Chicago Harbor Lock – North Pier Repairs
Chicago, Illinois

Environmental Assessment
Appendix A - Section 404(b)(1) Analysis

U.S. Army Corps of Engineers
Chicago District

March 2019

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I. Project Description

a. Location

The location for the North Pier of Chicago Harbor is directly south of Navy Pier (Figure 1), and it extends eastward, out into Lake Michigan from the shoreline on the northern side of the entrance to the Chicago River in the City of Chicago, Cook County, Illinois. The North Pier is connected to the Chicago Harbor Lock and controlling works, and the address for the Chicago Harbor Lock is 108 North Streeter Drive, Chicago, Illinois 60611.

b. General Description

The main goal of the current project is to provide structural support and stabilize the existing crib structure and repair the steel sheet pile wall on the Chicago River side of the North Pier. See the drawings included with the Environmental Assessment (EA) (Attachment 03) for site details. The proposed repairs for the North Pier will include, but are not limited to the following:

- Relocate existing utilities within the existing tunnel structure. The utilities in the existing tunnel include water and sewer lines and power and telecommunication cables.
- Construct a new steel sheet pile anchor wall on the Lake Michigan side of the North Pier, approximately 70 feet north of the existing steel sheet pile wall on the southern, Chicago River side of the pier. Remove and replace stone as needed through the drive line. A portion of the large armor stone that is to be removed from the Lake Michigan side of the North Pier to clear the drive line may be temporarily stored on site or on a barge. The new steel sheet pile anchor wall will extend roughly 450 feet along the North Pier and will extend into the existing parking lot for approximately 150 feet.
- Install new tie rods to connect the newly constructed anchor wall on the Lake Michigan side of the pier to the existing steel sheet pile wall on the Chicago River side of the pier. The new tie rods are to be installed on six (6) foot centers between the existing, corroded tie rods that connect the existing steel sheet pile wall on the Chicago River side of the pier to the existing tunnel structure.
- The existing tunnel structure is to be demolished, but the existing tie rods that structurally support the steel sheet pile wall on the Chicago River side of the pier are corroded and connected to this tunnel structure. As a consequence, the load on these tie rods needs to be removed by deploying an alternate means of structural support; either permanently or temporarily during construction. The tunnel structure will not be demolished until the steel sheet pile wall on the Chicago River side is no longer dependent on the existing, corroded tie rods for structural support and an alternate means for structural support has been deployed.
- The recommended method for structurally supporting the existing wall on the Chicago River side of the pier during construction is to horizontally drill through the materials and permanently connect the new tie rods from the newly installed anchor wall on the Lake Michigan side of the pier to the existing wall on the Chicago River side. However, the contractor will be allowed to propose a different but equivalent method for temporarily bracing/shoring the existing steel sheet pile wall on the Chicago River side of the pier until the new tie rods are installed. The development of a different but equivalent method could potentially be advantageous because portions of the existing concrete slab, backfill, and/or tunnel structure could be removed to facilitate the drilling, installation, and connection of the new tie rods. The contractor may also propose to sequence the work differently and could install the bracing/shoring along the entire length of the pier or perform sections of the work incrementally.
- If the contractor proposes a different but equivalent method for temporarily bracing/shoring the existing steel sheet pile wall on the Chicago River side of the pier, a structural engineer will

review the work plan prior to the start of the construction activities to verify the proposed method is capable of providing adequate structural support and will prevent the failure of the existing steel sheet pile wall on the Chicago River side of the pier during construction.

- There are a variety of different but equivalent bracing/shoring methods that might be proposed by the contractor, but one method would be to use the large stone on the Lake Michigan side of the pier. Some of this large stone needs to be removed to clear the drive line for the new anchor wall, so the large stone that is removed could be transported and placed on the Chicago River side of the pier to brace/shore the steel sheet pile wall on that side of the pier. Prior to the end of construction, after the new tie rods have been permanently installed and connected, the majority of the large armor stone may be reused on the Lake Michigan side as backfill or toe stone, with the possible exception of a small amount of residual large stone material that has settled into the sediment on the Chicago River side of the pier. Alternately, the contractor may propose that some or all the large stone may remain in place on the Chicago River side of the pier to provide beneficial habitat. There will be no dredging of the Chicago River sediment. It is expected that the large stone will not retain significant sediment on the surface. Any Chicago River sediment that is accidently removed would need to be dewatered upland (with no direct return water) and disposed of at an appropriate upland facility.
- If the contractor proposes that some or all of the materials used to temporarily brace/shore the existing wall on the Chicago River side of the pier remain in place, such as the large stone from the Lake Michigan side of the pier, the materials and placement location will be evaluated prior to the start of construction to ensure they will be acceptable and will not degrade and adversely impact the water quality or impede, constrain, or interfere with the navigational (draft) requirements for the Federal channel or the operation of the Chicago Lock. Due to the potential for adverse impacts to navigation, materials that are placed above a depth of 14 feet below Low Water Datum (LWD) will need to be removed prior to the completion of construction. The only materials that will be allowed to permanently remain in place on the Chicago River side of the pier are the materials below a depth of 14 feet below LWD.
- After the utilities from the existing tunnel structure have been relocated and the existing steel sheet pile wall on the Chicago River side of the pier is adequately supported and is no longer dependent on the existing, corroded tie rods, the existing tunnel structure is to be demolished and sections of the concrete slab are to be removed.
- Following the installation of the new tie rods, armor and toe stone previously cleared to install the new steel sheet pile anchor wall will be reused as backfill, toe, or armor stone on the Lake Michigan side of the pier. Additional coarse aggregate (CA1) stone will be used on top to bring up the grade.
- Some of the concrete from demolition of the tunnel structure and demolition of the concrete slab will be reused as backfill between the new steel sheet pile anchor wall and existing wall on the Lake Michigan side of the pier. If any steel reinforcement is observed protruding from the concrete pieces, the reinforcement is to be cut flush with the face of the concrete prior to the reuse and placement of any concrete pieces as backfill.
- Other than the concrete pieces described above, construction debris or any unsuitable soils/sediments and waste materials that are encountered will be taken off-site for disposal.
- A new concrete slab and retaining wall are to be constructed over the existing crib structure for the storage of stop logs for the Chicago Lock. If sufficient funding is available, grouting of the existing crib structure may be performed to fill void space and improve its structural stability. A portion of the pier surface will initially be covered with coarse aggregate (CA6) gravel to improve vehicle access, and the vehicle access area may be paved in the future.
- A new duct bank extension will be installed in the parking lot to route power lines. New water and sewer lines will be installed from the parking lot all the way to the end of the pier, and the water line will be heat traced. A power feed will be provided to connect a power generator (by others).
- A fifteen (15)-foot wide vegetative strip will be constructed on the Lake Michigan side of the

North Pier. Plant selection and the landscaping for this area will be accomplished by others, as described in further detail below. Temporary seeding or other erosion controls will be provided until the vegetative strip is permanently stabilized.

The existing North Pier is approximately forty-five (45) feet wide, and the new steel sheet pile anchor wall will be installed approximately twenty-five (25) feet further north towards Lake Michigan than the existing steel sheet pile cut-off wall on that side of the pier. Thus, the width of the pier will increase from around forty-five (45) to around seventy (70) feet. Refer to the cross-sectional drawing included with the EA (Attachment 03) for details.

The North Pier for Chicago Harbor has a long history. Funds to improve the harbor were initially appropriated by the Federal Government (19th Congress) on March 2, 1833 (Larson 1979). At that time, the Chicago River made a bend southward near its outlet to Lake Michigan, and a beach of sand and gravel, roughly a half-mile long, was located in between the bend of the river and the outlet to lake (Larson 1979, USACE 1876). The beach, which was also referred to as an above-water sand bar, was reportedly formed by the action of strong northwesterly winds along the shoreline (USACE 1876). The first work the Federal Government performed to improve Chicago Harbor was the excavation of the sand to remove the bend and provide the Chicago River with a straight outlet to Lake Michigan (Larson 1979, USACE 1876). The North Pier was then constructed along the northern bank of the outlet for the Chicago River, and the South Pier was subsequently constructed along the southern bank.

Presumably, the strong northwesterly winds and littoral drift caused sand to accumulate on the northern side of the North Pier, and the accretion of sand gradually caused the shoreline to extend further outward, towards Lake Michigan. Shoals of sand also formed near the eastern end of the North Pier where the Chicago River flowed into Lake Michigan, so the northern and southern piers were extended further eastward. A drawing prepared by the U.S. Engineer Office, Chicago, Illinois and dated July 1, 1892 shows the progress of the pier construction as well as the changes to the shoreline from around 1835 to 1890 (Figure 2). In addition, the Annual Report from the Chief of Engineers for 1876 includes a brief history of the work at Chicago Harbor through 1875, and this history explains that in 1870 a Board of Engineers approved plans to develop Chicago Harbor into a harbor of refuge (USACE 1876). These plans included the construction of a long breakwater to create a large [inner] basin for all classes of vessels.

According to Larson (1979), the early construction of the piers for Chicago Harbor consisted of using a series of timber (pine) cribs, thirty (30) feet long. The cribs were formed together near the shore, floated into position, and then sunk by filling up the cribs with stone. The bottom of each crib was open except for cross logs, and the stone that rested on the cross logs was to hold the cribs in place. In order to prevent tilting, the cribs were also held in place by piles that were twelve (12)-inches square, driven in at twelve (12)-foot distances along the inside of the crib.

The goal of the current project is to repair the easternmost portion of the North Pier that is connected to the Chicago Harbor Lock. The North Pier is approximately 450 feet long. The July 1, 1892 drawing mentioned above shows that this portion of North Pier was constructed east of the entrance to the ship basin known as the Ogden Slip, and it was originally constructed between 1875 and 1876, although the superstructure, or upper portion of the pier, was rebuilt in 1891.

Due to fires, deterioration, and collisions, the wood superstructure for the North Pier was later removed and replaced with a concrete superstructure between 1907 and 1908 (USACE 1908). A protected passageway, or tunnel, was installed within the concrete superstructure for the lighthouse keeper to access the lighthouse during severe storms or when the outer walk was covered in ice (USACE 1903). A cross-section of the stone-filled, timber crib, for the North Pier with the concrete superstructure and tunnel is shown in Figure 3a, and the 1984 Project Map for Chicago Harbor is shown in Figure 3b (USACE

1984a).

Chicago Harbor Lock and controlling works were designed and constructed by the Metropolitan Sanitary District of Greater Chicago between 1936 and 1938 (USACE 2016), and these structures were connected to the Chicago Harbor North Pier. According to this agency's website, the name was subsequently changed to the "Metropolitan Water Reclamation District of Greater Chicago" (MWRDGC) on Jan. 01, 1989 to provide a more accurate perception of the District's current functions and responsibilities. Further details regarding the reason for separating the waters between the Chicago River and Lake Michigan are provided below in the paragraph on Authority and Purpose.

Drawings from the Metropolitan Sanitary District of Greater Chicago show that additional construction work was performed to improve the lock and North Pier in the early 1940s. This work included the installation of the existing steel sheet pile cut-off wall parallel to the North Pier, on the Lake Michigan side of the structure (USACE 2017a). The drawings specify that the existing rock fill needed to be removed as may be necessary to drive the steel sheet piling for the cut-off wall. These same drawings also show that clay fill material was placed in between the North Pier and new steel sheet pile cut-off wall, and new rock fill was placed on the exterior, Lake Michigan side of the cut-off wall.

The U.S. Army Corps of Engineers (USACE), Chicago District performed repairs to the deck slab (concrete superstructure) for the North Pier in 1948 (USACE 1948). Apparently, these repairs consisted of a six-inch thick reinforced concrete overlay placed over the original tunnel roof (Patrick Engineering 1986). Then, in 1965, the USACE, Chicago District rehabilitated the North Pier by installing a new steel sheet pile wall parallel to the southern, Chicago River (channel) side of the North Pier (USACE 1965). Tie rods were connected from this new steel sheet pile wall to the interior of the tunnel on the pier's concrete superstructure, and stone fill material was placed in between the North Pier and this new steel sheet pile wall (USACE 2017a).

In the interests of navigation, the operation and maintenance responsibilities for the Chicago Harbor Lock were transferred to the Federal Government in 1984, and this transfer was conducted pursuant to a Memorandum of Agreement between the Department of the Army and the Metropolitan Sanitary District of Greater Chicago and two (2) Public Laws; Public Law 98-63, approved July 30, 1983, and Section 107 of Public Law 97-88 (USACE 1984b).

In 1986, a geotechnical and structural investigation of the Chicago Harbor Lock was performed for the construction of a boat house in the southwest corner of the North Pier in Chicago Harbor (Patrick Engineering 1986). One of the conclusions from this investigation was that the roof of the tunnel within the superstructure for the North Pier was determined to be in fair condition, and it was recommended that vehicles loads on the tunnel be restricted to an axle load of up to 3,000 pounds. A subsequent structural analysis performed by the Chicago District explains that this load restriction is due to the lack of reinforcement in the top slab, being reinforced with smooth "T-sections" spaced at 4 feet on center, and uncertainties with the anchoring of the existing steel sheet pile wall into the old, rehabilitated timber crib of unknown capacity (USACE 2017a). The USACE, Chicago District has also performed periodic inspections of the Chicago Harbor Lock and has prepared inspection reports for the structures since 1987 (USACE 1987).

In 1997, Patrick Engineering (1997) prepared a separate geotechnical investigation and groundwater study for the Illinois Department of Water Resources to help determine the amount of leakage though the North Pier and through the property adjacent and north of the western side of the North Pier. Additional geotechnical investigations are discussed in the USACE, Chicago District Design Analysis for this project (USACE 2017a).

In 1999, the USACE, Chicago District prepared an evaluation report to evaluate whether there was

sufficient justification to complete a major rehabilitation of the Chicago Harbor Lock (USACE 1999). It indicates in this study that the walls for the lock and walls for the harbor enclosure were designed to withstand a difference in water elevation between Lake Michigan and the Chicago River of eight (8) feet in either direction. This study further explains that the lock can be opened during or after severe storms to prevent flood damage when the water level in the Chicago River rises, an event known as a backflow, and the lock otherwise has an important environmental function to prevent polluted Chicago River water from contaminating the primary source of drinking water for the City of Chicago, Lake Michigan (USACE 1999).

