



HOW RIVERS GOT CLAD IN CONCRETE

A brief history of “watercourse improvements”
that paved 17 miles of Milwaukee channels



Honey Creek, 1964



Kinnickinnic River, 1961



Underwood Creek, 1974
images courtesy Tom Chapman, MMSD

By Michael Timm

December 2025

Between 1950 and 1974, the Milwaukee Sewerage Commissions funded millions of dollars of projects to modify rivers and streams.

A decades-long campaign meant “deepening, widening, and improving” urban waterways.

Throughout the 1950s, waterways were modified in response to flooding and basement backups.

Throughout the 1960s, armoring channels in concrete became a widespread practice.

Lincoln Creek, Underwood Creek, Honey Creek, Oak Creek, the Menomonee River, the Root River, and the Kinnickinnic River were all heavily modified.

Engineers called it “watercourse improvement.”

These changes came on the heels of Milwaukee’s population boom after the first world war, then a housing boom after the second.

“In 1920, Milwaukee’s population density peaked at 18,213 persons per square mile — second only to New York City’s,” wrote historian John Gurda in *The Making of Milwaukee*. “Between 1940 and 1970, the number of housing units in the four-county metropolitan area almost doubled, rising from 238,514 to 449,044.”

The expansion of society placed tremendous pressures on systems that sustain life.

We are still collectively dealing with the same issues of water management today.

Except now, in the 21st century, engineers are removing concrete from rivers.

Among other sources, this report relies mainly on review of annual reports of Milwaukee’s two Sewerage Commissions, especially those documenting 1950 through 1974, focusing on capital budgets for watercourse improvements. Independent research was conducted from July through November 2025.

Until the Milwaukee Metropolitan Sewerage District (MMSD) formed in 1982, the Milwaukee area was governed by two separate public sewerage commissions (one for the City of Milwaukee and the other for Metropolitan Milwaukee). Both, separately and in coordination, implemented a policy of “watercourse improvement” from 1950 to 1974.

City leadership certified and appointed seven commissioners to the serve terms on the city commission. The governor appointed three people, certified by the city commission, to serve on the metropolitan commission for Milwaukee County.

Watercourse improvement consisted of straightening, deepening, altering, and in many cases paving rivers and the streams that fed them. This strategy of modifying waterway channels was in response to flooding and basement backups in a region that had grown densely populated, leading to stormwater management challenges evident during heavy precipitation.

The commissions solicited requests for proposals from local engineering firms to conduct watercourse improvement projects. The capital projects and the bids were recorded in the annual reports, which note a typical bid response ranging from three to five engineering firms. Many firms performed multiple projects over the years.

Many projects were funded through bond issues approved by the Milwaukee County Board. The legal authority of the sewerage commission to perform watercourse improvements and to issue bonds to fund them was clarified by the state Legislature by an amended statute in 1951.

Chief engineers set the course and implemented a policy that reconstructed Milwaukee’s rivers and streams in response to public priorities advanced by civic leaders and private property owners.

Raymond D. Leary served as the city commission’s chief engineer and general manager from April 1, 1950 to Sept. 3, 1974. Leary presided over 24 miles of “watercourse improvements” during his celebrated tenure.

