5.3 Compliance with Environmental Statutes

The plans presented in this Integrated Environmental Assessment are in compliance with appropriate statutes and executive orders including the Natural Historic Preservation Act of 1966; the Endangered Species Act of 1973; the Fish and Wildlife Coordination Act; Executive Order 12898 (environmental justice); Executive Order 11990 (protection of wetlands); Executive Order 11988 (floodplain management); and the Rivers and Harbors Act of 1899. The potential project is in compliance with the Clean Air Act; the Clean Water Act, and the National Environmental Policy Act of 1969.

5.3.1 Environmental Justice EO12898

To the greatest extent practicable and permitted by law, and consistent with the principles set forth in the report on the National Performance Review, each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as

appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations in the United States and its territories and possessions, the District of Columbia, the Commonwealth of Puerto Rico, and the Commonwealth of the Mariana Islands.

A database search of the EPA EJView mapping tool (Accessed 19 December 2011), revealed that within the portion of Highland Park containing the Rosewood Park project site, 0-10% of the population is considered below the poverty line and 0-10% of the population is considered as a minority. Since the overall project and the selected Preferred Plan is considered ecosystem restoration and will only benefit the surrounding environment and communities, no adverse effects to any minority populations and/or low income populations are expected.

5.3.2 Clean Air Act

Due to the small scale, short duration and unpolluted nature of the restoration project, it is assumed that the project is below the de minimis level of PM 100 tons per year. As a reference, other Chicago District projects that are much larger in scale and earthwork have GCA well below the PM 100 tons per year.

5.3.3 Section 404/401 of the Clean Water Act

A 404(b)(1) Determination was completed to assess effects of fill into the waters of the US (Appendix G). The current findings of compliance are as follows:

- No adaptation of the Section 404(b)(1) guidelines was made for this evaluation.
- No practical alternatives are available that produce fewer adverse aquatic impacts than the proposed plan.
- The proposed project would comply with applicable water quality standards.
- The project is in compliance with applicable Toxic Effluent Standards under Section 307 of the Clean Water Act; with the Endangered Species Act of 1973; with the National Historic Preservation Act of 1966; and with the Marine Protection, Research, and Sanctuaries Act of 1972.
- The proposed fill activity would have no significant adverse impact on human health or welfare, including municipal and private water supplies, recreational and commercial fisheries, plankton, fish, shellfish, or wildlife communities (including community diversity, productivity, and stability), species aquatic sites, or recreation, aesthetic, and economic values.
- Measures will be taken to minimize construction impacts such as: construction sequencing, stone stabilizing materials, erosion control matting and coir logs, and rapidly revegetate disturbed earth.
- On the basis of the Guidelines, the proposed site for the discharge of fill material is specified as complying with the requirements of these guidelines with the inclusion of

appropriate and practical conditions to minimize pollution or adverse impacts to the aquatic ecosystem.

Compliance under 401 is being pursued with the Illinois Environmental Protection Agency (ILEPA). During the design phase, a 401 application will be submitted to ILEPA in which they will review the proposed plans and drawings. It is anticipated 401 compliance will be awarded since instream features will improve water quality (i.e. riffles and native plantings).

5.3.4 Floodway Permit Compliance

A State of Illinois Floodway permit will be required for placing instream structures for habitat improvement within the ravine stream and lacustrine habitats. This permit would be acquired prior to the commencement of construction at some point during the plans and specifications phase as a joint application with the section 401 Clean Water Act.

5.3.5 USF&WS Coordination

Coordination with the U.S. FWS commenced on 20 July 2010 with a project scoping letter. Upon review of the scoping document and memorandum for record, the U.S. FWS concluded that the project is not likely to adversely affect federal or state listed species, and their letter dated 30 August 2010, precluded the need for further consultation on the Rosewood Park restoration project as required under Section 7 of the Endangered Species Act of 1973, as amended. The intent of the Preferred Plan is to aid in the overall restoration of the Lake Michigan coastal ecosystem.

5.3.6 Finding of No Significant Impact

A draft Finding of No Significant Impact (FONSI) of the Rosewood Park restoration project as it is currently considered by USACE may be found in Appendix G. After public review and comment of this project USACE will evaluate all comments received and modify the environmental assessment and project, if necessary, and document in the FONSI. If the evaluation concludes this action does not significantly affect the quality of the human environment the FONSI will be signed. If the evaluation concludes the project does significantly affect the quality of the human environment the project may be modified and if the impacts of the modified project are not reduced to a level that will not significantly affect the quality of the human environment, an environmental impact statement will be prepared for public review and comment.

6. Recommendation

I have considered all significant aspects of the problems and opportunities as they relate to the project resource problems of Rosewood Park. Those aspects include environmental, social, and economic effects, as well as engineering feasibility.

I recommend 7, which consists of restoring all communities within Rosewood Park. The recommended plan has a total project cost of approximately $[redacted] (2012 price levels). This plan provides 33.6 habitat units over 7 acres of bluff-lacustrine interface. All costs associated with the restoration and preservation of the Rosewood Park ecosystem has been considered.

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Frederic A. Drummond Jr.
Colonel, U.S. Army
District Commander

References

Buchholz, T. and T. Younos. 2007. Urban stream daylighting: case study evaluations. Virginia Water Resources Research Center VWRRC Special Report SR35-2007.

Chotkowski, M.A. and J.E. Marsden. 1995. Reproductive success of stocked lake trout in southwestern Lake Michigan. Illinois Natural History Survey Aquatic Ecology Technical Report 95/12.

Chrzastowski, M.J., T.A. Thompson, and C.B. Trask. 1994. Coastal geomorphology and littoral cell divisions along the Illinois-Indiana coast of Lake Michigan. Journal of Great Lakes Research 20:27-43.

Cronk, J.K. and M.S. Fennessy. 2001. Wetland Plants Biology and Ecology. New York: Lewis Publishers. 462pp.

Frappier, B., R.T. Eckert, and T.D. Lee. 2003. Potential impacts of the invasive exotic shrub *Rhamnus frangula* L. (glossy buckthorn) on forests of southern New Hampshire. Northestern Naturalist 10(3):277-296.

Horns, W.H. 1991. Site-specific substrate mapping of Julian's Reef. Illinois Natural History Survey Aquatic Ecology Technical Report 91/7.

Knight, K.S., J.S. Kurylo, A.G. Endress, J.R. Stewart, and P.B. Reich. 2007. Ecology and ecosystem impacts of common buckthorn (*Rhamnus cathartica*): a review. Biological Invasions 9:925-937.

Midwestern Regional Climate Center. 2011. Climate of the midwest: Chicago Botanical Garden, Illinois. Station ID 111497 (Cook County, IL). <http://mrcc.isws.illinois.edu/climate_midwest/maps/in_mapselector.htm> (Accessed 1 February 2011).

National Audubon Society, Inc. 2007 Audubon watchlist. <http://web1.audubon.org/science/species/watchlist/browseWatchlist.php> (Accessed 9 June 2011)

National Audubon Society, Inc. Common birds in decline. <http://stateofthebirds.audubon.org/cbid/browseSpecies.php> (Accessed 9 June 2011)

Packard, S. and C.F. Mutel. 1997. The tallgrass restoration handbook: for prairies, savannas, and woodlands. Washington: Island Press. 463pp.

Pinkham, R. 2000. Daylighting: new life for buried streams. Old Snowmass, Colorado: Rocky Mountain Institute. 73pp.

Rovey, C.W. II and M.K. Borucki. 1994. Bluff evolution and long-term recession rates, southwestern Lake Michigan. Environmental Geology 23:256-263.

Shabica, C.W., J.R. Jennings, M. Riley, and J. Boeckler. 2010. Stabilization of ravines, adjacent beaches, and bluffs on Lake Michigan. Shore & Beach 78(1):3-26.

Swink, F and G. Wilhelm. 1979. Plants of the Chicago region. 3rd edition. Indianapolis: Indiana Academy of Science.

Weiland, B. 2009. Stresses and opportunities in Illinois Lake Michigan watersheds: strategic sub-watershed identification process (SSIP). Alliance for the Great Lakes: Report for the Lake Michigan Watershed Ecosystem Partnership.

William, H.B. 1971. Summary of the geology of the Chicago Area. Circular 460. Illinois State Geological Survey, Urbana, IL:77 pp.

Zedler, J.B. and S. Kercher. 2004. Causes and consequences of invasive plants in wetlands: opportunities, opportunists, and outcomes. Critical Reviews in Plant Sciences 23(5):431-452.

Rosewood Park Coastal Section 506

Great Lakes Fishery and Ecosystem Restoration

Appendix A – H&H

Appendix A: Hydraulics and Hydrology

Introduction

In support of the ecological restoration efforts proposed in Rosewood Park, stream and lacustrine restoration measures including the removal of an existing double barrel 4'x7' box culvert in order to daylight the existing ravine stream and the creation of pocket beaches using nearshore rubble mound breakwater structures have been proposed. This appendix describes the engineering design consideration of these features.

Stream Restoration

The existing ravine stream currently travels from the top of the bluff down to the existing parking lot on Rosewood beach where it travels through a 200 foot 4'x7' double barrel box culvert before its outlet onto the beach and into Lake Michigan (see figure 1). To estimate the high flows that enter the ravine the capacity of the culvert at full flow was calculated using the Manning equation. To size the proposed channel to replace the existing culvert, the Manning formula was used to calculate the capacity of a trapezoidal cross section with consideration of the site specific constraints including a parking lot to the north and the existing bluff to the south (see attached calculations). Due to the proposed stream being located adjacent to the parking lot and existing bluff, stone protection will be placed along the banks to prevent long-term erosion of the side slopes.

Figure 1: Existing Box Culvert

Breakwater Design

Hydrodynamic Conditions

Rosewood Park is located in Highland Park, Illinois and is situated on the south western shore of Lake Michigan. The existing shoreline at Rosewood beach consists of a parking area and a beach stabilized by steel, shore-perpendicular groins. The regional area shoreline is situated such that winds from the north and easterly directions induce the most critical wave conditions at lakefront due to fetch lengths of 200-300 miles over the entire lake. The local shoreline is oriented approximately 330° from the north and shore normal is approximately 60°. Waves generated from the north and east fetches are referred to as Class III and Class II waves, respectively, while waves generated out of the southerly direction are

referred to as Class I waves (see figure 2 below). Class III waves were selected for the design criteria since they create the most severe conditions at the lakefront.

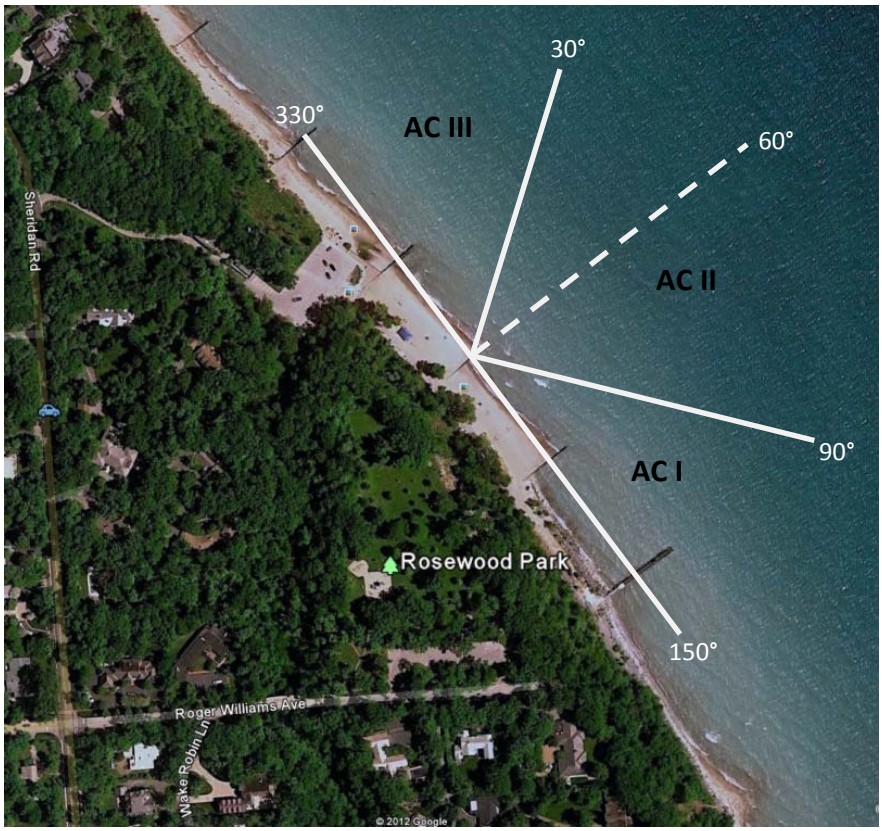


Figure 2: Angle Class Description

The proposed condition at Rosewood beach consists of removing the existing steel groins, and replacing them with nearshore, rubble mound breakwaters in conjunction with beach fill. In order to design the nearshore rubble mound breakwaters it was first necessary to transform deepwater waves in Lake Michigan to the nearshore environment (see attached calculations). For coastal projects having a 50-year design economic lifetime, USACE recommends designing for the larger of the combination of the 20-yr wave combined with a 10-yr lake level or a 10-yr wave with a 20-year lake level. It is understood that this combined event occurs on average once every 111 to 200 years. To obtain deepwater wave conditions in this area USACE Wave Information Studies (WIS) was used. The nearest available WIS station is WIS No. 4 located at 42.25°N, 87.73°S which is approximately 6 miles north and 2 miles east of the project site. Deep water wave conditions and periods for the 10-yr and 20-yr events are as follows:

	Angle Class II		Angle Class III	
Return Period (year)	Ho (ft)	Adjusted Period (s)	Ho (ft)	Adjusted Period (s)
10	11.8	10.1	18.7	12.2
20	12.5	10.3	19.4	12.3

Design water levels were taken from a publication titled “Design Water Level Determination on the Great Lakes” prepared by the USACE Detroit District. Water levels are recorded at Gage # 7044 located at Calumet Harbor, IL and at Gage # 7057 located in Milwaukee, WI. Since project location at Highland Park is approximately 1/3 of the distance from the Milwaukee Gage to the Calumet Harbor Gage it was necessary to interpolate between the gage locations to estimate a design water level at the project site. Water levels for the 10 and 20 year conditions are as follows:

Return Period	Calumet Harbor Gage (Feet - IGLD 85)	Milwaukee Gage (Feet - IGLD 85)	Interpolated Value (Feet - IGLD 85)
10	582.9	582.2	582.4
20	582.3	582.5	582.8

Bathymetric Data

Bathymetric data for the nearshore slope was obtained from a survey performed by JJR for the 2008 feasibility study completed for the Park District of Highland Park (PDHP) in support of shoreline developments proposed as part of the Highland Park Lakefront plan. Offshore bathymetry was taken from National Geophysical Data Center (NGDC).

Additional Design Considerations

An adjacent project in Lake Forest, Illinois (see figure 3) located approximately 6 miles north of the project site and situated on a similar shoreline orientation has been used as an indicator of potential project performance. Historic aerials show the beach has been relatively stable for at least 10 years beginning in 2002 and field inspection of the structure indicate structure stability.

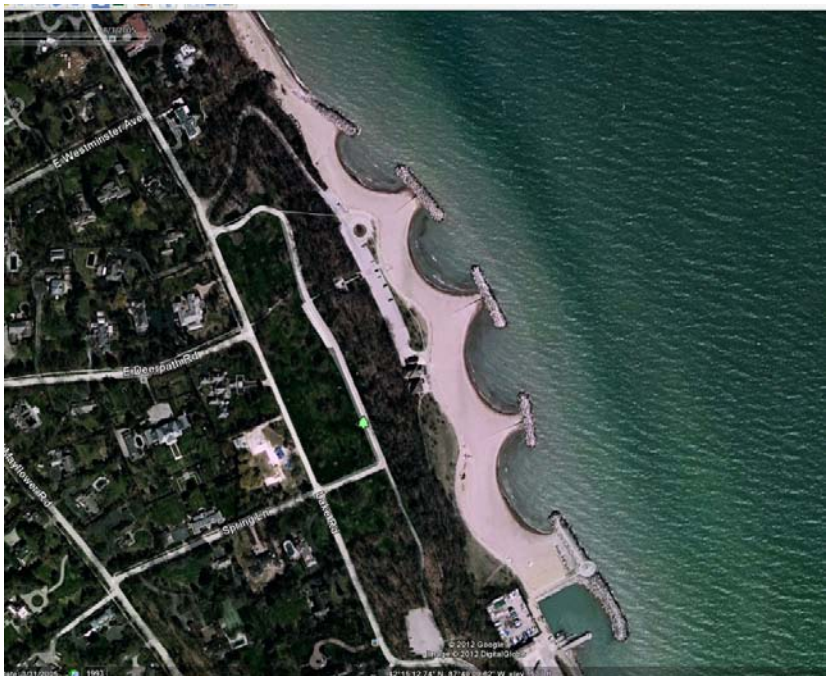


Figure 3: Lake Forest Project

Beach Fill Requirements

A permit from the Illinois Department of Natural Resources (IDNR) is required for any shore protection that involves building a beach. This requirement includes filling the beach to the maximum capacity of computed sand retention, plus a 20% overfill volume in addition to the capacity volume. The 20% overfill volume assures sand is available, if needed, for unforeseen adjustment to the nearshore beach profile.

Sand gradations to be used for fill will be discussed with the PDHP. It is expected that sand gradations used will be based on the existing gradations that currently exist on Rosewood Beach and produce the most stable slope for long term beach stability.

Conclusion

The preliminary calculations indicate design of this project is feasible under the assumed geologic and hydrodynamic conditions at the project site. Specific details regarding littoral impacts, structure overtopping, and wave forces in relation to the breakwaters will be explored during the design phase using computerized modeling. Armor stone sizes, along with structure dimensions will be compared with the adjacent project in Lake Forest to verify the final design. In addition, more detailed flow and velocity information for stone sizing related to the stream restoration and stabilization features will also be explored.

References

Rehabilitation of the Chicgao Shoreline: A Coastal Engineering Perspective. Micheael Krecic, P.E., Mark Wagstaff, P.E.

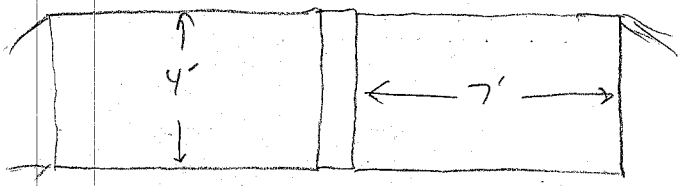
Goda, Y. 2000. *Random Seas and Design of Maritime Structures (2nd Ed.)*. World Scientific, River Edge, NJ.

Resio, D.T and Vincent, C.L. 1976. *Design Wave Information for the Great Lakes: Report 3 Lake Michigan*. Technical Report H-76-1. Waterways Experiment Station, Coastal Engineering Research Center, Vicksburg, MS.

Hubertz, J.M., D.B. Driver, and R.B. Reinhard. 1991. *Hindcast Wave Information for the Great Lakes: Lake Michigan*. WIS Report No. 24. Waterways Experiment Station, Coastal Engineering Research Center, Vicksburg, MS.

US Army Corps of Engineers Chicago District	PROJECT TITLE: Rosewood Park	COMPUTED BY:	DATE:	SHEET:	
	STRUCTURE TITLE: 4'x7' double box culvert	CHECKED BY:	DATE:	CONTRACT NO:	

Existing double 4'x7' box culvert capacity (-1

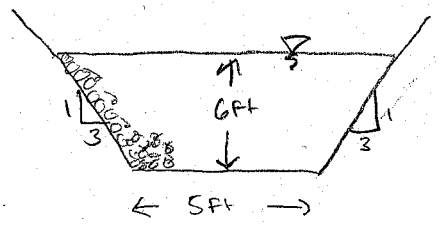


Assumptions:
- Full flow
- Slope = 0.001
- Length = 200 ft
- n = 0.012 (Concrete)

From manning $Q = \frac{1.49}{n} AR^{2/3} S^{1/2}$ = 129.1 cfs (one barrel)

$Q_{2\text{-barrels}}$ = 129.1 cfs x 2 = 258.2 cfs

Proposed channel capacity



Assumptions:

Slope = 0.001 (longitudinal)
Side slopes = 3:1 (H:V)
n = 0.05
Bottom width = 5 Ft
Depth = 6 Ft

From manning, $Q = \frac{1.49}{n} AR^{2/3} S^{1/2}$ = 283.2 cfs (4ft bottom = 267.1 cfs)

283 cfs > 258 cfs ✓ O.K.

US Army Corps of Engineers Chicago District	PROJECT TITLE: Rosewood Coastal	COMPUTED BY:	DATE:	SHEET: 1 of
	STRUCTURE TITLE: Breakwater	CHECKED BY:	DATE:	CONTRACT NO:

Deepwater Wave Conditions

From: "Hindcast wave information for the Great Lakes: Lake Michigan"
by Jon M. Hubertz, David B. Driver, Robin D. Reinhard

Deepwater Wave Conditions

Project site located at: 87.77 W, 42.17 N
WIS Station #4 located: 87.73 W, 42.25 N

	Class 1	Class 2	Class 3
10 year deep water waves:	2.8 m (9.2 ft)	3.6 m (11.8m)	5.7m (18.7 ft)
20 year deep water waves:	2.9 m (9.5ft)	3.8 m (12.5ft)	5.9 m (19.4 ft)

For coastal projects having 50-yr design economic lifetime, a combined lake level and deepwater wave corresponding to a 200-yr recurrence interval is recommended. This design will use the most conservative result based on a 10 yr lake level with a 20-yr wave and 20 yr lake level with 10 yr wave.

Annual Design Water Levels

From "Design Water Level Determination of the Great Lakes" prepared by U.S. Army Corps of Engineers. Annual design water levels:

Gage Location	10 yr SWL (IGLD 55)	20 yr SWL (IGLD 55)
Calumet Harbor	582.39 ft (582.93 ft IGLD 85)	582.74 ft (583.28 ft IGLD 85)
Milwaukee	581.68 ft (582.19 ft IGLD 85)	582.00 ft (582.51 ft IGLD 85)
Interpolated values: (project site)	582.4 ft (IGLD 85)	582.8 ft (IGLD 85)

Wave Periods

From "Design Wave Information for the Great Lakes" Technical report H-76-1 by Donald T. Resio and Charles L. Vincent (Grid point 33 - Highland Park)

	Class 2	Class 3		* Class 2	* Class 3
10 yr	8.1	10.2	+2.0 =>	10.1	12.2
20 yr	8.3	10.3		10.3	12.3

* USACE (1998) reported wave periods published by Resio & Vincent underestimate prototype periods by approximately 2 seconds.

1CStructure → Final

US Army Corps of Engineers Chicago District	PROJECT TITLE:	COMPUTED BY:	DATE:	SHEET: 2 of
	STRUCTURE TITLE:	CHECKED BY:	DATE:	CONTRACT NO:

Estimate nearshore wave conditions at proposed breakwater:

Assume breakwater will be placed 150 - 200 ft offshore.

From nearshore bathymetry data collected by JJR during 2008 feasibility study for Roseward Park:

Lake bed elevation approximately 200 ft from shoreline (toe of structure) = 573.00 (IGLD 85)

$SWL_{10yr} = 582.4$ ft $SWL_{2oyr} = 582.8$ ft

$d_{10yr} = 582.4 - 573 = 9.4$ ft $d_{2oyr} = 9.8$ ft

Wave Height (10 yr Lake / 20 yr wave – Class 3 wave)

$H_o = 19.4$ ft $t = 12.3$ s

$\frac{d}{L_o 2\pi} = \frac{d}{gT^2}$ $d = \frac{d L_o 2\pi}{gT^2}$ $L_o = \frac{gT^2}{2\pi} = \frac{(32.2\ ft/s^2)(12.3\ s)^2}{2\pi} \Rightarrow$

From Appendix C - Plate C-1 SPM: $L_o = 775.33$ ft

$\frac{d}{L_o} = 0.0121$ $\frac{H}{H_o'} = 1.37 \Rightarrow H_o = \frac{H}{1.37} = \frac{19.4}{1.37} = 14.16$ ft (Class 3)

Assume relatively flat lake bed (1/100)

$\frac{hd_{10}}{H_o'} = \frac{19.4\ ft}{14.16\ ft} = 0.66$ $\frac{H_o'}{L_o} = \frac{14.16}{775.33} = 0.018$

Goda (1985) figure 13.31: $\frac{H_s}{H_o'} = 0.50 \Rightarrow H_s = (0.50)(14.16\ ft)$

$H_s = 7.08$ ft = 7.1 ft

US Army Corps of Engineers Chicago District	PROJECT TITLE: Rosewood Park	COMPUTED BY:	DATE:	SHEET:	
	STRUCTURE TITLE: Armor Stone Sizing	CHECKED BY:	DATE:	CONTRACT NO:	

Size Armor Stone using Hudson Formula:

$$M_a = \frac{\rho_a H_s^3}{K_D \Delta_a^3 \cot\theta} \qquad \text{where} \quad \Delta_a = \frac{\rho_a}{\rho - 1}$$

Assume structure will have sideslopes 1.5:1 and $K_D = 2$

$$M_a = \frac{(165\ lb/ft^3)(7.1\ ft)^3}{(2.)(1.65)^3(2)} = 4616.89\ lbs = \underline{2.31\ tons}$$

$$D_{50} = \left(\frac{M_a}{\rho_a}\right)^{1/3} = \underline{3.03\ ft}$$

Submerged Breakwater Stability Factor (Structure will be partially submersed)

From Van der Meer 1991:

$$f_i = \left[(1.25) - 4.8\left(\frac{R_c}{H_s}\right)\left[\frac{S_{op}}{2\pi}\right]^{0.5}\right]^{-1.0}$$

Assume crest elevation of 585.0 (IGLD 85):

$R_c = 585 - 582.4 = 2.6$ $\quad H_s = 7.1\ ft$ $\quad \frac{R_c}{H_s} = 0.367$

$$S_{op} = \frac{H_s}{L_o} = \frac{7.1\ ft}{775.33\ ft} = .01$$

$$f_i = \left[(1.25) - 4.8(0.367)\left[\frac{0.01}{2\pi}\right]^{.5}\right]^{-1.0} = \underline{0.85}$$

Primary armor stone size = $(0.85)(D_{50}) =$ **2.6 ft**

From EM 1110-2-2904:

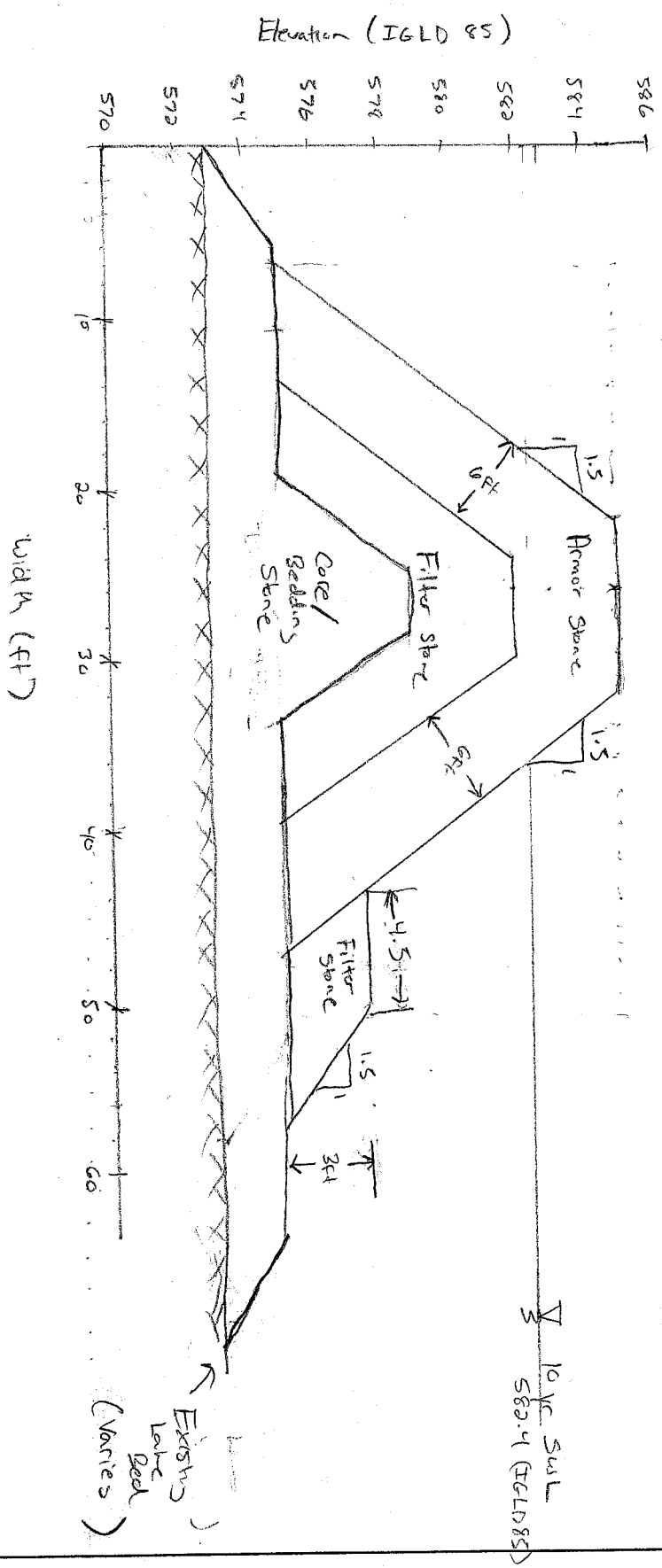
Filter stone = W/10 to W/15 = 462 lbs to 308 lbs => 500-300 lbs

Core stone = W/200 to W/4000 = 23 lbs to 1 lbs => 25 lbs to 1 lb

US Army Corps of Engineers Chicago District	PROJECT TITLE: Rosewood Park	COMPUTED BY:	DATE:	SHEET:	
	STRUCTURE TITLE: Typical Breakwater Cross Section	CHECKED BY:	DATE:	CONTRACT NO:	

Crest width ≤ 3 armor units ≤ 9 ft (use 10 ft)
Side slopes = 1.5 : 1
Armor layer thickness = 2 armor units ≤ 6 ft

W50 Armor = 2.5 tons ⇒ D50 ≤ 3 ft
W50 Filter = 300 - 500 lbs ⇒ D50 ≥ 1.5 ft
W Bedding/Core = 1 - 25 lbs ⇒ D ≤ 6.0 inches



Rosewood Park Coastal Section 506

Great Lakes Fishery and Ecosystem Restoration

Appendix B – Planning

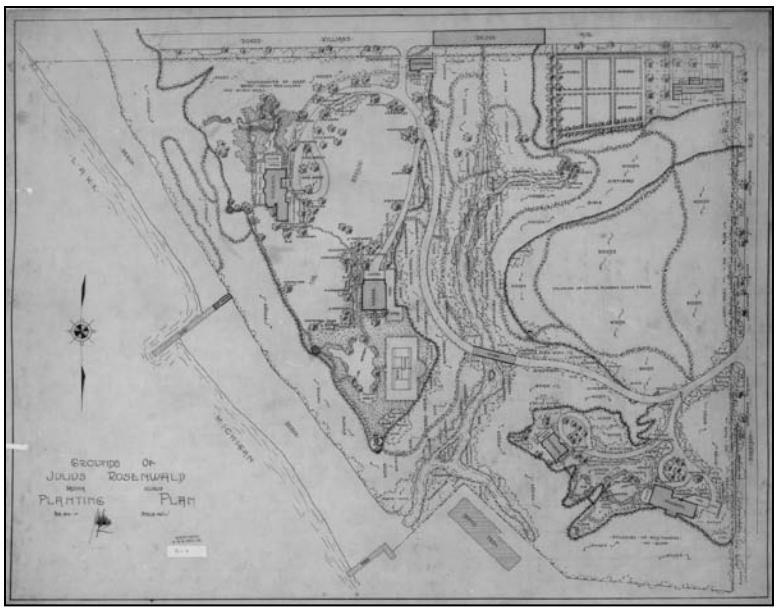


Figure 1. Jens Jensen landscape design overview for Rosenwald Estate (courtesy Park District of Highland Park).

