
Preliminary Engineering Report

Inflow and Infiltration Reduction Improvements

Prepared for

Town of Owasco

2 Bristol Avenue

Auburn, New York



June 2021

Barton & Loguidice

Inflow and Infiltration Reduction Improvements
Town of Owasco, Cayuga County

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Prepared For:

Town of Owasco
2 Bristol Avenue
Auburn, New York 13021

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TABLE OF CONTENTS

Section	Page
Executive Summary	iv
ABBREVIATIONS.....	v
1.0 Introduction	1
1.1. Authorization	1
1.2. Background	1
1.3. Scope of Services.....	1
2.0 Project Background & History	3
2.1. Site Information	3
2.1.1. Location.....	3
2.1.2. Geologic Conditions.....	3
2.1.3. Environmental Resources.....	3
2.1.4. Environmental Justice	3
2.1.5. Floodplain Considerations.....	3
2.1.6. Impaired Waterbodies	3
2.2. Ownership and Service Area.....	4
2.2.1. Facility Ownership	4
2.2.2. Presence of Outside Users	4
2.2.3. Required Agreements	4
2.2.4. Industrial Users.....	4
2.2.5. Population Trends and Projected Growth.....	4
2.2.6. Equivalent Dwelling Units (EDUs)	5
2.3. Financial Status	5
2.3.1. Source of Income	5
2.3.2. City of Auburn Treatment Charges	6
2.3.3. Status of Existing Debt	6
2.3.4. Required Reserve Accounts.....	7
3.0 Existing Facilities	8
3.1. Overview of Sewer District No. 1 and Existing Mapping	8
3.2. Permit Conditions and Effluent Discharge Limits.....	8
3.3. History of Sanitary Sewer Overflows.....	9
3.4. Historical I-I Investigations, Reduction Improvements, and Expansions.....	9
3.5. Historical Flow Data Review.....	11
3.6. Residential Building Inspections.....	13
3.7. Manhole Inspections	13
3.8. Flow Monitoring.....	14
3.9. Wet-Weather Flow Observations.....	16
3.10. Smoke Testing.....	17
3.11. Closed-Circuit Televising (CCTV) Observations	18
4.0 SUMMARY OF EXISTING CONDITIONS AND NEED FOR A CAPITAL PROJECT	19

5.0 Alternative Analysis 21

5.1. No Action 21

5.2. Alternative No. 1 - Sewer Rehabilitation and Public Side I-I Reduction 21

5.2.1. Manhole Rehabilitation..... 21

26

5.2.2. Sewer Mainline Rehabilitation Methods..... 28

5.2.3. Additional I-I Reduction Improvements..... 31

5.2.4. Green Infrastructure 31

5.3. Alternative No. 2 - Sewer Rehabilitation and Replacement focused on Private Side Sewer Separation 31

5.3.1. General Description of Alternative No. 2 Design..... 32

5.3.2. Homeowner Participation and Compliance Strategy..... 34

5.3.3. A “Phased” Implementation Approach..... 35

5.3.4. Green Infrastructure 36

6.0 Summary & Alternative Comparison 37

6.1. Feasible Alternatives Summary..... 37

6.2. Non-Monetary Factors 37

6.3. Alternative Capital Costs..... 39

6.4. Alternative Operation and Maintenance Costs 39

6.5. Alternative Short-Lived Asset Replacement Costs 40

6.6. Life-Cycle Cost Analysis..... 40

7.0 Recommended Alternative 41

7.1. Basis of Selection..... 41

8.0 project financing 43

8.1. Grant Funding and Project Financing Opportunities..... 43

8.1.1. Plausible Funding Scenarios 44

8.2. Annual User Costs 44

9.0 Environmental Review 46

9.1. Wetlands and Surface Waters 46

9.2. Threatened and Endangered Species..... 46

9.3. Cultural and Historic Resources 46

9.4. Environmental Permit Summary..... 46

9.5. Smart Growth..... 47

10.0 Recommendations for Project Implementation 48

11.0 Conclusion..... 49

12.0 REFERENCES 50

Tables

Table 2-1: Population Data Taken from U.S. Census 4

Table 2-2: EDU Summary (2021) 5

Table 2-3: Town of Owasco Debt Obligations..... 6
 Table 2-4: Reserve Account Balance 7
 Table 3-1: Average Daily Flows per EDU (2018-2020) 11
 Graph 3-1a: Owasco Sewer Districts Average Daily Flows per EDU (2018-2020) 11
 Graph 3-1b: Owasco Sewer District No. 1 Average Daily Flows (2018-2020)..... 12
 Table 3-2: Sewer District No. 1 - Flow Summary Table (2018-2020)..... 12
 Table 3-3 Manhole Inspection Summary 14
 Table 5-1: Approximate Inflow Contributions from Manhole Covers* 24
 Table 6-1: Estimate of Probable Capital Cost..... 39
 Table 6-2: Life Cycle Cost Analysis..... 40
 Table 7-1: Comparison of Alternatives Table..... 42
 Table 8-1: Summary of Impacts on Annual User Cost 45