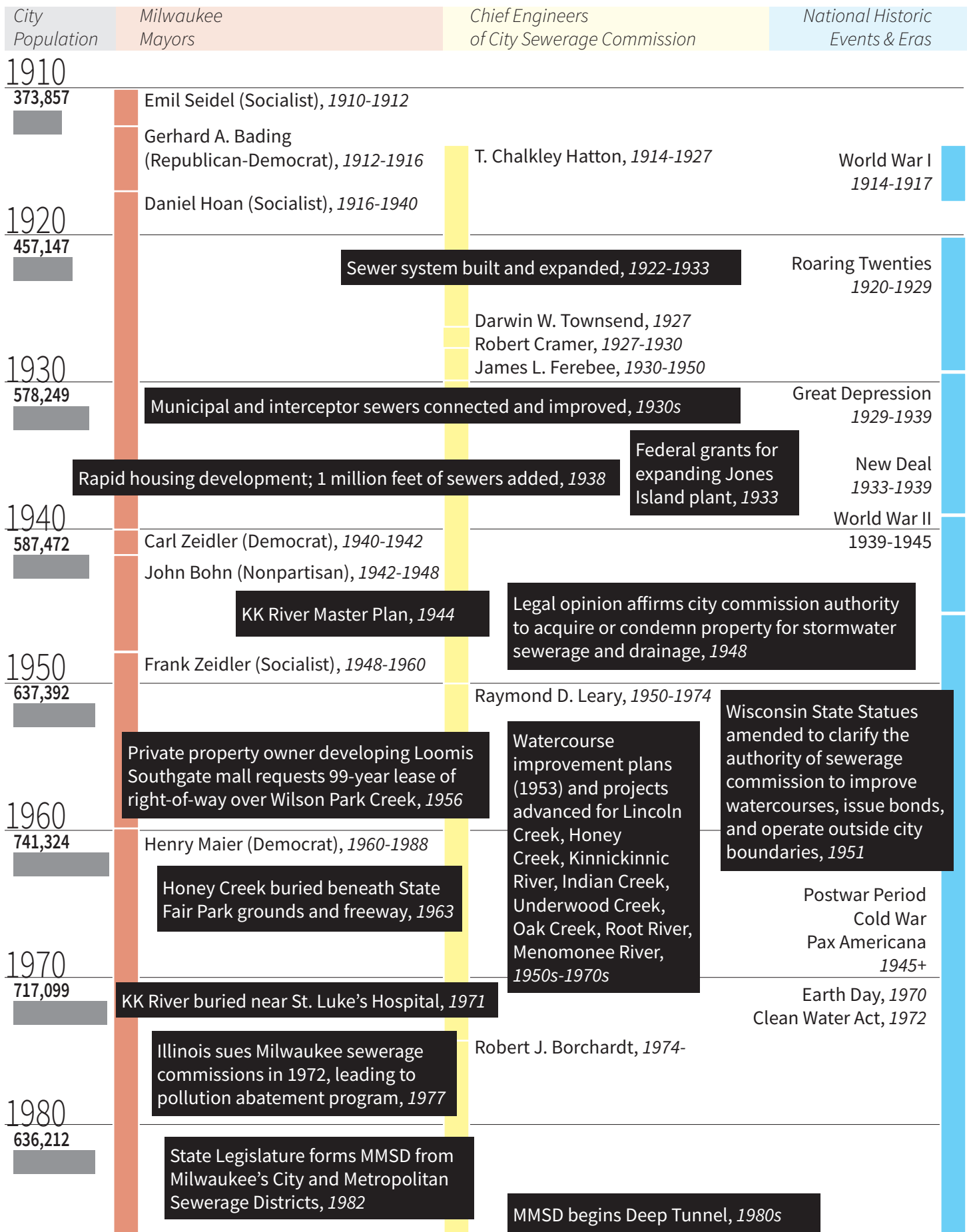
Who made these choices?

