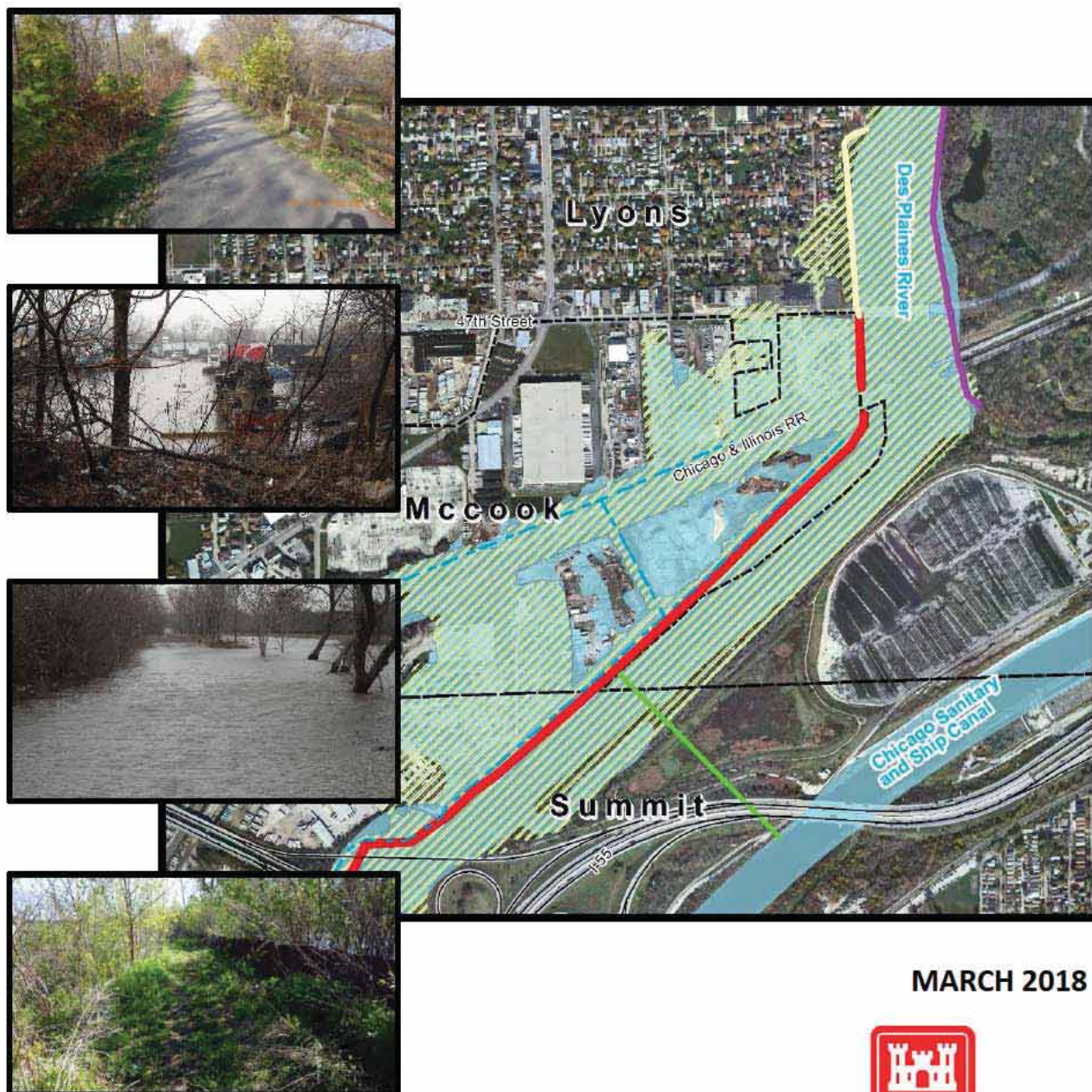


MARCH 2018

**McCook Levee, Illinois
Continuing Authorities Program
Section 205
Small Flood Risk Management**

**Detailed Project Report and Integrated Environmental Assessment
DRAFT**



MARCH 2018



US Army Corps
of Engineers®
Chicago District

MARCH 2018

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Detailed Project Report

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- H†* – Public and Stakeholder Agency and Organization Input and Comments
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- J*- Review reports (DQC, ATR & IEPR as reqd.)
- K* - Sponsor Certifications (Letter of Intent, Financial & LERRDS Capability)

* - To be completed following public comment period. Not included with this submittal.

† denotes pertinence to NEPA and the 30-day Agency & Public Review Period

1 *INTRODUCTION

1.1 STUDY PURPOSE AND SCOPE

This study was completed to investigate measures that could address flood risks in the communities of McCook, Lyons, and Summit, Illinois. While two existing levees, locally named the “McCook Levee” and the “West Lyons Levee,” are providing some level of protection for these communities, flooding risk remains due to overtopping risk, risk of breach prior to overtopping as a result of seepage, and a lack of maintenance and repair of the existing structures. Significant flooding was experienced behind the McCook Levee portion of the project area during a record flood event in April 2013. The source of flooding was identified as levee overtopping. Levee assessments conducted by the U.S. Army Corps of Engineers (USACE) have identified stability and seepage issues with both structures in their current conditions and the associated risk of levee failure is considered to be high.

The purpose of this feasibility study is to compile and evaluate information pertinent to flooding risk associated with the existing McCook and West Lyons Levee systems. The need of this study is to develop flood risk management alternatives to address the risk of flooding due to overtopping or failure of the existing levies, exemplified by the significant flooding experienced behind the McCook Levee portion of the project area during a record flood event in April 2013 and by observations of significant erosion on the riverside slopes of the levee.

The study, conducted in concert with the non-federal sponsor, the Metropolitan Water Reclamation District of Greater Chicago (MWRDGC), includes considers key stakeholder priorities and identifies a viable Recommended Plan that may be implemented under the Continuing Authorities Program (CAP) 205 Authority.

1.2 LOCATION

1.2.1 Study Area

The McCook and West Lyons Levees are located on the west bank of the Des Plaines River in western Cook County, about 10 miles southwest of Downtown Chicago. The area at risk of flooding includes industrial and residential areas within the Villages of McCook, Lyons, and Summit, Illinois. The surrounding area is highly urbanized, with a strong residential and industrial base.

The study area is within the Des Plaines River Watershed, defined as Hydrologic Unit Code (HUC) 07120004 by the United States Geological Survey (USGS). It is located approximately 2.5 miles downstream of the confluence of the Des Plaines River and Salt Creek. From this confluence, the Des Plaines River flows southwest to its confluence with the Kankakee River near the Village of Channahon, Illinois, approximately 40 miles downstream. The study area is shown in Figure 1.

The communities of McCook, Lyons, and Summit are located in the Illinois Third Congressional District, represented by Daniel Lipinski.

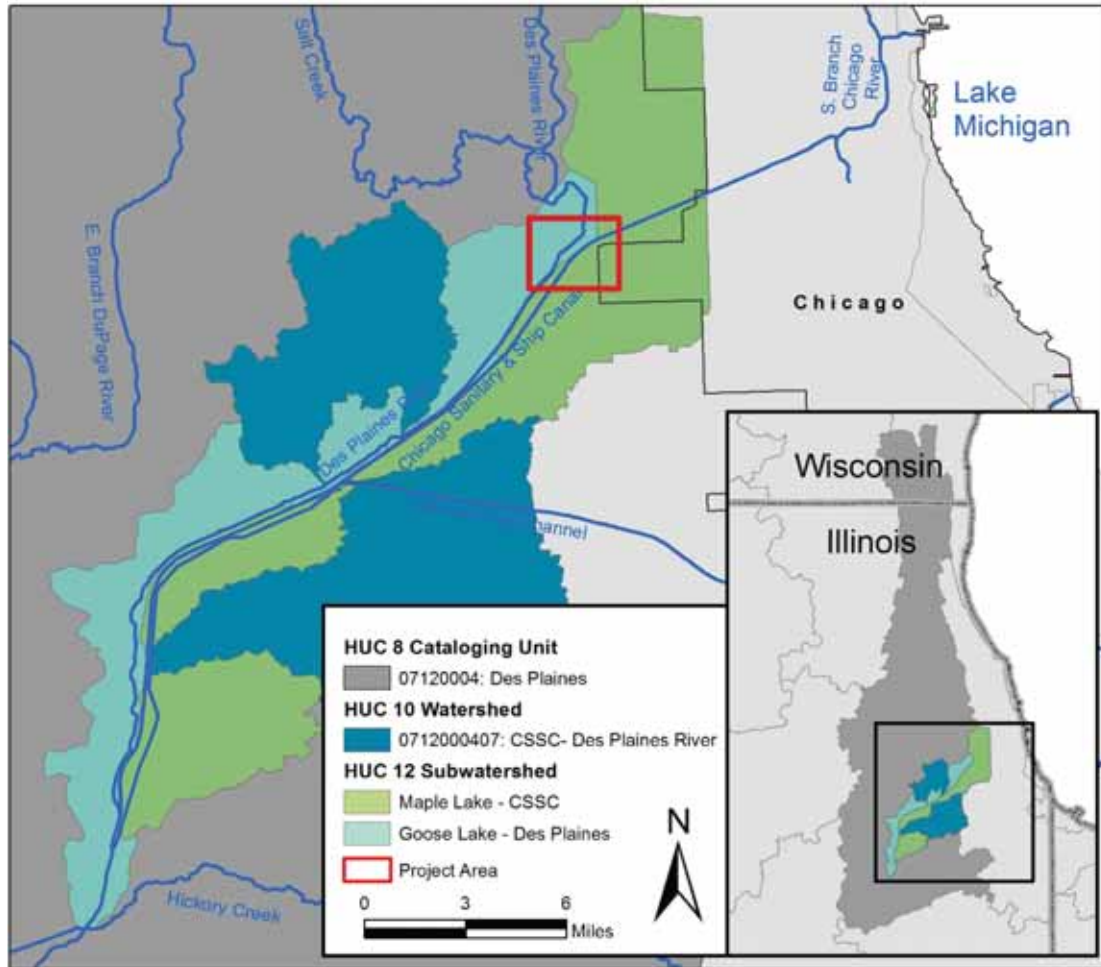


Figure 1. Study Area

1.2.2 Project Area

The existing McCook and West Lyons Levees and the areas at risk of flooding associated with these structures are in the 'Goose Lake — Des Plaines River' subwatershed (HUC 071200040706).

Figure 2 highlights the hydraulic features of the Summit Conduit Subwatershed.

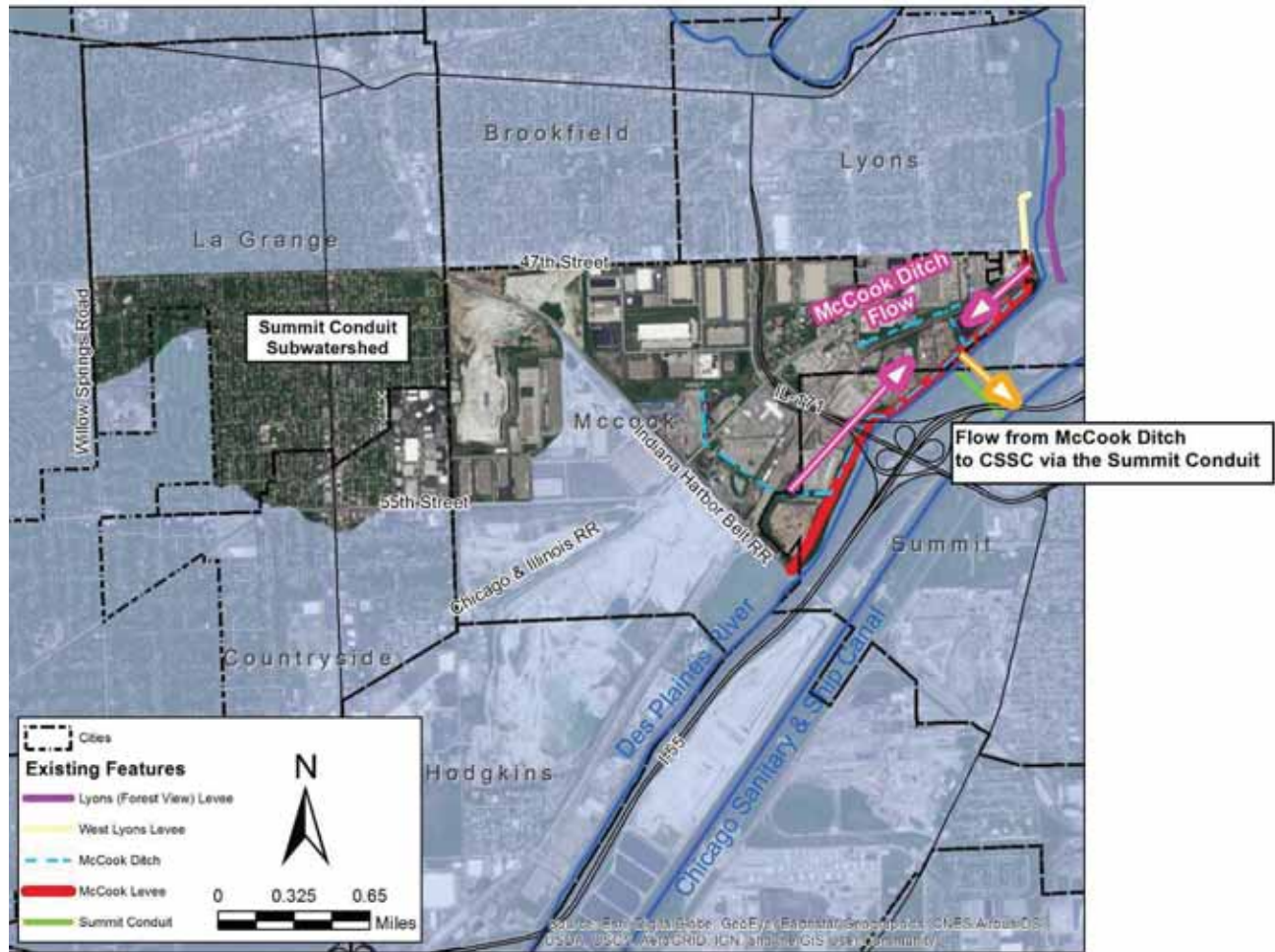


Figure 2. Summit Conduit Subwatershed

While the majority of this watershed drains directly to the Des Plaines River, the drainage area attributed to the McCook Ditch, behind the McCook Levee, is redirected to the “Maple Lake – Chicago Sanitary and Ship Canal (CSSC)” subwatershed (HUC 071200040705) via the Summit Conduit. Drainage from the Summit Conduit Sub-watershed is conveyed in a system of ditches, sewers, and culverts to a large ditch which runs parallel to the McCook Levee, called the McCook Ditch. Flow in the McCook Ditch is routed to the east under the McCook Levee and the Des Plaines River directly to the Chicago Sanitary and Ship Canal (CSSC) via the Summit Conduit. The Summit Conduit sub-watershed consists of residential and industrial land, including the area at risk of flooding associated with the Des Plaines River and the McCook Levee. This sub-watershed is approximately 3,500 acres (5.5 square miles) roughly bounded by Willow Springs Road to the west, 55th Street and the Indiana Harbor Belt Railroad tracks to the south, and 47th Street to the north, and the McCook Levee to the east.

The CSSC was built between 1889 and 1907 to direct Chicago River flows away from Lake Michigan and provides a permanent connection between the Chicago River and the Illinois Waterway. Water levels in the CSSC are managed as part of the Chicago Area Waterway System.

Figure 3 highlights the location of all of the major hydraulic features within the project area and these features are described below. The McCook levee was originally constructed around the turn of the 20th century by the MWRDGC, then known as the Sanitary District of Chicago. The levee is essentially segmented in two sections: the southern portion and the northern portion.

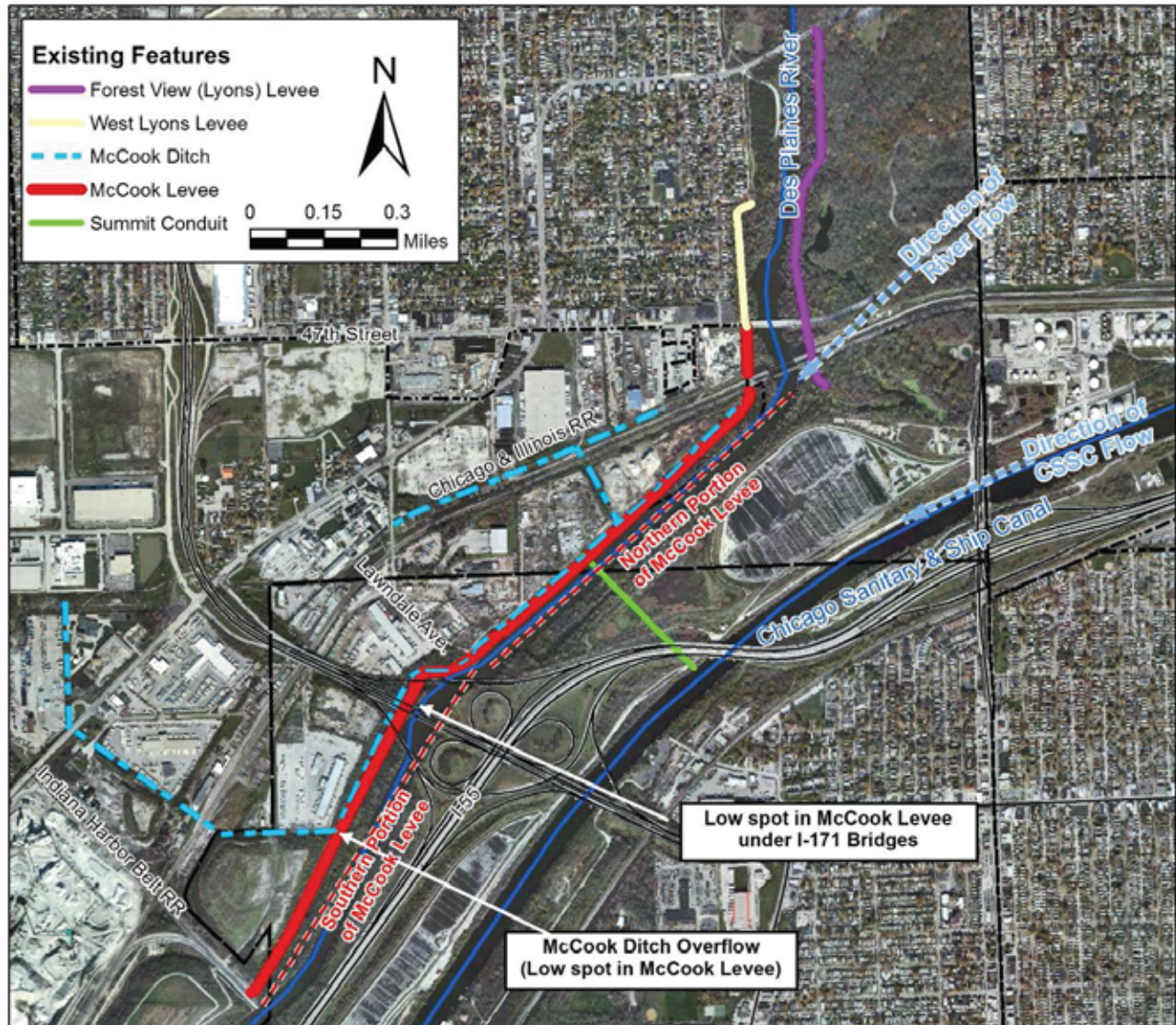


Figure 3. Project Area

Southern Portion of McCook Levee – The southern portion of the levee is approximately 4,500 feet long and extends between Lawndale Avenue and the Indiana Harbor Belt Railroad tracks, approximately 3,300 feet south of IL-171. This portion of the levee has several low spots at which the level of protection is lower than the 1% annual chance flood profile as identified by MWRDGC hydraulic modeling. The levee dips down under the IL-171 bridges to allow for clearance of Illinois Department of Transportation (IDOT) maintenance vehicles, which use the top of the levee as an access road to the highway bridges. The levee also has a low spot approximately 900 feet south of IL-171, which acts as an overland overflow outlet for the McCook Ditch, but also allows for frequent levee overtopping from the

Des Plaines River into the ditch. Overtopping at this location can lead to interior flooding behind the levee along the length of the McCook Ditch. A review of available flood stage data indicates that the Des Plaines River has overtopped the McCook Levee at this ditch overflow location at least 17 times since 1948 and at the dip in the levee under the IL-171 bridges 10 times over the same period. Presently, most of the area behind this section of the levee is higher than the levee and no structures are considered to be at risk of flooding behind the southern portion of the levee. When this portion of the McCook Levee overtops due to high water levels on the Des Plaines River, the McCook Ditch pools up and the water is conveyed north through the culvert at Lawndale Avenue towards the Summit Conduit intake structure, as described above.

Northern Portion of McCook Levee – The northern portion of the levee extends northeast from Lawndale Avenue approximately 4,100 feet to the Chicago & Illinois Railroad tracks. The levee continues approximately 550 feet north to tie into high ground at 47th Street. In 1979, a section of the levee breached and MWRDGC repaired the damaged portion and drove steel sheet pile along the length of the levee to increase the height of flood protection and to prevent seepage through, but not under, the levee. The top of the levee along most of the northern McCook Levee is at least 2-feet above the 1% annual chance flood profile for the Des Plaines River with the exception of a portion of the levee near the railroad track crossing. Figure 5 contains a profile of the top of the levee in relationship to the 1% Annual Chance of Exceedance (ACE) flood profile. There are no known overtopping occurrences since the repairs and elevation were completed in 1979.

The stationing shown in Figure 4 was prepared for the earthwork alternative development. Stationing of the whole system will be recalculated during design so that they are continuous.

The area behind this portion of the levee contains several industries which are in danger of flooding, either from breaching or overtopping of the McCook Levee or from the McCook Ditch overbanking as a result of limited capacity of the Summit Conduit.

The area potentially impacted by flooding by possible failure or overtopping of the McCook Levee is entirely industrial. The industries include a recycling company, repair shops, trucking and intermodal facilities, manufacturing operations, and an oil and fuel handling facility.



Figure 4. Existing Northern Portion of McCook Levee (A) & West Lyons Levee (B) with Stationing

West Lyons Levee – The West Lyons Levee is located in the Village of Lyons north of McCook and is a separate system from the McCook Levee. It extends approximately 1,400 feet between 47th Street and 45th Street. The date of construction is unknown, and there are no as-built drawings or soil borings available for the levee. Based on survey data conducted by USACE, the top of the levee is above the 1% annual chance flood profile for the Des Plaines River and there are no known overtopping occurrences. The area potentially impacted by flooding by possible failure or overtopping of the West Lyons Levee is entirely residential. Figure 5 includes a plot of the top of the levee in comparison to the 1% ACE flood elevation.

Lyons Levee (Forest View Levee) – While not in the project area, the Lyons Levee, also referred to as the Forest View Levee, is highlighted on project area maps. It is located on the east bank on the Des Plaines River across the river from the McCook and West Lyons Levees. This levee was the subject of a separate CAP 205 Feasibility Study conducted by the Chicago District of the USACE in partnership with MWRDGC.

The Detailed Project Report (DPR) for that study, which was approved in January 2017, recommended repair and improvement of the existing levee. Design of these repairs is currently underway and construction is expected to begin in the summer of 2018.

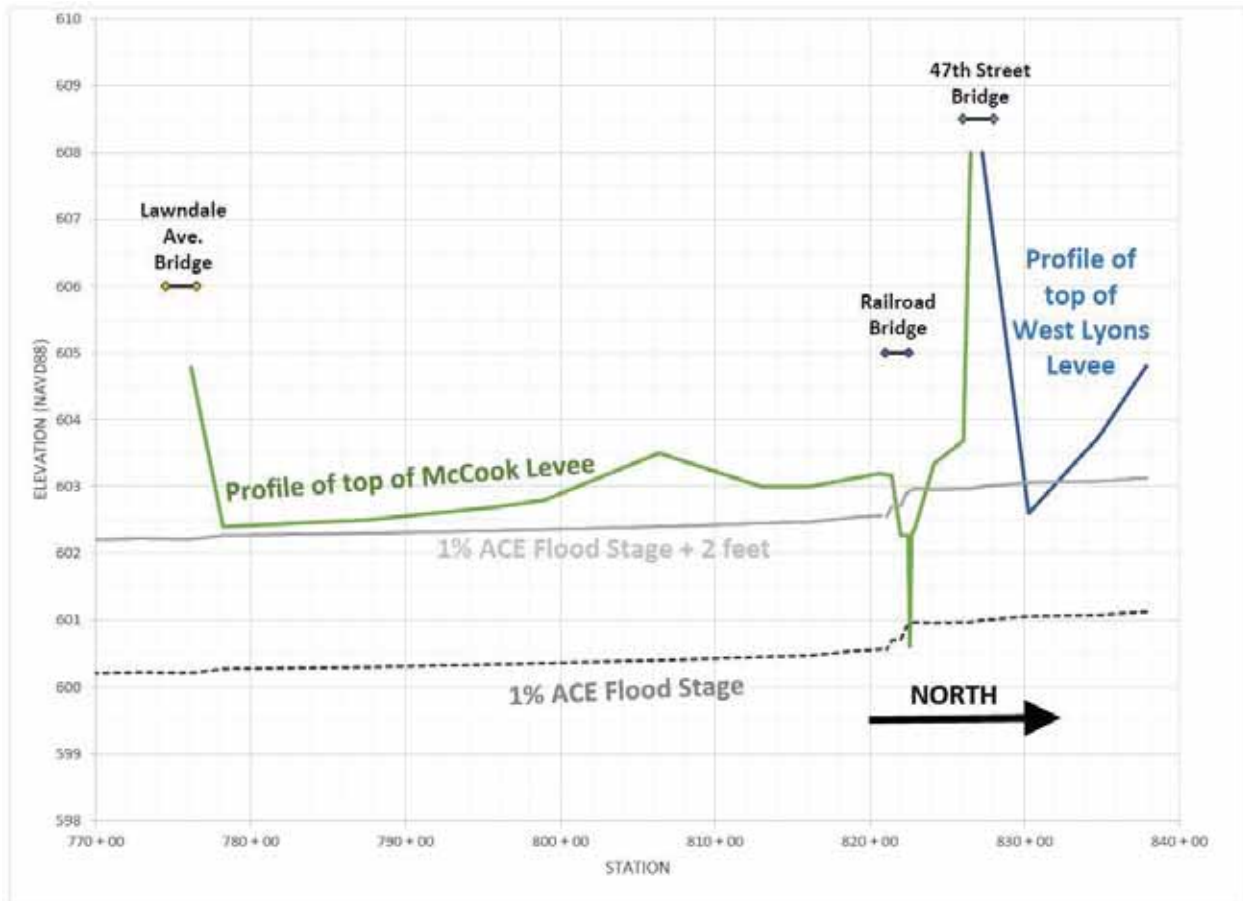


Figure 5. Profile Plot of Existing Top of Levee (Stationing is for the river, not levee)

1.3 STUDY AUTHORITY

Section 205, Flood Control Act of 1948 (P.L. 80-858), as amended. Section 205 authorizes the Secretary of the Army, in cooperation with non-Federal interests, to plan and construct small flood risk management (FRM) projects. Section 205 projects are part of the USACE CAP Authority. Individual projects are limited to \$10,000,000 in total Federal expenditures, including all planning, design, and implementation costs.