Figures

- Figure 1: Avenues Area Existing Collection System
- Figure 2: Sewer District No. 1 Existing Collection System
- Figure 3: Sanitary System Process Flow Diagram
- Figure 4: Home Inspection Summary
- Figure 5: Wet Weather/Night-time Flow Observations
- Figure 6: Improvements Alternative No. 1
- Figure 7: Improvements Alternative No. 2

Appendices

- Appendix A Environmental Resource Mapping
- Appendix B FEMA Flood Zone Map
- Appendix C NYSDEC Sanitary Sewer Overflow Reports
- Appendix D Summary of Manhole Inspections
- Appendix E ECHO Flow Monitoring Data
- Appendix F Smoke Testing Observations
- Appendix G CCTV Reports
- Appendix H Manhole Rehabilitation Recommendation Table
- Appendix I Estimate of Probable Project Cost
- Appendix J Project Financing
- Appendix K Smart Growth Assessment Form
- Appendix L Engineering Report Certification

EXECUTIVE SUMMARY

The Town of Owasco owns and operates a sanitary sewer collection system that conveys wastewater to the City of Auburn for sewer treatment. Large portions of the Sewer District No. 1 collection system, originally constructed in 1939, are antiquated and are in need of upgrade. The Town of Owasco conveys sewage to the City of Auburn and bills the Town based on flow. The treatment of “clean” stormwater is believed to cost the Town of Owasco a significant amount each year. During heavy rain events, the Town often experiences sanitary sewer overflows along their main sewer interceptor; which results in frequent residential complaints.

This study reviewed historical flow data which determined that most of Town’s inflow and infiltration (I-I) issues are located in Sewer District No. 1 (SD1). It is believed that I-I from SD1 costs the Town of Owasco between \$320,000 and \$451,000 in treatment charges during a typical year. SD1 experiences significant seasonal flow fluctuation, indicative of significant private side I-I in the form of sump pump and footing drain connections. Based the impacts of previous projects, it is believed that public side improvements, without removing floor drain and sump pump connections, are not likely to significantly reduce yearly I-I treatment costs. This Preliminary Engineering Report (PER) summarizes various sewer investigation programs that were completed and outlines improvement alternatives for the “Avenues” area of SD1.

It is recommended for the Town to proceed with a capital improvement alternative that will not only address the upgrade of public infrastructure and reduce public I-I, but also provide infrastructure to allow for private side I-I reduction. This alternative would be inclusive of mostly replacing mainline sewer infrastructure and manholes to extend their useful lives another 75 to 100 years. Dedicated stormwater infrastructure would be constructed to convey flows from basement floor drains, foundation drains, and gutter down spouts in order to eliminate these I-I sources long term. Internal residential home inspections would be conducted to ensure sanitary flow is separated from stormwater flow at each house. This would require the Town to work with private homeowners to mandate lateral separation.

The estimated probable project cost of the recommended capital improvement project is \$25,000,000 (in 2023 dollars). Based on the large capital size of this project, it is recommended to test the I-I reduction effectiveness of this alternative an initial Phase (Phase 1) with an estimated capital improvement project of \$3,199,000 (in 2023 dollars) prior to proceeding with the entire project. The additional annual charge to implement Phase 1 of the proposed capital project is estimated to be between \$3.75/EDU and \$30.50/EDU per quarter depending on the final funding package.

ABBREVIATIONS

AOR	Actual Oxygen Rate
BMP	Best Management Practice
BOD ₅	Biochemical Oxygen Demand (5-day)
C	Celsius
cfs	Cubic feet per second
cfu	Colony-forming unit
COE	United States Army Corps of Engineers
CWSRF	Clean Water State Revolving Fund
DEC	New York State Department of Environmental Conservation
DMR	Discharge Monitoring Report
DO	Dissolved oxygen
DOT	New York State Department of Transportation
ECL	Environmental Conservation Law
EDU	Equivalent Dwelling Unit
EFC	New York State Environmental Facilities Corporation
EPA	United States Environmental Protection Agency
F	Fahrenheit
fps	Feet per second
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
gpd	Gallons per day
GML	General Municipal Law
gpm	Gallons per minute
MHI	Median Household Income
MGD	Million gallons per day
MLSS	Mixed liquor suspended solids
NEIWPCC	New England Interstate Water Pollution Control Commission
P	Phosphorus
PER	Preliminary Engineering Report
ppm	parts per million
psig	Pounds per square inch (gauge)
SBR	Sequencing Batch Reactor
scfm	Standard cubic feet per minute (68 degrees F and 1 atmosphere)
SEQR	State Environmental Quality Review
SOR	Standard oxygen rate
SPDES	State Pollutant Discharge Elimination System

