BUFFALO SEWER AUTHORITY

SPDES Permit No. NY0028410

Long Term Control Plan Semi-Annual Status Report Reporting Period: January through June 2020 Amended Administrative Order CWA-02-2014-3033 (Amends CWA-02-2012-3024)

September 2020

CWA-02-2014-3033 BUFFALO SEWER AUTHORITY

Long Term Control Plan Semi-Annual Status Report

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1. INTRODUCTION

The Buffalo Sewer Authority (Authority) received approval of its Long Term Control Plan (LTCP) from the United States Environmental Protection Agency (USEPA) and New York State Department of Environmental Conservation (NYSDEC) on March 18, 2014. The Authority entered into an Amended Administrative Order on April 16, 2014 (herein after referred to as the AO), with the USEPA: This AO establishes a schedule for implementation of the Authority's LTCP, approved by the USEPA and NYSDEC.

The AO in part requires that the Authority submit written Semi-Annual Status Reports to the USEPA and NYSDEC by September 1st for current year January 1– June 30 reporting period, and March 1st for the previous calendar year July 1 – December 31 reporting period. The AO requires that the following be provided in each Semi-Annual Status Report:

- The project milestones, deadlines and other terms that the Authority is required to meet since the date of the last Semi-Annual Status Report, whether and to what extent the Authority has met those requirements, and the reason for any anticipated delays and/or noncompliance.
- A general description of the work completed during the reporting period and the applicability of the work to meet indicated design criteria, as well as the projection of work to be performed during the next reporting period and any anticipated delays for the upcoming work. Any changes in key personnel must also be noted.
- Enclosure of public meeting (if held) materials including: advertisements, handouts, formal meeting notes, and a summary of the meeting (see Attachment C).
- Copies (to USEPA only) of all monthly monitoring reports or other reports pertaining to combined sewer overflows (CSOs) and bypasses that Authority submitted to the NYSDEC during the reporting period. Please note DMRs are now submitted electronically directly to the USEPA and no dry weather overflows occurred during this period, so this item does not apply during this reporting period.

This report covers January through June 2020 which serves as Semi-Annual Report No. 13.

2. REQUIREMENTS DUE IN REPORTING PERIOD

Attachment A provides the current status of all projects listed in the Administrative Order. Issues with implementing these projects are detailed in Section 4 of this document.

This document serves as the September 1, 2020 semi-annual report.

Certificates of Acceptance and Occupancy for fully completed projects for this reporting period are included in Attachment D.

3. WORK COMPLETED IN CURRENT REPORTING PERIOD AND PROJECTION OF WORK TO BE PERFORMED NEXT REPORTING PERIOD

A general description of the work completed on LTCP projects during the current reporting period and the work projected to be performed during the next reporting period is provided in Attachment A. Items that have been completed have been highlighted orange.

A more detailed description of each project including the location and the goal to be achieved through each project is provided in Attachment B.

4. IMPLEMENTATION ISSUES

The ongoing COVID-19 pandemic has affected Authority operations, as well as those of consultants and contractors working on LTCP projects. While the Authority is currently operating with its full workforce, the Authority continues to experience decreased revenues due to the pandemic, and some consultants and contractors have experienced reduced staff capacity. Nevertheless, the Authority has been, and will continue to, work with internal staff and all necessary outside parties to facilitate the timely completion of LTCP projects.

4.1 Hamburg Drain Optimizations

Preliminary design for the Hamburg Drain Optimizations was begun prior to January 1, 2014; however, detailed design was delayed due to high water levels in Lake Erie. As a result of this delay the March 18, 2016 Notice to Proceed deadline was exceeded. The Authority completed a model recalibration and submitted the model calibration report to the EPA and DEC on January 8, 2019. The Authority is moving forward with conducting new SWMM modeling and until this modeling is completed, the Authority is unable to set a deadline for completing the Hamburg Drain Optimizations. Updated deadline dates will be requested via formal request following the additional modeling of this area. Design of the Mill Race In-Line Storage project is in progress with construction bidding expected in early 2021.

4.2 WWTP Improvement Project Alternative C2

Design of this project has been delayed due to the presence of extensive quantities of grit that have accumulated in the system reducing WWTP capacity. Before further upgrades are considered, the existing issues must first be rectified to allow for accurate measurements of existing capacity. The cleaning of the A-side influent channels, aeration basin 3 and both the A-side and B-side effluent channels was completed in two separate contracts for the facility. Phase 1 removal of the grit in the secondary system included the removal and disposal of over 1,210 wet tons of grit. Phase 2 of the grit removal project continued with grit removal for the remaining influent and effluent channels and consisted of the removal of an additional 240 wet tons of grit.

The Authority worked with a consulting engineer to begin the next phase of removing grit from the aeration tanks in the secondary system, and issued bidding documents for the removal and associated tank isolation activities. The bids received ranged from \$6.7 to \$12.2 million, which are much higher figures than the Authority anticipated. After reviewing the bids and considering the costs solely of grit removal, the Authority determined that it would be more prudent to replace the entire 24-year old aeration system in order to ensure its longevity and to improve energy efficiency.

On June 28, 2019, the Authority submitted to USEPA and NYSDEC, for review, a revised schedule for completion of the WWTP Improvement Project, which includes replacement of the aeration system as well as rehabilitation and replacement of equipment. Following this, the Authority had a number of discussions with USEPA and NYSDEC regarding this revised schedule, while moving forward with engineering for this part of the project. On January 28, 2020, the Authority submitted to NYSDEC the Engineering Report for the Secondary System Rehabilitation and Upgrade. This work is necessary prior to moving forward with the LTCP programmed projects

Comments regarding the Engineering Report were received on June 11, 2020 and responses to those comments were submitted to USEPA and NYSDEC on July 10, 2020. Contract documents for the estimated \$42,000,000.00 project are expected to be released next reporting period with construction contract award expected by December 2020.

On May 20, 2020 the Authority issued a Request for Proposals to five (5) consulting engineering firms for the Primary System Upgrades. In addition to the installation of a new primary bypass chlorine contact tank, this work will involve retrofitting of the existing primary settlement tanks and sludge pumping station. A contract for the design for this project is expected to be awarded during the next reporting period.

In a letter dated February 6, 2020, USEPA and NYSDEC requested a detailed financing plan for remaining work under the approved LTCP. The Authority has contracted with a professional engineering firm to create a financial assessment which is expected to be completed during the next reporting period.

4.3 North Relief-Interceptor

Preliminary subsurface investigation in conjunction with the North Relief-Interceptor concept has revealed concerns with the location of bedrock and the feasibility of the proposed tunnel location. Due to the noted concerns, the Authority has phased the proposed project. The initial phase, the Bird Avenue Underflow Sewer Project has been completed. Engineering analysis for additional phases is currently focused on the implementation of real time control technology and short circuit methodologies with the intention of reducing the scale of a North Relief-Interceptor project. The Authority is exploring additional projects that have a potential reduction in the scope of the North Relief-Interceptor project.

5. CHANGES IN KEY PERSONNEL

The Principal Sanitary Engineer Catherine Knab has left the Authority. Additionally, Frank Rafferty retired from his position as Treatment Plant Superintendent, and the Authority's new Treatment Plant Superintendent is David Rossney.

6. PUBLIC MEETINGS

A presentation on the history of Buffalo's sewers was given to the New York State Society of Professional Engineers Erie-Niagara Chapter in February 2020. A keynote address on the history of Buffalo's sewers and a presentation on Buffalo Sewer's F.O.G. program was given to the Western Chapter of the New York Water Environment Association in March 2020. In April 2020 a presentation on the history of Buffalo's sewers was given to the Project Management Institute's Buffalo Chapter (PMI Buffalo Chapter) and the Buffalo Chapter of the Institute of Supply Management (ISM-Buffalo) through a Virtual Dinner meeting. The slides used in all of the presentations are included in Attachment C.

7. MODEL MODIFICATIONS

The Authority is moving forward with utilizing the January 2019 model for LTCP project planning purposes. All projects that were implemented or designed and underway for implementation in 2019 were added into the model during this reporting period.

8. GREEN INFRASTRUCTURE

Construction has continued on Niagara St. phase 3 with anticipated completion in spring 2021. A private property green infrastructure grant program is anticipated to be issued during the next reporting period.

9. CERTIFICATION STATEMENT

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Oluwole A. McFoy, P.E., General Manager

28 Date

Work Completed in Current Period/ Projection of Work to be Performed in Next Reporting Period

Project Name	Project Milestone	AO Project Deadline	Actual Completion Dates	Project Status			
Phase I Projects							
CSO 060 GI Project			Prior to 1/1/2014	Complete.			
Bird/Lang RTC	Construction Start	3/17/2014	2/24/2014	Complete			
Projects	Completion Date	9/2/2014	5/9/2016	Complete			
	Operations/ Optimization (RTC)	9/3/2014 – 9/3/15	10/1/2016	Complete			
Bird RTC Project	Construction Start	3/17/2014	2/24/2014	Complete			
	Completion Date	9/2/2014	5/6/2016	Complete			
	Operations/ Optimization (RTC)	9/3/2014 – 9/3/15	10/1/2016	Complete			
Lang RTC Project	Construction Start	3/17/2014	2/24/2014	Complete			
	Completion Date	9/2/2014	5/9/2016	Complete			
	Operations/ Optimization (RTC)	9/3/2014 – 9/3/15	10/1/2016	Complete			

Project Name	Project Milestone	AO Project	Actual Completion	Project Status
		Deadline	Dates	
Foundation Projects	_			
Foundation 1 -	Engineering Start	3/18/2014	Prior to 1/1/2014	Complete
Smith Street	Engineering Completion	3/18/2015	6/10/2015	Complete
Storage	Notice to Proceed	3/18/2015		Complete
	Substantial Completion	3/18/2017	10/9/2017	Complete
CSO No. 026 Sewer	Engineering Start	3/18/2014	Prior to 1/1/2014	Complete
Separation	Engineering Completion	3/18/2015	4/3/2015	Complete
	Notice to Proceed	3/18/2015	7/8/2015	Complete
	Substantial Completion	3/18/2017	6/22/2016	Complete
CSO No. 026 RTC	Engineering Start	3/18/2014	Prior to 1/1/2014	Complete
Structure	Engineering Completion	3/18/2015	6/10/2015	Complete
	Notice to Proceed	3/18/2015	7/13/2016	Complete
	Substantial Completion	3/18/2017	10/9/2017	Complete
Foundation 2 - SPP	Engineering Start	3/1/2014	Prior to 1/1/2014	Complete
Optimization (20	Engineering Completion	3/18/2015	4/20/2015	Complete
projects)	Notice to Proceed	3/1/2014	Prior to 1/1/2014	Complete
	Substantial Completion	3/18/2017		
SPP 180	Engineering Start		Prior to 1/1/2014	Complete
Optimization	Engineering Completion		4/20/2015	Complete
	Notice to Proceed		9/8/2015	Complete
	Substantial Completion	3/18/2017	12/16/2015	Complete
SPP 331	Engineering Start		Prior to 1/1/2014	Complete
Optimization	Engineering Completion	3/18/2015	4/20/2015	Complete
	Notice to Proceed		9/8/2015	Complete
	Substantial Completion	3/18/2017	12/16/2015	Complete

Project Name	Project Milestone	AO Project Deadline	Actual Completion Dates	Project Status
SPP 036	Engineering Start		Prior to 1/1/2014	Complete
Optimization	Engineering Completion		1/20/2014	Complete
	Notice to Proceed		5/30/2014	Complete
	Substantial Completion	3/18/2017	8/4/2014	Complete
SPP 217	Engineering Start		Prior to 1/1/2014	Complete
Optimization	Engineering Completion		4/3/2015	Complete
	Notice to Proceed		7/8/2015	Complete
	Substantial Completion	3/18/2017	12/21/2015	Complete
SPP 318	Engineering Start		Prior to 1/1/2014	Complete
Optimization	Engineering Completion		4/3/2015	Complete
	Notice to Proceed		7/8/2015	Complete
	Substantial Completion	3/18/2017	12/21/2015	Complete
SPP 097A	Engineering Start		Prior to 1/1/2014	Complete
Optimization	Engineering Completion		4/20/2015	Complete
	Notice to Proceed		9/8/2015	Complete
	Substantial Completion	3/18/2017	12/16/2015	Complete
SPP 122	Engineering Start		Prior to 1/1/2014	Complete
Optimization	Engineering Completion		Prior to 1/1/2014	Complete
	Notice to Proceed		Prior to 1/1/2014	Complete
	Substantial Completion	3/18/2017	Prior to 1/1/2014	Complete
SPP 163	Engineering Start		3/1/2014	Complete
Optimization	Engineering Completion		11/25/2014	Complete
	Notice to Proceed		3/1/2015	Complete
	Substantial Completion	3/18/2017	8/6/2015	Complete
SPP 165	Engineering Start		Prior to 1/1/2014	Complete
Optimization	Engineering Completion		Prior to 1/1/2014	Complete
	Notice to Proceed		Prior to 1/1/2014	Complete
	Substantial Completion	3/18/2017	Prior to 1/1/2014	Complete

Project Name	Project Milestone	AO Project Deadline	Actual Completion Dates	Project Status
SPP 165A	Engineering Start		Prior to 1/1/2014	Complete
Optimization	Engineering Completion		4/4/2014	Complete
	Notice to Proceed		7/25/2014	Complete
	Substantial Completion	3/18/2017	11/3/2014	Complete
SPP 178	Engineering Start		Prior to 1/1/2014	Complete
Optimization	Engineering Completion		Prior to 1/1/2014	Complete
	Notice to Proceed		Prior to 1/1/2014	Complete
	Substantial Completion	3/18/2017	Prior to 1/1/2014	Complete
SPP 335B	Engineering Start		Prior to 1/1/2014	Complete
Optimization	Engineering Completion		Prior to 1/1/2014	Complete
	Notice to Proceed		Prior to 1/1/2014	Complete
	Substantial Completion	3/18/2017	Prior to 1/1/2014	Complete
SPP 336A	Engineering Start		Prior to 1/1/2014	Complete
Optimization	Engineering Completion		4/20/2015	Complete
	Notice to Proceed		9/8/2015	Complete
	Substantial Completion	3/18/2017	12/16/2015	Complete
SPP 341A	Engineering Start		1/1/2014	Complete
Optimization	Engineering Completion			This project is on hold pending the results of post-
	Notice to Proceed			construction monitoring of Lang and Hazelwood
	Substantial Completion	3/18/2017		RTCs.
SPP 342B	Engineering Start:		Prior to 1/1/2014	Complete
Optimization	Engineering Completion		Prior to 1/1/2014	Complete
	Notice to Proceed		Prior to 1/1/2014	Complete
	Substantial Completion	3/18/2017	Prior to 1/1/2014	Complete
SPP 001	Engineering Start:		Prior to 1/1/2014	Complete
Optimization	Engineering Completion		3/27/2014	Complete
	Notice to Proceed		6/16/2014	Complete
	Substantial Completion	3/18/2017	12/12/2014	Complete

Project Name	Project Milestone	AO Project Deadline	Actual Completion Dates	Project Status
SPP 183	Engineering Start		Prior to 1/1/2014	Complete
Optimization	Engineering Completion		Prior to 1/1/2014	Complete
	Notice to Proceed		Prior to 1/1/2014	Complete
	Substantial Completion	3/18/2017	Prior to 1/1/2014	Complete
SPP 283	Engineering Start		Prior to 1/1/2014	Complete
Optimization	Engineering Completion		Prior to 1/1/2014	Complete
	Notice to Proceed		Prior to 1/1/2014	Complete
	Substantial Completion	3/18/2017	Prior to 1/1/2014	Complete
SPP 211	Engineering Start		Prior to 1/1/2014	Complete
Optimization	Engineering Completion		Prior to 1/1/2014	Complete
	Notice to Proceed		Prior to 1/1/2014	Complete
	Substantial Completion	3/18/2017	Prior to 1/1/2014	Complete
Foundation 3 -	Engineering Start	3/18/2016	8/9/2016	Ongoing
Remaining RTC	Notice to Proceed	3/18/2017		
(14 sites)	Engineering Completion	3/18/2023		
	Substantial Completion	3/18/2024		
Hertel Northwest In-	Engineering Start			
Line Storage	Engineering Completion			
	Notice to Proceed			
	Substantial Completion	3/18/2024		
Hertel South (Hertel	Engineering Start		1/19/2018	Complete
at Deer) In-Line Storage	Engineering Completion		12/13/2018	Complete
	Notice to Proceed		2/9/2019	Complete
	Substantial Completion		5/6/2020	Complete
Hertel Northeast In-	Engineering Start			
Line Storage	Engineering Completion			
	Notice to Proceed			
	Substantial Completion	3/18/2024		

Project Name	Project Milestone	AO Project Deadline	Actual Completion Dates	Project Status
Bird East In-Line	Engineering Start			
Storage	Engineering Completion			
	Notice to Proceed			
	Substantial Completion	3/18/2024		
East Ferry In-Line	Engineering Start			
Storage	Engineering Completion			
	Notice to Proceed			
	Substantial Completion	3/18/2024		
Colorado In-Line	Engineering Start			
Storage	Engineering Completion			
	Notice to Proceed			
	Substantial Completion	3/18/2024		
North Bailey In-Line	Engineering Start		12/8/2017	Complete
Storage	Engineering Completion		6/5/2018	Complete
	Notice to Proceed		10/16/2018	Complete
	Substantial Completion		5/27/2020	Complete
South Bailey In-Line	Engineering Start			
Storage	Engineering Completion			
	Notice to Proceed			
	Substantial Completion	3/18/2024		
Roslyn In-Line	Engineering Start			
Storage	Engineering Completion			
	Notice to Proceed			
	Substantial Completion	3/18/2024		
Hazelwood (Kay) In-	Engineering Start		8/9/2016	Complete
Line Storage	Engineering Completion		9/22/2017	Complete
	Notice to Proceed		2/2/2018	Complete
	Substantial Completion	3/18/2024	6/19/2019	Complete

Project Name	Project Milestone	AO Project Deadline	Actual Completion Dates	Project Status
Amherst Quarry Off-	Engineering Start			
Line Storage	Engineering Completion			
	Notice to Proceed			
	Substantial Completion	3/18/2024		
Fillmore North In-	Engineering Start			
Line Storage	Engineering Completion			
	Notice to Proceed			
	Substantial Completion	3/18/2024		
Gibson CSO Line	Engineering Start			
Storage	Engineering Completion			
	Notice to Proceed			
	Substantial Completion	3/18/2024		
Montgomery CSO	Engineering Start			
Line Storage	Engineering Completion			
	Notice to Proceed			
	Substantial Completion	3/18/2024		
Babcock Pump	Engineering Start		6/19/2019	Complete
Station In-Line	Engineering Completion		5/15/2020	Complete
Storage	Notice to Proceed		7/24/2020	Complete
	Substantial Completion	3/18/2024		
Smith St. and Eagle	Engineering Start		4/4/2019	Complete
St. In-Line Storage	Engineering Completion		2/27/2020	Complete
	Notice to Proceed		7/13/2020	Complete
	Substantial Completion	3/18/2024		
Broadway at Oak In-	Engineering Start		4/4/2019	Complete
Line Storage	Engineering Completion			
	Notice to Proceed			
	Substantial Completion	3/18/2024		
Foundation 4 -	Engineering Start	3/18/2015	Prior to 1/1/2014	Complete
Hamburg Drain	Engineering Completion	3/18/2017	2/23/2017	Complete
Optimizations	Notice to Proceed	3/18/2016	5/16/2017	Complete

Work Completed in Current and Projection of Work to be Performed in Next Reporting Periods

Project Name	Project Milestone	AO Project Deadline	Actual Completion Dates	Project Status
	Substantial Completion	3/18/2018		
Foundation 4 -	Engineering Start	3/18/2028		
Hamburg Drain	Engineering Completion	3/18/2030		
Storage	Notice to Proceed	3/18/2030		
	Substantial Completion	3/18/2032		
Mill Race In-Line	Engineering Start		4/4/2019	Complete
Storage	Engineering Completion			Expected to be complete in the next reporting period
	Notice to Proceed			
	Substantial Completion	3/18/2032		
WWTP	-		-	
WWTP	Engineering Start	11/26/2019		See 4.2. As requested on Nov. 8, 2018, BSA
Improvement Project Alternative	Engineering Completion	10/15/2024		submitted a written Request for Extension that
	Notice to Proceed	5/30/2022		reflects these amended dates. Completion dates
C2	Substantial Completion	6/30/2027		are still under review.