A non-Federal sponsor must support all phases of the project. While the first \$100,000 of Feasibility Study costs are at 100% Federal expense, the remaining study costs are shared 50% Federal and 50% non-Federal. Design and implementation costs are shared 65% Federal and 35% non-Federal. The non-Federal sponsor must provide all lands, easements, rights-of-way, relocation, and disposal areas (LERRDs). While the sponsor may receive credit toward this cost-share for work-in-kind and LERRDs, a minimum cash contribution of 5% is required. Once a project has been implemented, operations,

maintenance, repair, replacement, and rehabilitation (OMRR&R) of the project is a 100% non-Federal responsibility.

FRM projects being considered for further investigation must also meet economic criteria with respect to the benefits and costs associated with the implementation of a project. A Federal interest is determined by having demonstrated National Economic Development (NED) benefits that outweigh costs; i.e. positive net benefits.

1.4 RELEVANT PRIOR STUDIES AND REPORTS

The following studies and reports were utilized in determining federal interest in proceeding with a cost-shared feasibility study.

McCook Final Feasibility Report with Draft Environmental Assessment, August 1986 (USACE):

Investigated flood damage problems in the area behind the McCook Levee along the Des Plaines River and determined economic, environmental, and technical feasibility of various alternatives. The study was completed at the direction of Congress as part of the Chicago-South End of Lake Michigan (C-SELM) study authority. Several alternatives were investigated:

- Levee rehabilitation by clearing, grubbing and raising the height of the levee
- Adding sheet piling and fill
- Relocation of the industries
- Floodproofing and other non-structural measures
- Several interior drainage schemes

The study identified a tentatively selected plan (TSP) of rehabilitating the levee to a 100-year level of protection and re-routing a portion of the interior drainage flow directly to the Des Plaines River. The benefit to cost ratio (BCR) of that project was ■■■. The project avoided any environmentally sensitive areas and a “Finding of No Significant Impact” (FONSI) was issued. Further development of the recommended plan was not conducted due to lack of local support at that time.

Preliminary McCook Levee Flood Control Improvements Alternatives Analysis, 2015 (MWRDGC): Prior to requesting assistance from USACE, MWRDGC completed a preliminary alternatives analysis for the McCook Levee to characterize existing conditions and identify potential alternatives to address the flood risk associated with the levee. The analysis documented the flood-fight efforts behind the levee in April 2013 and conducted a comparison of historic crests recorded along the Des Plaines River to the levee’s low top elevation. The analysis reviewed two alternatives:

- Summit Conduit Alternative 1 – Improvement and elevation of approximately 5,400 feet of the northern and southern portions of the McCook Levee as well as modification of the McCook Ditch drainage and overflow path to address interior drainage flooding behind the levee.
- Summit Conduit Alternative 2 – Improvement and elevation of approximately 4,000 feet of the northern portion of the McCook Levee as well as modification of the McCook Ditch drainage and overflow path to address interior drainage flooding behind the levee. Alternative 2 would require the construction of a 400 foot long tie-back levee approximately 2–3 feet high to provide protection to structures.

The analysis did not identify a preferred alternative, but further discussion with MWRDGC staff indicated that Alternative 2 is likely a more viable and economical solution.

Forest View, Illinois Draft Detailed Project Report and Integrated Environmental Assessment, January 2017 (USACE): USACE completed a Detailed Project Report to assess flood risk associated with the Lyons Levee, located just upstream of the McCook Levee on the east bank of the Des Plaines River in Forest View, IL. While the study and project areas of this report are different than those of the McCook Levee, the hydraulic and hydrologic tools used for the Forest View study extend through the McCook Levee study area and were referenced for this McCook Levee analysis. The TSP recommended in the report includes repair and improvement of the existing Lyons Levee. The report was approved by the USACE Great Lakes and Ohio River Division in January, 2017. Design of these repairs is currently underway and construction is expected to begin in the summer of 2018.

Forest View Flood Warning Plan, July 2014 (USACE): The Chicago District, MWRDGC, and the Village of Forest View partnered to develop a flood warning and preparedness plan for the village. The plan includes monitoring the existing Des Plaines River Gage at Riverside along with a new gage installed along the Lyons Levee alignment. In addition to monitoring for flood conditions, the plan outlines steps for emergency officials and residents to take prior to and during a flood event.

Lower Des Plaines Detailed Watershed Plan, February 2011 (MWRDGC): The Lower Des Plaines Detailed Watershed Plan (DWP) was developed to meet the goals of the Cook County Stormwater Management Plan, published by MWRDGC in February 2007. The plan:

- Documents stormwater problem areas
- Evaluates existing conditions
- Provides flow, stage, frequency, and duration information for flood events along the waterway
- Estimates damages associated with stormwater management problems
- Evaluates potential solutions to regional stormwater management problems

The McCook Levee area was one of the problem areas identified in the DWP (DP-DP-MC-FR-01). The solution evaluated in the plan (identified as DPR-14C) was an improvement of approximately 5,000 feet of the existing McCook Levee from 47th Street to Interstate 55 including elevation of the levee with sheet piling in low spots to meet 3 feet of freeboard as well as the construction of a pump station to address interior drainage. Total project costs were estimated at [REDACTED].

The West Lyons Levee area was also identified as a problem area (DP-DP-LY-FR-04) based on hydraulic modeling results. The solution evaluated (identified as DPR-14A) was to construct an approximately 1,200 foot long floodwall from 45th Street to 47th Street to protect the residential area identified as at risk due to flooding.

The Forest View Levee was also identified as a problem area (DP-DP-FV-FR-01). The solution evaluated in the plan (identified as DPR-14D) was to enhance the existing Forest View Levee (referred to as “47th”

Street Levee”) by construction of 3,000 feet of floodwall in roughly the same alignment as the existing levee. The study assumed pump stations would be required to address interior drainage.

Clean Construction of Demolition Debris (CCDD) Soil Sampling Report, May 2016 (American Surveying & Engineering, PC): This report, completed by Environmental Design International, Inc., documents soil and sediment sampling and analysis that was conducted to evaluate subsurface soils to provide a preliminary recommendation for soil disposal associated with a proposed roadway project. One sediment sample was taken in the McCook Ditch just south of Lawndale Avenue near the project area.

2 *AFFECTED ENVIRONMENT - EXISTING CONDITIONS

McCook Levee

The McCook Levee was constructed on the Des Plaines River over 100 years ago by the MWRDGC. As described in Section 1.2.2 and depicted in Figure 3, the levee can be considered as two separate segments: the southern portion and the northern portion.

The southern portion of the McCook levee is an earthen structure which extends from Lawndale Avenue south to the Indiana Harbor Belt Railroad tracks and is approximately 4,500 feet long. The levee has several large trees growing along its crest, toe, and slope and has several low spots allowing for frequent overtopping of the Des Plaines River into the McCook Ditch. While the condition of the levee is considered poor, most of the area behind this portion of the levee is higher than the levee and no structures are considered to be at risk of flooding behind the levee.

The northern portion of the McCook levee is an earthen structure which extends from Lawndale Avenue north through the Chicago & Illinois Railroad tracks to 47th Street and is approximately 4,600 feet long. The levee crest is approximately 20 feet wide, slopes which vary from 1:1 to about 3:1, and a maximum height of approximately 15 feet. Following a breach in 1979, MWRDGC repaired the damage and drove steel sheet pile along the length of most of the levee to increase the height of flood protection and to prevent seepage through the levee. However, the sheet pile does not extend deep enough to prevent seepage under the levee so risk related to seepage undermining the structure of the levee remains.

Due to lack of maintenance, large trees and other vegetation are growing along the toe and slope along the entire stretch of the levee. Figure 6 and Figure 7 include photographs of the typical condition of the top of the levee taken from a USACE site inspection on 2 May 2016. The vegetation inhibits inspection and maintenance. Additionally, the root systems may encourage piping through the levee and impair the stability from trees that could fall over and rip out significant chunks of the levee with their root balls. Vegetation may encourage burrowing animals, which would further impair the condition of the levee, by providing habitat.



Figure 6. Top of McCook Levee – Fallen Trees



Figure 7. Top of McCook Levee – Overgrown Vegetation

In addition to risk associated with the large vegetation, the levee has experienced significant erosion on the riverside of the levee. Figure 8 depicts one location at which erosion on the riverside of the levee is so severe that the sheetpile cutoff wall has been completely exposed down to the normal water line of the Des Plaines River. This severe erosion is a significant risk to the stability of the sheetpile cutoff wall and the levee structure itself.



Figure 8. Riverside Erosion on McCook Levee

Seepage through the levee was first documented during the 1986 flood in a memorandum completed by USACE and there have been many events after this that probably experienced seepage as well, despite the lack of field observations. In events such as 2013, the high water and vegetation in the ditch likely limited the inspector's ability to document any seepage.

West Lyons Levee

A field visit was completed by USACE staff on 14 November 2016 to walk the levee north of 47th Street. As shown in Figure 9, the crest of the levee has an asphalt bike path and wooden fence on the riverside. The slopes of the levee are covered in vegetation and some mature trees. The landside toe was investigated for features such as culverts, encroachments, etc. but none were identified. The date of construction is unknown, and there are no as-built drawings or soil borings available for the levee although it was likely constructed around the same time as the McCook Levee. Based on LiDAR data, the levee has approximately a 20+ ft wide crest, roughly 2:1 slopes, and a maximum height of approximately 8 feet tall on the riverside, and 10 feet tall on the landside.



Figure 9. Top of West Lyons Levee

Impacts of Levee Failure

To understand the potential impacts of a breach event, a model was created to simulate flows and predict the river stages in the leveed areas in the event of a levee breach for a range of flood stages. This analysis is discussed in Section 3.3.1.

2.1 CLIMATE

Climate in northeastern Illinois is classified as humid continental, characterized by warm summers, cold winters, and daily, monthly, and yearly fluctuations in temperature and precipitation. Average annual rainfall is usually between 30 to 40 inches per year, with greater proportions falling between April and August. Seasonal snowfall averages about 28 inches annually. Early spring floods occur when snow accumulations extend into a period of increasing temperatures that result in melting. If this occurs when soils are already saturated, runoff increases dramatically due to the large area of impervious surfaces within the basin caused by urban development.

2.2 SOILS AND GEOLOGY

2.2.1 Geology and Physiography

The geology of the Chicago area is largely a consequence of a series of continental glacial advances and retreats. During the most recent glaciations, the Wisconsinan, the area was covered by several thousand feet of ice of the Lake Michigan lobe. The area had been covered with surficial deposits up to 300 feet thick that were deposited by glaciers and higher level stages of Lake Michigan. Bedrock typically consists of sedimentary dolomitic limestone, dolomite shale, and sandstone.

Based on the Illinois State Geological Survey, Surficial Geology of the Chicago Region Map (1970), the majority of the project is within the Glacial Sluiceway (sl) and Lake Plain (lp), with the Cahokia Alluvium (c) and exposed bedrock (S) regions nearby. Descriptions of each of these regions are included below.

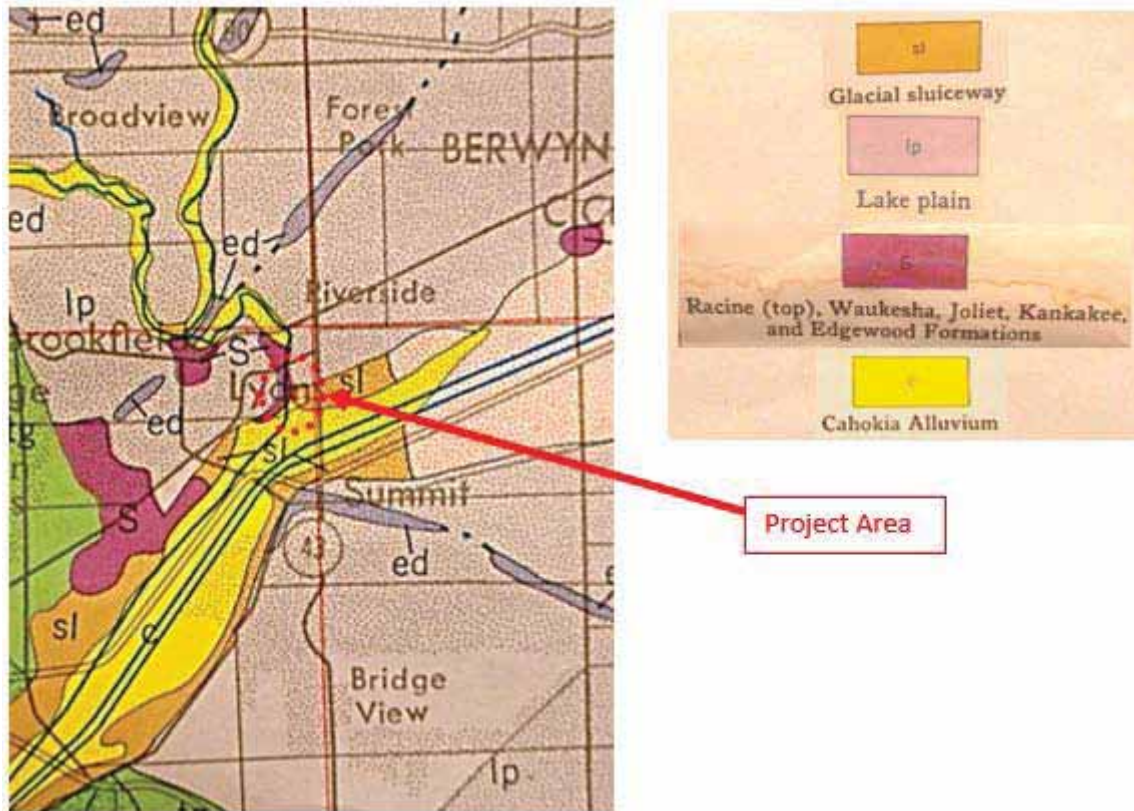


Figure 10: Soil Type Map of Project Area (1970)

- *Glacial Sluiceway* – Erosional channels; mostly outlets of glacial lakes where cut into till; where cut into bedrock, as along Illinois, Des Plaines, and Kankakee Valleys, the bedrock formation is mapped instead; contains local deposits (mostly bars) of sand and gravel of the Henry Formation.
- *Cahokia Alluvium* – Deposits in floodplains and channels of modern rivers and streams; mostly poorly sorted silt and sand containing local deposits of sandy gravel; in many places overlies relatively well sorted glacial outwash of the Henry Formation.
- *Lake Plain* – Floors of glacial lakes flattened by wave erosion and by minor deposition in low areas; largely underlain by glacial till; thin deposits of silt, clay, and sand of the Equality Formation present locally.
- *Racine (top), Waukesha, Joliet, Kankakee, and Edgewood Formations* – Largely dolomite, slightly to moderately argillaceous with scattered chert nodules; Racine Formation contains large reefs of massive to well bedded pure dolomite; minor beds of shale and shaly dolomite in lower part and locally bordering reefs in upper part; partly limestone in places near Kankakee Valley; fills pre-Silurian valleys as much as 100 feet deep in Maquoketa Shale in some areas.

2.2.2 Soil Associations

The majority of the leveed area of McCook Levee is considered urban land, which has been modified due to development. Along the levee alignment, the soil is considered Sawmill silty clay loam, which is defined as nearly level, poorly drained soil on flood plains along rivers and streams and generally consists of firm silty clay loam. A small area to the north of the West Lyons Levee consists of Rockton silt

loam, which is defined as loamy drift over clayey residuum derived from limestone and dolomite. This would indicate very shallow bedrock to the north. The soils and their locations are shown in Figure 11.



Figure 11: NRCS Soils Map of Project Area

Map Unit Symbol	Map Unit Name	Percent of Area
392A	Urban land-Orthents, loamy, complex, nearly level	6.4%
533	Urban land	75.1%
1107A*	Sawmill silty clay loam, undrained, 0-2% slopes, frequently flooded	9.7%
503B	Rockton silt loam, 2 to 6% slopes	1.2%
W	Water	7.6%

A total of 15 soil borings were completed along the existing levee. Nine of these were completed in 1979 by Walter H. Flood & Co while six were completed in 1984 by Patrick Engineering, Inc. These borings were completed between Lawndale Road and 47th Street, so no subsurface information is available for the West Lyons Levee. The boring logs generally identified 4 types of soil that make up the existing levee; (1) random fill with clay, debris, and stone; (2) very stiff silty clay; (3) medium dense silty sand to very stiff silty sandy clay; and (4) organic silty clay. The foundation material was identified under 5 general descriptions; (5) loose silty to clean sand; (5A) loose silty to clean sand and gravel; (6) soft silty clay; (7) very stiff silty clay/clayey silt; and (8) extremely dense silty sand. Bedrock was encountered as shallow as 583 ft NGVD29, but varied by at least 15 feet underneath the McCook Levee. Additional information on the existing material can be found in Appendix F (Geotechnical Analysis).

2.2.3 Hydric Soils

The study area was formerly part of the Des Plaines River active floodplain and has been for the most part filled in and cut off from the river since the early 1900s by the construction of the McCook & Lyons Levees. The natural Sawmill soil type was identified as having geomorphic position that would classify them as hydric such as being on a flood plain, outwash plain, or lake plain; however, this type is now

covered, mixed or removed from the levee zone. Figure 11 shows the location of this soil type in relation to the existing levees. Also, investigation revealed that there was no hydrology to support the formation of hydric soils within the levee zone, including the absence of surficial ponding immediately after flooding.

Soils within the river channel along the toe of the existing levee that form the base for the induced fringe wetland of Reed Canary Grass (*Phalaris arundinacea*) and within adjacent floodplain areas are derived from material sloughing off of the levee and fine sediment settling out from the wash load of the Des Plaines River. This type of material is considered a combination of manmade materials and Fluvaquents-Udifluvents, which is subject to continual erosion, movement and deposition based on Des Plaines River floods and magnitudes. A site visit conducted on 08 November 2017 confirmed these conditions.

The conclusion is that there are no developed Hydric soils within the affected zone (levees and 25 foot buffer on each side) of the existing levee and interior ditch systems.

2.3 SURFACE WATER AND OTHER AQUATIC RESOURCES

2.3.1 Surface Water

As discussed in Section 1.2, surface water in the study area includes the Des Plaines River and the McCook Ditch. The Des Plaines River originates in Wisconsin and flows south in Illinois through Lake County to Cook County, where it passes the study area. The river then flows southwest to its confluence with the Kankakee River, where the two rivers combine to form the Illinois River. The McCook Ditch was constructed as a project feature to the McCook Levee to manage internal drainage.

Section 303(d) of the Clean Water Act requires that all states maintain and publish lists of impaired waterways—water that does not meet water quality standards set by those states. In its 2016 303(d) list, the State of Illinois identified impairments in both the Des Plaines River and the nearby Chicago Sanitary and Ship Canal (to which the Summit Conduit Drains), summarized in Table 1. Because this is a large waterway and only a small segment passes through the study area, only the assessment units in the study area are presented.

Table 1. Surface Water Impairments

Waterway	Designated Uses ^[1]	Causes	Sources
Des Plaines River (IL_G-39)	Aquatic Life (N) Fish Consumption (N) Primary Contact Recreation (N) Secondary Contact Recreation (X) Aesthetic Quality (F)	Aldrin, arsenic, chloride, lindane, methoxychlor, other flow regime alterations, dissolved oxygen, pH, total phosphorus, mercury, polychlorinated biphenyls, fecal coliform	Contaminated sediments, combined sewer overflows, municipal point source discharges, urban runoff/storm sewers, impacts from hydrostructure flow regulation/modification, dam or impoundment, atmospheric deposition of toxics, unknown sources
Chicago Sanitary and Ship Canal (IL_GI-06)	Fish consumption (N) Secondary contact recreation (X) Indigenous aquatic life (N) Aesthetic quality (X)	Polychlorinated biphenyls, iron, dissolved oxygen, total dissolved solids, total phosphorus	Combined sewer overflows, sediment resuspension (contaminated sediment), urban runoff/storm sewers, unknown sources

^[1] N = Waterway does not support designated use; F = waterway fully supports designated use; X = not assessed
Source: *Illinois Integrated Water Quality Report and Section 303(d) List*. Illinois Environmental Protection Agency – Bureau of Water. 2016.

2.3.2 Groundwater

Soil borings completed along the existing McCook Levee recorded the groundwater elevation encountered during drilling. These measurements ranged from elevation 571 to 592 ft NGVD29, with an average of 586 ft NGVD29. These water elevations were taken on various dates from November 1984 and January 1985, indicating that the water levels can fluctuate by up to 10 feet depending on when the reading was taken in the borehole. Groundwater quality in the area of the project is unknown. Shallow groundwater resources and surface streams are often hydraulically connected; therefore, groundwater quality is vulnerable to surface-derived contaminants. The intensity of urban development in the region has likely contributed to groundwater quality degradation.

2.3.3 Flood Plains

Since the McCook Levee is not accredited by the Federal Emergency Management Agency (FEMA), the levee and the area behind by the levee are designated as Special Flood Hazard Area (SFHA) on FEMA's Flood Insurance Rate Maps (FIRMs). The West Lyons Levee is also not accredited by FEMA, however the area behind that levee is not mapped as SFHA, likely because it was not recognized that high ground along the bank of the river was due to a levee structure at the time that the FIRMs were completed. As part of MWRDGC's DWP, described in Section 1.4, an updated floodplain analysis was completed and a 100-year inundation area was defined, which is slightly different than FEMA's SFHA. FEMA's floodplain and MWRDGC's inundation area are both depicted in Figure 12. Additional information regarding the existing without project hydrologic and hydraulic conditions is included in Section 3.3.1 and Appendix D of this report.

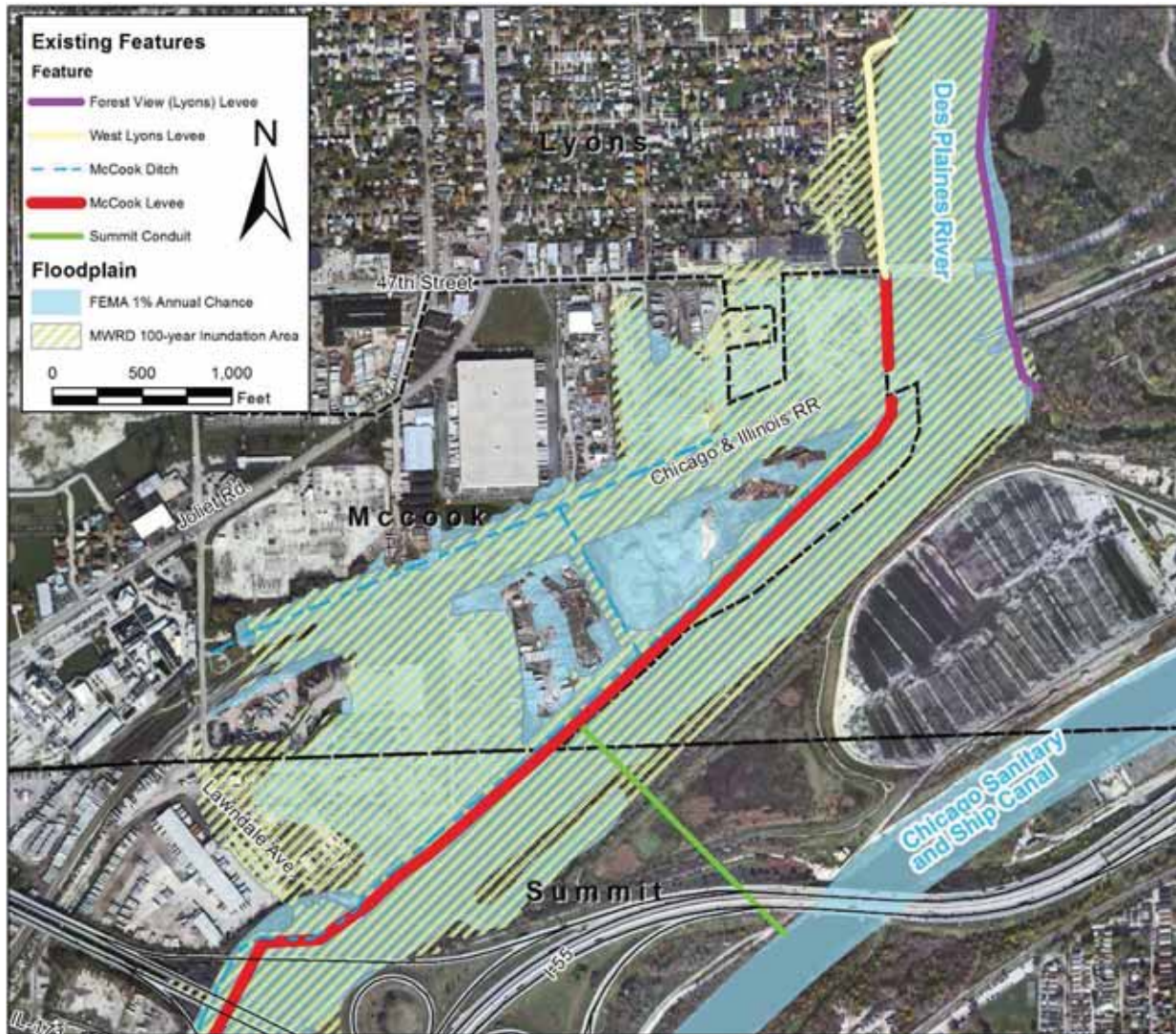


Figure 12. Floodplain Areas

In terms of ecosystem integrity and function, the Des Plaines River has had its floodplain removed from use in terms of fluviogeomorphic processes and supporting native riverine biota along the McCook Levee. The floodplain here has been fragmented by the existing levee and filled in with different kinds of earth and stone materials to allow urban development, making it unavailable to riverine and riparian flora and fauna. The floodplain along the Lyons Levee area is still connected to the Des Plaines River and provides temporal floodplain spawning and migration corridor habitats, albeit highly degraded in terms of native vegetation.