ABBREVIATIONS (cont'd)

SRT	Solids retention time
SVI	Sludge volume index
SWPPP	Storm Water Pollution Prevention Plan
TDH	Total dynamic head
TKN	Total Kjeldahl Nitrogen
TMDL	Total Maximum Daily Load
TSS	Total suspended solids
USFWS	United States Fish and Wildlife Service
WLA	Waste Load Allocation
WWTP	Wastewater treatment plant

1.0 INTRODUCTION

1.1. Authorization

The Town of Owasco retained the services of Barton & Loguidice, D.P.C. (B&L) to prepare a Preliminary Engineering Report (PER) to investigate inflow and infiltration (I-I) present within the gravity collection system serving the “Avenues” area of Town’s Sewer District No. 1. Based on previous sewer rehabilitation and wet-weather flow management projects completed by the Town during the past two (2) decades, it is believed that the majority of the I-I volume enters the system in the “Avenues” area of Sewer District No. 1. This PER describes the investigation efforts and findings, and alternatives to reduce the volume of clean water, or extraneous flow entering the system.

1.2. Background

The Town owns and operates a sanitary sewer collection system that conveys wastewater to the City of Auburn for treatment. The City of Auburn bills the Town of Owasco based on metered sanitary flow. Therefore, the Town is billed for treatment of “clean” extraneous flow in the form of inflow and infiltration, which costs the Town’s sewer district customers an average of \$385,000 each year. During heavy precipitation events, the Town frequently experiences sanitary sewer overflows (SSOs) along the Owasco Interceptor, leading to residential complaints and reports to the NYSDEC.

Over the years, Owasco has completed various I-I reduction and wet-weather management capital improvement projects. Based on these previous projects and investigations completed by Town personnel, it is believed that the root of this problem is located in the “Avenues” area of Sewer District No. 1, generally depicted in Figure 1. Basement inspections completed in this area have documented private inflow sources connected to the sanitary sewer including roof gutters, foundation drains, and sump pumps.

This study and PER includes an asset condition assessment of a portion of the Town’s collection system within Sewer District No. 1, and an evaluation of alternative asset rehabilitation methods for extending the useful service life of the existing assets, and for removing/reducing extraneous flows within the collection system to reduce annual City treatment costs. The PER outlines a recommended capital improvement plan based on evaluation of capital, operation and maintenance, and life-cycle costs, and presents a preliminary plan of finance for financing the recommended CIP.

1.3. Scope of Services

The scope of services completed in support of this PER is as follows:

- Review Current Collection System Mapping and Flow Data
- Manhole Inspections
- Flow Monitoring
- Wet-Weather Flow Observations
- Smoke Testing

- Sewer Mainline Cleaning and Televising Video Review
- Development of a Preliminary Engineering Report

2.0 PROJECT BACKGROUND & HISTORY

2.1. Site Information

2.1.1. Location

The Town of Owasco is located in east central Cayuga County on the northeast side of Owasco Lake. Neighboring communities are the City of Auburn to the northwest, the Town of Sennett to the north, and the Town of Niles to the south. Owasco Lake and the Owasco Outlet are located on the western border of the Town. A project location map of the "Avenues" area and map of the entire Sewer District No. 1 are included as Figures 1 and 2, respectively.

2.1.2. Geologic Conditions

Geologic conditions, including a topographic map are included in Appendix A. A USDA Web Soil Survey of the project area was completed to determine soil conditions and depth to the water table. Soil conditions within the Town are generally characterized by silty loam. Complete results of the Web Soil Survey are included in Appendix A.

2.1.3. Environmental Resources

Preliminary screening through the New York State Department of Environmental Conservation Environmental Resource Mapper has identified that the project area is not located within the vicinity of natural communities or rare plant and animal habitats. The U.S. Fish and Wildlife Survey National Wetlands Inventory indicates portions of the project area are located within a freshwater emergent wetland and freshwater forested/shrub wetland. A copy of the Environmental Resource Map and National Wetlands Inventory Map is included in Appendix A.

2.1.4. Environmental Justice

According to the DEC's *Maps & Geospatial Information System (GIS) Tools for Environmental Justice*, there are no environmental justice areas located in the project area.

