NOTICE OF APPLICATION FOR FEDERAL CONSISTENCY REVIEW
LAKE MICHIGAN COASTAL ZONE PROGRAM

Project Number: ER-18846 (LM-204)

Name of Applicant: Matthew Shanks
Address of Applicant:
US Army Corps of Engineers, Chicago District
231 South LaSalle Street, Suite 1500
Chicago, IL 60604

Project Description:
Great Lakes Fishery & Ecosystem Restoration (Section 506): restore 15.8 acres of Jeorse Park Beach with invasive species removal, native plantings, and installation of rock reefs; East Chicago

Location of Project:
East Chicago, IN; Lake County

Send comments to the following no later than August 18, 2016:

Federal Consistency Review Coordinator, Environmental Unit
Division of Fish and Wildlife
Department of Natural Resources
402 West Washington Street, Room W273
Indianapolis, IN 46204
Electronic mail: **environmentalreview@dnr.in.gov**

Copies of the request, accompanying information and data are available for inspection at the following location:

Environmental Unit
Division of Fish and Wildlife
Department of Natural Resources
402 West Washington Street, Room W273
Indianapolis, IN 46204

LM-204
ER-18846
Federal Consistency

DEPARTMENT OF THE ARMY
CHICAGO DISTRICT,U.S.ARMY CORPS OF ENGINEERS
231 SOUTH LA SALLE STREET, SUITE 1500
CHICAGO IL60604

Planning Branch

21 JUL 2016

Indiana Department of Natural Resources
Division of Fish and Wildlife
Environmental Unit
402 West Washington St, Room W273
Indianapolis, Indiana 46204

Dear Sir or Madam:

The U.S. Army Corps of Engineers, Chicago District in partnership with the City of East Chicago is proposing an ecosystem restoration project at Jeorse Park Beach within the City of East Chicago, Lake County, Indiana. The proposed activity will include beach, dune and lacustrine restoration to improve ecosystem benefits for native fish and wildlife species. Restoration activities will include selective invasive plant species removal, minor land grading, sand placement, and live plug and seed plantings of native species over 14.8 acres of publicly accessible beach. Approximately 1 acre of native shrubs and herbaceous species will be planted on an adjacent breakwater. Finally, two cobble mound fish reefs (707.17 cubic yards over a total of 0.011 acres) will be constructed on Lake Michigan bottom. The proposed activity complies with Indiana's approved coastal management program and will be conducted in a manner consistent with such a program.

This letter also includes a copy of the IDEM application for Authorization to Discharge Dredged or Fill Materials to the State Regulated Wetland and/or Waters of the State Permit as well as the IDNR Permit Application for Construction under the Navigable Waterways Act. Questions regarding the proposed project may be directed to Mr. Matthew Shanks, at (312) 846-5581 or matthew.r.shanks@usace.army.mil.

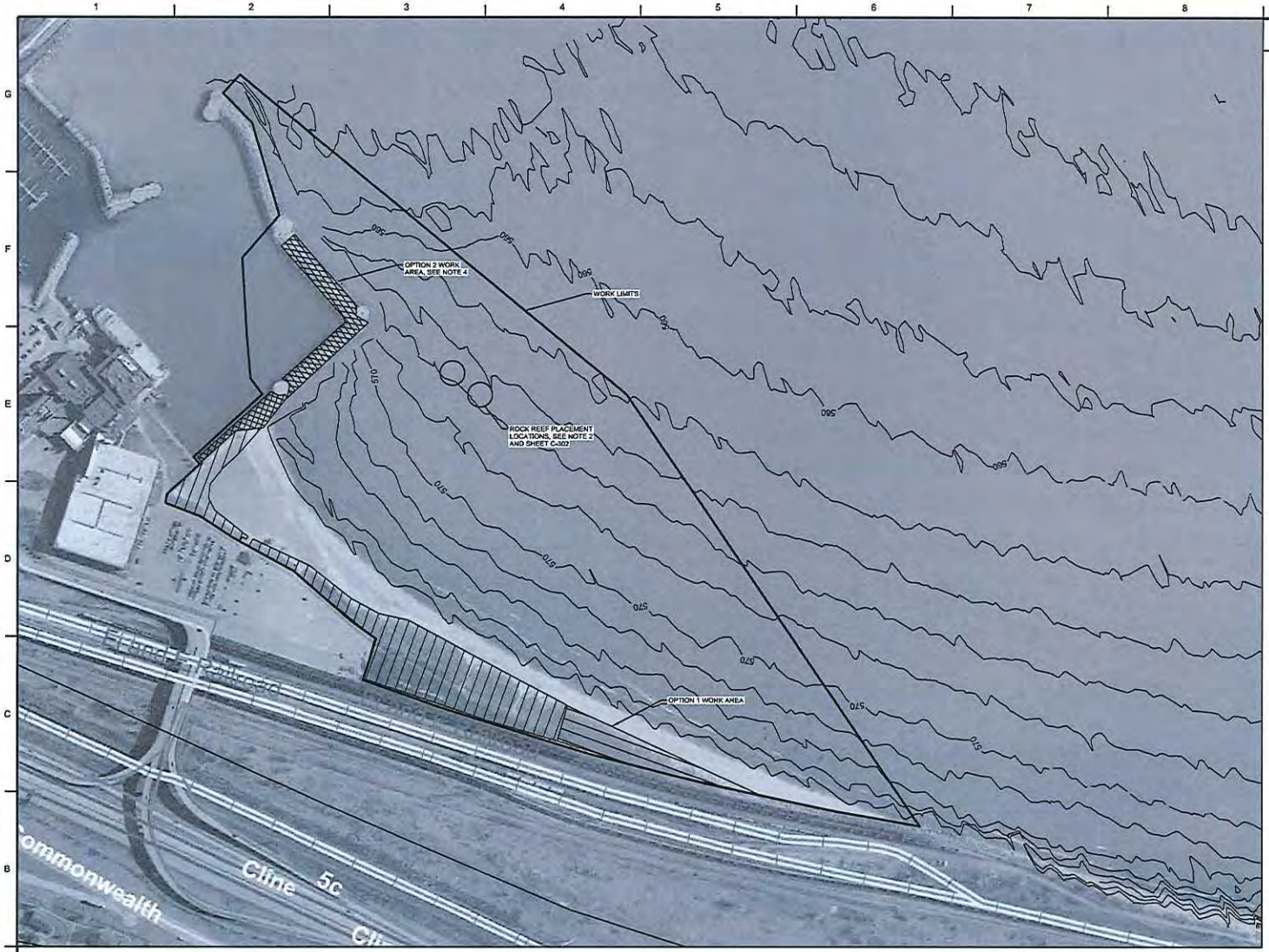
Sincerely,

Christopher T. Drew
Colonel, U.S. Army
District Commander

* Left message asking what we need to do.
7/25 MS

Enclosures

RECEIVED JUL 25 2016



GENERAL NOTES

1. THE 2 ROCK REEFS ARE SHOWN LARGER THAN SCALE FOR CLARITY.
2. BOTH REEFS SHALL BE PLACED IN THE AREA SHOWN, AT APPROXIMATE ELEVATION 564. VERIFY PLACEMENT IN FIELD WITH COR. 2' BATHYMETRIC CONTOURS ARE SHOWN.
3. OPTION AREA 2 FOR BREAKWATER PLANTING MAY BE REVISED IF A BREAKWATER REALIGNMENT PROJECT TO BE COMPLETED BY OTHERS IS AWARDED. THE PLANTING AREA WILL BE VERIFIED AT TIME OF OPTION AWARD, AND QUANTITIES WILL NOT BE REVISED.

- PLANTING TYPE 1 - BEACH AND DUNE
- PLANTING TYPE 2 - BREAKWATER
- PLANTING TYPE 3 - OPTIONAL BREAKWATER
- PLANTING TYPE 4 - OPTIONAL BEACH AND DUNE

J.CHECKER

A1 PLANTING AND RESTORATION PLAN
SCALE: 1" = 200'

N

0 200' 400'

US Army Corps of Engineers®

MARK	DESCRIPTION	DATE

DESIGNED BY: L. VANDENBERG, P.E.
DRAWN BY: J.CHECKER
CHECKED BY:
SUBMITTED BY: JOHN GROBOSKI, P.E.
SEE: ANSI D
FILE NAME: Jeorse Park Section 506_CE102.dgn
ISSUE DATE: 13 JUNE 2016
SOLICITATION NO.: W912P8-16-B-0010
CONTRACT NO.: XXXXXX-XX-X-XXXX
PROJECT CODE:

U.S. ARMY CORPS OF ENGINEERS
CHICAGO DISTRICT
2315 LASALLE ST
CHICAGO, IL 60604

JEORSE PARK BEACH
ECOSYSTEM RESTORATION SECTION 506
EAST CHICAGO, IL

PLANTING AND RESTORATION PLAN

SHEET ID
CE102

pw:\\COE-LRCPWP02CHI.lrc.ds.usace.army.mil:coe-lrcpwp02chi.lrc.ds.usace.army.mil\Documents\Projects\Jeorse Park Section 506 - 40102\00003 - CADD BIM\00-Sheets\Planting and Restoration Plan
H6TS0LCV 6/15/2016 MicroStation

%STATUS%

APPLICATION FOR AUTHORIZATION TO DISCHARGE DREDGED OR FILL MATERIAL TO ISOLATED WETLANDS AND/OR WATERS OF THE STATE

State Form 51821 (R2 / 11-15)

Indiana Department of Environmental Management

INSTRUCTIONS: *1. Read the instruction sheet before filling out this form.*
2. You must complete all applicable sections of this form

1. Applicant Information

Name of Applicant
City of East Chicago

Mailing address *(Street/ PO Box/ Rural Route, City, State, ZIP Code)*
4127 Lombardy St
East Chicago, IL 46312

Daytime Telephone Number
219-808-2175

Fax Number
219-397-2144

E-mail address *(optional)*
mreed@globalconsultingslin.com

Contact person *(required)*
Milton Reed

2. Agent Information

Name of Agent
US Army Corps of Engineers, Chicago District

Mailing address *(Street/ PO Box/ Rural Route, City, State, ZIP Code)*
231 South LaSalle Street
Suite 1500
Chicago, IL 60604

Daytime Telephone Number
312-846-5581

Fax Number
312-886-5475

E-mail address *(optional)*
matthew.r.shanks@usace.army.mil

Contact person
Matthew Shanks

3. Project / Tract Location

County
Lake

Nearest city or town
East Chicago

U.S.G.S. Quadrangle map name *(Topographic map)*
Whiting (41087F4)

Project street address *(if applicable)*
Jeorse Park Beach
East Chicago, IN 46312

Quarter
NW

Section
22 & 23

Township
37N

Range
9W

Type of aquatic resource(s) to be impacted *(Attach Worksheet One.)*
Lake Michigan Open Water

Project name or title *(if applicable)*
Jeorse Park Beach Section 506 Great Lakes Fishery and Ecosystem Restoration Project

Other location descriptions or driving directions
Jeorse Park Beach is located along the Lake Michigan shoreline just southeast of Indiana Harbor and Shipping Canal in Lake County, IN. The park is bounded to the north by the Ameristar Casino, to the west by Cline Avenue and the Majestic Star Hotel parking lot, to the south by the Majestic Star Casino, and to the east by Lake Michigan. Access is through the Ameristar parking lot.

4. Project Purpose and Description *(Use additional sheet(s) if required.)*

Has any construction been started?
☐ Yes ☑ No

Anticipated start date *(month, day, year)*
November 15, 2016

If yes, how much work is completed?

Purpose of project and overview of activities
By restoring aquatic and buffering habitats and addressing invasive species issues, this project would provide essential habitat for fish, migratory birds, reptiles and amphibians within a highly urbanized area. Restoration measures include the planting of native beach and dune species, removal of invasive plant species, planting native herbaceous plants and shrubs on the existing breakwater and the construction of rock reef fisheries habitat. Plantings will occur above the Lake Michigan ordinary high water mark (581.5 IGLD). This application for fill in the open waters of Lake Michigan will address the construction of fish habitat reefs utilizing glacially derived cobble from local sources. Selective invasive species removal is also planned to occur below the ordinary high water mark as necessary throughout the project site as indicated on the attached plan sheets. A Detailed Project Report and Integrated Environmental Assessment titled "Jeorse Park Beach Section 506 Great Lakes Fishery & Ecosystem Restoration Study" is attached for additional information on the selection of this alternative.

5. Avoidance, Minimization, and Mitigation Information: Applicants must answer all of the following questions

(Use additional sheet(s) if necessary - provide a detailed response to all applicable questions.)

A. For projects with Class II isolated wetlands –

1. Is there a reasonable alternative to the proposed activity?

2. Is the proposed activity reasonably necessary or appropriate?

B. For projects with Class III wetlands, adjacent wetlands, and/or streams, rivers, lakes or other water bodies –

1. Is there a practicable alternative to the proposed activity?
   No practicable alternatives to creating fish habitat were identified through the feasibility study and integrated environmental assessment which produced equal or greater benefits to the aquatic ecosystem. Naturally derived cobble will be mixed with larger limestone slab to create a lake bottom mound reminiscent of a stone outcrop. The mound will provide a diversity of interstitial spacing between the stone that may be used for spawning, shelter, nursery and foraging habitat by native fishes. This same level of habitat function cannot be derived from artificial, man-made structures or interlocking rip rap stone.

2. Have practicable and appropriate steps to minimize impacts to water resources been taken?
   Construction of the cobble reef habitats will be timed to avoid spawning seasons for native fishes in the littoral zone of Lake Michigan. Stone will be placed into position from a work barge using on board machinery and dropped onto the lake bottom. All fill materials will be free of fines (<5% passing a #200) and deleterious materials procured from a commercial source and inspected prior to placement. Additionally, submittals will be required from the contractor on the source of material and a sample of the material to be used prior to delivery of material to the site. Fill materials will be placed and not dumped, which will limit the resuspension of the existing bed.

Describe all compensatory mitigation required for unavoidable impacts.
No mitigation is required. Impacts to the aquatic resources are minor and temporary. No significant adverse effects are expected. The intended purpose for the construction project is to create fish and wildlife habitat to restore ecosystem structure and function on the project footprint.

6. Drawing / Plan Requirements *(Applicants must provide the following.)*

a. Top/aerial/overhead views of the project site showing existing conditions and proposed construction. Attached JPB Draft Plans
b. Cross sectional view of areas of fill or alterations to streams and other waters. Attached JPB Draft Plans
c. North arrow, scale, property boundaries. Attached JPB Real Estate Map
d. Include wetland delineation boundary *(if applicable)*. Label all wetlands (jurisdictional, isolated and exempt) as I-1, I-2, I-3, etc. and the mitigation areas as M-1, M-2, etc. N/A
e. Location of all surface waters, including wetlands, erosion control measures, existing and proposed structures, fill and excavation locations, disposal area for excavated material, including quantities, and wetland mitigation site *(if applicable)*. Attached Draft Plans (CE102)(CE302)
f. Approximate water depths and bottom configurations *(if applicable)*. Attached Draft Plans (CE102)

7. Supplemental Application Materials *(Applicants must provide the following.)*

a. A wetland delineation of all wetlands on the project site *(for projects with wetland impacts)*. N/A
b. At least three photographs of the project site. Indicate the photo locations on the project plans. Attached JPB Pictures and Aerial
c. If isolated wetlands are present, a letter from the Corps of Engineers verifying this statement. N/A
d. Wetland mitigation plan and monitoring report. N/A
e. Classification of all isolated wetlands on the tract *(if isolated wetlands are present onsite)*. N/A
f. Copies of all applicable local permits and/or resolutions pertaining to the project or tract. N/A
g. Tract history *(see instructions)*. N/A

8. Additional information that MAY be required *(IDEM will notify you if needed.)*

a. Erosion control and/or storm water management plans.
b. Sediment analysis.
c. Species surveys for fish, mussels, plants and threatened or endangered species. Attached Detailed Project Report Section 2.3 pgs. 16-23
d. Stream habitat assessment.
e. Any other information IDEM deems necessary to review the proposed project.

9. Permitting Requirements

a. Does this project require the issuance of a Department of the Army Section 404 Permit from the US Army Corps of Engineers? ☐ Yes ☑ No

If no, you do not need to answer Part b.

b. Have you applied for an Army Corps of Engineers Section 404 permit? ☐ Yes ☑ No

If yes, please supply the Corps of Engineers ID Number, the Corps of Engineers District, the project manager, and a copy of any correspondence with the Corps. **If no, contact** the Army Corps of Engineers regarding the possible need for a permit application.

N/A

c. Have you applied for, received, or been denied a permit from the Department of Natural Resources for this project? ☑ Yes ☐ No

Please give the permit name, permit number, and date of application, issuance or denial.

An Indiana Department of Natural Resource Lake Michigan Permit application was submitted concurrently for this project..

d. Have you applied for, received, or been denied any other federal, state, or local permits, variances, licenses, or certifications for this project? ☐ Yes ☑ No

Please give the permit name, agency from which it was obtained, permit number, and date of issuance or denial.

10. Adjoining Property Owners and Addresses

List the names and addresses of landowners adjacent to the property on which your project is located and the names and addresses of other persons (or entities) potentially affected by your project. Use additional sheet(s) if required.

Name Ameristar Casino Address *(number and street)* 777 Aldis Ave City: East Chicago State: IN ZIP Code: 46312	Name Majestic Star Casino & Hotel Address *(number and street)* 1 Buffington Harbor Dr City: Gary State: IN ZIP Code: 46406
Name ArcelorMittal USA Address *(number and street)* No address available - tract ending in 004 on attached map City: Gary State: IN ZIP Code: 46312	Name Address *(number and street)* City State ZIP Code
Name Address *(number and street)* City State ZIP Code	Name Address *(number and street)* City State ZIP Code
Name Address *(number and street)* City State ZIP Code	Name Address *(number and street)* City State ZIP Code
Name Address *(number and street)* City State ZIP Code	Name Address *(number and street)* City State ZIP Code
Name Address *(number and street)* City State ZIP Code	Name Address *(number and street)* City State ZIP Code

11. Signature - Statement of Affirmation

I certify that I am familiar with the information contained in this application and, to the best of my knowledge and belief, such information is true and accurate. I certify that I have the authority to undertake and will undertake the activities as described in this application. I am aware that there are penalties for submitting false information. I understand that any changes in project design subsequent to IDEM's granting of authorization to discharge to a water of the state are not authorized and I may be subject to civil and criminal penalties for proceeding without proper authorization. I agree to allow representatives of the IDEM to enter and inspect the project site. I understand that the granting of other permits by local, state, or federal agencies does not release me from the requirement of obtaining the authorization requested herein before commencing the project.

Applicant's Signature: _____ Date: 06/24/16 (mm/dd/yyyy)

Print Name: Christopher T. Drew Colonel, U.S. Army District Commander Title: _____

Worksheet – Summary of Onsite Water Resources and Project Impacts

A. Jurisdictional Wetlands (Existing Conditions) / Jurisdictional Wetlands (Proposed Impacts)

Wetland Type	Size of wetland *(acreage)*	To be Impacted?	Acreage	Fill quantity *(cys)*	ATF
☐ EM ☐ SS ☐ FO		☐ Yes ☐ No			
☐ EM ☐ SS ☐ FO		☐ Yes ☐ No			
☐ EM ☐ SS ☐ FO		☐ Yes ☐ No			
☐ EM ☐ SS ☐ FO		☐ Yes ☐ No			
☐ EM ☐ SS ☐ FO		☐ Yes ☐ No			
☐ EM ☐ SS ☐ FO		☐ Yes ☐ No			
☐ EM ☐ SS ☐ FO		☐ Yes ☐ No			

Describe the type and composition of fill material to be placed in wetlands on the project site:

Describe the type and composition and quantity *(cubic yards)* of material proposed to be dredged or excavated from wetlands on the project site:

B. Isolated Wetlands (Existing Conditions) / Isolated Wetlands (Proposed Impacts)

Wetland Class	Type	Size of wetland *(acreage)*	To be Impacted?	Acreage	Fill quantity *(cys)*	ATF
☐ 1 ☐ 2 ☐ 3	☐ NF ☐ F		☐ Yes ☐ No			
☐ 1 ☐ 2 ☐ 3	☐ NF ☐ F		☐ Yes ☐ No			
☐ 1 ☐ 2 ☐ 3	☐ NF ☐ F		☐ Yes ☐ No			
☐ 1 ☐ 2 ☐ 3	☐ NF ☐ F		☐ Yes ☐ No			
☐ 1 ☐ 2 ☐ 3	☐ NF ☐ F		☐ Yes ☐ No			
☐ 1 ☐ 2 ☐ 3	☐ NF ☐ F		☐ Yes ☐ No			

Describe the type and composition of fill material to be placed in isolated wetlands on the project site:

Describe the type and composition and quantity *(cubic yards)* of material proposed to be dredged or excavated from isolated wetlands on the project site:

C. Bridges and Stream Crossings - provide the following information for EACH structure *(Use additional sheet(s) if required.)*

Stream name

Description of impacts

Length of upstream bank impacts:
Left side: Right side:

Length of downstream bank impacts:
Left side: Right side:

Bank protection fill placed below the Ordinary High Water Mark:
Volume per running foot:

Bank protection fill placed below the Ordinary High Water Mark:
Area of coverage:

D. Bank Stabilization – provide the following information for EACH segment (*Use additional sheet(s) if required.*)

Water body name
Description of Impacts
Length of shoreline or bank protection
Volume *(cubic yards)* of bank protection fill placed below the Ordinary High Water Mark per running foot
Area *(square feet)* of bank protection fill placed below the Ordinary High Water Mark

E. Stream Relocation

Water body name	
Description of impacts	
Length of existing channel to be relocated *(linear feet)*	
Length of new channel to be constructed *(linear feet)*	
Existing channel to be backfilled? ☐ Yes ☐ No	Type of relocation ☐ Piping ☐ Open ☐ Channel ☐ Other:____
Type of fill and volume *(cubic yards)*	

F. Open Water Fill

Water body name Lake Michigan
Description of Impacts Glacially derived cobble and limestone slabs will be mounded on the lake bottom to create fish habitat reefs in shallow water habitat. Minor and temporary impacts are expected to occur during active construction to include suspension of bottom sediments (sand) and disturbance to local fauna.
Area of water body to be filled *(acres)* 0.011 acres
Type of fill and volume *(cubic yards)* 707.17 cubic yards of glacially derived cobble from local source

PERMIT APPLICATION FOR CONSTRUCTION

State Form 42946 (R6 / 2-05)
Approved by the State Board of Accounts, 2005

Mail To: **Department of Natural Resources Division of Water**
402 West Washington Street, Room W264
Indianapolis, Indiana 46204-2641
Telephone Number: (317) 232-4160
Toll Free: 1-877-928-3755
Fax Number: (317) 233-4579
www.IN.gov/dnr/water

Based on the "Permit Application Assistance Manual", I am submitting this application to perform work under:

Permit Type	Application Fee	Permit Type	Application Fee
☐ IC 14-26-2 Lake Preservation Act	$ 100.00	☐ IC 14-29-3 Sand and Gravel Permits Act	$ 50.00
☐ IC 14-26-5 Lowering of the Ten Acre Lake Act	$ 25.00	☐ IC 14-29-4 Construction of Channels Act	$ 100.00
☒ IC 14-29-1 Navigable Waterways Act	No Fee		
☐ IC 14-28-1 Flood Control Act, *(select one of the following:)*			
☐ Excavation, fill, or non-residential construction in a floodway			$ 200.00
☐ Residential reconstruction in a floodway, other than the Ohio River floodway			$ 50.00
☐ Residential construction, or reconstruction, in the Ohio River floodway			$ 10.00

PLEASE TYPE OR PRINT

1. APPLICANT INFORMATION

Name of Applicant: City of East Chicago — Name of Contact Person: Milton Reed

Applicant Mailing Address: 4127 Lombardy St (Street, P.O. Box or Rural Route) — East Chicago (City) — IL (State) — 46312 (ZIP Code)

Contact Information: Daytime Tele. # (219) 808-2175 — Fax # (219) 397-2144 — E-mail Address: mreed@globalconsultingsIn.com

2. AGENT INFORMATION

Name of Agent: US Army Corps of Engineers, Chicago — Name of Contact Person: Matthew Shanks

Agent Mailing Address: 231 S. LaSalle St. Suite 1500 (Street, P.O. Box or Rural Route) — Chicago (City) — IL (State) — 60604 (ZIP Code)

Contact Information: Daytime Tele. # (312) 846-5581 — Fax # (312) 886-5475 — E-mail Address: Matthew.r.shanks@usace.army.mil

3. PROPERTY OWNER INFORMATION

Name of Property Owner: City of East Chicago — Name of Contact Person: Milton Reed

Property Owner Mailing Address: 4127 Lombardy St (Street, P.O. Box or Rural Route) — East Chicago (City) — IN (State) — 46312 (ZIP Code)

Contact Information: Daytime Tele. # (219) 808-2175 — Fax # (219) 397-2144 — E-mail Address: mreed@globalconsultingsIn.com

Relationship of applicant to property: ☒ Owner ☐ Purchaser ☐ Lessee Other: Federal Project Partner

4. PUBLIC NOTICE *(See Permit Application Assistance Manual)*

Complete and submit SF # 52086 titled "Adjacent Property Owners Listing - Form N-4: Affirmation of personal service, 1st class mail service, or certified mail service

5. PROJECT DESCRIPTION 5.1 Description Narrative: *(See Permit Application Assistance Manual)*

By restoring aquatic and buffering habitats and addressing invasive species issues, this project would provide essential habitat for fish, migratory birds, reptiles and amphibians within a highly urbanized area. Restoration measures include the planting of native beach and dune species, removal of invasive plant species, planting native herbaceous plants and shrubs on the existing breakwater and the construction of rock reef fisheries habitat. A Detailed Project Report and Integrated Environmental Assessment titled "Jeorse Park Beach Section 506 Great Lakes Fishery & Ecosystem Restoration Study" is attached for additional information on the selection of this alternative. This application for fill in the open waters of Lake Michigan will address the construction of fish habitat reefs utilizing glacially derived cobble from local sources. The fish habitats will be constructed as two cobble mounds each 17.6 feet in diameter with a maximum height of 3.5 feet above the lake bottom with side slopes at a 2:1 ratio. The mounds will be placed approximately 400 and 500 feet southeast of the existing breakwater elbow (see attached plan sheet CE102 & CE302). Each mound will consist of 354 cubic yards of clean cobble material free of fines (<5% passing a #200 screen) and procured from a commercial source. Selective invasive species removal is also planned to occur below the ordinary high water mark as necessary throughout the project site as indicated on the attached plan sheets (CE 101).

6. PROJECT LOCATION

6-1 Location Narrative: *(See Permit Application Assistance Manual)* **Stream/Lake Name:**

Jeorse Park Beach is located along the Lake Michigan shoreline just southeast of Indiana Harbor and Shipping Canal in Lake County, IN. USGS Quadrangle map name Whiting (41087F4), NW Quarter, Section 22&23, Township 37N, Range 9W. The park is bounded to the north by the Ameristar Casino, to the west by Cline Avenue and the Majestic Star Hotel parking lot, to the south by the Majestic Star Casino, and to the east by Lake Michigan.

6-2 Driving Directions: *(See Permit Application Assistance Manual)*

Take the I-90 E to Exit 10 toward IN-912/Gary/Cline Ave. Continue onto Gary Rd. Turn right onto Cline Ave. Use the left lane to take the IN-912 N ramp to Cline Ave. Merge onto IN-912 W/US-12 E. Continue onto IN-912 W. Take exit 5C toward Jeorse Park/Pastrick Marina/Ameristar Casino. You can access the beach through the Ameristar Casino parking lot and the beach parking lot is located outside and behind the parking garage structure.

6-3 Special Information: *(See Permit Application Assistance Manual)*

Jeorse Park Beach is a publicly accessible beach with public parking behind the casino. The breakwater may be walked to gain a better perspective.

6-4 Project Location Map: *(See Permit Application Assistance Manual)* Attached JPB Location Map.

6-5 Project Site Map: *(See Permit Application Assistance Manual)* Attached JPB Real Estate Map

7. DISTURBED AREA DRAWING

7-1 Drawing Requirements: *(See Permit Application Assistance Manual)* Attached JPB Draft Plans (CE101, CE102, CE302)

8. PROJECT PHOTOGRAPHS

8-1 Images: *(See Permit Application Assistance Manual)*

8-2 Photo Orientation Map: *(See Permit Application Assistance Manual)* } Attached JPB Pictures and Aerial

8-3 Photo Documentation: *(See Permit Application Assistance Manual)*

9. RELATED PROJECT INFORMATION

Department of Natural Resources

Administrative Cause #	Related Application(s) #	Early Coordination # ER-18846
Floodplain Analysis/Regulatory Assessment #	Violation #	Exemption #

Department of Environmental Management

Section 401 # Concurent Application Submittal

Corps of Engineers

Public Notice #	Section 404 Application #	Section 10 Application #

10. STATEMENT OF AFFIRMATION

I hereby swear or affirm, under the penalties for perjury, that the information submitted herewith is to the best of my knowledge and belief, true, accurate and complete. I further certify that I possess the authority to undertake the project. I hereby grant to the Department of Natural Resources, the right to enter the above-described location to inspect the work.

Signature of Applicant or Authorized Agent *(REQUIRED)*

06/24/16
Date *(month, day, year)*

Christopher T. Drew
Colonel, U.S. Army
District Commander

11. REGULATORY FEES

11-1 Regulatory Fees Submitted: *(See Permit Application Assistance Manual)*

11-3 Payment Method: *(See Permit Application Assistance Manual)*

REQUIREMENT FOR ADDITIONAL INFORMATION AND PERMITS

Application made to and approval granted by the Department of Natural Resources does not in any way relieve the applicant of the necessity of securing easements or other property rights, permits and approvals from affected property owners and other local, state, and federal agencies.

ADJACENT PROPERTY OWNERS LISTING — Form N4

State Form 52086 (3-05)
Approved by the State Board of Accounts, 2005

Mail To: **Department of Natural Resources Division of Water**
402 West Washington Street, Room W264
Indianapolis, Indiana 46204-2641
Telephone Number: (317) 232-4160
Toll Free: 1-877-928-3755
Fax Number: (317) 233-4579
www.IN.gov/dnr/water

4. PUBLIC NOTICE IN CONFORMANCE WITH IC 14-11-4 AND 312 IAC 2-3-3

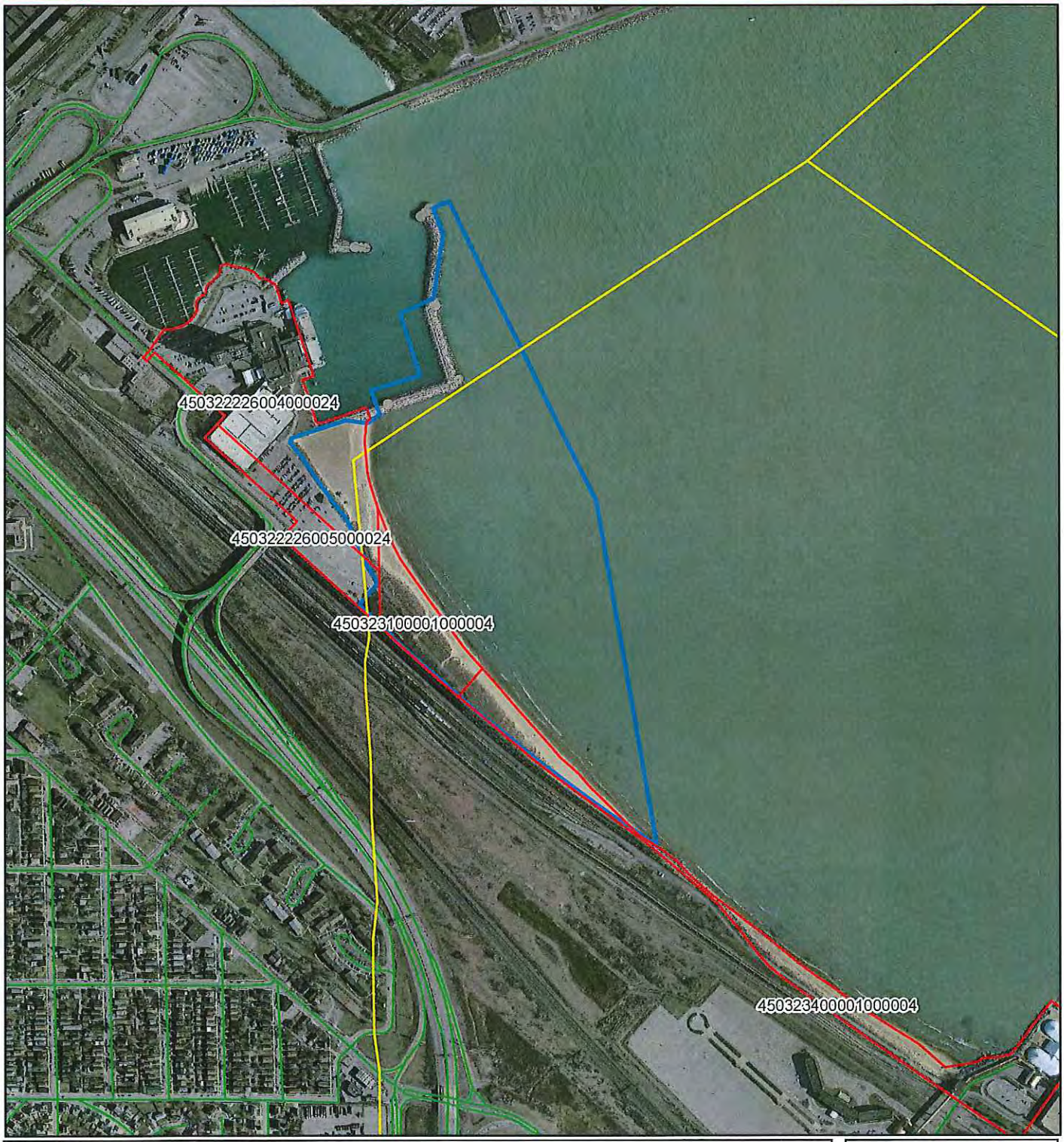
N/A Property Owner *(if not applicant or adjacent landowner)* Adjacent property owners are greater than 1/4 mile from the proposed reef location with all property within 1/4 mile owned by City of East Chicago, the local sponsor to the Corps project. Address City State ZIP Code	☐ Personal service was provided on: _____ (date) ☐ 1st Class Mail service was provided on: _____ (date). I affirm that 21 days have passed without the mailing returned as undelivered or undeliverable. Attached is PS Form 3817 as proof of mailing. ☐ Certified Mail service was provided on: _____ (date). Attached is PS Form 3811 (green card) as proof of mailing.
Adjacent Property Owner Address City State ZIP Code	☐ Personal service was provided on: _____ (date) ☐ 1st Class Mail service was provided on: _____ (date). I affirm that 21 days have passed without the mailing returned as undelivered or undeliverable. Attached is PS Form 3817 as proof of mailing. ☐ Certified Mail service was provided on: _____ (date). Attached is PS Form 3811 (green card) as proof of mailing.
Adjacent Property Owner Address City State ZIP Code	☐ Personal service was provided on: _____ (date) ☐ 1st Class Mail service was provided on: _____ (date). I affirm that 21 days have passed without the mailing returned as undelivered or undeliverable. Attached is PS Form 3817 as proof of mailing. ☐ Certified Mail service was provided on: _____ (date). Attached is PS Form 3811 (green card) as proof of mailing.
Adjacent Property Owner Address City State ZIP Code	☐ Personal service was provided on: _____ (date) ☐ 1st Class Mail service was provided on: _____ (date). I affirm that 21 days have passed without the mailing returned as undelivered or undeliverable. Attached is PS Form 3817 as proof of mailing. ☐ Certified Mail service was provided on: _____ (date). Attached is PS Form 3811 (green card) as proof of mailing.
Adjacent Property Owner Address City State ZIP Code	☐ Personal service was provided on: _____ (date) ☐ 1st Class Mail service was provided on: _____ (date). I affirm that 21 days have passed without the mailing returned as undelivered or undeliverable. Attached is PS Form 3817 as proof of mailing. ☐ Certified Mail service was provided on: _____ (date). Attached is PS Form 3811 (green card) as proof of mailing.

