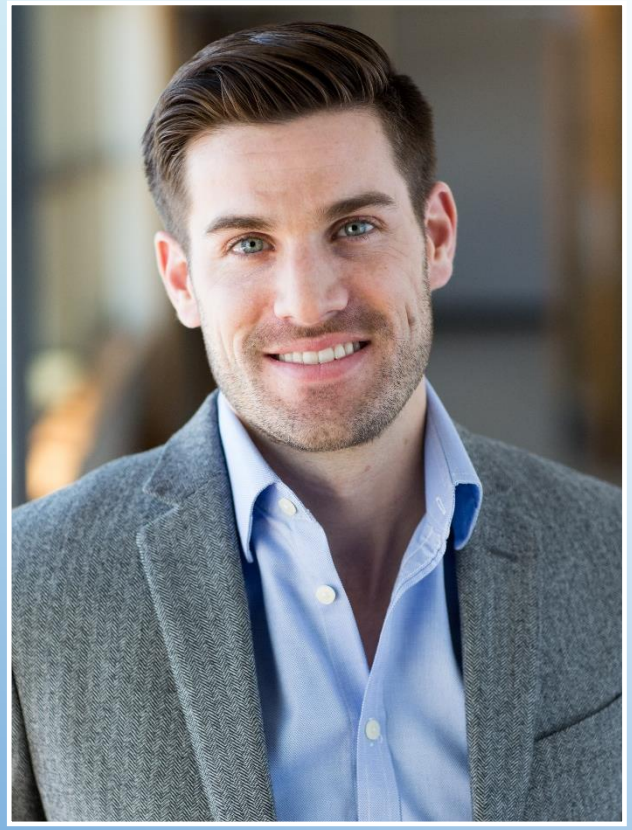
Metropolitan Water Reclamation District of Greater Chicago

Welcome to the March Edition of the 2023 M&R Seminar Series

NOTES FOR SEMINAR ATTENDEES

- Remote attendees' audio lines have been muted to minimize background noise. For attendees in the auditorium, please silence your phones.
- A question and answer session will follow the presentation.
- For remote attendees, Please use the "**Chat**" feature to ask a question via text to "Host". For attendees in the auditorium, please raise your hand and wait for the microphone to ask a verbal question.
- The presentation slides will be posted on the MWRD website after the seminar.
- This seminar has been approved by the ISPE for one PDH and approved by the IEPA for one TCH. Certificates will only be issued to participants who attend the entire presentation.

Patrick Jensen, P.E.
Principal Civil Engineer
Metropolitan Water Reclamation District of Greater Chicago



Mr. Patrick Jensen, P.E., is a Principal Civil Engineer in the Collection Facilities/TARP (Tunnel and Reservoir Plan) Section of the Engineering Department at the MWRDGC. He has been with the District 14 years, working on large infrastructure projects. As a Principal Civil Engineer, Mr. Jensen now serves as a project manager for the flood and pollution control project of the McCook Reservoir and other TARP related projects, oversees the District's collection systems asset management plan as well as the District's sewer rehabilitation design projects. He has a Bachelor of Science degree in Civil Engineering from Marquette University in Milwaukee, WI.

Brian Wawczak, P.E.
Senior Civil Engineer
Metropolitan Water Reclamation District of Greater Chicago

Brian Wawczak, P.E., is a Senior Civil Engineer within the Infrastructure Management Division of the Engineering Department at the MWRDGC. Brian assists with administration of the SRF Loan Program for District capital improvement projects. His recent projects include the Final Preparation of the Thornton Composite Reservoir, the Decommissioning of the Thornton Transitional Reservoir, the Anita Mox™ Nitrogen Removal project, and Energy Neutrality Feasibility Studies at District facilities. Brian has over 26 years of experience in civil design, stormwater management planning, and construction administration. He received his bachelor's and master's degree from Bradley University. He is a registered professional engineer in the State of Illinois and a certified floodplain manager. In his spare time, he enjoys reading and traveling with his family to visit major league baseball parks across the country.

Deep Tunnel 50th Birthday

Patrick Jensen, P.E., Principal Civil Engineer
Brian Wawczak, P.E., Senior Civil Engineer

AND A FLOOD CAME.

Over Five and One-Half Inches of Rainfall in Nineteen Hours in Chicago.

Sewers Too Small to Carry Off This Great Quantity—Many Basements Submerged.

Growing Corn Benefited but Grain in Shock Injured by the Unusual Downpour.

There was a heavy rainfall throughout the West yesterday, but Chicago, as was to be expected, easily took first place. Having come to the conclusion that the monotony of pleasant days should be broken by a bit of "Lunnon weather," she had a wet day—and no mistake. The signal-service records, as read at 7:30 p. m., showed a rainfall of 5.58 inches over the street was blown from its fastenings and landed against the big plate-glass window belonging to West Bros.' billiard parlor at Nos. 157 and 159 Dearborn street. The glass was shivered to atoms. Another window was broken in the same way at No. 158 State street. The watchmen report Chinamen moving out of their quarters in all parts of the city, especially along Milwaukee avenue. They also say that many cellars where they had no access are flooded badly, and that the loss will be heavy.

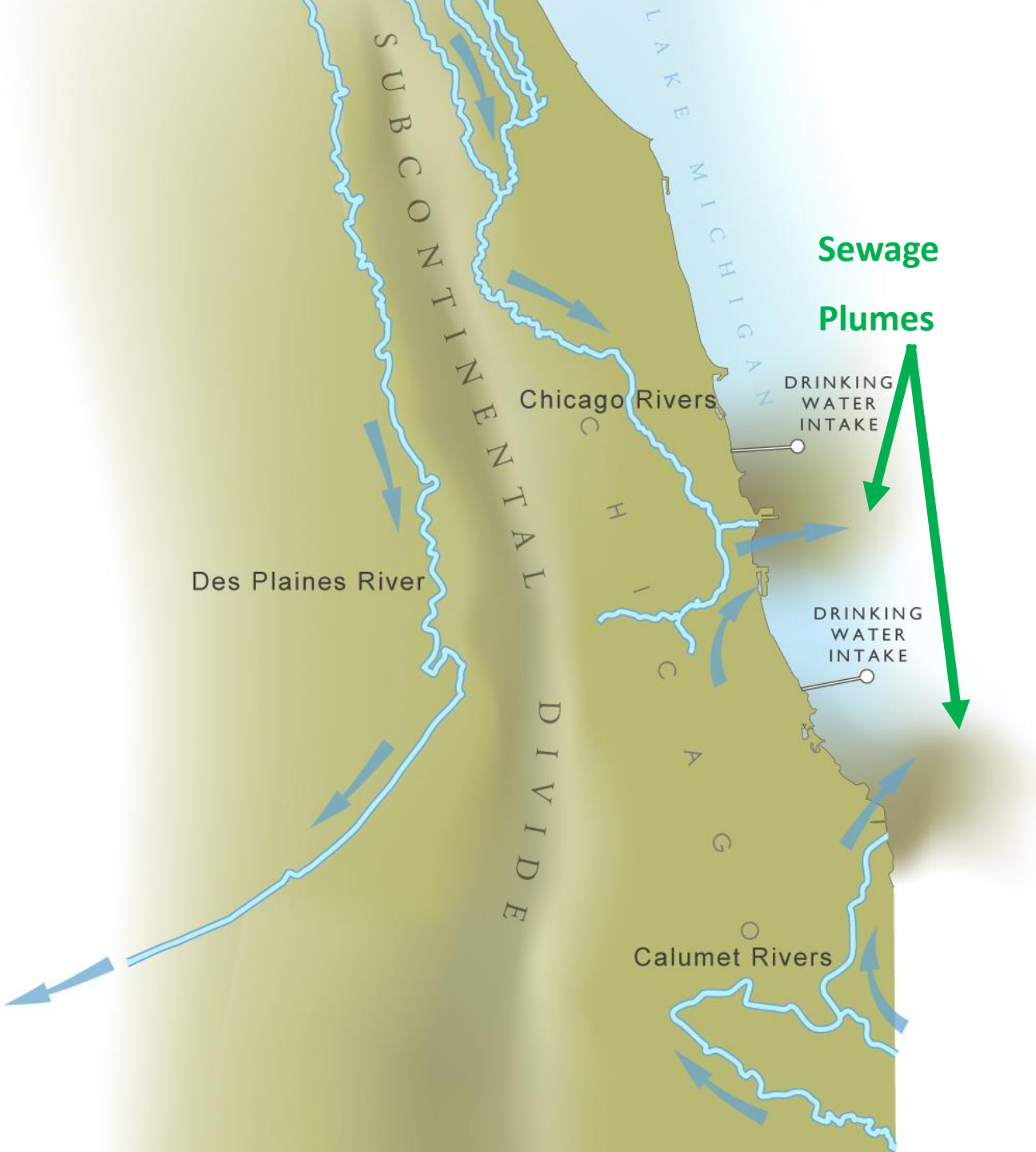
INADEQUATE SEWERS.

The storm demonstrated the fact that the sewage system of the city is entirely inadequate to carry off such a quantity of water as fell during the twenty-four hours. In every case of flooding of basements it was entirely owing to the backing up of the water in the sewers and not to an overflow from the street. Had it not been that the rain of the early morning had pretty thoroughly carried off all the accumulated filth it would have been forced back into the basements by the flood of water. The rain was very efficient in this respect, as was apparent in one basement, where only a handful of dirt had been washed out of a four-inch sewer. The proprietor was congratulating himself upon this fact. "It beats Dr. De Wolf's appropriation of $50,000 as a means of purifying the city," he said.

Metropolitan Water Reclamation District of Greater Chicago

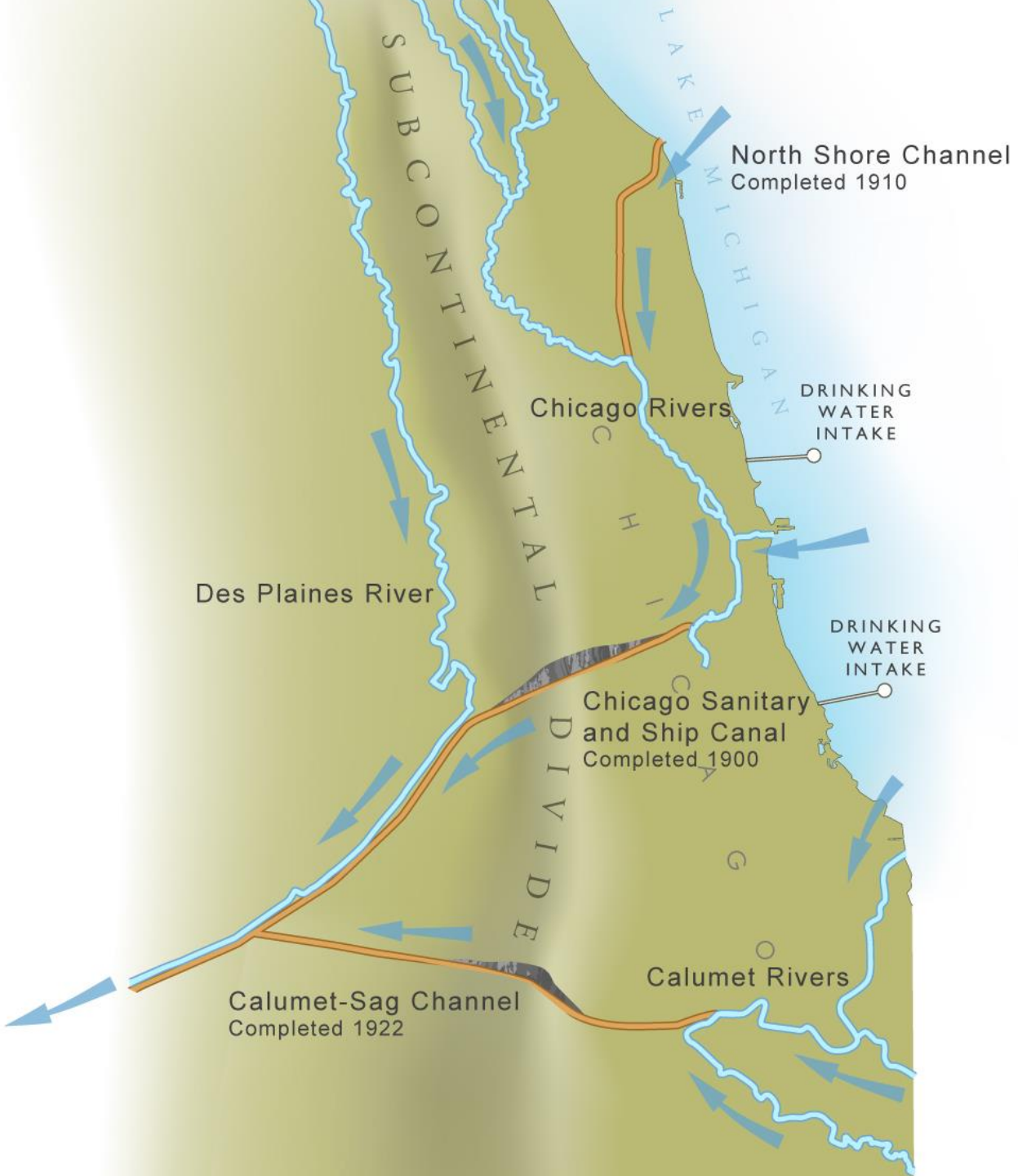
Metropolitan Water Reclamation District of Greater Chicago

Before 1900


LAKE MICHIGAN
SUBCONTINENTAL DIVIDE
Chicago Rivers
Des Plaines River
Calumet Rivers
DRINKING WATER INTAKE
DRINKING WATER INTAKE
Sewage Plumes
CHICAGO

Metropolitan Water Reclamation District of Greater Chicago

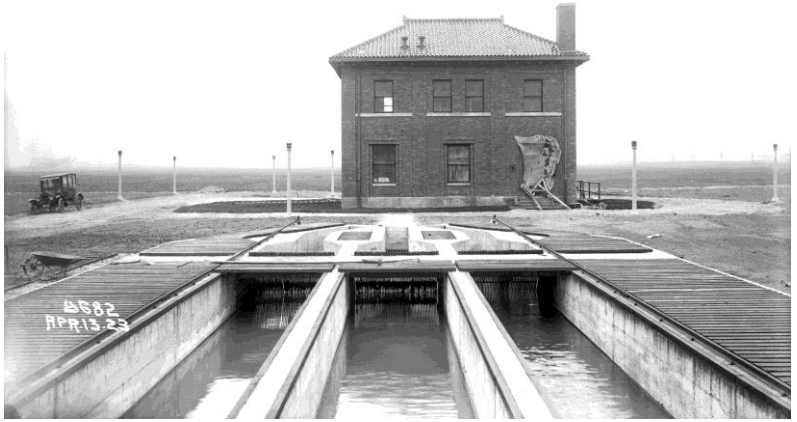
After 1922


LAKE MICHIGAN
North Shore Channel
Completed 1910
SUBCONTINENTAL DIVIDE
Chicago Rivers
DRINKING WATER INTAKE
Des Plaines River
DRINKING WATER INTAKE
Chicago Sanitary and Ship Canal
Completed 1900
Calumet Rivers
Calumet-Sag Channel
Completed 1922


4992-10-5-1914

Metropolitan Water Reclamation District of Greater Chicago

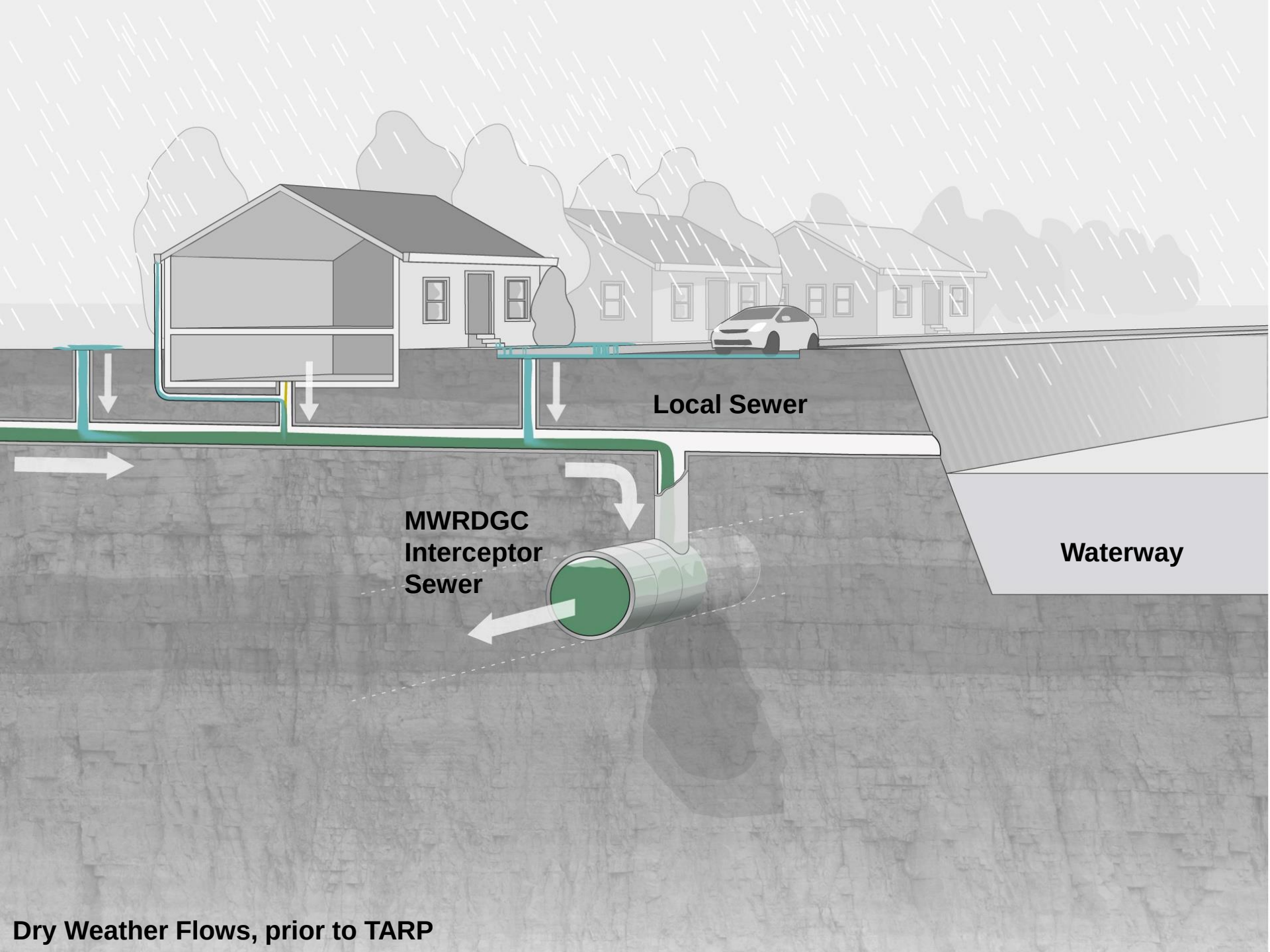
MWRD Interceptors Began 1907



Calumet Plant in Operation 1922

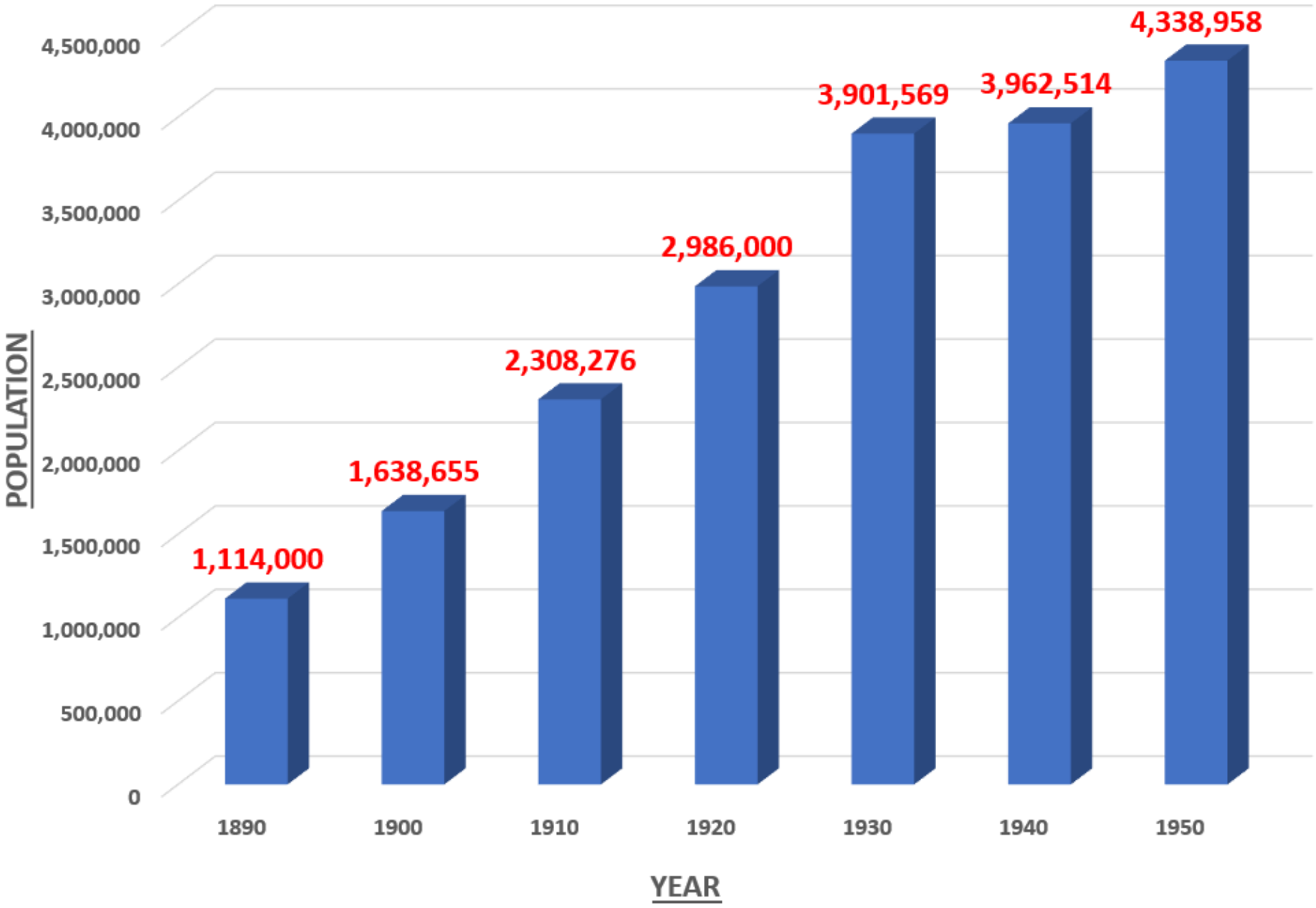
O'Brien Plant (North Side) in Operation 1928

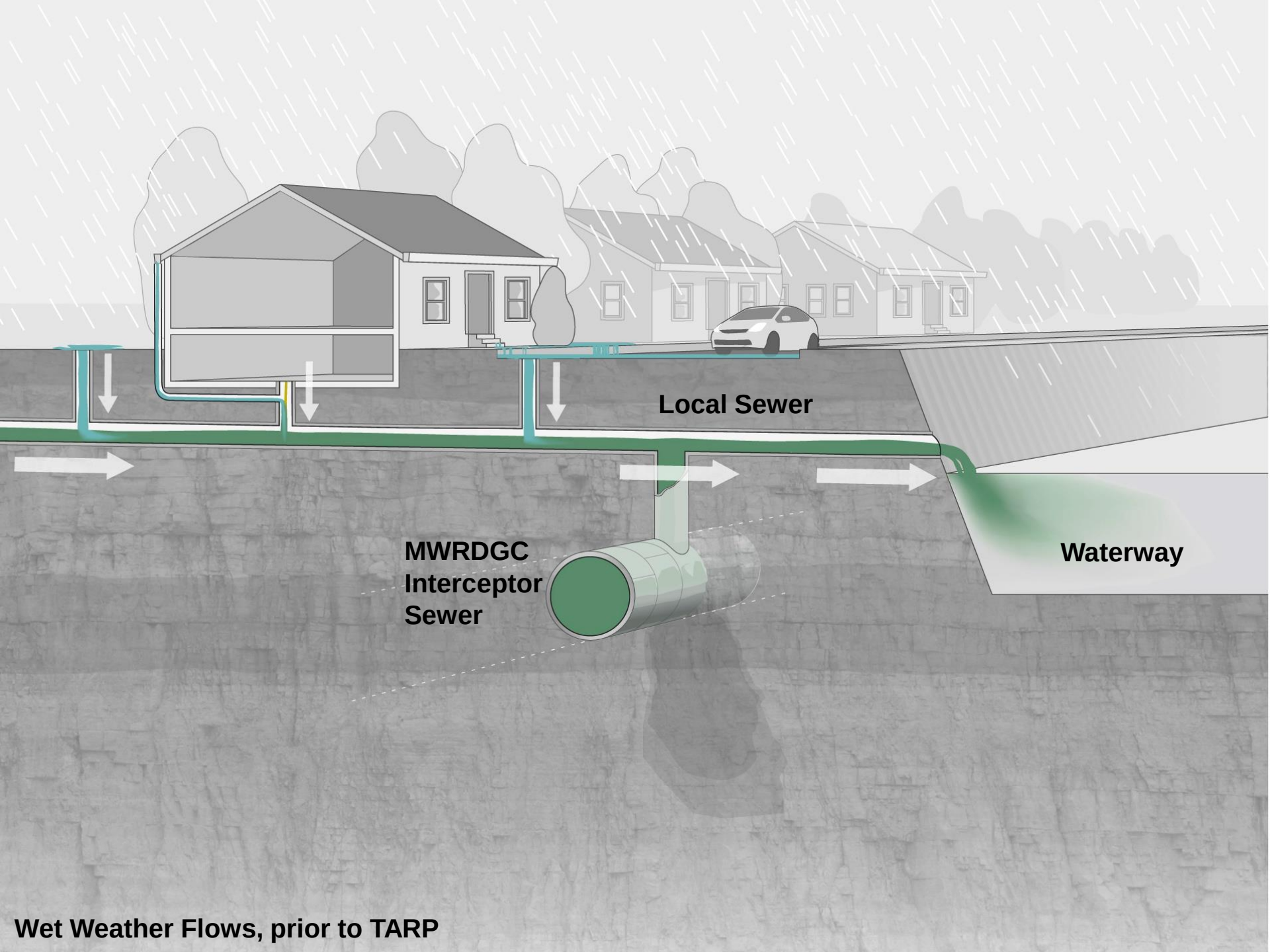
West Side Treatment Plant (Stickney) 1930



Dry Weather Flows, prior to TARP

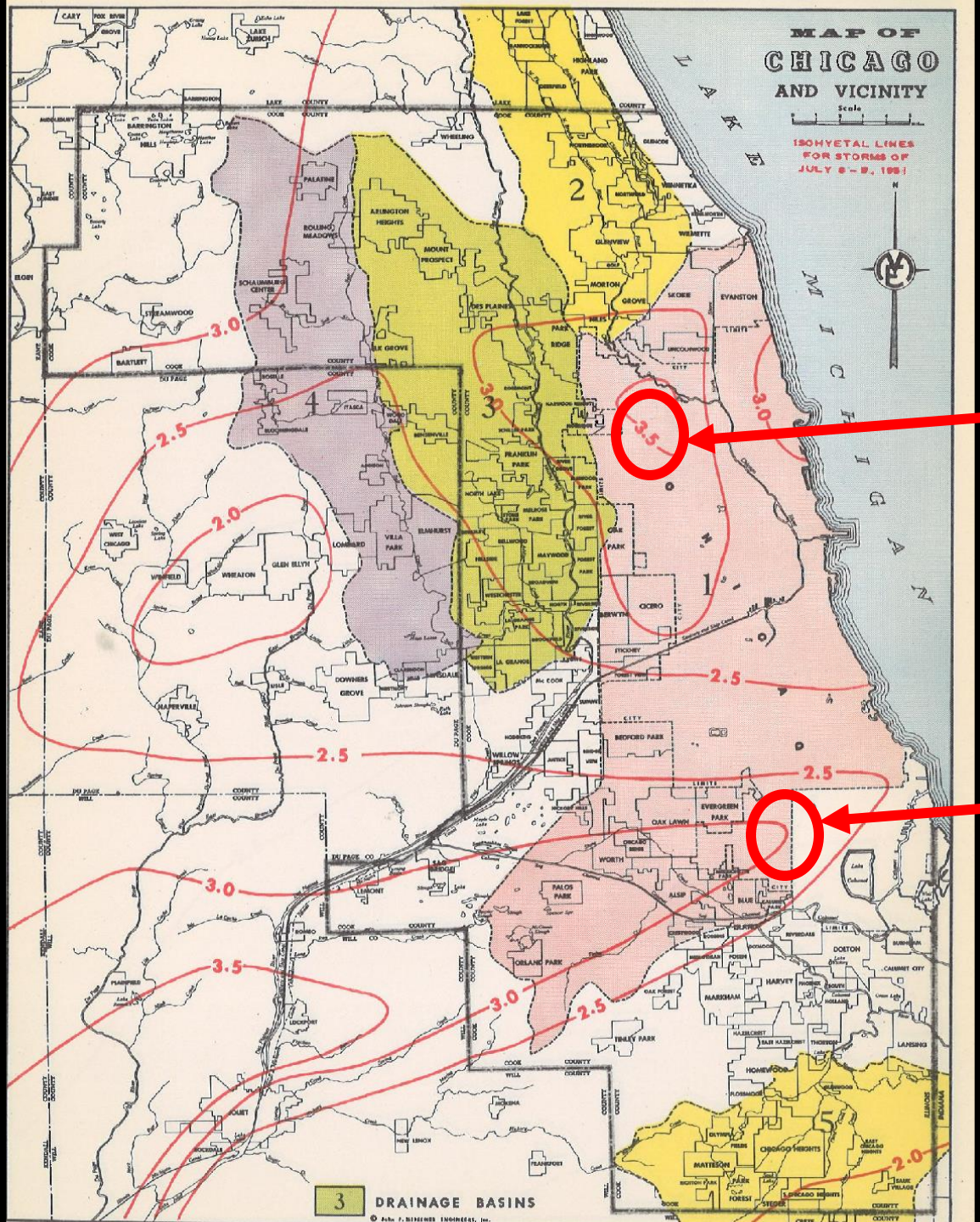
Population Within The MWRDGC





Wet Weather Flows, prior to TARP

Storm of July 8-9, 1951



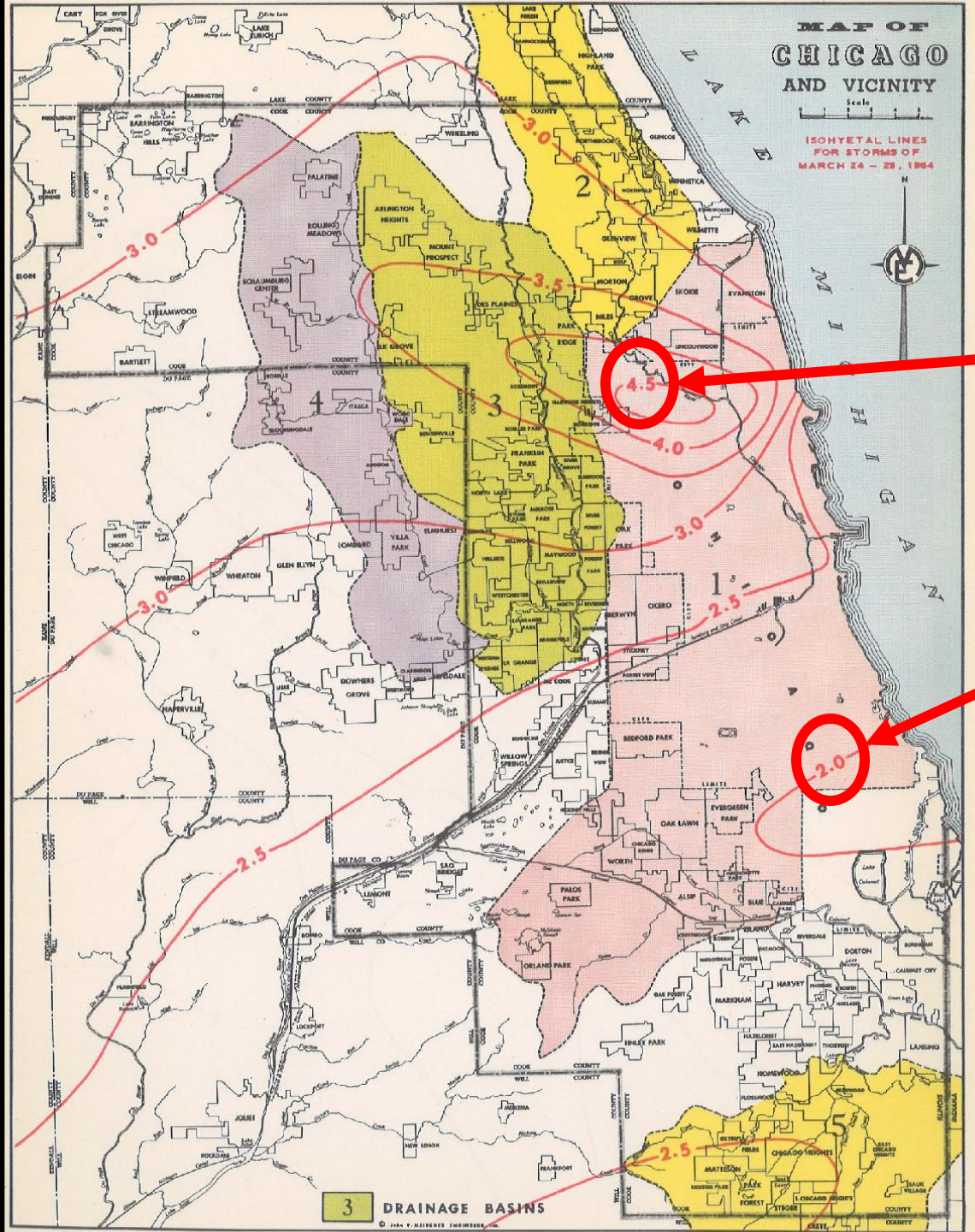
Instantaneous rain events exceeding ½" per hour.

3.5"

3"

Pontiac IL, 75 miles SW of Chicago exceeded 13 inches in 6 hours

Storm of March 24-25, 1954

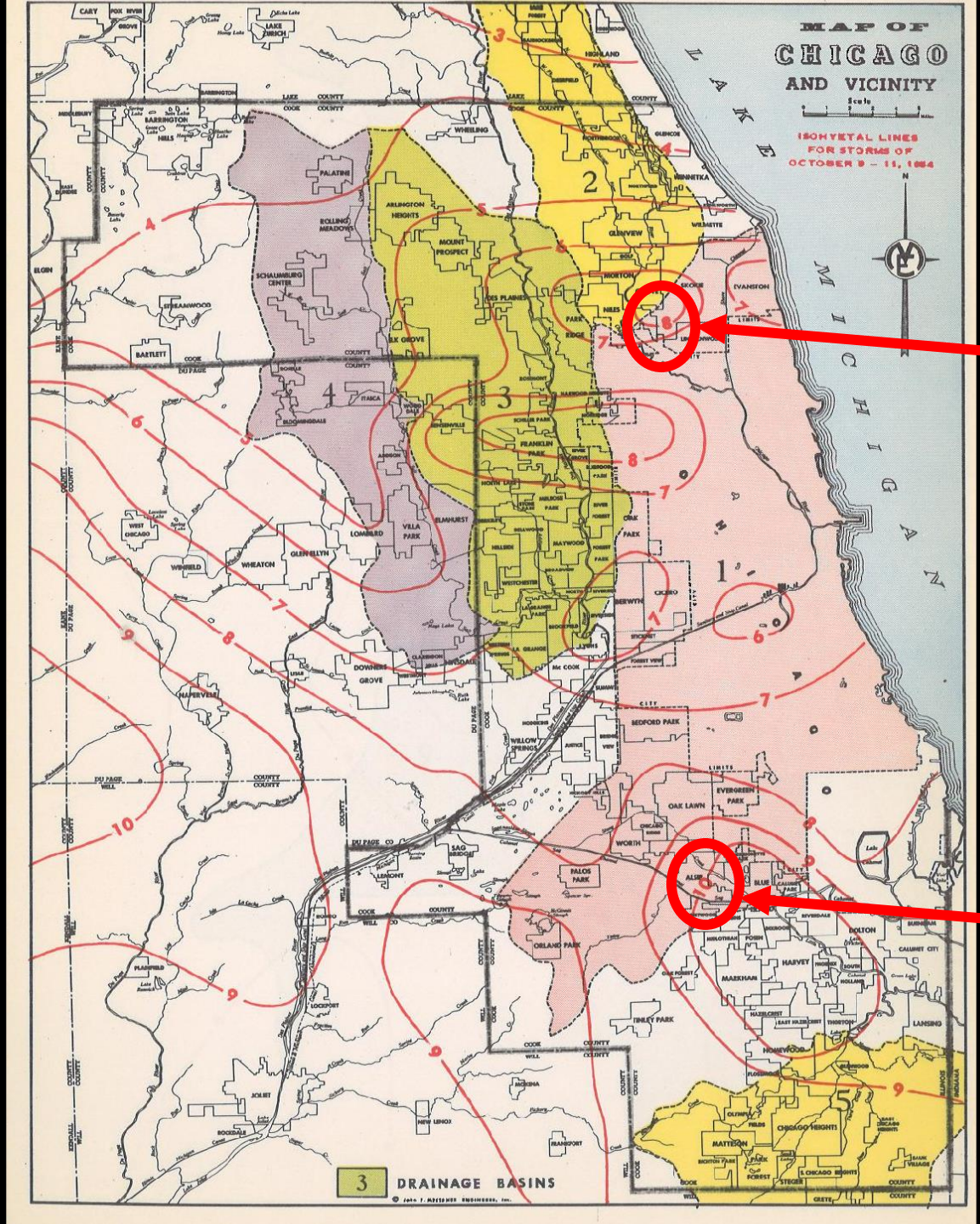


3 inches of rain fell in 3 hours on the north side of Chicago

4.5”

2”

Storm of October 9-11, 1954



50 miles west of Chicago experienced 12” of rain

Wettest Year Proves to Be Hot One, Too
Chicago Daily Tribune (1923-1963); Jan 1, 1955; ProQuest Historical Newspapers: Chicago Tribune
pg. 1

Wettest Year Proves to Be Hot One, Too

(Charts on page 6)

If any Chicagoan who lived thru the flood of Oct. 9-10 had any doubts that it was wet, they can now be dispelled. The weather bureau reported yesterday 1954 was the wettest year on record for the Chicagoland area.