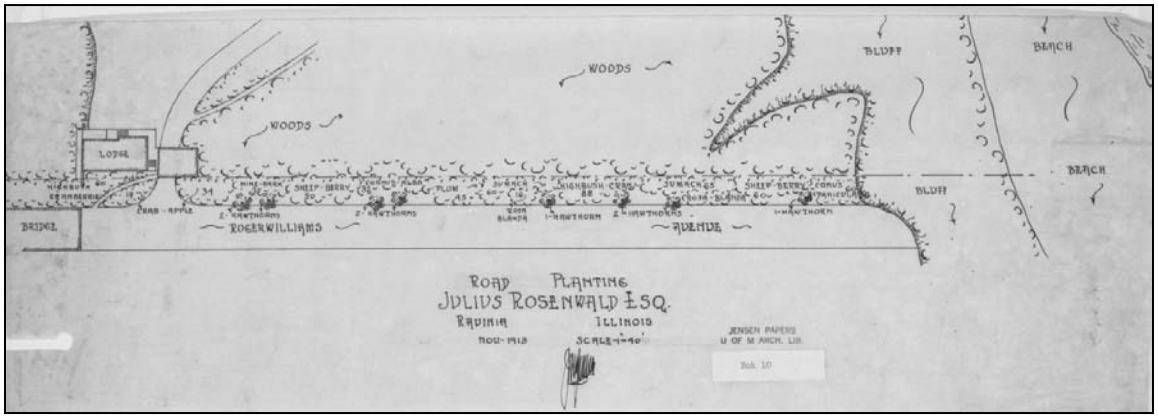


Figure 2. Jens Jensen landscape design for entrance to lower Rosenwald Estate (courtesy Park District of Highland Park).

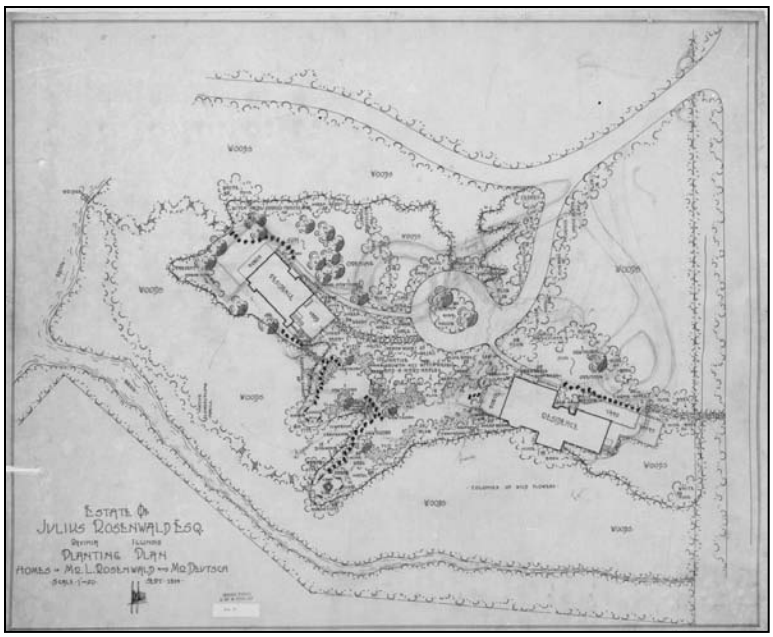


Figure 3. Jens Jensen landscape design for lower Rosenwald Estate, area before carriage bridge (courtesy Park District of Highland Park).

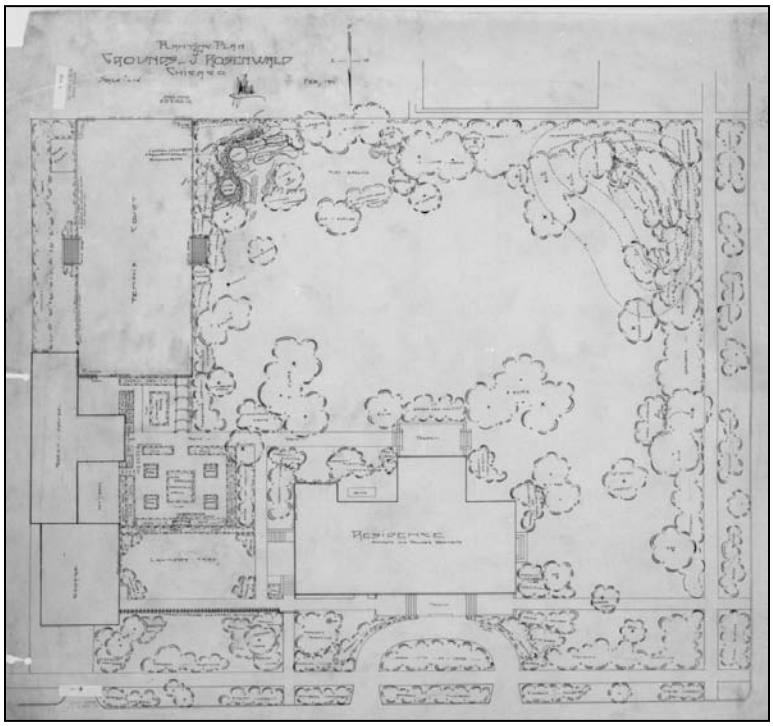


Figure 4. Jens Jensen landscape design for upper Rosenwald Estate, immediate area surrounding residence (courtesy Park District of Highland Park).

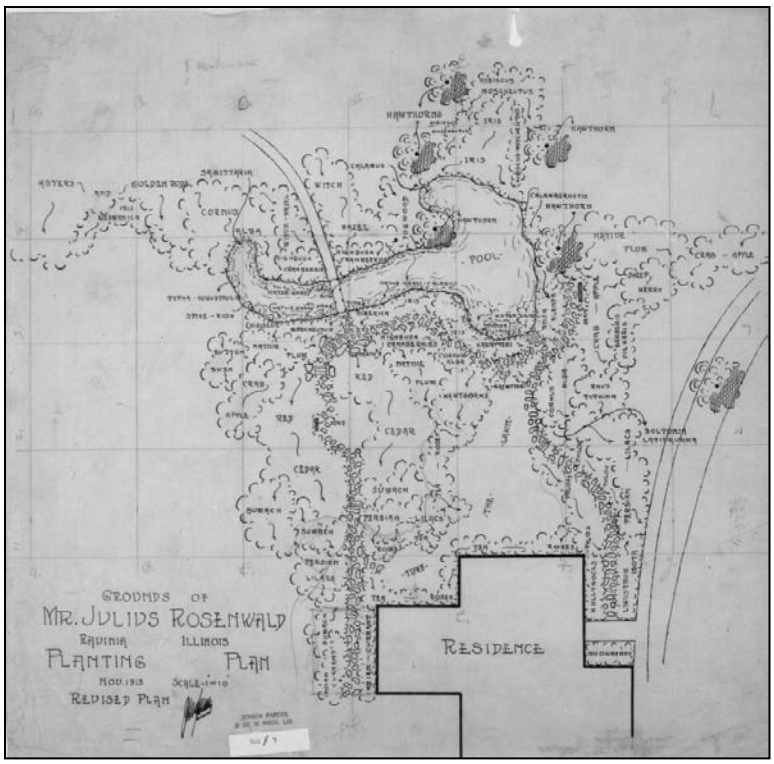


Figure 5. Jens Jensen landscape design for upper Rosenwald Estate, south of residence. Reflecting pool still remains at Rosewood Park today (courtesy Park District of Highland Park).

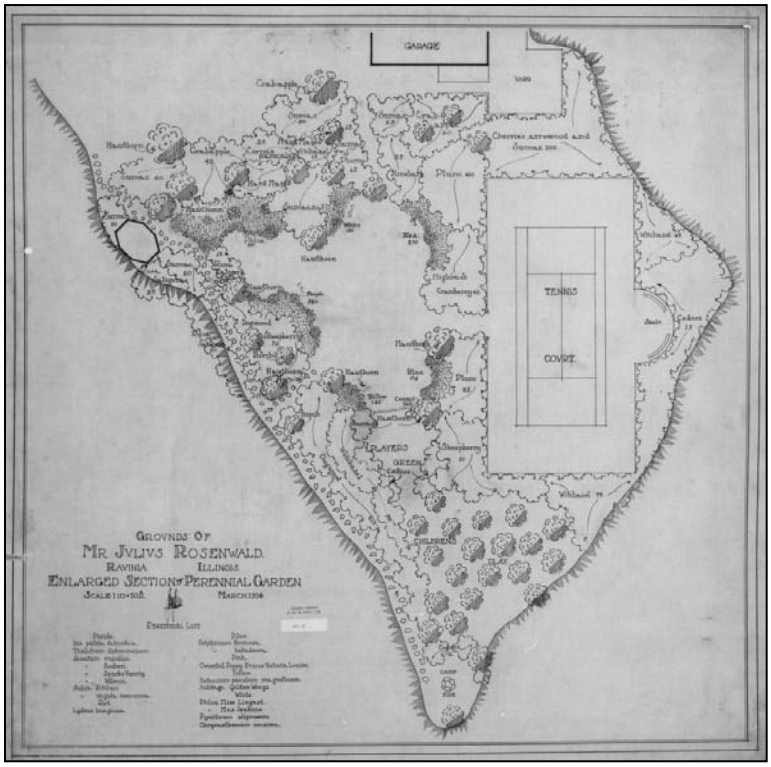


Figure 6. Jens Jensen landscape design for upper Rosenwald Estate, north of residence (courtesy Park District of Highland Park).

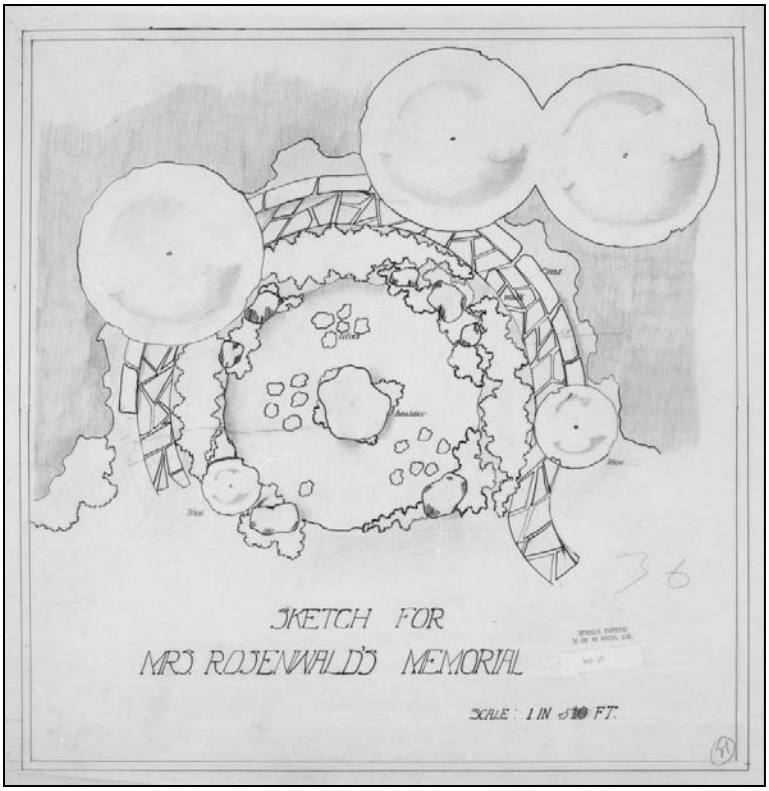


Figure 7. Jens Jensen landscape design for Mrs. Rosenwald's memorial (courtesy Park District of Highland Park).

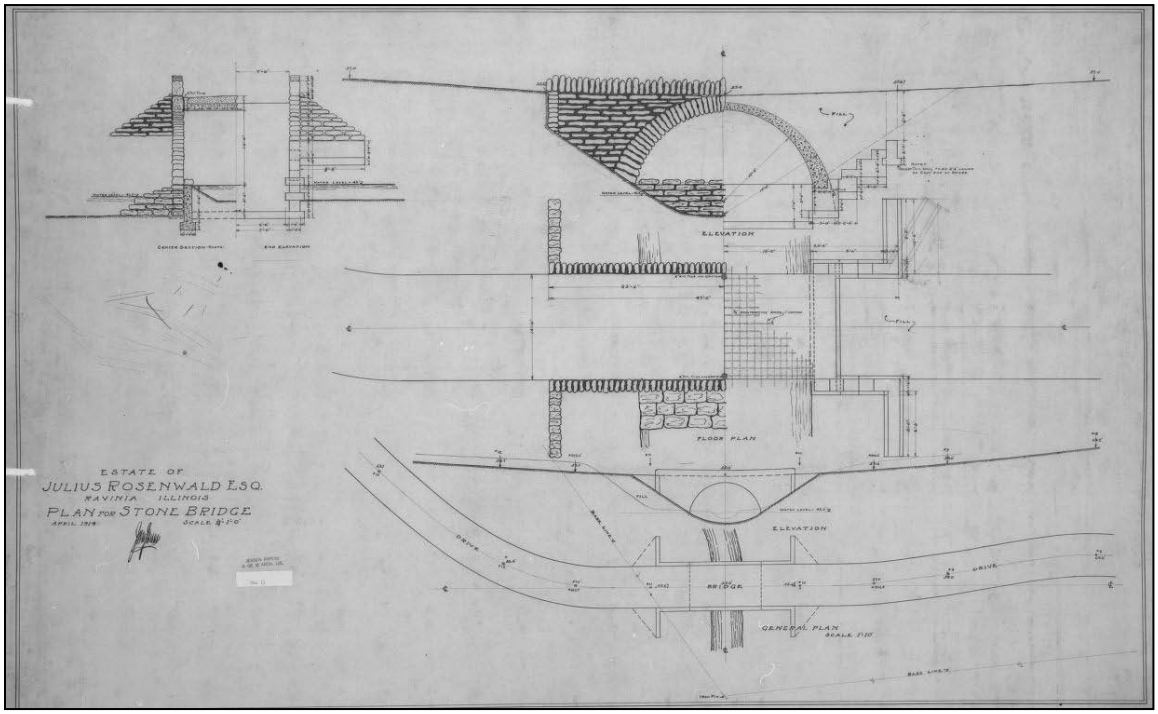


Figure 8. Jens Jensen landscape design for carriage bridge which still remains at Rosewood Park today (courtesy Park District of Highland Park).

Table 1. Birds recorded during the 2010 Lakefront Bird Survey by PDHP.

Scientific Name	Common Name	Resident	Migrator	Migrator Breeder	Status
Corvus brachyrhychos	American Crow	X			
Carduelis tristis	American Goldfinch	X			
Setophaga ruticilla	American Redstart			X	
Turdus migratorius	American Robin	?		X	
Icterus galbula	Baltimore Oriole			X	
Riparia riparia	Bank Swallow			X	
Ceryle alcyon	Belted Kingfisher	X			
Mniotilta varia	Black-and-White Warbler		X	?	
Parus atricapillus	Black-Capped Chickadee	X			
Dendroica virens	Black-Throated Green Warbler		X		
Cyanocitta cristata	Blue Jay	X			
Polioptila caerulea	Blue-Gray Gnatcatcher			X	
Molothrus ater	Brown-Headed Cowbird	X		X	
Sterna caspia	Caspian Tern		X		
Dendroica pansylvanica	Chestnut-Sided Warbler		X	?	
Chaetura pelagica	Chimney Swift			X	
Spizella passerina	Chipping Sparrow			X	
Quiscalus quiscula	Common Grackle	X			
Sterna hirundo	Common Tern		X		** E-IL
Geothlyphis trichas	Common Yellowthroat			X	
Accipiter cooperii	Cooper's Hawk	X			
Phalacrocorax auritus	Double-Crested Cormorant		X		
Picoides pubescens	Downy Woodpecker	X			
Sayornis phoebe	Eastern Phoebe		X	?	
Contopus virens	Eastern Wood-Pewee			X	
Sterna forsteri	Forster's Tern			X	E-IL
Vermivora chrysoptera	Golden-Winged Warbler			X	*
Dumetella carolinensis	Gray Catbird			X	
Ardea herodias	Great Blue Heron			X	
Myiarchus crinitus	Great Crested Flycatcher			X	
Larus argentatus	Herring Gull	X			
Carpodacus mexicanus	House Finch	X			
Troglodytes aedon	House Wren			X	
Passerina cyanea	Indigo Bunting			X	
Anas platyrhynchos	Mallard	X		X	
Zenaida macroura	Mourning Dove		X		
Cardinalis cardinalis	Northern Cardinal	X			
Colaptes auraus	Northern Flicker	?		X	
Parula americana	Northern Parula		X		
Stelgidopteryx serripennis	Northern Rough-Winged Swallow			X	
Melanerpes carolinus	Red-Bellied Woodpecker	X			
Vireo olivaceus	Red-Eyed Vireo			X	
Melanerpes erythrocephalus	Red-Headed Woodpecker	X			*
Agelaius phoeniceus	Red-Winged Blackbird	?		X	
Larus delawarensis	Ring-Billed Gull	X			
Pheucticus ludovicianus	Rose-Breasted Grosbeak			X	
Regulus satrapa	Ruby-Crowned Kinglet		X		
Piranga olivacea	Scarlet Tanager			X	
Melospiza melodia	Song Sparrow	X			
Actitis macularius	Spotted Sandpiper			X	
Vermivora peregrina	Tennessee Warbler		X		
Tachycineta bicolor	Tree Swallow		X		
Sitta carolinensis	White-Breasted Nuthatch	X			
Zonotrichia leucophrys	White-Crowned Sparrow		X		
Zonotrichia albicollis	White-Throated Sparrow		X		
Troglodytes troglodytes	Winter Wren		X	?	
Hylocichla mustelina	Wood Thrush			X	*
Dendroica coronata	Yellow-Rumped Warbler		X		

* National Audubon Society Species of Concern

** National Audubon Society Common Declining Bird

E-IL State Endangered Species

Rosewood Park Coastal Section 506

Great Lakes Fishery and Ecosystem Restoration

Appendix C – Civil Design (Included) & Cost Estimate (Intentionally Not Included)

Rosewood Park Coastal Section 506 Great Lakes Fishery & Ecosystem Restoration

Design Analysis Report

May 2012 Study Partnership

Park District of Highland Park

US Army Corps
of Engineers
Chicago District

ROSEWOOD PARK COASTAL SECTION 506, GREAT LAKES FISHERY & ECOSYSTEM RESTORATION DESIGN ANALYSIS REPORT

Table of Contents

SECTION 1 - GENERAL

1.1 Introduction

The study area contains approximately 7 acres that are part of the Lake Michigan coastline (Figure 1) and is located in northeastern Illinois within the southeast boundary of Lake County (Figure 2). The proposed project would be located within the Highland Park community, near Rosewood Drive and Sheridan Road. The Rosewood Park Section 506 study area consists of one ravine (3L), the bluff along the coastline, the savanna habitat atop the bluff, the dune & beach habitat, and the littoral zone of Lake Michigan.

The land bordering the Illinois coast has varied landscape characteristics that were divided into three geomorphic settings by Chrzastowski (1995, 2007); the low lying beach-ridge plain to the north, the bluff coast in the middle, and the Chicago lake plain to the south. The bluff coast zone lies between the City of North Chicago and Winnetka.

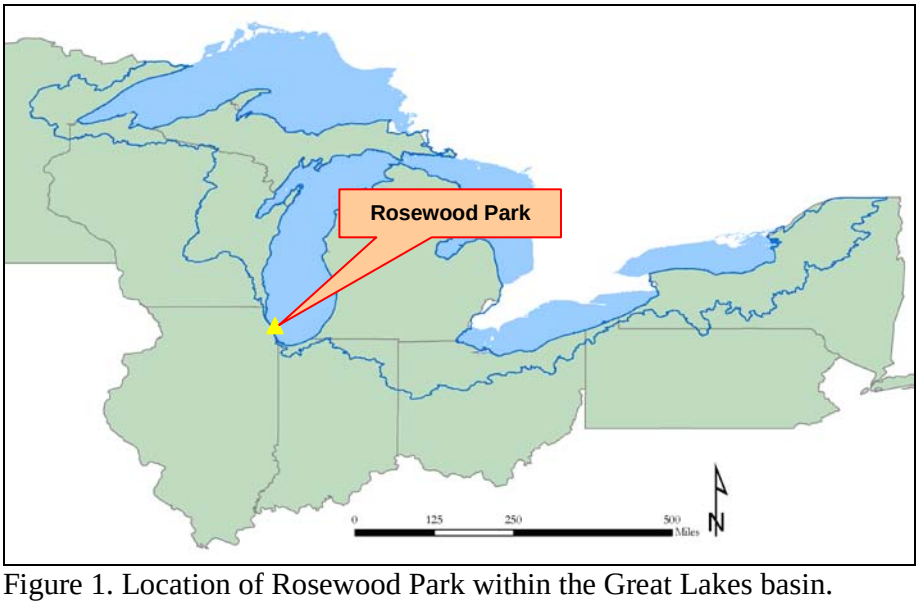


Figure 1. Location of Rosewood Park within the Great Lakes basin.

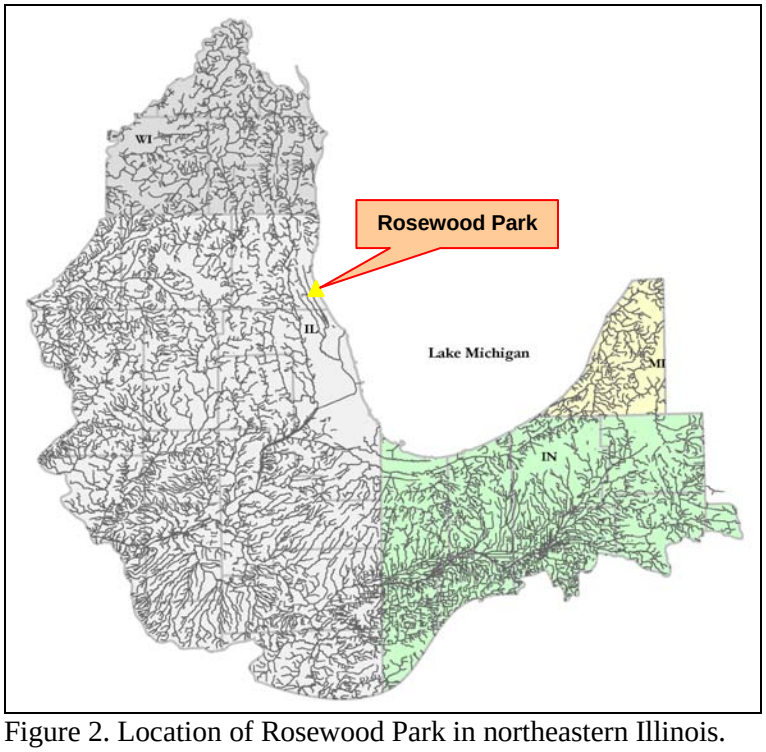


Figure 2. Location of Rosewood Park in northeastern Illinois.

1.2 Purpose and Scope

The purpose of this report is to: 1) describe design criteria, engineering methods and procedures that were used layout and perform preliminary design analysis of the alternatives; 2) present the methods used and calculations developed for earthwork quantities 3) present the requirements for the real estate needed; 4) present criteria and requirements for utility interferences; and 5) discuss the engineering design analysis requirements for the next phase of the project.

This study is composed of six sections: a. Stream Restoration, b. Lacustrine Restoration, c. Beach & Dune Restoration, d. Ravine Restoration, and e. Savanna Restoration

1.3 Previous Investigations and Projects

Highland Park Lakefront Plan. 2006. The community of Highland Park encompasses nearly 10 percent of the Illinois' Lake Michigan shoreline. In 2006, the community created a Lakefront Plan that established a series of long and short term restoration recommendations specific to the following parks in the area: Moraine Park, Central Park, Millard Park, and Rosewood Park. In addition to infrastructure renovations listed in the plan, enhancement of the extensive ravine system was put forth as a primary objective. Ravine improvement was to include bluff and ravine stabilization, habitat restoration, and beach enrichment.

Rosewood Park Draft Environmental Investigation Report. 2008. Prepared by JJR. The purpose of the report was to identify existing environmental information and reports to assist the regulatory agencies with the permit application review process.

Rosewood Park Physical Hydraulic Model Study (Highland Park, IL on Lake Michigan). 2008. Prepared by HCCL in consultation with JJR. This report described the three-dimensional hydraulic model testing program and background coastal engineering analyses for the proposed shoreline works at Rosewood Park in the state of Illinois situated on the shore of Lake Michigan. The investigation is in support of technical analyses conducted to assist in the development of Rosewood Park, within the context of the Park District of Highland Park's "Highland Park Lakefront Plan".

Lakefront Improvement Project: Rosewood Park Schematic Design Report. 2008. Prepared by the Park District of Highland Park. This document presented the Schematic Design of the proposed park, beach, shoreline protection and related environmental and recreational improvements at Rosewood Park along the Lake Michigan shoreline in Highland Park, Illinois.

Highland Park, IL: Assessment of Littoral Impacts of Proposed Shoreline Works at Central and Rosewood Parks. 2008. Prepared by HCCL in consultation with JJR. This report presented on littoral impacts of proposed shoreline projects at Rosewood Park and Central Park within the Park District of Highland Park on Lake Michigan, Illinois.

Shore Management Alternatives for Short and Long Term Planning. 1986. Prepared by the City of Highland Park. This report presented an inventory of the Highland Park shore and looked at various management alternatives for the area.

1.4 Topographic Survey, Survey Control and Soils

Topography was generated from the Bleck Engineering Company, Inc., for Highland Park Park District. Horizontal accuracy standards for 1"=100' maps are better than 1' at based on a RMSE (Horizontal) North American Datum of 1983.

The horizontal coordinates are on the NAD83 grid, State Plane Illinois East State plane Coordinate System. The vertical datum is the NAVD of 1988.

The placement of Control Points has been schedule and will be available in the final plans and specifications. Surveying will produce a Control Point plan sheet, which will be included in the plan set.

Soil samples were obtained for the planting areas, but soils boring are not required for the grading and structures being installed.

1.5 Final Design Activities/Task

Verification of existing conditions is required by USACE, prior to the contractor beginning work.

1.6 Objectives

The main objectives of Appendix B are to:

- Eliminate infrastructure from the beach
- Remove ravine outfall culvert to reduce erosion and promote healthy littoral process
- Stabilize bluff, ravine, dune, and beach communities to reduce erosion and sedimentation into Lake Michigan Restore historical native plant communities along Lake Michigan
- Restore fish habitat
- Remove non-native/invasive species which are degrading native plant communities
- Improve habitat for endangered/threatened coastal species
- Identify potential hurdles
- Provide open communication with local stakeholders for their contribution

SECTION 2 – CIVIL DESIGN

2.1 References

1) ER 1110-2-1150 "*Engineering and Design for Civil Works Projects*" U.S. Army Corps of Engineers, dated 31 August 1999

2) ER 1110-1-12, Quality Management (dated 21 July 2006, updated 30 September 2006)

3) ER 1110-1-8155, Specifications (dated 10 October 2003)

2.2 Utility Relocations

Utility information for water, storm, sanitary sewer and surrounding roadways were provided in the Bleck Engineering Company, Inc Topography. These existing features are shown in the attached plan sheets.

The contractor shall coordinate any and all relocation with the respective owners of those utilities. In the current Feasibility Phase, the relocation of utilities is not required. The existing sanitary sewer main, running parallel with the cost line, is at a depth which will not impact the site improvements.

2.3 Staging Areas

Staging areas are necessary to give the contractor sufficient room to temporarily store construction equipment and/or materials used to construct the project. The staging area have been placed adjacent to the proposed work and have been coordinated with the local sponsor. Keeping the staging areas close to the construction area will reduce the length of transporting construction equipment and materials through public and private properties and will likely reduce the cost of construction.

The staging areas are located and identified on the plan sheets which are attached for your reference.

2.4 Real Estate

The required real estate was determined based on the location of the proposed work, staging areas, and future access for maintenance of the project. The proposed work is all located within property owned by the local sponsor. Areas needed for construction, staging, or access have been identified on the Real Estate Maps. All construction and permanent access points originate from City and State owned roads where possible, which will reduce land acquisition costs.

2.5 Erosion Control

Soil erosion and sediment control measures will be designed in accordance with the Illinois Handbook for Erosion Control. The minimum measures required at the project site include:

- Hydroseeding, seeding, and mulching to stabilize disturbed areas
- Installing silt fences in and around construction areas
- Protecting water ways with floating turbidity barriers that retain debris and prevent sediments from traveling downstream
- Stabilizing construction entrances to limit soil disturbance at the ingress/egress from the site
- Installing erosion blanket and seeding along the re-graded stream banks

2.6 Grading

The project site has two locations where grading will occur, as part of the site improvements. The first is the proposed beach nourishment area along the existing Lake Michigan shoreline. The proposed beach grading will be sloped from west to east, in insure positive drainage towards the lake. A main focus area of the beach grading will be the outlet of the removed box culvert. The ravine channel and beach grading will be coordinated to allow for drainage from the bluffs, through the ravine, and continue out to Lake Michigan. The graded area of the outlet shall be open and free of obstruction to allow for the ravine flow to meander along the beach, out to the lake.

The second area of grading, as mentioned above, is the open channel grading. The regarding of the channel is required since the two box culverts are being removed to “day light” the channel. The day lighted channel is constrained on the north and south by the existing bluff (south) and the existing/proposed parking lot. The channel is designed to have a five foot base with 3:1 side slopes to meet existing.

The proposed graded areas within the park have been coordinated with the local sponsor to insure the least amount of impact possible, while still achieving the restoration goals.

2.7 Demolition

A portion of the restoration plan includes the removal and replacement of existing asphalt parking lot, with concrete curb, and the 4’x7’ Dual Concrete Box Culvert. The culverts are located on the south end of the parking lot, underneath the asphalt parking lot. The culverts will be removed and the open channel will be graded and stabilized. The parking lot will be removed near project completion, dependant on the contractors construction sequence. The reason for this, is that the parking lot area will be utilized as the staging and storage area.

2.8 Maintenance of Traffic

Maintenance of traffic during construction is required per IDOT Specifications. Pavement for the road surfaces damaged during construction will be removed and replaced as in accordance with IDOT specifications for pavement patching.

2.9 Ecosystem Restoration Measures

The following measures are based on a collaborative effort between the USACE and the PDHP. Measures were developed with the intent to restore habitat structure in a sustainable fashion taking into account the dynamic range of groundwater processes and habitat succession. Herein, these measures will be further evaluated for implementation feasibility under the USACE 506 Authority.