I hereby swear or affirm, under the penalties of perjury, that the aforementioned statements submitted herewith are to the best of my knowledge and belief, true, accurate and complete, and that the property owner(s), and adjoining landowners have been notified of the activity in conformance with the provisions of 312 IAC 2-3-3.

Application Number Signature Date *(month, day, year)*

Jeorse Park Real Estate

U.S. Army Corps of Engineers
Chicago District



Legend

Parcels | Townships | Streets | Project_Boundary

Date: 2/3/2014

N
W E
S

1 IN = 836 FT

Coordinate System: NAD 1983 StatePlane Illinois East FIPS 1201 Feet
Projection: Transverse Mercator
Datum: North American 1983

Path: G:\Projects_LRC\PRJ_506_Jeorse Park\MXD\Levee37 RE ma

US Army Corps of Engineers®
_____ District

JEORSE PARK BEACH
ECOSYSTEM RESTORATION SECTION 506
EAST CHICAGO, IL

LOCATION MAP
(N.T.S.)

VICINITY MAP
(N.T.S.)

SOLICITATION NO.: W912P6-16-B-0010

ISSUE DATE: 13 JUNE, 2016

PRELIMINARY SUBMITTAL - 100% BCOES

SHEET INDEX

SHEET NUMBER	SHEET REFERENCE	TITLE
1.	G-001	LOCATION, VICINITY MAP AND SHEET INDEX,
2.	G-002	LEGEND, ABBREVIATIONS AND GENERAL NOTES
3.	C-101	SITE PLAN AND STAGING AREA
4.	CE-101	CLEARING AND INVASIVE REMOVAL PLAN
5.	CE-102	PLANTING AND RESTORATION PLAN
6.	CE-103	TOPSOIL AND SAND PLACEMENT PLAN
7.	CE-301	BREAKWATER PLANTING TYPICAL SECTION
8.	CE-302	TYPICAL SECTIONS, ROCK REEF

THIS PROJECT WAS DESIGNED BY THE CHICAGO DISTRICT CORPS OF ENGINEERS. THE INITIALS OR SIGNATURES 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:

/S/
ATR TEAM LEADER DATE

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

APPROVAL RECOMMENDED BY:

/S/
PROJECT MANAGER DATE

APPROVED BY:

/S/
CHIEF, DESIGN BRANCH DATE

US Army Corps of Engineers®

MARK	DESCRIPTION	DATE

U.S. ARMY CORPS OF ENGINEERS
CHICAGO DISTRICT
231 S LASALLE ST
CHICAGO, IL 60610

DESIGNED BY: L. VANDENBERG, P.E.
DRAWN BY: LCV
CHECKED BY: J.CHECKER
SUBMITTED BY: JOHN GROBOSKI, P.E.
SIZE: ANSI D
FILE NAME: Jeorse Park Section 506_G001.dgn
ISSUE DATE: 13 JUNE 2016
SOLICITATION NO.: W912P6-16-B-0010
CONTRACT NO.: XXXXXX-XX-X-XXXX
PROJECT CODE:

JEORSE PARK BEACH
ECOSYSTEM RESTORATION SECTION 506
EAST CHICAGO, IL

COVER SHEET, LOCATION AND VICINITY MAP

SHEET ID
G001

%STATUS%

pw:\\COE-LRCPWP02CHLlrc.ds.usace.army.mil\coe-lrcpwp02chLlrc.ds.usace.army.mil\Documents\Projects\Jeorse Park Section 506 - 401926\00003 - CADD BIM\00-Sheets\Cover Sheet, Location and Vicinity Map
H6TS0LCV 6/15/2016 MicroStation

GENERAL NOTES

1. THE HORIZONTAL DATUM IS BASED ON THE INDIANA STATE PLANE COORDINATE SYSTEM, WEST ZONE, NAD 1983.

2. THE VERTICAL DATUM SHALL BE BASED ON NORTH AMERICAN VERTICAL DATUM (NAVD) OF 1988.

3. HORIZONTAL_POSITIONAL_ACCURACY HORIZONTAL_POSITIONAL_ACCURACY_REPORT: DATA SET BASED ON PHOTOGRAMMETRICALLY COMPILED MAP DATA PURPORTED TO MEET NATIONAL MAP ACCURACY STANDARDS FOR 1:1200 SCALE MAPS, IMPLYING THAT NO MORE THAN 10 PERCENT OF TESTED POINTS ARE IN ERROR OF MORE THAN 1/50TH OF AN INCH PROVIDED THE TEST IS APPLIED TO WELL DEFINED POINTS. HORIZONTAL ACCURACY FOR THIS DATA, THEN, IS APPROX. +/- .5 FT. AT THE TIME OF COMPILATION. STANDARD COUNTY QUALITY ASSURANCE AND CHECKING HAS BEEN PERFORMED.

4. VERTICAL_POSITIONAL_ACCURACY_REPORT: SURVEY WAS PERFORMED IN OCTOBER 2014 TO REESTABLISH EXISTING CONTROL MONUMENTS AND PERFORM TOPOGRAPHIC SURVEY IN THE AREAS OF PROPOSED GRADING. REFER TO SURVEY SHEETS FOR FUTHER DETAILS. IN ALL OTHER AREAS, VERTICAL DATA SET BASED ON PHOTOGRAMMETRICALLY COMPILED MAP DATA PURPORTED TO MEET NATIONAL MAP ACCURACY STANDARDS FOR 1:1200 SCALE MAPS, IMPLYING THAT NO MORE THAN 10 PERCENT OF TESTED ELEVATIONS ARE IN ERROR OF MORE THAN ONE-HALF THE CONTOUR INTERVAL PROVIDED THE PERMISSIBLE HORIZONTAL ERROR TOLERANCE IS ALLOWED. VERTICAL ACCURACY FOR THIS DATA, THEN, IS APPROX. +/- 1 FT. AT THE TIME OF COMPILATION. STANDARD COUNTY QUALITY ASSURANCE AND CHECKING HAS BEEN PERFORMED.

5. BEFORE BEGINNING CONSTRUCTION, VERIFY ALL CRITICAL DIMENSIONS, LOCATIONS AND ELEVATIONS BEFORE PROCEEDING WITH PROPOSED WORK. IMMEDIATELY NOTIFY THE CONTRACTING OFFICER'S REPRESENTATIVE OF ANY SIGNIFICANT DISCREPANCIES.

6. BEFORE START OF CONSTRUCTION, CONSULT WITH ALL UTILITY SYSTEM OWNERS. CALL INDIANA 811 NO LESS THAN 48 HOURS BEFORE START OF ANY EXCAVATION.

7. THE CONTRACTOR IS RESPONSIBLE FOR THE DEMARKATION AND PROTECION OF ALL UTILITIES WITHIN THE WORK LIMITS. UTILITIES DAMAGED DURING CONSTRUCTION MUST BE REPAIRED OR REPLACED AT NO ADDITIONAL COST TO THE GOVERNMENT.

8. THE CONTRACTOR MUST INSTALL AND MAINTAIN TEMPORARY EROSION CONTROL BEST MANAGEMENT PRACTICIES (BMPs) AND IN ACCORDANCE WITH THE ILLINOIS URBAN MANUAL AND SECTION 01 57 20 ENVIROMENTAL PROTECTION FOR INDIANA, AS NECESSARY TO CONTROL SEDIMENT AND EROSION ON THE SITE DURING CONSTRUCTION.

9. WORK MUST BE IN ACCORDANCE WITH CORPS OF ENGINEERS SAFETY AND HEALTH REQUIREMENTS MANUAL EM385-1-1, AS CURRENT AT TIME OF CONTRACT AWARD.

STANDARD ABBREVIATIONS

ACOE	ARMY CORPS OF ENGINEERS
CB	CATCH BASIN
CL	CENTERLINE
CJ	CONSTRUCTION JOINT
COR	CONTRACTING OFFICER'S REPRESENTATIVE
COE	CORPS OF ENGINEERS
CMP	CORRUGATED METAL PIPE
DIA.	DIAMETER
DBH	DIAMETER AT BREAST HEIGHT
DTM	DIGITAL TERRAIN MODEL
D.I.P.	DUCTILE IRON PIPE
EHH	ELECTRICAL HAND HOLE
EMH	ELECTRICAL MAN HOLE
ELEV	ELEVATION
EJ	EXPANSION JOINT
EN	EXTRACTION WELL
FF	FINISH FLOOR
FH	FIRE HYDRANT
GF	GRADE AT FOUNDATION
G.D.	GRATE DRAIN
G.M.H.	GRATED MANHOLE
HWL	HIGH WATER ELEVATION
H	HORIZONTAL
IDOT	ILLINOIS DEPARTMENT OF TRANSPORTATION
LCP	LOCAL CONTROL PANEL
MH	MANHOLE
MIN	MINIMUM
MW	MONITORING WELL
NGVD	NATIONAL GEODETIC VERTICAL DATUM
NWL	NATURAL WATER LINE
NAVD	NORTH AMERICAN VERTICAL DATUM
NTS	NOT TO SCALE
OSI	OCEAN SURVEYS, INC.
S	PIPE SLOPE
RCP	REINFORCED CONCRETE PIPE
SSP	STEEL SHEET PILE
TYP.	TYPICAL
VIF	VERIFY IN FIELD
V	VERTICAL
WLP	WELL POINTS
WL	WORK LIMIT
WP	WORK POINT

VERT./HORIZ. ALIGNMENT ABBREVIATIONS

PI	POINT OF ELEVATION
PC	POINT OF CURVATURE
CC	CENTER OF CURVATURE
R	RADIUS
L	LENGTH
▲	DEFLECTION ANGLE
D	DEGREE OF CURVE
STA.	STATION
	HORIZONTAL CONTROL POINT
	HORIZONTAL & VERTICAL CONTROL POINT

LEGEND

LINE STYLES

- FENCE
- 10 DESIGN CONTOUR
- 11 EXISTING CONTOUR
- EDGE OF WATER
- WORK LIMITS
- RAILROAD LINE
- TREELINE
- SANITARY WASTE
- STORM DRAIN
- ELECTRICAL PRIMARY
- ELECTRICAL SECONDARY
- TELEPHONE LINE
- FUEL OIL SUPPLY
- WATER DOMESTIC MAIN
- GAS LINE HIGH PRESSURE
- GAS LINE LOW PRESSURE

SYMBOLS

- STORM MANHOLE
- WATER MANHOLE
- TRAFFIC SIGNAL MAST ARM
- TRIANGULATION POINT
- ELECTRICAL MANHOLE
- MONITORING WELL
- WATER VALVE VAULT
- FIRE HYDRANT
- W.L. AT '( ) WATER LEVEL
- ELECTRIC HANDHOLE
- GUY WIRE
- UTILITY POLE
- TREE
- CATCH BASIN
- CATCH BASIN ROUND

GRID LETTER/NUMBER

X# DRAWING AREA TITLE

SCALE:

DRAWING AREA TITLE INDICATOR

DETAIL INDICATOR: GRID LETTER/NUMBER OF DETAIL; SHEET WHERE DETAIL IS SHOWN

SECTION INDICATOR: DIRECTION OF CUT; GRID LETTER/NUMBER OF SECTION; SHEET WHERE SECTION IS SHOWN

PATTERNS

- INVASIVE REMOVAL 1 - BEACH AND DUNES
- INVASIVE REMOVAL 2 - BREAKWATER
- OPTIONAL INVASIVE REMOVAL
- PLANTING TYPE 1 - BEACH AND DUNES
- PLANTING TYPE 2 - BREAKWATER
- PLANTING TYPE 3 - OPTIONAL BREAKWATER
- PLANTING TYPE 4 - OPTIONAL BEACH AND DUNES
- TOPSOIL REMOVAL
- DEBRIS/GRAVEL AREA

US Army Corps of Engineers®

MARK	DESCRIPTION	DATE

DESIGNED BY: L. HANDESSER, P.E.
DESIGN DATE: 13 JUNE 2016
DRAWN BY:
SOLICITATION NO.: W912P8-16-B-XXXX
CHECKED BY: J. HAYES, P.E.
CONTRACT NO.: XXXXXX-XX-X-XXXX
SUBMITTED BY: J. HAYES, P.E.
PROJECT CODE:
DATE:
FILE NAME:

U.S. ARMY CORPS OF ENGINEERS CHICAGO DISTRICT 231 S LaSALLE ST CHICAGO, IL 60604

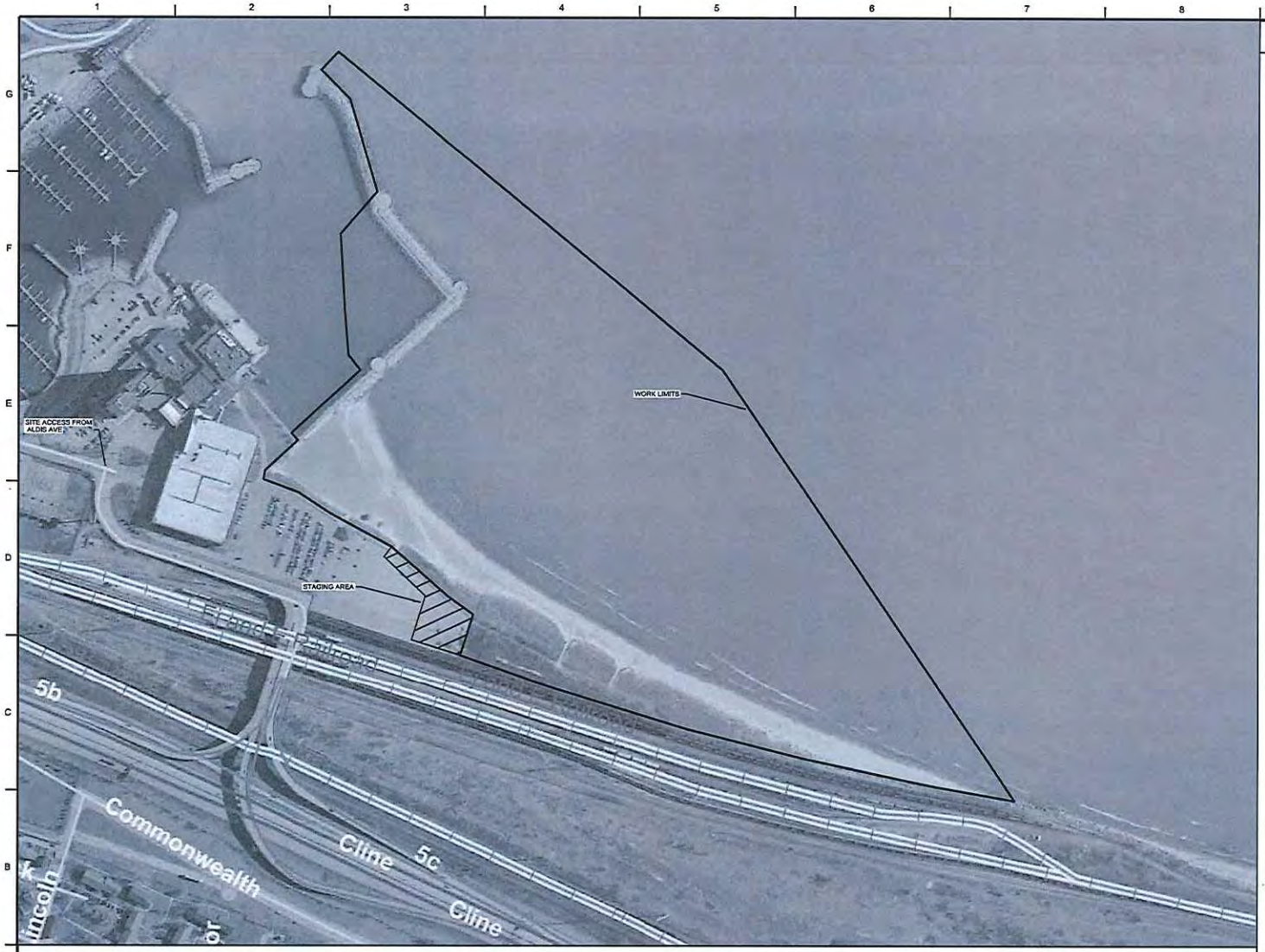
JEORSE PARK BEACH
ECOSYSTEM RESTORATION SECTION 506
EAST CHICAGO, IN.

LEGEND ABBREVIATIONS AND GENERAL NOTES

SHEET ID
G002

%PRODUCTION DATA 3%
%PRODUCTION DATA 3%
%PRODUCTION DATA 3%
%PRODUCTION DATA 3%

%STATUS%



A1 SITE PLAN
SCALE: 1" = 200'

N

0 200' 400'

GENERAL NOTES

1. WORK LIMITS AS SHOWN. CONTRACTOR SHALL VERIFY.

US Army Corps of Engineers®

MARK	DESCRIPTION	DATE

DESIGNED BY: L. VANDENBERG, P.E.
DRAWN BY: LCV
CHECKED BY:
SUBMITTED BY: JOHN GROBOSKI, P.E.
SIZE: ANSI D
FILE NAME: Jeorse Park Section 506_C101.dgn
ISSUE DATE: 13 JUNE 2016
SOLICITATION NO.: W912PB-16-B-0010
CONTRACT NO.: XXXXXX-XX-X-XXXX
PROJECT CODE:

U.S. ARMY CORPS OF ENGINEERS
CHICAGO DISTRICT
231 S LASALLE ST
CHICAGO, IL 60604

JEORSE PARK BEACH
ECOSYSTEM RESTORATION SECTION 506
EAST CHICAGO, IL

SITE PLAN AND STAGING AREA

SHEET ID
C101

pw:\\CCE-LRCPWP02CHI.lrc.ds.usace.army.mil:cce-lrcpwp02chi.lrc.ds.usace.army.mil\Documents\Projects\Jeorse Park Section 506 - 401926\00003 - CADD BIM\00-Sheets\Site Plan and Staging Area
H6TS9LCV 6/15/2016 MicroStation

%STATUS%

GENERAL NOTES

1. REFER TO SPECIFICATION SECTION 31 31 19.13 FOR INVASIVE SPECIES CONTROL DETAILS.

INVASIVE REMOVAL 1 - BEACH AND DUNES (14.8 AC)

INVASIVE REMOVAL 2 - BREAKWATER (0.3 AC)

OPTIONAL INVASIVE REMOVAL AND BURNING (0.3 AC)

A1 CLEARING PLAN
SCALE: 1" = 200'

0 200' 400'

US Army Corps of Engineers®

MARK	DESCRIPTION	DATE

DESIGNED BY: J. DESIGNER
DRAWN BY: J. DRAWER
CHECKED BY:
SUBMITTED BY: J. SUBMITTER
SIZE: ANSI D
FILE NAME: Jeorse Park Section 506_CE101.dgn
ISSUE DATE: JUNE 13, 2016
SOLICITATION NO.: W912P8-15-B-0010
CONTRACT NO.: XXXXXX-XX-X-XXXXX
PROJECT CODE:

U.S. ARMY CORPS OF ENGINEERS
CHICAGO DISTRICT
231 S LASALLE ST
CHICAGO, IL 60604

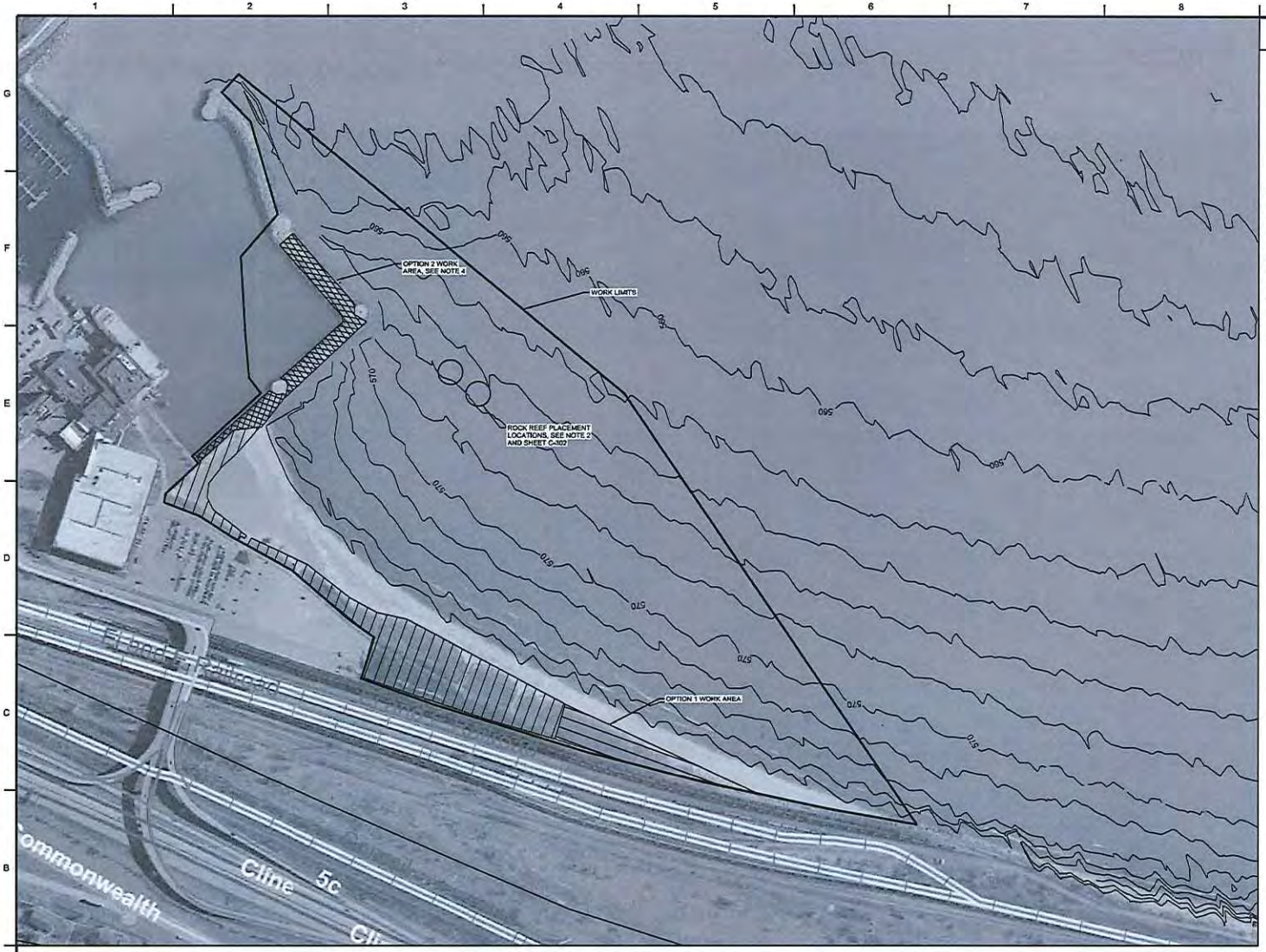
JEORSE PARK BEACH
ECOSYSTEM RESTORATION SECTION 506
EAST CHICAGO, IL

CLEARING PLAN

SHEET ID
CE101

pw:\\COE-LRCPWP02CHI.lrc.ds.usace.army.mil:coe-lrcpwp02chi.lrc.ds.usace.army.mil\Documents\Projects\Jeorse Park Section 506 - 401926\00003 - CADD BIM\00-Sheets\Clearing Plan
H6TS0LCV 6/15/2016 MicroStation

%STATUS%



GENERAL NOTES

1. THE 2 ROCK REEFS ARE SHOWN LARGER THAN SCALE FOR CLARITY.
2. BOTH REEFS SHALL BE PLACED IN THE AREA SHOWN, AT APPROXIMATE ELEVATION 564. VERIFY PLACEMENT IN FIELD WITH COR. 2' BATHYMETRIC CONTOURS ARE SHOWN.
3. OPTION AREA 2 FOR BREAKWATER PLANTING MAY BE REVISED IF A BREAKWATER REALIGNMENT PROJECT TO BE COMPLETED BY OTHERS IS AWARDED. THE PLANTING AREA WILL BE VERIFIED AT TIME OF OPTION AWARD, AND QUANTITIES WILL NOT BE REVISED.

- PLANTING TYPE 1 - BEACH AND DUNE
- PLANTING TYPE 2 - BREAKWATER
- PLANTING TYPE 3 - OPTIONAL BREAKWATER
- PLANTING TYPE 4 - OPTIONAL BEACH AND DUNE

J.CHECKER

A1 PLANTING AND RESTORATION PLAN
SCALE: 1" = 200'

N

0 200' 400'

US Army Corps of Engineers®

MARK	DESCRIPTION	DATE

DESIGNED BY: L. VANDENBERG, P.E.
DRAWN BY: LE/MECKER
CHECKED BY:
SUBMITTED BY: JOHN GROBOSKI, P.E.
SIZE: ANSI D
FILE NAME: Jeorse Park Section 508_CE102.dgn
ISSUE DATE: 13 JUNE, 2016
SOLICITATION NO.: W912PB-16-B-0010
CONTRACT NO.: XXXXXX-XX-XXXXX
PROJECT CODE:

U.S. ARMY CORPS OF ENGINEERS
CHICAGO DISTRICT
231 S LASALLE ST
CHICAGO, IL 60604

JEORSE PARK BEACH
ECOSYSTEM RESTORATION SECTION 508
EAST CHICAGO, IL

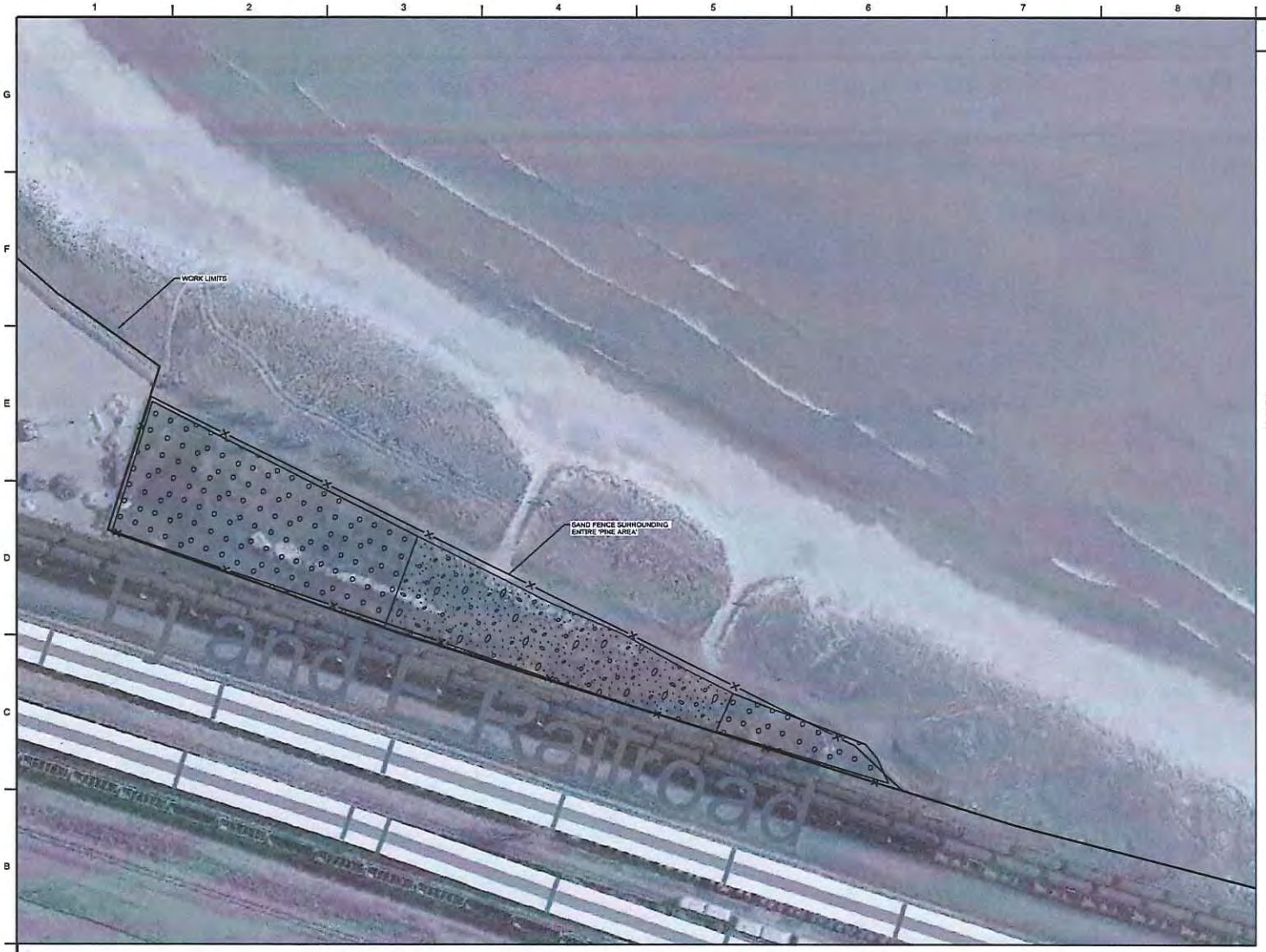
PLANTING AND RESTORATION PLAN

SHEET ID
CE102

J.CHECKER

pw:\\COE-LRCPWP02CHI.lrc.ds.usace.army.mil:coe-lrcpwp02chi.lrc.ds.usace.army.mil\Documents\Projects\Jeorse Park Section 508 - 40192\00003 - CADD BIM\00-Sheets\Planting and Restoration Plan
H6TS0LCV 6/15/2016 MicroStation

%STATUS%



GENERAL NOTES

1. REMOVAL APPROXIMATELY 6" OF TOPSOIL COVER IN THE AREAS SHOWN, UNTIL UNDERLYING SAND LAYER IS REVEALED.
2. FORM SEVERAL SMALL MOUNDS FROM THE DEBRIS WITHIN THE 'DEBRIS/GRAVEL AREA' SHOWN.
3. PLACE EXCAVATED TOPSOIL OVER DEBRIS/STONE MOUNDS.
3. COVER ENTIRE PINE AREA ('TOPSOIL REMOVAL' PLUS 'DEBRIS/GRAVEL AREA') WITH 2' OF NEW SAND, REFER TO SPECIFICATION SECTION 31 00 00 FOR DETAILS OF GRADING PLAN.
4. REFER TO SPECIFICATION SECTION 31 00 00 FOR SAND FENCE REQUIREMENTS.

TOPSOIL REMOVAL (0.9 AC)

DEBRIS/GRAVEL AREA (0.5 AC)

J.CHECKER

A1 TOPSOIL AND SAND PLACEMENT PLAN
SCALE: 1" = 200'

0 50 100

US Army Corps of Engineers®

MARK	DESCRIPTION	DATE

DESIGNED BY: L. VANDERBERG, P.E.
DRAWN BY: LCV
CHECKED BY:
SUBMITTED BY: JOHN GROSDEN, P.E.
SIZE: ANSI D
FILE NAME: Jeorse Park Section 500_CE103.dgn
ISSUE DATE: 13 JUNE 2016
SOLICITATION NO.: W912P8-16-B-0010
CONTRACT NO.: XXXXXX-XX-X-XXXX
PROJECT CODE:

U.S. ARMY CORPS OF ENGINEERS
CHICAGO DISTRICT
231 S LASALLE ST
CHICAGO, IL 60604

JEORSE PARK BEACH
ECOSYSTEM RESTORATION SECTION 506
EAST CHICAGO, IL

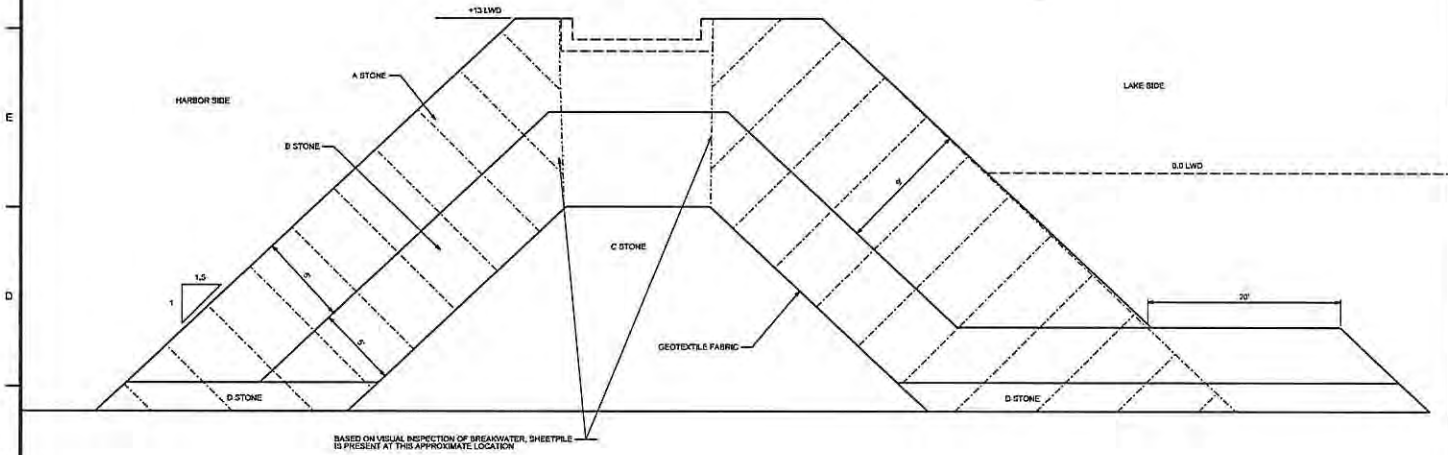
TOPSOIL REMOVAL PLAN

SHEET ID
CE103

J.CHECKER

pw:\\COE-LRCPWP02CHI.lrc.ds.usace.army.mil\coe-lrcpwp02chi.lrc.ds.usace.army.mil\Documents\Projects\Jeorse Park Section 500 - 40192\60\0003 - CADD BIM\00-Sheets\Pine grading area site plan
H6TS9LCV 6/15/2016 MicroStation

%STATUS%



A1 EXISTING BREAKWATER TYPICAL SECTION

SCALE: 1" = 200'

0 200' 400'

GENERAL NOTES

1. HATCHED AREA INDICATES TYPICAL SAND PLACEMENT FOR BREAKWATER PLANTINGS. REFER TO SHEET CE-102 FOR LOCATIONS OF SAND ALONG BREAKWATER. PORTIONS OF THIS AREA ARE ALREADY INUNDATED WITH SAND AND SMALLER RIPRAP.

2. IF EXISTING BREAKWATER IS NOT FILLED WITH ENOUGH SAND AND SMALL RIPRAP TO SUPPORT THE NEW SAND PLACEMENT, AN OPTIONAL ITEM MAY BE AWARDED TO PLACE INDOT COURSE AGGREGATE #5 WITHIN THE BREAKWATER AS A BASE LAYER.