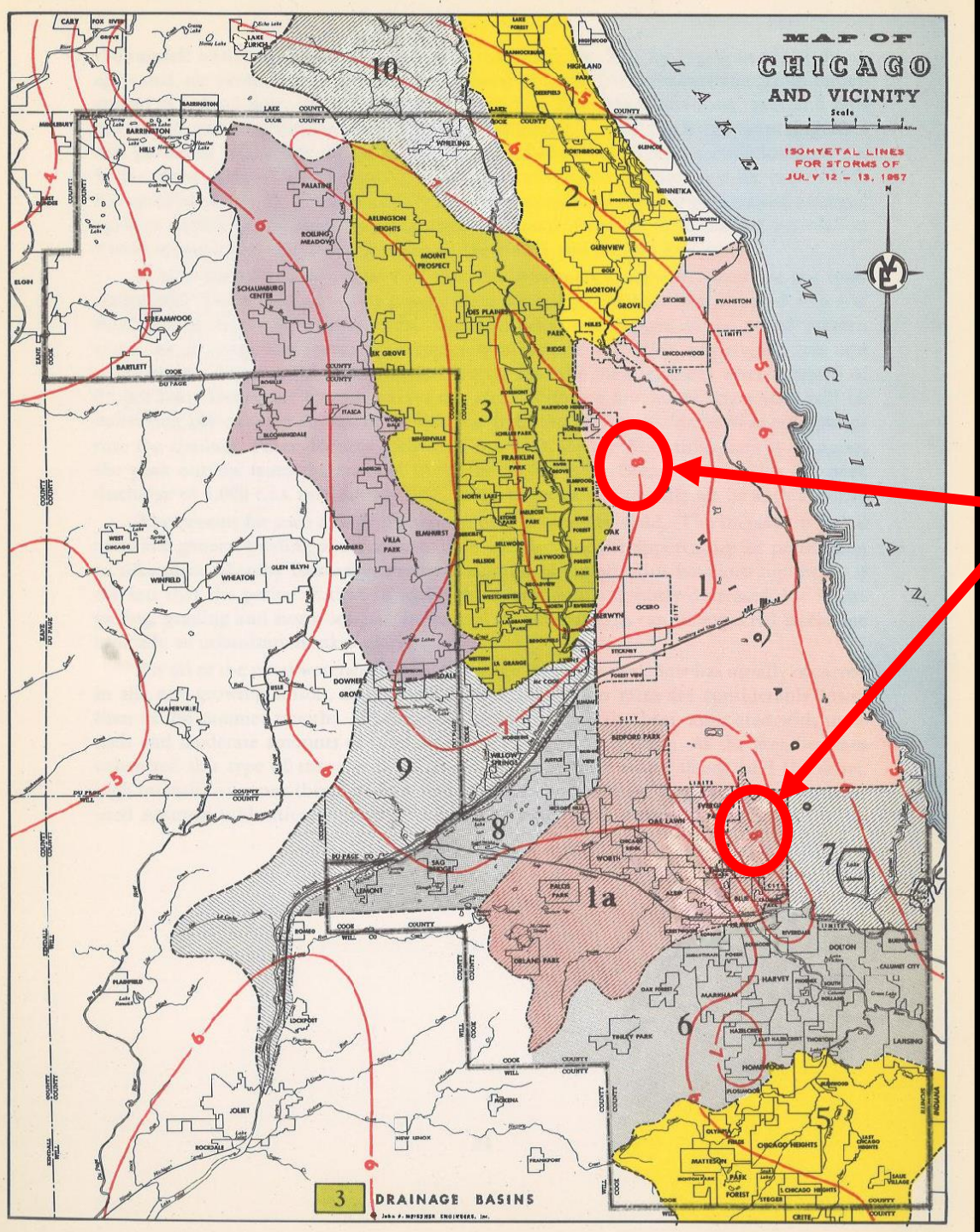
It also was warmer than usual. And along with the warmth and rain, the year brought a variety of serious storms that caused considerable loss of life and property damage estimated at 30 million dollars.

fell short of the 42 days of such heat in 1953.

Precipitation for the year totaled 45.92 inches, or .06 of an inch more than the old record set in 1883. The year's precipitation was 13.20 inches more than the normal of 32.72 inches. There were 125 days which had measurable precipitation, only one day more than the normal.

A good part of the excess rainfall was accounted for by the October flood, when 5.63 inches of rain fell in 24 hours. There were 45.2 inches of snow, including 11.8 inches in one 24

Storm of July 12-13, 1957



From 5pm-11pm, 6 inches of rain fell over most of Chicago.

One hour average intensities as high as 2.5"/hr

50 miles south of Chicago experienced 11" of rain

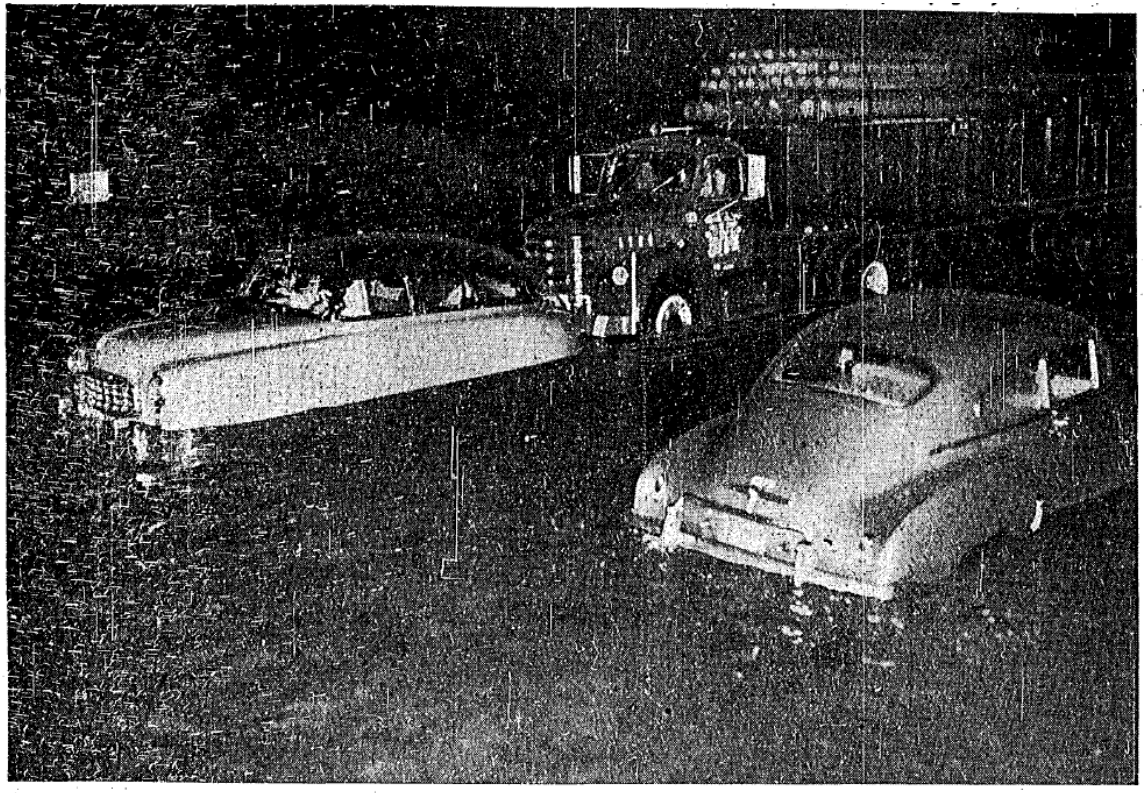
HEAVY RAINS SWAMP CITY!: 48 Hurt as Theater Tent Falls on 250 Flood ...
Chicago Daily Tribune (1923-1963); Jul 13, 1957; ProQuest Historical Newspapers: Chicago Tribune
pg. 1

HEAVY RAINS SWAMP CITY!

Flood Basements; Traffic Disrupted; Many Trees Down

River Up 6 Feet; Water Emptied Into Lake

The Chicago area lay flooded early today after 12 hours of torrential rains, accompanied by violent winds, lightning, and hail that disrupted traffic and tore down hundreds of communications and power lines. The storm, one of the worst in years, wrought its havoc after the area had passed safely thru an afternoon tornado alert.



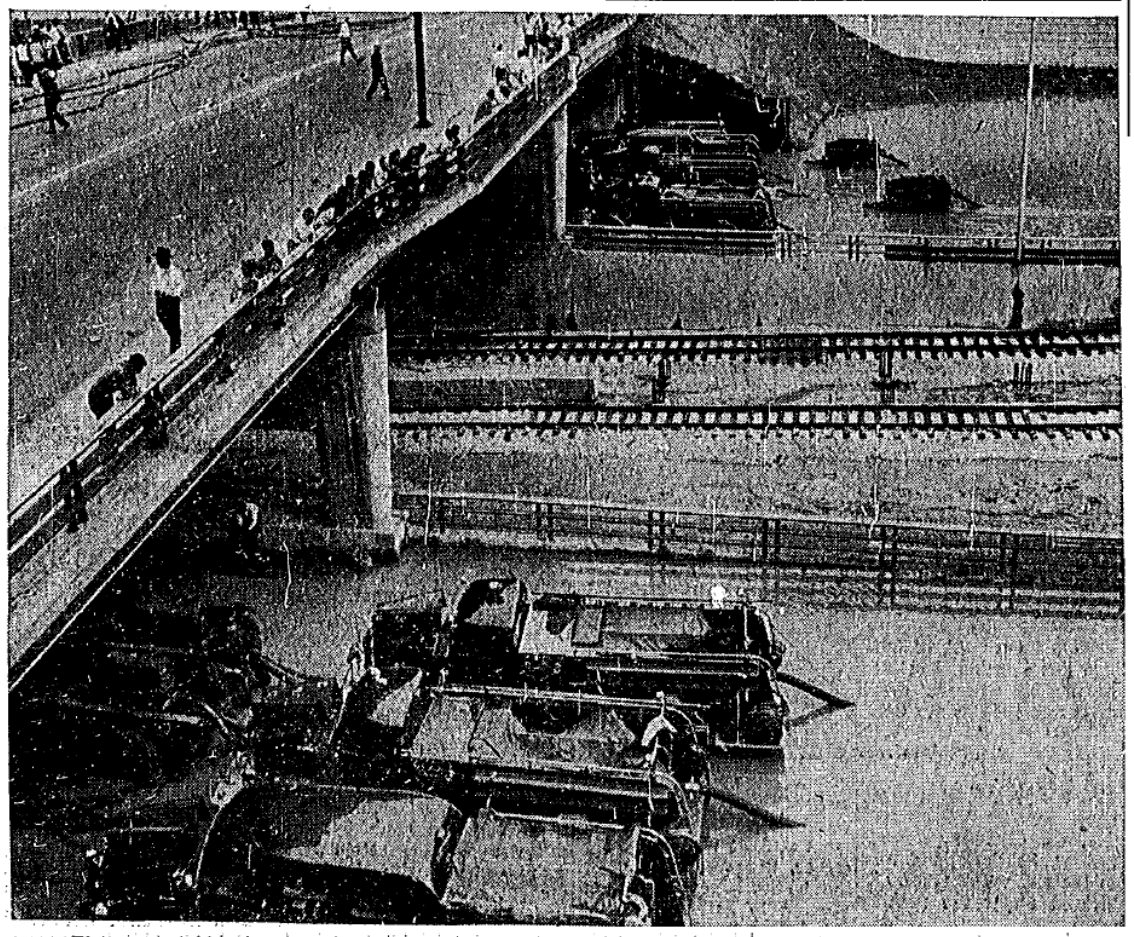
[TRIBUNE Photo]

Truck pushing stalled auto thru high waters under viaduct at 1765 Elston av., while stranded car at right has been abandoned. Many persons were unable to reach homes because of flooded underpasses after worst storm in years.

FLOOD DAMAGE IN MILLIONS: HUNDREDS HOMELESS; BIG CLEANUP STARTS 13 ...
Chicago Daily Tribune (1923-1963); Jul 14, 1957; ProQuest Historical Newspapers: Chicago Tribune
pg. 1

FLOOD DAMAGE IN MILLIONS

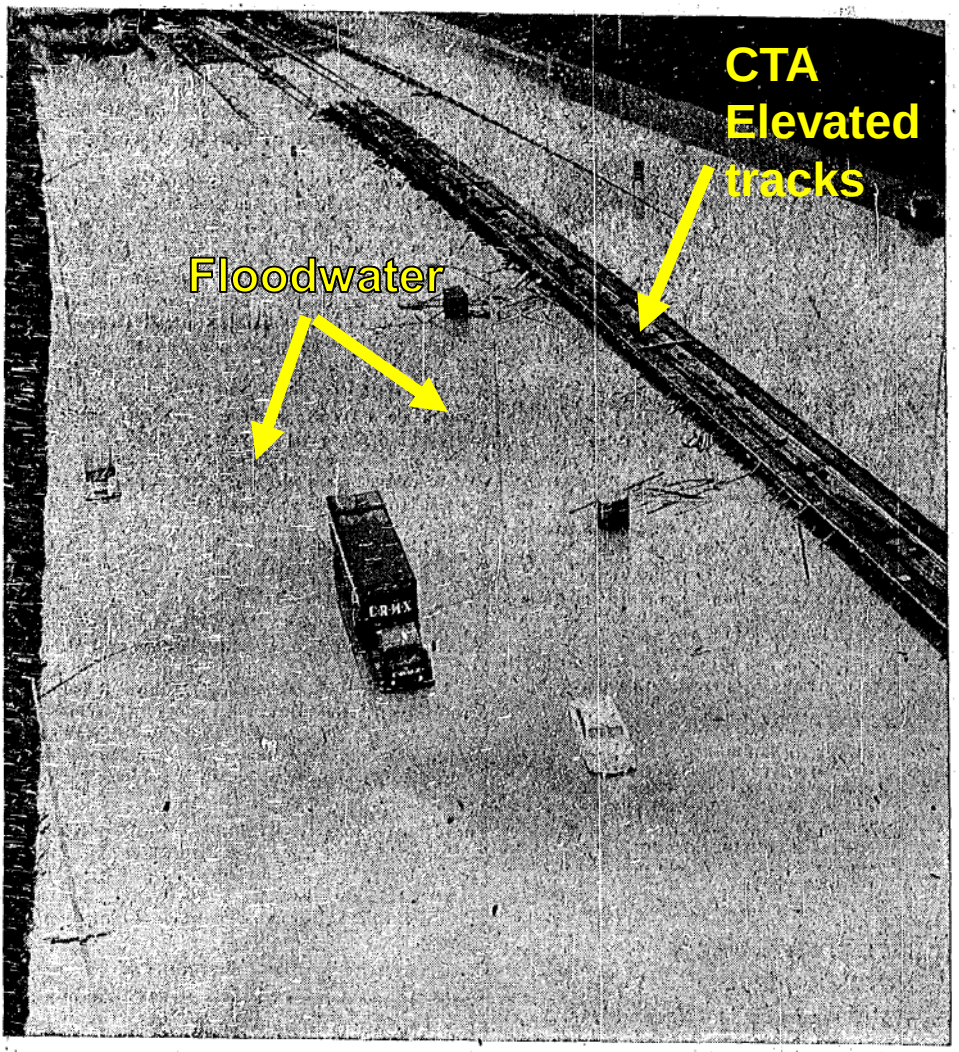
Flood Waters Cripple Subway and Congress expwy.



Firemen pumping water off east and west bound lanes of Congress expwy. at Halsted st. Flood water resulted in closing entire stretch of highway from loop to Laramie av. [TRIBUNE Photo]

Record Rain Closes Congress st. Expressway—Hospital Patients Evacuated as Water Fills Basement

(Stories on page 1)

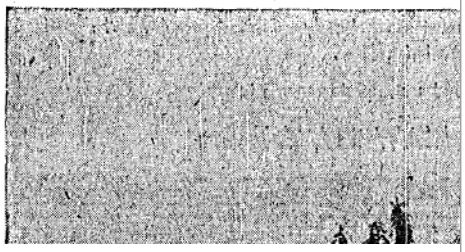


[TRIBUNE Photo]

What appears to be a barge floating is actually CTA elevated stations under construction in median strip of Congress st. expressway, just east of Sacramento blvd., which was inundated by city's severest 24 hour rain storm.

[TRIBUNE Photo]

Patient being evacuated from Ingalls Memorial hospital in Harvey yesterday after flood waters broke thru basement windows and rose 9 feet to ceiling. About 140 patients were removed.



CITY DRIES OUT
4 DAYS AFTER
RECORD RAINS

But Scars of Storm
Still Remain

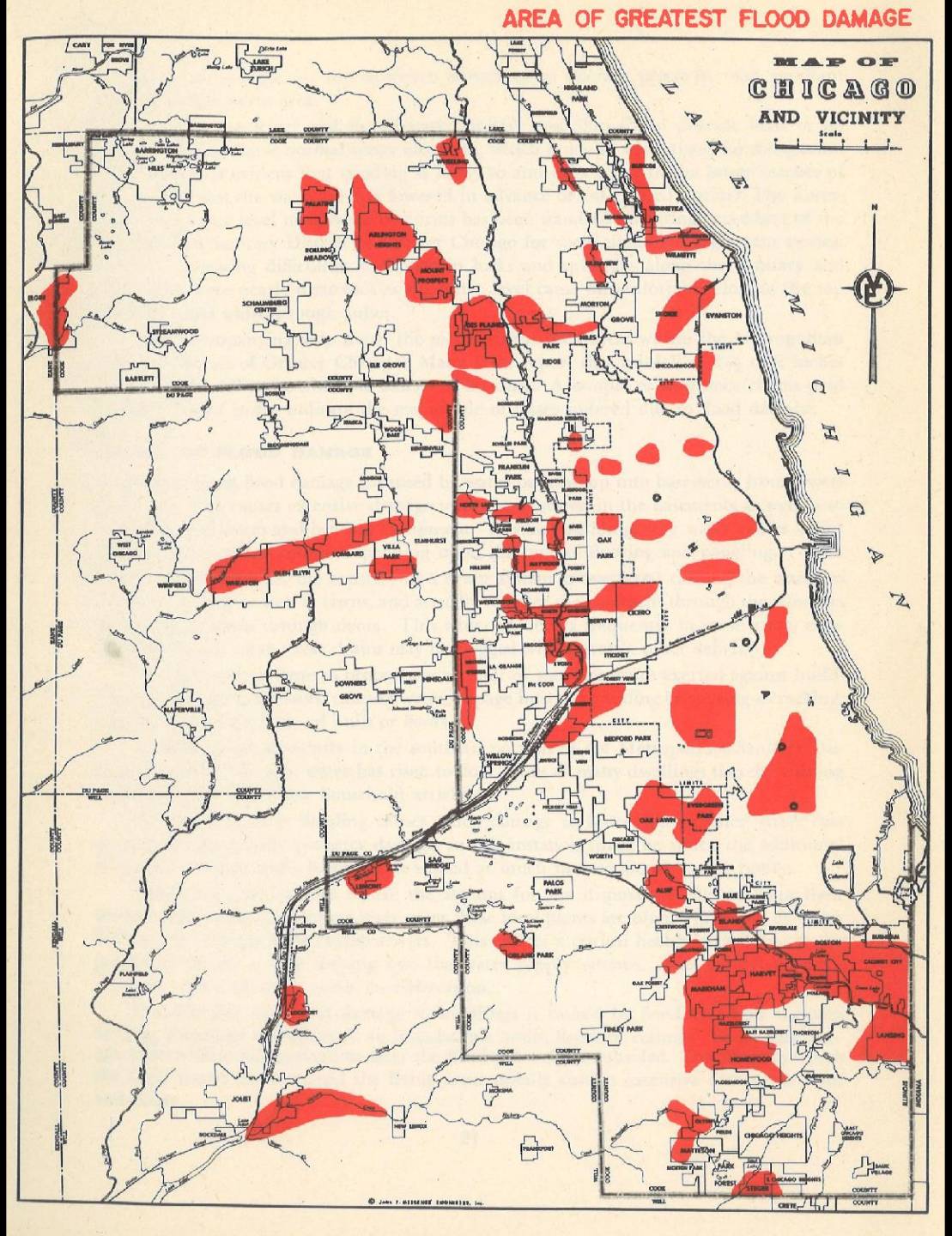
CITY DRIES OUT 4 DAYS AFTER RECORD RAINS: But Scars of Storm Still Remain

Chicago Daily Tribune (1923-1963); Jul 16, 1957; ProQuest Historical Newspapers: Chicago Tribune
pg. 10


TA Kedzie Garage
South Sacrame
Boulevard
Google


TA Kedzie Garage
South Sacrame
Boulevard
Google

Flood Damage
1957



Flood Damages 1932-1957

ESTIMATED FLOOD DAMAGE IN THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO DURING THE PAST 25 YEARS

Alsip	$ 100,000
Arlington Hgts.	1,000,000
Barrington Woods, S.D.	40,000
Bartlett	20,000
Bedford Park	175,000
Bellwood	150,000
Bensenville	500,000
Berkeley	150,000
Berwyn	150,000
Blue Island	1,000,000
Bridgeview	150,000
Broadview	200,000
Brookfield	500,000
Buffalo Grove	25,000
Burnham	100,000
Calumet City	2,000,000
Calumet Park	150,000
Central Stickney S.D.	50,000
Chicago	100,000,000
Chicago Hgts.	750,000
Chicago Ridge	500,000
Cicero	2,500,000
Crestwood	50,000
Des Plaines	2,000,000
Dixmoor	500,000
Dolton	750,000
E. Chicago Hgts.	200,000
Elgin*	100,000
Elk Grove	300,000
Elmwood Park	1,500,000
Evanston	2,000,000
Evergreen Park	2,500,000
Forest Park	1,250,000
Forest View	100,000
Franklin Park	1,000,000
Garden Homes S.D.	50,000
Glencoe	1,000,000
Glen Oak Acres S.D.	50,000
Glenview	1,500,000
Glenwood	50,000
Golf	50,000
Grandview S.D.	50,000
Harvey	2,000,000
Harwood Hgts.	750,000
Hickory Hills	50,000
Hillside	250,000
Hinsdale*	20,000
Hodgkins	100,000
Hometown	500,000
Justice	50,000
Kenilworth	1,000,000
La Grange	1,000,000
La Grange Park	500,000
Lansing*	1,000,000
Lemont	1,000,000
Lincolnwood	100,000
TOTAL	$133,530,000

Lyons	$ 250,000
Manor Hgts. S.D.	200,000
Markham	500,000
Maywood	350,000
McCook	50,000
Melrose Park	500,000
Merrionette Park	100,000
Midlothian	200,000
Morton Grove	1,500,000
Mount Prospect	1,000,000
Niles	200,000
Norridge	200,000
Northbrook	500,000
Northfield	250,000
Northfield Wds. S.D.	100,000
Northlake	500,000
North Riverside	100,000
Oak Forest	250,000
Oak Lawn	1,000,000
Oak Park	250,000
Orchard Pl. S.D.	50,000
Orland Park	250,000
Palatine	500,000
Palos Park	150,000
Park Ridge	250,000
Phoenix	250,000
Posen	100,000
Prospect Meadows S.D.	10,000
Richton Park*	10,000
Riverdale	400,000
River Forest	250,000
River Grove	250,000
Riverside	1,000,000
Robbins	50,000
Rolling Meadows	50,000
Roselle*	50,000
Rosemont	250,000
Sag Bridge	50,000
Sauk Village	50,000
Schaumberg Center	25,000
Schiller Park	200,000
Skokie	1,000,000
South Holland	500,000
S. Stickney S.D.	500,000
Stickney	200,000
Stone Park	500,000
Streamwood	100,000
Summit	1,500,000
Tinley Park	250,000
Westchester	200,000
Western Springs	500,000
Wheeling	1,000,000
Willow Springs	150,000
Wilmette	3,000,000
Winnetka	2,000,000
Worth	100,000
TOTAL	$ 23,695,000
GRAND TOTAL	$157,225,000

* Denotes Part
SD Denotes Sanitary District

23

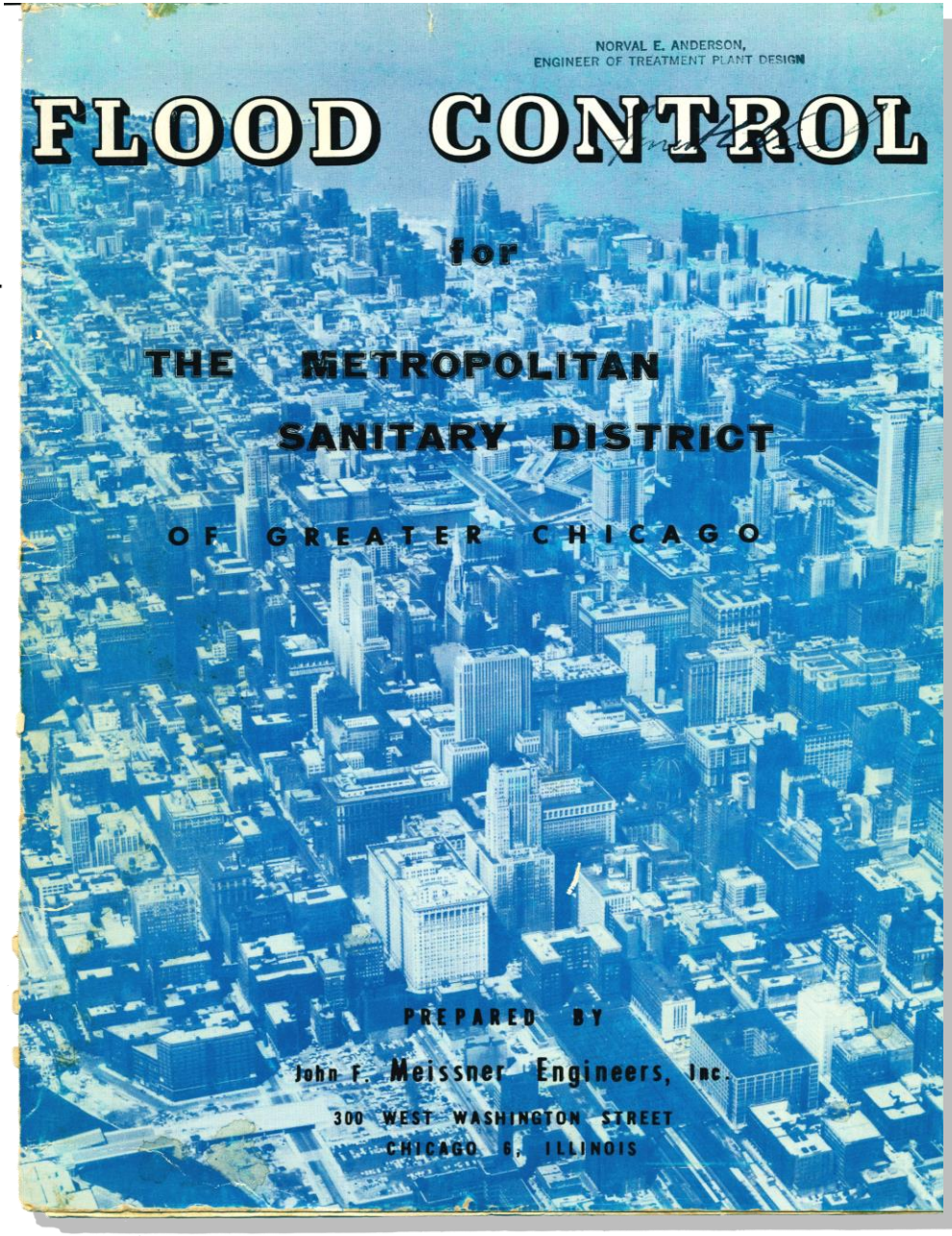
Present Value:
$1,474,785,126

Chicago, April 10, 1958

To the Honorable, the President and Meabers of the Board of Trustees of The Metropolitan Sanitary District of Greater Chicago.

GENTLEMEN:

Your Committee on Finance reports that it has received a communication from the General Superintendent in which he states in connection with a solution of the flood water problem within the boundaries of The Metropolitan Sanitary District of Greater Chicago, he considers that an extensive engineering study should be made with a view toward exploring all possibilities for an ultimate plan and realistic solution of the problem. The General Superintendent states it is imperative that this work be instituted as soon as possible, and as the Engineering Department is fully engaged with other necessary and equally important work, it is felt that outside capable engineering help should be secured to assist in the preparation of the required studies.



CHICAGO DAILY NEWS
The Independent Newspaper
2 PAGES TUESDAY, AUG. 26, 1958. 7¢
MARKETS FINAL

CHICAGO AREA FLOOD CONTROL PLAN BARED

$2.3 Billion Outlay Urged

Engineers Propose 50-Year Project to Sanitary District

A proposed $2.3 billion 50-year flood control plan for the Chicago area was disclosed Tuesday by the Sanitary District.

The plan includes $2 billion to be spent by local communities for new storm sewers and nearly $300 million to be spent by the district for control works to handle flow from these sewers.

The expenditures are recommended in a 110-page report based on a four-month survey by John F. Meissner Engineers Inc.

The estimate of $2 billion for local storm sewers was based on the cost of the present storm sewer system of the City of Chicago.

"In the past, such expenditures have been made by local governing bodies and financed by bond issues authorized by the voters," said the study.

• • •

"IN THE FINAL analysis flood control becomes a matter of choice on the part of the individuals who desire dry basements."

"Their separate decisions to provide local relief will accumulate into an unavoidable demand for correspondingly increased channel and/or reservoir capacity.

"Construct the entire system of control works at a pace consistent with the installation of storm sewers and with available financing," the firm recommended.

The recommended plan for control works, to cost $295 million, calls for these projects:

—Chicago River pumping plant, 36,000 cubic feet per second, and channel improvements for a flow of 56,000 cubic feet per second — $84 million.

—Channel enlargement, North Branch below Niles, and lagoon system—$20 million.

—Pumping station, channel improvement, detention basin at Wilmette—$25 million.

—Calumet Lock pumping plant to handle 30,000 cubic feet per second, channel enlargements in Little Calumet and Calumet rivers, improvement of drainage ditches and building of reservoirs — $47 million.

—Reservoir and creek improvement on the Des Plaines River above Gurnee—$13 million.

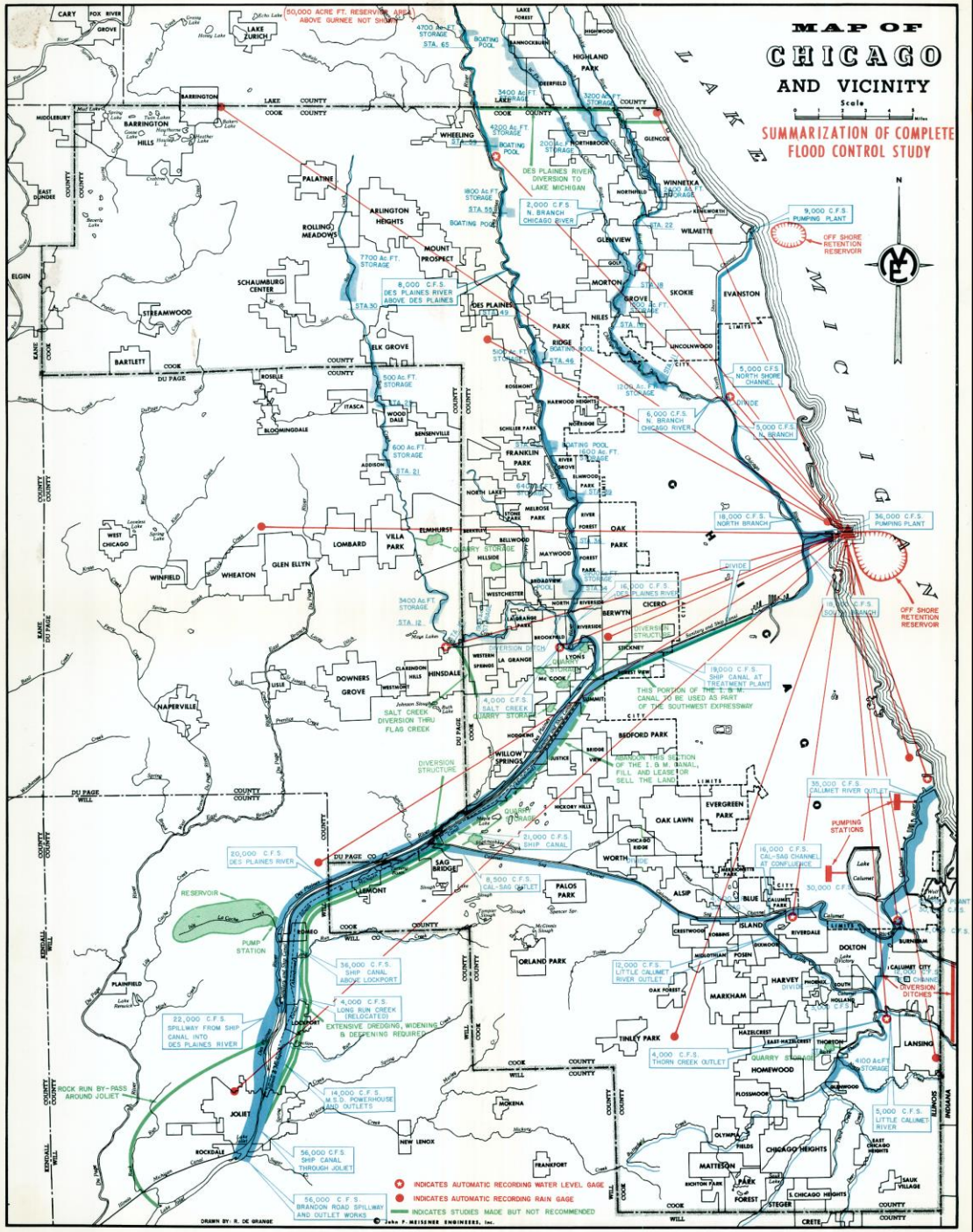
—Channel improvement and recreational flood-water reservoirs in Des Plaines River — $66 million.

—Enlargement of the Des Plaines River to 21,000 c. f. s. capacity from Riverside to the spillway at the Sanitary and Ship Canal, and improvement of creeks and drainage ditches, also storage basins—$40 million.

• • •

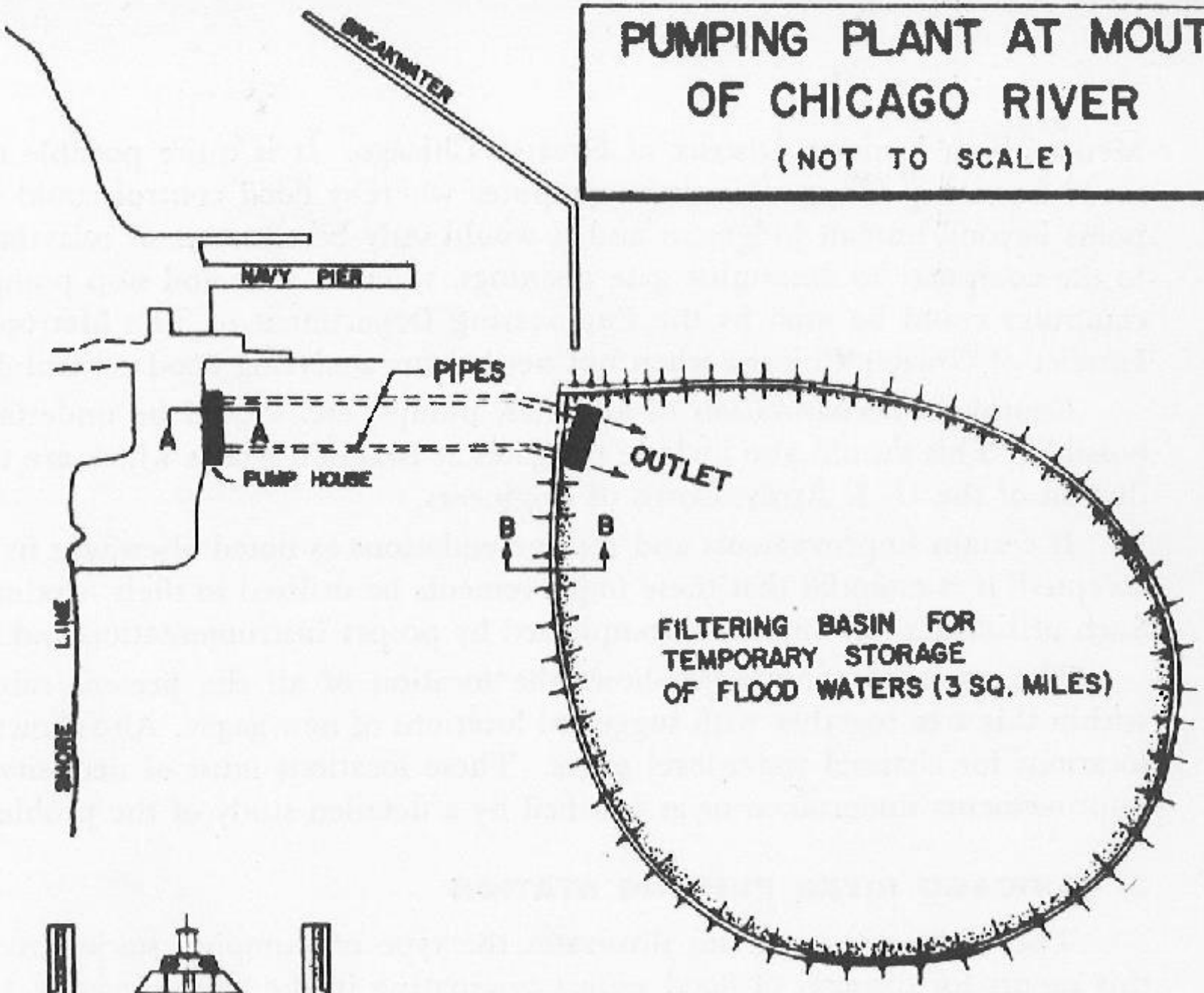
MEISSNER was given the job last April 10 of surveying the flood control problem at a cost of $85,000.