Restoration Measures

SR1 – Stream Restoration – Option 1

This measure is not combinable with SR2 or SR3. This measure seeks to completely address stream hydraulics and hydrology, stream and lake connectivity, channel downcutting, aquatic species dispersal, and sediment and stormwater loading. This measure seeks to completely remove 4 degraded concrete weirs upstream of the current parking lot, which are preventing the upstream dispersal of aquatic species as well as inhibiting the functionality of natural stream hydraulics (i.e. boulder/cobble riffles). A sufficient number of boulder/cobble riffles already exist upstream of the parking lot to regulate stormwater influxes, allow for sediment accretion and deposition within the ravine, repair channel downcutting, and increase ravine stabilization. Plantings along the riparian zone would cover approximately 0.2 acres.

This measure also includes the complete removal the box culvert which is inhibiting the upstream dispersal of aquatic species by fragmenting the flow of the ravine mouth to the lake. Initially, the 220 linear feet culvert would be removed. River rock (mixture of gravel [diameter: 0.08 – 0.63 in], pebbles [diameter: 0.67 – 2.52 in], and cobble [diameter: 2.56 – 10.08 in]) would be placed along the length of the newly opened channel to recreate the streambed. Two boulder/cobble riffles would be constructed within the new channel to maintain stream hydraulics, provide aquatic species habitat, reduce sediment loading, and to restore natural riffle/pool complexes. Finally, the streambank would be contoured through light grading and native vegetation would be planted for bank stabilization (approximately 0.08 acres).

SR2 – Stream Restoration – Option 2

This measure is not combinable with SR1 or SR3. This measure seeks to completely address stream hydraulics and hydrology, stream and lake connectivity, channel downcutting, aquatic species dispersal, and sediment and stormwater loading. This measure seeks to completely remove 4 degraded concrete weirs upstream of the current parking lot, which are preventing the upstream dispersal of aquatic species as well as inhibiting the functionality of natural stream hydraulics (i.e. boulder/cobble riffles). A sufficient number of boulder/cobble riffles already exist upstream of the parking lot to regulate stormwater influxes, allow for sediment accretion and deposition within the ravine, repair channel downcutting, and increase ravine stabilization. Plantings along the riparian zone would cover approximately 0.2 acres.

SR3 – Stream Restoration – Option 3

This measure is not combinable with SR1 or SR2. This measure seeks to completely address stream and lake connectivity, aquatic species dispersal, and sediment and stormwater loading. This measure includes the complete removal the box culvert which is inhibiting the upstream dispersal of aquatic species by fragmenting the flow of the ravine mouth to the lake. Initially, the 220 linear feet culvert would be removed. River rock (mixture of gravel [diameter: 0.08 – 0.63 in], pebbles [diameter: 0.67 – 2.52 in], and cobble [diameter: 2.56 – 10.08 in]) would be placed along the length of the newly opened channel to recreate the streambed. Two boulder/cobble riffles would be constructed within the new channel to maintain stream hydraulics, provide aquatic species habitat, reduce sediment loading, and to restore natural riffle/pool complexes. Finally, the streambank would be contoured through light grading and native vegetation would be planted for bank stabilization (approximately 0.08 acres).

L1 – Lacustrine Restoration – Option 1

This measure is not combinable with L2 or L3. This measure seeks to mitigate shoreline and bluff recession due to the interruption of local long shore sediment transport by constructing a series of nearshore breakwaters. The four steel groins north of the fishing pier at Rosewood Park will be removed and replaced with a series of beach cells (5 beach cells) constructed nearshore. Beach cells will be composed of limestone riprap and will be prefilled with 120% of the estimated stable volume upon construction. Sheet piling will be used to stabilize 3 of the 5 beach cells. This measure is the configuration designed by the local sponsors.

L2 – Lacustrine Restoration – Option 2

This measure is not combinable with L1 or L3. This measure seeks to mitigate shoreline and bluff recession due to the interruption of local long shore sediment transport by constructing a series of nearshore breakwaters. The four steel groins north of the fishing pier at Rosewood Park will be removed and replaced with five nearshore breakwaters constructed approximately 150 feet offshore. Breakwaters will be composed of limestone riprap and will be prefilled with 120% of the estimated stable volume upon construction.

L3 – Lacustrine Restoration – Option 3

This measure is not combinable with L1 or L2. This measure seeks to mitigate shoreline and bluff recession; however, natural lacustrine processes such as sediment transport will not be addressed. Limestone riprap will be placed around the four steel groins located north of the fishing pier at Rosewood Park, and prefilled with 120% of the estimated stable volume upon construction. Placement of the boulder will create more aesthetically pleasing structures; however, limited aquatic species habitat would be created.

BD – Beach and Dune Restoration

This measure seeks to restore beach and foredune habitat through beach nourishment, removal of invasive and opportunistic woody vegetation and planting of native species known to occupy foredune habitats. Restoration would cover approximately 4.3 acres of beach and dune habitat. Selective shrub and tree clearance includes, but is not limited to, common buckthorn (*Rhamnus cathartica*), glossy buckthorn (*Frangula alnus*), European highbush cranberry (*Viburnum opulus*), black locust (*Robinia pseudoacacia*), staghorn sumac (*Rhus typhina*), Norway maple (*Acer platanoides*), gray dogwood (*Cornus racemosa*), white mulberry (*Morus alba*), green ash (*Fraxinus lanceolata*), cottonwood (*Populus deltoides*), and basswood (*Tilia americana*). Native species of local genotype that are known to inhabit foredune communities will be planted (seeds and plugs). Follow up

will include the removal of invasive herbaceous species by spot application of herbicide over 5 years. This measure also includes the complete removal of the asphalt walkway.

BF – Bluff Restoration

This measure seeks to restore the bluff vegetative community through the selective removal of invasive and opportunistic woody vegetation shading the bluff understory and planting of native species that are known to occupy lakeshore bluffs. Restoration would cover approximately 2.2 acres of bluff habitat. Selective shrub and tree clearance includes, but is not limited to, common buckthorn (*Rhamnus cathartica*), glossy buckthorn (*Frangula alnus*), European highbush cranberry (*Viburnum opulus*), black locust (*Robinia pseudoacacia*), staghorn sumac (*Rhus typhina*), Norway maple (*Acer platanoides*), gray dogwood (*Cornus racemosa*), white mulberry (*Morus alba*), green ash (*Fraxinus lanceolata*), cottonwood (*Populus deltoides*), and basswood (*Tilia americana*). Native species of local genotype that are known to inhabit the lakeshore bluff communities will be planted (seeds and plugs). This measure also includes the removal of invasive herbaceous species by spot application of herbicide over 5 years. In addition, a prescribed burn would be incorporated for 3 of the 5 years.

RV – Ravine Restoration

This measure seeks to restore the ravine vegetative community through the selective removal invasive and opportunistic woody vegetation shading the ravine's understory and planting of native species that are known to occupy lakeshore ravines. Restoration would cover approximately 2.1 acres of ravine habitat. Selective shrub and tree clearance includes, but is not limited to, common buckthorn (*Rhamnus cathartica*), glossy buckthorn (*Frangula alnus*), European highbush cranberry (*Viburnum opulus*), black locust (*Robinia pseudoacacia*), Japanese barberry (*Berberis thunbergii*), Norway maple (*Acer platanoides*), gray dogwood (*Cornus racemosa*), white mulberry (*Morus alba*), green ash (*Fraxinus lanceolata*), cottonwood (*Populus deltoides*), and basswood (*Tilia americana*). Native species of local genotype that are known to inhabit the lakeshore ravine communities will be planted with plugs only within the ravine bottom. Following selective clearance, all stumps will be swabbed with herbicide. This measure also includes the removal of invasive herbaceous species by spot application of herbicide over 5 years. In addition, a prescribed burn would be incorporated for 3 of the 5 years.

SV – Savanna Restoration

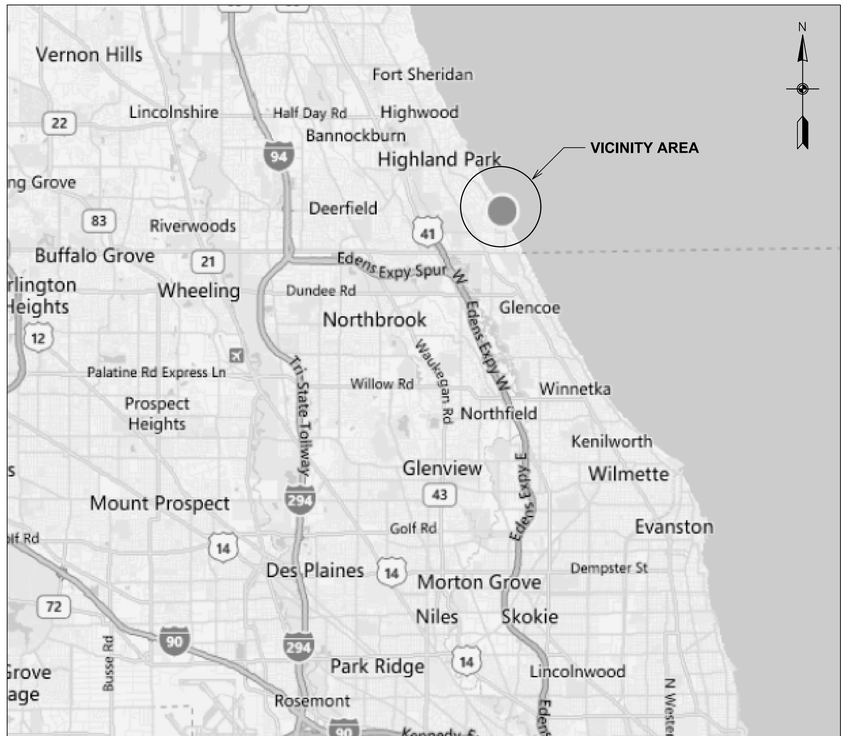
This measure seeks to restore the savanna vegetative community through selective removal of invasive and opportunistic woody vegetation shading the savanna's herbaceous understory and planting of native species that are known to occupy savanna habitat. Restoration would cover approximately 1.9 acres of savanna habitat. Selective shrub and tree clearance includes, but is not limited to, common buckthorn (*Rhamnus cathartica*), glossy buckthorn (*Frangula alnus*), European highbush cranberry (*Viburnum opulus*), black locust (*Robinia pseudoacacia*), Japanese barberry (*Berberis thunbergii*), Norway maple (*Acer platanoides*), gray dogwood (*Cornus racemosa*), white mulberry (*Morus alba*), green ash (*Fraxinus lanceolata*), cottonwood (*Populus deltoides*), and basswood (*Tilia americ*ana). Native species of local genotype that are known to inhabit the lakeshore savanna communities will be planted (seeds and plugs). Following selective clearance, all stumps will be swabbed with herbicide. This measure also includes the removal of invasive herbaceous species by spot application of herbicide over 5 years. In addition, a prescribed burn would be incorporated for 3 of the 5 years.

ROSEWOOD PARK COASTAL SECTION 506, GREAT LAKES FISHERY & ECOSYSTEM RESTORATION
DESIGN ANALYSIS

PLAN SET

US Army Corps
of Engineers®
Chicago District

ROSEWOOD PARK
SECTION 506
HIGHLAND PARK, IL



LOCATION MAP
(N.T.S.)

VICINITY MAP
(N.T.S.)

Preliminary Submittal - 30% FEASIBILITY
Solicitation: W912P6-12-B-00XX
Contract: W912P6-12-C-00XX
MAY 2012

SIGNATURE AFFIXED BELOW INDICATE OFFICAL RECOMMENDATION AND APPROVAL FOR ALL DRAWINGS CONTAINED IN THE SHEET INDEX.

APPROVAL RECOMMENDED BY:

PROJECT MANAGER — DATE

APPROVED BY:

CHIEF, DESIGN BRANCH — DATE

THIS PROJECT WAS DESIGNED BY THE CHICAGO DISTRICT CORPS OF ENGINEERS. THE INITIAL CONSULTANTS AND REGISTRATION DESIGNATIONS OF INDIVIDUALS APPEAR ON THESE PROJECT DOCUMENTS WITHIN THE SCOPE OF THEIR EMPLOYMENT AS REQUIRED BY ER 1110-1-8152. SIGNATURES INDICATE OFFICIAL RECOMMENDATION OF ALL DRAWINGS IN THIS SET:

REVIEWED BY:

ATR TEAM LEADER — DATE

US Army Corps of Engineers®
Chicago District

MARK	DESCRIPTION	TRACKING NO.	ACTION	DATE

MARK	DESCRIPTION	TRACKING NO.	ACTION	DATE

U.S. ARMY CORPS OF ENGINEERS
CHICAGO DISTRICT
CHICAGO, IL

DESIGNED BY: ZL
DRN BY: DB
CKD BY:
SUBMITTED BY: JAG
DATE: MAY 2012
SOLICITATION NO.: W912P6-12-B-00XX
CONTRACT NO.: W912P6-12-C-00XX
PLOT SCALE: 1.0000'/IN
PLOT DATE: 5/29/2012
FILE NUMBER:
SIZE: ANSI D
FILE NAME: RWPH_G-001COV.dgn

ROSEWOOD PARK
SECTION 506
HIGHLAND PARK, IL

LOCATION AND VICINITY MAP

SHEET IDENTIFICATION
G-001
SHEET 1 OF 0

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SHEET INDEX

SHEET NUMBER	SHEET REFERENCE	TITLE
1.	G-001	LOCATION AND VICINITY MAP
2.	G-002	SHEET INDEX, LEGEND, ABBREVIATIONS AND GENERAL NOTES
3.	G-003	SURVEY CONTROL AND BENCHMARKS
4.	C-001	WORKLIMITS AND STAGING AREAS
5.	CD101	DEMOLITION PLAN
6.	CD102	DEMOLITION PLAN
7.	CD103	DEMOLITION PLAN
8.	CG101	SITE PLAN
9.	CG102	SITE PLAN
10.	CG103	SITE PLAN
11.	CS101	PLANTING PLAN
12.	CS102	PLANTING PLAN
13.	CS103	PLANTING PLAN
14.	CS501	TYPICAL DETAILS

GENERAL NOTES

1. ALL DETAILS AND NOTES, RELATIVE TO EXISTING SURFACE AND UNDERGROUND UTILITIES SHOWN AND LOCATED ON THE PLANS, ARE NOT GUARANTEED ACCURATE BY THE ENGINEER. THE CONTRACTOR SHALL VERIFY ALL SUCH DETAILS AND NOTES IN THE FIELD AND WITH, BUT NOT LIMITED TO, THE FOLLOWING:
   A. VILLAGE OF HIGHLAND PARK
   B. HIGHLAND PARK PARK DISTRICT
   C. ALL PROPERTY OWNERS WHERE CONSTRUCTION IS LOCATED
   D. J.U.L.I.E. (1-800-892-0123)
2. ALL ELEVATIONS SHOWN ON THE PLANS REFER TO NAVD88.
3. FOR HORIZONTAL AND VERTICAL CONTROL, SEE CONTROL DATA INFORMATION SHOWN ON SH. NO. G-03.
4. THE CONTRACTOR SHALL MAINTAIN IN SERVICE ALL EXISTING SEWERS, CULVERTS, DITCHES, DRAINS, MANHOLES AND ALL OTHER UTILITIES DURING CONSTRUCTION. ANY CHANGES OR MODIFICATIONS TO THESE EXISTING FACILITIES, DUE TO CONSTRUCTION UNDER THIS CONTRACT, SHALL BE AT THE CONTRACTOR'S EXPENSE.
5. THE CONTRACTOR SHALL VERIFY ALL CONTOUR ELEVATIONS SHOWN ON THE DRAWINGS PRIOR TO START OF WORK AT ANY SITE. IF DISCREPANCIES BECOME APPARENT, THE ENGINEER SHALL BE NOTIFIED PRIOR TO START OF WORK.
6. FOR ACCESS TO SITE, SEE C-01, WORK LIMITS.
   LOCATIONS, ELEVATIONS AND DIMENSIONS OF EXISTING STRUCTURES,
7. LOCATION OF UTILITIES, AND OTHER SITE FEATURES ARE APPROXIMATE AND SHALL BE VERIFIED BY THE CONTRACTOR IN THE FIELD. THE CONTRACTOR SHALL IMMEDIATELY REPORT ANY DISCREPENCIES TO THE CONTRACTING OFFICER'S REPRESENTATIVE THE CONTRACTING OFFICER REPRESENTATIVE SHALL DETERMINE MEASURES AS MAY BE REQUIRED TO RESOLVE THE DISCREPANCY.
8. THE CONTRACTOR SHALL INVESTIGATE THE SITE IN ACCORDANCE WITH THE CONTRACT CLAUSE 52-236-3, SITE INVESTIGATIONS AND CONDITIONS AFFECTING THE WORK.
9. THE CONTRACTOR SHALL BE RESPONSIBLE FOR 10-YEAR FLOOD PROTECTION OF FACILITIES WITHIN LIMITS OF CONSTRUCTION.

LEGEND

- PROPOSED CONTOUR (10)
- EXISTING CONTOUR (11)
- SHORELINE
- STORM MANHOLE (D)
- WATER MANHOLE (W)
- WORKLIMITS (C / E)
- BLUFF PLANTING
- DUNE PLANTING
- STEAM RESTORATION
- RAVINE AND SLOPE PLANTING
- WEIR REMOVAL (10'-0")
- INVASIVE SPECIES REMOVAL
- SAVANNA PLANTING
- BEACH NOURISHMENT
- BREAKWATER

STANDARD ABBREVIATIONS

CJ	CONSTRUCTION JOINT
EJ	EXPANSION JOINT
NTS	NOT TO SCALE
MIN	MINIMUM
V	VERTICAL
H	HORIZONTAL
S	PIPE SLOPE
IDOT	ILLINOIS DEPARTMENT OF TRANSPORTATION
VIF	VERIFY IN FIELD
MH	MANHOLE
COR	CONTRACTING OFFICER'S REPRESENTATIVE
SSP	STEEL SHEET PILE
RCP	REINFORCED CONCRETE PIPE
CMP	CORRUGATED METAL PIPE
DTM	DIGITAL TERRAIN MODEL
ACOE	ARMY CORPS OF ENGINEERS
COE	CORPS OF ENGINEERS
OSI	OCEAN SURVEYS, INC.

US Army Corps of Engineers
Chicago District

MARK	DESCRIPTION	TRACKING NO.	ACTION	DATE

MARK	DESCRIPTION	TRACKING NO.	ACTION	DATE

DESIGNED BY: ZA
DWN BY: DB
CKD BY:
SUBMITTED BY:
PLOT SCALE: 1.000000'/1"
PLOT DATE: 5/20/2012
SIZE: ANSI D
DATE: MAY 2012
SOLICITATION NO.: W912PS-12-B-000X
CONTRACT NO.: W912PS-12-C-00XX
FILE NUMBER:
FILE NAME: RWP01_G-002ND.dgn

U.S. ARMY CORPS OF ENGINEERS
CHICAGO DISTRICT
CHICAGO, IL

ROSEWOOD PARK
SECTION 506
HIGHLAND PARK, IL

SHEET INDEX, LEGEND, ABBREVIATIONS AND GENERAL NOTES

SHEET IDENTIFICATION
G-002
SHEET 2 OF 0

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HORIZONTAL & VERTICAL CONTROL POINTS

POINT	IL EAST NAD83 STATEPLANE COORDINATES NORTHING (Y)	 EASTING (X)	ELEV. NAVD88	ELEV.	DESCRIPTION
1	1845964.493	1203710.033	589.753		BRASS DISK

SITE BENCHMARK DESCRIPTIONS

GENERAL NOTES

1. THE SURVEY CONDITIONS SHOWN ON THESE DRAWINGS ARE FROM A SURVEY PERFORMED BY _________________________________ AND REPRESENTS CONDITIONS EXISTING AT THAT TIME. EXISTING CONDITIONS DURING CONSTRUCTION MAY VARY AND DIFFER FROM THOSE SHOWN. THE CONTRACTOR SHALL TAKE ALL NECESSARY ACTIONS TO ASSESS THE EXISTING CONDITIONS AT THE TIME OF BIDDING, AND INCLUDE COST ACCORDINGLY IN THE BID.
2. ALL COORDINATES SHOWN ARE REFERENCED TO THE ILLINOIS STATE PLANE COORDINATE SYSTEM, EAST ZONE, NORTH AMERICAN DATUM OF 1983 (NAD83) U.S. FEET.
3. ALL ELEVATIONS SHOWN ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88) U.S. FEET.
4. ALL HORIZONTAL AND VERTICAL CONTROL POINTS ARE REFERENCED TO NGS MONUMENTS ME1966, AE9231, ME3356, AND ME2887.

COUNTRY	TYPE OF MARK	STATION	ELEVATION
LOCALITY	STAMPING ON MARK	AGENCY (CAST IN MARK)	DATUM
LATITUDE	LONGITUDE	DATUM	ESTABLISHED BY (AGENCY)
(NORTHING) (US FT)	(EASTING) (US FT)	GRID AND ZONE	DATE / ORDER
DESCRIPTION:			

NOT TO SCALE

CONTROL MONUMENT △

N

DA FORM 1959 1 OCT 04 MODIFIED 22 APRIL 2009 USACE

DESCRIPTION OR RECOVERY OF HORIZONTAL CONTROL STATION
For use of this form see FM 3-34.331; the proponent agency is TRADOC.

COUNTRY	TYPE OF MARK	STATION	ELEVATION
LOCALITY	STAMPING ON MARK	AGENCY (CAST IN MARK)	DATUM
LATITUDE	LONGITUDE	DATUM	ESTABLISHED BY (AGENCY)
(NORTHING) (US FT)	(EASTING) (US FT)	GRID AND ZONE	DATE / ORDER
DESCRIPTION:			

NOT TO SCALE

CONTROL MONUMENT △

N

DA FORM 1959 1 OCT 04 MODIFIED 22 APRIL 2009 USACE

DESCRIPTION OR RECOVERY OF HORIZONTAL CONTROL STATION
For use of this form see FM 3-34.331; the proponent agency is TRADOC.

COUNTRY	TYPE OF MARK	STATION	ELEVATION
LOCALITY	STAMPING ON MARK	AGENCY (CAST IN MARK)	DATUM
LATITUDE	LONGITUDE	DATUM	ESTABLISHED BY (AGENCY)
(NORTHING) (US FT)	(EASTING) (US FT)	GRID AND ZONE	DATE / ORDER
DESCRIPTION:			

NOT TO SCALE

CONTROL MONUMENT △

N

DA FORM 1959 1 OCT 04 MODIFIED 22 APRIL 2009 USACE

DESCRIPTION OR RECOVERY OF HORIZONTAL CONTROL STATION
For use of this form see FM 3-34.331; the proponent agency is TRADOC.

COUNTRY	TYPE OF MARK	STATION	ELEVATION
LOCALITY	STAMPING ON MARK	AGENCY (CAST IN MARK)	DATUM
LATITUDE	LONGITUDE	DATUM	ESTABLISHED BY (AGENCY)
(NORTHING) (US FT)	(EASTING) (US FT)	GRID AND ZONE	DATE / ORDER
DESCRIPTION:			

NOT TO SCALE

CONTROL MONUMENT △

N

DA FORM 1959 1 OCT 04 MODIFIED 22 APRIL 2009 USACE

DESCRIPTION OR RECOVERY OF HORIZONTAL CONTROL STATION
For use of this form see FM 3-34.331; the proponent agency is TRADOC.

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Chicago District

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MARK	DESCRIPTION	TRACKING NO	ACTION	DATE

U.S. ARMY CORPS OF ENGINEERS CHICAGO DISTRICT CHICAGO, IL	DESIGNED BY: ZL		DATE: MAY 2012
	DWN BY: DB	CKD BY:	SOLICITATION NO.:
	SUBMITTED BY:		CONTRACT NO.:
	PLOT SCALE:	PLOT DATE: 5/29/2012	FILE NUMBER:
	SIZE: ANSI D	FILE NAME: RWP01_G-003SUR.dgn	

ROSEWOOD PARK
SECTION 506
HIGHLAND PARK, IL

SURVEY CONTROL AND BENCHMARKS

SHEET
IDENTIFICATION
G-003
SHEET 3 OF 0

WORKLIMIT CONTROL POINTS		
POINT	NORTHING	EASTING
WL1	00000000	000000

N

0 100' 200'

SCALE:1"=100'

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Chicago District

MARK	DESCRIPTION	TRACKING NO.	ACTION	DATE

MARK	DESCRIPTION	TRACKING NO.	ACTION	DATE

U.S. ARMY CORPS OF ENGINEERS
CHICAGO DISTRICT
CHICAGO, IL

DESIGNED BY: ZL		DATE: MAY 2012	
DWN BY: DB	CKD BY:	SOLICITATION NO.: W912P5-12-B-00XX	
SUBMITTED BY:		CONTRACT NO.: W912P5-12-C-00XX	
PLOT SCALE:	PLOT DATE:	FILE NUMBER:	
SIZE: ANSI D	ISSUED FILE NAME: RVIP01_C-001WRK.dgn		

ROSEWOOD PARK
SECTION 506
HIGHLAND PARK, IL

WORK LIMITS AND STAGING AREAS

SHEET IDENTIFICATION
C-001
SHEET 4 OF 0

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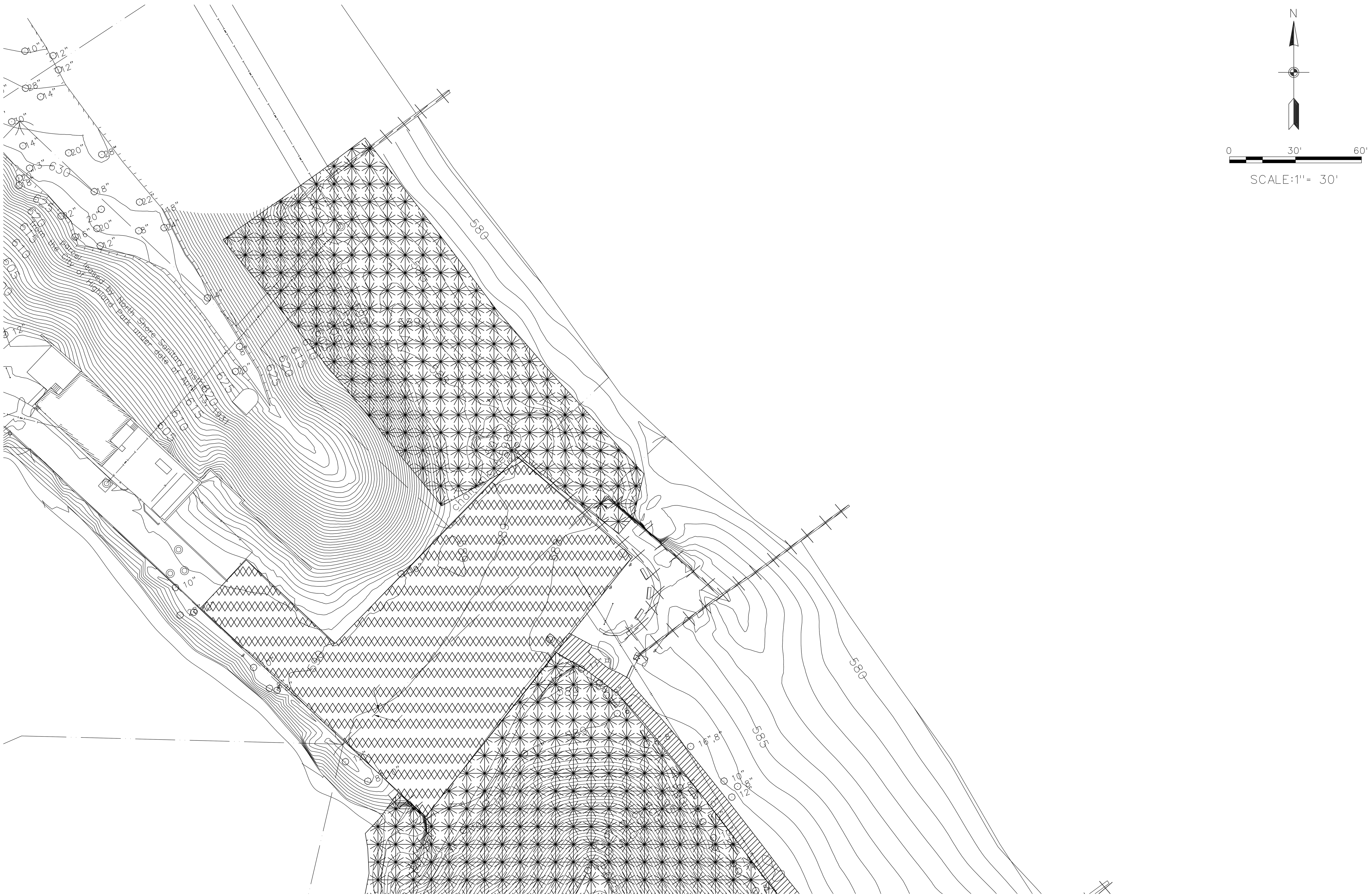

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ROSEWOOD PARK
SECTION 506
HIGHLAND PARK, IL

DEMOLITION PLAN

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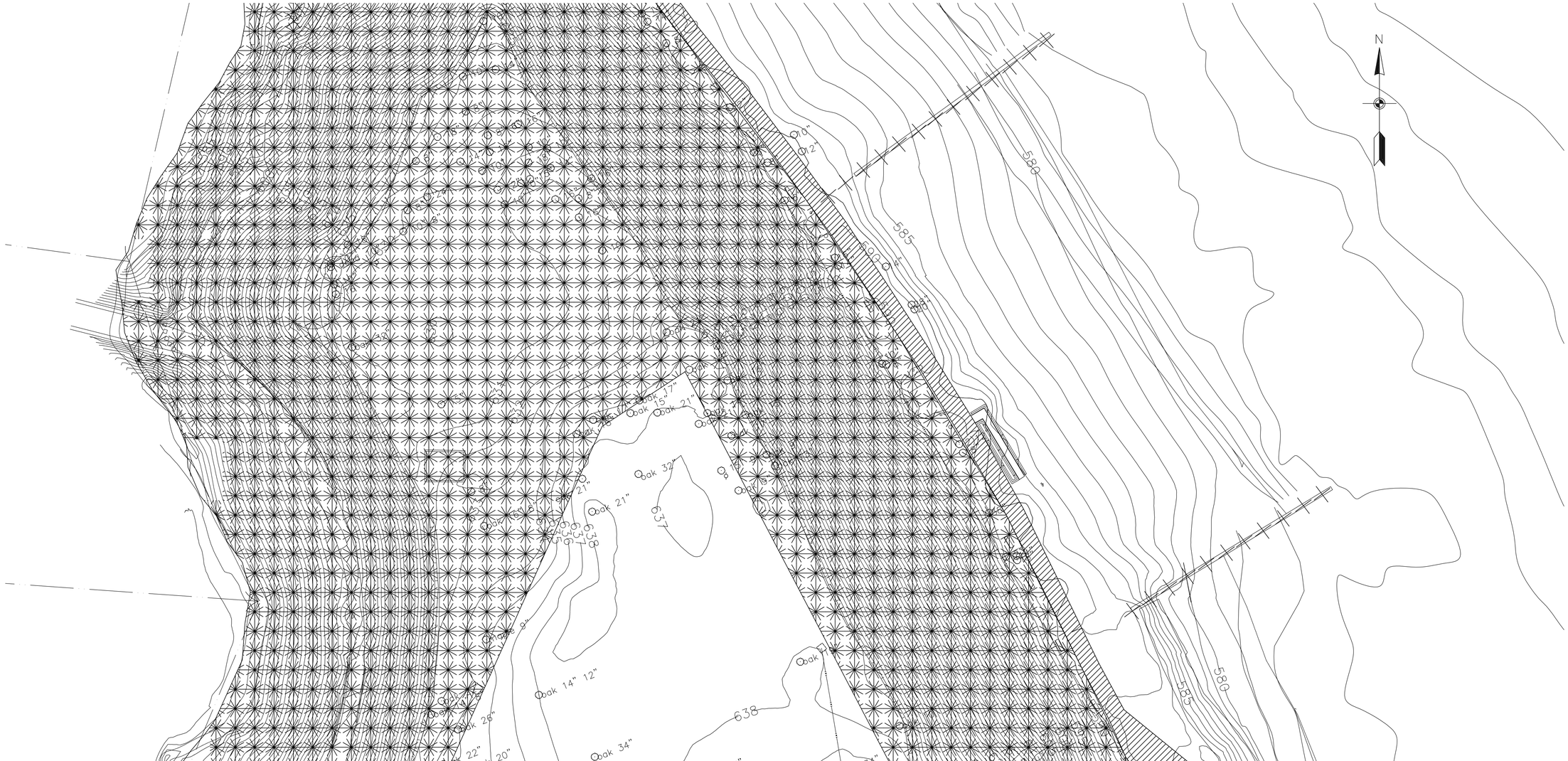