The normal differential in water elevation at the lock between Lake Michigan and the Chicago River is approximately two (2) feet, and the normal direction of flow is from Lake Michigan west through the lock and into the Chicago River (USACE 2008). The Chicago Lock reportedly has an operational range of 0 to four (4) feet in either direction, and, in 2007, the Illinois Department of Natural Resources listed the Chicago Lock in the National Inventory of Dams (USACE 2008).

The periodic lock inspection performed in 2007 found that the tie rods for the structural sheet pile wall along the south side of the North Pier were showing significant signs of corrosion. The USACE, Chicago District Design Analysis for the North Pier explains that the tunnel in the superstructure is in very poor shape, and it further notes that "The current sheet pile wall on the river side is supported by tie rods that are corroding and tied to a failing tunnel structure" (USACE 2017a). According to this analysis, "Approximately 13 of the sheet pile tie rods were found to be severely corroded during recent inspections on the inside of the North Pier Tunnel." The detailed computations and geotechnical and structural designs for the proposed North Pier Repair Project are provided in the USACE, Chicago District's Design Analysis (USACE 2017a), which includes structural, geotechnical, and civil engineering information and analyses.

c. Authority and Purpose

Table 1 provides a brief historical summary of the continuing improvements to Chicago Harbor, and more details are included in the legislation and various Annual Reports from the Chief of Engineers. Note that "purpose and need" are also discussed in the main EA document.

The Chicago Harbor Lock is unique because it is one of the locations where water is diverted from the Great Lakes Basin to the Mississippi River Basin, and the diversion of water at Chicago has been the subject of a number of legal disputes (Barker 1986). One result from the legal disputes is a provision that requires the State of Illinois to monitor the water diverted from Lake Michigan (Duncker and Johnson 2016), and the U.S. Army Corps of Engineers (USACE) monitors the measurement and computation of the Lake Michigan diversion by the State of Illinois (USACE 2017b). USACE also prepares an annual report on the accounting of the Lake Michigan water diverted by the State of Illinois (USACE 2017b), and this accounting relies on the U.S. Geological Survey (USGS) for accurate gaging stations and streamflow monitoring (Duncker and Johnson 2016).

The water from the Great Lakes Basin is diverted to the Mississippi River Basin for two (2) reasons; the first and foremost reason is to prevent polluted water from entering Lake Michigan, which is the primary source of drinking water for the Chicago area. The second reason is that the diversion helps maintain navigable depths on the Chicago Area Waterway System (CAWS) (Barker 1986). The CAWS consists of approximately 90 miles of interconnected, natural and manmade channels in the metropolitan Chicago area of northeastern Illinois (Duncker and Johnson 2016).

During the mid to late 1800s, the development of the Chicago sewer system led to severe sanitation problems in the Chicago River (USACE 2017b). Chicago was growing rapidly at this time, and the polluted water from the Chicago River was discharging into the adjacent waters of Lake Michigan, which,

as mentioned earlier, was and still is, the primary source of drinking water for Chicago. As a consequence, in the mid to late 1800s, the population of Chicago had a high incidence of sickness from waterborne diseases (Changnon and Changnon 1996; Macaitis 1985; Walker 1957).

Early attempts to protect the water supply included extending the water intake structures further out into Lake Michigan from the shoreline, and building tunnels between the intake structures and Chicago to transport the water (Macaitis 1985; Walker 1957; Brown 1894). However, under certain weather conditions, the waves, currents, and/or storm water runoff could still transport contaminants from the polluted Chicago River water to the intake structures.

The Illinois and Michigan Canal was authorized by Congress on March 02, 1827 (Table 1) to connect the waters of the Illinois River with those of Lake Michigan. Construction of this canal began in 1836, and it was completed in 1848 (Macaitis 1985; Brown 1894). The Illinois and Michigan Canal was intended for navigation, but the canal was generally not considered to be successful because it was narrow and shallow, barges had to pass through time-consuming locks, and the railroads provided an alternative means of transportation (Macaitis 1985). When the Illinois and Michigan Canal opened, water was initially pumped into it from the Chicago River to improve navigation, but the pumping of the water was also found to be beneficial for reducing the pollution in the Chicago River (Brown 1894). Also, between 1867 and 1871, the Illinois and Michigan Canal was deepened to help divert the flow of polluted water away from Lake Michigan (Barker 1986; Walker 1957; Brown 1894).

Nevertheless, similar to the extension of the water intake structures, the efforts to use the Illinois and Michigan Canal to divert polluted Chicago River water away from Lake Michigan did not satisfactorily solve the water supply problem (Changnon and Changnon 1996; Barker 1986; Walker 1957; Brown 1894). The efforts were largely ineffective for several reasons: First, the Illinois and Michigan Canal had insufficient capacity and tended to collect sediment and debris. In addition, the natural water level of Lake Michigan became low during dry periods, and, during a storm event, the Illinois and Michigan Canal was short-circuited by another canal, known as the Ogden-Wentworth Canal, which was dug by private land owners. Another reason the Illinois and Michigan Canal was ineffective is because the population of Chicago and amount of sewage were rapidly increasing (Changnon and Changnon 1996, Brown 1894).

The water supply problem was eventually resolved by construction of the Chicago Sanitary and Ship Canal (CSSC). Flow though the CSSC commenced on January 17, 1900, and it reversed the flow through the Chicago River (USACE 2017b; Barker 1986). Although the CSSC alleviated the water supply problem for Chicago, as mentioned earlier, the diversion was the subject of a number of legal disputes (Barker 1986). As part of one of the Supreme Court cases, *Wisconsin v. Illinois*, 289 U.S. 395 (1933), the State of Illinois was ordered to construct controlling works to prevent reversals of the Chicago River and avoid danger to the water supply from storm events.

It is likely that the water quality of the Chicago River has changed considerably since the Chicago Harbor Lock and controlling works were first constructed, but the lock, as well as the structures that connect to the lock, such as the North Pier, are critical for protecting the water quality of Lake Michigan and the drinking water supply for the population of Chicago. These structures are also important for assuring compliance with the court decision that limits the diversion of water from the Great Lakes Basin to the Mississippi River Basin.

d. General Description of Dredged or Fill Material

(1) General Characteristics of Material

A geotechnical analysis for the proposed repairs at the North Pier was included with the USACE,

Chicago District Design Analysis (USACE 2017a). This geotechnical analysis explains that one of the critical concerns for the project is the area on the Lake Michigan side of the pier. The top of the fill material on this side of the pier consists of large armor stone that needs to be cleared prior to driving the steel sheet pile anchor wall (Figure 4). The characteristics of the material below the armor stone are somewhat unknown, but it is estimated that there is large rock or a mixture of large and small rock backfill sitting on native lake sediment (sand and silt), based on historical design drawings. The steel sheet pile can be driven through the small rock and finer-grained materials, but due to the large stones, it was presumed that the backfill material below the armor stone will need to be cleared prior to driving the steel sheet piles for the new anchor wall.

One of the historical cross-sectional drawings prepared by the Metropolitan Sanitary District of Greater Chicago in 1940 for the installation of the existing steel sheet pile cut-off wall for the North Pier, on the Lake Michigan side, shows that some of the existing rock fill will need to be removed as may be necessary to drive the steel sheet piles (USACE 2017a). In addition, the civil design analysis included with the USACE, Chicago District Design Analysis explains that it was assumed that the size of the stone is large within the drive line, so all the stone would need to be excavated.

It is presumed that most of the rock backfill material was placed adjacent to the existing steel sheet pile cut-off wall in the early 1940s, when the Metropolitan Sanitary District of Greater Chicago originally installed the cut-off wall. Due to the weight of these materials, it is likely that some settlement has occurred. Historical borings included with the geotechnical analysis reveal that one or more of the stratigraphic layers beneath the bottom of Lake Michigan in this area are comprised of soft to stiff silty clay material (USACE 2017a). There are no recent sediment quality data, but it is anticipated that the rock backfill (stone) is underlain by native sands/silts typical of the Illinois shoreline.

As discussed under the Project Description, there are a variety of temporary bracing/shoring methods that may be proposed, but a potential method would be to temporarily use the large armor stone on the Lake Michigan side of the pier. A portion of the large armor stone needs to be removed from the Lake Michigan side of the North Pier to clear the drive line for the new anchor wall, and, since a portion of this large stone needs to be removed, it could be transported and placed on the Chicago River side of the pier to brace/shore the steel sheet pile wall on that side of the pier. Prior to the end of construction, the majority of the large armor stone may be reused on the Lake Michigan side as backfill or toe stone, with the possible exception of a small amount of residual large stone material that has settled into the sediment on the Chicago River side of the pier. Alternately, the contractor may propose that some or all the large stone may remain in place on the Chicago River side of the pier to provide beneficial habitat. There will be no dredging of the Chicago River sediment. It is expected that the large stone will not retain significant sediment on the surface. Any Chicago River sediment that is accidently removed would need to be dewatered upland (with no direct return water) and disposed of at an appropriate upland facility.

Additional coarse aggregate (CA1) stone will be used on top as backfill to bring up the grade, as necessary. Figure 4 contains a photograph showing the existing armor stone along the Lake Michigan side of the pier and a typical cross-sectional drawing is included with the EA (Attachment 03). The North Pier is sheltered by breakwaters and Navy Pier, and it can be observed from Figure 4 that the size of the existing armor stone is smaller than the armor stone typically used along the Lake Michigan shoreline.

Some of the concrete from demolition of the tunnel structure and demolition of the concrete slab will be reused as backfill between the new steel sheet pile anchor wall and existing wall on the Lake Michigan side of the pier. If any steel reinforcement is observed protruding from the concrete pieces, the reinforcement is to be cut flush with the face of the concrete prior to the reuse and placement of

any concrete pieces as backfill.

(2) Quantity of Material

The estimated volume of armor stone and rock backfill material that will need to be removed from the water or moved within the water to clear the drive line for the new steel sheet pile anchor wall on the Lake Michigan side of the North Pier is approximately 10,000 cubic yards. It is anticipated that approximately 4,000 cubic yards of this material will consist of the large stone that could potentially be placed along the Chicago River side of the pier as toe stone to help support and brace the existing steel sheet pile on that side of the pier during construction. After the new steel sheet pile anchor wall and new tie rods have been permanently installed, most of the large armor stone may then be reused on the Lake Michigan side of the pier for armor stone, backfill, and/or toe stone. No Chicago River sediment is to be dredged and the transport of sediment from the Chicago River side of the pier to the Lake Michigan side will be minimized. It is expected that the large stone will not retain significant sediment on the surface. Any Chicago River sediment that is accidently removed would need to be dewatered upland (with no direct return water) and disposed of at an appropriate upland facility. It is anticipated that a small amount of the large stone may settle into the sediment on the Chicago River side of the pier, so this stone material will remain on that side of the pier to avoid dredging Chicago River sediment.

Alternately, the contractor may propose that some or all the large stone may remain in place on the Chicago River side of the pier to provide beneficial habitat. Due to the potential for adverse impacts to navigation, materials that are temporarily placed above a depth of 14 feet below Low Water Datum (LWD) will need to be removed prior to the completion of construction. The only materials that will be allowed to permanently remain in place on the Chicago River side of the pier are the materials below a depth of 14 feet below LWD. Any debris or unsuitable materials that are observed will not be reused and will be properly disposed of off-site at a landfill.

It is estimated that approximately 8,200 cubic yards of coarse aggregate material will be needed for backfill and filling in the space between the new steel sheet pile anchor wall and the North Pier, above and below the water line, and roughly 5,000 cubic yards will be needed for toe stone on the Lake Michigan side of the new steel sheet pile anchor wall. Based on the estimates, the volume needed for backfill and toe stone would exceed the estimated volume that will be removed to clear the drive line by approximately 3,200 cubic yards. As discussed earlier, some or all of the material that will be removed to clear the drive line may potentially be used to brace/shore the existing wall on the Chicago River side of the pier, and some or all of this material may be reused on the Lake Michigan side of the pier, or may remain in place on the Chicago River side of the pier. In addition, some of the concrete from the demolition of the tunnel structure and demolition of the concrete slab are to be reused as backfill. The quantity of additional backfill or toe stone proposed for this project is expected to be around 4,000 to 5,000 cubic yards. The toe stone will consist of coarse aggregate gradation number CA 1, as described by the current standard specifications adopted by the Illinois Department of Transportation. Smaller gravel (e.g. CA6) will be used upland for vehicle access areas.

(3) Source of Material

The materials will mainly originate from two (2) different sources: The first source is the existing armor stone and rock backfill materials that will need to be removed from the water or moved within the water to clear the drive line for the new steel sheet pile anchor wall. It is proposed that these materials be reused and placed back into the water, or moved back into position within the water for armor stone, backfill, and/or toe stone for the new steel sheet pile anchor wall. The second source of material is a commercial source for the coarse aggregate material (CA-1) that will be needed for toe stone or for backfill between the new steel sheet pile anchor wall and the existing wall on the Lake

Michigan side of the North Pier, above and below the water line. A minor amount of backfill material will consist of pieces of concrete from the demolition of the existing tunnel structure and concrete slab.

e. Description of the Proposed Discharge Site(s)

(1) Location

The proposed site is the North Pier for Chicago Harbor. As mentioned before, the North Pier is directly south of Navy Pier (Figure 1), and it extends eastward, out into Lake Michigan from the shoreline on the northern side of the entrance to the Chicago River in the City of Chicago, Cook County, Illinois. The North Pier is connected to the Chicago Harbor Lock and controlling works, and the address for the Chicago Harbor Lock is 108 North Streeter Drive, Chicago, Illinois 60611.