US Army Corps of Engineers®

MARK	DESCRIPTION	DATE

DESIGNED BY: L. VANDERBERG, P.E.
DRAWN BY: LCV
CHECKED BY:
SUBMITTED BY: JOHN GROBOSKI, P.E.
SIZE: ANSI D
TITLE NAME: Jeorse Park Section 506_CE301.dgn
ISSUE DATE: 13 JUNE 2016
SOLICITATION NO.: W912P8-16-B-0010
CONTRACT NO.: XXXXXX-XX-X-XXXX
PROJECT CODE:

U.S. ARMY CORPS OF ENGINEERS
CHICAGO DISTRICT
231 S LASALLE ST
CHICAGO, IL 60604

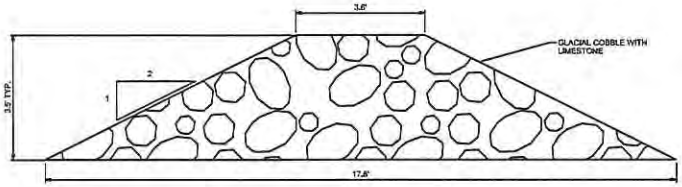
JEORSE PARK BEACH
ECOSYSTEM RESTORATION SECTION 506
EAST CHICAGO, IL

TYPICAL SECTION
BREAKWATER PLANTINGS

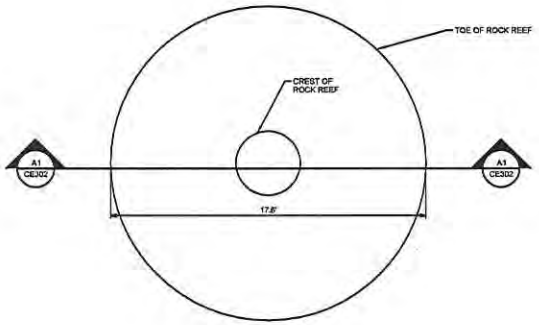
SHEET ID
CE301

%STATUS%

pw:\\COE-LRCPWP02CHI.lrc.ds.usace.army.mil:coe-lrcpwp02chi.lrc.ds.usace.army.mil\Documents\Projects\Jeorse Park Section 506 - 401\02\00003 - CADD BIM\00-Sheets\Breakwater Planting Typical Section
H6TS9LCV 6/15/2016 MicroStation



A1 ROCK REEF TYPICAL CENTER SECTION
SCALE: 1" = 200'



A1 ROCK REEF PLAN VIEW
SCALE: 1" = 400'

GENERAL NOTES

1. EACH REEF TO BE CONSTRUCTED OF GLACIAL COBBLE WITH 1.2' AVERAGE DIAMETER. LARGER LIMESTONE MAY BE PLACED WITHIN THE CENTER OF THE REEF. SEE SPEC SECTION 35 35 20.00 03 FOR DETAILS.

US Army Corps of Engineers®

MARK	DESCRIPTION	DATE

DESIGNED BY: L. VANDENBERG, P.E.
DRAWN BY: LCV
CHECKED BY:
SUBMITTED BY: JOHN GROBOSKI, P.E.
SIZE: ANSI D
FILE NAME: Jeorse Park Section 506 CE302.dgn
ISSUE DATE: 13 JUNE 2016
SOLICITATION NO.: W912P8-16-R-0030
CONTRACT NO.: XXXXXX-XX-XX-XXX
PROJECT CODE:

U.S. ARMY CORPS OF ENGINEERS
CHICAGO DISTRICT
231 S LASALLE ST
CHICAGO, IL 60604

PROJECT/CONTRACT LOCATION 1
PROJECT/CONTRACT DESCRIPTION 2
PROJECT/CONTRACT DESCRIPTION / IDENTIFIER 3
PROJECT/CONTRACT IDENTIFIER IF NEEDED 4

TYPICAL SECTIONS
ROCK REEF

J.CHECKER

SHEET ID
CE302

pw:\\CCE-LRCPWP02CH\Jrc.ds.usace.army.mil\cce-lrcpwp02ch\Jrc.ds.usace.army.mil\Documents\Projects\Jeorse Park Section 506 - 401020\00003 - CADD BIM\00-Sheets\Typical Sections, Rock Reef
H6TS9LCV 6/15/2016 MicroStation

%STATUS%

Jeorse Park Beach Pictures and Reference Aerial

Reference Aerial with picture IDs and locations

Picture 1: Access road on upland portion of Jeorse Park beach facing north by northwest.

Picture 2: Landward edge of sand beach facing south by southeast.

Picture 3: North edge of sand beach and breakwater promenade facing east.

Picture 4: Picture of north half of sand beach, marram grass dune, and Ameristar casino breakwater facing north.

THIS IS NOT A PERMIT

State of Indiana
DEPARTMENT OF NATURAL RESOURCES
Division of Fish and Wildlife
Early Coordination/Environmental Assessment

DNR #: ER-18846 **Request Received:** February 2, 2016

Requestor: US Army Corps of Engineers, Chicago District
Matthew Shanks
231 South LaSalle Street, Suite 1500
Chicago, IL 60604

Project: Great Lakes Fishery & Ecosystem Restoration (Section 506): restore 15.8 acres of Jeorse Park Beach with invasive species removal, native plantings, and installation of rock reefs; East Chicago

County/Site info: Lake

The Indiana Department of Natural Resources has reviewed the above referenced public notice in accordance with the 1956 Fish and Wildlife Coordination Act. Our agency offers the following comments for your information.

If our agency has regulatory jurisdiction over the project, the recommendations contained in this letter may become requirements of any permit issued. If we do not have permitting authority, all recommendations are voluntary.

Regulatory Assessment: The Department of Natural Resources has permitting authority under The Navigable Waters Act, IC 14-29-1 for placing, filling, or erecting a permanent structure in; water withdrawal from; or mineral extraction from below the ordinary high watermark of Lake Michigan. Therefore, any work proposed below the ordinary high watermark of 581.5' IGLD 1985 in or along the Lake Michigan shoreline may require a permit from the Department of Natural Resources. Please submit a copy of this letter with the permit application, if required.

*NOTE: This project falls within the Lake Michigan Coastal Program's boundary; therefore, it may be subject to Federal Consistency (FC) review. For more information regarding items requiring Federal Consistency Review, please go to http://www.in.gov/dnr/lakemich/files/20070214-IR-312070085NRA.xml.pdf. If your project requires a Permit, Agency Action, or Funding as listed in Section III (pages 8-13) it must go through a FC Review. It is your responsibility to initiate a FC Review. Failure to do so may result in the Federal entity denying your project. Please follow the FC process outlined at http://www.in.gov/dnr/lakemich/6041.htm.

Natural Heritage Database: The Natural Heritage Program's data have been checked.
The managed land and species below have been documented within 1/2 mile of the project area. The Division of Nature Preserves recommends confining restoration work to the project area limits to minimize water quality impacts due to siltation effects. Care should also be taken to avoid impacting plant species located near the work area.

A) MANAGED LAND: Callahan Park, East Chicago Parks Department (SW of project)
B) PLANTS, southeast of project area:
1. Calamint (Satureja glabella var. angustifolia), state endangered
2. Leafy Northern Green Orchis (Platanthera hyperborea), state threatened
3. Crawe Sedge (Carex crawei), state threatened
4. Capitate Spike-rush (Eleocharis geniculate), state threatened
5. Prairie Goldenrod (Solidago ptarmicoides), state rare
6. Beach Sumac (Rhus aromatica var. arenaria), state rare

C) ANIMAL: Lake Sturgeon (Acipenser fulvescens), state endangered

THIS IS NOT A PERMIT

State of Indiana
DEPARTMENT OF NATURAL RESOURCES
Division of Fish and Wildlife

Early Coordination/Environmental Assessment

Fish & Wildlife Comments: With the information provided, it is difficult to properly assess the project's impacts to fish, wildlife, and botanical resources. However, we do not foresee any impacts to the lake sturgeon as a result of this project.

Additional detailed project information is needed including final plans and specifications for the rock reefs, breakwater plantings, and modifications to the breakwater pending the EPA E-coli study. Further coordination with the Division of Fish and Wildlife is encouraged as the project develops. Avoid areas of concern to fish, wildlife, and botanical resources to the greatest extent possible.

The Division of Fish and Wildlife supports efforts to improve native communities and control non-native, invasive species. Such efforts must consider the existing condition and avoid impacts to non-target species.

The additional measures listed below should be implemented to avoid, minimize, or compensate for impacts to fish, wildlife, and botanical resources:

1. Revegetate all bare and disturbed areas with a mixture of grasses (excluding all varieties of tall fescue), legumes, and native shrub and hardwood tree species as soon as possible upon completion.
2. Minimize and contain within the project limits all tree and brush clearing.
3. Do not cut any trees suitable for Indiana bat or Northern Long-eared bat roosting (greater than 3 inches dbh, living or dead, with loose hanging bark, or with cracks, crevices, or cavities) from April 1 through September 30.
4. Minimize the movement of resuspended bottom sediment from the immediate project area.
5. Inspect structural erosion and sediment control practices daily and repair as necessary until all construction is complete and disturbed areas are permanently stabilized.
6. Do not excavate or place fill in any riparian wetland.
7. Do not use broken concrete or slag as artificial reef habitat.
8. Appropriately designed measures for controlling erosion and sediment must be implemented to prevent sediment leaving the construction site; maintain these measures until construction is complete and all disturbed areas are stabilized.

Contact Staff: Christie L. Stanifer, Environ. Coordinator, Fish & Wildlife
Our agency appreciates this opportunity to be of service. Please contact the above staff member at (317) 232-4080 if we can be of further assistance.

Christie L. Stanifer **Date:** February 26, 2016
Environ. Coordinator
Division of Fish and Wildlife

2016

Jeorse Park Beach Section 506 Great Lakes Fishery & Ecosystem Restoration Study

Detailed Project Report & Integrated Environmental Assessment

East Chicago,
Lake County,
Indiana

US Army Corps of Engineers, Chicago District
City of East Chicago
March 2016

EXECUTIVE SUMMARY

This report presents the results of an ecosystem restoration feasibility study for Jeorse Park Beach. This Feasibility Report presents the assessment of ecological conditions and potential plans to restore important migratory bird, fish and wildlife habitat within a highly urbanized environment. This report gathered historic and current site conditions, and forecasts future without and future with project conditions for Jeorse Park Beach and the surrounding area. This report also provides a recommended plan for restoring habitat at Jeorse Park Beach.

The ecological conditions at Jeorse Park Beach have been significantly altered from the natural dune and beach ecosystem that once thrived along the southern rim of Lake Michigan. The landscape was once a vast expanse of vegetated beach and dunal communities merging with low lying wetland complexes but is now replaced with heavily modified shorelines populated with a mix of industrial, commercial and residential areas. As a result, habitat diversity in the near shore areas of the lake has declined, reducing fish spawning and foraging habitats. Floristic diversity and abundance on the beaches has also been diminished due to the urban development which has severely degraded both resident and migrant bird habitat structure and function. The City of East Chicago requested that the Chicago District, US Army Corps of Engineers (USACE) initiate a study under the Section 506 WRDA 2000, Great Lakes Fishery and Ecosystem Restoration (GLFER) authority to investigate the feasibility of restoring both the aquatic and coastal habitats at Jeorse Park Beach to a more natural and healthy state.

Jeorse Park Beach, owned and operated by the City of East Chicago, is located along the Lake Michigan shoreline just southeast of Indiana Harbor and Ship Canal in Lake County, IN. The park is bounded to the north by the Ameristar Casino, to the west by Cline Avenue and the Majestic Star Hotel parking lot, to the south by the Majestic Star Casino, and to the east by Lake Michigan. The project site is adjacent to Amtrak railroad lines with approximately 15.8 acres of beach and foredune habitat on the lakeside. The beach offers nearly 4500 feet of shoreline for potential aquatic habitat improvement and over 25 acres of lake bottom. Although the surrounding land use is primarily industrial and commercial, Jeorse Park Beach is commonly visited by birders and fishermen that take advantage of the park's natural resources.

Cultural modifications such as in-lake structures and landfill into the lake have altered water circulation patterns near the beach trapping algae and man-made debris, decreased nutrient cycling between near shore and off shore habitats and decreased water quality all of which negatively impact the aquatic resources. The most significant landfill project expanded the mouth of the Indiana Harbor Canal lakeward approximately 2.5 miles and is mainly used for industrial facilities housing steel mills and chemical manufacturing plants. The significant size of the altered coastal topography and existing development makes it impractical to reverse and difficult to repair in terms of ecological function but getting the ecosystem to a less degraded and more natural condition is quite achievable. The following resource problems could be addressed at the Jeorse Park Beach site:

- Altered hydrodynamics of near shore zone
- Lack of nutrient cycling between near shore and offshore habitats
- Excessive accumulation of algae and debris
- Lack of high quality fish foraging and spawning habitat
- Degradation of existing fish foraging and spawning habitat
- Degradation of aquatic migratory bird habitat
- Instability of coastal incipient dunes
- Lack of native grass and forb species (food bearing plants)

- Lack of dune and lake interactions

To address the noted ecosystem problems at Jeorse Park Beach, six (6) measures, including the No Action measure, were input into the IWR-Planning Suite in terms of costs and benefits. Dune and Beach (D) and Breakwater Plantings (BP) restoration measures were dependent on first initiating Invasive Plant Removal (IPR). The remaining measures including the IPR measure were considered independent and could be implemented as a standalone project. Based on the cost and benefit inputs and the dependency criteria, the IWR-Planning software generated 20 alternative combinations for ecosystem restoration.

The cost effectiveness analysis was used to ensure that certain alternatives would be screened out if they produced the same amount or less output at a greater cost than other alternatives with a lesser cost. Twenty (20) alternative combinations were analyzed for cost effectiveness. Of these, eight (8) cost effective alternative combinations were identified, which is inclusive of the six (6) Best Buy Plans. The No Action plan is always deemed cost effective and a Best Buy. Twelve (12) alternative combinations were screened out as non-cost effective.

An incremental cost analysis was performed on the six (6) Best Buy Plans identified from the cost effectiveness analysis:

- Alternative 1 – No Action Plan
- Alternative 2 – (RR) Rock Reef Habitat
- Alternative 3 – (IPR) Invasive Plant Removal, (BP) Breakwater Plantings
- Alternative 4 – (IPR) Invasive Plant Removal, (D) Dune and Beach Plantings, (BP) Breakwater Plantings
- Alternative 5 – (IPR) Invasive Plant Removal, (D) Dune and Beach Plantings, (BP) Breakwater Plantings, (RR) Rock Reef Habitat
- Alternative 6 – (IPR) Invasive Plant Removal, (D) Dune and Beach Plantings, (BP) Breakwater Plantings, (RR) Rock Reef Habitat, (BWM) Breakwater Modification

The objective of the incremental cost analysis is to assist in determining whether the additional output provided by each successive plan is worth the additional cost. The alternative plan(s) that qualified for further consideration were further assessed in order to identify whether the benefits are worth the Federal investment. The effects include a measure of how well the plan(s) achieve the planning objectives, benefits and costs. The supportive facts include the reality of the ecosystem outputs; significance of the ecosystem outputs; completeness, acceptability, effectiveness and efficiency of the potential plan, and any associated risks or uncertainties that may affect or result from the potential plan.

The plan that reasonably maximizes net National Ecosystem Restoration benefits and is consistent with the Federal objective, authorities and policies, is identified as the NER/Preferred Plan. The NER/Preferred Plan was determined to be Alternative 5. 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.

Alternative 6 was forecasted to provide the largest average annual habitat units when compared to the remaining best buy alternatives and provided a restoration plan addressing all project objectives. However, an incremental cost analysis revealed that Alternative 6 provided only a 7.5% increase in habitat units over Alternative 5 at an incremental cost over 1000% higher. The higher costs of Alternative 6 are due to the inclusion of a breakwater modification restoration measure which alters hydraulic flow patterns at and near the beach. These altered flow patterns result in periodic accumulation of man-made and natural debris and fecal material from waterfowl foraging the debris near the breakwater. This accumulation degrades the ecosystem function and covers natural habitat when present. While Alternative 6 would probably resolve these issues, ecosystem benefits that would be gained from its implementation do not justify the significant increase in costs and therefore is not part of the Great Lakes Fishery and Ecosystem Restoration (GLFER) recommended plan. While a breakwater modification does not provide an increase in ecosystem benefits sufficient to justify its implementation under the GLFER authority, it was shown through a parallel study to have tremendous benefits to water quality with implications to human health. A group of Federal, State and local agencies, including the USEPA, has formed the Jeorse Park Taskforce which has recommended further study and design to be completed to possibly implement the breakwater modification if justified through alternative means including USEPA's Economy Act. Implementation of the breakwater modification will not affect the costs or the benefits gained from the Alternative 5 GLFER plan but will delay the planting of approximately 1 acre of native species in the new breakwater alignment for an estimated 2-4 years. This report provides two suggested layouts for implementation of the recommended restoration measures included within Alternative 5 to account for a future with or without the breakwater modification.

An Environmental Assessment was completed for the proposed habitat restoration at Jeorse Park Beach. The Environmental Assessment has found that there would be no adverse effects, resulting from implementation of the NER/Preferred Plan. A 30-day Public Review period was held from 28 January 2016 to 5 March 2016. Agency and public review comments will be addressed as they are received with pertinent comments incorporated into the document.

All significant aspects of the problems and opportunities as they relate to the Jeorse Park Beach study area's resource problems have been considered. Those aspects include environmental, social, cultural, and economic effects, as well as engineering feasibility. The National Ecosystem Restoration (NER) Plan is Alternative 5, which consists of restoring native plant and fauna communities within Jeorse Park Beach and the nearshore waters of Lake Michigan. The NER plan has a Fully Funded Cost of approximately $2,380,000 (2015 price levels). This plan provides 225.6 net average annual habitat units over 15.8-acres of beach and 25 acres of lake bottom.

JEORSE PARK BEACH
EAST CHICAGO, INDIANA

DETAILED PROJECT REPORT & ENVIRONMENTAL ASSESSMENT

September 2015

TABLE OF CONTENTS

CHAPTER 1 – INTRODUCTION 1
1.1 REPORT STRUCTURE 1
1.2 STUDY AUTHORITY 2
1.3 STUDY PURPOSE 3
1.4 STUDY BACKGROUND 3
1.5 PRIOR AND ONGOING STUDIES & PROJECTS 7
1.5.1 Reports & Studies 7
CHAPTER 2 – STUDY AREA INVENTORY & FORECASTING 9
2.1 HISTORIC CONDITIONS & CONSIDERATIONS 9
2.2 PHYSICAL RESOURCES 12
2.2.1 Geology, Glacial Stratigraphy and Soils 12
2.2.2 Sediment Quality and Transport 13
2.2.3 Water Quality 13
2.2.4 HTRW Investigation 14
2.2.5 Hydraulics and Hydrology 14
2.3 ECOLOGICAL RESOURCES 16
2.3.1 Existing Plant Communities 17
2.3.2 Aquatic Macroinvertebrates 18
2.3.3 Fishes 19
2.3.4 Reptiles & Amphibians 21
2.3.5 Birds 22
2.3.6 Mammals 23
2.3.7 Threatened and Endangered Species 23
2.4 CULTURAL & ARCHITECTURAL ENVIRONMENT 24
2.4.1 Archaeological & Historical Properties 24
2.4.2 Land Use History 25
2.4.3 Social Setting 25
2.4.4 Recreation 25
2.5 HABITAT QUALITY FORECASTING 25
2.6 FUTURE WITHOUT-PROJECT CONDITIONS 28
CHAPTER 3 – PROBLEMS & OPPORTUNITIES 30
3.1 PROBLEMS AND OPPORTUNITIES 30
3.1.1 Study Area Problems 30
3.1.2 Opportunities 32
3.2 GOALS, OBJECTIVES AND CONSTRAINTS 33
3.2.1 Goal 33
3.2.2 Objectives 33
3.3 PLANNING CONSTRAINTS 36
CHAPTER 4 – PLAN FORMULATION & EVALUATION 37
4.1 HABITAT MEASURES 37

4.2 HABITAT MEASURES COST & ASSUMPTIONS 40
4.3 HABITAT MEASURES BENEFITS 41
4.4 ALTERNATIVE PLAN GENERATION 42
4.5 COST EFFECTIVENESS/INCREMENTAL COST ANALYSIS 43
4.5.1 Cost Effectiveness 43
4.5.2 Incremental Cost Analysis 44
4.6 NER PLAN JUSTIFICATION 45
4.6.1 Significance of Ecosystem Outputs 46
4.6.2 Acceptability, Completeness, Effectiveness & Efficiency 51
4.6.3 Risk and Uncertainty 53
4.7 NATIONAL ECOSYSTEM RESTORATION (NER) PLAN RECOMMENDATION 54
CHAPTER 5 – INTEGRATED ENVIRONMENTAL ASSESSMENT 58
5.1 NEED & PURPOSE 58
5.2 ALTERNATIVES CONSIDERED 58
5.3 THE AFFECTED ENVIRONMENT 58
5.4 DIRECT & INDIRECT EFFECTS OF THE PREFERRED PLAN 59
5.4.1 Physical Resources 59
5.4.2 Ecological Resources 60
5.4.3 Cultural Resources 62
5.4.4 17 Points of Environmental Quality 63
5.5 CUMULATIVE EFFECTS 65
5.5.1 Scope of Cumulative Effects Analysis 65
5.5.2 Cumulative Effects on Resources 66
5.6 COMPLIANCE WITH ENVIRONMENTAL STATUTES 67
5.7 DRAFT FINDING OF NO SIGNIFICANT IMPACT (FONSI) 69
CHAPTER 6 – PLAN IMPLEMENTATION 71
6.1 PROJECT AUTHORIZATION 71
6.2 NER PLAN IMPLEMENTATION & SEQUENCING 71
6.3 REAL ESTATE CONSIDERATIONS 72
6.4 PERMIT REQUIREMENTS 72
6.5 MONITORING PLAN 72
6.6 OPERATION & MAINTENANCE 74
6.7 IMPLEMENTATION OF ENVIRONMENTAL OPERATING PRINCIPLES 75
6.8 NEPA COMPLIANCE 76
6.8.1 Mitigation Requirements 76
6.8.2 Public/Agency Comments & Views 76
6.9 PROJECT SCHEDULE & COSTS 77
6.9.1 Total Project Costs 77
6.9.2 Financial Capability of Non-Federal Sponsor 78
CHAPTER 7 – RECOMMENDATION 80
CHAPTER 8 – REFERENCES 82

List of Figures

Figure 1: Location of Study Area within the Chicago Region 5
Figure 2: Vicinity Map of the Jeorse Park Beach 6
Figure 3: Historical aerial photograph of the landfill project creating Jeorse Park Beach and the jetty. 11
Figure 4: Existing conditions at Jeorse Park Beach including a new breakwater surrounding the Ameristar Casino 12

Figure 5: Indiana Shoals and the Inland Steel Landfill are identified as two major geologic features which significantly impact wave climate at the Jeorse Park Beach project location. 15
Figure 6: Northward and eastward water velocities measured (red) and model simulated (black) by researchers at Michigan State University. 16
Figure 7: Marram grass growing at Jeorse Park Beach which is helping in the formation of a foredune. 18
Figure 8: Six-line Racerunner utilizing the dune habitat for foraging opportunities. 22
Figure 9: FWOP Average Annual Habitat Type Benefit Prediction for Jeorse Park Beach 29
Figure 10: Cladophora algae mats become trapped near the breakwater structure at Jeorse Park Beach and may eventually be washed on shore during higher energy events. 32
Figure 11: Habitat Suitability Indices over 50-year Period of Analysis (See Table 6 for a description of each restoration measure acronym) 42
Figure 12: Cost Effective Analysis on 20 Alternative Combinations. 44
Figure 13: Incremental Cost and Output of "Best Buy" Alternative Plans. 45
Figure 14: NER/Preferred Plan 57

List of Tables

Table 1: Fish species found within 1 mile of the project location from 2000-2014 20
Table 2: Fish Species within Southern Lake Michigan with the potential to colonize the Jeorse Area ... 20
Table 3: Reptiles and amphibians located within the Grand Calumet River Basin 21
Table 4: Indiana avian endangered and species of special concern within the Grand Calumet River Basin 23
Table 5: FWOP Average Annual Habitat Suitability Index Scores and Habitat Units 29
Table 6: Total and Average Annual Costs per Measure 41
Table 7: Total and Net Average Annual Habitat Units per Measure* 42
Table 8: Summary of CE/ICA "Best Buy" Alternative Plans 44
Table 9: Monitoring Schedule and Costs 74
Table 10: Study & Tentative Project Schedule 77
Table 11: NER Plan Total Costs in 1,000s 78
Table 12: NER Plan Cost Apportionment in $1,000s 78

List of Technical Appendices

Appendix A: Data, Compliance and Coordination
Appendix B: Engineering & Design
Appendix C: Cost Engineering
Appendix D: Hazardous, Toxic and Radioactive Waste (HTRW) and Non-HTRW investigation
Appendix E: Real Estate
Appendix F: Monitoring and Adaptive Management Plan

List of Acronyms

AAHUs	Average Annual Habitat Units
AOC	Area of Concern
BUI	Beneficial Use Impairment
CEICA	Cost Effectiveness and Incremental Cost Analysis
DPR	Detailed Project Report
ECO-PCX	Ecosystem Planning Center of Expertise
EOP	Environmental Operating Principals
FCSA	Feasibility Cost Sharing Agreement
FONSI	Finding of No Significant Impact
FQA	Floristic Quality Assessment
FVCOM	Finite Volume Community Ocean Model
FWOP	Future Without Project Conditions
FWP	Future With Project
GIS	Geographic Information System
GLFER	Great Lakes Fishery and Ecosystem Restoration
HIS	Habitat Suitability Index
HTRW	Hazardous, Toxic, and Radioactive Waste
HU	Habitat Unit
IDEM	Indiana Department of Environmental Management
IDEM	Indiana Department of Environmental Management
IHC	Indiana Harbor and Shipping Canal
INDNR	Indiana Department of Natural Resources
IVE	Initial Value Estimate
LERRDs	Lands, Easements, Rights-Of-Way, Relocations, and Disposal Areas
NEPA	National Environmental Policy Act
NER	National Ecosystem Restoration
NOAA	National Oceanic Atmospheric Administration
NRDC	Natural Resource Defense Council
OMRR&R	Operations, Maintenance, Repair, Replacement and Rehabilitation
PMP	Project Management Plan
PPA	Project Partnership Agreement
R	Native Fish Species Richness
RAP	Remedial Action Plan
REC	Recognized Environmental Condition
SHPO	State Historic Preservation Office
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	United States Geological Survey
WRDA	Water Resources Development Act

CHAPTER 1 – Introduction

1.1 Report Structure

This report presents the results of an ecosystem restoration feasibility study for Jeorse Park Beach located in the City of East Chicago, Lake County, Indiana. This Detailed Project Report (DPR) presents the assessment of ecological conditions and potential plans to restore important migratory bird, fish and wildlife habitat within a highly urbanized environment. This report gathered historic and current site conditions, and forecasts future without and future with project conditions for Jeorse Park Beach. This report also provides a recommended plan for restoring habitat at Jeorse Park Beach.

The report contains the following chapters and appendices:

Chapter 1 – *Introduction*: introduces the project and provides a description of the study area and a summary of relevant studies and projects completed

Chapter 2 – *Study Area Inventory & Forecasting:* contains an inventory or description of the study area which includes an assessment of pertinent historic, current and future without project conditions

Chapter 3 – *Problems & Opportunities:* discusses the problems within the study area, potential opportunities to remedy them, a study goal, restoration objectives and limiting constraints

Chapter 4 – *Plan Formulation and Evaluation:* discusses how plans have been formulated, presents the cost effectiveness and ecological benefits of each alternative, and discusses the evaluation process used to identify the National Ecosystem Restoration (NER) plan and select a recommended plan

Chapter 5 – *Integrated Environmental Assessment:* provides a description of potential impacts, both negative and positive, to cultural, ecological and physical resources within the surrounding environment and their significance.

Chapter 6 – *Plan Implementation*: discusses construction sequencing, monitoring and adaptive management, project costs and cost sharing responsibilities

Chapter 7 – *Recommendation:* provides the District Commander's recommendation for implementation of an ecosystem restoration plan

Appendix A: Data, Compliance and Coordination
Appendix B: Engineering and Design
Appendix C: Cost Engineering
Appendix D: Hazardous, Toxic and Radioactive Waste (HTRW) and Non-HTRW Investigation
Appendix E: Real Estate
Appendix F: Monitoring and Adaptive Management Plan

1.2 Study Authority

GREAT LAKES FISHERY & ECOSYSTEM RESTORATION (SECTION 506 WRDA 2000, as amended)

(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 Study Purpose

The DPR documents whether or not a project is warranted for Federal participation based on a feasibility level assessment of estimated costs, potential benefits, and possible environmental impacts of various alternatives, all of which follow USACE planning and policy guidelines. The main purpose of the DPR is to recommend a plan, including consideration of the No Action Plan, for ecological restoration of various areas within Jeorse Park Beach. By restoring aquatic and buffering habitats and addressing invasive species issues, this project would provide essential habitat for fish, migratory birds, reptiles and amphibians within a highly urbanized area. If an alternative is found to be worth the investment, the next steps include the signing of a Project Partnership Agreement (PPA) and development of a contract set of Plans and Specifications (P&S). The non-Federal sponsor is the City of East Chicago.

1.4 Study Background

The ecological conditions at Jeorse Park Beach have been significantly altered from the natural dune and beach ecosystem that once thrived along the southern rim of Lake Michigan. The landscape was once a vast expanse of vegetated beach and dunal communities merging with low lying wetland complexes but is now replaced with heavily modified shorelines populated with a mix of industrial, commercial and residential areas. As a result, habitat diversity in the nearshore areas of the lake has declined, reducing fish spawning and foraging habitats. Floristic diversity and abundance on and near the beaches has also been diminished due to development which has severely degraded both resident and migrant bird habitat structure and function. Additionally, Jeorse Park Beach has been identified as one of the public beaches most often closed due to *E. coli* levels routinely exceeding EPA regulations (47-67% of 2011-2013 seasons)[1]. The elevated levels of *E. coli* is the sole reason for one of fourteen beneficial use impairments,

[1] IDEM, 2013

beach closures, within the Grand Calumet Area of Concern[2]. The primary reason for this buildup of *E. coli* stems from unnatural geomorphology of the shoreline creating a depositional zone which traps Cladophora mats and bird feces. Additionally, this area becomes inundated with algae and man-made debris leading to a degraded fisheries habitat and promotes the concentration and growth of *E. coli* colonies.

The coastline at Jeorse Park Beach was originally a sandy dunal landscape which consisted of shifting dune and swale habitat abutting against the low lying marsh lands. As land use changed during settlement, swales and marsh lands were filled in and dunes were flattened. The diverse floristic assemblages of the coast began to dwindle and woody species such as jack and white pine which flourished on the established dunal crests were harvested for firewood and lumber. As a result of the degraded conditions the City of East Chicago requested that the Chicago District, US Army Corps of Engineers (USACE) initiate a study under the Section 506 WRDA 2000, Great Lakes Fishery and Ecosystem Restoration (GLFER) authority to investigate the feasibility of restoring both the aquatic and coastal habitats at Jeorse Park Beach to a more natural and healthy state. This report has evaluated the feasibility and environmental effects of restoring geomorphic features and lacustrine and coastal plant communities. The scope of this study addresses the issues of impaired coastal geomorphology, instability of existing dunes, invasive species, lack of natural fisheries habitat, and poor native species richness.

Jeorse Park Beach, owned and operated by the City of East Chicago, is located along the Lake Michigan shoreline just southeast of Indiana Harbor and Shipping Canal in Lake County, IN. The park is bounded to the north by the Ameristar Casino, to the west by Cline Avenue and the Majestic Star Hotel parking lot, to the south by the Majestic Star Casino, and to the east by Lake Michigan (Figures 1 & 2). The project site is adjacent to Amtrak railroad lines with approximately 15.8 acres of beach and foredune habitat on the lakeside. The beach offers nearly 4500 feet of shoreline for potential aquatic habitat improvement over 25 acres of lake bottom. Although the surrounding land use is primarily industrial and commercial, Jeorse Park Beach is commonly visited by birders and fishermen that take advantage of the park's natural resources.

[2] IDEM, 2012

Figure 1: Location of Study Area within the Chicago Region

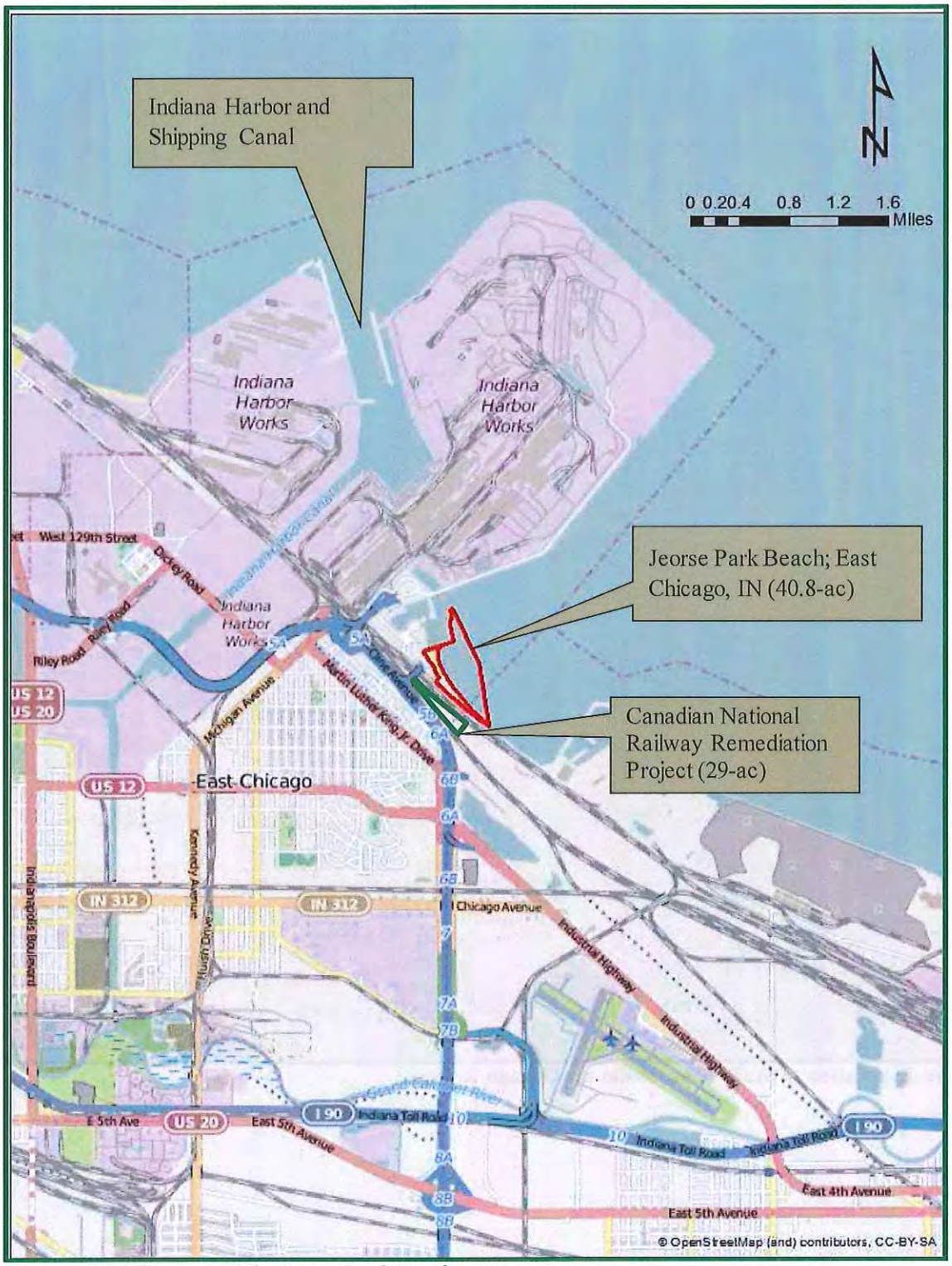


Figure 2: Vicinity Map of the Jeorse Park Beach

1.5 Prior and Ongoing Studies & Projects

This section summarizes the studies, reports and nearby projects that were completed on Jeorse Park Beach prior to the initiation of this study.

1.5.1 Reports & Studies

- Remediation of adjacent property by Canadian National Railway

Restoration efforts were initiated in 2013. This parcel is situated adjacent to the Corps proposed restoration project. Approximately 29 acres will be restored to dune and wetland habitat as part of a mitigation measure for railroad construction. This mitigation project is not associated with the Corps restoration and is physically separated from the project site by intersecting railroad tracks (Figure 2). However, there may be beneficial cumulative effects realized from the increased natural resources available within the region as well as at a local scale when combined with the efforts proposed here at Jeorse Park Beach.

- Stage 2.5 Remedial Action Plan (RAP), Grand Calumet River/Indiana Harbor Ship Canal Area of Concern

The Grand Calumet River AOC Stage 2.5 RAP identifies the Jeorse Park Beach as an area prone to excessive *E. coli* concentrations over state maximum safety standards. This in turn results in a high number of beach closures which is a beneficial use impairment (BUI) within the RAP. Project measures included within the scope of this report intended to improve fisheries habitat will incidentally help to alleviate *E. coli* build up as well.