2.1.5. Floodplain Considerations

Portions of the Town of Owasco are located within FEMA mapped flood zones. These areas are generally located along the Owasco Outlet and the northeastern corner of Sewer District No. 1. A copy of the FEMA Flood Zone Map is included in Appendix B.

2.1.6. Impaired Waterbodies

A major driver for originally sewerage many portions of the Town of Owasco was its location along Owasco Lake and the Owasco Outlet. Owasco Lake is listed as an impaired waterbody by NYSDEC with suspected impairment sources of sanitary waste and municipal discharges. The Owasco Outlet is listed as having minor impairment impacts with the main suspected source being sewer overflows and the Auburn WWTP.

The Town of Owasco sanitary system discharges to the Auburn WWTP and has had known sewer overflows in the immediate vicinity to the Owasco Outlet. A main driver of this study is to protect the water quality of Owasco Lake and the Owasco Outlet. DEC Fact Sheets for both waterbodies are included in Appendix A.

2.2. Ownership and Service Area

2.2.1. Facility Ownership

The existing sanitary collection system is owned and operated by the Town of Owasco. Sanitary sewage is conveyed to the City of Auburn for treatment.

2.2.2. Presence of Outside Users

The Town of Owasco accepts sanitary flow from 11 outside properties located in the Town of Niles Sewer District No.1. These properties, located immediately south of the Owasco town line along Owasco Lake, discharge into the Owasco Sewer District No. 3 low-pressure collection system which, in turn, discharges into Sewer District No.2 for continued conveyance north to Sewer District No. 1.

2.2.3. Required Agreements

There is an existing agreement in place between the Town of Owasco and the City of Auburn for the provision of wastewater treatment.

2.2.4. Industrial Users

There are currently no industrial users located in the project area. It is not anticipated that there are any in the future due to the area already being fully developed and zoned residential.

2.2.5. Population Trends and Projected Growth

Census and American Community Survey data indicates that the Town of Owasco population has fluctuated between 3,490 and 3,793 between 1990 and 2017. Currently, the Town of Owasco is estimated to have a population of about 3,700 people. Areas located within the Town of Owasco sewer systems are heavily developed and minimal growth (<5%) should be expected. It should be noted that sewer extensions to the south of Owasco in surrounding towns could potentially occur.

Table 2-1: Population Data Taken from U.S. Census

1990 Population	2000 Population	2010 Population	2014 Population	2017 Population	30-Year Projected Growth
3,490	3,760	3,793	3,761	3,696	10.0%

2.2.6. Equivalent Dwelling Units (EDUs)

An equivalent dwelling unit, or EDU, is the unit of measure by which a user is charged for sewer service, wherein a “typical” single-family household is equivalent to one (1) EDU. Based on the current EDU assessment structure, the Town of Owasco has approximately 1,382 EDUs as shown in the table below.

Table 2-2: EDU Summary (2021)

Location	Number of EDUs
Sewer District No. 1	933
Sewer District No. 2	254
Sewer District No. 3	184
Niles District No. 1 (outside user)	11

2.3. Financial Status

The Town of Owasco had a 2010 Census median household income (MHI) of \$67,768; a 2017 American Community Survey MHI of \$85,430; a 2017 families below poverty rate of 2.6%; and a 17.73% low-to-moderate income percentage.

2.3.1. Source of Income

The Town generates income from quarterly sewer bills issued to all sewer users. The current rate schedule is defined below:

Sewer District No. 1 Rates

- Avg. Capital Debt Charge (Ad Valorem Tax) – \$127.86
- Avg. O&M Charge (Ad Valorem Tax) – \$439.57
- Sewer Use Charge (Billed Quarterly)
 - Base Rate (0-7,500 gallons): \$50.25
 - Over 7,500 Gallons: \$6.70/1,000 Gallons
- Estimated Average Annual Sewer Rate: \$810

Sewer District No. 2 Rates

- Avg. Capital Debt Charge (Ad Valorem Tax) – \$348.53
- Avg. O&M Charge (Ad Valorem Tax) – \$116.05
- Grinder Pump Purchase/Replacement (Ad Valorem Tax) – \$218.14
 - Note Only Billed to certain parcels
- Sewer Use Charge (Billed Quarterly)
 - Base Rate (0-7,500 gallons): \$50.25
 - Over 7,500 Gallons: \$6.70/1,000 Gallons
- Estimated Average Annual Sewer Rate: \$770