Project Name	Project Milestone	AO Project Deadline	Actual Completion Dates	Project Status
Green Infrastructure	<u>Projects</u>			
Green 1 - Pilot	Engineering Start	3/1/2014	Prior to 1/1/2014	Complete
Projects – 267-acres	Engineering Completion	3/18/2016		Complete
of GI control SEE	Substantial Completion	3/18/2018	12/31/2016	Complete.
2001-2016	Engineering Start		Prior to 1/1/2014	Complete
Residential (traditional)	Engineering Completion		Prior to 1/1/2014	Complete
Demolitions	Substantial Completion	3/18/2018	12/31/2016	Complete.
2001 - 2016	Engineering Start		Prior to 1/1/2014	Complete
Commercial and Industrial	Engineering Completion		Prior to 1/1/2014	Complete
Demolitions	Substantial Completion	3/18/2018	12/31/2016	Complete.
Green 2 – 410 acres	Engineering Start:	3/18/2019	Prior to 1/1/2014	Complete
of GI Control	Engineering Completion:	3/18/2023		
	Substantial Completion:	3/18/2024		
2017 - 2024	Engineering Start		Prior to 1/1/2014	Complete.
Demolitions	Engineering Completion:			
Demontions	Substantial Completion:	3/18/2018		
Green Demolition	Engineering Start		Prior to 1/1/2014	Complete
Pilot Project	Engineering Completion			Complete
FIIOL FIOJECI	Substantial Completion		7/31/2017	Complete.
PUSH Blue Projects	Engineering Start		Prior to 1/1/2014	Complete
	Engineering Completion		Prior to 1/1/2014	Complete
	Substantial Completion	3/18/2018	7/1/2015	Complete.
Carlton Street	Engineering Start		Prior to 1/1/2014	Complete
Porous Asphalt	Engineering Completion		Prior to 1/1/2014	Complete
	Substantial Completion	3/18/2018	7/25/2014	Complete.
Fillmore Avenue	Engineering Start		Prior to 1/1/2014	Complete
Porous Parking and	Engineering Completion		Prior to 1/1/2014	Complete
Green Lots	Substantial Completion	3/18/2018	4/23/2015	Complete.
Ohio Street	Engineering Start		Prior to 1/1/2014	Complete

Work Completed in Current and Projection of Work to be Performed in Next Reporting Periods

Project Name	Project Milestone	AO Project	Actual Completion	Project Status
		Deadline	Dates	
	Engineering Completion		Prior to 1/1/2014	Complete
	Substantial Completion	3/18/2018	12/1/2014	Complete.
Kenmore Avenue	Engineering Start		4/30/2014	Complete
	Engineering Completion		4/20/2015	Complete
	Substantial Completion	3/18/2018	3/1/2017	Complete.
Genesee Street	Engineering Start		Prior to 1/1/2014	Complete
	Engineering Completion		6/8/2015	Complete
	Substantial Completion	3/18/2018	6/1/2017	Complete.
Allen Street	Engineering Start		Prior to 1/1/2014	Green infrastructre will no longer be implemented
	Engineering Completion			as part of the Allen Street streetscape project due
	Substantial Completion	3/18/2018		to site constraints.
Willert Park	Engineering Start		6/1/2016	Complete
	Engineering Completion		2/1/2017	Complete
	Substantial Completion	3/18/2018	4/26/2019	Complete
Northland Ave	Engineering Start		7/1/2016	Complete
	Engineering Completion		3/1/2017	Complete
	Substantial Completion	3/18/2018		
612 Northland Ave	Engineering Start		1/1/2019	Complete
	Engineering Completion		6/1/2019	Complete
	Substantial Completion		12/1/2019	Complete
Niagara Street	Engineering Start		Prior to 1/1/2014	Complete
Phase 1: Elmwood Street to Virgina	Engineering Completion		3/19/2014	Complete
Street	Substantial Completion	3/18/2018	12/1/2016	Complete.
Niagara Street Phase 2: Virgina Street to Porter	Engineering Start		Prior to 1/1/2014	Complete
	Engineering Completion		6/3/2015	Complete
Avenue	Substantial Completion	3/18/2018	11/16/2017	Complete.
Niagara Street	Engineering Start		10/28/2015	Complete
Phase 3: Hampshire Street to	Engineering Completion		3/21/2018	Complete

Work Completed in Current and Projection of Work to be Performed in Next Reporting Periods

Project Name	Project Milestone	AO Project Deadline	Actual Completion Dates	Project Status
Scajaquada Expy	Substantial Completion	3/18/2024		
	Engineering Start		10/28/2015	Complete
Phase 4a: Scajaquada Expy to	Engineering Completion		6/13/2018	Complete
	Substantial Completion	3/18/2024		

Project Name	Project Milestone	AO Project Deadline	Actual Completion Dates	Project Status
Niagara Street	Engineering Start		10/28/2015	Complete
Phase 4b: Hertel Ave to Ontario St	Engineering Completion		6/13/2018	Complete
	Substantial Completion	3/18/2024		
Niagara Street	Engineering Start		10/28/2015	Complete
Phase 5: Porter Avenue to	Engineering Completion			
Hampshire Street	Substantial Completion	3/18/2024		
Green 3 – 375 acres	Engineering Start:	3/18/2023		
of GI Control	Engineering Completion:	3/18/2028		
	Substantial Completion:	3/18/2029		
Green 4 – 263 acres	Engineering Start:	3/18/2028		
of GI Control	Engineering Completion:	3/18/2033		
	Substantial Completion:	3/18/2034		
<u>Gray Projects</u>				
CSOs 014/15 – Erie Basin In-line storage and optimization	Engineering Start		Prior to 1/1/2014	Complete
projects	Engineering Completion		Prior to 1/1/2014	Complete
	Notice to Proceed	3/18/2014	Prior to 1/1/2014	Complete
	Substantial Completion	3/18/2015	12/29/2014	Complete
SPPs 206A&B	Engineering Start		Prior to 1/1/2014	Complete
	Engineering Completion		Prior to 1/1/2014	Complete
	Notice to Proceed		5/30/2014	Complete
	Substantial Completion	3/18/2015	12/29/2014	Complete
SPP 035	Engineering Start		Prior to 1/1/2014	Complete

Project Name	Project Milestone	AO Project	Actual Completion	Project Status
		Deadline	Dates	
	Engineering Completion		Prior to 1/1/2014	Complete
	Notice to Proceed		Prior to 1/1/2014	Complete
	Substantial Completion	3/18/2015	5/31/2014	Complete
SPP 036	Engineering Start		Prior to 1/1/2014	Complete
	Engineering Completion		Prior to 1/1/2014	Complete
	Notice to Proceed		5/30/2014	Complete
	Substantial Completion	3/18/2015	12/5/2014	Complete
CSO 013 – Satellite	Engineering Start	1/1/2020	3/12/2020	Complete
storage,	Engineering Completion	1/1/2021		
conveyance, FM &	Notice to Proceed	1/1/2021		
PS	Substantial Completion	1/1/2023		
North Relief –	Engineering Start	3/18/2019	5/15/2015	Complete; See 4.3.
Interceptor	Engineering Completion	3/18/2022		
	Notice to Proceed	3/18/2022		
	Substantial Completion	3/18/2026		
CSOs 010, 008/010,	Engineering Start	3/18/2021		
061, 004 –	Engineering Completion	3/18/2023		
Underflow capacity				
upsizing	Notice to Proceed	3/18/2023		
	Substantial Completion	3/18/2024		
SPP 337 (CSO 053) –	Engineering Start	3/18/2023		
Satellite storage,	Engineering Completion	3/18/2025		
conveyance, FM &				
PS	Notice to Proceed	3/18/2025		
	Substantial Completion	3/18/2027		
SPP 336A&B (CSO	Engineering Start	3/18/2024		

Project Name	Project Milestone	AO Project	Actual Completion	Project Status
		Deadline	Dates	
053) – Satellite	Engineering Completion	3/18/2026		
storage,	Notice to Proceed	3/18/2026		
conveyance, FM &		- /		
PS	Substantial Completion	3/18/2029		
Jefferson Avenue &	Engineering Start	3/18/2025		
Florida Street (CSO	Engineering Completion	3/18/2027		
053) – Satellite	Notice to Proceed	3/18/2027		
storage,	Substantial Completion	3/18/2030		
CSO 055 – Satellite	Engineering Start:	3/18/2027		
storage,	Engineering Completion:	3/18/2030		
conveyance, FM &				
PS	Notice to Proceed:	3/18/2030		
	Substantial Completion:	3/18/2034		
CSOs 028/044/047 -	Engineering Start:	3/18/2028		
Satellite storage,	Engineering Completion:	3/18/2031		
conveyance, FM &	Notice to Proceed:	3/18/2031		
PS	Substantial Completion:	3/18/2034		
CSO 052 – Satellite	Engineering Start:	3/18/2030		
storage,	Engineering Completion:	3/18/2032		
conveyance, FM & PS	Notice to Proceed:	3/18/2032		
	Substantial Completion:	3/18/2034		
CSO 064 – Satellite	Engineering Start:	3/18/2030		
storage,	Engineering Completion:	3/18/2032		
conveyance, FM &	Notice to Proceed:	3/18/2032		
PS	Substantial Completion:	3/18/2034		

Detailed Project Descriptions

Project Name	Project Description	Project Purpose*
Phase I Projects		
CSO 060 GI Project	This project consisted of the construction of 4768 CF of rain garden on Windsor, Parkdale and Elmwood Avenues between Bird and Forest Avenues and 39,600 SF of permeable pavement on Clarendon and Claremont Avenues between Bird and Forest Avenues, installation of a Stormceptor unit at Bird Avenue and Granger Place and a total of 6,125 LF of 12-30 inch sewer designed to carry street flow to the existing storm overflow sewer on Forest Avenue from the above mentioned street segments. Additionally, weirs were raised in SPPs 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, and 240.	This project was designed to treat 13,600 cf of stormwater runoff from the 0.9 inch water quality storm event and remove 49.5 cfs of peak flow from the combined sewer system. Thereby reducing overflows through SPPs 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, and 241 to CSO 060. Together with other LTCP projects, this project is projected reduce CSO 060 discharges to Scajaquada Creek based on the 1993 Modified Typical Year (TY) to negligible activations and flow.
Bird/Lang RTC Projects	These RTC projects utilize available capacity of large sewers to provide flow control measures during wet weather events through the use of gates which allow continuous dry weather underflow.	
Bird RTC Project	The Bird RTC Project is located on Bird Avenue between Parkdale Avenue and Hoyt Street.	The Bird RTC project is designed to provide 1.01 MG of storage volume, thereby reducing discharges through SPP 013 to CSO 004. Together with other LTCP projects, this project is projected reduce CSO 004 discharges to the Black Rock Canal based on the TY to 3 activations.
Lang RTC Project	The Lang RTC Project is located on Lang Avenue between Courtland Avenue and Hagen Street.	The Lang RTC project is designed to have a storage volume of 0.84 MG, thereby reducing discharges through SPP 340 to CSO 053. Together with other LTCP projects, this project is projected to reduce CSO 053 discharges to Scajaquada Creek based on the 1993 Modified Typical Year (TY) to 4 activations.

Project Name	Project Description	Project Purpose*
Foundation Projects	<u>S</u>	
Foundation 1 - Smith Street Storage	Originally envisioned as a single project, these two projects have been separated to realize cost advantages due to the different levels of skill required for the projects and to expedite the sewer separation component.	Together with the Carith Chart in line stores are just the Carith Chart
	This project consisted of the installation of collection sewers for street receiver flows on Leddy Street, South Park Avenue, Owahn Place, Prenatt Street, Bolton Place, St. Stephen's Place, and Buffalo River Place, tributary to to SPP 88 and 90, in order to discharge these storm flows downstream of regulators, in conjuction with the optimization projects for SPP 217 and SPP 318.	Together with the Smith Street in-line storage project, the Smith Street partial sewer separation project is designed to divert storm flows directly to the Smith Street Drain thereby reducing CSO 026 discharges. Together with other LTCP projects, this project is projected to reduce CSO 026 discharges to the Buffalo River based on the TY to 6 activations or less.
CSO No. 026 RTC Structure	The second contract consists of an in-line storage project which is designed to detain wet weather flows along the western side of Smith Street using a weir structure between the I-190 and the I-190 off ramp within the Smith Street Drain for discharge to the South Interceptor thereby diverting combined sewer flows from CSO 026.	Together with the Smith Street partial sewer separation project, the Smith Street in-line storage project is designed to divert and detain the equivalent of a storage volume of 1.94 MG, thereby reducing CSO 026 discharges. Together with other LTCP projects, this project is projected to reduce CSO 026 discharges to the Buffalo River based on the TY to 6 activations or less.
Optimization (20	Project consists of multiple smaller projects that will overlap in engineering and construction. SEE DETAILS FOLLOWING FOR SPECIFIC PROJECTS	In general, these projects will reduce discharges to the CSOs by detaining flows within the BSA's system through the modification of existing control structures.
SPP 180 Optimization	This project consisted of raising of the weir associated with SPP 180 by 2.0' along its entire length. SPP 180 is located on Delaware Avenue at the intersection with West Delavan. As part of the revised SPP 331 Optimization, this weir will be raised an additional 1.75' along its entire length.	The SPP 180 Optimization project was designed to increase the capacity of the CSS at SPP 180 thereby decreasing CSO 006 discharges. Together with other LTCP projects, this project is projected to reduce CSO 006 discharges to the Black Rock Canal based on the TY to 4 activations.

Project Name	Project Description	Project Purpose*
SPP 331 Optimization	SPP331 is located at the intersection of Elmwood Avenue and West Delavan Avenue. Preliminary plans were for the diversion of flows from this point through a new sewer to Bird Avenue along the centerline of Elmwood Avenue. This would have required major disruption of a very high traffic commercial area and was deemed impractical. Plans have been developed to instead divert the same flow that was to have been diverted through this project through a system of localized weir modifications rather than extensive pipe installation. These modifications include raising the weir at SPP 180 by 1.75' and the bench located in SPP 332 on the northeast quadrant of Gates Circle which currently directs dry weather flows into the interceptor will be removed and replaced with a 6.2' weir and restored sewer trough which will direct dry weather flows into the Bird Avenue trunk sewer.	The SPP 331 Optimization project is designed to increase the underflow capacity at SPP 331 thereby decreasing CSO 006 discharges. Together with other LTCP projects, this project is projected to reduce CSO 006 discharges to the Black Rock Canal based on the TY to 4 activations.
SPP 036 Optimization	This project consisted of the reconstruction of 35' of 30" sewer associated with SPP 036 to reverse the slope. It was located on Church Street between the off and on ramps of the Skyway (State Route 5).	The SPP 036 Optimization project was designed to increase the underflow capacity at SPP 036 thereby decreasing CSO 015 discharges. Together with other LTCP projects, this project is projected based on the TY to reduce discharges to the Erie Basin through CSO 015 to 0 activations.
SPP 217 Optimization	In association with the Smith Street partial sewer separation project, this project consisted of the removal of two bottom orifice plates totaling 1.42' in height, increasing the orifice size and conveyance capacity of the Emslie Street Sewer. SPP 217 is located on Emslie Street at its intersection with Eagle Street.	The SPP 217 Optimization project is designed to increase the underflow capacity at SPP 217 thereby decreasing CSO 026 discharges. Together with other LTCP projects, this project is projected to reduce CSO 026 discharges to the Buffalo River based on the TY to 3 activations.

Project Name	Project Description	Project Purpose*
SPP 318 Optimization	In association with the Smith Street partial sewer separation project, this project consisted of the removal of an orifice plate, increasing the orifice size and conveyance capacity of the Clinton Avenue Sewer. SPP 318 is located east of the intersection of Fillmore Avenue and Clinton Street.	The SPP 318 Optimization project is designed to increase the underflow capacity at SPP 318 thereby decreasing CSO 026 discharges. Together with other LTCP projects, this project is projected to reduce CSO 026 discharges to the Buffalo River based on the TY to 3 activations.
SPP 097A Optimization	This project consisted of abandoning an inactive combined sewer, converting another to a storm sewer and abandoning the underflow connection. SPP 097A is located at the intersection of the extension of Prenatt and Orlando Streets.	The SPP 097A Optimization project is designed to eliminate SPP 097A thereby decreasing CSO 026 discharges. Together with other LTCP projects, this project is projected to reduce CSO 026 discharges to the Buffalo River based on the TY to 3 activations.
SPP 122 Optimization	This project consisted of raising of the weir associated with SPP 122 by 0.5' along its entire length. SPP 122 is located on South Legion Drive just north of the intersection with Meriden Street.	The SPP 122 Optimization project was designed to increase the flow volume conveyed by the CSS at SPP 122 thereby decreasing CSO 037 discharges. Together with other LTCP projects, this project is projected to reduce CSO 037 discharges to the Buffalo River based on the TY to 3 activations.
SPP 163 Optimization	The SPP 163 Weir Optimization project consisted of replacing the existing weir with a new weir 0.75' higher. It is located to the East of the intersection of Fillmore Avenue and Northland on Northland Avenue.	The SPP 163 Optimization project is designed to increase the flow volume conveyed by the CSS at SPP 163 thereby decreasing CSO 053 discharges. Together with other LTCP projects, this project is projected to reduce CSO 053 discharges to Scajaquada Creek based on the TY to 4 activations.
SPP 165 Optimization	This project consisted of raising of the weir associated with SPP 165 by 0.5' along its entire length. SPP 165 is located on Fillmore Avenue just north of the intersection with East Delavan Street.	The SPP 165 Optimization project was designed to increase the capacity of the CSS at SPP 165 thereby decreasing CSO 053 discharges. Together with other LTCP projects, this project is projected to reduce CSO 053 discharges to Scajaquada Creek based on the TY to 4 activations.
SPP 165A Optimization	The weir associated with SPP 165A located at the intersections of Fillmore and Kensington Avenues.	The SPP 165A Optimization project was designed to increase the capacity of the CSS at SPP 165A by raising the weir by 0.75' and upsizing 675' of 15" pipe to 18" pipe to reduce CSOs in association with CSO 053. Together with other LTCP projects, this project is projected to reduce CSO 053 discharges to Scajaquada Creek based on the TY to 4 activations.

Project Name	Project Description	Project Purpose*
SPP 178 Optimization		The SPP 178 Optimization project was designed to increase the flow volume conveyed by the CSS at SPP 178 thereby decreasing CSO 053 discharges. Together with other LTCP projects, this project is projected to reduce CSO 053 discharges to Scajaquada Creek based on the TY to 4 activations.
SPP 335B Optimization	This project consisted of raising of the weir associated with SPP 335B by 1.0' along its entire length. SPP 335B is located on Hager Street just south of the intersection with Florida Street.	The SPP 335B Optimization project was designed to increase the flow volume conveyed by CSS at SPP 335B thereby decreasing CSO 053 discharges. Together with other LTCP projects, this project is projected to reduce CSO 053 discharges to Scajaquada Creek based on the TY to 4 activations.
SPP 336A Optimization	This project has been constructed in association with the SPP 331 optimization. The project consist sof removing a sluice gate and orifice plate and modifying the existing structure by changing the existing side channel opening from 24" to 30". SPP 336A is located on Humboldt Parkway North of the Scajaquada Drain.	The SPP 336A Optimization project is designed to increase the underflow capacity of the CSS at SPP 336A thereby decreasing CSO 053 discharges. Together with other LTCP projects, this project is projected to reduce CSO 053 discharges to Scajaquada Creek based on the TY to 4 activations.
SPP 341A Optimization	SPP 341A is located on Genesee Street east of Kerns Avenue. This project is on hold pending the results of post-construction monitoring of Lang and Hazelwood RTCs.	The SPP 341A Optimization project would increase the flow volume conveyed by the CSS at SPP 341A thereby decreasing CSO 053 discharges. Together with other LTCP projects, this project is projected to reduce CSO 053 discharges to Scajaquada Creek based on the TY to 4 activations. Field conditions may require modification to this planned optimization.
SPP 342B Optimization	This project consisted of raising of the weir associated with SPP 342B by 1.0' along its entire length. SPP 342B is located on Sprenger Avenue adjacent to Schiller Park.	The SPP 342B Optimization project was designed to increase the flow volume conveyed by the CSS at SPP 342B thereby decreasing CSO 053 discharges. Together with other LTCP projects, this project is projected to reduce CSO 053 discharges to Scajaquada Creek based on the TY to 4 activations.

Project Name	Project Description	Project Purpose*
SPP 001 Optimization	The weir associated with SPP 001 located at the discharge of Cornelius Creek into the Niagara River and tributary to CSO 055 has been raised 1.0' to reduce CSOs.	The SPP 001 Optimization project was designed to increase the flow volume conveyed by the CSS at SPP 001 thereby decreasing CSO 055 discharges. Together with other LTCP projects, this project is projected to reduce CSO 055 discharges to the Niagara River based on the TY to 9 activations.
SPP 183 Optimization		The SPP 183 Optimization project was designed to increase the flow volume conveyed by the CSS at SPP 183 thereby decreasing CSO 059 discharges. Together with other LTCP projects, this project is projected to reduce CSO 059 discharges to Scajaquada Creek based on the TY to 0 activations.
SPP 283 Optimization	SPP 283 is located in the median between the I-190 South ramp to Porter Avenue and a service road near the West Side Rowing Club. This project consisted of removing an orifice plate which restricted flows from entering the Swan Trunk and the installation of a new 1.0' tall weir to restrict flows from discharging through CSO 063.	The SPP 283 Optimization project was designed to increase the underflow capacity of the CSS at SPP 283 thereby decreasing CSO 063 discharges. Together with other LTCP projects, this project is projected to reduce CSO 063 discharges to the Niagara River based on the TY to 4 activations.
SPP 211 Optimization	This project consisted of constructing a weir to an elevation above the overflow raised pipe invert at SPP 211. SPP 211 is located at the South East corner of the intersection of Clinton and South Ogden Streets.	The SPP 211 Optimization project was designed to increase the flow volume conveyed by the CSS at SPP 211 thereby decreasing CSO 066 discharges. Together with other LTCP projects, this project is projected to reduce CSO 066 discharges to the Buffalo River based on the TY to 4 activations.

