IFC 20160009

AECOM

Submitted by:
AECOM
303 E Wacker Drive
Chicago, IL 60601
April 5, 2016

April 5, 2016

Mr. James Casey
Illinois Department of Natural Resources
Office of Water Resources
Lake Michigan Management Section
Michael A. Bilandic Bldg.
160 N. LaSalle Street, Suite # S-700
Chicago, IL 60601

RE: Jackson Harbor 10 Year Maintenance Dredging Project
Chicago Park District

Mr. Casey,

This application provides detailed information in support of a federal consistency determination for a 10 year dredging permit at Jackson Harbor located at 6400 S. Coast Guard Drive in Chicago.

The Chicago Park District has been maintaining the harbor under a 10-year dredging permit that recently expired. This permit application package proposes to obtain a dredging permit for the next 10-year period. This permit application proposes mechanical dredging with upland disposal at appropriately permitted locations. The attached report provides a summary and illustration of the 10 year dredging plan limits.

The proposed activity complies with Illinois' approved coastal management program and will be conducted in a manner consistent with such policies. The conditions of the Illinois Coastal Management Program will be satisfied in considering the following:

- There will be no significant impacts to navigation
- Dredged material is clean sand and will be removed from the harbor in an appropriate fashion
- Water quality will not be degraded

If you have any questions regarding this application, please contact the undersigned at (847) 323-2171.

Sincerely,

Samuel Shaffer
Assistant Project Engineer

William J. Weaver, PE, D.WRE
Senior Principal Engineer – Vice President

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DIVISION OF RESOURCE MANAGEMENT

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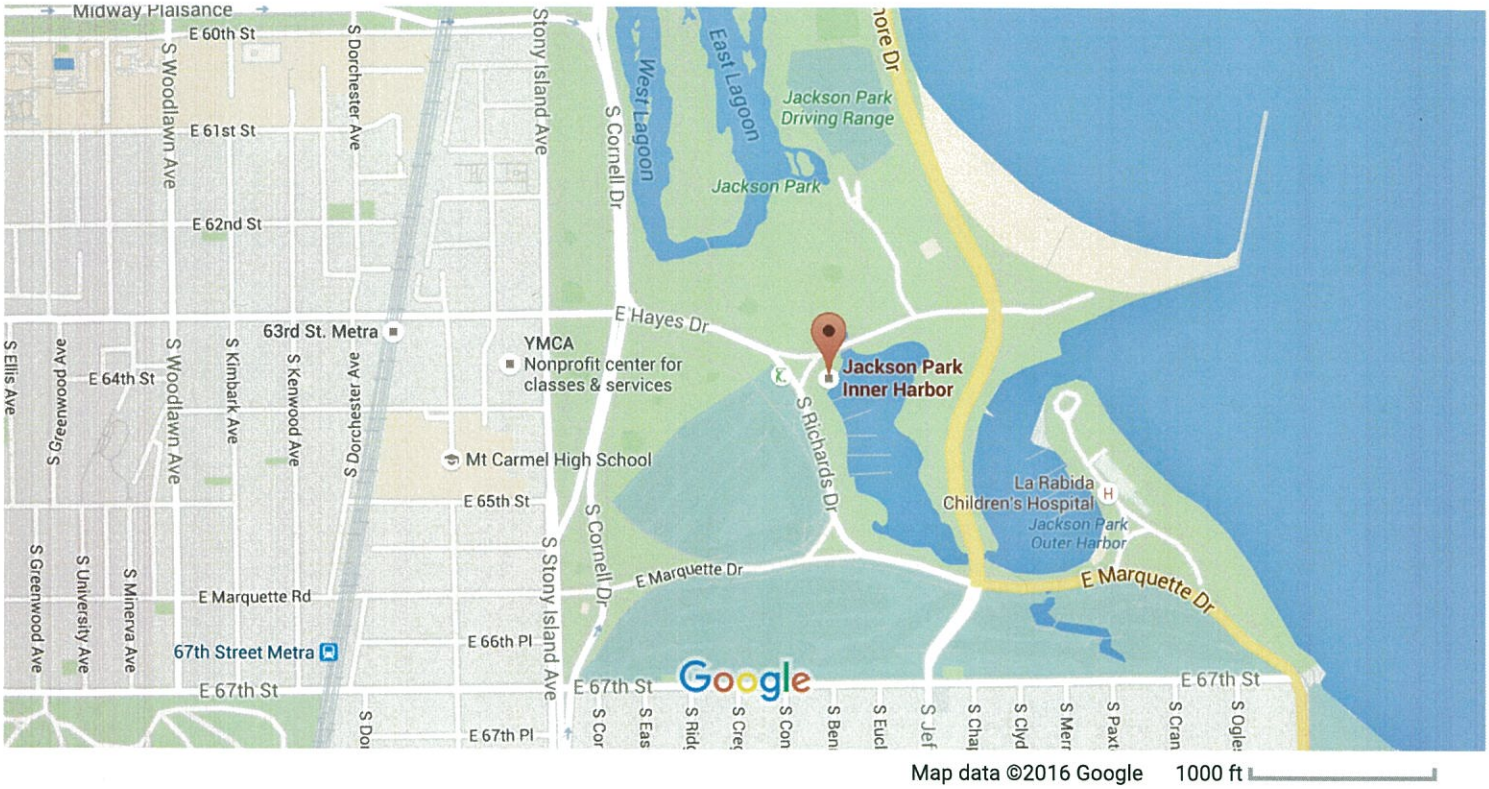
Google Maps Jackson Park Inner Harbor



Map data ©2016 Google 1000 ft

Google Maps

AECOM

Submitted by:
AECOM
Chicago, IL
Project No. 60283337
May, 2014

Permit Application Report:

IDNR Part 3700 Waterway Construction Permit, Clean Water Act Section 404 Permit, Section 10 of the Rivers and Harbors Act, and CWA Section 401 Water Quality Certification

Jackson Harbor Maintenance Dredging: 10 Year Permit Application
Chicago Park District

AECOM Project No. 60283337

Prepared by:
Sarah Pasquesi, EIT, Assistant Project Engineer
William J. Weaver, P.E., D.WRE
Sr. Principal Engineer, Vice President

JOINT APPLICATION FORM FOR ILLINOIS

ITEMS 1 AND 2 FOR AGENCY USE

1. Application Number	2. Date Received
C20160013	3/29/16

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

3a. Applicant's Name:	3b. Co-Applicant/Property Owner Name (if needed or if different from applicant):	4. Authorized Agent (an agent is not required):
Scott Stevenson	Heather Gleason	Bill Weaver
Company Name (if any) : Westrec Marinas	Company Name (if any): Chicago Park District	Company Name (if any): AECOM
Address: 541 N. Fairbanks Chicago, IL 60611	Address: 541 N. Fairbanks Chicago, IL 60611	Address: 303 E. Wacker Dr. Suite 1400 Chicago, IL 60601
Email Address:	Email Address:	Email Address:
Applicant's Phone Nos. w/area code	Applicant's Phone Nos. w/area code	Agent's Phone Nos. w/area code
Business:	Business:	Business:
Residence:	Residence:	Residence:
Cell:	Cell:	Cell:
Fax:	Fax:	Fax:

STATEMENT OF AUTHORIZATION

I hereby authorize, Bill Weaver to act in my behalf as my agent in the processing of this application and to furnish, upon reques permit application.

Applicant's Signature — Date: 3/29/2016

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

Name	Mailing Address	Phone No. w/area code
a. Chicago Park District	All Adjacent Properties are owned by the Chicago Park District	
b.		
c.		
d.		

6. PROJECT TITLE:
Jackson Harbor Maintenance Dredging: 10 Year Permit Application

7. PROJECT LOCATION:
Jackson Park Harbor, Chicago, IL

LATITUDE: 41.77953 °N	UTMs
LONGITUDE: -87.57298 °W	Northing: 4625457
	Easting: 452383

STREET, ROAD, OR OTHER DESCRIPTIVE LOCATION	LEGAL DESCRIPT	QUARTER	SECTION	TOWNSHIP NO.	RANGE
6400 S. Lake Shore Drive		NE	24	38N	14E

☒ IN OR ☐ NEAR CITY OF TOWN (check appropriate box)
Municipality Name: Chicago, IL

COUNTY	STATE	ZIP CODE
Cook	IL	60613

WATERWAY	RIVER MILE (if applicable)
Lake Michigan	

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DIVISION OF RESOURCE MANAGEMENT

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8. PROJECT DESCRIPTION (Include all features):

This project includes maintenance dredging for Jackson Harbor and the harbor mouth. See the attached permit report for further project details.

9. PURPOSE AND NEED OF PROJECT:

To remove sediment that regularly deposits at the harbor mouth and in the harbor to provide for boat access.

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

10. REASON(S) FOR DISCHARGE:

This application is for a Letter of Permission to perform mechanical dredging. The dredged material will be removed from Lake Michigan and deposited upland at an appropriately permitted site. No dredgined materials will be deposited or discharged to Lake Michigan.

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

TYPE: None

AMOUNT IN CUBIC YARDS:

None

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

None

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

Refer to the attached report for a detailed description of the dredging project. Dredging has been and continues to be the only option to keep the harbor open as sediment is periodically deposited in the harbor and harbor mouth areas.

14. Date activity is proposed to commence 08/2014 — Date activity is expected to be completed 8/2024

15. Is any portion of the activity for which authorization is sought now complete? Yes [ ] No [X] NOTE: If answer is "YES" give reasons in the Project Description and Remarks section. Indicate the existing work on drawings.
Month and Year the activity was completed

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

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

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

18. APPLICATION VERIFICATION (SEE SPECIAL INSTRUCTIONS)

Application is hereby made for the activities described herein. I certify that I am familiar with the information contained in the application, and that to the best of my knowledge and belief, such information is true, complete, and accurate. I further certify that I possess the authority to undertake the proposed activities.

Signature of Applicant or Authorized Agent — Date 03/2016

Signature of Applicant or Authorized Agent — Date 3/29/2016

Signature of Applicant or Authorized Agent — Date

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

SEE INSTRUCTIONS FOR ADDRESS

AECOM
303 E Wacker Drive
Chicago, IL 60601

847.323.2171 tel

May 17, 2014

Mr. Thaddeus Faught
Illinois Environmental Protection Agency
Division of Water
1021 North Grand Avenue East
Springfield, IL 62794

Mr. Mike Murphy
Department of the Army, Corps of Engineers
Chicago District
231 S. LaSalle Street, Suite 1500
Chicago, IL 60604

Mr. James Casey
Illinois Department of Natural Resources
Office of Water Resources
Lake Michigan Management Section
Michael A. Bilandic Bldg.
160 N. LaSalle Street, Suite # S-700
Chicago, IL 60601

RE: Jackson Harbor 10 Year Maintenance Dredging Project
Chicago Park District
AECOM Project No. 60283337

Gentlemen:

This report provides detailed information in support of a regulatory permit application for a 10 year dredging permit at Jackson Harbor located at 6400 S. Coast Guard Drive in Chicago. This report is supplemental to the joint application form that is attached as a cover to this package.

The Chicago Park District has been maintaining the harbor under a 10-year dredging permit that recently expired. This permit application package proposed to obtain permits for the next 10-year period. This permit application is for mechanical dredging with upland disposal at appropriately permitted locations. The attached report provides an summary and illustration of the 10 year dredging plan limits.

This application package includes a Joint Application for a Letter of Permission under Section 404 of the Clean Water Act, a Section 401 Water Quality Certification, and an Illinois Waterway Construction Permit.

If you have any questions regarding this application, please contact the undersigned at

Sincerely,

Sarah Pasquesi, EIT
Assistant Project Engineer

William J. Weaver, PE, D.WRE
Senior Principal Engineer – Vice President

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Table of Contents

1.0 Project Introduction and Background 1
2.0 Project Setting 1
3.0 Proposed Project 3
3.1 Proposed Project Description 3
4.0 Proposed Project Alternatives Analysis 4
4.1 Harbor Dredging Alternatives Analysis 4
4.2 Site Plan Alternatives 4
4.2.1 No Action Alternative 4
4.3 Selected Alternative 4
5.0 Existing Environmental Setting 5
5.1 Environmental Setting and Analysis Approach 5
5.1.1 Water Quality, Current Patterns, and Circulation 5
5.1.2 Threatened and Endangered Species 5
5.1.3 Historic and Cultural Resources 7
5.1.4 Wildlife 7
5.1.5 Aquatic Resources 7
5.1.6 Regional Geology 8
5.2 Jackson Harbor Mouth Shoreline 12
5.2.1 Local Geology 11
5.2.2 Sediment Transport and Littoral Drift 13
6.1 Wave Climate 14
6.1.1 Nearshore Wave Condition Changes 14
6.1.2 Sediment Transport and Littoral Drift **Error! Bookmark not defined.**
6.2 Water Quality 14
6.3 Threatened and Endangered Species 14
6.4 Historic and Cultural Resources 14
6.5 Wildlife 12
6.6 Aquatic Resources 14
6.6.1 Fish 14
6.6.2 Benthic Macroinvertebrates 14
6.6.3 Plankton 12
6.7 Navigation 13
6.8 Special Aquatic Sites 15
6.9 Parks, Monuments, Wilderness Areas, Research Sites, Preserves 15
6.10 Recreational and Commercial Fisheries 15
6.11 Water Related Recreation 13
7.0 Harbor Lake Bottom Sediment Analysis 14
7.1 Supernatant Chemical Analysis 14
7.2 Sediment Chemical Analysis 15
8.0 References 16

Tables

Table 5-1 Rare, Threatened & Endangered Species

Table 5-2 Reference Fishery Studies, By Location

Table 5-3 Seasonal Plankton Population

Figures

Figure 1-1 Project Location Map

Figure 2-1: Project Setting

Figure 2-2 Northerly Wind Littoral Drift Currents

Figure 2-3 Southerly Wind Littoral Drift Currents

Figure 3-1 Proposed Harbor Dredging Limits

Figure 3-2 Harbor Mouth Navigation Improvements Cross Sections

Appendices

Appendix A - Proposed Project Plan

Appendix B – Vibracore Boring Program Summary

- Boring Location Map
- Vibracore Boring Logs and Grain Size Curves
- Physical Characterization Laboratory Test Results
- Vibracore Photographs

Appendix C – Sediment Analytical Chemical Analysis

1.0 Project Introduction and Background

Jackson Harbor has been operating under a 10 – year dredging permit for navigation maintenance. The permit expired during 2013. The Chicago Park District is now applying for a new 10 year Dredging Permit. Figure 1-1 provides a project location map.

This permit application is limited to mechanical dredging with upland disposal at appropriately permitted upland locations.

Figure 2-1 Project Location Map

2.0 Project Setting

Sediment that is transported by Lake Michigan near shore currents in the vicinity of Jackson Harbor is comprised primarily of sand and silty sand. There are no significant sources of this soil material between Chicago Harbor to the North, and Calumet Harbor to the south. Furthermore, most land masses in between have hard point structures, and there are no significant sources of river sediment in this region. The beach areas that exist within this region are mature and hold fairly stable amounts of sand – generally in a state of equilibrium. During storm conditions, sand can travel to and from these areas, however, the shoreline position remains somewhat stable in a long term sense. Figure 2-1 provides an aerial photograph with existing bathymetry for this site.

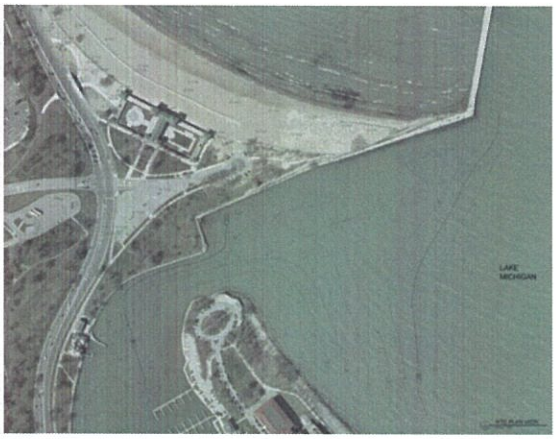

Figure 2-2: Project Setting

Jackson Harbor is situated just south of the 63rd Street pier. This pier juts out into 20 feet of water and has been a very efficient sand trap for the beach. During extreme wave events originating out of the north, the end of the pier is located within the surf zone, and a fairly significant littoral current can pass sediment to the south. Since there is little excess supply of sediment in the region, the amount of sediment passing towards Jackson Harbor is not overwhelming. However, this material tends to settle into the deeper area on the south side of the 63rd Street Beach pier located just east of the harbor mouth.

Wind generated waves and currents traveling from the south similarly carry sediment to the north. There are a number of stable beach cells north of Calumet Harbor that receive sediment during these conditions. These include the north side of the water filtration plant at 79th Street, Rainbow Beach, and the South Shore Cultural Center beach. Since there is little new sediment introduced into the region near Jackson Harbor due to the extensive lakefront development that exists in this reach, the sediment that is deposited in Jackson Harbor originates locally from a finite source of sediment that drifts north and south depending on the direction of littoral currents. The littoral currents from the south are much smaller than those from the north; as such, the amount of littoral drift that finds its way from south to north at the 63rd Street Pier is relatively smaller.

The Jackson Harbor mouth area is very well sheltered from wave activity and littoral currents from the north as well as the south. Figure nos. 2-2 and 2-3 illustrate a numerical simulation of currents from both directions. Inspection of the currents at the harbor mouth illustrates how the water is quiescent in front of the harbor mouth for winds from

both directions. In fact, the littoral currents separate from their normal directions in both cases – and are redirected towards the harbor mouth in a circular eddy current patter. This flow separation phenomenon causes reverse rolling currents that tend to focus sediment deposition at the harbor mouth. The harbor mouth is set back to the west of the longshore currents and sediment finding its way to this area tends to stay in this area.

The harbor sediment problem is exacerbated when waves from the east create littoral currents that tend to push any excess sediment at the harbor mouth area into the harbor. A sand bar historically forms just east of the harbor mouth. The sand bar tends to accumulate to form a water depth of 4 to 6 feet. At that point, waves start to break and sediment transport into the harbor is somewhat regulated. This phenomenon has been more pronounced in the recent decade as the Lake level has been at a relatively low level when compared to the historical norm. The lake level has been more than two feet below normal in recent years – even more so when the wind is blowing to the east.

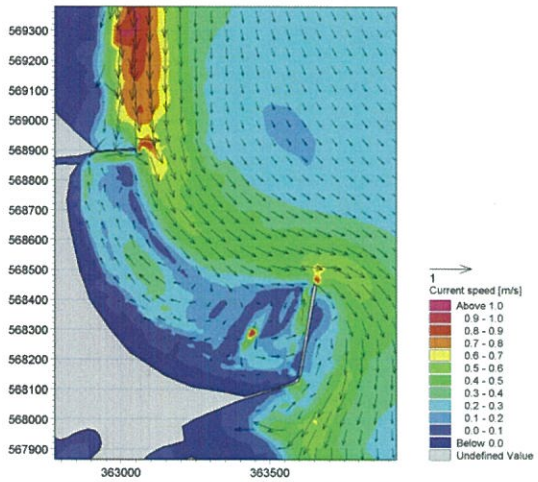

Figure 2-3 Northerly Wind Littoral Drift Currents

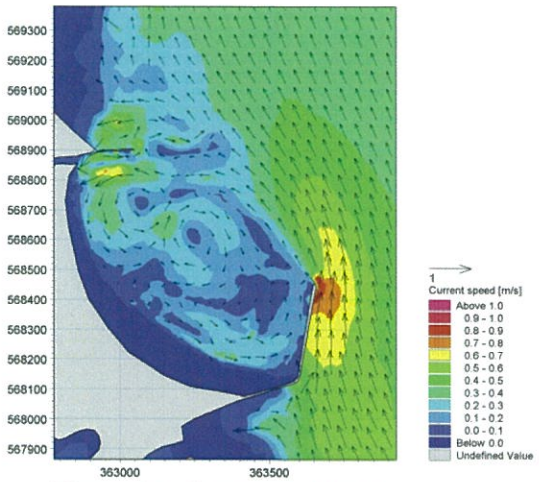

Figure 2-4 Southerly Wind Littoral Drift Currents

The amount of sediment that is presently in the harbor and harbor mouth area that has accumulated in recent years is estimated to be approximately 50,000 to 80,000 cubic yards. Much of this sediment has been accumulating over a number of years. This application seeks issuance of a new 10 year dredging permit for a total potential dredging amount of 200,000 cubic yards. The dredging to be completed under this permit will include mechanical dredging with upland disposal in appropriately permitted locations. Hydraulic dredging with discharge back to Lake Michigan is not proposed.