Sewer District No. 3 Rates

- Avg. Capital Debt Charge (Ad Valorem Tax) – \$611.79
- Avg. O&M Charge (Ad Valorem Tax) – \$180.45
- Grinder Pump Purchase/Replacement (Ad Valorem Tax) – \$150.00
 - Note Only Billed to certain parcels
- Sewer Use Charge (Billed Quarterly)
 - Base Rate (0-7,500 gallons): \$45.00
 - Over 7500 Gallons: \$6.00/1,000 Gallons
- Estimated Average Annual Sewer Rate: \$1,160

2.3.2. City of Auburn Treatment Charges

The City of Auburn currently charges the Town of Owasco \$2.85/100 CF (\$3.81/1,000 gallons) of metered sewage flow for treatment. The total cost of treatment can vary significantly as the flow Owasco sends to Auburn varies from year-to-year due to significant I-I. In 2019, Owasco paid Auburn approximately \$750,000 at a rate of \$2.78/100 CF. However in 2020, when the rate increased to \$2.85/100 CF, Owasco only paid Auburn approximately \$640,000 in treatment charges. It is believed that more I-I entered the Owasco system in 2019 when compared to 2020.

2.3.3. Status of Existing Debt

The Town of Owasco Sewer District's outstanding debt obligations are summarized in the table below.

Table 2-3: Town of Owasco Debt Obligations

Project Name/Bond Description	Principal Balance (as of 12/31/2020)	Expires	Annual Principal Payment	Interest Rate
Sewer District 1 - Rehab Project	\$ 648,000	2033	\$40,000 - 60,000	4.390 - 4.612%
Sewer District 1 - Melrose/Havens	\$ 665,000	2041	\$25,000 - 40,000	2.075 -4.269%
Sewer District 1 - Improvements	\$ 1,065,000	2047	\$30,000 - 50,000	1.181 -3.976%
Sewer District 2 - Rehab Project	\$ 162,000	2033	\$10,000 - 15,000	4.390 - 4.612%
Sewer District 2 - Construction	\$ 630,000	2032	\$45,000 - 60,000	4.631 -4.901%
Sewer District 2 - Improvements	\$ 395,000	2047	\$10,000 - 15,000	1.181 -3.976%
Sewer District 3 - Construction	\$ 3,150,168	2048	\$112,600	0%

2.3.4. Required Reserve Accounts

Each sewer district in the Town of Owasco typically collects enough sewer rents to fund a sewer reserve account. Yearly contributions to sewer district reserve accounts tend to vary from year to year. It should be noted that the SD2 and SD3 reserve accounts were specifically set up to fund grinder pump replacement only. The current reserve account balances are summarized in the table below as of the first quarter in 2021:

Table 2-4: Reserve Account Balance

District	Approximate Reserve Account Balance
Sewer District No. 1	\$536,471
Sewer District No. 2	\$211,718
Sewer District No. 3	\$100,156

3.0 EXISTING FACILITIES

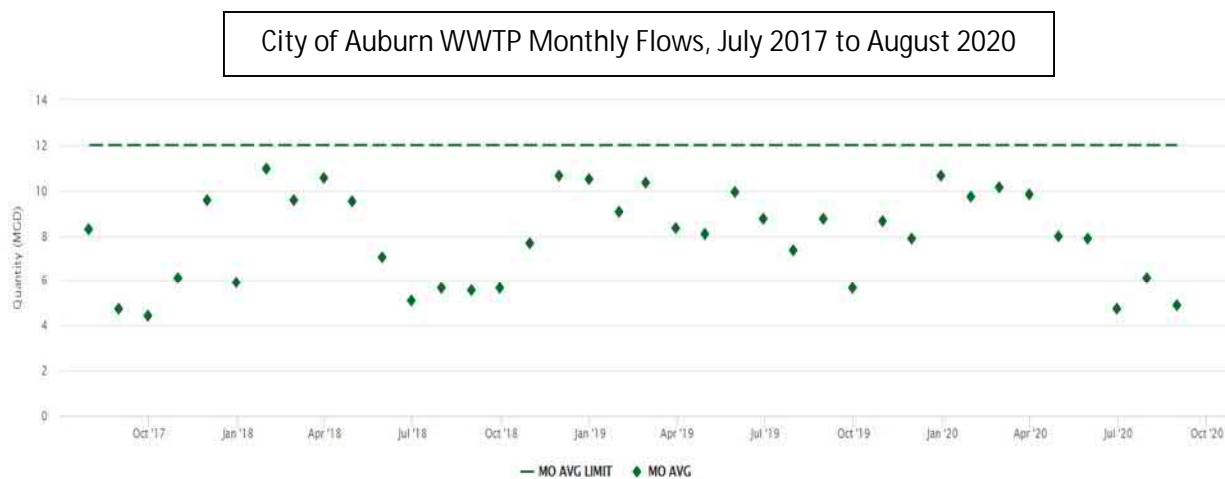
3.1. Overview of Sewer District No. 1 and Existing Mapping