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CHICAGO, IL

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ROSEWOOD PARK
SECTION 506
HIGHLAND PARK, IL

DEMOLITION PLAN

SHEET IDENTIFICATION
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SHEET 0 OF 0

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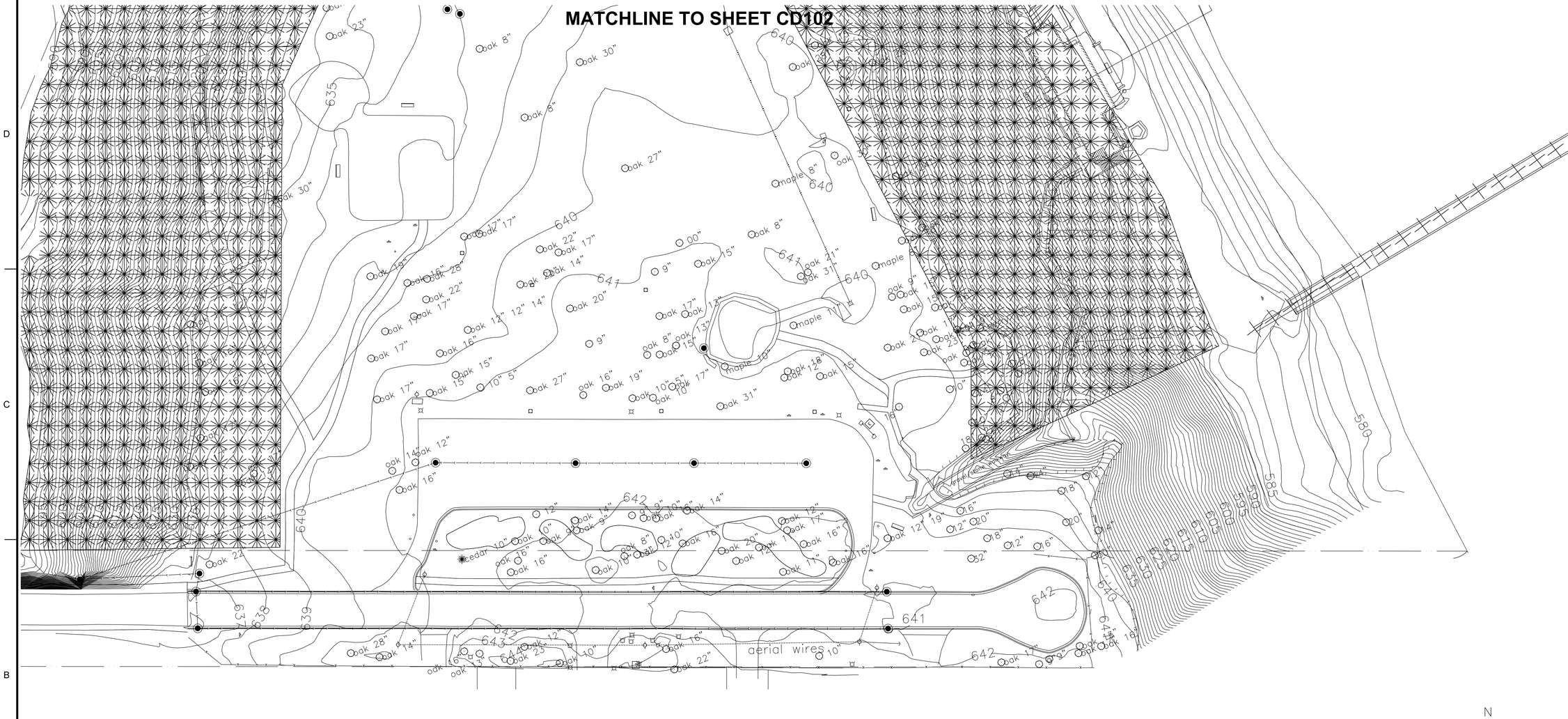

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CHICAGO DISTRICT
CHICAGO, IL

ROSEWOOD PARK
SECTION 506
HIGHLAND PARK, IL

DEMOLITION PLAN

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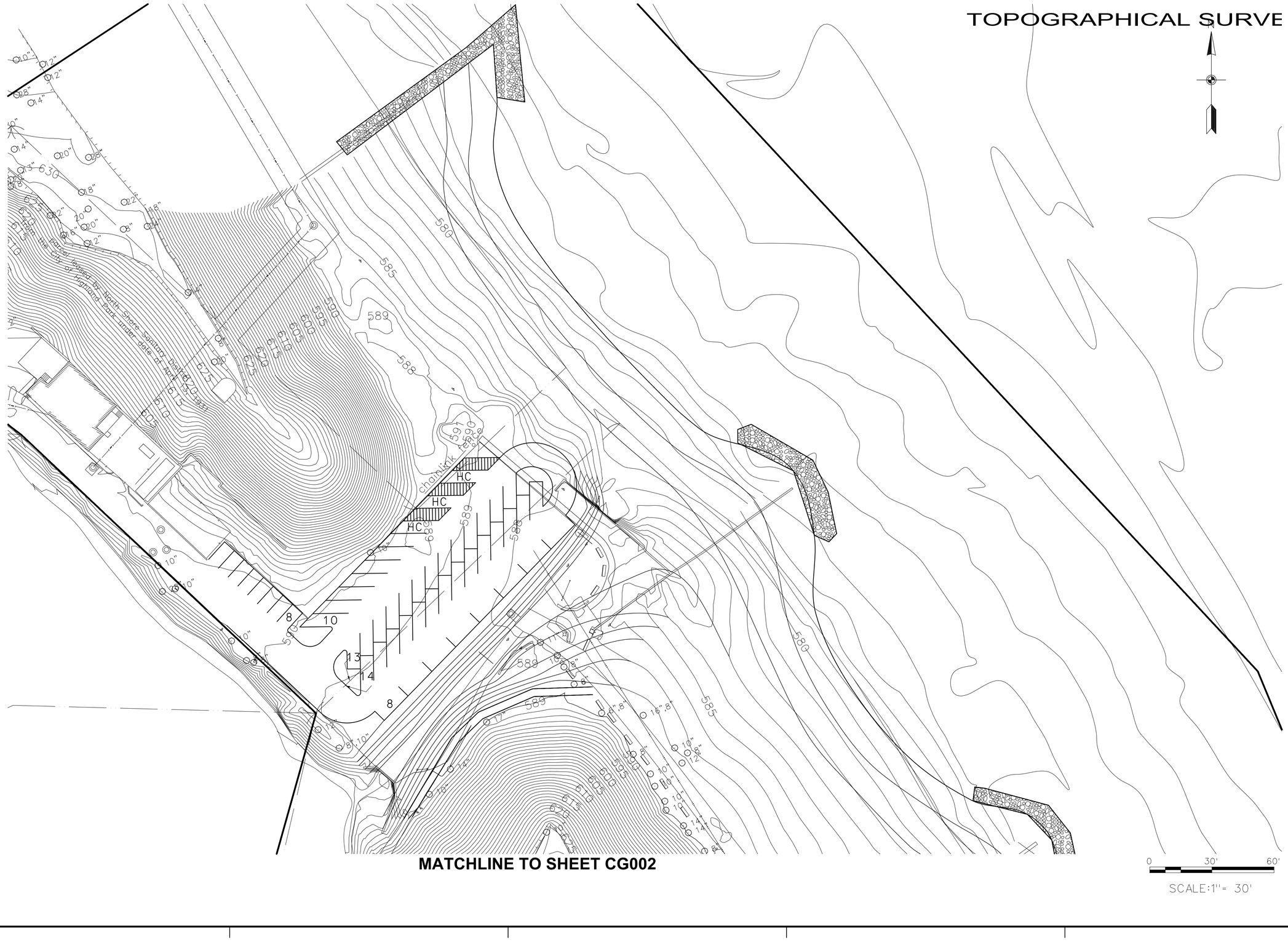

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CHICAGO, IL

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ROSEWOOD PARK
SECTION 506
HIGHLAND PARK, IL

SITE PLAN

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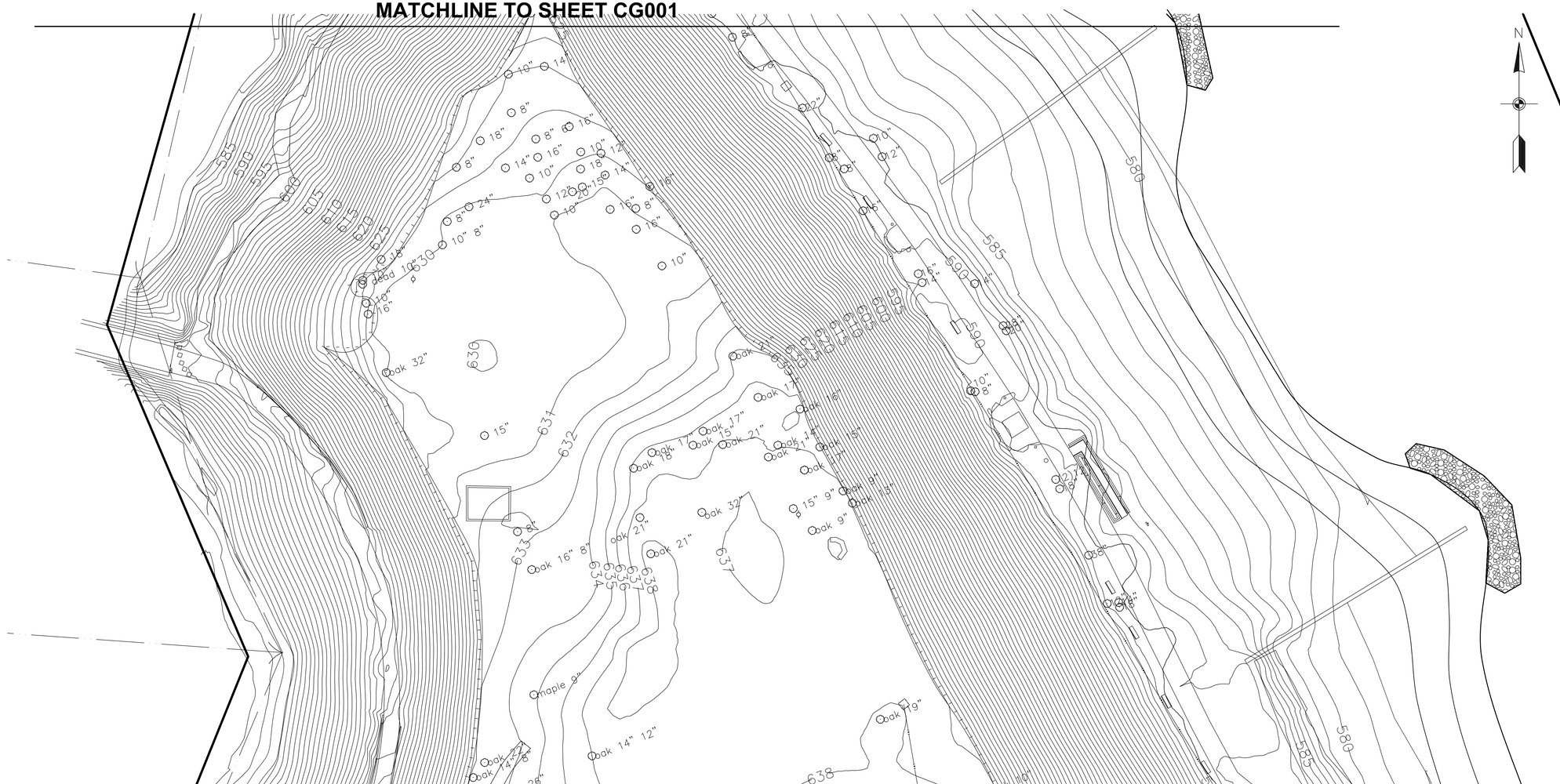

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CHICAGO DISTRICT
CHICAGO, IL

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ROSEWOOD PARK
SECTION 506
HIGHLAND PARK, IL

SITE PLAN

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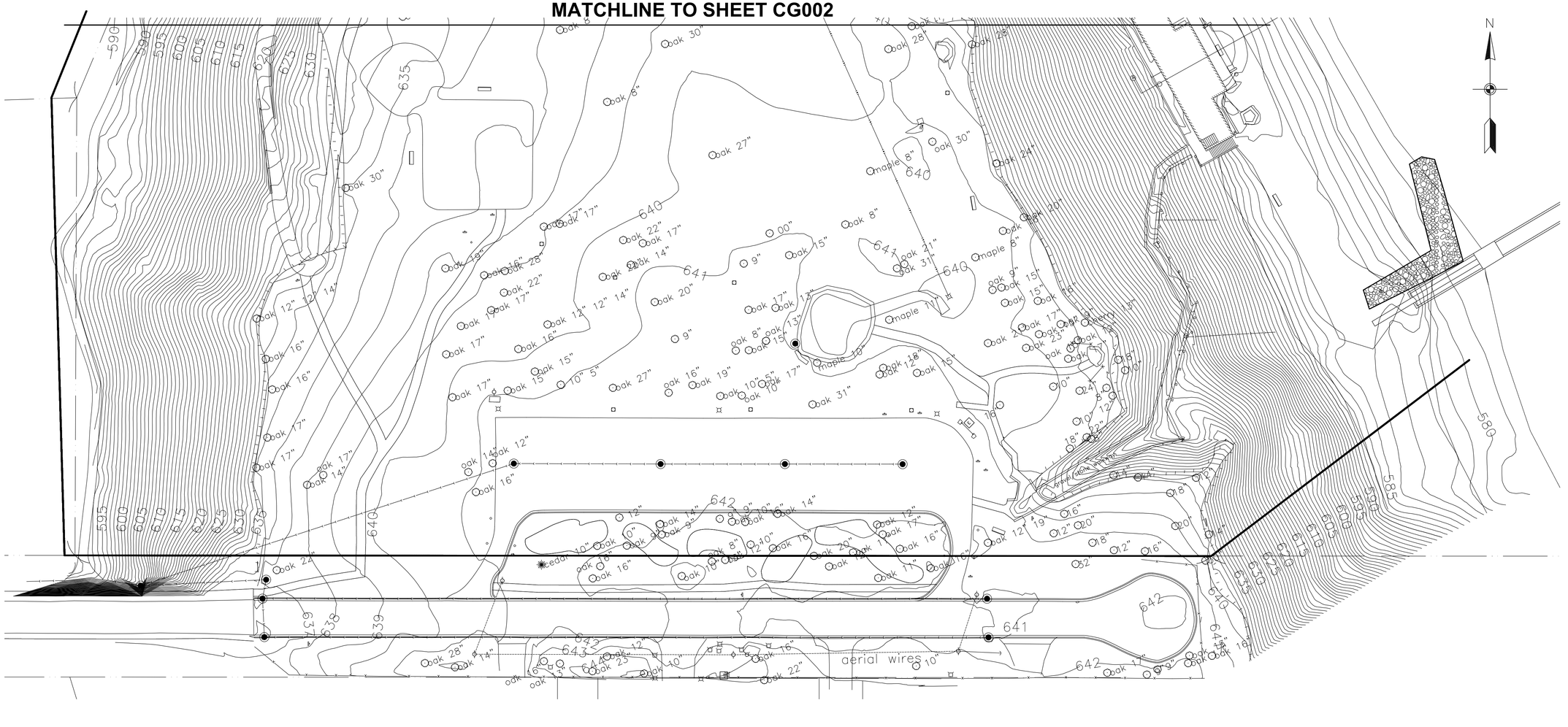

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CHICAGO DISTRICT
CHICAGO, IL

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ROSEWOOD PARK
SECTION 506
HIGHLAND PARK, IL

SITE PLAN

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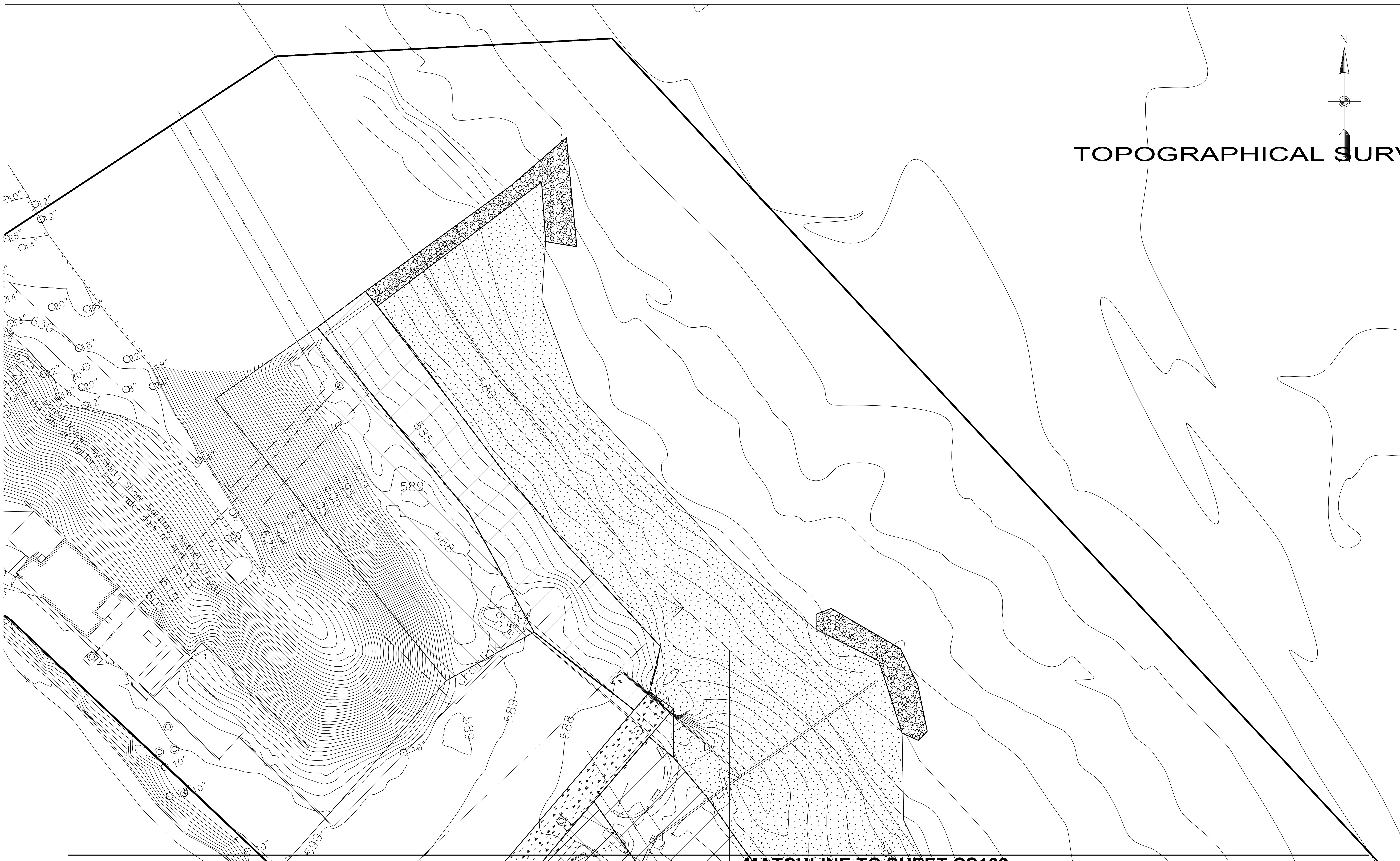

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CHICAGO DISTRICT
CHICAGO, IL

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ROSEWOOD PARK
SECTION 506
HIGHLAND PARK, IL

PLANTING PLAN

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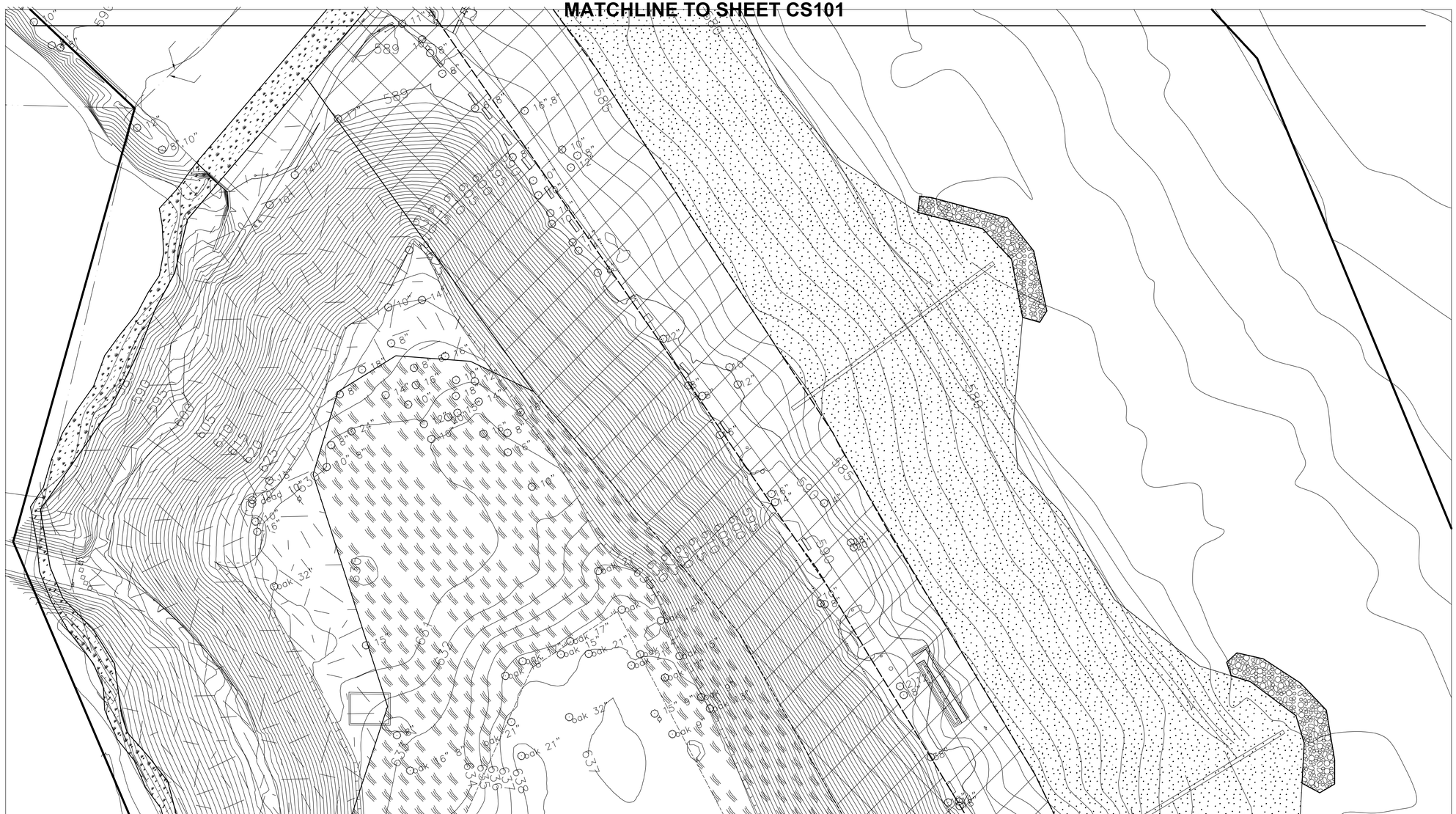

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US Army Corps of Engineers
Chicago District

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U.S. ARMY CORPS OF ENGINEERS
CHICAGO DISTRICT
CHICAGO, IL

ROSEWOOD PARK
SECTION 506
HIGHLAND PARK, IL

PLANTING PLAN

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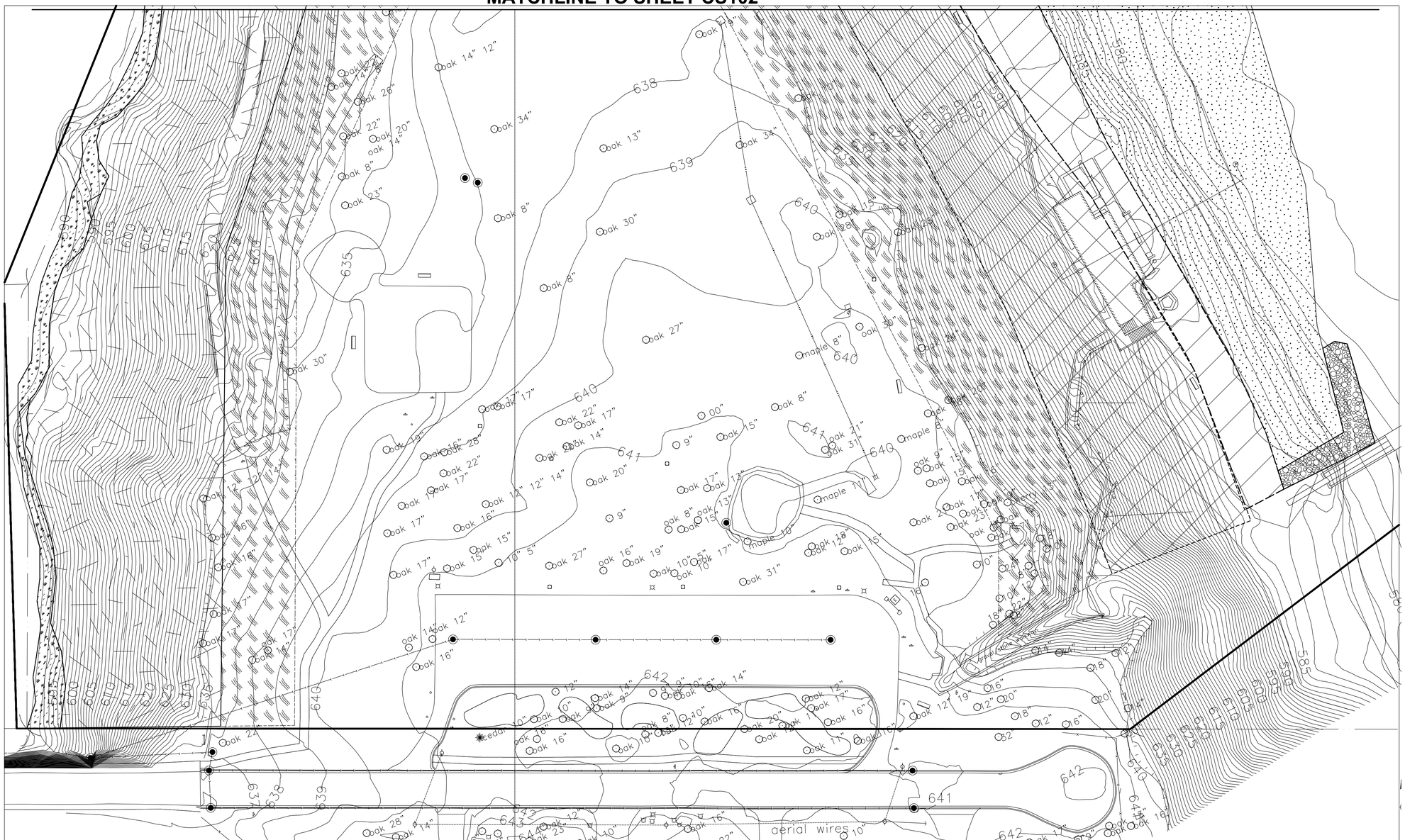

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CHICAGO, IL

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ROSEWOOD PARK
SECTION 506
HIGHLAND PARK, IL

PLANTING PLAN

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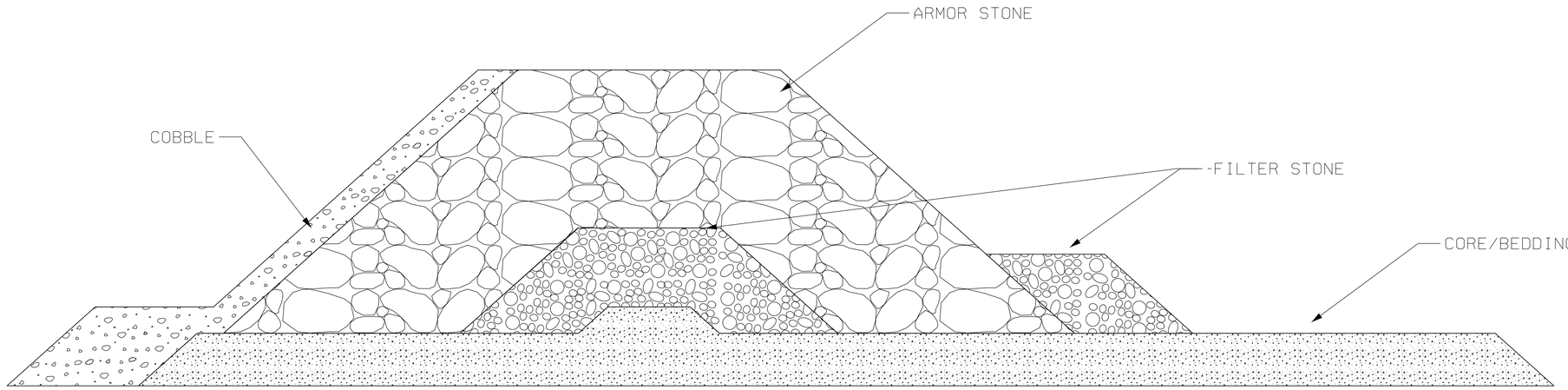

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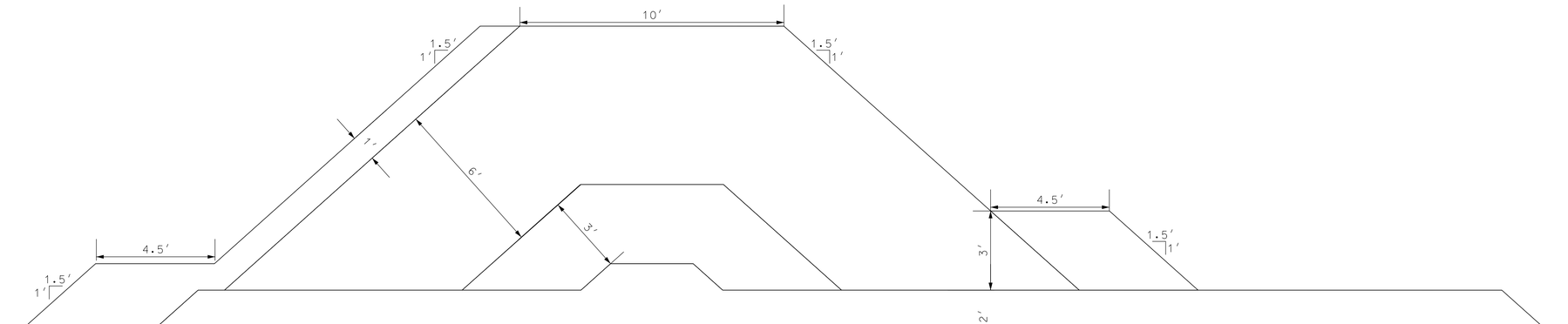

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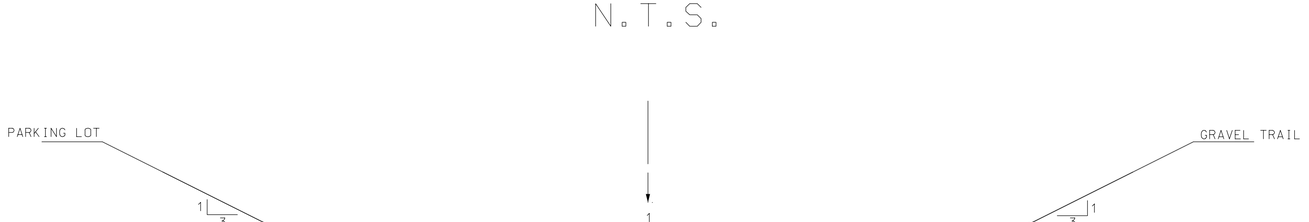

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US Army Corps of Engineers
Chicago District

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CHICAGO DISTRICT
CHICAGO, IL

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ROSEWOOD PARK
SECTION 506
HIGHLAND PARK, IL

TYPICAL DETAILS

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Rosewood Park Coastal Section 506

Great Lakes Fishery and Ecosystem Restoration

Appendix D – HTRW

CELRC-TS-HE **29 April 2011**

MEMORANDUM FOR CELRC-PM-PM (Buczak)

SUBJECT: HTRW and non-HTRW Report for Rosewood Park

1. Enclosed is the HTRW investigation report for the Rosewood Park project. This investigation was based on review of existing information, a database research, and a site visit conducted in March 2011.