3.0 Proposed Project

3.1 Proposed Project Description

The proposed dredging limits are illustrated on Figure 3-1. The dredging will be limited to sand with a maximum depth to the -12 lwd contour, and within the limits shown on this figure.

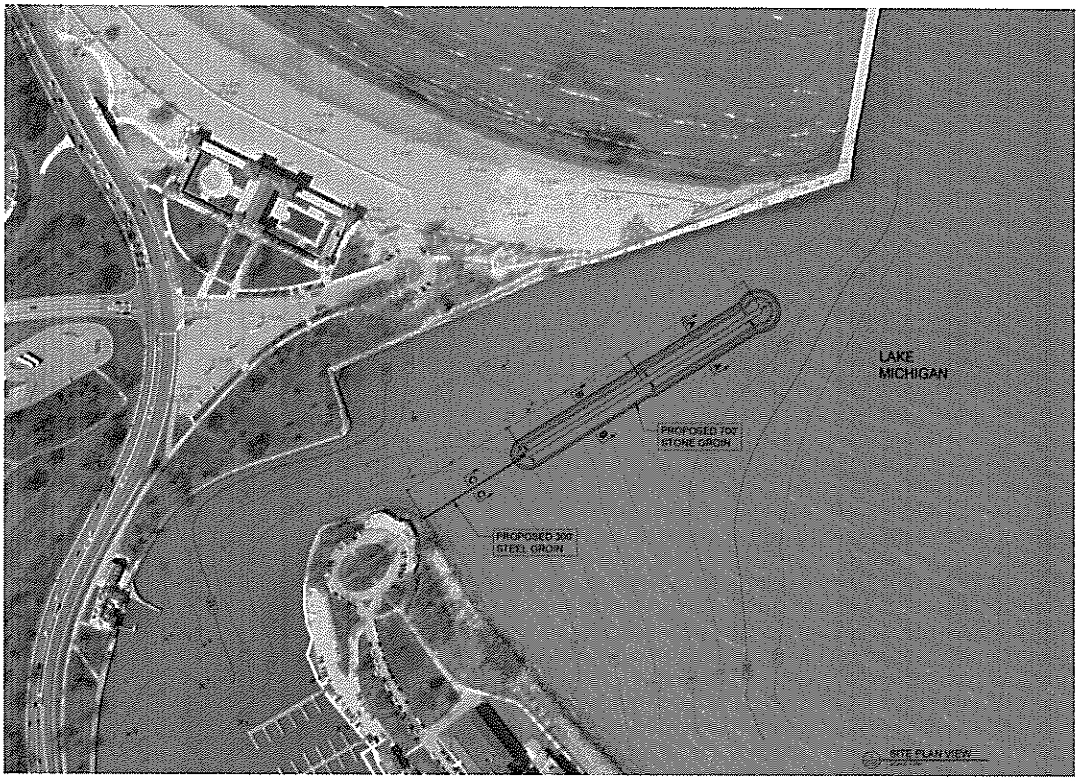

Figure 3-1 Proposed Harbor Dredging Limits

4.0 Proposed Project Alternatives Analysis

4.1 Harbor and Harbor Mouth Dredging Alternatives Analysis

A number of alternative design configurations were considered for the proposed Jackson Harbor dredging project. The alternative design selection process included consideration of the following issues:

- Environmental impact avoidance and minimization, and enhancement opportunities
- Construction cost and economic viability
- Stakeholder issues
- Navigation issues
- Enhancement to the public experience in the Jackson Harbor mouth area
- Public space impacts and access to the water
- Public safety

4.2 Alternatives

4.2.1 No Action Alternative

The no action alternative was considered and ruled out for this site for the following reasons:

- The existing condition is a problem that threatens to overwhelm the harbor with sediment. The removal of sediment in an ongoing dredging maintenance program is necessary to maintain proper access into the harbour mouth and to the boat slips.
- If a sediment management program is not possible, sediment will continue to funnel into the harbor due to the littoral setting as described in section 2.0. Access will be restricted and the harbor will no longer be viable.

4.3 Selected Alternative

The proposed 10 year dredging plan provides a maintenance activity that is necessary to keep the harbor accessible to the public. Dredging has been an ongoing activity for this historic harbor, and is necessary to maintain proper and safe access for the boating public that uses the harbor. Without dredging, the harbor siltation will make access difficult and eventually impossible forcing the shutdown of the harbor.

5.0 Existing Environmental Setting

5.1 Environmental Setting and Analysis Approach

5.1.1 Water Quality, Current Patterns, and Circulation

There are no comprehensive water quality data available for this site. None of the agencies contacted indicate that the lake is monitored on a regular basis except for the water supply intake sites, and that data is not readily available. Limited information is available (JJR, 1991) as follows:

- MWRD evaluated various water quality parameters as part of the Operation Lake Watch Program between 1980 and 1985 at seven shoreline locations. During 1985 various nutrients and pollutant parameters were monitored on a monthly basis from February to November. These data generally exceeded the Water Quality Standards for Lake Michigan waters designated by the State of Illinois. While fecal coli form levels exceeded standards, there have been reports of beach closings over the years when beaches have been closed.

- WAPORA, Inc. initiated a water quality evaluation at navy Pier in 1980 and found dissolved Oxygen levels to average 8.7 mg/l and secchi disk depth was 16 feet – both indications of good water quality.

Turbidity levels fluctuate significantly during Lake Michigan storm conditions. This phenomenon is readily observed during storm events.

Water quality monitoring conducted by IEPA during 2006 at Diversey Harbor indicates the following:

- Dissolved oxygen generally ranged between 6.1 and 11.3 mg/l. Most readings were in the 8 to 9.5 mg/l range. The lowest readings occurred in shallow areas of the harbor during summer months.

- Oxygen levels generally reduce with depth however, the reduction is not significant at all but the most shallow sample locations.

- Secchi disc depth readings range from 1.2 feet to 9 feet. The lower readings tend to occur in the more shallow sites. The deeper water sample sites generally produce readings in the range of 6.5 to 9 feet.

A 1982 study completed as part of a Cook County maintenance dredging and disposal facility environmental assessment (USCOE, 1982) indicates that the water quality of Lake Michigan is highly variable and frequently does not meet the water quality standards for Lake Michigan. Reference is made to periods of stagnant water and algae blooms. However, the water quality is sufficient to support a viable benthic and fish population.

The project is not expected to have any significant impacts to water quality. The existing flow patterns, flow, velocity of water, and Lake Michigan wave action will not be altered during implementation of the project, or after completion.

5.1.2 Threatened and Endangered Species

No state- or federally-listed threatened and endangered species are known to be present within the project area. The site is within the range of the federally endangered Indiana Bat (*Myotis sodalist)* the Karner blue butterfly (*Lycaeides Melissa samuelis),* the threatened Pitcher's thistle (*Cirsium pitcheri*), and the candidate eastern massasauga rattlesnake (*Sistrurus catenatus catenatus).* However, the project area contains no habitat likely to be used by threatened or endangered species with the possible exception of migratory avian species. Due to the nature of the project area as a disturbed urban lacustrine environment, no species of rare, threatened or endangered plants will be affected by the project. Four species of fish in Lake Michigan are listed as threatened by

the state of Illinois; the lake sturgeon, the longnose sucker, the cisco and the lake whitefish. These fish have specific habitat requirements which do not occur within the project area. Accordingly, these species are not likely to be affected by the project. Table 5-1 provides a summary of rare, threatened and endangered species with potential to be in the project area.

Seven species of threatened and endangered birds are known to have been observed along the Chicago lakefront. The species are passing migrants and would not have breeding or other critical habitat that would be affected by the project. None of these species will be affected by the project.

TABLE 5-1
Rare, Threatened & Endangered Species (Of Motile Populations)
Which Have Potential Presence in the Project Area

Fish Species		
Species Name	Status	Habitat
Acipenser fulvescens Lake Sturgeon	Threatened	Bottom-dweller of lakes and large rivers; 4-9m deep, over mud, sand and gravel bottoms
Catostomus catastomus Longnose Sucker	Threatened	Prefers clear, cold, deep (> 8 m) water of lakes and tributaries.
Coregonus artedii Cisco	Threatened	Deep water lake fish; all-season depth range of 15-55m.
Coregonus clupeaformis Lake Whitefish	Threatened	Deep water lake fish; found at depths up to 128m.
Bird Species*		
Species Name	Status	Habitat
Ammodramus henslowii Henslow's Sparrow	Threatened	Area-sensitive grassland bird; prefers grassy areas > 50 ha in size. Migrant.
Botaurus lentiginosus American bittern	Endangered	Reclusive wading bird of marshes and shallow lakeshores.
Chlidonias niger Black Tern	Endangered	Freshwater marshes and shallow ponds, lakes and large wetlands. Rare migrant.
Nycticorax nycticorax Black crowned night heron	Endangered	Summer resident of bottomland forest, willow or cottonwood thickets. Visitors from Lake Calumet colony, Cook County, Illinois.

Pandion haliaetus Osprey	Endangered	Summer resident; coastal areas where fish are abundant. Migrant.
Sterna forteri Forster's Tern	Endangered	Marsh-bordered lakes. Common migrant and rare resident in Illinois. Inland nester in Chain-o-Lakes area, Lake County, Illinois.
Sterna hirundo Common Tern	Endangered	Colonial nester in sand and pebble beaches. Common migrant. Colony at Illinois Beach State Park, Lake County, Illinois.

*Bird species presented here were observed in the vicinity of Navy Pier by Eisman and Shank in 1962. List modified through personal communication with Doug Stotz, Ornithologist at the Chicago Field Museum.

Habitat synopses from "Endangered and Threatened Species of Illinois: Status and Distribution, Volume 2 – Animals." Illinois Endangered Species Protection Board, 1991.

5.1.3 Historic and Cultural Resources

The site of the proposed shoreline construction project is in an open water area that does not contain any known historic or cultural resources.

5.1.4 Wildlife

Wildlife use of the project area is limited and consists primarily of birds and mammals common to developed lakeshore and urban areas. Species include common songbirds, pigeons, ducks, geese, gulls and other waterbirds, and small mammals such as mice and rats, bats, possum, squirrels and raccoons. The Lake Michigan shoreline is part of a known migratory flyway; seasonally, many migratory birds can be identified passing through the project area.

5.1.5 Aquatic Resources

Over the past 15 years, aquatic resource studies have not been regularly conducted within the project area. Periodically, Chicago lakeshore studies have been conducted by private companies, Loyola University, the Metropolitan Water Reclamation District (MWRD), the Illinois Department of Natural Resources (IDNR) and the U.S. Fish & Wildlife Service (USFWS). Some of these studies have been made available to AECOM for review in this assessment.

Among the literature obtained for review is the August 1991 "Navy Pier Dock Wall and Foundation Stabilization Environmental Report" (JJR, 1991). This report includes private aquatic resource information collected from offshore areas near Loyola University located north of the project area.

The generally homogenous character of Chicago's intensely developed lakefront allows some of the available aquatic resource studies to be used as reference studies for proximal Chicago lakefront areas which have similar bathymetry. Previous studies from Montrose Harbor (5.25 mi. NNE), Belmont Harbor (4.2 mi. NNE) and Burnham Harbor (1.8 mi. S), appear most directly applicable to the project area. Many studies conducted prior to 1990 do not reflect the impact of more recent invasive species such as zebra mussels, round goby, the ruffe and others.

5.1.5.1 Fish

While Savitz *et alia* (1996) assert that the river-dwelling channel catfish (*Ictalurus punctatus*) was not previously known to occur in the Illinois waters of Lake Michigan until one example was line-caught at Diversey Harbor in 1989, an earlier study gill-netted two Lake Michigan channel catfish in the vicinity of the proposed Chicago World's Fair Site in 1984. This same site is the former Meigs Airfield site. This data is from the open waters of Lake

Michigan and documents a slightly different fish population than the data taken inside relatively sheltered Burnham Harbor a few years later.

Savitz *et alia* indicated that according to creel surveys, the sports fishery along the lakefront consists almost exclusively of yellow perch which are plentiful in all the harbors. Electrofishing of these harbors produced a more diverse result, as shown in table 5-2. Species counts vary from harbor to harbor, but a summary of total catch numbers indicates that yellow perch and alewife are the most common species, followed by gizzard shad, salmon, bass and carp. The smelt fishery appears to be limited to the deeper harbors used in this study (Belmont, Montrose and Burnham); gill-netting efforts in the shallower harbors at Diversey and Jackson Park yielded no catch.

The recreational fishery at the Jackson harbor site is likely to exhibit the same population characteristics as the reference harbors; an active sport fishery of yellow perch and seasonally, rainbow smelt. The bathymetry at this site does not encourage breeding or spawning; however, it would remain a favorable habitat for foraging and feeding.

Table 5-2
Reference Fishery Studies, By Location

Observed Fish Species by Site, Year & (Effort type)	Worlds' Fair Site 1984 (E,G,S,T)	Burnham Harbor 1988-90 (E,C)	Belmont Harbor 1988-90 (E,C)	MontroseHarbor 1988-90(E,C,G)
Alewife	X	X	X	
Black Bullhead		X	X	X
Black Crappie			X	X
Bloater	X			
Bluegill			X	
Bluntnose Minnow			X	
Brown Trout	X	X	X	X
Channel Catfish	X			
Chinook Salmon	X	X	X	
Coho Salmon	X	X	X	X
Common Carp	X	X	X	
Common Shiner	X			
Emerald Shiner	X	X	X	X
Fathead Minnow	X			
Freshwater Drum	X			
Gizzard Shad	X	X	X	X
Golden Shiner	X	X	X	X
Goldfish			X	
Green Sunfish			X	

Table 5-2
Reference Fishery Studies, By Location

Observed Fish Species by Site, Year & (Effort type)	Worlds' Fair Site 1984 (E,G,S,T)	Burnham Harbor 1988-90 (E,C)	Belmont Harbor 1988-90 (E,C)	MontroseHarbor 1988-90(E,C,G)
Johnny Darter	X			
Lake Chub	X			
Lake Trout	X			
Lake Whitefish*	X			
Largemouth Bass			X	
Longear Sunfish			X	
Longnose Dace	X			
Longnose Sucker*	X			
Mottled Sculpin	X			
Pumpkinseed		X	X	
Quillback Carpsucker			X	
Rainbow Smelt	X	X	X	X
Rainbow Trout	X	X	X	X
Rock Bass		X	X	
Sand Shiner	X			
Smallmouth Bass	X		X	
Spottail Shiner	X	X	X	X
Trout-Perch	X			
White Perch			X	
White Sucker	X	X	X	
Yellow Perch	X	X	X	X
Total Species Observed	28	15	25	10

*State of Illinois threatened species

E=electrofishing; G = gill-netting; C = creel survey; T = trawling; S = seining

5.1.5.2 Benthic Macroinvertebrates

Benthic macroinvertebrates serve as the both a food source for fish and other organisms higher on the food chain and as primary consumers of organic matter on the lake bottom. The diversity, abundance and composition of the macroinvertebrate population can be affected by environmental factors, including overall water quality, substrate type, and the physical parameters of temperature and current.

While we are not aware of any studies performed at the project site, studies within the nearby Chicago Harbor (USCOE, 1982) have indicated that the Chicago Harbor maintains a viable macroinvertebrate community of mostly tolerant and facultative organisms. These studies identified 15 taxa from three samples collected from the Harbor. The number of organisms ranged from 8,670 to 48,146 individuals per square meter, and the dominant organism was the Tubificidaek- a tolerant aquatic work. A high number of snails, midges and crustaceans were also present.

Application of the biotic index, presented in the Illinois Environmental Protection Agency (IEPA) Macroinvertebrate Tolerance List (1996), provides unified historic benthic community data along the Chicago lakefront. Generally, the lakefront benthic community exhibits 14 IEPA-scored classes, families or genera with an average tolerance index of 6.14. This assessment indicates generally fair to poor water quality and occasional low dissolved oxygen. Lower population counts are observed in the summer than in the fall and spring; this is attributed to seasonal population cropping by foraging fishes.

Chironomids formed the bulk of the individuals collected, along with tubificid worms and other oligochetes. Mollusks observed were largely Sphaeriidae and Valvatidae snails; very few others were noted. Amphipodae could be locally abundant, due to contagious distribution of the organisms.

5.1.5.3 Plankton

Ecologically, plankton is considered to be a bio-indicator of changes to the chemical and physical parameters of the aquatic environment. Copepods, small crustaceans found in nearly every freshwater habitat, constitute the largest source of available protein in the open ocean and are considered a cornerstone of the aquatic food chain.

In Lake Michigan, historic plankton counts have always indicated that diatoms were the dominant algal taxa, due to the high availability of silica (for their microscopic glass-like shells or "valves") and the low nutrient levels. Now that Chicago's inshore waters have become more eutrophic, green and blue-green algae have become locally dominant, but in open waters, diatoms still predominate. In aquatic ecosystems, plankton populations experience seasonal fluctuations in species composition and abundance. Zooplankton, which feed upon phytoplankton, follow the same seasonal cycles as their prey. This tandem fluctuation is a classic predator-prey population cycle. Zooplankton see population pressure from both the availability of phytoplankton and the predation of larval fishes.

In Savitz (1993), 33 generae of phytoplankton are identified during the summer in the reference harbors. Pennate diatoms Fragilaria and Asterionella tend to dominate throughout the year, sharing seasonal dominance with the common, chain-forming Tabellaria diatoms in the spring. The blue-green alga Anabaena, the green algae Oedogonium, Scenedesmus and Ulothrix, are also abundant.

In this same study, copepods and daphnia were found to comprise the bulk of the zooplankton year round, with seasonal populations of rotifers Brachionus and Keratella. Zooplankton numbers were generally low. It is unlikely that zooplankton provide much forage for any but the smallest larval fishes and even then, the low numbers would restrict how many of these fishes would become part of the adult population. Table 4-3 summarizes the Plankton population from the referenced studies.

Table 5-3
Seasonal Plankton Population (Raw Counts), Pooled Samples from Years 1988 to 1990
Selected Chicago Harbors (Montrose, Belmont and Burnham),

Species	Spring Count	Summer Count	Autumn Count	Winter Count
Phytoplankton				
Anabaena		406		
Ankistrodesmus		108		
Asterionella	4328	779	12	2
Ceratium		46		
Chlorella		6		
Closterium		112		
Cosmarium		2		
Cyclotella		36		
Cymbella	7			7
Dinobryon		185		
Fragilaria	43268	3303	2326	800
Gomphpspaeria		3		
Oedogonium	1281	188	23	219
Oscilliatoria		4		
Pediastrum		1		
Scenedesmus	6490	41		
Spirogira	92	34		
Staurastrum		2		
Synedra		16		
Tabellaria	43963	774	98	498
Ulothrix		643		
Volvox		12		
Unidentified		179		3
Zooplankton				
Alona		2		
Bosmina		72		
Brachionus	47			
Copepods	2	50	12	25
Daphnia	1	96	43	9

Table 5-3 Seasonal Plankton Population (Raw Counts), Pooled Samples from Years 1988 to 1990 Selected Chicago Harbors (Montrose, Belmont and Burnham),				
Keratella	21	20	2	
Protozoa	7			
Hydracarina	13	2		
Total Individuals	**99520**	**7122**	**2516**	**1593**

5.1.6 Regional Geology

The geology of the Chicago area is largely a consequence of a series of continental glacial advances and retreats. During the most recent glaciation, the Wisconsinan, the area was covered by several thousand feet of ice of the Lake Michigan lobe. The area had been covered with surficial deposits up to 300 feet thick that were deposited by glaciers and higher level stages of Lake Michigan. Bedrock typically consists of sedimentary dolomitic limestone, dolomite shale and sandstone. The bedrock is generally not exposed in Chicago, except in quarries and local outcroppings, as the rock is typically covered by glacial drift. In addition to these natural processes, the Chicago lakefront has been extensively modified during the last 150 years from man-made structures and filling operations.