SEWERAGE COMMISSION OF THE CITY OF MILWAUKEE		
Present and Former Commissioners:		
*George P. Miller	Sept. 2, 1913 to June 24, 1931	
*Conrad Niederman	Sept. 2, 1913 to Apr. 28, 1927	
*Michael Carpenter	Sept. 2, 1913 to Oct. 23, 1926	
*Theodore O. Vilter	Sept. 2, 1913 to Sept. 18, 1919	
*George H. Benzenberg	Sept. 2, 1913 to May 8, 1918	
*William H. Gillen	Sept. 29, 1919 to June 28, 1920	
Victor H. Kadish	Jan. 22, 1920 to May 18, 1923	
*Fred H. Dorner	Dec. 31, 1920 to Feb. 12, 1923	
*William E. Reddin	Mar. 30, 1923 to Apr. 20, 1923	
Jacob F. Friedrich	May 14, 1923 to May 31, 1966	
*Robert Cramer	July 17, 1923 to Apr. 29, 1927	
*John Anderson	Oct. 25, 1926 to Oct. 14, 1929	
*Charles F. Bindrich	June 24, 1927 to June 1, 1945	
*Bruno V. Nordberg	June 24, 1927 to Aug. 19, 1946	
*Marshall Whaling	Nov. 22, 1929 to Dec. 17, 1961	
Bruno V. Bitker	Jan. 11, 1932 to May 5, 1963	
*Chester V. Salomon	July 30, 1945 to Jan. 19, 1961	
Raymond D. Leary	Mar. 18, 1947 to Nov. 15, 1949	
Roger A. Sutherland	May 8, 1950 to Mar. 9, 1965	
Leonard K. Place	Sept. 7, 1953 to Aug. 31, 1954	
*Carl R. Hampel	Sept. 1, 1954 to Apr. 22, 1957	
Donald E. Murphy	Apr. 24, 1957	Now Serving
*Mathias G. Schimenz	Jan. 20, 1961 to July 22, 1962	
Donald La Prest	Jan. 23, 1962	Now Serving
Charles E. Gillett	July 11, 1962	Now Serving
Theodore Asti	Mar. 9, 1965 to June 12, 1971	
Richard J. Steinberg	Mar. 22, 1967 to July 2, 1973	
Valentine J. Wells	Jan. 25, 1972	Now Serving
Harry J. Williams	Jan. 29, 1974	Now Serving
Chief Engineers:		
*T. Chalkley Hatton	Jan. 6, 1914 to Jan. 7, 1927	
*Darwin W. Townsend, Acting Chief Engineer	Jan. 7, 1927 to Apr. 29, 1927	
*Robert Cramer	Apr. 29, 1927 to Sept. 5, 1930	
*James L. Ferebee	Sept. 5, 1930 to Mar. 31, 1950	
Raymond D. Leary	Apr. 1, 1950 to Sept. 1, 1974	
Robert J. Borchardt	Sept. 3, 1974	Now Serving

METROPOLITAN SEWERAGE COMMISSION OF THE COUNTY OF MILWAUKEE		
Present and Former Commissioners:		
*Charles B. Perry	Oct. 20, 1921 to Dec. 23, 1937	
*George P. Miller	Oct. 20, 1921 to June 24, 1931	
*Fred W. Ullius	Oct. 20, 1921 to May 25, 1928	
*James L. Ferebee	Aug. 3, 1928 to Sept. 5, 1930	
*George H. Gabel	Oct. 30, 1930 to Nov. 15, 1946	
Jacob F. Friedrich	Nov. 12, 1931 to Aug. 2, 1966	
*Henry G. Meigs	Dec. 23, 1937 to May 15, 1963	
*Ralph H. Cahill	Nov. 15, 1946 to Aug. 10, 1956	
O. Neil Olson	Apr. 24, 1957 to Aug. 1, 1974	
Roy A. Gruber	May 16, 1963 to Aug. 18, 1970	
Donald La Prest	Aug. 3, 1966 to Now Serving	
Norbert F. Fridl	Aug. 19, 1970 to Now Serving	
Dr. Raymond J. Kipp	Sept. 16, 1974 to Now Serving	

source: 1974 annual report

Milwaukee "Watercourse Improvement": A Selected Timeline



Watercourse improvement was done in order to protect property and manage drainage in wake of flooding and eroding urban streambanks.

Watercourse improvement consisted of straightening, deepening, altering, and in many cases paving rivers and the streams that fed them. (Imagine driving west on I-94 from downtown Milwaukee out to the Delafield, Wis. Walmart — that's how many Milwaukee river miles were altered.) Some stream segments — notably Honey Creek beneath the State Fair grounds — were also buried to accommodate other uses, like freeways and parking lots. These reconfigurations had hydrological implications — accelerating flow, constricting floodplains, and denaturing habitats — but they also further altered urban society's cultural relationship to waterways.

From the general perspective of 2025, all this river concretization may seem abhorrent and counterproductive, but for decades this was the accepted engineering solution to the societal challenge of managing flood risk in rapidly developing urban and suburban areas. It was a policy repeatedly advanced and expanded by those public officials who were responsible for managing water in the metropolitan Milwaukee area. This is reflected in the emergence, prevalence, and continuance of significant items in several decades of sewerage commission capital budgets (1950s – 1970s).