2.3.4 Wetlands

The affected study area was inventoried several times by USACE ecologists and environmental scientists. There were no naturally derived wetlands still extant within the affected levee zone except the Des Plaines River proper, which is classified as Riverine – Rock Bottom (Cowardin et al 1979).

The McCook Ditch is not considered a riverine wetland system since it was specifically created to manage internal drainage behind the levee to avoid flooding issues. The current condition of the ditch is such that there are no natural soils present, dries out during periods of drought since there is no groundwater support, collects large amounts of trash, and is not connected to the Des Plaines River, but to the CSSC via a pipe that travels underneath the Des Plaines River. This ditch is also densely populated with highly invasive species including but not limited to Japanese Knotweed (*Reynoutria japonica*), Giant Reed (*Phragmites australis*), and Reed Canary Grass (*Phalaris arundinacea*). The typical condition of the vegetation in the McCook Ditch is represented in the photo in Figure 13, which was taken in November 2017.



Figure 13. Photo of McCook Ditch Exotic Species Infestation

The Riverine floodplain in the West Lyons Levee zone is generally considered a mesic condition that becomes inundated frequently as flood durations and elevations dictate. Wetlands were not apparent based on hydrology (short periods of frequent inundation, no ground water expression or ponding (Cowardin et al. 1979), wetland vegetation (native and invasive mesic plants / or no understory cover) and soils (Fluvaquents-Udifuvents: riverine silt deposition) characteristics that would identify the toe of the levee as a static wetland were not apparent. The typical condition of floodplain adjacent to the West Lyons Levee is represented in the photo in Figure 14, which was taken in November 2017.



Figure 14. Photo of Affected Floodplain Forest Mesic Habitat along Lyons Levee Toe

The Des Plaines River in this reach is naturally a bedrock river, which is classified as Riverine – Rock Bottom (Cowardin et al 1979). Quiescent margins along the stream banks have wetland vegetation in the form of Riverine - Nonpersistent - Marsh and within the river channel, loose silty cobble areas colonized by Riverine – Aquatic Bed of Water Willow (*Justicia americana*). These conditions do not occur within the affected study area. The only wetland extant within the affected study area is along the toe of the existing McCook Levee, which was induced after the existing levee was constructed by material sloughing off of the levee and silt settling out from river wash load. This unconsolidated material has allowed a Reed Canary Grass fringe to form. The typical condition of the vegetation at the toe of the McCook Levee and the adjacent channel substrate conditions is represented in the photos in Figure 15 and Figure 16, respectively, which were taken in November 2017.



Figure 15. Photo of Reed Canary Grass Fringe Wetland along McCook Levee Toe



Figure 16. Photo of Des Plaines River Rock Bottom Bedrock & Cobble Substrates within Study Area

2.4 FISH AND WILDLIFE HABITATS

In general, the project area formerly consisted of diverse Riverine, Palustrine and upland habitats. These historic conditions have been extensively modified, which generally created a homogenous Eurasian thicket habitat. The floodplain along the Lyons Levee is still intact hydrogeomorphically; however, the native plant community is suppressed due to invasive plant species, erratic hydroperiodicity and poor

water quality of the Des Plaines River. Although the adverse ecological change incurred within the floodplain has not improved, the Des Plaines River itself does provide habitat at varying degrees of quality for a suite of fish and wildlife.

2.4.1 Terrestrial and Aquatic Vegetation

Levee & Dry Areas

The McCook Levee is characterized as mesic to dry communities consisting of ruderal Eurasian thickets, or European and Asian ornamental tree and shrub thickets induced by man. The species composition of these thickets are primarily comprised of European Buckthorn (*Rhamnus cathartica*), Tree of Heaven (*Ailanthus altissima*), and Mulberry (*Morus alba*). A few native Silver Maple (*Acer saccharinum*) and Boxelder (*Acer negundo*) were scattered throughout. Other dominant herbaceous vegetation included Burdock (*Arctium lappa*), Tall Goldenrod (*Solidago altissima*), Riverbank Grape (*Vitis riparia*), Creeping Charlie (*Glechoma hederacea*), Teasel (*Dipsacus* spp.), Thistle (*Sonchus* spp.), Mugwort (*Artemisia vulgaris*) and various cool season non-native grasses. Site visits in late October 2017 revealed that significant portions of the McCook Levee had been cleared of woody vegetation, which should be the normal yearly maintenance activity.

The Lyons Levee is characterized as mesic to dry communities. These communities are more naturalistic, as they are part of the drier areas of the Des Plaines River floodplain and some invasive species control and native seeding seems to be taking place. The species composition of this area is still dominated by European Buckthorn, Mulberry and Tree of Heaven, but includes native species as well such as Hackberry (*Celtis occidentalis*), Slippery Elm (*Ulmus rubra*), Silver Maple, Sugar Maple (*Acer saccharum*), Boxelder, Catalpa (*Catalpa speciosa*), and Linden (*Tilia americana*).

Adjacent Floodplain

The adjacent floodplain to the Lyons Levee has a much healthier structure and species composition than the levees themselves; however, this area is still dominated by invasive and weedy species. The wetter areas along the Des Plaines River bank are bare areas of unconsolidated silts or Reed Canary Grass with a Silver Maple canopy. Other floodplain vegetation encountered includes Cottonwood (*Populus deltoides*), Aster spp., *Polygonum* spp., Nettle (*Urtica dioica*), and Iris (*Iris virginica*). The area adjacent to the toe of the Lyons Levee (25 foot wide) is generally a successional woodland and not considered a Palustrine - Forested Wetland as discussed in Section 2.3.4 and following Cowardin (1979). Tree canopy composition included Hackberry, Silver Maple, Tree of Heaven, and European Buckthorn. Shrubs were not apparent. A few native understory species were present including Nettle, Sweet Joe-Pye Weed (*Eutrochium purpureum*) and in openings, Goldenrods (*Solidago* spp.), mostly Tall Goldenrod (*Solidago altissima*).

Riverine Fringe

Riverine – Aquatic Beds of Water Willow within the study area were not evident. The river dynamics and bedrock bottom within this reach offers little opportunity for aquatic vegetation to grow unless along the quiet margins of the river or cobble bars where silts can settle out. This condition occurs along the toe of the McCook Levee with a small strip (5 to 10 feet wide) of Reed Canary Grass. Iris were present here and there, but very limited in abundance.

McCook Ditch

The McCook ditch, which is a constructed drain system to control internal flooding, is a highly degraded and invasive species dominated area. Predominant vegetation consists of Giant Reed, Japanese Knotweed, Reed Canary Grass and European Buckthorn.

2.4.2 Fauna

Due to the high level of disturbance and degradation of the affected study area, species inventories were limited to existing data and observations during site visits.

Riparian Fauna

Due to the highly impaired riparian hydrogeomorphology, soils and subsequent plant communities, habitat for native conservative fauna is absent or very limited within the affected levee zones and beyond. Typical urban species most likely dominate the site, which include, but are not limited to:

Birds: Robin, Cardinal, Crow, European House Sparrows, Black Crown Night Heron, Mallard Duck, Canadian Geese, King Fisher, Cooper's Hawk, Turkey Vulture, Double Crested Cormorant, Blue Heron, White Egret, and Black Capped Chickadee.

Mammals: Black Mink, White Tail Deer, Raccoon, Coyote, Gray Squirrel, Cotton Tail Rabbit, Norwegian Rat, Black Rat, European Mouse, and Feral Domestic Dog.

Riverine Fauna

Reptiles & Amphibians: Snapping Turtle, Softshell Turtle, Painted Turtle, Redear Slider, Bullfrog, Leopard Frog, Garter Snake, Water Snake, Queen Snake.

Fishes: The Chicago Region Fish Database was queried for species within 0.5 mile of the affected study area. The only collection site within this range is at the 47th street bridge crossing. Eight (8) collections were made by the Illinois DNR between 1996 and 2001. Thirty seven (37) species were recorded with two (2) being non-native: Goldfish and Common Carp. Two (2) species were recorded that are sensitive to water quality and habitat change, the Suckermouth Minnow (*Phenacobius mirabilis*) and Bigmouth Shiner (*Notropis dorsalis*); all other species are considered common and generally tolerant.

Table 2. Chicago Region Fish Database Species

Species	Common Name	Species	Common Name
<i>Alosa chrysochloris</i>	Skipjack Herring	<i>Micropterus dolomieu</i>	Smallmouth Bass
<i>Ambloplites rupestris</i>	Rock Bass	<i>Micropterus salmoides</i>	Largemouth Bass
<i>Ameiurus melas</i>	Black Bullhead	<i>Minytrema melanops</i>	Spotted Sucker
<i>Ameiurus natalis</i>	Yellow Bullhead	<i>Morone mississippiensis</i>	Yellow Bass
<i>Amia calva</i>	Bowfin	<i>Notemigonus crysoleucas</i>	Golden Shiner
<i>Carassius auratus</i>	Goldfish	<i>Notropis atherinoides</i>	Emerald Shiner
<i>Catostomus commersonii</i>	White Sucker	<i>Notropis dorsalis</i>	Bigmouth Shiner
<i>Cyprinella spiloptera</i>	Spotfin Shiner	<i>Notropis hudsonius</i>	Spottail Shiner
<i>Cyprinus carpio</i>	Common Carp	<i>Notropis stramineus</i>	Sand Shiner
<i>Dorosoma cepedianum</i>	Gizzard Shad	<i>Noturus gyrinus</i>	Tadpole Madtom
<i>Esox lucius</i>	Northern Pike	<i>Perca flavescens</i>	Yellow Perch
<i>Etheostoma nigrum</i>	Johnny Darter	<i>Phenacobius mirabilis</i>	Suckermouth Minnow
<i>Fundulus notatus</i>	Blackstripe Topminnow	<i>Pimephales notatus</i>	Bluntnose Minnow
<i>Ictalurus punctatus</i>	Channel Catfish	<i>Pimephales promelas</i>	Fathead Minnow
<i>Ictiobus bubalus</i>	Smallmouth Buffalo	<i>Pomoxis annularis</i>	White Crappie
<i>Lepomis cyanellus</i>	Green Sunfish	<i>Pomoxis nigromaculatus</i>	Black Crappie
<i>Lepomis gibbosus</i>	Pumpkinseed	<i>Sander canadense</i>	Sauger
<i>Lepomis humilis</i>	Orangespotted Sunfish	<i>Sander vitreus</i>	Walleye
<i>Lepomis macrochirus</i>	Bluegill		

2.5 THREATENED AND ENDANGERED SPECIES

2.5.1 Federal

The county distribution of federally-listed threatened, endangered, and candidate species for Cook County, Illinois was reviewed. The following federally-listed species, their status, and/or their critical habitat 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.
- 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
- Eastern massasauga (*Sistrurus catenatus*) – Candidate – Graminoid dominated plant communities (fens, sedge meadows, peatlands, wet prairies, and shrublands).
- Hine’s emerald dragonfly (*Somatochlora hineana*) – Endangered – Spring-fed wetlands, wet meadows, and marshes.
- Rattlesnake-master borer moth (*Papaipema eryngii*) – Candidate – Undisturbed prairie and woodland openings that contain their only food plant, rattlesnake-master (*Eryngium yuccifolium*).
- Eastern prairie fringed orchid (*Platanthera 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.
- Northern long-eared bat (*Myotis septentrionalis*) – Threatened – Hibernates in caves and mines, swarms in surrounding wooded areas in autumn. Roosts and forages in upland forests and woods.
- Rusty Patched Bumble Bee (*Bombus affinis*) – Endangered – Grasslands and tallgrass prairies of the Upper Midwest and Northeast. Nesting sites typically occur underground in abandoned rodent tunnels and dens, or in clumps of grasses.

(September, 2017. Source: <https://www.fws.gov/midwest/chicago/endangered/index.html>)

Based on the critical habitat information listed above and site assessments, Federally Endangered and Threatened species or their critical habitats do not occur within the study area.

2.5.2 State

Based on site assessments, state endangered and threatened species or their critical habitats do not occur within the study area.

2.6 RECREATIONAL, SCENIC, AND AESTHETIC RESOURCES

2.6.1 Local Resources

Ottawa Woods is one of a series of forest preserves operated by the Forest Preserve District of Cook County (FPDCC) and located in their “Central Zone”. This preserve contains picnic tables, picnic shelters, and public restrooms. Additionally, the Salt Creek Greenway Trail runs through Ottawa Woods in the project area and crosses over to the East bank of the Des Plaines River at 47th Street. There are trail entry points at the Chicago Portage National Historic Site on the east side of the Des Plaines River and a parking area at the Stony Ford Canoe Landing just north of the project area at 43rd (Historic U.S 66) Street.

Each of the surrounding communities operates their own park department. Although the available facilities vary, most community parks include baseball and soccer fields, basketball courts, tennis courts, and picnic areas.

An access road and/ or recreational footpath is currently in place along the top of the McCook and West Lyons Levees. On the day of the USACE site visit on 2 May 2016, there was evidence of some recreational use of the footpath.

2.6.2 Regional Resources

The Chicago Portage National Historic Site in the Village of Lyons, Illinois consists of 91 wooded acres and contains a portion of the Des Plaines River and Portage Creek, where the two waterbodies intersect. It is located in Chicago Portage Forest Preserve (Portage Woods and Ottawa Woods), with a memorial designed by Leonard Volk depicting the portage of the French explorers is located near the parking area. A trail leads from the memorial down into the portage wilderness area. The site contains a parking area, the memorial statue, interpretive signs, trails, and picnic tables. Visitors use the site for hiking, bird watching, and canoeing. In addition, guided walks through the park are sponsored by Friends of the Chicago Portage. The existing infrastructure at the Chicago Portage National Historic Site is concentrated

to the east of the project area, but the site boundaries shown on the National Register of Historic Places extend westward to include a portion of the proposed work (<https://www.nps.gov/nr/research/>).

2.7 CULTURAL RESOURCES

The Chicago Portage connects the watersheds and the navigable waterways of the Mississippi River and the Great Lakes. It cuts through the Valparaiso Moraine, crossing the continental divide that separates the Great Lakes and Gulf of St. Lawrence watersheds from the Gulf of Mexico watershed, making it one of the most strategic points in the interior of the North American continent. The saddle point of the gap is within the City of Chicago, and one of the reasons that Chicago exists and has developed into the immensely important city that it is today.

2.7.1 Cultural History

The Portage was revealed to the Europeans Louis Joliet (Jolliet) and Father Jacques Marquette by Native Americans in 1673. The importance of “Le Portage-e de Chicago” was realized early in the era of French exploration, with the concept of a connecting canal proposed by the French explorer LaSalle coming in 1682.

The Portage continued to be utilized as a trail crossing between the Des Plaines River and the Chicago River by settlers moving into the area after 1812. In 1848, the Illinois and Michigan Canal was opened, breaching the water divide, enabling navigation between the two waterways, and making the portage redundant. In 1900 the Illinois and Michigan Canal was replaced by the larger Chicago Sanitary and Ship Canal.

The Chicago Portage was designated as an “affiliated area” of the National Park Service on January 3, 1952. Now designated as the Chicago Portage National Historic Site, the site is owned and administered by the FPDCC. Preserved within the park is the western end of the historic portage, the only part that remains in a natural and protected state. As discussed in Section 2.6.2, the site contains a parking area, a memorial statue, interpretive signs, and trails. Activities at the site include hiking, canoeing, and guided walks sponsored by the Friends of the Chicago Portage. The existing McCook and West Lyons Levees are on the opposite (west) bank of the Des Plaines River from the Chicago Portage National Historic Site and are not contributing structures.

2.7.2 Previous Investigations

A review of prior studies was conducted to determine whether any cultural material had previously been identified in the study area. A literature search including an overview and assessment that focused on the Chicago Portage was conducted by Archaeological Research, Inc., under contract for USACE Chicago District in 1999. A number of archaeological investigations have been conducted at the Chicago Portage since 1974. David Keene with the Field Museum conducted archaeological excavations at the Portage from 1976 to 1980. These investigations did not identify any cultural material near the proposed project area.

The Chicago District previously conducted a similar flood risk management study in 2016 that focused on the Lyons Levee in Forest View, Illinois. The study area for that study was directly across the Des

Plaines River eastward of the current study. The cultural resources assessed in the Forest View study would be very similar to those present in this study.

2.8 AIR QUALITY

The study area is within Cook County, Illinois, which is considered a non-attainment area under the Clean Air Act for ozone. Industrial facilities in the area, including transportation, trucking, and truck repair facilities may impact air quality on a localized basis.

2.9 NOISE

Existing noises in the study area are associated with background traffic noises from two major roads that pass through the study area—IL-171 and 47th Street—and 2 major regional rail lines—Indiana Harbor Belt Railroad and the Chicago & Illinois Railroad tracks. Operation of the industrial businesses in the project area involves multiple semi-trucks entering and exiting the area every day.

2.10 HAZARDOUS AND TOXIC SUBSTANCES

A Phase I Hazardous, Toxic, and Radioactive Waste (HTRW) Environmental Site Assessment (ESA) was completed for the study area in accordance with ASTM E-1527-13. According to Engineering Regulation (ER) 1165-2-132, non-HTRW environmental issues that do not comply with federal, state, and local regulations should be discussed in the HTRW evaluation along with HTRW issues. The HTRW assessment included in Appendix F was completed using a review of existing information, historical topographic maps and aerial photographs, database research, and a site visit. No HTRW, or recognized environmental conditions (RECs), were identified as part of the investigation. Two non-HTRW environmental conditions were identified as part of the investigation. A Phase II ESA is not recommended.

- A sediment sample collected during the Plainfield Road Corridor Study suggests that the sediment in McCook Ditch may contain levels of iron, lead, and chromium above the State of Illinois CCDD clean fill standards. All the reported sediment analytical results are within the State of Illinois risk-based closure value for residential properties, the most restrictive human health risk standards used for State voluntary cleanup actions.
- There is some limited trash and debris located within the project limits, including materials dumped at Lawndale Avenue and debris located upstream of the Lawndale Avenue culvert.

2.11 SOCIOECONOMIC AND ENVIRONMENTAL JUSTICE

The leveed area in McCook is primarily industrial, with a large number of transportation, trucking, and truck repair companies. In Lyons, the leveed area is primarily residential. Adjacent to this residential area there is access to an expansive trail system that runs through Ottawa Woods and is maintained by the Forest Preserve District of Cook County.

2.11.1 EO 12898 Environmental Justice

On February 11, 1994, President Clinton issued Executive Order 12898: Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations. The order focuses federal attention on the relationship between the environment and human health conditions of minority

communities and calls on agencies to make achieving environmental justice part of their mission. The order requires the U.S. Environmental Protection Agency (USEPA) and all federal and state agencies receiving Federal funds to identify and address disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority and low-income populations. It also requires the agencies to develop strategies to address this problem.

USACE conducted an evaluation of potential Environmental Justice impacts using a two-step process. As a first step, the study area was evaluated to determine whether it contains a concentration of minority and/or low-income populations. Following that evaluation, USACE determined whether the proposed action or its alternatives would result in the types of effects listed above, as documented in Section 4.10.

Minority Population

As defined in Executive Order 12898 and Council on Environmental Quality (CEQ) guidance, a minority population occurs where one or both of the following conditions are met within a given geographic area:

- The American Indian, Alaskan Native, Asian, Pacific Islander, Black, or Hispanic population of the affected area exceeds 50 percent.
- The minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis.

A minority population also exists if more than one minority group is present and the aggregate minority percentage meets one of the above conditions. The selection of the appropriate unit of geographic analysis could be a governing body's jurisdiction, a neighborhood, census tract, or other similar unit. Note that the Hispanic/Latino population is a multi-racial group, which may overlap with other minority groups. A summary of the population demographics is shown in Table 3.

Table 3. Population Demographics

Population	Lyons ^[1]	McCook ^[1]	Study Area ^{[1][2]}	Cook County ^[1]	Illinois ^[1]
Total	10,668	208	10,876	5,236,393	12,873,761
Race and Hispanic/Latino					
Not Hispanic/Latino					
<i>White alone</i>	45.4 %	76.9 %	46.0 %	43.1 %	62.5 %
<i>Black or African American alone</i>	4.7 %	1.0 %	4.6 %	23.7 %	14.1 %
<i>American Indian and Alaska Native alone</i>	0.1 %	0.0 %	0.1 %	0.1 %	0.1 %
<i>Asian alone</i>	1.6 %	3.4 %	1.7 %	6.7 %	5.0 %
<i>Native Hawaiian/Pacific Islander alone</i>	0.0 %	0.0 %	0.0 %	0.0 %	0.0 %
<i>Some other race</i>	0.0 %	0.0 %	0.0 %	0.2 %	0.1 %
<i>Two or more races</i>	1.3 %	2.9 %	1.4 %	1.5 %	1.7 %
Hispanic/Latino	46.8 %	15.9%	46.2 %	24.7 %	16.5 %
<i>[1] – 2015 American Community Survey</i>					
<i>[2] – Lyons and McCook combined</i>					

Based on this demographic information, minorities constitute greater than 50 percent of the total population within the study area (54.0 %). Further, the study area is expected to have Hispanic or Latino residents making up about 46.2 percent of the total population, which is comparatively much higher than in Cook County (24.7%) and Illinois (16.5%). Therefore, the study area would likely qualify as having a minority population under EO 12898 and CEQ guidance. This conclusion is supported using the USEPA's EJSCREEN tool at <https://ejscreen.epa.gov/mapper/>.

Low-income Population

Executive Order 12898 does not provide criteria to determine if an affected area consists of a low-income population. For the purpose of this assessment, the CEQ criteria for defining a minority population has been adapted to identify whether or not the population in an affected area constitutes a low-income population. An affected geographic area is considered a low-income population (i.e., below the poverty level, for purposes of this analysis) where one or both of the following conditions are met within a given geographic area:

- The poverty rate of the total population is above 50 percent.
- The percentage of individuals in poverty is meaningfully greater than in the general population or other appropriate unit of geographic analysis.

Table 4. Poverty Distribution

	Lyons ^[1]	McCook ^[1]	Cook County ^[1]	Illinois ^[1]
Percent of individuals below the poverty line^[1]	15.2 %	8.7 %	17.1 %	14.3 %
Percent of families below the poverty line^[1]	12.2 %	3.8 %	13.2 %	10.5 %
<i>[1] – 2015 American Community Survey</i>				
<i>[2] – Lyons and McCook combined</i>				

Based on the 2011-2015 American Community Surveys, neither Lyons nor McCook has a poverty rate greater than 50%. Additionally, neither village has a poverty rate that is significantly higher than Cook County or Illinois. Alternatively, using USEPA's EJSCREEN tool and its definition of low-income, 44% of the population within the McCook section of the project area is low-income. Within the Lyons section of the project area, 23% of the population is low-income.

The study area does not meet either criterion to be considered a low-income population, as the percentages for individuals in poverty are less than 50 percent and do not appear to be significantly higher than in Cook County and the State of Illinois as a whole. The study area does not constitute an environmental justice community based on its low-income population.

3 PLAN FORMULATION

3.1 *PROBLEMS AND OPPORTUNITIES

Problems: The Villages of McCook, Lyons, and Summit are at risk of flooding as a result of levee overtopping, failure, or ditch overbanking due to overbank flooding of the Des Plaines River. There is a higher risk of failure due to lack of maintenance and repair. Several residences, businesses, industries, roadways, and railroads are at risk.

Opportunities: Managing flood risks in the community can improve the safety of residents and employees and reduce economic damages.

3.2 OBJECTIVES AND CONSTRAINTS

3.2.1 Planning Objectives

The Federal objective of water and related land resources planning is to contribute to National Economic Development consistent with protecting the nation's environment. For this study, the objective is to reduce flood risk in the Villages of McCook, Lyons, and Summit associated with Des Plaines River and McCook Ditch overbank flooding.

3.2.2 Planning Constraints

Formulated plans are limited by constraints, including resource, legal, and policy constraints. Resource constraints are associated with limits on knowledge, expertise, experience, ability, data, information, funding, and time. Legal and policy constraints are those defined by law and USACE policy and guidance. For this study, the following constraints have been identified:

- Flood risks addressed in plan formulation are limited to overbank flooding of the Des Plaines River and the McCook Ditch. Flooding associated with insufficient local drainage infrastructure is not within the scope of this study.
- Any plans to address flood risk must avoid increasing flood stages in other areas impacted by Des Plaines River flooding and the McCook Ditch.

3.3 MOST PROBABLE FUTURE WITHOUT PROJECT CONDITIONS

If no project is implemented, it is expected that no additional improvements to either the McCook or the West Lyons Levees would be completed. Flood risk in the communities of McCook, Lyons, and Summit, Illinois associated with overbank flooding of Des Plaines River or the McCook Ditch via the Des Plaines River would remain.

As described in Section 1.2.2 (*Southern Portion of McCook Levee*), when the southern portion of the McCook Levee overtops due to high water levels on the Des Plaines River, the McCook Ditch pools up and the water is conveyed north through the culvert at Lawndale Avenue towards the Summit Conduit intake structure, as described above. When this occurs, it overwhelms the capacity of the Summit Conduit, which was only designed for the capacity of the Summit Conduit Watershed, not for additional volume as a result of the levee overtopping. When the Summit Conduit is overwhelmed, the McCook

Ditch rises out of its bank and impacts the industrial properties behind the northern portion of the McCook Levee.