Most of the natural overburden soils were originally deposited by the Lake Michigan lobe ice sheet or were deposited as lake-bottom and near-shore deposits of the ancient Lake Chicago or its ancestors. Glacial and lacustrine processes resulted in the deposition of three types of materials: recent deposits of fluvial and eolian sand, lacustrine silt and clay, and till-related deposits. The thickness of the overburden soils generally ranges from 40 to 90 feet.

Recent deposits consisting of silty sand or clean, poorly graded sand sediments have been deposited in the near shore area as a result of erosion or littoral drift processes. During the past 100 years the primary source of sediment is bluff erosion caused in part by ice drift.

5.2 Jackson Harbor Mouth Shoreline

5.2.1 Local Geology

The construction of manmade fills and bulkheads many decades ago dramatically altered this portion of the shoreline. Harbors, jetties, breakwaters have diverted and trapped the littoral sand. Borings performed in this project reach indicate approximately 3 to 10 feet of poorly graded fine sand over clay on the lake bottom which is situated about 4 to15 feet below the level of Lake Michigan. This deposit is consistently encountered across the lake bottom in the harbor mouth and inner harbor area.

Other sediments range from lacustrine or glacialfluvial sediments of the Equality Formation to eolian sediments of the Parkland Sand. These sediments consist of shore or shallow-water lacustrine deposits, commonly found in ridges defining former spits and beaches.

The majority of the glacial deposits are of the Wedron Formation which includes till-related deposits and gravel, sand and silt. The till consists of gray silty clay with localized silt seams. The uppermost bedrock unit is the Silurian Niagran series. The uppermost unit consists of either pure, gray, massive, vuggy dolomite or argillaceous, silty, fine-grained, thinly-bedded, grayish-brown dolomite.

5.2.2 Sediment Transport and Littoral Drift

The shoreline condition north of the Jackson Harbor includes the 63rd Street and 57th Street beach areas. Areas south include rock shorelines at LaRabida Hospital. The South Shore Cultural Center beach is located not far to the south. There are numerous structures that exist south of Rainbow Beach and north of Jackson harbor that essentially block the majority of sand transport along the shoreline. There is no source of significant new sand sediment supply in the region due to the presence of hard edged structures and mature beach deposits at most locations and interruptions from harbors and other man-made structures. Therefore, the project is located in an area that does not experience significant sand transport except that Jackson harbor is a significant sink where sediment is lost from the system.

6.0 Environmental Impact Assessment

6.1 Wave Climate

6.1.1 Nearshore Wave Condition Changes

The proposed maintenance dredging will maintain existing wave conditions without significant change.

6.2 Water Quality

The proposed shoreline project location is in an area that currently supports extensive boat traffic. The maintenance dredging activity will be structured to have no impact on the boating public that uses the harbor. The proposed use of the proposed project area is compatible with the existing use and will not adversely affect water quality.

6.3 Threatened and Endangered Species

Seven species of threatened and endangered birds are known to have been observed along the Chicago lakefront. The species are passing migrants and would not have breeding or other critical habitat that would be affected by the project. None of these species will be affected by the project.

6.4 Historic and Cultural Resources

The project area is manmade artificial Lake Michigan shoreline consisting entirely of post-1920 landfill with park land and the harbor created through heavily landscape modification that included grading, blading and filling to create the present park landscape. The present shoreline is armored with boulder revetments. The adjacent lakebed immediately offshore contains no structures or historic properties. No intact archaeological deposits are present.

6.5 Wildlife

Wildlife use of the project area is limited and consists primarily of birds and mammals common to developed lakeshore and urban areas. No significant adverse impacts to wildlife are expected.

6.6 Aquatic Resources

6.6.1 Fish

Though the deep bathymetry at the site does not encourage breeding or spawning, it would remain a favorable habitat for foraging and feeding.

6.6.2 Benthic Macroinvertebrates

The proposed proposed dredging is not expected to have any long term significant impacts to benthic macroinvertebrates. Short term impacts will occur in areas of proposed dredging; however, the impact is expected to be insignificant.

6.6.3 Plankton

The proposed project is not expected to have any significant impact on Plankton.

6.7 Navigation

The project will improve navigation for the boat harbor, and will have no significant impact on navigation outside of the harbor.

6.8 Special Aquatic Sites

There are no known special aquatic sites within the project limits.

6.9 Parks, Monuments, Wilderness Areas, Research Sites, Preserves

There are no known Parks, Monuments, Wilderness Areas, Research Sites, or Preserves within the project limits that will be adversely affected by the project. North of Jackson Harbor is the 63rd Street beach. This public recreation area and park provides habitat as well as a feeding and resting area for migrating birds during spring and fall migrations.

6.10 Recreational and Commercial Fisheries

The project will have no significant impact to recreational or commercial fisheries. It is likely that the large stones to be placed on the lakebed will increase the diversity of habitat in the region and could improve the fishery.

6.11 Water Related Recreation

The project will provide a significant enhancement of water related recreation with respect to an improved harbor and harbor mouth condition in terms of boat access and safety.

7.0 Harbor Lake Bottom Sediment Analysis

Three sediment samples and one background water quality sample from Lake Michigan were collected and submitted under chain of custody control to Grace Analytical Lab, Inc. in Berkeley, Illinois. The samples were analyzed for chemical analysis as detailed below.

7.1 Supernatant Chemical Analysis

Three sediment samples and the lake water were used to prepare supernatant samples by standard method 2540f for analysis of the following:

Parameters Method

- Metals 6010B/7470
- Pesticides 8081
- SVOCs 8270C
- Ammonia Nitrogen 350.2/4500B, C
- Total Dissolved Solids 160.1
- Total Suspended Solids 160.2
- Total Volatile Solids 160.4
- Hardness 2340B
- Total Phosphorous 365.2

Each of the three supernatant samples was run on a 4 hour, 24 hour and 48 hour basis. Analysis results are provided on the eleven tables provided in Appendix C. The Supernatant Analysis is summarized in Appendix C Table nos. 1 through 3 relative to the effluent standards from 35 IAC 304. These effluent standards would not be applicable to this project since mechanical dredging will be used and disposal of sediment will be in an appropriately permitted upland site. However, these standards are provided to illustrate the general characterization of the sediment.

The Supernatant Analysis did not identify any metals, pesticides or SVOCs above the effluent standards from 35 IAC 304. Each of the three-4 hour supernatant samples exceed the total suspended solids (TSS) standard and all of the supernatant samples exceed the Ammonia as N standard from 35 IAC 304.

7.2 Sediment Chemical Analysis

The three sediment samples were analyzed for the following:

Parameters Method

- TAL Metals 6010B/7470
- Herbicides 8150B
- Pesticides/Herbicides 8141

- Pesticides 8081A
- Polychlorinated Biphenyls (PCBs) 8082
- Volatile Organic Compounds (VOCs) 5035/8260B
- Semi-volatile Organic Compounds (SVOCs) 8270
- Cyanide 335.4R1.0

The sediment analysis is summarized in the Appendix C Table nos. 4 through 8 relative to the TACO Tier 1 Residential standards (35 IAC 742). The sediment analysis did not identify any concentrations in the three sediment samples above both the background concentrations and the TACO Tier 1 Residential standards. These same standards are utilized by the Chicago Park District as acceptance standards for fill material.

7.3 Asbestos Analysis

Two of the sediment samples were submitted under chain of custody control to EMSL Analytical, Inc. in Cinnaminson, New Jersey for asbestos analysis. The asbestos analysis was conducted by USEPA Superfund Method EPA-540-R97-028. The attached Table 10 summarizes the asbestos analysis. Sample GS-4 had 11 total asbestos structures identified, while sample GS-9 had no asbestos structures identified.

8.0 References

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Appendix A

Proposed Dredging Plan

LEGEND

-9-	EXISTING HARBOR BED CONTOUR (LOW WATER DATUM)
60	DEPTH BELOW LOW WATER DATUM
—o—o—	DREDGING LIMITS

SITE PLAN VIEW
SCALE 1:200

200 0 200 400
SCALE: 1" = 200'

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CHICAGO PARK DISTRICT
JACKSON HARBOR
CHICAGO, IL

JACKSON HARBOR
PROPOSED 10 YEAR
DREDGING LIMITS

Issued

Rev	Date	Description

Designed	WJM	5/2014
Drawn	LK	5/2014
Checked	–	–
Approved	–	–

PROJECT NUMBER
60283337

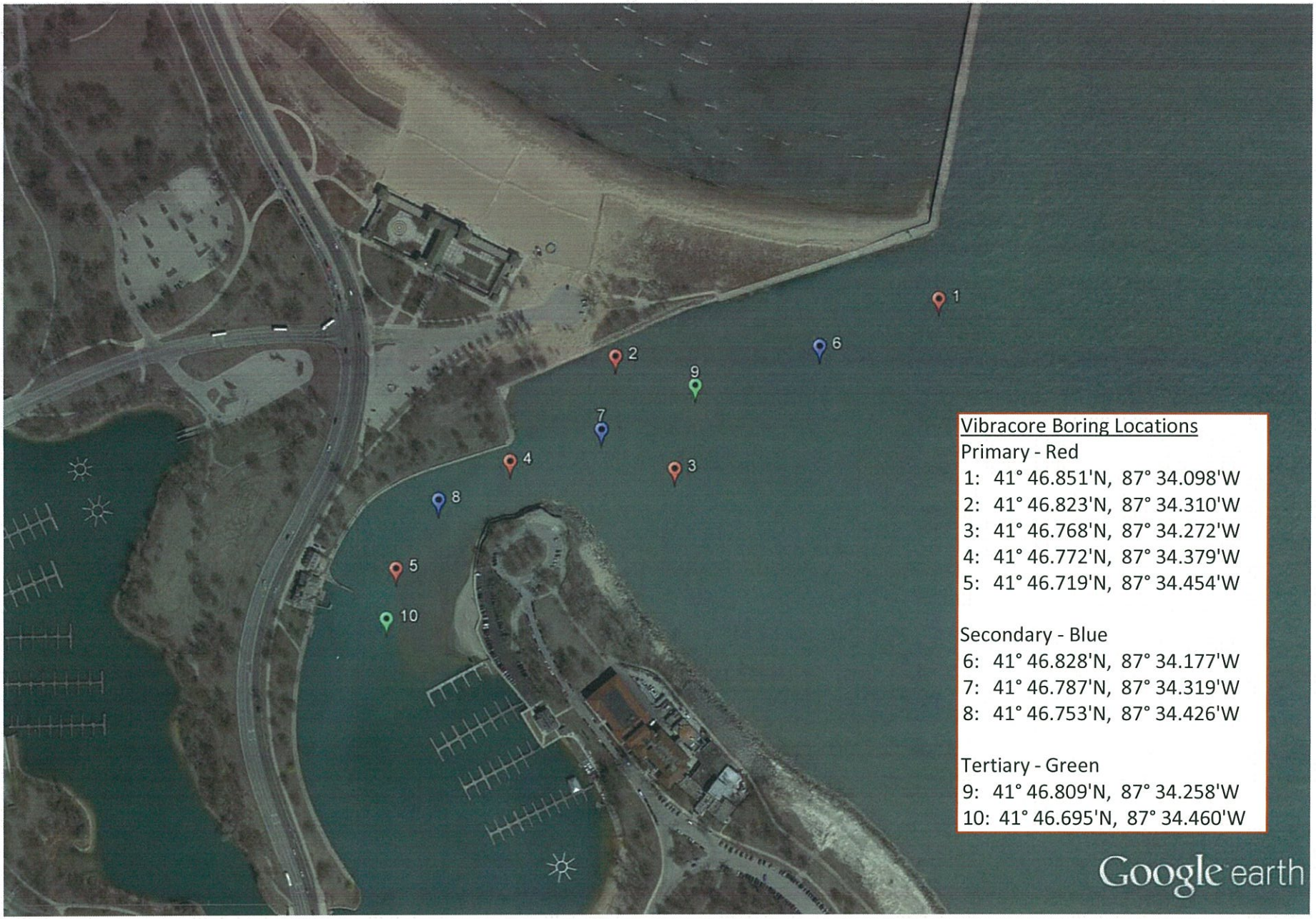
SHEET REFERENCE NUMBER

FIGURE 3-1

P:\60283337\000_CAD\001_Drawings\Sheets\01\Figure_3-1.dwg 6/17/2014 12:19:48 PM, 4005x46, USA, 375.dwg

Appendix B – Vibracore Boring Program Summary

- Boring Location Map
- Vibracore Boring Logs and Grain Size Curves
- Physical Characterization Laboratory Test Results
- Vibracore Photographs



Google Earth Pro

LOG OF VIBRACORE NO. GSI-01

CLIENT AECOM	**CORE LOCATION** Northing: 41.78087 Easting: 087.56828
PROJECT LOCATION Jackson Harbor Chicago, Illinois	**PROJECT DESCRIPTION** Jackson Harbor

DEPTH (ft.) BELOW WATER SURFACE	SAMPLE DISTANCE	SAMPLE RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT.^{3}	UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2} / CALIBRATED PENETROMETER TONS/FT.^{2} (1, 2, 3, 4, 5, 6+) / WATER CONTENT % (10, 20, 30, 40, 50, 60+)
			SURFACE WATER ELEVATION 577.4		
5.0 10.0			LAKE WATER 565.4		
			Poorly Graded SILTY SAND, Trace GRAVEL–gray (SM) 563.4		
15.0			Poorly Graded SAND, Trace WHITE SHELL–gray (SP) 561.4		
			Poorly Graded SAND with SILT–gray (SP–SM) 559.4		
20.0			Poorly Graded SAND, Trace GRAVEL–gray (SP) 555.4		
25.0			END OF CORE		

COMMENTS	
Water Depth	12.0'
Core Depth	10.0'
Capped Core Length	7.6'
Time Capped (CST)	1155

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Geotechnical, Environmental & Civil Engineering
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(630) 355-2838

CORE STARTED	November 7, 2013		
CORE COMPLETED	November 7, 2013		
RIG	Vibracore	FOREMAN	JK
DRAWN	MT	APPROVED	AJP
GSI JOB No.	13158	SHEET	1 OF 1

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LOG OF VIBRACORE NO. GSI-02

CLIENT AECOM	**CORE LOCATION** Northing: 41.78033 Easting: 087.57182
PROJECT LOCATION Jackson Harbor Chicago, Illinois	**PROJECT DESCRIPTION** Jackson Harbor

DEPTH (ft.) BELOW WATER SURFACE	SAMPLE DISTANCE	SAMPLE RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT.^{3}	UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2} / CALIBRATED PENETROMETER TONS/FT.^{2} (1, 2, 3, 4, 5, 6+) / WATER CONTENT % (10, 20, 30, 40, 50, 60+)
			SURFACE WATER ELEVATION 577.4		
			LAKE WATER 572.5		
5.0			Poorly Graded SAND with SILT, Trace WHITE SHELL–gray (SP–SM) 568.5		
10.0			Poorly Graded SAND, Trace GRAVEL–gray (SP) 566.5		
			Poorly Graded SILTY SAND, Trace WHITE SHELL–gray (SM) 562.5		
15.0			END OF CORE		
20.0					
25.0					

COMMENTS	
Water Depth	4.9'
Core Depth	10.0'
Capped Core Length	7.9'
Time Capped (CST)	1040

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DRAWN	MT	APPROVED	AJP
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LOG OF VIBRACORE NO. GSI-03

CLIENT AECOM	CORE LOCATION Northing: 41.77951 Easting: 087.57114
PROJECT LOCATION Jackson Harbor Chicago, Illinois	PROJECT DESCRIPTION Jackson Harbor

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2}

CALIBRATED PENETROMETER TONS/FT.^{2}

1 2 3 4 5 6+

WATER ● CONTENT %

10 20 30 40 50 60+

DEPTH (ft.) BELOW WATER SURFACE	SAMPLE DISTANCE	SAMPLE RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT.^{3}
			SURFACE WATER ELEVATION 577.4	
			LAKE WATER 571.3	
5.0				
			Poorly Graded SAND with SILT–gray (SP–SM) 567.3	
10.0				
			Poorly Graded SILTY SAND–gray (SM) 565.3	
			Poorly Graded SAND with SILT–gray (SP–SM) 561.3	
15.0				
			END OF CORE	
20.0				
25.0				

COMMENTS	
Water Depth	6.1'
Core Depth	10.0'
Capped Core Length	7.8'
Time Capped (CST)	1310

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DRAWN	MT	APPROVED	AJP
GSI JOB No.	13158	SHEET	1 OF 1

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LOG OF VIBRACORE NO. GSI-04

CLIENT AECOM	**CORE LOCATION** Northing: 41.77954 Easting: 087.57296
PROJECT LOCATION Jackson Harbor Chicago, Illinois	**PROJECT DESCRIPTION** Jackson Harbor

DEPTH (ft.) BELOW WATER SURFACE	SAMPLE DISTANCE	SAMPLE RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT.^{3}	UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2} / CALIBRATED PENETROMETER TONS/FT.^{2} (1 2 3 4 5 6+) / WATER CONTENT % (10 20 30 40 50 60+)
			SURFACE WATER ELEVATION 577.4		
5.0 10.0			LAKE WATER 567.4		
			Poorly Graded SAND with SILT, Trace WHITE SHELL–gray (SP–SM) 565.4		
15.0			Poorly Graded SAND, Trace WHITE SHELL–gray (SP) 561.4		
20.0			Poorly Graded SAND with SILT–gray (SP–SM) 557.4		
25.0			END OF CORE		

COMMENTS	
Water Depth	10.0'
Core Depth	10.0'
Capped Core Length	6.7'
Time Capped (CST)	0910

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CORE STARTED	November 7, 2013		
CORE COMPLETED	November 7, 2013		
RIG	Vibracore	FOREMAN	JK
DRAWN	MT	APPROVED	AJP
GSI JOB No.	13158	SHEET	1 OF 1

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LOG OF VIBRACORE NO. GSI–05

CLIENT AECOM	**CORE LOCATION** Northing: 41.77866 Easting: 087.57432
PROJECT LOCATION Jackson Harbor Chicago, Illinois	**PROJECT DESCRIPTION** Jackson Harbor

DEPTH (ft.) BELOW WATER SURFACE	SAMPLE DISTANCE	SAMPLE RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT.^{3}	UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2} / CALIBRATED PENETROMETER TONS/FT.^{2} (1 2 3 4 5 6+) / WATER ● CONTENT % (10 20 30 40 50 60+)
			SURFACE WATER ELEVATION *577.4*		
5.0			LAKE WATER *570.3*		
			Poorly Graded SAND, Trace WHITE SHELL–gray (SP) *568.3*		
10.0			Poorly Graded SAND with SILT, Trace GRAVEL (SP–SM) *566.3*		
			Poorly Graded SAND, Trace WOOD and GRAVEL–gray (SP) *563.1*		
15.0			LEAN CLAY, Trace SAND and GRAVEL–gray–soft (CL) *560.3*		
20.0					*0.25*
25.0					

COMMENTS	
Water Depth	7.1'
Core Depth	10.0'
Capped Core Length	7.2'
Time Capped (CST)	0755

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CORE STARTED	November 7, 2013		
CORE COMPLETED	November 7, 2013		
RIG	Vibracore	FOREMAN	JK
DRAWN	MT	APPROVED	AJP
GSI JOB No.	13158	SHEET	1 OF 1

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LOG OF VIBRACORE NO. GSI–06

CLIENT AECOM	**CORE LOCATION** Northing: 41.78048 Easting: 087.56947
PROJECT LOCATION Jackson Harbor Chicago, Illinois	**PROJECT DESCRIPTION** Jackson Harbor