(2) Size

The size of the project for stone placement along the length of the 450-foot North Pier is estimated to be roughly one (1) acre. Large stone may be temporarily placed on the Chicago River side of the pier, so this additional area was included. At the end of construction, the portion of the surface area that would be converted from water to fast land would be approximately 0.25 acre, and the removal and placement of stone below the water surface would affect around another 0.25 acre. The work limits for the construction project will cover a substantially larger area of two (2) to three (3) acres, because of the additional area potentially needed for construction. This includes space to accommodate silt curtains, the movement of vessels, barges, and mechanical equipment, the staging of equipment and materials, the installation of steel sheet pile in the parking lot area, an area for a temporary contractor field office, etc.

(3) Type of Site

The site is adjacent to the lakeshore of Lake Michigan in an open freshwater habitat, alongside the North Pier for the Chicago Harbor Lock and controlling works in the City of Chicago, a large urban area. Numerous vessels pass through lock during the summer months, and Navy Pier, which is located about 600 feet to the north of the North Pier, is one of Chicago's most popular tourist destinations and attractions.

(4) Type of Habitat

The natural habitat in which the Chicago Lock now currently occupies before the City of Chicago was developed (~1800) was most likely an interaction of riverine processes intermingled with lacustrine processes that created a highly diverse Riverine/Open/Drown River Mouth system (Albert et al 2005). This natural wetland ecosystem most likely consisted of shifting sands and organic sediments, hemi-marsh and meadow, braided sloughs discharging into Lake Michigan, and with enough sand bar formation to attenuate wave attack. This natural condition no longer exists, and the current habitat is considered man-made that resembles a Lacustrine/Open/Shoreline system (Albert et al 2005). Existing habitat surrounding the Chicago Lock primarily consists of manmade rock/riprap piles that sit on sand and lean against hardened shoreline structures such as sheet pile and concrete walls.

(5) Timing and Duration of Discharge

The proposed North Pier Repair Project is dependent upon Government approval and appropriations. It is presently anticipated that the Chicago Harbor North Pier Repair Project will be able to commence

in the summer to fall of 2019 and will take roughly around one (1) to two (2) years to be completed. This two (2)-year duration presumes that construction activities may need to be delayed or suspended during the cold winter months or if there are adverse weather conditions. Thus, if the proposed North Pier repairs start in the fall of 2019, it is anticipated that the repairs should be finished by the fall of 2021.

f. Description of Placement Method

Due to the large volume, size, and weight of the armor stone and rock backfill materials, these materials will need to be removed from the water, placed back into the water, or moved within the water, using heavy, mechanical construction equipment. The mechanical equipment typically used for this work consists of either an appropriate clamshell bucket attached to crane and/or a backhoe (hydraulic) excavator. The crane and/or backhoe may either be operated from the shoreline or by placing the equipment on a flat-bottomed barge that can be maneuvered using a tug boat or by placing the equipment on a large vessel. If any heavy equipment will be operated from the shoreline, a geotechnical and/or structural analysis may need to be performed to ensure the structures or embankments along the shoreline have sufficient bearing capacity and stability to support the equipment. If a flat-bottomed barge is utilized, the barge may be equipped with spuds to anchor the vessel to the lakebed. The rock and backfill materials may be temporarily stored on a separate flat-bottomed barge or within a scow.

When removing or moving the large armor stone or rock backfill material to clear the drive line for the new steel sheet pile anchor wall, some finer-grained material may be associated with these activities. This is because smaller-sized rock, gravel, sand, or finer-grained materials may have been deposited or could have accumulated on or within the pore spaces of the larger stone materials, and this smaller-sized material may be removed, disturbed, or suspended while clearing the larger rock materials from the drive line for the sheet piles. It was also mentioned before that the characteristics of the material below the armor stone are somewhat unknown.

After the drive line for the steel sheet pile has been cleared, and the new steel sheet pile anchor wall has been installed, the armor stone and large stone materials will be reused and placed as backfill and/or as toe stone adjacent to the new steel sheet pile anchor wall. Similar to clearing the drive line, finer-grained materials could cause short-term and minor increases of suspended solids and turbidity when placing the armor stone and rock backfill materials back into the water or when moving these materials within the water adjacent to the new steel sheet pile anchor wall.

Large armor stone removed from the Lake Michigan side of the North Pier to clear the drive line may be placed along the Chicago River side of the pier to temporarily brace/shore the existing steel sheet pile on that side of the pier during construction. This large armor stone would be placed and removed using the same mechanical equipment and methods described above. A small amount of residual large stones may settle into the sediment on the Chicago River side of the pier, and these stones would remain on that side of the pier to avoid the dredging of sediment from the Chicago River. There will be no dredging of the Chicago River sediment. It is expected that the large stone will not retain significant sediment on the surface. Any Chicago River sediment that is accidently removed would need to be dewatered upland (with no direct return water) and disposed of at an appropriate upland facility.

Alternately, the contractor may propose that some or all the large stone may remain in place on the Chicago River side of the pier to provide beneficial habitat. Due to the potential for adverse impacts to navigation, materials that are temporarily placed above a depth of 14 feet below LWD will need to be removed prior to the completion of construction. The only materials that will be allowed to permanently remain in place on the Chicago River side of the pier are the materials below a depth of 14 feet below LWD.

In order to prevent adverse water quality impacts, silt curtains will need to be properly deployed around the work area whenever any armor stone, rock backfill materials, or coarse aggregate backfill will be removed from the water, placed back into the water, or moved within the water. Once the new steel sheet pile anchor wall has been completely installed or the area has been properly separated from the open water, the silt curtains would not be necessary for the placement of backfill in the space between the new steel sheet pile anchor wall and the existing North Pier or above the water line since there will be no effluent or return water released to Lake Michigan.

The steel sheet piles are typically driven using specialized pile driving rigs, equipment, and accessories. There are generally three (3) types of pile driving hammers; diesel hammers, hydraulic impact hammers, or vibratory hammers. Minor environmental impacts may occur from the installation of the sheet piling due to the associated noise and disturbance to the sediment, but these impacts are expected to be localized and temporary.

II. Factual Determinations

a. Physical Substrate Determinations

(1) Substrate Elevation and Slope

According to the drawing titled Survey Control and Benchmarks, Sheet ID V-001, included with the EA document (see Attachment 03), "All elevations shown are referenced to the North American Vertical Datum of 1988 (NAVD88) U.S. feet. The draft cross-sectional drawing in Attachment 03 of the EA shows approximate elevations of the bottom of Lake Michigan and top of the new steel sheet pile anchor wall. This drawing also shows that the armor stone and large rock backfill material will be placed adjacent to the steel sheet pile wall. The toe stone material will slope downwards toward the lake bottom at roughly a slope of 1:2 (vertical to horizontal).

(2) Sediment Type

The large rock materials that will be cleared prior to driving the steel sheet pile wall consists of the armor stone and rock backfill material previously placed along the Lake Michigan side of the North Pier. Figure 4 shows the existing large armor stone that was placed on the surface along the Lake Michigan side of the North Pier. The characteristics of the rock backfill material beneath the large armor stone are somewhat unknown, but, based on historical design drawings, the material is believed to be large rock or a mixture of large and small rock backfill. Since the steel sheet piles can typically be driven through small rock, gravel, sand, and finer-grained material, it would not be necessary to remove or move such materials to clear the drive line. Nevertheless, smaller-sized rock, gravel, sand, or finer-grained sediments may have been deposited or could have accumulated on or within the pore spaces of the larger stone materials. This previously deposited or accumulated sediment may be removed, disturbed, or suspended when larger rock materials are cleared from the drive line for the installation of the sheet piles. There are no recent sediment quality data in the project vicinity, but it is anticipated that the rock backfill (stone) is underlain by native sands/silts typical of the Illinois shoreline.

Some of the large stone that needs to be removed to clear the drive line for the new anchor wall may be transported and placed on the Chicago River side of the pier to brace/shore the steel sheet pile wall on that side of the pier. Prior to the end of construction, the large stone placed on the Chicago River side of the pier may be reused on the Lake Michigan side of the pier as backfill or toe stone, with the possible exception of a small amount of residual large stone material that has settled into the sediment

on the Chicago River side of the pier. There are no recent sediment quality data for the Chicago River side of the North Pier, but due to past industrial activities, rainwater discharges, and discharges from wastewater treatment plants, it was presumed that the quality of the sediment on the Chicago River side is poor and the resuspension and/or transport of this sediment needs to be minimized. There will be no dredging of the Chicago River sediment. It is expected that the large stone will not retain significant sediment on the surface. Any Chicago River sediment that is accidently removed would need to be dewatered upland (with no direct return water) and disposed of at an appropriate upland facility.

Alternately, the contractor may propose for some or all the large stone from the Lake Michigan side of the pier to remain in place on the Chicago River side of the pier to provide beneficial habitat. Due to the potential for adverse impacts to navigation, materials that are temporarily placed above a depth of 14 feet below Low Water Datum (LWD) will need to be removed prior to the completion of construction. The only materials that will be allowed to permanently remain in place on the Chicago River side of the pier are the materials below a depth of 14 feet below LWD.

Some of the concrete from demolition of the tunnel structure and demolition of the concrete slab will be reused as backfill between the new steel sheet pile anchor wall and existing wall on the Lake Michigan side of the pier. If any steel reinforcement is observed protruding from the concrete pieces, the reinforcement is to be cut flush with the face of the concrete prior to the reuse and placement of any concrete pieces as backfill.

Title 40 of the Code of Federal Regulations (C.F.R.), § 230.60 (a), notes that "Dredged or fill material is most likely to be free from chemical, biological, or other pollutants where it is composed primarily of sand, gravel, or other naturally occurring inert material." The large armor stone and rock backfill materials that were previously used for backfill are anticipated to be composed of coarse and inert materials that generally do not carry contamination.

It is also relevant to note that Title 40 of the C.F.R., Paragraph § 230.60 (c) says the following:

> "Where the discharge site is adjacent to the extraction site and subject to the same sources of contaminants, and materials at the two sites are substantially similar, the fact that the material to be discharged may be a carrier of contaminants is not likely to result in degradation of the disposal site. In such circumstances, when dissolved material and suspended particulates can be controlled to prevent carrying pollutants to less contaminated areas, testing will not be required."

Since the same material that presently exists along the North Pier will be reused, and silt curtains will be deployed to help minimize the movement of suspended solids and turbidity from the construction area, the placement of the rock materials is unlikely to result in degradation of the placement site. As noted above, Title 40 of the C.F.R., Paragraph § 230.60 (c) indicates that testing should not be required in this situation, and samples of the armor stone or large rock materials have not been collected or analyzed. Any unsuitable debris or waste materials that are observed will not be reused and will be properly disposed of off-site at a landfill.

(3) Dredged/Fill Material Movement

The armor stone and rock backfill material currently in position along the Lake Michigan side of the North Pier will be cleared from the drive line for the new steel sheet pile anchor wall. Then, after the new steel sheet pile anchor wall has been installed, these same materials will be reused for backfill and placed adjacent to the new wall. Historical records indicate that the rock backfill material was likely placed on the Lake Michigan side of the North Pier when the existing steel sheet pile cut-off wall was

originally installed by the Metropolitan Sanitary District of Greater Chicago in the early 1940s. It is therefore evident that these rock materials are sufficiently large and heavy enough to remain in place over a long period of time, and they are expected to be resilient and resistant to movement from currents and waves. In addition, since the site is partially sheltered by the outer breakwater and Navy Pier, as well as a city pier that is northeast of the project site (Figure 3b), these nearby structures reduce the impacts from storms and adverse weather conditions and help prevent movement of the backfill.

(4) Physical Effects on Benthos

A portion of the existing periphyton, epibenthic plankton, and benthic macroinvertebrate organisms that currently reside on or within the armor stone and rock backfill materials on the Lake Michigan side the North Pier would be removed or disturbed when these materials are removed from the water, placed back into the water, or moved within the water. The armor stone and rock backfill materials will need to be moved to clear the drive line for the new steel sheet pile anchor wall, and then, after the new steel sheet pile anchor wall has been installed, the armor stone and rock backfill materials will be reused and placed adjacent to the new anchor wall and in the space between the new anchor wall and the existing steel sheet pile cut-off wall on the Lake Michigan side of the North Pier. Organisms that typically reside in dynamic, high wave energy environments near shorelines and piers are generally tolerant of turbid waters and adapted to elevated suspended solids concentrations. As a consequence, the periphyton, epibenthic plankton, and an initially low diversity of benthic macroinvertebrate organisms would quickly repopulate, grow, and recolonize on the rock materials after the new steel sheet pile anchor wall has been installed and the materials have been reused along the pier. If the contractor proposes to place the large rock either temporarily or permanently on the Chicago River side of the pier, there should be similar physical effects on the benthic macroinvertebrate organisms that currently reside on that side of the pier.

(5) Other Effects

The removal of the rock backfill materials from the water, the placement of these same materials back into the water, or movement of these materials within water will likely cause short-term increases in the concentration of suspended solids and turbidity, but the organisms that typically reside in dynamic, high wave energy environments near shoreline, and have adapted to artificial habitats such as piers, riprap revetments and concrete walls are generally tolerant of turbid waters and adapted to elevated suspended solids concentrations. Thus, any adverse impacts caused by the short-term increases in suspended solids due to the removal of the armor stone and rock backfill materials from the water, the placement of these materials back into the water, or movement of these materials within the water are anticipated to be temporary and minor.

(6) Actions Taken to Minimize Impacts

A silt curtain will be deployed around the work area to help control and minimize the movement of suspended solids and turbidity from the construction area.

b. Water Circulation, Fluctuation and Salinity Determinations

(1) Water

(a) Salinity

Lake Michigan is a freshwater lake. The proposed work is not expected to increase or decrease

the salinity of the water and will not add salts to the system.

(b) Water Chemistry

The Illinois Environmental Protection Agency periodically prepares a Water Quality Report (2016) of the State's water resources. The most recent report does not specifically list Chicago Harbor, but it does list Lake Michigan Nearshore waters. These waters are described as fully supporting of aquatic life, public and food processing water supplies, and primary (e.g., swimming, water skiing) and secondary (e.g., boating, fishing) contact, but they are not supporting of fish consumption or aesthetic quality. The causes for the fish consumption and aesthetic quality impairments are mercury, polychlorinated biphenyls, and total phosphorus, and these causes are attributed to atmospheric deposition – toxics and unknown sources.