Additionally, the Des Plaines River has risen to within 5 feet of the top of the McCook and West Lyons Levees at least nine times in the last 30 years. While there hasn't been a levee failure yet, condition of the levees degrades after every flood event. There are several items documented during the USACE site visit on 2 May 2016, as well as during previous flood fight activities, that indicate the potential for future issues. Documentation of this erosion damage can be found in Appendix E – Geotechnical. Figure 12 of Appendix E shows the worst area of erosion, and Attachment 4 of Appendix E documentations additional damage from the October 1986 event.

McCook Levee

Behind the McCook Levee, there are at least 19 industrial buildings in the estimated 1% annual chance inundation area at risk of flooding. Little change is expected for the area behind the McCook Levee for the without project condition during the 50-year period of analysis. Aerial imagery was used to compare the current makeup of the area, to the last time it was studied (1986). This research showed that very little, if any, physical change has occurred over the previous 30 years. Businesses have come and gone, but the number, purpose, and location of these businesses has largely remained the same, in spite of being mapped in the regulatory floodplain. These observations suggest that the area will continue to remain relatively stable into the future. Since the area has been industrial for such a long period of time, it is unlikely that any residential areas will seek to move into this area.

Of particular concern is the riverside slope, which has experienced significant erosion when compared to the as-built cross section. The sheetpile does not extend much deeper than the base of the levee, so as the riverside slope continues to erode, the sheetpile will lose its embedment and could tip toward the river. The seepage path is also significantly shortened. Additionally, during the October 1986 event, seepage was observed at several locations along the landside toe. These seeps were considered minor at the time, but as seepage paths become more developed, the levee can lose additional foundation material and eventually collapse. This seepage was not noted in the recent April 2013 event, however, this was likely due to the landside ditch being inundated with water from overtopping farther downstream. The additional water on the landside decreased the head differential for the levee, which decreased the likelihood of, or hid, potential seepage issues. If this source of water is cut off from the landside, the seepage risk would greatly increase. Furthermore, large trees present on the levee also present a significant risk. As trees mature and die, they are more likely to fall over during storm events, increasing the incidence of significant root ball upheaval from the levee leading to decay of the levee section.

A range of levee fragility curves, including (1) the best estimate case or most likely probability of failure, (2) the best reasonable case or low likelihood of failure, and (3) the worst reasonable case or high likelihood of failure was developed using methodology outlined in Engineering Manual (EM) 1110-2-1619 Risk-Based Analysis for Flood Damage Reduction Studies based on a site visit conducted and

review of past performance of the levee, as described above. The development of these curves is detailed in Attachment 3 of Appendix E.

Based on this methodology, the 'probable no failure point' (PNP) (15% chance of failure) is approximately 7.5 feet from the top of levee at elevation 593.5 and the 'probable failure point' (PFP) (85% chance of failure) is approximately 1.5 foot from the top of levee at elevation 600.6 for the most likely failure scenario. All units of elevation are in North American Vertical Datum of 1988 (NAVD 88 datum). Figure 17 provides a schematic of the range of fragility curves developed for the McCook Levee. The figure also includes information regarding the modeled water surface elevations for various flood frequency events, 0.5-, 0.2-, 0.1-, 0.02-, 0.01-, 0.002- ACE, for reference.

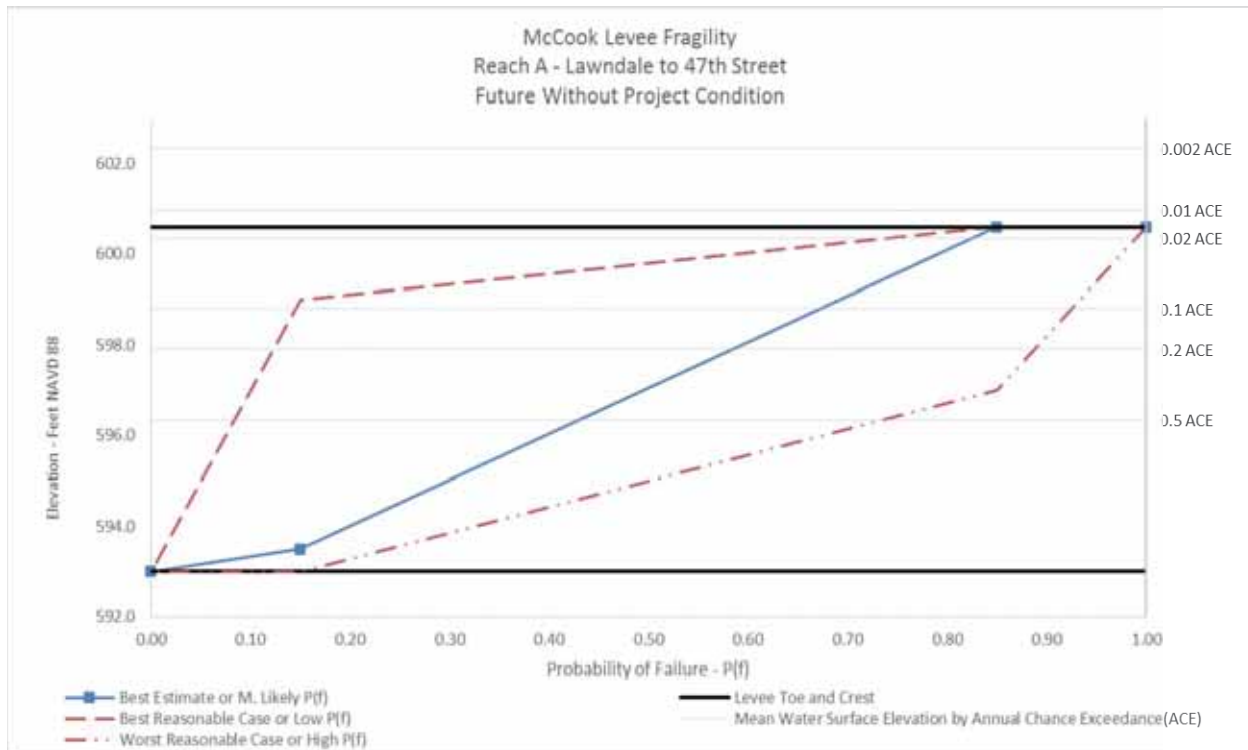


Figure 17. McCook Levee Fragility Curve (Reach A)

West Lyons Levee

Behind the West Lyons Levee, at least 17 residential structures are within the 1% annual chance inundation area. Similarly to the area behind the McCook Levee, no change in land use has been observed in the area and no significant changes are projected during the 50-year period of analysis.

The West Lyons Levee was visually inspected which did not note any signs of erosion, depressions, animal burrows, encroachments, etc. The only features noted were a split-wood fence and asphalt path along the crest. However, thick vegetation limited the ability of the inspection to note these deficiencies, so some may have gone unnoticed. The vegetation is present on the levee slopes and both toes with many mature trees and brush, which increases risk to the levee by propagating seepage paths via root systems and limits the ability to inspect and flood-fight during high water. Trees are also

susceptible to falling over, pulling their root wad out of the levee to create additional instability, seepage, and erosion issues.

As with the McCook Levee, a range of levee fragility curves was developed for the West Lyons Levee. The development of these curves is detailed in Attachment 3 of Appendix E.

Based on this assessment, the PNP (15% chance of failure) is approximately 6 feet from the top of the levee at elevation 596.0 and the PFP (85% chance of failure) is approximately at the top of the levee at elevation 602.4 for the most likely failure scenario. Figure 18 provides a schematic of the range of fragility curves developed for the West Lyons Levee.

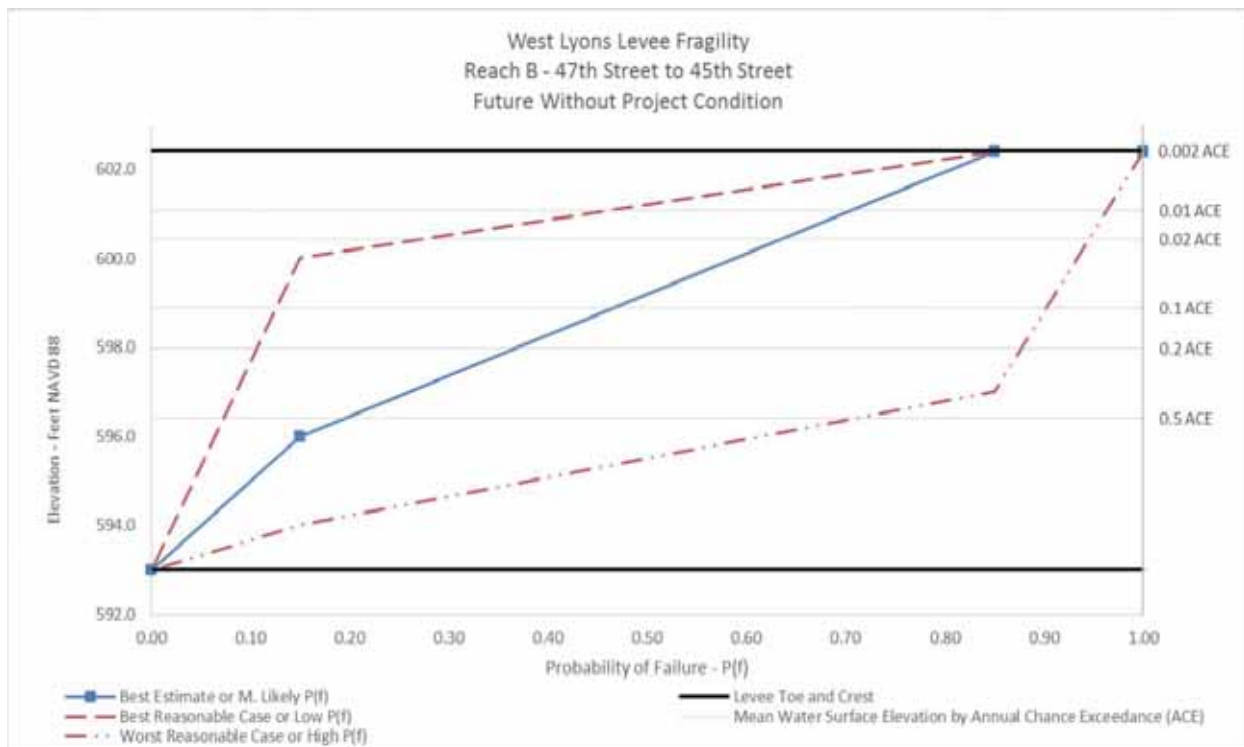


Figure 18. West Lyons Levee Fragility Curve (Reach A)

3.3.1 Without Project Hydrologic and Hydraulic Conditions

A flow frequency analysis for the USGS gage on the Des Plaines River at Riverside, Illinois, located one and a half miles upstream of the project area was conducted was completed by MWRDGC in support of updated Hydrologic and Hydraulic modeling efforts for the Lyons Levee project, on the opposite side of the river from the McCook Levee project area. The analysis used Hydrologic Engineering Center's Statistical Software Package (HEC-SSP) to conduct a frequency analysis based on a period of record of 1914 through 2013. The results of the analysis are shown in Table 5. A full description of the updated hydrologic analysis is included in Section 2.2 of Attachment 1 to Appendix E of this report.

Table 5. Flow Frequency Analysis at Riverside Gage

% Chance Exceedance	Computed flow (cfs)	Expected Probability Flow (cfs)	5% Confidence Limit (cfs)	95% Confidence Limit (cfs)
0.2 (500-yr)	11,760	12,090	13,740	11,360
0.5 (200-yr)	10,620	10,850	12,260	9,440
1.0 (100-yr)	9,750	9,950	11,140	8,730
2.0 (50-yr)	8,870	8,980	10,030	8,010
5.0 (20-yr)	7,670	7,730	8,540	7,010
10.0 (10-yr)	6,720	6,760	7,390	6,200
20.0 (5-yr)	5,710	5,730	6,190	5,320
50.0 (2-yr)	4,130	4,130	4,420	3,870

A sensitivity analysis was performed on the 100-year period of gage record to evaluate whether impacts of urbanization or increased precipitation may warrant an updated flow frequency analysis using only a selected period of time. The HEC-SSP computer program was used to analyze a 40 year gage record extending from 1974 through 2013. The results were compared with the 100 year gage record analysis to determine if there has been a discernable change in the discharge frequency on the Des Plaines River at Riverside. Results of this analysis for two gage record time periods are detailed in Section 2.3.4 of Attachment 1 to Appendix E of this report. The 1% chance exceedance flow at Riverside based on the record that excludes all data except for the last 40 years resulted in an approximately 15% increase in flow when compared to the 1% exceedance flow at the same gage using the entire 100 year period of record. The shorter record requires more extrapolation to estimate the 100-yr flow than the 100 year record. Furthermore, one or more large flood events can significantly skew the magnitude of the 1% flow, when a shorter period of record is considered. Based on this sensitivity analysis, the full period of record was used to estimate flow frequency in the study area.

Flood profiles were generated using a Hydrologic Engineering Center's River Analysis System (HEC-RAS) model developed by MWRDGC and calibrated to recent large flood events, including the April 2013 flood. An additional flood in July 2014 was used in the calibration, taking advantage of a newly installed gage, deployed as part of the Forest View Flood Warning Plan described in Section 1.4. A summary of the modeled flood elevations at various locations is included in Table 6. A full description of the hydraulic analysis, including model updates, calibration, and design storm analysis is included in Section 2.3 of Attachment 1 to Appendix E of this report.

Table 6. Modeled Flood Elevations

Reach	River Station	Stage by Annual Chance Exceedance ^[1]							
		0.99	0.5	0.2	0.1	0.04	0.02	0.01	0.002
West Lyons Levee 47th to 45th (Reach B)	83788.26	592.57	596.51	598.06	598.95	599.84	600.50	601.14	602.50
	83026.35	592.43	596.42	597.99	598.88	599.77	600.43	601.07	602.43
	82725.92	592.36	596.37	597.94	598.82	599.71	600.37	601.01	602.36
McCook Levee Lawndale to 47th (Reach A)	82415.00	592.31	596.34	597.90	598.79	599.68	600.34	600.97	602.33
	77614.32	592.01	595.96	597.46	598.27	599.12	599.69	600.22	601.32

^[1] Median modeled river stages in ft North American Vertical Datum of 1988 (NAVD88)

3.3.2 Without Project Condition Damages

The economic estimate of damages and benefits uses a 50-year period of analysis. Because there is no future development expected in the study area and the likelihood of levee failure would not decrease, it is assumed that future condition damages would not change from the existing condition.

An economic analysis was conducted to quantify the benefits of the proposed alternatives using USACE Hydrologic Engineering Center's Flood Damage Assessment (HEC-FDA) software. A structure inventory was based on current parcel data, recent LiDAR, and aerial imagery. The corresponding vehicle counts, values, and location assignments were based on HAZUS data and verified using aerial imagery and through discussions with local business owners. First floor elevations were assigned based on an assumed offset from the local topography, established using LiDAR data developed by Cook County.

The index location is a point selected within the HEC-FDA for the creation of aggregate stage-damage curves. The levee elevations within the model are in reference to this index location.

The most significant flood risk is associated with levee failure, as discussed above. The projected future without project damages used in this economic analysis are those that would occur in the event of a levee breach. Damages were modeled in HEC-FDA using simulated flood elevations and the estimated levee fragility curves. In the event of a levee breach or overtopping event, flood elevations behind the McCook Levee were assumed to equal the Des Plaines River profile elevations due to the confined nature of the topography behind the levee, and this assumption was confirmed through detailed 2-Dimensional Hydraulic modeling, as described in Appendix D. The estimated damages for each event were used to calculate total average annual without project condition damages of \$587,800 for the area impacted by the McCook Levee and \$67,500 for the area impacted by the West Lyons Levee.

3.4 MEASURES TO ACHIEVE PLANNING OBJECTIVES

In order to address flood damages, several flood management measures were considered. The costs of all measures considered are expected to fall well below the maximum \$10 million per project Federal cost limitation of the Section 205 authority.

3.4.1 Preliminary Structural and Non-Structural Measures

3.4.1.1 Structural Measures

Levee repair and rehabilitation – To bring the existing McCook and/or West Lyons Levees into compliance with current USACE design standards, several repairs would be needed. This measure would complete those repairs. Ensuring use of appropriate design standards, compliance with operation and maintenance requirements, and planning for controlled overtopping should be considered as part of alternatives that include a levee alignment. These additional actions will serve to mitigate some of the remaining residual risks. Repairs would include removal of trees and stumps, placement of compacted fill and rip-rap, and replacement of the existing gravel maintenance road/footpath.

Repair of the existing levees would significantly decrease the likelihood of levee failure and, therefore, provide significant additional protection against flood damage to the industries at risk of flooding.

3.4.1.2 Non-structural Measures

Non-structural measures are activities such as floodproofing, relocations and buyouts, and development of flood warning plans that can manage flood risk without affecting the hydrologic or hydraulic conditions.

Non-structural measures considered to address flood damage of the industrial buildings and stored contents behind the McCook Levee include:

- Floodproofing
- Elevation of storage facilities
- Relocation
- Buyouts

3.4.2 Excluded Measures

Repair or elevation of southern portion of McCook Levee – MWRDGC's Preliminary McCook Levee flood Control Improvements Alternatives Analysis, described in Section 1.4 considered an alternative (*Summit Conduit Alternative 1*), which would improve and elevate approximately 5,400 feet of the McCook Levee, including approximately 1,400 feet of levee south of Lawndale Avenue. As described in Section 1.2.2, most of this area behind this section of the levee is higher than the levee and no structures are considered to be at risk of flooding behind this portion of the levee. Furthermore, several issues were identified with the potential elevation of the southern portion of the McCook Levee, including low clearance under the IL-171 bridges. Additionally, this measure would eliminate the existing McCook Ditch overflow pathway and would require the implementation of a significant mitigation component—likely requiring a large outlet structure and the addition of an associated storage facility.

Since the 1,400 feet of levee south of Lawndale Avenue does not directly protect any structures (therefore the life-safety risk is presumed to be negligible), the Project Delivery Team (PDT) removed this measure from consideration due to the higher associated cost and no anticipated added benefits.

Storage: The purpose of storage reservoirs is to capture and store floodwater as floodwaters rise to reduce flood stages downstream. A recent flood risk management for the Upper Des Plaines watershed, which ends just upstream of the study area, found that storage volumes of 200 acre-feet or more reduced flood stages only by inches. In contrast, estimated flood stages resulting from levee breach or overtopping range from 2 to 7 feet. Thus, given the small area impacted by flooding and the scale of a storage solution, this measure was not considered in further detail.

3.5 Formulation and Comparison of Alternative Plans

For the purpose of evaluating alternatives for the McCook and West Lyon Levees, two separable problem areas were identified:

Problem Area A –Area associated with overbank flooding or failure of McCook Levee

Problem Area B –Area associated with overbank flooding or failure of West Lyons Levee

These areas are topographically distinct such that solutions identified for each area are separable and potentially combinable to form a comprehensive flood risk reduction plan. The separable areas are identified in Figure 19.

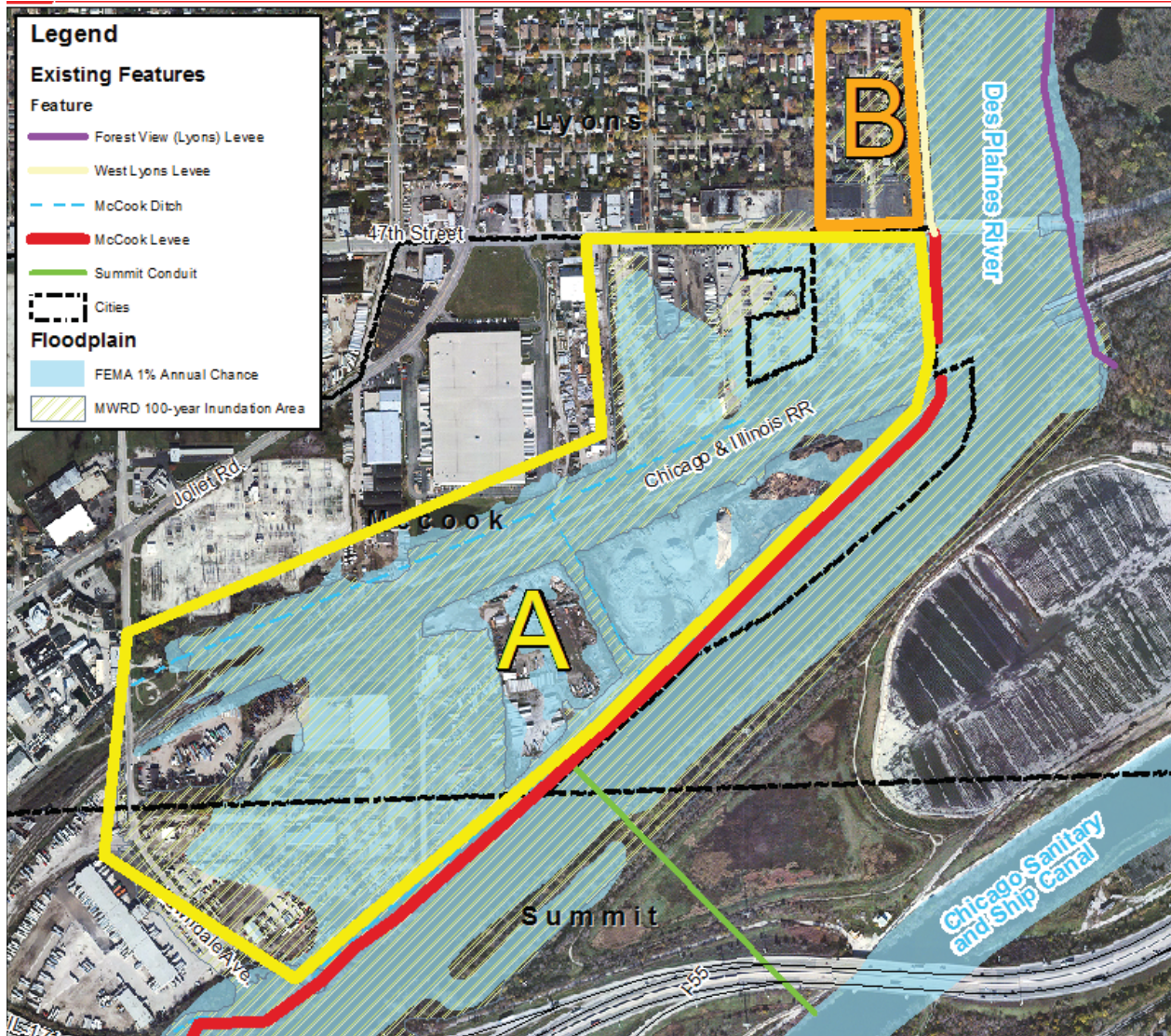
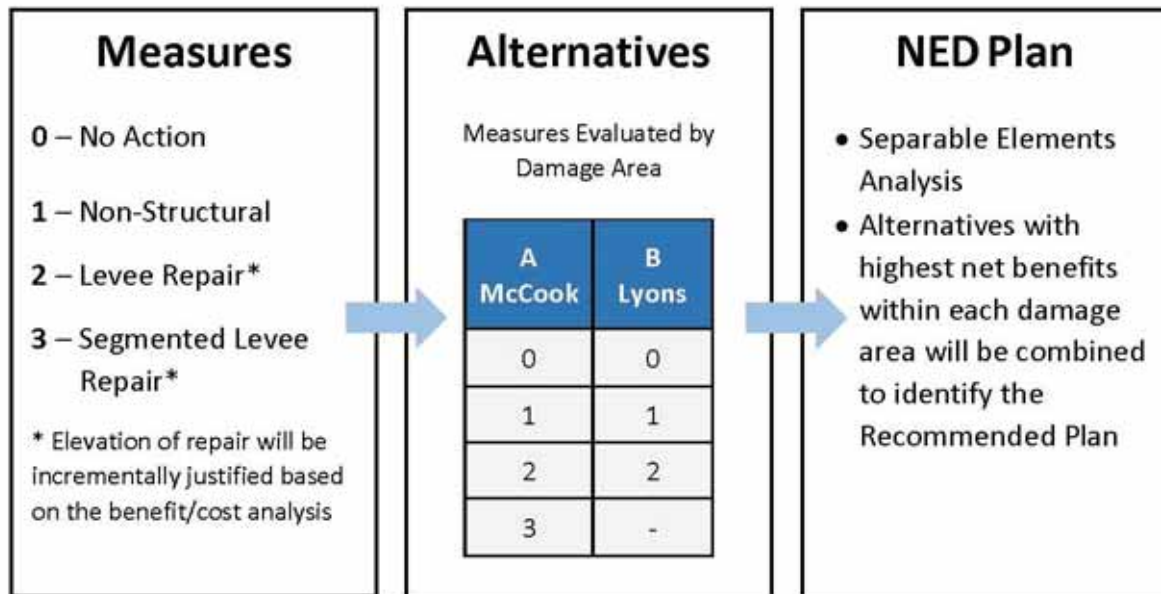


Figure 19. Identification of Problem Areas

3.5.1 Alternative Plan Descriptions

A separable elements analysis was completed for the evaluation of alternative plans. Each of the identified measures were evaluated for each damage area and alternatives with highest net benefits within each damage area will be combined to identify the Recommended Plan. The schematic included in Figure 20 summarizes the plan identification, evaluation, and selection process. Additional details about each alternative are included below.



Alternative 0A- McCook No Action

For this alternative, no improvements would be made to the McCook Levee and no new flood risk management measures would be implemented.

Alternative 0B- Lyons No Action

For this alternative, no improvements would be made to the West Lyons Levee and no new flood risk management measures would be implemented.