DEPTH (ft.) BELOW WATER SURFACE	SAMPLE DISTANCE	SAMPLE RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT.^{3}	UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2} / CALIBRATED PENETROMETER TONS/FT.^{2} (1, 2, 3, 4, 5, 6+) / WATER CONTENT % (10, 20, 30, 40, 50, 60+)
			SURFACE WATER ELEVATION 577.4		
5.0			LAKE WATER 568.6		
10.0			Poorly Graded SAND with SILT, Trace WHITE SHELL–gray (SP–SM) 566.6		
			Poorly Graded SAND, Trace WHITE SHELL and GRAVEL–gray (SP) 564.6		
15.0			Poorly Graded SILTY SAND–gray (SM) 558.6		
20.0			END OF CORE		
25.0					

COMMENTS	
Water Depth	8.8'
Core Depth	10.0'
Capped Core Length	6.2'
Time Capped (CST)	1115

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CORE COMPLETED	November 7, 2013		
RIG	Vibracore	FOREMAN	JK
DRAWN	MT	APPROVED	AJP
GSI JOB No.	13158	SHEET	1 OF 1

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LOG OF VIBRACORE NO. GSI–07

CLIENT AECOM	CORE LOCATION Northing: 41.77984 Easting: 087.57194
PROJECT LOCATION Jackson Harbor Chicago, Illinois	PROJECT DESCRIPTION Jackson Harbor

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2}

CALIBRATED PENETROMETER TONS/FT.^{2}

1 2 3 4 5 6+

WATER ● CONTENT %

10 20 30 40 50 60+

DEPTH (ft.) BELOW WATER SURFACE	SAMPLE DISTANCE	SAMPLE RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT.^{3}
			SURFACE WATER ELEVATION 577.4	
5.0			LAKE WATER 570.2	
			Poorly Graded SAND with SILT, Trace GRAVEL and WOOD–dark gray (SP–SM) 568.2	
10.0			Poorly Graded SAND with SILT, Trace GRAVEL and WHITE SHELL–gray (SP–SM) 566.2	
			Poorly Graded SAND with SILT, Trace WHITE SHELL–gray (SP–SM) 564.2	
15.0			Poorly Graded SAND, Trace GRAVEL–gray (SP) 560.2	
20.0			END OF CORE	
25.0				

COMMENTS	
Water Depth	7.2'
Core Depth	10.0'
Capped Core Length	7.1'
Time Capped (CST)	0950

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CORE STARTED	November 7, 2013		
CORE COMPLETED	November 7, 2013		
RIG	Vibracore	FOREMAN	JK
DRAWN	MT	APPROVED	AJP
GSI JOB No.	13158	SHEET	1 OF 1

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LOG OF VIBRACORE NO. GSI–08

CLIENT AECOM	CORE LOCATION Northing: 41.77930 Easting: 087.57366
PROJECT LOCATION Jackson Harbor Chicago, Illinois	PROJECT DESCRIPTION Jackson Harbor

DEPTH (ft.) BELOW WATER SURFACE	SAMPLE DISTANCE	SAMPLE RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT.^{3}	UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2} / CALIBRATED PENETROMETER TONS/FT.^{2} (1, 2, 3, 4, 5, 6+) / WATER CONTENT % (10, 20, 30, 40, 50, 60+)
			SURFACE WATER ELEVATION 577.4		
5.0 10.0			LAKE WATER 567.3		
15.0			Poorly Graded SAND with SILT, Trace GRAVEL–gray (SP–SM) 563.3		
20.0			Poorly Graded SAND with SILT–gray (SP–SM) 557.3		
25.0			END OF CORE		

COMMENTS	
Water Depth	10.1'
Core Depth	10.0'
Capped Core Length	5.7'
Time Capped (CST)	0825

Geo Services, Inc.
Geotechnical, Environmental & Civil Engineering
805 Amherst Court, Suite 204
Naperville, Illinois 60565
(630) 355-2838

CORE STARTED	November 7, 2013		
CORE COMPLETED	November 7, 2013		
RIG	Vibracore	FOREMAN	JK
DRAWN	MT	APPROVED	AJP
GSI JOB No.	13158	SHEET	1 OF 1

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LOG OF VIBRACORE NO. GSI-09

CLIENT AECOM	**CORE LOCATION** Northing: 41.78012 Easting: 087.57088
PROJECT LOCATION Jackson Harbor Chicago, Illinois	**PROJECT DESCRIPTION** Jackson Harbor

DEPTH (ft.) BELOW WATER SURFACE	SAMPLE DISTANCE	SAMPLE RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT.^{3}	UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2} / CALIBRATED PENETROMETER TONS/FT.^{2} (1 2 3 4 5 6+) / WATER ● CONTENT % (10 20 30 40 50 60+)
			SURFACE WATER ELEVATION 577.4		
5.0			LAKE WATER 569.9		
10.0			Poorly Graded SAND with SILT, Trace WHITE SHELL–gray (SP–SM) 567.9		
			Poorly Graded SILTY SAND, Trace GRAVEL and WHITE SHELL–gray (SM) 563.9		
15.0			Poorly Graded SAND with SILT, Trace GRAVEL–gray (SP–SM) 559.9		
20.0			END OF CORE		
25.0					

COMMENTS	
Water Depth	7.5'
Core Depth	10.0'
Capped Core Length	7.4'
Time Capped (CST)	1235

Geo Services, Inc.
Geotechnical, Environmental & Civil Engineering
805 Amherst Court, Suite 204
Naperville, Illinois 60565
(630) 355-2838

CORE STARTED	November 7, 2013		
CORE COMPLETED	November 7, 2013		
RIG	Vibracore	FOREMAN	JK
DRAWN	MT	APPROVED	AJP
GSI JOB No.	13158	SHEET	1 OF 1

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LOG OF VIBRACORE NO. GSI-10

CLIENT AECOM	**CORE LOCATION** Northing: 41.77827 Easting: 087.57434
PROJECT LOCATION Jackson Harbor Chicago, Illinois	**PROJECT DESCRIPTION** Jackson Harbor

DEPTH (ft.) BELOW WATER SURFACE	SAMPLE DISTANCE	SAMPLE RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT.^{3}	UNCONFINED COMPRESSIVE STRENGTH TONS/FT.^{2} / CALIBRATED PENETROMETER TONS/FT.^{2} (1, 2, 3, 4, 5, 6+) / WATER CONTENT % (10, 20, 30, 40, 50, 60+)
			SURFACE WATER ELEVATION 577.4		
5.0			LAKE WATER 570.8		
10.0			Poorly Graded SILTY SAND–dark gray (SM) 566.8		
			Poorly Graded SAND with SILT–gray (SP–SM) 564.8		
15.0			Poorly Graded SAND, Trace GRAVEL–gray (SP) 560.8		
20.0			END OF CORE		
25.0					

COMMENTS	
Water Depth	6.6'
Core Depth	10.0'
Capped Core Length	8.1'
Time Capped (CST)	1345

Geo Services, Inc.
Geotechnical, Environmental & Civil Engineering
805 Amherst Court, Suite 204
Naperville, Illinois 60565
(630) 355-2838

CORE STARTED	November 7, 2013		
CORE COMPLETED	November 7, 2013		
RIG	Vibracore	FOREMAN	JK
DRAWN	MT	APPROVED	AJP
GSI JOB No.	13158	SHEET	1 OF 1

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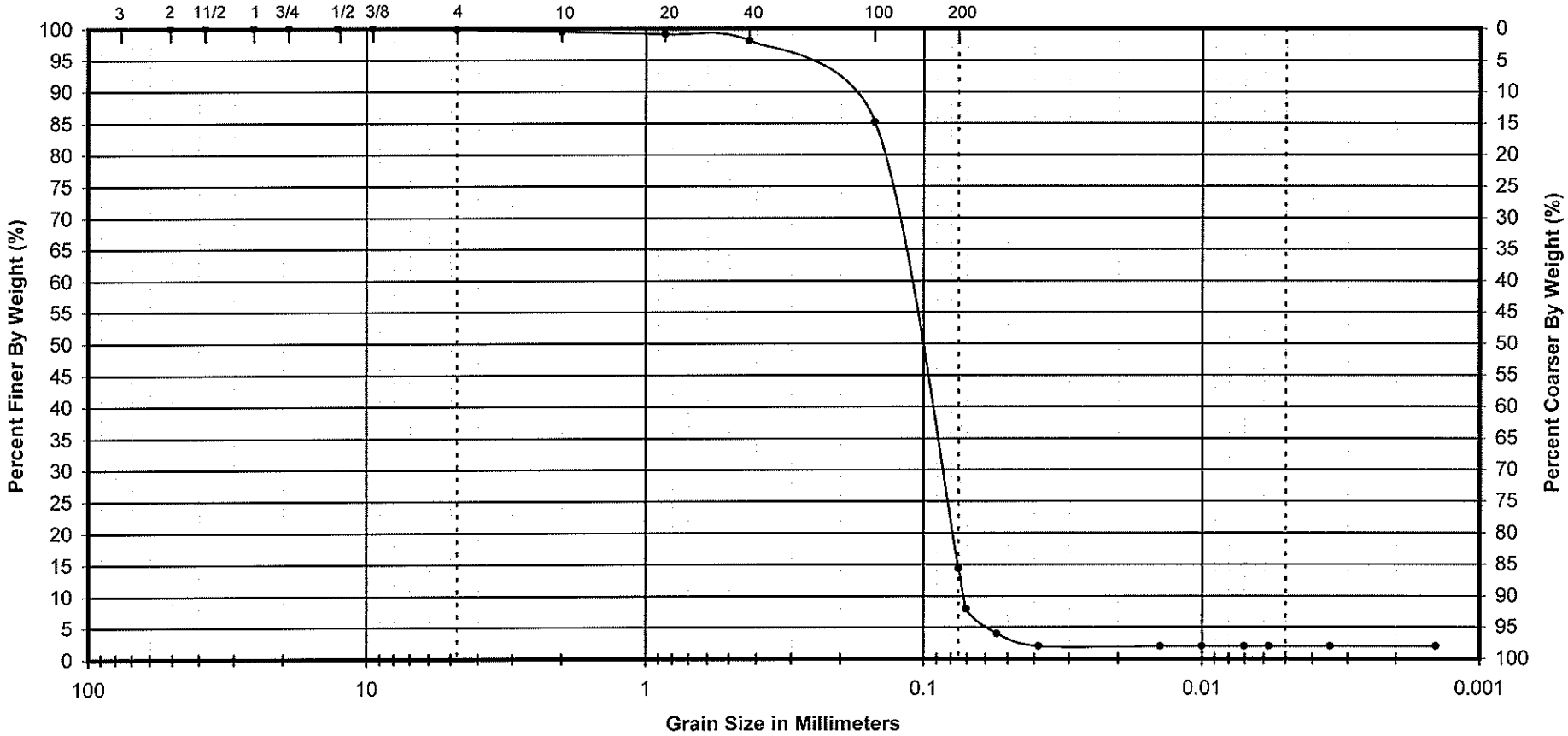
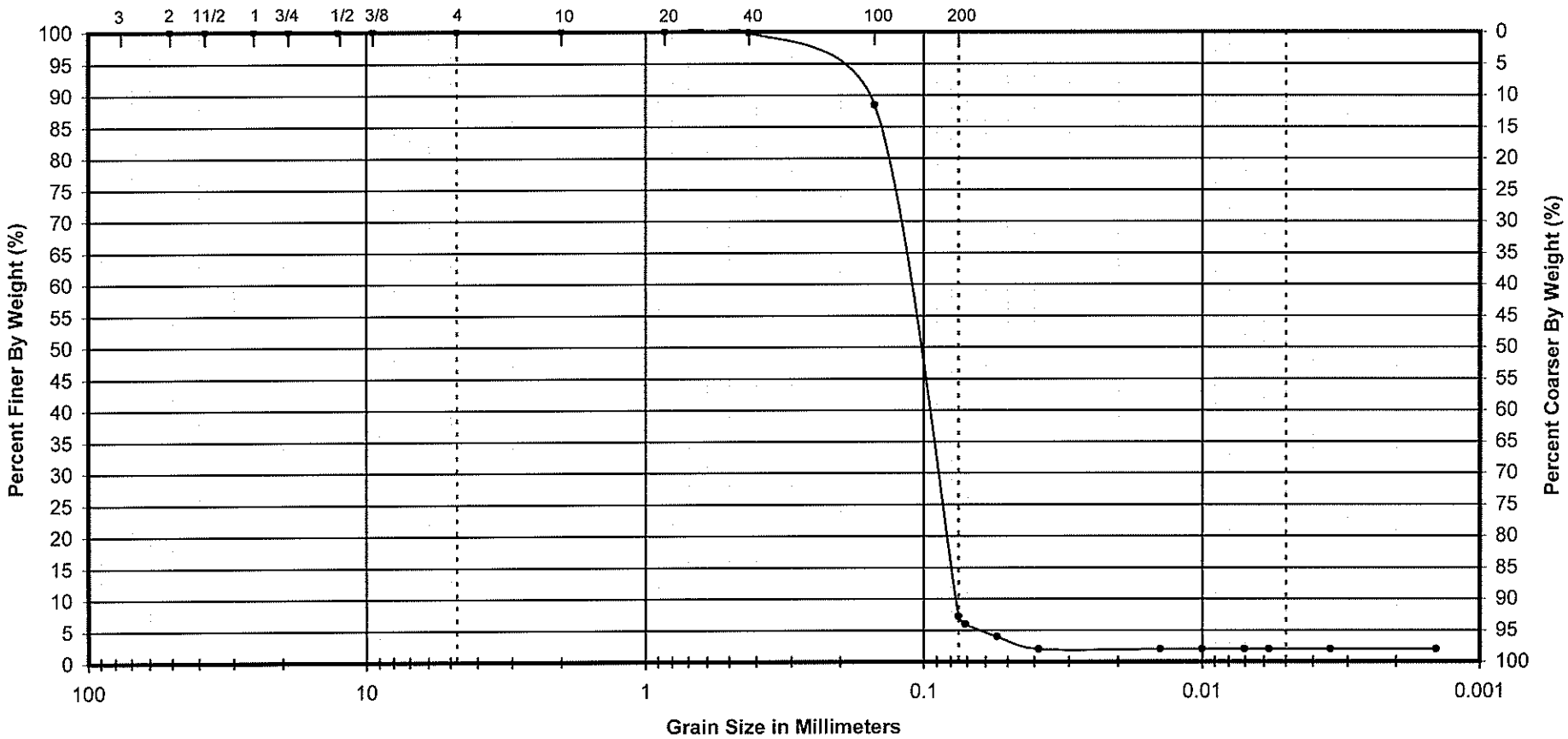


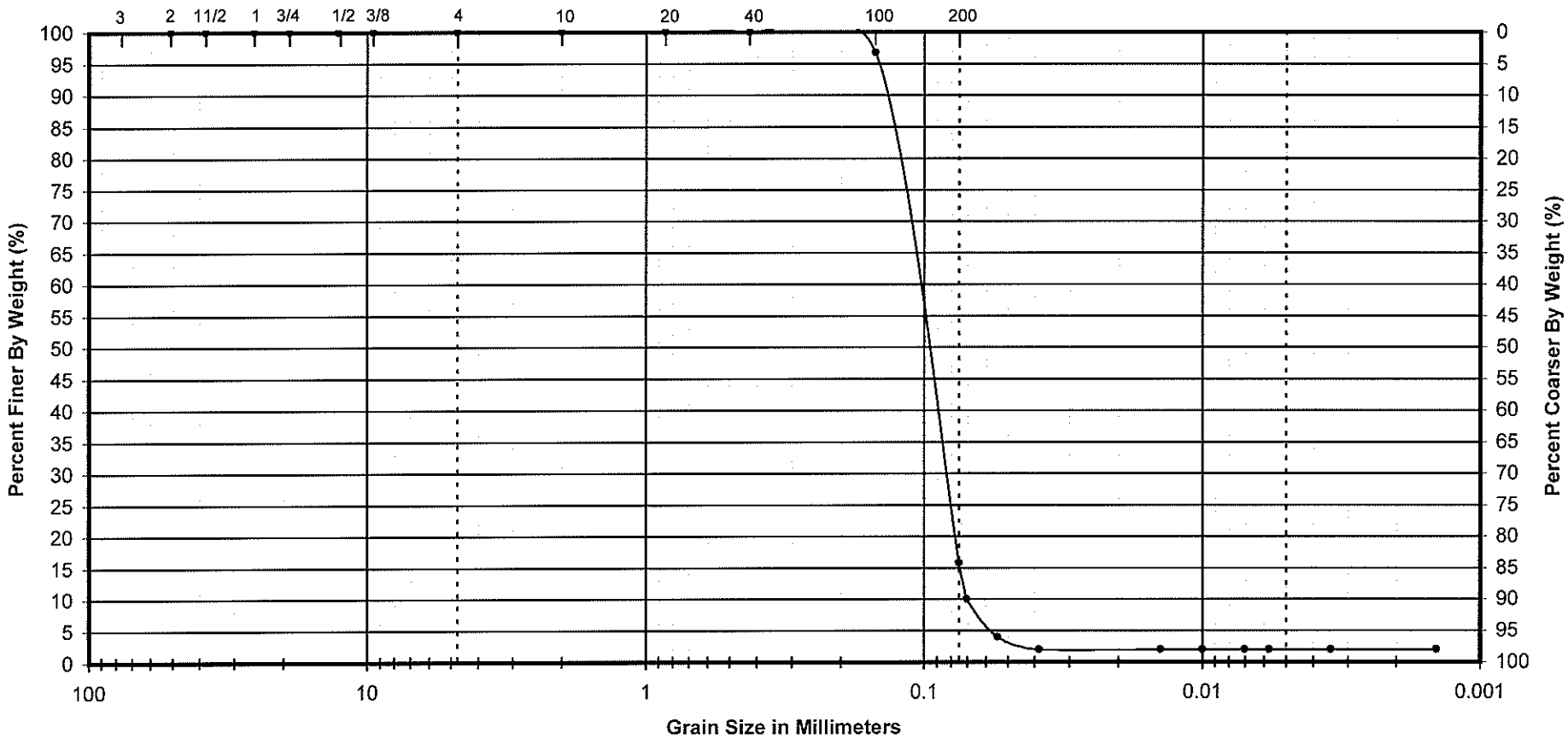
GRAVEL	SAND			SILT	CLAY
	COARSE	MEDIUM	FINE		

Boring No.	GS-1	CLASSIFICATION-ASTM D 2487		PARTICLE SIZE ANALYSIS-ASTM D 422
Sample No.	1	SILTY SAND (SM)		Jackson Harbor Dredging
Depth	0.0'-2.0'			& Modification Project
Liquid Limit	-	gray		Chicago Park District
Plastic Limit	-			Chicago, Illinois
Plasticity Index	NP			
Test By	CC	% Gravel	0.1	Geo Services, Inc.
Date	11/20/13	% Sand	85.5	Geotechnical, Environmental and Civil Engineering
Reviewed By	KA	% Silt	12.3	An MBE - DBE Firm
Job No	13158	% Clay	2.0	1235 E. Davis St., Arlington Heights, IL 60005
				Phone 847-253-3845 • Fax 847-253-0482