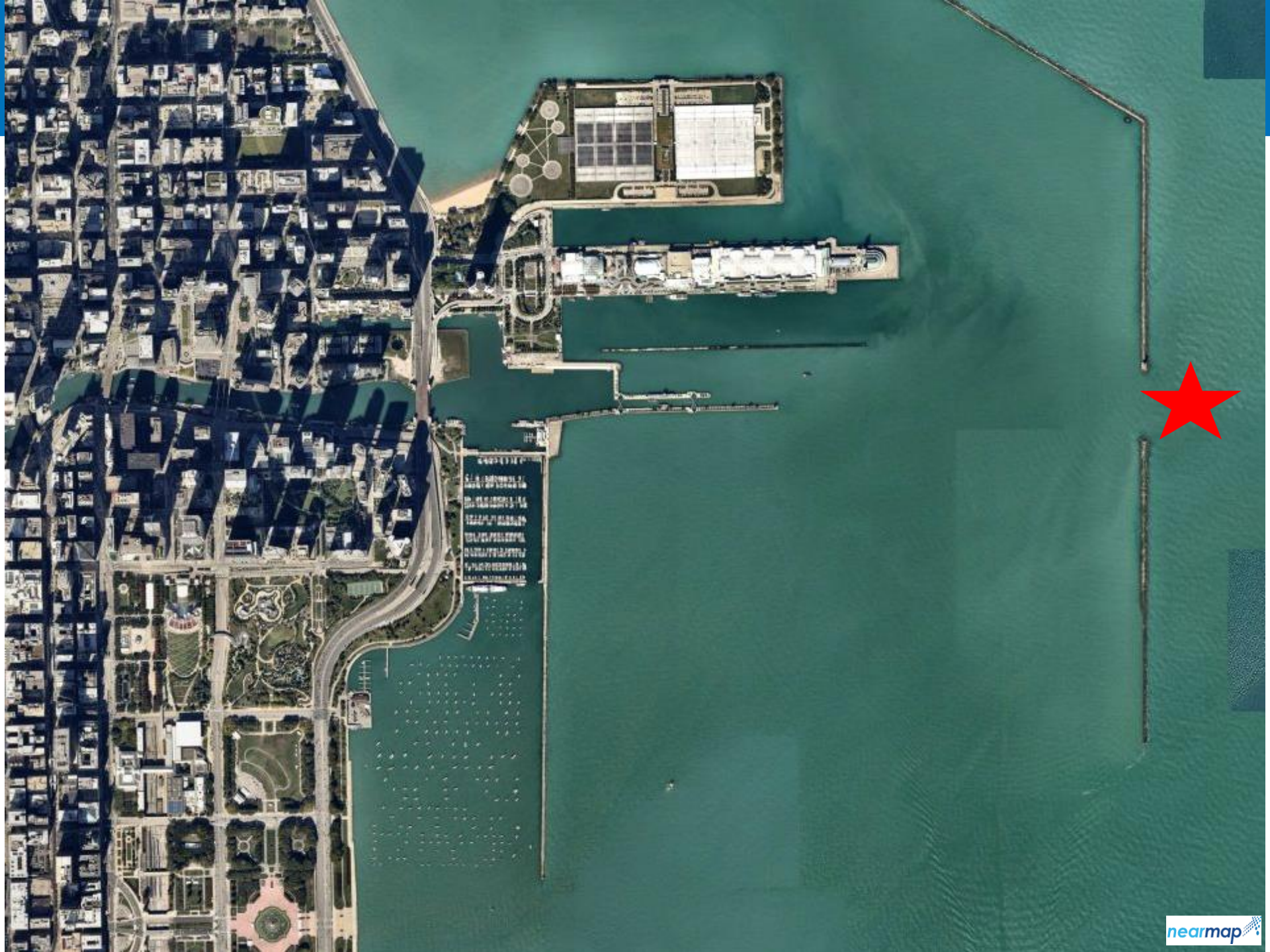
This was exactly a week after the district's chief engineer, Horace P. Ramey, submitted his own plan for flood control.


MAP OF
CHICAGO
AND VICINITY
Scale
SUMMARIZATION OF COMPLETE FLOOD CONTROL STUDY
LAKE MICHIGAN
50,000 ACRE FT. RESERVOIR AREA ABOVE GURNEE NOT SHOWN
4700 Ac. Ft. STORAGE STA. 65
BOATING POOL
3400 Ac.Ft. STORAGE
3200 Ac.Ft. STORAGE
4200 Ac.Ft. STORAGE
BOATING POOL
200 Ac.Ft. STORAGE
DES PLAINES RIVER DIVERSION TO LAKE MICHIGAN
1800 Ac.Ft. STORAGE
STA. 55
BOATING POOL
2,000 C.F.S. N. BRANCH CHICAGO RIVER
7700 Ac.Ft. STORAGE
8,000 C.F.S. DES PLAINES RIVER ABOVE DES PLAINES
STA. 30
STA. 49
500 Ac.Ft. STORAGE
STA. 46
BOATING POOL
1200 Ac.Ft. STORAGE
500 Ac.Ft. STORAGE
STA. 5
600 Ac.Ft. STORAGE
STA. 21
1600 Ac.Ft. STORAGE
STA. 19
640 Ac.Ft. STORAGE
STA. 17
QUARRY STORAGE
3400 Ac.Ft. STORAGE
STA. 12
STA. 8
STA. 4
DIVERSION STRUCTURE
DIVERSION DITCH
4,000 C.F.S. SALT CREEK QUARRY STORAGE
SALT CREEK DIVERSION THRU FLAG CREEK
DIVERSION STRUCTURE
QUARRY STORAGE
21,000 C.F.S. SHIP CANAL
8,500 C.F.S. CAL-SAG OUTLET
20,000 C.F.S. DES PLAINES RIVER
RESERVOIR
PUMP STATION
36,000 C.F.S. SHIP CANAL ABOVE LOCKPORT
4,000 C.F.S. LONG RUN CREEK (RELOCATED)
EXTENSIVE DREDGING, WIDENING & DEEPENING REQUIRED
22,000 C.F.S. SPILLWAY FROM SHIP CANAL INTO DES PLAINES RIVER
ROCK RUN BY-PASS AROUND JOLIET
14,000 C.F.S. M.S.D. POWERHOUSE AND OUTLETS
56,000 C.F.S. SHIP CANAL THROUGH JOLIET
56,000 C.F.S. BRANDON ROAD SPILLWAY AND OUTLET WORKS
9,000 C.F.S. PUMPING PLANT
OFF SHORE RETENTION RESERVOIR
5,000 C.F.S. NORTH SHORE CHANNEL
DIVIDE
6,000 C.F.S. N. BRANCH CHICAGO RIVER
5,000 C.F.S. N. BRANCH
18,000 C.F.S. NORTH BRANCH
36,000 C.F.S. PUMPING PLANT
DIVIDE
16,000 C.F.S. DES PLAINES RIVER
18,000 C.F.S. SOUTH BRANCH
OFF SHORE RETENTION RESERVOIR
19,000 C.F.S. SHIP CANAL AT TREATMENT PLANT
THIS PORTION OF THE I. & M. CANAL TO BE USED AS PART OF THE SOUTHWEST EXPRESSWAY
ABANDON THIS SECTION OF THE I. & M. CANAL, FILL AND LEASE OR SELL THE LAND
35,000 C.F.S. CALUMET RIVER OUTLET
PUMPING STATIONS
16,000 C.F.S. CAL-SAG CHANNEL AT CONFLUENCE
30,000 C.F.S.
12,000 C.F.S. LITTLE CALUMET RIVER OUTLET
DIVERSION DITCHES
4,000 C.F.S. THORN CREEK OUTLET
QUARRY STORAGE
4100 Ac.F.S. STORAGE
5,000 C.F.S. LITTLE CALUMET RIVER
INDICATES AUTOMATIC RECORDING WATER LEVEL GAGE
INDICATES AUTOMATIC RECORDING RAIN GAGE
INDICATES STUDIES MADE BUT NOT RECOMMENDED
DRAWN BY: R. DE GRANGE
© John F. Meisner Engineers, Inc.
CARY
FOX RIVER GROVE
LAKE ZURICH
BARRINGTON
BARRINGTON HILLS
PALATINE
ARLINGTON HEIGHTS
ROLLING MEADOWS
MOUNT PROSPECT
SCHAUMBURG CENTER
STREAMWOOD
ELGIN
BARTLETT
ELK GROVE
ROSELLE
ITASCA
BLOOMINGDALE
WOOD DALE
BENSENVILLE
ADDISON
WEST CHICAGO
WINFIELD
WHEATON
GLEN ELLYN
LOMBARD
VILLA PARK
ELMHURST
NAPERVILLE
DOWNERS GROVE
LISLE
HINSDALE
WESTMONT
CLARENDON HILLS
WILLOWBROOK
BURR RIDGE
DARIEN
WOODRIDGE
LEMONT
ROMEO
PLAINFIELD
JOLIET
ROCKDALE
NEW LENOX
MOKENA
ORLAND PARK
PALOS PARK
SAG BRIDGE
WORTH
ALSIP
OAK LAWN
EVERGREEN PARK
BEDFORD PARK
WILLOW SPRINGS
LA GRANGE
LA GRANGE PARK
BROOKFIELD
WESTERN SPRINGS
MC COOK
SUMMIT
BERWYN
CICERO
OAK PARK
RIVER FOREST
RIVER GROVE
FRANKLIN PARK
SCHILLER PARK
NORTH LAKE
MELROSE PARK
BELLWOOD
HILLSIDE
MAYWOOD
BROADVIEW
WESTCHESTER
STONE PARK
NORRIDGE
HARWOOD HEIGHTS
ROSEMONT
ELMWOOD PARK
LINCOLNWOOD
NILES
MORTON GROVE
GLENVIEW
GOLF
SKOKIE
EVANSTON
WILMETTE
KENILWORTH
WINNETKA
NORTHFIELD
GLENCOE
NORTHBROOK
WHEELING
DEERFIELD
HIGHLAND PARK
HIGHWOOD
LAKE FOREST
LAKE BLUFF
NORTH CHICAGO
GREAT LAKES
WAUKEGAN
ZION
BENTON HARBOR
MICHIGAN CITY
GARY
HAMMOND
EAST CHICAGO
HARBOR
INDIANA
ILLINOIS
WISCONSIN
MICHIGAN
LAKE COUNTY
COOK COUNTY
DU PAGE COUNTY
KANE COUNTY
WILL COUNTY
KENDALL COUNTY
LIMITS
CITY
PARK
RIDGE
SKATING POOL
DIVERSION STRUCTURE
SUBURBS
CRESTWOOD
ROBBINS
DIXMOOR
MIDLOTHIAN
POSEN
BLUE ISLAND
RIVERDALE
DOLTON
CALUMET CITY
BURNHAM
HARVEY
MARKHAM
THORNTON
SOUTH HOLLAND
HAZELCREST
EAST HAZELCREST
TINLEY PARK
HOMEWOOD
FLOSSMOOR
OLYMPIA FIELDS
MATTESON
RICHTON PARK
PARK FOREST
STEGER
S. CHICAGO HEIGHTS
CHICAGO HEIGHTS
EAST CHICAGO HEIGHTS
SAUK VILLAGE
LANSING
CRETE
FRANKFORT
LOCKPORT
Lake Calumet
Lake Michigan

PUMPING PLANT AT MOUTH OF CHICAGO RIVER

(NOT TO SCALE)




nearmap

Walter M. Bacon

CHICAGO TUNNEL DRAINAGE PROJECT

PRELIMINARY EVALUATION OF FEASIBILITY

BY

HARZA ENGINEERING COMPANY

BAUER ENGINEERING, INC.

MAY 1964

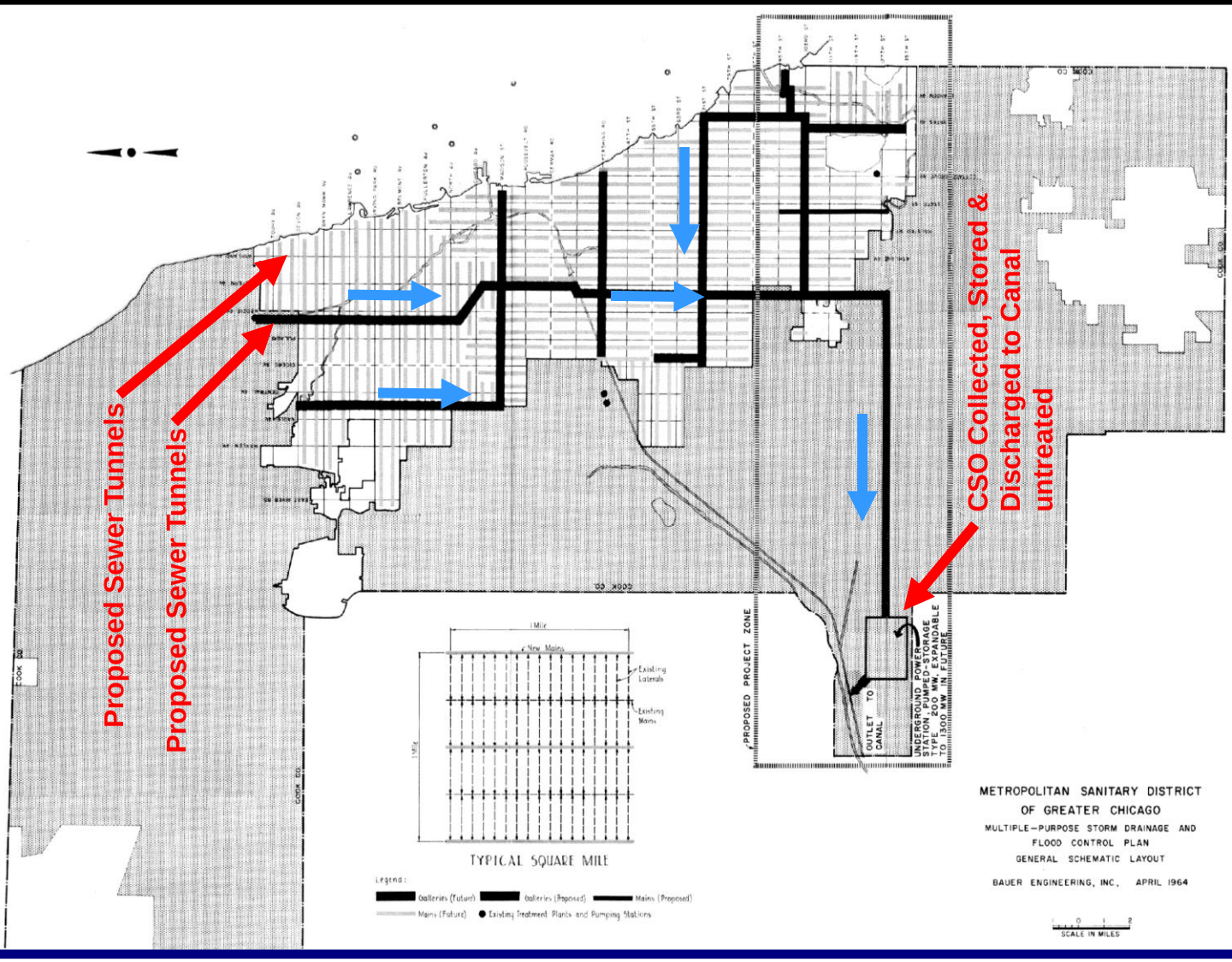
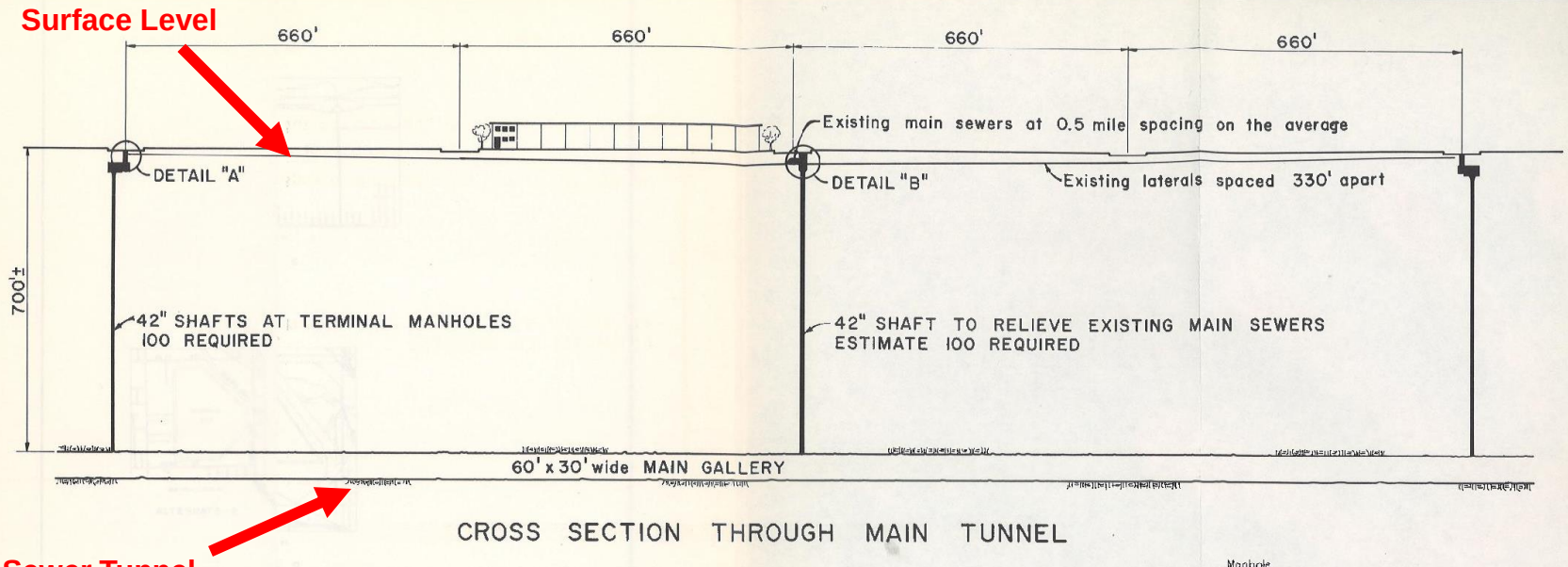
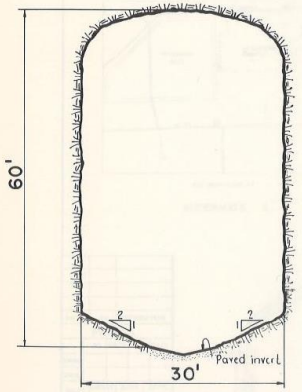

Proposed Sewer Tunnels
Proposed Sewer Tunnels
CSO Collected, Stored & Discharged to Canal untreated
PROPOSED PROJECT ZONE
OUTLET TO CANAL
UNDERGROUND POWER-STORAGE STATION 2000 MW STAGEABLE TO 1500 MW FUTURE
1 Mile
New Mains
Existing Laterals
Existing Mains
1 Mile
TYPICAL SQUARE MILE
Legend:
Galleries (Future)
Galleries (Proposed)
Mains (Proposed)
Mains (Future)
Existing Treatment Plants and Pumping Stations
METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO
MULTIPLE-PURPOSE STORM DRAINAGE AND FLOOD CONTROL PLAN
GENERAL SCHEMATIC LAYOUT
BAUER ENGINEERING, INC., APRIL 1964
SCALE IN MILES

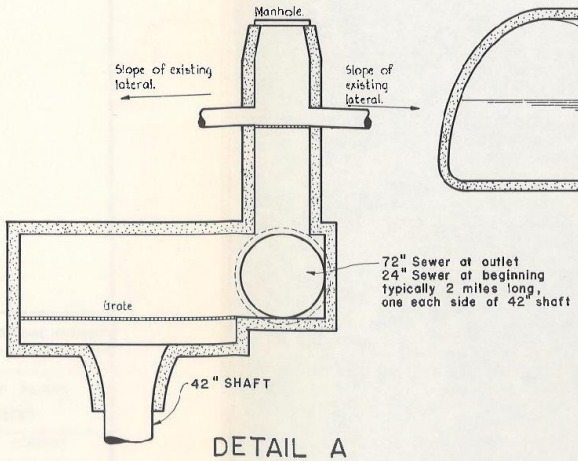
EXHIBIT B



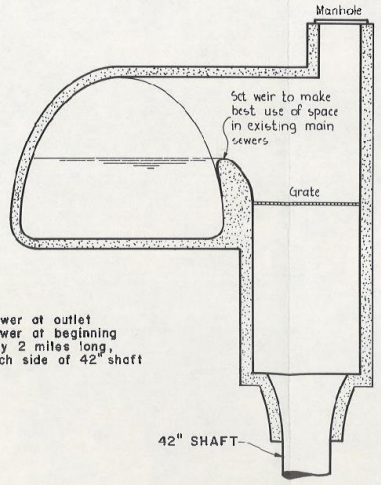
CROSS SECTION THROUGH MAIN TUNNEL



MAIN GALLERY



DETAIL A



DETAIL B

METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

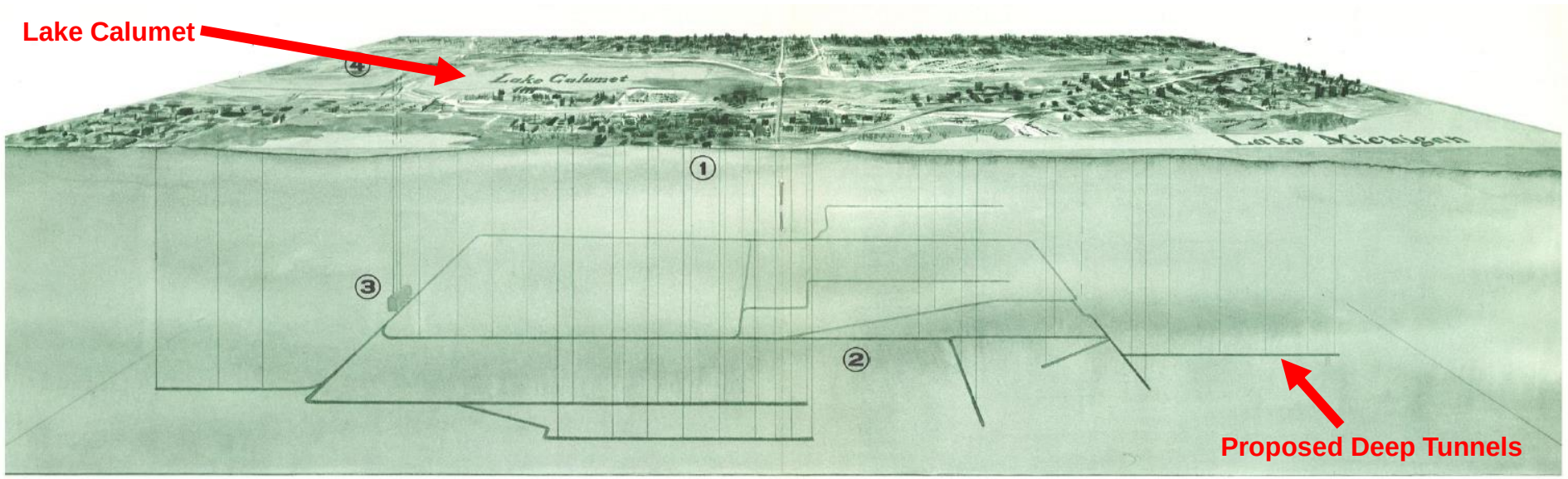
CHICAGO DRAINAGE	GALLERY SYSTEM

GENERAL SECTIONS AND DETAILS

BAUER ENGINEERING INC.

BY W. J. Bauer

CHICAGO, ILLINOIS | APR 1964 | SHEET OF



FLOOD and POLLUTION CONTROL

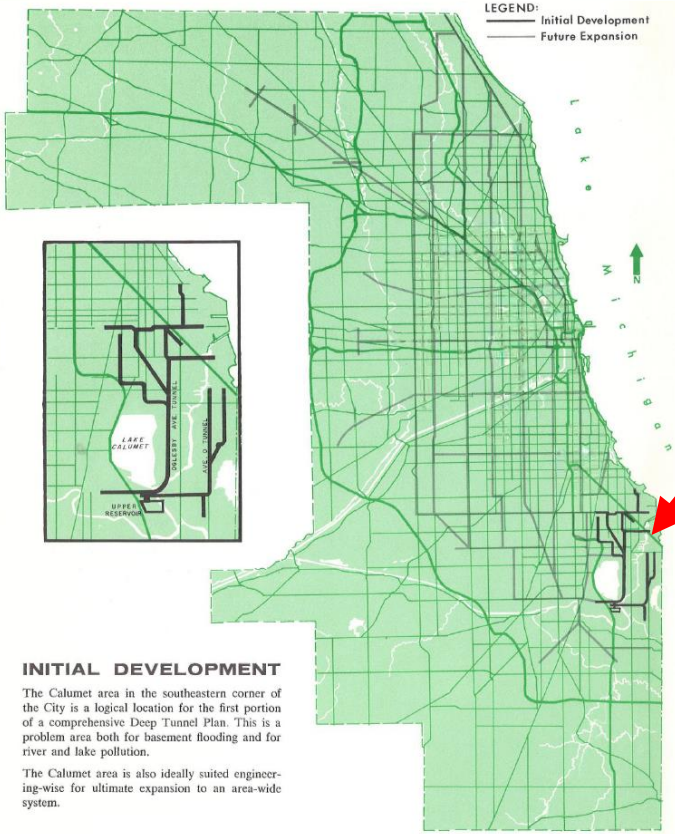
A DEEP TUNNEL PLAN FOR THE CHICAGOLAND AREA

A plan for deep underground storage of storm water to eliminate flooding, reduce pollution and develop electric power.

THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

May 1966

1B001.1

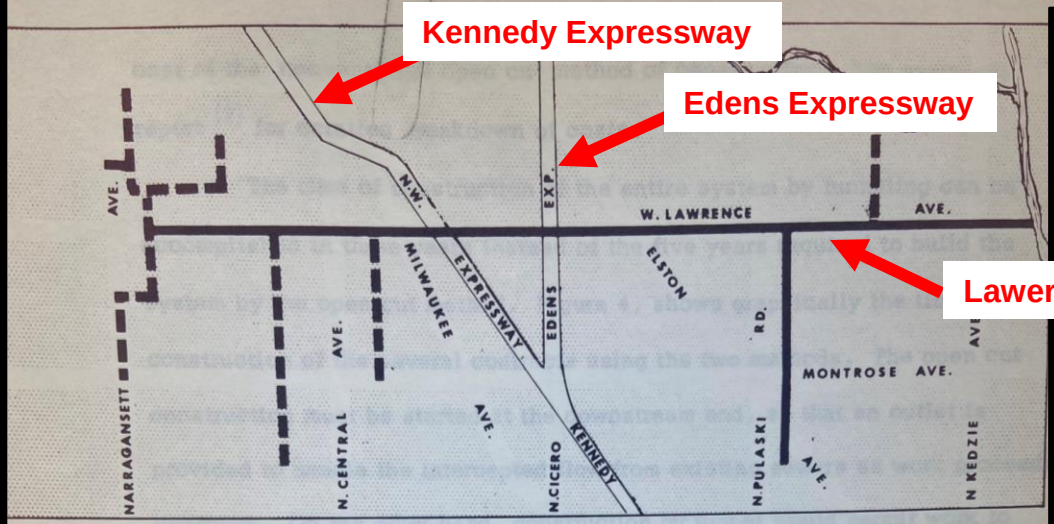


INITIAL DEVELOPMENT

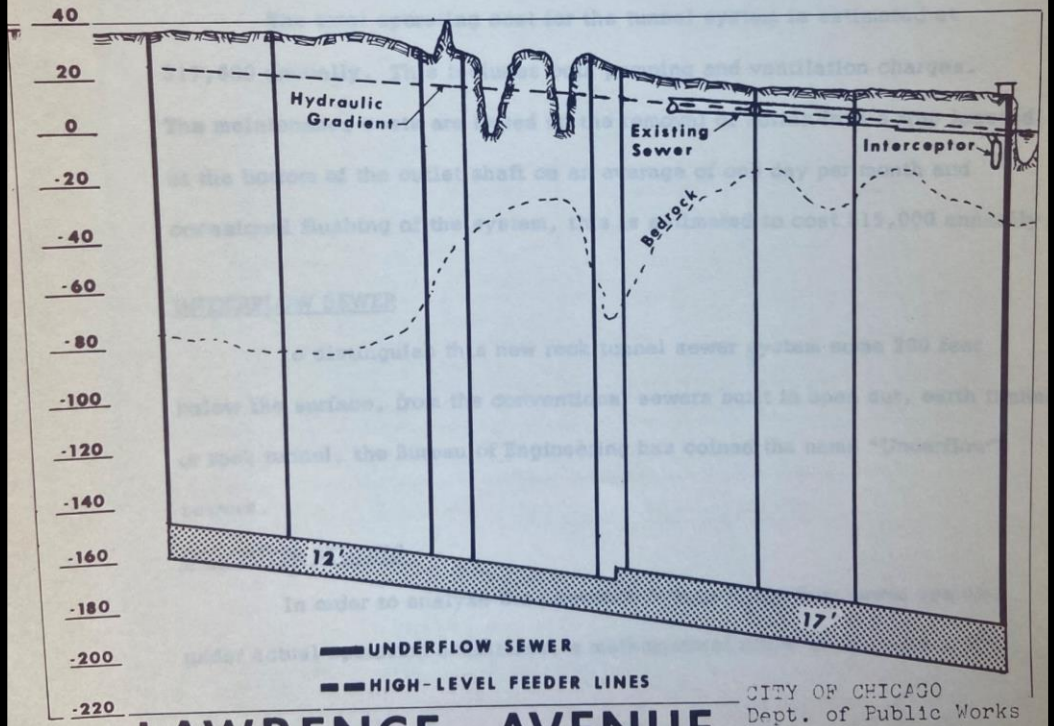
The Calumet area in the southeastern corner of the City is a logical location for the first portion of a comprehensive Deep Tunnel Plan. This is a problem area both for basement flooding and for river and lake pollution.

The Calumet area is also ideally suited engineering-wise for ultimate expansion to an area-wide system.

City of Chicago designing a prototype tunnel in 1966 for feasibility of a master flood and pollution control plan



UNDERFLOW PLAN



CITY OF CHICAGO
Dept. of Public Works
Bur. of Engineering

LAWRENCE AVENUE UNDERFLOW TRIBUTARY

Figure 3

State Will Seek Area Flood Control
Judge, Bernard
Chicago Tribune (1963-1996); May 1, 1966; ProQuest Historical Newspapers: Chicago Tribune
pg. U1

State Will Seek Area Flood Control

BY BERNARD JUDGE

The state is moving to establish a master flood control program for the Chicago metropolitan area.

Francis S. Lorenz, state director of public works and buildings, said he has started to form a planning committee of engineers and officials of municipalities.

Their job will be to make recommendations which will be used by the state as a framework for the passage of legislation. Lorenz said.

Hits Local Agreements

Lorenz said that many times the state has entered a contract with local governments to clear and clean a stream. "After the state cleans the stream, the local government fails to live up to its half of the bargain to keep the stream clean."

John C. Guillou
. . . outlines future plans

Francis S. Lorenz
. . . calls for conference

Frank W. Chesrow
. . . offers cooperation

act fast, flood plain land will be filled with nothing but roofs and parking lots."

Urges Tightening Permits

Pikarsky vowed the city's support and said the city has already spent 111 million dollars on its sewer program. He said the future of the sewer program hinges on the passage of the June 14 referendum which includes a 4¢ million dollar allocation for the sewer systems.

Chesrow said the sanitary district has begun far-reaching flood programs. He urged tightening the issue of building permits in flood plains, and the need for water retention basins. To bring home his point, Chesrow said, "If the corps of engineers would allow us an additional six inches of depth in our 72 miles of channels and canals, we would have a retention basin the size of a football field that would be 1,000 feet deep."

The state is backing a plan for the construction of dams and locks on the sanitary and ship canal to reduce flooding in a large portion of the Chicago area. Guillou said the state wants to build a dam and locks at Western avenue, demolish the Brandon locks and dam complex south of Joliet, eliminate the Lockport dam and locks, and construct a new dam and locks about a mile upriver.

Flood Control Coordinating Committee Formed

Members include *State of IL*, *Cook County*, *MWRD & City of Chicago*

Technical Advisory Committee

- **Total of 27 meetings from February 13, 1968 through June 10, 1970**
- **The committee on September 30, 1968 approved a resolution concerning a composite drainage plan for the Chicago area. This resolution outlined a general framework for the 300 square miles of combined sewer area.**
- **Three conceptual plans were developed based on this resolution:**
  - **State of Illinois Division of Waterways**
    - **Widen, deepen and straighten the river systems to provide capacity for storm waters.**
  - **City of Chicago**
    - **Excavate a series of rock tunnels 200-300 feet under the North Shore Channel, Des Plaines and Calumet Rivers and Sanitary Ship Canal to intercept storm and sewage overflows until treatment plants could receive their flows.**
  - **MWRD**
    - **Excavate tunnels 600-800 feet below the surface in the similar areas as the City of Chicago but incorporate underground storage reservoirs, provide electricity for water pumped from these reservoirs, and excavated rock disposing areas repurposed as recreational sites such as a toboggan and ski hill.**

The committee could not arrive on a final recommendation and was temporarily abandoned after Chairman Guillou's resignation on 6/10/1970.

TECHNICAL ADVISORY COMMITTEE

to the

FLOOD CONTROL COORDINATING COMMITTEE

13 February 1968

MEMBERS PRESENT

John C. Guillou, *Chairman*	*Illinois Department of Public Works and Buildings*
Frank C. Dalton	*Metropolitan Sanitary District of Greater Chicago*
Clint J. Keifer	*City of Chicago Department of Public Works*
Arthur Janura	*Cook County Forest Preserve District, County of Cook*
Benn J. Leland *for Clarence Klassen*	*Illinois Department of Public Health*
Robert W. Hirshfield	*Commonwealth Edison Company and Chicago Association of Commerce and Industry*
Louis D'Alba	*Chicago District, U.S. Army Corps of Engineers*
Robert Ducharme *for Matthew L. Rockwell*	*Northeastern Illinois Planning Commission*

MEMBERS ABSENT

Walter Poston	*Federal Water Pollution Control Administration*

OTHERS PRESENT

Vic Koelzer	*Harza Engineering*
William Bauer	*Bauer Engineering*
Charles D. Mitchell	*Illinois Division of Waterways*
Bruce Barker	*Illinois Division of Waterways*
John B. Carlisle	*Illinois Division of Waterways*
Vinton W. Bacon	*Metropolitan Sanitary District*
Charles Estes	*Cook County Forest Preserve District*
Roland Eisenbeis	*Cook County Forest Preserve District*
Forrest Neil	*Metropolitan Sanitary District*

Tunnels Project Rises to the Surface Again
Wagner, Sally
Chicago Tribune (1963-1996); Jun 6, 1971; ProQuest Historical Newspapers: Chicago Tribune
pg. W_A10

Tunnels Project Rises to the Surface Again

Technical Advisory Committee "Part Two"

- **Technical Advisory Committee reactivated on May 17, 1971**
- **Committee members were trimmed down to the following:**
  - **Illinois Institute of Environmental Quality – Michael Schneiderman (Chairman)**
  - **MWRD**
  - **City of Chicago**
  - **Cook County Forest Preserve**

Technical Advisory Committee "Part Two"

- Technical Advisory Committee investigated 23 separate flood plan alternatives
  - Alternatives were labeled "A" through "T"

- Some Evaluation Criteria:
  - Costs expanding existing WRP's
  - Cost of tunnels
  - Cost of near surface collecting sewers & drop shafts
  - Cost of construction pits or storage quarries
  - Cost of mining
  - Cost of aeration in storage facilities
  - Strength of rock and drillability
  - Effect of earthquakes on mined areas
  - Maximum permissible velocities in tunnels

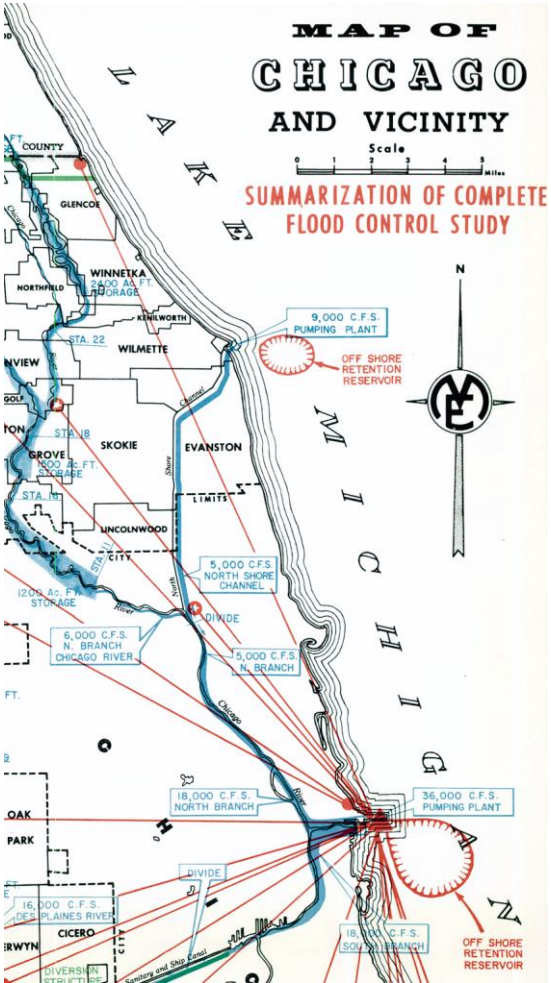
- Committee members led to the recommendation that 6 of the 23 should NOT receive further study:
  - Plans ***eliminated*** "K", "L", "M", "N", "P", and "T"

Technical Advisory Committee "Part Two"

- **Highlights from some of the *Eliminated* Plans:**

"K" Leffler Plan

The Leffler Plan comprises the construction of a series of dikes in Lake Michigan to develop flood ponds with a total area of about 14,680 acres, 3,800 acres for the North Shore Channel, 2,560 acres for the Chicago River & 8,320 acres for the Calumet River



"L" Meissner Plan

August 1958 report comprised of channel improvements, surface reservoirs and discharges to Lake Michigan. More than 100,000 acre feet of surface storage along waterways and in Lake Michigan.

Technical Advisory Committee "Part Two"

- **Highlights from some of the *Eliminated* Plans:**

"M" Ramey-Williams Channel Improvement Plan

Widening improvements to the Chicago Sanitary and Ship Canal to increase the outflow at Lockport to 30,000 cfs without attaining flood stages in the waterway.

"N" Sheaffer Plan

Proposes the abandonment of the existing sewage plants and the conveyance of all combined sewage to areas in Central Illinois for treatment in aerobic treatment cells with spray irrigation of effluent on under-productive farmland.

"T" Separate System of Sanitary Sewers

Separation of sanitary and industrial wastes from storm water by the construction of parallel sanitary sewers. The proposed separate sanitary sewers would drain into existing MWRD interceptors for conveyance to the existing sewage treatment plants.