The quality of the water on the southern, Chicago River side of the North Pier is considerably lower than the water on the northern, Lake Michigan side of the North Pier. The Illinois Environmental Protection Agency Water Quality Report (2016) did not assess the Chicago River water for secondary contact or aesthetic quality, but it does report that the water is not supporting of aquatic life, fish consumption, or primary contact. The causes listed for these impairments are dissolved oxygen, pH, total phosphorus, mercury, polychlorinated biphenyls, fecal coliform, changes in stream depth and velocity patterns, loss of instream cover, and other flow regime alterations. These causes are attributed to atmospheric deposition – toxics, channelization, combined sewer overflows, impacts from hydrostructure flow regulation/modification, municipal point source discharges, loss of riparian habitat, other recreational pollution sources, and unknown sources.

If some of the large stone from the Lake Michigan side of the pier is used to temporarily brace/shore the wall on Chicago River side of the pier, and then this large stone will be reused on the Lake Michigan side as armor stone, backfill, or toe stone, there will be no dredging of the Chicago River sediment. It is expected that the large stone will not retain significant sediment on the surface. Any Chicago River sediment that is accidently removed would need to be dewatered upland (with no direct return water) and disposed of at an appropriate upland facility.

The materials that will be used during the repairs are commercially available coarse aggregate (CA-1) and the armor stone and rock backfill that are currently in the water adjacent to the existing steel sheet pile cut-off wall. These materials are generally inert and coarse, and they are not expected to be a source of contamination. Moreover, since the armor stone and the rock backfill that will be placed adjacent to the new steel sheet pile anchor wall are the same materials that currently exist along the existing steel sheet pile cut-off wall, the reuse of these materials is not anticipated to result in any degradation or long-term effects on, or changes to, the water chemistry or quality.

If concrete pieces from the demolition of the tunnel structure and concrete slab will be reused as backfill, this material would be used in the space between the new steel sheet pile anchor wall and existing wall on the Lake Michigan side of the pier. If any steel reinforcement is observed protruding from the concrete pieces, the reinforcement is to be cut flush with the face of the concrete prior to the reuse and placement of any concrete pieces as backfill. The reuse of these concrete pieces as backfill behind the steel sheet pile anchor wall is not anticipated to result in any degradation or long-term effects on, or changes to, the water chemistry or quality.

Short-term effects on the water quality are expected due to temporary and minor increases in the concentration of suspended solids and turbidity that will likely result when the armor stone and rock backfill materials are removed from the water, placed back into the water, or moved within

the water. As explained earlier, the armor stone and rock backfill materials need to be removed from the water, or moved within the water, to clear the drive line for the new steel sheet pile anchor wall. Then, after the new steel sheet pile anchor wall has been installed, the armor stone and rock backfill materials will be reused and placed back into the water, or moved within the water, adjacent to the new wall.

In order to prevent adverse water quality impacts, silt curtains will need to be properly deployed around the work area whenever any armor stone, rock backfill materials, or coarse aggregate backfill will be removed from the water, placed back into the water, or moved within the water. Once the new steel sheet pile anchor wall has been completely installed or the area has been properly separated from the open water, the silt curtains would not be necessary for the placement of backfill in the space between the new steel sheet pile anchor wall and the existing North Pier or above the water line if there will be no effluent or return water released to Lake Michigan.

Smaller-sized rock, gravel, sand, or finer-grained materials may have been deposited or could have accumulated on or within the pore spaces of the larger stone materials, and this smaller-sized material may be removed, disturbed, or suspended while clearing the larger rock materials from the drive line for the sheet piles. As a consequence, there will likely be temporary and minor increases of suspended solids and turbidity in the local work area when removing the armor stone and rock backfill materials from the water, placing these materials back into the water, or when moving these materials within the water. The increased levels of suspended solids and turbidity are expected to affect the water quality and chemistry, but the deployment of silt curtains around the work area should help control and minimize the movement of suspended solids and turbidity from the construction area.

It is relevant to stress that the steel sheet piles can be driven through fine-grained sediments, so there should be no need to intentionally remove fine-grained materials from the water, place fine-grained materials back into the water, or move fine-grained sediments within the water column. As discussed above, a small quantity of fine-grained sediments will likely be associated with the larger rock materials due to the deposition of fine-grained sediments on the larger rocks or the accumulation of fine-grained material in the pore spaces, but such a small quantity of fine-grained sediment should not cause eutrophication or persistently elevated suspended solids, turbidity, or nutrient levels.

Note that the National Oceanic and Atmospheric Administration Coast Survey charts indicate that the closest water intake cribs for the water treatment plants that serve the City of Chicago are located over two (2) miles away from the project site, so the construction activities at the North Pier are not expected to cause any adverse impacts to the public water supply system, such as reduced water clarity, color changes, unpleasant odors, or other effects.

(c) Clarity

Since the commercially available coarse aggregate and existing armor stone and rock backfill materials are coarse and inert, they should not be a considerable source of contamination. Furthermore, the armor stone and rock backfill materials are the same materials that presently exist in the water adjacent to the existing steel sheet pile cut-off wall, so the reuse and placement of these materials adjacent to the new steel sheet pile anchor wall is unlikely to cause any degradation or long-term effects to the water clarity. Short-term, minor, and localized effects on the water clarity are expected due to temporary increases in the concentration of suspended solids and turbidity when removing the armor stone and rock backfill materials from the water, placing these same materials back into the water, or when moving these materials within the water. Silt curtains will be deployed around the work area to help control and minimize the movement of

suspended solids and turbidity from the construction area.

(d) Color

The commercially available coarse aggregate and existing armor stone and rock backfill materials are not anticipated to cause any considerable long-term effects on, or changes to, the water color. Temporary, minor, and localized increases in the concentration of suspended solids and turbidity will likely occur when removing the existing armor stone and rock backfill materials from the water, placing these same materials back into the water, or when moving these materials within the water. Due to these elevated levels of suspended solids, there may be minor and localized changes to the color of the water, but these effects are expected to be confined and limited to the work area by the deployment of silt curtains.

(e) Odor

The commercially available coarse aggregate and existing armor stone and rock backfill materials are not be anticipated to cause any considerable long-term effects on, or changes to, the odor of the water. Temporary, minor, and localized increases of suspended solids and turbidity are likely to occur when removing the existing armor stone and rock backfill materials from the water, placing these same materials back into the water, or when moving these materials within the water. The increased suspended solids and turbidity may in turn possibly create some slightly unpleasant odors in the water for organisms in the vicinity of the work area, but any potential unpleasant odors are expected to be minor, confined, and limited to the work area by the deployment of silt curtains.

(f) Taste

The commercially available coarse aggregate and existing armor stone and rock backfill materials are not be anticipated to cause any considerable long-term effects on, or changes to, the taste of the water. As mentioned above, the removal of the existing armor stone and rock backfill materials from the water, placement of these same materials back into the water, or movement of these materials within the water will likely cause temporary, minor, and localized increases of suspended solids concentrations and turbidity. These elevated suspended solids and turbidity levels might be associated with slight changes to the taste of the water for organisms in the work area, but changes to the taste of the water should be limited and confined to the work area by the deployment of silt curtains.

(g) Dissolved Gas Levels

The commercially available coarse aggregate and existing armor stone and rock backfill materials are not anticipated to cause any considerable long-term effects on, or changes to, the dissolved gas levels in the water. The removal of the existing armor stone and rock backfill materials from the water, placement of these same materials back into the water, or movement of these materials within the water will likely cause minor, temporary, and localized increases of suspended solids concentrations and turbidity. These increases in the suspended solids concentrations and turbidity in the work area may have an effect on the dissolved gas and nutrient levels in the water column, which could adversely impact some of the aquatic plants and organisms near the site. In particular, increases of suspended solids and turbidity could slightly reduce the amount of dissolved oxygen in the water column, and this is because the biological and chemical content of the suspended solids might react with some of the dissolved oxygen. However, the aquatic plants and organisms that have adapted to the dynamic, high wave energy environments near the shoreline and piers are

generally tolerant of the turbid waters that occur during storm events, so most of the aquatic plants and organisms should be able to withstand the short-term and minor changes in dissolved gas and nutrient levels. Changes to the dissolved gas levels in the water should be limited and confined to the work area by the deployment of silt curtains.

(h) Nutrients

The commercially available coarse aggregate and existing armor stone and rock backfill materials are coarse and inert, so they should not cause any considerable long-term effects on, or changes to, the nutrient levels in the water. The removal of the existing armor stone and rock backfill materials from the water, placement of these same materials back into the water, or movement of these materials within the water may cause temporary, minor, and localized changes to the suspended solids, turbidity, and nutrient levels. These changes could adversely impact some of the aquatic plants and organisms in the vicinity of the work area, but the aquatic plants and organisms along the shoreline and piers should be tolerant of the turbid waters that occur during storm events and should quickly recover. Elevated nutrient levels in water due to the above- mentioned construction activities should be limited and confined to the work area by the deployment of silt curtains.

(i) Eutrophication

Eutrophication is commonly caused when water is subjected to prolonged and elevated nutrient levels, particularly nitrogen and phosphorus. The removal of the armor stone and rock backfill materials from the water, placement of these same materials back into the water, or movement of these materials within the water is expected to cause temporary, minor, and localized changes to the suspended solids, turbidity, and nutrient levels, but the nutrient levels should return to their normal concentrations shortly after the materials have been placed adjacent to the new steel sheet pile anchor wall and the suspended particles have settled from the water column. The changes to suspended solids, turbidity, and nutrient levels should be limited and confined to the work area by the deployment of silt curtains.

(j) Others as Appropriate

The public water supply intakes are over two (2) miles away from the project site, and silt curtains will be deployed to help control the movement of suspended solids and turbidity from the construction area. As a result, any effects the construction activities may have on the localized water quality, such as to the clarity, color, odor, taste, dissolved gas, or nutrient levels, is not expected to adversely impact the public water supply or the effects should be negligible. It is important to stress that the temporary and minor increases of suspended solids concentrations and turbidity produced by the proposed construction activities are expected to be considerably less than the corresponding impacts to the water quality that are commonly caused by storm events and adverse weather conditions that produce high waves and strong currents.

(7) Current Patterns and Circulation, Current Flow and Water Circulation

(a) Current Patterns and Flow

The new steel sheet pile anchor wall will widen the North Pier approximately twenty-five (25) feet further north towards the water than the existing steel sheet pile cut-off wall. The armor stone and rock backfill materials are to be reused and placed adjacent to the structure. The new anchor wall will therefore slightly reduce the distance between the North Pier and the City Pier (Figure 3b). The distance between these structures is currently approximately one hundred (100) feet, and the North Pier is partially sheltered by the outer breakwater and Navy Pier. Although

the new position of the steel sheet pile anchor wall for the North Pier will slightly reduce the distance to the City Pier, it is not expected to have a discernable effect on the current patterns or flow.

(b) Velocity

As described above, the new steel sheet pile anchor wall will be installed approximately twenty-five (25) feet further north towards the water than the existing steel sheet pile cut-off wall, and the armor stone and rock backfill material are to be placed adjacent to the new structure. The new steel sheet pile anchor wall will slightly reduce the distance between the North Pier and the City Pier, but this small reduction is not expected to have a noticeable impact on the direction and/or velocity of the flow (current patterns and waves).

(c) Stratification

Lake Michigan is an enormous lake. The proposed repairs to the North Pier include the installation of a new steel sheet pile anchor wall on the Lake Michigan side of the pier and placement of armor stone and rock backfill material adjacent to the new wall approximately twenty-five (25) feet further north toward the water than the existing steel sheet pile cut-off wall. The construction activity and repairs to the North Pier are not expected to cause any considerable long-term effects on the thermal stratification of the water column. The wind, waves, and currents on the Lake Michigan side of the North Pier are expected to continue to sufficiently mix the water column and supply adequate dissolved oxygen levels for fish and other aquatic organisms.

(d) Hydrologic Regime

The proposed installation of the new steel sheet pile anchor wall and the placement of the armor stone and rock backfill materials along this anchor wall should not have a discernable effect on the current patterns or flow and should not have any noticeable short- or long-term, individual or cumulative effects on the local or regional currents in Lake Michigan. In addition, any changes to, or effects on, the hydraulic regime, are expected to be negligible, including the circulation patterns, water level fluctuations, or the thermal stratification in Lake Michigan.

(8) Normal Water Level Fluctuations

Lake Michigan is an extremely large lake that has a huge surface area and contains an immense volume of water. According to the Great Lakes Atlas, (Government of Canada and USEPA 1995), Lake Michigan has a water surface area of 22,300 square miles (57,800 square kilometers) and a volume of 1,180 cubic miles (4,920 cubic kilometers). It can take multiple months, seasons, or even years of persistently wet/dry conditions to cause an impact to the water levels of the Great Lakes (USACE 2013). The USACE, Detroit District, tracks the water levels in each of the Great Lakes, and the primary factors that determine water level changes are precipitation falling on the lake surface, runoff draining to the lake, evaporation from the lake surface, diversions into or out of the lake, and connecting channel inflows and outflows (USACE 2013).

As discussed before, the Chicago Harbor Lock and controlling works is one of the few locations where water is diverted from the Great Lakes Basin to the Mississippi River Basin. Since the North Pier is connected to these structures, it helps limit the diversion of water out of Lake Michigan and contributes to maintaining normal water level fluctuations. These structures also protect the water quality of Lake Michigan, which supplies the drinking water for the Chicago area. It is therefore very important to help stabilize the existing steel sheet pile wall along the Chicago River side of the pier and the existing crib structure for the North Pier by performing the

proposed repairs.

(9) Salinity Gradients

Lake Michigan is a fresh water lake, so the effect of the North Pier Repair Project on salinity gradients is not applicable.