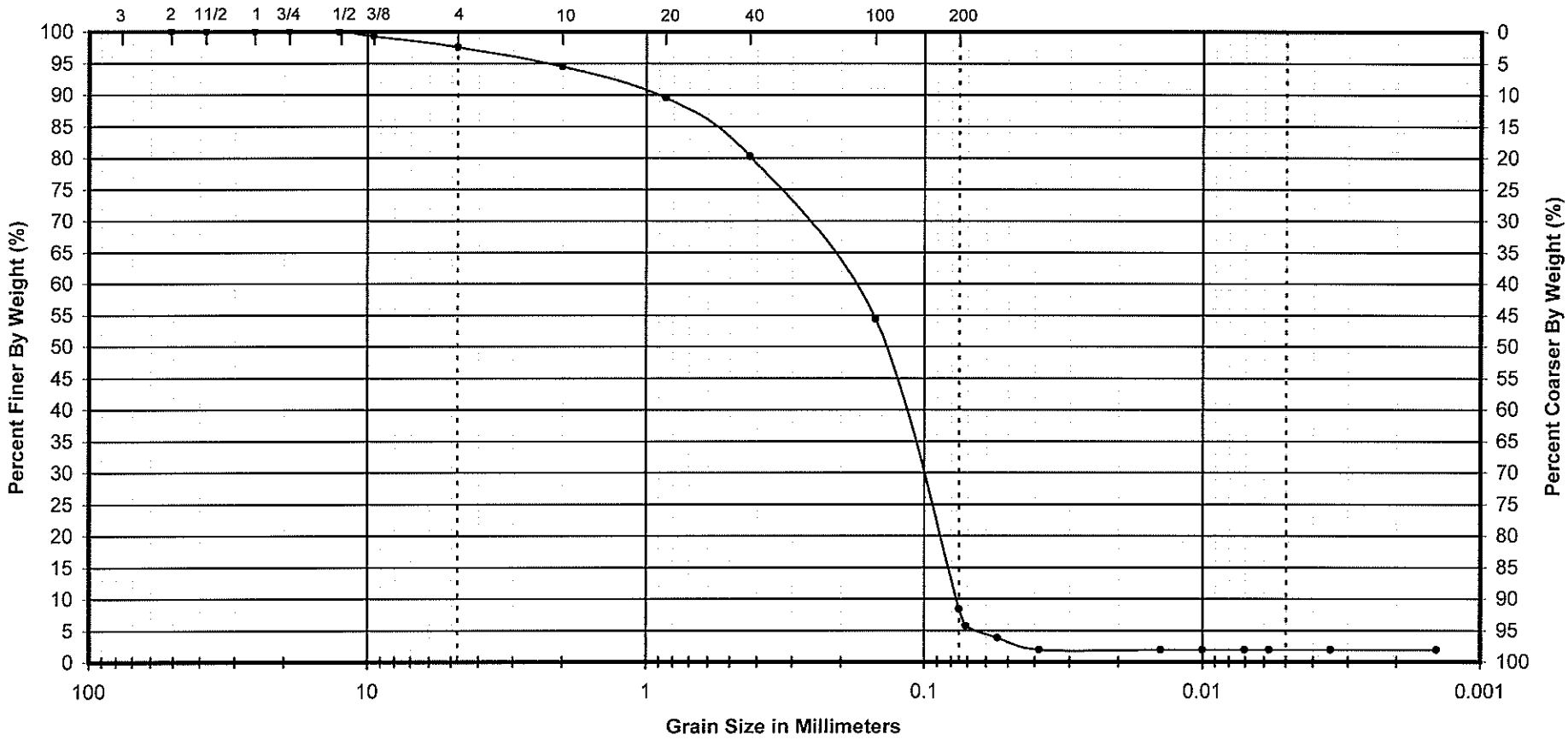
GRAVEL	SAND			SILT	CLAY
	COARSE	MEDIUM	FINE		

Boring No.	GS-2	CLASSIFICATION-ASTM D 2487		PARTICLE SIZE ANALYSIS-ASTM D 422
Sample No.	2	POORLY GRADED SAND with SILT (SP-SM)		Jackson Harbor Dredging
Depth	2.0'-4.0'			& Modification Project
Liquid Limit	-	gray		Chicago Park District
Plastic Limit	-	Cu	1.6	Chicago, Illinois
Plasticity Index	NP	Cc	0.9	
Test By	CC	% Gravel	0.0	Geo Services, Inc.
Date	11/20/13	% Sand	92.8	Geotechnical, Environmental and Civil Engineering
Reviewed By	KA	% Silt	5.2	An MBE - DBE Firm
Job No	13158	% Clay	2.0	1235 E. Davis St., Arlington Heights, IL 60005
				Phone 847-253-3845 • Fax 847-253-0482



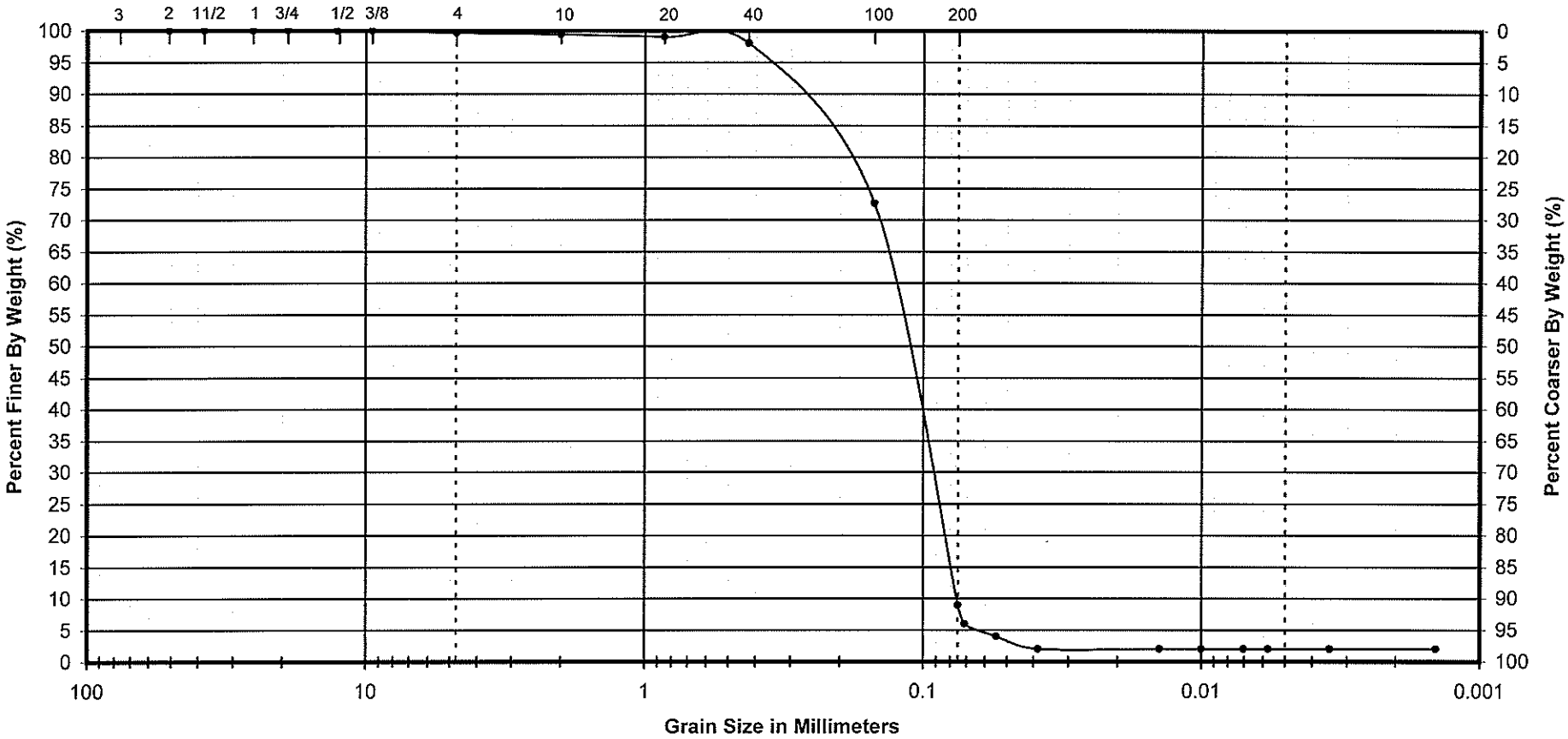
GRAVEL	SAND			SILT	CLAY
	COARSE	MEDIUM	FINE		

Boring No.	GS-3	CLASSIFICATION-ASTM D 2487		PARTICLE SIZE ANALYSIS-ASTM D 422
Sample No.	3	SILTY SAND (SM)		Jackson Harbor Dredging
Depth	4.0'-6.0'			& Modification Project
Liquid Limit	-	gray		Chicago Park District
Plastic Limit	-			Chicago, Illinois
Plasticity Index	NP			
Test By	CC	% Gravel	0.0	Geo Services, Inc.
Date	11/20/13	% Sand	84.2	Geotechnical, Environmental and Civil Engineering
Reviewed By	KA	% Silt	13.8	An MBE - DBE Firm
Job No	13158	% Clay	2.0	1235 E. Davis St., Arlington Heights, IL 60005
				Phone 847-253-3845 • Fax 847-253-0482



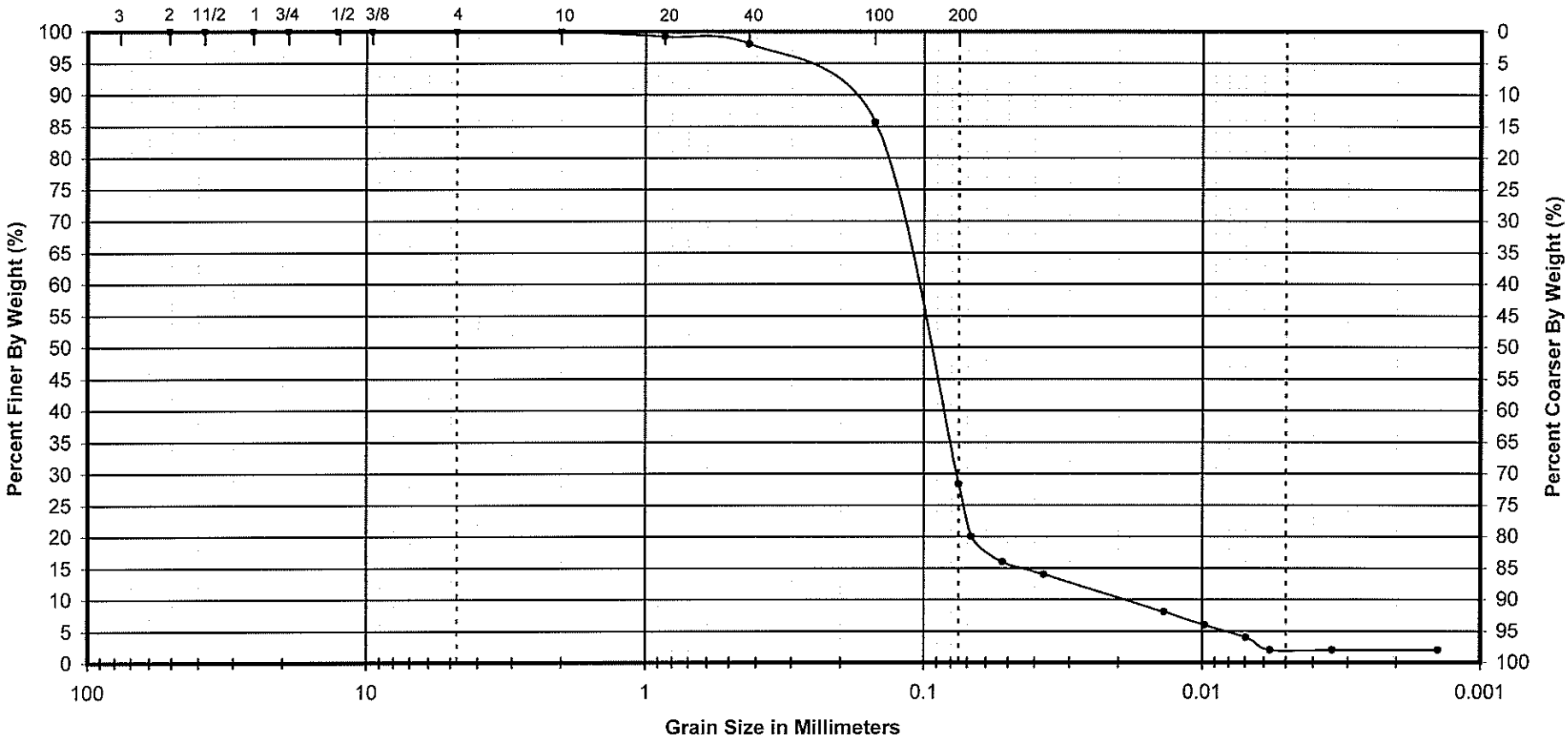
GRAVEL	SAND			SILT	CLAY
	COARSE	MEDIUM	FINE		

Boring No.	GS-4	CLASSIFICATION-ASTM D 2487		PARTICLE SIZE ANALYSIS-ASTM D 422
Sample No.	1	POORLY GRADED SAND with SILT (SP-SM)		Jackson Harbor Dredging
Depth	0.0'-2.0'			& Modification Project
Liquid Limit	-	gray		Chicago Park District
Plastic Limit	-	Cu	2.3	Chicago, Illinois
Plasticity Index	NP	Cc	0.7	
Test By	CC	% Gravel	2.4	Geo Services, Inc.
Date	11/20/13	% Sand	89.2	Geotechnical, Environmental and Civil Engineering
Reviewed By	KA	% Silt	6.4	An MBE - DBE Firm
Job No	13158	% Clay	1.9	1235 E. Davis St., Arlington Heights, IL 60005
				Phone 847-253-3845 • Fax 847-253-0482



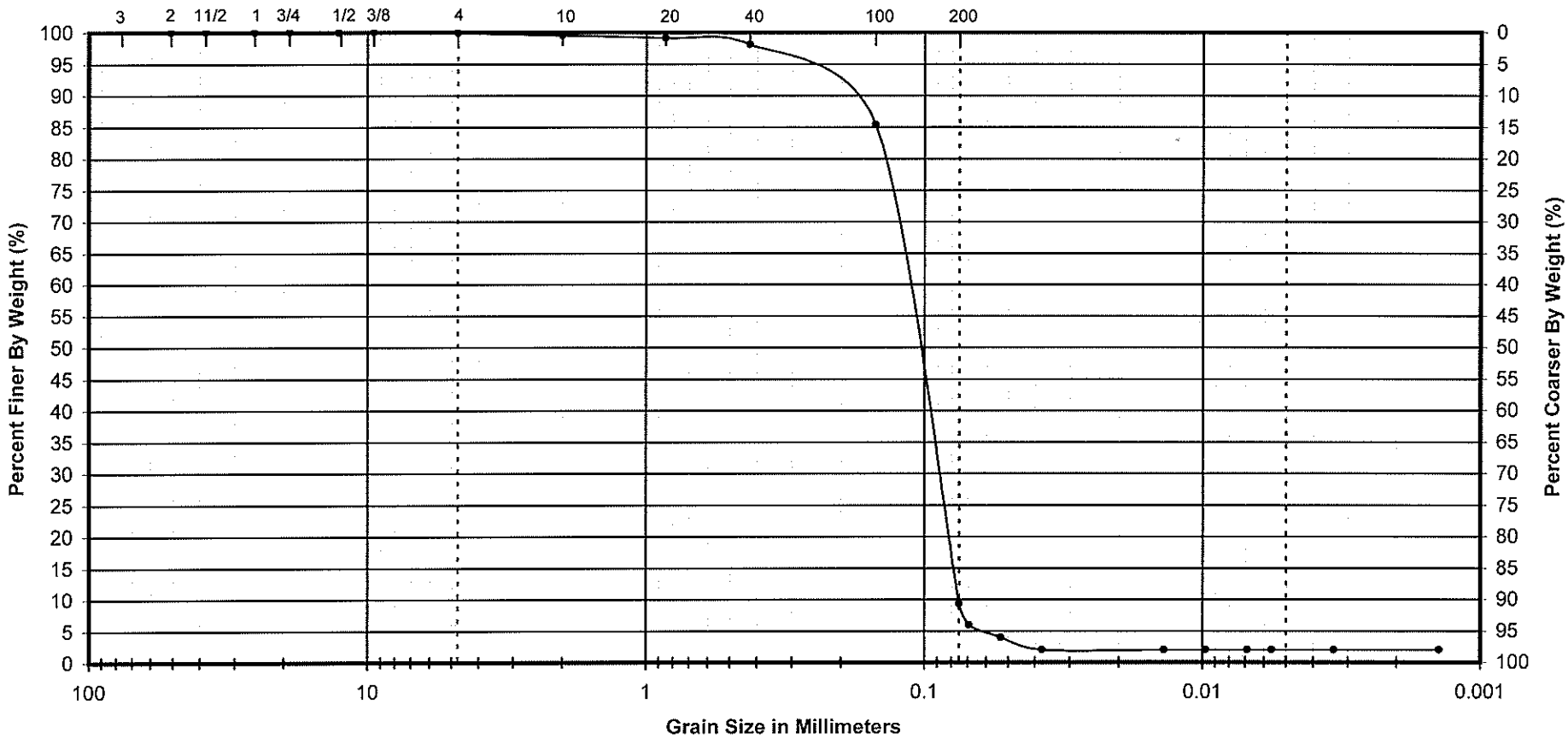
GRAVEL	SAND			SILT	CLAY
	COARSE	MEDIUM	FINE		

Boring No.	GS-5	CLASSIFICATION-ASTM D 2487		PARTICLE SIZE ANALYSIS-ASTM D 422
Sample No.	2	POORLY GRADED SAND with SILT (SP-SM)		Jackson Harbor Dredging
Depth	2.0'-4.0'			& Modification Project
Liquid Limit	-	gray		Chicago Park District
Plastic Limit	-	Cu	1.9	Chicago, Illinois
Plasticity Index	NP	Cc	0.8	
Test By	CC	% Gravel	0.3	Geo Services, Inc.
Date	11/20/13	% Sand	90.7	Geotechnical, Environmental and Civil Engineering
Reviewed By	KA	% Silt	6.9	An MBE - DBE Firm
Job No	13158	% Clay	2.0	1235 E. Davis St., Arlington Heights, IL 60005
				Phone 847-253-3845 • Fax 847-253-0482



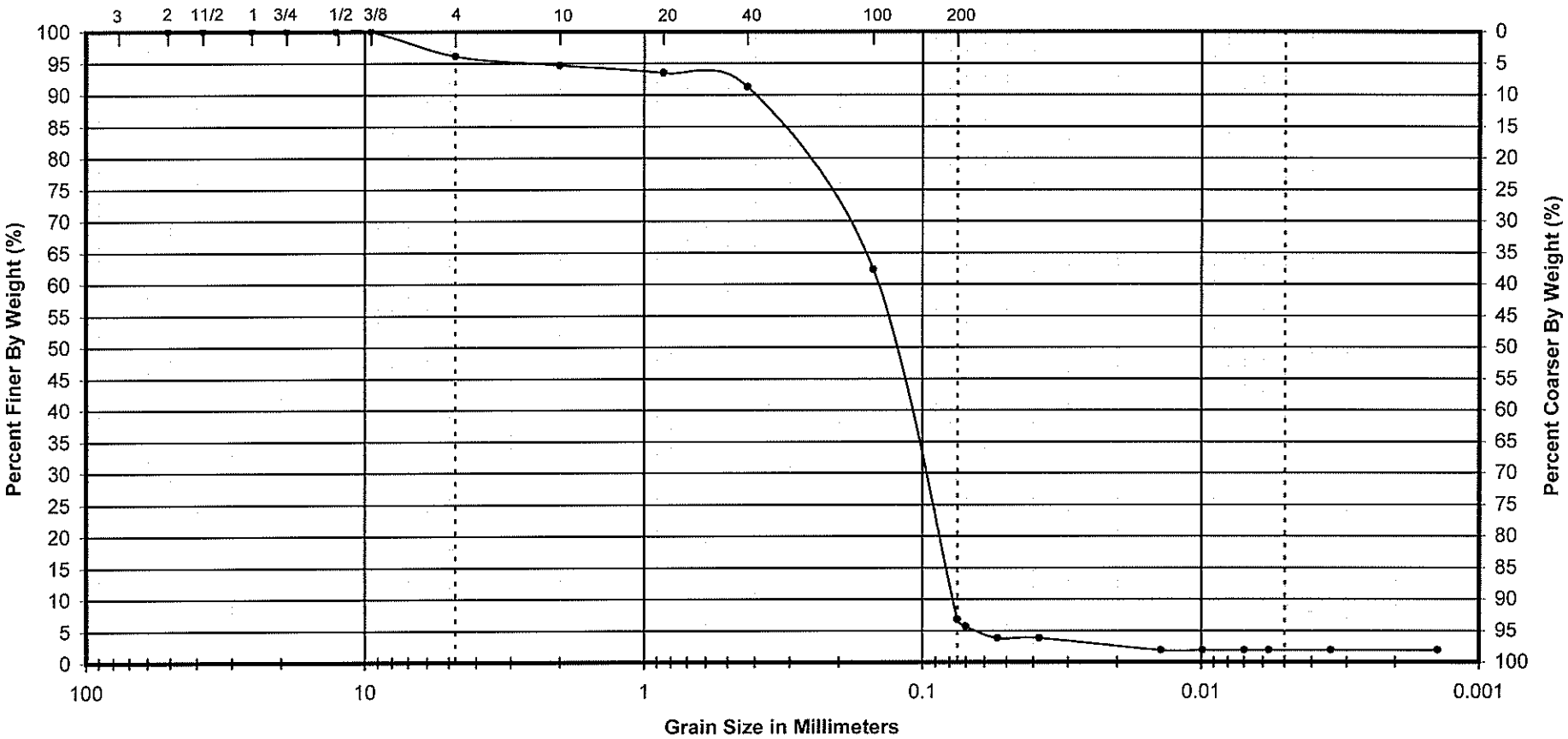
GRAVEL	SAND			SILT	CLAY
	COARSE	MEDIUM	FINE		