- City of East Chicago Redevelopment Commission's Waterfront Revitalization Initiative

The City of East Chicago is developing plans for the Jeorse Park area that would revitalize the community with the intent of boosting economic growth and development. Revitalization would include the surrounding inland commercial and public lands as well as shoreline property at Jeorse Park Beach. A coordination meeting was held with the consulting firms, SEH (Short, Elliott, Hendrickson Inc.) and K. Brown and Associates Consulting, LTD, working with the City on this project to ensure that the needs of the public can be met while still providing valuable habitat to the Great Lakes region.

- Modeling the Relative Influence of Indiana Harbor on Recreational Water Quality and Remediation Scenarios at Jeorse Park Beach.

Michigan State University and the Great Lakes Science Center (United States Geological Survey) have developed several models to help understand water quality reactions to several remediation techniques including beach nourishment, modifications to existing structures or construction of new structures. USACE is cooperating with these agencies closely to ensure that this model is available to assess impacts of alternative plans presented within this DPR.

- An Investigation of *E. coli* Sources in Beach Water at Jeorse Park

The United States Geologic Survey (USGS) Lake Michigan Ecological Research Station was asked by the Indiana Department of Environmental Management (IDEM) to assess the source of *E. coli* contamination at Jeorse Park Beach. The study found *E. coli* exceedance rates at approximately 71% through the

summer of 2010. *E. coli* densities were tracked against water chemistry, sanitary surveys of the beach and checked for known genetic markers for gulls and humans. Results of the study suggest that the majority of contamination is derived from gulls and geese with humans and cormorants as incidental contributors. The report also contributes high concentrations of *E. coli* to collection of Cladophora algae and unnatural shoreline morphology resulting in a depositional zone.

- Economy Act project to design and implement a breakwater structural modification to improve water quality and human health at Jeorse Park Beach

Per the recommendation from the Jeorse Park Taskforce to move forward with a breakwater modification project, the USEPA has reached out to the Chicago District Corps of Engineers through the Economy Act to design a project that would reduce beach closures at Jeorse Park due to high bacterial concentrations. The high concentrations of bacteria have been attributed to a combination of altered hydraulic flows near the beach, collection of man-made and natural debris, and fecal input from nuisance waterfowl foraging through the collected debris. The Chicago District has attended Jeorse Park Taskforce meetings and worked closely with the taskforce throughout the GLFER feasibility study to ensure that implantation of either project does not negatively affect the costs, ecosystem benefits or constructability of one another. The Economy Act project is currently being investigated in further detail through additional numerical modeling at Michigan State University. The modeling should be completed by fall 2016 and will guide the design of the project and ultimately the final decision to move forward or not with implementation. Should the decision to move forward be made, final design of the project would be completed in 2017 with award of a contract for construction in late 2017 or early 2018.

CHAPTER 2 – STUDY AREA INVENTORY & FORECASTING

This step of the planning process is to develop an inventory and forecast of critical resources (physical, demographic, economic, social etc.) relevant to the problems and opportunities under consideration in the study area. This information is used to define and characterize the problems and opportunities. A quantitative and qualitative description of these resources is made, for both current and future conditions, and is used to define existing and future without-project conditions. Existing conditions are those at the time the study is conducted. The forecast of the future without-project condition reflects the conditions expected during the period of analysis. The future without-project condition provides the basis from which alternative plans are formulated and impacts are assessed. Since impact assessment is the basis for plan evaluation, comparison and selection, clear definition and full documentation of the without-project condition are essential. Gathering information about historic and existing conditions requires an inventory. Gathering information about potential future conditions requires forecasts, which should be made for selected years over the period of analysis to indicate how changes in economic and other conditions are likely to have an impact on problems and opportunities. Information gathering and forecasts will most likely continue throughout the study process. As such, Chapter 2 contains the following:

- An inventory of relevant historic conditions;
- An inventory of relevant current conditions and the studies that have been completed to identify those conditions; and
- A forecast of future without-project conditions.

2.1 Historic Conditions & Considerations

The present hydrology of the Lake Michigan coastal area in Indiana is significantly changed from what existed before development. The industrialization and urbanization which began in northwest Indiana during the late nineteenth century extensively altered the natural landscape and drainage patterns.

Between the Calumet Beach Ridge (a narrow area just south of the west arm of the Little Calumet River) and the Lake Michigan sand hills formed over years by fluctuating lake levels, a vast wetland existed. Wetlands dotted other areas of the sand hills and further inland; however, none were as continuous as the wetland north of the Calumet Beach Ridge. From Michigan City west through the Indiana Dunes National Lakeshore laid the Great Marsh, which averaged half a mile in width. The Great Marsh was centered on Dunes Creek, which flowed through a channel into Lake Michigan between the dunes. To the west of the Great Marsh, the wetland narrowed to approximately one-quarter mile. Further west, the wetland broadened again to encompass the lower meanders of the Little Calumet River. The enormous wetland complex evolved as back waters of Dunes Creek and Calumet Rivers and as lagoons that were left standing after Lake Michigan finally retreated to its present lake level.

The coastline at Jeorse Park Beach was originally a sandy dunal landscape which consisted of shifting dune and swale habitat abutting against the low lying marsh lands described above. The sandy beaches were interspersed with a spectrum of native vegetation which transitioned from pioneer species close to the shoreline to a more diverse and established community on the dunes and low lying swales further inland. Conditions at the project location may have been similar to those experienced at the Indiana Dunes National Lakeshore (IDNL) approximately 17 miles east of the project site. The biological diversity at IDNL is amongst the highest per unit area of all national parks with over 1,100 flowering

plant species covering a wide variety of habitat types[3]. As land use changed during settlement, swales and marsh lands were filled in and dunes were flattened out to create buildable and arable land. The diverse floristic assemblages of the coast began to dwindle and woody species such as jack and white pine which flourished on the established dunal crests were harvested for firewood and lumber.

The morphology and flow regimes of the Calumet Rivers began to evolve around 1800 as Native Americans began utilizing the marshes between Wolf Lake and Lake Calumet as a portage corridor until a permanent channel was opened to Lake Michigan. The southern river, flowing west across the Calumet region and discharging into the Lake from Illinois became the Little Calumet River. The northern river, flowing east and discharging into the Lake in Indiana became the Grand Calumet River. The mouth of the river in Illinois was cleared in 1870 for the development of Calumet Harbor. By 1872 the mouth of the river in Indiana was so clogged with aquatic vegetation and sand that it no longer could empty into the Lake. A map made by the US Topographic Bureau in 1845 showed that the Grand Calumet River no longer flowed into Lake Michigan in Indiana. Instead, the current had been reversed and its waters flowed with the Little Calumet River in Illinois[4]. This was the first of many changes that would alter the environmental conditions of the nearshore waters at present day Jeorse Park Beach.

The present outlet for the Grand Calumet River in Indiana was created in the early 1900s when the Indiana Harbor and Ship Canal (IHC) was constructed. At this time, the shoreline to the east of the IHC was losing further wetland and dune and swale habitats which were replaced by mainly industrial and commercial land use. Additionally, the growing popularity of the IHC as an industrial waypoint increased the need for more robust breakwaters and land space and land filling activities continued to extend the shoreline lakeward along the breakwaters protecting the IHC. This landfill now extends over 2.5 miles into Lake Michigan and severely impacts the original nearshore current patterns. As the infrastructure developed even further in the 1950s with the construction of Interstate 90, residential communities began to flourish as well. Increased residential properties lead to the need for additional recreational facilities such as parks and marinas. The Jeorse Park Beach and East Chicago Marina were created during this time (1951-58) which allowed greater access to Lake Michigan for the public. The original park was created through a landfill project which created a small protected harbor for the marina and included a small sand beach placed on the east portion of the park and held in place by a simple breakwater (Figure 3). As the coastline became more fixed in its position it also lost the natural variety found in the submerged fisheries habitat. Lake bottom was dredged to make room for navigational channels which may have altered what natural rock reef structures may have existed. Additionally, the shifting sandy beaches of the coastline were replaced with seawalls, large armor stone breakwaters or rip rap.

[3] NPS, 2015
[4] INDNR-NRC, 2014

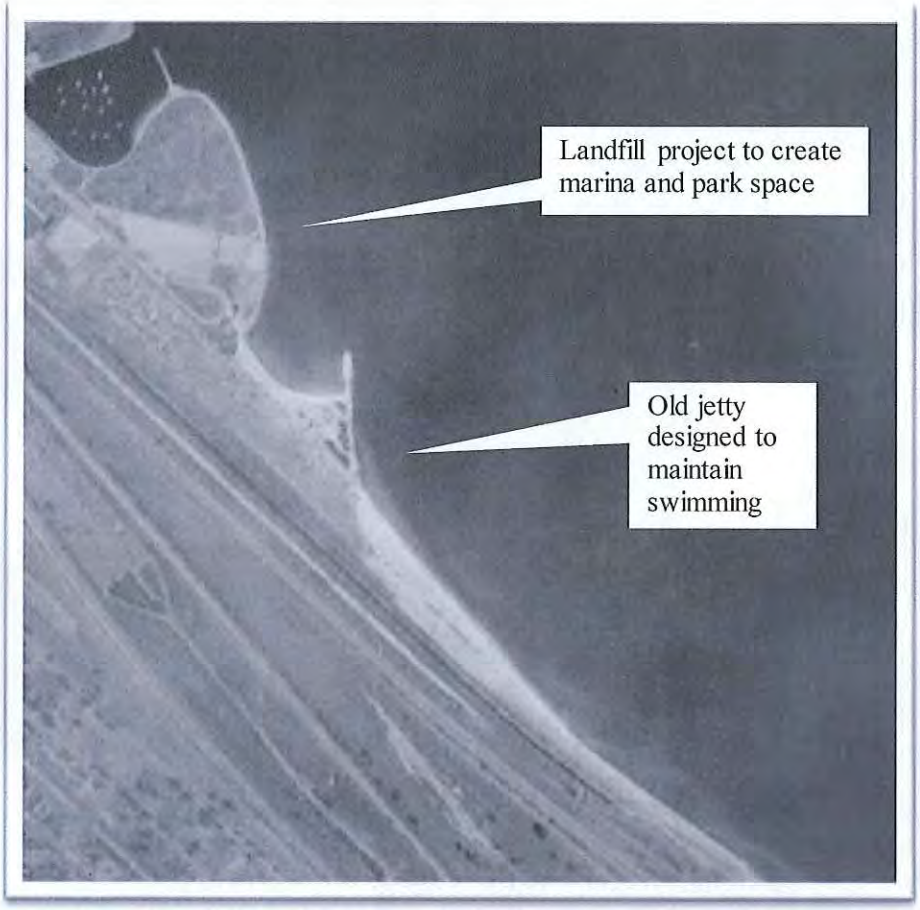


Figure 3: Historical aerial photograph of the landfill project creating Jeorse Park Beach and the jetty.

Further economic developments in East Chicago eventually lead to a deal to lease Jeorse parkland over to the Ameristar Casino. The casino was planned to accommodate hotel guests with onshore facilities while the gambling quarters would be located within a large vessel permanently docked within the lake. The new casino essentially replaced the majority of Jeorse Park and its beach. The construction of the gambling facilities throughout the 1990s completely altered the morphology of the shoreline and available natural area within remaining portions of the park. The new shapes of the park and beach have undergone minimal changes from its creation to the existing resource on site (Figure 4).

Figure 4: Existing conditions at Jeorse Park Beach including a new breakwater surrounding the Ameristar Casino.

2.2 Physical Resources

2.2.1 Geology, Glacial Stratigraphy and Soils

Bedrock Geology

Like the majority of the Chicago regional bedrock system, Silurian dolomite underlies the overburden soils at Jeorse Park. This dolomite ages from the Niagaran Series and is commonly referred to as Wabash formation in Indiana, whereas this same formation is known as Racine Dolomite in Illinois. The bedrock

in the area is primarily composed of dolomite, limestone, and shale. Bedrock in the area is estimated to be about 100 to 150 feet below existing ground surface. The surface of the bedrock does not follow the surficial topography, as it gently slopes downward toward the east.

Glacial Stratigraphy and Overburden Geology

The overburden soils present in the Chicago region were deposited by various glacial movements. Indiana specifically has overburden soils that can be traced to the pre-Illinoisan, Illinoisan, and Wisconsin glaciations, with the latter receding about 14,000 years ago which created Lake Michigan. Material deposited over bedrock consists of glacial till from each glaciation, then glacial fluvial outwash. After the glaciers receded, Lake Michigan protruded farther south than present day. During the lake's retreat north, waves and wind deposited sediment, mainly in the form of sands, silts, and gravels. Around 5,000 years ago, present day dunes along the Indiana lakeshore were being created, called the Toleston Beach. The Jeorse Park area has also been subjected to manmade fills along the coastline during the last 200 years. Though no borings exist within the geotechnical database, nearby projects indicated that silt and clay materials underlie the dune sand at varying depths (see Appendix B for project examples).

2.2.2 Sediment Quality and Transport

The sediment of the Lake Michigan shoreline in proximity to the Jeorse Park Beach consists of lake sands with occasional gravel lenses deposited via glacial till. Within the depositional zone created by altered shoreline morphology adjacent to the casino breakwater, large algal mats (primarily *Cladophora spp.*) and human generated debris have been known to collect in substantial quantities. This debris and algae begin to deteriorate and embed within the sediment and substrates degrading fisheries and macroinvertebrate habitat. Additionally, large flocks of gulls and geese become attracted to these debris fields to forage which greatly increases fecal input to this area. Gull and goose feces along with human waste have been identified as the primary drivers to harmful *E. coli* loading at Jeorse Park Beach. The project goals of increasing avian habitat for rest over sites along the migratory flyway are focused toward non-nuisance species which have not been associated with *E. coli* problems at Jeorse Park Beach. High *E. coli* concentrations have been shown to have a negative effect to human health[5]. The surface sands at the existing public beach were deposited as dredged material from the inside of the adjacent casino breakwater during its construction. The sand underwent extensive sampling prior to dredging as well as during dredging to assure the sediment was clean and suitable for public use.

The natural littoral hydraulic processes of southern Lake Michigan have been completely altered from their natural state in the vicinity of Jeorse Park Beach. Sand is now transported and trapped at much different points due to the numerous structures along the whole southern basin of Lake Michigan. At the project site specifically, natural wave action and current dynamics have been altered by the construction of the Inland Steel peninsula to the northwest and the Buffington Harbor breakwater to the southeast. The Ameristar Casino breakwater was installed in the mid 1990's in the northwest corner of this beach cell and further altered the local hydraulic regime. This casino breakwater is the primary driver of a depositional zone adjacent to its southern edge (Figure 4) which promotes the collection of drifting algal mats in this localized area.

2.2.3 Water Quality

[5] USEPA, 2009

Indiana's entire portion of the Lake Michigan shoreline was last assessed in 2001 and was found to be fully supporting of aquatic life use and fully supporting of drinking water uses for the 33 designated miles. All 59 miles of the shoreline in Indiana were assessed as impaired for recreational and fishable uses. The Lake Michigan shoreline in Indiana and its tributaries have several 303(d) listed impairments, including *E. coli*, mercury in fish tissue, and PCBs in fish tissue which contribute to the impaired assessment for recreational and fishable uses.

2.2.4 HTRW Investigation

USACE conducted an initial Phase I Environmental Site Assessment (ESA) in accordance with ASTM E-1527-13. According to ER 1165-2-132, non-HTRW environmental issues that do not comply with federal, state, and local regulations should be discussed in the HTRW evaluation along with HTRW issues. The HTRW assessment included in Appendix D was completed using information provided by the local sponsor, review of existing information, historical documents and aerial photographs, database research, and a site visit. No recognized environmental conditions (RECs) or non-HTRW issues were identified in the ESA. A historical map review was conducted which showed that the Jeorse Park was constructed from lakeward expansion of the land for the purposes of forming a park. There is no indication that fill used during lakeward expansion consisted of hazardous or environmentally undesirable materials. A site visit was conducted on 16 September 2014. While some accumulation of rubbish was noted, particularly within crevasses of the breakwater, no major indication of dumping or other RECs were observed. Consistent with the park's history of beach closings due to *E. coli* exceedances, a large presence of waterfowl (primarily seagulls) and several decaying animal carcasses were noted.

2.2.5 Hydraulics and Hydrology

Lake Michigan water levels vary seasonally in response to changes in the amount of precipitation and associated runoff. Seasonal fluctuation in the lake level is typically in the range of 4 feet with the highest lake levels occurring in July and the lowest levels generally experienced in February. Storm surge may affect lake levels at an even finer temporal scale and may result in fluctuations of up to 3 feet in response to short term variation in atmospheric pressure and wind stress[6]. Longer term variation in the lake level over years is mostly attributed to corresponding variation of precipitation and evaporation rates. Long term variation in Lake Michigan has historically been in the magnitude of several feet. All elevations for water levels are referred to the Lake Michigan Low Water Datum (LWD) of 577.5 feet, IGLD 1985[7]. A summary of extreme water levels was undertaken by Thompson Engineering, LTD in the planning and design of the casino breakwater at Jeorse Park Beach. Their study reviewed the recorded water levels at the National Oceanic Atmospheric Administration (NOAA) gauge at the Calumet Harbor for the period of 1903 to 1993. Their results indicated an instantaneous maximum of +6.2 and minimum of -3.6 from the LWD. Monthly mean maximum water levels were recorded at +4.9 and minimum at -1.5 from the LWD. In comparison, the IGLD ordinary high water datum is recorded at elevation 581.5 feet or +4 feet from the LWD. According to the Federal Emergency Management Agency (FEMA), the project boundary is within the regulated floodplain. The project's purpose is to restore degraded habitat structure and function to a more natural state and this is best served by addressing the problems found within the project footprint in the floodplain.

The wave climate at the Jeorse Park Beach is significantly affected by the Inland Steel landfill to the west of the project and the Indiana Shoals located just north of the lake fill. The project location is sheltered

[6] Thompson Engineering, 1994
[7] International Great Lakes Datum (IGLD), 1985

from west to north waves by the lake fill which also changes the dynamics of waves generated from other directions. The shallow water areas surrounding the Indiana Shoals affect the height and directions of the incident waves. Thompson Engineering took these factors into account when designing the breakwater and modeled nearshore wave patterns with a University of Delaware model (REF/DIF 1) which assessed the transformation of waves as they propagate from offshore towards the site. Statistical analysis of the hourly nearshore wave climate were performed over a 38 year hindcast of offshore waves from 1956-1994. The three largest waves generated at the project location occurred from wave directions out of the east-northeast, east and northeast with maximum heights at 17.6 feet, 8.2 feet and 6.6 feet respectively. Wave climate was also described as percent occurrence per direction with 65% of the year to be calm, 28.5% from the three highest wave height directions (N, ENE, NE) and 6.5% from the remaining directions (ESE and SE).

Figure 5: Indiana Shoals and the Inland Steel Landfill are identified as two major geologic features which significantly impact wave climate at the Jeorse Park Beach project location.

Long-shore currents along the southern Lake Michigan coastline near the project location are predominately directed from north to south and west to east but opposite current direction is not uncommon. These long-shore currents are significantly altered within the beach cell of the project site contained between the Inland Steel lake fill and the Buffington Harbor breakwaters. Based on aerial photography of the site before the casino breakwater was installed, the USACE Great Lakes Hydraulics and Hydrology Branch states in a support letter to regulatory permitting that 'observable accretion and sediment movement patterns do not indicate a primary direction of alongshore littoral transport[8]. This coincides with the findings of Michigan State University's hydraulic models of the beach cell. Their model closely matched observed currents within the beach cell within proximity of the existing swimming beach indicating velocities throughout the summer months were sporadic in their direction and rarely exceeding magnitudes of over 0.2 m/s (Figure 5)[9] .

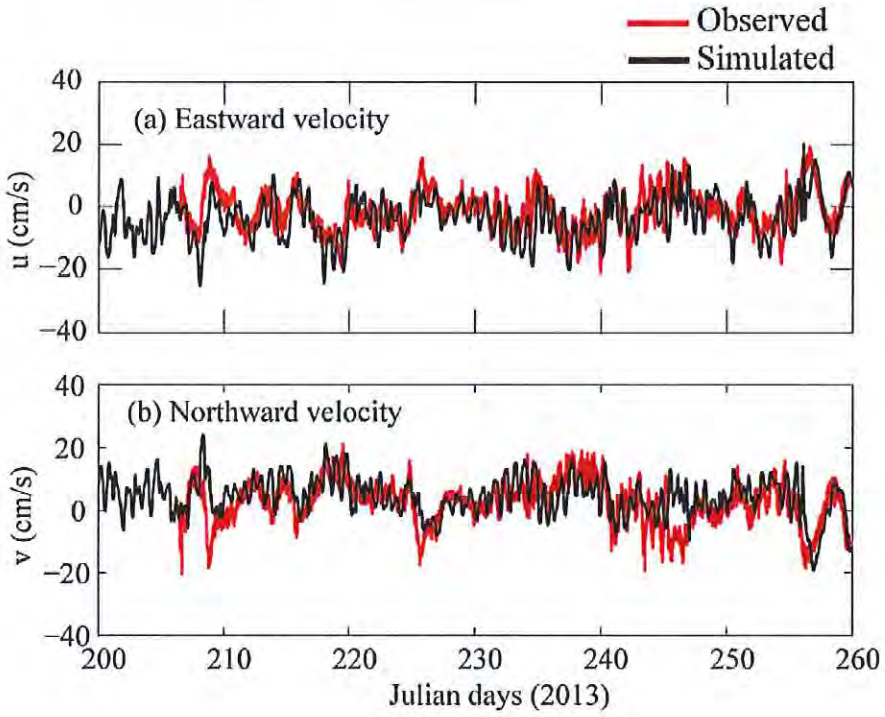


Figure 6: Northward and eastward water velocities measured (red) and model simulated (black) by researchers at Michigan State University.

2.3 Ecological Resources

This section presents the current conditions for those ecological/biological resources that would be affected by this project. All plant inventory sheets and Floristic Quality Assessment results are provided in Appendix A.

[8] USACE, 1994

[9] Phanikumar and Nguyen, 2015

2.3.1 Existing Plant Communities

Lacustrine

Submerged vascular vegetation is nearly absent from the nearshore aquatic habitat along the beach with drifting *Cladophora* spp. mats accumulating in the area and attached *Cladophora* clings to any available hard substrate. Attached living *Cladophora* is not as much of a nuisance as the drifting dead mats and may provide some limited habitat for macroinvertebrate communities and other planktonic organisms. Submerged vascular vegetation is unlikely to be supported within the nearshore area due to the high wave energy that the beach is exposed to throughout the year. Without submerged aquatic vegetation to provide vertical habitat, nearby sunken barges and the adjacent breakwaters serve as the only functional structures for aquatic fauna reproduction, foraging grounds and protected areas. The area is lacking natural formations that fill these functional requirements for the native macroinvertebrates and fishes.

Beach & Dune

Important foredune plant species recorded include Indiana sea rocket (*Cakile edentula*), the dune stabilizing marram grass (*Ammophila breviligulata*), sand reed grass (*Calmovilfa longifolia*), little bluestem (*Schizachyrium scoparium*), as well as gray goldenrod (*Solidago nemoralis*), swtichgrass (*Panicum virgatum*), eastern cottonwood (*Populus deltoides*), giant goldenrod (*Solidago gigantea*), and riverbank grape (*Vitis riparia*). Marram grass and sea rocket are on the state of Indiana "watch list." These pioneering species are the first to colonize a sandy beach and assist in the establishment of dunes by providing a shadow zone on their leeward side. This shadow zone is protected from wind coming off the lake and allows Aeolian sands to settle and build. Over time, this accumulation of sand becomes a foredune and increase the elevation of the vegetated area. As season after season of vegetative growth and decay, organic material begins to form a soil layer allowing for increased floristic diversity. Jeorse Park is fortunate to have foredune development on the beach with a few exceptional plant species but the area is prone to human disturbance and introduction of invasive species which may lead to fragmentation of habitat, degradation of dune structure and loss of biodiversity. Some of the alien and invasive species observed include spotted knapweed (*Centaurea stoebe ssp. micranthos*), autumn olive (*Elaeagnus umbellata*), tree of heaven (*Ailanthus altissima*), mugwort (*Artemisia vulgaris*), sandbar willow (*Salix interior*), great mullein (*Verbascum thapsus*), and common sunflower (*Helianthus annuus*). Figure 7 provides a picture of the existing foredune habitat at Jeorse Park Beach.

Figure 7: Marram grass growing at Jeorse Park Beach which is helping in the formation of a foredune.

2.3.2 Aquatic Macroinvertebrates

Several studies on aquatic macroinvertebrates in Southern Lake Michigan have been completed as well as a few within the Grand Calumet River and Indiana Harbor Canal. Garza and Whitman[10] of the United States Geological Survey investigated macroinvertebrate assemblages of Southern Lake Michigan and observed macroinvertebrates from forty taxa. Approximately 81% of the observed taxa consisted of a species of segmented worm (*Chaetogaster diastrophus)* and a variety of round worms (*Nematoda spp*). Nalepa et al.[11] also conducted surveys throughout southern Lake Michigan that encompassed areas adjacent to the City of Chicago. The study identified three main groups of macroinvertebrates including Amphipods (*Diporeia*), worms (*Oligochaeta*), and bivalves (*Sphaeriidae*). Another study investigating the diet of Lake Whitefish (*Coregonus clupeaformis*) from 1985 to 2000 revealed a shift in the macroinvertebrate prey items with the establishment of the Zebra and Quagga mussels (*Dreissena polymorpha* and *Dreissena burgensis)*. As *Dreissena spp.* filtered the water of Southern Lake Michigan it reduced the food availability to native macroinvertebrates and severely impacted populations of amphipods (*Diporeia spp*), the dominant food source for Lake Whitefish. At the turn of the century, Lake Whitefish along the southeast coast of Lake Michigan had turned to consuming *Chironomidae* as their

[10] Garza and Whitman 2004
[11] Nalepa et al. 1998

primary prey item with *Dreissena polymorpha, Mysis relicta* and *Spaeriidae* supplementing the diet[12]. Yellow perch diets were analyzed under yet another study in southeast Lake Michigan in 1998 and 1999. These fish were found to be consuming primarily *Mysis relicta, Chironomidae, Gammarus spp.* and *Isopoda*[13].

2.3.3 Fishes

Fishes common to the littoral zone of southern Lake Michigan are likely to be found within the Jeorse Park Beach project and include native sport species such as Yellow perch (*Perca flavescens*) and Smallmouth bass (*Micropterus dolomieu*). Lesser known native forage fishes may include Sand Shiner (*Notropis stramineus*), Spottail Shiner (*Notrpis hudsonius*) and Longnose Dace (*Rhinichthys cataractae*) among others. Non-native species such as the Chinook Salmon (*Oncorhynchus tshawytscha*) have been introduced to the area for additional recreational opportunities while other invasive species like the Round goby (*Neogobius melanostomus*) have colonized southern Lake Michigan through range expansion from other Great Lakes. Historical sampling records along 43 miles of Lake Michigan shoreline from Calumet Harbor in Cook County, Illinois to the Indiana Dunes National Lakeshore in Porter County, Indiana were analyzed for species richness. A total of 55 species of fishes were recorded from 36 monitoring trips taken from 1878 to 2005. Over this period, changes in the composition of fish species began to occur as Lake County began development in earnest and populations of urban areas skyrocketed during the 1950s and early 1960s. Fisheries surveys conducted before 1960 (n=12) collected a total of 31 native species and 3 non-native species. As the landscape use began to change, anthropogenic stressors such as the loss/degradation of habitat, pollution and invasive species introductions affected the fish community. Over twice as many surveys conducted post 1960 (n=25) collected a total of only 24 native species and the number of non-native species increased to ten. Table 1 provides a list of species from recent sampling years (2000 – 2014) that have been captured within 1 mile of the project site. The reduced species richness and high percentage of non-native species in Table 1 are indicative of poor habitat resources available to the present Lake Michigan fish assemblage. Table 2 provides a list of 49 species that have potential to utilize nearshore habitat types in the vicinity of the project location. Several species from the 55 that were identified from historic sampling were excluded from Table 2 since the chance of re-colonization to the project area is unlikely.

The Jeorse Park Beach location affords a great opportunity to increase habitat structure and function due to its proximity to the Grand Calumet River increasing connectivity. Nearshore habitat is especially important near tributary mouths as young-of-year fishes leave their natal stream and move into the lacustrine system[14]. Since 1991 the Grand Calumet River has been the focus of restoration projects designed to cap or remove contaminated sediments while improving habitat structure and native species compositions. These extensive restoration efforts have been implemented by local, state and federal agencies. Since 2007, over 1.5 million cubic yards of contaminated sediment has been removed from the river with extensive in-stream restoration completed including riffle construction, native plantings, bank grading and boulder pile with snag enhancements. Fish and other aquatic wildlife use have improved markedly in these areas post-construction. Additional restoration projects are ongoing throughout both the east and west branches which will continue to improve the aquatic resources of the Grand Calumet River.

[12] Pothoven et al. 2001
[13] Pothoven et al. 2000
[14] Höök et al. 2007

Table 1: Fish species found within 1 mile of the project location from 2000-2014

Common Name	*Scientific Name*
Rock Bass	*Ambloplites rupestris*
White Sucker	*Catostomus commersonii*
Common Carp	*Cyprinus carpio**
Gizzard Shad	*Dorosoma cepedianum*
Banded Killifish	*Fundulus diaphanus*
Pumpkinseed	*Lepomis gibbosus*
Bluegill	*Lepomis macrochirus*
Smallmouth Bass	*Micropterus dolomieu*
Largemouth Bass	*Micropterus salmoides*
Round Goby	*Neogobius melanostomus**
Rainbow Trout	*Oncorhynchus mykiss**
Bluntnose Minnow	*Pimephales notatus*
Brown Trout	*Salmo trutta**
Lake Trout	*Salvelinus namaycush*
Walleye	*Sander vitreus*

*non-native species

Table 2: Fish Species within Southern Lake Michigan with the potential to colonize the Jeorse Area

	Common Name	*Scientific Name*		Common Name	*Scientific Name*
1	Lake Sturgeon	*Acipenser fluvescens*	25	Smallmouth Bass	*Micropterus dolomieu*
2	Alewife*	*Alosa pseudoharengus**	26	Largemouth Bass	*Micropterus salmoides*
3	Rock Bass	*Ambloplites rupestris*	27	White Perch*	*Morone americana**
4	Black Bullhead	*Ameiurus melas*	28	Silver Redhorse	*Moxostoma anisurum*
5	Yellow Bullhead	*Ameiurus natalis*	29	Shorthead Redhorse	*Moxostoma macrolepidotum*
6	Freshwater Drum	*Aplodinotus grunniens*	30	Round Goby*	*Neogobius melanostomus**
7	Goldfish*	*Carassius auratus**	31	Golden Shiner	*Notemigonus crysoleucas*
8	Quillback	*Carpiodes cyprinus*	32	Emerald Shiner	*Notropis atherinoides*
9	Longnose Sucker	*Catostomus catostomus*	33	Spottail Shiner	*Notropis hudsonius*
10	White Sucker	*Catostomus commersonii*	34	Sand Shiner	*Notropis stramineus*
11	Lake Herring	*Coregonus artedi*	35	Coho Salmon*	*Oncorhynchus kisutch**
12	Lake Whitefish	*Coregonus clupeaformis*	36	Rainbow Trout*	*Oncorhynchus mykiss**
13	Common Carp*	*Cyprinus carpio**	37	Rainbow Smelt	*Osmerus mordax*
14	Gizzard Shad	*Dorosoma cepedianum*	38	Yellow Perch	*Perca flavescens*
15	Northern Pike	*Esox lucius*	39	Logperch	*Percina caprodes*
16	Banded Killifish	*Fundulus diaphanus*	40	Trout-perch	*Percopsis omiscomaycus*
17	Threespine Stickleback*	*Gasterosteus aculeatus**	41	Bluntnose Minnow	*Pimephales notatus*
18	Chestnut Lamprey	*Ichthyomyzon castaneus*	42	Fathead Minnow	*Pimephales promelas*
19	Channel Catfish	*Ictalurus punctatus*	43	White Crappie	*Pomoxis annularis*
20	Longnose Gar	*Lepisosteus osseus*	44	Black Crappie	*Pomoxis nigromaculatus*
21	Green Sunfish	*Lepomis cyanellus*	45	Ninespine Stickleback	*Pungitius pungitius*
22	Pumpkinseed	*Lepomis gibbosus*	46	Longnose Dace	*Rhinichthys cataractae*
23	Bluegill	*Lepomis macrochirus*	47	Brown Trout*	*Salmo trutta**
24	Burbot	*Lota lota*	48	Lake Trout	*Salvelinus namaycush*
			49	Walleye	*Sander vitreus*

*non-native species

A fisheries survey was conducted by Corps biologists on 14 August 2014 at the Jeorse Park Beach and East Chicago Marina. Electrofishing was conducted both inside and outside the breakwater surrounding the East Chicago Marina. The most abundant species collected was Smallmouth Bass, *Micropterus dolomieu,* which was collected on both sides of the breakwater. Only one other species, Round Goby (*Neogobius melanostomus*) was collected during the standardized 15 minute electrofishing run. Additional sampling took place at specific areas of interest which resulted in the collection of two more species, Pumpkinseed (*Lepomis gibbosus*) and Bluegill (*Lepomis macrochirus*) sunfish. These fishes

were included in the list of species (Table 1) found to be utilizing habitat near the project location. Only 15 species are listed in Table 1 of which 26% (n=4) are non-native to Lake Michigan. Based on the list of 49 species which are present within the vicinity and have potential to utilize habitat at Jeorse Park Beach (Table 2), the area is only supporting 30% of those species. Degraded habitat was observed during the fish sampling which included the large breakwater stones, sand and gravel sediments and submerged aquatic vegetation. The breakwater itself provided some vertical habitat structure but the interstitial space provided within the structure was much larger than natural materials could offer and less abundant as the large angular rock settled into an interlocking position.

2.3.4 Reptiles & Amphibians

A study conducted by Mierzwa et al. at the Grand Calumet River Basin, which terminates just east of the Jeorse Park Beach project area, identified 26 species of reptiles and amphibians[15] (**Table 3**). While all of these species may not be found within the study site, the close proximity to the Grand Calumet River Basin may suggest that some are likely present and could be established after restoration. Two species found are listed as Indiana species of special concern (SC) and two are listed as Indiana state endangered (E). During a site visit by USACE botanists several six-line racerunners (*Cnemidophorus sexilneatus*) were observed utilizing the adjacent load stone running along the railroads (Figure 8). These reptiles were utilizing the dune habitat for foraging opportunities.

Table 3: Reptiles and amphibians located within the Grand Calumet River Basin

Common Name	*Scientific Name*
Cricket frog	*Acris crepitans*
Spring peeper	*Pseudacris crucifer*
Western chorus frog	*Pseudacris triseriata*
Bullfrog	*Rana catesbeiana*
Green frog	*Rana clamitans*
Northern leopard frog	*Rana pipiens*
American toad	*Bufo americanus*
Fowler's toad	*Bufo fowleri*
Musk turtle	*Sternotherus odoratus*
Snapping turtle	*Chelydra serpentina*
Painted turtle	*Chrysemis picta*
Spotted turtle	*Clemmys guttata***
Blanding's turtle	*Emydoidea blandingii***
Eastern newt	*Notophthalmus viridescens*
Blue-spotted salamander	*Ambystoma laterale**
Tiger salamander	*Ambystoma tigrinuin*
Western slender glass lizard	*Ophisaurus a. attenuatus*
Six-line Racerunner	*Cnemidophorus sexlineatus*
Eastern hognose snake	*Heterodon platirhinos*
Milk snake	*Lampropeltis triangulum*
Northern water snake	*Nerodia sipedon*
Brown snake	*Storeria dekayi*
Western ribbon snake	*Thamnophis proximus**
Plains Garter Snake	*Thamnophis radix*
Common Garter Snake	*Thamnophis sirtalis*

[15] Mierzwa et al. 1999

Figure 8: Six-line Racerunner utilizing the dune habitat for foraging opportunities.