The Metropolitan Sanitary District of Greater Chicago

CAPITAL COSTS COMPARISON

EXPENDITURES VS. B. O. D. CAPTURE

96 Year Storm — 300 Sq. Miles

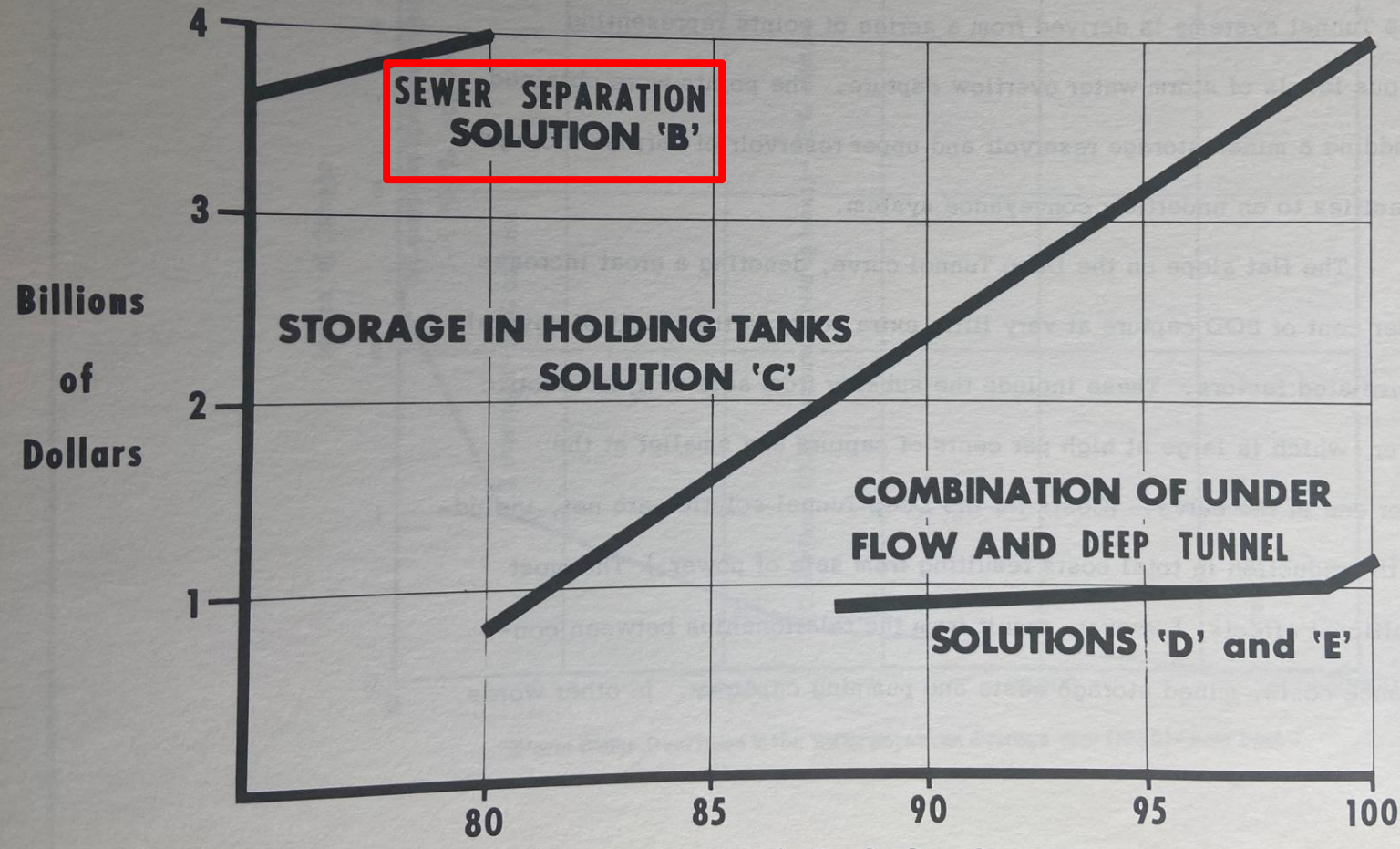
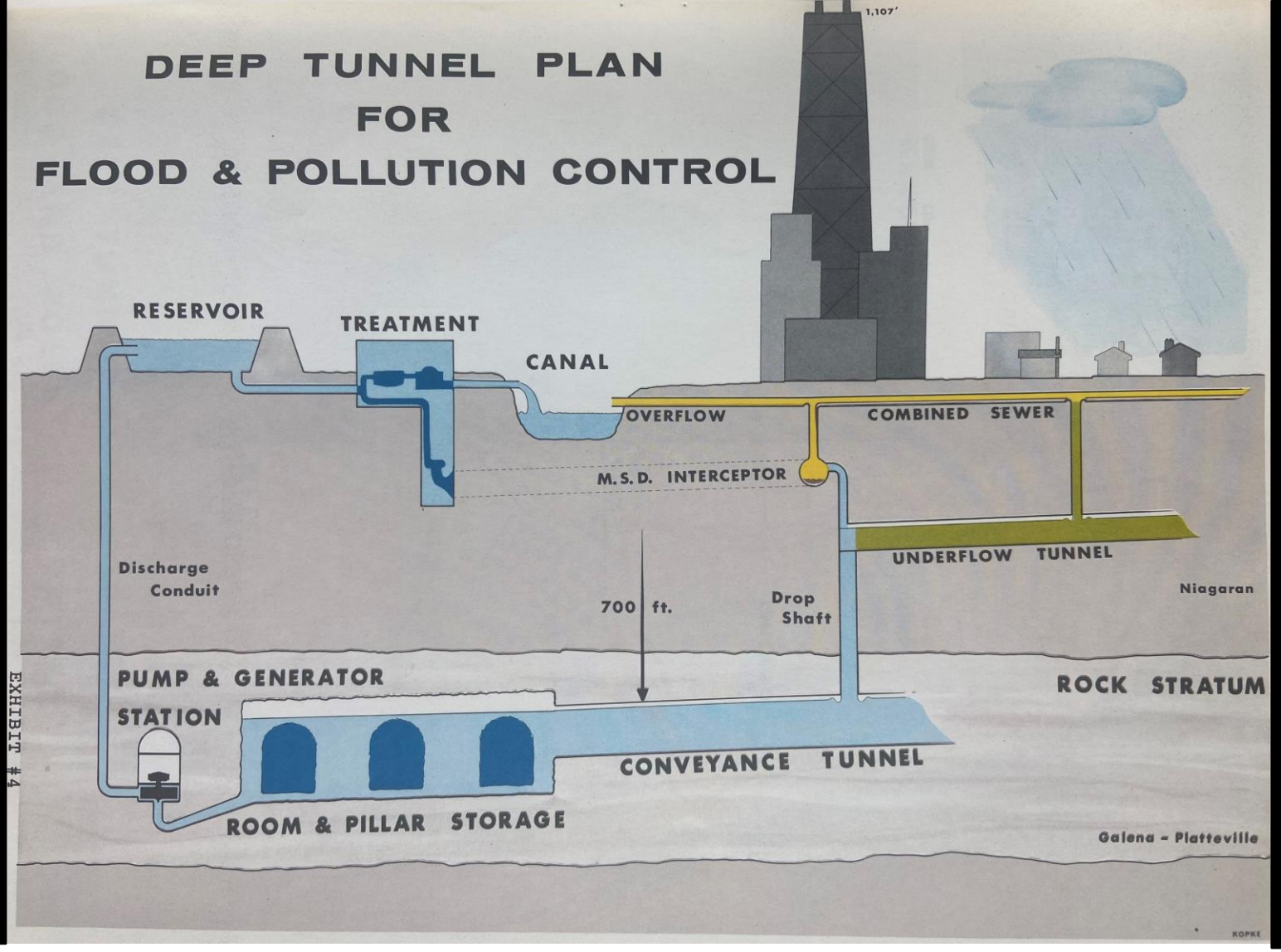


Fig. 22

JULY, 1968

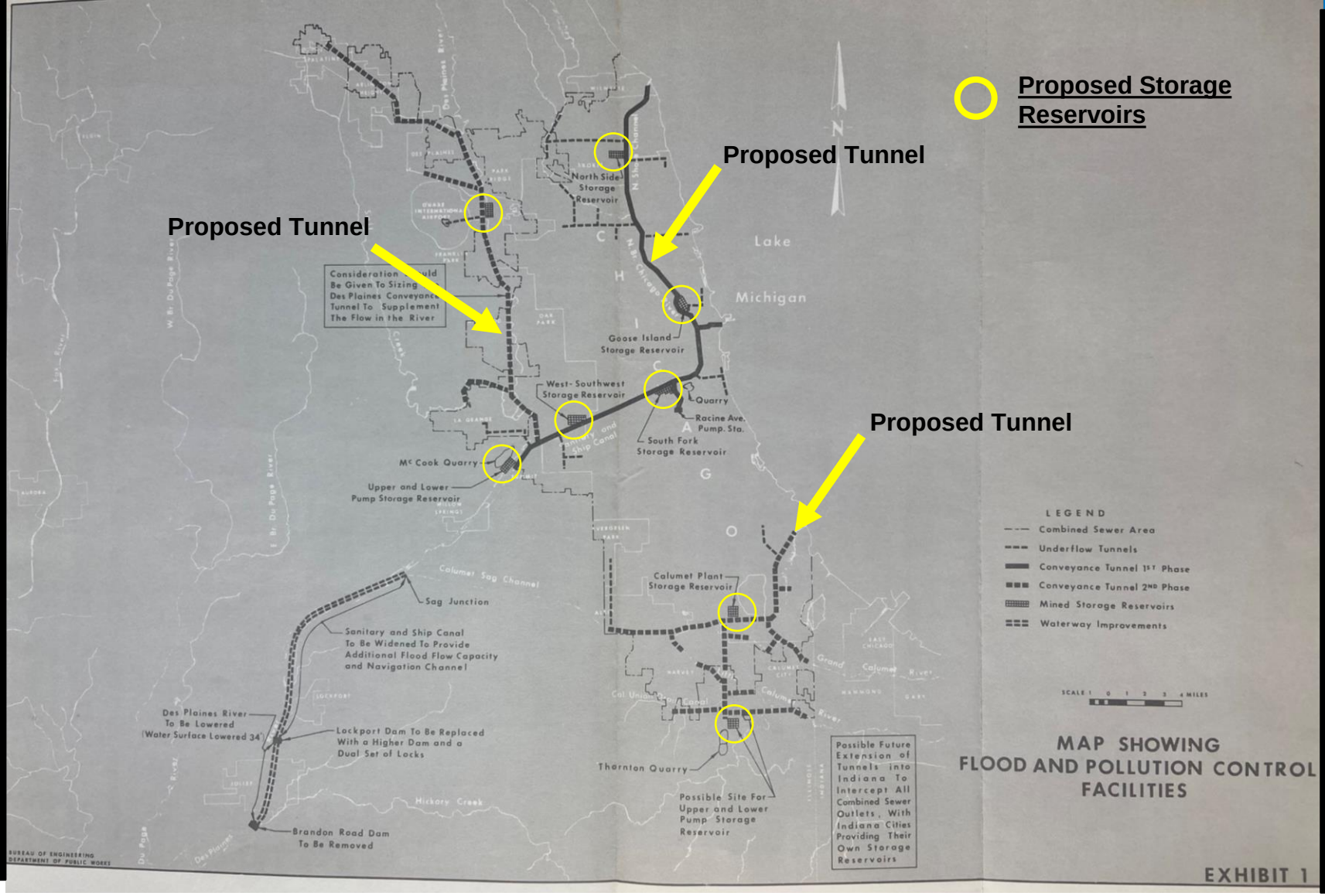


- **Highlights from some of the *Feasible* Plans by Harza-Bauer Engineering for *MWRD*:**

Alt. "A" Original Deep Tunnel Plan with Mined & Surface Storage in the Calumet Area

Alt. "B" Original Deep Tunnel Plan with Mined & Surface Storage in the Calumet Area & Stickney Areas

Alt. "C" Original Deep Tunnel Plan with Mined & Surface Storage in 3 locations in Calumet, Stickney & North Side WRPs



- **Highlights from some of the *Feasible* Plans by *City of Chicago*:**

Alt. "E" Series of tunnels conveying CSO's to Stickney, North Side & O'Hare WRP. Mined Storage Areas of various locations

Alt. "G" Single Quarry in the McCook Area

Alt. "H" Two Quarries: One at McCook and another at Thornton

Alt. "J" Three Quarries: McCook, Stearns Quarry, & Thornton

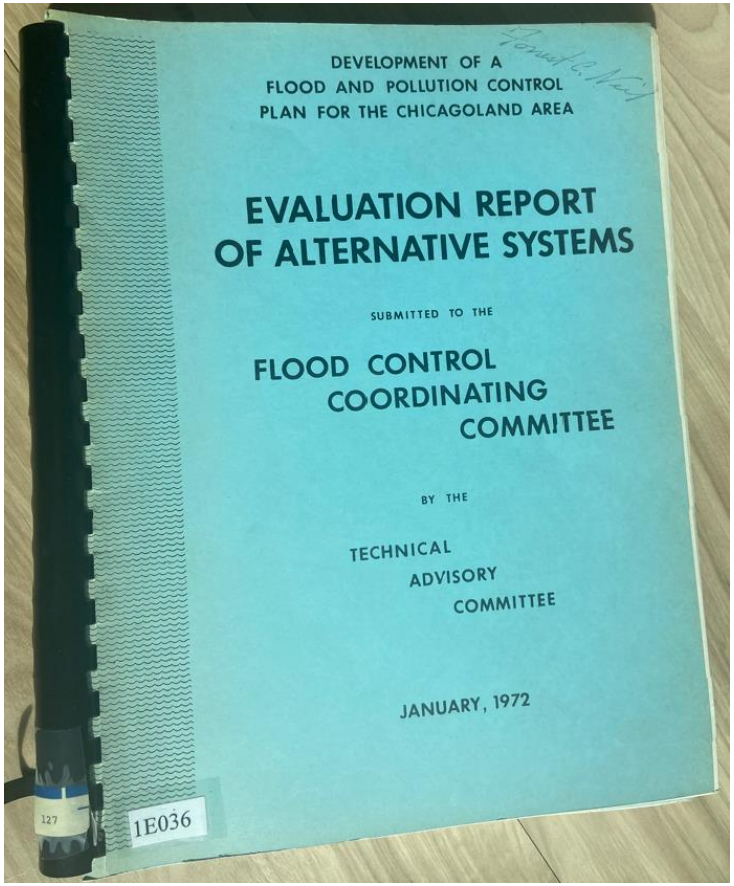
Alt. "S" McCook and O'Hare Storage facilities

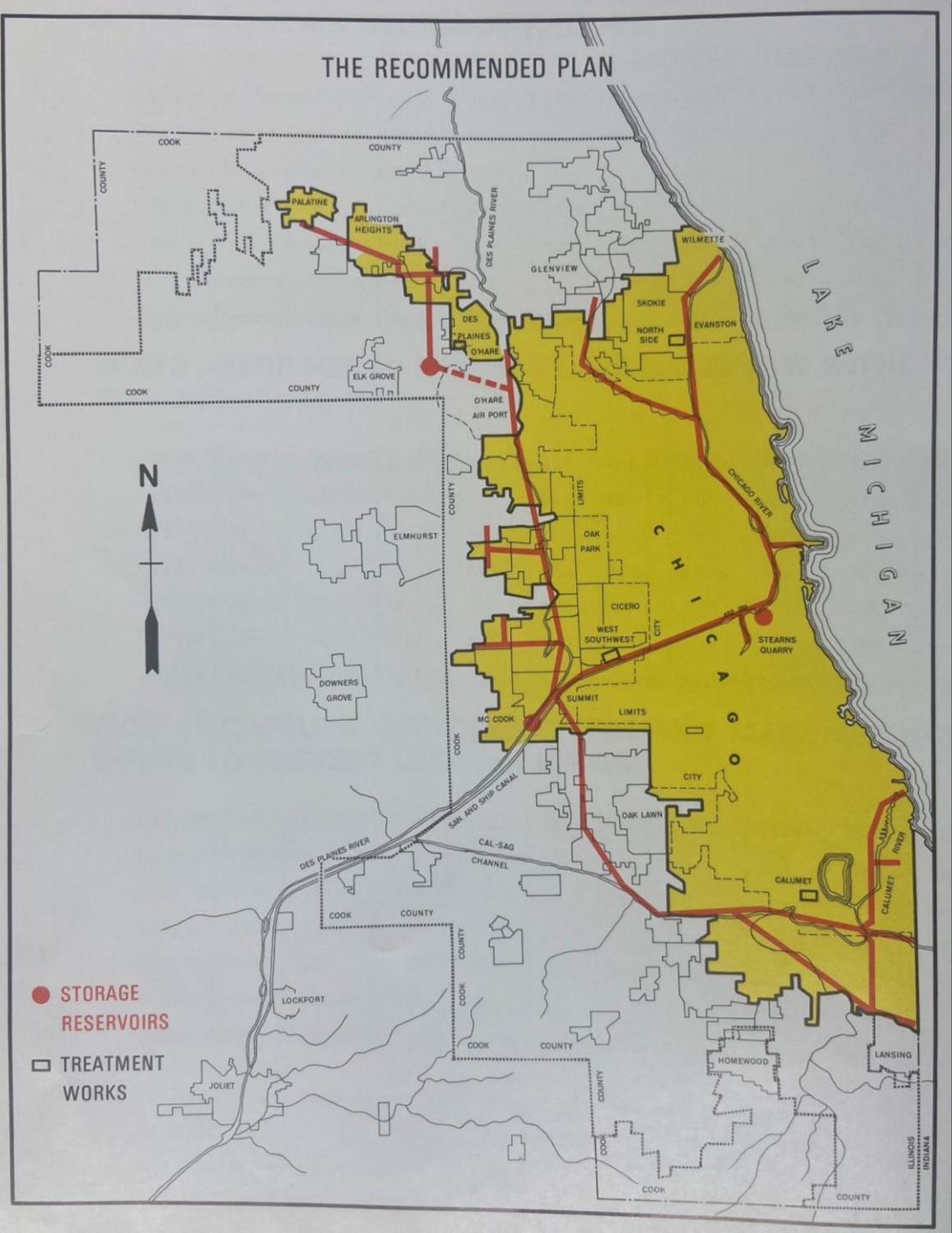
Technical Advisory Committee "Part Two"

- After extensive review of the evaluation report, the committee agreed that the "Chicago Underflow Plan" (Alternatives "G", "H", "J" and "S") are less costly and would be more environmentally friendly to the community.

- Primary emphasis was to provide storage to prevent backflows to Lake Michigan

- "G", "H", "J" and "S" included conveyance tunnels and evaluating optimal location(s) at McCook, Thornton, O'Hare, and/or Stearns Quarry

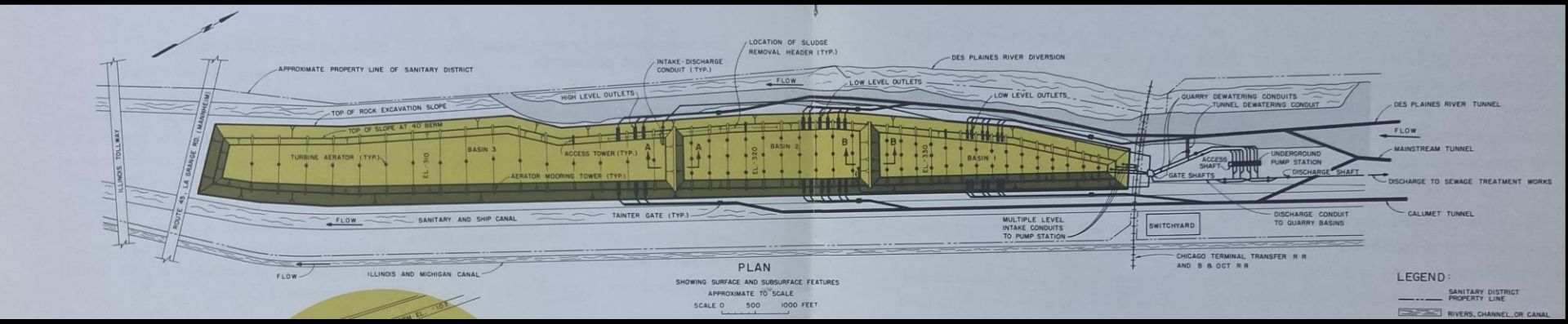




Technical Advisory Committee RECOMMENDED PLAN in 1972

- A composite of the several Underflow Plan alternatives due to its storage economy and simplicity.
- 120 miles of conveyance tunnels 150-300ft below ground
- McCook Storage Reservoir on existing MWRD sludge lagoons (57,000 acre-feet or 18.5 BG)
- O'Hare Storage Reservoir (1,800 acre-feet or 590 MG)
- Stearns Quarry Reservoir (4,000 acre-feet or 1.3 BG)

Technical Advisory Committee
RECOMMENDED Storage Sites in 1972



McCook Storage Site on MWRD Lagoons (18.5 BG)

Reservoir near O'Hare TBD (590 MG)

Stearns Quarry 28th & Halsted (1.3 BG)

Technical Advisory Committee
RECOMMENDED Plan in 1972

COST

The total cost of the recommended Chicago Underflow Plan is estimated as follows:

Surface Collection and Drop Shafts	$ 93,000,000
Tunnels	567,200,000
Storage Facilities	350,000,000
Pumping Stations	38,000,000
	$1,048,200,000
Contingencies	100,000,000
	$1,148,200,000
Engineering, Legal, Administrative	75,000,000
Total Project Cost (1972 Base)	$1,223,200,000

Project Cost $1.2 B (1972 Costs)

Funding would be from local, State and Federal sources

An aggressive 10-year construction program was recommended by the committee commencing in 1973 and totally operational by end of 1982…

October 26, 1972…TARP officially adopted by MWRD.

OKd by Sanitary District Chief: Tunnel Flood Project Backe
Jones, Sally
Chicago Tribune (1963-1996); Sep 21, 1972; ProQuest Historical Newspape
pg. N1

Arlington Heights Backs Tunnel Plan to End Floods
Chicago Tribune (1963-1996); Nov 12, 1972; ProQuest Historical Newspapers: Chicago Tribune
pg. NW5

Arlington Heights Backs
Tunnel Plan to End Flood

OKd by Sanitary District Chief

Tunnel Flood Project Backed

Metropolitan Sanitary District President John Egan has endorsed a $1.2 billion tunneling project to capture and treat storm water in 375 square miles of Cook County.

He said the plan, proposed by a study committee appointed by former Gov. Kerner in 1967, "is the only alternative" to solving the problem of polluted sewage and rain overflows in areas where sewage and rainwater are carried in the same pipes. Engineers estimate the overflows account for 45 per cent of inner Cook County's water pollution.

Mayor Backs $1.2 Billion Tunnel Plan to End Floods
Jones, Sally
Chicago Tribune (1963-1996); Oct 26, 1972; ProQuest Historical Newspapers: Chicago Tribune
pg. B14

Mayor Daley addressing meeting of Metropolitan Sanitary Dist
board of trustees.

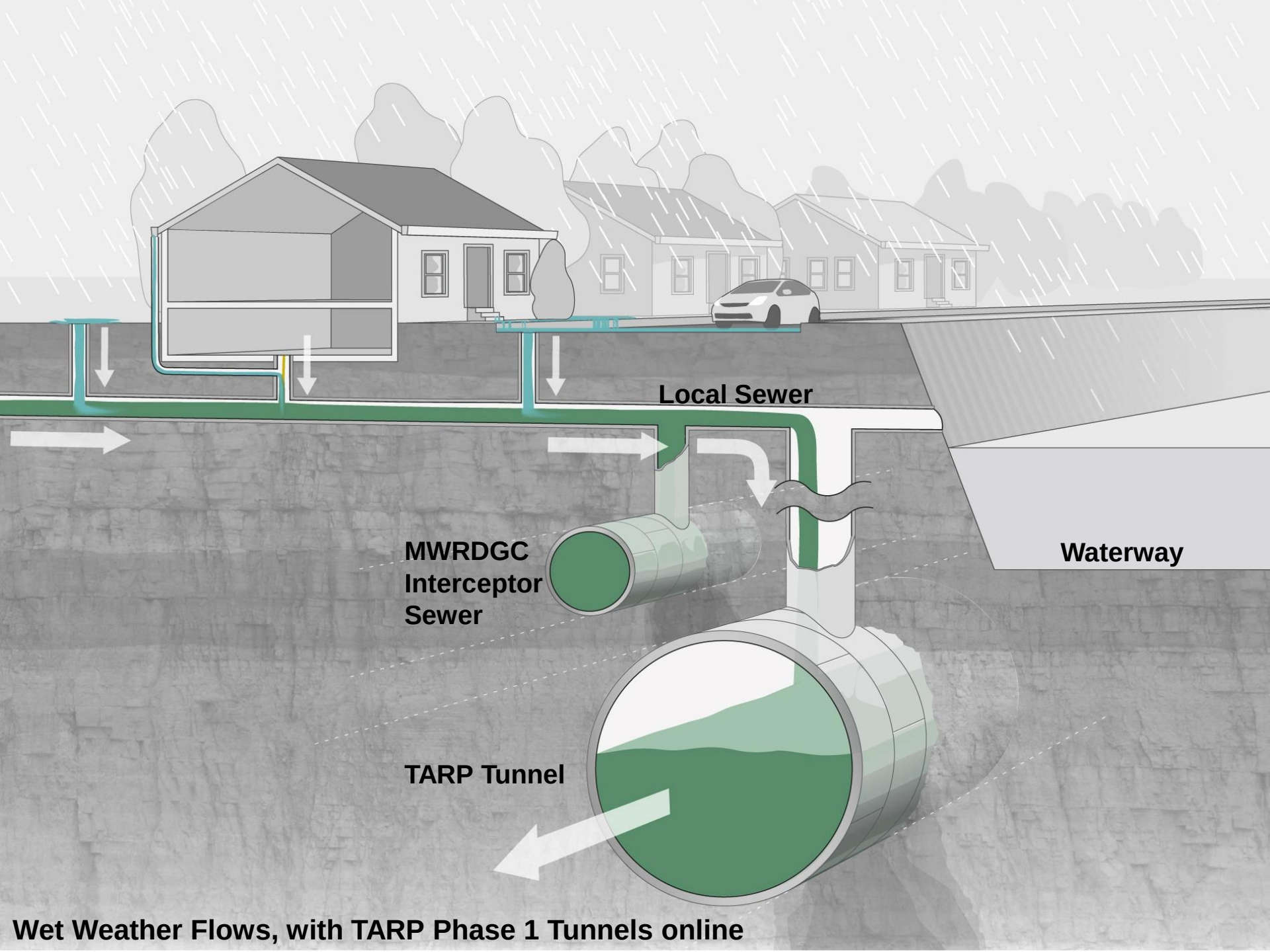
Mayor Backs $1.2 Billion
Tunnel Plan to End Floods

October 26, 1972: TARP officially adopted by MWRD Board of Commissioners

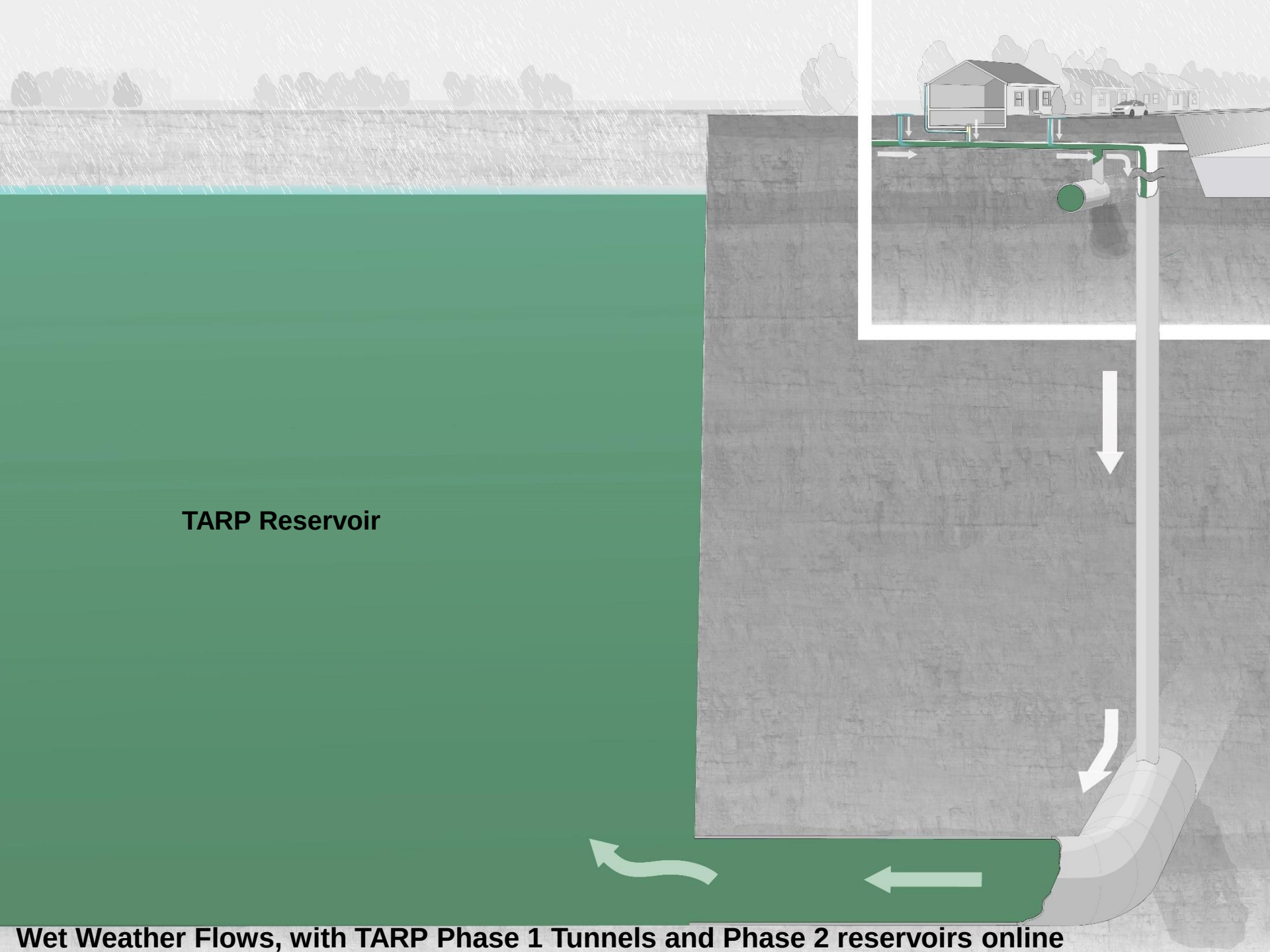
- More than 50 alternative plans developed and evaluated over a 7-Year period
- Final Plan was the composite of the 8 best alternatives
- Adopted by MWRDGC on October 26, 1972 – 8 days after the Clean Water Act was passed

TARP Goals

- ***Protect*** **…… Lake Michigan from River Backflows**
- ***Eliminate*** **…… Waterway Pollution Caused by CSO**
- ***Provide*** **…….. An Outlet for Flood Waters to Reduce Basement Sewage Backups**
- ***Comply*** **…….. With Federal and State Environmental Laws**
- ***Accomplish*** **... The Above Results in the Most Cost Effective Manner**

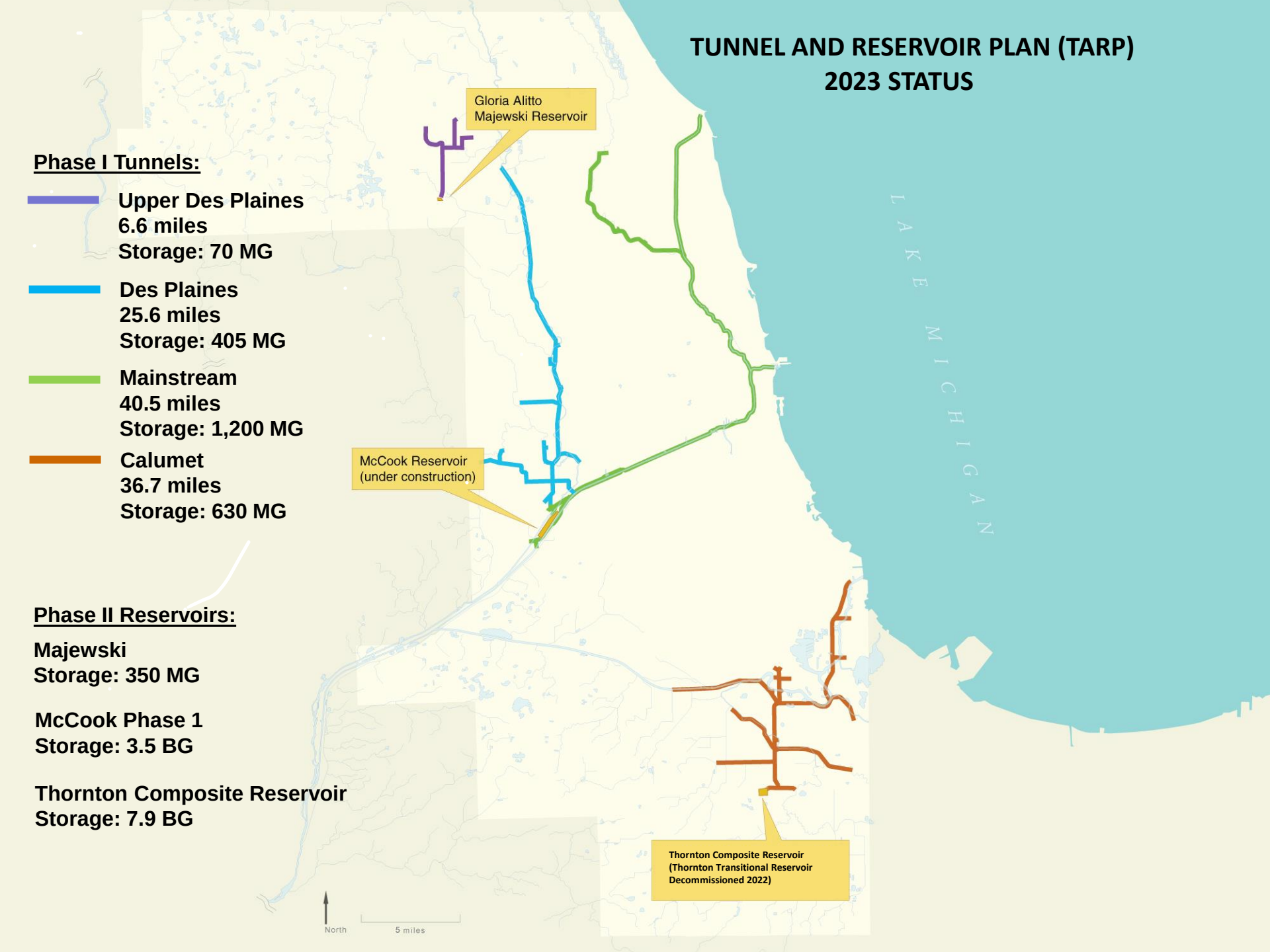


Wet Weather Flows, with TARP Phase 1 Tunnels online



Wet Weather Flows, with TARP Phase 1 Tunnels and Phase 2 reservoirs online

TUNNEL AND RESERVOIR PLAN (TARP)
2023 STATUS



Phase I Tunnels:

Upper Des Plaines
6.6 miles
Storage: 70 MG

Des Plaines
25.6 miles
Storage: 405 MG

Mainstream
40.5 miles
Storage: 1,200 MG

Calumet
36.7 miles
Storage: 630 MG

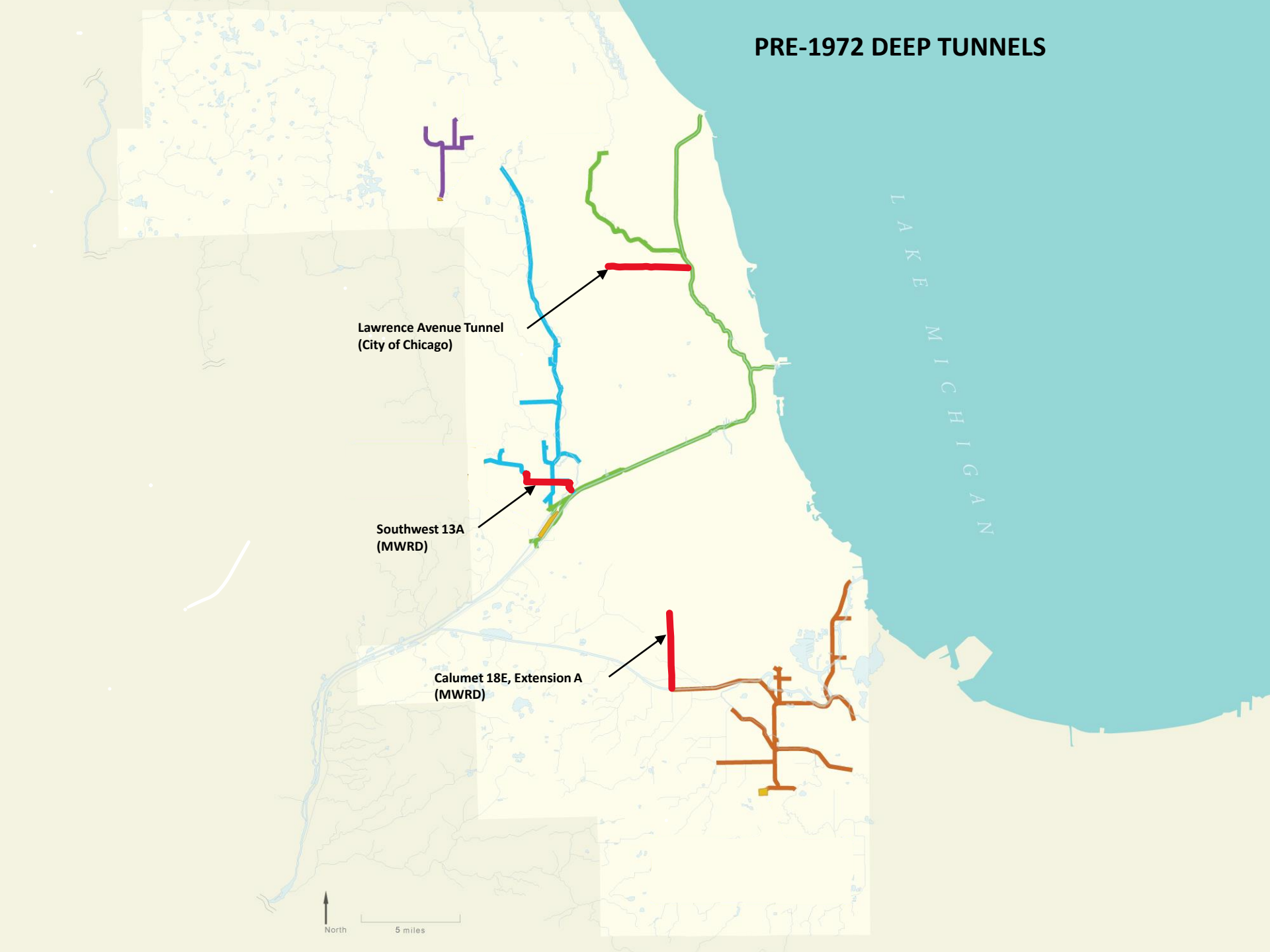
Phase II Reservoirs:

Majewski
Storage: 350 MG

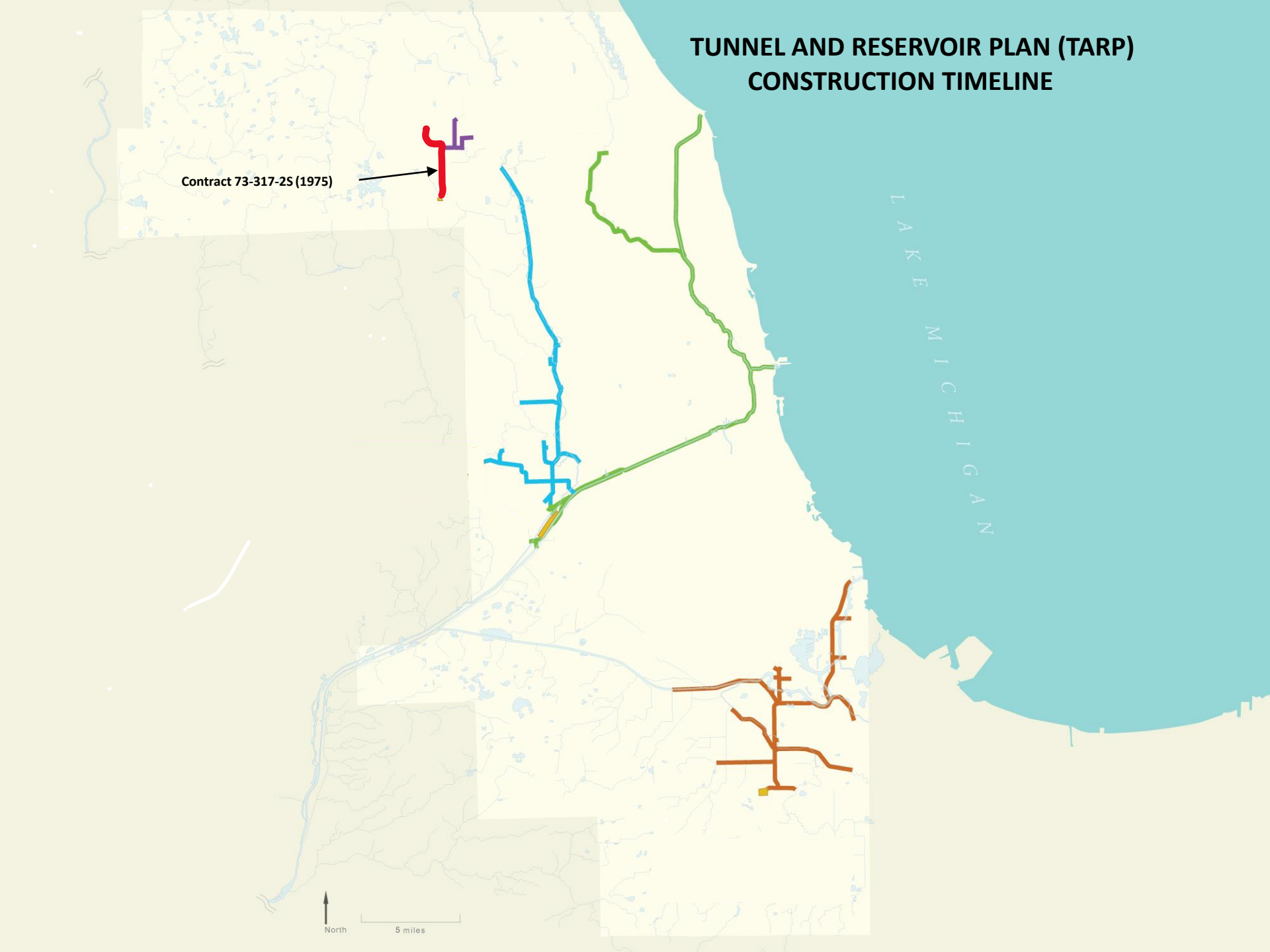
McCook Phase 1
Storage: 3.5 BG

Thornton Composite Reservoir
Storage: 7.9 BG

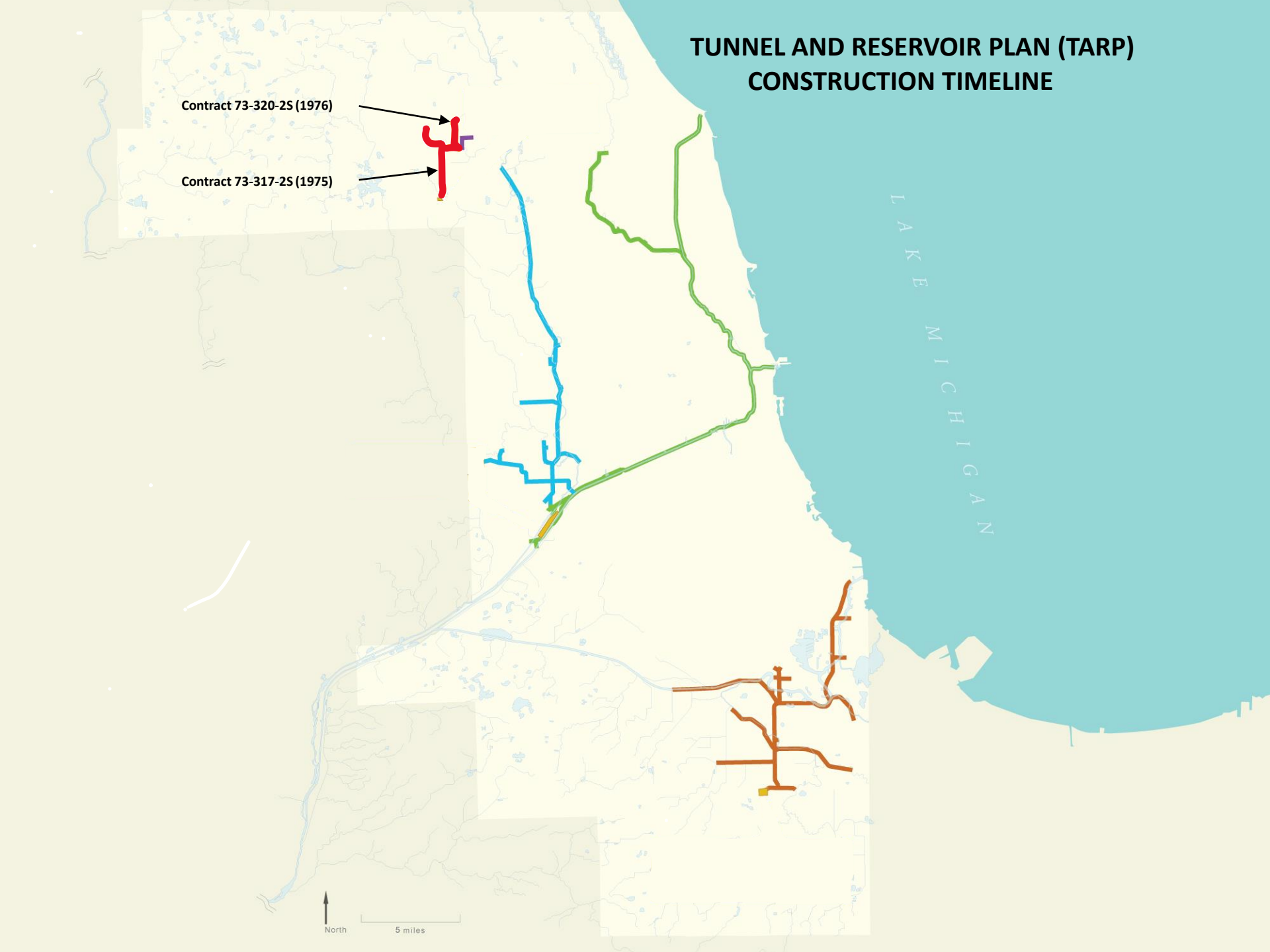
PRE-1972 DEEP TUNNELS



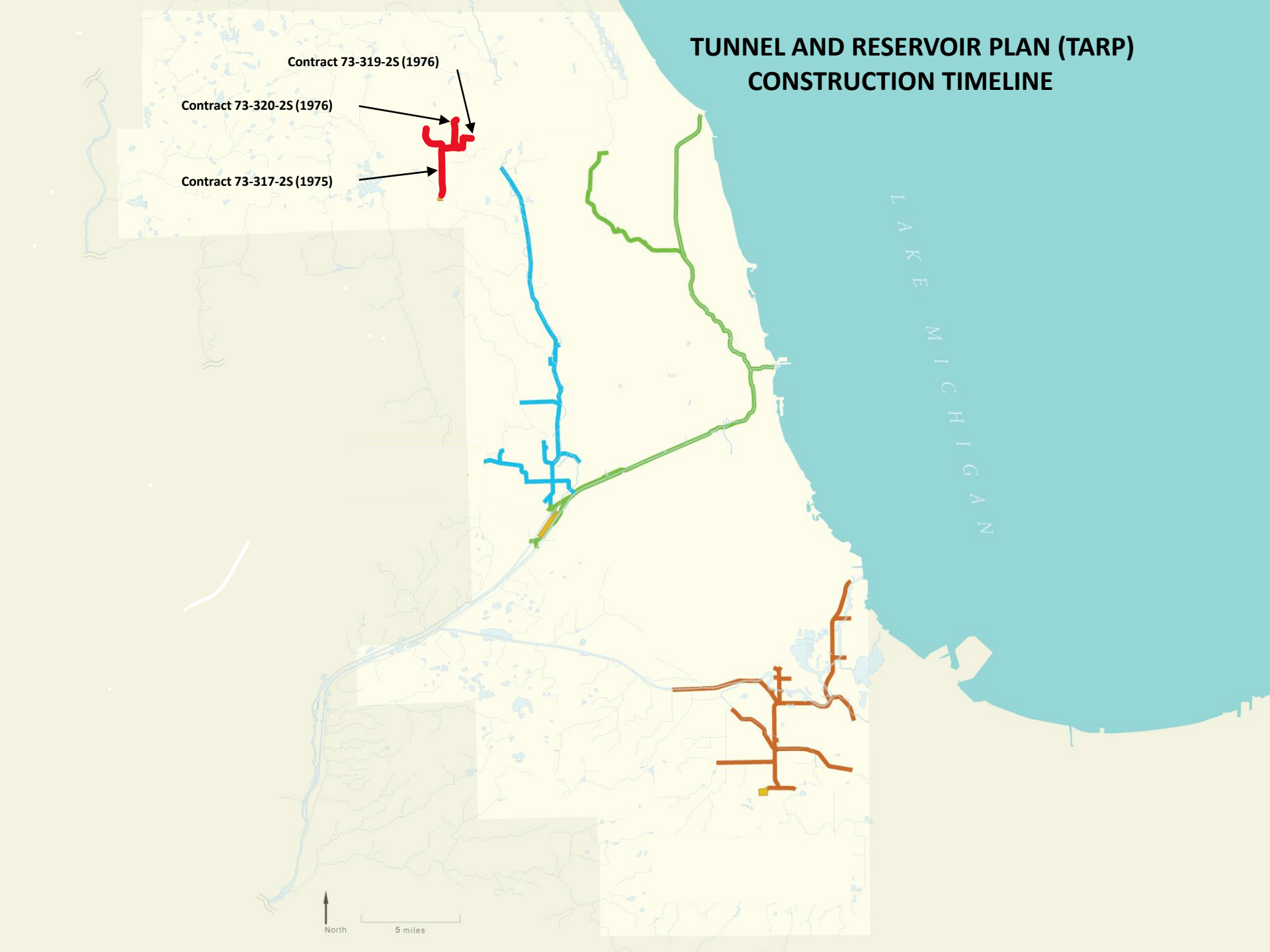
TUNNEL AND RESERVOIR PLAN (TARP) CONSTRUCTION TIMELINE



TUNNEL AND RESERVOIR PLAN (TARP) CONSTRUCTION TIMELINE



TUNNEL AND RESERVOIR PLAN (TARP) CONSTRUCTION TIMELINE



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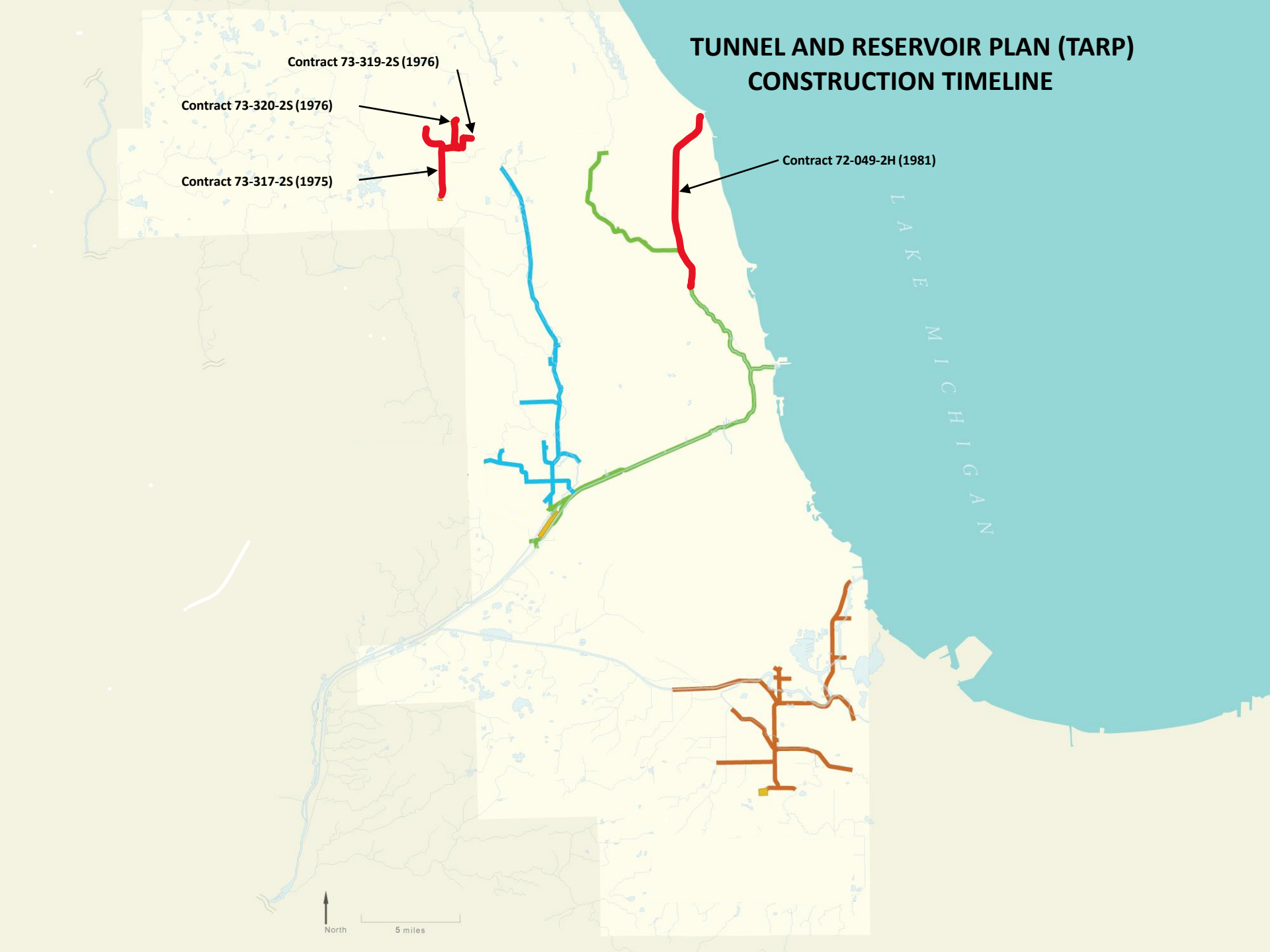

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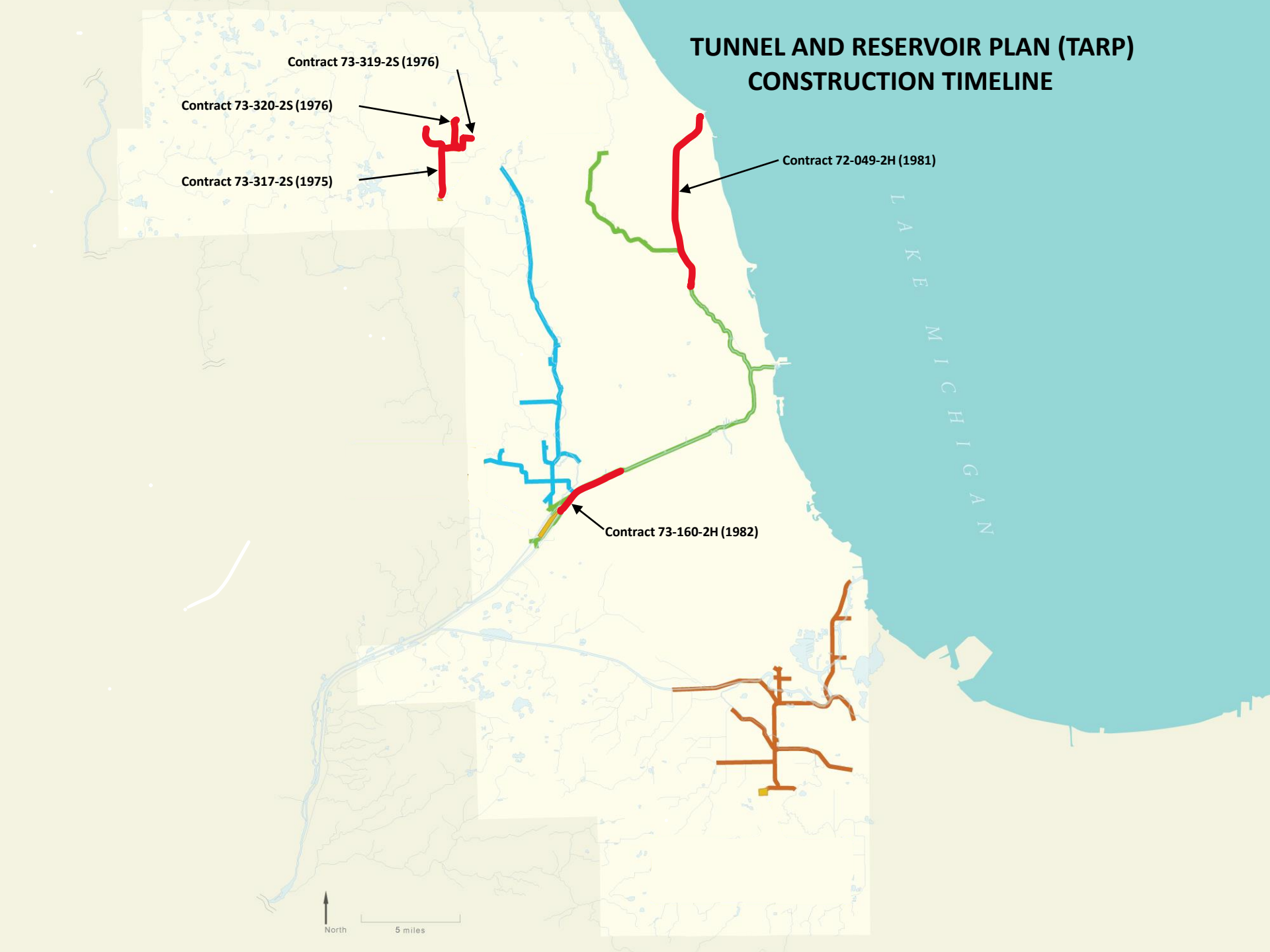

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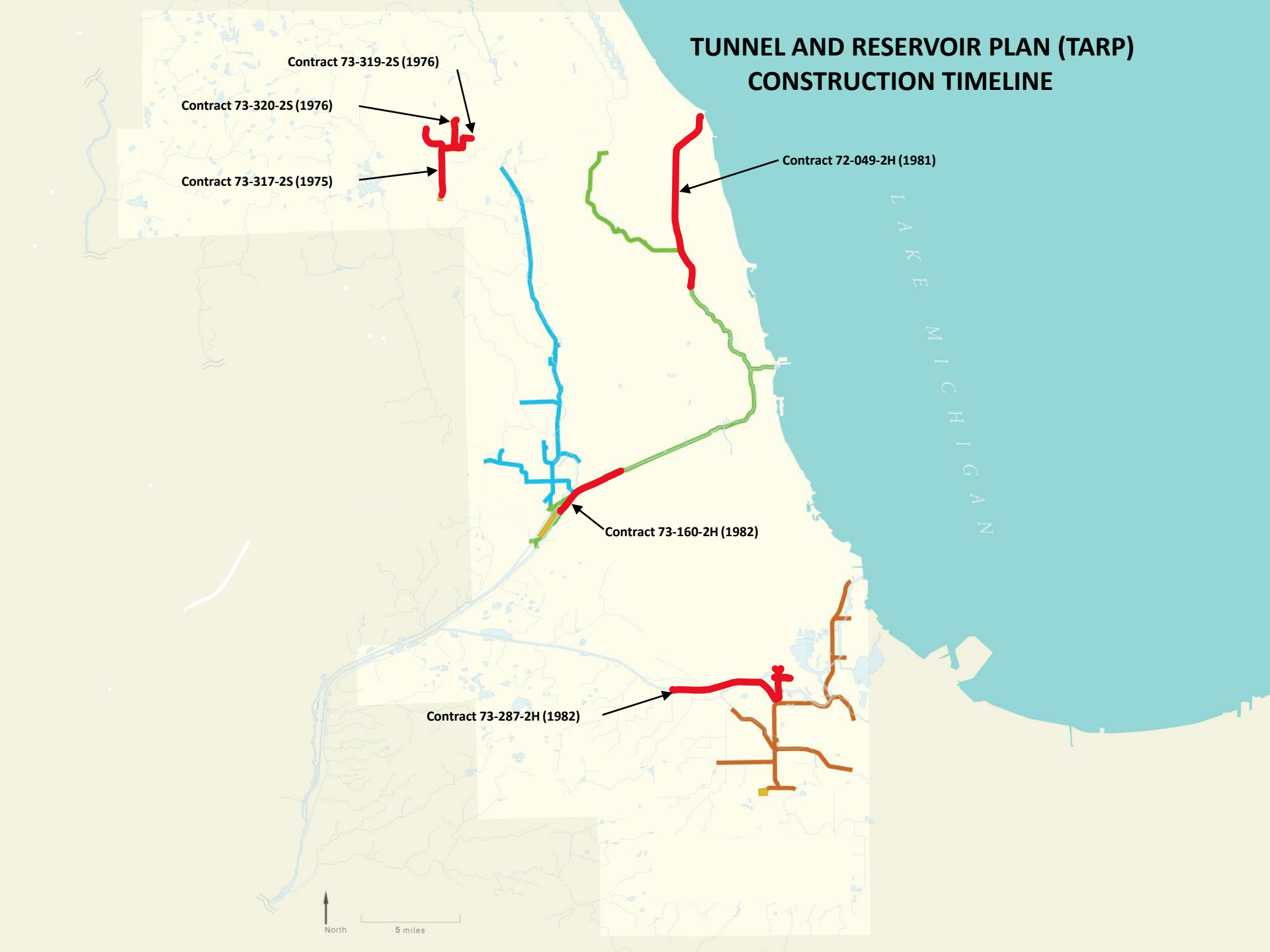

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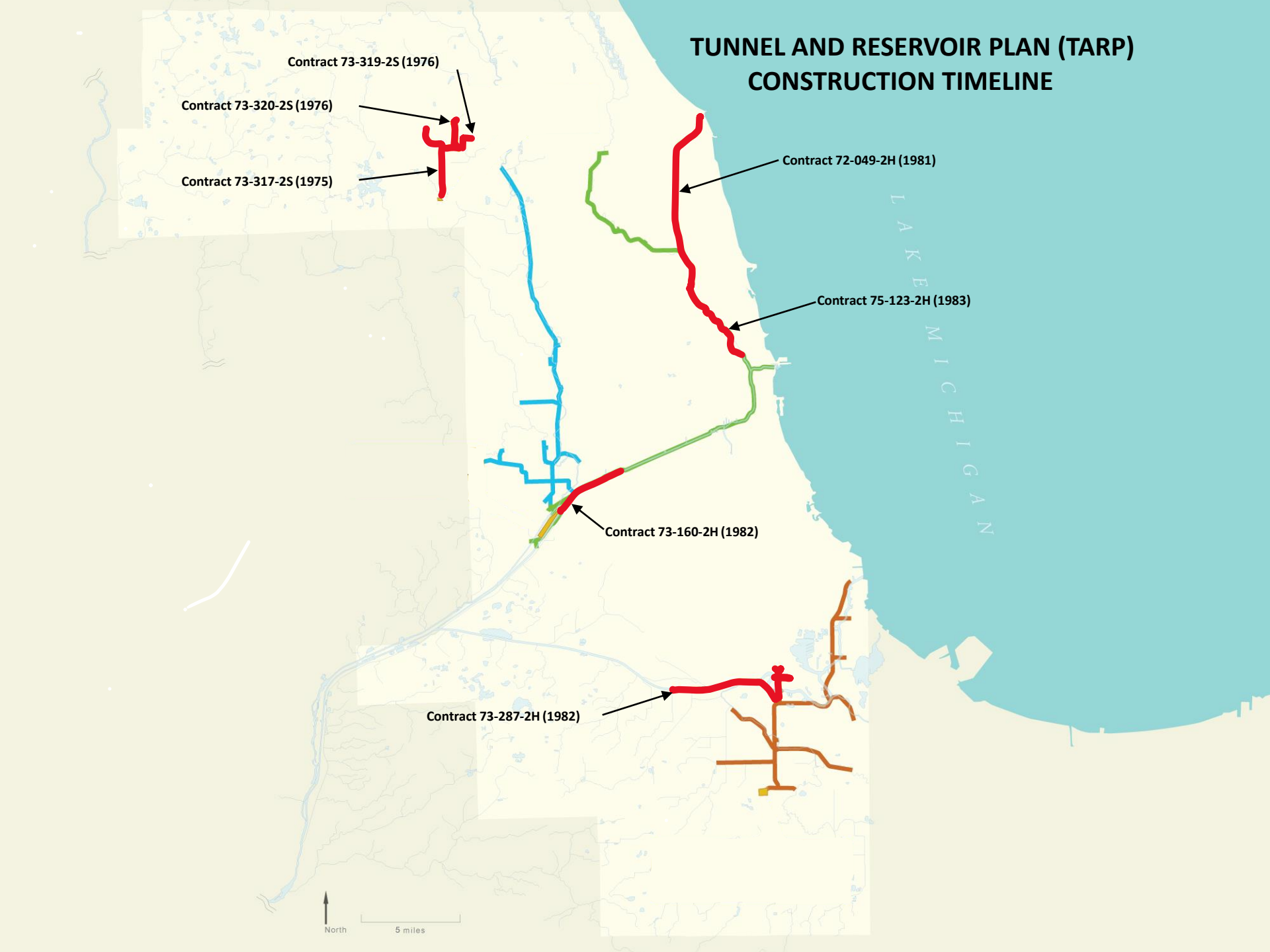

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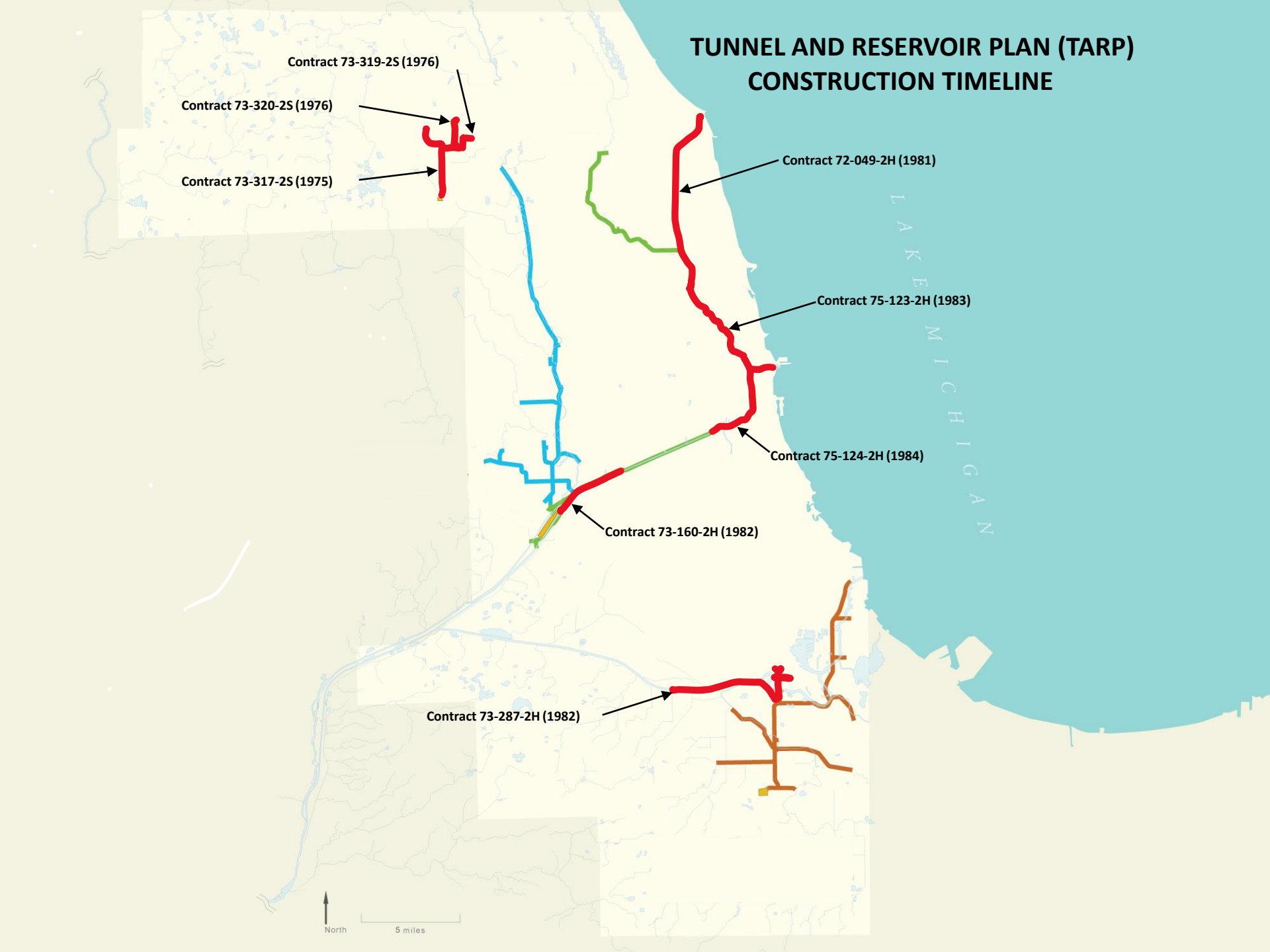

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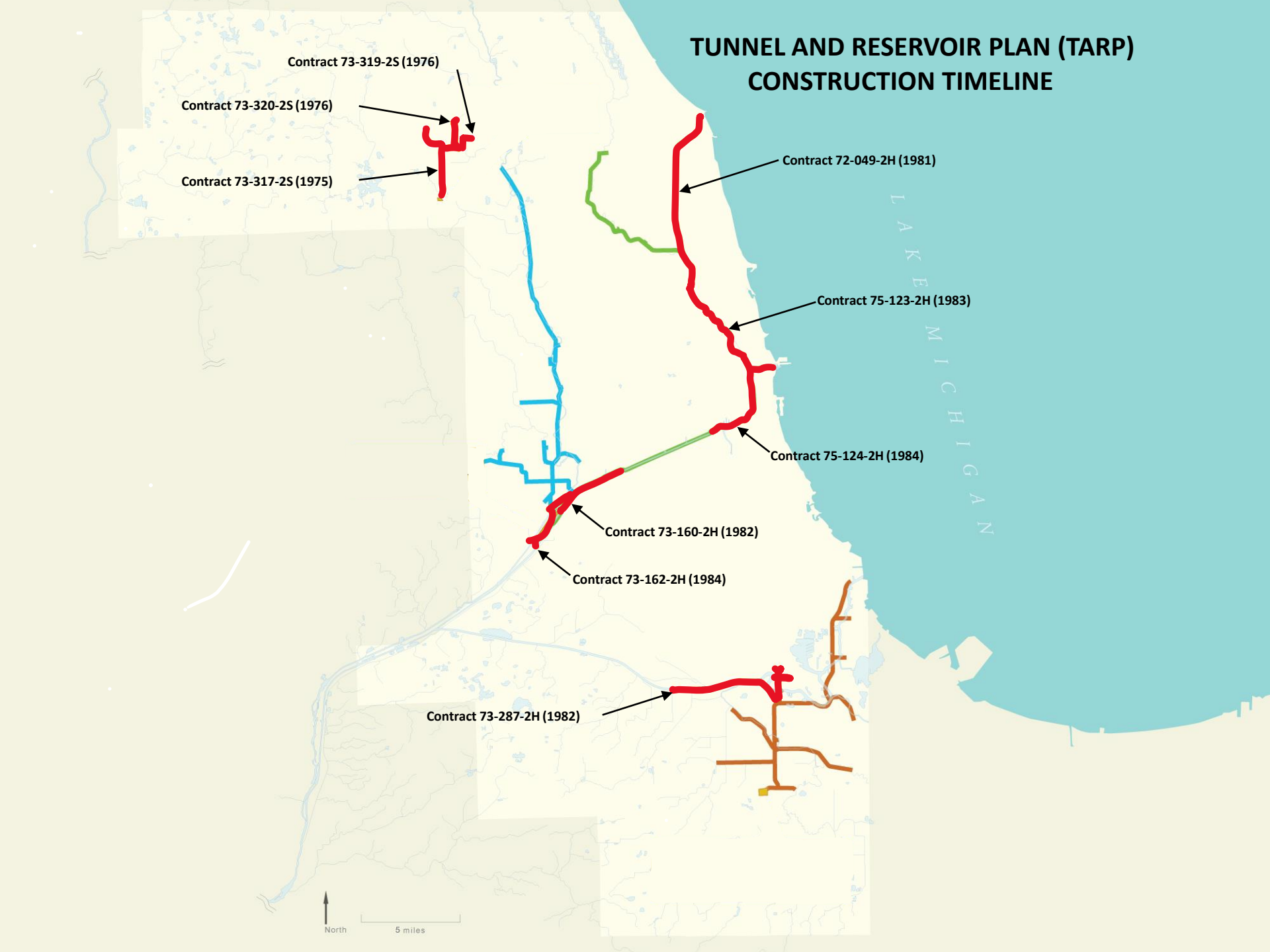

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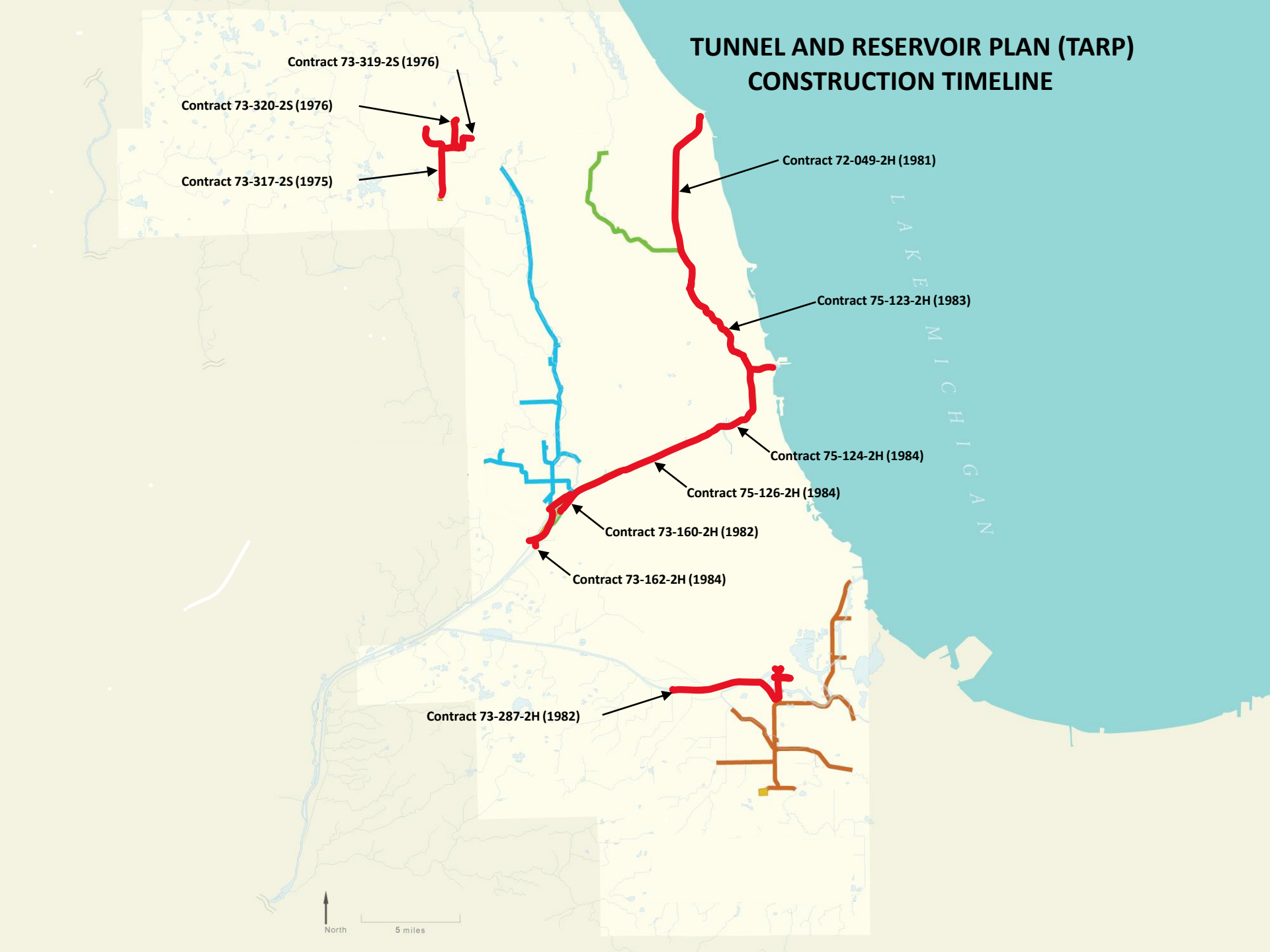

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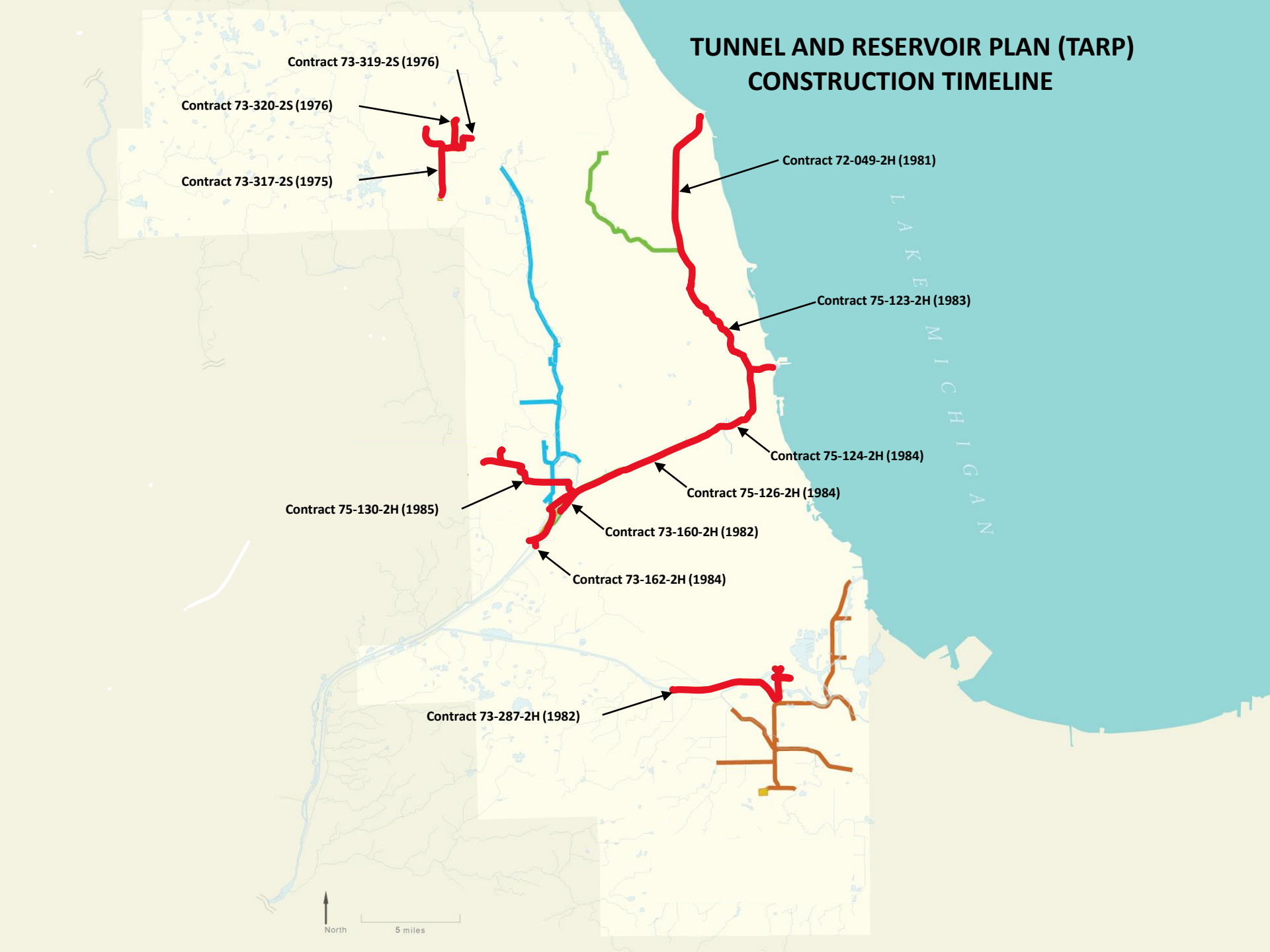