Project Name	Project Description	Project Purpose*
Foundation 3 - Remaining RTC (14 sites)	These RTC projects propose to utilize available capacity in the CSS to provide flow control measures during wet weather events through the use of active controls.	In general, these projects are designed to reduce discharges to the CSOs through the detention of flows within the BSA's CSS system.
Hertel Northwest In-Line Storage	This RTC project is proposed to utilize available capacity of a large sewer to provide flow control measures during wet weather events while allowing continuous dry weather underflow. The proposed project location is within the northern portion of the two large combined sewers which are located under Hertel Avenue.	This RTC project is proposed to utilize available capacity within the collection system to detain flows until downstream capacity becomes available. Together with other LTCP projects, this project is projected to reduce CSO 055 discharges to the Niagara River based on the TY to 9 activations.
Hertel South (Hertel at Deer) In- Line Storage	This RTC project is proposed to utilize available capacity of a large sewer to provide flow control measures during wet weather events while allowing continuous dry weather underflow. The proposed project location is within the southern portion of the two large combined sewers which are located under Hertel Avenue.	This RTC project is proposed to utilize available capacity within the collection system to detain flows until downstream capacity becomes available. Together with other LTCP projects, this project is projected to reduce CSO 055 discharges to the Niagara River based on the TY to 9 activations.
Hertel Northeast In- Line Storage	This RTC project is proposed to utilize available capacity of a large sewer to provide flow control measures during wet weather events while allowing continuous dry weather underflow. This project will be located within the northern portion of the two large combined sewers which are located under Hertel Avenue.	This RTC project is proposed to utilize available capacity within the collection system to detain flows until downstream capacity becomes available. Together with other LTCP projects, this project is projected to reduce CSO 055 discharges to the Niagara River based on the TY to 9 activations.
Bird East In-Line Storage	This RTC project is proposed to utilize available capacity of a large sewer to provide flow control measures during wet weather events while allowing continuous dry weather underflow. This project will be located to the east of the above mentioned Bird RTC project along the same Bird Avenue sewer.	This RTC project is proposed to utilize available capacity within the collection system to detain flows until downstream capacity becomes available. Together with other LTCP projects, this project is projected to reduce CSO 004 discharges to the Black Rock Canal based on the TY to 3 activations.

Project Name	Project Description	Project Purpose*
East Ferry In-Line Storage	This RTC project is proposed to utilize available capacity of a large sewer to provide flow control measures during wet weather events while allowing continuous dry weather underflow. The proposed project location is along the Ferry Street sewer upstream of its leaping weir overflow to the Scajaquada Drain north of Florida Street.	This RTC project is proposed to utilize available capacity within the collection system to detain flows until downstream capacity becomes available. Together with other LTCP projects, this project is projected to reduce CSO 053 discharges to Scajaquada Creek based on the TY to 4 activations.
Colorado In-Line Storage	This RTC project is proposed to utilize available capacity of a large sewer to provide flow control measures during wet weather events while allowing continuous dry weather underflow. The proposed project location is along the Colorado Avenue sewer which runs underneath the manufacturing facility located at 1001 East Delavan Avenue.	This RTC project is proposed to utilize available capacity within the collection system to detain flows until downstream capacity becomes available. Together with other LTCP projects, this project is projected to reduce CSO 053 discharges to Scajaquada Creek based on the TY to 4 activations.
North Bailey In- Line Storage	This RTC project is proposed to utilize available capacity of a large sewer to provide flow control measures during wet weather events while allowing continuous dry weather underflow. The proposed project location is along Bailey Avenue north of Scajaquada Street.	This RTC project is proposed to utilize available capacity within the collection system to detain flows until downstream capacity becomes available. Together with other LTCP projects, this project is projected to reduce CSO 053 discharges to Scajaquada Creek based on the TY to 4 activations.
South Bailey In- Line Storage	This RTC project is proposed to utilize available capacity of a large sewer to provide flow control measures during wet weather events while allowing continuous dry weather underflow. The proposed project location is along Bailey Avenue north of Scajaquada Street and south of the afore mentioned North Bailey In-Line Storage project.	This RTC project is proposed to utilize available capacity within the collection system to detain flows until downstream capacity becomes available. Together with other LTCP projects, this project is projected to reduce CSO 053 discharges to Scajaquada Creek based on the TY to 4 activations.
Roslyn In-Line Storage	This RTC project is proposed to utilize available capacity of a large sewer to provide flow control measures during wet weather events while allowing continuous dry weather underflow. The proposed project location is near Roslyn Street on Lang Avenue.	This RTC project is proposed to utilize available capacity within the collection system to detain flows until downstream capacity becomes available. Together with other LTCP projects, this project is projected to reduce CSO 053 discharges to Scajaquada Creek based on the TY to 4 activations.

Project Name	Project Description	Project Purpose*
Hazelwood (Kay) In Line Storage	This RTC project, now known as Hazelwood, is proposed to utilize available capacity in the CSS capacity of a large sewer to provide flow control measures during wet weather events while allowing continuous dry weather underflow. The proposed project location is on Hazelwood Avenue between East Delavan and Easton Avenues.	This RTC project is proposed to utilize available capacity within the collection system to detain flows until downstream capacity becomes available. Together with other LTCP projects, this project is projected to reduce CSO 053 discharges to Scajaquada Creek based on the TY to 4 activations.
Amherst Quarry Off-Line Storage	This RTC project proposes to utilize available capacity within the active Amherst Quarry to provide flow control measures during wet weather events, once downstream capacity is available, flows will then be pumped back into the system. The Amherst Quarry is located in an area bounded by Parkridge Avenue, East Amherst Street, and Hewitt Avenue.	This RTC project is proposed to utilize available capacity of the quarry to detain flows until downstream capacity becomes available. Together with other LTCP projects, this project is projected to reduce CSO 053 discharges to Scajaquada Creek based on the TY to 4 activations.
Fillmore North In- Line Storage	This RTC project is proposed to utilize available capacity of a large sewer to provide flow control measures during wet weather events while allowing continuous dry weather underflow. This project is proposed to be located on Fillmore Avenue, however pending the results of post-construction monitoring, it may be eliminated depending on the efficancy of the Smith Street Storage project.	This RTC project is proposed to utilize available capacity within the collection system to detain flows until downstream capacity becomes available. Together with other LTCP projects, this project is projected to reduce CSO 026 discharges to the Buffalo River based on the TY to 3 activations.

Project Name	Project Description	Project Purpose*
Gibson CSO Line Storage	This project is proposed to utilize the available capacity of the CSO pipe downstream of the SPP, but before the discharge point or outfall. It would be designed to convey water to prevent surface flooding and overflows through upstream SPPs. Once the storm event has subsided, it would be designed to dewater back into the combined system. The dewatering rate would be controlled so that it would not cause overflows downstream from the control structure. The proposed project location is on Gibson Street, however pending the results of post-construction monitoring, it may be eliminated depending on the efficancy of the Smith Street Storage project.	This RTC project is proposed to utilize available capacity within the collection system to detain flows until downstream capacity becomes available. Together with other LTCP projects, this project is projected to reduce CSO 026 discharges to the Buffalo River based on the TY to 3 activations.

Project Name	Project Description	Project Purpose*
Montgomery CSO Line Storage	This project is proposed to utilize the available capacity of the CSO pipe downstream of the SPP, but before the discharge point or outfall. It would be designed to convey water to prevent surface flooding and overflows through upstream SPPs. Once the storm event has subsided, it would be designed to dewater back into the combined system. The dewatering rate would be controlled so that it would not cause overflows downstream from the control structure. The proposed project location is along the railroad right- of-way near Montgomery Street, however pending the results of post-construction monitoring, it may be eliminated depending on the efficancy of the Smith Street Storage project.	This RTC project is proposed to utilize available capacity within the collection system to detain flows until downstream capacity becomes available. Together with other LTCP projects, this project is projected to reduce CSO 026 discharges to the Buffalo River based on the TY to 3 activations.
Babcock Pump Station In-Line Storage	This RTC project is proposed to modify the function of an existing pump station to utilize available capacity of a large sewer to provide flow control measures during wet weather events. The proposed project location is at the existing pump staion on New Babcock Street at Howard Street.	This RTC project is proposed to utilize available capacity within the collection system to reduce the peak flow into the Swan Trunk. Together with other LTCP projects, this project is projected to reduce CSO 027 discharges to the Buffalo River based on the TY to 6 activations.
Smith at Eagle In- Line Storage	This RTC project is proposed to utilize available capacity in the Smith St Drain to provide flow control measures during wet weather events while allowing continuous dry weather underflow. The proposed project location is upstream of the existing CSO 026 RTC project on Smith St. and Eagle St.	This RTC project is proposed to utilize available capacity within the collection system to detain flows until downstream capacity becomes available. Together with other LTCP projects, this project is projected to reduce CSO 026 discharges to the Buffalo River based on the TY to 6 activations.
Broadway at Oak In-Line Storage	This RTC project is proposed to utilize available capacity in the collection system to provide flow control measures during wet weather events while allowing continuous dry weather underflow. The proposed project location is on Broadway St. at Oak St.	This RTC project is proposed to utilize available capacity within the collection system to detain flows until downstream capacity becomes available. Together with other LTCP projects, this project is projected to reduce CSO 017 discharges to the Buffalo River based on the TY to 6 activations.

Project Name	Project Description	Project Purpose*
Foundation 4 - Hamburg Drain Optimizations	This project will entail several in-system optimizations, e.g. rerouting of flows, installation of weirs, partial sewer separations etc. and/or green infrastructure to reduce the overflow events at a number of upstream SPPs in order to control flows through CSOs 017, 022, and 064. These optimizations would be located within the Hamburg Basin.	These optimization projects are proposed to increase the flow volume conveyed by the CSS upstream of the SPPs and diverting stormwater flows out of the CSS thereby decreasing CSO 017, 022, and 064 discharges. Together with other LTCP projects, this project is projected based on the TY to reduce discharges to the Buffalo River through CSO 017 to 4 activations, CSO 022 to 5 activations, and CSO 064 to 3 activations.
Foundation 4 - Hamburg Drain Storage	Together with the Hamburg Drain Optimizations, this project would be designed to provide the equivalent of 5 MG of offline storage. This facility would be located within the Hamburg Basin and may involve the installation of RTCs.	This storage project is proposed to provide off-line storage thereby decreasing CSO 017, 022, and 064 discharges. Together with other LTCP projects, this project is projected based on the TY to reduce discharges to the Buffalo River through CSO 017 to 4 activations, CSO 022 to 5 activations, and CSO 064 to 3 activations.
Mill Race In-Line Storage	This RTC project is proposed to utilize available capacity of a large sewer to provide flow control measures during wet weather events while allowing continuous dry weather underflow. The proposed project location is on Larkin Street near Roseville Street.	This RTC project is proposed to utilize available capacity within the collection system to detain flows until downstream capacity becomes available. Together with other LTCP projects, this project is projected to reduce CSO 017 discharges to the Buffalo River based on the TY to 6 activations.
<u>WWTP</u> WWTP Improvement Project Alternative C2	The proposed project is expected to rehabilitate the existing primary clarifiers by adding high rate disinfection and provide additional secondary clarifiers at the Bird Island WWTP.	This project would be designed to provide treatment of wet weather flows and increased secondary treatment capacity.

Project Name	Project Description	Project Purpose*		
Green Infrastructur	Green Infrastructure Projects			
Green 1 - Pilot Projects – 267- acres of GI control	Projects consist of multiple green infrastructure projects that will overlap in engineering and construction.	In general, this phase is designed to control stormwater flow from 267 acres of impervious area in the various sewer sheds within the targeted areas.		
2001-2016 Residential Demolitions	This project consists of the demolition of vacant houses thereby replacing impervious with pervious surfaces.	This project is designed to remove 256 total acres of impervious area and manage stormwater on site.		
2001-2016 Commercial and Industrial Demolitions	This project consists of the demolition of commercial and industrial structures thereby replacing impervious with pervious surfaces.	This project is designed to control stormwater flow from 78 total acres of impervious area.		
Green 2 – 410 acres of GI Control	These projects will consist of multiple green infrastructure projects that will overlap in engineering and construction. Details will be provided in future reports.	In general, these projects would be designed to retain stormwater flow from 410 acres of impervious area in the various sewer sheds in the targeted areas.		
2017 -2024 Demolitions	This project consists of the demolition of vacant and dilapidated structures thereby replacing impervious surface with pervious surface	This project is designed to control stormwater flow for each post demolition vacant lot. Total acreate TBD on a rolling basis depending upon demolitions completed.		
Green Demolition Pilot Project	A three year pilot study where the City of Buffalo's demolition specifications were altered to allow for the use of shallow bioretention to increase onsite infiltration	Over the course of the pilot project the revised demolition specifications/bioretention approach was applied to 221 sites impacting a total of 19.03 acres.		
PUSH Blue Projects	PUSH-Buffalo will install rain gardens, porous pavement and a green roof and distribute rain barrels within the CSO 012 sewershed.	This project is designed to control stormwater flow from 1 acre of impervious area.		
Carlton Street Porous Asphalt	This project consisted of the installation of pervious pavement to retain stormwater from the area tributary to the Right-of-Way on Carlton Street between Michigan and Jefferson Avenues in the City of Buffalo as part of the City's streetscape project.	This project is designed to control stormwater flow from a 5.9 acre sewershed.		

Project Name	Project Description	Project Purpose*
Fillmore Avenue Porous Parking Lots and Green Lots	This project consisted of the installation of porous pavement parking lots and modified rain gardens to retain stormwater from the area tributary to the Right-of-Way of Fillmore Avenue in the City of Buffalo as part of the City's streetscape project.	This project is designed to control stormwater flow from 0.4 total acres of impervious area.
Ohio Street	This project consisted of the installation of green infrastructure to retain stormwater from the area tributary to the Right-of-Way on Ohio Street in the City of Buffalo as part of the City's streetscape project.	This project is designed to control stormwater flow from 6.1 total acres of impervious area.
Kenmore Avenue	This project consists of the installation of green infrastructure to retain stormwater from the area tributary to the Right-of-Way on Kenmore Avenue in the City of Buffalo as part of the City's streetscape project.	This project is designed to control stormwater flow from 5.17 total acres of impervious area.
Genesee Gateway Project	This project consists of the installation of green infrastructure to retain stormwater from the area tributary to the Right-of-Way on Genesee Street in the City of Buffalo as part of the City's streetscape project.	This project is designed to control stormwater flow from 2.8 total acres of impervious area.
Allen Street	This project will consist of the installation of green infrastructure to retain stormwater from the area tributary to the Right-of-Way for the portion of Allen Street between Main Street and Elmwood Avenue in the City of Buffalo as part of the City's streetscape project.	This project is designed to control stormwater flow from 2.5 total acres of impervious area.
Willert Park	This project will consist of the installation of green infrastructure to retain stormwater from the area tributary to the Right-of-Way for the portion of William Street between Michigan and Jefferson in the City of Buffalo.	This project is designed to control stormwater flow from 13.9 total acres of impervious area.
Northland Ave	This project will consist of the installation of green infrastructure to retain stormwater from the area tributary to the Right-of-Way for the portion of Northland Avenue between Fillmore and Grider in the City of Buffalo.	This project is designed to control stormwater flow from 6.1 total acres of impervious area.

Project Name	Project Description	Project Purpose*
612 Northland Ave	The project consists of a rain garden, permeable gravel pavement, and conversion of impervious pavement to lawn/shrubs.	The project is designed to control stormwater flow from 0.26 acres of impervious area.

Project Name	Project Description	Project Purpose*
Niagara Street Phase 1: Elmwood Street to Virgina Street	This project consists of the installation of green infrastructure to retain stormwater from the area tributary to the Right-of-Way for the length of Niagara Street in the City of Buffalo as part of the City's streetscape project.	This project is designed to control stormwater flow from 2 total acres of impervious area.
Niagara Street Phase 2: Virgina Street to Porter Avenue	This project consists of the installation of green infrastructure to retain stormwater from the area tributary to the Right-of-Way for the length of Niagara Street in the City of Buffalo as part of the City's streetscape project.	This project is designed to control stormwater flow from 7.3 total acres of impervious area.
Niagara Street Phase 3: Hampshire Street to Scajaquada Expressway Niagara Street Phase 4a: Scajaquada Expy to Hertel Ave Niagara Street Phase 4b: Hertel Ave to Ontario St Niagara Street Phase 5: Porter Avenue to Hampshire Street	This project consists of the installation of green infrastructure to retain stormwater from the area tributary to the Right-of-Way for the length of Niagara Street in the City of Buffalo as part of the City's streetscape project.	This project is designed to control stormwater flow from 15 total acres of impervious area in MS4 drainage areas and 25.5 in CSO drainage areas.
Green 3 – 375 acres of GI Control	These projects will consist of multiple green infrastructure projects that will overlap in engineering and construction. Details will be provided in the Phase 2 Green Infrastructure Master Plan.	In general, these projects would be designed to retain stormwater flow from 375 acres of impervious area in the various sewer sheds in the targeted areas.

Project Name	Project Description	Project Purpose*
Green 4 – 263 acres of GI Control	These projects will consist of multiple green infrastructure projects that will overlap in engineering and construction. Details will be provided in the Phase 2 Green Infrastructure Master Plan.	In general, these projects would be designed to retain stormwater flow from 263 acres of impervious area in the various sewer sheds in the targeted areas.
<u>Gray Projects</u>	- -	
CSOs 014/15 – Erie Basin In-line storage and optimization	SEE DETAILS FOLLOWING FOR SPECIFIC PROJECTS	
SPPs 206A&B	A new 113,000 gallon in-line storage facility was constructed in association with SPPs 206A&B to reduce CSOs at CSO 014. This site is located at Trenton Road/ Village Court north east of Fourth Street.	This project was designed to provide in-line storage thereby decreasing CSO 014 discharges through SPPs 206A&B. Together with other LTCP projects, this project is projected based on the TY to reduce discharges to the Erie Basin through CSO 014 to 2 activations.
SPP 035	A new 50,000 gallon in-line storage facility was constructed between the Genesee Trunk and Swan Trunk sewers to create additional storage capacity in association with SPP 035 (CSO 015). This project is located to the north west of the intersection of South Elmwood Avenue and West Genesee Street.	This project was designed to provide in-line storage thereby decreasing CSO 015 discharges through SPP 35. Together with other LTCP projects, this project is projected based on the TY to reduce discharges to the Erie Basin through CSO 015 to 0 activations.
SPP 036	This project consisted of the reconstruction of 35' of 30" sewer associated with SPP 036 to reverse the slope. This site is located on Church Street between the off and on ramps of the Skyway bridge (State Route 5).	This sewer reconstruction project was designed to increase the underflow capacity of the CSS thereby decreasing CSO 015 discharges. Together with other LTCP projects, this project is projected based on the TY to reduce discharges to the Erie Basin through CSO 015 to 0 activations.

Project Name	Project Description	Project Purpose*
CSO 013 – Satellite	CSO 013 is located at the extension of Virginia Street, in LaSalle	This storage project would provide off-line storage thereby decreasing CSO
storage,	Park, into the Black Rock Canal, the structure is tentatively planned	013 discharges. Preliminary design is for a 0.3 MG offline storage facility.
conveyance, FM &	to be built between the last SPP structure and the Canal. The	Together with other LTCP projects, this project is projected based on the TY
PS	proposed satellite storage facility would consist of a covered,	to reduce discharges to the Black Rock Canal through CSO 013 to 4
	concrete, underground tank.	activations.

Project Name	Project Description	Project Purpose*
North Relief – Interceptor	The original conception of this project was of a deep tunnel relief sewer to run in the vicinity of Niagara Street between Bird Avenue and Albany Street with an additional line connecting the tunnel to the WWTP influent siphon. Preliminary design is for 5,310' of 96"pipe and 571' of 120" pipe. Due to site constraints this project may be redesigned.	The purpose of this project is to reduce discharges through CSOs 004, 011, and 012, by creating a new relief sewer thereby creating offline storage capacity capacity in the CSS. Together with other LTCP projects, this project is projected based on the TY to reduce discharges to the Black Rock Canal through CSO 004 to 3 activations, CSO 011 to 4 activation, and CSO 012 to 2 activations.
CSOs 010, 008/010, 061, 004 – Underflow capacity upsizing	This project will consist of upsizing of underflow piping to maximize flow to the interceptors. This project is tentatively proposed for between Breckenridge Street and Brace Street along the I-190 with an extension along Brace Street across Niagara Street.	This underflow capacity upsizing project would increase the capacity of the CSS thereby decreasing CSO 010, 008, 061 and 004 discharges. Together with other LTCP projects, this project is projected based on the 1993 Modified Typical Year to reduce discharges to the Black Rock Canal through CSO 004 to 3 activations, CSO 010 to 1 activations, CSO 008 to 0 activations, and CSO 061 to 4 activations.
– Satellite storage,	SPP 337 is located at Colorado Street North of Scajaquada Street. The proposed satellite storage facility would consist of a covered, concrete, underground tank.	The purpose of this project is to reduce discharges through CSO 53 to the Scajaquada Creek. Preliminary design is for a 0.7 MG off-line storage facility. Together with other LTCP projects, this project is projected reduce CSO discharges to Scajaquada Creek based on the TY to 4 activations.
SPP 336A&B (CSO 053) – Satellite storage, conveyance, FM & PS	SPP 336A&B are located on Humboldt Parkway on each side of the Scajaquada Drain. The proposed satellite storage facility would consist of a covered, concrete, underground tank.	The purpose of this project is to reduce discharges through CSO 53 to the Scajaquada Creek. Preliminary design is for a 4.2 MG off-line storage facility. Together with other LTCP projects, this project is projected reduce CSO discharges to Scajaquada Creek based on the TY to 4 activations.
Jefferson Avenue & Florida Street (CSO 053) – Satellite storage, conveyance and FM	The proposed location for this facility is in the vicinity of the intersection of Jefferson Avenue and Florida Street. The proposed satellite storage facility would consist of a covered, concrete, underground tank.	The purpose of this project is to reduce discharges through CSO 53 to the Scajaquada Creek. Preliminary design is for a 2.6 MG off-line storage facility. Together with other LTCP projects, this project is projected reduce CSO discharges to Scajaquada Creek based on the TY to 4 activations.