This report focuses on Sewer District No. 1 and, in particular, the “Avenues” area of Sewer District No. 1. Since original construction in 1939, the Town-owned sanitary sewer system has undergone several major extensions including the addition of Sewer District Nos. 2 and No. 3. Also, since original construction, various I-I reduction and wet-weather management capital improvement projects have been completed in Sewer District No. 1. For purposes of this and previous studies, Sewer District No. 1 has been subdivided into nine (9) distinct subareas as shown on the enclosed figures. System mapping is shown on Figures 1 and 2; Figure 3 includes a process flow diagram of the entire Owasco sewer system. The major infrastructure assets serving the “Avenues” Area of Sewer District No. 1 include:

- 253 manholes
- 39,000 feet of 8-inch vitrified clay gravity sewer
- 17,000 feet of 8-inch PVC gravity sewer
- 1,000 feet of 12-inch PVC gravity sewer
- 1,300 feet of 14-inch HDPE gravity sewer
- 5,000 feet of 15-inch PVC (interceptor)
- 6,000 feet of 8-inch force main
- Four (4) pump stations
- Flows conveyed to City of Auburn WWTP

3.2. Permit Conditions and Effluent Discharge Limits

The Town of Owasco does not own or operate a WWTP. The Town discharges flows to the City of Auburn sewer system. The Auburn WWTP has a Monthly Average Flow Limit of 12 MGD. As shown in the graph below, the Auburn WWTP approaches, but does not exceed, this limit on a regular basis. Reducing I-I in the Owasco sewer system would generate additional hydraulic capacity at the Auburn WWTP.



3.3. History of Sanitary Sewer Overflows

The Town of Owasco has a history of sanitary sewer overflows (SSOs). These SSOs have principally occurred along the Owasco Interceptor during heavy precipitation or thaw events when a seasonal high water table is present, and result in discharge of untreated wastewater to the adjacent Owasco Outlet. Since 2018, four (4) SSOs have been reported to the NYSDEC by the Town of Owasco. The full list of SSOs in the Owasco Sewer system are shown in detail in Appendix C.



Manhole along Owasco Interceptor Overflowing into Owasco Outlet

3.4. Historical I-I Investigations, Reduction Improvements, and Expansions

The Town of Owasco has been focused on reducing and managing extraneous wet-weather flows for over 20 years. A detailed Inflow and Infiltration Reduction study was initially completed in June of 2000 following execution of a NYSDEC consent. At the time, the Owasco Sewer System was much smaller and also contained permitted sanitary sewer overflows (SSOs). Although this study is over 20 years old, much of information contained in the study is still relevant today. Notable findings (that are still relevant to the current study) include:

- Owasco Sewer District No. 1 was split into nine (9) sub areas. The current study utilizes the same subarea boundaries and numbers for consistency. It should be noted that these subareas have been more densely developed with new subdivisions since the 2000 study was completed.
- Building inspections found that a significant number of sump pumps, roof drains, floor drains, and basement perimeter drains were connected to the sanitary sewer system in the "Avenues" area of District No. 1. Most of these items are still connected today as this area still lacks an adequate storm sewer system, and it was determined (in consultation with Region 7 NYSDEC) to be cost prohibitive at the time to require residents to disconnect private inflow sources. Figure No. 4 summarizes the results of the Sewer District No. 1 building inspection program completed in the early 2000s.

- Sewer District No. 1 interceptor piping experienced peak wet-weather flow rates that exceeded the interceptor's capacity, and would bypass to the Owasco Outlet during rain events. Although bypassing to the outlet is no longer permitted, the Town has reported four (4) such SSOs to the NYSDEC since 2018.
- Average daily sanitary flows between July 1998 and May 2000 were approximately 429,000 GPD for District No. 1 and peak daily flows were around 2,345,000 GPD. Since 2000, several new subdivisions in SD1 of Owasco were approved and sanitary flows have increased accordingly. Average flows for a more developed service area were 466,000 GPD between September 2017 and September 2020. Also peak flows for a more developed service area only exceeded 2,345,000 gallons nine (9) times during the same three (3) year period. Although, major sewer rehabilitation projects have been completed since the June 2000 study, the sewer system is also 20 years older and has 20 years of additional deficiencies.

