Chicago: Stormwater Management 1900-2017

National Association of Flood & Stormwater Management Agencies

Catherine A. O’Connor
Director of Engineering
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Flood Risk Management in Chicagoland

• 1900’s – Canal System
• 1970’s – Tunnel and Reservoir Plan
• 1980’s – Stormwater Reservoirs
• 2004 – Stormwater Management, Cook County
• 2014 – Local Program
• 2016 – The Robbins Plan
“Sanitary District of Chicago”
Chicago Sanitary and Ship Canal Excavation, 1895
City grew rapidly • Historical image of city from 1850s? 1857
Chicago discharged sewage into the Chicago River, which drained into Lake Michigan.
St. Louis filed an injunction to stop flow in the CSSC.
After Canal Construction

Chicago Waterway System
Lockport Lock and Dam
SANITARY BODY ACTS TO AVOID FLOOD THREATS

Sanitary district trustees moved yesterday to ease the danger of floods along the Illinois River waterway just below Chicago. They instructed Horace Ramey, chief district engineer, to confer with W. P. Foster of the Illinois Waterway district, John P. Corey, chief district engineer, on plans to back into working condition the flood control gates on the Brandon dam just below Joliet.

The decision was made after the district's chief engineer, Horace P. Ramey, warned that unless the district acted now, the stored flow of water from storm sewers would create intolerable conditions by 1970.

Must Keep Pace

He said the district must keep pace with the City of Chicago, which has 800,000 people on its streets and sewers to step up its storm-water system.

1. Be forced to operate the locks of the Chicago River to discharge storm water into Lake Michigan, as it did during the flood of 1955.
2. Cause millions of dollars of property loss in Cook County.

Ramey's suggestion for a flood-control program calls for widening of the Sanitary & Ship Canal in the Calumet-Sag Channel to Lockport from 160 to 300 feet and also to deepen it. As a result, it could cost $300,000,000, he said.

The board also formally approved the sale of 2 million dollars in revenue bonds by Halsey Stuart & Co. from $50,000 to $500,000 in the finance construction of a sanitary sewer for Mount Prospect. These are the first revenue bonds ever issued by the district under authority granted by the legislature.

Press Plan For Flood Curbs Here

Envision Use of I-M Canal in Flood Plan

Sewer Cost Prohibitive

The cost of a sewer system for the Des Plaines River drainage area would be prohibitive, according to E. H. Dunlap, street commissioner of the city of Chicago.

The cost of running a separate treatment plant would be $50 million, Dunlap said.

The sewer in the Fox River watershed, and that the cost of running the interceptors Sewer drainage area will be prohibitive.

Also authorized was a 52-year lease of a 200 by 260 feet plot, on the east bank of the North Shore channel, north of Howells' Point, for the development of a median road.

The Illinois-Michigan canal system was not used since 1967, and it is estimated to cost $50 million to dredge the Illinois side of the canal.

The Illinois-Michigan canal system was to be used for the Illinois-Michigan canal system and the Illinois-Michigan canal system has been available in the city of Chicago.

The city's drainage plan would be to use the Illinois-Michigan canal system to supplement the sanitary and ship canal, and the city would handle its own drainage problems.

The widening of the Illinois-Michigan canal system with a 90-foot-wide channel would require a bridge over the canal.

City Spurs Action On Drainage Plan

Engineers Cite Recent Floods, Map Bid to '59 Legislature

Recent Chicago-area floods have prompted sanitary district engineers to propose the expansion of the district's storm-water drainage facilities.

A proposal for construction of a storm sewer system will be placed before the 1959 state legislature, Peter P. Girard, the district's sewer designer, said.

He said the proposal will be a revision of a similar plan which failed to get approval in 1955.

It calls for construction of a storm sewer that would drain into the Illinois River through the Des Plaines River, and would reduce flooding in the city.

Girard said the project will be financed through bond issues that would require approval of the legislature.

The project would cost at least 10 percent more than the $50 million bond issue needed for the project proposed in 1953.

At present, the district maintains sewers for disposal of storm-water only. Storm-water must drain through the channels.

The proposed storm drainage system would serve the suburban and rural areas.

Drainage in most of Chicago is affected by a combination of a natural system that carries both storm and waste waters.

Girard said his staff would begin revising the 1955 proposal by October.