Project Name	Project Description	Project Purpose*
storage, conveyance, FM &	For CSO 055, the proposed storage facility would be located upstream of the regulator, near Military Road. At this location, an offline facility would be constructed and flows above 26 MGD (instantaneous peak) would be diverted from the South Hertel Trunk sewer into the storage facility. The proposed satellite storage facility would consist of a covered, concrete, underground tank.	The purpose of this project is to reduce discharges through CSO 55 to the Niagara River. Preliminary design is for a 7.5 MG off-line storage facility. Together with other LTCP projects, this project is projected reduce CSO discharges to the Niagara River through CSO 55 based on the TY to 9 activations.
Satellite storage,	The proposed location for this facility is underneath the Tops parking lot between South Park Avenue and the Buffalo River. The proposed satellite storage facility would consist of a covered, concrete, underground tank.	The purpose of this project is to reduce discharges through CSO 28 to the Buffalo River and through CSOs 047 and 044 to Cazenovia Creek. Preliminary design is for a 2.3 MG off-line storage facility. Together with other LTCP projects, this project is projected reduce CSO discharges based on the TY to 6 activations through CSO 028, 2 activations through CSO 044 and 3 activations through CSO 047.
storage, conveyance, FM &	The proposed location for this facility is in the vicinity of South Ogden Street between Mineral Springs Road and Cazenovia Creek. The proposed satellite storage facility would consist of a covered, concrete, underground tank.	The purpose of this project is to reduce discharges through CSO 52 to the Buffalo River. Preliminary design is for a 0.6 MG offline storage facility. Together with other LTCP projects, this project is projected reduce CSO discharges to the Buffalo River through CSO 052 based on the TY to 3 activations.
storage,	The proposed location for this facility is in the vicinity of the confluence of Ohio, Louisiana and Saint Claire Streets. The proposed satellite storage facility would consist of a covered, concrete, underground tank.	The purpose of this project is to reduce discharges through CSO 064 to the Buffalo River. Preliminary design is for a 0.1 MG off-line storage facility. Together with other LTCP projects, this project is projected reduce CSO discharges to the Buffalo River through CSO 064 based on the TY to 3 activations.

*Note: Black Rock Canal Performance Criterion is 4 Activations in the Typical Year Buffalo River Performance Criterion is 6 Activations in the Typical Year Cazenovia Creek - B Performance Criterion is 4 Activations in the Typical Year Cazenovia Creek - C Performance Criterion is 6 Activations in the Typical Year Erie Basin Performance Criterion is 2 Activations in the Typical Year Niagara River Performance Criterion is 9 Activations in the Typical Year Scajaquada Creek - Performance Criterion is 4 Activations in the Typical Year

Attachment C to the Semi-Annual Status Report: September 2020

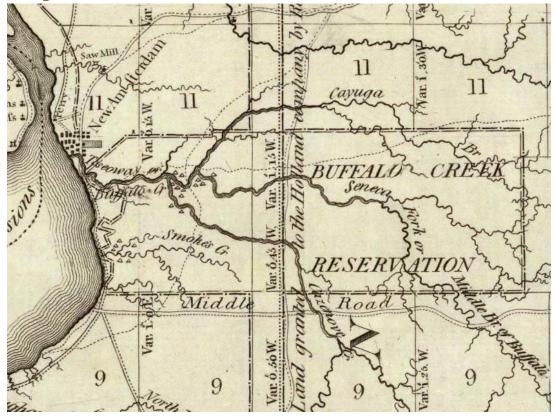
Public Meeting Materials

History of Buffalo's Sewers and Impacts on Modern Projects

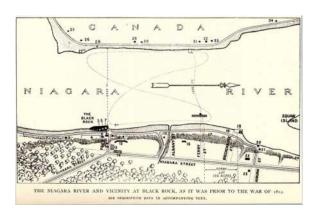
ROSALEEN B. NOGLE, P.E., BCEE, ENV-SP, PMP M.S., B.S. CIVIL ENGINEERING M.A. PASTORAL MINISTRY, M. DIV., M.P.A. B.A. ANTHROPOLOGY

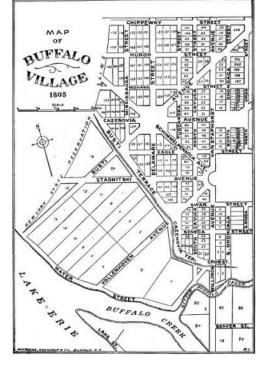
> BUFFALO SEWER AUTHORITY

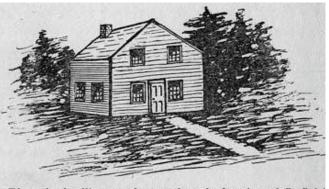
History: City of Buffalo



History: Early Years 1785-1825





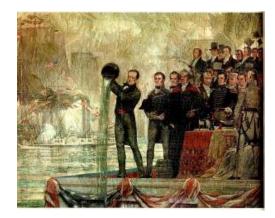


The only dwelling not destroyed at the burning of Buffalo

36

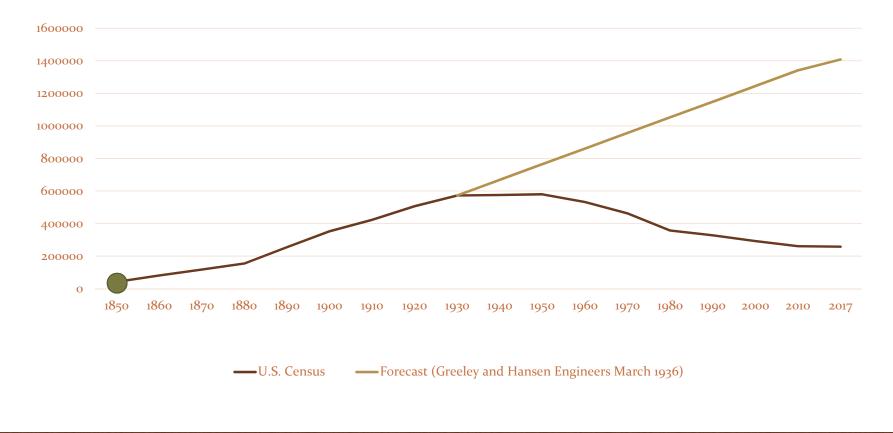
History: Canal Years 1825-1848

- Drain to nearest water way
- Cholera epidemic 1832
- Private construction
 - Oak Street 1834-1835
 - Dry brick
 - Board bottom
 - Triangular
 - Pennsylvania (???)
 - Flag Stone
 - Arch





History: Canal Years 1825-1848



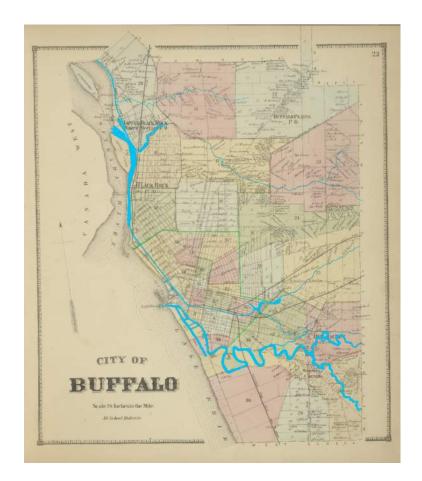
History: Canal Years Continued 1848-1861

- Report of Committee on Sewers, 2/15/1848
 - Basis of design report
 - Property owners and taxes
 - First sewer Michigan Street
 - \$12,500.00
 - 4.5 ft-2 ft diameter
- Cholera epidemics 1849, 1854
- 1852 Water Works Company
 - Bathing
 - Indoor toilets
- 1860 Albany Street Trunk (Black Rock)



History: 1861-1866 Civil War

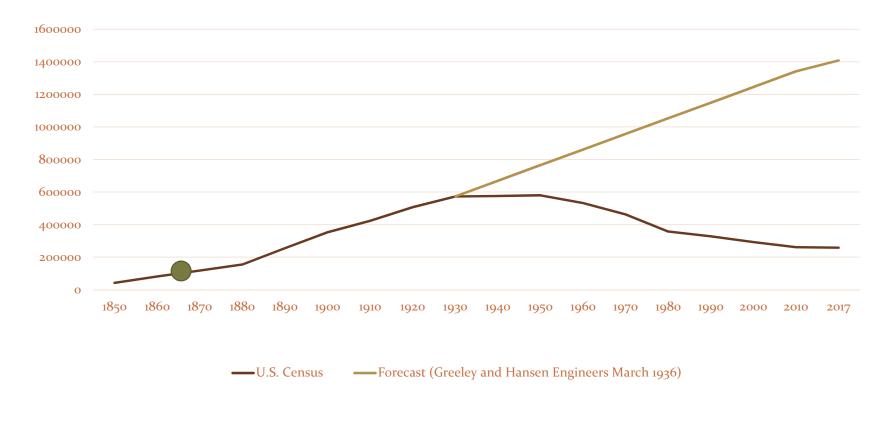
- 1861-1865
 - Civil War
 - Halt in construction
- Oliver G. Steele, Esq.
 - 1866 Presentation to Historical Society Club
 - Leader of 1848 Sewer Committee
 - Warned of need to not rest on laurels
 - Issue of lack of proper traps
 - Too few catch basins and manholes



Quiz: Antebellum

- Why were antebellum sewers primarily constructed? **Drainage**
- What materials were used to construct these sewers? **Stone and Brick**
- What events precipitated construction of additional sewers? Cholera and Piped Drinking Water

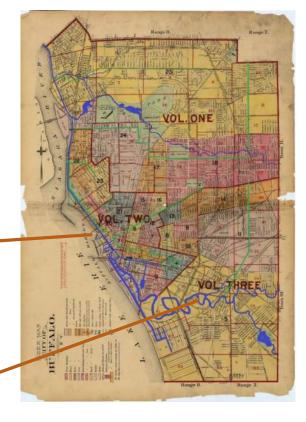
History: 1861-1866 Civil War



History: Industrial Revolution 1867-1899

- George E. Waring, Jr. 1884
- Trunks
 - Genesee, Bird-Ferry, Hertel, Bailey, Mill Race
 - Swan
 - 3 Flushing gates
 - Main and Hamburg canal and Wilkenson Slip putrid
 - 90 degree turn at Albany Street





History: Industrial Revolution 1867-1899

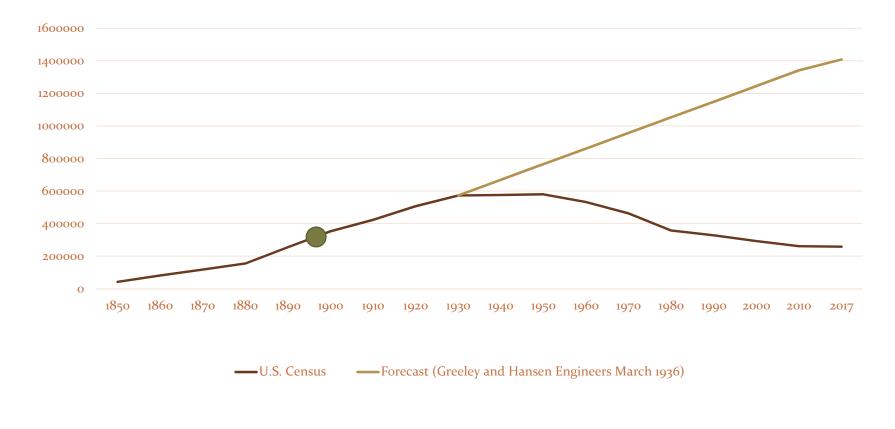
- Majority of existing system
- Brick 24"+
- VTP 8"-21"





MERCY M. SUMM FERRY ST. SEWER (CONTER) BETWEEN ELIMODE AVER & ICO WEST OF DELAWARE AVE. 1400 PT- 18 DOILLY 1874 STRET-1.5 VIT - DUILLY 1874 STRET-15 VIT - DUILLY 1874 MERCY DUELE ADDRESS BETWEEN BERRY SE. SHING IN DUELE BERRY SE. SHING IN DUEL	HAMPSHIRE ST. SEWER (CANTER) DETIVELY POURTEENTH ST. & FORKY ST. ITBEFT- 3'-4'-STONE & BRICK-BUILT 1875
HOIS	FROM ELEMENCED. HVE. TO FOURTHEAMTH ST. TOR NEW FROME SEE 5933 AND AND AND AND AND AND AND AND AND AND

History: Industrial Revolution 1867-1899

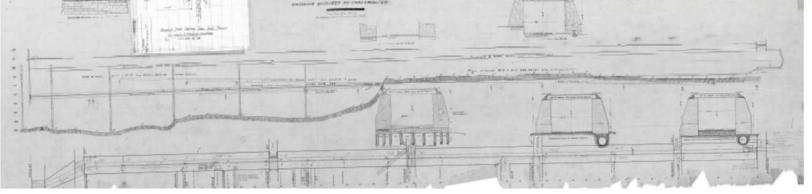


- Waterways Sewers
 - Main Hamburg Canal to Hamburg Drain 1901-1903
 - Ohio Basin to Ohio Drain 1902-1904
 - Cornelius Creek to Hertel Avenue Overflow Drain 1914
 - Scajaquada Creek to Scajaquada Drain
- Sewers installed in North Buffalo for intra-city suburban developments
 - Deeper
 - Into rock
 - Laterals plunge suddenly to main

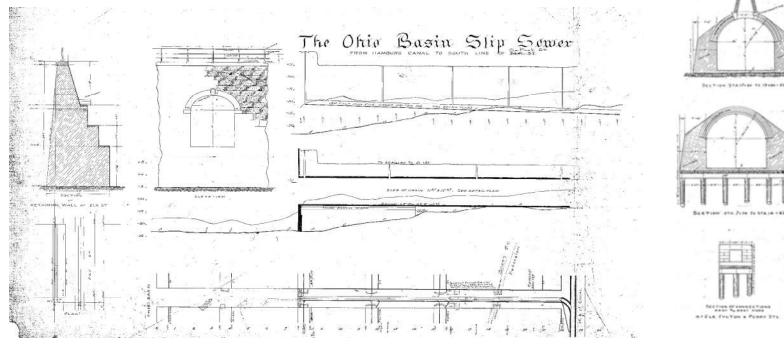
& HAMBURG CAN

• Main and Hamburg Canal to Hamburg Drain





• Ohio Slip and Basin to Ohio Drain



No. Tone: STA 14 To 17-88 - 340 C

• Scajaquada Creek to Scajaquada Drain







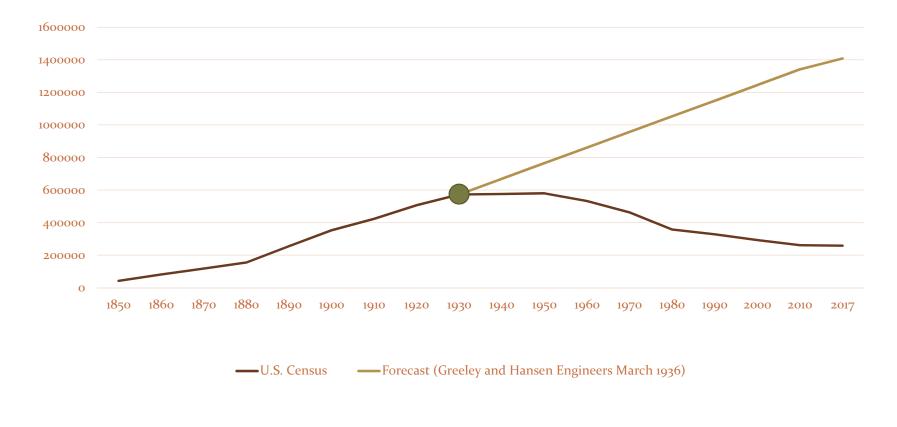




From: https://www.wnyheritage.org/content/scajaquada_drian_project_-_1920s/index.html

Quiz: 1865-1929

- What was the primary reason for the construction of the Swan Trunk? Flushing of canals
- Why were canals and other waterways buried/ covered? Heavily polluted and source of disease
- When were most of the sewers constructed in Buffalo?
 1880s-1890s



- Establishment of International Joint Commission
- January 11, 1909

It is further agreed that the waters herein defined as boundary waters and waters flowing across the boundary shall not be polluted on either side to the injury of health or property on the other.

- 1918 Report
 - "In the Detroit and Niagara Rivers conditions exist which imperil the health and welfare of the citizens of both countries in direct contravention of the treaty."
 - 80% of pollution of Niagara River originates in Buffalo

EVENING NEWS: TUESDAY, SEPTEMBER 24. 1929 BUFFALO EVENING NEWS: MONDAY, DECEMBER 5, 1927 BUFFALO Keitzel Assails Buffalo ents for 'Bathing in Own Filth' Date for Hearing on Flood "Head of Izaak Walton League Hits Dumping of Sewage **Relief Set by City** Coun-50,000,000 Gallons of Waste in Niagara, in Talk Before Conservationists. cil. COM lease municipal pier Dumped Daily in Buffalo River 4 \$10 er rate. 114 Report to Council by Fisk Stirs Perkins to Demand Check on Plants.

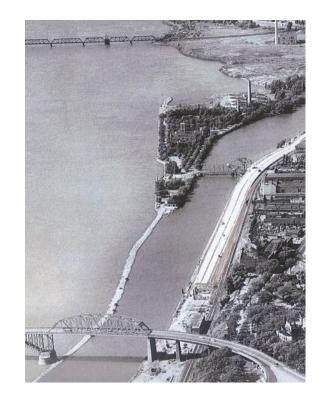
- Comprehensive Plan of Sewerage for Buffalo, NY
 - George B. Gasciogne, Consulting Engineer
 - May 1930
- 10-12 year plan
- Sewage treatment through construction of 2 WRRFs
 - South-East by Tifft-Hopkins WRRF
 - North by Unity Island WRRF
- Construction of sewers
 - Interceptors
 - Swan Trunk extension
 - Storm relief sewers
- \$23,000,000.00



- NYS Dept. of Health mandate
 - March 1935
 - Primary Wastewater Treatment Plant
 - Interceptor sewers
- Establishment of BSA
 - April 8, 1935
 - \$15 million (\$283 M) bonding capacity
 - After 5 years or after all bonds are paid off, system will revert to city and Buffalo Sewer will dissolve
 - Structures of any public service corporation must be removed at expense of corporation for Buffalo Sewer to construct project



- Buffalo Sewer Authority General Plan for Collecting and Treating the Sewage of Buffalo
- Greeley and Hansen Engineers (Messrs. Greeley and Hansen)
 - Redid Gasciogne's calculations
 - March 1936
- Initial focus on treatment and conveyance for treatment
 - Single WRRF on Bird Island
 - CSO diversion structures
 - Interceptors





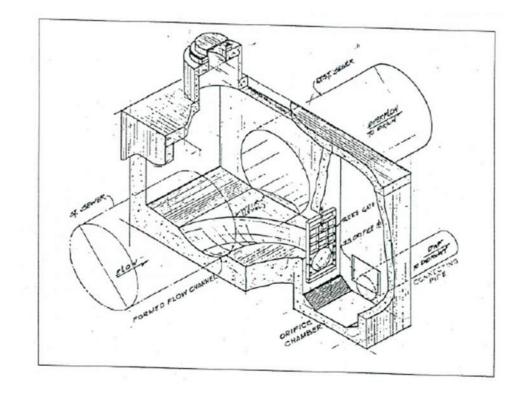




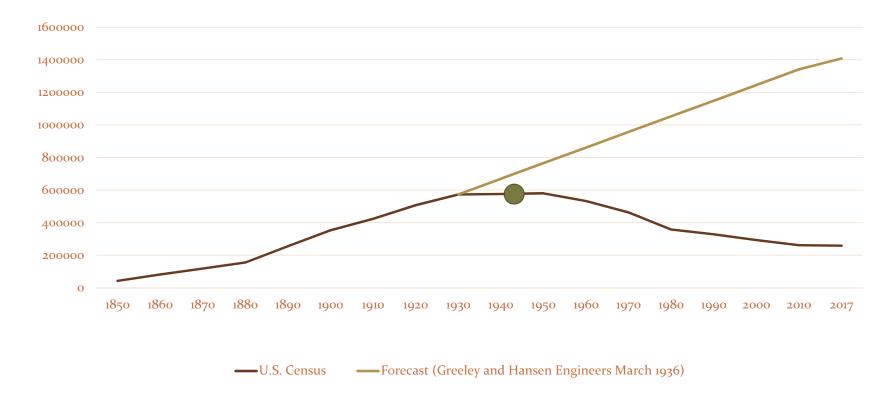


From: https://www.wnyheritage.org/content/scajaquada_drian_project_-_192os/index.html