2.3.5 Birds

The study site offers refugia habitat for a variety of resident and migratory birds. The important lacustrine, dunal, and surrounding wetland habitat allow for great foraging, nesting, and stop-over habitat. It is also very important to note that the study area and the Grand Calumet River are within the Great Lakes portion of the Mississippi Flyway, a globally significant migration route for hundreds of bird species and in particular, migratory song birds. A study conducted by Brock (1999) within the adjacent Grand Calumet River Basin Identified a minimum of 163 species that utilize the area. Out of the 163 species of birds that are known to utilize the basin of the study area, 9 are listed as Indiana state endangered species and 2 species of special concern that are found within Lake County Indiana (**Table 4**). Therefore, the restoration could increase important habitat for a myriad of bird species and may help state listed species in the long-term.

Table 4: Indiana avian endangered and species of special concern within the Grand Calumet River Basin

Common Name	*Scientific Name*	Status
Henslow's Sparrow	*Ammodramus henslowii*	SE
Great Egret	*Ardea alba*	SC
American Bittern	*Botaurus lentiginosus*	SE
Red-shouldered Hawk	*Bueo lineatus*	SC
Marsh Wren	*Cistothorus palustris*	SE
Sedge Wren	*Cistothorus platensis*	SE
Least Bittern	*Ixobrychus exilis*	SE
Loggerhead Shrike	*Lanius ludovicianus*	SE
Black-crowned Night Heron	*Nycticorax nycticorax*	SE
King Rail	*Rallus elegans*	SE
Virginia Rail	*Rallus limicola*	SE

2.3.6 Mammals

Common mammals that are adaptive to urban landscapes may occur within the project boundaries. These species include raccoon (*Procyon lotor*), thirteen-lined ground squirrel (*Spermophilus tridecemlineatus*), cottontail rabbit (*Sylvilagus flordianus*), gray squirrel (*Sciurus carolinensis*), fox squirrel (*Sciurus niger*), and opossum (*Didelphis virginiana*). With close proximity to Lake Michigan, muskrat (*Ondatra zibethicus*) and the North American beaver (*Castor canadensis*) are also possible within the study area.

2.3.7 Threatened and Endangered Species

Federally-listed Threatened, Endangered, Proposed and Candidate Species were reviewed for the project area by the Chicago District (http://www.fws.gov/midwest/endangered/section7/index.html). The following federally listed species, status and their critical habitats are identified by the USFWS as occurring within Lake County:

- Indiana bat (*Myotis sodalis*) – Endangered – Hibernation occurs in caves and mines, with swarming in surrounding wooded areas. Summer roosting and foraging habitat occurs in wooded stream corridors and in bottomland and upland forests and woods.
- Northern long-eared bat (*Myotis septentrionalis*) – Threatened – Hibernates in caves and mines, with swarming in surrounded wooded areas in autumn. Roosts and forages in upland forests and woods.
- Karner blue butterfly (*Lycaeides Melissa samuelis*) – Endangered – Pine barrens and oak savannas on sandy soils and containing wild lupines (*Lupinus perennis*), the only known food plant of larvae.
- Pitcher's (Dune) thistle (*Cirsium pitcheri*) – Threatened – Lakeshores; stabilized dunes and blowout areas
- Mead's milkweed (*Asclepias meadii*) – Threatened – Late successional tallgrass prairie, tallgrass prairie converted to hay meadow, and glades or barrens with thin soil

Based on the information listed above and site assessments, federally endangered and threatened species or their critical habitats do not occur within the study area. The study team has coordinated with the U.S. Fish & Wildlife Service and expects concurrence with USACE's determination of "no effects".

The Indiana Natural Heritage Database has indicated twenty one state listed vascular plants and at least two federally listed species to be in the vicinity (.5 miles) of the project location. Although project features could help support the establishment of these species on site, they currently do not exist within the proposed project boundaries. These species and their designation are listed here:

➢ Lake Sturgeon (*Acipenser fulvescens*)	Federally and State Endangered
➢ Dune Thistle (*Cirsium pitcheri*)	Federally and State Threatened
➢ Bluehearts (*Buchnera americana*)	State Endangered
➢ Variegated Horsetail (*Equisetum variegatum*)	State Endangered
➢ Beach peavine (*Lathyrus maritimus*)	State Endangered
➢ Clustered Broomgrape (*Orobanche fasciculata*)	State Endangered
➢ Northeastern Bladderwort (*Utricularia resupinata*)	State Endangered
➢ Crawe Sedge (*Carex crawei*)	State Threatened
➢ Capitate Spike-rush (*Eleocharis geniculata*)	State Threatened
➢ Calamint (*Satureja glabella var. angustifolia*)	State Threatened
➢ Leafy Northern Green Orchis (*Platanthera hyperborea*)	State Threatened
➢ Silverweed (*Potentilla anserina*)	State Threatened
➢ Heartleaf Willow (*Salix cordata*)	State Threatened
➢ Sticky Goldenrod (*Solidago simplex*)	State Threatened
➢ Lesser Bladderwort (*Utricularia minor*)	State Threatened
➢ Michaux's Stitchwort (*Arenaria sticta*)	State Rare
➢ Golden-fruited Sedge (*Carex aurea*)	State Rare
➢ Small Yellow Lady's-slipper (*Cypripedium calceolus*)	State Rare
➢ Ground Juniper (*Juniperus communis*)	State Rare
➢ Beach Sumac (*Rhus aromatica*)	State Rare
➢ Prairie Goldenrod (*Solidago ptarmicoides*)	State Rare
➢ False Asphodel (*Tofieldia glutinosa*)	State Rare
➢ Small White Lady's-slipper (*Cypridpedium candidum*)	State Watch List

2.4 Cultural & Architectural Environment

2.4.1 Archaeological & Historical Properties

Northwest of the project area is located one of the few East Chicago places listed on the National Register of Historic Places, the Marktown Historic District, a planned workers community added to the National Register of Historic Places in 1975. Southeast of the project area is an area known as the Indiana Harbor Commercial Historic District, an informal district of historic buildings that are eligible for addition to the National Register of Historic Places, but have not been officially added to the national register.

One archaeological site has been identified within the project footprint by the Indiana DNR Historic Preservation and Archaeology department. Although archaeological deposits may be present within the project area, the project includes no construction within undisturbed areas. Any cultural resources within the project area will be avoided.

Native American groups having an historic cultural interest in northwest Indiana have been consulted (NEPA scoping letters dated 28 October 2013). A distribution list is included within Appendix A. In the event that cultural remains are discovered during the project, the Chicago District Archaeologist will be notified immediately and work will cease to allow for consultations with the Indiana DNR Division of Historic Preservation and History to take place.

2.4.2 Land Use History

The East Chicago area was settled (primarily by New Englanders) in the early 1850s. Between 1851 and 1855 a railroad (originally Michigan Southern & Northern Indiana RR) was built that connected the East Chicago area to Chicago. East Chicago was incorporated in 1893. As a major railroad terminus with connections to both Lake Michigan and the Calumet River, by 1900 East Chicago was considered the industrial gateway to Chicago.

East Chicago boomed as an industrial center supporting multiple steel mills, chemical factories, and petroleum refineries. During World War I East Chicago earned the name "Arsenal of America", because of the high concentration of war related industry. East Chicago remained an industrial powerhouse until the 1960's when decline set in and the steel mills and factories began to close. By 1990 the population of the city had dropped from approximately 53,000 in 1960 to roughly 30,100 (2010).

2.4.3 Social Setting

The City of East Chicago is located about 15 miles southeast of Chicago, on the Lake Michigan shore near the Illinois-Indiana state line in northern Lake County, Indiana. The City is primarily an industrial community of about 12 square miles and about 30,100 (2010) residents. The surrounding communities include Hammond and Whiting, Indiana, and Chicago, Illinois. Average household income in East Chicago is $30,480 (2010) and average house value is about $70,660 (2010).

In 2010 the county's population was about 493,297. Lake County has an ethnically and racially diverse population. The median home value for the county is $97,500 (2010) and the median household income is $39,727 (2010).

2.4.4 Recreation

East Chicago contains multiple city parks providing soccer and softball fields. Jeorse Park, located on the Lake Michigan shore contains the East Chicago marina with slips for 50 pleasure boats, and also offers a swimming beach as well as picnicking and fishing facilities. The city is also home to both the Ameristar Casino and the Majestic Star Casino. To the east, Whihala Beach County Park (before 1930 known as Whiting Beach) features a fishing pier, public boat launch, food concessions, picnic tables, swimming beach, and jogging trail.

2.5 Habitat Quality Forecasting

The purpose of this study is to identify problems and solutions to address the altered and degraded ecosystem of Jeorse Park Beach and provide connectivity to other scarce habitats. The PDT assessed measures that would improve the quality and increase the quantity of viable habitat within the project area. To determine if a project would be successful in providing increased ecosystem benefits, USACE used ecological indices that appropriately reflected the system of interest. Quality is measured in non-monetary units called Habitat Units that are averaged across the project's life, Average Annual Habitat Units. Habitat Units are a comparative method to 1) quantitatively measure current and FWOP conditions, and 2) quantitatively capture future improvements to habitat resultant of proposed restoration measures.

The level of habitat suitability, which takes into account the structure of the ecosystem, is calculated by developing a Habitat Suitability Index (HSI). The HSI is an algebraic function that uses various habitat structure indicators. Community based indices were employed since the aim is to restore the system as a

whole; whereas species specific indices may preclude habitat requisites for the multitude of other species. One HSI that has been certified by the USACE's Center of Expertise for Ecosystem Restoration, the Floristic Quality Assessment, was used to quantify existing ecological conditions, future without project conditions and future with project conditions for the Jeorse Park Beach terrestrial study area since plants are the secondary driver to ecosystem biodiversity. Plant communities are the most indicative for a project such as this since they provide structure, food, and cover for all fish & wildlife, in most cases directly and in some indirectly.

A second HSI, fish species richness (R), was used to assess the existing submerged aquatic habitat and compare future with and without project benefits. Species richness is an excellent indicator of the quality of habitat available in any given area as trends in species richness reflect the quality and diversity of the available habitat. Available habitat within the project footprint is currently limited to man-made breakwaters and an archaeological site of sunken barges along with a lake bottom substrate composed primarily of sand with occasional gravel lenses. With the exception of the man-made structures there is not vertical habitat structural variability available to fish populations within the near shore area delineated. This area is defined as 25 acres of lake bottom within 250 feet lakeward of the shoreline and the existing breakwater structure. While habitat restoration measures may not cover the entirety of this delineated footprint the predicted benefits from the restoration may affect these 25 acres at a minimum as fish and their prey items utilize the area in and around the newly created natural habitat. It is likely that any natural habitat created within the 500 plus acre beach cell between the Inland Steel landfill to the west and Buffington Harbor to the east will provide some benefits to the area. However, this report will take the conservative approach of only accounting for 25 acres of benefits adjacent to the restoration project. This method of assessment was selected over a single species index to maintain a community based approach to the restoration plan.

Beach and Dune Habitat Assessment

The Floristic Quality Assessment (FQA) is based on the Chicago Region's floristic coefficients of conservatism developed by Swink and Wilhelm[16] and was approved for regional use by the USACE Ecosystem Planning Center of Expertise (ECO-PCX). The FQA will capture the effects of various future scenarios on the quality of the plant community. Regarding the FQA, the determination of "quality" with respect to plant assemblages has been the subject of much discussion and development in Illinois since the mid 1970's and more recently, throughout the U.S. and Canada. Quality, as used in this study, is essentially an assessment of the degree to which native plant species to a region are present within a defined area of land. Vegetation, which can be a mix of native and non-native species, reflects long-term natural area stability and/or complexity and this pattern is the basis for the integration of the concept of floristic quality indicating overall system quality. Plants are exceptional indicators of short and long-term disturbance in terms of changes to the geomorphology, soils and/or hydrology of an area. Out of the approximately 2,500 plant species known to occur in the Chicago Region, around one-third were not present before European colonization. Non-native species did not evolve within the same environmental conditions as native species, although their persistence indicates a certain degree of naturalization to the area. 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 Floristic Quality Assessment.

FQA was designed for use as an all-inclusive method, not just a method to identify high quality sites. This method has been extensively studied and shows great promise as a quick and easily understood method of assessing the quality of plant communities in any situation, either urban or an undisturbed remnant

[16] Swink and Wilhelm, 1979

setting. Baseline floristic quality was surveyed in the spring of 2014, which will serve as a comparison for predictions of changes to the plant community based on alternative future scenarios. Based on the species inventory, the FQA generates two essential metrics: the Mean C (coefficient of conservatism), 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,

Error! Bookmark not defined.

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

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[17] and as such the Mean C value represents the more comparable and accurate metric. 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.

Lacustrine Habitat Assessment

This portion of the assessment uses fish species richness (R), which is the total number of fish species. An assessment was done utilizing the Fishes of the Chicago Region database, which is primarily comprised of fish collection vouchers from multiple sources including the Chicago Field Museum of Natural History and the Illinois Natural History Survey from 1878 - 2005. Thirty six sampling records were queried over forty three miles of southern Lake Michigan shoreline which included all of the Lake County coastline and portions of Cook and Porter Counties to the east and west. Full species lists from those records along with data collected by Corps biologists in 2014 are presented in section 2.3.3 of this report and within Appendix A. It was determined from the collection data that about 49 species have the potential to utilize restored habitat at Jeorse Park Beach upon completion of the project.

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 two methods described above. These predicted benefits are resultant of the measures described in Section 3.1. The following were used for the HSI:

- Beach and Dune Restoration HSI = Mean C
- Lacustrine Restoration = R/4.9

For terrestrial restoration activities at the beach and dunes, each native plant 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. 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 mean C provides a comparable and accurate metric for quantifying changes (beneficial or detrimental) to the existing resources and is utilized as the habitat suitability index for the terrestrial restoration measure of success. The lacustrine restoration activities will utilize fish species richness in calculating the HSI. In order to keep the scale of R comparable to that of mean C, the HSI for lacustrine restoration will take the

[17] Ervin et al., 2006

calculated R and divide it by one tenth of the total number of projected fish species able to use the project area. Since there are 49 species present within the vicinity of the project area capable of utilizing habitat at Jeorse Park Beach, the HSI will be equal to R/4.9.

2.6 Future Without-Project Conditions

Jeorse Park Beach is located in an area once dominated by vast wetland stretches that spread right up to the coast. Beach and dune habitat formed the connection between the low lying wetlands and the open waters of southern Lake Michigan. Embryonic dunes and foredunes were allowed to establish a foothold along the coastline and were stabilized with native pioneer species at first and as the foredunes grew larger more robust species of native plants colonized. The foredunes then established a more permanent position within the landscape and established a floristic community rich with native species. As humans colonized northwest Indiana they began to shape the land to fit the needs of a developing urban and industrial environment. Today, the beach at Jeorse Park is constrained landward by parking lots, structures and railroads which limit the growth and natural succession of the dunal community. The existing foredunes located within the project boundaries are unable to move and grow as would occur in an unrestrained system and are thus subjected to a continuous attack by nuisance pioneer plant species. While many of the species currently established on site are native others are non-native and some have been classified as invasive. These invasive pioneer species are likely to outcompete with comparable natives and displace them from the site if left untreated. The local sponsor of East Chicago currently maintains the beach solely from a recreational standpoint and do not have the expertise or experience to deal with the affected environment. Beach grooming occurs along the lakeward edge of the foredunes and several walking paths have developed from people accessing the groomed beach through the vegetated foredunes. These disturbed areas if left to continual use will provide further areas for invasive species to gain a foothold. While invasive species may continue to out-compete native species at the project site it is unlikely that any one particular species may be extirpated completely from the area. Thusly, the current conditions as shown in Table 5 are indicative of the calculated future without project conditions even though the ratio of native species to non-native species abundance may decrease over time.

Lacustrine habitat at the project has been similarly impacted by human mediated changes to the submerged environment. Near shore stressors specific to the project site have included land filling and breakwater construction both of which have significantly altered hydraulic flow patterns at the shoreline. These distorted flows have caused accumulation of excessive debris near the beach in the form of anthropogenic wastes (plastic, paper, rubber, etc.) and large decaying algal mats. This debris limits the use of existing fisheries habitat used for spawning and foraging. Additionally, habitat structural diversity within the project area is limited to the breakwater structure built there which provides poor interstitial spacing in comparison with natural materials such as gravel, cobble and large woody debris. There are no plans by the local sponsor to increase the quality or quantity of available fisheries habitat. The future without project conditions of fisheries habitat will remain degraded but should not continue to diminish further as they have reached an endpoint in functional value. The local sponsor along with the USEPA, IDEM and many other Federal, State and local stakeholders are currently seeking to improve water quality conditions at Jeorse Park Beach through implementation of a modification to the existing breakwater structure. This effort seeks to change the shape of the breakwater in such a way as to maintain the current beach configuration while increasing circulation along the near shore waters of the swimming beach. This project could improve habitat conditions at the sight by reducing the amount of man-made and natural debris that currently accumulates on the beach and near shore submerged substrates.

Climate change impacts may also affect the Jeorse Park Beach project area through fluctuations to the existing patterns of seasonal temperatures and precipitation. The current floristic composition at the beach is relatively low in species diversity and may be subject to dramatic degradation if climate

conditions change enough to affect one or more of the existing high quality native species. As high quality natives are lost from the site, non-native invasive species will replace them and reduce the overall resource quality to wildlife. The intent of the restoration plan is to improve the floristic diversity of the site to build ecosystem resilience to climate change and other environmental stressors.

Table 5 and **Figure 9** presents the results of the project specific floristic and fisheries inventories and forecast utilizing the Floristic Quality Assessment and the fish species richness as presented in the previous section. **Plate 1** provides the calculation sheet for the FWOP Average Annual HSI and Average Annual Habitat Units (AAHUs). Floristic Quality Assessment sheets and species lists are provided in **Appendix A**. This analysis shows that the current and FWOP conditions for native plant communities, which are the basis for fish and wildlife habitat, are considered ruderal and weedy due to the lack of native conservative plant species indicative of healthy native habitats. While there are several high quality floristic species present on the site, they are greatly outnumbered by a species composition inclusive of non-native, invasive and low quality native plants. Therefore, there is great opportunity for improving the functional value of the beach and dune plant community at Jeorse Park. Similarly, only a fraction of the littoral fish community of southern Lake Michigan appears to be utilizing the nearshore waters surrounding the Jeorse Park Beach. This is likely due to the lack of diverse habitat structure and poor function of existing habitat available for fish foraging and spawning activities.

Table 5: FWOP Average Annual Habitat Suitability Index Scores and Habitat Units

Description	Habitat Types	Acres	ExHSI	AAHSI	HUs	AAHUs
Current Conditions	Beach & Dune	15.8	1.35		20.25	
	Lacustrine	25.0	3.1		77.5	
No Action / FWOP	Beach & Dune	15.8	1.35	1.35		20.25
	Lacustrine	25.0	3.1	3.1		77.5

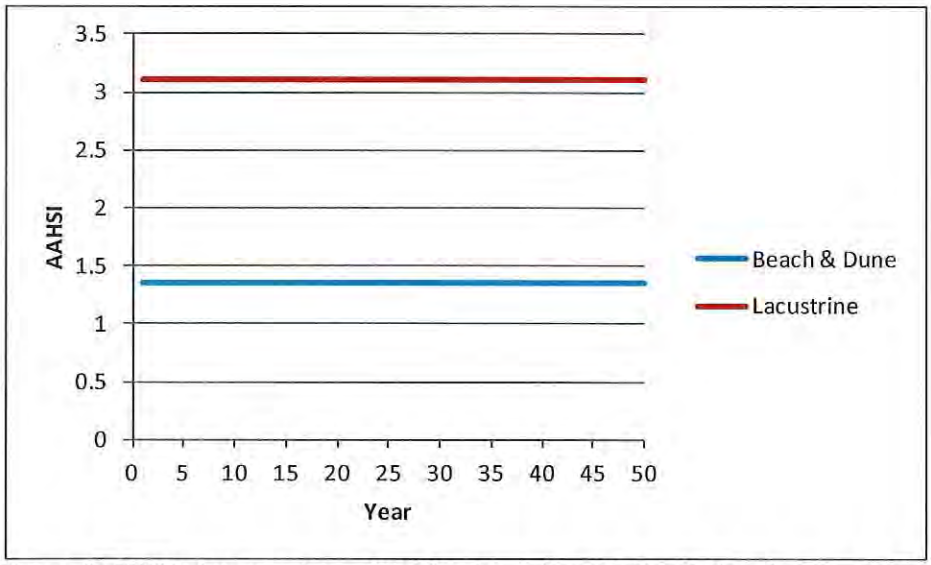


Figure 9: FWOP Average Annual Habitat Type Benefit Prediction for Jeorse Park Beach.

CHAPTER 3 – Problems & Opportunities

This chapter provides a description of identified problems within the study area along with opportunities for improvement. It also outlines the overall project goal along with a list of planning objectives and constraints.

3.1 Problems and Opportunities

The Great Lakes maintain 20% of the world's freshwater and are important for social, economic, and ecological values throughout the region. However, these values can be lost when the integrity of the system begins to decline. The current trend of the Great Lake's ecosystem is that of declination. Anthropogenic modifications to the system have subsequently caused habitat degradation, fragmentation, pollution and invasive species issues, all of which are intertwined. As a result, ecosystem diversity and clean water have become more of a concern. These trending problems can be lessened and ultimately reversed via physical and institutional efforts. The Jeorse Park Beach study provides a look at opportunity to provide restored acres of fish and wildlife habitat and important migratory bird habitat.

3.1.1 Study Area Problems

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, dune, marsh, savanna and prairie into industrial, urban and recreational lands. Most of the habitat destruction and decline has resulted directly from channelization, dredging, damming and loss of bank side vegetation, sedimentation, eutrophication, industrialization and armoring shorelines. At Jeorse Park, cultural modifications such as in-lake structures and built out lands into the lake have altered water circulation patterns near the beach trapping algae and man-made debris, decreased nutrient cycling between nearshore and off shore habitats and decreased water quality all of which negatively impact the aquatic resources. The most significant landfill project expanded the mouth of the Indiana Harbor Canal lakeward approximately 2.5 miles and is mainly used for industrial facilities housing steel mills and chemical manufacturing plants. The significant size of the altered coastal topography and existing development makes it impractical to reverse and difficult to repair in terms of ecological function but getting the ecosystem to a less degraded and more natural condition is quite achievable. The following resource problems could be addressed at the Jeorse Park Beach site:

- Altered hydrodynamics of near shore zone
- Lack of nutrient cycling between nearshore and offshore habitats
- Excessive accumulation of algae and debris
- Lack of high quality fish foraging and spawning habitat
- Degradation of existing fish foraging and spawning habitat
- Degradation of aquatic migratory bird habitat
- Instability of coastal incipient dunes
- Lack of native grass and forb species (food bearing plants)
- Lack of dune and lake interactions

The alteration, fragmentation, and finally loss, of natural habitats are the major causes of the increasingly rapid decline in overall biotic diversity on Earth[18]. To solve such problems one must consider not only the dynamics of the target species or process, but also the changes in the biotic and abiotic surroundings[19].

Urban areas can harbor diverse ecosystems ranging from semi-natural habitats to wastelands, parks and other highly human-influenced biotopes with their associated species assemblages[20]. Although ecological processes in cities are the same as in rural areas, some of them, such as invasion by alien species are more prevalent in urban than in rural conditions[21]. Parks, remnants of natural habitats and other green areas are important for preserving biodiversity in urban areas. Ockinger et al investigated the relative importance of habitat type and connectivity for butterfly species richness in the city of Malmö, Sweden and compared species richness and composition in the urban habitats with that in the surrounding agricultural landscape. This study highlights the importance of the urban landscape composition for species richness in urban habitats, but also demonstrates clearly that urban habitats, especially those characterized by an early-successional stage, can be of relatively high conservation value in regions dominated by intensive human land use[22]. This is particularly the case at Jeorse Park Beach which represents a small pocket of natural beach and foredune habitat in a sea of industrial and commercial zoning. These terrestrial habitat types provide a resting and foraging area for both migratory and resident bird species. It also provides suitable habitat which supports the life cycles for several species of reptiles, amphibians and small mammals. However, these habitats are being degraded by invasive species insurgence, encroaching human development and destructive land use practices resulting in fragmented and degraded habitat.

The hydrodynamic, chemical and biological coastal processes within the nearshore area of Lake Michigan at Jeorse Park Beach have also been drastically altered due to anthropologic modifications. Detrimental landfill projects have been implemented in the surrounding area of Jeorse Park but the most immediate and influential impediment to coastal ecology within the beach cell stems from the adjacent breakwater protection project surrounding the Ameristar Casino. This breakwater structure has created a poorly circulated embayment along its southeastern edge which acts as a sink for human generated debris and other nuisance flotsam such as large mats of detached and decaying Cladophora algae.

Cladophora algal mats are a consistent problem within the Jeorse Park Beach cell throughout mid-summer to early fall. This algae is generally a benthic species which attaches to hard substrates but becomes free floating in the water column as wave energy detaches it or it releases due to poor health or death. Large Cladophora mats become trapped within the stagnant shallow waters in proximity to the breakwater structure as currents push them into the beach but cannot cycle them back out . The algal mats have several detrimental effects to the existing submerged habitat which include reduced interstitial space between hard substrates, decreased dissolved oxygen availability and decreased habitat variability. Cladophora mats have been attributed to increased fish egg predation, avoidance of habitat for spawning and decreased egg survival for many species[23] . Additionally, these dead algal mats have been shown to be carriers of botulism and can transmit that disease to foraging waterfowl which pick through the algae for macroinvertebrates and other food items[24].

[18] Burgess & Sharpe 1981; Harris 1984; Saunders et al. 1987
[19] Angelstam 1992
[20] Niemelä 1999
[21] Niemelä 1999
[22] Ockinger et al 2008
[23] Ecometrix 2014
[24] Chung et al 2013

Figure 10: Cladophora algae mats become trapped near the breakwater structure at Jeorse Park Beach and may eventually be washed on shore during higher energy events.

3.1.2 Opportunities

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 southern Lake Michigan basin. This project can provide a vital piece to the large-scale Great Lakes Restoration by providing a significant quantity of valuable habitat for a multitude of locally rare species, a significant number of sensitive fish species, and migratory and resident bird species.

Humans fragment and alter landscapes to the detriment of fish and wildlife, especially birds. Marzluff & Ewing[25] review the effects of urbanization on birds inhabiting nearby native habitats and suggest how restoration ecologists can minimize these effects. This study suggests that the severity of the effects of fragmentation is determined by (a) the natural disturbance regime, (b) the similarity of the anthropogenic matrix to the natural matrix, and (c) the persistence of the anthropogenic change. As a result, urbanization is likely to produce greater effects of fragmentation than either agriculture or timber harvest. Marzluff &

[25] Marzluff & Ewing (2001)

Ewing emphasize the importance of maintaining, restoring and monitoring species reproduction, survivorship, and dispersal:

> Restoration ecologists, land managers, and urban planners can help maintain native birds in fragmented landscapes by a combination of short- and long-term actions designed to restore ecological function (not just shape and structure) to fragments, including: (1) maintaining native vegetation, deadwood, and other nesting structures in the fragment, (2) managing the landscape surrounding the fragment (matrix), not just the fragment, (3) making the matrix more like the native habitat fragments, (4) increasing the foliage height diversity within fragments, (5) designing buffers that reduce penetration of undesirable agents from the matrix, (6) recognizing that human activity is not compatible with interior conditions, (7) actively managing mammal populations in fragments, (8) discouraging open lawn on public and private property, (9) providing statutory recognition of the value of complexes of small wetlands, (10) integrating urban parks into the native habitat system, (11) anticipating urbanization and seeking creative ways to increase native habitat and manage it collectively, (12) reducing the growing effects of urbanization on once remote natural areas, (13) realizing that fragments may be best suited to conserve only a few species, (14) developing monitoring programs that measure fitness, and (15) developing a new educational paradigm[26].

In addition to benefits to the native coastal ecosystem, this project has the incidental potential to reduce the concentration of harmful *Escherichia coli* (*E. coli*) bacteria at the beach. This bacterium by itself can be a detriment to human health in elevated concentrations but is also used by state and federal regulatory agencies as an indicator species for monitoring other potential contamination issues at recreational water bodies throughout the nation. *E. coli* contamination at Jeorse Park Beach has been found to exceed state minimum safety standards during a high percentage of the summer months. In 2010, the beach was closed due to bacterial contamination 76% of the swimming season[27]. Due to the location of the Jeorse Park Beach within the USEPA's Grand Calumet Area of Concern, the beach closures are responsible for one of fourteen beneficial use impairments (BUI) within the area. This project may incidentally reduce the number of beach closures at Jeorse Park Beach.

3.2 Goals, Objectives and Constraints

3.2.1 Goal

The goal of this study is to determine a cost effective and ecologically beneficial plan, while considering No Action, which would restore self-sustaining native plant communities on shore and improve degraded hydrodynamic and biological processes within the near shore areas of Jeorse Park Beach.

3.2.2 Objectives

Federal Ecosystem Objectives

The Federal objective of water and related land resources planning is to contribute to national economic and/or ecosystem development in accordance with national environmental statutes, applicable executive orders, and other Federal planning requirements and policies. The use of the term "Federal objective" should be distinguished from planning/study objectives, which are more specific in terms of expected or

[26] Marzluff & Ewing 2001
[27] USGS 2014

desired outputs whereas the Federal objective is considered more of a National goal. Water and related land resources project plans shall be formulated to alleviate problems and take advantage of opportunities in ways that contribute to study objectives and to the Federal objective. Contributions to national improvements are increases in the net value of the national output of goods, services and ecosystem integrity. Contributions to the Federal objective include increases in the net value of those goods, services and ecosystems that are or are not marketable.

Restoration of the Nation's environment is achieved when damage to the environment is reversed, lessened, eliminated or avoided and important cultural and natural aspects of our nation's heritage are preserved. The objectives and requirements of applicable laws and executive orders are considered throughout the planning process in order to meet the Federal objective. The following laws and executive orders that specifically provided guidance for this study are not limited to, but include:

- Endangered Species Act of 1973, as amended (16 USC 1531 et seq.)
- Fish and Wildlife Coordination Act, as amended (16 USC 661)
- Migratory Bird Treaty Act of 1918, as amended (16 USC 703 et seq.)
- Responsibilities of Federal Agencies to Protect Migratory Birds (E.O. 13186)
- Clean Water Act of 1977, as amended (33 USC. 1251 et seq.)
- National Environmental Policy Act of 1969 (42 U.S.C. 4321 et seq.)
- Invasive Species (E.O. 13112)
- Nonindigenous Aquatic Nuisance Prevention & Control Act of 1990, as amended (16 U.S.C. 4701 et seq.)
- National Invasive Species Act of 1996 (Public Law 104 – 332)
- Protection of Wetlands (E.O. 11990)
- Protection and Enhancement of Environmental Quality (E.O. 11514)
- Protection and Restoration of the Great Lakes (E.O. 13340)
- Floodplain Management (E.O. 11988)

Responsibilities of Federal Agencies to Protect Migratory Birds (E.O. 13186)

Migratory birds are of great ecological and economic value to this country and to other countries. They contribute to biological diversity and bring tremendous enjoyment to millions of Americans who study, watch, feed, or hunt these birds throughout the United States and other countries. The United States has recognized the critical importance of this shared resource by ratifying international, bilateral conventions for the conservation of migratory birds. Such conventions include the Convention for the Protection of Migratory Birds with Great Britain on behalf of Canada 1916, the Convention for the Protection of Migratory Birds and Game Mammals-Mexico 1936, the Convention for the Protection of Birds and Their Environment- Japan 1972, and the Convention for the Conservation of Migratory Birds and Their Environment-Union of Soviet Socialist Republics 1978.

These migratory bird conventions impose substantive obligations on the United States for the conservation of migratory birds and their habitats, and through the Migratory Bird Treaty Act (Act), the United States has implemented these migratory bird conventions with respect to the United States. This Executive Order directs executive departments and agencies to take certain actions to further implement the Act

> (g) "Federal agency" means an executive department or agency, but does not include independent establishments as defined by 5 U.S.C. 104.
> (h) "Action" means a program, activity, project, official policy (such as a rule or regulation), or formal plan directly carried out by a Federal agency. Each Federal agency will further define what the term "action"

> means with respect to its own authorities and what programs should be included in the agency-specific Memoranda of Understanding required by this order. Actions delegated to or assumed by nonfederal entities, or carried out by nonfederal entities with Federal assistance, are not subject to this order. Such actions, however, continue to be subject to the Migratory Bird Treaty Act.

The Jeorse Park restoration project has great potential to provide critical migratory bird habitat. The project features will help to increase foraging diversity on shore by increasing the native species richness of grass and forb species. The project will also reduce the amount of standing Cladophora mats collecting near the high quality beach habitat which have the potential to transmit botulism to the avian community.

Planning Objectives

As part of the USACE Civil Works mission, the federal objective of ecosystem restoration projects is to restore the structure, function and dynamic processes of degraded ecosystems to a less degraded, more natural condition. The non-Federal sponsor has an ecosystem restoration objective that partners well with the federal objective stated above. Study objectives are statements that describe the desired results of the planning process by solving the problems associated with the study purpose and need. These objectives were used for the development and evaluation of alternative plans. Objectives must be clearly defined and provide information on the effect desired, the subject of the objective (what will be changed by accomplishing the objective), the location where the expected result will occur, the timing of the effect (when would the effect occur) and the duration of the effect.

Three (3) planning objectives were identified by the study team, including the non-Federal sponsor and various stakeholders, which were used in the formulation of alternatives:

Objective 1 – Restore Near shore Hydrodynamic Processes to a more Natural State

Currently, the near shore hydrodynamics within the swash and surf zones at Jeorse Park Beach are impacted by man-made structures. These altered hydrodynamics have reduced circulation of water at the beach and have created a sink for large mats of algae and other human generated refuse. The collection of this debris covers existing habitat, displaces high quality forage food and reduces water quality parameters such as dissolved oxygen that supports spawning requirements for a multitude of native fish, mollusks and other aquatic macroinvertebrate species.

Objective 2 – Increase Floristic Quality and Quantity of Foredune and Beach Habitats

Currently, the beach and dune habitats at Jeorse Park Beach contain a high percentage of non-native and invasive plant species as well as numerous low quality native plant species that may be injurious to a healthy ecosystem. This condition resulted from alteration to the natural hydrologic regime, prevention of natural processes, and the introduction of non-native and native weedy (ruderal) plants. Furthermore, continued disturbance to the area increases the opportunity for the less desirable species to outcompete the high quality natives. Thus, the changes to the native plant community desired are those that will reestablish a base native plant community that will diversify overtime. These affects would be sustained and increased over the life of the project and optimistically in perpetuity. This objective seeks to reestablish native plant community richness and structure to support critical beach and dune habitats.

Objective 3 – Increase the Quality and Quantity of Available Fish Habitat

Structural fisheries habitat within the vicinity of Jeorse Park Beach is available in the form of man-made structures including large armor stone breakwaters and sunken barges. Historical records indicate that this area was once dominated by reef and bedrock shoals which provided a diversified bathymetry in the

near shore zone. These shoals were covered by landfill projects which caused irreparable losses in forage, spawning and nursery habitat for many littoral fish species. Currently, the near shore area consists mainly of sand and gravel lenses spread across a fairly uniform lake bottom. There is some diversity in depth just lakeward of the beach due to a dredging project which has created a hole. However, this hole is gradually filling back in from the surrounding lake-bottom sediments and changes in water depth are quite gradual. Fish habitat is better provided by sharp changes in relief from the lake bottom. This project seeks to recreate a small percentage of what was once a diverse underwater landscape by establishing rock reefs along the lakeshore with naturally available cobble.