Rights Parley

Charles S. Zimmerman, chairman of the AICB civil rights department, will be the speaker at the annual civil rights conference in Chicago, Dec. 16, in the Sherman Hotel. The Jewish Labor Committee is sponsor of the conference.
FLOOD CONTROL
for
THE METROPOLITAN
SANITARY DISTRICT
OF GREATER CHICAGO

PREPARED BY
John F. Meissner Engineers, Inc.
300 West Washington Street
Chicago, Ill., Illinois
A tabulation, showing the storage basin volumes and the channel discharges for 17 sub-basins, for drainage, covering the entire Cook County region, is shown (page 52). The total of all the channel discharges amounts to 148,000 cfs.

Then (page 53) is listed the suggested program and works recommended for construction, as follows:

1. Creation of a central authority for flood control.
2. Installation of transmitting instruments and centralised recording devices for control of operation of works.
3. Chicago River Pumping Station
4. Widening and deepening of the Ship Canal
5. Reservoirs and channel improvements on the North Branch of the Chicago River.
6. Channel improvement and pumping station for the North Shore Channel.
7. Reservoir to control the upper Des Plaines River.
8. Reservoirs and channel improvements on Salt Creek
10. Reservoirs and channel improvements on Thorn Creek
11. A pumping station, new channels, and improvements for the Little Calumet River.
12. New sewer pumping stations at 125th and 95th Streets, and reservoirs on Tinley and Stony Creeks.

These items will be discussed individually, below.

Central Authority for Flood Control

The need for a central authority for flood control is so obvious that it needs no discussion. Water always runs down hill, without regard to any political lines. A comprehensive flood control plan must be devised on an area-wide basis; and the watersheds of the streams involved are items which must be considered, rather than the limits of the municipalities served. The most obvious agency, now in existence, to handle flood problems, is, of course, The Metropolitan Sanitary
In existence on and off since 1957

Consisted of representatives of:
  - Illinois Department of Public Works
  - Cook County
  - The City Chicago
  - District

Created a Technical Advisory Committee in 1968 to review various plans and develop recommendations for course of action
Tunnel and Reservoir Plan (TARP)

- More than 50 Alternative Planes Developed and Evaluated Over a 7 Year Period
- TARP was the Composite of the 8 Best Alternatives
- Recommend by Flood Control Coordination Committee
- Adopted by MWRDGC on October 26, 1972 - eight days after the Clean Water Act was enacted.
What Was Constructed?

- 109.4 Miles of Deep Tunnels
  - 10’ - 35’ in Excavated Diameter
  - 150’ - 350’ Below Ground
- 264 Dropshafts 4’ – 25’ in Diameter
- 19 Construction Shafts 25’ -32’ in Diameter
- 3 Major Pumping Stations
- Over 600 Near-Surface Connecting and Regulating Structures
Tunnel and Reservoir Plan Costs

Phase 1 Tunnels ............... $ 2.3 Billion
O’Hare CUP Reservoir ........ $ 45 Million
Thornton Reservoir .......... $420 Million
McCook Reservoir .......... $800 Million
Total TARP .................. $3.6 Billion
Above Average Rainfall in Cook County
1990 - 2014

Average Annual Rainfall
36"
Mean Number of Fish Collected Below the Outfall

Mean Number of Fish Collected Below the Outfalls of Three MWRD Water Reclamation Plants

- O'Brien WRP
  - North Shore Channel
  - Touhy Ave.

- Stickney WRP
  - Chicago Sanitary & Ship Canal
  - Harlem Ave.

- Calumet WRP
  - Little Calumet River
  - Halsted St.

Legend:
- Red: 1970's
- Orange: 1980's
- Blue: 1990's
- Dark Blue: 2000's
Existing Flood Control Reservoirs

- 35 Existing Reservoirs

- Constructed from 1960s to 1990s in cooperation with NRCS, USACE, and other regional agencies

- Total Volume of 12,000 acre-feet
Flooding remains our #1 issue

• Stormwater Phase I Projects
  • Design and Construction of Regional Flood Control and Streambank Stabilization Projects

• Stormwater Phase II Projects
  • Funding of Shovel-Ready Projects
  • Design of Conceptual Projects

• Green Infrastructure
  • Partnerships with Local Communities

• Flood-Prone Property Acquisitions
  • Voluntary buyouts where no practical engineered solution exists
MWRD conveyed authority in November 2004 to plan, manage, implement, and finance activities relating to stormwater management in Cook County.

Cook County Stormwater Management Plan (CCSMP) adopted in 2007 establishing program framework.