Overall, at least \$36 million (\$343 million, when adjusted to 2025 dollars) of public dollars were committed to “watercourse improvements” between 1950 and 1974.

It was a major, enduring effort.

1951

February 19 an opinion was requested from the City Attorney as to whether the County Board could, under the Metropolitan Sewerage District act, issue bonds for the Kinnickinnic River Improvement, and under date of May 22nd he suggested that the law be amended to definitely include issuance of bonds for such work. An amendment to the act to “include the improvement of water courses (including the building of storm sewers) needed for this purpose in order to prevent surcharging of the sewer system”, was adopted by the 1951 session of the State Legislature.

Excerpt from 1951 report clarifying that public bonds could be issued to fund river modification work under the sewerage commission, a debated question in 1950 and prior since its primary mission had been to manage the sanitary sewer system. Work on the KK was postponed at least one year until after this opinion allowed the bond issuance.

1960

subsection 6 (a) of section 59.96, Wisconsin Statutes, so that this section now reads in part as follows:

“6. POWERS AND DUTIES. (a) The Metropolitan Sewerage Commission * * * may improve * * * any watercourse within the district by deepening and widening or otherwise changing the same where in the judgment of the commission it may be necessary in order to carry off surface or drainage water, and such power may be exercised outside the district in any case where any such watercourse flows from within the district to a point outside the district and then returns to the district.”

The above section would seem to make it abundantly clear that the Metropolitan Sewerage Commission may improve any water course (and by definition “any water course” is a very broad term embracing every stream which has a noticeable flow) so long as it is necessary in order to carry off surface or drainage water; therefore, it would seem that the Metropolitan Commission certainly has the power to improve a water course which fits that definition, and we would assume that the secondary streams which you are talking about have a noticeable flow.

Excerpt from 1960 Milwaukee City Attorney opinion reiterating the authority of the sewerage commissions to “improve” any watercourse subject to their jurisdiction in the interests of drainage in response to a query to clarify the scope of this statutory authority granted by the Wisconsin State Legislature. After 1960, such questions of authority were no longer prominently noted in annual reports. 1960 also witnessed intense rain and flooding in Milwaukee that influenced public priorities.

1971

WATERCOURSE IMPROVEMENT

KINNICKINNIC RIVER

January 29 the following resolution was adopted authorizing and directing the Sewerage Commission of the City of Milwaukee to enter into an agreement with St. Luke's Hospital for the enclosing of a section of the channel of the Kinnickinnic River in a concrete box sewer pursuant to the provisions of Contract No. 749, Alternate #2 and awarding the contract to The Druml Company, Inc.:

WHEREAS, St. Luke's Hospital is desirous of increasing its parking facilities at 2900 W. Oklahoma Avenue for the benefit of its employees, patients and visitors; and

Channel modification was also done as a matter of convenience to property owners as the city and suburbs swelled during the postwar period. For example, St. Luke's Hospital wanted to expand its parking, leading to a portion of the Kinnickinnic River (Wilson Park Creek) to be buried beneath three city blocks, ultimately in 1971.

Flooding was a perennial concern in the 1940s, with discussion of sewer overflows and backed-up sewers. In 1944, the commission produced a “master plan” for the Kinnickinnic River, which was already densely surrounded by buildings and tightly traversed by bridges by the 1930s. This plan called for lining the river in concrete, but that did not happen broadly until the 1960s. During the 1950s, Milwaukee’s waterways were often widened and graded, and there was also a sustained campaign of “grubbing” creek right-of-ways. There was a desire to clear the channels of vegetation and obstructions. (Another public engineering effort — road and freeway construction — also interacted with the effort to modify and constrain watercourses.)

By 1953, the commission described preliminary maps for improving the drainage basins for Lincoln Creek,

Honey Creek, the Kinnickinnic River, and Indian Creek. After almost a decade of intense postwar sewer construction and after persuading legislators to authorize their authority to implement their channel designs, significant engineering expertise was now brought to bear on retrofitting waterways.