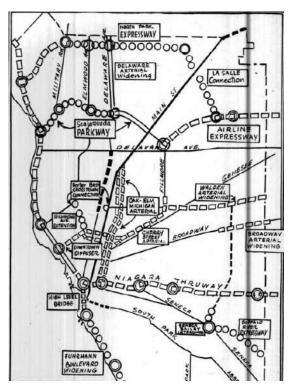


History: Storm Relief and Sprawl 1941-1970

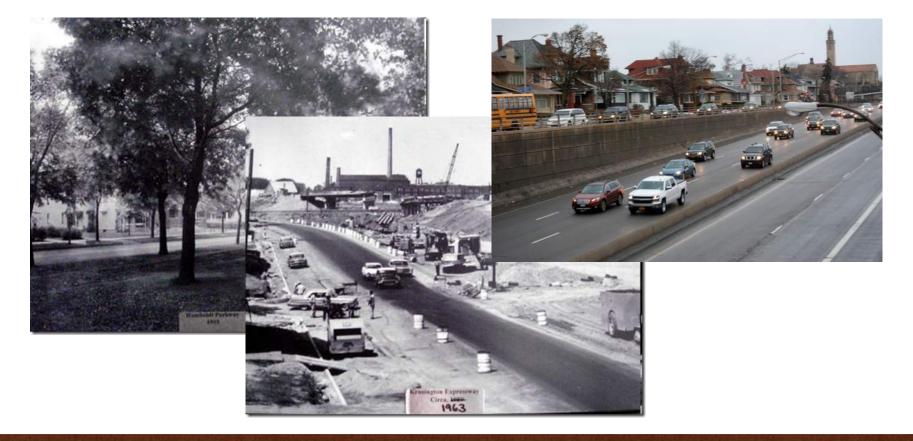


History: Storm Relief and Sprawl 1941-1970

- Comprehensive Plan for Relief Sewers
 - February 1941
 - Greeley and Hansen
 - WRRF online as of 1938
 - Last of Interceptors under construction
- Attack on Pearl Harbor December 7, 1941
- Post 1945 suburban development
- Floods of 1963
 - July 29: 3.8": \$1.5 (\$12.7) million in damage
 - August 7: 3.88" in 5 hours: \$35 (\$295.9) million in damage



History: Storm Relief and Sprawl 1941-1970



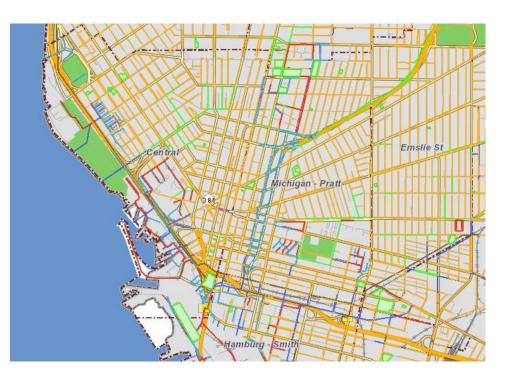
History: Storm Relief and Sprawl 1941-1970



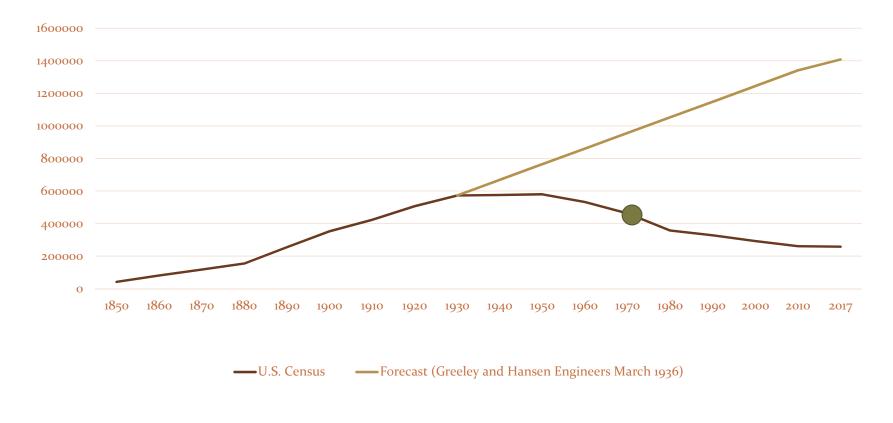


History: Storm Relief and Sprawl 1941-1970

- Urban Renewal 1960-1970
- Demolition of tenement areas
 - Urban core
 - Oldest parts (and oldest sewers) of city
- Construction of new municipal housing project
 - New separated sewers
 - Concrete storm sewers
 - Asbestos concrete pipe sanitary sewers

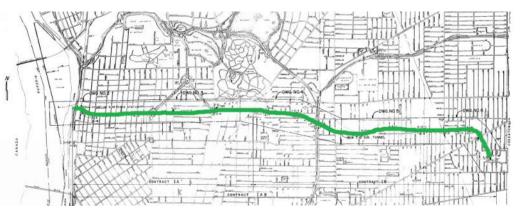


History: Clean Water Act 1970-1982



History: Clean Water Act 1970-1982

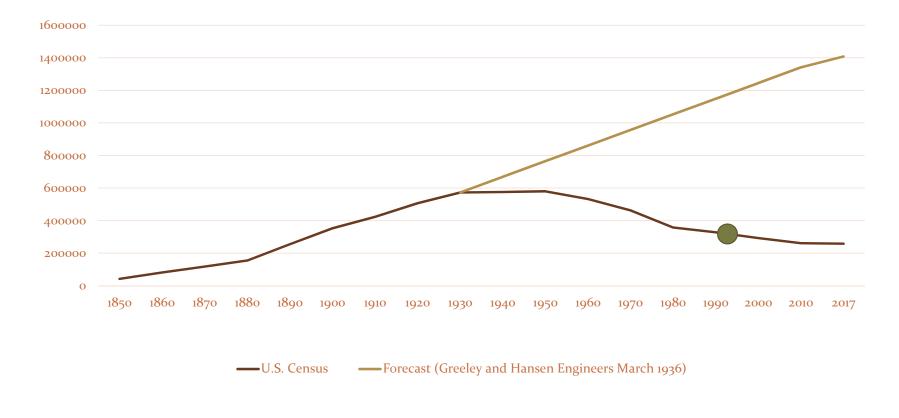
- Scajaquada Tunnel 1977
- Weir Modifications 1980-1982
 - Diversion from Scajaquada Drain to Scajaquada Tunnel
 - Raising of weirs
- Backwater Gates
- Secondary Treatment Process 1980







History: CSO Abatement Phase I 1983-2010

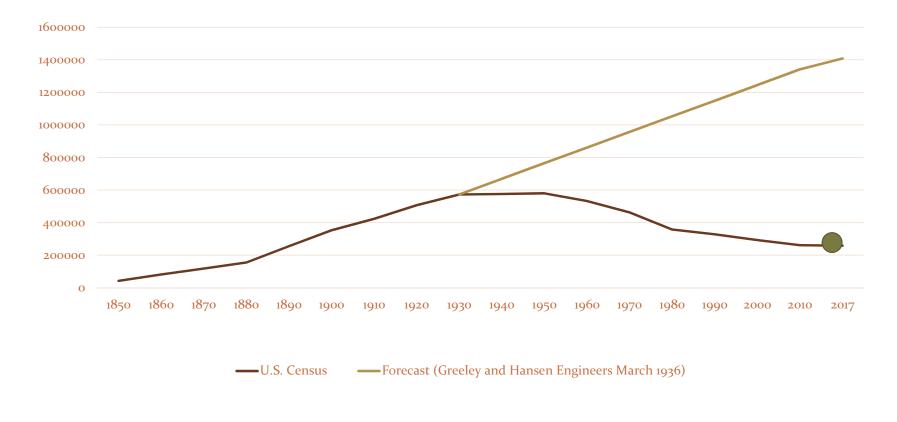


History: CSO Abatement Phase I 1983-2010

- Sewer Separation
- Weir modifications
- Emphasis on eliminating Combined Sewer Overflow locations



CSO Abatement Phase II LTCP 2010-Today



History: CSO Abatement Phase II LTCP 2010-Today

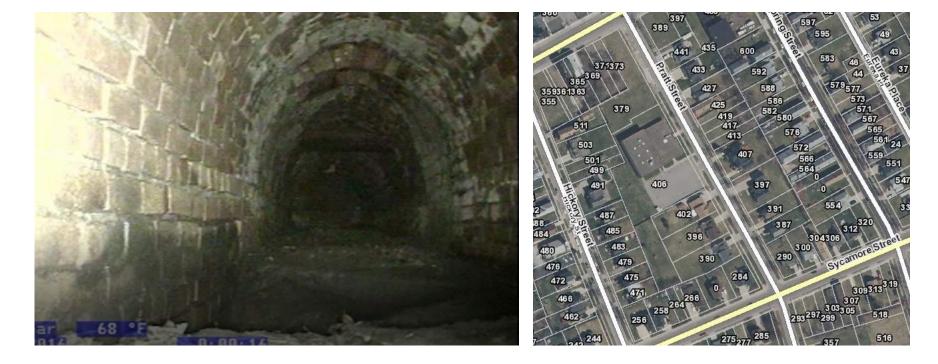
- Final LTCP approved March 18, 2014
- Some projects completed before then
- Reduction in CSO activations
- Mix of gray
 - WRRF upgrades
 - Real Time Control "Smart Sewers"
 - Sewer Separation
 - Underground detention tanks
- And green
 - Bioretention
 - Permeable pavement
 - Demolitions



Quiz: World War II to Today

- What impact did the construction of the NY-33 Kensington Expressway have on the sewer system?
 Cut off the Eastern part of the city (severed the Bird-Ferry Trunk)
 Required additional storm sewers be constructed
- What was the main criteria for CSO abatement in the 1980s, 1990s, and 2000s?
 - **Elimination of CSO outfalls**
- What is the main criteria for CSO abatement today? Elimination of CSO activations

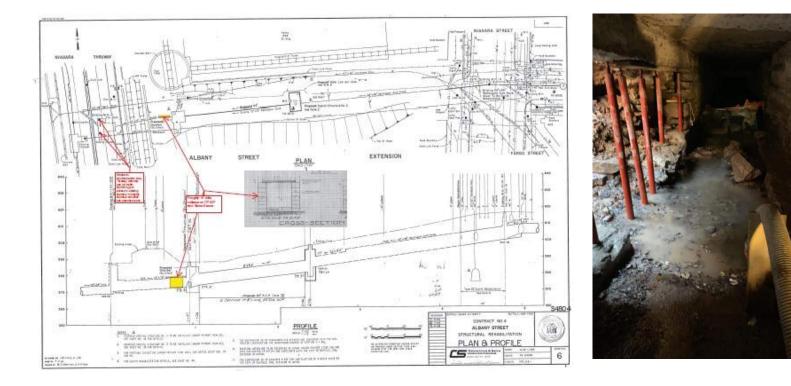
Maintenance and Repairs: Pratt Street



Maintenance and Repairs: North Oak Street



Maintenance and Repairs: Albany Street



Maintenance and Repairs: Reactive to Preventative

- Part of Pratt Street sewer collapsed (pre-Civil War) in 2016
- Part of North Oak Street sewer collapsed (pre-Civil War) in 2016
- Parts of two other large diameter pre-Civil War sewers collapsed in 2017
- Partial collapse of Albany Street overflow pipe (pre-Civil War) collapsed in 2018-19
- Pre-Civil War sewers represent a very small portion of sewer system
- Conclusion: pre-Civil War sewers should be prioritized for inspection
- Problem: Buffalo Sewer's records for many pre-Civil War sewers are missing dates
- Solution: look at historical mapping for areas where older sewers would have been built and then cross-reference with sewers without dates

Maintenance and Repairs: Lost Waterways







Maintenance and Repairs: Lost Waterways





Modern Location River is ~450 feet away

1870 Map Buffalo Creek runs under location

Maintenance and Repairs: 10 States Non-Compliance

- Most sewers had manholes installed in 1930s
- Still some sewers without manholes or 1000+ feet between manholes
- Tempting to just order manholes to be installed
- But....



Quiz: Maintenance and Repairs

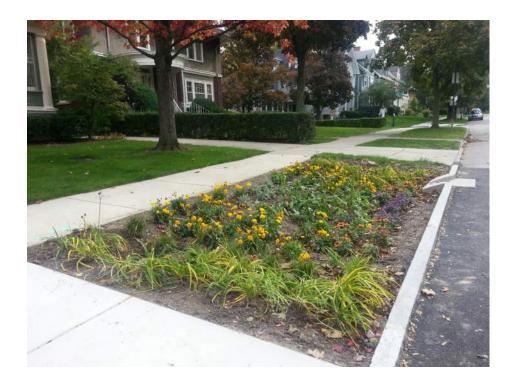
- What criteria can be searched for within GIS data to identify Antebellum Sewers?
 - Stone or brick material
 - 24"+ diameter round, rectangular, or egg-shaped cross-section Located along waterways as they existed prior to 1865
- What issues may be encountered with buried waterways? **Subsidence and excessive drainage**

Long Term Control Plan Projects: RTC Viability

- Vacancy on East Side
 - Vacant lots absorbing water that would have gone into combined system
 - Sanitary and industrial discharges reduced
- Kensington Expressway cutting off half of the flows
- Hertel sewers are deep to capture Cornelius Creek



Long Term Control Plan Projects : Bioretention and VTP





Bibliography

- Gasciogne, George B. "A Comprehensive Plan of Sewerage for Buffalo, New York Summary Report." May 1930.
- Greeley and Hansen. "Comprehensive Plan for Relief Sewers Summary Report." February 1941.
- Greeley and Hansen. "General Plan for Collecting and Treating the Sewage of Buffalo." March 1936.
- Kane, Patrick, Jr. "Buffalo, N.Y. is Doing Away with Public Nuisance Through the Construction of an Underground Drain." *The American City*. February 1923. https://www.wnyheritage.org/content/scajaquada_drian_project_-_1920s/index.html
- Robison, F. Luman. "Floods of August 7 in Buffalo, NY." Floods of 1963 in the United States. 1963.
- Rossi, Mary C. "The History of Sewage Treatment in the City of Buffalo, New York." 1995.
- Rotated 1894 City of Buffalo Atlas. http://www2.erie.gov/atlases/index.php?q=rotated-index-map.
- Steele, Oliver G. Esq. "Buffalo City Sewerage and Sanitary Science." Jan. 3, 1866.
- Waring, George E. "The Buffalo Trunk Sewer in Course of Construction." June 1884.

Questions?

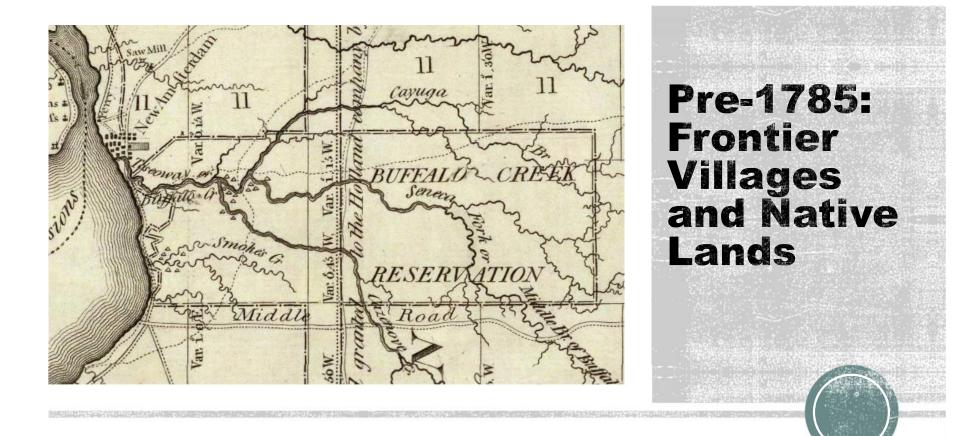


BUFFFALO SEWER AUTHORITY

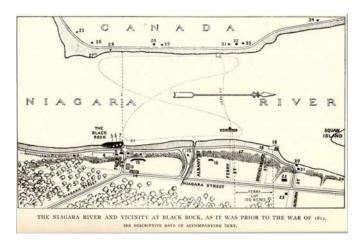
Buffalo's Sewers: 185 Years of Improving Public Health and the Environment

Rosaleen B. Nogle, PE, BCEE, PMP

Asst. Principal Engineer



1785-1825: Early Years





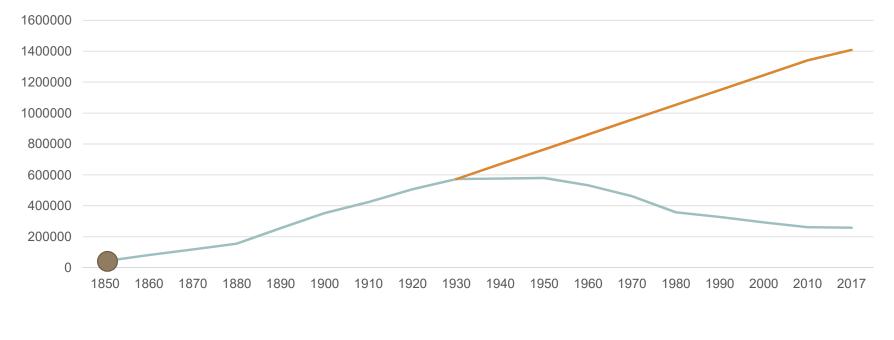


The only dwelling not destroyed at the burning of Buffalo

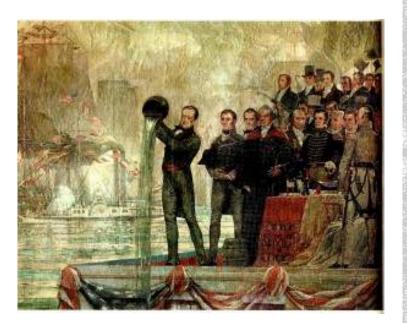
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1825-1848: Early Canal Years



-U.S. Census ----Forecast (Greeley and Hansen Engineers March 1936)





1825-1848: Early Canal Years

- Drain to nearest water way
- Cholera epidemic 1832
- Private construction
 - Oak Street 1834-1835
 - Dry brick
 - Board bottom
 - Triangular
 - Pennsylvania Street (???)
 - Flag Stone
 - Arch



1848-1861: Later Canal Years

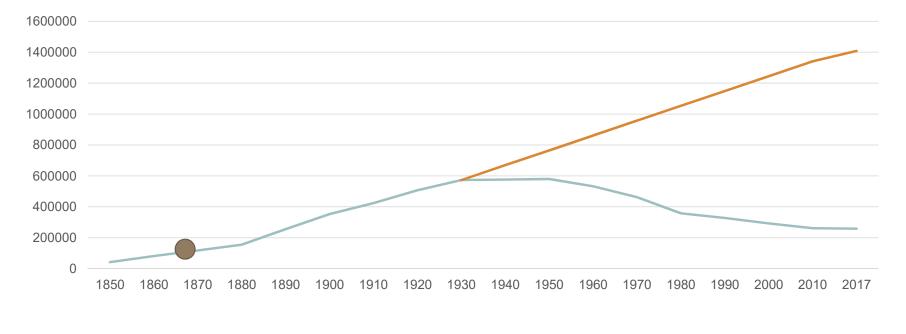
- Report of Committee on Sewers
 - 2/15/1848
 - Basis of design report
 - Property owners and taxes
 - First sewer Michigan Street
 - \$12,500.00
 - 4.5 ft-2 ft diameter brick
 - Non-circular cross-sections
- Cholera epidemics 1849, 1854
- 1852 Water Works Company
 - Bathing
 - Indoor toilets
- 1860 Albany Street Trunk (Black Rock)



1861-1865: The Civil War

- The Civil War
 - Halt in construction
 - Materials and manpower needed for war
 - Important strategic location
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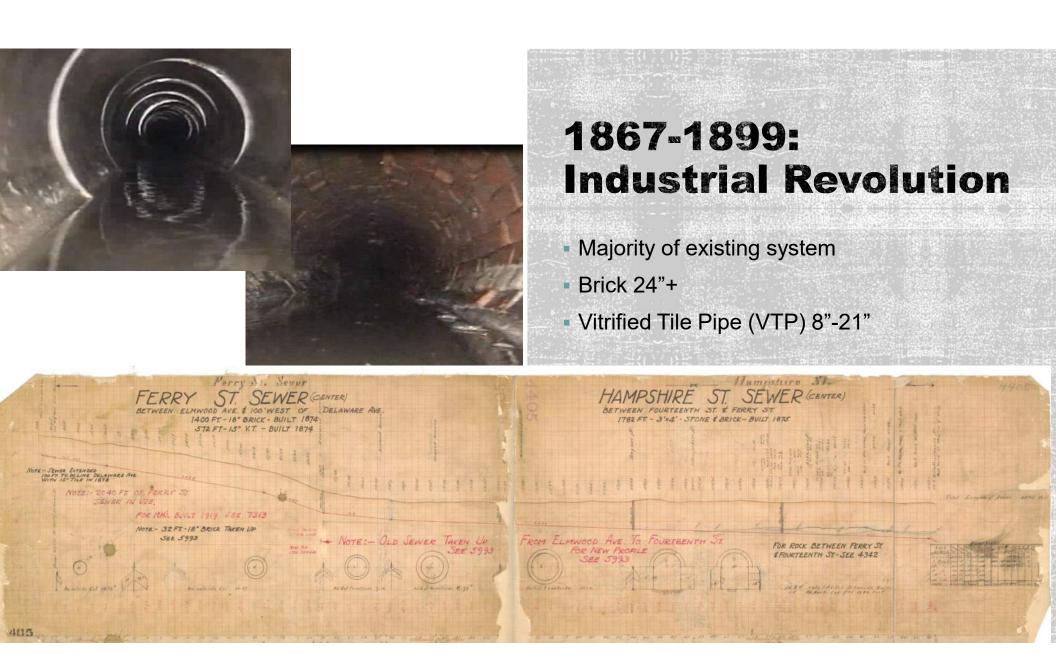