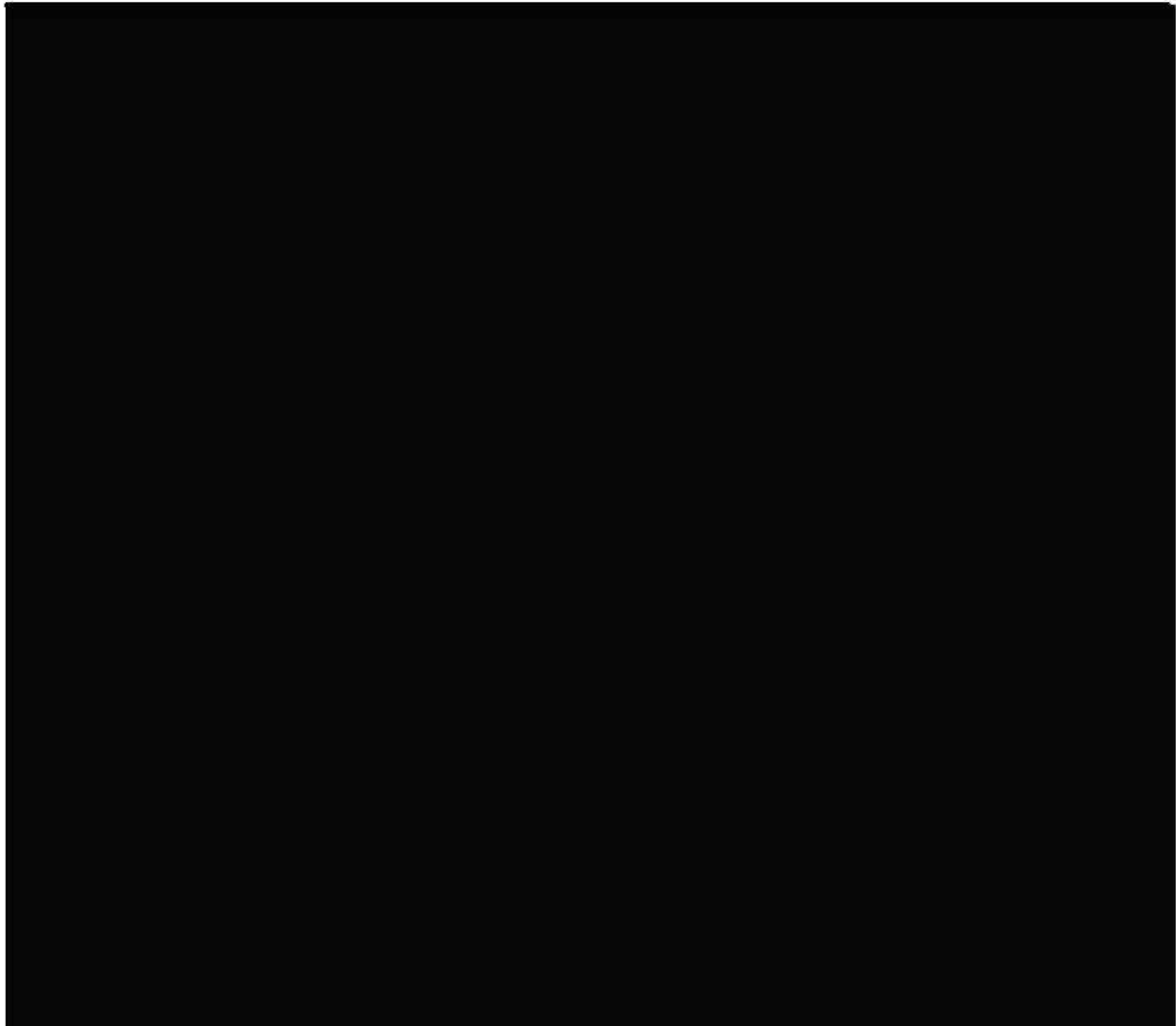
Alternative 1A - McCook Non-structural:

Figure 21. Alternative 1A- McCook Non-structural Schematic

This alternative includes the non-structural protection of 28 industrial buildings identified as at risk of flooding behind the existing McCook Levee. All of the structures are industrial, with businesses including a recycling company, repair shops, trucking and intermodal facilities, manufacturing operations, and an oil and fuel handling facility. Non-structural options for reducing the impacts of flooding to these businesses include wet- or dry-floodproofing 7 structures and elevation as well as relocation or buyouts of 21 structures. While protection of the structures would be included as part of this non-structural alternative, this area also typically contains stored materials in semi-trucks or in above ground storage tanks which would not be protected as part of the non-structural plan. These materials may be mobile and could be evacuated from the area before flooding occurs, but evacuation would depend on advanced knowledge of pending flooding. Figure 22 and Figure 23 contain oblique aerial images of a part of the area at risk of flooding, which give indications of the contents stored on site during typical operations of these businesses.



Figure 22. Aerial image of industrial area behind McCook Levee near Lawndale Ave.

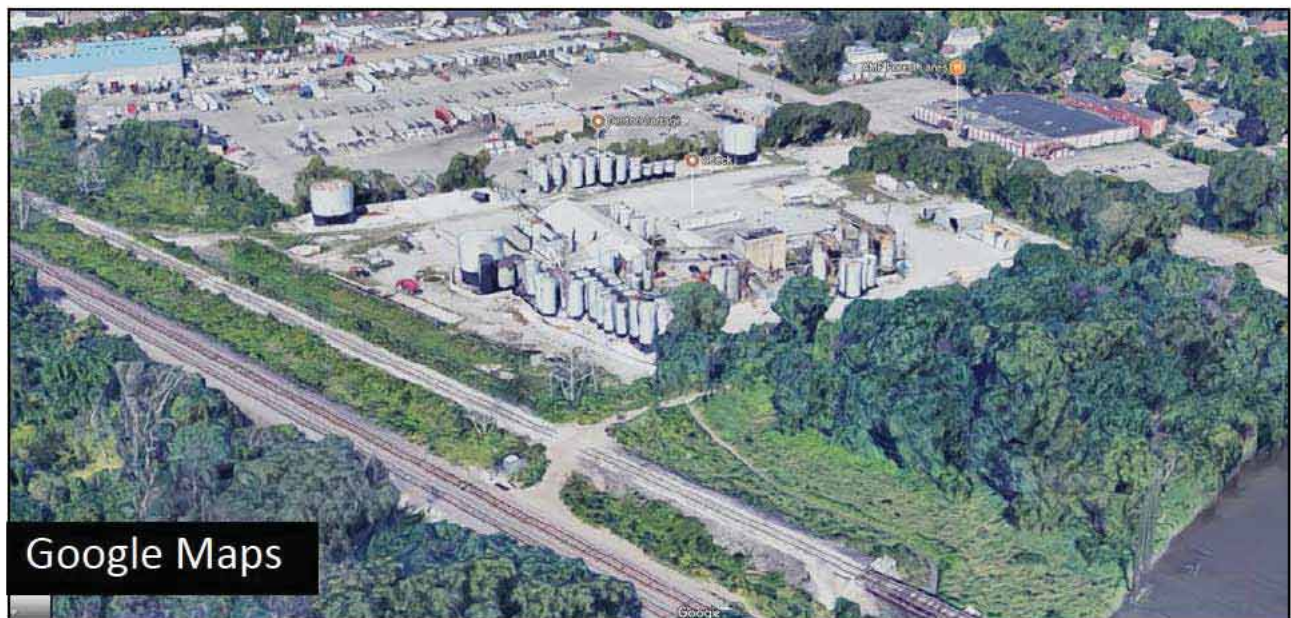


Figure 23. Aerial image of industrial area south of 47th St.

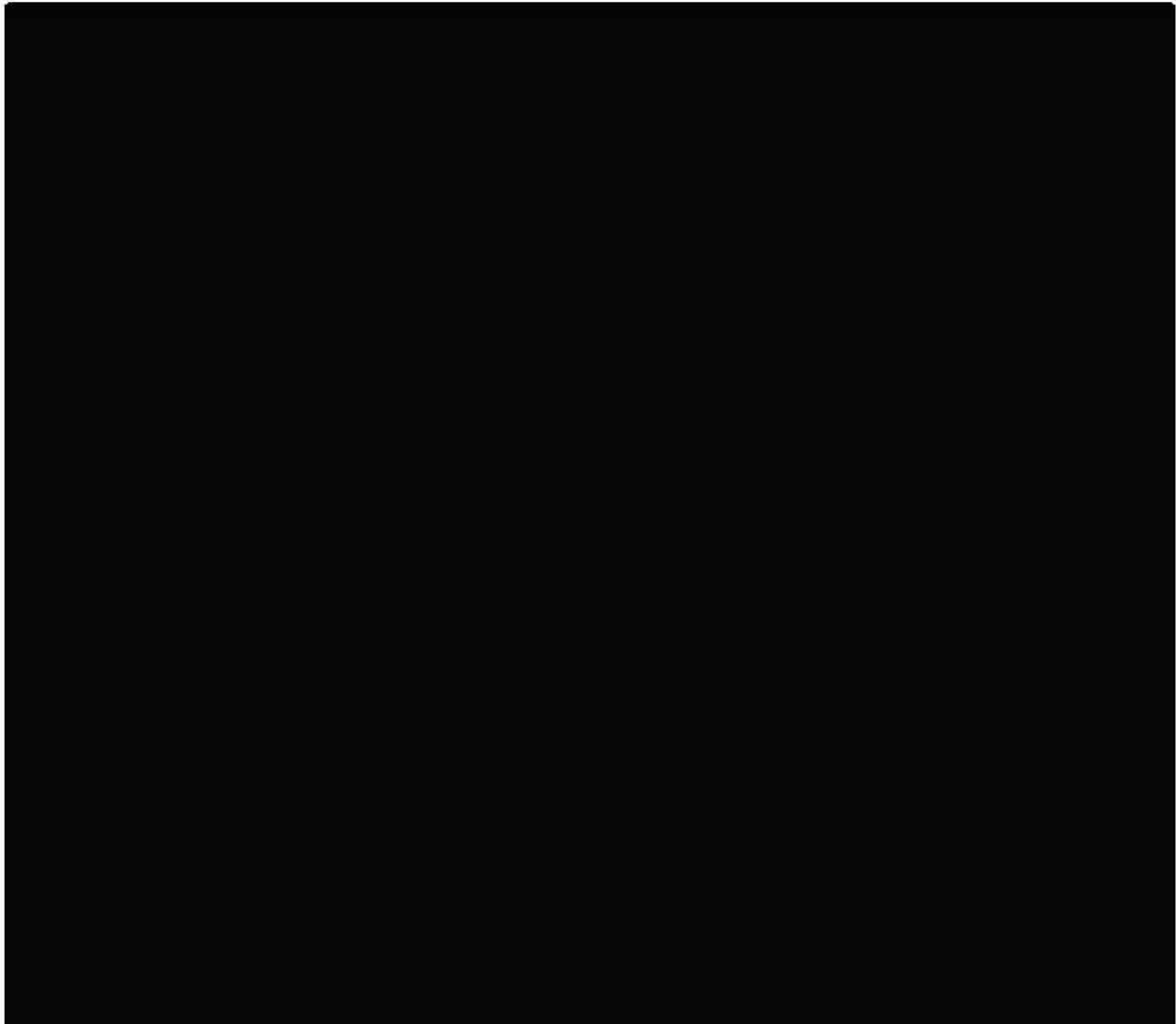
Alternative 1B - Lyons Non-structural:

Figure 24. Alternative 1B- West Lyons Non-structural Schematic

This alternative includes the non-structural protection of 18 residential structures, all of which are single family homes including one-story, split level, and two-story structures. Non-structural measures considered for these structures include elevation, dry floodproofing, or buyouts. This alternative was developed by identifying which structures in the West Lyons leveed area were likely to be impacted by an overtopping or breach event. This alternative assesses the effectiveness of potential non-structural modifications, including dry floodproofing 12 structures and the evacuation (buyout) of 6 structures. Twelve of the single family homes identified as at risk of flooding are split-level (bi-level) homes. Low-entry points for these split-level are located below natural grade ground elevation and a portion of the main living space is located at least partly below grade. Elevation or flood proofing of these types of structures is usually not possible in a cost-effective manner, such that buyouts of these structures may be the only option to reduce the risk of flooding of these types of buildings.

Alternative 2A – McCook Levee Repair: (includes improvement and modification of McCook Ditch drainage)



Figure 25. Alternative 2A – McCook Levee Repair Schematic

To bring the existing levee into compliance with current USACE design standards, several repairs would be needed. Repairs would include removal of trees and stumps, placement of compacted fill and rip-rap, regrading of portions of the levee to its intended elevation, and replacement of the existing gravel maintenance road/footpath.

The levee repairs would maintain a minimum 2.5H:1V side slope on the land side of the levee to allow for levee stability as well as access for maintenance and inspection. The river side of the levee varies from 2:1 to 2.5:1 for the riprap and clay restoration, respectively. A minimum 12 foot crest width would be established along the levee. In addition to clearing trees from the levee alignment, trees would also be removed from a buffer zone extending 15 feet from the toe on both sides of the levee. Additionally,

the construction of approximately 1,100 feet of toe drains would be required to control seepage issues identified along this portion of the levee.

The level of protection of the levee is restricted by the elevation of the Chicago and Illinois railroad tracks crossing the levee just south of 47th Street. Increasing the level of protection (i.e. elevation) of the levee would require elevation of the railroad tracks and modification of the railroad bridge. These measures were considered to be cost-prohibitive, and therefore no optimization of the levee crest elevation was performed. The repairs to the McCook Levee would aim to repair the levee to its existing design elevation but not to elevate it.

This alternative would also require the modification of the drainage of the McCook Ditch. The most frequent occurrence of flooding and structure damage is directly related to levee overtopping from the Des Plaines River into the McCook Ditch at low spots in the southern portion of the levee. When the Des Plaines River overtops the levee, water flows north towards the Summit Conduit. Structure damage in the project area results from limited outlet capacity for the ditch through the Summit Conduit. To reduce the likelihood of McCook Ditch overtopping north of Lawndale Avenue, closure of the existing Lawndale Road culvert and re-routing the McCook Ditch directly to the Des Plaines River was considered. However, Hydrologic and Hydraulic Analysis indicated that complete re-route of the McCook Ditch to the Des Plaines River would result in water surface profile rises and adverse impacts along the Des Plaines River at every flood frequency, as documented in Appendix D. Instead, an alternative was developed to reduce the amount of flow allowed through the culvert at Lawndale Avenue so as to not overwhelm the Summit Conduit and divert the remainder of the McCook Ditch flow directly to the Des Plaines River. Hydraulic analysis has confirmed that modifying the flow regime in this manner will not result in any adverse impacts on the Des Plaines River.

The existing culvert at Lawndale will remain partially open, allowing the McCook ditch to continue draining through the Summit Conduit. A sluice gate closure structure will be installed to keep flows at a level that can be drained through the Summit Conduit without causing interior flooding. A new concrete headwall will be constructed at the south entrance to the culvert under Lawndale. A 5' by 5' sluice gate will be installed with a trash rack installed in front of the gate. The gate will be kept partially closed during most conditions. MWRDGC will need to maintain the gate at the correct level, or enter into an Operations and Maintenance (O&M) agreement with the local community to do so. The remainder of the water flowing through McCook ditch will drain to the Des Plaines River through a new culvert installed just south of Lawndale, which will have a backflow preventer installed to prevent flow from the Des Plaines River from entering the McCook Ditch at that location.

Repair of the existing levee and modification of the McCook ditch flow regime would significantly decrease the likelihood of levee failure and, therefore, provide significant additional protection against flood damage to the industries at risk of flooding.

Alternative 2B – West Lyons Levee Repair:

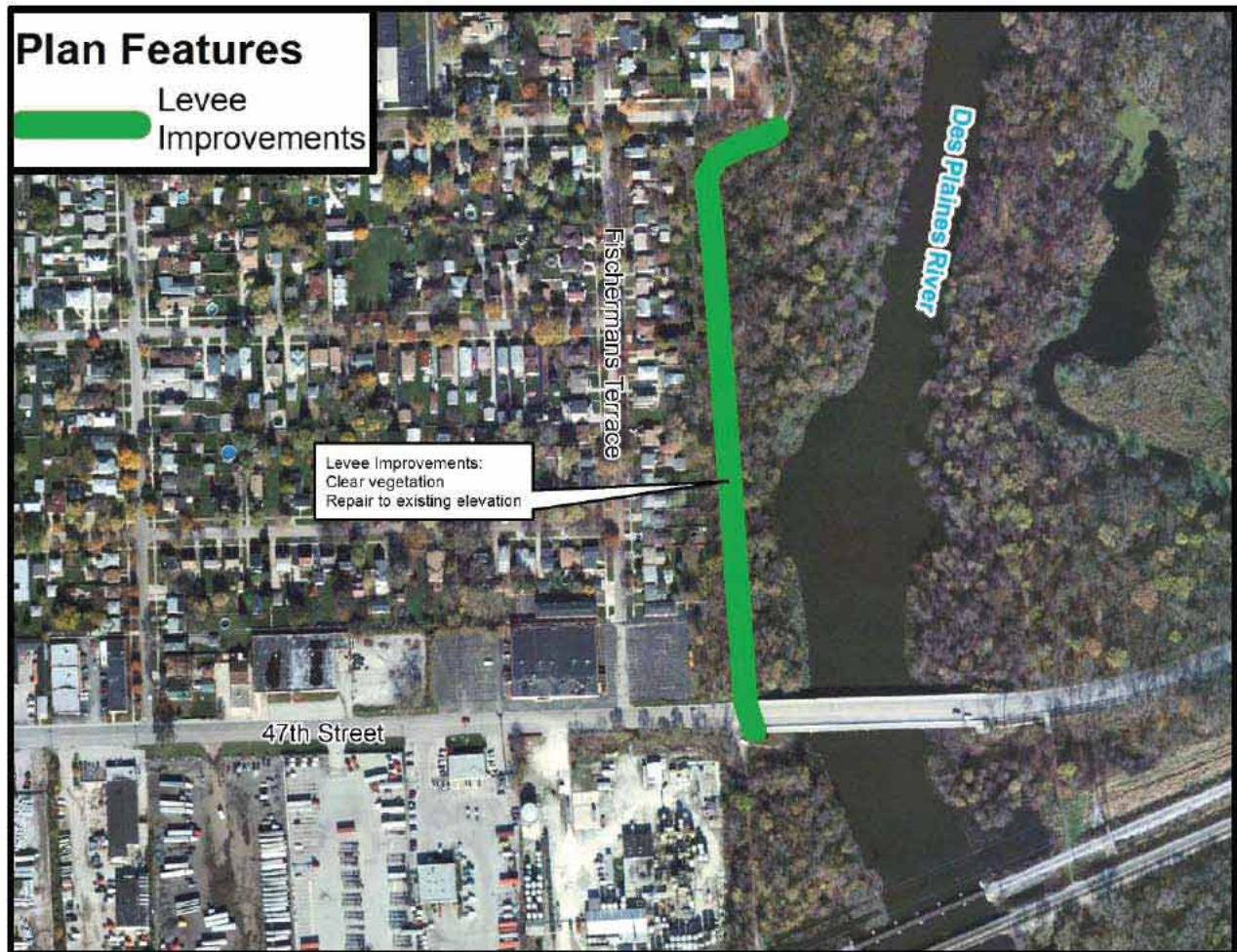


Figure 26. Alternative 2B – West Lyons Levee Repair Schematic

To bring the existing levee into compliance with current USACE design standards, removal of trees and stumps, regrading, and replacement of the existing paved bike path would be required.

The levee repairs would maintain a minimum 3H:1V side slope on both sides of the levee to allow for levee stability as well as access for maintenance and inspection. A minimum 12 foot crest width would be established along the levee. In addition to clearing trees from the levee alignment, trees would also be removed from a buffer zone extending 15 feet from the toe on both sides of the levee.

Elevation of this levee can be considered and selection of the height of the levee was evaluated via an incremental cost/ benefit analysis. For the purposes of this analysis, the alternatives are defined as:

Alternative 2Ba: Existing freeboard – Repair to existing elevation (602.4 feet)

Alternative 2Bb: 2 feet Freeboard – Repair and elevation to provide approximately 2 feet of freeboard for the 1% ACE event (603 feet)

Alternative 3A – McCook Levee Segmented Repair

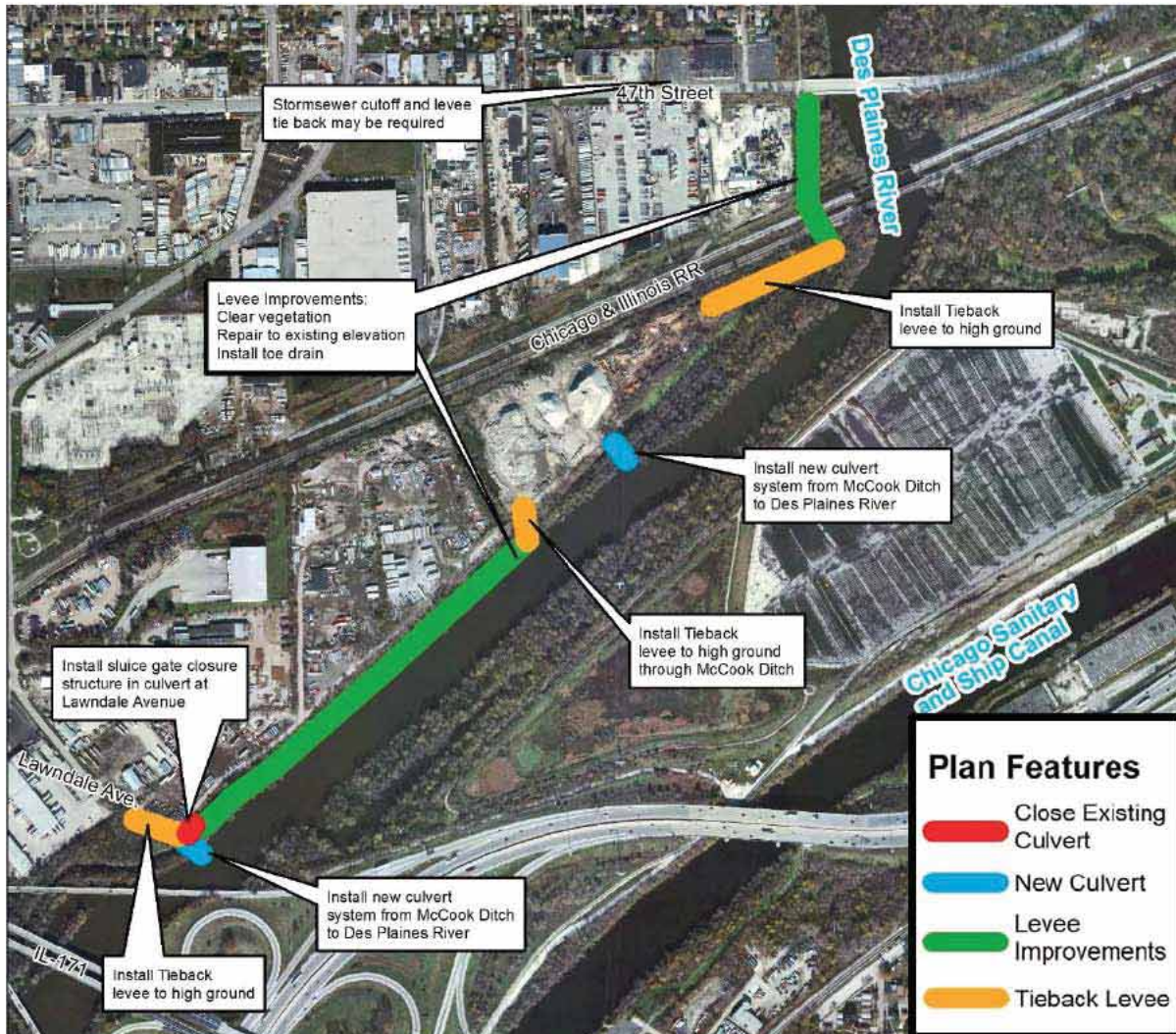


Figure 27. Alternative 3A – McCook Levee Segmented Repair Schematic

This alternative employs several of the same measures as Alternative 2A, however a portion of the McCook Levee would not be repaired, and instead two separate levee segments would be formed via the construction of additional tie backs to high ground. The land behind the portion of the levee that would not be repaired is high-ground and therefore there are no structures at risk of flooding behind this portion of the levee. The installation of two additional tie-back levees – one just south of the Chicago & Illinois Railroad lines and one just north of a tributary inflow into the McCook Ditch approximately at the midpoint of the McCook Levee. The approximate location of the tie-back levees is depicted in Figure 27.

Due to the smaller footprint, this alternative may require less maintenance and less wetland mitigation when compared to Alternative 2A while providing the same level of protection to at-risk flood areas.

The levee repairs would maintain a minimum 2.5H:1V side slope on the land side of the levee to allow for levee stability as well as access for maintenance and inspection. The river side of the levee varies from 2:1 to 2.5:1 for the riprap and clay restoration, respectively. A minimum 12 foot crest width would be established along the levee. In addition to clearing trees from the levee alignment, trees would also be removed from a buffer zone extending 15 feet from the toe on both sides of the levee.

Drainage of McCook ditch in this alternative will be very similar to alternative 2A. A sluice gate structure will also be installed at the south inlet of the Lawndale Ave culvert, to be closed only during large storm events. Summit Conduit will remain in use, and will provide interior drainage to the southern levee.

3.5.2 Comparison of Alternatives

Flood Risk Management benefits consist of reductions in potential flood damages to residential, commercial, industrial and public structures, as well as reductions in other flood related costs such as emergency response, clean-up, and traffic detours. These cost reductions are compared to the costs of project implementation. A project is considered economically justified if the total value of the average annual benefits exceeds the average annual costs.

As described in Section 3.3.1, the future without project condition and all alternative plans were evaluated over a 50-year period, using the FY2018 Federal discount rate (2.75%).

Estimated Flood Risk Management Benefits and Costs

In the *No Action* alternative (Plan 0), there would be no changes to the existing conditions and the threat of levee failure would remain. There would be no benefits associated with this plan.