(10) Actions That Will Be Taken to Minimize Impacts

In order to prevent adverse water quality impacts, silt curtains will need to be properly deployed around the work area whenever there is a potential for the construction activities to adversely impact the water quality. This is primarily when any armor stone, rock backfill materials, or coarse aggregate backfill will be removed from the water, placed back into the water, or moved within the water. Once the new steel sheet pile anchor wall has been completely installed or the area has been properly separated from the open water, the silt curtains would not be necessary for the placement of backfill in the space between the new steel sheet pile anchor wall and the existing North Pier or above the water line if there will be no effluent or return water released to Lake Michigan.

c. Suspended Particulate/Turbidity Determinations

(1) Expected Changes in Suspended Particulates and Turbidity Levels in Vicinity of Disposal Site

When removing or moving the large armor stone or rock backfill material to clear the drive line for the new steel sheet pile anchor wall, some finer-grained material may be associated with these activities. This is because smaller-sized rock, gravel, sand, or finer-grained materials may have been deposited or could have accumulated on or within the pore spaces of the larger stone materials, and this smaller-sized material may be removed, disturbed, or suspended while clearing the larger rock materials from the drive line for the sheet piles. Also, as mentioned before, the characteristics of the material below the armor stone are somewhat unknown.

After the drive line for the steel sheet pile has been cleared, and the new steel sheet pile anchor wall has been installed, the armor stone and large stone materials will be reused and placed as backfill adjacent to the new steel sheet pile anchor wall. Similar to clearing the drive line, finer-grained materials could cause short-term and minor increases of suspended solids and turbidity when placing the armor stone and rock backfill materials back into the water or when moving these materials within the water adjacent to the new steel sheet pile anchor wall. As described above, the action that will be taken to minimize these impacts is the deployment of a silt curtain around the local work area.

(2) Effects (degree and duration) on Chemical and Physical Properties of the Water Column

(a) Light Penetration

The activities are expected to cause minor, temporary, and localized increases of suspended solids and turbidity that will likely decrease the clarity of the water and reduce the penetration of light through the water column. If the penetration of light is reduced for an extended period of time, it can lower the rate of photosynthesis and “primary productivity” of an aquatic area. Primary productivity generally refers to the conversion of light energy from the sun into chemical energy by green plants (i.e., autotrophs) in a terrestrial ecosystem, or phytoplankton for an aquatic ecosystem. Persistently high turbidity can cause adverse impacts to sight-dependent species

because the reduced clarity can hinder the feeding ability of these species, and thereby limit their growth and increase their susceptibility to disease.

In regards to elevated suspended solids concentrations, it explains the following in 40 C.F.R. 230.21:

> "The extent and persistence of these adverse impacts caused by discharges depend upon the relative increase in suspended particulates above the amount occurring naturally, the duration of the higher levels, the current patterns, water level, and fluctuations present when such discharges occur, the volume, rate, and duration of the discharge, particulate deposition, and the seasonal timing of the discharge."

The minor, temporary, and localized increases of suspended solids and turbidity associated with the construction activities are anticipated to be low relative to the increased levels of suspended solids and turbidity that typically result from storm events and adverse weather conditions. The project is therefore not expected to cause any long-term adverse impacts.

(b) Dissolved Oxygen

Minor, temporary, and localized increases of suspended solids and turbidity might cause a slight reduction in the level of dissolved oxygen in the water. This reduction may be due to the biological and chemical content of the suspended solids, which could react with the dissolved oxygen and slightly lower concentrations in the water column.

(c) Toxic Metals and Organics

The armor stone and rock backfill materials that are currently in position adjacent to the existing steel sheet pile cut-off wall along the North Pier will be reused, so the placement of these same rock materials adjacent to the new steel sheet pile anchor wall is unlikely to result in any degradation of the placement site. The armor stone and rock backfill materials are anticipated to be predominantly naturally occurring coarse and inert materials that generally do not carry toxic metals or organics.

(d) Pathogens

There are Chicago Park District public beaches located north and south of Chicago Harbor. Pathogens, particularly disease-causing bacteria and other germs, are a major concern for beaches in the Chicago area. The Chicago Park District routinely tests the water for *Escherichia coli* (*E. coli* for short) bacteria during the swimming and recreational boating season. Although *E. coli* is not harmful itself and is naturally occurring in the environment, the bacteria is a potential indicator of sewage contamination and the possible presence of human pathogens (bacteria, protozoa, and viruses) (Whitman and Nevers 2003). Whitman and Nevers (2003) suggest that potential sources include rainwater (sewage) overflows, leaking septic systems, and birds occupying the beach.

The armor stone and rock backfill materials that will be used for the new steel sheet pile anchor wall along the North Pier are the same materials that are currently in position adjacent to the existing steel sheet pile cut-off wall. These are inert and coarse materials that are not typically a source of pathogens. Moreover, these same materials will be reused for the new steel sheet pile anchor wall, so they are not expected to cause degradation of the placement site or cause any adverse impacts associated with pathogens.

The quality of the water on the southern, Chicago River side of the North Pier is considerably lower than the water on the northern, Lake Michigan side of the North Pier. The Illinois Environmental Protection Agency Water Quality Report (2016) reports that one of the causes for the use impairments listed for the Chicago River water is fecal coliform bacteria. The installation of the new steel sheet pile anchor wall is important for stabilizing the existing crib structure for North Pier and helping to prevent the polluted Chicago River water from contaminating Lake Michigan, the primary source of drinking water for the Chicago area.

It was explained earlier that a portion of the large stone removed to clear the drive line for the new steel sheet pile anchor wall could potentially be used for temporarily bracing/shoring the steel sheet pile wall on the Chicago River side of the pier. Most of the large armor stone would then be reused on the Lake Michigan side of the pier for armor stone, backfill, and/or toe stone. No Chicago River sediment is to be dredged, and the transport of sediment from the Chicago River side of the pier to the Lake Michigan side would be minimized.

(e) Aesthetics

The proposed repairs to the North Pier are not anticipated to cause any long term effects on, or changes to, the aesthetics of the water at the project site. There will likely be some temporary and minor increases of suspended solids and turbidity in the work area, and these increases are commonly associated with short-term and slight decreases of water clarity and/or changes to the color of the water. Nevertheless, these adverse aesthetic impacts should be short-term and minor, and the water is expected to return to a normal clarity and color as the suspended particles rapidly settle from the water column. In addition, the visual presence of barges, vessels, large cranes, backhoes, and other construction equipment and may generate noise and cause temporary and minor adverse impacts to the aesthetic beauty of the water surface along the North Pier. The North Pier Repair Project is expected to be frequently viewed by the public because the site is located roughly 600 feet to the south of Navy Pier; one of Chicago's most popular tourist attractions, and numerous recreational vessels pass through the Chicago Harbor Lock during boating season.

(f) Others as Appropriate

The construction work and repairs to the North Pier of Chicago Harbor are not expected to have any other adverse effects on the chemical and physical properties of the water column or aesthetics of the site.

(3) Effects on Biota

(a) Primary Production, Photosynthesis

As discussed above in the discussion of light penetration, primary production generally refers to the fixation of solar energy by phytoplankton for an aquatic ecosystem. The North Pier Repair Project will likely cause some minor, temporary, and localized increases of suspended solids and turbidity, but the effects are anticipated to be low relative to the increased levels of suspended solids that typically result from storm events and adverse weather conditions. The aquatic ecosystem in the area is likely comprised of aquatic organisms that typically reside in dynamic, high wave energy environments near breakwaters and piers, so they should be tolerant of turbid waters and adapted to elevated suspended solids concentrations and turbidity. The project is not expected to cause any significant or long-term adverse impacts to primary production or photosynthesis for the biota.

(b) Suspension/Filter Feeders

The North Pier Repair Project will cause some minor, temporary, and localized increases of suspended solids and turbidity, which could benefit suspension/filter feeders. The effects are anticipated to be low relative to the increased levels of suspended solids and turbidity that typically result from storm events and adverse weather conditions, and the project is not expected to have any long-term effects on suspension/filter feeders.

(c) Sight Feeders

Persistently high turbidity levels can cause adverse impacts to sight-dependent species because the reduction in clarity can hinder the feeding ability of these species, and thereby limit their growth and increase their susceptibility to disease. The North Pier Repair Project is expected to cause minor, temporary, and localized increases of suspended solids and turbidity, but, as mentioned previously, the effects are anticipated to be low relative to the increased levels of suspended solids and turbidity that typically result from storm events and adverse weather conditions. Although there may be minor, temporary, and localized impacts, the project is not expected to have any persistent, long-term, and adverse effects on sight feeders. The proposed use of a silt curtain should also limit and confine any adverse impacts to the work area.

(4) Actions Taken to Minimize Impacts

The proposed actions that will be taken to minimize the effects on biota are the same actions discussed earlier. In particular, a silt curtain will be deployed around the immediate work area to help control the movement of suspended solids and turbidity from the construction area. The silt curtain is expected to limit and confine any adverse impacts to the work area. Although there may be minor and temporary adverse impacts to biota within the local work area, the silt curtain should minimize any broader effects on biota that reside outside the immediate vicinity of the work area.

d. Contaminant Determinations

No specific chemical analyses or contaminant determinations were conducted because the commercially available coarse aggregate, armor stone, large rock, and concrete pieces that will be used for backfill materials are not expected to introduce any new contaminants or release existing contaminants. These materials are predominantly composed of coarse and inert minerals, and the armor stone and rock backfill materials are the same materials presently in position adjacent to the existing steel sheet pile cut-off wall and will be reused. The placement of these materials adjacent to the new steel sheet pile anchor wall should not have any considerable long-term effects on, or changes to, the water quality or aquatic ecosystem.

e. Aquatic Ecosystem and Organism Determinations

(1) Effects on Plankton

Plankton are pelagic, which means they live within the water column itself, as opposed to benthic organisms that live along the bottom (Water Encyclopedia 2016). Plankton generally drift along with the water currents and/or float on or near the water surface, as opposed to nekton, which are active swimmers that can propel themselves through water currents. Plankton are typically divided into phytoplankton, which includes photosynthesizing species like algae that derive energy from sunlight, water, and carbon dioxide, and zooplankton, which consume food in order

to derive energy. Although most planktonic species are small and often microscopic, there are large plankton organisms that are still considered to be plankton because they drift with the water current.

Researchers have found that Lake Michigan has experienced substantial and complex changes to the food-web structure since the 1980s (Vanderploeg et al. 2012, Makarewicz et al. 1998, and Scavia et al. 1988). The paper by Vanderploeg et al. (2012) lists the following changes: (1) a decrease in phosphorus loading, (2) increased control of planktivorous alewife (*Alosa pseudoharengus*) by the introduction of Pacific salmon, (3) the invasion of the visual-feeding spined predatory cladoceran *Bythotrephes longimanus* in the mid-1980s from northern Europe, (4) invasion by a host of Ponto-Caspian species, including zebra (*Dreissena polymorphia*) and quagga mussels (*Dreissena rostiformis bugensis*) during the 1990s, and (5) loss of the spring phytoplankton bloom in 2007 and 2008 likely caused by intense filtering during winter and spring by quagga mussels following their massive population expansion into deep water starting in 2004.

The many changes, invasive or non-native species, and complex interactions that have occurred in Lake Michigan makes it difficult to assess and/or quantify the effects on different species and the food-web (Vanderploeg et al. 2012). The proposed North Pier Repair Project will cause some minor, temporary, and localized impacts to some phytoplankton and zooplankton, but, due to the nature of these organisms and large scale of Lake Michigan in comparison to the project site, the impacted populations of plankton in the vicinity should recover quickly, and no considerable long- term effects on plankton communities are anticipated.

Likewise, many of the plankton species that are present in Lake Michigan are also present at the mouth of the Chicago River, on the downstream side of the Chicago Lock. The proposed North Pier Repair Project will cause some minor, temporary, and localized impacts to some phytoplankton and zooplankton. However, many of these organisms will be replenished through drift from Lake Michigan and should recover quickly. Many of the 50+ species of plankton present in the Great Lakes is estimated to have an average biomass of several milligrams per cubic meter and as such tens of millions of individual organisms per second are able to flow from Lake Michigan into the river during peak times (Vanderploeg et al 2012; INHS 2019; NOAA 1993). As a result, no considerable long-term effects on plankton communities are anticipated for the Chicago River side of the project area.

(2) Effects on Benthos

Benthos refers to the organisms (plants and animals) that inhabit the bottom of a sea, stream or lake. For the current project, the benthos includes organisms that live on, in, or near the bottom of Lake Michigan and the Chicago River. The removal of the armor stone and rock backfill materials adjacent to the existing steel sheet pile cut-off wall, as well as the replacement of these materials and commercially available coarse aggregate adjacent to the new steel sheet pile anchor wall, will cause some minor destruction and temporary adverse effects on the existing benthos in the local work area. However, benthic communities that are established near the shoreline and piers are generally tolerant and adapted to dynamic, high wave and energy environments. Likewise, established benthic organisms in the vicinity of the river side of the work area are generally tolerant of the highly modified riverine system. In addition, the armor stone and rock backfill materials are presently in position adjacent to the existing steel sheet pile cut-off wall, and these materials will be reused adjacent to the new steel sheet pile anchor wall. There is a possibility for transfer of some armor stone to the river side of the project along less than 500 linear feet at the base of the sheet pile wall. There will be some impact to the species in the immediate vicinity, but the addition of the stone would likely increase favorable habitat available for species in the area. Due to these factors, the benthic communities should become reestablished over the long- term,

and the North Pier Repair Project is not expected to have any considerable, long-term adverse effects on the local benthos.

(3) Effects on Nekton

Nekton refers to the aquatic life (organisms) that can swim freely and are generally independent of the water currents (Water Encyclopedia 2016). The work activities are expected to cause minor auditory disturbances to nekton in the vicinity of the work area, and some aquatic organisms that are slow or unable to move away quickly enough could be injured or killed during the removal of the armor stone and rock backfill or when these materials are placed back into the water, or moved within the water, adjacent to the new steel sheet pile anchor wall or to the sheet pile wall on the river side. However, compared to the tremendous size of Lake Michigan and extensive shoreline of the Chicago River, the work area is small. A silt curtain will be used around the area to limit adverse effects on aquatic organisms. There might be some minor, temporary, and localized adverse impacts, but the proposed North Pier Repair Project is not anticipated to degrade or have any permanent or noticeable effects on the nekton or nekton habitat in Lake Michigan.