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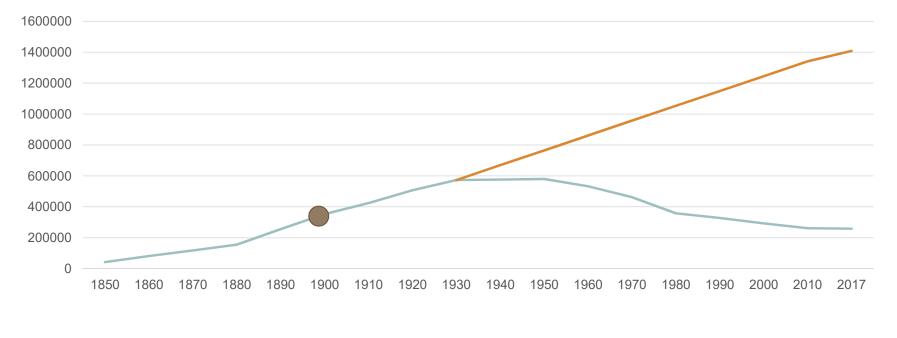


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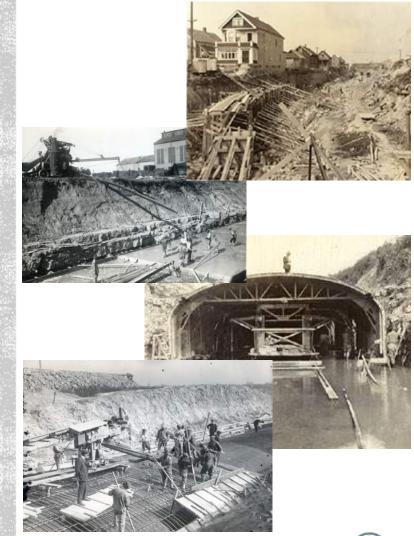


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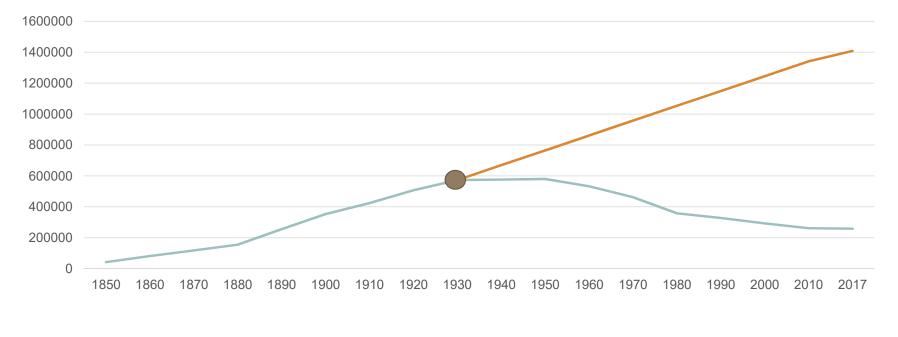
1900-1929: N. Buffalo & Burying of Waters

- Sewers installed in North Buffalo for intra-city suburban developments
 - 20 feet plus deep mains
 - Rock 3-5 feet below surface
 - Laterals plunge suddenly to main
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- Waterways Sewers
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Photo Credit: https://www.wnyheritage.org/content/scajaquada_drian_project - 1920s/index.html



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NYS Dept. of Health mandate

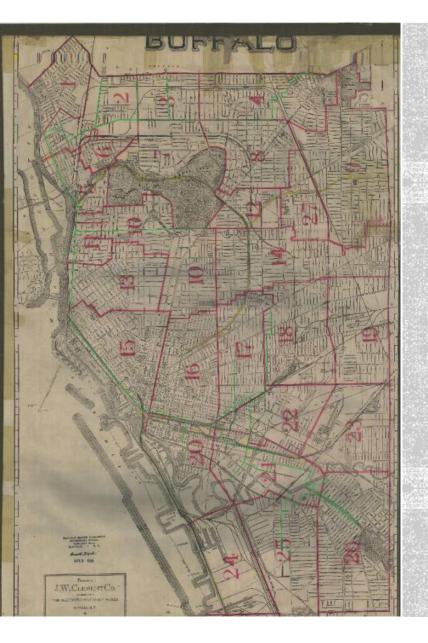
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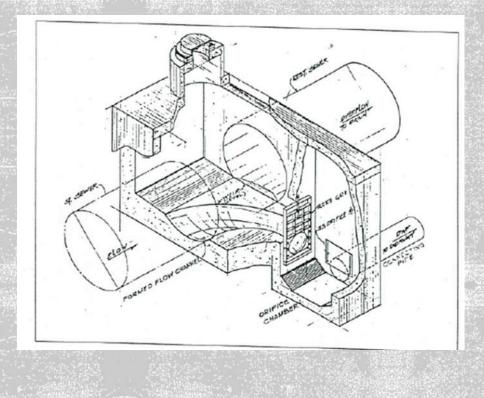


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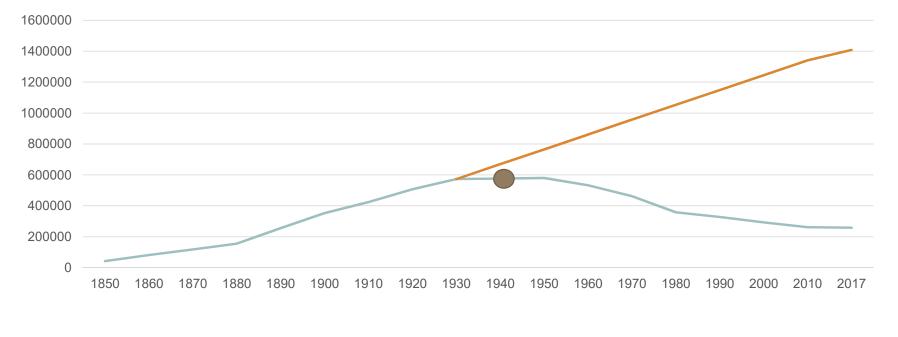
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History: Creation of Buffalo Sewer Authority 1929-1941



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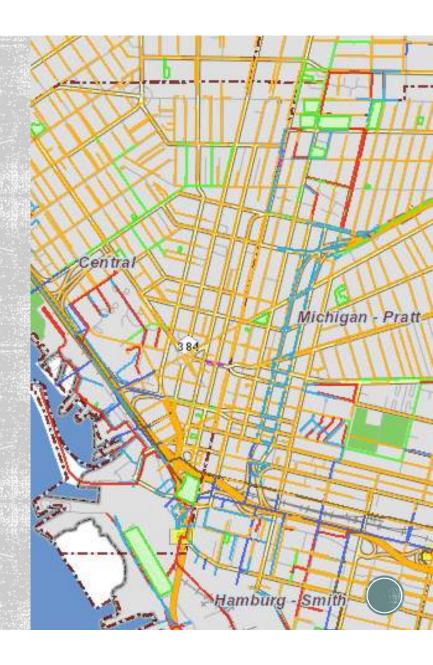
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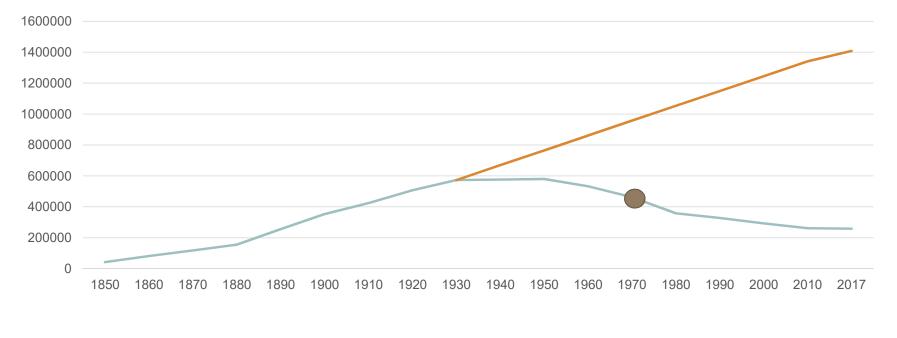
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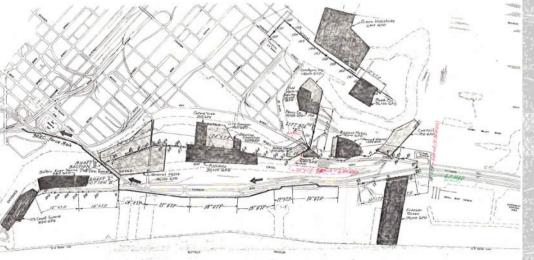
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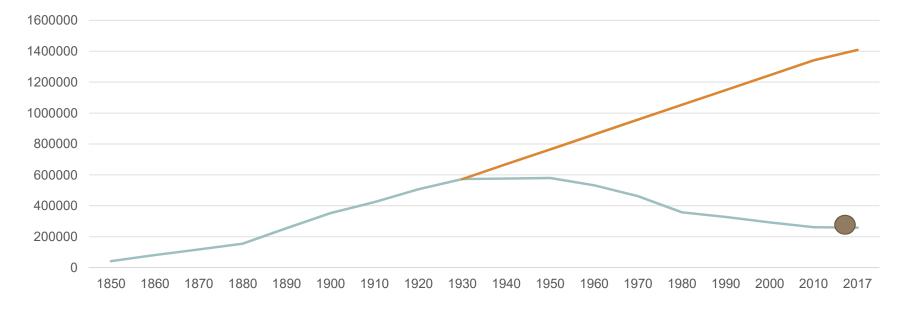
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Bibliography

- Gasciogne, George B. "A Comprehensive Plan of Sewerage for Buffalo, New York Summary Report." May 1930.
- Greeley and Hansen. "Comprehensive Plan for Relief Sewers Summary Report." February 1941.
- Greeley and Hansen. "General Plan for Collecting and Treating the Sewage of Buffalo." March 1936.
- Kane, Patrick, Jr. "Buffalo, N.Y. is Doing Away with Public Nuisance Through the Construction of an Underground Drain." *The American City.* February 1923. https://www.wnyheritage.org/content/scajaquada_drian_project_-_1920s/index.html
- Robison, F. Luman. "Floods of August 7 in Buffalo, NY." *Floods of 1963 in the United States*. 1963.
- Rossi, Mary C. "The History of Sewage Treatment in the City of Buffalo, New York." 1995.
- Rotated 1894 City of Buffalo Atlas. http://www2.erie.gov/atlases/index.php?q=rotated-index-map.
- Steele, Oliver G. Esq. "Buffalo City Sewerage and Sanitary Science." Jan. 3, 1866.
- Waring, George E. "The Buffalo Trunk Sewer in Course of Construction." June 1884.



Questions?



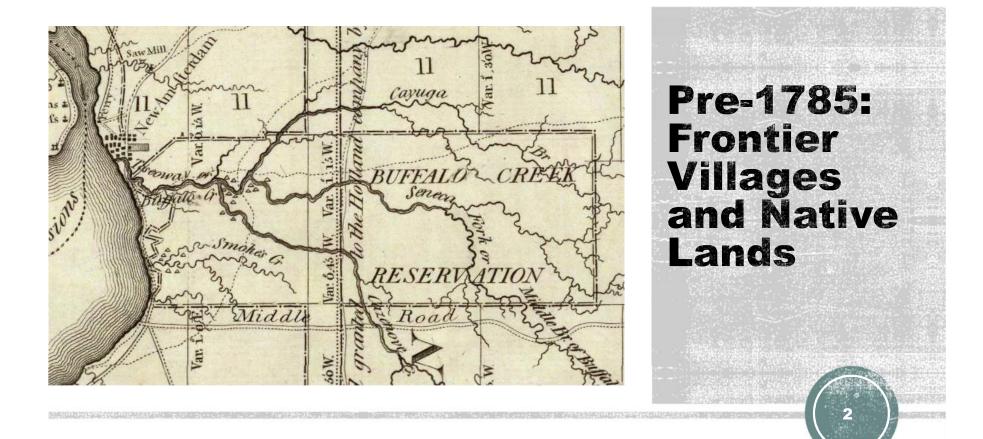
BUFFFALO SEWER AUTHORITY

Buffalo's Sewers: 185 Years of Improving Public Health and the Environment

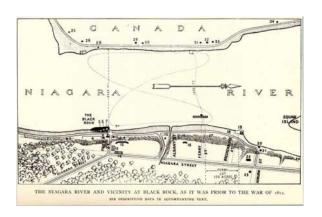
Rosaleen B. Nogle, PE, BCEE, PMP

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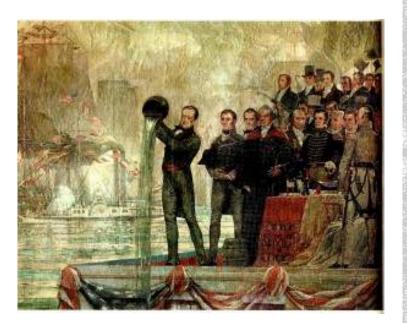
1785-1825: Early Years







36



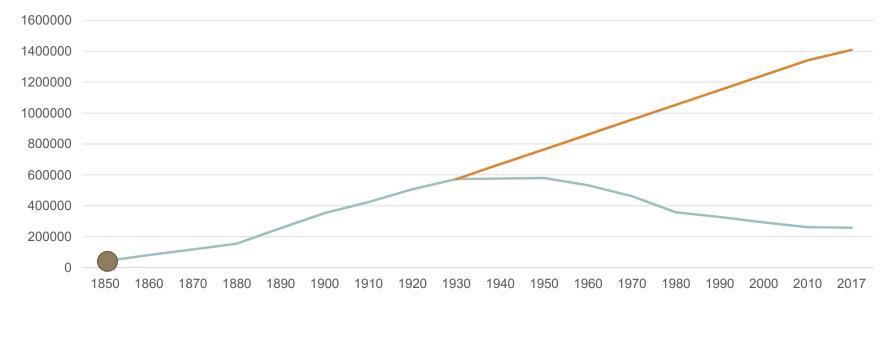


1825-1848: Early Canal Years

- Drain to nearest water way
- Cholera epidemic 1832
- Private construction
 - Oak Street 1834-1835
 - Dry brick
 - Board bottom
 - Triangular
 - Pennsylvania Street (???)
 - Flag Stone
 - Arch



1825-1848: Early Canal Years



-U.S. Census ----Forecast (Greeley and Hansen Engineers March 1936)

5



1848-1861: Later Canal Years

- Report of Committee on Sewers
 - 2/15/1848
 - Basis of design report
 - Property owners and taxes
 - First sewer Michigan Street
 - \$12,500.00
 - 4.5 ft-2 ft diameter brick
 - Non-circular cross-sections
- Cholera epidemics 1849, 1854
- 1852 Water Works Company
 - Bathing
 - Indoor toilets
- 1860 Albany Street Trunk (Black Rock)



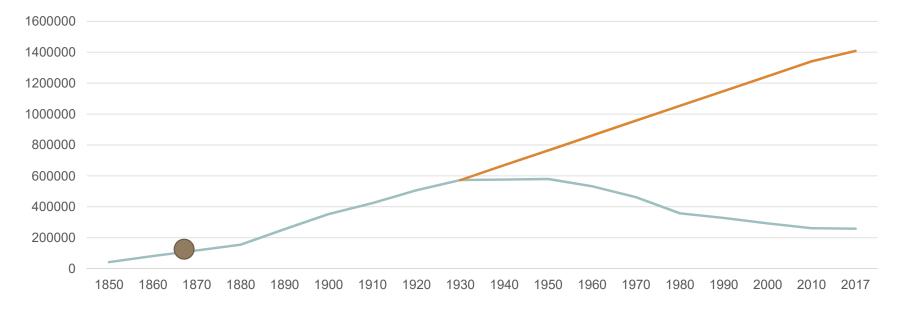
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Quiz: Antebellum

- Why were antebellum sewers primarily constructed?
 Drainage
- What materials were used to construct these sewers?
 Wood, Stone, and Dry Brick
- What events precipitated construction of additional sewers?
 Population Growth, Cholera, Canal Construction, and Piped Drinking Water

1861-1865: Civil War



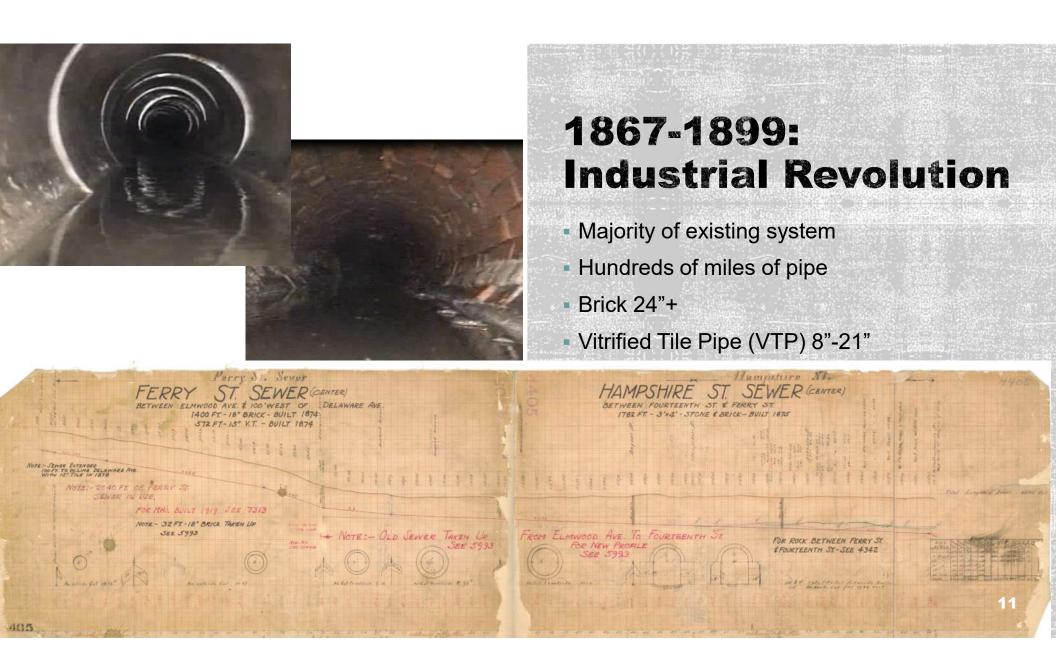
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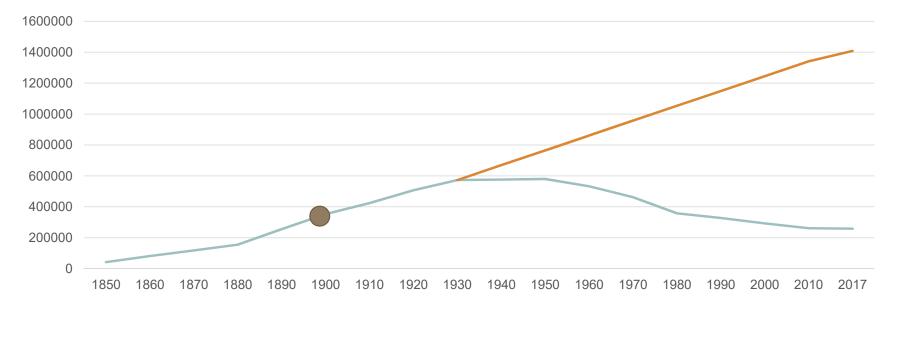


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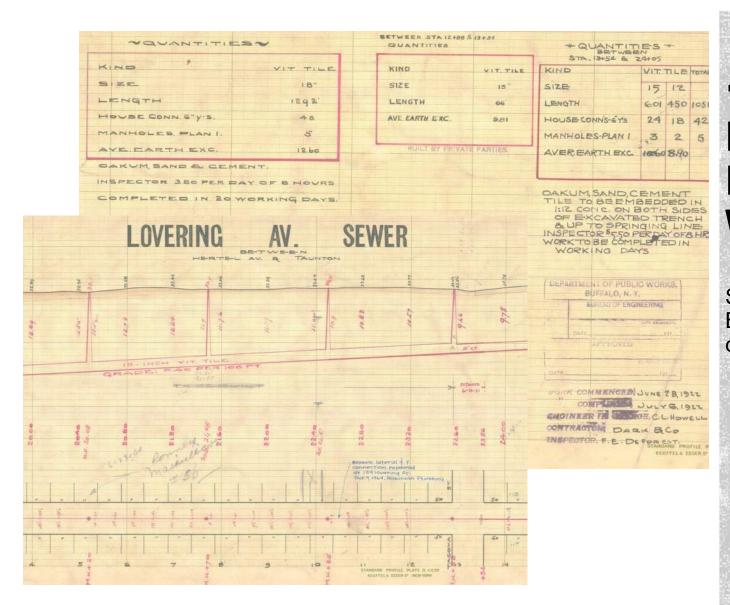
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Sewers installed in North Buffalo for intra-city suburban developments