The costs associated with the non-structural alternatives (1A & 1B) were developed based on the number and type of modifications required. Due to the variability of the industrial buildings and businesses to be protected, evaluation of measures to be implemented at individual structures such as relocation, buyouts, floodproofing, or elevation were evaluated in greater detail during the feasibility phase after a detailed structure inventory had been developed. The potential benefits associated with a non-structural plan include reduction in damage to structures and stored contents, but the implementation of non-structural measures may be difficult based on the complexity and logistical requirements of the industries to be protected.

Alternative 1A (McCook Non-Structural) – This alternative was developed by identifying which structures in the McCook leveed area were likely to be impacted by an overtopping or breach event. This alternative assesses the effectiveness of potential non-structural modifications, including floodproofing 7 structures and the evacuation (buyout) of 21 structures.

Alternative 1B (Lyons Non-Structural) – This alternative was developed by identifying which structures in the West Lyons leveed area were likely to be impacted by an overtopping or breach event. This alternative assesses the effectiveness of potential non-structural modifications, including floodproofing 12 structures and the evacuation (buyout) of 6 structures.

The remaining four alternatives (2A, 3A, 2Ba, & 2Bb) developed for this investigation would include a levee that has been repaired or constructed to meet USACE design standards and modifications to the McCook Ditch drainage path. Even though all alternatives include risk reduction to at least a 1% annual chance flood profile, they do not completely eliminate risk of flooding and the area will remain subject to residual damages during events that overtop the repaired levee. It is unlikely that there will be sufficient damages to justify the increased cost associated with the higher level of protection afforded by alternative 2Bb, but this was reviewed during the Feasibly Phase. The levee and any associated structures would be maintained to continue to meet these standards over the period of analysis. Therefore, under these alternatives the risk of failure would be low. The preliminary estimate of benefits for each of the alternatives accounts for the reduced risk of inundation as a result of levee overtopping or failure. While the probability of inundation through failure or overtopping is reduced by the proposed levee repairs, the consequences of overtopping remain high both in terms of potential life safety and economic damages. The communities will need to remain aware and make use of the existing flood warning system currently employed by the Forest View community directly across the river, described in Section 1.4.

Alternative 2A (McCook Existing Levee Repair) – This alternative was developed by identifying which structural issues needed to be addressed in order for the levee to perform as designed. Currently, the levee is faced with many deficiencies and has a crest elevation of 600.6 feet. After this levee is repaired, in its current configuration, it would have a crest elevation of 602.5 feet, approximately 2 feet above the 1% ACE flood profile, and would be expected to withstand a full loading without breaching.

Alternative 2Ba (West Lyons Existing Levee Repair: Existing Freeboard) – This alternative was developed by identifying which structural issues needed to be addressed in order for the levee to perform as designed. Currently, the levee is faced with many deficiencies and has a crest elevation of 602.4 feet. After this levee is repaired, in its current configuration, it would have a crest elevation of 602.5 feet, approximately 1.5 feet above the 1% ACE flood profile, and would be expected to withstand a full loading without breaching.

Alternative 2Bb (West Lyons Existing Levee Repair: 2 feet Freeboard) – This alternative was developed by identifying which structural issues needed to be addressed in order for the levee to perform as designed. Currently, the levee is faced with many deficiencies and has a crest elevation of 602.4 feet. After this levee is repaired, in its current configuration, it would have a crest elevation of 603 feet, approximately 2 feet above the 1% ACE flood profile, and would be expected to withstand a full loading without breaching.

Alternative 3A (McCook Segmented Repair) – This alternative was developed by identifying which structural issues needed to be addressed in order for the levee to perform as designed. Currently, the levee is faced with many deficiencies and has a crest elevation of 600.6 feet. After this levee is repaired, it would have a crest elevation of 602.5 feet, approximately 2 feet above the 1% ACE flood profile, and would be expected to withstand a full loading. The

configuration of the levee will be slightly altered, reducing the total length of levee to be repaired.

For the preliminary estimate of costs, several factors were taken into account:

General Design considerations: Preliminary cost estimates were developed for all alternatives. The costs are based on preliminary designs based on the components for each plan listed in Section 3.5.1.

Real Estate: Lands, Easements, Relocations, Rights-of-Way, and Disposal Areas (LERRDs) real estate estimates were prepared based on an estimate of land required for each alternative and the type of easements required. The estimated easement requirements are summarized below in Table 6.

Operations and Maintenance: This preliminary estimate is based on typical operation, maintenance, repair, rehabilitation, and replacement (OMRR&R) activities for similar levees in the region. The most significant costs would be associated with maintaining the gravel access road and controlling vegetation on the levees.

The estimated costs are shown in Table 7. Table 8 shows the cost-benefit analysis. As shown in the tables, Alternatives 2A, 3A, and 2Ba would result in positive net benefits based on this preliminary analysis.

Table 7. Estimated Average Annual Costs (Preliminary)

McCook Levee Cost Estimate	Estimated Cost (\$1,000)					
	Alt. 1A Non-Struct	Alt. 2A Full Repair	Alt. 3A Segmented Repair	Alt. 1B Non-Struct	Alt. 2Ba Full Repair	Alt. 2Bb Full Repair
Construction ^[1]	■	■	■	■	■	■
Engineering and Design (12.5%)	■	■	■	■	■	■
Construction Management (13.5%)	■	■	■	■	■	■
LERRDs	■	■	■	■	■	■
Total First Costs	■	■	■	■	■	■
Interest During Construction ^[2]	■	■	■	■	■	■
Annualized First Costs	■	■	■	■	■	■
Annual OMRR&R	■	■	■	■	■	■
Average Annual Cost	■	■	■	■	■	■
^[1] Construction Estimate includes a contingency. Reflects 80% confidence. ^[2] Interest During Construction accounts for the time value of money, prior to project implementation 2020 Base Year; October 2017 Price Levels; 2.75% Federal Discount Rate for FY2018; 50 year period of analysis						

Table 8. Cost Benefit Analysis (Preliminary)

Reach	Plan Name	Plan Description	Values in Thousands		
			Average Annual Benefits	Average Annual Costs	Average Annual Net Benefits
Reach A – 47 th to Lawndale	Alt. 1A	Non-Structural Improvements	\$473		
	Alt. 2A	Repair Existing Levee (602.5 ft)	\$584		
	Alt. 3A	Segmented Repair (602.5 ft)	\$584		
Reach B – 45 th to 47 th	Alt. 1B	Non-Structural Improvements	\$52		
	Alt. 2Ba	Repair Existing Levee (602.5 ft)	\$65		
	Alt. 2Bb	Repair Existing Levee (603 ft)	\$67		
October 2017 Price Levels; 2.75% Federal Discount Rate for FY2018; 50 year period of analysis.					

3.5.3 Key Analysis Assumptions, Risks, and Uncertainties

Key uncertainties associated with the development and evaluation of alternative plans are summarized in Table 9. The risks are qualitatively described regarding the key assumption, the reason for concern, and how each was incorporated in the analysis. These uncertainties focus on how these assumptions were derived and carried through the alternative development and evaluation process. These are focused on the critical engineering, environmental, and economic inputs used to evaluate the with-project alternatives. The table also indicates which of the feasibility analysis risks are considered to be design risks and will continued to be managed as a risk during the design and implementation phase.

Table 9. Summary of Key Assumptions and Associated Risks for the Decision Analysis

Risk Element/ Assumption	Consequence Description (Reason for Concern)	How Incorporated in the Analysis (Mitigation Technique)	Design Risk
River Flow Frequency	The exact flow in the river for any event frequency is not known. Flow frequency is used to quantify the frequency that the river will reach a given stage and therefore the probability that a levee will be loaded to a certain elevation or overtopped.	Gage record was used to define the uncertainty around the peak annual flow frequency (Bulletin 17b). 100 years of gage record were assumed in the HEC-FDA model to estimate this uncertainty.	-
River stage	River stages are used to quantify the economic damages based on established stage-damage curves. The exact stage resulting from a particular flow rate is not known and there may be a deviation between observed stages and modeled stages.	The hydraulic modeling used included close calibrations for six recent historical flood events, with three exceeding the 1% FEMA peak discharge. A normal distribution with a standard deviation of 0.22 feet was used to estimate this uncertainty.	-

Table 9. Summary of Key Assumptions and Associated Risks for the Decision Analysis

Risk Element/ Assumption	Consequence Description (Reason for Concern)	How Incorporated in the Analysis (Mitigation Technique)	Design Risk
Interior Drainage and Summit Conduit Flow Assumptions	Existing interior drainage is a factor of the runoff from the Summit Conduit subwatershed and overtopping flows from the Des Plaines River. A certain amount of interior drainage is required to accommodate basin flows. The interior drainage behind the McCook Levee relies on the capacity of the Summit Conduit.	The assumed capacity of the Summit Conduit was coordinated with MWRD, USGS and MWRD's consultant Knight Engineering based on hydraulic modeling and flow metering data. The proposed interior drainage modifications include the installation of an adjustable sluiceway at Lawndale Avenue which will allow for adaptive management.	X
Future Hydrology Conditions (Climate Change)	Projected rainfall in Illinois is anticipated to increase in intensity throughout the period of analysis which may impact the flow frequency assumptions. If flow frequency increases, the level of protection of the recommended plan will be reduced.	The levee crest is limited to historic levee crest elevations due to local topographic restrictions, which limits the adaptability of the project for changes to future conditions flows. The existing flood warning system will help to manage residual risks.	-
Exterior- Interior Water Surface Elevation (WSEL) Relationship	The relationship between the water surface elevation of the Des Plaines River and the area behind the levees in the event of levee breach or overtopping is an input to the economic analysis to determine economic damages that would occur during these events.	Due to the unique nature of the interior drainage for this project (Summit Conduit, Lawndale culvert, overflows between the McCook Ditch and the Des Plaines River), a 2-dimensional hydraulic breach analysis was conducted to determine if interior flood stages would be less than river stages during a breach condition. The results of the 2D breach analysis determined that using the river stages for damages was a reasonable assumption.	-
Levee Fragility	The levee fragility curve may not reflect the actual conditions of the existing levee. This effects the estimated likelihood of levee failure at given loadings, effecting the average annual economic damages estimate.	Professional Engineers reviewed existing data to establish the curves based on the worst conditions along the alignment (Appendix E, Attachment 3). A range of curves were developed to account for variability including the best reasonable case, worst reasonable case, and most likely failure scenarios.	-
Acceptability of Existing Structure & Foundation Materials	The proposed rehabilitation relies on the adequacy of existing levee features such as fill material and sheetpile. This assumption effects the quantities, materials, and labor required to implement the project alternatives.	The levees have been in place since the early 1900's, with one failure reported in 1979 which was repaired and the entire levee was bolstered with sheetpile. Conservative soil parameters were used in stability design which indicated adequate factor of safety (Appendix E, Table 6). Additional borings will be completed before final design.	X

Table 9. Summary of Key Assumptions and Associated Risks for the Decision Analysis

Risk Element/ Assumption	Consequence Description (Reason for Concern)	How Incorporated in the Analysis (Mitigation Technique)	Design Risk
Railroad Seepage	The railroad crossings are supported on permeable ballast, which may lead to uncontrolled seepage through levee which could affect the performance of the levee.	Proposed design includes a clay blanket on riverside slopes to tie into bridge abutment to prevent seepage. A similar design was completed on the Upper Des Plaines Levee 50 project and was determined to acceptably address seepage risks. Additionally, soil borings around the railroad will identify the extents of the permeable material to determine how much clay blanket would be required. Site-specific details will be finalized in design.	X
Levee Seepage	A toe drain feature was assumed to be an adequate management technique to address levee underseepage concerns.	Toe drain technique was assumed to develop a feasibility level cost and should be appropriate for most seepage mitigation scenarios. After additional borings are collected, another method may be recommended which would cost less than the toe drain feature (as discussed in Appendix E).	X
Construction of Closure Structure and Tie-backs Through McCook Ditch	Subsurface of tie-backs and closure structure over the existing ditch is unknown. Quantities and construction methods assume that the materials are adequate for the levee foundation.	Additional borings will identify conditions for final design. The feasibility report identifies this risk and applies an appropriate cost contingency based on the likelihood and consequence of needing to make a significant design change.	X
Existing Levee Footprint and Crest Elevation	The footprint, slopes, and crest elevations (top of levee) affect the amount of material and construction methods required for performing the necessary repairs for with-project alternatives. Significant discrepancies between estimates and actual needs can affect the final cost estimate.	The existing topographical and LiDAR data were used to develop feasibility estimates for quantities and construction methods. Additionally, a survey was conducted to confirm the accuracy of these recently developed datasets. This risk was considered in the contingency developed for the alternative cost estimates.	X
Rates for Labor, Equipment, and Material	The project cost is a function of the labor, equipment, and material required for each alternative. Estimates for these inputs are uncertain and can change based on market demands.	The current rates for current labor, equipment, and material were used, with estimates for escalation over time. Additionally, the uncertainties associated with these inputs were addressed during the cost certification process and accounted for in the cost contingency.	X
Construction Schedule	The construction schedule impacts the amount of cost escalation required and increases to the schedule duration can drive up the cost.	The construction duration for similar projects served as the basis for this estimate, accounting for some site-specific needs. The uncertainties associated with these inputs were addressed during the cost certification process and accounted for in the cost contingency.	X

Table 9. Summary of Key Assumptions and Associated Risks for the Decision Analysis

Risk Element/ Assumption	Consequence Description (Reason for Concern)	How Incorporated in the Analysis (Mitigation Technique)	Design Risk
HTRW Potential	The likelihood of encountering HTRW within the project area relies on existing information obtained through EDR and a current site visit; though unlikely, there is potential for future discovery of HTRW that could delay project implementation.	A HTRW Phase I ESA completed during the feasibility phase indicates that there is no evidence of REC/HTRW on the project site that will require a response action. HTRW response actions are a non-Federal cost and local sponsor responsibilities associated are outlined in the PPA.	X
Managing Excess Materials Onsite	Quantities used and costs developed assume all soil and sediment materials generated during construction can be incorporated into the project and reused onsite. If materials must be transported for offsite disposal, actual disposal costs will be higher than assumed for feasibility.	Current project design allows for incorporation of all excess materials. Additional characterization and/or coordination with the local sponsor is recommended in the design phase if all excess materials cannot be reused onsite. Offsite disposal may be to other upland site, for beneficial reuse, or regulated facility.	X
Environmental Habitat Mitigation	Feasibility analysis assumes no wetland mitigation or tree mitigation will be required for implementation of the recommended project.	Project features will be coordinated with the local regulatory agencies, other project stakeholders, and real estate interests, during public review period for concurrence with assumptions.	X
Endangered or Protected Status Species	At the time of the feasibility study, no endangered or protected species were identified on the project site.	NEPA scoping completed with FWS and IDNR, and other regulatory agencies, during feasibility phase supports the analysis. Project features will be coordinated with the local regulatory agencies during public review period for concurrence on "no effect" determination.	X
Tree Removal Adjacent to Residential Properties	There is a risk for a lack of local support for the project if trees are removed adjacent to residential properties. This can result in an increase to the amount of time to coordinate a resolution.	No trees were identified for removal on residential properties at this time. It is believed that the current easement is sufficient and the current landowner would support tree removal to adequately construct, operate, and maintain this project.	X
Railroad Easement Negotiations	Generally 18 months is the standard for acquisition required involving railroads, due to the complexity associated. If the acquisition timeline is longer, this may impact project schedule and associated escalation of construction costs.	It was decided that 16 months was sufficient and consistent with project needs. Length of time deemed sufficient due to anticipated precedent set with identical acquisition required for the Forest View project (directly east).	X
Construction of Tie-backs on Leased Land	Tie-back land is owned by the NFS and is currently leased for industrial use. Lease-holder's property may be impacted more than expected; final design will determine exact acquisition requirements.	Length of time required for negotiations was considered and taken into account for schedule formulation (16 month timeline).	X

Table 9. Summary of Key Assumptions and Associated Risks for the Decision Analysis

Risk Element/ Assumption	Consequence Description (Reason for Concern)	How Incorporated in the Analysis (Mitigation Technique)	Design Risk
Impact to Existing Utilities	Any need for utility relocation could impact the acquisition schedule and an opinion of compensability would be required by a real estate attorney.	The PDT is aware that coordination will be required if impact is determined during the design phase. No utility impacts were identified at this time.	X
Structure Inventory Counts and Composition Assumptions	The inventory is composed of industrial, commercial, and residential structures. The number and location of structures typically affects the benefit estimates more than the remainder of inputs.	Available information shows little change in the past several decades and is expected to remain the same into the future. The inventory counts and composition were kept static for the entirety of the period of analysis.	-
Structure & Vehicle Elevations	The elevation of structures affect the beginning damage point for the structure specific depth-damage functions. This affects the estimation of project benefits.	Recent LiDAR and Google StreetView Imagery were used to perform a visual survey of the inventory and assess the elevation variability. The uncertainty surrounding the first floor elevations was estimated using a normal distribution with a standard deviation of 1.5 feet.	-
Structure & Content Values	The structure & content values are the primary input to determine the economic damages which could be avoided in the with-project conditions. This affects the estimation of project benefits.	Recent county assessor appraisal data was used to develop the structure value estimates. The uncertainty surrounding the structure & content values was estimated using a normal distribution with a standard deviation of 50% of the structure value.	-
Vehicle Values	The exact number and value of vehicles is not known. Potential damages avoided to vehicles affect the benefits provided by the with-project conditions.	HAZUS 2.2 estimates for vehicle counts and values, derived from the 2010 Census, were used as the basis for these estimates. The uncertainty surrounding the structure & content values was estimated using a normal distribution with a standard deviation of 50% of the vehicle value.	-
Emergency Costs	The exact type and amount of emergency costs associated with flooding are not known. Potential damages avoided to vehicles affect the benefits provided by the with-project conditions.	These inputs are highly uncertain as only minimal flooding has been experienced and emergency costs are not typically widely available without a detailed post-flood history report. As a proxy, the emergency costs were estimated using an available report developed by the New Orleans District, using expert elicitation for typical costs associated with evacuation, cleanup, and displacement.	-

3.6 RECOMMENDED PLAN

The National Economic Development (NED) Plan consists of the alternatives that best meet the study objectives, avoids constraints, and provides the highest net benefits for each Damage Area (A & B). Based on the separable elements analysis conducted and the assessment of environmental impacts, segmented levee repair of the McCook Levee (Alternative 3A) and repair of the West Lyons Levee to the existing elevation (Alternative 2Ba) are combined together for the Recommended Plan.

The recommended plan for the McCook Levee provides approximately 2 feet of freeboard above the 1%ACE flood profile and the recommended plan for the West Lyons Levee provides approximately 1.5 feet of freeboard. Since the recommended plan does not provide 2 feet of freeboard for the 1% ACE for the complete system, the levees will not be eligible for FEMA levee accreditation as part of the National Flood Insurance Program (NFIP).

3.6.1 * Recommended Plan Description

McCook Levee – Segmented Levee Repair (Alternative 3A):

The existing McCook Levee will be repaired and improved in 2 segmented sections protecting two individual low ground areas: the north and the south segments. Both segments will be repaired and regarded to an elevation of 602.5 feet, which provides approximately 2 feet of freeboard above the 1% ACE flood profile.

Southern Segment

The southern segment will require two tiebacks:

- The southern tieback levee will extend from high ground at Lawndale Ave southwest to meet elevation 602.5 feet. This levee is 170 feet long and will require a clearing area of the existing levee, plus 15 feet on each side of the toe. Six inches of topsoil will be removed and respread at this location.
- The north tieback for this south levee will be onto the adjacent industrial property, and an easement will be required. The tieback is required to elevation 602.5 feet and will cross McCook ditch. The entire southern levee will need to be cleared of existing woody material, a total length of 2,450 feet for an approximate clearing area of 2.5 acres.

The main portion of the south segment of the levee will be repaired to its existing elevation, side slopes repaired and woody material cleared from the levee and its buffer zone. The length of the south levee is 2,080 feet. The Riverside slopes will be repaired with riprap to a 2:1 slope. The landside slopes will be cut back into the levee to create a 2.5:1 slope, while still maintaining a minimum 10 foot wide crest. Repair and improvement activities will also include removal of existing levee encroachments such as trees and placing compacted fill where roots, animal burrows, or other encroachments have compromised the integrity of the levee.

The existing culvert at Lawndale will remain partially open, allowing the McCook ditch to continue draining through Summit Conduit. A closure structure will be installed to keep flows at a level that can be drained through the Summit Conduit without causing interior flooding. A new concrete headwall will be constructed at the south entrance to the culvert under Lawndale. A 5 by 5 foot sluice gate will be installed with a trash rack installed in front of the gate. The gate will be kept partially closed during most flood conditions. MWRDGC will need to maintain the gate at the correct level, or enter into an O&M agreement with the local community to do so.

The remainder of the water flowing through McCook ditch will drain to the Des Plaines River through a new culvert installed just south of Lawndale. This culvert will be either a Reinforced Concrete Pipe (RCP) at 78 inches in diameter or Corrugated Metal Pipe (CMP) at 102 inches in diameter. Length of pipe will be 35 feet, with approximately 20 feet of open channel drainage ditch leading up to the culvert on both the inlet and outlet ends. The newly installed culvert will have a backflow preventer to prevent flow from the Des Plaines River from entering the McCook Ditch at that location.

Northern Segment

The second portion of the recommended alternative is to create a North levee, extending from a tieback just south of the Railroad, north to 47th street. This tieback will also cross McCook Ditch, onto private property and require an easement. This levee will tie into elevation of 602.5 feet. Along with this tieback, some repair will be done of the levee crest just south of the Railroad to maintain the 602.5 foot elevation all the way to the RR tie-in. This requires a repair of approximately 200 feet of existing levee.

The main portion of the levee from the Railroad to 47th street does not require significant work. The existing elevation is sufficient, and the side slopes vary from 2:1 to 3:1. Based on test repair surfaces, a minimal clay quantity of about 350 cubic yards (CY) would be needed to restore the entire levee length of 540 feet to 3:1 slopes. Therefore no repair is needed on this portion of the levee to meet the requirements.

Clearing will be done on the main levee and the tieback, for a total clearing distance of 765 feet, and an approximate clearing area of 1.0 acre. Activities will include removal of existing levee encroachments such as trees and placing compacted fill where roots, animal burrows, or other encroachments have compromised the integrity of the levee.

At the intersection of the levee with the Railroad, clay blankets will be installed on the north and south sides of the railroad slope, to tie into the levee crest elevation. This is to prevent overtopping and seepage through the railroad ballast. The clay blanket will be 3 feet thick, and tie into the existing levee to the north and south.

In the section of existing levee that will not be repaired, between the north and south levee tiebacks, a new culvert will be added to drain the northern portion of McCook Ditch to the Des Plaines River. The culvert will be a 35 feet long, 39 inches in diameter RCP, with a small drainage ditch leading up to the inlet and outlet.

West Lyons Levee – Repair with Existing Freeboard (Alternative 2Ba):

The existing West Lyons Levee will be repaired to its existing elevation for 870 feet, which varies from 602.5 feet to 603.1 feet (high ground). The majority of the existing levee slopes are greater than 3H:1V. Approximately ½ of the riverside length, or 450 feet, will need minimal regrading to meet slope requirements, and approximately 975 CY of fill. Woody vegetation will be cleared on

the levee and for 15 feet to each side. Repair activities will include removal of existing levee encroachments such as trees and placing compacted fill where roots, animal burrows, or other encroachments have compromised the integrity of the levee. The levee will be repaired and regraded to an elevation of 602.5 feet, which provides approximately 1.5 feet of freeboard above the 1% ACE flood profile.

3.6.2 Recommended Plan Benefits and Costs

For this project, the NED plan is the recommended plan. Once the recommended plan has been identified, the cost engineers perform a final review and update of the total plan to provide a better understanding of the necessary investment and implementation assumptions. This process results in a “certified” cost estimate, which typically varies from the parametric, or preliminary estimates used for plan formulation. This final cost estimate is used for making a final determination regarding the project’s feasibility, budgeting decisions, and potential cost sharing agreements for project implementation. The certified estimate and the annualized economic cost is provided below, in Table 10.

Table 10. Certified Cost Estimate for the Recommended Plan

McCook Levee Recommended Plan Cost Estimate	Estimated Cost (\$1,000)	
	Alt. 3A & 2Ba Segmented Repair To 602.5 ft	
Construction ¹		
Engineering and Design (15.6%)		
Construction Management (8.8%)		
LERRDs		
Total First Costs		
Interest During Construction ²		
Annualized First Costs		
Annual OMRR&R		
Average Annual Cost		
¹ Construction Estimate includes a contingency ² Interest During Construction accounts for the time value of money, prior to project implementation 2021 Base Year; October 2017 Price Levels; 2.75% Federal Discount Rate for FY2018; 50 year period of analysis		

As fully detailed in Appendix C (Economic Analysis), the estimates used to develop the average annual net benefits (outlined in Table 7) are appropriate for making a risk-informed decision regarding the NED plan. However, these estimates do not account for the uncertainty in levee performance, or the full distribution of cost estimates. By combining these two pieces of information with the analysis previously described, decision-makers can have a clearer understanding regarding the expected economic performance of the NED plan. The following distributions were developed and analyzed using @Risk, an Excel Add-In frequently used for quantitative risk analyses within USACE.

Probabilistic distributions for the BCR and net benefits we derived using:

- A triangular distribution defined by cumulative damage distributions for three failure scenarios (high, most likely, and low risk of failure scenarios)
- Weibull distributions defined by:
 - Construction Cost estimates representing the base estimate (5th percentile), 50th percentile, and 80th percentile
 - OMRR&R and LERRDs estimates representing the base estimates (5th percentile) and 80th percentiles
- Output distributions defined by:
 - Benefits minus costs, or net benefits
 - Benefits divided by costs, or benefit cost ratios (BCRs)
- Monte Carlo simulation with 50,000 iterations

These estimates, including their five number summaries, are displayed in Table 11. The quartile values can be interpreted as the probability that the estimated value will exceed a given percentage of time, or the confidence that we expect a value to be met or exceeded. For example, we are 75 percent confident that the project's BCR will equal or exceed [REDACTED] and 25 percent confident that the project's BCR will equal or exceed [REDACTED]. By displaying these ranges, decision makers can better understand the potential uncertainty in costs and benefits associated with the Recommended Plan.