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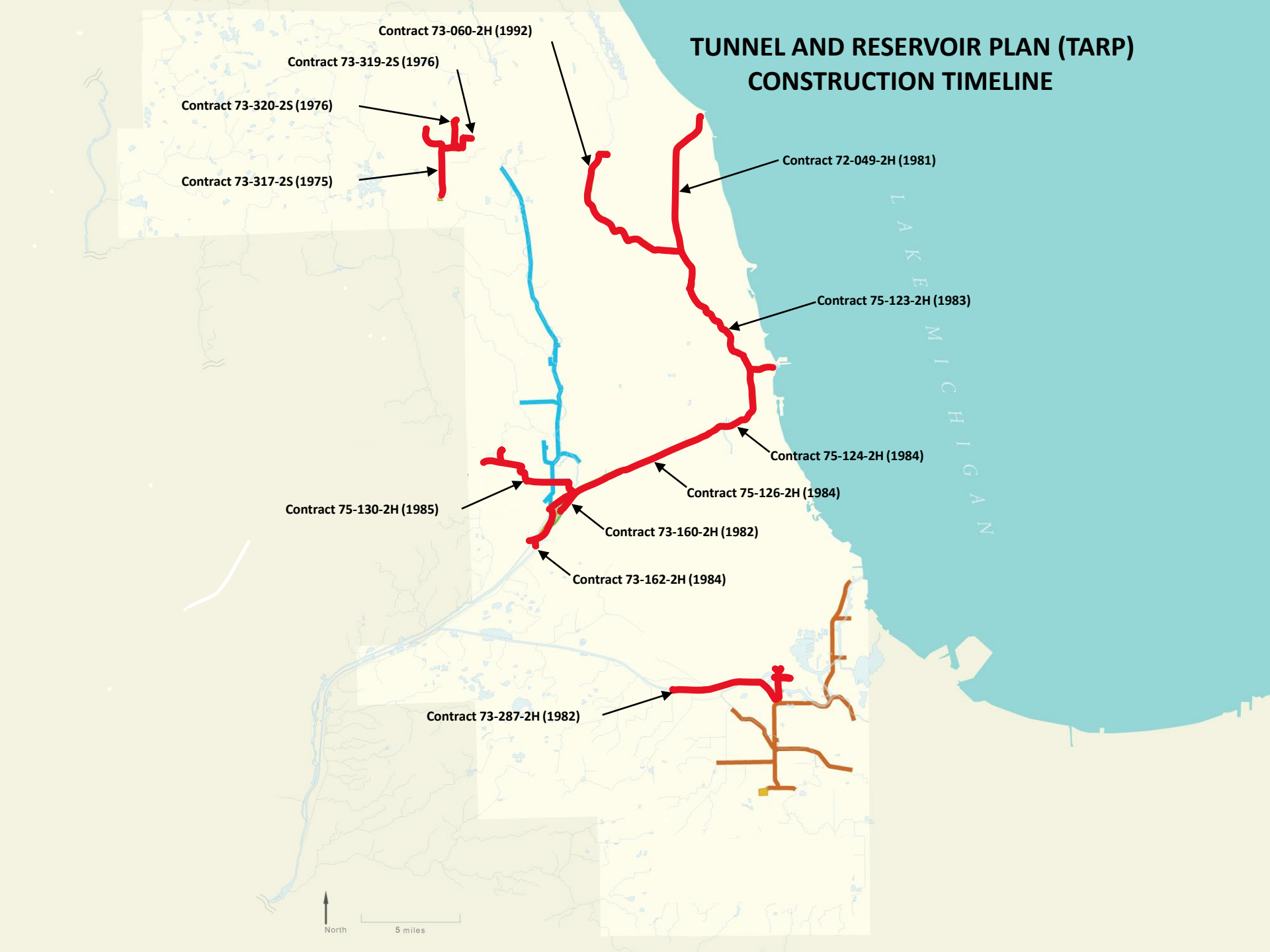

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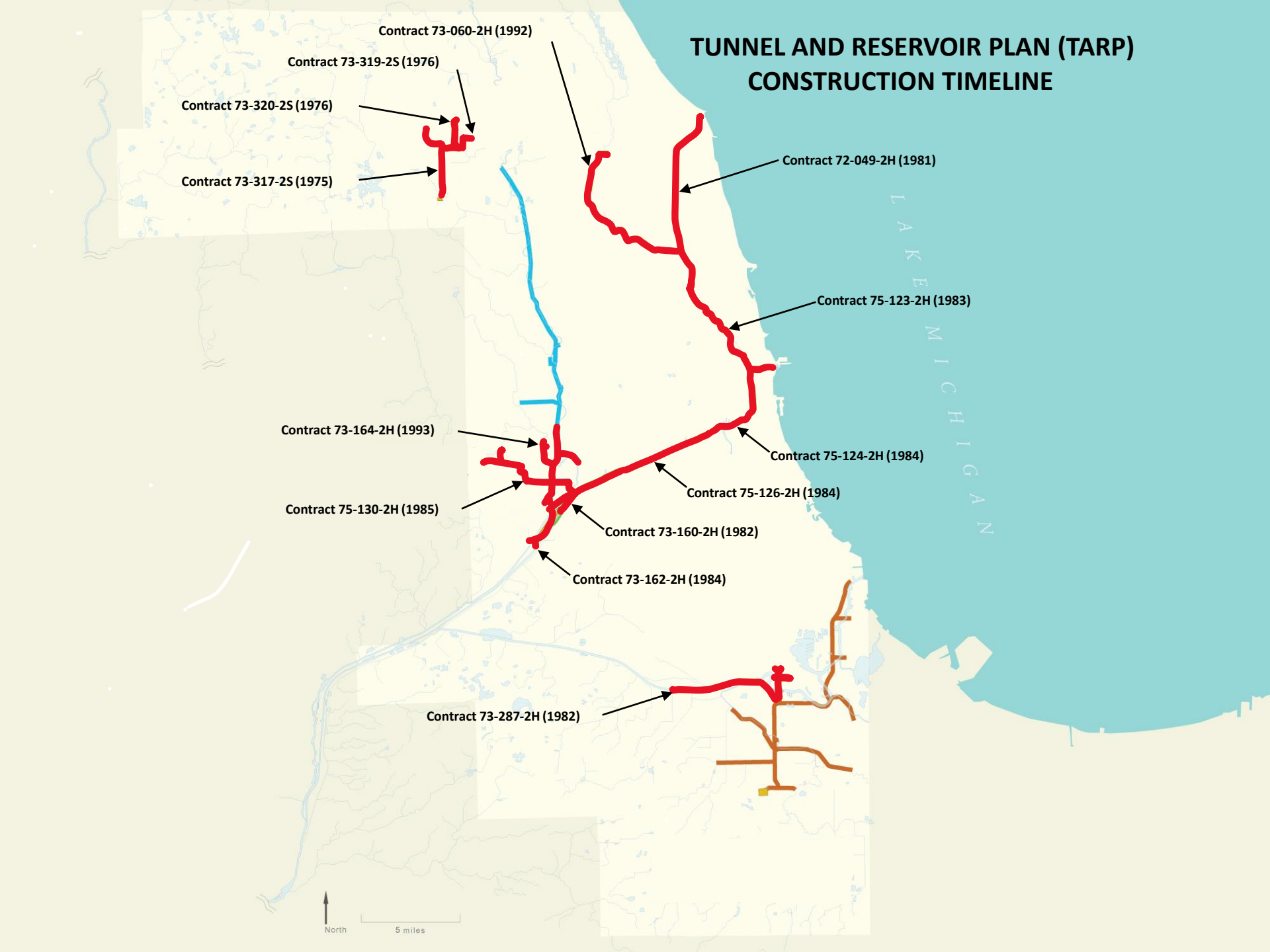

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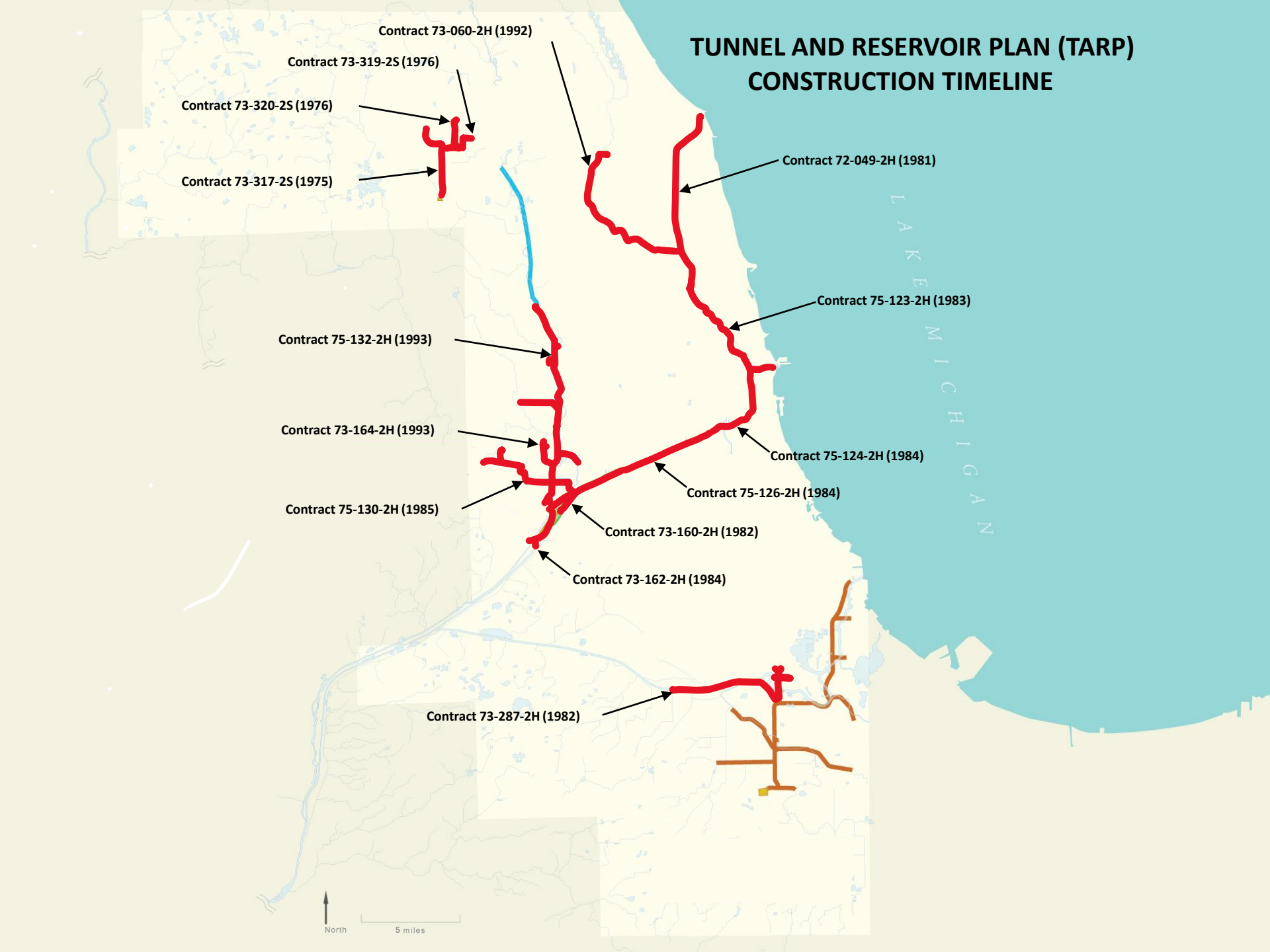

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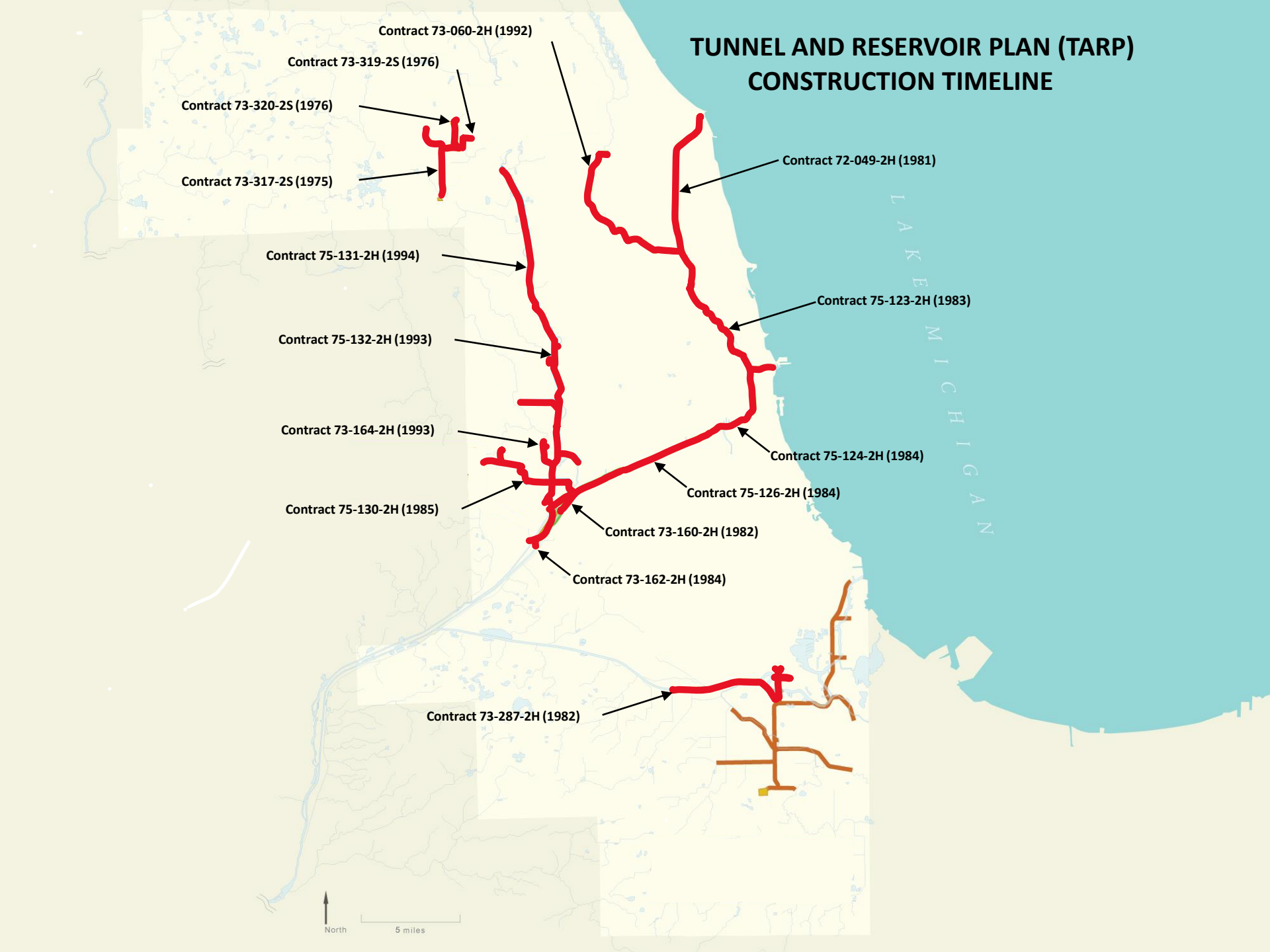

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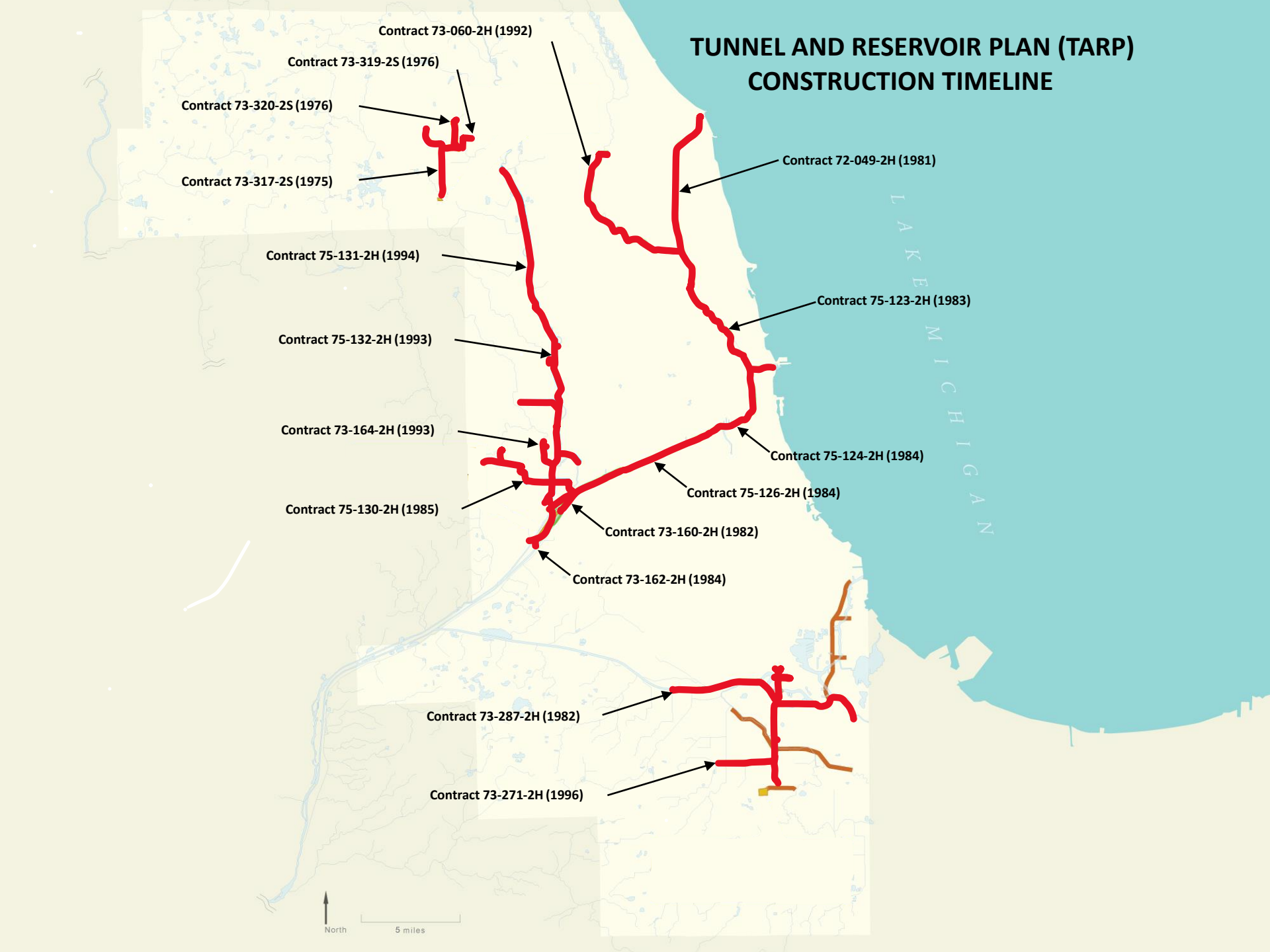

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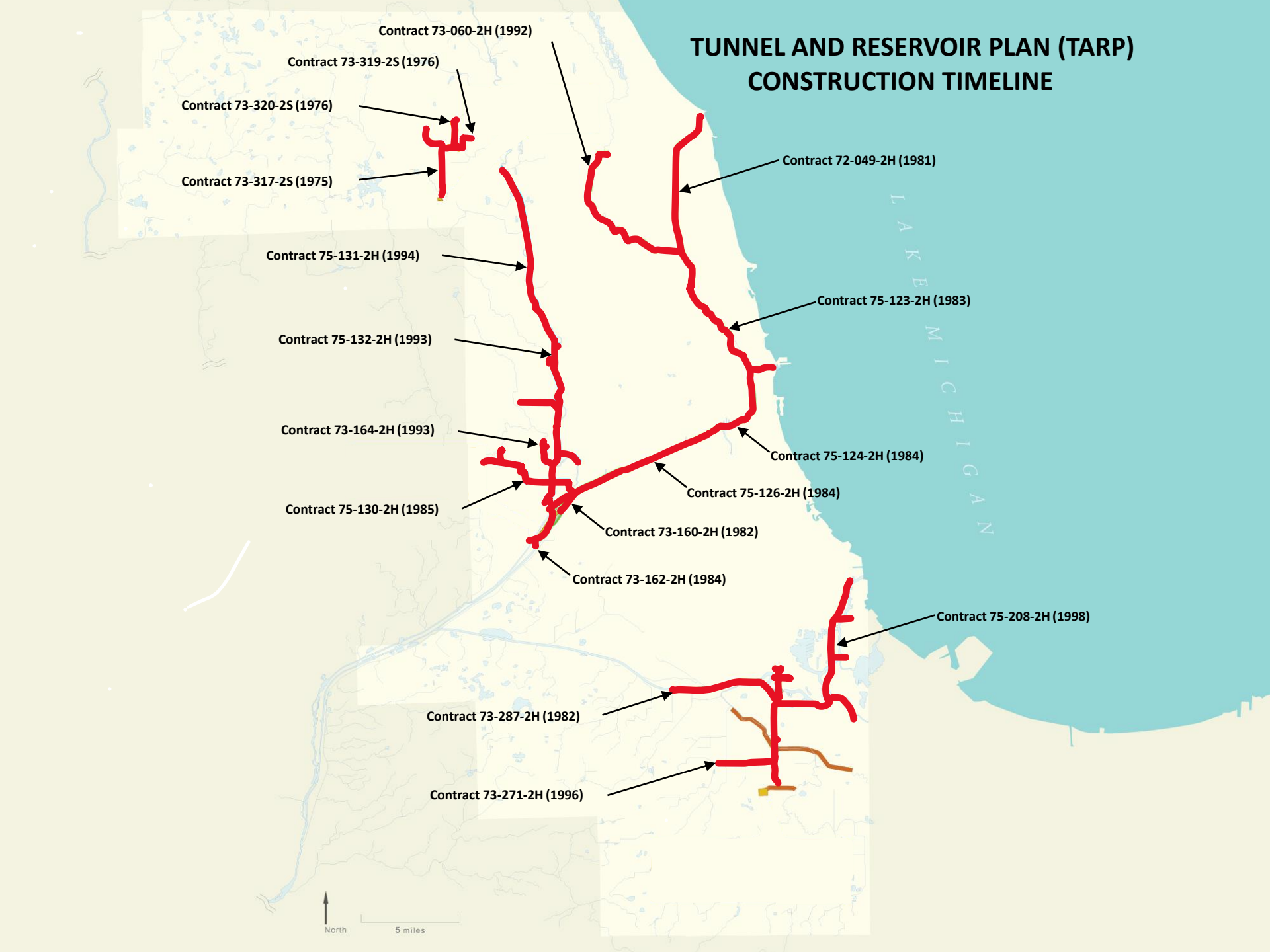

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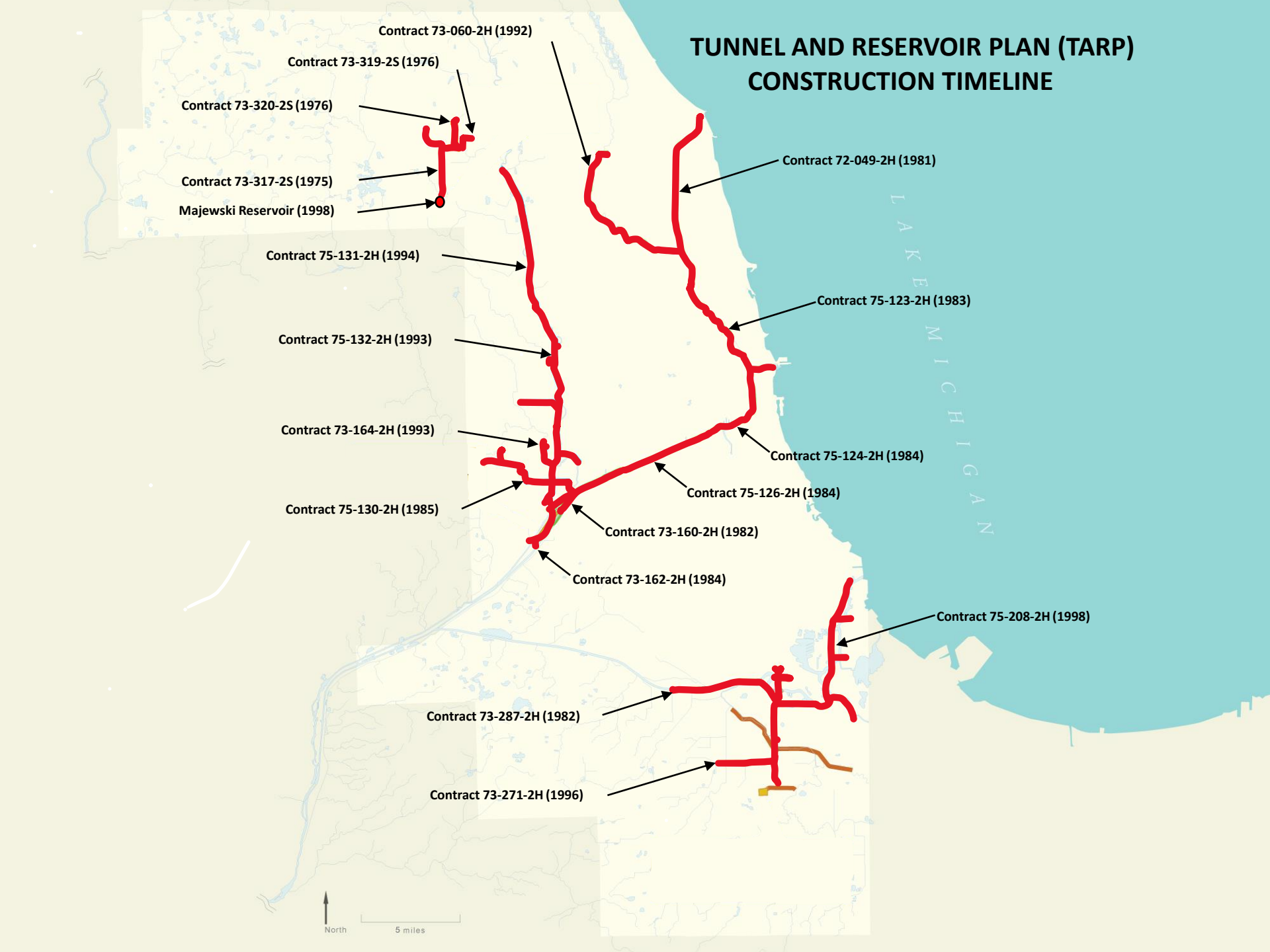

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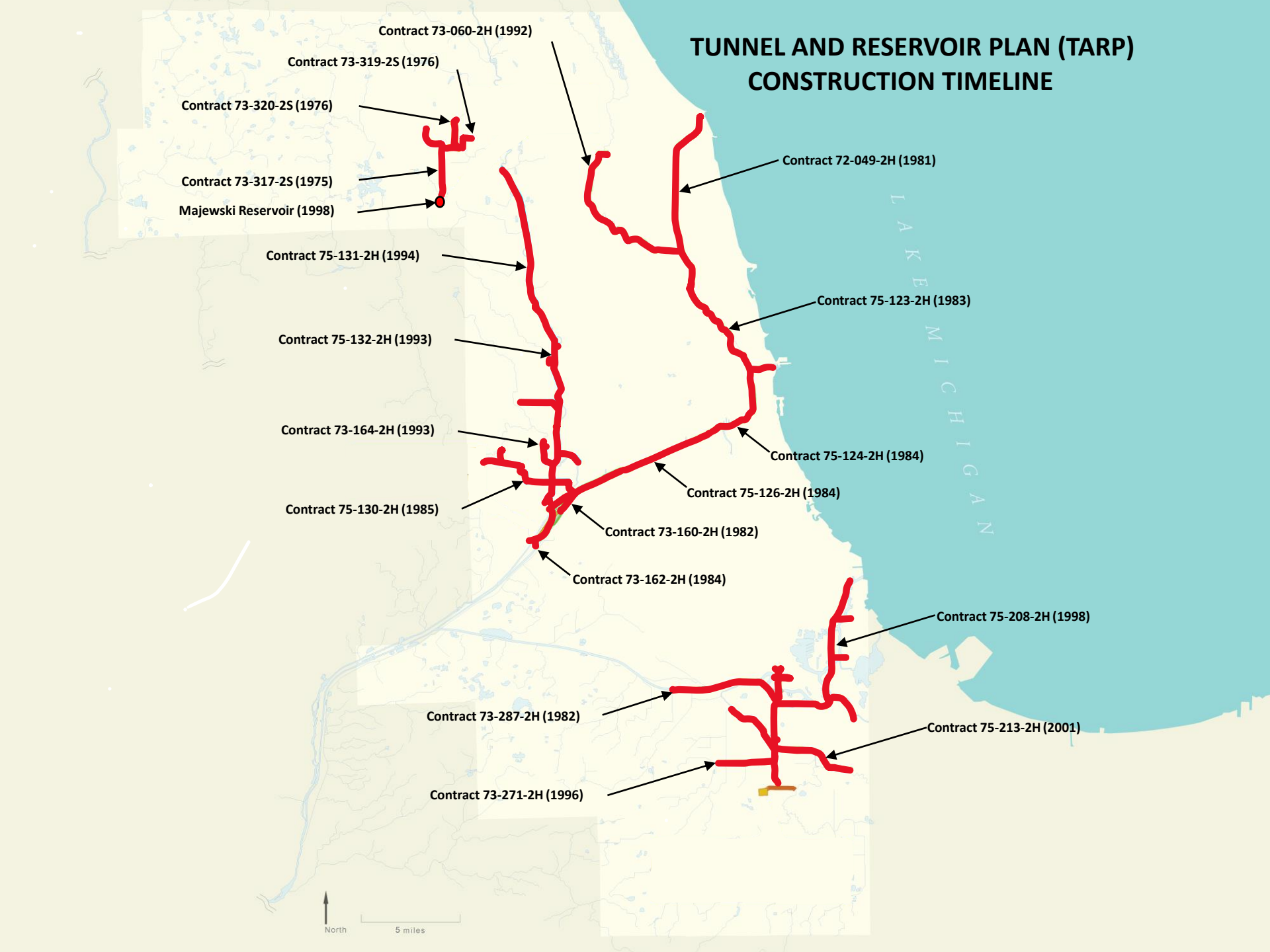

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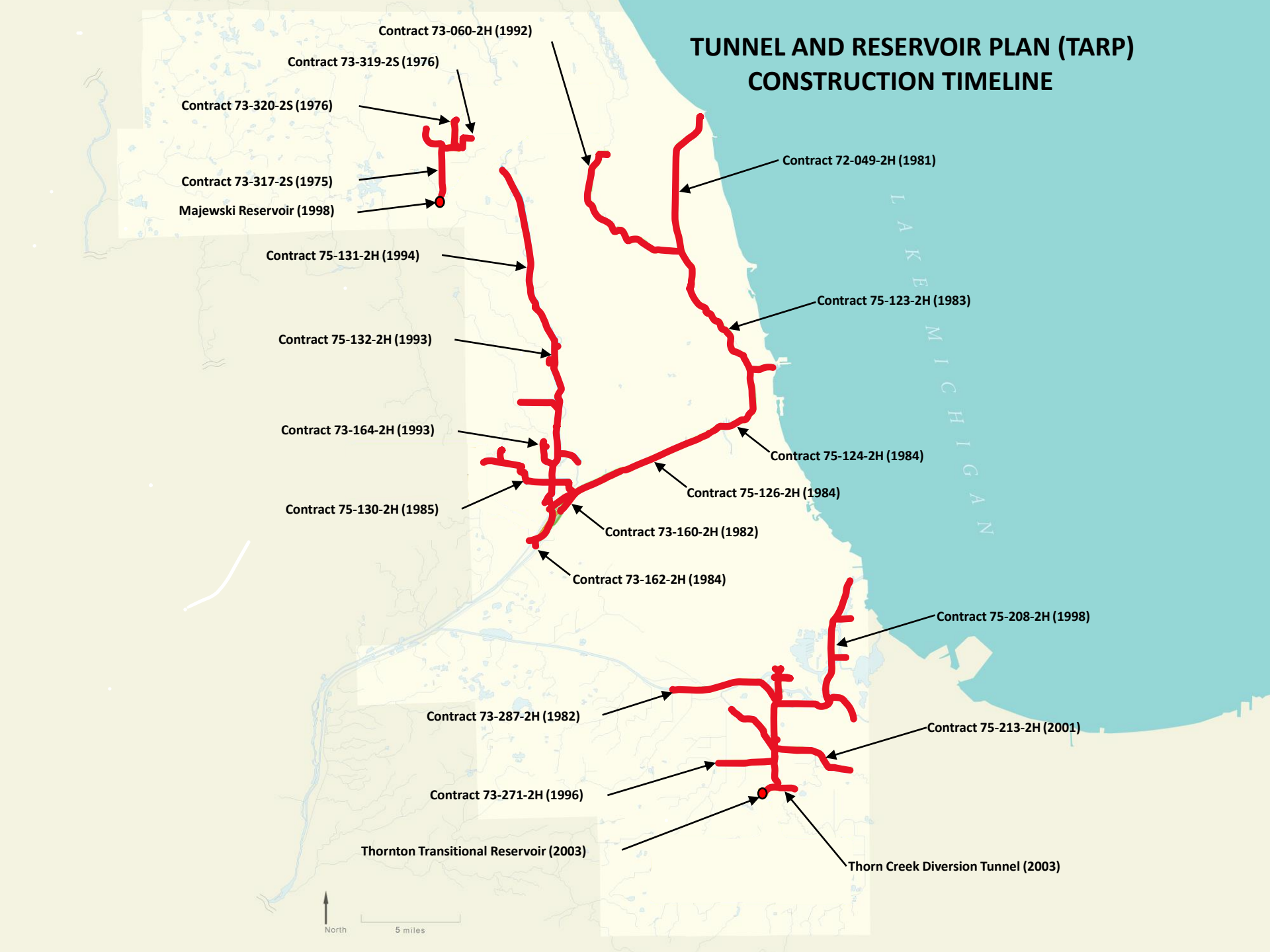

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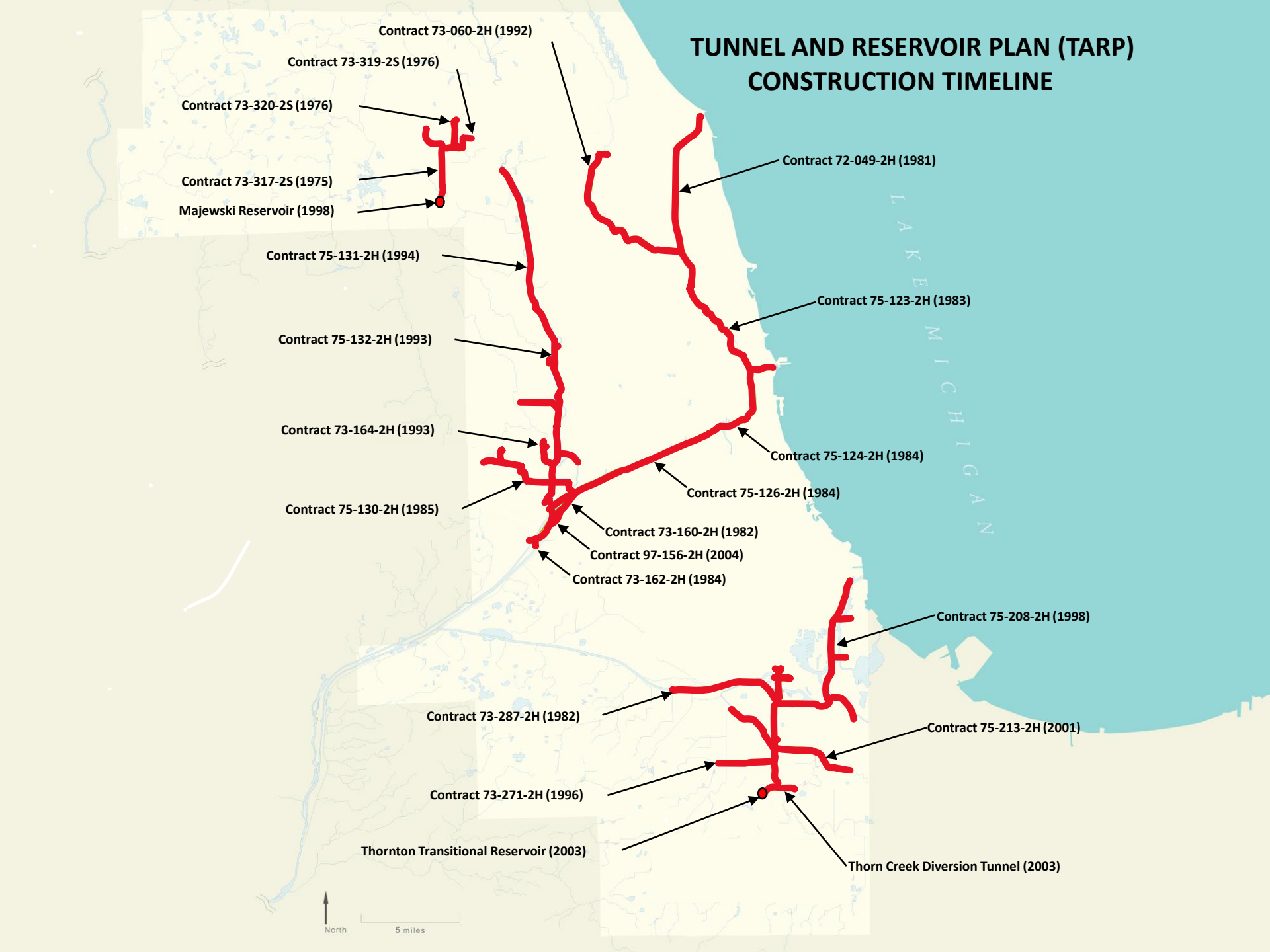