3.3 Planning Constraints

The PDT has identified the following planning constraints, in no particular order, for this project:

- Avoid adverse effects to vessel traffic into and out of the East Chicago Marina
- Maintain storm damage protection to the Marina and Casino properties
- Avoid adverse impacts to the railroad rights of way adjacent to the project site
- Avoid adverse impacts to surrounding recreational activities
- Avoid restoration measures which would attract nuisance avian species (i.e. gulls/geese)
- Avoid adverse impacts to Gary International Airport flight patterns through increased or modified migratory bird flyways
- Avoid adverse effects to the potential Beneficial Use Impairment, Beach Closure Reduction Project and work with the Jeorse Park Taskforce to coordinate project objectives and goals
- Avoid adverse impacts to littoral drift sediment transport

CHAPTER 4 – Plan Formulation & Evaluation

The formulation, evaluation, and comparison of alternative plans comprise the third, fourth, and fifth steps of the USACE 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 alternative plans, and then evaluating and comparing those plans to select a final recommended plan, which is feasible for implementation.

Plan formulation for ecosystem restoration presents a challenge because alternatives have non-monetary benefits. To facilitate the plan formulation process, the Study Team used the methodology outlined in USACE Engineering Regulation, ER 1105-2-100, Planning Guidance Notebook. The steps in the methodology are:

1. Identify a primary project purpose. For this study, ecosystem restoration (ER) is identified as the primary purpose.
2. Formulate and screen management measures to achieve planning objectives and avoid planning constraints. Measures are the building blocks of alternative plans.
3. Formulate, evaluate, and compare an array of alternatives to achieve the primary purpose and identify cost effective plans.
4. Perform an incremental cost analysis on the cost effective plans to determine the National Ecosystem Restoration (NER) plan.

4.1 Habitat Measures

Hydraulic Restoration

Perched Beach (PB) – This measure consists of sand fill placement along the casino breakwater at the northwest end of the beach to extend the shoreline lake-ward. In order to maintain the new shoreline configuration without the need for continual nourishments in the future, a rock wall retaining structure will also be constructed along the newly placed sand accompanied by safety signage indicating the drop off. This measure restores a more natural hydraulic flow pattern to the near shore area of Jeorse Park Beach which will eliminate the collection of drifting algal mats and debris that degrade the natural habitat. This measure will also help to reduce the amount of nuisance bird species attracted to the standing debris in the area as well as reduce the concentration of bacterial colonies such as *E. coli*. Additional benefits can be gained from created shoreline for native plantings and dune creation. This measure may be combined with Breakwater Modification (BWM).

- Sand fill placement
- Rock wall retaining structure
- Safety signage to warn of sudden drop off at retaining structure

Sluice Gate (SG) – This measure seeks to install a sluice gate within the casino breakwater to allow for a more natural flow pattern along the near shore area of Jeorse Park Beach. The casino breakwater creates a stagnated pocket of water on its southeastern side that collects large drifting algal mats and debris. This deposited debris in turn creates an attractant for foraging nuisance species such as seagulls and geese while also choking out the natural submerged habitat. The sluice gate installation will allow greater flow through this area which will maintain a clean lake bottom and reduce local nuisance bird attractants. This measure may be combined with BMR.

- Submerged sluice gate installation in casino breakwater

Breakwater Modification (BWM) – This measure seeks to eliminate an unnatural area of deposition created by the breakwater. By altering the shape of the existing breakwater, a more natural flow regime can be restored to the near shore area of Jeorse Park Beach. This more natural flow pattern will reduce the amount of debris collection at the beach including algal mats and human litter. This measure may be combined with either SG or BWM.

- Revised breakwater shape to increase flow in unnatural depositional zone
- Materials to match existing breakwater structure

Screening Hydraulic Measures

The three structural measures listed above, PB, SG and BWM were selected as the most viable options from brainstorming activities with the product delivery team (PDT), the local sponsor and other federal, state and local stakeholders through the Jeorse Park taskforce. These three options had the most likelihood of success from a suite of ideas to restore near shore hydraulics to a less degraded state at Jeorse Park lacustrine habitat. While the primary objective of this measure is to reduce debris collection and algal mat concentrations over fisheries habitat the Jeorse Park Taskforce is also concerned about *E. coli* concentrations and water quality degradation on the swimming beach. Prior to Corps involvement in the project, the Water Reclamation District of East Chicago and the Indiana Department of Natural Resources had provided a grant to Michigan State University (MSU) to assess a suite of scenarios that may reduce *E. coli* concentrations at the beach. The planning of this GLFER project was coordinated with the Jeorse Park Taskforce and MSU researchers to ensure that no restoration measures were selected that would further degrade water quality at the public beach. MSU researchers used a finite volume community ocean model (FVCOM) based on a structured grid at the near shore area of Jeorse Park Beach to assess existing conditions as well as projected post-project conditions for the three measures listed above. The FVCOM takes into consideration both the hydrodynamic processes of the target area and the biological process of the target organism to estimate concentrations of the target organism within the structured grid. While the FVCOM was not used directly to assess the success of each of the GLFER project restoration measures, its results were consulted to screen out measures that did not align with the Jeorse Park Taskforce project goals for water quality.

Results from the model indicated that the sluice gate option did not increase flows enough to adequately address the water quality issues. This option was then eliminated from further consideration. The perched beach option was shown to be effective only if beach sands were extended into the lake for the full length of the breakwater, 540 feet. This option was immediately eliminated due to cost restrictions as preliminary estimates for construction exceeded both GLFER project limits and the local sponsor's budget. The final measure involving modification of the existing breakwater shape provided FVCOM results suggesting increased beach cell flushing would adequately address *E. coli* concentrations at the swimming beach. This option, BWM, was found to have construction costs within the GLFER program allowance and based on a review of the projected flows, provided adequate flushing of the beach cell to prevent the accumulation of debris. This is the only option that was chosen for further investigation of detailed cost effectiveness and incremental cost analysis for ecosystem restoration benefits. While the FVCOM model is not a Planning Center of Expertise (PCX) certified Corps model per EC 1105-2-412, this preliminary assessment was used to help screen out measures that were not consistent with the Jeorse Park Taskforce water quality project. Further analysis using a certified Corps model will be used to assure adequate flows are predicted to eliminate standing debris if the BMR measure passes the CE/ICA cost analysis and screening tool.

Plant Community Restoration

Invasive Plant Species Removal (IPR) – This measure seeks to address 14-acres of invasive and non-native plant species from all plant communities located at the Jeorse Park beach and dune habitats. Invasive, non-native plant species lead to the degradation of suitable habitat and contribute to the overall loss of biodiversity. Non-native and nuisance species commonly occurring within this site include:

Spotted knapweed (*Centaurea stoebe spp. micranthos*), autumn olive (*Elaeagnus umbellata*), tree of heaven (*Ailanthus altissima*), mugwort (*Artemisia vulgaris*), sandbar willow (*Salix interior*), great mullein (*Verbascum thapsus*), and common sunflower (*Helianthus annuus*).

- Selective tree removal over 4" DBH
- Removal of non-native vegetation through herbicide/mechanical removal
- Spot herbicide all invasive aquatic and terrestrial species through the duration of the establishment period

Dune/Beach Restoration (D) – This measure seeks to improve the dune habitat structure and quality of the Jeorse Park beach and dune habitats. This measure is dependent on the IPR measure. Approximately 14-acres of beach habitat would be affected. Seed mixtures and live plugs will be utilized to supplement the existing native plants on site. Newly planted areas are included on the leeward side of existing dunes and along the fringe of the recreational beach. These areas will involve increased densities of live plugs to ensure establishment as well as provide immediate structure for dune and sand stabilization. Woody plantings will also occur along the backside of dunes and along the breakwater to provide further stabilization to the dune while contributing to aeolian sand deposition on the restoration project. These qualities will help support a wide array of neotropical migrant and resident bird communities who depend on the Lake Michigan shoreline for resting and foraging areas. The newly planted areas and protected habitat will also promote the growth of rare beach and dune plants while simultaneously offering a natural buffer to the shoreline of Lake Michigan.

- Supplemental live plugs and shrub plantings near and within existing vegetated dunes
- Plant herbaceous plugs in high density within new dune and beach creation or newly planted areas
- Plant woody species such as shrubs and trees near the breakwater and behind established dunes
- Supplemental sand placement over compacted gravel areas to promote dune growth and native plant establishment
- Minor grading/scrapping of topsoil and debris dumping to access appropriate sand/soil ratios conducive to establishing native dune plantings (all material used on-site)
- Certain native trees onsite will be retained

Breakwater Plantings (BP) - This measure consists of live plantings on the lakeward half of the breakwater surrounding the casino. The breakwater consists of large storm protection stone which have created ample interstitial space that will be filled with clean sand as a planting medium. These areas will then be planted with herbaceous plugs and gallon shrubs from a select group of hardy, native species. These new plantings will primarily increase the floristic quality of the breakwater area to support native song birds and reptiles. Additionally, the dense rooted vegetation will help to secure the planting medium in place within the voids. The plantings will also benefit native fishes at the beach by increasing overhanging vegetation. Overhanging vegetation can provide shaded canopies under the water that may regulate microhabitat temperatures, provide organic input to the near shore area used by macroinvertebrates and increase foraging options for insectivorous fishes as prey items fall to the water.

This measure will also provide an ancillary benefit of reducing perching areas for nuisance bird species at the beach.

- Fill voids within breakwater with a sand mix planting medium
- Planting of herbaceous plugs and gallon shrubs

Fisheries Habitat Restoration

Rock Reef (RR) – This measure seeks to install naturally rounded rock reef structures in four cobble mound pockets. Reefs will be placed approximately 200-300 from lakeward of the breakwater toe, at depths of approximately 16 feet, which should ensure stability and protection from wave energy and will provide habitat for species like Smallmouth Bass (*Micropterus dolomieu*), Rock Bass (*Ambloplites rupestris*) and Silver Redhorse (*Moxostoma anisurum*). This measure will enhance the structure of the submerged lacustrine near shore area and provide spawning, protective and foraging habitat for native species. All submerged stone piles will be placed in areas that do not interfere with boat traffic and should be marked with appropriate warning buoys. The rock reef design will ensure that this restoration feature is physically separated from the existing breakwater.

- Material will consist of naturally rounded cobble stones
- A nominal stone size of 1.2 feet will be used to ensure stability of the structure
- Stone will be placed at a 1:1 slope but minor sloughing will be allowed as material settles

4.2 Habitat Measures Cost & Assumptions

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 estimates, but rather individual restoration measures 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 went through the plan formulation process, and additional design information developed for the recommended plan, a more detailed and reliable cost estimate was performed. Planning level cost estimates were developed using data from current construction contracts and other studies. A 25% contingency was applied to all measures. Planning level unit costs were placed into a matrix to utilize the different costs for each measures of work. Costs include initial value estimate real estate, monitoring, adaptive management and operations and maintenance.

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 2016). 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 this project is 50 years. The present value method was used to discount future costs to the base year. Costs are compounded or converted to present value for the base year then amortized over the 50-year period of analysis to determine the average annual cost. The discount rate was determined by the appropriate Economic Guidance Memorandum Economic Guidance Memorandum 13-01, Federal Interest Rates for Corps of Engineers Projects, which is 3.5%. The individual measures of the project have the construction period spread out over 1 to 5-years. 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 (**Table 6**).

Table 6: Total and Average Annual Costs per Measure

Code	Measure	Measure Cost	IVE LERRD	AA O&M	AA Cost	Dependency
D	Dune & Beach	$ 574,463	$ 14,370	$ 2,500	$ 30,930	IPR
IPR	Invasive Species Plant Removal	$ 22,964	NA	$ -	$ 1,136	
BP	Breakwater Plantings	$ 108,677	NA	$ 500	$ 5,878	IPR
RR	Rock Reef	$ 255,338	$ 12,900	$ -	$ 13,454	
BWM	Breakwater Modification	$ 9,850,495	$ 500	$ -	$ 519,013	

Real Estate: An Informal Value Estimate (IVE) was prepared to provide real estate costs for Feasibility level planning analyses. Water was estimated at $500/acre and land was $1,000/acre.

4.3 Habitat Measures Benefits

The evaluation of habitat benefits is a comparison of the with-project and without-project conditions for each restoration measure per habitat type (**Table 7 & Figure 11**). Environmental outputs are the desired or anticipated products or results of restoration measures and plans. The term "outputs" is often used interchangeably with "benefits" or "habitat units (HUs)". Ecosystem restoration plans 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 have beneficial effects to the Jeorse Park Beach ecosystem. The measures for this study were evaluated using the Mean C of the Chicago Region Floristic Quality Assessment (FQA) methodology and fish species richness based off current and historical survey records for southern Lake Michigan (Section 2.5). **Appendix A** provides the calculation sheet for the FWP Average Annual HSI and Average Annual Habitat Units (AAHUs). Floristic Quality Assessment sheets and species lists are also provided in **Appendix A**.

Multiple restoration measures are available for implementation at each of the habitat types for Jeorse Park Beach. Benefit outputs are generated for each of the restoration measures based on the affected acreage of that measure. The dune and beach habitat includes invasive species removal as an obligatory measure of which dunal plantings and breakwater plantings are dependent on but is also included as a standalone measure. Generally, invasive species removal is always associated with a replacement native planting plan to ensure disturbed areas are not colonized by invasive plants. In the case of Jeorse Park Beach however, invasive removal is limited to selective treatments and no broad scale removal activities are anticipated. This method will leave ample natives to buffer any disturbed areas and to fill the space left by the invasive removals. Lacustrine measures include the hydraulic restoration by breakwater modification and the rock reef placement to enhance fish habitat. While these measures are independent of one another the timing and placement of the rock reef habitat will depend on whether the breakwater modification is implemented. It was assumed that there would be a short term reduction in benefits during the initial stages of construction for in water lacustrine measures as construction activity disturbs existing habitat and disrupts the lake bottom. This reduction in benefits was assumed to be temporary in nature but could take a year or two before a net increase in benefits is realized.

Table 7 lays out the restoration measures, their affective acreage and the benefits measured in habitat units associated with those areas. The no action plan evaluates the existing lacustrine and beach habitats with a measure of the habitat units they afford the park in their current state. Existing condition benefits are categorized in terms of affected acreage per potential restoration measure for ease of comparison between the existing condition and the future without project conditions. Net Average Annual Habitat Units were calculated by taking the difference between FWP AAHUs and equivalent acreage of FWOP

AAHUs. All measures were then input into the IWR-Planning Suite software to establish and evaluate alternative restoration plans for cost effectiveness and incremental cost analysis.

Table 7: Total and Net Average Annual Habitat Units per Measure*

Description	Habitat Type / Restoration Measure	Acres Affected	AAHSI	AAHUs	NAAHUs
No Action / FWOP	Dune & Beach / IPR	15.8	1.35	20.25	
	Dune & Beach / D	14.8	1.35	19.98	
	Dune & Beach & Lacustrine / BP	3	4.45	13.35	
	Lacustrine / RR	25	3.1	77.5	
	Lacustrine / BWM	25	3.1	77.5	
Action / FWP	Dune & Beach / IPR	15.8	2.75	43.45	23.2
	Dune & Beach / D	14.8	4.33	64.084	44.104
	Dune & Beach & Lacustrine / BP	3	13.1	39.3	25.95
	Lacustrine / RR	25	8.39	209.75	132.25
	Lacustrine / BWM	25	3.79	94.75	17.25

See Table 5 for FWOP AAHUs

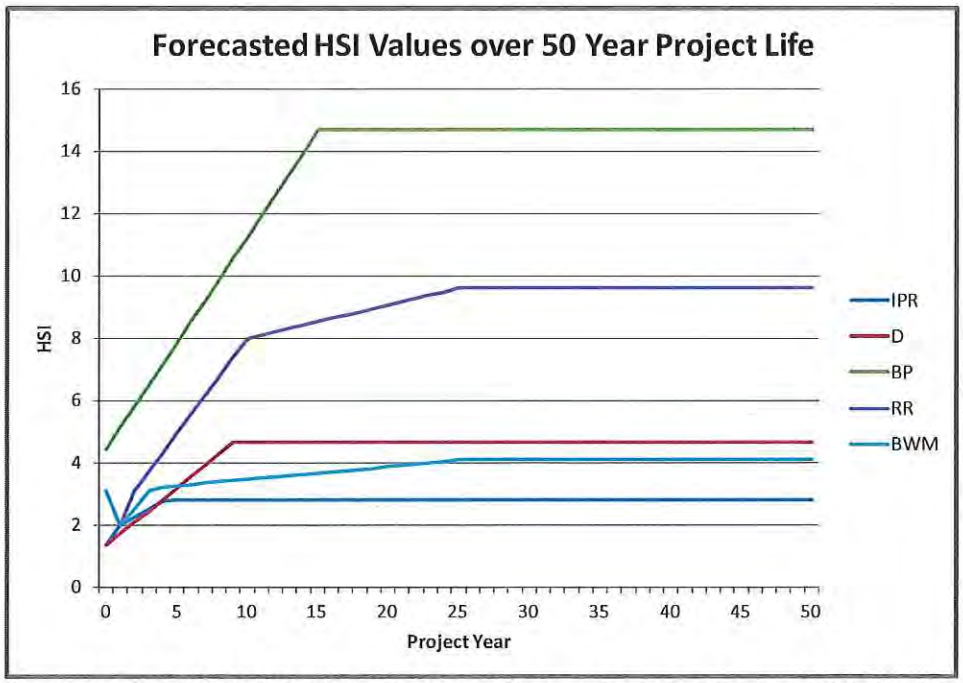


Figure 11: Habitat Suitability Indices over 50-year Period of Analysis (See Table 6 for a description of each restoration measure acronym).

4.4 Alternative Plan Generation

Six (6) measures, including the No Action measure, were input into the IWR-Planning Suite in terms of costs and benefits shown in **Tables 6 and 7**. Dune and Beach (D) and Breakwater Plantings (BP) restoration measures were dependent on first initiating Invasive Plant Removal (IPR). The remaining measures including the IPR measure were considered independent and could be implemented as a standalone project. Based on the cost and benefit inputs and the dependency criteria, the IWR-Planning software generated 20 alternative combinations for ecosystem restoration. These alternative combinations

were analyzed with the IWR Planning Suite Cost Effective & Incremental Cost Analysis, which are presented in the following sections.

4.5 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 alternative'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.

Incremental cost analysis means that the subset of cost effective alternatives are examined sequentially to determine which alternatives are most efficient in the production of environmental benefits. Those most efficient alternatives 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 alternatives, 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 alternative. The results of the incremental analysis must be evaluated along 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 alternative.

4.5.1 Cost Effectiveness

The cost effectiveness analysis was used to ensure that certain alternatives would be screened out if they produced the same amount or less output at a greater cost than other alternatives with a lesser cost. Twenty (20) alternative combinations were analyzed for cost effectiveness. Of these, eight (8) cost effective alternative combinations were identified (**Figure 12**), which is inclusive of the six (6) Best Buy Plans. The No Action plan is always deemed cost effective and a Best Buy. Twelve (12) alternative combinations were screened out as non-cost effective.

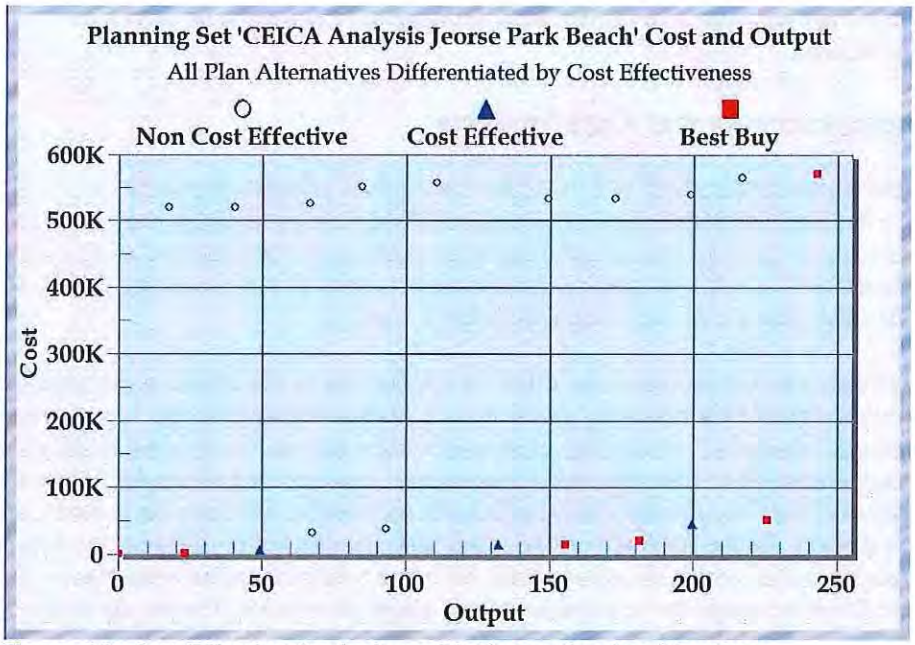


Figure 12: Cost Effective Analysis on 20 Alternative Combinations.

4.5.2 Incremental Cost Analysis

An incremental cost analysis was performed on the six (6) Best Buy Plans identified from the cost effectiveness analysis. The objective of the incremental cost analysis is to assist in determining whether the additional output provided by each successive alternative is worth the additional cost. This incremental cost analysis (**Table 8** and **Figure 13**) compares six alternative combinations for ecological restoration that were considered for selecting as the National Ecosystem Restoration (NER) Plan:

Table 8: Summary of CE/ICA "Best Buy" Alternative Plans

#	Alternative Plan	HU	AA Cost	AA Cost / HU	Inc. Cost	Inc. HU	Inc. Cost / HU
1	No Action Plan	0.0	$0	$0	$0	0.0	$0
2	IPR	23.2	$1,136	$49	$1,136	23.2	$49
3	IPR, RR	155.5	$14,590	$94	$13,454	132.3	$102
4	IPR, BP, RR	181.5	$20,468	$113	$5,878	26.0	$226
5	IPR, D, BP, RR	225.6	$51,398	$228	$30,930	44.1	$701
6	IPR, D, BP, RR, BWM	242.9	$570,411	$2,349	$519,013	17.3	$30,088

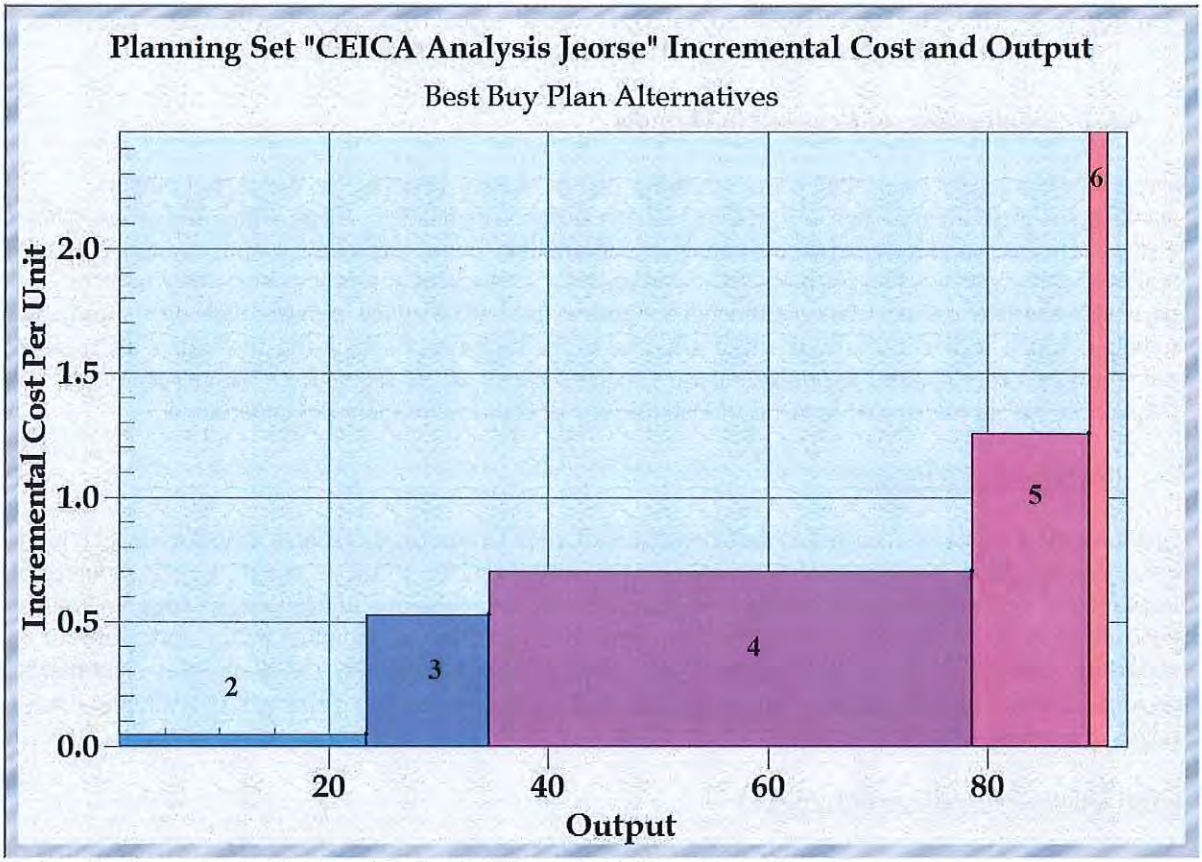


Figure 13: Incremental Cost and Output of "Best Buy" Alternative Plans.

4.6 NER Plan Justification

The alternative plan(s) that qualified for further consideration were assessed in order to identify whether the benefits are worth Federal investment. The effects include a measure of how well the plan(s) achieve the planning objectives, benefits and costs. Previously in the evaluation process, the positive effects of each plan on Jeorse Park's ecosystem were considered individually and compared to the without-project condition. In this step, supportive facts are presented to determine if it is worthwhile to select a plan as the NER Plan for implementation. The supportive facts include the reality of the ecosystem outputs; significance of the ecosystem outputs; completeness, acceptability, effectiveness and efficiency of the potential plan, and any associated risks or uncertainties that may affect or result from the potential plan.

Alternative 1 – No Action Plan

Alternative 2 – (IPR) Invasive Plant Removal

Alternative 3 – (IPR) Invasive Plant Removal, (RR) Rock Reef Habitat

Alternative 4 – (IPR) Invasive Plant Removal, (BP) Breakwater Plantings, (RR) Rock Reef Habitat

Alternative 5 – (IPR) Invasive Plant Removal, (D) Dune and Beach Plantings, (BP) Breakwater Plantings, (RR) Rock Reef Habitat

Alternative 6 – (IPR) Invasive Plant Removal, (D) Dune and Beach Plantings, (BP) Breakwater Plantings, (RR) Rock Reef Habitat, (BWM) Breakwater Modification

4.6.1 Significance of Ecosystem Outputs

Due to the challenges associated with comparing 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 Jeorse Park Beach restoration outputs are herein recognized in terms of institutional, public, and/or technical importance.

Institutional Recognition

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.

Great Lakes Areas of Concern (AOCs)

Great Lakes Areas of Concern (AOCs) are severely degraded geographic areas within the Great Lakes Basin. They are defined by the U.S.-Canada Great Lakes Water Quality Agreement (Annex 1 of the 2012 Protocol) as "geographic areas designated by the Parties where significant impairment of beneficial uses has occurred as a result of human activities at the local level." The U.S. and Canadian governments have identified 43 such areas; 26 in U.S. waters, 17 in Canadian water (five are shared between U.S. and Canada on connecting river systems). The Great Lakes Water Quality Agreement calls for Remedial Action Plans (RAPs) to restore and protect 14 beneficial uses in Areas of Concern. An impaired beneficial use means a change in the chemical, physical or biological integrity of the Great Lakes system sufficient to cause impairment to any of the 14 beneficial uses.

The Jeorse Park Beach restoration project lies within the Grand Calumet AOC. The Grand Calumet AOC has been listed with all 14 beneficial use impairments which are discussed within the Indiana Department of Environmental Management's Remedial Action Plan. The Sec 506, GLFER restoration project alternative plans 3 through 6 would support delisting of the following beneficial use impairments (in bold):

1. Restrictions on fish and wildlife consumption
2. Tainting of fish and wildlife flavor
3. **Degradation of fish and wildlife populations**
4. Fish tumors or other deformities
5. Bird or animal deformities or reproduction problems
6. **Degradation of benthos**
7. Restrictions on dredging activities
8. **Eutrophication or undesirable algae**
9. Restrictions on drinking water consumption, or taste and odor problems

10. **Beach closings**
11. **Degradation of aesthetics**
12. Added costs to agriculture or industry
13. Degradation of phytoplankton and zooplankton populations
14. **Loss of fish and wildlife habitat**

Urban Waters Federal Partnership

This partnership reconnects urban communities, particularly those that are overburdened or economically distressed, with their waterways by improving coordination among 14 federal agencies and collaborating with community-led revitalization efforts to improve our Nation's water systems and promote their economic, environmental and social benefits. Specifically, the Urban Waters Federal Partnership:

- Breaks down federal program barriers to promote more efficient and effective use of federal resources through better coordination and targeting of federal investments.
- Recognizes and build on local efforts and leadership, by engaging and serving community partners.
- Works with local officials and effective community-based organizations to leverage area resources and stimulate local economies to create local jobs.
- Learns from early and visible victories to fuel long-term action.
- This partnership aligns with President Obama's America's Great Outdoors initiative, which calls on agencies to support innovative community efforts to provide safe, healthy and accessible outdoor spaces.

The Jeorse Park Beach project is a perfect example of the Urban Waters program in action. The Jeorse Park Task Force was designed with help from Urban Waters representatives and is a coalition of Federal, State and local stakeholders to coordinate restoration and recreation objectives for the Jeorse Park Beach. Any alternative plan (1-6) that is chosen in cooperation with the Jeorse Park Task Force would be supported by the Urban Waters Federal Partnership program.

Migratory Bird Treaty Act (1918)

The Migratory Bird Treaty Act is the domestic law that implements the United States' commitment to four international conventions for the protection of migratory birds and their habitats. The Act protects species or families of birds that live, reproduce, or migrate within or across international borders at some point during their annual life cycle. The four Migratory Bird Conventions are:

- Convention for the Protection of Migratory Birds with Great Britain on behalf of Canada (1916)
- Convention for the Protection of Migratory Birds and Game Mammals - Mexico (1936)
- Convention for the Protection of Migratory Birds and Their Environment - Japan (1972)
- Convention for the Protection of Migratory Birds and Their Environment - Union of Soviet Socialist Republics (1978)

The Mississippi Flyway

There are 4 principal North American flyways, the Atlantic, Mississippi, Central and Pacific. Except along the coasts, such as Lake Michigan, the flyway boundaries are not always sharply defined. Its eastern boundary runs along western Lake Erie and the western boundary is ambiguous, as the Mississippi Flyway merges unnoticeably into the Central Flyway. The longest migration route in the Western Hemisphere lies in the Mississippi Flyway; from the Arctic coast of Alaska to Patagonia, spring

migration of some shorebird species fly this nearly 3,000 mile route twice. Parts of all four flyways merge together over Panama.

The flyway which includes Jeorse Park Beach is ideal for migratory waterfowl because it is uninterrupted by mountains, dotted with tens of thousands of lakes, wetlands, ponds, streams and rivers, and is well timbered in certain reaches. Chicago and its surrounding suburbs are located in the Lake Michigan portion of the Mississippi Flyway and more than 300 species of birds have been recorded in the Chicagoland area since 1970. The Chicago reach is also one of America's most important migration routes for songbirds, with more than ~5 million individuals passing through during the migration season. Illinois and Indiana farmland consists of corn and soybean fields, which do not provide the type and variety of food and shelter required by nearly all migrating birds. In comparison, Lake Michigan's shoreline provides a variety of plant life and habitat for resting and refueling. Chicago's parks and even residential backyards are particularly important, because of they are the only patches of habitat left within a concrete watershed. The preservation of parkland along water bodies is critical to the survival of millions of birds that migrate through Chicago every spring and fall. The Jeorse Park Beach restoration project has great potential to provide critical migratory bird habitat.

Alternative Plans 3 through 6 are in full support of the Migratory Bird Treaty Act.

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. This project will restore lacustrine, beach, dune, and fish habitat, thus providing forage and shelter for numerous migratory bird species. This project lies within a significant portion of the Mississippi Flyway along the coast of Lake Michigan that particularly favors both ecological and economically valuable waterfowl species. Alternative Plans 3, 4, 5 and 6 fulfill the USACE's role and responsibility by utilizing its Ecosystem Restoration Mission, authority and supporting polices to restore diverse habitats for Migratory Waterfowl and fishes that support these bird species.

EO 13547 Stewardship of the Ocean, Our Coasts, and the Great Lakes – This order establishes a national policy to ensure the protection, maintenance, and restoration of the health of ocean, coastal, and Great Lakes ecosystems and resources, enhance the sustainability of ocean and coastal economies, preserve our maritime heritage, support sustainable uses and access, provide for adaptive management to enhance our understanding of and capacity to respond to climate change and ocean acidification, and coordinate with our national security and foreign policy interests. All alternatives with the exception of the no action plan would restore physical characteristics of Lake Michigan coastal habitats, which is in full support of this EO.

EO 13340 Establishment of Great Lakes Interagency Task Force and Promotion of a Regional Collaboration of National Significance for the Great Lakes - 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. Alternative Plans 3, 4, 5 and 6 would restore physical characteristics of Lake Michigan coastal habitats, which is in full support of this Act. 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**

Fish and Wildlife Conservation Act of 1980 – all Federal departments and agencies to the extent practicable and consistent with the agency's authorities should promote the conservation of non-game fish, wildlife, and their habitats. Alternative Plans 2, 3, 4, 5 and 6 would restore physical characteristics of Lake Michigan coastal habitats, which is in full support of this Act.

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 both the habitat and aesthetic values of Jeorse Park Beach would be achieved via Alternatives 3, 4, 5 or 6. This project has already provided leadership to the Jeorse Park Task Force in developing a restoration plan for the project site that improves the structure and function of ecosystem components at the beach while making significant steps forward in coordination with water quality improvement projects.

EO 13112 Invasive Species – prevent the introduction of invasive species and provide for their control and to minimize associated economic, ecological, and human health impacts. Implementation of Alternative Plans 3 through 6 would remove nonnative and invasive plant species from 15-ac of dune and beach habitat. Alternatives 2 through 6 include rock reef habitat creation that utilize materials to promote native fish establishment by providing protective cover for native eggs and larvae from invasive fish such as the round goby, *Neogobius melanostomus.*

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. Implementation of Alternative Plans 3 through 6 would enhance opportunities for the establishment of 12 state endangered and 7 state listed rare plant species which have been documented within 0.5 miles of the project site within the Indiana Natural Heritage Database. The federally and state threatened Pitcher's thistle (*Cirsium pitcherii*) is also included in this list of plantings which may benefit from the alternative restoration plans.

Clean Water Act – restore the chemical and biological integrity of the Nation's waters. Although water quality improvement is not within the USACE Mission, policy acknowledges that habitat restoration provides incidental water quality improvements most of the time. The Clean Water Act also has provisions for wetland and biological integrity protection. The No Action Alternative does not support this Act by denying opportunity to improve water quality and increase viable wetland acres. Alternative Plans 3 through 6 support the Clean Water Act by providing increased vegetative buffers for surface water runoff to be incidentally made marginally cleaner than the nearby parking facilities.

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.

Jeorse Park Beach Task Force

The Jeorse Park Beach Task Force is a compilation of Federal, State, local and other NGO entities which have banded together in an effort to restore and revitalize the Jeorse Park Beach natural environments and recreational areas. The task force has received public support and includes members that are residents of the project area and actively utilize Jeorse Park Beach. The task force goals include restoration of beach, dune and lacustrine habitats at the park along with the delisting of an Area of Concern beneficial use impairment, beach closings along with incidental improvements to fish and wildlife populations, degradation of benthos and reduced eutrophication or undesirable algae. The task force meets semi-regularly every couple months to share success stories and coordinate project plans. Members of the taskforce include key staff from regulatory agencies directly involved with the planning and delisting of AOC-BUIs. Taskforce members are representative from multiple agencies including:

- US Environmental Protection Agency
- US Army Corps of Engineers
- US Geologic Survey
- US Forest Service
- Indiana Department of Natural Resources
- Indiana Department of Environmental Management
- City of East Chicago
- City of East Chicago Water Reclamation District
- Save the Dunes
- Alliance for the Great Lakes

Stakeholder Support

Partners in support of the Jeorse Park Ecosystem Restoration Project and Alternative Plan 5 presented in this Detailed Project Report includes, but are not limited to: the US Environmental Protection Agency (USEPA), US Fish & Wildlife Service (USFWS), Indiana Department of Environmental Management (IDEM), Indiana Department of Natural Resources (IDNR), the City of East Chicago, the Water Reclamation District of East Chicago, the Great Lakes National Program Office (GLNPO) of USEPA, the US Geological Survey (USGS) and the Northwest Indiana Regional Planning Commission are all critical and involved stakeholders.