(4) Effects on Aquatic Food Web

When discussing the effects on plankton, it was previously noted that Lake Michigan experienced substantial and complex changes to the food web since the 1980s (Vanderploeg et al. 2012, Makarewicz et al. 1998, and Scavia et al. 1988). The mouth of the Chicago River shares many of its species with Lake Michigan and is expected to have a comparable food web to that of Lake Michigan at its mouth. Although it is likely that proposed repairs to the North Pier might cause effects on some food web organisms in the vicinity, particularly sedentary organisms along the bottom, the North Pier site is small compared to the extremely large size of Lake Michigan and the river, and the food web organisms near the shoreline should be tolerant and adapted to dynamic, high wave and energy environments and the highly modified riverine system. The food web organisms should repopulate and become reestablished shortly after the repairs are completed, so any adverse impacts to the aquatic food web are expected to be minor, temporary, and localized. The construction activities along the North Pier are not expected to have any permanent or considerable long-term effects on the food web structure.

(5) Effects on Special Aquatic Sites

(a) Sanctuaries and Refuges

There are no sanctuaries or refuges in the vicinity, so this topic is not applicable.

(b) Wetlands

Brinson (1993) defines wetlands as the following:

> "Those areas that are inundated or saturated at a frequency to support, and which normally do support, plants adapted to saturated and/or inundated conditions. They normally include swamps, bogs, marshes, and peatlands."

The project site is in open freshwater lake and river habitat adjacent to an urban concrete pier and parking lot. Since there are no identifiable wetland plants in the vicinity of the site, this topic does not seem to be applicable.

Historically this area was likely wetland habitat that resembled a riverine wetland, since it is adjacent to the mouth of the Chicago River, or a lacustrine/open/shoreline system (Albert et al

2005). However, due to the development of the City of Chicago around the site, this natural wetland type no longer exists. Existing habitat surrounding the Chicago Harbor North Pier primarily consists of manmade rock/riprap piles that sit on sand and lean against hardened shoreline structures such as steel sheet pile and concrete walls. The Preferred Plan would not come in contact with or disturb any wetlands and/or habitats within Lake Michigan or the river's mouth surrounding the Chicago Harbor Lock. It is anticipated that the Preferred Plan would have no effects to existing lacustrine wetlands and associated habitat resources.

(c) Mud Flats

There are no mud flats in the vicinity of the site, so this topic is not applicable.

(d) Vegetated Shallows

No vegetated shallows are in the vicinity of the site, so this topic is not applicable.

(e) Coral Reefs

There are no coral reefs in freshwater environments, so this topic is not applicable.

(f) Riffle and Pool Complexes

There are no riffle and pool complexes in the vicinity of the site, so this topic is not applicable.

(6) Threatened and Endangered Species

Federally-listed Threatened, Endangered, Proposed and Candidate Species were reviewed for the project area by the Chicago District. The following federally listed species and their critical habitats are identified by the U.S. Fish and Wildlife Service (USFWS) as occurring within Cook County:

- Piping Plover (*Charadrius melodus*) – Endangered – Wide, open, sandy beaches with very little grass or other vegetation
- Eastern Massasauga (*Sistrurus catenatus*) – Candidate – Graminoid dominated plant communities (fens, sedge meadows, peat lands, wet prairies, open woodlands, and shrublands)
- Hine's Emerald Dragonfly (*Somatochlora hineana*) – Endangered – Spring fed wetlands, wet meadows and marshes
- Eastern Prairie Fringed Orchid (*Platanthaera leucophaea*) – Threatened – Moderate to high quality wetlands, sedge meadow, marsh, and mesic to wet prairie.
- Leafy-prairie Clover (*Dalea foliosa*) – Endangered – Prairie remnants on thin soil over limestone
- Mead's Milkweed (*Asclepias meadii*) – Threatened – Late successional tallgrass prairie, tallgrass prairie converted to hay meadow, and glades or barrens with thin soil
- Prairie Bush Clover (*Lespedeza leptostachya*) – Threatened – Dry to mesic prairies with gravely soil
- Northern Long-eared Bat (*Myotis septentrionalis*) – Threatened – Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. Roosts and forages in upland forests and woods.
- Rufa Red Knot (*Calidris canutus rufa*) – Threatened – Only actions that occur along coastal areas or large wetland complexes during migratory window of May 1 - September 30

- Rattlesnake-master Borer Moth (*Papaipema eryngii*) – Candidate – Undisturbed prairie and woodland openings that contain their only food plant, rattlesnake-master (*Eryngium yuccifolium*).

- Rusty Patched Bumble Bee (*Bombus affinis*) – Endangered – Grasslands with flowering plants from April through October, underground and abandoned rodent cavities or clumps of grasses above ground as nesting sites, and undisturbed soil for hibernating queens to overwinter.

The Chicago Lock's North Pier is a man-made structure built in early 1900s. There is no critical habitat within the immediate study area of the structure. It is determined that this repair project would have "no effect" on listed species or proposed or designated critical habitat.

State listed species identified by the ILDNR in a letter dated 03 January 2018 that occur within the Chicago Harbor area are the Longnose Sucker (*Catostomus catostomus*), Banded Killifish (*Fundulus diaphanus*) and the Mudpuppy (*Necturus maculosus*). Based on surveys performed by USACE ichthyologists, the Longnose Sucker does not occupy the nearshore around the North Pier, but occupies the gaps in the detached breakwaters where there are currents. The Banded Killifish is becoming ubiquitous within the Chicago Area and is highly abundant along the shorelines of Lake Michigan; however, there are no records for this species within the vicinity of the North Pier. The Mudpuppy is known to occupy all of the structures at the Chicago Lock in the winter months, and in particular, the lock chamber itself.

The Mudpuppy (*Necturus maculosus*) salamander is the only state listed species that could be present within the work limits. This species is known to occupy the lock chamber during the colder winter months of December through February. Lock and breakwater operations and repairs seem to have no effect on this species, as they have been known to be present for over 30 years. In fact, this species has taken advantage of man-made rock structures throughout the Great Lakes, in which maintenance and repairs have not deterred them from its use. The only task that could directly affect the Mudpuppy would be moving stones out of the sheet pile drive line. Since the sheet pile driving and stone moving is a short duration, off timing to Mudpuppy being nearshore, and small footprint, it is unlikely the activity would adversely affect the Mudpuppy populations yet alone individuals. It is anticipated that the Preferred Plan would have no effects to existing Mudpuppy individuals, populations and their required habitats.

Other Wildlife

No other wildlife would be adversely impacted by the proposed repairs to the North Pier for the Chicago Harbor Lock and controlling works.

(7) Actions Taken to Minimize Impacts

The proposed actions that will be taken to minimize adverse impacts to the aquatic ecosystem and organisms are the same actions mentioned earlier. Namely, a silt curtain will be deployed around the immediate work area to help control the suspended solids and turbidity, limit and confine any adverse impacts to the local work area, and prevent the movement of suspended solids and turbidity from the construction area. Although there may be minor and temporary adverse impacts to organisms living within the immediate footprint of the construction activities, the silt curtain should minimize any adverse or long-term impacts to the aquatic ecosystem and organisms living outside the work area.

f. Proposed Disposal Site Determinations

(1) Mixing Zone Determination

A mixing zone determination is not applicable. The materials that will be removed and placed back into the water, or moved within the water, will include coarse and inert armor stone and rock backfill. The repairs to the North Pier will likely cause some minor, temporary, and localized increases of suspended solids and turbidity, but these effects should not be toxic or persistent and they will be confined and limited to the immediate work area by the use of a silt curtain. These increases should be diluted and dissipate quickly, and they are not expected to violate water quality standards.

(2) Determination of Compliance with Applicable Water Quality Standards

A minor amount of backfill material will consist of pieces of concrete from the demolition of the existing tunnel structure and concrete slab. This backfill will be placed between the new steel sheet pile anchor wall and existing wall on the Lake Michigan side of the pier. If any steel reinforcement is observed protruding from the concrete pieces, the reinforcement is to be cut flush with the face of the concrete prior to the reuse and placement of any concrete pieces as backfill. The commercially available coarse aggregate, armor stone, and rock backfill that are proposed for use during the North Pier Repair Project will predominantly be coarse and inert materials. In addition, the armor stone and rock backfill are the same materials currently in the water adjacent to the existing steel sheet pile cut-off wall.

None of the proposed materials are expected to be a source of toxic or persistent contamination, and the materials are not anticipated to cause any considerable long-term effects on, or changes to, the water chemistry or quality. Minor, short-term, and localized adverse impacts may occur within the immediate work area due to increases in the concentration of suspended solids and turbidity that are associated with the construction activities, but a silt curtain will be deployed around the work area to minimize the adverse effects and prevent the movement of suspended solids and turbidity from the construction area. In general, the activities are expect to comply with the applicable water quality standards and no violations are anticipated.

(3) Potential Effects on Human Use Characteristic

(a) Municipal and Private Water Supply

According to the 2017 Illinois State Water Survey map of the distribution of water use in Illinois, the public water supply intakes nearest to the North Pier Repair Project are the Drever and Four Mile Cribs, and these intakes are located over two (2) miles away from the North Pier. Construction activities during the project are expected to cause minor, temporary, and localized adverse impacts due to increases in suspended solids and turbidity, but a silt curtain will be deployed around the work area and the water supply intakes are a long distance away. As a consequence, no adverse effects on the water supplies are anticipated.

(b) Recreational and Commercial Fisheries

The construction activities that occur during North Pier Repair Project will not have any effects on the operations of commercial fisheries because there are no commercial fisheries in the vicinity of Chicago Harbor and the North Pier. There may be very minor, temporary, and localized disruptions for recreational fishing in the immediate vicinity of the project due to the implementation of restrictions around the site to ensure public safety and secure the construction site and equipment.

(c) Water Related Recreation

It is likely that access to the area surrounding North Pier Repair Project will be restricted during the construction activities to ensure public safety and secure the site and equipment. These restrictions could potentially result in some minor, temporary, and localized inconveniences for fishing near the North Pier or recreational boat users in the immediate vicinity of the project. However, the North Pier repairs are expected to be completed within a reasonably short duration, and the site is small in comparison the other potential alternatives and variety of locations along the Lake Michigan shoreline for water-related recreation. Lock operation itself is not anticipated to be impacted, so there will not be an impact to recreational boaters using the lock.

(d) Aesthetics

The proposed repairs will increase the width of the North Pier by approximately twenty-five (25) feet. The work includes the demolition of the existing tunnel structure and the construction of a concrete retaining wall. The increased width of the pier will provide needed space to improve vehicle access and store stop logs for the Chicago Harbor Lock on the Chicago River side of the pier. Otherwise, the structure will appear somewhat similar to the existing conditions. During construction, it is likely that the aesthetics of the local area will occasionally be affected by the additional noise and operations of the vessels and heavy equipment while performing the repairs; this will include the placement and removal of the silt curtains, removal and replacement of armor stone and rock backfill materials, excavations for the relocation of utilities, driving steel sheet piles, removing the concrete slab and tunnel structure, drilling through materials to install the new tie rods, etc. Since the project location is near Navy Pier; a major Chicago tourist attraction, and the site is next to the Chicago Harbor Lock, which is extremely busy during boating season, the construction activities may adversely impact the noise and visual aesthetics for this popular destination along the Chicago Shoreline. It was also mentioned earlier that the movement of the armor stone and rock backfill is likely to cause short-term and temporary increases in the suspended solids and turbidity, and these increases could reduce the aesthetic quality of the water by causing minor and temporary impacts to the clarity or color of the water in the local area. In general, the aesthetic effects are expected to be minor and temporary and should only impact those people and organisms in the immediate vicinity.

(e) Parks, National and Historical Monuments, National Seashores, Wilderness Areas, Research Sites, and Similar Preserves

Several small Chicago parks and the Lakefront Trail are located near the entrance to Navy Pier, and Navy Pier is a Chicago Landmark, but access to the North Pier Repair Project site is restricted by security fencing. The security fence separates the site from Navy Pier and travels along the northern side of a small parking lot that is located just north of the western side of the North Pier. The project is not anticipated to cause any permanent or long-term effects on the parks or Lakefront Trail, but, as discussed above, there could be minor and temporary effects on the aesthetics of the local area. Since there are no national or historical monuments, national seashores, wilderness areas, research sites, and similar preserves in the vicinity of the project, the effects on these sites are not applicable.

g. Determination of Cumulative Effects on the Aquatic Ecosystem

The Section 404(b)(1) Guidelines indicates that cumulative effects are the effects attributable to the collective effect of numerous individual dredged or fill material placement events. Although the impact from one particular, individual dredged or fill material placement event may only cause a minor effect on the aquatic ecosystem, numerous individual dredged or fill material placement events could cause a more substantial effect on the aquatic ecosystem.

The North Pier Repair Project is a short-term construction project, and there will not be numerous individual placement events. As described previously, the armor stone and rock backfill that are presently

along the North Pier are to be cleared from the drive line in order to install a new steel sheet pile anchor wall. The armor stone could potentially be used as a bracing/shoring mechanism on the river side for the existing sheet pile wall as the tie rods for the wall are removed. The new anchor wall will then be installed, and generally the same armor stone and rock backfill materials will be placed back into the water or moved within the water adjacent to the new steel sheet pile anchor wall. If armor stone was placed on the river side it would be removed to at least 14 feet below LWD without transferring river sediment to Lake Michigan in the process. After the new steel sheet pile anchor wall has been installed and the armor stone and rock backfill materials are placed adjacent to the new anchor wall, there should be no further disturbance to the aquatic ecosystem, so there should be no cumulative effects.