- Sandy soils
- 10 feet plus deep mains
- Laterals plunge suddenly to main
- Sewers and laterals primarily VTP
- Need to tie into former Cornelius Creek

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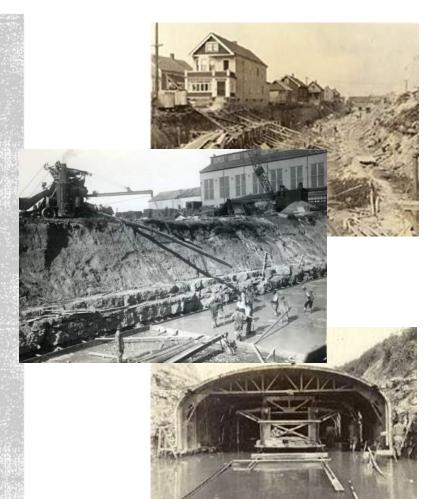
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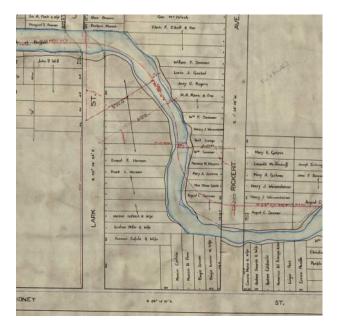
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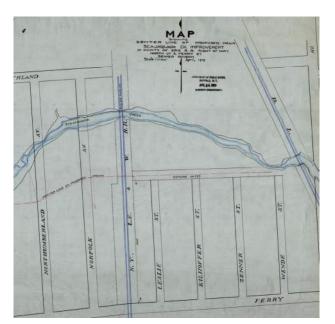


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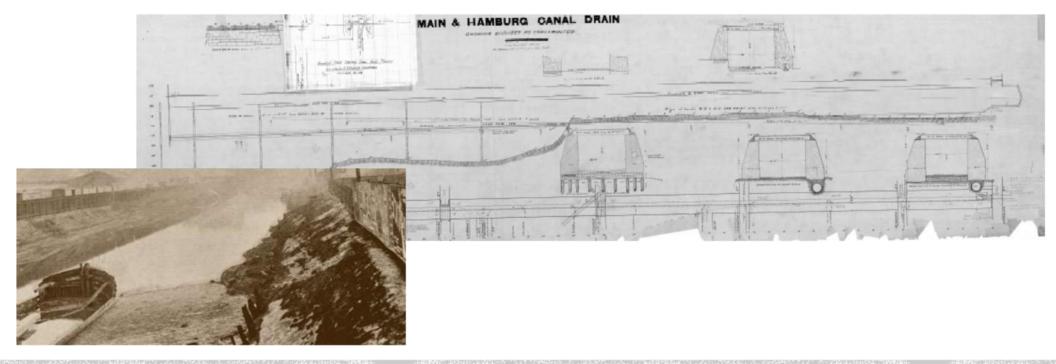




History: Burying of Waters 1900-1929

15

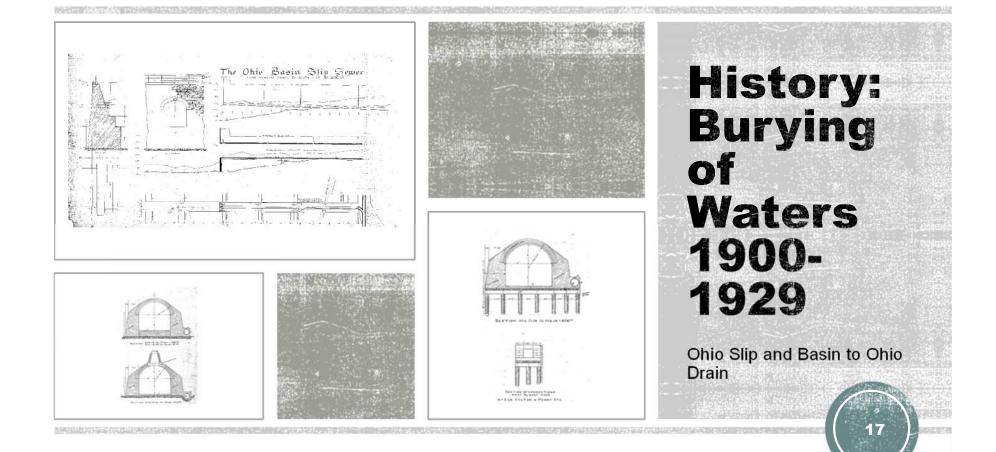
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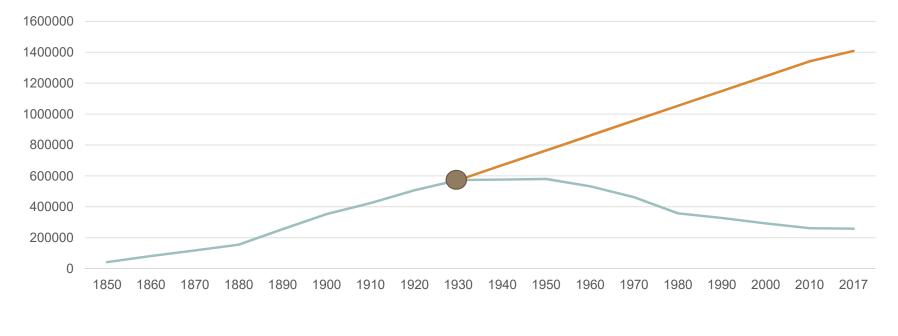


Quiz: 1865-1929

- What was the primary reason for the construction of the Swan Trunk?
 Flushing of canals
- Why were canals and other waterways buried/ covered?
 Heavily polluted and source of disease
- When were most of the sewers constructed in Buffalo?
 1880s-1890s



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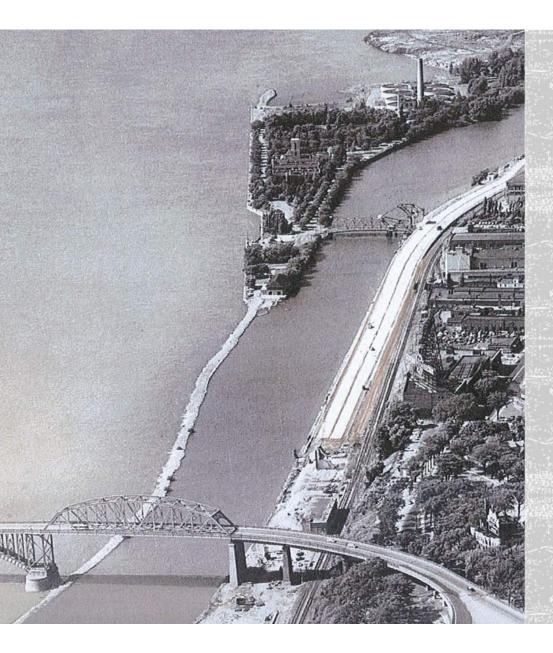
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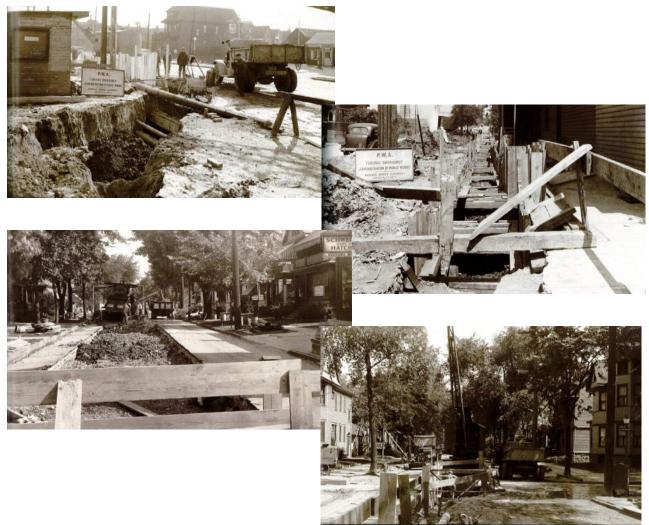
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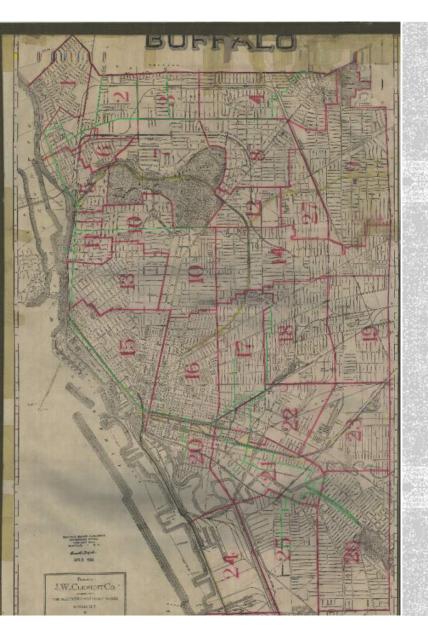
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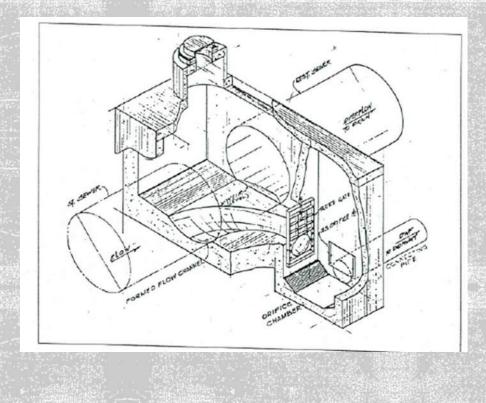


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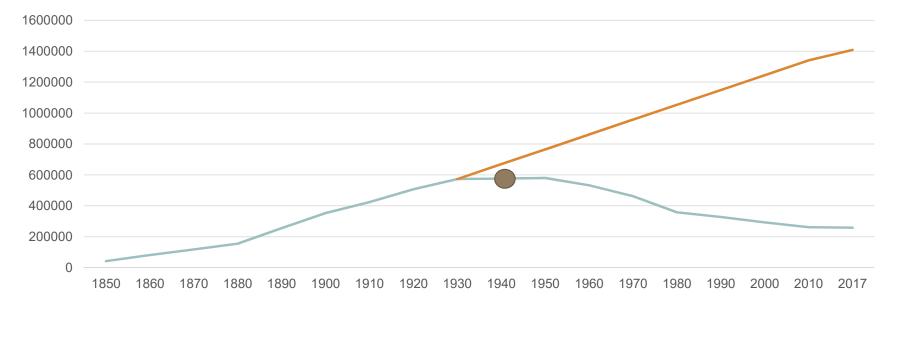


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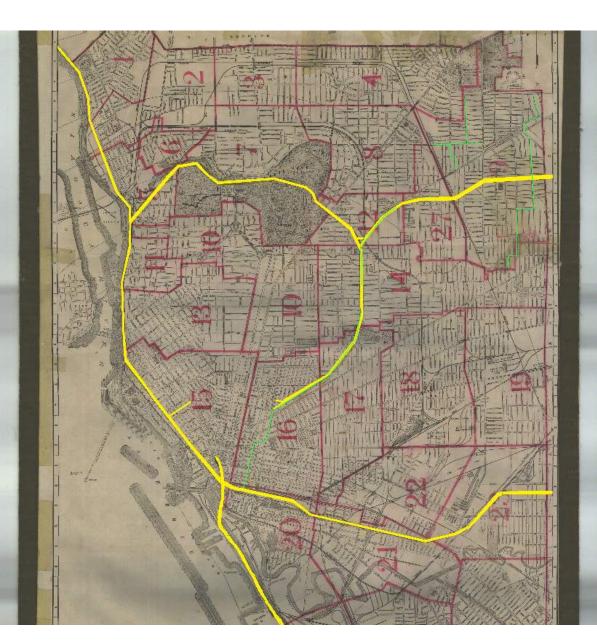




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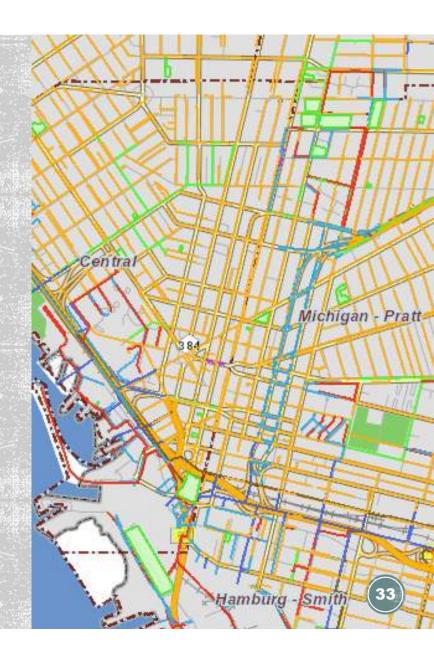
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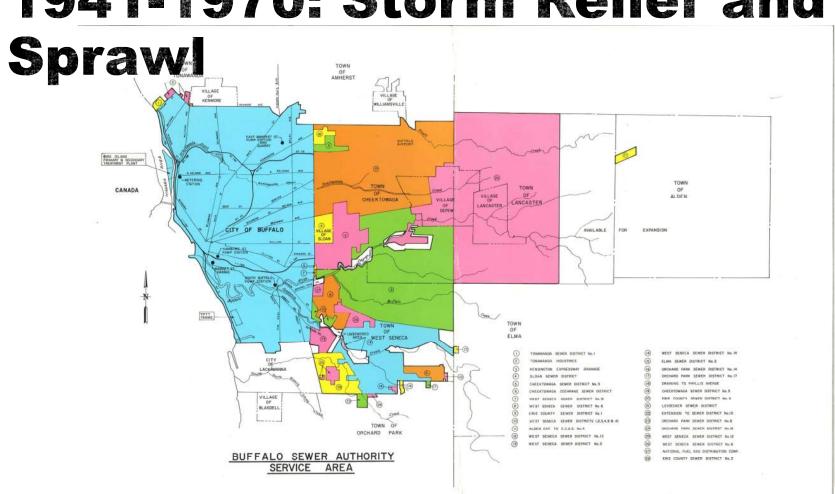


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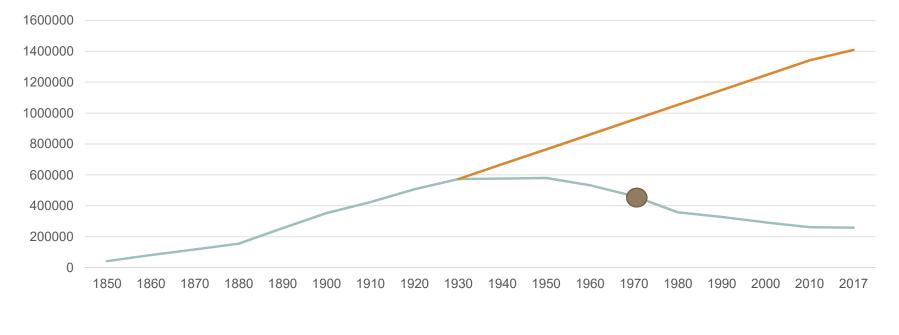
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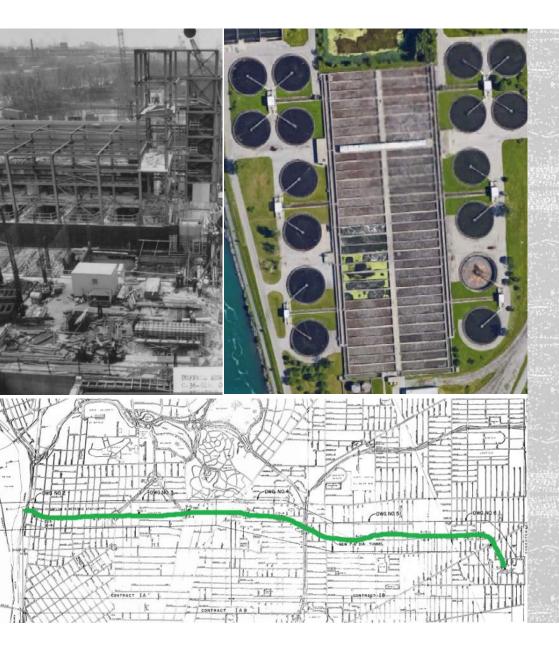


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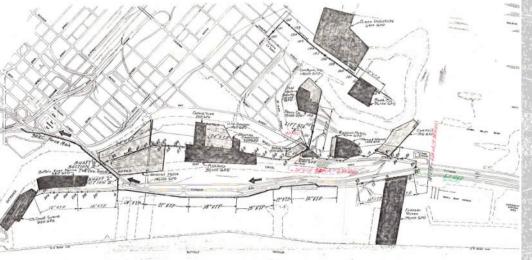
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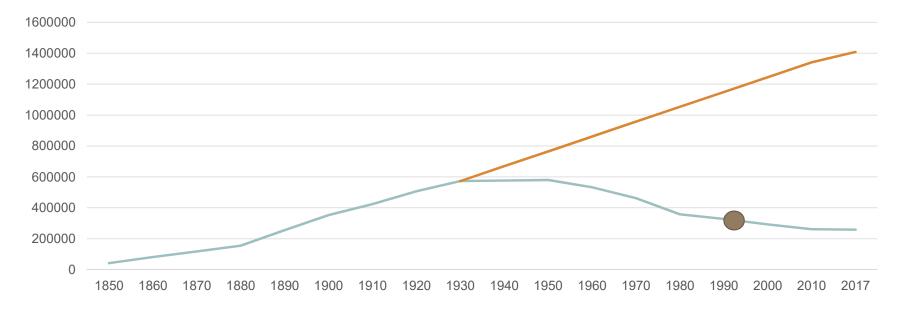




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History: CSO Abatement Phase I 1983-2010

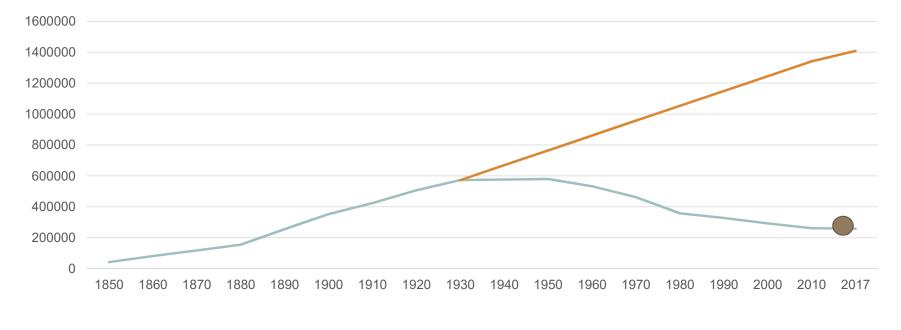


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- Emphasis on eliminating number of CSO locations

CSO Abatement Phase II LTCP 2010-Today



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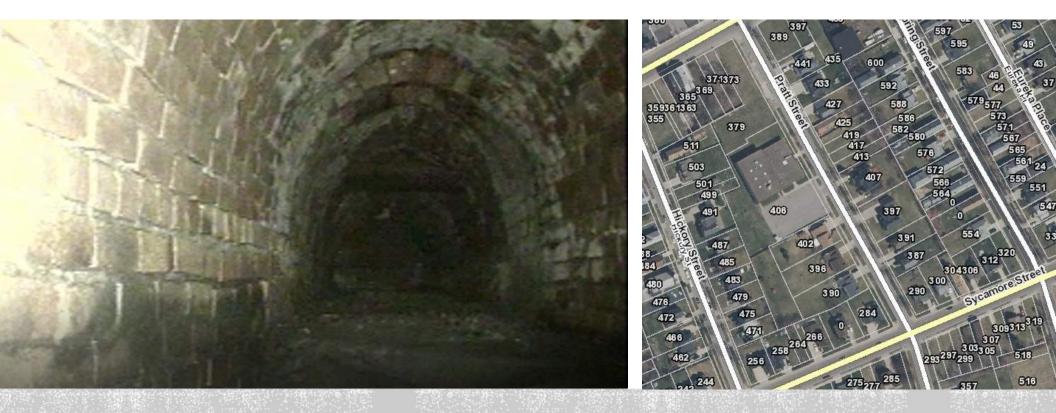


2010-Today: CSO Abatement Phase II

- Final Long-Term Control Plan (LTCP) approved March 18, 2014
- Decrease CSO activations
- \$380 Million
- Mix of gray
 - Water Resource Recovery Facility upgrades
 - Real Time Control "Smart Sewers"
 - Localized Sewer Separation
 - Underground detention tanks
- And green
 - Bioretention
 - Permeable pavement
 - Demolitions

Quiz: World War II to Today

- What impact did the construction of the NY-33 Kensington Expressway have on the sewer system?
 Cut off the Eastern part of the city (severed the Bird-Ferry Trunk)
 - Required additional storm sewers be constructed
- What was the main criteria for CSO abatement in the 1980s, 1990s, and 2000s?
 Elimination of CSO locations
- What is the main criteria for CSO abatement today?
 Elimination of CSO activations



Maintenance and Repairs: Pratt Street





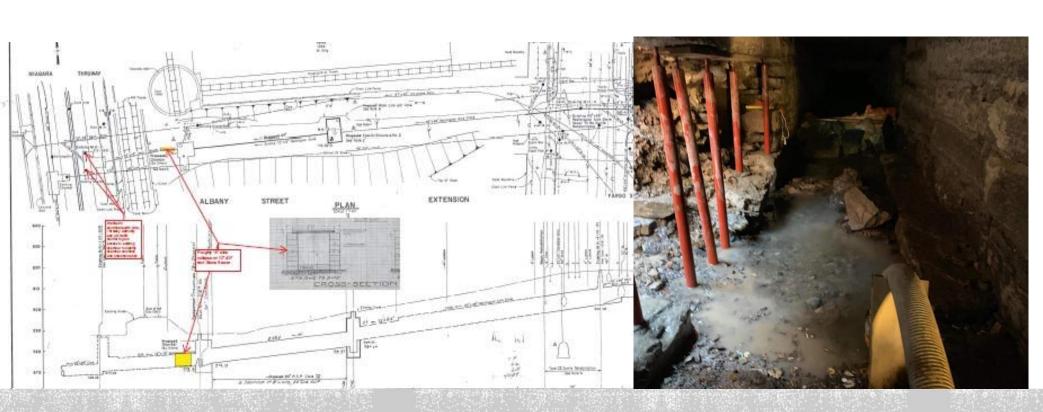


Maintenance and Repairs: North Oak Street

- Call from contractor
 - Cut for DOT project for electrical line
 - Street gave way
- Hole in 1851 sewer
- Once repair started kept running into issues
 - 150 feet of sewer replacement
 - Washed out bottom area further up Oak

Maintenance and Repairs: Albany Street





Maintenance and Repairs: Reactive to Preventative

- Observations
 - Part of Pratt Street sewer collapsed (pre-Civil War) in 2016
 - Part of North Oak Street sewer collapsed (pre-Civil War) in 2016
 - Parts of two other large diameter pre-Civil War sewers collapsed in 2017
 - Partial collapse of Albany Street overflow pipe (pre-Civil War) collapsed in 2018-19
 - Pre-Civil War sewers represent a very small portion of sewer system
- Conclusion: pre-Civil War sewers should be prioritized for inspection
- Problem: Buffalo Sewer's records for many pre-Civil War sewers are missing dates
- Solution: look at historical mapping for areas where older sewers would have been built and then cross-reference with sewers without dates



Maintenance and Repairs: Lost Waterways



Maintenance and Repairs: Lost Waterways

Modern Location

1870 Map

River is ~450 feet away



Buffalo Creek runs under location



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Maintenance and Repairs: 10 States Non-Compliance

- Most sewers had manholes installed in 1930s
- Still some sewers without manholes or 1000+ feet between manholes
- Tempting to just order manholes to be installed
- But....