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.

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.

Status and Trend measures the relationship between previous, current and future conditions.

Connectivity is the measure of a resource's connection to other significant natural habitats.

Limiting Habitat is the measure of resources present supporting significant species.

Wildlife conservation in urban habitats is increasingly important due to current urbanization trends[28]. Alternative Plans 2 through 6 focuses on restoring diverse habitats within the Jeorse Park Beach, which is representative of a scarce coastal ecosystem resource. Alternative Plans 2, 5 and 6 include rock reef habitat creation using natural cobble and boulder sources. This habitat type has been largely removed or covered in the nearshore areas of Lake Michigan's southern coastline through land filling or shoreline protection projects and can be regarded as scarce. Alternative Plans 3 through 6 address the beach and dune habitat and its vegetated cover types. These plans include the removal of invasive species and the planting of native dunal species to restore connectivity, function and structure. Natural shoreline habitats are extremely *scarce* within the southern rim of Lake Michigan with the closest similarity currently being found in at the Indiana Dunes National Lakeshore. These habitats were known to occur more frequently at one point in history; however, shoreline armoring, landfills and industrialization of land use have displaced the majority of natural shoreline. In terms of connectivity, this project adds to the increasing patches of habitat within northwest Indiana, lessening the distance species have to travel over inhospitable areas of urbanized lands. The coastal zone of Lake Michigan in Illinois is trending towards wide spread improvement and connectivity, indicative of projects such as the Ravine projects along the north shore, 63rd Street Dune and Beach 506, Northerly Island 506, and various smaller parks being restored by local sponsors along the coastline. Restoring viable habitat within and along the Lake Michigan coastal zone would provide a critical habitat for migratory waterfowl and wetland fishes such as Grass Pickerel and Warmouth. The proposed habitat restoration would have great potential to support at least one federally threatened plant species, the Pitchers Thistle (*Cirsium pitcherii*).

4.6.2 Acceptability, Completeness, Effectiveness & Efficiency

Acceptability, completeness, effectiveness, and efficiency are the four evaluation criteria USACE uses in evaluating 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. The tentatively recommended plan must be acceptable to the non-Federal cost-sharing partner. The Jeorse Park Beach 506 study was developed in a collaborative fashion in which planning and design meetings screened and refined habitat restoration measures. The Federal, State and local groups that participated in these activities are discussed in the previous section. Alternative 1, No Action, provides no ecosystem improvements and does not meet the Federal Objective, the non-Federal sponsor's goals and stakeholder

[28] Fernández-Juricic & Jokimäki 2001

desires. Alternative 5 and 6 are the most acceptable in terms of the Federal Objective and non-Federal sponsor/stakeholder vision for reestablishing a sustainable and viable ecosystem within the Jeorse Park Beach study area. Alternatives 1, 2, 3 and 4 provide limited benefits but generally leave critical aquatic habitat types in a degraded state. Alternative 6 was screened out as unacceptable to the Federal government due to excessive costs related to the incremental gain in benefits. Taking the Federal Objective, study objectives, and non-Federal sponsor/stakeholder needs into consideration, Alternative 5 provides the most diverse habitat possible at the most cost effective rate and therefore would be the most acceptable.

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 an adaptive management plan should be proposed and must be accounted for in the implementation plan.

All of the factors were considered in the development or post formulation assessment of alternative plan costs/outputs, consistency with other Federal and non-Federal Plans, real estate, O&M, monitoring and non-Federal sponsorship. Alternative 1 does not provide any action to restore degraded habitats and therefore is incomplete in realization of ecosystem improvements. Alternatives 1, 2, 3 and 4 are incomplete in terms of restoring the entire Jeorse Park Beach system and are inconsistent with State and local plans for reestablishing a healthy coastal zone. Alternatives 5 and 6 are the most complete in that they would change Jeorse Park Beach from degraded park, to a diverse and native habitat system for fish, wildlife and migratory birds. Alternatives 5 would have the least O&M and adaptive management features since the alternatives are complete from ecological systems points of view. Alternative 6 is the only alternative that would include a restoration measure to restore the nearshore hydraulic patterns to a more natural state. However, ecosystem benefits related to the restoration of nearshore hydraulics were determined to be relatively low in comparison to the remainder of the project site and the associated costs were higher than all other restoration measures totaled.

Effectiveness

Objective 1 – Restore Nearshore Hydrodynamic Processes to a more Natural State

This objective seeks to return nearshore hydraulic patterns of circulation to a more natural state to reduce collection of debris and algal mats over aquatic habitat used in the life history cycles of native species.

Objective 2 – Increase the Quality and Quantity of Available Fish Habitat

This objective seeks to improve and increase the amount of fisheries habitat used for reproduction, foraging and predator avoidance by native species.

Objective 3 – Increase Floristic Quality and Quantity of Foredune and Beach Habitats

This objective seeks to reestablish native plant community richness and structure to support critical beach and dune habitats within the Jeorse Park Beach natural areas.

- Alternative 1 takes no action, and therefore does not meet the three planning objectives since the future without-project conditions do not foresee natural recovery of this system.

- Alternative 2 would restore only the fisheries habitat and meets the requirements of objective 2 only. Beach and dune habitats would not be addressed and will likely degrade further over the life of the project.

- Alternative 3 includes invasive plant removal within the beach and dune habitats and planting native species on the breakwater structure. This alternative only partially addresses the establishment of native species on the beach and leaves opportunities for invasive species to re-enter the site. This alternative does not address objectives 1 or 2. This alternative would provide about 15.8-acres of dune and beach habitat with risk of reverting back to a degraded state post construction.

- Alternative 4 builds upon Alternative 3 by adding native plantings to the dune and beach acreage but still does not address objectives 1 or 2. This alternative would provide about 15.8-acres of sustainable habitat to the project site.

- Alternative 5 builds upon Alternative 4 by adding fish habitat placement within the lacustrine nearshore zone of Lake Michigan. This alternative would provide about 20.8-acres of habitat. This alternative addresses Objective 2 and 3 but does not address Objective 1.

- Alternative 6 builds upon Alternative 5 by altering the morphology of the existing breakwater to increase circulation patterns to a more natural flow regime. This alternative would provide about 20.8-acres of habitat but would increase the fisheries habitat quality by preventing further collection of debris over the habitat.

Efficiency

An ecosystem restoration plan must represent a cost-effective means of solving habitat problems and seizing opportunities to improve the environment. It must be determined that the plan's restoration outputs cannot be produced more cost effectively than any other plan via the USACE's Six-Step Planning Process.

Four measures were refined to seize site specific opportunities, address Jeorse Park Beach's problems and were further honed by targeting three ecosystem objectives. Using the USACE Institute for Water Resources Planning Suite Software, twenty (20) alternative combinations were generated from the 4 habitat restoration measures. Through the CE/ICA analyses, eight (8) cost effective combinations were identified, which is inclusive of the six (6) Best Buy Plans. The No Action plan is always deemed cost effective and a Best Buy Plan. Twelve (12) alternative combinations were screened out as non-cost effective.

4.6.3 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 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.

Overall, there is low risk associated with Alternatives 5 not performing as predicted. Sufficient investigations to the level of project complexity were performed to ensure that the restored plant communities would not revert to invasive, weedy species again by a) lessons learned from constructed park like plant restoration projects i.e. Eugene Field Park & 63rd Street Dune & Beach, b) designing plant communities to the hydrology and geomorphology instead of fighting it (i.e. the overall design replicating plant communities indicative of Lake Michigan's coastal sandy zone), and c) a dedicated non-Federal sponsor that will maintain the project as constructed with intended ecological benefits. However, planting of native species within the breakwater stone as described in the 'BP' measure has not yet been attempted by another Chicago District project. The plant species list was carefully selected to represent hardy species capable of withstanding extreme climatic events but an adaptive management plan was also designed to account for loss of vegetation.

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. A prominent issue is that invasive plant species are adapted for colonizing areas that are disturbed and have ruined soils. Measures that alleviate ruined soil properties consist of adding leaf litter compost to the top 6" of soil during late summer or early fall. Incorporating soil amendments such as this will decrease bulk density, hold moisture longer and increase organic matter and microbial activity. This would further the soil's ability to provide for native plants and reduce the vulnerability of the plant community to noxious weed invasion. This measure has been found to work on several Chicago District habitat restoration projects where the soils were highly altered. The other end of the spectrum would be the addition of inorganic substrates to reverse the overly organic substrates currently in place. The only situation worse than a plant community completely comprised of weedy, nonnative species, is no plant community at all. While Jeorse Park Beach currently has an ideal condition for planting native coastal species on the beach and existing dunes there does require some scraping of about a 6" layer of topsoil over parent material of lacustrine sands on the back side of the dunes near the parking lot.

Native plantings also have an associated risk of not establishing due to a variety of unforeseen events. Predation from herbivorous animals is likely since Canada geese are quite abundant in the area. Weather also plays a large role in the establishment success of new plantings. Periods of drought, flood or early frost can alter the survival percentage of plantings. To mitigate these risks, planting over several years, overplanting and/or adaptive management and monitoring may be incorporated into the overall plan. In addition, climate change may or may not affect project outcomes. Increased temperatures or rainfall may lead to changes in the ecosystem of the project area; however, Lake Michigan primarily drives the weather in the Chicagoland area and may partly mitigate climate change concerns for the near future. This climate concern is alleviated by having a broader pallet of adaptive plant species to compensate for climatic shifts.

4.7 National Ecosystem Restoration (NER) Plan Recommendation

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.

This restoration project was planned in cooperation with the City of East Chicago and various Federal, State and local stakeholders. Also, this restoration project makes a significant contribution to regional, national, and international programs that include the North American Waterfowl Management Plan, Lake-wide Management Plans, and the Coastal Zone Management Plan. This plan included an opportunity for open comment to ensure all stakeholder parties have had time for contribution.

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 that are in construction and design phases. 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 Lake Michigan fisheries (commercial, recreational and non-sport species) and aquatic ecology is highlighted by several federal (Executive Order 13340 Great Lakes Interagency Task Force and Great Lake Restoration Initiative) and state (IN Lake Michigan Coastal Program) sources. Additionally, the importance of Migratory Birds in terms of human uses and aesthetics has been documented through numerous sources, most importantly the Migratory Bird Treaty Act (1918) and Executive Order 13186 Responsibilities of Federal Agencies to Protect Migratory Birds.

Non-monetary values associated with the Jeorse Park Beach restoration project include a variety of ecological, social and educational benefits. The project will provide important stop-over habitat for birds traveling along the Lake Michigan portion of the Mississippi Flyway, a migratory route recognized as nationally significant by the Audubon Society. In addition, the native habitat types planned will benefit native resident species. A variety of aquatic species such as fish, macroinvertebrates, and amphibians will greatly benefit through the addition of important foraging, refuge, and spawning habitat. The restoration of Jeorse Park Beach natural areas will markedly increase the ecological integrity of the surrounding area and is well worth the investment.

The plan that reasonably maximizes net National Ecosystem Restoration benefits and is consistent with the Federal objective, authorities and policies, is identified as the NER plan. The NER/Preferred Plan was determined to be Alternative 5.

4.7.1 NER/Preferred Plan Description

The preferred plan, Alternative 5, includes habitat restoration measures rock reef (RR), dune and beach native plantings (D), invasive species plant removal (IPR) and breakwater plantings (BP). Sequencing and coordination of these measures is an important aspect of creating a successful restoration project at Jeorse Park Beach. Invasive plant removal is the first step in this restoration plan and includes physical removal and spot herbicide treatment across the entire project footprint. While this is an important first step in the project to prevent competition with freshly planted native species this measure must also be continually monitored and allow plant establishment over a period of 5 years to ensure existing seed banks are exhausted and there is no further recruitment of invasive species. The second restoration measure will immediately follow invasive plant removal and includes dune and beach native species plantings. All plantings will use live herbaceous plugs or larger woody shrubs including one to five gallon root wads. Live trees are also planned for establishment behind the foredunes. Dune and beach plantings will include minor scraping of top soil from the dunes behind the parking lots to access a soil base comprised mostly of beach sands. This sandy soil is required for the establishment of ammophilus species such as White Pine (*Pinus strobus*). The scraped topsoil will be condensed and used to cover existing piles of construction debris onsite. This topsoil covered debris is landward of the existing dune structures and will be planted with an appropriate native planting mix corrected to the soil type. No offsite disposal will be required for this project. Native plantings will supplement the existing marram

grass vegetation on the fore dunes and will also include areas of the beach surrounding the parking lot and breakwater. Plantings will also occur within the existing beach access points which cut through the dunes to reestablish connectivity between within the dune system. A beach access point will be maintained which circumvents the restored habitat. Beach access for recreational use by the public will be maintained at the parking lot and recreational facilities. These newly planted areas will help promote the growth of new dune creation and extend the existing dunes. The plantings will also help in buffering runoff from the parking lots as surface water makes its way down to the beach.

Rock reef placement will entail the construction of four reefs built with natural, glacially derived cobble stone. This material will afford the most diverse assemblage of interstitial spacing used by fishes for a variety of life history traits such as reproduction, foraging or shelter from predators. A nominal stone size of 1.2 feet will be used to ensure diversity of shape and stability of the structure within the reefs. Minor wave impacts and sloughing of the original 1:1 slope to the reef structure are expected and are natural processes which help create diversity of habitat. Stone size was and depth of placement were assessed to ensure that complete degradation and spreading of the stone will not occur (see Appendix B for more details). Native plantings on the breakwater will include shrubs to provide overhanging vegetation to the lake water. Overhanging vegetation will provide foraging opportunities through increased insect populations, increase organic matter input over the rock reef habitat useful for aquatic macroinvertebrate production and increased shaded areas used by prey for predator avoidance and by predators for staging areas while foraging. Figures 13 and 14 provide an overview of the restoration measures on the project site for the existing breakwater configuration and the proposed modification to the breakwater shape.

Figure 14: NER/Preferred Plan

Left: Physical Restoration Measures including plantings and fisheries habitat creation. Right: Invasive species removal areas.

CHAPTER 5 – INTEGRATED ENVIRONMENTAL ASSESSMENT

This chapter involves prediction of direct, indirect and cumulative environmental effects to current conditions stemming from implementation of the Preferred Plan/NER Plan.

5.1 Need & Purpose

The present hydrology of the Lake Michigan coastal area in Indiana is significantly changed from what existed before development. The industrialization and urbanization which began in northwest Indiana during the late nineteenth century extensively altered the natural landscape and drainage patterns. The scope of this study addresses the issues of impaired coastal geomorphology, instability of existing dunes, invasive species, lack of natural fisheries habitat, and poor native species richness. Based on site inventory and characterization by the USACE, a set of problems and opportunities were developed by the study team, non-Federal Sponsors and supporting stakeholders. These drive the need for action, which is summarized as the historic loss of significant migratory bird, fish and wildlife habitats. The purpose of this feasibility study and integrated environmental assessment is to identify the most environmentally beneficial, cost effective and publicly supported habitat restoration project to restore resources lost by the alteration of coastal habitat via the development of East Chicago and the Jeorse Park Beach.

5.2 Alternatives Considered

Section 4.1 provides discussion on the suite of measures that were developed to address study problems and meeting objectives. These measures that were processed through the IWR Planning Suite program to generate cost effective plans. The cost effectiveness and incremental cost analyses take implementation and real estate costs and ecosystem outputs into consideration. Ecosystem outputs were measured via the Floristic Quality Index (FQA) and fish species richness. Six (6) alternatives, including the No Action Plan, were deemed best case scenarios for project implementation. Alternative 5 was selected as the National Ecosystem Restoration (NER) Plan, which for the purposes of this Environmental Assessment is termed the Preferred Plan. Rationale for selecting the NER/Preferred Plan is presented in Section 4.7.

Alternative 1 – No Action Plan

Alternative 2 – (RR) Rock Reef Habitat

Alternative 3 – (IPR) Invasive Plant Removal, (BP) Breakwater Plantings

Alternative 4 – (IPR) Invasive Plant Removal, (D) Dune and Beach Plantings, (BP) Breakwater Plantings

Alternative 5 – (IPR) Invasive Plant Removal, (D) Dune and Beach Plantings, (BP) Breakwater Plantings, (RR) Rock Reef Habitat

Alternative 6 – (IPR) Invasive Plant Removal, (D) Dune and Beach Plantings, (BP) Breakwater Plantings, (RR) Rock Reef Habitat, (BMR) Breakwater Modification

5.3 The Affected Environment

A detailed description of the affected environment can be found in Chapter 2 – Study Area inventory & Forecasting. Shoreline development has been the greatest impact to the Jeorse Park Beach and throughout East Chicago natural areas. Industrialization onshore coupled with extensive landfill and storm damage armoring projects within Lake Michigan have severely impacted natural habitat for native fish and

wildlife. Jeorse Park Beach provides an island of natural area with a small amount of high quality foredune habitat populated with the regionally rare marram grass, *Ammophila breviligulata*. Landward of the foredune habitat exists a strip of degraded remnant dune which has been restricted by adjacent railroad lines and used for slag and excess road surface material dumping. The dunes are also populated with low quality natives and invasive species which reduce the benefits to wildlife. Fish habitat within the nearshore waters is limited to manmade breakwater armoring stone and reduced variability of lake bottom substrate currently consisting of sand and gravel. The USFWS online wetland mapper tool[29] identifies the nearshore area as lacustrine, littoral wetland with unconsolidated bottom substrate. Nearshore hydraulics have been significantly altered from their natural state by the nearby breakwater structures as well which allows the accumulation of debris and algal mats over the limited fish habitat. The No Action Alternative conditions are synonymous with the Future Without-Project Conditions, which are presented in Section 2.6.

5.4 Direct & Indirect Effects of the Preferred Plan

In addition to the effects discussed in the following sections, a 404(b)(1) analysis is provided in **Appendix A**. This analysis further documents whether or not there are effects to the aquatic environment resulting from construction activities.

5.4.1 Physical Resources

Geology, Glacial Stratigraphy & Soils

Like the majority of the Chicago regional bedrock system, Silurian dolomite underlies the overburden soils at Jeorse Park. The bedrock in the area is primarily composed of dolomite, limestone, and shale. Surficial soils are comprised of artificial and manmade fill as well as beach and dune sand along present and recently abandoned beaches. Natural dunes in Indiana were formed from glacial outwash, which include clay, silt, and sand that was transported and deposited by wind. Though no borings exist within the geotechnical database, nearby projects indicated that silt and clay materials underlie the dune sand at varying depths. Since the minor surficial grading associated with the plantings on the landward side of the foredunes would not disturb or displace glacial materials present, there would be no adverse effects resulting from implementation of the Preferred Plan/NER Plan. Geomorphic features and composition effects resulting from the implementation of the Preferred Plan/NER Plan are considered to be beneficial. If native soils are present onsite, they would be preserved through the planting of native vegetation throughout the park. Additionally, the preferred plan would stabilize the existing sand dune with deep-rooted native vegetation, effectively replacing the existing shallow-rooted non-native and invasive plant species. Overall implementation would improve soil conditions and processes.

Sediment Quality

The sediment of the Lake Michigan shoreline in proximity to the Jeorse Park Beach consists of lake sands with occasional gravel lenses deposited via glacial till. Implementation of the Preferred Plan/NER Plan would result in minor temporary disturbance to the sediments during installation of rock reef fish habitat along the existing breakwater. Suspension of sediments into the water column will likely occur during the placement of the cobble mounds but would return to its natural conditions shortly after with little loss of sediment to littoral drift as the project area experience only minor hydraulic effects due to shadowing from the adjacent Indiana Harbor landfill project. Additionally, the presence of the rock reefs may cause

[29] http://www.fws.gov/wetlands/Data/Mapper.html Accessed [10 November 2015]

a minor amount of trapping of littoral sediments in their shadow, but this trapped sediment will be periodically remobilized by seasonal, high energy storm events.

Water Quality

The Preferred Plan/NER Plan would have incidental water quality benefits through the increased native plant abundance surrounding the adjacent parking lots and along the breakwater. Adverse effects to water quality stemming from construction activities may be observed temporarily during installation of cobble mound as turbidity increases through suspension of the sediments. These adverse effects are not thought to significantly affect the ecosystem as they will be completed outside of spawning windows for fish and aquatic wildlife.

Hazardous, Toxic & Radioactive Wastes

The Preferred Plan/NER Plan would not result in the release of or influence to HTRW materials.

Hydrology

No significant adverse effects resulting from implementation of the Preferred Plan/NER Plan are expected. The Preferred Plan/NER Plan would maintain the current hydrologic conditions. Furthermore, there are no adverse effects to conducting this project within a floodplain, as identified in Section 2.2.5 of this report. The current alternatives to restore the beach and dune plant communities through planting and invasive species removal will provide increased floodplain benefits through additional storage, filtration and therefore increased water quality. These alternatives specifically will have no adverse effects or alter the characteristics of the floodplain.

5.4.2 Ecological Resources

Plant Communities

Plant communities at Jeorse Park Beach include several acres of high quality marram grass stands that have developed foredunes on the beach along with several more acres of low quality native species and invasive, non-native species behind the foredunes. The Preferred Plan/NER Plan recommends the removal of invasive, nonnative plants and Eurasian species and the supplementing the existing vegetation with a variety of native plants to increase species diversity. Invasive and non-native trees will be removed from the project area and replaced with native coastal species endemic to the dunal ecosystems of southern Lake Michigan. Based on this, there would be no adverse effects to plant communities within Jeorse Park or the surrounding areas resulting from implementation of the Preferred Plan/NER Plan. Plant community effects resulting from the implementation of the Preferred Plan/NER Plan are considered to be beneficial.

Wetlands

The USFWS online wetland mapper tool[30] identifies the nearshore area as lacustrine, littoral wetland with unconsolidated bottom substrate. This definition includes the area of Lake Michigan from the shoreward boundary to 2 meters below the annual low water and describes the bottom substrate as containing at least 25% cover of particles smaller than stones and a vegetative cover of less than 30%. The NER/Preferred Plan will not cause adverse effects to the wetlands present on the project site or within the surrounding

[30] http://www.fws.gov/wetlands/Data/Mapper.html Accessed [10 November 2015]

areas. Positive ecological effects could be realized to the existing wetland areas through the natural buffering of commercial and industrial runoff through the enhanced native plantings to occur landward of the existing wetlands. Submerged fish habitat in the form of rock reefs will be placed deeper than 2 meters below the annual low water line and will not adversely affect the existing wetlands onsite.

Macroinvertebrates

There have been numerous studies in the Southern Lake Michigan rim documenting aquatic macroinvertebrate populations through direct sampling and indirectly through diet analysis of fishes. These studies are referenced in the associated detailed project report within section 2.3.2. While there have not been any studies conducted directly at the Jeorse Park Beach, the Preferred Plan/NER Plan includes restoration of cobble mound reef for fisheries habitat. This habitat will increase interstitial space used in the reproduction of many native macroinvertebrates. The Preferred Plan/NER Plan will also increase the abundance and diversity of onshore plantings which will enhance the structure and function of the ecosystem for supporting terrestrial macroinvertebrates. Based on this, there would be no adverse effects to aquatic or terrestrial macroinvertebrate communities within Jeorse Park Beach or the surrounding area resulting from implementation of the Preferred Plan/NER Plan. Macroinvertebrate effects resulting from the implementation of the Preferred Plan/NER Plan are considered to be beneficial.

Fishes

The fish assemblage at Jeorse Park Beach nearshore waters of Lake Michigan was found to be quite low in recent surveys when compared with historical surveys of the surrounding area. The reduced species richness can be partially attributed to the loss and degradation of existing habitat. The Preferred Plan/NER Plan recommends establishing cobble mound rock reefs to increase fish spawning and foraging habitat. Additionally, breakwater plantings will increase the amount of overhanging vegetation at the shoreline which provides increased food sources and shaded areas used by both predators and prey. While the cobble mounds offer a variety of benefits to the native fish assemblage at the beach, non-native fishes such as the round goby may also utilize this habitat. Based on this, there would be no adverse effects to fish communities within Jeorse Park Beach or the surrounding area resulting from implementation of the Preferred Plan/NER Plan. Fish community effects resulting from the implementation of the Preferred Plan/NER Plan are considered to be beneficial.

Reptiles & Amphibians

During a site visit by USACE botanists several six-line racerunners (*Cnemidophorus sexilneatus*) were observed utilizing the adjacent load stone running along the railroads. These reptiles were utilizing the dune habitat for foraging opportunities. The Preferred Plan/NER Plan does not include demolition of the existing load stone armoring that is currently being utilized by the racerunners. Several species of snakes are also common within the immediate area of Jeorse Park Beach which may also utilize the dune complex for foraging. The Preferred Plan/NER Plan recommends improving the structure and function of the dune complex by increasing plant diversity which would also increase foraging opportunities. The rock reef habitat creation within the Preferred Plan/NER Plan would also increase foraging opportunities for aquatic snake predators. Based on this, there would be no adverse effects to reptile and amphibian communities within Jeorse Park Beach or the surrounding area resulting from implementation of the Preferred Plan/NER Plan. Reptile and amphibian community effects resulting from the implementation of the Preferred Plan/NER Plan are considered to be beneficial.

Birds

The Jeorse Park Beach study area is located within the Lake Michigan portion of the Mississippi Flyway, which is nationally recognized as an important route for many migratory and resident birds. The Preferred Plan/NER Plan recommends the removal of invasive plant species and the establishment of native plants which provide habitat for organisms and plants that support migratory birds and in particular, neotropical songbirds and waterfowl (herons, ducks, mergansers, grebes, etc). Coordination on bird habitat restoration features and activities are being coordinated with the Audubon Society Chicago and the Gary/Chicago International Airport. Based on this, there would be no adverse effects to migratory and residential birds within Jeorse Park Beach or the surrounding area resulting from implementation of the Preferred Plan/NER Plan. Bird species effects resulting from the implementation of the Preferred Plan/NER Plan are considered to be beneficial.

Mammals

Currently, only those mammal species indicative of urban life are present within the Jeorse Park Beach study area. Based on this, there would be no adverse effects to small or large mammals within Jeorse Park resulting from implementation of the Preferred Plan/NER Plan. Mammal species effects resulting from the implementation of the Preferred Plan/NER Plan are considered to be beneficial, but minor.

Threatened and Endangered Species

Federal – Currently, there are no Federally Endangered or Threatened Species, or their critical habitats within the Jeorse Park Beach study area. The Federally Threatened Dune Thistle (Cirsium pitcher) is listed as occurring within 0.5 miles of the project site. The Preferred Plan/NER Plan will implement invasive species removal and establish protected natural areas that could benefit recruitment of this federally threatened species on the site. Based on this, there would be no adverse effects to Federally Listed Species resulting from implementation of the Preferred Plan/NER Plan.

State – Currently, there are no state listed species or critical habitats listed within the Jeorse Park Beach study area. The Indiana Natural Heritage Database has indicated a multitude of state listed vascular plants within the vicinity (0.5 miles) of the project site however. A full list of these species can be located in Section 2.3.7 Threatened and Endangered Species of the feasibility report. The Preferred Plan/NER Plan will implement invasive species removal and establish protected natural areas that could benefit recruitment of these state listed species on the site. Based on this, there would be no adverse effects to State Listed Species resulting from implementation of the Preferred Plan/NER Plan.

5.4.3 Cultural Resources

Archaeological & Historical Properties

The Preferred Plan/NER Plan would have no adverse impacts on archaeological or historic properties. One archaeological site has been identified within the project footprint by the Indiana DNR Historic Preservation and Archaeology department. The site contains two historic shipwrecks referenced as Unknown 5 and Unknown 6 in a listing of shipwrecks within the Indiana waters of Lake Michigan. Both wrecks are believed to be work barges dating from either the 19th or 20th centuries. Although archaeological deposits may be present within the project area, the project includes no construction within undisturbed areas. Clearance was pursued with the Indiana Historic and Preservation Agency with the submittal of a letter dated 16 December 2016 pursuant to Section 106 of the National Historic Preservation Act (54 U.S.C. § 306108) and C.F.R. Part 800. The Indiana SHPO has conducted an analysis of the material in that letter along with this report and draft environmental assessment during the 30 day public and agency review period. Indiana SHPO provided concurrence with the USACE's finding

of no adverse effects to historic building, structures, districts, objects or archaeological resources by the proposed project in letters dated 20 January 2016 and 25 February 2016. Native American groups having an historic cultural interest in northwest Indiana have been consulted (letters dated October 28, 2013). Coordination with SHPO will continue through the design and implementation phase if cultural, historic or archaeological resources are discovered.

Social Properties

The Preferred Plan/NER Plan will not have any adverse impacts on the area's social properties. Aesthetic and open space improvements resulting from implementation of the Preferred Plan/NER Plan may positive effects on adjacent parks and neighborhoods. The Preferred Plan/NER Plan may also contribute to increased water quality objectives at Jeorse Park Beach leading to decreased beach closures for public contact with the water.

Recreational Activities

The Preferred Plan/NER Plan would have no adverse, long term effects on recreational activities at Jeorse Park Beach. Short term impediments to passive recreational activities will occur during first and second years of construction during breakwater planting establishment and placement of rock reef habitat. After all physical restoration features are implement after the second year, portions of the park would be open to the public for recreation once again.

5.4.4 17 Points of Environmental Quality

The 17 points are defined by Section 122 of the Rivers, Harbors & Flood Control Act of 1970 (P.L. 91-611) from (ER 1105-2-240 of 13 July 1978). Effects to these points are discussed as follows:

Noise – Any of the alternative plans would cause minor and temporary increases in noise levels beyond the current conditions. The minor noise effects would stem from machinery utilized to place rock reef habitat along the breakwater and minor scraping of the top soil along the backside of the dune habitat.

Displacement of People – None of the alternative plans will displace any people.

Aesthetic Values – Currently, portions of Jeorse Park Beach along the backside of the dunes and beyond the existing parking lots contain piles of refuse and construction debris which would be removed as part of the Preferred Plan/NER Plan. All alternatives inclusive of the D, Dune and Beach Restoration, will include removal of this refuse. Removal of the refuse and non-native species will increase aesthetic values at Jeorse Park Beach.

Community Cohesion – Any of the alternative plans would not disrupt community cohesion, but provide restored open space for community activities and decrease beach closings.

Desirable Community Growth – Any of the alternative plans would not adversely affect community growth and would potentially attract people to a more aesthetically pleasing area based on project restoration measures.

Desirable Regional Growth – Any of the alternative plans would not adversely or beneficially affect regional growth.

Tax Revenues – Any of the alternative plans would not adversely or beneficially affect tax revenues.

Property Values – Any of the alternative plans would not have adverse effects on property values, but have the potential to increase surrounding land values since the aesthetics would improve due to project restoration measures.

Public Facilities – The Preferred Plan/NER Plan would temporarily disturb public access to fishing pier locations along the breakwater during installation of breakwater plantings and rock reef habitat. Fishing pier access would be returned to normal operation following these activities. Alternative Plan 6 which includes reshaping the existing breakwater would involve the permanent removal of several boat mooring buoys within the harbor. Approximately 75% of the existing buoys would be retained.

Public Services – Any of the alternative plans would not adversely or beneficially affect public services. All restoration would require temporary closure of the passive park areas, such as the recreational areas of the beach and the breakwater fishing access pier. An appropriate access point to the beach will be maintained for maintenance and beach grooming vehicles which will not disturb the restored vegetation.

Employment – Any of the alternative plans would not adversely affect employment and would temporarily increase employment during construction activities.

Business and Industrial Activity – Any of the alternative plans would not adversely or beneficially affect local commerce.

Displacement of Farms – Any of the alternative plans would not adversely affect farmland since restoration areas do not occur on agricultural fields.

Man-made Resources – Any of the alternative plans would not adversely or beneficially affect man-made resources.

Natural Resources – The No Action Plan allows for the Jeorse Park Beach ecosystem to remain degraded. The Preferred Plan/NER Plan would have improve natural resources such as fish, wildlife, migratory birds, water quality, natural food production, fishing, bird watching, paddling, etc.

Air Quality – The local air quality in East Chicago and Lake County are considered 'non-attainment' under the Clean Air Act for the 8-Hour Ozone Standard and particulates (PM-2.5). The project is within the non-attainment zone. Once implemented, the project itself will be neutral in terms of air quality, with no features that either emit or sequester air pollutants to a large degree. During the project construction, heavy equipment would cause minor, temporary air quality impacts, however all equipment will be in compliance with current air quality control requirements for diesel exhaust, fuels, and similar requirements. Air quality impacts will be short and temporary in nature and emissions will be de minimis. A general conformity analysis is not required due to the de minimis emissions.

Water Quality – As discussed previously, any of the alternative plans would not adversely affect water quality. The Preferred Plan/NER Plan would incidentally improve water quality within the nearshore areas of Lake Michigan by providing increased buffer vegetation surrounding the parking lots and by stabilizing existing vegetation on the dunes. Alternative Plan 6 would directly increase water quality within the nearshore zone of Lake Michigan by increasing circulation at the beach which dilutes contamination that would otherwise build up within the stagnant waters created by the existing breakwater.

5.5 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 important resources. 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 Council on Environmental Quality (CEQ) and the U.S. Environmental Protection Agency (USEPA 315-R-99-002). This guidance provides an eleven-step process for identifying and evaluating cumulative effects in NEPA analyses.

5.5.1 Scope of Cumulative Effects Analysis

Through 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 was broadened to consider watershed effects. The spatial boundary being considered is normally in the general area of the proposed ecological restoration; however, the area may be expanded on a case-by-case basis if some particular resource condition necessitates broadening the boundary. The analysis will include Jeorse Park Beach and a 1.5 mile radius around the project site.

Three temporal boundaries were considered:

- Past – mid to late1800s because this is the approximate time that the landscape was developed
- Present – 2015 when the decision is being made on the most beneficial ecological restoration.
- Future – 2066, the year used for determining project life end, however, the ecological restoration is expected to persist long after the 50 year project economic evaluation period.

Projecting the reasonably foreseeable future actions is difficult. The proposed action (ecosystem 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. Some future projections were taken from watershed and specific studies generated for the general project area. In this case, reasonably foreseeable future actions include:

- Further improvements in water quality due to large-scale projects (Breakwater Modification Project), small BMPs (Recently added by IDEM) and education (signage on site)
- Further improvements in aquatic and riparian habitat in and along the Lake Michigan system including the Canadian National Railway remediation project adjacent to Jeorse Park Beach
- Further improvements in connectivity between Lake Michigan system habitats

5.5.2 Cumulative Effects on Resources

The plan formulation process took into account existing and planned projects, studies and known ecological restoration projects in the study area. Existing Projects were identified in Section 1.5.2 that has the potential for affecting or being affected by a potential Jeorse Park Beach restoration project. Prior studies and reports, listed in Section 1.5 were reviewed to ensure that the modeled conditions are the best possible representation of actual conditions. The main project that was considered in greater detail in relation to cumulative effects at the Jeorse Park Beach location consisted of the Canadian National Railway Remediation project. The Technical Recognition Section also takes existing and future habitat restoration projects into consideration for assessing project effects. Finally, the study team also worked with Federal, State and local agencies to coordinate ongoing planning to address local environmental and infrastructure issues.