The construction activities are likely to cause some minor, temporary, and localized increases of suspended solids and turbidity, but the aquatic ecosystems along shorelines generally consist of plants and animals that are hardy and tolerant of dynamic, high wave energy environments and turbid waters. Since shorelines are commonly impacted by storms and adverse weather conditions, the aquatic plants and animals that live in these areas need to be resilient and able to withstand such adverse impacts. Most fish species are likely to swim away to deeper water, and other animals may seek shelter nearby or move away from the area.

In comparison to adverse weather conditions, the elevated levels of suspended solids and turbidity related to the construction activities are expected to settle or dissipate in a short time period. Moreover, a silt curtain will be deployed around the work area during the construction activities to contain and minimize any adverse impacts and prevent the movement of suspended solids and turbidity from the construction area. The aquatic ecosystem should therefore quickly recover from the minor and temporary effects, and no long-term, permanent, or cumulative effects are anticipated.

h. Determination of Secondary Effects on the Aquatic Ecosystem

According to the Section 404(b)(1) Guidelines, secondary effects are the effects associated with the placement of dredged or fill material, but they are not a direct result from the placement of dredged or fill material. For example, secondary effects may include the effects from activities to be conducted on fast land that was created by the placement of dredged or fill material.
The North Pier Repair Project will increase the width of the structure by approximately twenty-five (25) feet and will be under 500 linear feet. The space between the existing steel sheet pile cut-off wall on the Lake Michigan side of the pier and the new steel sheet pile anchor wall will be filled with commercially available coarse aggregate (CA- 1), existing large stone and rock backfill materials, and concrete pieces from the demolition of the tunnel structure and concrete slab. The additional land created by the North Pier Repair Project will be similar to the land currently adjacent to the existing steel sheet pile cut-off wall. The new steel sheet pile anchor wall will separate the additional fast land from Lake Michigan, and activities on the land are not expected to cause any secondary effects to the aquatic ecosystem.

III. Findings of Compliance or Non-Compliance with the Restrictions on Discharge

a. Adaptation of the Section 404(b)(1) Guidelines to this Evaluation

For the North Pier Repair Project, the armor stone and rock backfill materials that are currently adjacent to the existing steel sheet pile cut-off wall will be removed to clear the drive line for the new steel sheet pile anchor wall. These same materials will be reused and placed adjacent to the new steel sheet pile anchor wall after it has been installed. As a consequence, these materials will simply be removed or moved for a short time period, and the same materials will be placed adjacent to the new steel sheet pile anchor wall. There is a possibility for the armor stone and rock backfill to be temporarily placed on the Chicago River side of the pier as a bracing/shoring mechanism for the southern sheet pile will while the existing tie rods are replaced. In this instance, the total amount of river bottom that would have rock

placed on it temporarily is expected to be less than 500 linear feet. For stone removal from the river side the armor stone will be removed to a minimum of 14 feet below LWD so as not to affect navigation and no river sediment will be removed in the process. Upon lake side placement, the materials will slightly change position due to the proposed twenty-five (25)-foot increase in the width of the pier, but the materials will mostly be the same, so there is little potential for significant degradation of the aquatic environment. In § 230.6(a) (Adaptability) of the Section 404(b)(1) Guidelines, it explains "It is anticipated that substantial numbers of permit applications will be for minor, routine activities that have little, if any, potential for significant degradation of the aquatic environment. It generally is not intended or expected that extensive testing, evaluation, or analysis will be needed to make findings of compliance in such routine cases." Additional backfill materials will include commercially available coarse aggregate (CA-1), and concrete pieces from the demolition of the tunnel structure and concrete slab are to be used between the newly constructed steel sheet pile anchor wall and the existing sheet pile wall on the Lake Michigan side of the pier, but these materials are not anticipated to cause any unacceptable adverse impacts. No adaptations of the Section 404(b)(1) guidelines were necessary for this evaluation.

b. Evaluation of Availability of Practicable Alternatives to the Proposed Discharge Site Which Would Have Less Adverse Impact on the Aquatic Ecosystem

The "no action" alternative would be to not repair the existing North Pier. This alternative is unacceptable because the North Pier is an important structure for navigation and, as discussed previously, it connects to the Chicago Harbor Lock and controlling works and helps protect the water quality of Lake Michigan. Other repair options for the North Pier were evaluated during the design analysis, but the proposed method for repairing the structure was estimated to be the most effective alternative in terms of constructability and cost (USACE 2017a). All of the other practicable alternatives that were considered, besides the "no action" alternative, would likely have similar or more substantial impacts to the aquatic ecosystem.

c. Compliance with Applicable State Water Quality Standards

The armor stone and rock backfill materials that will be used for the new steel sheet pile will primarily consist of the same materials currently adjacent to the existing steel sheet pile cut-off wall. In addition, commercially available coarse aggregate (CA-1) will be used, and concrete pieces from the demolition of the tunnel structure and concrete slab will be used for backfill between the new steel sheet pile anchor wall and the existing steel sheet pile wall on the Lake Michigan side of the pier. These materials are believed to be coarse and inert, and they are not expected to be a source of contamination. These materials are not anticipated to cause any considerable long-term effects on, or changes to, the water chemistry or quality. Minor and short-term effects on the water quality are likely to occur during construction because of increases in the concentration of suspended solids and turbidity. In particular, these increases are expected to occur when clearing the drive line for the new steel sheet pile wall and after the new wall has been installed and the armor stone and rock backfill materials are reused and placed adjacent to the new wall. A silt curtain will be utilized to contain and minimize any adverse impacts. The temporary increase of suspended solids is expected to cause short-term decreases in water clarity and minor changes to the color of the water. However, these impacts are expected to be minor and short-term, so the project is expected to comply with all applicable water quality standards and no violations are anticipated.

d. Compliance with Applicable Toxic Effluent Standard or Prohibition Under Section 307 Of the Clean Water Act

The project is expected to be in compliance with applicable Toxic Effluent Standards under Section 307 of the Clean Water Act; with the Endangered Species Act of 1973; with the National Historic Preservation Act of 1966; and with the Marine Protection, Research, and Sanctuaries Act of 1972.

e. Compliance with Endangered Species Act of 1973

Coordination with the USFWS commenced with a project scoping letter dated 12 December 2017. Coordination under the Fish & Wildlife Coordination Act (FWCA) of the Preferred Plan will be completed during the Agency and public review period as requested by USFWS in an email dated 13 December 2017. The EA identified the 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); which precludes the need for further consultation under Section 7. The USACE specifically requests the USFWS to determine if a "no work" window is warranted during the spring and fall bird migrations since the Preferred Plan repair work is considered a minor operation and maintenance action.

f. Compliance with Specified Protection Measures for Marine Sanctuaries Designated by the Marine Protection, Research, and Sanctuaries Act of 1972

Compliance with the specified protection measure for marine sanctuaries is not applicable because the proposed project is for Lake Michigan, and the Great Lakes are fresh water lakes that are not included within the Marine Protection, Research, and Sanctuaries Act of 1972.

g. Evaluation of Extent of Degradation of the Waters of the United States

(1) Significant Adverse Effects on Human Health and Welfare

The proposed fill activity is not expected to have any significant, long-term adverse impacts on human health or welfare, including:

(a) Municipal and private water supplies,
(b) Recreational and commercial fisheries,
(c) Plankton,
(d) Fish,
(e) Shellfish,
(f) Wildlife communities (including community diversity, productivity, and stability), or
(g) Special aquatic sites.

(2) Significant Adverse Effects on Life Stages of Aquatic Life and Other Wildlife Dependent on Aquatic Ecosystems

It was indicated previously that the work activities may cause minor auditory disturbances to nekton in the vicinity of the work area, and some aquatic organisms that are slow or unable to move away quickly enough could be injured or killed during the removal of the armor stone and rock backfill or when these materials are placed back into the water, or moved within the water, adjacent to the new steel sheet pile anchor wall. However, these impacts are not considered to be significant because, compared to the tremendous size of Lake Michigan, the work area is small, and a silt curtain will be used around the area to limit adverse effects on aquatic organisms. There might be some minor, temporary, and localized adverse impacts, but the proposed North Pier Repair Project is not anticipated to degrade or have any permanent or noticeable effects on the nekton or nekton habitat in Lake Michigan.

(3) Significant Adverse Effects on Aquatic Ecosystem Diversity, Productivity and Stability

Lake Michigan is enormous in comparison to the size of the project site, and no long-term adverse

effects are expected on aquatic ecosystem diversity, productivity, or stability. Furthermore, it should be noted that the elevated levels of suspended solids would be expected to settle or dissipate within a relatively short time period, and the minor and temporary increases of suspended solids concentrations produced by the clearing of the drive line for the new steel sheet pile anchor wall, as well as the placement operations, are expected to be considerably lower than the increased turbidity that would typically result from adverse weather conditions that produce high waves and strong currents.

(4) Significant Adverse Effects on Recreational, Aesthetic, and Economic Values

The width of the North Pier will increase by approximately twenty-five (25) feet. The work includes the demolition of the existing tunnel structure and the construction of a concrete retaining wall. The increased width of the pier will provide needed space to improve vehicle access and store stop logs for the Chicago Harbor Lock on the Chicago River side of the pier. The structure will otherwise be somewhat similar to the existing conditions. During construction, it is likely that the aesthetics of the local area will occasionally be affected by the additional noise and operations of the vessels and equipment while performing the repairs, including the removal and replacement of the armor stone and rock backfill materials and when driving the steel sheet pile anchor wall. The project location is near a major Chicago tourist attraction, Navy Pier, and it is next to the Chicago Harbor Lock, which is extremely busy during boating season, so the construction activities may moderately affect the noise and visual aesthetics for this popular destination along the Chicago Shoreline. The movement of the armor stone and rock backfill is also likely to cause short-term and temporary increases in the suspended solids and turbidity, and these increase could reduce the aesthetic quality of the water by causing minor and temporary impacts to the clarity or color of the water in the vicinity. In order to contain and minimize any adverse impacts, a silt curtain will be used when construction operations have the potential to cause adverse impacts to the water quality. In general, the aesthetic effects are not expected to be significant, but there will likely be some minor and temporary effects that impact people and organisms in the immediate vicinity. The North Pier Repair Project is not expected to cause any significant adverse impacts to economic values, but this project is critical for protecting the water quality of Lake Michigan, which provides the drinking water for the population of Chicago, maintaining navigation though the Chicago Area Waterway System (CAWS), and ensuring compliance with the court decision that limits the diversion of water from the Great Lakes Basin to the Mississippi River Basin.

h. Appropriate and Practicable Steps Taken to Minimize Potential Adverse Impacts of the Discharge on the Aquatic Ecosystem

In order to prevent adverse water quality impacts, silt curtains will be properly deployed around the work area whenever any armor stone, rock backfill materials, or coarse aggregate backfill will be removed from the water, placed back into the water, or moved within the water. Once the new steel sheet pile anchor wall has been completely installed or the area has been properly separated from the open water, the silt curtains would not be necessary for the placement of backfill in the space between the new steel sheet pile anchor wall and the existing North Pier or above the water line if there will be no effluent or return water released to Lake Michigan. All practicable steps will be taken to minimize adverse impacts to the aquatic ecosystem.

i. On the Basis of the Guidelines, the Proposed Placement Sites for the Discharge of Fill Material is:

Specified as complying with the requirements of these guidelines, with the inclusion of appropriate and practical conditions to minimize adverse effects on the aquatic ecosystem.

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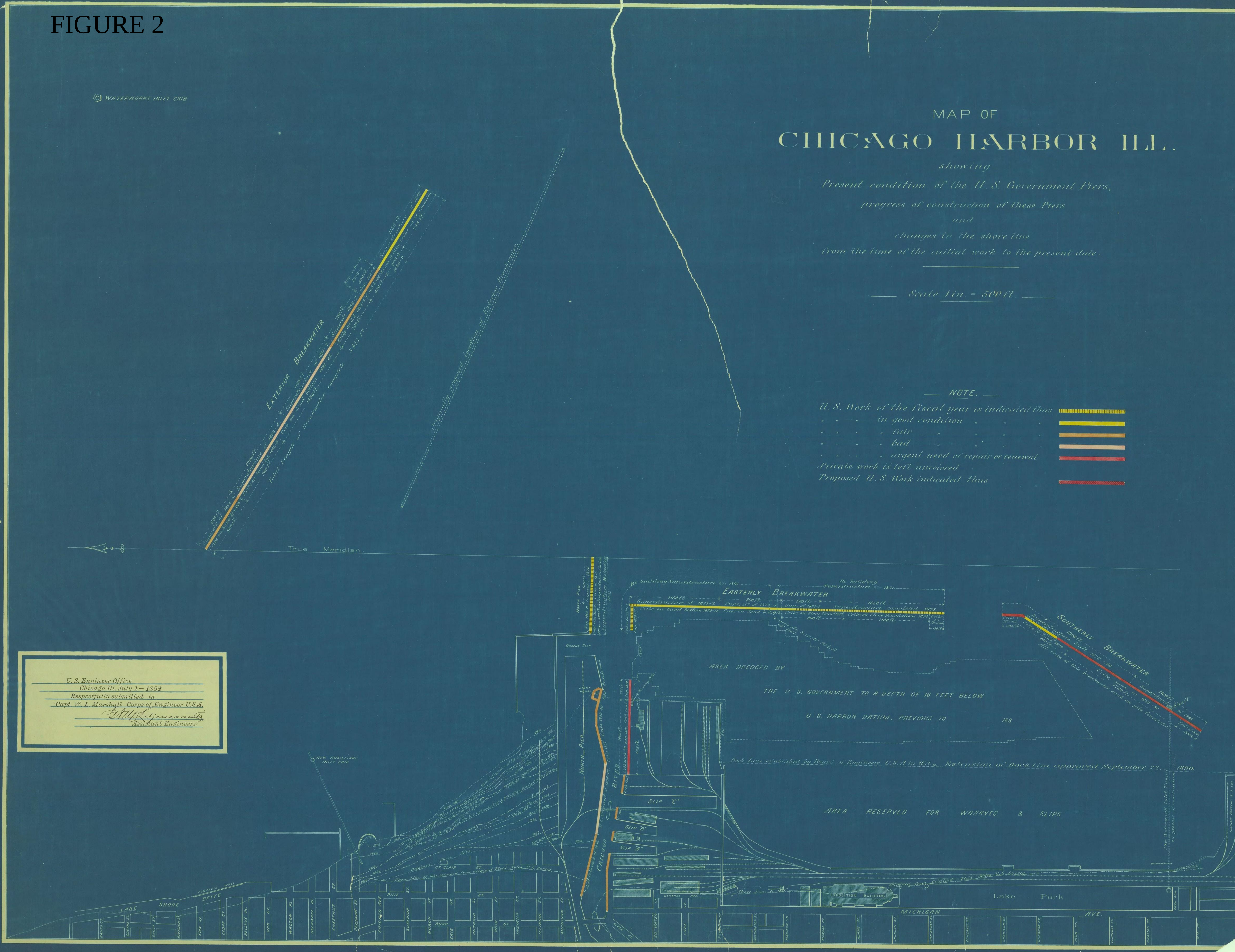
V. Figures

F.igure 1 - ProJect .on.b) ap .