Boring No.	GS-6	CLASSIFICATION-ASTM D 2487		PARTICLE SIZE ANALYSIS-ASTM D 422
Sample No.	3	SILTY SAND (SM)		Jackson Harbor Dredging
Depth	4.0'-6.0'			& Modification Project
Liquid Limit	-	gray		Chicago Park District
Plastic Limit	-			Chicago, Illinois
Plasticity Index	NP			
Test By	CC	% Gravel	0.0	Geo Services, Inc.
Date	11/20/13	% Sand	71.7	Geotechnical, Environmental and Civil Engineering
Reviewed By	KA	% Silt	26.3	An MBE - DBE Firm
Job No	13158	% Clay	2.0	1235 E. Davis St., Arlington Heights, IL 60005
				Phone 847-253-3845 • Fax 847-253-0482



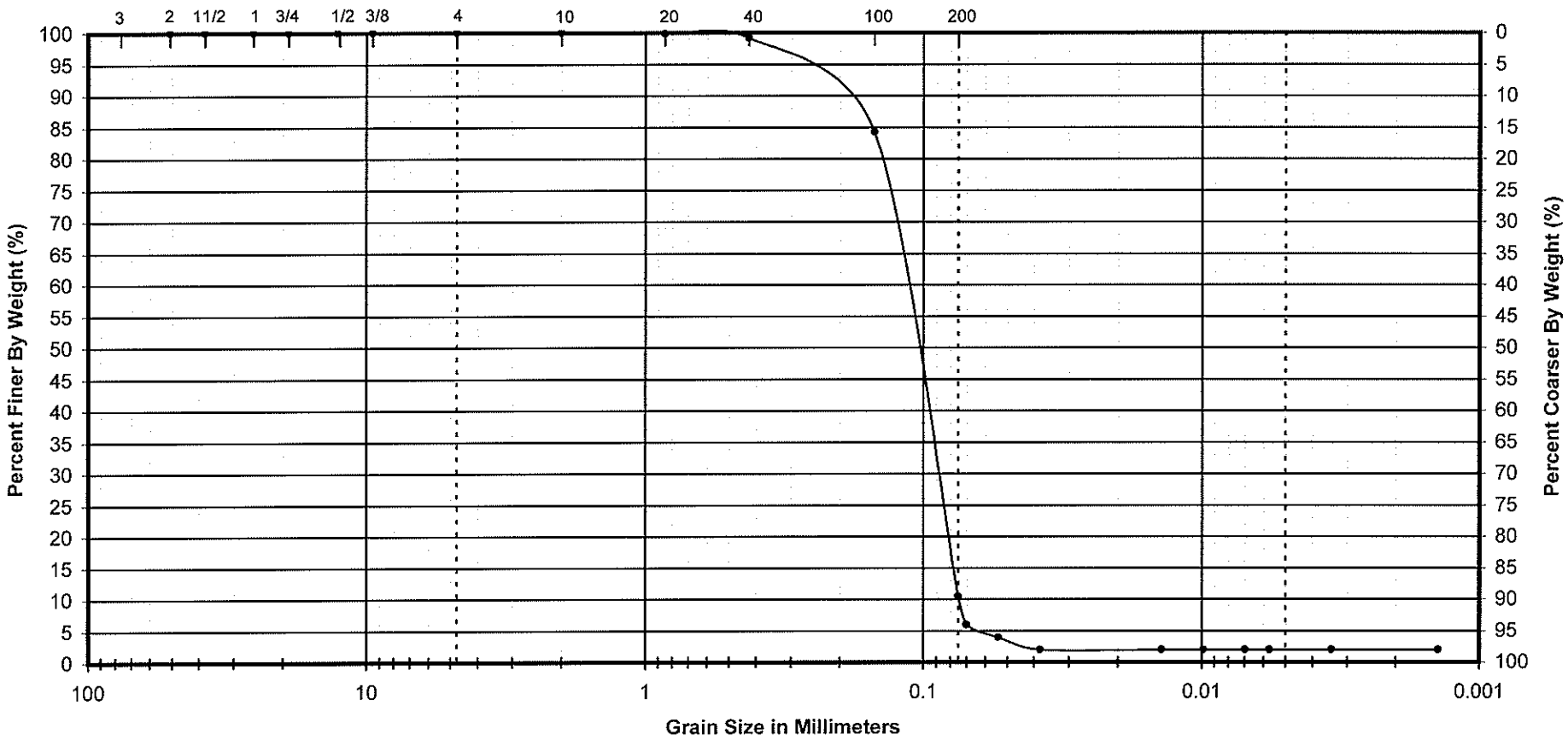
GRAVEL	SAND			SILT	CLAY
	COARSE	MEDIUM	FINE		

Boring No.	GS-7	CLASSIFICATION-ASTM D 2487		PARTICLE SIZE ANALYSIS-ASTM D 422
Sample No.	2	POORLY GRADED SAND with SILT (SP-SM)		Jackson Harbor Dredging
Depth	2.0'-4.0'			& Modification Project
Liquid Limit	-	gray		Chicago Park District
Plastic Limit	-	Cu	1.6	Chicago, Illinois
Plasticity Index	NP	Cc	0.9	
Test By	CC	% Gravel	0.1	Geo Services, Inc.
Date	11/20/13	% Sand	90.6	Geotechnical, Environmental and Civil Engineering
Reviewed By	KA	% Silt	7.3	An MBE - DBE Firm
Job No	13158	% Clay	2.0	1235 E. Davis St., Arlington Heights, IL 60005
				Phone 847-253-3845 • Fax 847-253-0482



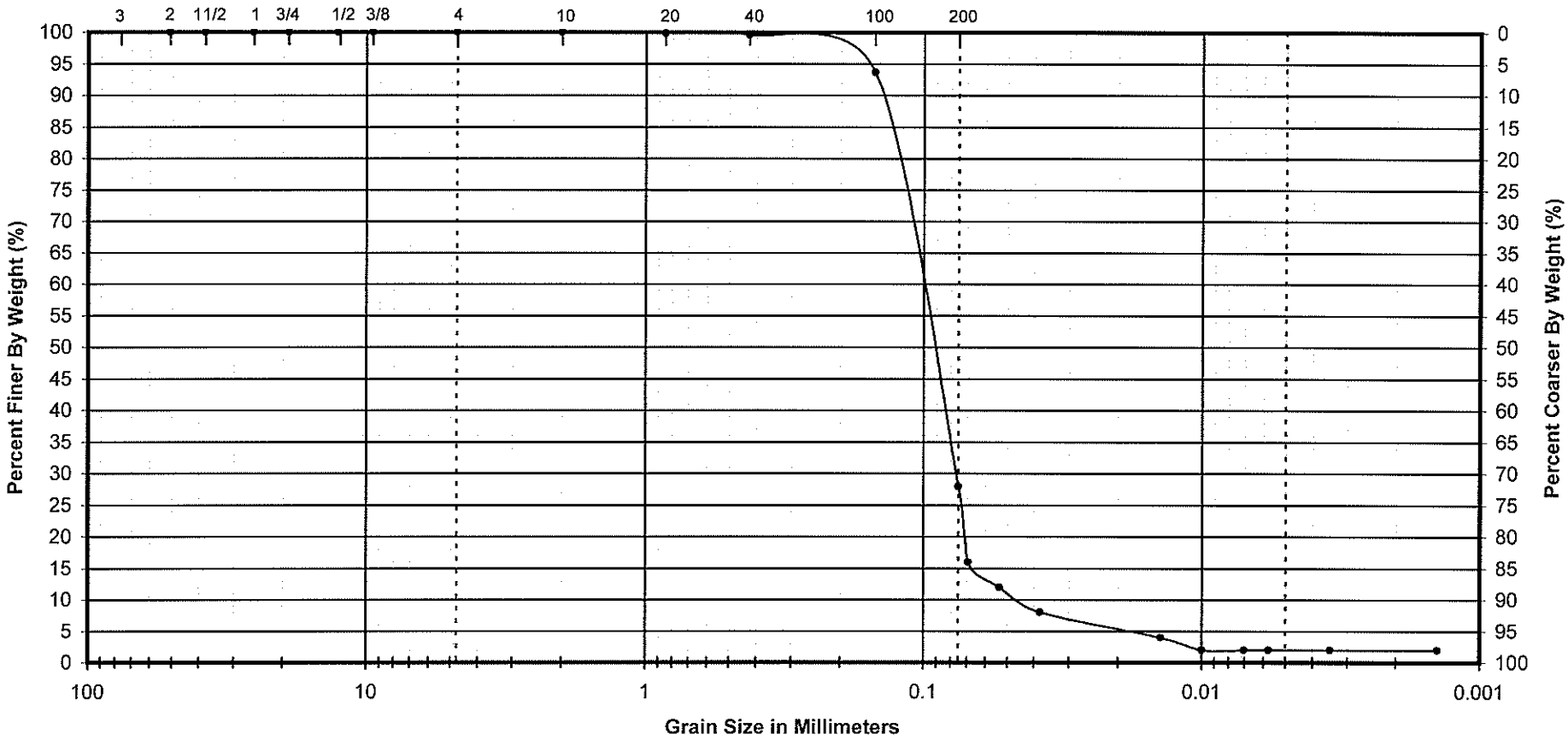
GRAVEL	SAND			SILT	CLAY
	COARSE	MEDIUM	FINE		

Boring No.	GS-8	CLASSIFICATION-ASTM D 2487		PARTICLE SIZE ANALYSIS-ASTM D 422
Sample No.	1	POORLY GRADED SAND with SILT (SP-SM)		Jackson Harbor Dredging
Depth	0.0'-2.0'			& Modification Project
Liquid Limit	-	gray		Chicago Park District
Plastic Limit	-	Cu	1.9	Chicago, Illinois
Plasticity Index	NP	Cc	0.8	
Test By	CC	% Gravel	3.9	Geo Services, Inc.
Date	11/20/13	% Sand	89.3	Geotechnical, Environmental and Civil Engineering
Reviewed By	KA	% Silt	4.9	An MBE - DBE Firm
Job No	13158	% Clay	1.9	1235 E. Davis St., Arlington Heights, IL 60005
				Phone 847-253-3845 • Fax 847-253-0482



GRAVEL	SAND			SILT	CLAY
	COARSE	MEDIUM	FINE		

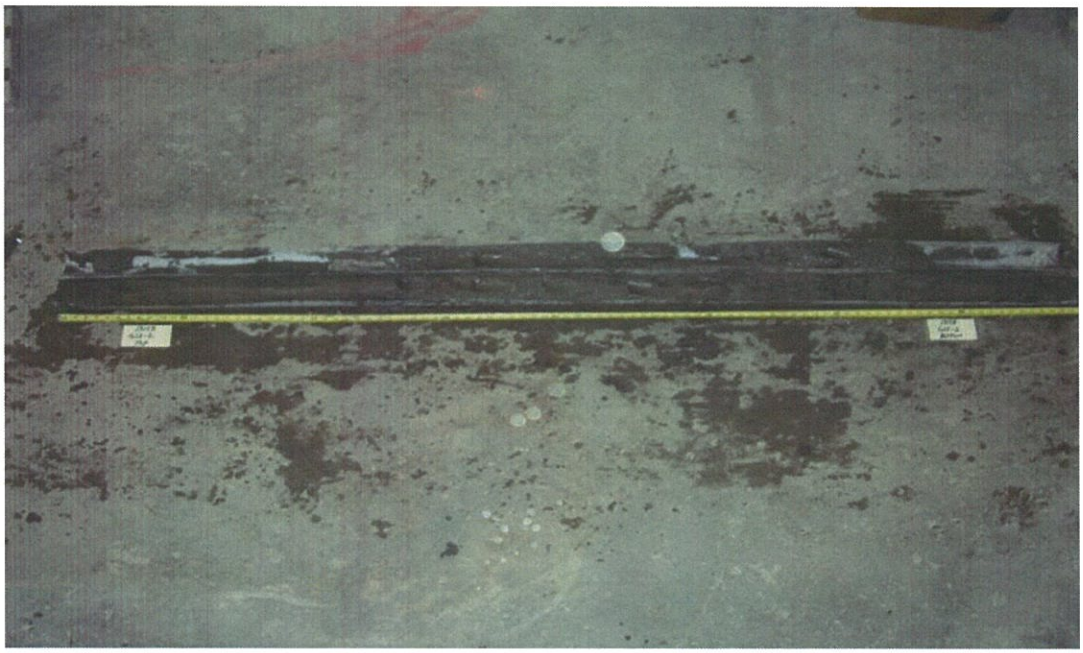
Boring No.	GS-9	CLASSIFICATION-ASTM D 2487		PARTICLE SIZE ANALYSIS-ASTM D 422
Sample No.	1	POORLY GRADED SAND with SILT (SP-SM)		Jackson Harbor Dredging
Depth	0.0'-2.0'			& Modification Project
Liquid Limit	-	gray		Chicago Park District
Plastic Limit	-	Cu	1.7	Chicago, Illinois
Plasticity Index	NP	Cc	0.8	
Test By	CC	% Gravel	0.0	Geo Services, Inc.
Date	11/20/13	% Sand	89.6	Geotechnical, Environmental and Civil Engineering
Reviewed By	KA	% Silt	8.4	An MBE - DBE Firm
Job No	13158	% Clay	2.0	1235 E. Davis St., Arlington Heights, IL 60005
				Phone 847-253-3845 • Fax 847-253-0482



GRAVEL	SAND			SILT	CLAY
	COARSE	MEDIUM	FINE		

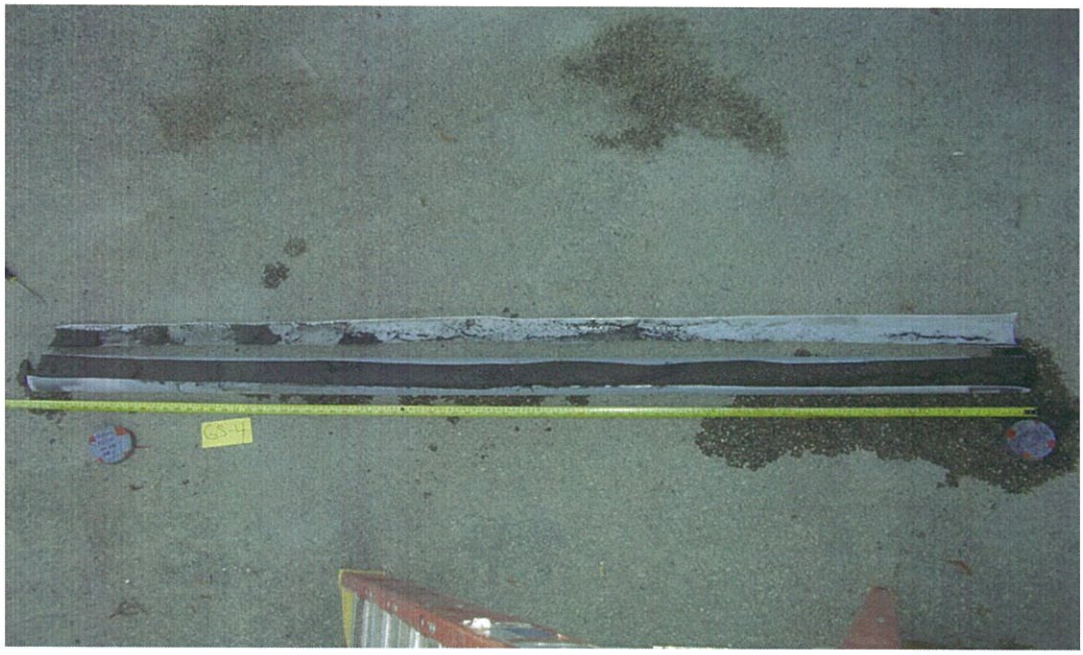
Boring No.	GS-10	CLASSIFICATION-ASTM D 2487		PARTICLE SIZE ANALYSIS-ASTM D 422
Sample No.	4	SILTY SAND (SM)		Jackson Harbor Dredging
Depth	6.0'-8.0'			& Modification Project
Liquid Limit	-	gray		Chicago Park District
Plastic Limit	-			Chicago, Illinois
Plasticity Index	NP			
Test By	CC	% Gravel	0.0	Geo Services, Inc.
Date	11/20/13	% Sand	72.1	Geotechnical, Environmental and Civil Engineering
Reviewed By	KA	% Silt	25.9	1235 E. Davis St., Arlington Heights, IL 60005
Job No	13158	% Clay	2.0	Phone 847-253-3845 • Fax 847-253-0482

GSI-01



GSI-02

GSI-03



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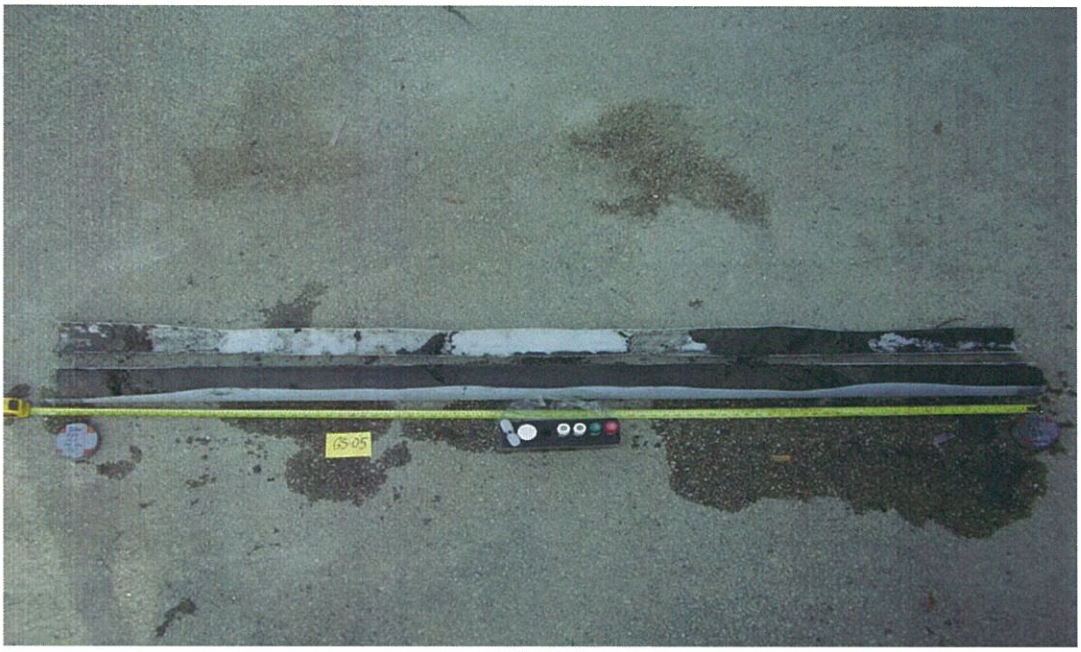