Physical Resources

Physical alterations to the Lake Michigan coastline at and near the Jeorse Park Beach have been extensive in the past with dramatic land use changes inland of the project area shifting from natural areas to industrial, commercial and residential. As a result, geomorphology and near shore hydraulics are impacted due to site specific and watershed-scale alterations, as well as daily activities such as road salting, municipal discharge, and the human impacts on areas of the park not purposed for recreation. It is reasonably foreseeable that small projects within the Lake Michigan system for ecological restoration purposes would occur. A close by project, the Canadian National Railway Remediation, is currently underway and is restoring 29 acres of dune and wetland habitat. This project is not expected to negatively affect physical resources in the project location even when combined with all other activities occurring in the area. Best management practices and water reclamation systems are not numerous and big enough to cause significant detrimental effects from sewer waters into the Lake Michigan system at this point, but could possibly be in the future as technology advances. IDEM has recently initiated several best management practices directly on Jeorse Park Beach at the recommendation of USACE through the Jeorse Park Taskforce which entail covered garbage receptacles, educational signage and a bird scare program to reduce nuisance bird species on the beach. Given the past, current and future condition of the coastal Lake Michigan system, the implementation of ecosystem restoration and infrastructure projects would be minor terms of the vast array and quantity of adverse effects caused by development; however, they are important in terms of beginning to address all the human induced problems the watershed suffers. There are no irrecoverable loss of resources identified in terms of geology, soils, substrates, topography, hydrology, water quality and fluvial geomorphology due to implementation of the Preferred Plan/NER Plan. Cumulative beneficial effects to the Lake Michigan system are anticipated in terms of soils, substrates, and water quality. When the GLFER Preferred Plan/NER Plan is assessed in combination with known projects in the vicinity of the proposed restoration site and reasonably foreseeable future actions, it is not expected to have negative cumulative effects to the existing physical resources.

Ecological Resources

The ecology along the coastal Lake Michigan watershed has had significant impacts as a result of previous physical resource alterations. The watershed was once a diverse mosaic of marsh, prairie, savanna, woodland, and glacial ponds that had a steady and dependable hydrology. Extreme landscape modification has caused most of the natural land use to be converted into concrete. It is estimated that only about 2% of the remaining 14% of open space is considered high quality ecosystem, and that this 2% also suffers from fragmentation. No longer is there a natural landscape to provide enough natural lands for fish and wildlife habitat or to attenuate large rainfall events. Considering these past, current and future conditions of the watershed, the implementation of the Preferred Plan/NER Plan within Jeorse Park Beach is minor in terms of the vast array and quantity of significant effects caused by industry and urbanization;

however, it is instrumental in beginning to address the human induced problems the watershed suffers. The effects of the Preferred Plan/NER Plan is expected to have beneficial impacts to the ecological resources available in and around the Jeorse Park Beach area. Current projects such as the Canadian National Railway Remediation project will improve surrounding habitat islands and increase the available resources for resting migratory birds and waterfowl. Current IDEM BMPs will help increase water quality within the near shore area of Jeorse Park Beach by limiting the impacts of nuisance birds. Therefore, there are no irrecoverable losses of resources identified in terms of plant, insect, fish, amphibian, reptile, bird, and mammal taxa or to their habitats they occupy due to implementation of the Preferred Plan/NER Plan. Cumulative beneficial effects to the coastal Lake Michigan system are anticipated in terms of fish and wildlife and their preferred habitats.

Cultural & Historic Resources

Although one archaeological site has been identified within the project footprint by the Indiana DNR Historic Preservation and Archaeology department, there are no negative effects expected to archaeological or cultural resources resulting from implementation of the Preferred Plan/NER Plan. . Clearance was pursued with the Indiana Historic and Preservation Agency with the submittal of a letter dated 16 December 2016 pursuant to Section 106 of the National Historic Preservation Act (54 U.S.C. § 306108) and C.F.R. Part 800. The Indiana SHPO has conducted an analysis of the material in that letter along with this report and draft environmental assessment during the 30 day public and agency review period. Indiana SHPO provided concurrence with the USACE's finding of no adverse effects to historic building, structures, districts, objects or archaeological resources by the proposed project in letters dated 20 January 2016 and 25 February 2016. Coordination with SHPO will continue through the design and implementation phase if cultural, historic or archaeological resources are discovered.

Cumulative Effects Summary

The cumulative effects of the Preferred Plan/NER Plan are considered to be beneficial and environmentally important, but not significant from the cumulative/watershed effects perspective. The environment and its human community are expected to benefit from replacing unsightly and overgrown non-native plant communities with native plant communities.

5.6 Compliance with Environmental Statutes

The Preferred Plan presented in this integrated Environmental Assessment are in compliance with appropriate statutes, executive orders and memoranda 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. There were no adverse environmental effects identified which cannot be avoided should the proposal be implemented [1502.16 (102(2)(C)(ii))]. This proposal reverses some of the adverse effects of how man's local and short-term uses of the environment, while maintenance and restoring the long term productivity of a portion of Lake Michigan's coastal zone [1502.16 (102(2)(C)(iv))]. There have been no irreversible and irretrievable commitments of resources identified resulting from the proposed action should it be implemented [1502.16 (102(2)(C)(v))]. The proposed project supports land-use plans identified in the City of East Chicago redevelopment Commission's Waterfront Revitalization Initiative in terms of natural area restoration [NEPA 1502.16].

Environmental Justice

Executive Order 12898 (environmental justice) requires that, 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 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 26 May 2015), revealed that within the portion of East Chicago containing the Jeorse Park Beach project site, that majority of the population (40-100%) is considered below the poverty line. Similarly, the majority of the population (40-100%) is considered as a minority. Since the overall project and the preferred plan is considered ecosystem restoration, no adverse human health effects or environmental effects on minority populations and/or low income populations are expected. It is anticipated that this habitat restoration project would have beneficial affects to local communities in terms of aesthetics, wildlife, green open space, recreational opportunity, cleaner surface waters and cleaner air. Recreational activities and beach access may be limited for short periods of time during the initial construction and planting phase. This will primarily be confined to the first year of construction activity but will not be an issue for the following four years of establishment activities.

Coastal Zone Management Act

Project restoration measures that are proposed under the NER/Preferred Plan comply with the regulations set forth in the Coastal Zone Management Act and have been fully coordinated with the State of Indiana Department of Environmental Management and Department of Natural Resources. A coastal zone consistency determination will be obtained if required by the Coastal Zone Management Act and state regulatory agencies.

Clean Air Act

The local air quality in East Chicago and Lake County are considered 'non-attainment' under the Clean Air Act for ozone and particulates (PM-2.5). The project is within the non-attainment zone. Once implemented, the project itself will be neutral in terms of air quality, with no features that either emit or sequester air pollutants to a large degree. During the project construction, heavy equipment would cause minor, temporary air quality impacts, however all equipment will be in compliance with current air quality control requirements for diesel exhaust, fuels, and similar requirements. A general conformity analysis was not conducted due to the short and temporary nature of any air quality impacts.

Section 401 of the Clean Water Act

A Section 404(b)(1) analysis was completed for the preferred plan and is located in Appendix A. Features addressed by the 404 include the fill materials for the construction of cobble mound lenses to perform functionally as rock reef fish habitat. No adverse effects were determined. Since project activities under the jurisdiction of Section 401 are very limited and are all restorative in terms of aquatic ecosystem and water quality, Section 401 Water Certification is expected to be granted via the Indiana Department of Environmental Management (IDEM). IDEM and the Indiana Department of Natural Resources have been intimately involved with the planning process of the Preferred Plan/NER Plan and have provided input throughout the process.

USFWS Coordination

Coordination with the USFWS commenced with a project scoping letter dated 28 October 2013. This environmental assessment identified the NER/Preferred Plan to have "no effects" on federally endangered species or their habitats as determined by following the protocol and guidelines provided by Region 3 Fish & Wildlife Service (http://www.fws.gov/midwest/endangered/section7/index.html); therefore Section 7 is precluded and in compliance. Coordination under the FWCA of the NER/Preferred Plan was conducted through the 30 day NEPA public and agency review and a letter was provided to the USFWS on 28 January 2016. The USFWS provided a response letter dated 26 February 2016 indicating their concurrence that the proposed project is not likely to adversely affect any federally endangered or threatened species.

State of Indiana Historic Preservation Act

Coordination with the Indiana DNR Division of Historic Preservation and Archaeology commenced with a project scoping letter dated 28 October 2013. In a letter 2 December 2013, the IDNR Historic Preservation Division informed USACE that no historic properties are affected by the NER/Preferred Plan but requested further information to determine potential impacts to a nearby archaeological area containing two shipwrecks. This detailed project report and a description of the projected changes to current and wave action at the beach have been provided to IDNR Historic Preservation Division. A determination of no effect is expected once coordination is completed during the design phase.

Federal Aviation Administration Coordination

Coordination with the US Department of Agriculture Animal and Plant Health Inspection Service (USDA-APHIS) and the Federal Aviation Administration (FAA) commenced with a project scoping letter dated 3 December 2014. A response letter dated 30 December 2015 was received by the Chicago District Corps from USDA-APHIS indicating the preliminary plans for restoration appear to have a low potential to create significant threat to aircraft movements associated with the Gary-Chicago International Airport. Coordination will be maintained with the Gary-Chicago International Airport through the remainder of the planning process, during the construction phase and into post-construction monitoring.

E.O. 11988 Floodplain Management

Each agency shall provide leadership and shall take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health and welfare, and to restore and preserve the natural and beneficial values served by floodplains. Reestablishing aquatic and terrestrial habitats as functioning, viable and sustainable ecosystems will restore the value of floodplains by minimizing impacts of floods through increases in storm water storage capacity and improvement of water quality. The preferred/NER plan will have no adverse impacts to the characteristics of the floodplain within the project area. The improvement of dune and beach habitat may provide additional storage and filtration capacity resulting increased water quality as well as provide native habitat for a myriad of species. Therefore, the implementation of this project demonstrates leadership in floodplain management.

5.7 Draft Finding of No Significant Impact (FONSI)

The Finding of No Significant Impact (FONSI) maybe found in Appendix A. An Environmental Assessment was completed for the proposed habitat restoration Jeorse Park Beach, East Chicago, Indiana. The Environmental Assessment has found that there would be no adverse effects resulting from implementation of the Preferred Plan/NER Plan. A 30-day Public Review period was be held from 28

January 2016 to 5 March 2016, and any comments received were incorporated into the document if necessary. The NEPA document and supporting appendices were distributed to members of the Jeorse Park Taskforce, consisting of federal, state and local stakeholders, and was also posted at local libraries in proximity to the study site.

CHAPTER 6 – PLAN IMPLEMENTATION

This chapter outlines details for implementing the Preferred Plan/NER Plan. Plan implementation details include sequencing, environmental assessment findings, mitigation requirements, permit requirements, agency and stakeholder views, project schedule, total project costs and cost sharing requirements.

6.1 Project Authorization

Study and implementation authorization by Congress is provided by the Great Lakes Fishery & Ecosystem Restoration (Section 506 WRDA 2000, as amended). Following completion and approval of this feasibility study, USACE and the City of East Chicago will enter into a Project Partnership Agreement for completion of design, plans and specifications, construction and subsequent monitoring.

6.2 NER Plan Implementation & Sequencing

The National Ecosystem Restoration (NER) Plan is the recommended plan, which is Alternative 5. This alternative consists of 4 measures: Dune and Beach Plantings (D), Invasive Plant Species Removal (IPR), Rock Reef Fish Habitat (RR), and Breakwater Plantings (BP). The implementation of all of these measures would restore lacustrine, beach and dune communities within Jeorse Park Beach. The implementation of these features is generally described as follows and according to the measures descriptions in Section 4.1. Much more detail would be added to the plan should this project commence to the implementation phase, for example, specifying spatial distribution of native plugs within a given zone and species clumping, planting centers, soil amendment percentages, temporary predator controls, and establishment activities. General construction activities and sequencing would include:

1) Site Preparation – The first task would be to install safety fencing, signage and other safety features in order to keep the public out of the site during heavy construction. Staging areas and access roads would be demarcated.

2) Invasive Species Eradication – All invasive plant species would be physically and if need be, chemically eradicated from the planting zones. The areas behind the existing foredunes and adjacent to the parking lot would be prepared for planting via a light scraping of the topsoil to expose a more natural sandy substrate. All woody invasive species removed too small for snag habitat would be chipped into small pieces and spread over areas within Jeorse Park Beach. Based on lessons learned from Chicago District restoration projects, the addition of these wood chips greatly aids in starting a plant community from scratch and saves money by avoiding hauling and disposal costs and is environmentally preferred over burning the material.

4) Native Plant Community (Dune and Beach) Establishment – Next would be to establish native plant communities of beach and dune over the remainder of the construction period. These plantings will exclude areas along the existing breakwater and those areas needed for access and staging for breakwater plantings, and rock reef placement. Planting lists are presented in Appendix A. Zones would be planted with live plugs. Live plug areas will require predatory control, primarily stringing and caging to prevent Canada Goose predation. Again, the duration of the construction contract would primarily be for spot herbicide application and additional planting; most activities similar to home gardening activities.

5) Rock Reef Habitat Installation – Rock reef habitat will be created at a location and depth within the nearshore zone of Lake Michigan during the initial year of construction activity. The reefs will be located approximately 200-300 feet lakeward of the breakwater toe at a depth of 16 feet to ensure that the reefs are physically separated from the breakwater structure. This measure will create four reef habitats

composed of various sized naturally derived cobble. Each reef will reach approximately 4-5 feet in height from the lake bottom and provide fish spawning, foraging and refugia habitat.

6) Breakwater Plantings and Establishment – Finally, the breakwater will be prepared for native plantings by first filling in all large void spaces. Voids will first be filled with rip rap stone and then capped with sand. Native plantings will be established within the sand cap which fills in the space between armor stones. Live plug plantings will be used to establish both herbaceous and shrub flora specifically picked to withstand the harsh environments along the breakwater. A planting list is presented in Appendix A.

6.3 Real Estate Considerations

This Real Estate Plan, Appendix E, was prepared in support of the AFB-level feasibility study of the Jeorse Park Beach ecosystem restoration study. The Real Estate Plan identifies and describes the area proposed for construction, operation and maintenance of the Project, in addition to the real estate requirements and procedures for implementation of a recommended Plan.

Non-Federal Sponsor Lands – The non-federal sponsor currently owns in fee all areas that will be utilized for this project. Total acreage of non-federal sponsor property needed for this project is 15.8-acres.

Non-Standard Estates – There are none for this study area.

LERRDs Crediting – Currently crediting amount is estimated to be $28,000

6.4 Permit Requirements

The following required permits are anticipated and will be obtained prior to implementation of plan components:

- Section 401 Water Quality Permit (Issued by IDEM)
- Lake Michigan Permit (Navigable Waters Act IC 14-29-1; Issued by IDNR)
- Lake Michigan Coastal Zone Consistency Determination

6.5 Monitoring Plan

Ecosystem restoration monitoring plans, activities, results and cost sharing are governed by 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 up to10 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.

Component 1 – Structural Sustainability

This component covers the structural sustainability of the implemented features. It is a qualitative assessment of whether each feature is retaining its physical character and project purpose. The most important information derived from this component would be to determine if adaptive management measures are needed or not. This monitoring would take place once a year for up to 10-years. Structural components are currently broken down into the following:

1) breakwater void fill and rock reef habitat
    a) monitor stability and erosion
2) plant community reestablishment
    a) dune
    b) beach
    c) breakwater plantings

The following is a list of parameters that would be assessed:

1. Breakwater Void Fill and Rock Reef Habitat
    a. Cohesiveness and durability
    b. Conformity
2. Plant Community Zones
    a. Spatial coverage
    b. Invasive species % coverage
    c. Predator induced damages
    d. Hydraulic induced damages
3. Human Interference & Damages
    a. Physical damage
    b. Removal
    c. Rubbish and foreign debris

Component 2 – Biological Response

These monitoring events would occur every other year during a 10-year monitoring period.

1. Plant Communities
    a. FQA
    b. Species Richness
2. Macroinvertebrate & Fish Community
    a. Species Richness
    b. Abundance
3. Avian Community
    a. Species Richness
    b. Abundance
4. Other Fish & Wildlife Communities
    a. Species Richness
5. Supporting Data (DO, pH, temperature, nutrients)

Component 3 – Planning Goal & Objectives

The principal goal of the potential project is to restore a lacustrine, beach and dune communities for resident and migratory birds, native amphibians and fishes in the Jeorse Park Beach. The monitoring plan

goal is to determine if the goal as stated is being met. This would be determined through the assessment of whether the study objectives are being met. Planning objectives for this study are as follows:

The two planning objectives would be assessed the same way as the FWOP and FWP project benefits were modeled as described in Section 2.5 – Habitat Quality Forecasting. The floristic portion of the modeling would be completed as described in Section 2.5. The habitat portion of the modeling would be completed as described in Section 2.5. **Tables 3-5** shows what data would be collected.

Schedule of Costs

Table 9: Monitoring Schedule and Costs

Tasks	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Total
Component 1	$ -	$ 1,000	$ -	$ 1,000	$ -	$ 1,000	$ -	$ 1,000	$ -	$ 1,000	$ 5,000
Component 2	$5,000	$ 5,000	$5,000	$ 5,000	$5,000	$ 5,000	$5,000	$ 5,000	$5,000	$ 5,000	$ 50,000
Component 3			$1,000	$ -	$ -	$ -	$1,000	$ -	$ -	$ 1,000	$ 3,000
Final Report	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$10,000	$ 10,000
Total	$5,000	$ 6,000	$6,000	$ 6,000	$5,000	$ 6,000	$6,000	$ 6,000	$5,000	$17,000	$ 68,000

6.6 Operation & Maintenance

A detailed O&M Manual containing all the duties will be provided to the non-Federal sponsor after construction is closed out. The O&M for Chicago District ecosystem projects are practical and minimal due to initial project design efforts and design targets for sustainability. Most if not all of the O&M activities are no different than the specific activities that would take place during construction. The O&M described here is not the same as Adaptive Management measures that may be warranted to correct for deficiencies found in either structural integrity or biological response metrics within the monitoring plan. The O&M costs of the project are estimated to an average annual cost of $3,000 with a 3.75% interest rate over 50 years. The following are currently known operation and maintenance activities that the non-Federal Sponsor would undertake.

Invasive Plant Species Control – The maintenance activity is probably the most important to conduct. Staying ahead of the weeds goes a long way in avoiding large scale herbicide or physical eradication and replanting efforts. Three work days a year by a qualified entity would be able to keep weeds from invading the Jeorse Park ecosystem since the acres are so small. Species that should be eradicated include but is not limited to Russian Olive, Canadian Thistle, Reed Canary Grass, Glossy False Buckthorn, Yellow Sweet-Clover, Rough Cocklebur, and Tree of Heaven.

Native Plant Community Maintenance – It will be required to maintain the species richness, abundance and structure of the restored plant communities within Jeorse Park. Invasive plant species are not the only threat to plant community degradation. Aside from minor re-plantings, it will be important to continue to protect plant communities from external changes by man's daily activities, whether single incidents or chronic stressors. These can cause plant communities to experience significant species richness declines even to the point of becoming monotypic stands. The best operational measure to quickly identify and rectify external stressors is vigilance. Routine inspections by the non-Federal sponsor's qualified stewards are imperative to notice adverse change quickly. The long term monitoring plan provided above will not catch quick change as would routine inspection by site stewards.

Fish, Amphibian, and Bird Monitoring – It will be encouraged to monitor for the presence of native bird, fish, amphibian and reptile species. Monitoring for native fauna provides insight into the continued success of the restoration of the Jeorse Park ecosystem and may provide clues to the improving or degrading conditions of the site years after the restoration work has been completed.

6.7 Implementation of Environmental Operating Principles

In assessing the environmental effects, USACE implemented the following Environmental Operating Principles (EOPs)[31] as part of this Feasibility Study.

Foster sustainability as a way of life throughout the organization.

Plans to restore native plant and fauna communities to Jeorse Park will be easily sustainable because of the adaptability of the proposed communities to the conditions on site. With minimal monitoring and maintenance, the newly introduced communities outlined within the NER should have lasting success. This design creates sustainability by avoiding the use any mechanical features which would require intensive operations and maintenance over time. Additionally, the proposed work is taking place within the East Chicago Park District lands, which are cared for and maintained in perpetuity.

Proactively consider environmental consequences of all Corps activities and act accordingly.

The study team considered environmental consequences of proposed restoration features and construction activities. A cumulative effect assessment was completed to ensure all things were considered. Participation from Federal, state and local agencies and stakeholders were also held to ensure the most environmentally beneficial project. The study team does not anticipate negative impacts to the Jeorse Park study area based on the restorative nature of the project, which would reestablish healthy native plant communities.

Create mutually supporting economic and environmentally sustainable solutions.

The study team formulated potential restoration plans to determine what the most cost-effective solution for ecosystem restoration is; however, appropriate engineering studies and biological assessments were performed to ensure that an implemented plan would be sustainable. Designs for the Jeorse Park restoration project rely on the parameters provided by the everyday system and predicted future changes.

Continue to meet our corporate responsibility and accountability under the law for activities undertaken by the Corps which may impact human and natural environments.

This project is exemplary for meeting USACE corporate responsibility and accountability. HTRW analyses were completed and reviewed to ensure construction activities would not result in an unlawful release of contamination (Appendix D). The Laws, Compliance Statues and Executive Orders support the NER plan, which are discussed in the Federal Objective, Institutional Significance of the NER Plan and Compliance.

Consider the environment in employing a risk management and systems approach throughout life cycles of projects and programs.

Risks associated with ecosystem restoration projects are typically low, for example, if certain portions of the project were to fail, other portions could be successful just as well; so it is not an all or nothing scenario. There is typically no chance for the loss of or causing discomfort to human life as well. In the case of Jeorse Park, restoring native plant and fauna communities within the study area would only have

[31] USACE. Environmental Operating Principles.
https://eko.usace.army.mil/usacecop/environmental/eop/

beneficial affects to people and the environment. Risk considerations for this project primarily deal with the cost obligated to restore the environment and ultimately gain no benefits in return. The study team has not only incorporated very detailed engineering models to ensure the physical resilience of the habitat features, but have also weighed the biological conditions against other natural areas and similar restoration projects to ensure the plan will function as expected. The study has also presented this question to review teams within and outside of the USACE to ensure a high level of quality assurance.

Leverage scientific, economic, and social knowledge to understand the environmental context and effects of Corps actions in a collaborative manner.

This Feasibility Study was conducted in a manner that leveraged scientific knowledge from the USEPA, USGS, IN-DNR, GLNPO, Michigan State University, East Chicago Water Management District and previously constructed Chicago District ecosystem restoration projects. The study team will also meet with governmental agencies, local industry, and environmental interest groups to gather scientific, economic and social information that pertains to the Jeorse Park study area.

Employ an open, transparent process that respects views of individuals and groups interested in Corps activities.

This study process and subsequent Feasibility Report was drafted in a manner that has reduced redundancies, excessive and inconsequential information, and confusing engineering and policy discussions. Presentation of this study was done in a clear sequential order to show what the natural condition of Jeorse Park was historically, what the existing conditions are now, what they would be if left alone, what could be done, and what should be done based on considerations of ecosystem improvement and associated costs.

6.8 NEPA Compliance

The President's Council on Environmental Quality guides public participation opportunities with respect to Feasibility Reports and Environmental Assessments, Engineering Regulations, and procedures for implementing NEPA. The Jeorse Park ecosystem restoration plan was determined to be in compliance with NEPA and all other appropriate statutes and executive orders (Section 5.6 Compliance with Environmental Statutes). Coordination and compliance for this feasibility study and integrated environmental assessment included comprehensive public involvement, agency coordination, and review of and has included compliance with applicable Federal statues per the USACE Engineering Regulation 1105-2-100, Planning Guidance Notebook.

6.8.1 Mitigation Requirements

Since this is an ecosystem restoration project in which once lost resources would be recovered by the Federal Action; therefore, mitigation is not warranted.

6.8.2 Public/Agency Comments & Views

Public and Agency Review of the Draft EA

A draft Detailed Project Report and Integrated Environmental Assessment along with a draft Finding of No Significant Impact were released for public and agency comment on 28 January 2016 (Appendix A). The comment period was open through 5 March 2016. The review package was available to the public through an open access website where the main report and all appendices could be readily downloaded.

Access to the documents could also be requested if there were any issues in accessing these documents on the webpage. To help distribute news of the public review period, the Chicago District released a Facebook post on 5 February 2016 and press releases to the Post Tribune, the NW Indiana Times and the Great Lakes Information Network on 9 February 2016. Additionally, a summary of the Preferred Plan/NER Plan was provided to the Jeorse Park Interagency Taskforce and a link to the project website was provided to that group for further disbursement. No public comments were received during the NEPA 30 day review period.

In addition to the public outreach, stakeholder and agency letters were mailed from the Chicago District on 28 January 2016. A mailing list of agencies included can be found in Appendix A. Response letters were received from five agencies including US Fish and Wildlife Service, US Environmental Protection Agency, State Historic Preservation Office, Indiana Department of Environmental Management, and the Indiana Department of Natural Resources. Overall, the letters showed support for the Preferred Plan/NER Plan with no objections. Precautionary statements were provided indicating required permits for the proposed restoration measures of breakwater plantings and rock reef construction. Best management practices for erosion control, suspended sediment containment and re-vegetation of impacted resources were also recommended.

Publication of the Finding of No Significant Impact (FONSI)

The Agency and Public review and comment period ended 5 March 2016. All pertinent comments from Agencies and the Public were received, considered and incorporated into the Final document as warranted. There are no outstanding issues remaining. The signed Finding of No Significant Impact may be found in Appendix A.

6.9 Project Schedule & Costs

Table 10: Study & Tentative Project Schedule

Schedule Item	Completion Date
Alternative Formulation Briefing/Approval for Release	December 2015
NEPA Public and Agency Review Period (30-Day)	January 2016
Final Feasibility Report Approval	March 2016
Project Partnership Agreement (PPA) Signed	July 2016
Real Estate Complete	July 2016
Contract Award	September 2016
Implementation Complete	Fall 2021

6.9.1 Total Project Costs

Total project costs include costs for study, design, implementation, contingencies, construction management, engineering during construction (EDC) and project management. Costs for design and management are estimated based on a percentage of estimated implementation costs and contingencies. These costs will be revised prior to the execution of a Project Partnership Agreement (PPA) and actual costs for these activities will be used to remedy final cost sharing responsibilities during project close-out. Total project costs were escalated to the mid-point of estimated construction using factors contained in EM 1110-2-1304, Civil Works Construction Cost Index System (CWCCIS). **Table 11** provides a summary of the Fully Funded Project costs for the NER Plan as presented in the Cost Certification TPC. Using the fully funded escalated costs and the implementation schedule, a summary of funding requirements by fiscal year was developed as presented in **Table 12** for the NER Plan.

Table 11: NER Plan Total Costs in 1,000s

Item	Cost
Feasibility Study	$ 200
Planning Engineering and Design	$ 86
Construction	$ 1,893
Const. Management & Monitoring	$ 173
LERRDs Credit	$ 28
Total Project Cost	**$ 2,380**
Average Annual O&M	$ 3
Cost Sharing	
100% Federal	$ 100
65% Federal	$ 1,482
35% non-Federal	$ 798
Total	$ 2,380

Cost Certified by Walla Walla Cost MCX 30 September 2015

Table 12: NER Plan Cost Apportionment in $1,000s

	FY14	FY15	FY16	Cost Shared Total
Feasibility Phase				
Feasibility Report	$50	$150		$200
Design & Implementation				
Planning Engineering and Design			$86	$86
Construction			$1,893	$1,893
Const. Management & Monitoring			$173	$173
LERRDs Credit			$28	$28
Shared Project Cost	**$50**	**$150**	**$2,180**	**$2,380**
Fed / non-Fed Breakdown				
FED Share Feasibility $100K	$50	$50	$ -	$100
FED Share	$ -	$65	$1,417	$1,482
non-FED	$ -	$35	$763	$798
non-FED cash/WIK	$ -	$35	$735	$770
non-FED LERRD	$ -	$ -	$28	$28

Cost Certified by Walla Walla Cost MCX 30 September 2015

6.9.2 Financial Capability of Non-Federal Sponsor

In accordance with regulation ER1105-2-100, Appendix D, the non-Federal sponsor has sufficient funds currently available. The non-Federal sponsor is committed to its specific cost share of the Design & Implementation (D&I) Phase, and expresses willingness to share in the costs of construction to the extent that can be funded.

CHAPTER 7 – RECOMMENDATION

I have considered all significant aspects of the problems and opportunities as they relate to the project resource problems of the Jeorse Park Beach restoration project. Those aspects include environmental, social, and economic effects, as well as engineering feasibility. I recommend that the NER Plan be implemented as a Federal project, with such modifications thereof as in the discretion of the Commander, USACE may be advisable. The estimated Fully Funded Cost of the NER Plan is $2,380,000 and the estimated annual operations, maintenance, repair, replacement and rehabilitation (OMRR&R) cost is $3,000. The Federal portion of the estimated total project cost is $165,000 for the Feasibility Phase and $1,417,000 for Design & Implementation. The non-Federal share of the estimated first cost of the project is about $798,000 and will be covered by lands, easements, rights-of-way, utility or public facility relocations, and dredged or excavated material disposal areas (LERRDs)of $28,000 and a cash contribution of $770,000.

As established in PL99-662, as amended, project costs are shared with the non-Federal sponsor in accordance with project outputs. The City of East Chicago has agreed to serve as the local cost-sharing sponsor for the Jeorse Park Beach, City of East Chicago, Indiana 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. Federal implementation of the recommended project would be subject to the non-Federal sponsor agreeing to comply with applicable Federal laws and policies, including but not limited to:

a. Provide a cost share of the total project costs as further specified below:

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 PCA
   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 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 USACE implementation guidance limitation of $10,000,000
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

The recommendations contained herein reflect the information available at this time and current departmental policies governing formulation of individual projects. They do not reflect program and budgeting priorities inherent in the formulation of a national Civil Works construction program nor the perspective of higher review levels within the Executive Branch.

Christopher T. Drew
Colonel, U.S. Army
District Commander

CHAPTER 8 – REFERENCES

Angelstam, P. 1992. Conservation of communities—the importance of edges, surroundings and landscape mosaic structure. Pages 9–70 in L. Hansson, editor. Ecological principles of nature conservation. Applications in temperate and boreal environments. Elsevier Applied Science, London.

Burgess, R.L. and D.M. Sharpe. 1981. Forest Island dynamics in man dominated landscapes. *Folia Geobotanica et Phytotaxonomica,* 18(2), 188.

Brock, K.J. 1999. Birds of the Grand Calumet River Basin. 1999/2000 Proceedings of the Indiana Academy of Science 108/109; 145-162.

Chung CL, Ochsner U, Byappanahalli MN, Whitman RL, Tepp WH, Lin G, Johnson EA, Peller J, and Sadowsky MJ. 2013. Association of toxin-producing Clostridium botulinum with the macroalga Cladophora in the Great Lakes. Environmental Science Technology, 2013 Mar 19; 47(6):2587-94.
Ecometrix Incorperated. 2014. Literature Review and Field Investigations of Round Whitefish Habitat along the North Shore of Lake Ontario. http://www.ajax.ca/en/doingbusinessinajax/resources/LiteratureReview.pdf [accessed 6 November 2014].
Ervin, G. N., Herman, B. D., Bried, J. T., & Holly, D. C. 2006. Evaluating non-native species and wetland indicator status as components of wetlands floristic assessment. *Wetlands, 26*(4), 1114–1129.

Fernandez-Juricic, E. and J. Jokimäki. 2001. A habitat island approach to conserving birds in urban landscapes: case studies from southern and northern Europe. *Biodiversity & Conservation,* 10(12), 2023-2043.

Garza, E.L., Whitman, R.L., 2004. The nearshore benthic invertebrate community of southern Lake Michigan and its response to beach nourishment. *J. Great Lakes Res.* 30, 114–122.

Harris G.P. 1994. Pattern, process and prediction in aquatic ecology. A limnological view of some general ecological problems. *Freshwater Biology*, 32, 143-160.

Höök, T.O., E.S. Rutherford and D.M. Mason. 2007. Hatch Dates, Growth, Survival, and Overwinter Mortality of Age-0 Alewives in Lake Michigan: Implications for Habitat-Specific recruitment Success. *Transactions of the American fisheries Society* 136(5), 1298-1312.

Indiana Department of Environmental Management (IDEM). 2012. Update to the Stage 2.5 Remedial Action Plan (RAP) Grand Calumet River/Indiana Harbor Ship Canal Area of Concern. http://www.in.gov/idem/files/grancal_rap_stage_2_update.pdf [accessed 15 May 2014].
Indiana Department of Environmental Management (IDEM). 2013. Microbial Contaminants and Their Potential Sources along the Indiana Shoreline. Report Prepared by US Geological Survey, Great Lakes Science Center for IDEM. March 15, 2013. Contract A305-1-13.

Indiana Department of Natural Resources - Natural Resource Commission. 2014. A Synthesis of Major Topics in the Lake Michigan Coastal Area.
http://www.in.gov/nrc_dnr/lakemichigan/3v5wetdr/3v5wetdr1.html [accessed 6 May 2014].
Marzluff, J.M. and K. Ewing. 2001. Restoration of Fragmented Landscapes for the Conservation of Birds: A General Framework and Specific Recommendations for Urbanizing Landscapes. *Restoration Ecology,* 9(3), 280-92.

Mierzwa, K.S., S.A. Cortwright and D.A. Beamer. 1999. Amphibians and Reptiles of the Grand Calumet River Basin. *Proceedings of the Indiana Academy of Science,* 108/109:105-121.

Nalepa, T.F., Hartson, D.J., Fanslow, D.L., Lang, G.A., and Lozano, S.J. 1998. Declines in benthic macroinvertebrate populations in southern Lake Michigan, 1980–1993. *Can. J. Fish. Aquat. Sci.* 55:2402–2413.

Niemelä J. 1999. Ecology and urban planning. *Biodiversity and Conservation* 8: 119–131.

National Park Service. 2015. Indiana Dunes – Nature. http://www.nps.gov/indu/learn/nature/index.htm. [Accessed 15 November 2015].

Ockinger, E., Smith, H., 2008. Do corridors promote dispersal in grassland butterflies and other insects? Lands. Ecol. 23, 27–40.

Phanikumar, M.S. and T.D. Nguyen. 2015. Modeling the Relative Influence of Indiana Harbor on Recreational Water Quality and Remediation Scenarios at Jeorse Park Beach. Final Report to Indiana Department of Environmental Management.

Pothoven, S.A., Nalepa, T.F., and Brandt, S.B. 2000. Age-0 and Age-1 Yellow Perch Diet in Southeastern Lake Michigan. J. Great Lakes Research 26(2):235-239.

Saunders, D. A., G. W. Arnold, A. A. Burbidge, and A. M. Hopkins, editors. 1987. Nature conservation: the role of remnants of native vegetation. Surrey Beatty and Sons, Chipping Norton, Australia.

Steven A. Pothoven , Thomas F. Nalepa , Philip J. Schneeberger & Stephen B. Brandt (2001) Changes in Diet and Body Condition of Lake Whitefish in Southern Lake Michigan Associated with Changes in Benthos, North American Journal of Fisheries Management, 21:4, 876-883, DOI: 10.1577/1548 8675(2001)021<0876:CIDABC>2.0.CO;2.

Swink, F.A. and Wilhelm, G.S. 1979. Plants of the Chicago region (3d ed., revised and expanded with keys): Lisle, Ill., The Morton Arboretum.
United States Army Corps of Engineers (USACE). 2002. Environmental Operating Principles. http://www.usace.army.mil/Missions/Environmental/EnvironmentalOperatingPrinciples.aspx [accessed 18 Sept 2015].

United States Army Corps of Engineers (USACE), Great Lakes Hydraulics and Hydrology Branch. 1994. Review of Application to construct a breakwater and docking facilities related to operation of a floating casino in Lake Michigan at East Chicago, Indiana. CENCE-EP-HR (CENCE-CO-L/94-056-027-0A/19 Jul 94) (1145) 1st End Thompson/66792/26 August 1994.

United States Census Bureau. 2010. *2010 Census*.U.S. Census Bureau. http://www.census.gov/2010census/data/ [accessed 10 November 2014].

United States Environmental Protection Agency (USEPA) Office of Water Health and Ecological Criteria Division. 2009. Review of Published Studies to Characterize Relative Risks from Different Sources of Fecal Contamination in Recreational Water. February 2009. EPA 822-R-09-001.
United States Geologic Survey (USGS) – ScienceBase Catalog. 2014. Jeorse Park Beach Contamination. https://www.sciencebase.gov/ catalog/item/53598194e4b0031b2f4a0752 [accessed 6 November 2014].