2. This document provides details to support the opinion that the proposed Rosewood Park site, located in Highland Park, Illinois appears to be free of any consequential HTRW and non-HTRW contamination.

3. If there are any questions regarding this HTRW investigation, please contact Christel Johnson at (312) 846-5512, christel.d.johnson@usace.army.mil.

Jay A. Semmler, P.E.
Chief, Hydraulic & Environmental
Engineering Section

HAZARDOUS, TOXIC, AND RADIOACTIVE WASTE (HTRW) AND NON-HTRW INVESTIGATION

CONTINUING AUTHORITIES PROJECT (CAP)
ROSEWOOD PARK, HIGHLAND PARK, IL, SECTION 506

Hydraulic and Environmental Engineering Section (TS-DH)
U.S. Army Corps of Engineers, Chicago District

April 29, 2011

HAZARDOUS, TOXIC, AND RADIOACTIVE WASTE (HTRW) AND NON-HTRW INVESTIGATION
ROSEWOOD PARK, HIGHLAND PARK, IL

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INTRODUCTION

The purpose of this report is to discuss the hazardous, toxic, and radioactive waste (HTRW) investigation for the Rosewood Park, Section 506 CAP Project located in Highland Park, Illinois. This report identifies both HTRW and non-HTRW environmental issues, and presents appropriate measures to resolve these issues. The methods used in performing the investigation are described in detail. Conclusions and recommendations regarding potential impacts due to HTRW and non-HTRW issues associated with the project site are provided.

AUTHORITY

Engineer Regulation (ER) 1165-2-132, Hazardous, Toxic, and Radioactive Waste Guidance for Civil Works projects, requires that a site investigation be conducted as early as possible to identify and evaluate potential HTRW problems. According to ER 1165-2-132, non-HTRW issues that do not comply with the federal, state, and local regulations should be discussed in the HTRW investigation along with HTRW issues. Therefore, HTRW and non-HTRW issues identified are discussed in this report.

No HTRW investigation can wholly eliminate uncertainty regarding the potential for HTRW associated with a project area. Performance of the HTRW investigation is intended to reduce, but not eliminate, uncertainty regarding the potential for HTRW in connection with a project area, and this practice recognizes time and cost constraints.

GUIDANCE

Supplemental guidance was provided by the Standard Practice for Environmental Assessments: Phase I Environmental Site Assessment Process (Designation: E 1527-00) prepared by the American Society for Testing of Materials (ASTM). These standards include a records review, site visit, interviews, and report preparation. This report followed many of the ASTM E 1527-00 guidelines but not to the same level of detail described by the ASTM E 1527-00 guidance.

Hazardous, Toxic, and Radioactive Waste

The objective of ER 1165-2-132 is to outline procedures to facilitate early identification and appropriate consideration of HTRW problems. This investigation, therefore, identifies potential HTRW problems and discusses resolutions and/or provides recommendations regarding the HTRW problems identified.

Non-Hazardous, Toxic, and Radioactive Waste

According to ER 165-2-132, non-HTRW environmental issues that do not comply with federal, state and local regulations should be discussed in the HTRW investigation along

with HTRW issues. For example, solid waste is a non-HTRW issue considered. Petroleum releases from Leaking Underground Storage Tanks (LUSTs) are not considered HTRW, but are regulated under the Illinois Administrative Code (IAC), Title 35, Part 731 - Underground Storage Tanks, Part 732 - Petroleum Underground Storage Tanks, and Part 742 - Tiered Approach to Corrective Action Objectives (TACO). Non-HTRW problems identified during the investigation are also discussed in this report, along with resolutions and/or recommendations for resolving the issue.

LAWS AND REGULATIONS

Federal

The definition of HTRW according to ER 1165-2-132, page 1, paragraph 4(a) is as follows: "Except for dredged material and sediments beneath navigable waters proposed for dredging, for purposes of this guidance, HTRW includes any material listed as a 'hazardous substance' under the Comprehensive Environmental Response, Compensation and Liability Act, 42 U.S.C. 9601 et seq. (CERCLA). (See 42 U.S.C. 9601(14).) Hazardous substances regulated under CERCLA include 'hazardous wastes' under Sec. 3001 of the Resource Conservation and Recovery Act, 42 U.S.C. 6921 et seq.; 'hazardous substances' identified under Section 311 of the Clean Air Act, 33 U.S.C. 1321, 'toxic pollutants' designated under Section 307 of the Clean Water Act, 33 U.S.C. 1317, 'hazardous air pollutants' designated under Section 112 of the Clean Air Act, 42 U.S.C. 7412; and 'imminently hazardous chemical substances or mixtures' on which EPA has taken action under Section 7 of the Toxic Substance Control Act, 15 U.S.C. 2606; these do not include petroleum or natural gas unless already included in the above categories. (See 42 U.S.C. 9601(14).)"

As stated in the definition of hazardous substance in the Environmental Statutes, 1988 Edition, the term does not include petroleum, including crude oil or any fraction thereof, which is not otherwise specifically listed or designated as a hazardous substance under the definition. Underground Storage Tanks (USTs) are federally regulated under 40 CFR Part 280, which includes technical standards and corrective action requirements for owner and operators of USTs.

State

The Illinois State regulations were examined to determine which regulations governed the state specific hazardous waste disposal, release, and cleanup requirements. Illinois regulates USTs under Illinois Administrative Code, Title 35, Subtitle G, Chapter I, Subchapter D, Part 731, Underground Storage Tanks. The definition of a regulated substance under this regulation means any "hazardous substance" or "petroleum." Hazardous substance UST is defined as an UST system that contains a "hazardous substance," or any mixture of "hazardous substances" and "petroleum" which is not a petroleum UST system. Petroleum UST means any UST system that contains petroleum or a mixture of petroleum with minimal quantities of other regulated substances. Owners and operators of petroleum or hazardous substance UST systems must comply with the

requirements of Part 731 except for USTs excluded under Section 731.110(b) and UST systems subject to RCRA corrective action requirements under 35 Ill. Adm. Code 724.200, 724.296, 725.296 or 725 Subpart G.

SITE DESCRIPTION

The site is located on the southwest shore of Lake Michigan in the City of Highland Park, Lake County, Illinois approximately 22 miles north of the City of Chicago. The project site encompasses approximately 9 acres and is primarily surrounded by residential areas (Figures 1 and 2). The site was landscaped by the famous architect Jens Jenson and was added to the National Register of Historical Places. The Park District of Highland Park purchased Rosewood Park in 1928 and in 1945 from Julius Rosenwald, owner of Sears, Roebuck and Company. Rosewood Park is split into two levels. The upper level is covered in vegetation and the lower level is the beach front and runs adjacent to Lake Michigan.

Figure 1: Rosewood Park, Highland Park, Illinois Vicinity Map

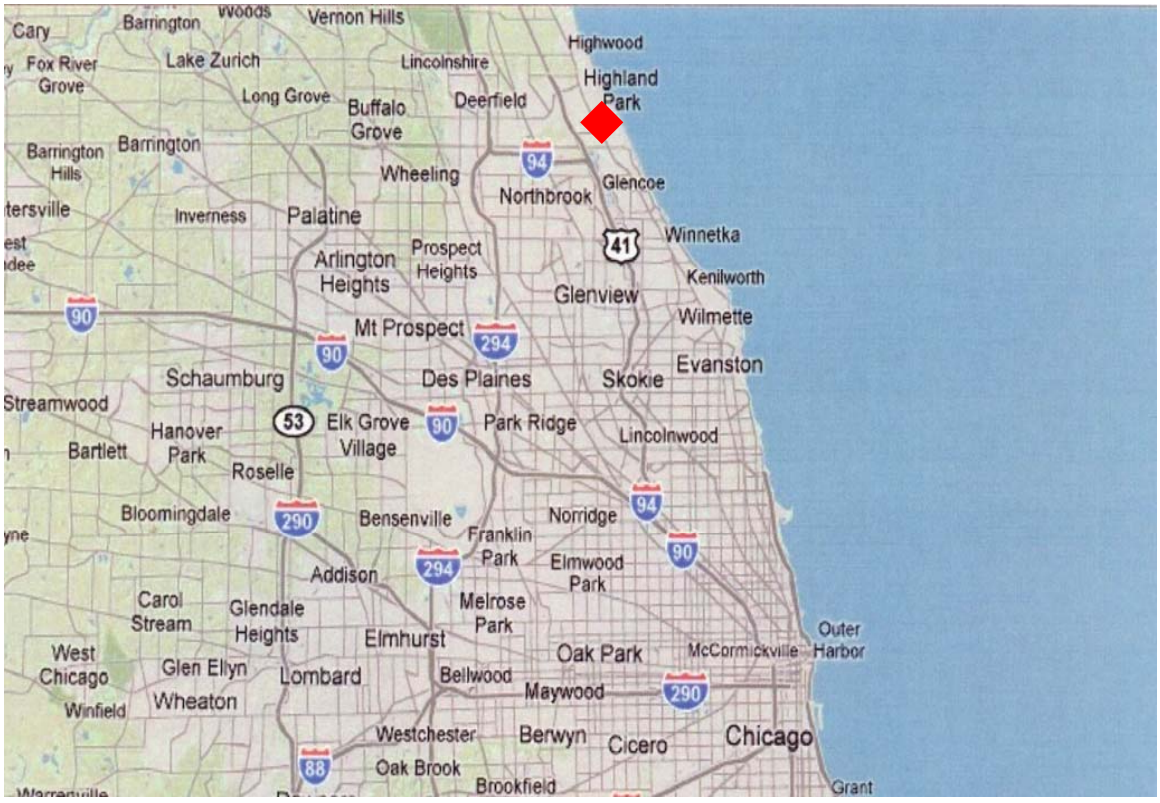


Figure 2: Rosewood Park Project Site Location Map

PROJECT DESCRIPTION

The methods proposed in completing this ecosystem restoration include:

- Eliminating infrastructure from the beach
- Removing ravine outfall culvert
- Stabilizing bluff, ravine, dune and beach community
- Removing non-native and invasive species
- Restoring fish habitat

The final proposed site layout is shown in Figure 3. This project will include the restructuring and stabilization of the bluff to help prevent runoff into the stream. The removal of the culvert will permit a free-flowing stream which is necessary for native plants. Along the shoreline, the removal of large stones and steel groynes will provide patron access to the beach as well as provide a more appealing view of the water front.

Figure 3: Proposed Site Layout

GENERAL METHODS

This assessment relies primarily on the location of regulated sites within the immediate vicinity of the project area identified in the database search, a review of existing information, and information gathered during a site visit. The following sections contain information that was gathered in accordance with ER 1165-2-132. The information was obtained from:

- Database search performed by Environmental Data Resources, Inc.
- Review of existing information
- Observations made during a site visit

DATABASE SEARCH

A search of available environmental records was conducted utilizing the Environmental Database Resources, Inc. (EDR) online. EDR searched federal and state databases using the minimum search distances issued in the ASTM E 1527-00 guidelines. Table 1 notes the recommended ASTM search distance for federal and state databases. The search was

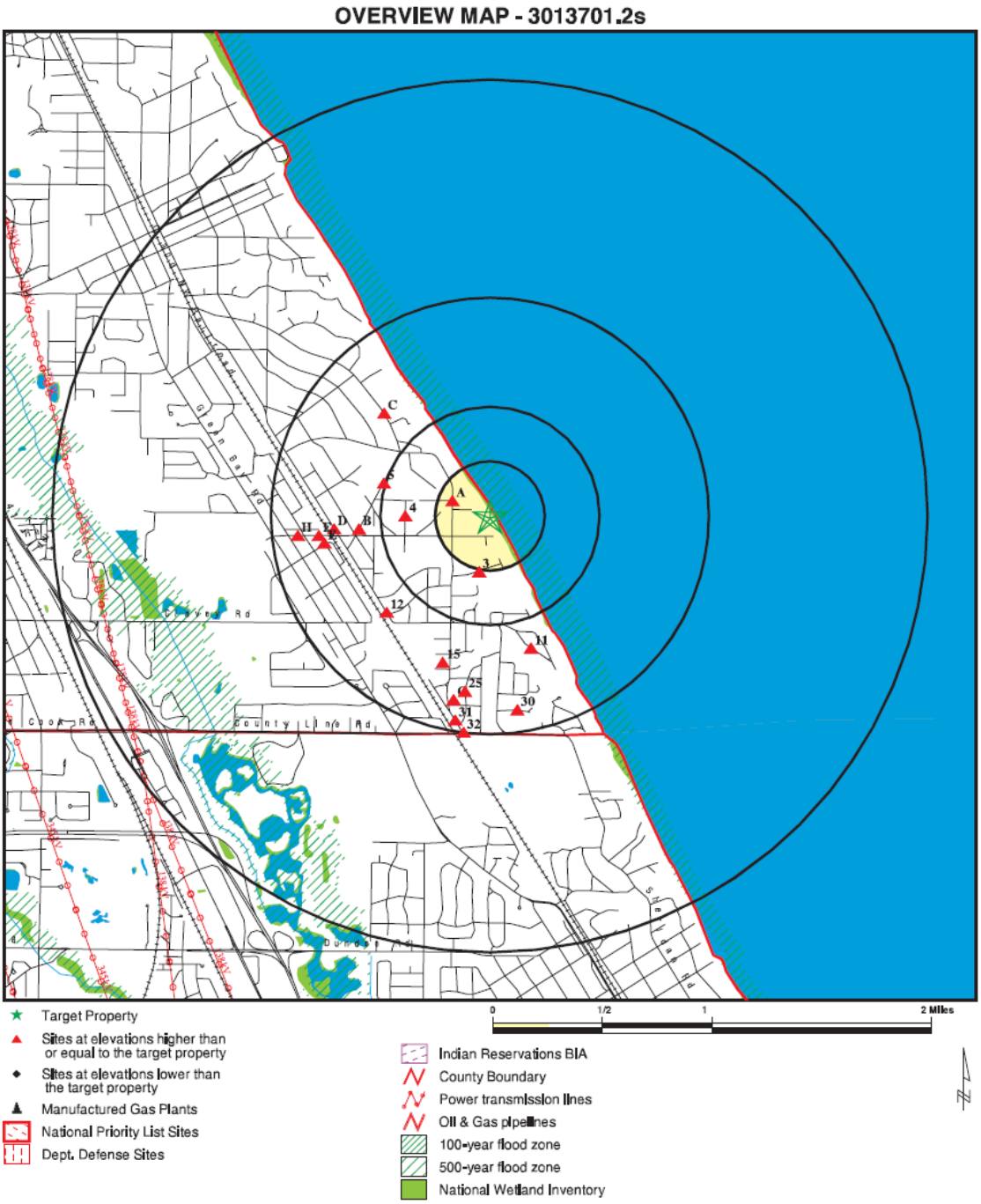
centered roughly near the middle of the shoreline that requires repair. The radius was expanded by 1 mile to accommodate the large size of the site.

Table 1: Minimum Search Distance for Federal and State Database Searches

Database	Approximate Minimum Search Distance (mi)
Federal NPL Site List	1.0
Federal CERCLIS List	0.5
Federal CERCLIS NFRAP site list	Property and Adjoining Properties
Federal RCRA CORRACTS Facilities List	1.0
Federal RCRA non-CORRACTS TSD Facilities List	0.5
Federal RCRA Generators List	Property and Adjoining Properties
Federal ERNS List	Property Only
State Equivalent NPL	1.0
State Equivalent CERCLIS	0.5
State Landfill/Solid Waste Disposal Site Lists	0.5
State LUST Lists	0.5
State registered UST List	Property and Adjoining Properties

The EDR overview map displaying the project area and the search results are given in Figure 4. Additional "orphan" sites were returned by the search, but were not mapped due to poor or inadequate address information. The site location was verified using online maps.

Figure 4: EDR Overview Map



CERCLIS

The Comprehensive Environmental Response, Compensation, and Liability, Information System (CERCLIS) contains data on any potential hazardous waste site that has been reported by states, municipalities, private companies, or private persons pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The CERCLIS database indicates the stages of evaluation and remediation that have been completed for any given site. The CERCLIS database includes the National Priority List (NPL), which identifies over 1,200 sites for priority cleanup under the Superfund program, and the CERCLIS-No Further Remedial Action Planned (NFRAP) List, which includes a listing of sites that have been removed from CERCLIS, for various reasons. The database search located one CERCLIS site within the search distance. See Table 2 for search summary.

Table 2: CERCLIS Search Results

Database	Map ID	Site Name	Proximity to Site (miles)	Address	Status
CERCLIS NFRAP	Orphan	Highland Park Landfill	4.4 NW	1150 Half Day Road	Archived site as of 1995

The CERCLIS database search revealed one orphan site, a former landfill. The database search was cross referenced with the Illinois Environmental Protection Agency's (IEPA) online search located at http://epadata.epa.state.il.us/land/inventory/. IEPA's database reveals the location is currently a golf course. The last update on the IEPA database search is 2008 and has no additional actions. Since the site has been archived and no further remediation action is required, the location is not anticipated to interfere with proposed construction activities.

RCRIS

The Resource Conservation and Recovery Information System (RCRIS) lists sites which generate, transport, store, and/or dispose of hazardous waste defined by the Resource Conservation and Recovery Act (RCRA). The RCRIS database includes RCRA Corrective Action Report (CORRACTS), which identify hazardous waste handlers with RCRA corrective action activity; RCRA treatment, storage, and disposal facilities (TSDFs), RCRA non-generators (NonGen) which do not presently generate hazardous waste, RCRA conditionally exempt small quantity generators (CESQGs), RCRA small quantity generators (SQGs), and large quantity generators (LQGs) facilities. The database search located five RCRA sites within the search distance. See Table 3 for a summary of information obtained from the database search.

Table 3: RCRIS Search Results

Database	Map ID	Site Name	Proximity to Site (miles)	Address	Status

Database	Map ID	Site Name	Proximity to Site (miles)	Address	Status
RCRA SQG	5	Bensinger	0.507 WNW	945 Dean Ave	Last IEPA Update: 2000
RCRA NonGen	B7	Ravinia Elementary	0.600 W	763 Dean Ave	Last IEPA Update: 2006 Non-Generator
RCRA SQG	B10	Joy Cleaners	0.630 W	447 Roger Williams Rd	Last IEPA Update: 2003 No Violations Found
RCRA SQG	12	Septran Inc	0.646 SW	441 St. Johns Rd	Last IEPA Update: 2003 No Violations Found
RCRA SQG	D17	Roessler Cleaners	0.713 W	727 St. Johns Rd	Last IEPA Update: 2003 No Violations Found

The database search was cross referenced with the IEPA's online RCRA search http://epadata.epa.state.il.us/land/inventory/ and EPA's online database search, http://www.epa.gov/enviro/facts/rcrainfo/search.html. The first item, Bensinger, is the closet to the project site and is identified as an ignitable hazardous waste generator. No violations have been noted and the last IEPA update was entered in 2000.

The remaining locations are more than a half a mile away and are primarily west of the project site. Two locations are dry cleaners and produce halogenated solvents. Septran, is a small generator of lead waste. The business is classified as a bus charter company. No violations have been found for any of the results listed in Table 3. Due to the proximity to the project site and no violations noted, there's no anticipated interference with the proposed construction project.

ERNS

The Emergency Response Notification System (ERNS) database lists information on reported releases of oil and hazardous substances. The database search located four ERNS sites within the search distance. See Table 4 for a summary of information obtained from the database search.

Table 4: ERNS Search Results

Database	Map ID	Site Name	Proximity to Site (miles)	Address	Status
ERNS	Orphan	Highland Park Ave & Rt 41	2.0 W	Highland Park Ave & Rt 41	Spill Reported in 1990 PCB
ERNS	Orphan	Transmission Substation	3.0 N	48 W. Park Ave	Spill Reported in 1987 PCB
ERNS	Orphan	TSS-48 Highland Park	2.0 W	Highland Park Ave at Route	Spill Reported in 1990 PCB

Database	Map ID	Site Name	Proximity to Site (miles)	Address	Status
		Ave		41	
ERNS	Orphan	Water Treatment Plant	3.0 N	10 E. Park Ave	Spill reported in 1988 Mercury

The ERNS search results produced 4 reports of emergency spills. All search results are orphan sites. The first emergency spill listed was reported in 1990 and is reported as being recovered. The second spill listed, Transmission Substation, was reported in 1987 and located 3 miles north of the project site. Soil contaminated by the spill was covered and excavated. The third spill listed is believed to be the same as the Highland Park Ave and Route 41 spill. The dates (06/16/1990), times (13:10), and material (PCB-Oil) are the same. The final spill listed was reported in 1988 as mercury. The soil was excavated and placed in a drum for disposal.

The locations of the spills, the dates of occurrences, and successful recovery of the contaminated material are anticipated to have no impact on the proposed project site and construction activities.

SHWS

The State Hazardous Waste Sites (SHWS), or State Oversight List, are the state equivalent to CERCLIS and NPL. These sites may or may not have already been listed on the federal CERCLIS list. The database search located no SHWS sites within the search distance.

SWF/LF

The IEPA records the state's Solid Waste Facilities/Landfill sites (SWF/LF). These sites may be active or inactive facilities or open dumps that failed to meet RCRA Subtitle D Section 4004 criteria for solid waste landfills or disposal sites. The database search located one SWF/LF site within the search distance. See Table 5 for a summary of information obtained from the database search.

Table 5: SWF/LF Search Results

Database	Map ID	Site Name	Proximity to Site (miles)	Address	Status
SWF/LF	Orphan	Glencoe Water Tower Site	5 SW	1900 Frontage Rd	Unknown

The landfill database search produced one orphan location that is 5 miles southwest of the project site. No interference from the listed landfill is anticipated due to the distance and direction from the project site.

UST/LUST

The Illinois State Fire Marshall maintains a listing of registered underground storage tanks (UST), as required by RCRA Subtitle I. The Illinois Environmental Protection Agency maintains a listing of leaking underground storage tank reports (LUST). The database search located three UST and fifteen LUST facilities. See Tables 6 and 7 for a summary of information obtained from the database search.

Table 6: UST Search Results

Database	Map ID	Site Name	Proximity to Site (miles)	Address	Status
UST	B8	Ravinia School	0.600 W	763 Dean Ave	Abandoned Heating Oil Tank 1995
UST	C14	North Suburban Synagogue	0.675 NW	1175 Sheridan Rd	Abandoned Heating Oil Tank 2007
UST	15	Ravinia Festival	0.704 SSW	201 S. St. Johns	Removed Gasoline Tank 1999

The database search revealed three UST sites around the search area. The UST database search was cross referenced with the Illinois State Fire Marshal's online search located at http://webapps.sfm.illinois.gov/ustsearch/. Information from both database searches compiles the summary of items in Table 6.

The UST's located at Ravinia School and the North Suburban Synagogue are abandoned and not in use. The gasoline tank located at Ravinia Festival was removed in 1999. The listed locations are not anticipated to have an impact on the proposed project site or construction activities.

Table 7: LUST Search Results

Database	Map ID	Site Name	Proximity to Site (miles)	Address	Status
LUST	B6	Ravinia School	0.600 W	763 Dean Ave	Heating Oil Tank NFR 1995
LUST	11	Burack Construction	0.634 SSE	306 N. Deere Park West	Fuel Oil Non LUST Determination 1999

Database	Map ID	Site Name	Proximity to Site (miles)	Address	Status
LUST	C13	North Suburban Synagogue	0.675 NW	1175 Sheridan Road	Other Petroleum
LUST	E19	Highland Park Fire Dept	0.760 W	692 Burton Ave	Gasoline, Diesel NFR 2008
LUST	E20	Leonards Ravinia Auto Service	0.766 W	710 Burton Ave	Gasoline Tank NFR 2001
LUST	E21	Andev, Inc	0.766 W	710 Burton Ave	Gasoline Tank NFR 2003 Fuel Oil Tank Non LUST Determination 2003
LUST	E22	Ravinia Union 76	0.766 W	710 Burton Ave	Gasoline, Fuel Oil, Used Oil NFR 1996
LUST	F24	Rodger Williams LLC	0.804 W	632 Rodger Williams Ave	Other Petroleum Tank NFR 2000
LUST	25	Braeside Elementary	0.812 S	150 Pierce Rd	Fuel Oil Tank NFR 1996
LUST	G26	Ravinia Festival	0.858 S	201 S. St. Johns	Gasoline Tank NFR 2000
LUST	H27	Ravinia Medical Building	0.882 W	625 Roger Williams Ave	Fuel Oil Tank NFR 1993
LUST	H28	Centrum Properties	0.891 W	632 Roger Williams Ave	Other Petroleum Tank NFR 2000
LUST	G29	Marigiu Lenzini	0.892 SSW	89 Lincolnwood	Other Petroleum Tank NFR 1998
LUST	30	Marshall Gerber	0.897 S	239 Ivy Lane	Other Petroleum Tank Pre 74 Letter: 2007
LUST	32	Septran Inc	0.998 S	Lake Cook & St. Johns	Gasoline and Used Oil NFR 2008

The LUST database search was cross referenced with IEPA's online search located at http://epadata.epa.state.il.us/land/ust/Search.asp. Information from both database searches compiles the summary items in Table 7. Locations are listed in order of proximity to the project site.

All of the listed LUSTs except two have received no further remediation or non Lust determination letters and are not expected to impact the proposed project site. The LUST listed at North Suburban Synagogue was reported in August 2006. The LUST owner was

approved by IEPA for a Site Investigation Plan in August of 2008. A Corrective Action Budget Plan submitted by the site owner was denied by in July of 2009. IEPA sent out a letter to the LUST owner listing reasons for the denial and is awaiting resubmittal. No additional activity from IEPA or the facility has been noted since 2009. The material listed as leaking is categorized as other petroleum. The LUST listed as Marshall Gerber is located almost a one mile south of the project site.

Site Remediation Programs

The Site Remediation Program (SRP) database lists all voluntary remediation projects administered through the pre-notice site clean-up program (1989 to 1995) and the site remediation program (1996 to present). The Brownfields database lists sites that have received grants under the Illinois Municipal Brownfields Redevelopment Grant Program for site investigation and cleanup activities. The search of these databases located three sites within the search distance. See Table 5 for a summary of information obtained from the database search.

Table 8: SRP Search Results

Database	Map ID	Site Name	Proximity to Site (miles)	Address	Status
SRP	D18	Ravinia Cleaners	0.713 W	727 St. John Ave	Inactive
SRP	F23	Ravinia Vogue Cleaners	0.787 W	565 Roger Williams Ave	Inactive
SRP	31	Oakwood Cleaners	0.948 S	57 St. Johns Ave	Active

The SRP database search was cross referenced with IEPA's online search located at http://epadata.epa.state.il.us/land/SRP/index.asp. Information from both database searches compiles the summary items in Table 9. The search reveals two locations are currently inactive and one is active in the remediation program. Each site listed is either west or south and almost a mile away from the project site.

FINDS

The FINDS database (facility index system/facility registry system) contains facility information and pointers to other sources that contain more detail. The EDR report includes the following FINDS databases in the report: PCS (Permit Compliance System), FATES (FIFRA and TSCA Enforcement System), FTTS (FIFRA/TSCA Tracking System which tracks administrative cases and pesticide enforcement actions and compliance activities related to FIFRA and TSCA, AIRS (Aerometric Information Retrieval System), DOCKET (Enforcement Docket used to manage and track information on civil judicial enforcement cases for all environmental statutes), FURS (Federal Underground Injection Control), C-DOCKET (Criminal Docket System used to

track criminal enforcement actions for all environmental statutes), FFIS (Federal Facilities Information System), STATE (Statement Environmental Laws and Statues), and PADS (PCB Activity Data System). Five FINDS were reported within a mile of the project site. See Table 9 for a summary of information obtained from the database search.

Table 9. FINDS Search Results

Database	Map ID	Site Name	Proximity to Site (miles)	Address	Status
FINDS	A1	Barry Moss	0.179 WNW	855 Sheridan Rd	Illinois ACES
FINDS AIRS	A2	North Shore Sanitary District	0.185 WNW	Cary Ave & Sheridan Rd	AFS; Illinois ACES; NEI
FINDS	3	Gail Heltzer	0.260 S	136 Lakewood	Illinois ACES
FINDS	4	Tom Goodman	0.386 W	815 Rice	Illinois ACES
FINDS	Orphan	City of Highland Park	2.5 NW	Central Ave & Green Bay Rd	Illinois ACES
FINDS	Orphan	City of Highland Park	5.0 NW	Ridge Rd & Midland Ave	Illinois ACES

The FINDS results produced additional reporting agencies such as The Illinois Agency Compliance and Enforcement System (ACES), AIRS Facility Subsystem (AFS), and the National Emissions Inventory (NEI).