As a result of this June 2000 study, the Town of Owasco completed sanitary sewer system rehabilitation and wet weather management projects between the years 2000 and 2003, including:

- Sewer rehabilitation of various areas in District No. 1 inclusive of manhole sealing and open-cut and trenchless mainline pipe rehabilitation;
- Construction of the 400,000 gallon Swift Street Sewage Equalization Tank;
- Construction of the Van Duyne Wet Weather Pumping Station and associated force main to the equalization tank; and
- Replacement of approximately 850 liner feet of the Owasco Interceptor Sewer using trenchless pipe bursting generally between 3rd Avenue and Bristol Avenue.

Also in the early 2000s, the Town of Owasco began extending a low-pressure collection system southerly along Owasco Lake (Sewer District No. 2), and several new single-family residential subdivisions were approved. As sewer flows began to increase, inflow and infiltration reduction and wet weather management was once again a major focus. In 2009 and 2010, the Town completed another major sanitary sewer system rehabilitation and wet weather management project which included:

- Conventional open-cut and trenchless sewer rehabilitation along Archie Street and Melrose Road; and
- Construction of the Archie Street Wet Weather Pumping Station and associated force main that effectively redirected a large portion of Sub-area 1 wet-weather flows to the Swift Street Equalization Tank.

The Town completed its most recent major sewer expansion in 2016 and 2017 with the construction of Owasco Sewer District No. 3 and the Town of Niles Sewer District No. 1, comprised entirely of low-pressure collection mains with residential grinder pumps. In order to accommodate flows from Owasco Sewer District No. 3, the Town replaced and upsized the remaining 5,000 linear feet of the Owasco Interceptor Sewer under this project that was not previously replaced under the early 2000s pipe bursting capital project.

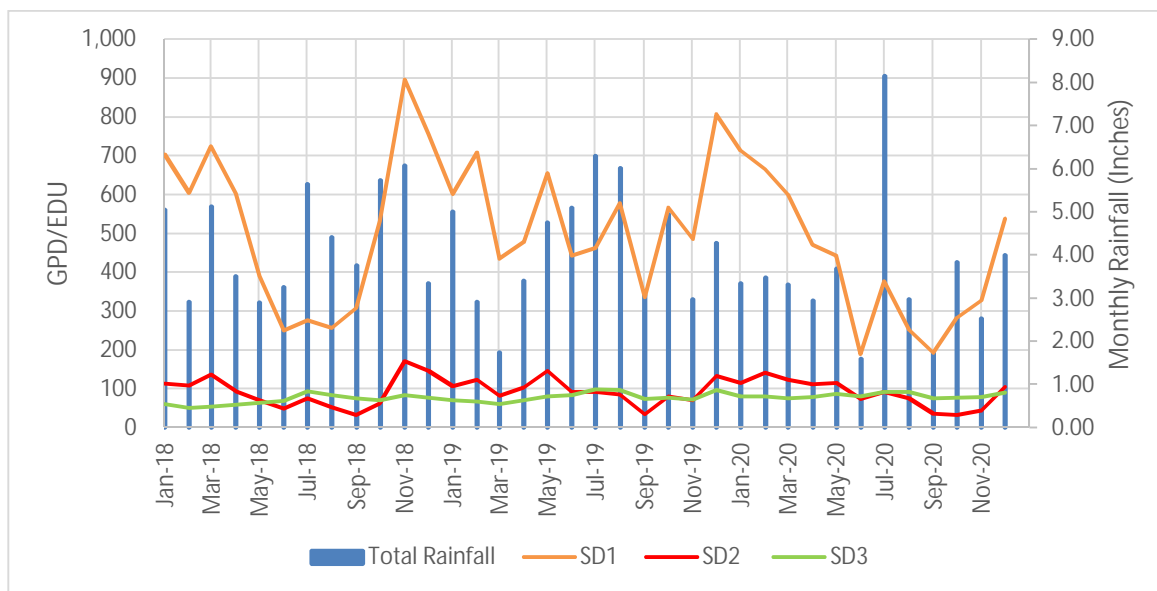
3.5. Historical Flow Data Review

Historical flow data was obtained and analyzed from the Town for all three (3) Sewer Districts. To analyze the extent of each Districts I-I issues, average flow was calculated on a per EDU basis and compared to rainfall as shown in the graphs and tables below.