FIGURE 2


MAP OF
CHICAGO HARBOR ILL.
showing
Present condition of the U. S. Government Piers,
progress of construction of these Piers
and
changes in the shore line
from the time of the initial work to the present date.
Scale 1 in = 500 ft.
NOTE.
U. S. Work of the fiscal year is indicated thus
" " " in good condition
" " " fair
" " " bad
" " " urgent need of repair or renewal
Private work is left uncolored
Proposed U. S. Work indicated thus
WATERWORKS INLET CRIB
EXTERIOR BREAKWATER
Total length of Breakwater complete 5415 ft
True Meridian
EASTERLY BREAKWATER
Superstructure completed 1875
SOUTHERLY BREAKWATER
AREA DREDGED BY
THE U. S. GOVERNMENT TO A DEPTH OF 16 FEET BELOW
U. S. HARBOR DATUM, PREVIOUS TO 188
Dock Line established by Board of Engineers U. S. A in 1871. Extension of Dock Line approved September 22. 1890.
AREA RESERVED FOR WHARVES & SLIPS
NORTH PIER
CHICAGO RIVER
SLIP "C"
SLIP "B"
SLIP "A"
NEW AUXILLIARY INLET CRIB
LAKE SHORE DRIVE
EXPOSITION BUILDING
Lake Park
MICHIGAN AVE.
U. S. Engineer Office
Chicago Ill, July 1 – 1892
Respectfully submitted to
Capt. W. L. Marshall Corps of Engineer U.S.A.
Assistant Engineer.

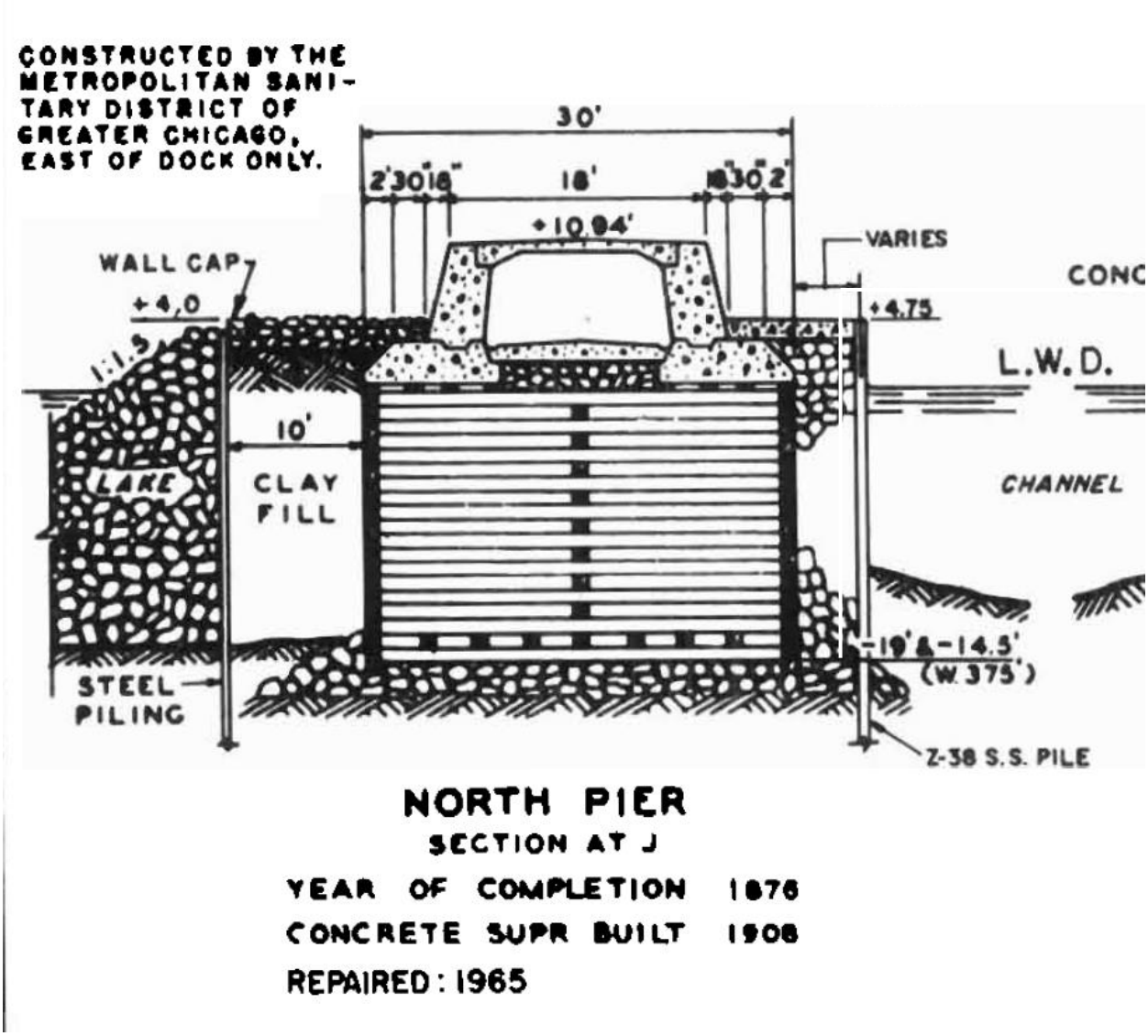


Figure 3a – Cross-section of stone filled, timber crib for the North Pier with concrete superstructure and tunnel.

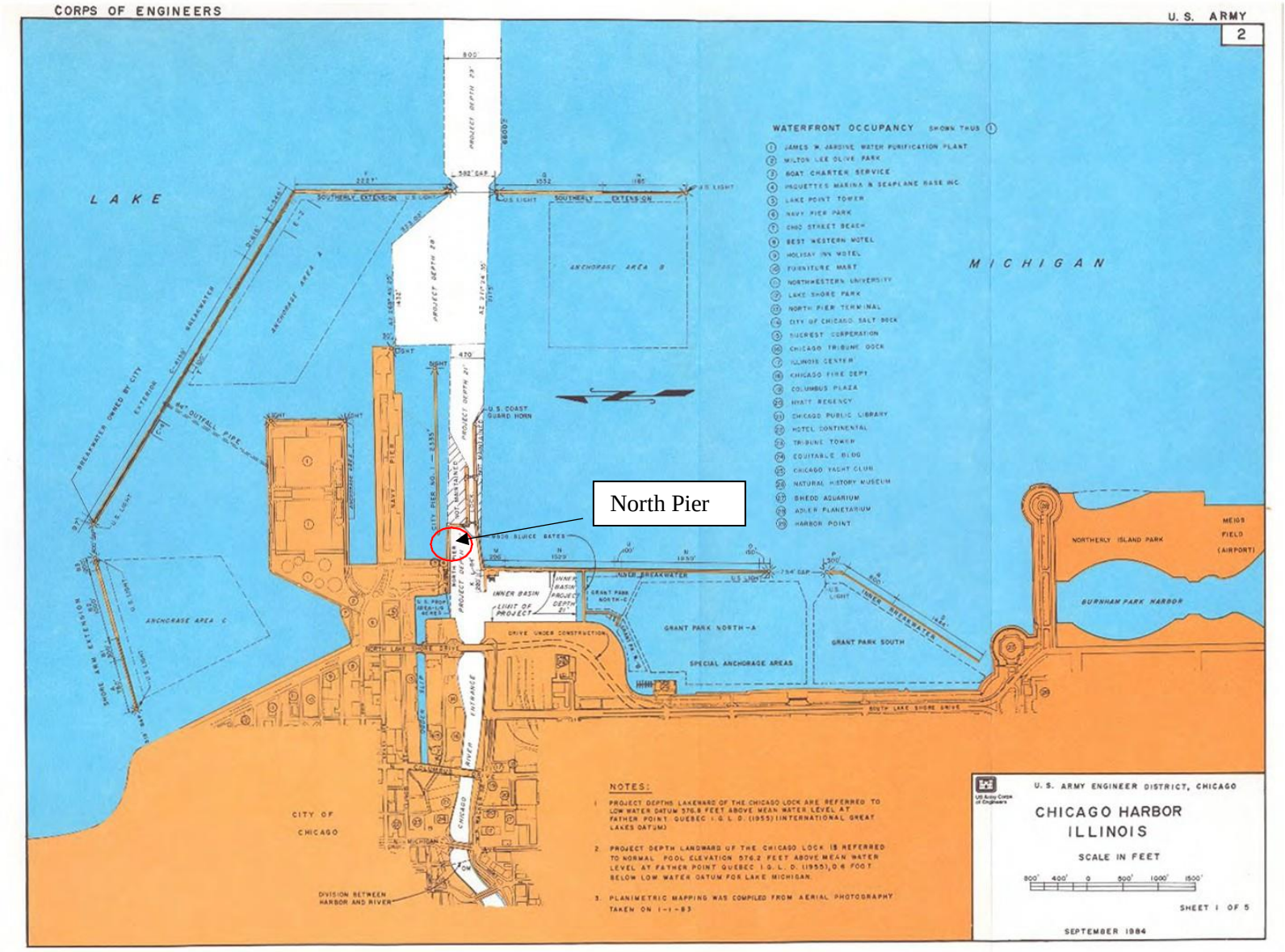


Figure 3b – Chicago Harbor project map showing location of North Pier.

Figure 4 – Existing armor stone along Lake Michigan side of Chicago Harbor North Pier.

VI. Table

Table 1: Chicago Harbor Authorization and Construction Work

Date	Work	Documents
Mar. 02, 1827	Congress granted a quantity of land to the State of Illinois to aid in opening a canal to connect the waters of the Illinois River with those of Lake Michigan.	19th Cong. Sess. II, Ch. 51.
Mar. 02, 1833	Initial appropriation for Chicago Harbor. In addition to the appropriation of Mar. 02, 1833, appropriations for continuing improvements to the harbor were included in acts on Jun. 28, 1834, Mar. 03, 1835, Jul. 02, 1836, Mar. 03, 1837, and Jul. 07 1838. The first work consisted of dredging and constructing piers to the north and south of the mouth of the Chicago River.	22nd Cong. Sess. II, Ch. 64 Annual Report (USACE 1915)
Aug 30, 1852	This work included an extension for the northern pier. In 1864, the City of Chicago provided funds for dredging and to further extend the northern pier. Appropriations for continuing improvements to the harbor, including extensions to the north and south piers, were also included in Congressional acts on Jun. 23, 1866, Jul. 01, 1868*, Jul. 25, 1868, and Apr. 10, 1869.	32nd Cong., Sess. 1, Ch. 104. Annual Report (USACE 1915)
Jul. 11, 1870	Enlargement of inner harbor facilities according to plans of the engineering department. Detailed plans for the harbor are described in the Annual Report (USACE 1870).	41st Cong., Sess. II, Ch. 240.
Jun. 14, 1880	Improving outer harbor: Continuing improvement, including commencement of construction of exterior breakwater.	46th Cong., Sess. II, Ch. 211.
Mar. 03, 1899	Present project depth in basin and entrance to Chicago River.	Annual Report (USACE 1897).
Jul. 25, 1912	Improving harbor by construction of a breakwater to form an outer harbor. (Shore-arm and southerly extension of exterior breakwater – USACE 1963).	62nd Cong., Sess. II, Ch. 253.
Jul. 27, 1916	Continuing improvement, by the construction of a breakwater to form an outer harbor.	64th Cong., Sess. I, Ch. 260.
Mar. 02, 1919	Improvement in accordance with report submitted in document by 64th Congress, Session 1. (Modification of area to be dredged in inner basin – USACE 1963).	65th Cong., Sess. III, Ch. 95.
Mar. 03, 1931	Act granted to the Commissioners of Lincoln Park the right to construct a breakwater in the navigable water of Lake Michigan and transferred jurisdiction over certain navigable waters.	71st Cong., Sess. III, Ch. 410.
Mar. 02, 1945	Resumption of jurisdiction over shore-arm extension of breakwater and over certain navigable waters in Lake Michigan that lie in the northwestern portion of the outer harbor. Commissioners of Lincoln Park were superseded by the Chicago Park District.	P.L. 79-14, Sec. 4
Oct. 23, 1962	Deepen the approach channel and maneuvering basin inside harbor entrance.	P. L. 87-874. Annual Report (USACE 2012)
Dec. 04, 1981	Made funds available to the Corps of Engineers – Civil for operation and maintenance of the Illinois Waterway and Chicago Sanitary Ship Canal portion of the Waterway in the interest of navigation.	Sec. 107 of P.L. 97-88
Jul. 30, 1983	In the interest of navigation, this law specifies that Section 107 of P.L. 97-88, which pertains to the maintenance and operation of the Chicago Sanitary and Ship Canal, includes the Control Structure and Lock in the Chicago River.	P.L 98-63

[1] Annual Report refers to the Annual Report from the Chief of Engineers for the date referenced.

[2] PL refers Public Law and the first number is the Congress and the second number is the law passed by that Congress.