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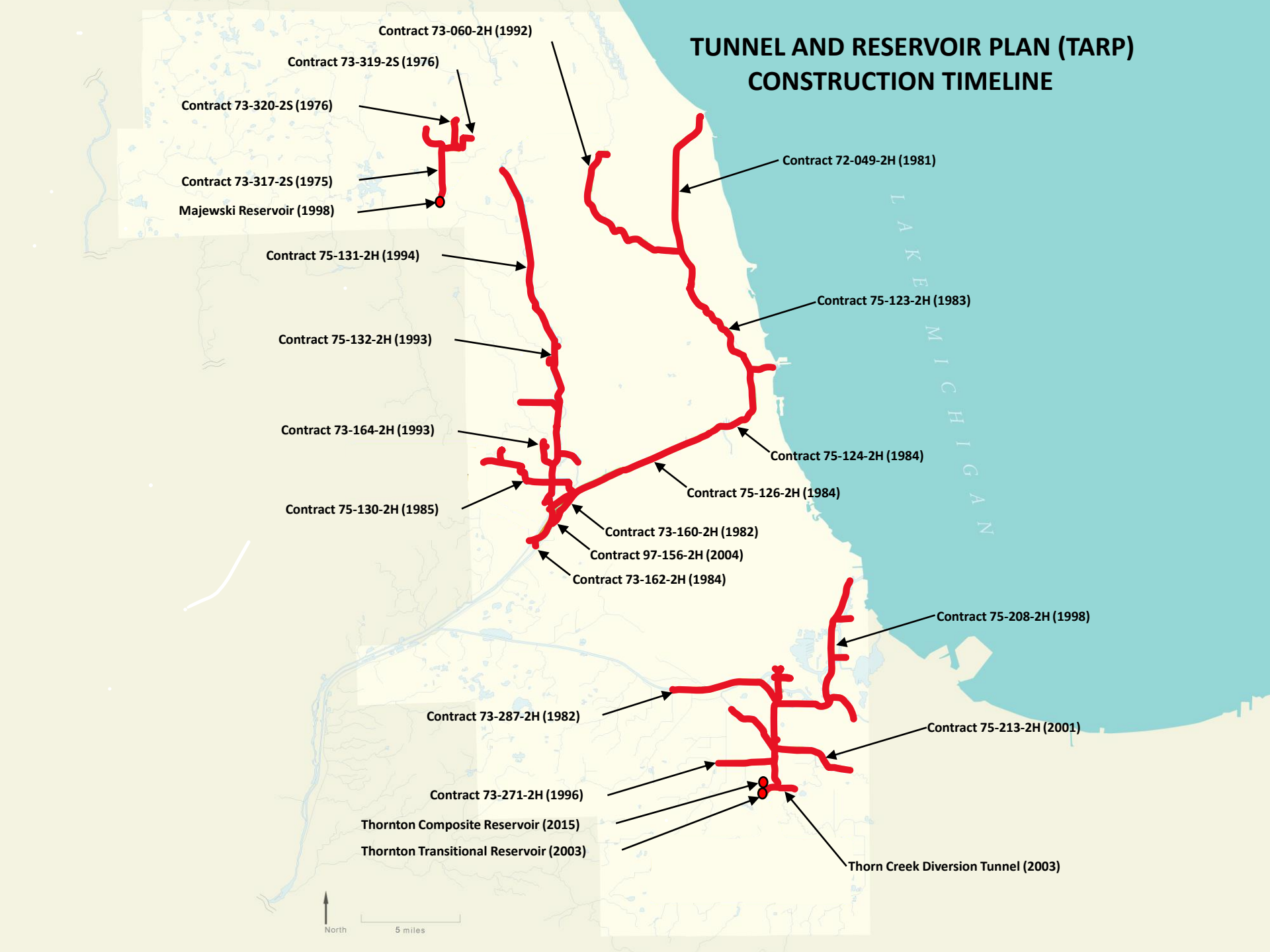

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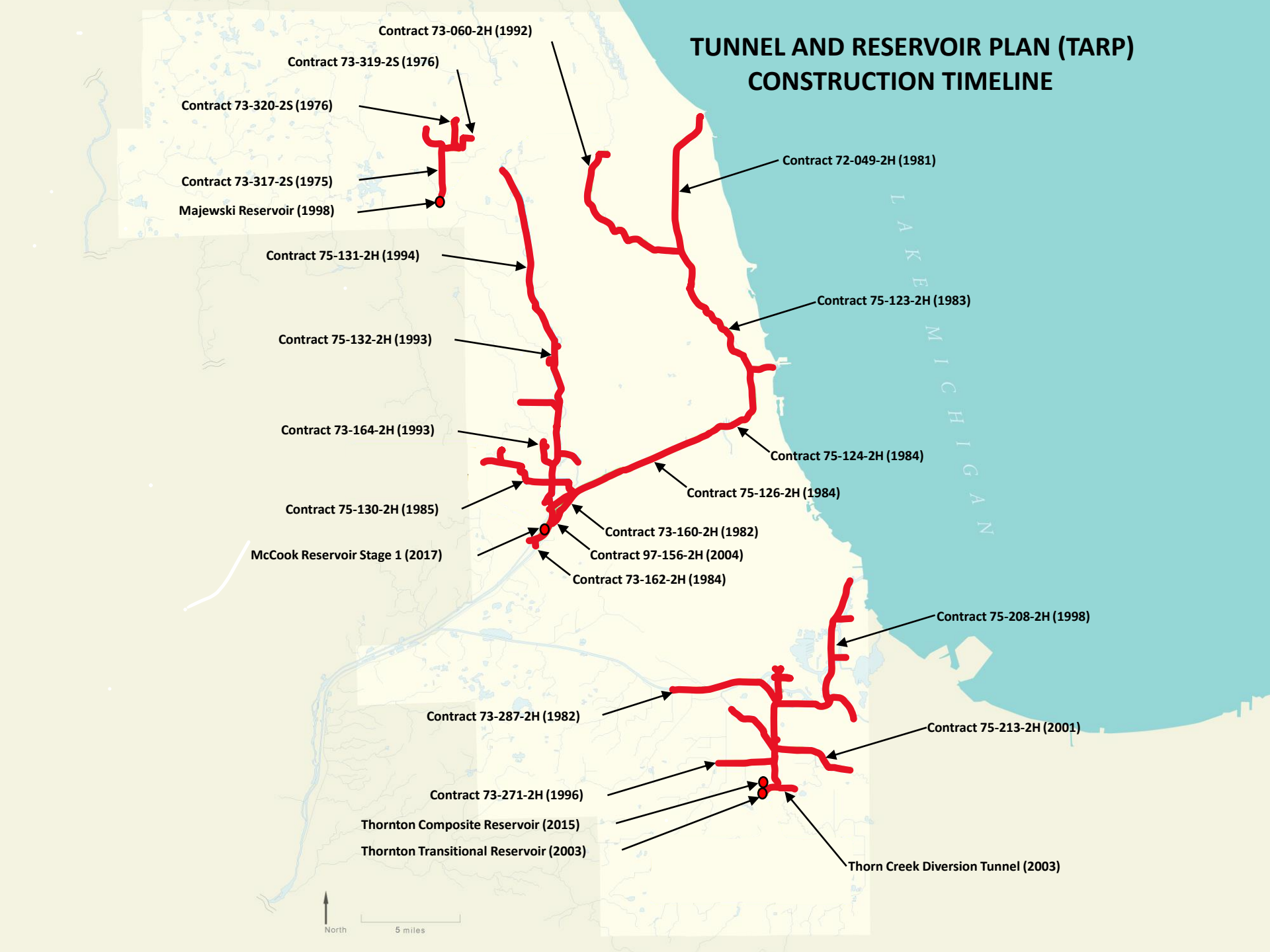

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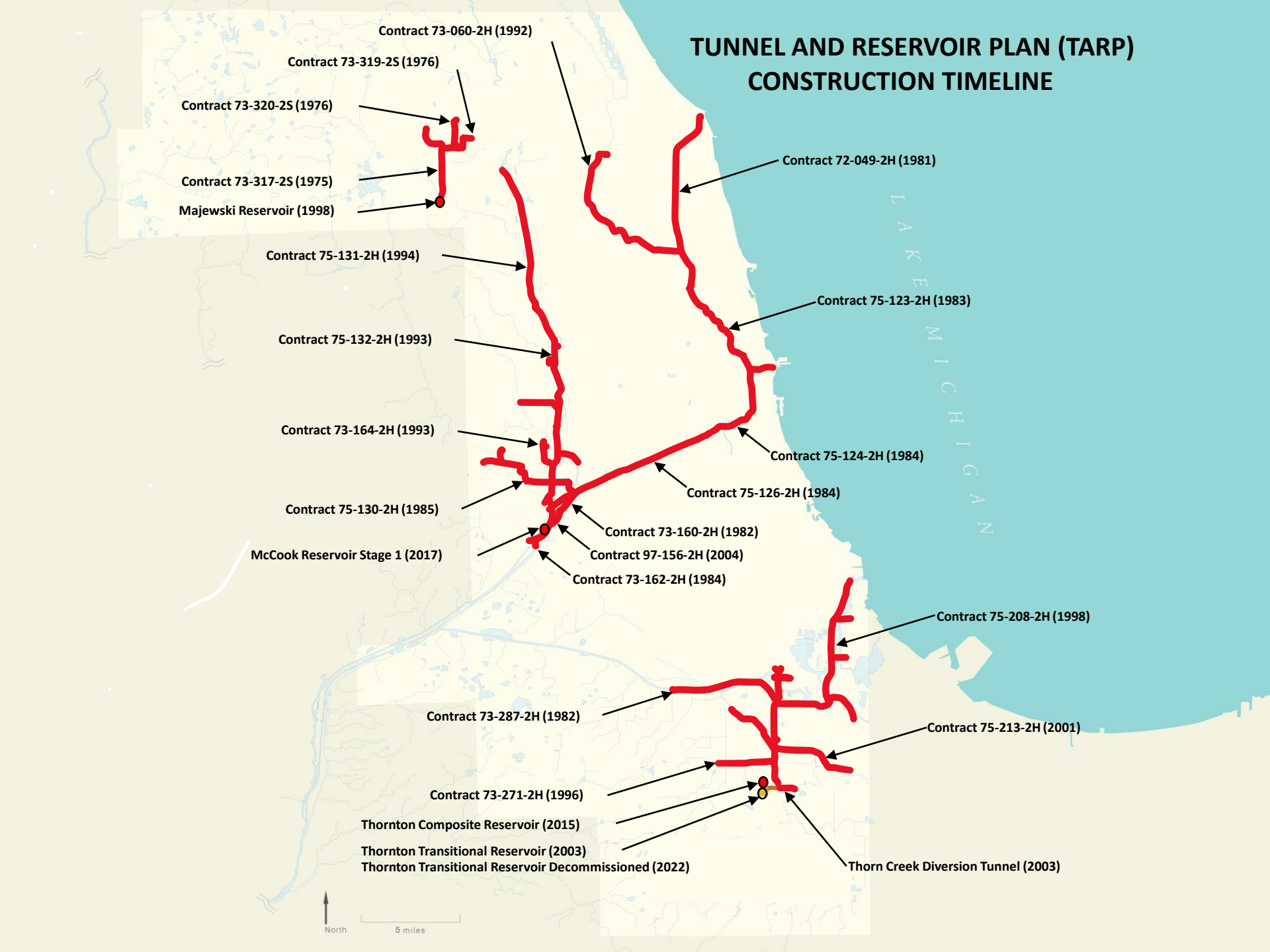

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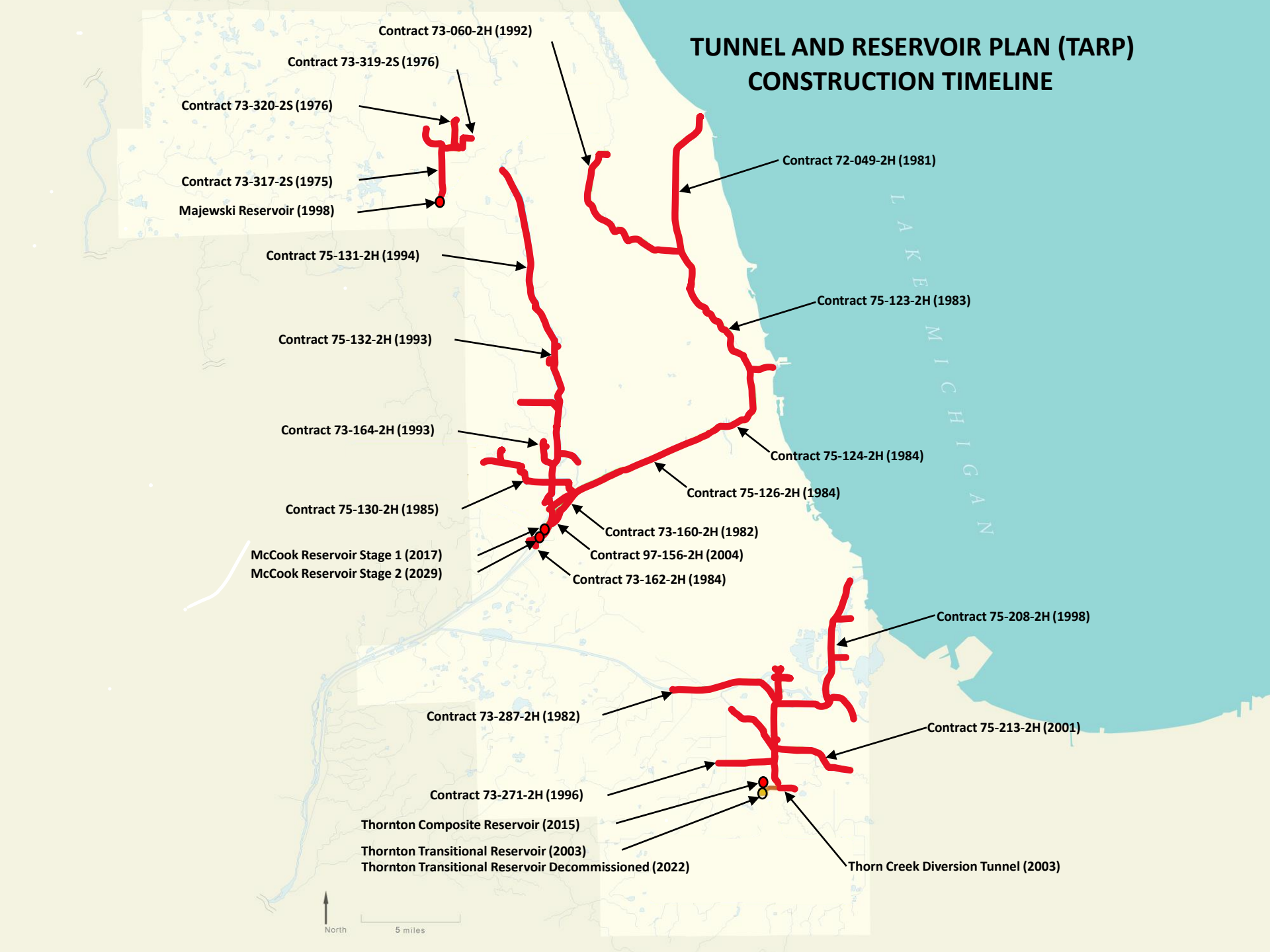
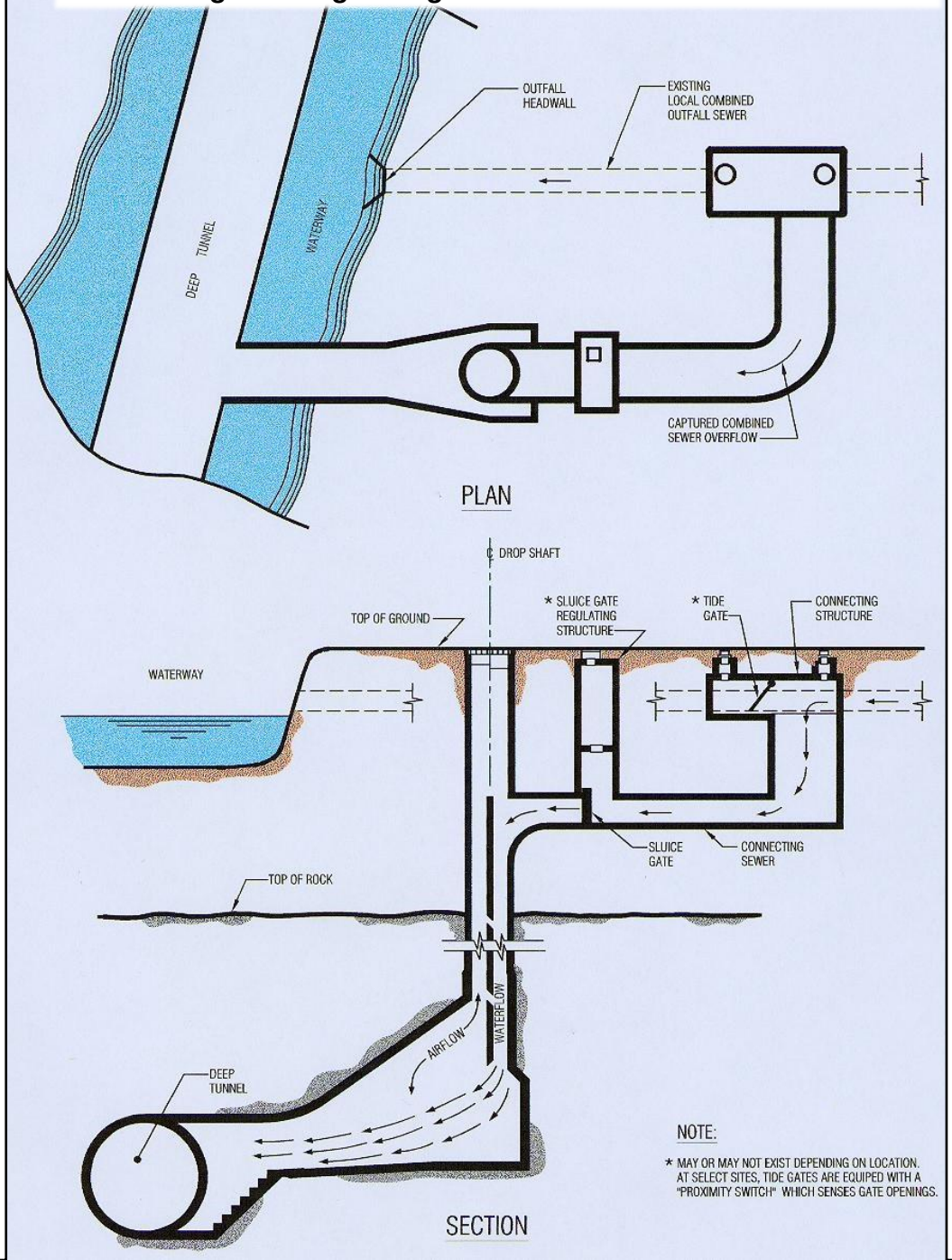


- **1972 – TARP approved by MWRD Board of Commissioners**
- **1975 – Tunnel Construction Begins**
- **1985 – Mainstream Tunnel Placed into Operation**
- **1998 – Majewski Reservoir Completed**
- **2006 – Tunnel System Completed**
- **2015 – Thornton Composite Reservoir Completed**
- **2017 – McCook Reservoir Stage 1 Completed**
- **2029 – McCook Reservoir Stage 2 Scheduled to be Completed**

TARP Phase 1 consisted of:

- **109.4** Miles of Concrete Lined Deep Tunnels
  - 8’ – 33’ Excavated Diameter
  - 150’ – 350’ Below Ground
- **264** Dropshafts (4’ – 25’ Diameter)
- **19** Construction Shafts (25’ – 32’ Diameter)
- **3** Major Pumping Stations
- Over **600** Near-Surface Connecting and Regulating Structures

Connecting and Regulating Structures Divert Flows to TARP



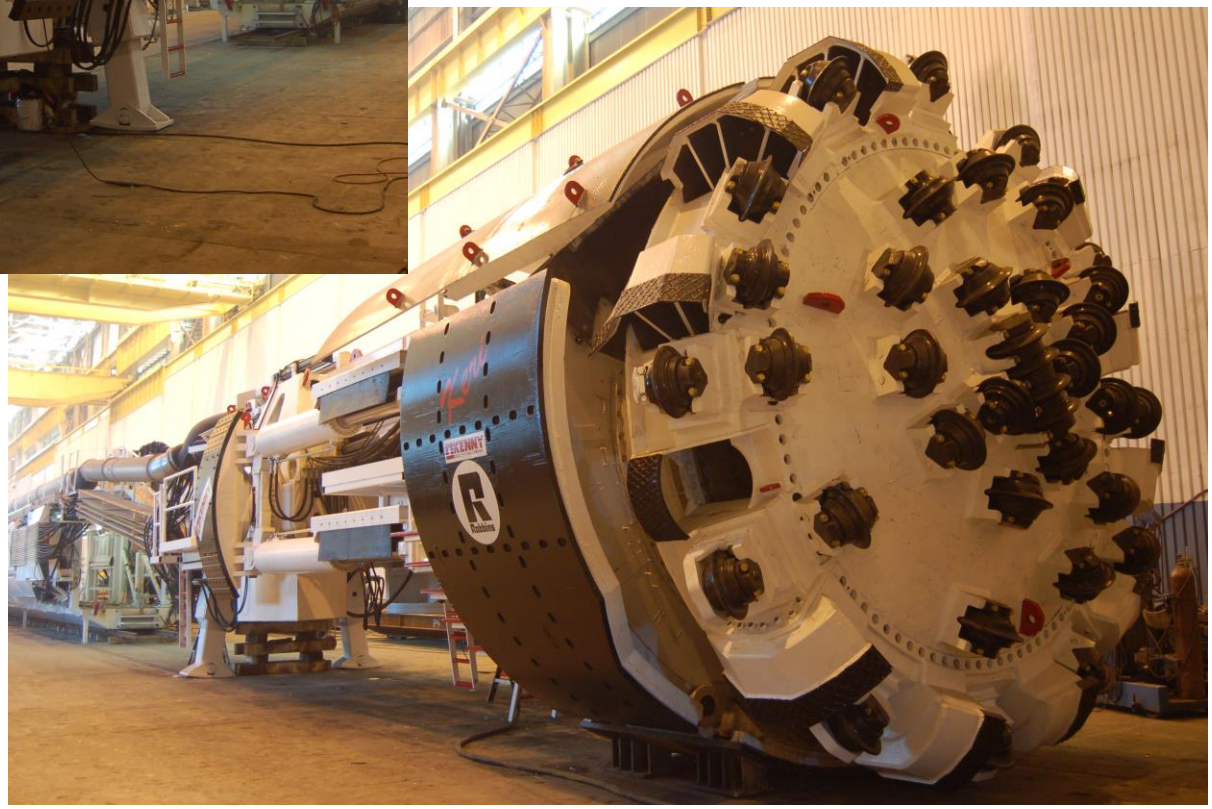
Metropolitan Water Reclamation District of Greater Chicago

Dropshaft DS-M61A

Metropolitan Water Reclamation District of Greater Chicago


10' 9.82 (5.58)

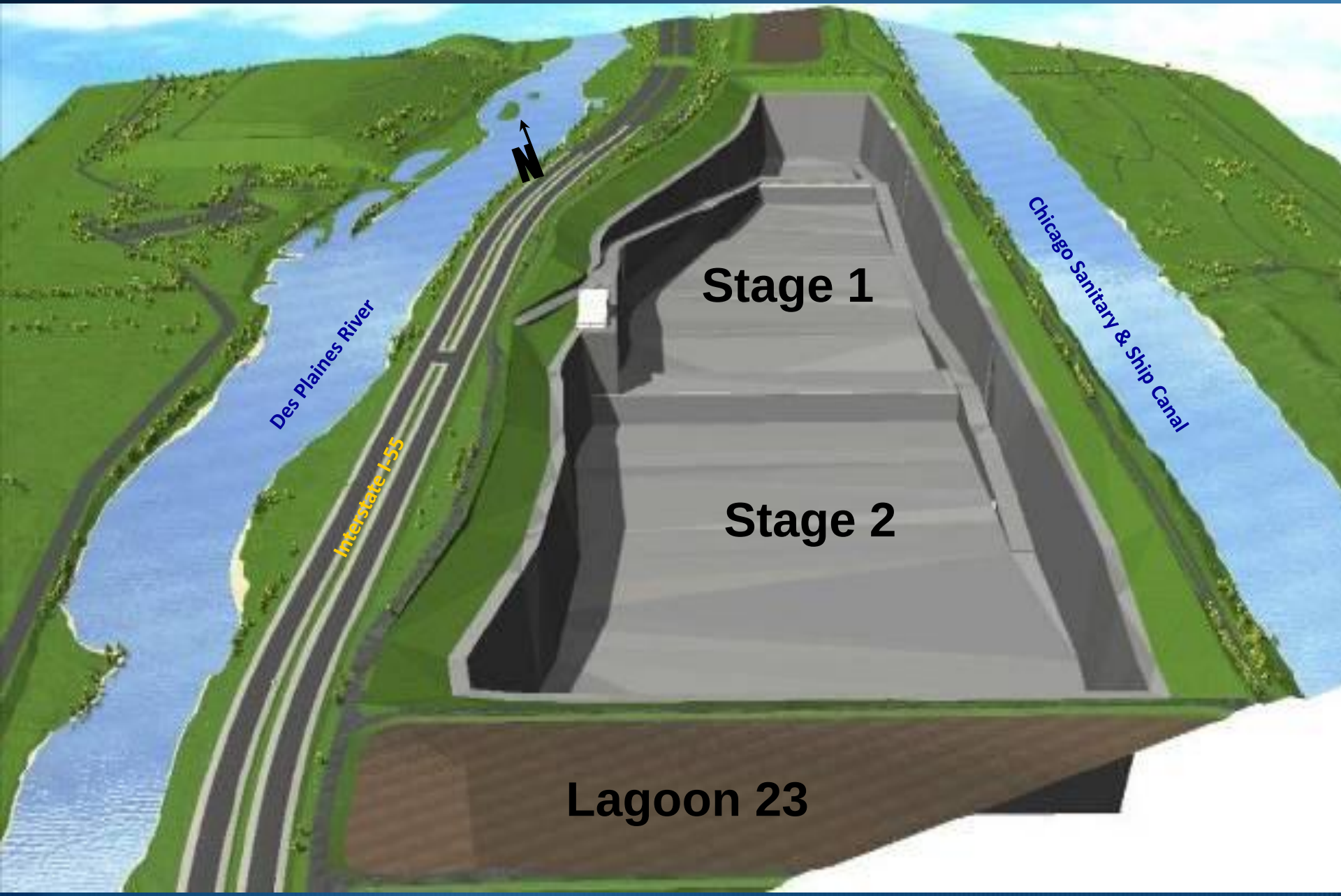

HERRENKNECHT


HERRENKNECHT
R
Robbins

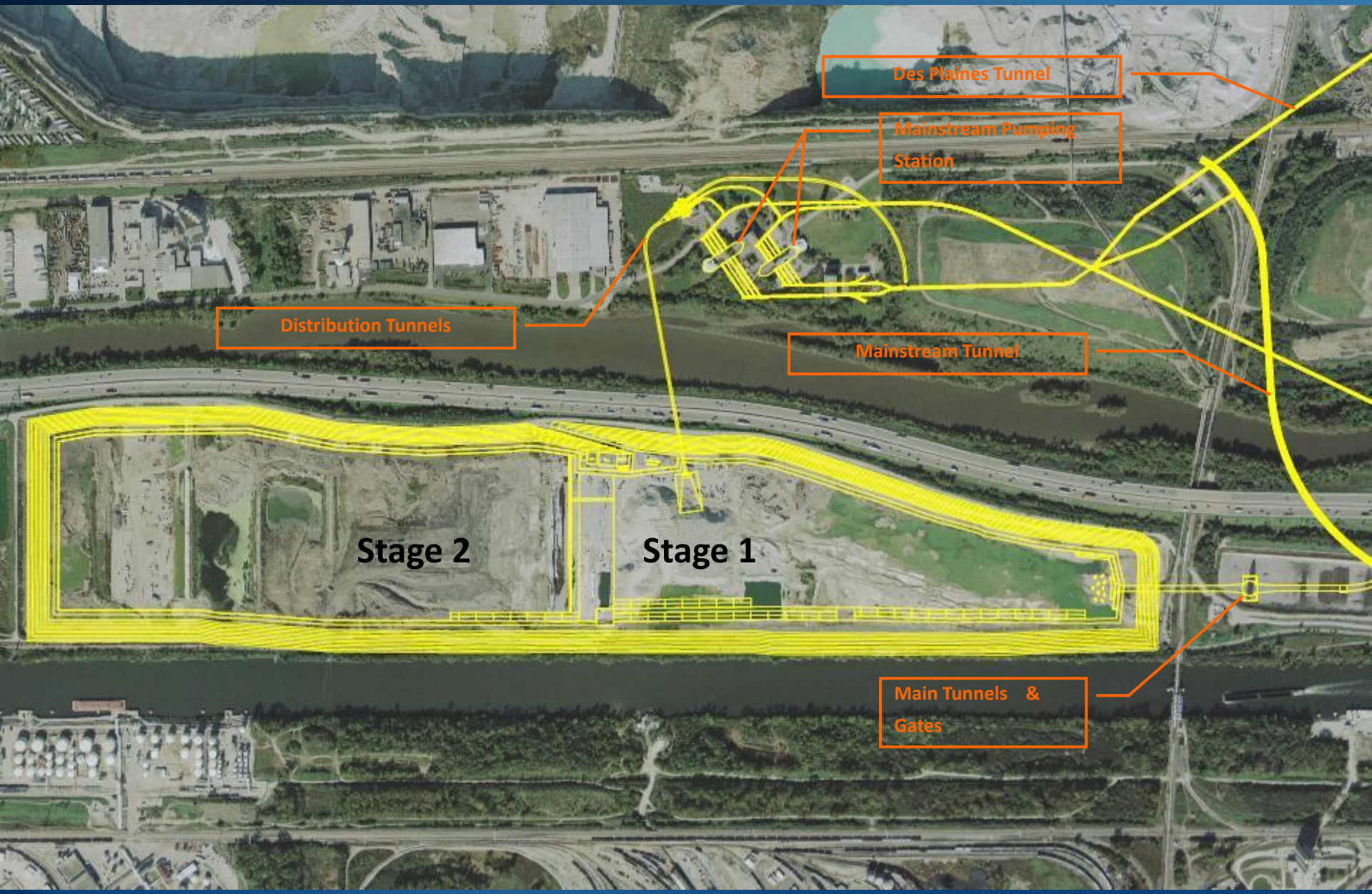
TARP Phase 2 consisted of:

- **O'Hare Cup (Majewski) Reservoir (1998)**
  - Service Area = 11 square miles; 3 communities
- **Thornton Composite Reservoir (2015)**
  - Service Area = 91 square miles; 14 communities
- **McCook Reservoir (Stage 1 - 2017)**
  - Service Area = 255 square miles; 37 communities
  - Stage 2 to be completed in 2029

McCook Reservoir



McCook Reservoir



Thornton Composite Reservoir

Flood Control

AGREEMENT

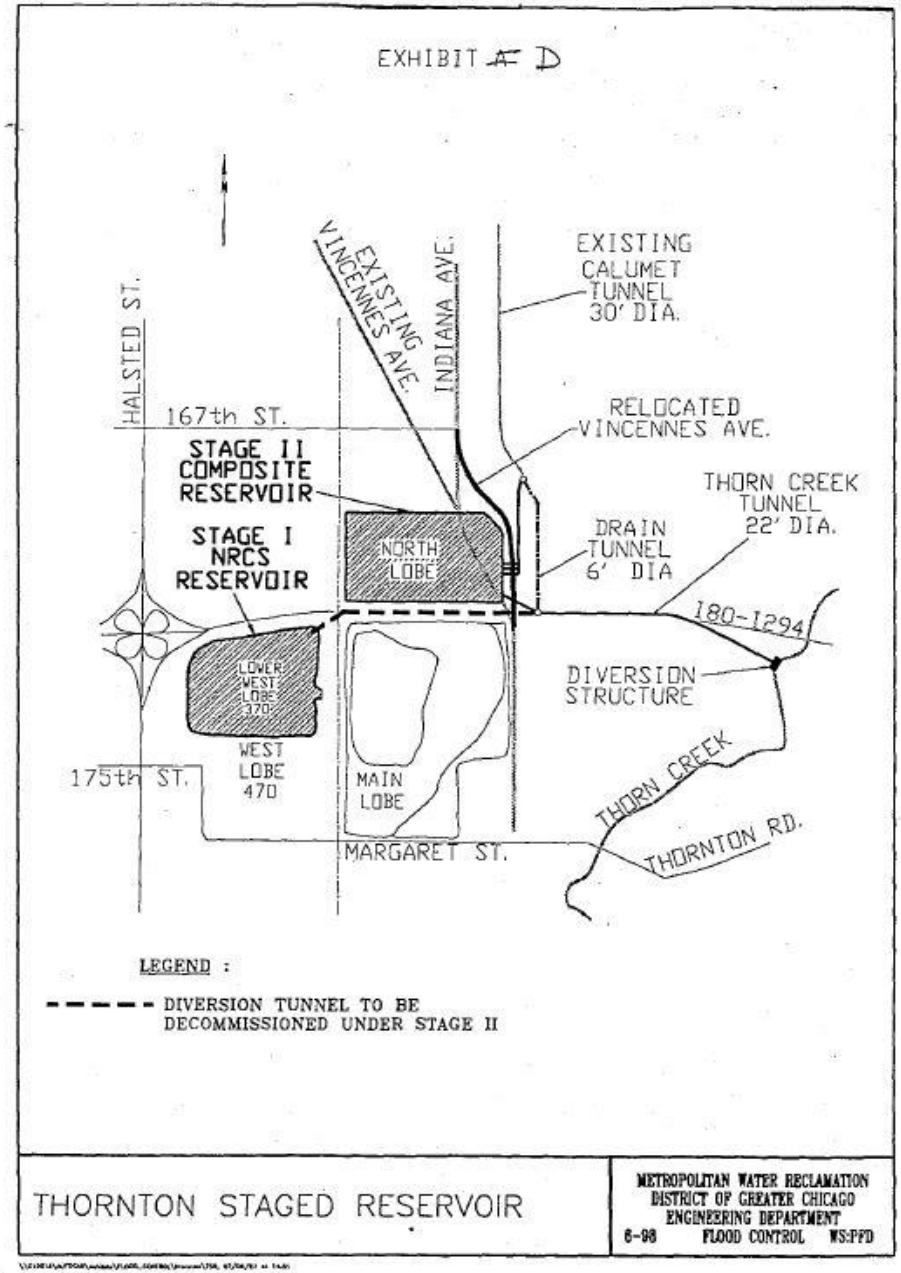
BY AND BETWEEN

MATERIAL SERVICE CORPORATION

AND

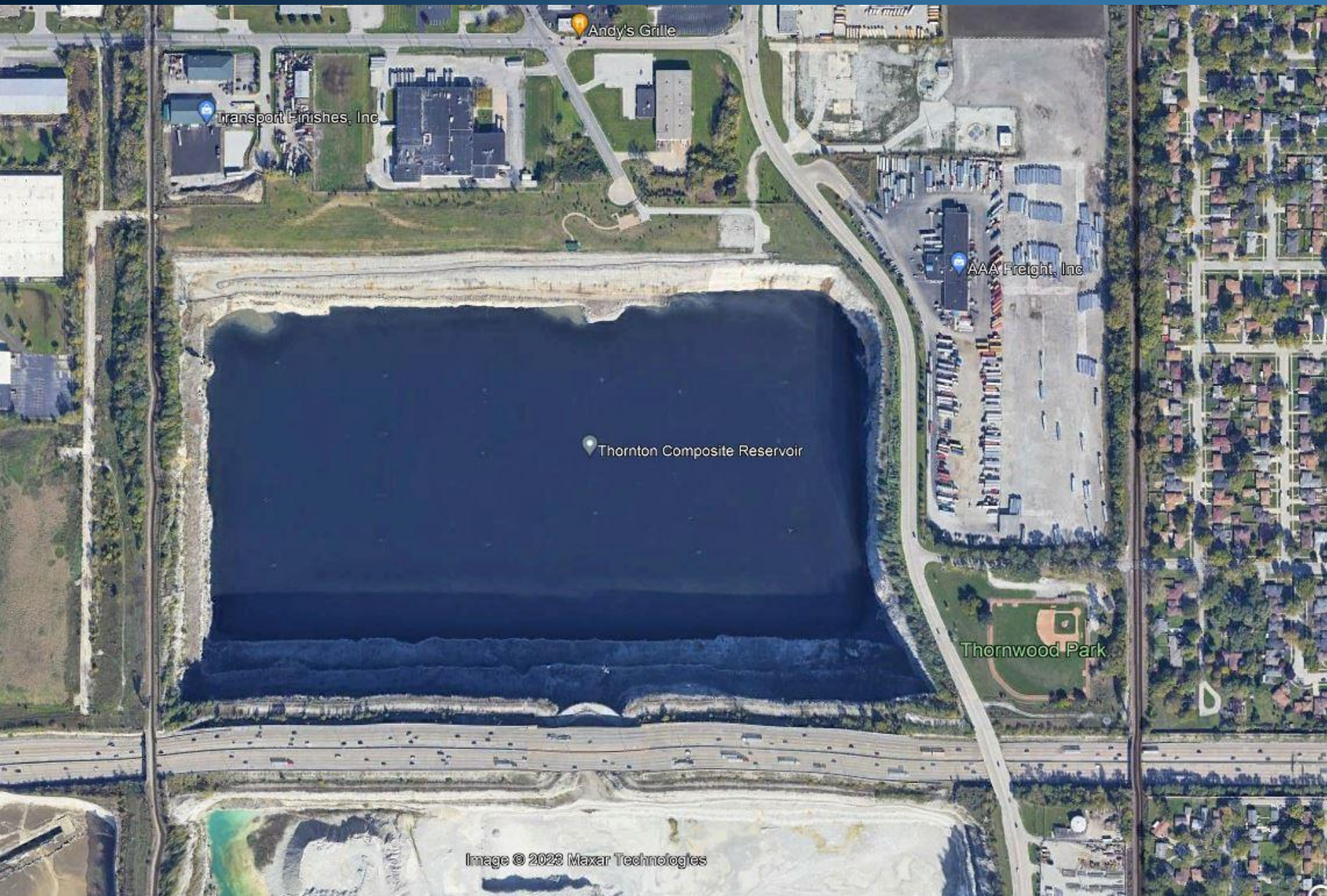
THE METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