Primary Stormwater Management Activities:

• Develop Capital Improvement Program (CIP) to address REGIONAL stormwater problems

• Comprehensive uniform stormwater regulations to ensure future development and redevelopment does not exacerbate flooding
Recommended DWP Projects

15 Flood Control Projects to address overbank flooding

12 Streambank Stabilization Projects to address critical erosion

Prioritized based on Benefit-to-Cost Ratio and Distributed across Cook County
Regional Streambank Projects

Streambank Stabilization Projects

- Address erosion threatening structures, roadways, utilities on regional waterways
- Natural channel design is our goal where practical
- Structural measures when necessary
  - Concrete walls
  - Sheet piles
  - Gabions
Heritage Park Flood Control Facility

- 150 Acre-feet of New Stormwater Storage
- Flood Control improvements integrated into Park District master plan
- Provides Compensatory Storage for USACE Levee 37 which protects 600 homes and businesses from flooding
- Tri-party IGA with MWRD, Wheeling and Wheeling Park District
Public Act 98-0652 enacted into Law June 2014

• Allowed the District to move forward on new initiatives under its **Phase II** program:
  • Partner with local communities, agencies to address **local** drainage problems,
  • Green Infrastructure Program
  • Purchasing flood prone and flood damaged property on a voluntary basis.

• District-wide call for local projects/problem areas in 2013, future calls to be done on biennial basis starting in 2017

• Application process developed for flood-prone acquisitions
Phase II Projects

Shovel-ready and Conceptual projects
distributed throughout county

Types of Projects include:

- Green infrastructure
- Localized detention
- Upsizing critical storm sewers/culverts
- Pump stations
- Establishing drainage ways
Shovel-Ready Example: Mayfair Reservoir Expansion

- 27 Acre-feet of New Stormwater Storage in Westchester
- 60 Structures Protected
- Village responsible for design, construction, and maintenance
- MWRD provided $2.1M for construction
- Project completed 2015
Conceptual Example: Natalie Creek Flood Control Proj.

- Conveyance and Storage Improvements in Village of Midlothian (est. $8.3M)
- 237 structures to be protected
- MWRD to design and construct
- Village to own and maintain all new improvements
- Project to be constructed in 2017
Stormwater Project Hurdles

- For local projects to be eligible for MWRD funding assistance, communities must follow MWRD Procurement Rules, Diversity Requirements, and comply with Multi-Project Labor Agreement
- Local communities must own and maintain new improvements
- Locals must provide up-front construction funding (MWRD funding is reimbursement-based)
- Project benefits must be clearly defined and quantifiable
- Socio-economic challenged communities have stormwater issues that go beyond flooding
Policy adopted by Board of Commissioners August 2014 after PA 98-0652

Three Distinct Components

1. Local Sponsor Assistance Program
2. District Initiated Program
3. Local Government Application
Minimum Criterion
1. Property must be within 100-year floodplain and/or DWP inundation area.
2. The Project’s Benefit-to-Cost Ratio must be greater than 1.0.

Factors Applicable to Each Program
1. Local government agency must serve as a local sponsor
2. Duties of local sponsor include:
   • Local Sponsor will be party responsible for direct contact with the private property owners during the acquisition process
   • Accept ownership of acquired property
   • Remove existing structures
   • Place deed restrictions against future development
   • Maintain property upon return to open land
   • Provide regular reports certifying property meets terms and conditions
Program Progress

- Glenview - 17 homes purchased
- Des Plaines (Ph. 1) – 3 homes acquired 10 more in process (13 total)
- Riverside-Lawn – 17 homes acquired 22 more in process (39 total)
- Northlake – in process of acquiring 7 homes
- Des Plaines (Ph. 2) – in process of acquiring 47 homes
- Stone Park – finalizing agreement to acquire 35 homes
- Flossmoor – finalizing agreement to acquire 2 homes
- Franklin Park – In negotiation to acquire 32 homes
- Wheeling Township – facilitating Cook Co. partnership to acquire 6 homes.
Green Infrastructure Projects

Prioritize projects based on various criteria, including:

- The likelihood of flooding and/or basement backup reduction
- Number of benefitting structures
- Project cost
- Project location with consideration given to maintenance and educational opportunities
- Socio-economic considerations

Develop partnerships
Virgil Grissom Elementary School

After
Robbins Phase II Concept Project

- Preliminary engineering alternatives developed to address flooding along Midlothian Creek which affects ~100 structures in a 100-year storm event.

- Evaluation of alternatives with community revealed need to consider other issues such as:
  - Limited local capacity
  - Development limitations
  - Lack of coordinated planning

- Need to rethink approach
MWRD’s goal is to redefine the meaning of infrastructure investment by implementing solutions that not only promote resiliency, but also promote the economic growth, health, and “well being” of a community.