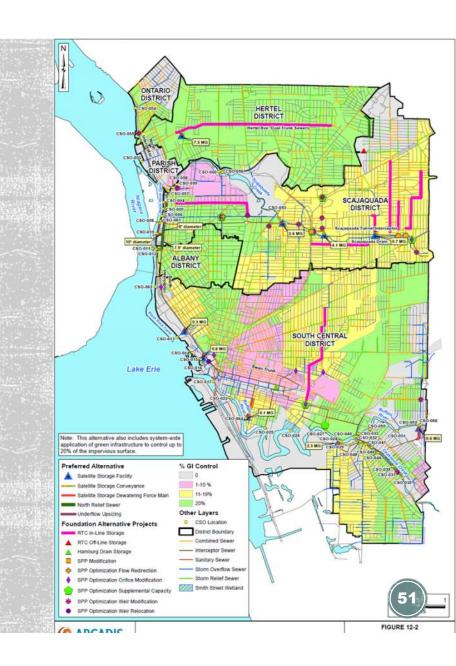


Quiz: Maintenance and Repairs

- What criteria can be searched for within GIS data to identify Antebellum Sewers? Stone or brick material 24"+ diameter round, rectangular, or egg-shaped cross-section Located along waterways as they existed prior to 1865
- What issues may be encountered with buried waterways?
 Subsidence and excessive drainage

Long Term Control Plan Projects: RTC Viability

- Vacancy on East Side
 - Vacant lots absorbing water that would have gone into combined system
 - Sanitary and industrial discharges reduced
- Kensington Expressway cutting off half of the flows
- Hertel sewers are deep to capture Cornelius Creek





Long Term Control Plan Projects: Bioretention and VTP



Bibliography

- Gasciogne, George B. "A Comprehensive Plan of Sewerage for Buffalo, New York Summary Report." May 1930.
- Greeley and Hansen. "Comprehensive Plan for Relief Sewers Summary Report." February 1941.
- Greeley and Hansen. "General Plan for Collecting and Treating the Sewage of Buffalo." March 1936.
- Kane, Patrick, Jr. "Buffalo, N.Y. is Doing Away with Public Nuisance Through the Construction of an Underground Drain." *The American City.* February 1923. https://www.wnyheritage.org/content/scajaquada_drian_project_-_1920s/index.html
- Robison, F. Luman. "Floods of August 7 in Buffalo, NY." *Floods of 1963 in the United States*. 1963.
- Rossi, Mary C. "The History of Sewage Treatment in the City of Buffalo, New York." 1995.
- Rotated 1894 City of Buffalo Atlas. http://www2.erie.gov/atlases/index.php?q=rotated-index-map.
- Steele, Oliver G. Esq. "Buffalo City Sewerage and Sanitary Science." Jan. 3, 1866.
- Waring, George E. "The Buffalo Trunk Sewer in Course of Construction." June 1884.

Questions?



54

LESSONS LEARNED IN DEVELOPING A F.O.G. PROGRAM

Lisa M. Yaeger, Esq., Intergovernmental Coordinator Rosaleen B. Nogle, PE, Assistant Principal Engineer

> BUFFALO SEWER AUTHORITY

WHAT IS F.O.G.?

2



- FOG: Fats, Oils, and Greases
- Byproduct of cooking
 - Animal products
 - Meat (such as bacon)
 - Fish
 - Dairy
 - Butter
 - Mayonnaise
 - Milk
 - Cooking oils
 - Canola
 - Vegetable

PROBLEM WITH F.O.G.

News + UK News + Thames Water PLC

80

54 SHARES

Enormous 'fatberg' the length of TWO BUSES found blocking sewers beneath Whitehall in London

UPDATED 12:44, 3 MOV 2014

WELP: SEWAGE 'FATBERGS' HAVE MADE IT TO SYDNEY

The congealed mass of mess - made up of food, wet wipes and other waste - clogged up a two-metre wide sewer pipe beneath

Public Works removes giant fatberg from sewer system





By Tony Bassett

12:38, 5 NOV 2014



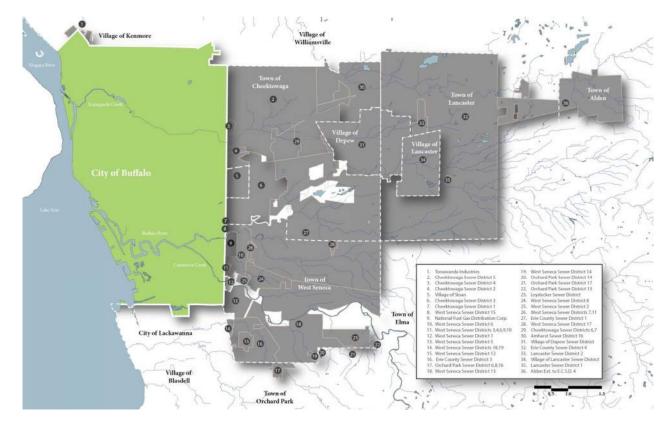
Officials hope Detroit-area fatburg offers teaching moment



By Associated Press | Posted: Wed 8:32 AM, Sep 12, 2018

NEWS

BUFFALO SEWER'S SERVICE AREA



HISTORICAL ISSUES WITH F.O.G.

- Known list of problem areas
- Not a general problem
- Urban renewal areas
 - High density housing
 - Separated sewers
 - Smaller diameters
 - Not getting storm flushing
 - Lower inclines
- Restaurants
 - Greasy foods
 - End of lines
 - Intermittent sewer usage

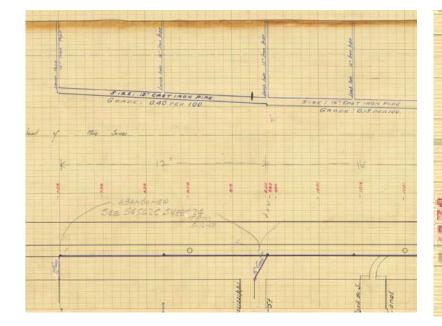


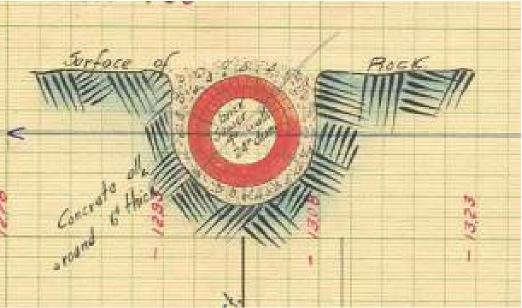
SATURDAY APRIL 1, 2017 3:00 PM

- Basement back-up reported in Canalside-Cobblestone area
- Hockey arena and cobblestone restaurants all in tributary area of blockage
- Combination vacuum-flusher truck dispatched to clear blockage
 - Unable to find clog
 - Removed greasy water creating holding capacity

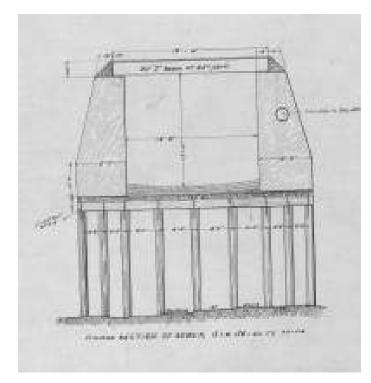


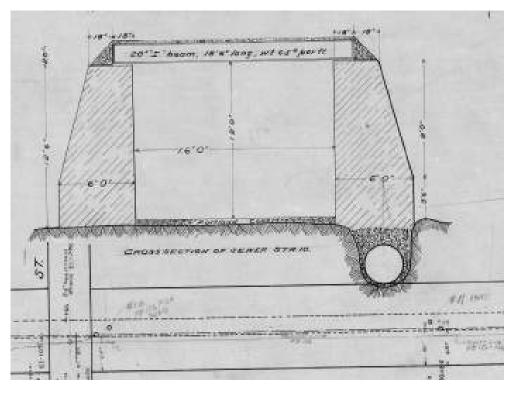
BLOCKED PIPE: HAMBURG DRAIN COMBINATION SEWER





BLOCKED PIPE: HAMBURG DRAIN COMBINATION SEWER ISSUE #1





BLOCKED PIPE: HAMBURG DRAIN COMBINATION SEWER ISSUE #2





REMOVAL OF BLOCKAGE

- Hockey season still ongoing
- Construction and cleaning contractors called in
- Round the clock staffing with internal staff
- By-pass pumping required to access blockage
- Extensive coordination with NYSDEC & NYSTA
- Full-service not restored until April 8, 2017
- Not something we ever wanted to repeat
 - Missing manholes
 - F.O.G.



EFFORTS SPRING 2017- FALL 2019

- Missing manholes
 - Identify possible issues
 - Coordinate and conduct manhole inspections
 - Televising from nearby manholes
- Upstream F.O.G. producers
 - Identified
 - Kitchen inspections
 - Buffalo Sewer Industrial Waste
 - City of Buffalo Plumbing
 - Enforcement letters to producers to require traps
 - Began enforcement against worst offender
- Added to existing workloads



SUMMER 2019



- Hiring of F.O.G. Administrator
- Tasked with:
 - Developing comprehensive F.O.G. management plan
 - Public outreach
 - Regulations
 - Enforcement policy
 - Implementation of enforcement
- Multi-pronged approach:
 - Address worst cases
 - Implement program city wide

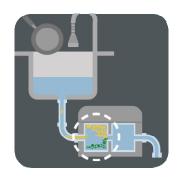
PUBLIC OUTREACH CAMPAIGN: WHAT CAN I DO?

- COOL IT, CAN IT, & TRASH IT!!!!
- Pour cooked Fats, Oils and Grease into a covered, disposable container and throw it into your garbage.
- Never pour Fats, Oils or Grease down sink drains or toilets.
- Soak up remaining Fats, Oils, and Grease with a paper towel and dispose with your food in a garbage can.









PUBLIC OUTREACH CAMPAIGN: WHAT CAN I DO?

- Before you wash dishes scrape food scraps from your plates, pots, and pans into your garbage can or compost container.
- Avoid using your garbage disposal.
- Use sink strainers to catch any remaining food waste while washing dishes.



PUBLIC OUTREACH CAMPAIGN: CERTIFIED F.O.G. FREE KITCHEN

- 1. Is there a tin can (or other container) under the sink or in the freezer that is used to collect liquid F.O.G.?
- 2.Are there paper towels used to absorb liquid F.O.G. and throw away in the garbage?
- 3. Are food scraps present in your garbage can with Fats, Oils and grease? For example lettuce with salad dressing?
- If "yes" to all three? Then your kitchen is CERTIFIED F.O.G. Free Kitchen!!!!

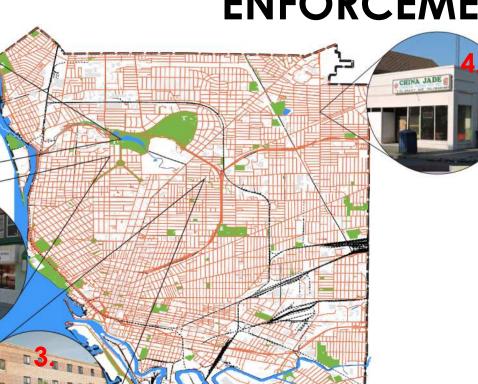
ENFORCEMENT INSPECTIONS

The Terrace
 Lincoln Parkway

India Gate
 1116 Elmwood Avenue

Humboldt House
 Hager Street

4. China Jade 3162 Bailey Avenue







THE TERRACE

- Downstream blockage
- Usage
 - 100 seat restaurant
 - 150 seat banquet facility
 - 60 employees
- F.O.G. Management
 - No external trap
 - 5 gallon under sink trap
 - Degreaser
 - Clean trap twice a month?

INDIA GATE



- Mr. Bath's restaurant is immaculate
- Neighbor assumed bucket was full of grease
- Bucket contained wash water
- Grease back-ups due to another restaurant
 - Most well-known
 - Longest operating
 - Two back-ups in 30 days
- Lessons: listen & investigate





HUMBOLDT HOUSE

- Original visit
 - Five months with new traps
 - New traps were never cleaned
- Revisit
 - Logs: cleaning every 2 weeks
 - Traps still not good enough...
 - Need to be cleaned <u>at</u> <u>least</u> weekly

CHINA JADE

- October 30, 2019
 - Language barrier
 - Not cleaning the grease trap!
 - "We skim the top"
- Today: Taking out all the water from the trap!



RESTAURANTS IN BUFFALO

		City Hall Room 3 -4078 / (716) 851-6 Type of Ent	583 Fax (71		
Sole Pr	oprietor 🗆	Corporation	Partnership	Limited Liability Company	
□ Restaurant 1-200 sests □ 201-400 sents □ 400+ seats □ Yes □ No Selling alcoho	\$275.00 \$350.00	Restaurant Dane Floor Show Live Music Mechanical COMMON COUNCI	\$450.00 \$250.00 \$175.00	Restaurant Take Out \$ 125.00 (with Food Store NYS Ags & Micts License Required) Food Store \$250.00 COMMON COUNCIL REQUIRED	
				Caterer \$ 100.00	
Certificate of Inspection \$100.00 (Public Assembly) Restaurant 50+ seats		Public Dance (based on sq ft) COMMON COUNCIL REQUIRED		□ Meat Fish Poultry \$ 165.00 (with Food Store NYS Ags & Mkts License Required)	
Coin Control Amusement games per game S		GoGo Dancing COMMON COUNCI		□ Bakery 0-25 employees \$220.00 26 + employees \$350.00	
	\$55.00	□ Bowling Alley pe # lanes		Skating Rink \$250.00 COMMON COUNCIL REQUIRED	
Music mechanical Music live, no dancing	\$60.00 \$75.00	Arcade # games per game \$55.00		Billiard Parlor per table S35.00 # tables COMMON COUNCIL REQUIRED	
News Stand	\$175.00	COMMON COUNCI	REQUIRED	Contraction of the second s	
Corporation Name				Business Phone ()	
				Business Fax ()	
Business Address (10 PC Bor					
Mailing Address (if differen	nf)				
NYS Tax ID #	Busin	tess Website		E-Mail	
Owner(s)/ Principal Partners Applicant (ass, fiist)				Home Phone	
Home Address: (P0 Box not Date of birth	eceptable) Plac	ce of Birth			
o-Applicant (last, first)			Home Phone		
Home Address: (PO How ort- Date of birth	acceptable) Play	ce of Birth		-	

and conditions to the license or timely abatement of any nuisance activity at or associated with the husiness.

For office use only Subscribed and sworn before me this day of 20	As an authorized agent of the entity identified above, I certify the information on this form is true, correct, complete and current to the best of my knowledge and belief.		
Commissioner of Deeds City of Buffalo	Print Name		
	Signature nust be present at time of all in-	Date	
Applicant	nust be present at time of all ine	discroute.	

- 547 sit down restaurants
- 280 take out restaurants
- Interdepartmental cooperation yields big results for F.O.G.

RESTAURANTS IN BUFFALO Type of Entity

Type of Energy				
□ Sole Propr	ietor 🛛	Corporation Dartnership	Limited Liability Company	
□ Restaurant 1-200 seats □ 201-400 seats □ 400+ seats	\$200.00 \$275.00 \$350.00	□ Restaurant Dance□ Floor Show\$450.00□ Live Music\$250.00□ Live function\$175.00	□ Restaurant Take Out \$ 125.00 (with Food Store NYS Ags & Mkts License Required)	
⊥ Yes ⊥ No Selling alcoholic b		Mechanical \$175.00 COMMON COUNCIL REQUIRED	□ Food Store \$250.00 COMMON COUNCIL REQUIRED	
Certificate of Inspection (Public Assembly) Restaurant 50+ s	\$100.00 eats	Public Dance (based on sq ft) COMMON COUNCIL REQUIRED	□ Caterer \$ 100.00 □ Meat Fish Poultry \$ 165.00 (with Food Store NYS Ags & Mkts License Required)	
□ Coin Control Amusement #games per game	\$55.00	 □ GoGo Dancing \$500.00 COMMON COUNCIL REQUIRED □ Bowling Alley per lane \$35.00 # lanes 	 □ Bakery 0-25 employees \$220.00 26 + employees \$350.00 □ Skating Rink \$250.00 COMMON COUNCIL REQUIRED 	
 Music mechanical Music live, no dancing 	\$60.00 \$75.00	□ Arcade # games per game \$55.00 COMMON COUNCIL REQUIRED	 Billiard Parlor per table \$35.00 # tables COMMON COUNCIL REQUIRED 	
News Stand	\$175.00			





Attachment D to the Semi-Annual Status Report: September 2020

Certificates of Acceptance and Occupancy

ITEM NO. 13

CONTRACTNO. 81900013

CERTIFICATE OF ACCEPTANCE AND OCCUPANCY

Hertel at Deer Real Time Control Project

BID: \$3,065,778.00

CONTRACTOR: Pinto Construction Services, Inc. 132 Dingens Street Buffalo, NY 14206

WHEREAS:

PROJECT:

The Principal Sanitary Engineer and staff have certified that the Contractor completed the work in accordance with the plans and specifications on February 13, 2020; and

WHEREAS

In Item No. 12, on May 6, 2020, the contract value was decreased by \$46,430.56.

NOW THEREFORE BEITRESOLVED:

That the Board of the Buffalo Sewer Authority hereby finds and determines that:

a. The work to be performed under the terms of the Contract has been complete and is accepted;

b. The date of entrance and occupancy be fixed as of May 6, 2020;

c. The maintenance period commence on May 6, 2020;

d. The final cost of the Contract is \$3,019,347.44.

MOTION 1	TO <u>APPROVE</u>		
MADE BY	Y MR. ROOSEVELT		
2 ND BY	MS. PETRUCCI		
AYES	3	NOES	0

Board Meeting of May 6, 2020

ITEM NO. 18

CONTRACTNO. 81900008

CERTIFICATE OF ACCEPTANCE AND OCCUPANCY

PROJECT: North Bailey Real Time Control Project

- BID: \$2,031,250.00
- CONTRACTOR: Nichols, Long & Moore Construction 770 Riverview Blvd. Tonawanda, NY 14150

WHEREAS: The Principal Sanitary Engineer and staff have certified that the Contractor completed the work in accordance with the plans and specification on May 1, 2020; and

WHEREAS In Item No. 17, at the Board Meeting of May 27, 2020, the contract value was decreased by \$135,328.00.

NOW THEREFORE BE IT RESOLVED:

That the Board of the Buffalo Sewer Authority hereby finds and determines that:

- a. The work to be performed under the terms of the Contract has been complete and is accepted;
- b. The date of entrance and occupancy be fixed as of May 1, 2020;
- c. The maintenance period commence on May 1, 2020;
- d. The final cost of the Contract is \$1,895,922.00.

MOTION TO	APPROVE			
MADE BY	MS. PETRUCCI			
2 ND BY	MR. ROOSEVELT			
AYES	3	NOES	0	

Board Meeting of May 27, 2020