The Barry Moss location is listed as a residential property and has no current information. IEPA last updated information for this site in 2003. The updated information only states the revision date is 2003. No further information is given. It is possible this is an old National Pollution Discharge Elimination System (NPDES) permit. The Gail Heltzer and Tom Goodman locations also include no current information. IEPA last updated information for both sites in 2003 as revisions. These are most likely old NPDES permits. The two orphan sites listed in Table 9 are not within close proximity of the proposed project site.

The North Shore Sanitary District is listed under AFS and NEI. Further research was conducted on the EPA's AFS database, located at http://www.epa.gov/enviro/facts/afs/search.html. The address should read Clavey Road and is an operating water sewage treatment plant. The site is in compliance as of 7 February 2011 and is a participant of the Air Program which monitors air pollutants generated by the plant. Since the site is in compliance with IEPA and is participating in the Air Monitoring Program, it is not anticipated to interfere with proposed construction activities.

Other Databases

Various other databases are searched that include supplemental information to the above databases, including: CERCLA consent decrees, National Priority list deletions, Nuclear Regulatory Commissions database of sites possessing radioactive materials, Superfund Liens, PCB Activity Database, Department of Defense sites, Toxic Chemical Release Inventory, FIFRA/TSCA tracking system, oil and gas pipelines, electric transmission lines, sensitive receptors, flood zone data, and the national wetlands inventory. Search results listed two facilities in other databases. The search also listed two orphan sites. See Table 10 for a summary of the search results.

Table 10: Other Search Results

Database	Map ID	Site Name	Proximity to Site (miles)	Address	Status
DRY CLEANERS	B9	Joy One Hour Cleaners	0.630 W	447 Roger Williams	License Expires 2010
DRY CLEANERS	D16	Ravinia 1 Hour Cleaners	0.713 W	727 St. Johns Ave	License Expires 2010
ICIS	Orphan	City of Highland Park	2.0 N	1707 St. John Ave	Clean Water Act Compliance
NPDES	Orphan	Lexus of Highland Park	6.0 NW	3039 & 3040 Skokie Valley Road	NPDES Permit

The database search lists two dry cleaners from the Illinois Drycleaner Environmental Response Trust Fund. Both licenses are listed as expiring in 2010. One orphan site is listed under the NPDES permit. The final listing is under the Integrated Compliance Information System (ICIS). The sites listed in Table 10 are not located on or adjacent to the project site.

REVIEW OF EXISTING INFORMATION

Rosewood Park is split into two areas. The upper area is vegetated with a parking lot, jungle gym, and walking trails that lead down to the ravine. See Figures 5 and 6. The ravine runs east and west and ends at a box culvert located near the lower level parking lot of Rosewood Park. See Figures 7 and 8. The lower level of Rosewood Park consists of a parking lot, the lakefront and beach area, a concrete sidewalk, large cobble stones, and steel groynes that extend west from the beach. See Figure 9.

Figure 5. View of Upper Rosewood Park

Figure 6. View of Ravine from Trail

Figure 7. Ravine and Box Culvert

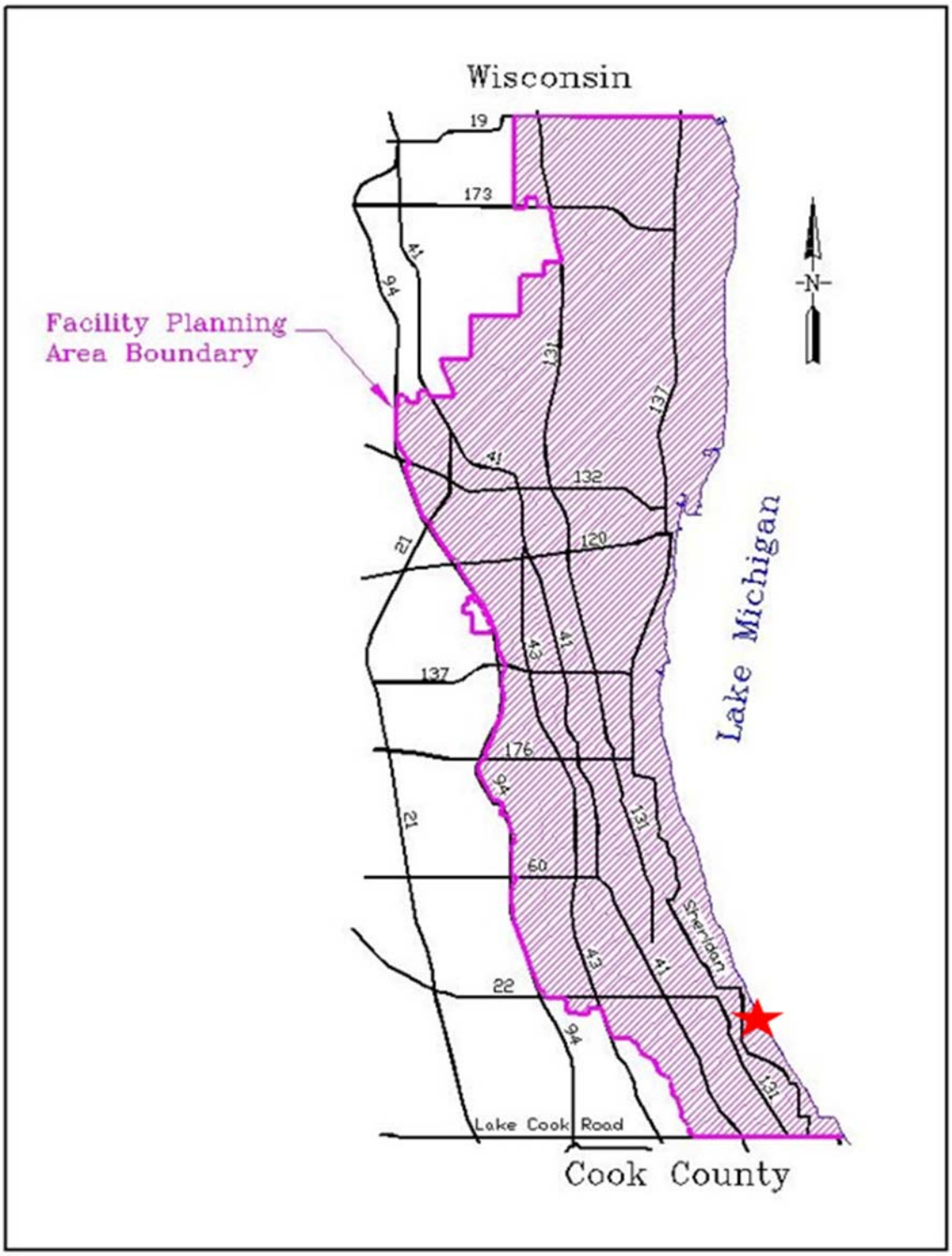
Figure 8. Lower Level Parking Lot

Figure 9. Large Stones and Steel Groyne along Shoreline

Grain size analysis and asbestos samples were taken in an area approximately 1 mile north of Rosewood Park. Three samples were collected near the shore. Results for the grain size analysis showed very little fines and the percent passing 230 sieve ranged from 2.2 percent to 5.1 percent. The asbestos analysis found no asbestos fibers in the samples. The Illinois Environmental Protection Agency issued a certification under Section 401 of the Clean Water Act (PL 95-217) in April 2001. A copy of the analysis can be seen in Attachment A. It is anticipated that current beach nourishment is of the same composition as the analyzed sand due to littoral drifting.

The North Shore Sanitary District (NSSD) is the water sewage treatment plant for Highland Park, IL and surrounding areas. See Figure 10 for the area map. NSSD has sewer lines that run along the shoreline. However, the proposed construction work includes removing large stones, removing steel groynes, and removing the box culvert. No earth work activities consisting of removing sediment are being proposed at this time and therefore should not interfere with the sewer lines.

Figure 10: NSSD Boundary



Historical aerial views of Rosewood Park can be seen in Figures 11 and 12. Only one steel groyne existed along the Rosewood Park shoreline in 1967. Additional groynes

were built between 1967 and 1972. Review of historical maps cannot determine the date for installation of the large stones located along the shoreline.

Figure 11: Aerial View of Rosewood Park - 1967

Figure 12: Aerial View of Rosewood Park – 1972

SITE VISIT

A site visit was conducted on March 26, 2011. An environmental engineering section staff member was present along with the PDT and the Sponsor. The purpose of the visit was to acquaint USACE personnel with the site and investigate the current conditions. The weather conditions on the day of the visit were cloudy, cold, 30°F, and windy.

The project area is located immediately along the shoreline of Lake Michigan in Highland Park, IL. The scope of the project covers the ravine area which runs east and west and the beach area. The PDT visited both project areas.

Examination of the project area revealed broken concrete along the ravine as well as the large box culvert. Low sand levels and limited access to the beach is due to the large stones seen along the shoreline. Although a visible eyesore, the steel groynes extending from the shoreline appeared to be in fair to good condition. No debris was found on or adjacent to the project site. A summary of the site visit is included as Attachment B.

FINDINGS AND CONCLUSIONS

In order to generate an HTRW report for the Rosewood Park, Highland Park, Illinois Project, three methods were employed:

- **Database Review**
  Review of a database search provided by Environmental Data Resources (EDR) identified no sites that will interfere with the proposed construction activities.

- **Review of Existing Information**
  Existing information on this project reviewed grain size analysis, asbestos analysis, and historical maps. Grain size samples revealed few fine sand particles. The asbestos analysis found no asbestos fibers in any of the samples. Historical maps revealed the construction and installation of steel groynes.

- **Site Visit**
  A site visit revealed no additional HTRW concerns at the project site. Damaged concrete blocks and a large box culvert were observed along the ravine. Low sand levels, large stones, and steel groynes were visible on the lower level of Rosewood Park. No debris was found on or adjacent to the project site.

No HTRW investigation can wholly eliminate uncertainty regarding the potential for HTRW associated with a project area. Performance of the HTRW investigation is intended to reduce, but not eliminate, uncertainty regarding the potential for HTRW in connection with a project area.

As a result of this HTRW analysis TS-DH has concluded that there is sufficient information to demonstrate that the work proposed for the Rosewood Park, Highland Park, IL site has little potential for encountering HTRW or non-HTRW contamination.

REFERENCES

American Society for Testing of Materials. Publication E 1527-00. Standard Practice for Environmental Assessments: Phase I Environmental Site Assessment Process.

Department of the Army. U.S. Army Corps of Engineers. ER 1165-2-132. Hazardous, Toxic, and Radioactive Waste (HTRW) Guidance for Civil Works Projects. June 1992.

Illinois 2004 Section 303(d) List (IEPA 2004a). Publication IEPA/BOW/04-005. Bureau of Water, Springfield, Illinois. November 2004.

Illinois Water Quality Report 2004 (IEPA 2004b). Publication IEPA/BOW/04-006. Bureau of Water, Springfield, Illinois. May 2004.

35 Illinois Administrative Code. Environmental Regulations for the State of Illinois.

U.S. Army Corps of Engineers. Hazardous, Toxic and Radioactive Waste (HTRW) and Non-HTRW Issues Investigation, Highland Park, Illinois, Section 14 Emergency Streambank and Shoreline Protection, Cook County, Illinois. 12 September 2000.

ATTACHMENT A

SEDIMENT AND ASBESTOS ANALYSIS 2001

STS Consultants, Ltd.
Solutions through Science & Engineering

April 10, 2001

Ms. Cindy Wilk-Kulczak
U.S. Army Corps of Engineers, Chicago District
111 N. Canal Street, Suite 600
Chicago, Illinois 60606-7206

Re: Highland Park Dredging Sampling - STS Project No. 1-31384-XH

Dear Ms. Wilk-Kulczak:

STS Consultants, Ltd. (STS) recently completed sampling and analysis of shallow offshore sediments at locations proposed for dredging. The locations, just north of Rosewood Park offshore of Highland Park, Illinois in Lake Michigan, were specified by your office. These locations are at approximately 120 feet north, 375 feet north, and 700 feet north of the south project limit line as shown on Sheet C-01 of the November 2000 plans which your office provided to STS. The samples were collected from water depths of 2 to 3 feet and consisted of sediment recovered from 0 to 2 feet below the lake bottom at those locations.

The samples were examined for evidence of anomalous, non-natural materials. No anomalous materials were noted during the sample collection.

The samples were submitted for grain size analysis to the STS Vernon Hills, Illinois laboratory. The requested analytic protocol is attached.

The samples were also submitted for analysis of asbestos content using Transmission Electron Microscope methods (TEM). Those analyses were conducted by TEM Laboratories of Glen Ellyn, Illinois.

The results of the grain size determinations are attached. The results show the percent passing the 230 sieve ranging from a maximum of 5.1 percent to 2.2 percent.

The asbestos analyses found no asbestos fibers in the samples analyzed. The laboratory report for that analysis is also attached.

We appreciate being of service to you on this project. Please contact us with any questions you may have regarding this matter.

Regards,

STS CONSULTANTS, LTD.

Richard G. Berggreen, C.P.G.
Principal Geologist

K:\31384\XH\R184H001.doc

ASBESTOS ANALYSIS

TEM LABORATORY
GLEN ELLYN, ILLINOIS

BULK SAMPLE ANALYSIS BY TRANSMISSION ELECTRON MICROSCOPY

(630)790-0880
(Fax)790-0882

TEM, Incorporated

443 Duane Street
Glen Ellyn, IL 60137

CLIENT STS Consultants, Ltd.	TEM PROJECT # 36920
CONTACT Rich Bergreen	DATE 4/10/01
ADDRESS 750 Corporate Woods Parkway	COMMENTS
CITY/STATE/ZIP Vernon Hills, IL 60061-3153	Army Corps Dredging
PHONE FAX	NVLAP ID # 1130
TYPE OF ANALYSIS QUALITATIVE	QUANTITATIVE CHATFIELD

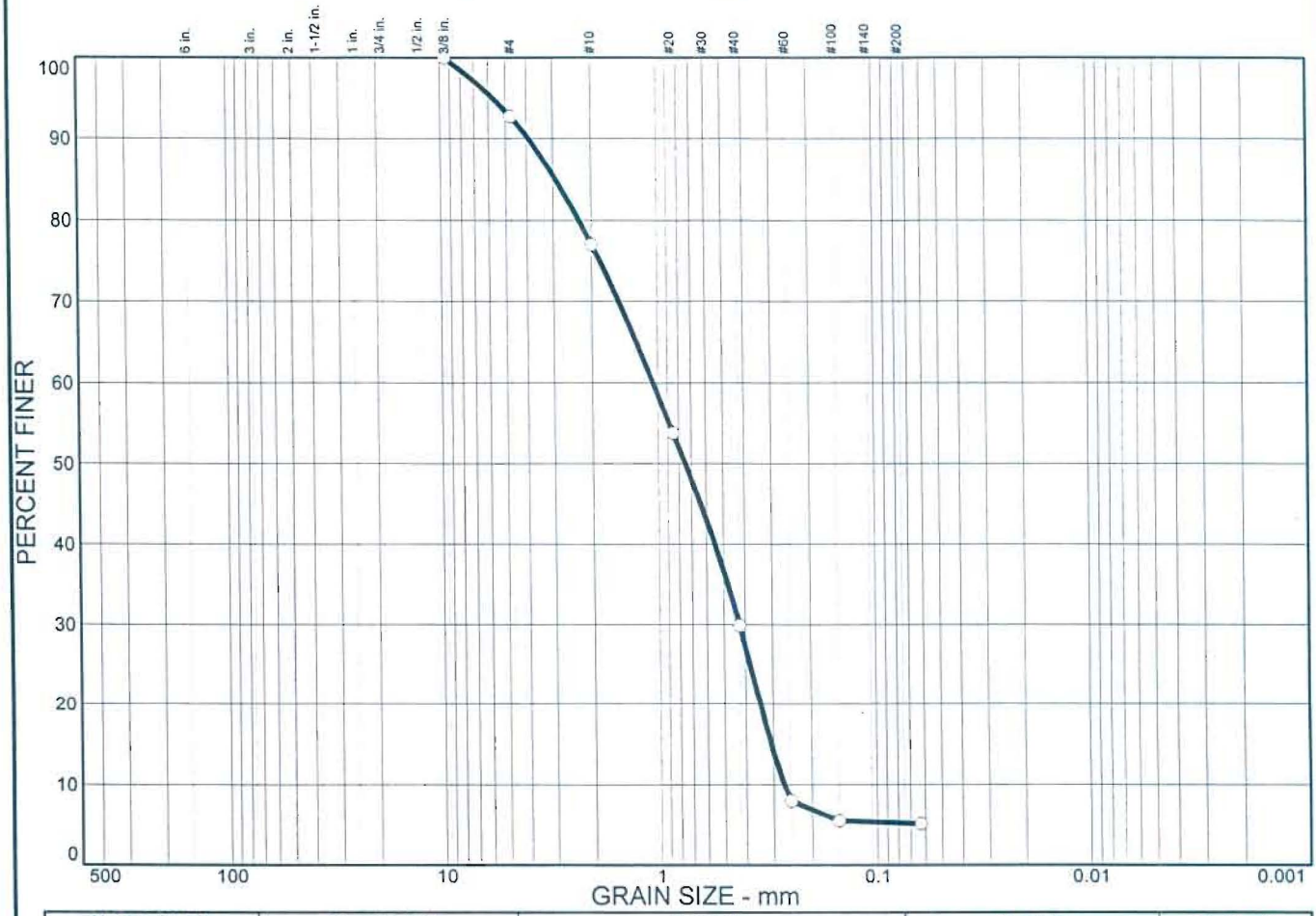
CLIENT I.D.	S-1,0'2	S-2,0'2	S-3.0'2	
TEM I.D.	148539	148541	148543	
COLOR	Tan	Tan	Tan	
FIBROUS	No	No	No	
LAYERS	No	No	No	
CONTAINS ASBESTOS	None Detected	None Detected	None Detected	
TYPE AND % ASBESTOS				
CHRYSOTILE				
AMOSITE				
CROCIDOLITE				
OTHER				
TOTAL ASBESTOS %	None Detected	None Detected	None Detected	
OTHER MATERIAL				
ORGANICS				
ACID SOLUBLE INORGANICS				
NON SOLUBLE INORGANICS				
UPPER VALUE - MICROSCOPE				
LOWER VALUE - MICROSCOPE				
NUMBER OF GRIDS	1	1	1	
NUMBER OF OPENINGS	5	5	5	
TOTAL AREA ANALYZED	0.060	0.060	0.060	
GRID STORAGE BOX NO. B02	WELL G5	WELL G7	WELL G9	WELL
> MAGNIFICATION USED	20Kx	20Kx	20Kx	
PRE ASH WEIGHT				
POST ASH WEIGHT				
COMMENTS				
DATE ANALYZED	3/30/01	3/30/01	3/30/01	
ANALYZED BY	K. Buehler	K. Buehler	K. Buehler	

ANALYZED BY Dawn Buehler	DATE/TIME
RECEIVED BY	DATE/TIME
LOGGED IN BY	DATE/TIME

GRAIN SIZE DETERMINATION

STS CONSULTANTS, LTD.
VERNON HILLS, ILLINOIS

Material Analysis for Dredge and Fill Activities



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	7.2	87.6	5.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375 in.	100.0		
#4	92.8		
#10	77.0		
#20	53.8		
#40	29.9		
#60	8.0		
#100	5.5		
#230	5.1		

* (no specification provided)

Soil Description

FINE-COARSE SAND TRACE FINE GRAVEL TRACE SILT - BROWN

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 2.92 D_{60}= 1.05 D_{50}= 0.747
D_{30}= 0.426 D_{15}= 0.307 D_{10}= 0.269
C_u= 3.92 C_c= 0.64

Classification

USCS= (SP-SM) AASHTO=

Remarks

SAMPLE PROCESSED WITH 6% HYDROGEN PEROXIDE SOLUTION.

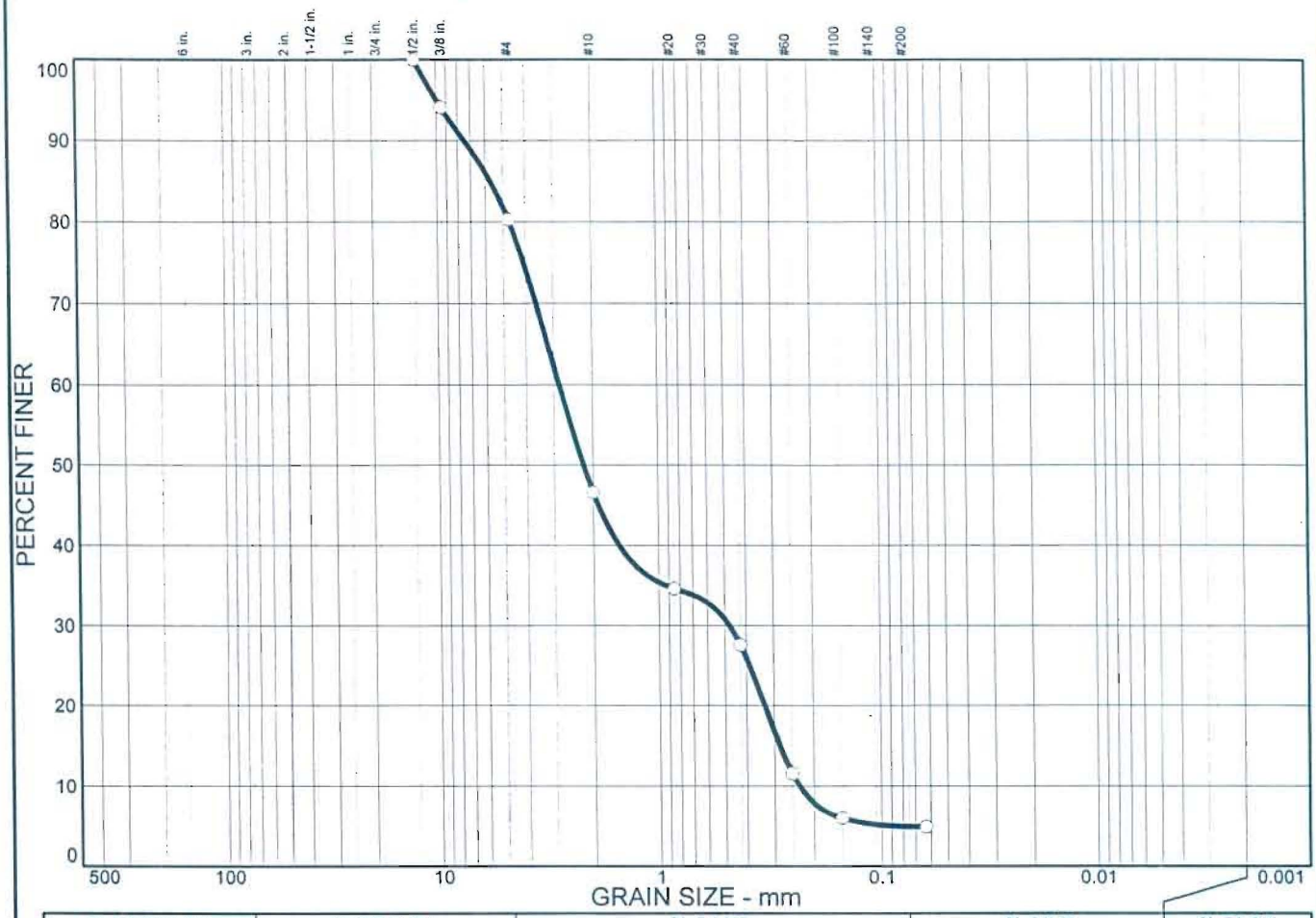
Sample No.: S-3 **Source of Sample:** **Date:** 3/29/01
Location: **Elev./Depth:** 0.0-2.0'

STS Consultants Ltd.
750 Corporate Woods Parkway
Vernon Hills, IL 60061

Client: U.S. ARMY CORPS OF ENGINEERS
Project: HIGHLAND PARK DREDGE SAMPLING

Project No: 31384-XH **Plate**

Material Analysis for Dredge and Fill Activities



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	19.7	75.4	4.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.50 in.	100.0		
.375 in.	94.1		
#4	80.3		
#10	46.6		
#20	34.6		
#40	27.6		
#60	11.6		
#100	6.0		
#230	4.9		

* (no specification provided)

Soil Description

FINE-COARSE SAND LITTLE FINE GRAVEL TRACE SILT - BROWN

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 5.69 D_{60}= 2.84 D_{50}= 2.21
D_{30}= 0.476 D_{15}= 0.283 D_{10}= 0.232
C_u= 12.26 C_c= 0.34

Classification

USCS= (SP) AASHTO=

Remarks

SAMPLE PROCESSED WITH 6% HYDROGEN PEROXIDE SOLUTION.

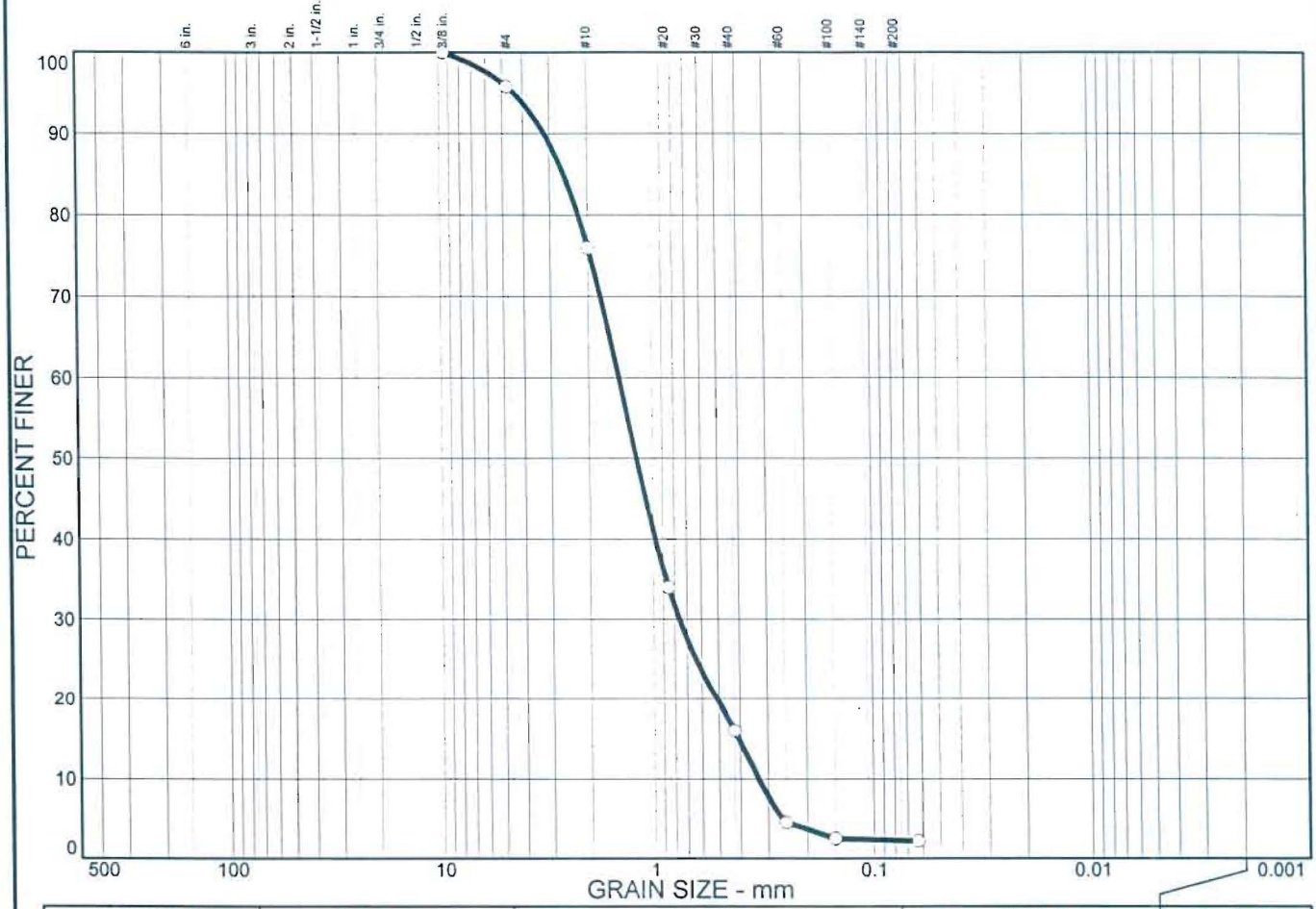
Sample No.: S-2 **Source of Sample:** **Date:** 3/29/01
Location: **Elev./Depth:** 0.0-2.0'

STS Consultants Ltd.
750 Corporate Woods Parkway
Vernon Hills, IL 60061

Client: U.S. ARMY CORPS OF ENGINEERS
Project: HIGHLAND PARK DREDGE SAMPLING

Project No: 31384-XH **Plate**

Material Analysis for Dredge and Fill Activities



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	4.2	93.5	2.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375 in.	100.0		
#4	95.8		
#10	76.0		
#20	34.0		
#40	16.0		
#60	4.5		
#100	2.5		
#230	2.2		

* (no specification provided)

Soil Description

FINE-COARSE SAND TRACE FINE GRAVEL TRACE SILT - BROWN

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 2.59 D_{60}= 1.44 D_{50}= 1.19
D_{30}= 0.759 D_{15}= 0.407 D_{10}= 0.331
C_u= 4.35 C_c= 1.21

Classification

USCS= (SP) AASHTO=

Remarks

SAMPLE PROCESSED WITH 6% HYDROGEN PEROXIDE SOLUTION.

Sample No.: S-1 **Source of Sample:** **Date:** 3/29/01
Location: **Elev./Depth:** 0.0-2.0'

STS Consultants Ltd.
750 Corporate Woods Parkway
Vernon Hills, IL 60061

Client: U.S. ARMY CORPS OF ENGINEERS
Project: HIGHLAND PARK DREDGE SAMPLING

Project No: 31384-XH **Plate**

APPENDIX C - ANALYTICAL PROTOCOLS FOR GRAIN SIZE PREPARATION

Grain Size Determination Protocol

Provide the results of a particle size analysis (sand/fine split). The analysis will follow procedures detailed below for the separation of sand from fines, and results will be reported as the percentage by weight passing a 62 micron sieve (#230 US sieve). The physical characteristics of the material shall be noted.

1. Significant organic matter should be removed as follows: Add 5 ml of 6-percent solution of hydrogen peroxide from each gram of dry sample which is in 40 ml of water. Stir and cover. Large fragments may be skimmed off if they are free of sediment. If oxidation is slow or has slowed, the mixture is heated to 93°C and stirred. More hydrogen peroxide solution may be necessary to complete oxidation. After the reaction has completely stopped, wash with distilled water.

2. The composited sediment is placed in the soil dispersion cup and diluted to 250 - 300 ml with distilled water. Mix for 5 minutes at 10,000 RPM.

3. The sediment is then wet-sieved using distilled water and a #230 US sieve (62 micron mesh). Washing should be continued until no sediment passes the screen. Material is then oven dried at 103° - 105°C, prior to weighing.