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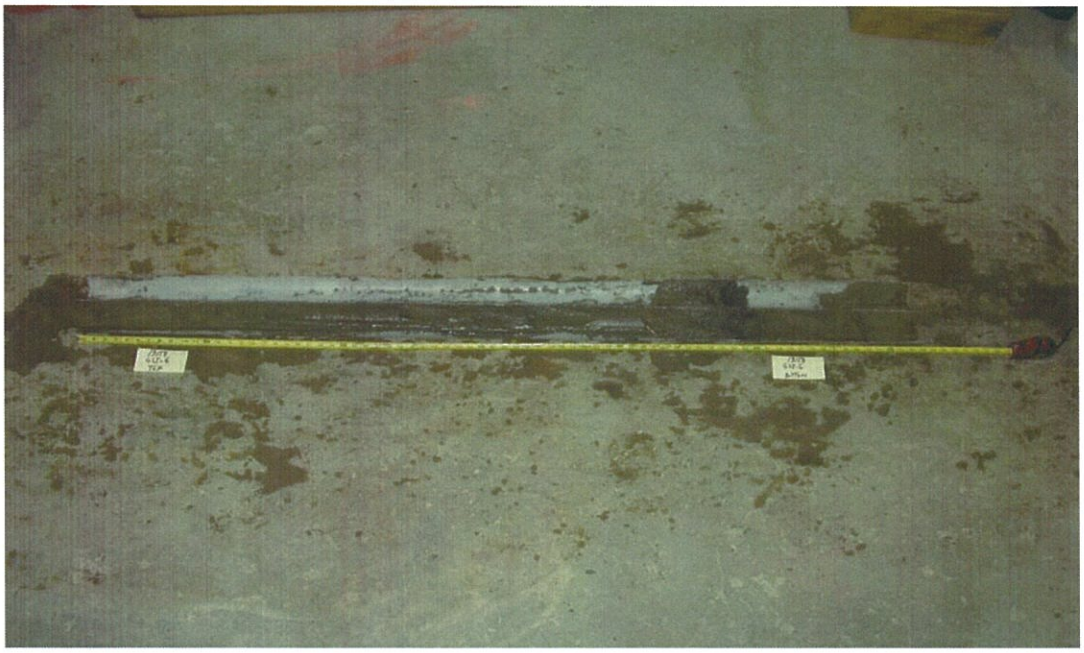
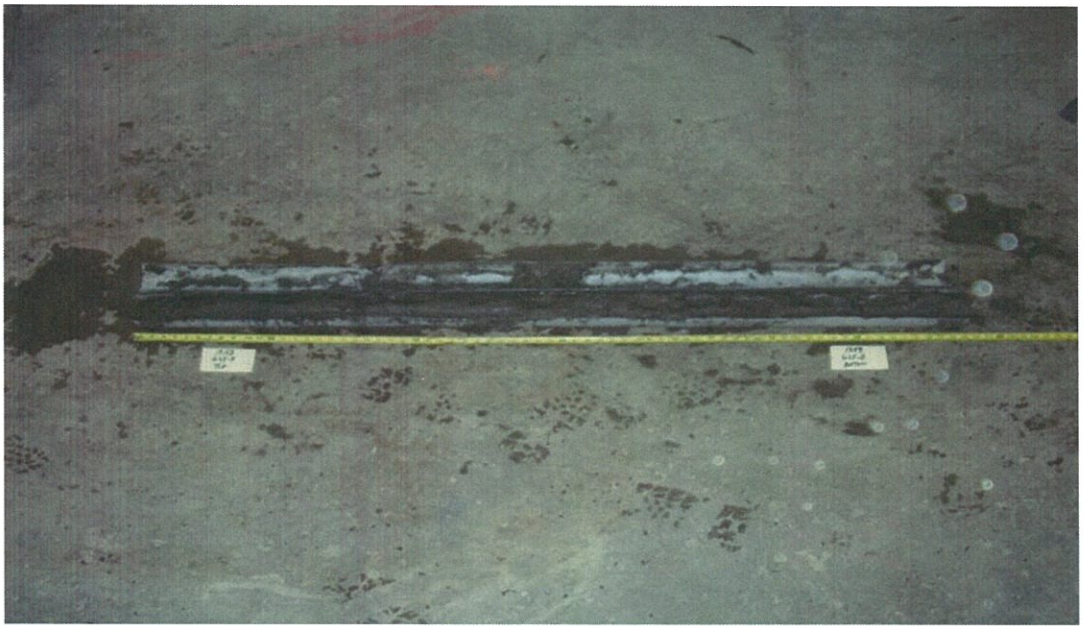


GSI-06

GSI-07



GSI-08

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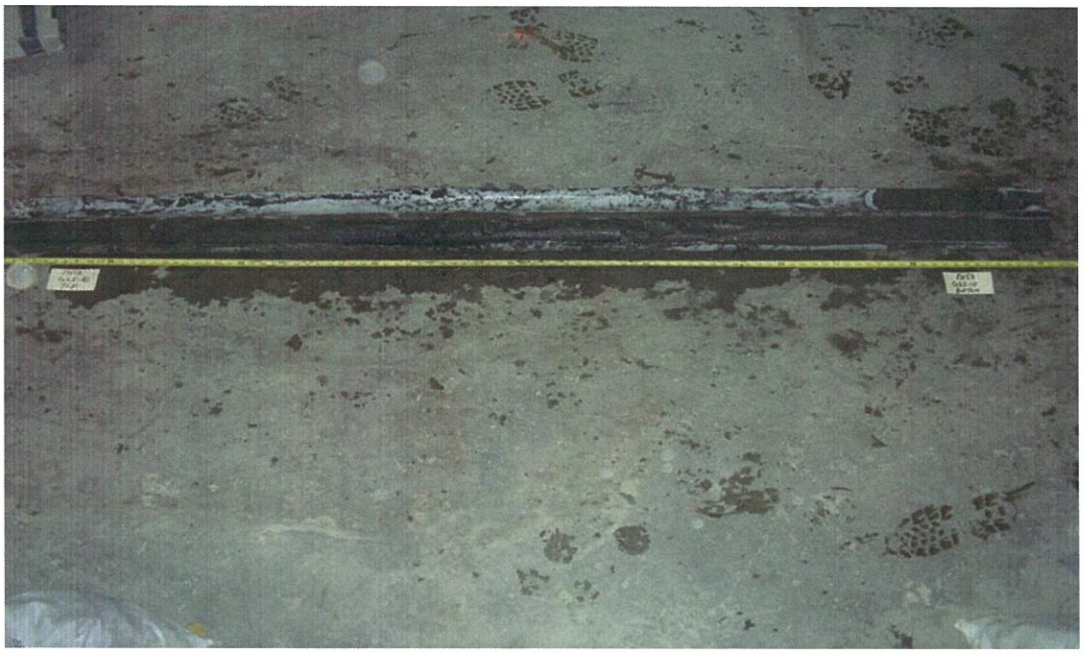

GSI-10

Appendix C – Sediment Analytical Chemical Analysis

Table 1
Semi-volatile Organic Compounds
Target Analyte List - Laboratory Analytical Results
Jackson Harbor

				Supernatant								
			Background	GS-4			GS-5			GS-9		
			Supernatant	4 hours	24 hours	48 hours	4 hours	24 hours	48 hours	4 hours	24 hours	48 hours
Date of Sample Collection:			11/13/2011	11/8/2013	11/8/2013	11/8/2013	11/8/2013	11/8/2013	11/8/2013	11/8/2013	11/8/2013	11/8/2013
GAL Laboratory ID			3110803-04	3110803-05	3110803-06	3110803-07	3110803-08	3110803-09	3110803-10	3110803-11	3110803-12	3110803-13
SVOCs (8270C)	**Units**	**Rep. Limit**										
1,2,4-Trichlorobenzene	ug/L	12	<12	<12	<12	<12	<12	<12	<12	<12	<12	<12
1,2-Dichlorobenzene	ug/L	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,3-Dichlorobenzene	ug/L	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
1,4-Dichlorobenzene	ug/L	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
2,4,5-Trichlorophenol	ug/L	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
2,4,6-Trichlorophenol	ug/L	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
2,4-Dichlorophenol	ug/L	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
2,4-Dimethylphenol	ug/L	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
2,4-Dinitrophenol	ug/L	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
2,4-Dinitrotoluene	ug/L	0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
2,6-Dinitrotoluene	ug/L	0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7
2-Chloronaphthalene	ug/L	12	<12	<12	<12	<12	<12	<12	<12	<12	<12	<12
2-Chlorophenol	ug/L	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
2-Methylnaphthalene	ug/L	12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12
2-Methylphenol	ug/L	11	<11	<11	<11	<11	<11	<11	<11	<11	<11	<11
2-Nitroaniline	ug/L	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
2-Nitrophenol	ug/L	13	<13	<13	<13	<13	<13	<13	<13	<13	<13	<13
3,3'-Dichlorobenzidine	ug/L	20	<20	<1.30	<1.30	<1.30	<1.30	<1.30	<1.30	<1.30	<1.30	<1.30
3/4-Methylphenol	ug/L	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
3-Nitroaniline	ug/L	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
4,6-Dinitro-2-methylphenol	ug/L	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
4-Bromophenyl phenyl ether	ug/L	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
4-Chloro-3-methylphenol	ug/L	20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
4-Chloroaniline	ug/L	20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
4-Chlorophenyl phenyl ether	ug/L	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
4-Nitroaniline	ug/L	20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
4-Nitrophenol	ug/L	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
Acenaphthene	ug/L	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Acenaphthylene	ug/L	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Anthracene	ug/L	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Benzo (a) anthracene	ug/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Benzo (a) pyrene	ug/L	3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
Benzo (b) fluoranthene	ug/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Benzo (g,h,i) perylene	ug/L	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Benzo (k) fluoranthene	ug/L	5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Benzyl alcohol	ug/L	20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Bis(2-chloroethoxy)methane	ug/L	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bis(2-chloroethyl)ether	ug/L	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bis(2-chloroisopropyl)ether	ug/L	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bis(2-ethylhexyl)phthalate	ug/L	5	<05	<05	<05	<05	<05	<05	<05	<05	<05	<05
Butyl benzyl phthalate	ug/L	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Carbazole	ug/L	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chrysene	ug/L	3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
Dibenz (a,h) anthracene	ug/L	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Dibenzofuran	ug/L	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Diethyl phthalate	ug/L	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Dimethyl phthalate	ug/L	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
Di-n-butyl phthalate	ug/L	11	<11	<11	<11	<11	<11	<11	<11	<11	<11	<11
Di-n-octyl phthalate	ug/L	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Fluoranthene	ug/L	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Fluorene	ug/L	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Hexachlorobenzene	ug/L	3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
Hexachlorobutadiene	ug/L	11	<11	<11	<11	<11	<11	<11	<11	<11	<11	<11
Hexachlorocyclopentadiene	ug/L	12	<12	<12	<12	<12	<12	<12	<12	<12	<12	<12
Hexachloroethane	ug/L	0.8	<0.80	<0.80	<0.80	<0.80	<0.80	<0.80	<0.80	<0.80	<0.80	<0.80
Indeno(1,2,3-cd)pyrene	ug/L	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Isophorone	ug/L	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Naphthalene	ug/L	12	<12	<12	<12	<12	<12	<12	<12	<12	<12	<12
Nitrobenzene	ug/L	12	<12	<12	<12	<12	<12	<12	<12	<12	<12	<12
N-Nitrosodi-n-propylamine	ug/L	0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7
N-Nitrosodiphenylamine	ug/L	4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4
Pentachlorophenol	ug/L	2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
Phenanthrene	ug/L	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Phenol	ug/L	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Pyrene	ug/L	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10

ug/L = micrograms per liter

Table 2
Metals and General Chemistry
Target Analyte List - Laboratory Analytical Results
Jackson Harbor

Field Sample ID			Background	GS-4			GS-5			GS-9		
			Supernatant	4 hours	24 hours	48 hours	4 hours	24 hours	48 hours	4 hours	24 hours	48 hours
Date of Sample Collection:			11/13/2011	11/8/2013	11/8/2013	11/8/2013	11/8/2013	11/8/2013	11/8/2013	11/8/2013	11/8/2013	11/8/2013
GAL Sample ID			3110803-04	3110803-05	3110803-06	3110803-07	3110803-08	3110803-09	3110803-10	3110803-11	3110803-12	3110803-13
Total Metals (6010B)	**Units**	**Rep. Limit**										
Arsenic	mg/L	0.002	<0.002	**0.003**	<0.002	0.003	<0.002	**0.002**	**0.003**	**0.003**	<0.002	<0.002
Cadmium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chromium	mg/L	0.001	<0.001	**0.004**	**0.001**	**0.001**	**0.003**	**0.002**	**0.001**	**0.008**	**0.002**	**0.002**
Copper	mg/L	0.001	<0.001	**0.004**	**0.002**	**0.002**	**0.003**	**0.002**	**0.002**	**0.008**	**0.004**	**0.002**
Lead	mg/L	0.002	**0.004**	**0.016**	**0.007**	**0.006**	**0.011**	**0.009**	**0.01**	**0.021**	**0.007**	**0.007**
Nickel	mg/L	0.001	**0.001**	**0.006**	**0.003**	**0.004**	**0.004**	**0.003**	**0.003**	**0.009**	**0.004**	**0.004**
Zinc	mg/L	0.005	<0.005	**0.009**	<0.005	<0.005	**0.007**	<0.005	<0.005	**0.024**	<0.005	<0.005
Total Metals (7470A)	**Units**	**Rep. Limit**										
Mercury	mg/L	0.050	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Wet Chemistry	**Units**	**Rep. Limit**										
Total Hardness, as CaCO3	mg/L	5	**109**	**135**	**144**	**137**	**140**	**112**	**120**	**142**	**113**	**111**
Total Dissolved Solids	mg/L	10	**170**	**318**	**186**	**166**	**184**	**162**	**130**	**144**	**136**	**130**
Total Suspended Solids	mg/L	1	<1	**109**	**10**	**9**	**56**	**13**	**9**	**179**	**9**	**7**
Total Volatile Solids	mg/L	10	**55**	**61**	**31**	**39**	**52**	**160**	**71**	**54**	**65**	**143**
Ammonia (as N)	mg/L	0.1	<0.1	**4.84**	**4.84**	**4.89**	**4.54**	**4.65**	**4.57**	**7.1**	**8.72**	**7.51**
Phosphate (Total as P)	mg/L	0.01	**0.43**	**0.011**	0.03	**0.04**	<0.010	**0.04**	**0.01**	**0.01**	**0.04**	**0.03**

mg/L = milligrams per Liter

Table 3
Pesticides
Laboratory Analytical Results
Jackson Harbor

				Supernatant								
			Background	GS-4			GS-5			GS-9		
			Supernatant	4 hours	24 hours	48 hours	4 hours	24 hours	48 hours	4 hours	24 hours	48 hours
Date of Sample Collection:			11/13/2011	11/8/2013	11/8/2013	11/8/2013	11/8/2013	11/8/2013	11/8/2013	11/8/2013	11/8/2013	11/8/2013
GAL Laboratory ID:			3110803-04	3110803-05	3110803-06	3110803-07	3110803-08	3110803-09	3110803-10	3110803-11	3110803-12	3110803-13
Pesticides (8081A)	**Units**	**Rep. Limit**										
4,4'-DDD	ug/L	0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16
4,4'-DDE	ug/L	0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16
4,4'-DDT	ug/L	0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
Aldrin	ug/L	0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
alpha-BHC	ug/L	0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
beta-BHC	ug/L	0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
Chlordane	ug/L	0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
delta-BHC	ug/L	0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
Dieldrin	ug/L	0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16
Endosulfan I	ug/L	0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
Endosulfan II	ug/L	0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16
Endosulfan sulfate	ug/L	0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16
Endrin	ug/L	0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16
Endrin aldehyde	ug/L	0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16
Endrin ketone	ug/L	0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16
gamma-BHC (Lindane)	ug/L	0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
Heptachlor	ug/L	0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
Heptachlor epoxide	ug/L	0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
Methoxychlor	ug/L	0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8
Toxaphene	ug/L	0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16

ug/L = micrograms per liter

Table 4
Pesticides and PCBs
Target Analyte List - Laboratory Analytical Results
Jackson Harbor

		Field Sample ID	GS-4	GS-5	GS-9	Tier 1 Re
		Date of Sample Collection:	11/8/2013	11/8/2013	11/8/2013	Soil Cleanu
		GAL Sample ID	3110803-01	3110803-02	3110803-03	Ingestion
Pesticides (8081A)	**Units**	**Rep. Limit**				
4,4´-DDD	ug/kg dry	16.00	<16.0	<16.0	<16.0	3,000
4,4´-DDE	ug/kg dry	16.00	<16.0	<16.0	<16.0	2,000
4,4´-DDT	ug/kg dry	16.00	<16.0	<16.0	<16.0	2,000
Aldrin	ug/kg dry	8.00	<8.01	<8.04	<8.07	40
alpha-BHC	ug/kg dry	0.13	<0.14	<0.17	<0.20	100
Aroclor-1016	ug/kg dry	80.00	<80.0	<80.0	<80.0	1,000
Aroclor-1221	ug/kg dry	80.00	<80.0	<80.0	<80.0	1,000
Aroclor-1232	ug/kg dry	80.00	<80.0	<80.0	<80.0	1,000
Aroclor-1242	ug/kg dry	80.00	<80.0	<80.0	<80.0	1,000
Aroclor-1248	ug/kg dry	80.00	<80.0	<80.0	<80.0	1,000
Aroclor-1254	ug/kg dry	160.00	<160	<160	<160	1,000
Aroclor-1260	ug/kg dry	160.00	<160	<160	<160	1,000
beta-BHC	ug/kg dry	8.00	<8.01	<8.04	<8.07	NE
Chlordane	ug/kg dry	80.00	<80.1	<80.4	<80.7	1,800
delta-BHC	ug/kg dry	8.00	<8.1	<8.4	<8.7	NE
Dieldrin	ug/kg dry	16.00	<16.1	<16.4	<16.7	40
Endosulfan I	ug/kg dry	8.00	<8.01	<8.04	<8.07	NE
Endosulfan II	ug/kg dry	16.00	<16.0	<16.0	<16.0	NE
Endosulfan sulfate	ug/kg dry	16.00	<16.0	<16.0	<16.0	NE
Endrin	ug/kg dry	16.00	<16.0	<16.0	<16.0	23,000
Endrin aldehyde	ug/kg dry	16.00	<16.0	<16.0	<16.0	NE
Endrin ketone	ug/kg dry	16.00	<16.0	<16.0	<16.0	NE
gamma-BHC (Lindane)	ug/kg dry	8.00	<8.00	<8.00	<8.00	500

esidential p Objectives Inhalation	Soil Component of the Groundwater Ingestion Exposure Route Values	
	Class I	Class II
NE	16,000	80,000
NE	54,000	270,000
NE	32,000	160,000
3,000	500	2,500
800	0.5	3
NE	NE	NE
NE	NE	NE
NE	NE	NE
NE	NE	NE
NE	NE	NE
NE	NE	NE
NE	NE	NE
NE	NE	NE
7,200	10,000	48,000
NE	NE	NE
1,000	4	20
NE	NE	NE
NE	NE	NE
NE	NE	NE
NE	1,000	5,000
NE	NE	NE
NE	NE	NE
NE	9	47

Table 5
Metals and Cyanide in Sediment
Laboratory Analytical Results - Target Analyte List
Jackson Harbor