DATED JUNE 18, 1998



Thornton Composite Reservoir

Thornton Composite Reservoir



Thornton Composite Reservoir

NORTH LOBE OF THORNTON QUARRY LOOKING SOUTH


JLG ULTRA BOOM 1350SJP
CENTRAL
777
9013

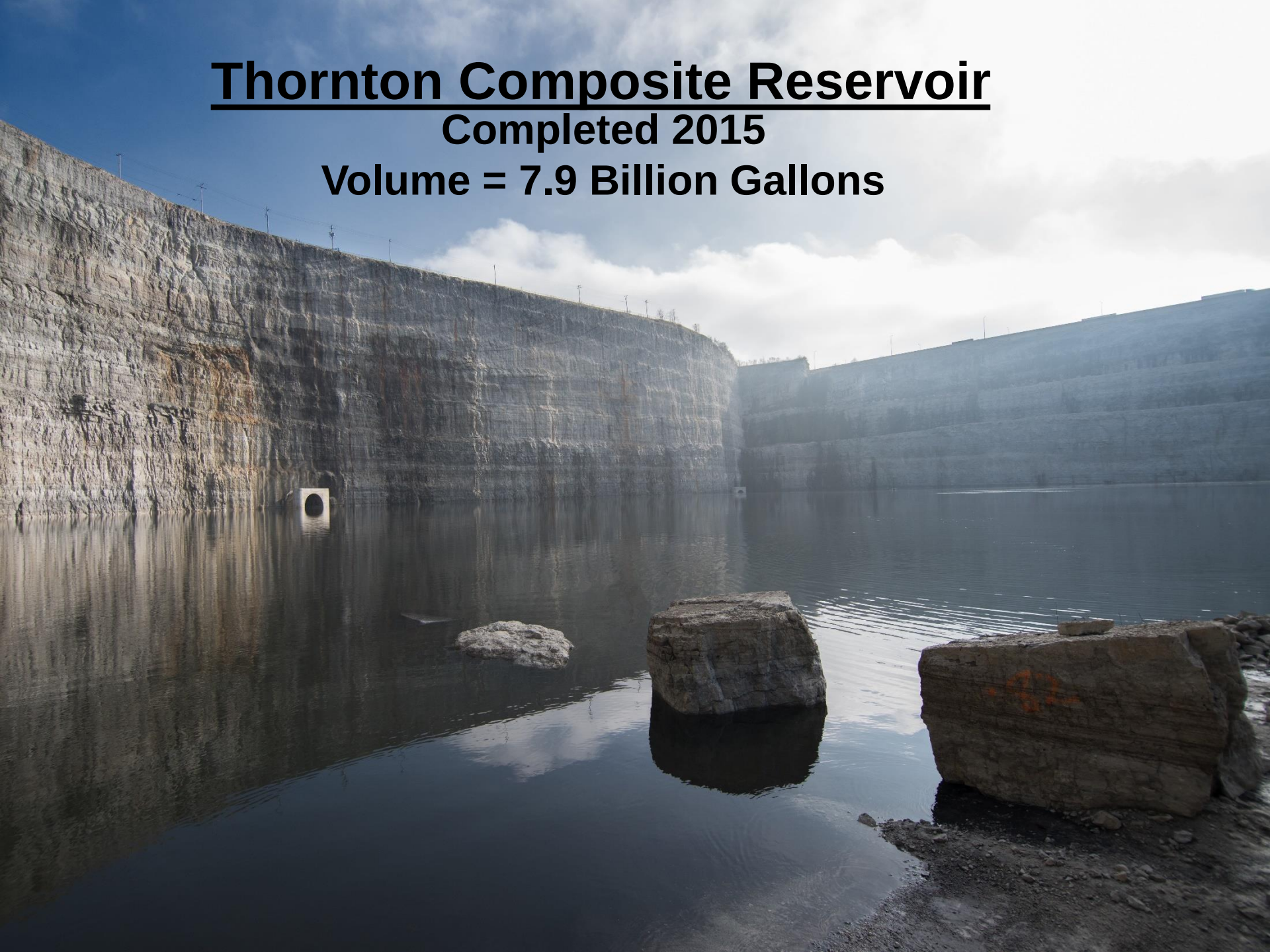
Gloria Alitto Majewski Reservoir

Completed 1998; Volume = 350 Million Gallons

Thornton Composite Reservoir

Completed 2015

Volume = 7.9 Billion Gallons


Thornton Composite Reservoir
Completed 2015
Volume = 7.9 Billion Gallons

McCook Reservoir

Under Construction

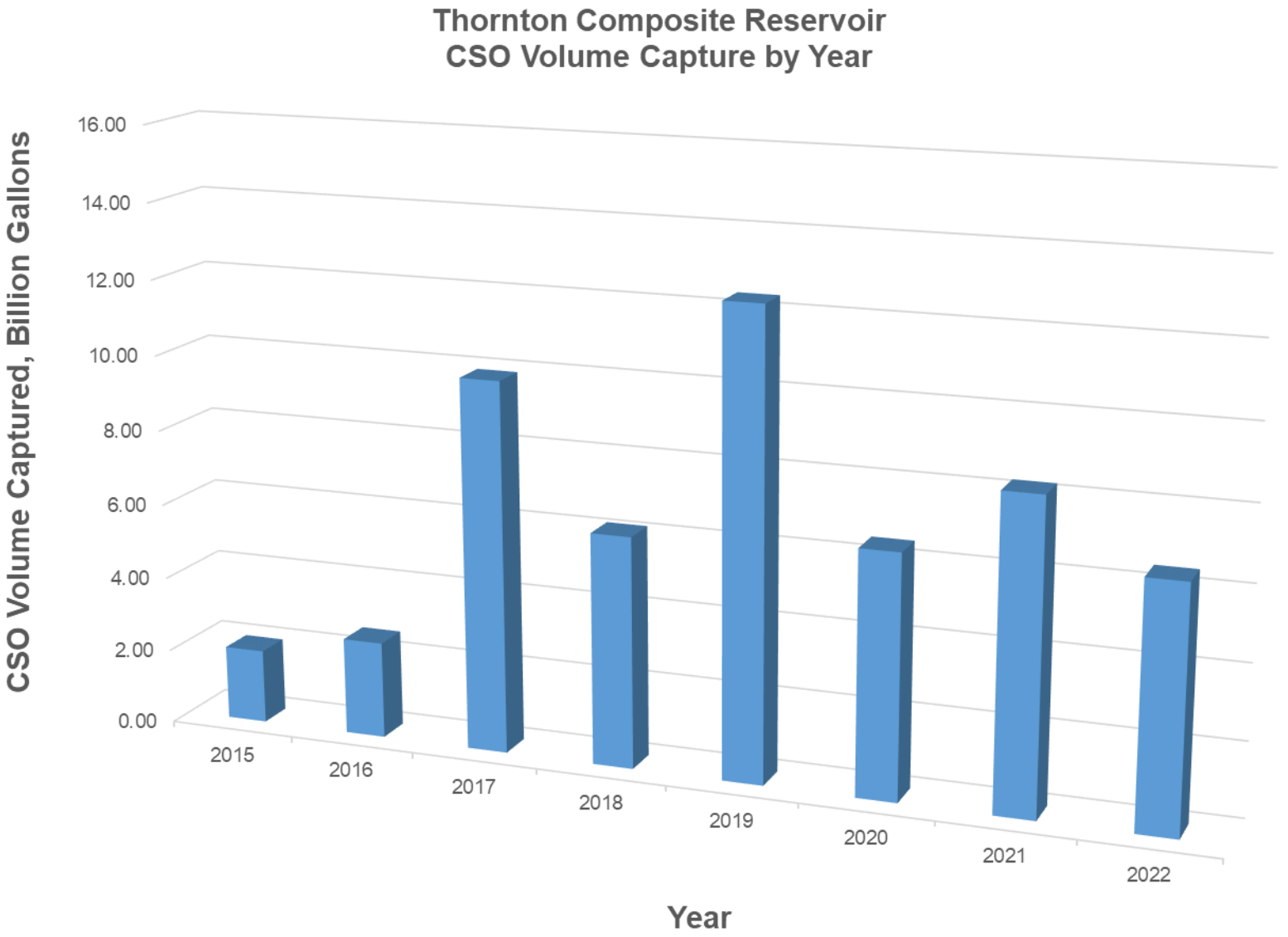
Stage 1 online 2017 (3.5 Billion Gallons)

Stage 2 online 2029 (6.5 Billion Gallons)

Thornton Composite Reservoir
CSO Capture

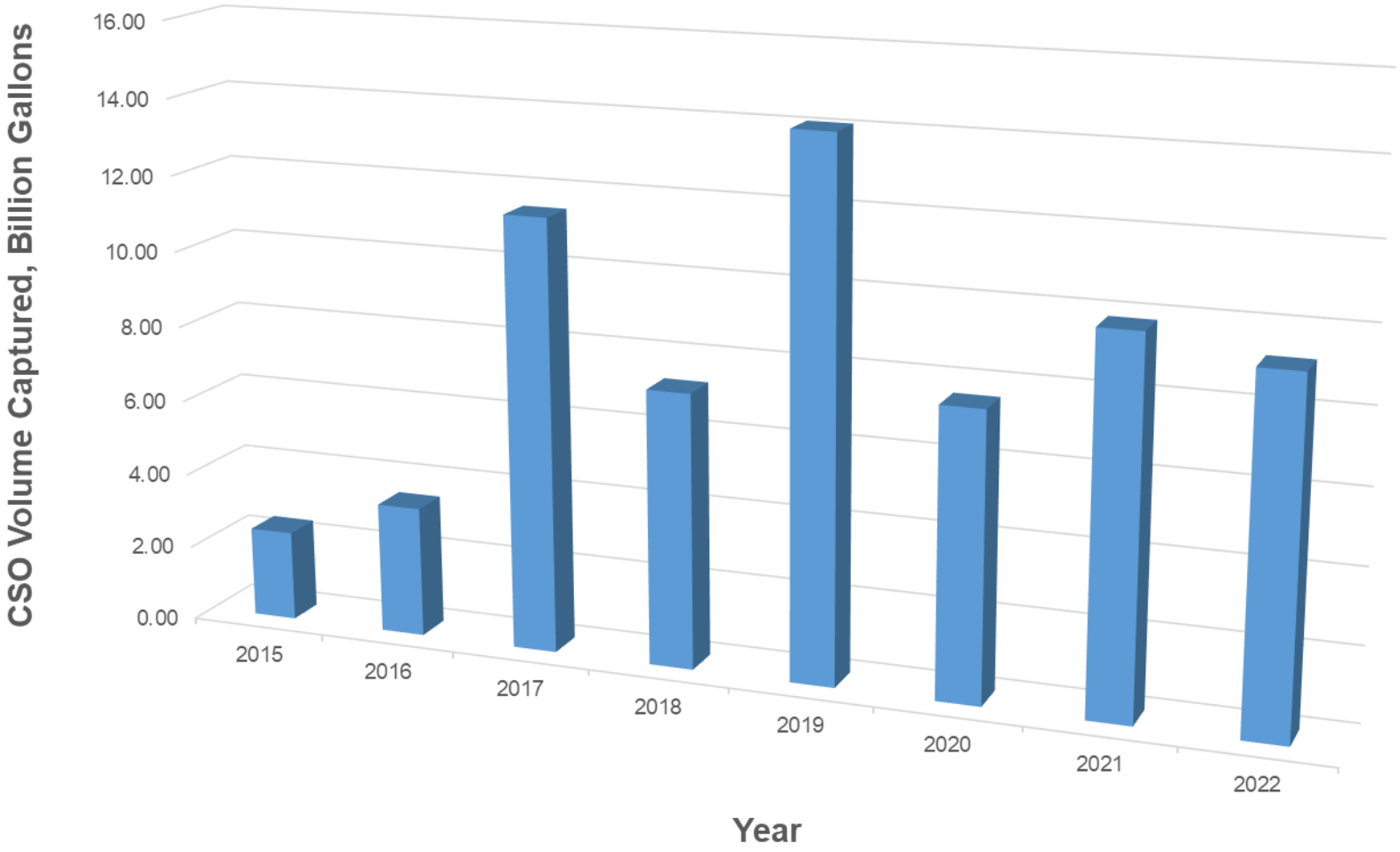
- TCR commissioned November 2015
- 140 Reservoir Fill Events through February 2023
- TCR has captured 54.3 BG of CSO volume
- $491M in flood reduction benefits in present day value (2003 LRR)
- TCR and Calumet TARP system total capture 65.5 BG 2015 to 2023
- 99.99% Capture of CSOs

Metropolitan Water Reclamation District of Greater Chicago



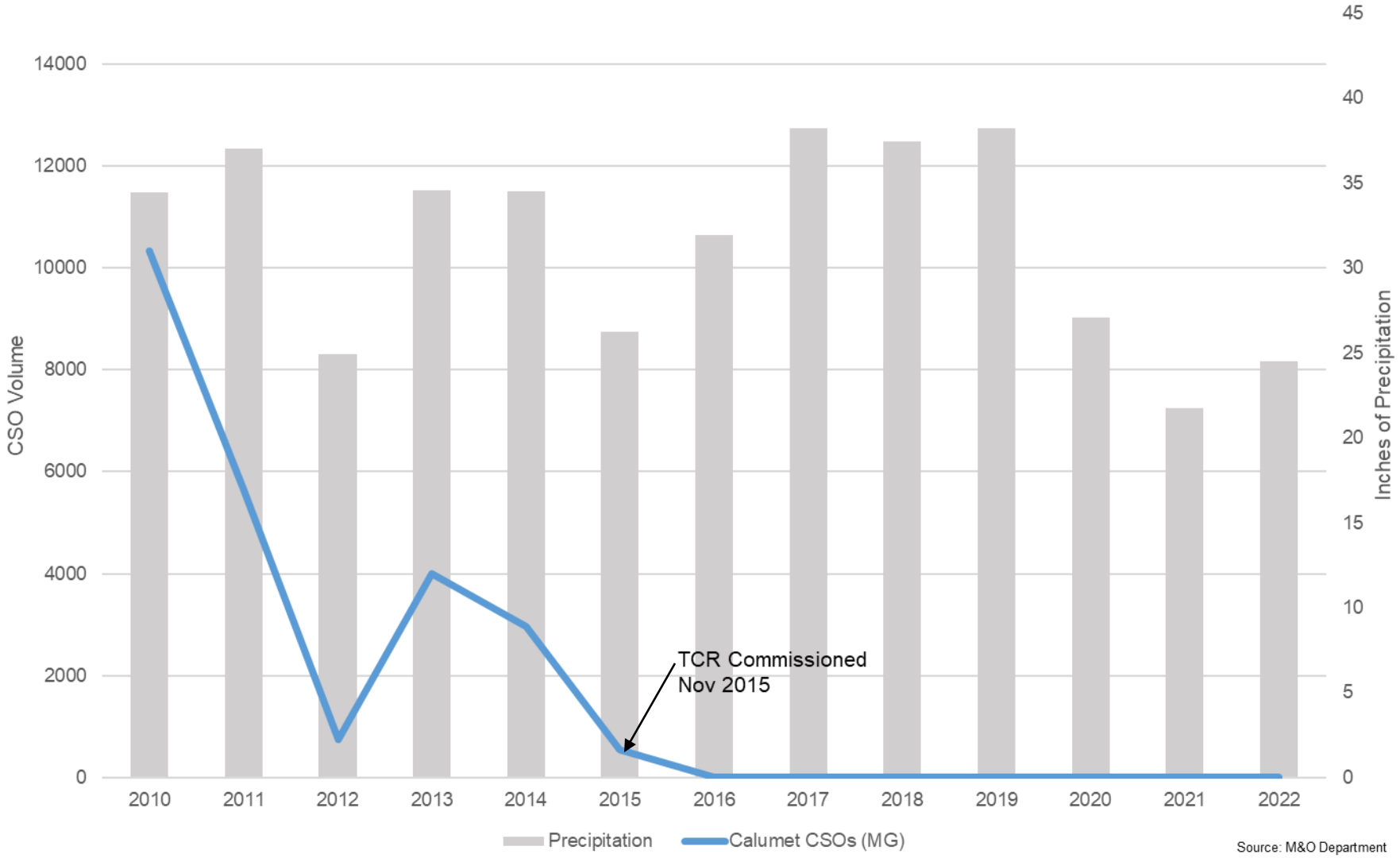
Metropolitan Water Reclamation District of Greater Chicago

Thornton Composite Reservoir + Calumet TARP System
CSO Volume Capture by Year



Metropolitan Water Reclamation District of Greater Chicago

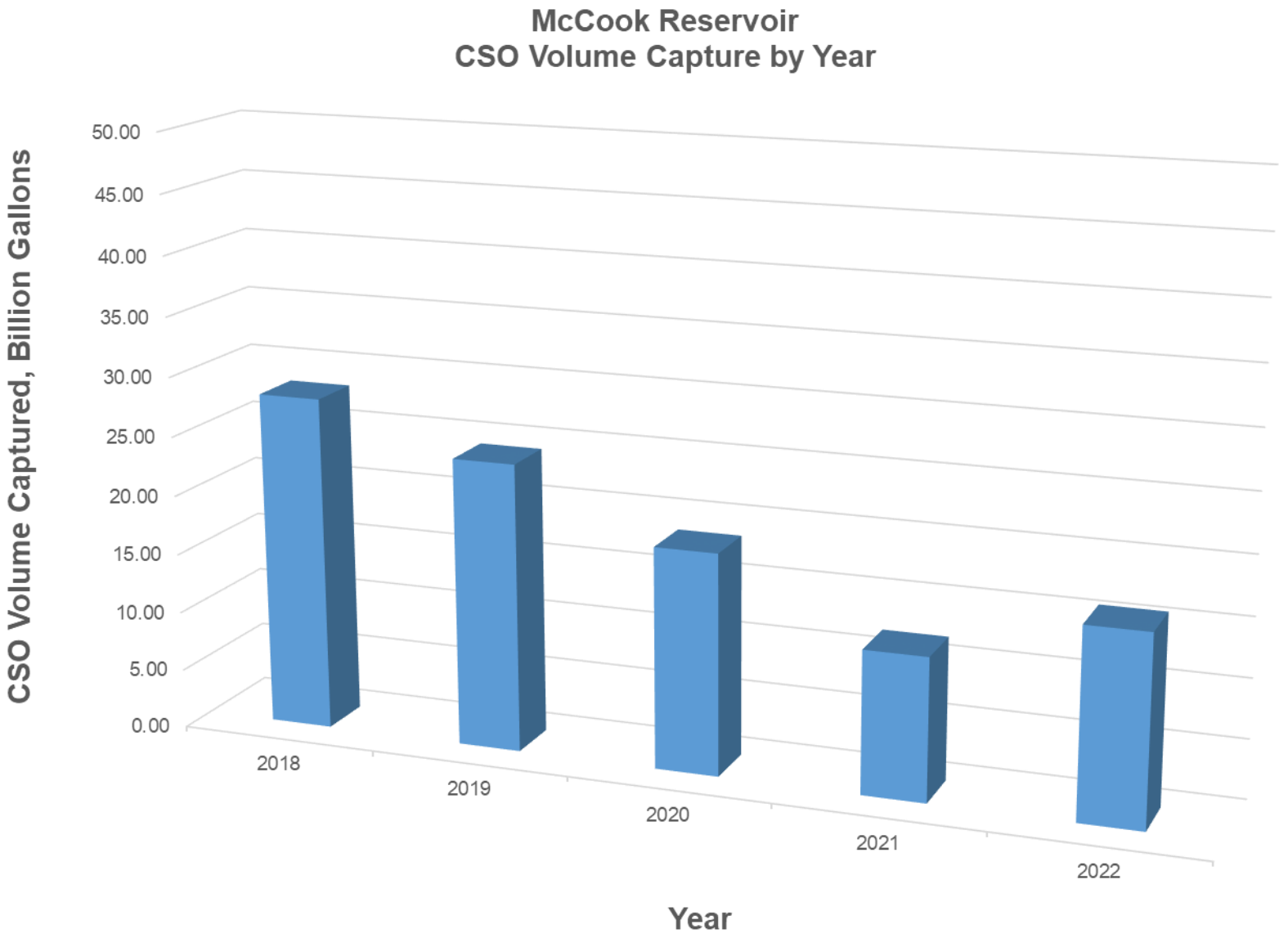
Calumet (Thornton) TARP System CSOs/Precipitation Totals 2010-2022



Source: M&O Department

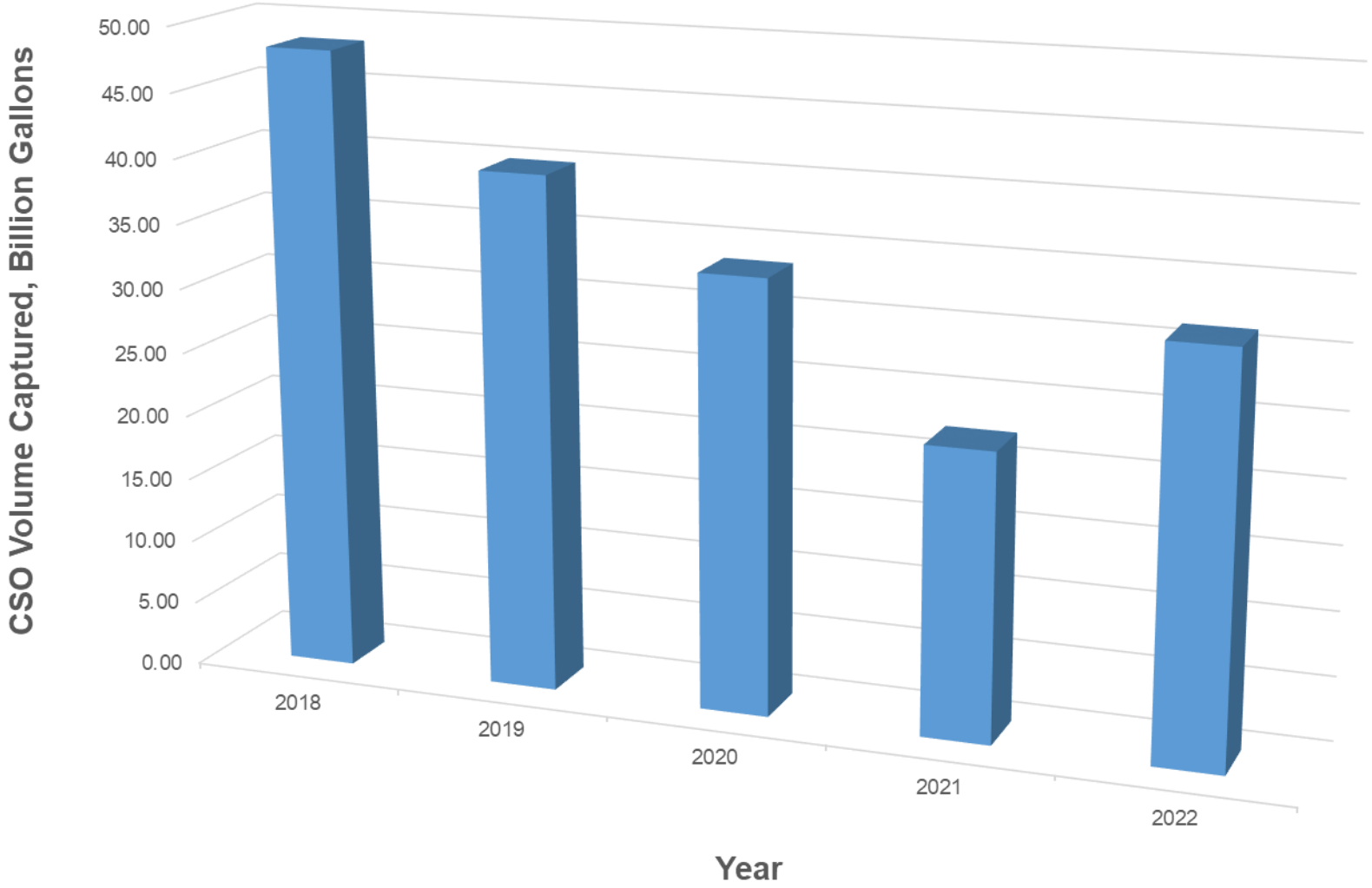
McCook Reservoir – Stage 1
CSO Capture

- McCook Stage 1 commissioned December 2017
- 197 Reservoir Fill Events through December 2022
- McCook Stage 1 has captured 99.0 BG of CSO volume
- $143M in annual flood reduction benefits once Stage 2 completed
- McCook, Mainstream and Des Plaines TARP system total capture 175 BG Dec 2017 to Dec 2022


McCook Reservoir
CSO Volume Capture by Year
CSO Volume Captured, Billion Gallons
50.00
45.00
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
2018
2019
2020
2021
2022
Year

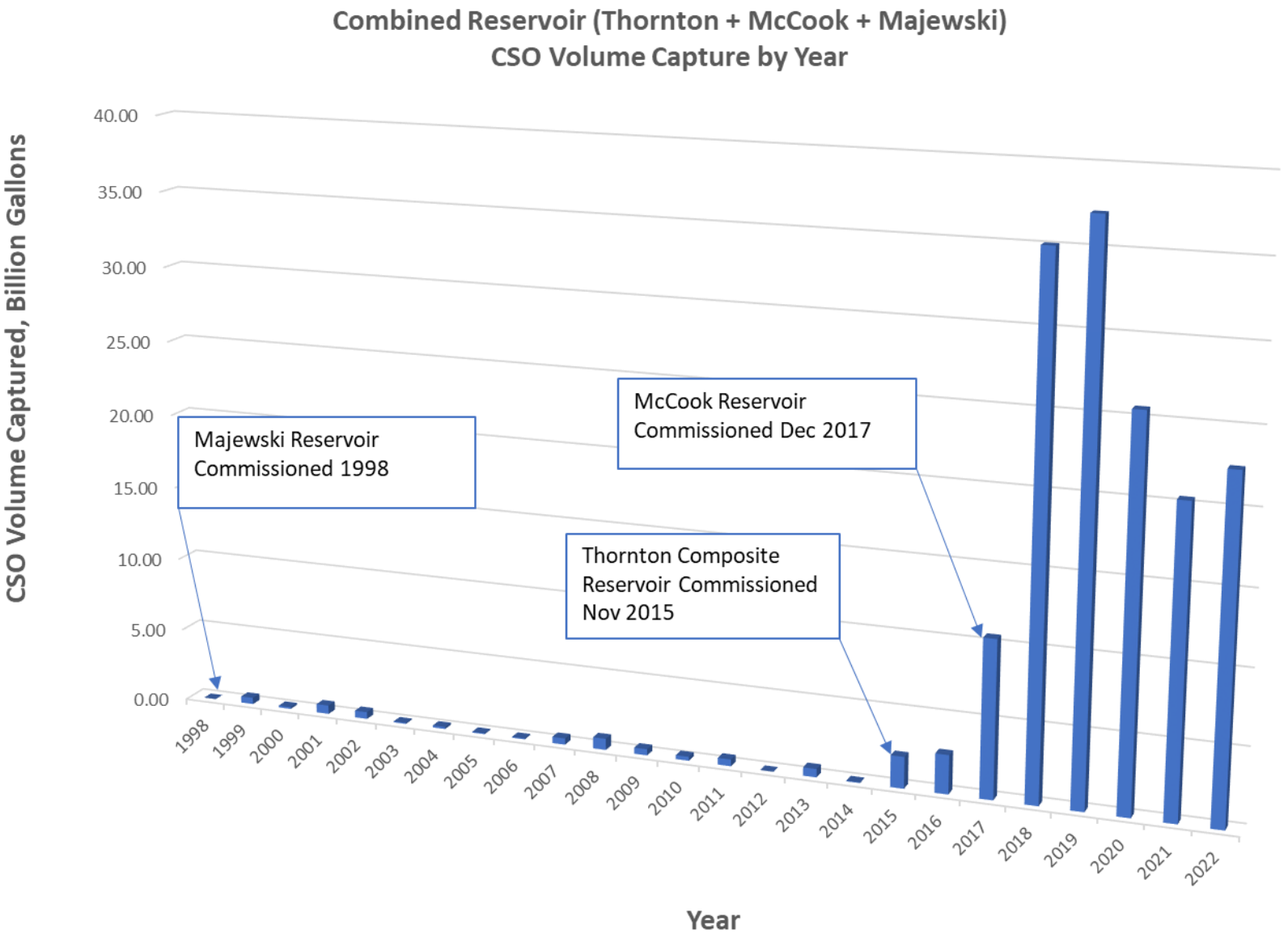
Metropolitan Water Reclamation District of Greater Chicago

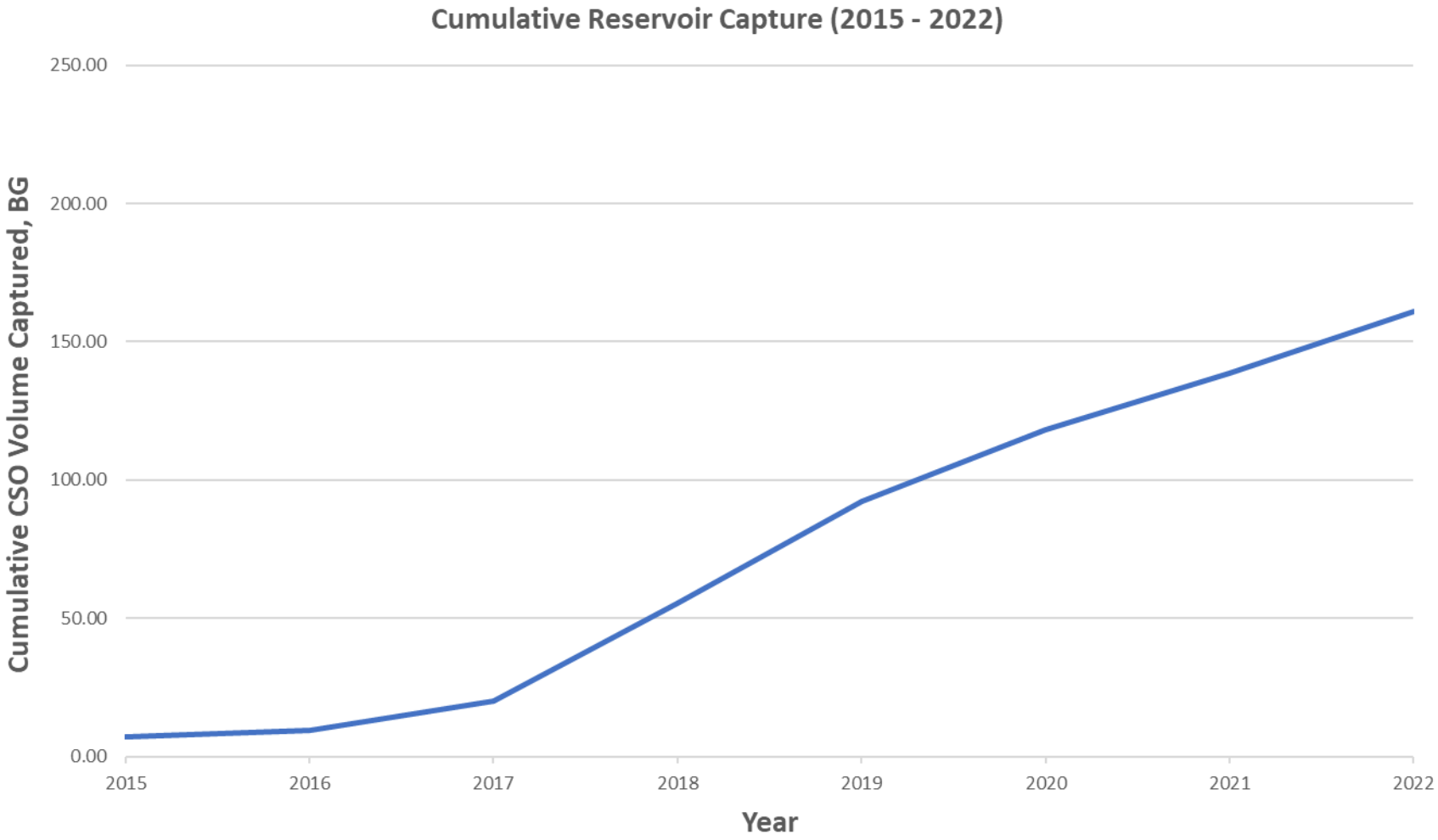
McCook Reservoir + Mainstream + Des Plaines TARP System
CSO Volume Capture by Year



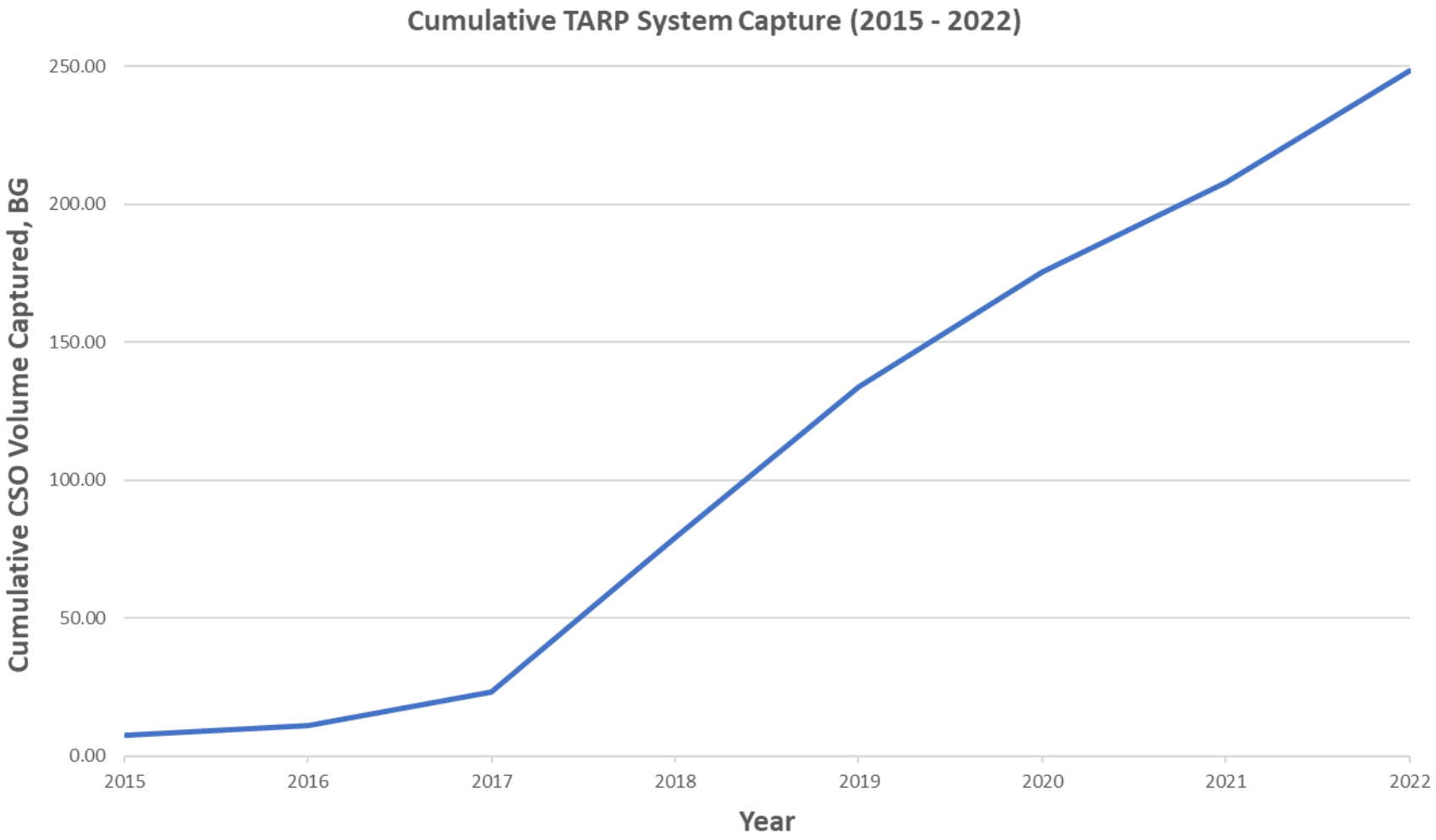
Metropolitan Water Reclamation District of Greater Chicago

Metropolitan Water Reclamation District of Greater Chicago





161 BG captured 2015-2022



248 BG captured 2015-2022

TARP CSO Capture Since 1985

- Engineering has tracked CSO capture on fill-event basis for reservoirs and tunnels using stage-storage data since commissioning of reservoirs
- M&O has tracked flow capture for tunnels on annual basis dating back to 1980s
- M&O data is comprehensive (includes dry weather flows, I/I, pumpback)
- CSO Tunnel Capture 1985 to 2014 = ????

TARP CSO Capture Since 1985

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- CSO Tunnel Capture 1985 to 2014 = 750 BG (estimated)

TARP CSO Capture Since 1985

- Engineering has tracked CSO capture on fill-event basis for reservoirs and tunnels using stage-storage data since commissioning of reservoirs
- M&O has tracked flow capture for tunnels on annual basis dating back to 1980s
- M&O data is comprehensive (includes dry weather flows, I/I, pumpback)
- CSO Tunnel Capture 1985 to 2014 = 750 BG (estimated)
- Total CSO Capture 1985 to 2022 = 1 Trillion Gallons (estimated)

TARP Summary

- TARP Overall Capacity = 20.55 BG
- Tunnel Capacity = 2.3 BG
- Reservoir Capacity = 18.25 BG
- Service Area = 352 square miles; 3.75 million people
- 1.5 million structures protected from flooding
- $180M+ annual flood reduction benefits

Water Quality Benefits
Little Calumet River

Summary Table of Mean Waterway Parameters at Halsted Street Sampling Station, 1975-2018

Parameter	1975	1993	2015	2018
Dissolved Oxygen, mg/L	4.1	6.0	8.0	8.2
Total Suspended Solids, mg/L	37	25	12	8
Total Ammonium-N, mg/L	8.8	2.0	0.6	0.34
Total Cyanides, mg/L	0.042	0.013	<0.005	<0.005
Fecal Coliform, CFU/100 mL	8,000	6,000	1,811	114
Fish Species	8	18	30	30

Source: *Metropolitan Water Reclamation District of Greater Chicago's Research and Development Department, Report No. 98-23, Water Quality Improvements in the Chicago and Calumet Waterways between 1975 and 1993, Associated with the Operation of Water Reclamation Plants, the Tunnel and Reservoir System, and Instream and Sidestream Aeration Stations (September 1998); Metropolitan Water Reclamation District of Greater Chicago's Research and Development Department, Report No. 16-34, 2015 Annual Summary Report, Water Quality within the Waterway System of the Metropolitan Water Reclamation District (October 2016); REPORT NO. 19-13 POST-CONSTRUCTION MONITORING REPORT FOR THE CALUMET TUNNEL AND RESERVOIR PLAN SYSTEM*

Metropolitan Water Reclamation District of Greater Chicago

Getty Images, 2022

Metropolitan Water Reclamation District of Greater Chicago

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Questions:
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WawczakB@mwrd.org