ATTACHMENT B

SITE VISIT
ROSEWOOD PARK, HIGHLAND PARK, ILLINOIS

CELRC-TS-D- HE March 25, 2011

MEMORANDUM FOR RECORD

SUBJECT: Rosewood Park, Highland Park, IL, Ecosystem Restoration Site Visit

1. On 24 March 2011, an initial site visit was conducted at Rosewood Park in Highland Park, IL. Items of discussions and attendees are listed below:

Shawna King	USACE	Zach Langel	USACE
Christel Johnson	USACE	Mike Rohde	USACE
Arun Heer	USACE	Frank Veraldi	USACE
Robbie Sliwinski	USACE	Highland Park District Personnel	

2. The weather in the Highland Park area was windy, cold, 30ºF, and cloudy. The area along the shoreline was observed. Conditions show steel groynes and large stone placed along the shoreline. See Photo 1. If funding allows, local sponsors would like the steel groynes removed and replaced with different structures. Currently, the restoration along the beach will include the removal of the large stone, a boardwalk addition, and beach nourishment.

Photo 1. Facing North West along Shoreline

3. Areas along the ravine were also observed during the site visit. No work is anticipated on the north side of the ravine near residential properties. A box culvert between the stream and the lake will be removed. Broken concrete blocks along the ravine will be removed and replaced with stone. See Photo 2.

Photo 2. Facing South West at bottom of Ravine

4. No hazardous items, debris, odor, or chemicals were observed at the site.

Christel Johnson
Environmental Engineer

Rosewood Park Coastal Section 506
Great Lakes Fishery & Ecosystem Restoration

Monitoring & Adaptive Management Plan

US Army Corps
of Engineers
Chicago District

GL-ECO-CX

August 2012

Table of Contents

List of Tables

Introduction

Section 2039 of WRDA 2007 directs the Secretary of the Army to ensure, that when conducting a feasibility study for a project (or component of a project) under the Corps ecosystem restoration mission, that the recommended project includes a monitoring plan to measure the success of the ecosystem restoration and to dictate the direction adaptive management should proceed, if needed. This monitoring and adaptive management plan shall include a description of the monitoring activities, the criteria for success, and the estimated cost and duration of the monitoring as well as specify that monitoring will continue until such time as the Secretary determines that the success criteria have been met.

Section 2039 of WRDA 2007 also directs the Corps to develop an adaptive management plan for all ecosystem restoration projects. The adaptive management plan must be appropriately scoped to the scale of the project. The information generated by the monitoring plan will be used by the District in consultation with the Federal and State resource agencies and the MSC to guide decisions on operational or structural changes that may be needed to ensure that the ecosystem restoration project meets the success criteria.

An effective monitoring program is necessary to assess the status and trends of ecological health and biota richness and abundance on a per project basis, as well as to report on regional program success within the United States. Assessing status and trends includes both spatial and temporal variations. Gathered information under this monitoring plan will provide insights into the effectiveness of current restoration projects and adaptive management strategies, and indicate where goals have been met, if actions should continue, and/or whether more aggressive management is warranted.

Monitoring the changes at a project site is not always a simple task. Ecosystems, by their very nature, are dynamic systems where populations of macroinvertebrates, fish, birds, and other organisms fluctuate with natural cycles. Water quality also varies, particularly as seasonal and annual weather patterns change. The task of tracking environmental changes can be difficult, and distinguishing the changes caused by human actions from natural variations can be even more difficult. This is why a focused monitoring protocol tied directly to the planning objectives needs to be followed.

This Monitoring and Adaptive Management Plan describes the existing habitats and monitoring methods that could be utilized to assess projects. By reporting on environmental changes, the results from this monitoring effort will be able to evaluate whether measurable results have been achieved and whether the intent of Section 506 Great Lakes Fishery and Ecosystem Restoration is being met.

Guidance

The following documents provide distinct Corps policy and guidance that are pertinent to developing this monitoring and adaptive management plan:

a. Section 2039 of WRDA 2007 Monitoring Ecosystem Restoration

(a) In General - In conducting a feasibility study for a project (or a component of a project) for ecosystem restoration, the Secretary shall ensure that the recommended project includes, as an integral part of the project, a plan for monitoring the success of the ecosystem restoration.

(b) Monitoring Plan - The monitoring plan shall--

(1) include a description of the monitoring activities to be carried out, the criteria for ecosystem restoration success, and the estimated cost and duration of the monitoring; and

(2) specify that the monitoring shall continue until such time as the Secretary determines that the criteria for ecosystem restoration success will be met.

(c) Cost Share - For a period of 10 years from completion of construction of a project (or a component of a project) for ecosystem restoration, the Secretary shall consider the cost of carrying out the monitoring as a project cost. If the monitoring plan under subsection (b) requires monitoring beyond the 10-year period, the cost of monitoring shall be a non-Federal responsibility.

b. USACE. 2009. Planning Memorandum. Implementation Guidance for Section 2039 of the Water Resources Development Act of 2007 (WRDA 2007) - Monitoring Ecosystem Restoration

c. USACE. 2000. ER 1105-2-100, Guidance for Conducting Civil Works Planning Studies. Washington D.C.

d. USACE. 2003a. ER 1105-2-404. Planning Civil Work Projects under the Environmental Operating Principles. Washington, D.C.

General Monitoring Objectives

As presented in "Guidance on Monitoring Ecosystem Restoration Project" on 12 January 2010, the following are general project monitoring objectives:

- To determine and prioritize needs for ecosystem restoration
- To support adaptive management of implemented projects
- To assess and justify adaptive management expenditures
- To minimize costs and maximize benefits of future restoration projects
- To determine "ecological success", document, and communicate it
- To advance the state of ecosystem restoration practice

Project Area Description

Rosewood Park, located in Lake County, is unique in that it preserves beach, bluff, ravine, and wet oak savanna habitat. Topography of the site is a direct result of the Lake Michigan Lobe of the Wisconsin glaciations, and the waxing and waning of those glaciers. Remnants of these geologic events are five moraines, including the Highland Park Moraine which Rosewood Park resides upon. The area has been primarily impacted by the effects of urbanization including influx of storm runoff due to increased impermeable surfaces, sedimentation as a result of increased storm runoff, reduced aquatic species richness due to ravine and stream degradation, and vegetation loss through the invasion of exotic and adventives woody plant species.

The general study area includes approximately 7 acres of land. This area lies entirely within the bounds of upper and lower Rosewood Park, which is owned by the Park District of Highland Park. The proposed project is located within the Highland Park community, near Rosewood Drive and Sheridan Road.

Habitat Trends Triggering Restoration

This project aims to remedy problems of:

- Erosional conditions caused by improperly placed infrastructure
- Ravine fragmentation caused by presence of oversized box culvert
- Littoral transport disruption caused by presence of antiquated man-made structures
- Instability of coastal communities (ravine, bluff, dune, beach, lake) caused by:
    - Presence of man-made structures
    - Excessive stormwater runoff and sediment loading
    - Infestation of invasive woody and herbaceous species
    - Lack of stabilizing native grass and forb species

Restoration Design Overview

The preferred plan will greatly increase the ecological integrity and complexity of Bonnie Brook. The specific elements of the proposed plan are:

- Reestablish ravine stream hydraulics, instream complexity, and connectivity
- Reestablish natural lacustrine processes
- Reduce invasive species and prevent further infestation or spread
- Maximize floral and faunal species richness and abundance

Monitoring Components

Monitoring Plan Goals & Objectives

The goal of the project is to increase habitat complexity and biodiversity in and around the project area. The following specific objectives were established for monitoring the effectiveness of this project:

- Restore ravine stream and riparian corridor habitat as measured by the Qualitative Habitat Evaluation Index: Target QHEI Score **≥64**
- Improve native fish species richness as measured by Fish Species Richness: Target R Score for Ravine Stream **≥32** and Target R Score for Lacustrine **≥ 36**
- Improve native plant species richness and assemblage structure as measured by coefficient of conservatism of the Chicago Region Floristic Quality Index: Target Overall Mean C Score **≥ 7**
- Eradicate/reduce the presence of non-native and invasive species: Target Invasive Species Eradication Percentage **<1% Areal Coverage**

Fish communities, ravine habitat, ravine hydraulics, and riparian vegetation will be monitored to determine the effectiveness of the restoration plan. All components will be monitored as specified below, once prior to the project and over the course of five years following completion of the project.

Ravine Stream Hydraulics

Hydraulic parameters will monitored at each riffle/pool complex within the ravine stream. In order for the created cobble riffles to provide conditions for lotic macroinvertebrates and fishes, induced flow velocities must be apparent; otherwise they are just a pile of rocks in a stream. These flow patterns will be monitored through observation in the field. Velocity, stream morphology, and substrate count data will be collected at certain cross-sections within the stream to determine how the channel is developing after restoration.

Ravine Stream Habitat

Habitat parameters for the restoration reach will be evaluated using the Qualitative Habitat Evaluation Index, or QHEI (Ranking 1989). The QHEI consists of eight sections with a maximum total of 100 points:

1. Characterization of substrate types and effects of siltation
2. Characterization of in-stream cover
3. Characterization of channel morphology
4. Characterization of the riparian zone and bank erosion
5. Assessment of the pool/glide & riffle/run
6. Gradient
7. Shade
8. Channel incision

One raw data sheet consisting of one to five transects will be completed for each site. The sites will be assessed from a river right descending perspective. The transects are dependent and based on the area sampled for fishes and will begin some distance up or downstream from evident bridge disturbance to the stream; however, the impacts from these structures should be taken into consideration when implementing restoration measures since this study recommends remedies to anthropogenic disturbance to stream morphology and function.

Fish Community

This portion of the assessment uses fish species richness (R), which is the total number of native fish species. An assessment was done utilizing the Fishes of the Chicago Region database, which is primarily comprised of fish collection vouchers stowed at the Field Museum on Natural History and the Illinois Natural History Survey from 1895 – 2004. One hundred and fifty six (156) fish collections were queried from the whole coast line of Lake County, IL and from two small streams just north of the study in Kenosha County, WI (Table 1).

Table 1. Projected fish species richness for ravine and lacustrine habitat restoration.

Species	Ravine R	Lacustrine R		Species	Ravine R	Lacustrine R
Acipenser fulvescens		1		*Luxilus cornutus*	1	
Ambloplites rupestris	1	1		*Micropterus dolomieu*	1	1
Ameiurus melas	1			*Micropterus salmoides*	1	1
Ameiurus natalis	1			*Moxostoma erythrurum*	1	
Ameiurus nebulosus				*Moxostoma anisurum*		1
Anguilla rostrata				*Moxostoma macrolepidotum*		1
Catostomus catostomus	1	1		*Myoxocephalus thompsonii*		1
Catostomus commersonii	1	1		*Notemigonus crysoleucas*	1	
Coregonus artedi		1		*Notropis atherinoides*	1	1
Coregonus clupeaformis		1		*Notropis dorsalis*	1	
Coregonus hoyi		1		*Notropis heterodon*		
Cottus bairdii	1	1		*Notropis heterolepis*		
Cottus cognatus		1		*Notropis hudsonius*	1	1
Couesius plumbeus	1	1		*Notropis stramineus*	1	1
Culaea inconstans	1	1		*Noturus gyrinus*		
Dorosoma cepedianum		1		*Perca flavescens*		1
Erimyzon sucetta				*Percopsis omiscomaycus*		1
Esox americanus	1			*Phoxinus erythrogaster*		
Esox lucius		1		*Pimephales notatus*	1	1
Etheostoma exile				*Pimephales promelas*	1	1
Etheostoma microperca				*Pomoxis annularis*		1
Etheostoma nigrum	1			*Prosopium cylindraceum*		1
Fundulus diaphanus	1	1		*Pungitius pungitius*	1	1
Gasterosteus aculeatus	1	1		*Rhinichthys cataractae*	1	1
Lepomis cyanellus	1	1		*Rhinichthys obtusus*	1	
Lepomis gibbosus	1	1		*Salvelinus namaycush*		1
Lepomis macrochirus	1	1		*Semotilus atromaculatus*	1	
Lota lota	1	1		*Umbra limi*	1	
				Total Species Richness, R	**32**	**36**

It was determined from these historic collections that about 32 native species have in the past utilized ravine stream habitat and about 36 native species could potentially use restored

lacustrine habitat. Several species were listed but not counted, such as blacknose shiner, since the chance of recolonization is unlikely.

Plant Communities

Evaluation of vegetation will be done using the Floristic Quality Assessment Index (FQA) and native plant richness, as described in the Feasibility Report. In short, the FQA is a measure of overall environmental quality based on the presence or absence of certain plant species. Plant species that are assigned a coefficient of conservatism of 5 to 10 are considered to be indicative of less human mediated disturbance and a higher level of functionality. As the area stabilizes after restoration measures are complete, the number of higher conservative plant species that become established will increase. Communities that have an average mean coefficient of conservatism of between 3 and 5 are considered to be fair quality. This is a good estimate of the future quality of the area based on the current plant community and 'good' quality natural sites in the surrounding areas. The overall number of native plant species is expected to increase dramatically as well, helping to increase the overall biodiversity of the area.

Sampling Stations

Transects will be established within ravine stream and littoral zones of the lacustrine habitat for fishes. Vegetation will be surveyed and analyzed by both a roaming and stratified random transect survey. Each habitat type will be analyzed separately.

Reference Site Discussion

No reference site is deemed necessary; improvements will be judged from current site conditions.

Sampling/Survey Frequency

<u>Fish Communities</u>

Monitoring will occur once per year in late spring over the course of 5 years.

<u>Plant Communities</u>

Plant monitoring would occur between June and August of each year of monitoring activities. Sampling would occur once a year. The total monitoring period will be 5 years.

<u>Stream Hydraulics and Habitat</u>

Observations will be conducted concurrently with fish sampling periods.

Data Analysis

Stream Hydraulics, Habitat, and Fish Communities

Fish parameters calculated will be displayed graphically to show trends through time. The repaired hydraulics and habitat structure of the ravine system should allow for a) increased QHEI scores within a year and b) increase in fish species richness (R) scores. If the trends in the data indicate a decrease in condition, adaptive management actions may be taken.

Plant Communities

The information generated through sampling the plant community would be used to indicate the trend in overall condition of the area. If the FQA analysis indicates a decrease in condition, adaptive management actions may be taken to increase the score for the following sampling year.

Monitoring Responsibilities

The US Army Corps of Engineers, Chicago District will be responsible for monitoring stream hydraulics, habitat, fish, and plants.

Monitoring Costs & Funding Schedule

Table 2 - Monitoring Costs
INTENTIONALLY REMOVED

Reporting Results

A yearly monitoring summary report would be drafted by the USACE that briefly summarizes the data collected and determines if adaptive management is needed. A final monitoring report would be drafted that details the outcomes of the restoration project.

Contact Information

Stream Hydraulics, Habitat, and Fish

Shawna Herleth-King
Fish Biologist
US Army Corps of Engineers, Chicago District
111 N. Canal St., Suite 600
Chicago, IL 60606
312-846-5407
Shawna.S.Herleth-King@usace.army.mil

Plant Communities

Robbie Sliwinski
Botanist
US Army Corps of Engineers, Chicago District
111 N. Canal St., Suite 600
Chicago, IL 60606
312-846-5486
Robbie.Sliwinski@usace.army.mil

Adaptive Management Planning

Adaptive management needs for this project are minimal and currently not foreseen needs are apparent. However, changes would be planned, approved and implemented if expectations are not being met.

Rosewood Park Coastal Section 506

Great Lakes Fishery and Ecosystem Restoration

Appendix G – 401(b), Correspondence, FONSI

DEPARTMENT OF THE ARMY
CHICAGO DISTRICT, U.S. ARMY CORPS OF ENGINEERS
111 NORTH CANAL STREET
CHICAGO IL 60606-7206

REPLY TO
ATTENTION OF

Planning Branch
Environmental Formulation Section

20 JUL 2010

20 JUL

Kenneth Westlake, Chief
Environmental Review Branch
U.S. EPA ME-19J
77 West Jackson
Chicago, IL 60604

Dear Mr. Westlake:

The Chicago District is preparing a National Environmental Policy Act (NEPA) document on impacts of a proposed ecosystem restoration project at Rosewood Park in Highland Park, Lake County, Illinois. As part of the scoping process the Chicago District would appreciate your comments on impacts associated with this construction. A map of the project area is attached.

The project calls for bluff and ravine stabilization, as well as restoration of the beach. Invasive plant species will be removed and native plant communities within the project area will be restored.

The project area is on the southwestern shore of Lake Michigan. Rosewood Park was designed by Jens Jensen and is listed on the National Register of Historic Places. The project area is heavily eroded bluff, ravine and Lake Michigan shoreline on the eastern edge of the park.

I am particularly interested in your comments regarding impacts to aquatic habitat and threatened or endangered species. Please comment within 30 days, marking your reply to the attention of Mr. Peter Bullock, U.S. Army Corps of Engineers, 111 North Canal Street, Suite 600, Chicago, Illinois 60606. Questions may be directed to Mr. Bullock at 312/846-5587, or at peter.y.bullock@usace.army.mil. Your assistance is appreciated.

Sincerely,

/s/

Susanne J. Davis, P. E.
Chief of Planning Branch

Enclosure

MFR: Routine scoping letter as required by NEPA.

Bullock PM-PL-E 7/19/10

Veraldi PM-PL-E

Fleming PM-PL-E

Davis PM-PL-E 7-19-10

FEDERAL AGENCIES

Kenneth Westlake, Chief
Environmental Review Branch
U.S. EPA ME-19J
77 West Jackson
Chicago, IL 60604

US Fish and Wildlife Service
Chicago Illinois Field Office
1250 South Grove, Suite 103
Barrington, Illinois 60010
Attn: Janice Engle

Executive Office, MSO-Chicago
U.S. Coast Guard
215 W. 83rd St. Suite D
Burr Ridge, IL 60521

STATE AGENCIES (Illinois)

Todd Rettig
Office of Resource Review
Illinois DNR
One Natural Resource Way
Springfield, IL 62702-1271

Robert Schanzle
Illinois DNR – Realty/Planning
One Natural Resource Way
Springfield, IL 62702-1271

Illinois DNR/OWR
36 S. Wabash Ave.
Room 1415
Chicago, IL 60603
ATTN: Dan Injerd

Illinois EPA
Water Pollution Division
1001 N. Grand
Springfield, IL 62794
ATTN: Bruce Yurdin

Illinois Hist. Pres. Agency
1 Old State Capitol Plaza
Springfield, IL 62701
ATTN: Anne Haaker

TRIBAL DISTRIBUTION LIST

Kickapoo Tribe of Oklahoma
P.O. Box 70
McCloud, OK 74851

Kickapoo Of Kansas
1107 Goldfinch Rd.
Horton, KS 66434

Kickapoo Tribe of Texas
Box HC 1 9700
Eagle Pass, TX 78853

Miami Nation in Indiana
P.O. Box 41
Peru, IN 46970

Miami Tribe of Oklahoma
P.O. Box 1326
Miami, OK 74355
George Strack

Citizen Potawatomi Nation
1901 S. Gordon Cooper Dr.
Shawnee, OK 74801

Forest County Potawatomi Exec. Council
P. O. Box 340
Crandon, WI 54520

Huron Potawatomi Tribal Office
2221 One-and-a-half Mile Rd.
Fulton, MI 49052

Hannahville Potawatomi Comm., Council
N 14911 Hannahville Road
Wilson, MI 49896-9728

Prairie Band Potawatomi Tribal Council
16281 Q RD
Mayetta, KS 66509

Pokagon Band of Band of Potawatomi Indians
P.O. Box 180
Dowagiac, MI 49047

Memorandum for Record

By: Peter Bullock, CELRC-PM-PL-E

Subject: Rosewood Park Scoping Response

Phone call

July 16, 2010

Janice Engle, U. S. Fish and Wildlife

Ms. Engle informed me that her office has no issues with the planned Rosewood Park Ecological Restoration Project in Highland Park, IL. However, she looks forward to reviewing the draft EA.

10-CPA-0094

DEPARTMENT OF THE ARMY
CHICAGO DISTRICT, U.S. ARMY CORPS OF ENGINEERS
111 NORTH CANAL STREET
CHICAGO IL 60606-7206

REPLY TO
ATTENTION OF

Planning Branch
Environmental Formulation Section

RECEIVED
JUL 21 2010
CHICAGO ILLINOIS
FIELD OFFICE

US Fish and Wildlife Service
Chicago Illinois Field Office
1250 South Grove, Suite 103
Barrington, Illinois 60010
Attn: Janice Engle

Dear Ms. Engle:

July 21, 2010

The Chicago District is preparing a National Environmental Policy Act (NEPA) document on impacts of a proposed ecosystem restoration project at Rosewood Park in Highland Park, Lake County, Illinois. As part of the scoping process the Chicago District would appreciate your comments on impacts associated with this construction. A map of the project area is attached.

The project calls for bluff and ravine stabilization, as well as restoration of the beach. Invasive plant species will be removed and native plant communities within the project area will be restored.

The project area is on the southwestern shore of Lake Michigan. Rosewood Park was designed by Jens Jensen and is listed on the National Register of Historic Places. The project area is heavily eroded bluff, ravine and Lake Michigan shoreline on the eastern edge of the park.

I am particularly interested in your comments regarding impacts to aquatic habitat and threatened or endangered species. Please comment within 30 days, marking your reply to the attention of Mr. Peter Bullock, U.S. Army Corps of Engineers, 111 North Canal Street, Suite 600, Chicago, Illinois 60606. Questions may be directed to Mr. Bullock at 312/846-5587, or at peter.y.bullock@usace.army.mil. Your assistance is appreciated.

Sincerely,

Susanne J. Davis, P. E.
Chief of Planning Branch

Enclosure

NO OBJECTION
U.S. Fish & Wildlife Services
Chicago Illinois Field Office
30 Aug 10
Supervisor **Date**

Illinois Department of
Natural Resources

One Natural Resources Way Springfield, Illinois 62702-1271
http://dnr.state.il.us

Pat Quinn, Governor
Marc Miller, Director

July 29, 2010

Ms. Susanne J. Davis, P.E.
Chief, Planning Branch
Chicago District, Corps of Engineers
111 North Canal Street
Chicago, Illinois 60606-7206

Attn: Peter Bullock

Dear Ms. Davis:

Reference is made to your letter of July 21, 2010 concerning the preparation of a National Environmental Policy Act (NEPA) document addressing the impacts of an ecosystem restoration project at Rosewood Park in the City of Highland Park. The project calls for bluff and ravine stabilization, beach restoration, removal of invasive plant species and restoration of native plant communities. Rosewood Park lies in the southeast quarter of Section 25, Township 43 North, Range 12 East, Lake County, Illinois.

The Illinois Natural Heritage Database contains occurrence records of several listed plant species approximately one-half mile southeast of the project site. These include the Illinois endangered marram grass (*Ammophila breviligulata*), false bugbane (*Cimicifuga racemosa*) and downy false Solomon's seal (*Polygonatum pubescens*), and the threatened sea rocket (*Cakile edentula*) and ground juniper (*Juniperus communis*). However, the plants are not known to occur at Rosewood Park and the Department does not anticipate any adverse impacts to these or other listed species as a result of the proposed ecosystem restoration. Similarly, the project appears unlikely to affect any sensitive aquatic habitats.

The Department appreciates the opportunity to comment. Please contact me at 217-785-4863 if we can be of further assistance.

Sincerely,

Robert W. Schanzle
Permit Program Manager
Office of Realty and Environmental Planning

RWS:rs

cc: USFWS (Cirton)

Illinois Historic
Preservation Agency

FAX (217) 782-8161

1 Old State Capitol Plaza • Springfield, Illinois 62701-1512 • www.illinois-history.gov

Lake County
Highland Park
Ecosystem Restoration, Rosewood Park
45 Roger Williams Ave.
IHPA Log #025072210

August 3, 2010

Peter Bullock
Department of the Army
Chicago District, U.S. Army Corps of Engineers
111 N. Canal St.
Chicago, IL 60606-7206

Dear Mr. Bullock:

Thank you for requesting comments from our office concerning the possible effects of your project on cultural resources. Our comments are required by Section 106 of the National Historic Preservation Act of 1966, as amended, and its implementing regulations, 36 CFR 800: "Protection of Historic Properties".

Our staff has reviewed the specifications of the referenced project as submitted by your office. This property was listed on the National Register of Historic Places on September 29, 1982. We cannot adequately review this proposed project until the following additional documentation has been submitted to our Agency:

Project plans and specifications for proposed undertaking.

In your reply, please refer to IHPA Log #025072210. If you have any further questions, please contact me at 217/785-5027.

Sincerely,

Anne E. Haaker

Anne E. Haaker
Deputy State Historic
Preservation Officer

MEMORANDUM FOR RECORD
TO: US Fish & Wildlife Service, Region 3 Barrington Field Office
CC: Illinois DNR
FROM: Shawna Herleth-King, Aquatic Ecologist, US Army Corps of Engineers, Chicago District
DATE: September 29, 2011
SUBJECT: Section 7 Endangered Species Act Consultation – Rosewood Park Section 506 Restoration Project – No Effects Determination

---

The proposed project is part of the western Lake Michigan coastline and includes approximately 9 acres located in Highland Park, Illinois. The proposed ecosystem restoration project at Rosewood Park in Lake County, Illinois is funded under the Great Lakes Fishery and Ecosystem Restoration Section 506 Authority (Water Resources Development Act of 2000, as amended), with non-Federal matching funds provided by the Park District of Highland Park (PDHP). A Feasibility Study and Integrated Environmental Assessment are currently in progress. A 30-day Agency and Public review of this document is scheduled for January 2012. All information and agency decisions acquired through this coordination memorandum would be incorporated into this document.

As part of Section 7 of the Endangered Species Act, Federal agencies are directed to ensure that the actions they take, including those they fund or authorize, do not jeopardize the existence of any listed species. This memorandum initiates the section 7 consultation process for the Rosewood Park Section 506 Restoration Project. An official species list for Lake County was obtained and shows the presence of the following Federally listed species is possible at the site:

Piping Plover (*Charadrius melodus*) – This species utilizes wide, flat, open, sandy beaches with very little grass or other vegetation. Nesting territories often include small creeks or wetlands. Lake County in Illinois contains designated critical habitat for the Piping Plover; however, this species has not been documented in Rosewood Park during bird surveys by the PDHP. This species has been documented from the Waukegan beach which is approximately 17 miles north of Rosewood Park. Due to the nature of the project, restoration features would only improve nesting habitat for Piping Plover's.

Eastern Massasauga (*Sistrurus catenatus*) – The eastern massasauga rattlesnake is a Federal candidate species. They live in wet areas including wet prairies, marshes, and low areas along rivers and lakes. In many areas massasaugas also use adjacent uplands during part of the year. They often hibernate in crayfish burrows but they may also be found under logs and tree roots or in small mammal burrows. Currently, critical habitat for this species does not exist within the project footprint.

Karner Blue Butterfly (*Lycaeides melissa samuelis*) – This Federally endangered species occupies pine and oak savanna/barrens that support wild lupine, only known food source of the larvae. Currently, critical habitat for this species does not exist within the project footprint.

Eastern Fringed Prairie Orchid (*Platanthera leucophaea*) – This Federally threatened species occupies moderate to high quality wetlands, sedge meadows, marshes, and mesic to wet prairies. Currently, critical habitat for this species does not exist within the project footprint.

Pitcher's Thistle (*Cirsium pitcher*) – This Federally threatened species grows on the open sand dunes and low open beach ridges of the Great Lakes' shores. It is most often found in near-shore plant communities but it can grow in all nonforested areas of a dune system. Currently, this species has not been documented within the project footprint, and restoration features would only benefit the species.

USACE Determination

Currently, the areas under consideration for ecological restoration measures are those areas that have been degraded. All high quality remnant areas will be avoided. Habitats that will be restored through this project include the littoral zone of Lake Michigan, beach, foredune, bluff and ravine. Methods include repairing damage to the ravine caused by urban runoff, placing naturalistic in-lake structures to restore littoral zone habitat and stabilize sand drift, removal of invasive species and planting native species specific to ravine, bluff and dune communities. A Feasibility Study and Integrated Environmental Assessment will be provided in the November 2011/January 2012 timeframe detailing the benefits and effects of the recommended plan.

Extensive surveys for biological communities have been performed in the recent past. Federally listed species that have been recorded from Lake County, Illinois have not been identified from the area to date. Furthermore, restoration activities would only benefit state listed species. For these reasons, we conclude the Rosewood Park Section 506 Restoration Project will have "no effect" on listed species or proposed or designated critical habitat. This memorandum will be attached to the Feasibility Report to document Section 7 coordination.

Shawna Herleth-King
Aquatic Ecologist
USACE, Chicago District

PRELIMINARY SECTION 404(B)(1) EVALUATION

Rosewood Park Section 506
Lake County, Illinois

May 2012

I. Project Description

a. Location

Rosewood Park, located in Lake County, provides prime habitat for a number of sensitive plant and animal species. The study area includes approximately 7 acres and is located in Lake County, Illinois. Rosewood Park was acquired by the Park District of Highland Park as two separate parcels purchased in 1928 and 1945. The project is near Rosewood Drive and Sheridan Road and consists of one ravine, the bluff along the coastline, the savanna habitat atop the bluff, the dune and beach habitat, and the littoral zone of Lake Michigan. The site has been heavily impacted by anthropogenic activities due to increased urbanization of this northern suburb of Chicago; however, restoration of the site will aid in the preservation of beach, bluff, ravine, and wet oak savanna habitat.

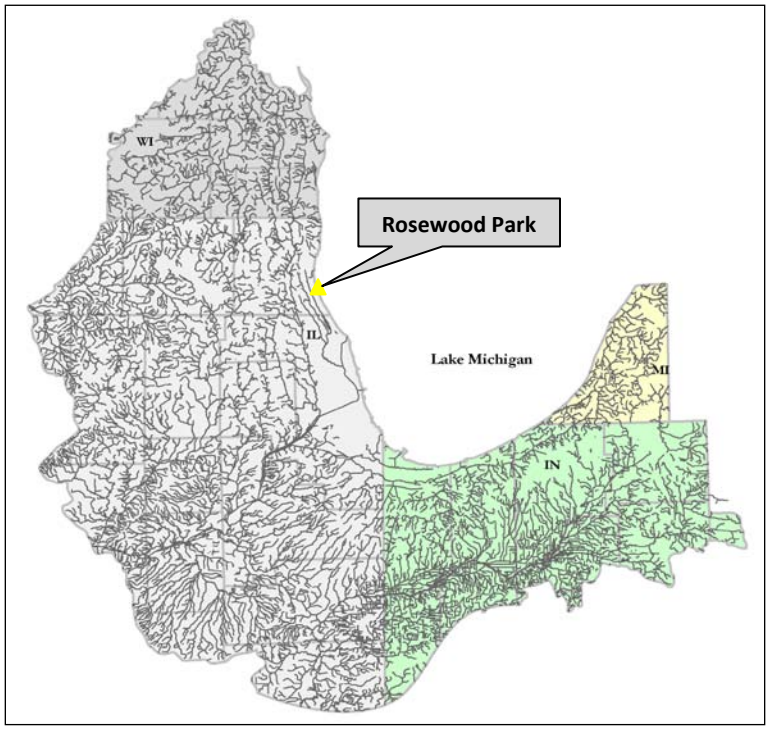


Figure 1 – Rosewood Park regional location.