Ultimately, there were 24 miles of watercourse improvements within the Metropolitan Sewerage District from 1950 to 1974, according to the 1974 annual report. MMSD’s 2017 report, *A New Era in Flood Management*, estimated that there were about 17 miles of concrete-lined channel in Milwaukee County by the early 1980s. That’s like the distance of driving I-94 from Summerfest out to Waukesha. In the same region, some 1,217 miles of suburban sewers were constructed from 1921 to 1974.



Kinnickinnic River, 1963, at 27th Street looking east



Kinnickinnic River, 1963, 20th Street Bridge in background

images courtesy Tom Chapman, MMSD

How much did watercourse improvement work cost?

\$36,425,439

Public dollars committed from 1950 to 1974 on “watercourse improvements”

\$907,000,000

*future expected watercourse work, 2026+

\$631,200,000

*Public dollars spent on implementing a new wave of watercourse work, including rehabilitation of concrete-lined channels, 1995-2025

\$343,387,702

adjusted for inflation, value in 2025 dollars

1950 - 1974

1995 - 2025

2026 - ????

*These figures from MMSD’s proposed 2026 capital budget

How much did this work cost?

<i>Year</i>	<i>Watercourse*</i>	<i>Line Item</i>	<i>2025 Adjusted*</i>	<i>Description</i>
1952	KK	\$100,000	\$1,225,660.38	WIDENING S 20TH TO AIRPORT
1952	LC	\$35,000	\$428,981.13	IMPROVEMENT
1952	**	\$50,000	\$612,830.19	CLEANING CREEKS
1953	LC	\$50,000	\$610,526.32	IMPROVEMENT & LAND ACQUISITION
1954	KK	\$200,000	\$2,414,869.89	WILSON PARK TO AIRPORT
1954	KK	\$10,000	\$120,743.49	IMPROVEMENT STUDY
1954	LC	\$100,000	\$1,207,434.94	FAIRMOUNT TO THURSTON
1955	LC	\$110,000	\$1,338,127.34	
1955	KK	\$250,000	\$3,041,198.50	WILSON TO AIRPORT
1955	LC	\$165,000	\$2,007,191.01	23RD TO 27TH
1956	KK	\$215,000	\$2,605,671.64	13TH TO AIRPORT
1956	KK	\$100,000	\$1,211,940.30	43RD TO JACKSON PARK
1956	HC	\$105,000	\$1,272,537.31	60TH TO COLDSRING
1956	HC	\$150,000	\$1,817,910.45	@ 84TH AND ADLER
1956	HC	\$25,000	\$302,985.07	ADLER TO 84TH
1956	LC	\$275,000	\$3,332,835.82	47TH TO HAMPTON