Table 11. Probabilistic Benefit to Cost Ratios for the Recommended Plan

	Mean & Five Number Summary (\$1,000)					
	Mean	Minimum	25 th Percentile	50 th Percentile	75 th Percentile	Maximum
Expected Annual Benefits	\$626	\$100	\$596	\$609	\$738	\$1,676
Expected Annual Costs	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Expected Annual Net Benefits	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Benefit to Cost Ratio	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
October 2017 Price Levels; 2.75% Federal Discount Rate for FY2018; 50 year period of analysis						

3.6.3 Residual Risk

Levees are often perceived as total protection from flood risk; however, with the implementation of any project there will be remaining residual risks of flooding due to the chance of extreme events exceeding the design capacity. There is also a residual risk of levee breach, although this risk is extremely low. If the levees are overtopped or fail, floodwater would impact the areas behind them resulting in risk to life safety and property.

Flood Warning and Preparedness

As described in Section 1.4, USACE, MWRDGC, and the Village of Forest View partnered to develop a flood warning and preparedness plan for the Village of Forest View in 2014. The plan includes monitoring the Des Plaines River gages at Riverside and 47th Street. In addition to monitoring for flood conditions, the plan outlines steps for emergency officials and residents to take prior to and during a

flood event. The National Weather Service provides forecasting for the Riverside gage when river stages approach flood elevations. The amount of warning time varies, and can be as little as a few hours in advance of a flood event, but is typically about a day prior to significant flooding. Similarly, the duration of a flood can vary, lasting from a few hours to a few days. Longer duration flood events will build slowly before reaching the peak stage and receding. The warning plan can be used to provide warning for potential overtopping of the McCook and West Lyons Levees as well.

Climate Change

As discussed in Appendix D, there is evidence that long term shifts in precipitation frequencies with increased storm intensities are possible in the future, which would result in an increase frequency of flood events. Based on these predictions, the proposed project may provide greater benefits in this future condition than currently estimated. In terms of impacts to life-safety, shifts in the storm frequency distribution could ultimately change the level of protection afforded by a proposed levee. As increased storm intensities are realized in the future, it will be important for USACE to work with the non-Federal sponsor and local community to help them understand probabilities of flooding and the risks associated with living behind a levee.

3.6.4 Estimated Project Costs and Schedule

Real estate requirements for the project include levee easements over 8.98 acres, temporary work area easement on 2.38 acres, and drainage ditch easement on 0.07 acres. No requirements for utility relocations have been identified. The estimated real estate costs are summarized in Table 12 and can also be found in Appendix G.

Table 12. LERRD Value Summary

Easement Requirement	Acres	Estimated Value (\$)
Flood Protection Levee Easement	8.98	
Drainage Ditch Easement	0.07	
Temporary Work Area Easement	2.38	
Incremental Cost Estimate (10%)	--	
Total Lands and Damages (Rounded)	10.52	
Administrative Costs	--	
TOTAL	--	

Total project costs and schedule for the completion of the Feasibility Study, Design Phase, and Construction were estimated based on previous and ongoing Chicago District projects and USACE Great Lakes and Ohio River Division (LRD) project schedule recommendations. Table 13 and Table 14 summarize anticipated project costs and schedule for implementation of the Recommended Plan. The cost and schedule are preliminary and are subject to change as the final designs are developed.

Table 13. Estimated Project Cost Apportionment

	FY2016	FY2017	FY2018	FY2019	FY2020	FY2021
Feasibility Study Costs^[1]	\$56k	\$111k	\$433k			
FED share ^[2]	\$56k	\$102k	\$192k			
non-FED	\$0k	\$9k	\$241			
Design & Implementation Costs^[3]						
Design Analyses, Plans & Specs						
Construction						
LERRDs						
FED share						
non-FED						
non-FED cash/WIK						
non-FED LERRD						
Total Project Cost						
FED share						
non-FED						
^[1] First \$100,000 is 100% federal responsibility. All Feasibility costs after Feasibility Cost Sharing Agreement (FCSA) execution are shared 50/50. ^[2] Assume Independent External Peer Review (IEPR) contract cost of \$130k in FY18 at 100% Federal cost, if determined necessary ^[3] Design and implementation costs are shared 65% Federal and 35% non-Federal						

Table 14 Implementation Schedule

Milestone	Scheduled ^[1]	Actual
Initiate Feasibility Phase	April 2016	April 2016
Submit Federal Interest Determination Report	July 2016	July 2016
Major Subordinate Command (MSC) Approved FID report	July 2016	July 2016
Execute Feasibility Cost Share Agreement	October 2016	March 2017
Submit MSC Decision Milestone (MDM) Draft DPR	March 2018	-
MSC Approved MDM Draft DPR	March 2018	-
NEPA Public Review	April 2018	-
Submit Draft Final DPR	August 2018	
MSC Approved Decision Document	October 2018	-
Project Approval - Initiate Design and Implementation Phase	December 2018	-
Fully Executed Project Partnership Agreement (PPA)	January 2019	-
Agency Technical Review (ATR) Certified Construction Plans and Specifications	September 2019	-
Real Estate Certification / RTA	April 2019	-
Construction Contract Award	July 2020	-
Construction Complete	June 2021	-
Project Closeout	August 2021	-
^[1] The first four "Scheduled" dates represent the dates that were presented in the Federal Interest Determination (FID) in July 2016; The remainder of the dates have been modified to represent the updated schedule that was developed following the execution of the FCSA		

3.6.5 Key Design and Implementation Assumptions, Risks, and Uncertainties

In addition to the key decision uncertainties detailed in Section 3.5.3, risks associated with design and implementation of the recommended plan exist. Table 16 summarizes identified risks associated with the investment decision analysis, as well as additional considerations, which need to be considered during design and implementation. Each risk element is outlined based on the reason for concern, a rating for the probability and consequence of risk, the overall risk rating, and the planned mitigation technique to be applied during the next phase of this project to manage the risk element. The probability and consequence ratings are used to define the overall risk rating for each of the key risk elements, and outlined in Table 15.

Several risks identified in Section 3.5.3 as key assumptions and risks for the decision analysis are carried forward for risks to be considered and managed during the design and implementation phase as well. Probability, consequence, and risk ratings are assigned to these risk elements for the design phase. Table 9 is referred to for a details on the consequence and mitigation technique applied.

Table 15. Risk Matrix

Consequence Rating					
High	Medium	Low	None		
High	High	Medium	None	High	Probability Rating
High	Medium	Low	None	Medium	
Medium	Low	Low	None	Low	
None	None	None	None	None	

Table 16. Key Risks for Design and Implementation of the Recommended Plan

Risk Element for Design & Implementation	Consequence Description (Reason for Concern)	Prob.	Cons.	Risk Rating	Planned Mitigation Technique
Interior Drainage and Summit Conduit Flow Assumptions	Refer to Table 9	L	L	L	Refer to Table 9
Acceptability of Existing Structure & Foundation Materials	Refer to Table 9	L	H	M	Refer to Table 9
Railroad Seepage	Refer to Table 9	L	L	L	Refer to Table 9
Levee Seepage	Refer to Table 9	M	L	L	Refer to Table 9
Construction of Closure Structure and Tie-backs Through McCook Ditch	Refer to Table 9a	M	M	M	Refer to Table 9
Existing Levee Footprint and Crest Elevation	Refer to Table 9	L	L	L	Refer to Table 9
Rates for Labor, Equipment, and Material	Refer to Table 9	M	L	L	Refer to Table 9
Construction Schedule	Refer to Table 9	M	L	L	Refer to Table 9
HTRW Potential	Refer to Table 9	L	M	L	Refer to Table 9
Managing Excess Materials Onsite	Refer to Table 9	L	M	L	Refer to Table 9
Environmental Habitat Mitigation	Refer to Table 9	L	L	L	Refer to Table 9
Endangered or Protected Status Species	Refer to Table 9	L	M	L	Refer to Table 9
Tree Removal Adjacent to Residential Properties	Refer to Table 9	L	L	L	Refer to Table 9
Railroad Easement Negotiations	Refer to Table 9	L	L	L	Refer to Table 9
Construction of Tie-backs on Leased Land	Refer to Table 9	L	L	L	Refer to Table 9

Table 16. Key Risks for Design and Implementation of the Recommended Plan

Risk Element for Design & Implementation	Consequence Description (Reason for Concern)	Prob.	Cons.	Risk Rating	Planned Mitigation Technique
Impact to Existing Utilities	<i>Refer to Table 9</i>	L	M	L	<i>Refer to Table 9</i>
Economic Justification	If the project costs were to change significantly during design or construction, it is possible the project would become too expensive to remain something that remains in the Federal Interest (a benefit to cost ratio above 1.0 at the current Federal Discount Rate).	L	L	L	The economic analyses included a comparison of the probabilistic benefits and costs. At the current Federal Discount Rate of 2.875%, this analysis estimated that there was a 99% level of confidence that the benefits produced would exceed the costs (be economically justified).
Contract Acquisition Strategy	Timing or source of contract may impact bid prices	L	L	L	Cost Estimate assumes range of acquisition possibilities. This risk is included in the cost contingency.
Funding Availability	The estimated design and construction schedule assumes federal and non-federal funding will be provided when necessary. If funding is not immediately available, the schedule may be impacted.	L	L	L	USACE and MWRDGC have indicated commitment to fully fund completing on this study and the construction of the recommended plan. Continued close coordination is planned.

3.6.6 Non-Federal Sponsor Responsibilities

The non-Federal sponsors must provide a minimum cash contribution equal to 5 percent of total project costs allocated to the project, as well as all LERRDs determined by the Government to be required for the project. If the sum of the sponsor's total cash and LERRD contributions is less than 35 percent of the costs assigned to FRM, the non-Federal sponsors will pay the difference in cash. If it is greater than 35 percent, total non-Federal costs shall not exceed 50 percent of total project costs assigned to flood control. Contributions in excess of 50 percent will be reimbursed by the Federal Government to the non-Federal sponsors, subject to the availability of funds (See ER 1105-2-100, Appendix E, Paragraphs E-21 a and b). However, the non-Federal sponsor is responsible for all costs in excess of the Federal per project limit, even if it results in a non-Federal share greater than the maximum non-Federal cost sharing percentage for structural flood control measures.

In addition to financial responsibilities, the non-Federal sponsor must comply with applicable Federal laws and policies, including the development of a floodplain management plan to communicate the residual risk remaining after project completion to affected stakeholders within one year after signing a

project cooperation agreement. This plan must be implemented within one year after the construction of the project.

Additional details related to non-Federal sponsor responsibilities is included in Section 9.

4 * ENVIRONMENTAL EFFECTS OF RECOMMENDED PLAN

The Recommended Plan is anticipated to have no significant adverse direct or indirect environmental effects; and due to the highly degraded nature of the study area, it is anticipated that benefits of invasive species eradication would be a positive outcome of the Recommended Plan. No impacts associated with the environmental resources described in Section 2 are anticipated.

The feasible alternatives that will not move forward as part of the Recommended Plan for McCook 205 would have no noticeably or significantly different environmental effects from those associated with the Recommended Plan. For this reason, the impacts of the non-preferred alternative(s) are not presented in detail in this section. The No Action Alternative conditions would result in relatively no change to the current conditions presented in Section 2.0 Affected Environment. .

A description of the HTRW investigation recommendations for the Feasibility Phase is also included below.

4.1 SOILS

The Recommended Plan will require the use of machinery to manipulate and grade soils within the study area. The soils are already highly disturbed within and around the levee since they were likely brought in from other sites to construct the levee initially. Should the No Action alternative be selected, this condition would remain. The small footprint of the project will result in no direct or indirect adverse effect to soils within the project area.

Soils of the affected study area in terms of ecosystem support have been obliterated from the existing levee zones (the levee and 25 foot buffer on each side), the McCook Ditch and various other areas affected by the surrounding industries and infrastructure. Since affected study area soils have already been removed, mixed, or are frequently disturbed naturally by floods, effects to natural soils in terms of supporting ecosystem integrity are not expected resulting from the Recommended Plan. Short term effects within a 25 foot work zone on each side of the levee include clearing, grubbing and minor excavation; however, the grade will be restored at project completion.

4.2 SURFACE WATERS AND OTHER AQUATIC RESOURCES

4.2.1 Surface Water

There are no adverse impacts to surface water anticipated as a result of the Recommended Plan. The 404(b)(1) evaluation included in Appendix I includes a full description of the evaluation and assessment of potential impacts. The No Action alternative would potentially not have any effects on wetlands or waters of the US.

4.2.2 Groundwater

Construction related to the recommend plan, including foundation work, is surficial and is not anticipated to have any impact on the existing groundwater conditions. There would be no change to groundwater conditions as well under the No Action alternative.

4.2.3 Flood Plains

The floodplain ecosystem at the McCook Levee no longer exists due to being developed. The floodplain ecosystem along the West Lyons Levee is hydrogeomorphically intact and connected to the river at most all flood stages. Since the Recommended Plan does not propose new levees within the floodplain or significantly enlarge existing levees that would further fill, fragment or impair existing floodplain areas, adverse effects are not expected. These conditions would also be the same under the No Action alternative.

Executive Order (EO) 11988 (May 24, 1977) outlines the responsibilities of Federal agencies in the role of floodplain management. In accordance with this EO, USACE is required to evaluate the potential effects of actions on floodplains, and to not undertake actions that directly induce development in the floodplain, unless no practicable alternative exists. The recommended plan includes actions in the floodplain, however it would not have any adverse impacts in the floodplain since the project consists mostly the repair of existing levee structures. Additionally, it is not anticipated that the plan would encourage additional development within the floodplain since the structures will not be elevated to provide an additional level of protection nor will they be eligible for levee accreditation through FEMA's NFIP and therefor the area behind the levees will not be eligible to be remapped as area protected by a levee on FEMA's Flood Insurance Rate Maps (FIRM).

4.2.4 Wetlands

The McCook Ditch is not considered a Riverine or Palustrine wetland due to the fact it was created to manage floodwaters behind the McCook Levee and was constructed with an amalgam of earthen fill types. This ditch also starts in a pipe, travels underneath the Des Plaines River in a pipe, and ends in a pipe that discharges into the CSSC. There are no Palustrine wetlands within Lyons Levee zone as there is no groundwater input or ephemeral or perennial surface water to support such systems. The only existing wetlands within the affected study area is the Riverine - Rock Bottom Des Plaines River proper, and Riverine - Emergent wetland along the toe of the existing McCook Levee. This narrow strip of wetland was induced by the construction of the McCook Levee as well, where the toe protrudes into the river forming a silt bench that Reed Canary Grass has grown in. The Floristic Quality Analysis (FQA) and Mean Coefficient of Conservatism (C) of this Reed Canary Grass wetland was determined to both be zero (0). These conditions would remain under the No Action alternative; however, the narrow strip of Riverine – Emergent wetland will be affected by the Recommend Plan via filling with angular dolomitic limestone, or riprap.

Since the Des Plaines River is consolidated bed rock (dolomitic limestone) in this reach, it is expected the addition of more dolomitic limestone to the stream bed will have no effects on the existing substrates of the river. However, since dolomitic limestone will replace the Riverine Emergent wetland fringe, it is expected that 0.84-acres of this wetland type will be changed to Riverine – Rock Bottom wetland. Since

the change in wetland type has offsetting values, no mitigation is being required; Section 5 discusses this point in detail.

4.3 WILDLIFE HABITATS

4.3.1 Terrestrial and Aquatic Vegetation

Terrestrial and aquatic plant communities within the affected study area are considered ruderal (disturbed by man) and highly impaired. It is estimated that there is nearly a 100% coverage of non-native and highly invasive species on the McCook Levee, McCook emergent wetland toe, McCook Ditch and Lyons Levee footprints. The Lyons Levee zone is only just better by having a few native tree and herbaceous plants scattered throughout the monotypic stands of Reed Canary Grass and Buckthorn thickets. These conditions are anticipated to remain under the No Action alternative; however, there could be non-Federal efforts in the future to clear the levees of noxious weeds for purposes of either levee or ecosystem integrity enhancements.

Since the Recommended Plan will remove all the invasive, non-native vegetation within the effected levee and McCook Ditch work limits, subsequently replanting with a mowable native grass and forb matrix, no adverse effects are expected to native terrestrial plant communities from these activities. Vegetation will be maintained in accordance with Engineering Technical Letter (ETL) 1110-2-583, "Guidelines for Landscape Planting and Vegetation Management at Levees, Floodwalls, Embankment Dams, and Appurtenant Structures" which requires grasses on these structures to be maintained at less than 12-inches in height. Vegetation must be managed in this manner in order to allow for inspection, maintenance, and flood fight response activities.

Levee standards require that there is no woody vegetation present along the toe of the levees for 15 feet. This zone will have all trees and shrubs removed, and subsequently replaced with a native mix of grasses and forbs that can be mowed once yearly. There may be disturbance and some tree removal within the greater 25 foot buffer for temporary construction activities, in which existing native plant species would be replaced in-kind.

Overall, no adverse effects to native plant communities are expected from the Recommended Plan. Benefits are anticipated to nearby or downstream natural areas by eradicating a large invasive species source that will also be managed for the expected life of the levee system.

4.3.2 Fauna

The natural and native plant communities and habitats within the effected levee zone have been modified into an engineered system and a resulting Eurasiatic Thicket plant community. This past effect caused the native faunal communities to change to one typical of an urban setting. These conditions would remain under the No Action alternative. The Recommended Plan proposes modification to the thicket communities, and for the most part eliminating them from the levee zone. This action will disperse those urbanized faunal species to other open spaces of the areas; which has no effect on the natural faunal communities of the Chicago Region. Adverse displacement effects to local urbanized faunal communities are not considered to be adverse or significant. It is anticipated based on vegetation

change to native grasses and forbs within the levee zone that certain terrestrial insect species groups will increase, such as bees, butterflies and spiders with subsequent uses by smaller bird species that utilize the food source native grassy habitats provide.

Indirect effects to migratory birds is possible, but unlikely due to the highly degraded plant community structure and absence of important food source plant species. In order to ensure that birds migrating down the Des Plaines River corridor are not disturbed, vegetation and tree clearing is recommended to only occur during non-migratory periods of winter and summer.

4.4 ENDANGERED AND THREATENED SPECIES

4.4.1 Federal

Federally Threatened & Endangered species or their critical habitat do not occur within the study area. Based on this, the USACE has determined “no effects” to Federally Endangered and Threatened Species and/or their critical habitats. The study team has coordinated with the U.S. Fish & Wildlife Service and received a response email on 17 July 2017. The team expects concurrence with USACE’s determination of “no effects”.

4.4.2 State

State Threatened & Endangered species or their critical habitat do not occur within the study area. Based on this, the USACE has determined “no effects” to State Endangered and Threatened Species and/or their critical habitats. The study team has coordinated with the Illinois Department of Natural Resources via a National Environment Policy Act (NEPA) scoping letter sent on 14 June 2017 and expects concurrence with USACE’s determination of “no effects”.

4.5 RECREATIONAL, SCENIC, AND AESTHETIC RESOURCES

Recreational resources would experience minor, short-term adverse impacts from the proposed project. During project construction, the portion of the Salt Creek Greenway Trail that crosses the West Lyons Levee may be temporarily disturbed. There would be no long-term impacts to the recreational resources. Tree removal along the levee slope and within 15 feet on each side of the levee footprint will result in an aesthetic modification for people that prefer woodlands to prairies. These changes may include increased line-of-sight from the Salt Creek Greenway Trail to the Des Plaines River and also increased line-of-sight to the residential backyards directly adjacent to the West Lyons Levee. The conditions under the No Action alternative would remain as more secluded thicket-like trails.

4.6 CULTURAL RESOURCES

The proposed construction would have no adverse effect on archaeological or historic properties, as defined by the National Historic Preservation Act of 1966. The Illinois State Historic Preservation Officer (SHPO) has concurred with this determination (letter dated December 17, 2015).

In the event that cultural remains are discovered during this project, all work will be halted, the Chicago District’s cultural resources point-of-contact will be notified, and consultations will take place with the Illinois SHPO.

Native American groups having an interest in Northeastern Illinois have been consulted via NEPA scoping letters dated June 14, 2017. The Miami Tribe of Oklahoma has responded to USACE's scoping letter as part of the NEPA process (letter dated July 3, 2017); they had no objections at that time, but requested immediate consultation should human remains or Native American cultural items be discovered at any time.

4.7 AIR QUALITY

Once implemented, the project itself will be neutral in terms of air quality, with no features that either emit or sequester air pollutants. The project is not and will not be a source of greenhouse gas emissions. During the project construction, heavy equipment would cause minor, temporary air quality impacts. However, all equipment will comply with federal vehicle emission standards and dust control measures will be implemented during construction. Temporary mobile source emissions from this project are expected to be *de minimis* in nature according to the terms of the National Ambient Air Quality Standards and the State Implementation Plan. As such, a general conformity analysis was not completed.

4.8 NOISE

The proposed action will cause temporary increases in noise from machinery and equipment during construction, which may not be noticeable in certain reaches due to industrial and commercial activities. These impacts will be temporary and will not result in significant or long-term adverse impacts. These moderately elevated noise conditions would not occur under the No Action alternative

4.9 HAZARDOUS AND TOXIC SUBSTANCES

No HTRW or RECs, will be impacted during project implementation. The following non-HTRW environmental conditions will be considered during design and project implementation:

- A sediment sample collected during the Plainfield Road Corridor Study suggests that the sediment in McCook Ditch may contain levels of iron, lead, and chromium above the State of Illinois CCDD clean fill standards; however, all the reported sediment analytical results are within the State of Illinois risk-based closure value for residential properties, the most restrictive human health risk standards used for State voluntary cleanup actions. Because the concentrations of contaminants found in the sediment are low, and there is no indication of a REC or continued release of contaminants at the site, the likelihood of a CERCLA or other regulatory HTRW response action being required at the site is very unlikely. If disturbance and/or removal of the sediment is required for construction of the project, the material will be used onsite as fill material without increased risk to site users.
- Excess soils and sediment materials generated at the site during construction will be incorporated into the project footprint as much as practicable. If excess sediment generated during construction cannot be reused onsite, it will be disposed in a RCRA Subtitle D landfill facility, or reused beneficially at another upland site, as directed by the project sponsor. Additional characterization will be conducted, if necessary, to determine appropriate disposal options. Sediments generated from the McCook Ditch will be prepared for disposal by dewatering onsite, with return water allowed to percolate into the existing site soils and not directed to a waterway for surface discharge. If surface discharge is the only option for disposal of dewater, additional sediment and elutriate testing will be required during design to confirm

that the discharge of dewater is in compliance with Section 401 of the Clean Water Act. In addition, if excess soils will be generated at the site that cannot be reused onsite, soil characterization will be required during design to determine appropriate disposal options.

- All site trash and debris located within the project limits, including materials dumped at Lawndale Avenue and debris located upstream of the Lawndale Avenue culvert will be removed from the site and disposed in accordance with Federal, State, and local laws and regulations.

4.10 SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE

The Recommended Plan will improve life safety and quality of life for all residents protected by the McCook and West Lyons Levees within the project area. There may be some incidental benefits to property values as well. The proposed project would provide regional economic benefits if sale prices increase following repair of the levees. The No Action alternative would have adverse effects to life safety and the quality of life for those citizen currently protected by the levees.

While this area was identified as containing a potential environmental justice community, no significant negative effects will be borne disproportionately by minority or low-income populations as a result of the project.

4.11 CUMULATIVE EFFECTS

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

Cumulative environmental effects for the proposed flood risk management project were assessed in accordance with guidance provided by the CEQ and USEPA (USEPA 315-R-99-002). This guidance provides an eleven-step process for identifying and evaluating cumulative effects in NEPA analyses.

The overall cumulative impact of the proposed McCook Levee flood risk management project is considered to be socially and economically beneficial, to have no long-term significant environmental impacts and to provide minor benefits to the surrounding natural areas for eradicating an invasive plant species source. This project would provide an average annual benefit of \$649,600 through implementing the proposed levee structural modification. Cumulatively under the No Action Plan, property damage, quality of life, economic, and invasive species effects would eventually result.

4.11.1 Scope of Cumulative Effects Analysis

Through this environmental assessment, cumulative effects issues and assessment goals are established, spatial and temporal boundaries are determined, and reasonably foreseeable future actions are identified. Cumulative effects are assessed to determine if sustainability of any of the resources is

significantly affected, with the goal of determining the incremental impact to key resources that would occur should the proposal be permitted. The spatial boundary being considered is the general area of the proposed flood risk management project. Three temporal boundaries were considered:

- a. *Past* – 1830s, the approximate time that the landscape was last in its natural state.
- b. *Past* – early 1900s, when the existing levee system was constructed
- c. *Present* – 2018, when the decision was being made on the most beneficial flood risk management project.
- d. *Future* – 2068, the year used for determining project life end.

Projecting reasonably foreseeable future actions is difficult. The proposed action (flood risk management) is reasonably foreseeable. Actions by others that may affect the same resources are not as clear. Projections of those actions must rely on judgment as to which are reasonable based on existing trends and, where available, projections from qualified sources. Reasonably foreseeable does not include unfounded or speculative projections. In this case, reasonably foreseeable future actions include:

- a. Continued growth in both population and water consumption within the watershed.
- b. Continued application of environmental requirements such as those under the Clean Water Act.
- c. Continued improvement to surrounding habitats and water quality.
- d. Continued maintenance of levees.
- e. Continued impacts related to climate variability trends, including: flooding, increased storm frequency, and increased storm severity.

4.11.2 Cumulative Effects on Resources

Physical Resources

The physical resources of the Des Plaines River watershed have been significantly modified from their original state. Geology, soils, topography, hydrology, floodplains, wetlands and fluvial geomorphic processes have all been altered for purposes of habitation, industry, commerce, and recreation. Daily activities such as road salting, industrial and municipal discharge, agricultural practices, and contaminants from transportation/vehicles further exacerbate the adverse environmental impacts of widespread landscape modification. As a result, water, sediment and physical habitat quality are impacted at both site-specific and watershed-scales.