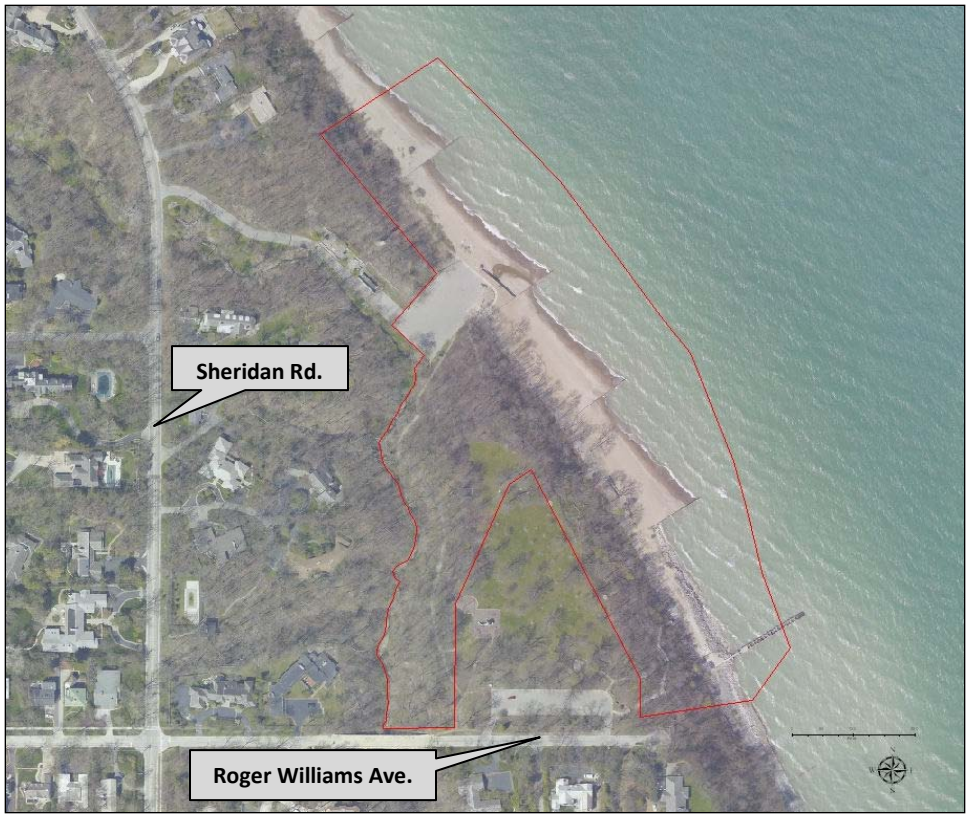


Figure 2– Rosewood Park project location.

b. General Description

The recommended plan includes the following measures:

- Restoration of ravine stream habitat. This measure seeks to restore the ravine stream and its connectivity to Lake Michigan. Currently the downstream end of the stream flows through an approximately 220 feet box culvert before emptying into Lake Michigan. This culvert contains no natural habitat structure and impedes the upstream dispersal of lacustrine aquatic species, especially during low flow. In addition, incision of the stream is also occurring upstream due to the presence of this structure. Also, the upstream dispersal of aquatic species is inhibited by the presence of four concrete weirs which were originally placed within the stream in an effort to reduce instream flow during storm surges. Finally, an asphalt parking lot adjacent to the ravine mouth would be removed and replaced with a porous concrete parking lot. The asphalt parking lot provides an influx of polluted runoff (runoff containing dirt, grease, oil, road salt, and sand) into the lake and ravine stream during a storm. Rebuilding the parking lot using porous concrete would decrease the total amount of runoff leaving the site, promote infiltration of runoff into the ground, reduce the amount of pollutants being carried to the lake and ravine stream, and aid with reducing peak runoff velocity and volume.

- Restoration of lacustrine habitat. This measure seeks to restore lacustrine habitat along the eastern boundary of Rosewood Park. Steel groynes were originally placed along the shoreline to act as wavebreaks and reduce shoreline erosion; however, these features are aesthetically displeasing and inhibit natural lacustrine processes. This measure seeks to restore these natural processes through the removal of the groynes and the placement of beach cells.

- This measure seeks to restore approximately 1.10 acres of beach and dune habitat along the eastern boundary of Rosewood Park. Natural beach processes have been inhibited by the presence of manmade structures and shoreline armoring. In the dunes, excessive foot traffic has led to the loss of natural dune topography and the trampling of while degraded habitat has led to the presence of invasive and non-native species. Removal of the asphalt walkway and replacement with a natural boardwalk would reduce the risk of potential toxins leaching into the surrounding environment. Asphalt contains polycyclic aromatic hydrocarbons (PAHs) and alkyl PAHs that can move into the ecosystem from the breakdown of asphalt. Since asphalt contains so many toxic and carcinogenic compounds and since leaching of harmful PAH compounds has been documented even in water pipe use, asphalt should be kept out of rivers, stream, and other natural waters to the extent possible.

- Restoration of native plant communities throughout the site. Approximately 6.15 acres of the project area will be eradicated of invasive and non-native vegetation via herbicide application and hand removal. Woody species will also be thinned in areas having dense canopy to allow sunlight to infiltrate the understory, hence allowing the growth of a rich herbaceous layer. In all, 1.74 acres of lake bluff, 2.27 acres of ravine, and 1.83 acres of savanna habitat will be restored with native vegetation indicative of these plant communities.

c. <u>Authority and Purpose</u>

This study is authorized under Section 506 of the Water Resources Development Act (WRDA) of 2000. Authority is given to plan, design, and construct projects to restore the fishery, ecosystem, and beneficial uses of the Great Lakes. Projects are justified by ecosystem benefits alone, while considering affects to public health, safety, economic benefits, recreational or any combination of these.

The Park District of Highland Park (PDHP) has requested that the Chicago District, US Army Corps of Engineers (USACE) initiate a Feasibility Study (FS) under the Section 506 Great Lakes Fishery and Ecosystem Restoration authority to ascertain the feasibility of restoration features to ensure ecological integrity within Rosewood Park. This FS has evaluated the feasibility and environmental effects of restoring: ravine stream hydrology and hydraulics, natural lacustrine processes, beach & dune habitat, bluff habitat, and savanna habitat. The scope of this study addresses the issues of altered hydrology and hydraulics, native plant community preservation, lacustrine processes, invasive species, connectivity, and native species richness. This FS

assessed and identified problems and opportunities, identified and evaluated measures, and recommends and designs the most cost effective feasible solution to the ecological problems that would be associated with disturbance of the site.

Rosewood Park was once the estate of U.S. clothier Julius Rosenwald, part owner and leader of Sears, Roebuck and Company. Famed landscape architect Jens Jensen was hired by Rosenwald to landscape the estate. Today, a reflecting pool, the surrounding at Upper Rosewood, and carriage bridge are all that remain of his work at the site.

Rosewood Park was acquired by the PDHP as two separate parcels. Upper Rosewood Park, which lies on top of the lake bluff, was obtained in 1928 and contains a majority of the remains of Jens Jensen's landscape design. Lower Rosewood is comprised of beach habitat extending approximately 65 feet from the bluff to Lake Michigan and was obtained by the PDHP in 1945. Topography of the site is a direct result of the Lake Michigan Lobe of the Wisconsin glaciations, and the waxing and waning of those glaciers. Remnants of these geologic events are five moraines, including the Highland Park Moraine which Rosewood Park resides upon.

d. Proposed Fill Material

1) General Characteristics

Fill material consists of:

- Wavebreaks, consisting of limestone riprap and cobble, would be constructed in Lake Michigan. Riparap and cobble would be appropriately sized and would create the main structure of the wavebreaks. The created shoreline protection structures would provide shield beach and bluff habitat from further erosion, as well as promote more natural lacustrine processes (e.g. sediment transport). In total, approximately 4 beach cells would be created.

Fill materials used to establish the beach cells will be free from the presence of environmental contaminants and will contain less than 5% fines.

- Two cobble riffles would be constructed within the daylighted portion of stream to create instream habitat for aquatic species. The riffles would be constructed of glacially derived cobble and boulder.

Fill materials used to create the riffles will be free from the presence of environmental contaminants and will contain less than 5% fines.

- Sand would be used to nourish the beach as well as fill the wavebreaks to the required 120%.

Fill materials used to nourish the beach habitat will be free from the presence of environmental contaminants.

2) Quantity

The four nearshore wavebreaks would require a total of 12,736 tons of armor stone, 3,639 tons of filter stone, 8,005 tons of bedding stone, and 2,183 tons of cobble. The four nearshore wavebreaks would require an approximate total of 17,800 tons of riprap and glacial cobble for construction. That is approximately 6,640.75 tons of material per structure.

The two cobble riffles constructed within the daylighted portion of stream would require approximately 80 cubic yards of glacial cobble and boulder per riffle. That is approximately 160 cubic yards of material total.

The sand amendment used in the restoration of the beach and dune habitat, as well as the backfill for the wavebreak structures will require approximately 61,800 tons of sand total for construction.

3) Source

Limestone riprap and cobble substrate for the wavebreak construction will be clean, inert materials obtained from a commercial supplier.

Glacially derived cobble and boulder for the riffle construction will be clean, inert materials obtained from a commercial supplier.

Substrate for the proposed beach nourishment will be clean, inert materials obtained from a commercial supplier.

e. Proposed Discharge Site

1) Location

The proposed wavebreak construction would occur in southwestern Lake Michigan along the nearshore area adjacent to Rosewood Park. The proposed riffle construction would occur within the stream mouth (to be daylighted portion) or Ravine 3L. Finally, beach nourishment would occur along the beach and dune area of Rosewood Park. The project study area location is within Highland Park, Sections 25, 31 and 36, Township 43 North, Range 12 East in Lake County, Illinois.

2) Size, Type, and Habitat

The study area lies within Rosewood Park which is part of the Great Lakes drainage basin. The Lower Park serves as the outlet of Ravine 3L, whose north and south branches flow through the park before converging and emptying into Lake Michigan. The portion of Ravine 3L within the study area has not been channelized; however, it has been impacted throughout the years by

increased urban runoff. The ravine is one of many that captures and transports stormwater from the City of Highland Park to Lake Michigan. The increase in impervious surfaces in the community has lead to the increase in runoff entering the ravine and has caused degradation to the associated ravine habitat. Continued degradation of the ravine is expected due to significant urbanization expected over the next 20 years. As a result of increased development, stormwater runoff quantities would increase (i.e. due to a further increase in impervious surfaces) as well as the frequency of flood events within the ravines watershed. This increase in total runoff and peak flow frequency will adversely impact the stability of the ravine and Lake Michigan.

3) Timing and Duration of Discharge

Construction of project features in Rosewood Park may begin as early as fall 2013 and may end as early as spring 2014. Placement of the wavebreaks is expected to require 4 - 6 weeks construction duration, while riffle construction is expected to require 1-2 weeks construction duration. Beach nourishment is expected to require 1 - 2 weeks construction duration.

f. Placement Method

Riprap and cobble used in the construction of the nearshore breakwaters and riffles will likely be brought to the project site by barge and will be placed into position using light weight machinery and finely adjusted by hand or with handheld tools.

Substrate used for the beach nourishment will likely be brought to the project site by truck and will be placed using light weight grading machinery.

II. Factual Determinations

a. Physical Substrate Determinations

1) Substrate Elevation and Slope

The ordinary high water mark for Lake Michigan is 581.5 feet (International Great Lakes Datum 1985). Breakwater structures will be constructed approximately 150 feet lakeward of the OHW at Rosewood Park.

Stream bottom elevations in the project area range from 582 ft to 592 ft NAVD83. There is appreciable slope to induce critical flow over the to be constructed riffle crests.

2) Sediment Type

Topography of the site is a direct result of the Lake Michigan Lobe of the Wisconsin glaciations, and the waxing and waning of those glaciers. Rosewood Park resides upon the Highland Park Moraine, which is composed of glacial deposits from the Wadsworth Till Member.

Natural soil series within the study area have been destroyed for the most part. Areas of natural soils (e.g. Ozaukee and Beach Sands) are currently present in and along the ravines, on the upland edge and down the bluffs, and along the sandy beached fed by littoral currents.

Beach Sands – Beach sediments along the Illinois coast consist of mixed sand, sandy gravel, and gravel. The primary source for beach sediments is erosion of the coastal bluffs.

Ozaukee – These soils are typically found on ground moraines, in this case the Highland Park moraine. Slopes on the plateaus range from 2 to 6% and in the ravines from 20 to 35%. These soils formed in thin loess and in the underlying loamy dense till. These soils are moderate to well drained and the potential for surface runoff ranges from medium to very high. Permeability is slow. These soils have a perched high water table at a depth of 1.5 to 3.5-feet for 1 month or more per year in 6 or more out of 10 years.

3) Material Movement

No significant movement of fill material used in the construction of the riprap breakwaters is expected after completion of construction. The breakwaters would allow natural lacustrine processes to occur (e.g. sediment transport) while preventing further erosion of beach, dune, and bluff habitat. Stone selected for construction of the breakwaters has been sized to withstand wave impacts and lacustrine currents.

There would be no significant movement of fill material after construction. Placement of cobble riffles within the daylighted portion of the ravine stream will encourage sand/sediment accretion upstream of the riffles and direct water flow to the center of the restored channel. Stone selected for establishment of cobble riffles are sized to withstand flood stage hydraulics.

4) Physical Effects on Benthos

Existing benthos directly beneath where the riprap/boulder/cobble would be placed would temporarily be covered, but the area is so small it would have insignificant effects on the macroinvertebrate population. Effects to the benthic invertebrate assemblage would be positive through the enhancement of riverine hydraulics, which would greatly increase species richness. These minor impacts are necessary to create improved conditions for benthic invertebrates. There are no significant adverse effects expected.

5) Other Effects

There would be no other significant substrate impacts.

6) Actions Taken to Minimize Impacts

No special measures would be taken to minimize the temporary or long-term impacts on physical substrates associated with the proposed activity since this project is both beneficial to ecology and water quality.

b. Water Circulation, Fluctuation, and Salinity Determinations

1) Water

The proposed fill activity would have no significant negative impacts to water chemistry, water clarity, color, odor, taste, dissolved gas levels, nutrients, or increased eutrophication as a result. Improvements in water clarity, color, dissolved oxygen levels, and levels of eutrophication will be noted in the long-term after placement of the wavebreaks in Lake Michigan and the riffles in Ravine 3L.

2) Current Patterns and Circulation

Long-term reduction in the volume of littoral sediment transport has occurred along the bluff coast. In the 1950s the USACE computed a maximum littoral transport rate along the bluff coast of 57,000-cyd/year (USACE 1953). Dredge records for sand captured at Wilmette Harbor near the south down drift end of the bluff coast suggest that the present-day bluff coast littoral transport is one third or less of what it was in the early 1950s. Only along the southern part of Illinois Beach State Park are present-day littoral transport volumes of about 80,000-cyd/year at or near what likely occurred in the natural setting. This volume of littoral transport is dependent on a sediment supply from erosion along the northern part of the state park shore as well as beach nourishment supplied to the state park shore. Through time, the Illinois coast has experienced considerable reduction in the volume of littoral sediment in transport. Construction of perpendicular structures such as jettied, piers, and small boat harbors formed total or near-total barriers to littoral transport, resulting in the segmentation of a continuous littoral cell into a series of cells. Construction of the nearshore wavebreaks will promote a more natural littoral transport as well as provide habitat for fish and aquatic macroinvertebrates. There are no significant adverse effects expected.

Originally formed by the erosive forces of storm water interacting with the bluffs, the ravine within the project area is the natural pathway by which tributary storm water runoff reaches Lake Michigan. It should be recognized that many of the ravines are still in the process of forming and as a result are naturally unstable. The alterations to the hydrologic system due to urbanization; however, have resulted in accelerated erosion and degradation of the ravine system. As a result of the development, the overall volume and peak discharges of storm water runoff have increased due to an increase in impervious surface and the introduction of storm sewer networks, respectively. Construction of boulder/cobble riffles within the ravine mouth (i.e. daylighted portion) will be constructed to encourage runoff to flow towards the center of the stream, creating high quality riffle/pool complexes and thusly reducing bank erosion to a natural rate. The volume

of water flowing through the ravine would not be altered and the hydrologic regime would not be significantly altered by the proposed activity. There are no significant adverse effects expected.

3) Normal Water Level Fluctuations

The proposed fill activity would have no significant impact on normal water level fluctuations upstream or downstream of Ravine 3L.

4) Salinity Gradients

Not applicable to freshwater environments.

5) Actions Taken to Minimize Impacts

No special measures would be taken to minimize the temporary impacts on water circulation and fluctuation associated with the proposed activity.

c. Suspended Particulate/Turbidity Determinations

1) Expected Changes in Suspended Particulates and Turbidity in Vicinity of Fill

There would be minor increases in suspended particulates and turbidity levels in the immediate area of the proposed fill activity during construction, most likely of which are less than any given summer thunderstorm.

2) Effects on Chemical and Physical Properties of Water Column

There would be negligible effects to light penetration or dissolved oxygen levels during construction. There are no known toxic metals, organics, or pathogens in the construction area. The placement of clean fill will not introduce metal, organic, or pathogens to the project area. Aesthetics would be improved in the long-term after instream habitat heterogeneity is established in the channel.

3) Effects on Biota

Only beneficial effects on aquatic biota are expected to result from the restoration activities and minor increase in turbidity or suspended particulates associated with the proposed fill and sediment movement activity is most likely less than that of summer thunderstorm event.

4) Actions Taken to Minimize Impacts

Erosion control fabric and cover cropping the newly graded banks would be taken to minimize the temporary turbidity impacts associated with the proposed activity.

d. Contaminant Determination

The proposed fill material would not introduce any new contaminants into Lake Michigan or Ravine 3L, or release any significant amounts of existing contaminants (if any are present) through bottom disturbance in the construction zone.

e. Aquatic Ecosystem and Organism Determinations

1) Effects on Plankton

Only beneficial affects to planktonic organisms are expected.

2) Effects on Benthos

Existing benthos directly beneath where the riprap/boulder/cobble would be placed would temporarily be covered, but the area is so small it would have insignificant effects on the macroinvertebrate population. Effects to the benthic invertebrate assemblage would be positive through the enhancement of riverine hydraulics, which would greatly increase species richness. These minor impacts are necessary to create improved conditions for benthic invertebrates. There are no significant adverse effects expected.

3) Effects on Nekton

Fish eggs and larvae would not be smothered by the proposed fill activity since the anticipated construction activities will occur during non-reproductive or rearing seasons. Fish and other free-swimming organisms will tend to avoid the construction area; the construction area will be used again by those organisms soon after construction ends and overall species richness is expected to increase.

4) Effects on Aquatic Food Web

Beneficial improvements to the food web are expected, due to expected increases in macroinvertebrate richness and abundance.

5) Effects on Aquatic Sites

a) Sanctuaries and Refuges – none present; no significant impact
b) Wetlands – increase in hydrophytic vegetation
c) Mud Flats – none present; no significant impact
d) Vegetated Shallows – increase in submergent aquatic macrophytes
e) Coral Reefs – not applicable to freshwater environments
f) Riffle and Pool Complexes – would increase along the ravine mouth

6) Threatened and Endangered Species

Based on the nature and objectives of this project, to restore habitat, lacustrine littoral habitat, ravine hydraulics and native vegetation communities' indicative of Rosewood Park, the US Army Corps of Engineers and the U.S. Fish and Wildlife Service has coordinated that the proposed ecological restoration project would not *affect any* Federal or State listed species. There is great potential for restoring habitat for these species that may or might use if present, or are attracted to the areas after restoration activities are complete. A 5-year monitoring plan that was developed in conjunction with the Feasibility Study and Integrated Environmental Assessment would take note if this were the case.

7) Other Wildlife

No other wildlife would be significantly impacted by the proposed activity.

8) Actions Taken to Minimize Impacts

General construction scheduling and sequencing would minimize impacts to reproducing macroinvertebrates and fishes.

f. <u>Proposed Discharge Site Determinations</u>

1) Mixing Zone Determination

A mixing zone is not applicable to this project as no violation of applicable water quality standards is expected during construction.

2) Determination of Compliance with Applicable Water Quality Standards

The proposed activity would not cause significant or long-term degradation of water quality within Lake Michigan or Ravine 3L and would comply with all applicable water quality standards.

3) Potential Effects on Human use Characteristics

No significant impacts to municipal and private water supplies, water-related recreation, aesthetics, recreational, or commercial fisheries are expected. No known National Parks, National and Historic Monuments, National Seashores, Wilderness Areas, Research Sites, and Similar Preserves are present. There are no significant adverse effects expected.

g. <u>Cumulative Effects on the Aquatic Ecosystem</u>

The proposed project would restore aquatic habitat structure and function. There are no significant adverse effects expected.

h. Secondary Effects on the Aquatic Ecosystem

No significant impacts on the Lake Michigan or Ravine 3L ecosystem are expected as a result of the proposed activity.

III. Findings of Compliance with the Restrictions on Discharge

a. No adaptation of the Section 404(b)(1) guidelines was made for this evaluation.

b. No practical alternatives are available that produce fewer adverse aquatic impacts than the proposed plan.

c. The proposed project would comply with applicable water quality standards.

d. The project is in compliance with applicable Toxic Effluent Standards under Section 307 of the Clean Water Act; with the Endangered Species Act of 1973; with the National Historic Preservation Act of 1966; and with the Marine Protection, Research, and Sanctuaries Act of 1972.

e. The proposed fill activity would have no significant adverse impact on human health or welfare, including municipal and private water supplies, recreational and commercial fisheries, plankton, fish, shellfish, or wildlife communities (including community diversity, productivity, and stability), special aquatic sites, or recreational, aesthetic, and economic values.

f. Typical erosion control measures would be taken to minimize construction impacts other than selection of the least environmentally damaging construction alternative.

g. On the basis of the Guidelines, the proposed site for the discharge of fill material is specified as complying with the requirements of these guidelines with the inclusion of appropriate and practical conditions to minimize pollution or adverse impacts to the aquatic ecosystem.

Date _____ _____

Susanne J. Davis, P.E.
Chief of Planning Branch

Finding of No Significant Impact (DRAFT)
Rosewood Park Section 506
Great Lakes Fishery and Ecosystem Restoration

Background

The 7 acre project area lies within Highland Park in Lake County, Illinois. Rosewood Park was once the estate of U.S. clothier Juluius Rosenwald, part owner and leader of Sears, Roebuck and Company. Famed landscape architect Jens Jensen was hired by Rosenwald to landscape the estate. Today, a reflecting pool, the surrounding at Upper Rosewood, and carriage bridge are all that remain of his work at the site. Rosewood Park was acquired by the Park District of Highland Park (PDHP) as two separate parcels. Upper Rosewood Park, which lies on top of the bluff, was obtained in 1928 and contains the majority of the remains of Jens Jensen's landscape design. Lower Rosewood is comprised of beach habitat extending approximately 65 feet from the bluff to Lake Michigan and was obtained by the PDHP in 1945. Rosewood Park is unique in that it preserves beach, bluff, ravine, and wet oak savanna habitat. Topography of the site is a direct result of the Lake Michigan Lobe of the Wisconsin glaciations, and the waxing and waning of those glaciers. Remnants of these geologic events are five moraines, including the Highland Park Moraine which Rosewood Park resides upon.

The following resource problems have been addressed at Nippersink Creek:

- Erosional conditions caused by improperly placed infrastructure
- Instability of coastal communities (ravine, bluff, dune, beach, lake) caused by:
- Infestation of invasive woody and herbaceous species
- Lack of stabilizing native grass and forb species
- Manmade structures
- Stormwater runoff and sediment loading
- Fragmentation of ravine from Lake Michigan

Brief Summary of the EA & Preferred Plan

The environmental assessment identified direct, indirect and cumulative effects of the 10 alternatives, including the No Action plan. The Preferred Plan was alternative 9, which is implementing a number of prescribed measures.

The Preferred Plan addresses the identified resource problems so that the ecological integrity of Rosewood Park and to a larger extent the southeastern coast of Lake Michigan, can be loosely returned to its pre-anthropogenic structure and function. The study area is comprised of lacustrine, ravine, beach & dune, bluff, and savanna communities which are currently under a high degree of pressure from invasive species within the site. In addition, manmade structures have impaired stream hydraulics and hydrology, stream mouth and lake connectivity, natural lacustrine processes, and aquatic species dispersal within the study area. Without implementation of the Preferred Plan, this parcel of highly unique habitats (e.g. coastal bluff, oak savanna, coastal ravine, etc.) will become skewed resulting in a shift towards a highly disturbed community with habitats dominated by invasive species such as common buckthorn (*Rhamnus cathartica*), glossy buckthorn (*Frangula alnus*), European highbush cranberry (*Viburnum opulus*), black locust (*Robinia pseudoacacia*), staghorn sumac (*Rhus typhina*), Norway maple (*Acer platanoides*), gray

dogwood (*Cornus racemosa*), white mulberry (*Morus alba*), green ash (*Fraxinus lanceolata*), cottonwood (*Populus deltoides*), and basswood (*Tilia americana*). Lacustrine and stream communities will also become further degraded from continued discontinuity, increasing channel incision, and further loss of species diversity without implementation of the Preferred Plan. However, with implementation of the Preferred Plan, Rosewood Park will become harmonized causing a shift towards a more desirable state, with a restored ravine/lacustrine system and the colonization of native plant species specific to foredune, bluff, riparian, and savanna communities.

The Preferred Plan includes restoring the connectivity of the ravine mouth to its outlet, Lake Michigan. The ravine is currently unstable due to the increased volume of water (primarily stormwater runoff) it must handle as a result of a plethora of impervious surfaces within the Highland Park area. The increased surface flow exacerbates stream downcutting which causes the lower banks adjacent to the stream to become steeper and eventually slump inward. Slumping of the banks then threatens the native trees and herbaceous growth which make the ravines such an ecological significance (Weiland, 2009; Shabica et al., 2010). Restoration will include the complete removal of the box culvert and instream weirs which are adding to the incision of the ravine channel, impeding upstream aquatic species dispersal, and connectivity of the stream mouth with its outlet Lake Michigan. A sufficient number of natural occurring riffles currently exist within the ravine upstream of the box culvert, such that construction of additional riffles is not warranted. The daylighted channel; however, will have a streambed of gravel/pebble/cobble placed as well as two cobble/boulder riffles constructed to repair stream mouth hydraulics. Restoration of the daylighted channel will also include a light grading of the streambanks to return appropriate bank slopes as well as plantings of native riparian vegetation to promote bank stabilization. Finally, the adjacent asphalt parking area will be completely removed and replaced with a bio-engineered parking area (i.e. porous paver). This will reduce the amount of impervious surface adjacent to the ravine stream causing an influx of stormwater runoff as well as reduce the amount of runoff pollution entering the ravine and Lake Michigan.

Lacustrine restoration is also addressed within the Preferred Plan. The lacustrine habitat is currently threatened by intense urbanization, loss of beach habitat, and increased stormwater runoff. Without proper coastal stabilization at Rosewood Park the following would likely occur or continue to occur: inhibited lacustrine sediment transport, further loss of beach habitat, erosion of the bluff toe resulting in bluff failure, and colonization of degraded and disturbed habitats by invasive species (Shabica et al., 2010). With implementation of the Preferred Plan, the four steel groynes would be completely removed and replaced with limestone riprap and glacial boulder lined wavebreaks. Foredune and beach habitat would be restored through beach nourishment, removal of invasive species, and planting of native grasses. Over time, the more natural wavebreaks would promote lacustrine sediment transport, protect the bluff toe from further erosion, encourage the formation of pocket beaches, and provide increased aquatic species habitat.

The final measures of the Preferred Plan include restoration of bluff, ravine, and savanna habitat. These habitats unique to the Lake Michigan coast line have become degraded over time primarily due to anthropogenic activities (e.g. urbanization). Plant communities within these habitats have become degraded from the colonization of invasive and non-native plant species as well as the suppression of a natural fire regime. Targeted invasive species to be removed and/or cleared during implementation of the Preferred Plan include common buckthorn (*Rhamnus cathartica*), glossy buckthorn (*Frangula alnus*), European highbush cranberry (*Viburnum opulus*), black locust (*Robinia pseudoacacia*), staghorn sumac

(*Rhus typhina*), Norway maple (*Acer platanoides*), gray dogwood (*Cornus racemosa*), white mulberry (*Morus alba*), green ash (*Fraxinus lanceolata*), cottonwood (*Populus deltoides*), and basswood (*Tilia americana*) as well as other species. Common buckthorn (*Rhamnus cathartica*) and glossy buckthorn (*Rhamnus frangula*) are trees and shrubs native to much of Europe and western Asia and are considered as highly invasive exotics in the U.S. Both species have an affinity for disturbed, open, and moist habitats within their native ranges. Through eradication of these species as well as others, resulting benefits will include the reversal or prevention of their impacts which include changes in soil nitrogen, alteration of native understory species abundance, decline in native tree seedling density, and effects on wildlife that may not be able to use the invasive species for habitat or foraging (Frappier et al., 2003; Knight et al., 2007). Through eradication of these invasive and non-native species, native plant diversity within the bluff, ravine, and savanna habitats is expected to increase.

Recreational features have not been proposed as part of this project, because of the ecosystem restoration component as well as the significant number of recreational amenities that are already offered by the PDHP at Rosewood Park.

Discussion of Major Environmental Compliance

An Environmental Assessment was completed for the proposed measures within the Rosewood Park Coastal area. A Public Review period was held from XX XX XXXX to XX XX XXXX for the Environmental Assessment.

The preferred plan is in compliance with appropriate statutes and executive orders including the Natural Historic Preservation Act of 1966; the Endangered Species Act of 1973; the Fish and Wildlife Coordination Act; Executive Order 12898 (environmental justice); Executive Order 11990 (protection of wetlands); Executive Order 11988 (floodplain management); the Clean Air Act of 1970; the Clean Water Act of 1972; and the National Environmental Policy Act of 1969.

<u>Section 401 of the Clean Water Act</u>

Compliance under 401 is being pursued with the Illinois Environmental Protection Agency (ILEPA). During the design phase, a 401 application will be submitted to ILEPA in which they will review the proposed plans and drawings. It is anticipated 401 Compliance will be awarded since lacustrine features will improve littoral transport as well as provide habitat for littoral aquatic species.

<u>State of Illinois Floodway Permitting</u>

A State of Illinois Floodway permit will be required for placing lacustrine structures for habitat improvement. This permit would be acquired before construction would commence at some point during the plans and specifications phase as a joint application with the section 401 Clean Water Act.

<u>Conclusion</u>

In accordance with the National Environmental Policy Act of 1969 and Section 122 of the River and Harbor and Flood Control Act of 1970, the U.S. Army Corps of Engineers (Chicago District) has assessed the environmental impacts associated with this project. The purpose of the Environmental Assessment (EA)

was to evaluate the impacts that would be associated with the restoration of Rosewood Park in Lake County, Illinois. The proposed project has been determined to be in full compliance with the appropriate statutes, executive orders and USACE regulations, including the National Environmental Policy Act, the Endangered Species Act, the Fish and Wildlife Coordination Act, the National Historic Preservation Act, the Clean Air Act, the Fish and Wildlife Coordination Act, the National Historic Preservation Act, the Clean Air Act, Sections 401 and 404 of the Clean Water Act.

The assessment process indicates that this project would not cause significant effects on the quality of the human environment. The assessment process indicates that this project would have only beneficial impacts upon the ecological, biological, social, cultural, or physical resources of this area, and would provide environmental benefits to the Illinois Beach Resource Rich Area as well as Lake Michigan. The findings indicate that that the proposed action is not a major Federal action significantly affecting the quality of the human environment. Therefore, I have determined that an Environmental Impact Statement is not required.

Frederic A. Drummond
Colonel, U.S. Army
District Commander

Date: _____