1957	**	\$250,000	\$2,942,028.99	CREEK R-O-W AND IMPROVEMENTS
1957	KK	\$24,460	\$287,848.12	5 WARRANTY DEEDS CONVEY LAND TO COMMISSION
1958	KK	\$200,000	\$2,271,328.67	13TH TO 6TH
1958	KK	\$500,000	\$5,678,321.68	JACKSON PARK TO LINCOLN AVE
1958	HC	\$45,000	\$511,048.95	68TH TO HOWARD
1958	LC	\$100,000	\$1,135,664.34	57TH & SILVER SPRING TO 52ND & GREEN TREE RD
1958	LC	\$100,000	\$1,135,664.34	TEUTONIA TO CAMERON
1959	KK	\$225,000	\$2,520,000.00	13TH TO 6TH
1959	KK	\$500,000	\$5,600,000.00	43RD & LINCOLN TO FOREST HOME
1959	HC	\$125,000	\$1,400,000.00	68TH TO HOWARD LAND ACQUISITION
1959	HC	\$100,000	\$1,120,000.00	ECKEL PARK TO MORGAN
1959	UC	\$50,000	\$560,000.00	123RD TO NORTH & EAST
1960	KK	\$273,345	\$3,030,117.95	S 13TH TO S 6TH RELOCATING CLEANING GRUBBING
1960	KK	\$800,000	\$8,868,259.39	16TH TO FOREST HOME
1960	KK	\$400,000	\$4,434,129.69	6TH TO HOWELL
1960	UC	\$300,000	\$3,325,597.27	FROM MENOMONEE RIVER TO W SCHLINGER
1960	LC	\$400,000	\$4,434,129.69	CAMERON TO 35TH
1961	KK	\$400,000	\$4,359,731.54	6TH TO HOWELL
1961	KK	\$555,000	\$6,049,127.52	6TH TO 16TH CONTRACT NO 705
1961	HC	\$1,000,000	\$10,899,328.86	BLUE MOUND RD TO N OF GREENFIELD
1961	UC	\$530,000	\$5,787,543.62	FISHER PARKWAY TO MENOMONEE RIVER
1962	KK	\$1,000,000	\$10,826,666.67	31ST TO 43RD ST
1962	KK	\$200,000	\$2,165,333.33	MANITOBA TO EUCLID
1962	HC	\$200,000	\$2,165,333.33	HWY 100 TO WATERTOWN PLANK RD
1962	LC	\$500,000	\$5,413,333.33	CAMERON TO 32ND
1963	HC	\$1,600,000	\$17,094,736.84	4-CELL UNDERGROUND GREENFIELD TO ARTHUR
1963	LC	\$100,000	\$1,068,421.05	SILVER SPRING / THURSTON TO MILL RD / GREEN TREE RD
1964	KK	\$100,000	\$1,051,132.69	6TH TO HOWELL - CONCRETE CUNETTE
1964	LC	\$312,000	\$3,279,533.98	HAMPTON TO 32ND
1964	LC	\$50,000	\$525,566.34	TEUTONIA TO CAMERA + SIDE SLABS
1965	KK	\$150,000	\$1,561,538.46	43RD TO 51ST - DEEPENING AND PAVING (531')
1965	HC	\$840,000	\$8,744,615.38	COMPLETE SECTION TO ARTHUR AVE
1965	HC	\$360,000	\$3,747,692.31	ARTHUR TO OKLAHOMA
1965	MR	\$1,000,000	\$10,410,256.41	60TH TO 67TH