Field Sample ID:			GS-4	GS-5	GS-9	Tier 1 Residential Soil Cleanup Objectives		Soil Component of the Groundwater Ingestion Exposure Route Values	
Date of Sample Collection:			11/8/2013	11/8/2013	11/8/2013				
GAL Sample ID			3110803-01	3110803-02	3110803-03	Ingestion (mg/kg)	Inhalation (mg/kg)	Class I	Class II
Cyanide, Total (4500CN,C,E)									
	Units	Rep. Limit							
Cyanide, Total	mg/kg	0.10	8.68	0.11	0.13	1,600	NE	40	120
Total Metals (6010B)									
Aluminum	mg/kg	5.0	3,630	1,800	1,710	NE	NE	NE	NE
Antimony	mg/kg	1.0	<1.0	<1.0	<1.0	31	NE	5	20
Arsenic	mg/kg	0.2	7.0	4.6	3.8	13	750	30	120
Barium	mg/kg	0.1	22.8	11.0	10.0	5,500	690,000	1,800	1,800
Beryllium	mg/kg	0.1	0.5	0.4	0.4	160	1,300	1,000	130,000
Cadmium	mg/kg	0.1	1.6	0.8	0.8	78	1,800	59	590
Calcium	mg/kg	10	46,000	42,700	47,300	NE	NE	NE	NE
Chromium	mg/kg	0.1	7.8	5.1	4.3	230	270	32	NE
Cobalt	mg/kg	0.1	5.3	3.2	2.9	4,700	NE	NE	NE
Copper	mg/kg	0.1	18.1	8.0	7.0	2,900	NE	330,000	330,000
Iron	mg/kg	1.0	10700	6020	5400	NE	NE	NE	NE
Lead	mg/kg	0.2	33.7	18.2	14.6	400	NE	107	1,420
Magnesium	mg/kg	10	27,100	25,900	29,200	325,000	NE	NE	NE
Manganese	mg/kg	0.1	339	216	220	1,600	69,000	NE	NE
Nickel	mg/kg	0.1	11.8	6.0	5.5	1,600	13,000	700	14,000
Potassium	mg/kg	10	1,270	714	563	NE	NE	NE	NE
Selenium	mg/kg	0.2	<0.2	<0.2	<0.2	390	NE	3.3	3.3
Silver	mg/kg	0.1	<1.0	<1.0	<1.0	390	NE	39	NE
Sodium	mg/kg	10	208	102	102	NE	NE	NE	NE
Thallium	mg/kg	1.0	<1.0	<1.0	<1.0	6.3	NE	3.4	34
Vanadium	mg/kg	1.0	11.0	7.7	6.4	550	NE	980	NE
Zinc	mg/kg	0.5	62.9	36.1	39.1	23,000	NE	16,000	32,000
Total Metals (7470A)									
	Units	Rep. Limit							
Mercury	mg/kg	0.05	0.13	<0.05	<0.05	23	10	6.4	32

mg/kg = milligrams per kilogram
NE - Not Established
Source of Cleanup Objectives - 35 IAC 742 Appendix B Table A Tier 1 Remediation Objectives for Residential Properties

Table 6
Volatile Organic Compounds in Sediment
Laboratory Analytical Results
Jackson Harbor

Field Sample ID:			GS-4	GS-5	GS-9	Tier 1 Residential Soil Cleanup Objectives		Soil Component of the Groundwater Ingestion Exposure Route Values	
Date of Sample Collection:			11/8/2013	11/8/2013	11/8/2013				
GAL Sample ID			3110803-01	3110803-02	3110803-03	Ingestion (mg/kg)	Inhalation (mg/kg)	Class I	Class II
Volatile Organic Compounds (8260B)									
	Units	Rep. Limit							
Acetone	ug/kg	100.0	<100	<100	<100	70,000,000	100,000,000	25,000	25,000
Benzene	ug/kg	2.0	<2.0	<2.0	<2.0	12,000	800	30	170
Bromodichloromethane	ug/kg	2.0	<2.0	<2.0	<2.0	10,000.00	3,000,000.00	600	600
Bromoform	ug/kg	2.0	<2.0	<2.0	<2.0	81,000	53,000	800	800
Bromomethane	ug/kg	5.0	<5	<5	<5	NE	NE	NE	NE
2-Butanone	ug/kg	5.0	<5	<5	<5	NE	NE	NE	NE
Carbon disulfide	ug/kg	5.0	<5	<5	<5	7,800,000	720,000	32,000	160,000
Carbon tetrachloride	ug/kg	5.0	<5	<5	<5	5,000	300	70	330
Chlorobenzene	ug/kg	5.0	<5	<5	<5	160,000	130,000	1,000	6,500
Chloroethane	ug/kg	5.0	<5	<5	<5	NE	NE	NE	NE
Chloroform	ug/kg	5.0	<5	<5	<5	100,000	300	600	2,900
Chloromethane	ug/kg	5.0	<5	<5	<5	NE	NE	NE	NE
Dibromochloromethane	ug/kg	5.0	<5	<5	<5	NE	NE	NE	NE
1,1-Dichloroethane	ug/kg	5.0	<5	<5	<5	7,800,000	1,300,000	23	110
1,2-Dichloroethane	ug/kg	5.0	<5	<5	<5	7,000	400	20	100
1,1-Dichloroethene	ug/kg	5.0	<5	<5	<5	3,900,000	290,000	60	300
cis-1,2-Dichloroethene	ug/kg	5.0	<5	<5	<5	780,000	1,200,000	400	1100
trans-1,2-Dichloroethene	ug/kg	5.0	<5	<5	<5	1,600,000	3,100,000	700	3400
1,2-Dichloropropane	ug/kg	5.0	<5	<5	<5	9,000	15,000	30	150
cis-1,3-Dichloropropene	ug/kg	2.0	<2.0	<2.0	<2.0	6,400	1,100	4	20
trans-1,3-Dichloropropene	ug/kg	2.0	<2.0	<2.0	<2.0	6,400	1,100	4	20
Ethylbenzene	ug/kg	5.0	<5	<5	<5	7,800,000	400,000	13	19
2-Hexanone	ug/kg	5.0	<5	<5	<5	NE	NE	NE	NE
4-Methyl-2-pentanone	ug/kg	5.0	<5	<5	<5	NE	NE	NE	NE
Methylene chloride	ug/kg	5.0	<5	<5	<5	85,000	13,000	20	200
Methyl tert-butyl ether	ug/kg	5.0	<5	<5	<5	780,000	8,800,000	320	320
Styrene	ug/kg	5.0	<5	<5	<5	16,000,000	1,500,000	4,000	18,000
1,1,2,2-Tetrachloroethane	ug/kg	5.0	<5	<5	<5	NE	NE	NE	NE
Tetrachloroethene	ug/kg	2.0	<2.0	<2.0	<2.0	12,000	11,000	60	300
Toluene	ug/kg	5.0	<5	<5	<5	16,000,000	650,000	12,000	29,000
1,1,1-Trichloroethane	ug/kg	5.0	<5	<5	<5	NE	1,200,000	2,000	96,000
1,1,2-Trichloroethane	ug/kg	5.0	<5	<5	<5	310,000	1,800,000	20	300
Trichloroethene	ug/kg	2.0	<2.0	<2.0	<2.0	58,000	5,000	60	300
Vinyl chloride	ug/kg	2.0	<2.0	<2.0	<2.0	460	280	10	70
Xylenes, Total	ug/kg	5.0	<5	<5	<5	16,000,000	320,000	150,000	150,000

ug/kg = micrograms per kilogram
NE - Not Established
Source of Cleanup Objectives - 35 IAC 742 Appendix B Table A Tier 1 soil Remediation Objectives for Residential Properties

Table 7
Herbicides in Sediment
Laboratory Analytical Results
Jackson Harbor

Field Sample ID:			GS-4	GS-5	GS-9	Tier 1 Residential Soil Cleanup Objectives		Soil Component of the Groundwater Ingestion Exposure Route Values	
Date of Sample Collection:			11/8/2013	11/8/2013	11/8/2013				
GAL Sample ID			3110803-01	3110803-02	3110803-03	Ingestion (mg/kg)	Inhalation (mg/kg)	Class I	Class II
Herbicides (8081/8082)									
	Units	Rep. Limit							
Acetochlor	ug/kg	100	<100	<100	<100	NE	NE	NE	NE
Alachlor	ug/kg	32	<32	<32	<32	8,000	NE	40	20
Aldicarb	ug/kg	100	<100	<100	<100	78,000	NE	13	70
Atrazine	ug/kg	48	<48	<48	<48	2,700,000	NE	66	330
Butylate	ug/kg	200	<200	<200	<200	NE	NE	NE	NE
Carbofuran	ug/kg	200	<200	<200	<200	390,000	NE	220	1,100
Cyanazine	ug/kg	200	<200	<200	<200	NE	NE	NE	NE
Disulfoton	ug/kg	100	<100	<100	<100	NE	NE	NE	NE
EPTC	ug/kg	100	<100	<100	<100	NE	NE	NE	NE
Ethalfluralin	ug/kg	100	<100	<100	<100	NE	NE	NE	NE
Famphur	ug/kg	100	<100	<100	<100	NE	NE	NE	NE
Metolachlor	ug/kg	200	<200	<200	<200	NE	NE	NE	NE
Metribuzin	ug/kg	100	<100	<100	<100	NE	NE	NE	NE
Parathion	ug/kg	100	<100	<100	<100	NE	NE	NE	NE
Pendimethalin	ug/kg	100	<100	<100	<100	NE	NE	NE	NE
Phorate	ug/kg	100	<100	<100	<100	NE	NE	NE	NE
Prometon	ug/kg	200	<200	<200	<200	NE	NE	NE	NE
Simazine	ug/kg	32	<32	<32	<32	390,000	1,500,000	40	370
Trifluralin	ug/kg	100	<100	<100	<100	NE	NE	NE	NE
Herbicides (8321A)									
2,4,5-TP (Silvex)	mg/kg	0.0041	<0.0041	<0.0041	<0.0041	7,800	NE	11	55
2,4-D	mg/kg	0.0041	<0.0041	<0.0041	<0.0041	NE	NE	NE	NE

ug/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
Source of Cleanup Objectives - 35 IAC 742 Appendix B Table A Tier 1 soil Remediation Objectives for Residential Properties

Table 8
Semi-volatile Organic Compounds in Sediment
Laboratory Analytical Results
Jackson Harbor

Field Sample ID:			GS-4	GS-5	GS-9	Tier 1 Residential Soil Cleanup Objectives		Soil Component of the Groundwater Ingestion Exposure Route Values		Background for Metropolitan Areas 35 IAC 742
Date of Sample Collection:			11/8/2013	11/8/2013	11/8/2013					
GAL Sample ID			3110803-01	3110803-02	3110803-03	Ingestion (mg/kg)	Inhalation (mg/kg)	Class I	Class II	
Semi-volatile Organic Compounds (8260B)										
	Units	Rep. Limit								
1,2,4-Trichlorobenzene	mg/kg	0.66	<0.66	<0.66	<0.66	780	3,200	5	53	NE
1,2-Dichlorobenzene	mg/kg	0.66	<0.66	<0.66	<0.66	7,000	560	17	43	NE
1,3-Dichlorobenzene	mg/kg	0.2	<0.2	<0.2	<0.2	NE	NE	NE	NE	NE
1,4-Dichlorobenzene	mg/kg	0.66	<0.66	<0.66	<0.66	NE	11,000	2	11	NE
2,4,5-Trichlorophenol	mg/kg	0.66	<0.66	<0.66	<0.66	NE	NE	NE	NE	NE
2,4,6-Trichlorophenol	mg/kg	0.12	<0.12	<0.12	<0.12	NE	NE	NE	NE	NE
2,4-Dichlorophenol	mg/kg	0.66	<0.66	<0.66	<0.66	NE	NE	NE	NE	NE
2,4-Dimethylphenol	mg/kg	1.3	<1.3	<1.3	<1.3	1,600	NE	9	9	NE
2,4-Dinitrophenol	mg/kg	0.18	<0.18	<0.18	<0.18	NE	NE	NE	NE	NE
2,4-Dinitrotoluene	mg/kg	0.13	<0.13	<0.13	<0.13	0.9	NE	0.0008	0.0008	NE
2,6-Dinitrotoluene	mg/kg	0.11	<0.11	<0.11	<0.11	0.9	NE	0.0007	0.0007	NE
2-Chloronaphthalene	mg/kg	0.66	<0.66	<0.66	<0.66	NE	NE	NE	NE	NE
2-Chlorophenol	mg/kg	0.66	<0.66	<0.66	<0.66	NE	NE	NE	NE	NE
2-Methylnaphthalene	mg/kg	0.66	<0.66	<0.66	<0.66	NE	NE	NE	NE	NE
2-Methylphenol	mg/kg	2.30	<2.3	<2.3	<2.3	3,900	NE	15	15	NE
2-Nitroaniline	mg/kg	0.12	<0.12	<0.12	<0.12	NE	NE	NE	NE	NE
2-Nitrophenol	mg/kg	0.66	<0.66	<0.66	<0.66	NE	NE	NE	NE	NE
3,3'-Dichlorobenzidine	mg/kg	1.30	<1.3	<1.3	<1.3	1	NE	0.007	0.033	NE
3/4-Methylphenol	mg/kg	0.16	<0.16	<0.16	<0.16	NE	NE	NE	NE	NE
3-Nitroaniline	mg/kg	0.15	<0.15	<0.15	<0.15	NE	NE	NE	NE	NE
4,6-Dinitro-2-methylphenol	mg/kg	2.00	<2	<2	<2	NE	NE	NE	NE	NE
4-Bromophenyl phenyl ether	mg/kg	0.66	<0.66	<0.66	<0.66	NE	NE	NE	NE	NE
4-Chloro-3-methylphenol	mg/kg	1.30	<1.3	<1.3	<1.3	NE	NE	NE	NE	NE
4-Chloroaniline	mg/kg	0.14	<0.14	<0.14	<0.14	310	NE	0.7	0.7	NE
4-Chlorophenyl phenyl ether	mg/kg	0.66	<0.66	<0.66	<0.66	NE	NE	NE	NE	NE
4-Nitroaniline	mg/kg	0.12	<0.12	<0.12	<0.12	NE	NE	NE	NE	NE
4-Nitrophenol	mg/kg	3.30	<3.3	<3.3	<3.3	NE	NE	NE	NE	NE
Acenaphthene	mg/kg	0.66	<0.66	<0.66	<0.66	4,700	NE	570	2,900	0.13
Acenaphthylene	mg/kg	0.66	<0.66	<0.66	<0.66	NE	NE	NE	NE	0.07
Anthracene	mg/kg	0.66	<0.66	**1.43**	**0.88**	23,000	NE	12,000	59,000	0.4
Benzo (a) anthracene	mg/kg	0.66	<0.66	**1.38**	**0.79**	0.9	NE	2	8	1.8
Benzo (b) fluoranthene	mg/kg	0.66	<0.66	**0.91**	<0.66	0.9	NE	5	25	2.1
Benzo (g,h,i) perylene	mg/kg	0.66	<0.66	<0.66	<0.66	NE	NE	NE	NE	1.7
Benzo (k) fluoranthene	mg/kg	1.8	<1.8	<1.8	<1.8	9	NE	49	250	1.7
Benzoic acid	mg/kg	1.5	<1.5	<1.5	<1.5	NE	NE	NE	NE	NE
Benzyl alcohol	mg/kg	1.3	<1.3	<1.3	<1.3	NE	NE	NE	NE	NE
Bis(2-chloroethoxy)methane	mg/kg	1.5	<15	<15	<15	NE	NE	NE	NE	NE
Bis(2-chloroethyl)ether	mg/kg	0.66	<0.66	<0.66	<0.66	0.6	0.2	0.004	0.004	NE
Bis(2-ethylhexyl)phthalate	mg/kg	0.66	<0.66	<0.66	<0.66	46	31,000	3,600	31,000	NE
Butyl benzyl phthalate	mg/kg	0.66	<0.66	<0.66	<0.66	16,000	930	930	930	NE
Carbazole	mg/kg	0.66	<0.66	<0.66	<0.66	32	NE	0.6	2.8	NE
Chrysene	mg/kg	0.66	<0.66	<0.66	<0.66	88	NE	160	800	2.7
Dibenz (a,h) anthracene	mg/kg	0.4	<0.4	<0.4	<0.4	0.1	NE	2	7.6	0.42
Dibenzofuran	mg/kg	0.66	<0.66	<0.66	<0.66	NE	NE	NE	NE	NE
Diethyl phthalate	mg/kg	0.66	<0.66	<0.66	<0.66	63,000	2,000	470	470	NE
Dimethyl phthalate	mg/kg	0.66	<0.66	<0.66	<0.66	NE	NE	NE	NE	NE
Di-n-butyl phthalate	mg/kg	0.5	<0.5	<0.5	<0.5	NE	NE	NE	NE	NE
Di-n-octyl phthalate	mg/kg	0.86	<0.89	<0.89	<0.89	1,600	10,000	10,000	10,000	NE
Fluoranthene	mg/kg	0.66	<0.66	**2.79**	**2.01**	3,100	NE	4,300	21,000	4.1
Fluorene	mg/kg	0.66	<0.66	<0.66	<0.66	3,100	NE	560	2,800	0.18
Hexachlorobenzene	mg/kg	0.66	<0.66	<0.66	<0.66	0.4	1	2	11	NE
Hexachlorobutadiene	mg/kg	0.66	<0.66	<0.66	<0.66	NE	NE	NE	NE	NE
Hexachlorocyclopentadiene	mg/kg	0.66	<0.66	<0.66	<0.66	NE	NE	NE	NE	NE
Hexachloroethane	mg/kg	0.20	<0.2	<0.2	<0.2	78	NE	0.5	2.6	NE
Indeno(1,2,3-cd)pyrene	mg/kg	0.66	<0.66	<0.66	<0.66	1	NE	14	69	1.6
Isophorone	mg/kg	0.66	<0.66	<0.66	<0.66	15,600	4,600	8	8	NE
Naphthalene	mg/kg	0.66	<0.66	<0.66	<0.66	1,600	170	12	18	0.2
Nitrobenzene	mg/kg	0.17	<0.17	<0.17	<0.17	39	92	0.1	0.1	NE
N-Nitrosodi-n-propylamine	mg/kg	0.16	<0.16	<0.16	<0.16	0.09	NE	0.00005	0.00005	NE
N-Nitrosodiphenylamine	mg/kg	0.67	<0.67	<0.67	<0.67	130	NE	1	5.6	NE
Pentachlorophenol	mg/kg	0.2	<0.2	<0.2	<0.2	NE	NE	NE	NE	NE
Phenanthrene	mg/kg	0.66	<0.66	**1.8**	**1.5**	NE	NE	NE	NE	2.5
Phenol	mg/kg	1.3	<1.3	<1.3	<1.3	23,000	NE	100	100	NE
Pyrene	mg/kg	0.66	<0.66	**1.79**	**1.12**	2,300	NE	4,200	21,000	3

mg/kg = milligrams per kilogram
NE - Not Established
Source of Cleanup Objectives - 35 IAC 742 Appendix B Table A Tier 1 soil Remediation Objectives for Residential Properties
Background Values are for metropolitan areas as defined in 35 IAC 742

Table 9
Geotechnical Soil Testing Results Summary
Jackson Harbor

Boring #	Sample #	Sample Depth	Material Description	USCS
GS-1	1	0.0' to 2.0'	Silty Sand	SM
GS-2	2	2.0' to 4.0'	Poorly Graded Sand with Silt	SP-SM
GS-3	3	4.0' to 6.0'	Silty Sand	SM
GS-4	1	0.0' to 2.0'	Poorly Graded Sand with Silt	SP-SM
GS-5	2	2.0' to 4.0'	Poorly Graded Sand with Silt	SP-SM
GS-6	3	4.0' to 6.0'	Silty Sand	SM
GS-7	2	2.0' to 4.0'	Poorly Graded Sand with Silt	SP-SM
GS-8	1	0.0' to 2.0'	Poorly Graded Sand with Silt	SP-SM
GS-9	1	0.0' to 2.0'	Poorly Graded Sand with Silt	SP-SM
GS-10	4	6.0' to 8.0'	Silty Sand	SM

Table 10
Asbestos Soil Testing Results Summary
Jackson Harbor

Boring #	Total Asbestos Structures	Density (structures/mm2)	Concentration (structures/gram)
GS-4	**11**	**8.68**	**3.28E+07**
GS-9	0	<3..11	< 8.85E+06