Given the past, current, and future conditions of the Des Plaines River watershed, the implementation of the proposed flood risk management project poses only minor, short-term impacts relative to the adverse effects already resulting from development, agriculture, and industry. There are no irrecoverable losses of resources identified with respect to geology, soils, topography, hydrology, water quality, or fluvial geomorphology due to implementation of the proposed plan (Table 17).

Ecological Resources

The ecological diversity of the Des Plaines River watershed has suffered greatly as a result of previous significant physical resource alterations. The watershed was once a diverse mosaic of marsh, prairie,

savanna, woodland, glacial ponds and lakes, and streams that had a steady and dependable hydrology. Extreme landscape modification since European settlement has caused nearly 90% of the original land cover to be converted to agricultural, residential, commercial and industrial land uses, including the McCook Levee study area. Considering past, current, and future conditions of the Des Plaines River watershed, implementation of the Recommended Plan applies minimal cumulative impact in terms of the vast array and magnitude of significant effects caused by development, agriculture, and industry. There are no irrecoverable losses of resources identified in terms of plant, insect, fish, amphibian, reptile, bird, or mammal taxa or the habitats they occupy due to implementation of the Recommended Plan (Table 17).

Table 17. Environmental Impact Summary

Categories of Potential Impact	Past Actions (early 1900s)	Proposed Direct Impacts		Cumulative Impact
		Construction	Operation	
Geology & Soils	Severe	Minor	None	None
Hydrology	Severe	Minor	None	None
Water Quality	Severe	None	None	None
Aquatic Resources	Severe	None	None	None
Terrestrial Resources	Severe	Minor	None	Minor Improved
Land Use	Severe	None	None	None
Aesthetics	Severe	Improved	Maintains Improved	Improved
Air Quality	None	None	None	None
Archaeology/Historic	NA	None	None	None

4.11.3 17 Points of Environmental Quality

As specified by Section 122 of the Rivers, Harbors & Flood Control Act of 1970 (P.L. 91-611), seventeen environmental quality categories of impacts were reviewed and considered in arriving at the final determination. As laid out in Table 18, the following categories were considered: noise, displacement of people, aesthetic values, community cohesion, desirable community growth, tax revenues, property values, public facilities, public services, desirable regional growth, employment, business and industrial activity, displacement of farms, man-made resources, natural resources, air and water. Long-term significant impacts from the Recommended Plan to these identified points are not expected. Temporary minor impacts from constructions activities would occur on some categories (Table 18).

Table 18. 17 Points of Environmental Quality Affects Considered

Points of Environmental Quality	Levee Construction Effects
Noise	minor, temporary negative
Displacement of people	no effects
Aesthetic values	improvement
Community cohesion	no effects
Desirable community growth	no effects
Tax revenues	no effects
Property values	potential benefits
Public facilities	no effects
Public services	flood risk mgmt. benefits
Desirable regional growth	no effects
Employment	no effects
Business and industrial activity	beneficial effects
Displacement of farms	no effects
Man-made resources	repairing man-made resource
Natural resources	minor improvement ^[1]
Air	minor, temporary negative
Water	no effects
^[1] Invasive species eradication & planting of native species	

4.11.4 Hydraulic Effects

A hydraulic analysis was completed to design the features of the recommended plan and determine the effects of the recommended plan on Des Plaines River flood frequency stages, as detailed in Appendix D. Since the plan includes the repair of the McCook Levee and West Lyons Levee to their existing elevations, with only a small areas requiring fill for elevation to the original design elevation adjacent to the railroad crossing, the levee repair does not have any impacts on Des Plaines River stages. Correspondingly, nor does it have any impact on the level of protection of the Forest View Levee on the opposite side of the river. Modifications to the McCook Ditch drainage were modeled to ensure that no adverse stage impacts were induced as a result. Appendix D includes additional detail on this analysis.

4.11.5 Cumulative Effects Summary

Along with direct and indirect effects, cumulative effects of the proposed plan were assessed. Past and present actions have caused significant adverse impacts to natural resources in the project area. Reasonably foreseeable future actions are expected to produce both beneficial and adverse effects. Incremental effects of the proposed project are relatively minor, particularly in comparison to the impacts from historical and present land use alterations in the Des Plaines watershed. As such, cumulative effects of the proposed flood risk management project are not considered to be adverse or significant. Further, the project is anticipated to be highly beneficial to the Villages of McCook, Lyons, and Summit, their people, and their economies.

5 * MITIGATION OF ADVERSE EFFECTS

Adverse effects to, or losses of wetlands or any type of natural community habitats are not anticipated. The existing levee zones have already been severely modified in the early 1900s, which removed all semblance of natural Chicago Region communities or ecotypes. The following activities are considered non-mitigable for reasons provided:

- a) The Recommended Plan will remove all trees within the levee zone, which includes the levee and a 15-foot buffer zone on each side. This activity is normal maintenance for a levee system that is accepted as part of the levee system's management plan, however it fell to the way-side. If this activity was properly implemented, there would be no trees or shrubs on the levee to start with. Also, the trees and shrubs that have colonized the levee zone are predominantly non-native Eurasiatic Thicket species that are specifically targeted for removal under Ecosystem Restoration projects. Finally, the levee zone will be planted with a short list of native grasses and forbs that can be mowed once a year to ensure woody vegetation does not establish. Therefore, this is considered an environmental improvement in itself based on the shift from non-native trees and shrubs to native grasses and flowers.
- b) The Recommended Plan may remove various native trees within a larger footprint (25-feet from toe of the levee zone) for purposes of temporary construction access and associated activities. The general condition of this zone is Eurasiatic Thicket, however, there are a few native trees including but not limited to Hackberry, Catalpa, and Silver Maple. Should any native trees over a DBH of 8 inches be removed from this zone, they will be replaced in kind if deemed high quality; smaller trees will not be replaced. Species such as Silver Maple and other weedy native floodplain trees will not be replaced in-kind, but would be replaced with a higher quality native hardwood species such as White Oak, Shag-bark Hickory, Sycamore, or American Elm. Furthermore, any ground disturbance in this zone will be repaired and seeded with native mesic Woodland Edge grasses and forbs.
- c) The Recommended Plan will clear all invasive species vegetation from the McCook Ditch system and make various repairs on pipe inlets and outlets, add a small amount of fill (250 CY of clay) and install a trash rack. This is a manmade system specifically built to control interior and overtopping drainage. The ditch's manmade geomorphology or hydrology will not change. Therefore, this is a non-mitigable feature; however, the removal of non-native invasive plant species and replacing them with native grasses and forbs will greatly improve site habitat from the current condition.
- d) The Recommended Plan will stabilize and protect the McCook Levee for about 2,440-feet along the toe and in the Des Plaines River proper, subsequently adding 3,000 CY of dolomitic limestone riprap. This thin band is being placed on top of 0.84-acres of existing Riverine-Emergent Marsh that was induced by the construction of the McCook Levee in the early 1900s. The Riverine – Emergent Marsh is a monotypic stand of Reed Canary Grass, with a resulting Chicago Region Floristic Quality Index value of 0. The addition of the dolomitic limestone to this area will actually change the ecotype to closely resemble the adjacent Wetland system of Riverine – Rock Bottom, with material being derived from the same geologic member. It is anticipated that the change in Wetland type will have offsetting values, if not an increase in

species richness and abundance of certain native fishes found within the reach, including but not limited to Bluntnose Minnow, Black Bullhead, Rockbass, Smallmouth Bass, Green Sunfish, Orangespotted Sunfish and IDNR stocked Sauger. The zone of new dolomitic limestone riprap could also be planted with the native emergent Water Willow to further provide native habitat and increase stability of the rock structure.

The Recommended Plan will construct three (3) small segments of tieback levee that will add fill (total of 530 CY in three spots) to already disturbed and graded soils from construction of the McCook and Lyons levee and associated construction for the existing Rail Road bridge crossing. These small tie-backs will not add fill to wetlands; however, they will require removal of the existing Eurasiatic Thicket habitats. Once the levees are complete, they will be planted with native grasses and forbs that can be mowed once a year.

6 IMPLEMENTATION REQUIREMENTS

6.1 PROJECT PARTNERSHIP AGREEMENT

The non-Federal sponsor, MWRDGC, submitted a Letter of Intent (LOI) on 3 April 2018 requesting assistance from USACE under the Section 205 authority. The non-Federal sponsor supports the project and is willing to share the cost of the project. The letter is included in Appendix K.

As summarized in Section 3.6.3, in order for design and implementation of the project to commence, MWRDGC and USACE will need to enter into a Project Partnership Agreement (PPA) which will define the breakdown of funding and work-in-kind requirements between the two agencies. Non-federal sponsor operations and maintenance requirements will be detailed in that agreement.

Federal implementation of the recommended project would be subject to the non-Federal sponsors agreeing to comply with applicable Federal laws and policies, including but not limited to:

- a. Provide a minimum of 35 percent, but not to exceed 50 percent of total flood damage reduction costs as further specified below:
 1. Provide the required non-Federal share of design costs allocated by the Government to flood damage reduction in accordance with the terms of a design agreement entered into prior to commencement of design work for the flood damage reduction features;
 2. Provide, during the first year of construction, any additional funds necessary to pay the full non-Federal share of design costs allocated by the Government to flood damage reduction;
 3. Provide, during construction, a contribution of funds equal to 5 percent of total flood damage reduction costs;
 4. Provide all lands, easements, and rights-of-way, including those required for relocations, the borrowing of material, and the disposal of dredged or excavated material; perform or ensure the performance of all relocations; and construct all improvements required on lands, easements, and rights-of-way to enable the disposal of dredged or excavated material all as determined by the Government to be required or to be necessary for the construction, operation, and maintenance of the flood damage reduction features;

5. Provide, during construction, any additional funds necessary to make its total contribution for flood damage reduction equal to at least 35 percent of total flood damage reduction costs;
- b. Shall not use funds from other Federal programs, including any non-Federal contribution required as a matching share therefore, to meet any of the non-Federal obligations for the project unless the Federal agency providing the Federal portion of such funds verifies in writing that expenditure of such funds for such purpose is authorized;
- c. Not less than once each year, inform affected interests of the extent of protection afforded by the flood damage reduction features;
- d. Agree to participate in and comply with applicable Federal floodplain management and flood insurance programs;
- e. Comply with Section 402 of the Water Resources Development Act (WRDA) of 1986, as amended (33 U.S.C.701b-12), which requires a non-Federal interest to prepare a floodplain management plan within one year after the date of signing a project cooperation agreement, and to implement such plan not later than one year after completion of construction of the flood damage reduction features;
- f. Publicize floodplain information in the area concerned and provide this information to zoning and other regulatory agencies for their use in adopting regulations, or taking other actions, to prevent unwise future development and to ensure compatibility with protection levels provided by the flood damage reduction features;
- g. Prevent obstructions or encroachments on the project (including prescribing and enforcing regulations to prevent such obstructions or encroachments) such as any new developments on project lands, easements, and rights-of-way or the addition of facilities which might reduce the level of protection the flood damage reduction features afford, reduce the outputs produced by the ecosystem restoration features, hinder O&M of the project, or interfere with the project's proper function;
- h. Comply with all applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646, as amended (42 U.S.C.4601-4655), and the Uniform Regulations contained in 49 Code of Federal Regulations (CFR) Part 24, in acquiring lands, easements, and rights-of-way required for construction, operation, and maintenance of the project, including those necessary for relocations, the borrowing of materials, or the disposal of dredged or excavated material; and inform all affected persons of applicable benefits, policies, and procedures in connection with said Act;
- i. For so long as the project remains authorized, operate, maintain, repair, rehabilitate, and replace the project, or functional portions of the project, including any mitigation features, at no cost to the Federal Government, in a manner compatible with the project's authorized purposes and in accordance with applicable Federal and State laws and regulations and any specific directions prescribed by the Federal Government;
- j. Give the Federal Government a right to enter, at reasonable times and in a reasonable manner, upon property that the non-Federal sponsor owns or controls for access to the project for the purpose of completing, inspecting, operating, maintaining, repairing, rehabilitating, or replacing the project;
- k. Hold and save the United States free from all damages arising from the construction, operation, maintenance, repair, rehabilitation, and replacement of the project and any betterments, except for damages due to the fault or negligence of the United States or its contractors;
- l. Keep and maintain books, records, documents, or other evidence pertaining to costs and expenses incurred pursuant to the project, for a minimum of 3 years after completion of the accounting for which such books, records, documents, or other evidence are required, to the extent and in such detail as will properly reflect total project costs, and in accordance with the standards for financial

- management systems set forth in the Uniform Administrative Requirements for Grants and Cooperative Agreements to State and Local Governments at 32 CFR Section 33.20;
- m. Comply with all applicable Federal and State laws and regulations, including, but not limited to: Section 601 of the Civil Rights Act of 1964, Public Law 88-352 (42 U.S.C.2000d) and Department of Defense Directive 5500.11 issued pursuant thereto; Army Regulation 600-7, entitled "Nondiscrimination on the Basis of Handicap in Programs and Activities Assisted or Conducted by the Department of the Army"; and all applicable Federal labor standards requirements including, but not limited to, 40 U.S.C.3141- 3148 and 40 U.S.C.3701 – 3708 (revising, codifying and enacting without substantial change the provisions of the Davis-Bacon Act (formerly 40 U.S.C.276a et seq.), the Contract Work Hours and Safety Standards Act (formerly 40 U.S.C.327 et seq.), and the Copeland Anti-Kickback Act (formerly 40 U.S.C.276c et seq.);
 - n. Perform, or ensure performance of, any investigations for hazardous substances that are determined necessary to identify the existence and extent of any hazardous substances regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Public Law 96-510, as amended (42 U.S.C.9601-9675), that may exist in, on, or under lands, easements, or rights-of-way that the Federal Government determines to be required for construction, operation, and maintenance of the project. However, for lands that the Federal Government determines to be subject to the navigation servitude, only the Federal Government shall perform such investigations unless the Federal Government provides the non-Federal sponsor with prior specific written direction, in which case the non-Federal sponsor shall perform such investigations in accordance with such written direction;
 - o. Assume, as between the Federal Government and the non-Federal sponsor, complete financial responsibility for all necessary cleanup and response costs of any hazardous substances regulated under CERCLA that are located in, on, or under lands, easements, or rights-of-way that the Federal Government determines to be required for construction, operation, and maintenance of the project;
 - p. Agree, as between the Federal Government and the non-Federal sponsor, that the non-Federal sponsor shall be considered the operator of the project for the purpose of CERCLA liability, and to the maximum extent practicable, operate, maintain, repair, rehabilitate, and replace the project in a manner that will not cause liability to arise under CERCLA; and
 - q. Comply with Section 221 of Public Law 91-611, Flood Control Act of 1970, as amended (42 U.S.C.1962d-5b), and Section 103(j) of the WRDA of 1986, Public Law 99-662, as amended (33 U.S.C.2213(j)), which provides that the Secretary of the Army shall not commence the construction of any water resources project or separable element thereof, until each non-Federal interest has entered into a written agreement to furnish its required cooperation for the project or separable element.

6.2 LANDS, EASEMENTS, RIGHTS-OF-WAY, RELOCATIONS AND DISPOSAL AREAS

Estates required for the project include Flood Protection Levee Easements, a Temporary Work Area Easement, and a Drainage Ditch Easement. No relocations or disposal areas are expected to be included in the project. The total estimated cost for the project LERRDs is [REDACTED]. Additional detail on the LERRD requirements can be found in Appendix G (Real Estate Plan).

6.3 OPERATION, MAINTENANCE, REPAIR, REPLACEMENT, AND REHABILITATION

Once construction activities are completed, the project will be turned over to the non-Federal sponsor, MWRDGC. OMRR&R of the levee will be the responsibility of MWRDGC. OMRR&R activities would include periodic inspections, mowing, debris removal and litter control, vermin control, and repair of the levee as needed in addition to supporting efforts during flood events. MWRDGC will also be responsible for outreaching to the communities, residents, and businesses in the leveed area about the project risks and the development of an emergency action/ response plan. Based on typical OMRR&R activities for similar levees in the region, the most significant costs will likely be associated with maintaining and controlling vegetation on the levees.

The completed levee will automatically be entered into the Corps levee safety program (PL 84-99) and recorded in the National Levee Database (NLD). Once constructed, a levee screening and periodic inspection report will be completed to serve as a baseline report for the project, as well as assess the residual risk of flooding and consequences. Every subsequent year will include annual inspections while the screening and periodic inspection reports would be updated roughly every 5 years. As long as the inspections indicate the project is being operated and maintained in accordance with the PPA and Project O&M Manual, it would be eligible to receive federal repair funds should it be damaged during a high water event.

6.4 * REGULATORY REQUIREMENTS

Sections 404 and 401 of the Clean Water Act: A 404(b)(1) Analysis (Appendix I) was completed to determine effects on water of the US in terms of fill materials. Overall, there are no significant long-term adverse effects expected to the aquatic ecosystem. The project area was already degraded by human disturbance in the early 1900s. The .84 acres of Riverine – Emergent wetland, which was induced by the existing levee, consists only of a highly invasive species that is typically eradicated during ecosystem restoration projects due to their adverse effects on native biota and floodplain dynamics. Also, habitat provided by this degraded wetland fringe is not being totally lost, but converted to Riverine – Rock Bottom.

Based on the 404(b)(1) Analysis, the proposed action is determined to be in compliance with the Section 404(b)(1) Guidelines, subject to appropriate and reasonable conditions, to be determined on a case-by-case basis, to protect the public interest. Based on the removal of a large area of highly invasive and noxious plant species, and replacing them with native grasses and flowers, the area is expected to have improvements in riparian zone health and native biodiversity. No net loss of wetland or natural aquatic habitats are expected.

A Section 401 Water Quality Certification would be obtained during the design phase of the project.

Floodway Construction Requirements: It is not expected that a floodway permit will be required for this project. An Illinois consent decree entered in 1975 requires USACE to obtain relevant state permit for work completed on the Des Plaines River between its confluence with the Kankakee River and River Mile 290 (Joliet Railroad Branch). The project is located on the Des Plaines River outside of the area defined

by this decree. However, plans will be formulated in accordance with the Illinois Department of Natural Resources' (IDNR) Part 3708 'Floodway Construction in Northeastern Illinois' permit requirements. The planned project will be coordinated with the IDNR – Office of Water Resources.

Clean Water Act: Since the proposed project will likely require more than one acre of land disturbing activities, a National Pollutant Discharge Elimination System (NPDES) construction site storm water runoff permit will be obtained during construction.

7 * PUBLIC INVOLVEMENT

7.1 PUBLIC VIEWS AND COMMENTS

To be determined, based on comments received during public review of the draft report.

7.2 STAKEHOLDER AGENCY COORDINATION/ NEPA COMPLIANCE

The President's Council on Environmental Quality guides public participation opportunities with respect to Feasibility Reports and Environmental Assessments, Engineering Regulations, and procedures for implementing NEPA. The McCook Levee Section 205 Flood Risk Management Recommended Plan was determined to be in compliance with NEPA and all other appropriate statutes, executive orders and memoranda. Coordination and compliance for this feasibility study and integrated environmental assessment included comprehensive public involvement, agency coordination, and review of and has included compliance with applicable Federal statutes per the USACE Engineering Regulation 1105-2-100, Planning Guidance Notebook. A Draft FONSI is provided at the front of this document.

A scoping letter was sent to potentially interested Tribes as well as Federal and State agencies in compliance with the National Environmental Protection Act (NEPA) on 14 June, 2017. The scoping letter informed recipients of the feasibility study and summarized the problem area and measures under consideration and solicited comments on potential impacts or concerns associated with flood risk management in the study area.

Letters were sent to:

- U.S. Senate Representatives for Illinois (Durbin and Duckworth)
- Congressman Daniel Lipinski
- U.S. Environmental Protection Agency (USEPA)
- U.S. Fish and Wildlife Service (USFWS)
- Federal Emergency Management Agency (FEMA)
- Federal Aviation Administration (FAA)
- U.S. Department of Agriculture (USDA)
- Illinois Environmental Protection Agency (IEPA)
- Illinois Department of Natural Resources (IDNR)
- Illinois Historic Preservation Association (IHPA)
- Forest Preserves of Cook County
- 11 potentially impacted tribes

7.2.1 Federal Agencies

The Miami Tribe of Oklahoma provided a response to the scoping letter in a letter dated July 3, 2017 and offered no objection to the project at the time, as they were not currently aware of existing documentation directly linking a specific Miami cultural or historic site to the project site. However, the Tribe requested immediate consultation should any human remains or Native American cultural items falling under the Native American Graves Protection and Repatriation Act (NAGPRA) or archaeological evidence is discovered during any phase of this project.

U.S. Environmental Protection Agency (USEPA) provided scoping comments in a letter dated July 14, 2017. The comments included recommendations for evaluating and documenting alternative plans including documentation of the purpose and need and how alternative plans were identified, documentation of potential impacts of construction activities, documentation of existing water quality conditions and potential impacts, documentation of potential impacts to listed species and significant wildlife resources, documentation of impacts to vegetation and wildlife habitat, assessment of floodplain impacts, documentation of impacts to cultural resources, minimizing impacts to air quality, and coordination with the public and stakeholders. These comments were considered during the preparation of the Detailed Project Report and Integrated Environmental Assessment and the results are integrated in the report.

USFWS provided scoping comments in an email dated July 18, 2017. While no specific issues of concern were identified, USFWS indicated an intent to review the NEPA documents when they are available during public review.

7.2.2 State Agencies

No comments from state agencies were received in response to the scoping letter.

7.2.3 Local Agencies

No comments from local agencies were received in response to the scoping letter.

However, preliminary coordination has been conducted with the project sponsor, MWRDGC, the primary landowner of the proposed project. In addition to the December 2015 LOI, the USACE PDT participated in a site visit of the project area with MWRDGC staff on 2 May 2016. The sponsor is in support of the Recommended Plan.

7.2.4 Non-Governmental Organizations

No coordination has been conducted with non-government organizations.

8 * NEPA COMPLIANCE

8.1 Mitigation Requirements

Adverse effects to, or losses of wetlands or any type of natural community habitats are not anticipated. The existing levee zones have already been severely modified in the early 1900s, which removed all semblance of natural Chicago Region communities or ecotypes. See Section 5 for determination details.

A FONSI is included in Appendix I of this report.

9 RECOMMENDATION

The District recommends MSC concurrence with the Recommended Plan to perform a segmented repair of the McCook Levee and a repair of the West Lyons Levee (alternatives 3A and 2Ba, as described) and MSC approval to complete the feasibility phase of this Study.

Implementation of the Recommended Plan will reduce the risk to human safety and property damage associated with the existing McCook and West Lyons Levee structures. The project is estimated to have a total first cost of [REDACTED]0 (average of [REDACTED] annualized over the 50-year period of analysis) and is expected to provide an average annual benefit of \$626,000. The Recommended Plan falls within the authority of the CAP 205 program and the non-federal sponsor, MWRD, is committed to partnering to successfully complete this project.

In accordance with the NEPA of 1969 and Section 122 of the Flood Control Act of 1970, the U.S. Army Corps of Engineers (Chicago District) has assessed the environmental impacts associated with this project. The purpose of the integrated Environmental Assessment is to evaluate the impacts that would be associated with the Recommended Plan. The assessment process indicates that this project would not cause significant effects on the quality of the human environment in the areas of construction and have only beneficial impacts upon the ecological, biological, social, cultural, or physical resources of the communities of McCook, Lyons, and Summit and the study area as a whole. The findings indicate that the proposed action is not a major Federal action significantly affecting the quality of the human environment. Therefore, it was determined that an Environmental Impact Statement is not required.

Federal implementation of the recommended project would be subject to the non-Federal sponsors agreeing to comply with applicable Federal laws and policies, as summarized in Section 6.1. The non-Federal sponsor, MWRDGC, supports the implementation of the Recommended Plan and has demonstrated intent and capability to execute a PPA to design, build, operate, and maintain the project.

10 REFERENCES

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- Metropolitan Water Reclamation District of Greater Chicago. 2011. *Lower Des Plaines Detailed Watershed Plan*. Chicago, IL: MWRDGC.
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- U.S. Army Corps of Engineers, Chicago District. 2016. *Forest View, Illinois Draft Detailed Project Report and Integrated Environmental Assessment, Draft 2016*. Chicago, IL: USACE.

11 ACRONYMS AND ABBREVIATIONS

ACE	Annual Chance of Exceedance
ATR	Agency Technical Review
BCR	Benefit-to-cost Ratio
CAP	Continuing Authorities Program
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR	Code of Federal Regulations
CMP	Corrugated Metal Pipe
CSSC	Chicago Sanitary and Ship Canal
DPR	Detailed Project Report
ER	Engineer Regulation
ESA	Environmental Site Assessment
ETL	Engineering Technical Letter
FID	Federal Interest Determination
FONSI	Finding of No Significant Impact
FPDCC	Forest Preserve District of Cook County
FRM	Flood Risk Management
HEC-FDA	Hydraulic Engineering Center-Flood Damage Analysis
HEC-RAS	Hydrologic Engineering Center River Analysis System
HEC-SSP	Hydrologic Engineering Center Statistical Software Package
HTRW	Hazardous, Toxic, and Radioactive Waste
HUC	Hydrologic Unit Code
IDNR	Illinois Department of Natural Resources
IHPA	Illinois Historic Preservation Association
LERRD	Lands, Easements, Relocations, Rights-of-Way, and Disposal Areas
MDM	MSC Decision Milestone
MSC	Major Subordinate Command
MWRDGC	Metropolitan Water Reclamation District of Greater Chicago
NAVD88	North American Vertical Datum of 1988
NED	National Economic Development
NEPA	National Environmental Policy Act
NFIP	National Flood Insurance Program
NLD	National Levee Database
NPDES	National Pollutant Discharge Elimination System
O&M	Operation and Maintenance
OMRR&R	Operation, Maintenance, Repair, Rehabilitation, and Replacement
PPA	Project Partnership Agreement
RCP	Reinforced Concrete Pipe
REC	Recognized Environmental Condition
SHPO	State Historic Preservation Officer
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
WRDA	Water Resources Development Act