<i>Year</i>	<i>Watercourse</i>	<i>Line Item</i>	<i>2025 Adjusted</i>	<i>Description</i>
1966	KK	\$126,000	\$1,286,943.40	MANITOBA TO EUCLID
1966	KK	\$270,000	\$2,757,735.85	51ST TO 58TH
1966	HC	\$220,000	\$2,247,044.03	OKLAHOMA TO MORGAN
1966	UC	\$525,000	\$5,362,264.15	2200' BOX CONCRETE SCHLINGER TO RAINBOW
1967	KK	\$500,000	\$4,936,170.21	ENCLOSES MANITOBA TO EUCLID
1967	OC	\$25,000	\$246,808.51	COLLEGE TO RAMSEY PROPERTY ACQUISITION
1967	LC	\$11,000	\$108,595.74	W GREEN TREE RD PROPERTY ACQUISITION
1968	KK	\$400,500	\$3,814,733.14	5000' EUCLID TO HOWARD
1968	LC	\$418,000	\$3,981,419.35	47TH TO HAMPTON 5500'
1969	KK	\$805,000	\$7,344,494.38	MANITOBA TO EUCLID
1969	KK	\$500,000	\$4,561,797.75	MITCHELL HOWELL TO LOGAN
1969	OC	\$40,000	\$364,943.82	RYAN RD TO HOWELL
1969	HC	\$533,000	\$4,862,876.40	HOWARD TO 60TH ST
1969	UC	\$432,800	\$3,948,692.13	SCHLINGER AVE TO GREENFIELD
1970	KK	\$605,050	\$5,198,948.15	MANITOBA TO EUCLID
1970	KK	\$418,750	\$3,598,148.15	EUCLID TO HOWARD
1970	KK	\$15,000	\$128,888.89	HOWARD TO 6TH
1970	OC	\$100,000	\$859,259.26	PENNSYLVANIA TO DREXEL
1970	HC	\$656,000	\$5,636,740.74	HOWARD TO AIRPORT FREEWAY
1970	UC	\$680,375	\$5,846,185.19	WATERTOWN PLANK TO BLUE MOUND RD
1970	UC	\$259,759	\$2,232,003.26	SCHLINGER AVE TO GREENFIELD
1970	LC	\$496,500	\$4,266,222.22	32ND TO 35TH
1971	KK	\$25,000	\$204,020.10	MITCHELL HOWELL TO LOGAN (ENGINEERING)
1971	KK	\$561,000	\$4,578,211.06	EUCLID TO HOWARD
1971	KK	\$25,000	\$204,020.10	MITCHELL LOGAN TO EDGERTON CHANNEL ROW
1971	OC	\$200,000	\$1,632,160.80	PENNSYLVANIA TO DREXEL
1971	HC	\$41,000	\$334,592.96	IN MCCARTY PARK
1971	UC	\$763,000	\$6,226,693.47	WATERTOWN PLANK TO BLUE MOUND RD
1971	LC	\$662,000	\$5,402,452.26	32ND TO 35TH
1972	KK	\$3,200,000	\$25,288,564.48	MITCHELL @ HOWELL & EDGERTON TO CNW
1972	KK	\$350,000	\$2,765,936.74	HOWARD TO 6TH
1972	KK	\$500,000	\$3,951,338.20	EUCLID TO HOWARD
1972	OC	\$380,000	\$3,003,017.03	PENNSYLVANIA TO DREXEL
1972	UC	\$300,000	\$2,370,802.92	WATERTOWN PLANK TO BLUE MOUND RD
1972	LC	\$678,000	\$5,358,014.60	32ND TO 35TH
1973	KK	\$2,220,900	\$16,933,059.15	
1973	KK	\$12,000	\$91,492.96	CONTRACT 869 (ENGINEERING ONLY)
1973	KK	\$12,000	\$91,492.96	CONTRACT 814 (ENGINEERING ONLY)
1973	RR	\$50,000	\$381,220.66	ENGINEERING ONLY
1973	HC	\$360,000	\$2,744,788.73	HOWARD TO AIRPORT FREEWAY
1973	UC	\$640,000	\$4,879,624.41	WATERTOWN PLANK TO BLUE MOUND RD
1973	MR	\$335,000	\$2,554,178.40	
1974	KK	\$843,000	\$5,875,673.82	
1974	RR	\$450,000	\$3,136,480.69	W MORGAN TO HALE CREEK
1974	MR	\$500,000	\$3,484,978.54	DEFERRED
1974	LC	\$50,000	\$348,497.85	

Kinnickinnic River (KK)
Lincoln Creek (LC)
Honey Creek (HC)
Underwood Creek (UC)
Menomonee River (MR)
Root River (RR)
Oak Creek (OC)

Inflation adjustment of annual report year dollars converted to 2025 cost using Bureau of Labor Statistics Consumer Price Index calculator.

https://www.bls.gov/data/inflation_calculator.htm

Input parameters: January of year converted to September of 2025; 12-1-25

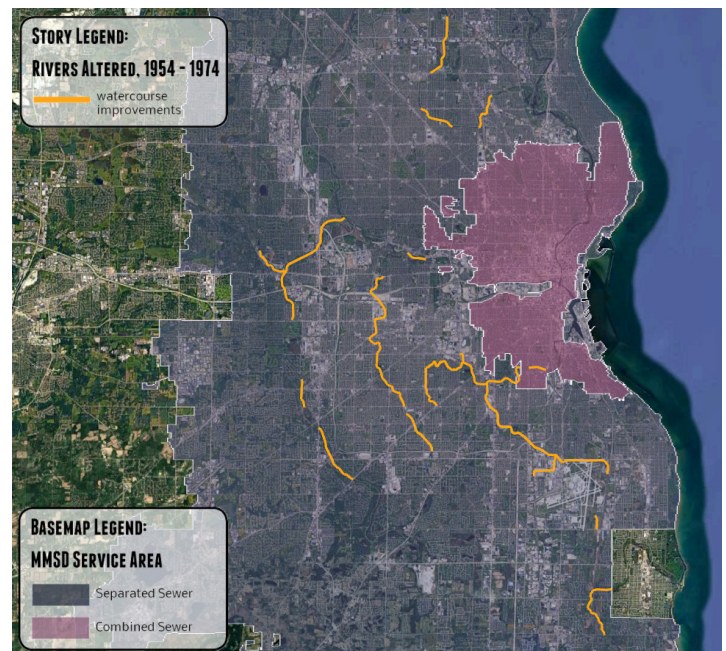
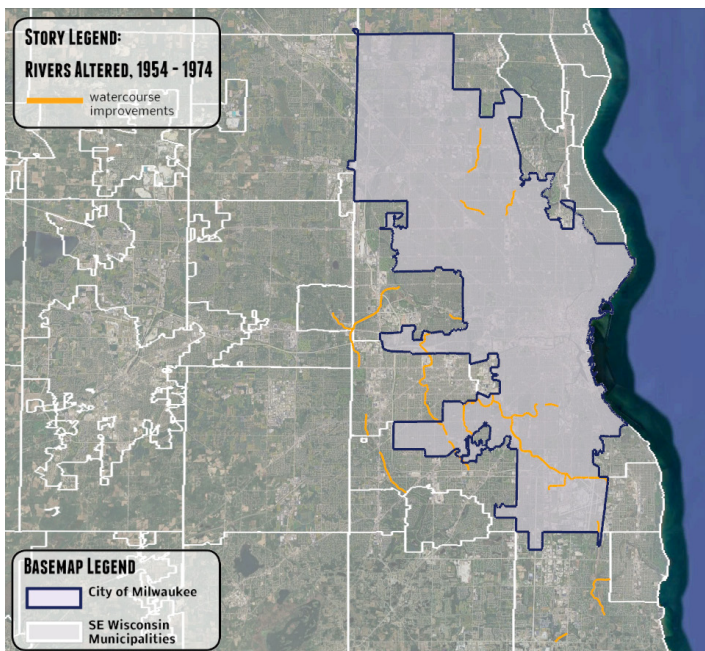
Which Milwaukee rivers were altered or transformed?

Watercourse Improvements” available through the Milwaukee Community Map in Google Earth, includes the stream reaches described in the sewerage commission annual reports. Screenshots of the watercourse reaches (orange lines) with the current MMSD service area as well as City of Milwaukee and adjacent municipal boundaries are shown here. The Kinnickinnic River and its tributaries were heavily altered within Wisconsin’s most densely populated and urbanized watershed. Note: the altered stream reaches on the map are associated with the annual report year of each line-itemed project, which may not be the project construction year. Projects and reaches may overlap.

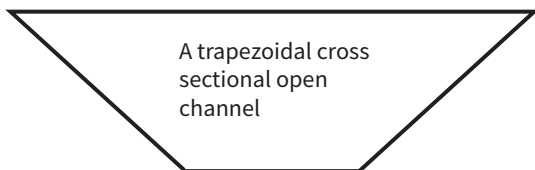


Underwood Creek, August 1974

image courtesy Tom Chapman, MMSD



How now, concrete trapezoidal channel?



$$Q = VA$$

Volumetric flow in an open channel = stream velocity x cross-sectional area

Hydronic engineers may prefer open channels with trapezoidal cross-sections to maximize flow capacity. This can be an advantage in an urban area with flashy stormwater during rain events that produce runoff from impervious surfaces. Engineers use equations that describe the physical relationships between measurable factors including slope, friction, volumetric flow (a volume moving with a velocity), and cross-sectional area to predict how water will interact with a channel design. A trapezoidal channel is in many ways the most efficient design to whisk water away, and concrete surfaces reduce friction and protect against bank erosion. However, the long-term tradeoffs to artificially reducing urban riparian floodplain to protect nearby properties this way include the possibility of dangerous flows, denuded aquatic habitat, expensive maintenance, and pulsing sediment loads.