Table 3-1: Average Daily Flows per EDU (2018-2020)

Year	Total (Avg. GPD/EDU)	SD1 (Avg. GPD/EDU)	SD2 (Avg. GPD/EDU)	SD3 (Avg. GPD/EDU)
2018	384	525	93	70
2019	401	547	96	79
2020	314	421	89	83
3-Yr. Average	366	498	92	77

Graph 3-1a: Owasco Sewer Districts Average Daily Flows per EDU (2018-2020)



Graph 3-1b: Owasco Sewer District No. 1 Average Daily Flows (2018-2020)

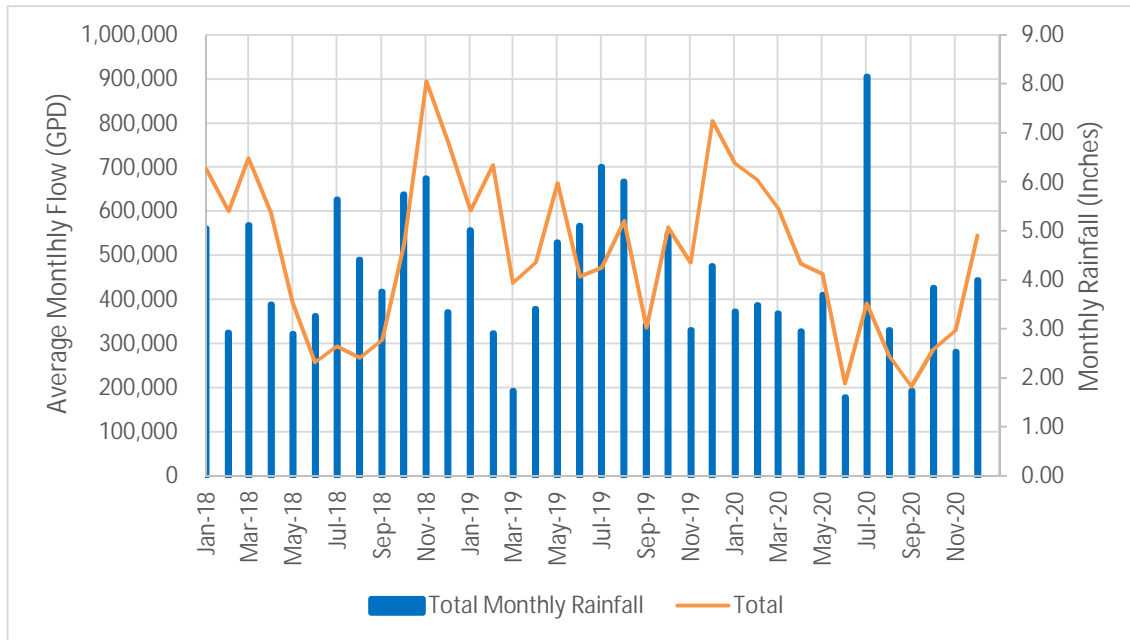


Table 3-2: Sewer District No. 1 - Flow Summary Table (2018-2020)

Parameter	2018	2019	2020	Average
Annual Precipitation (in.)	51.71	50.52	41.62	47.95
SD1 Average Daily Flow Rate (GPD)	490,000	510,000	393,000	464,000
Max. Daily Flow Rate (Gal.)	3,799,000	2,679,000	2,893,000	3,124,000
95 th -Percentile Max. Daily Flow Rate (GPD)	1,065,000	1,482,000	883,000	1,143,000
Anticipated "New System" Average Daily Flow for 933 EDU's (based on 150 GPD/EDU – typical avg. flows in similar districts)	140,000 GPD			
Anticipated Average Daily Flow based on 100 GPD per Capita (~2,340 capita in SD1)	234,000 GPD			
Estimated Average Daily I-I (GPD); (Percent over Base Flow)	256,000 to 350,000 (52% - 71%)	276,000 to 370,000 (54% - 73%)	159,000 to 253,000 (40% - 64%)	230,000 to 324,000 (50% - 70%)
Estimated Annual Average I/I (MG)	93 – 128 MG	101 – 135 MG	58 – 92 MG	84 – 118 MG
Estimated Yearly Cost Range of SD1 I-I based on \$2.85/100 CF (\$3.81/1,000 gallons)	\$356,000 - \$487,000	\$384,000 - \$515,000	\$221,000 - \$352,000	\$320,000 - \$451,000

The historical flow data analysis re-affirmed previous investigations that in excess of 95-percent of the Town's I/I enters the Sewer District No. 1 system. As shown in Table 3-5 above, I/I from SD1 costs the Town of Owasco between \$320,000 and \$451,000 in City treatment charges during a typical year. Based on the graphs above, SD1 experiences significant seasonal wet-weather flow increases, indicating the influence of seasonal precipitation compounded by an

elevated water table. This flow behavior, as shown by field investigations and building inspections, is indicative of significant “private side” I-I in the form of sump pump, foundation and footing drain connections to the sanitary sewer. Public side improvements, without removing floor drain and sump connections, are not likely to significantly reduce I-I beyond that which has been realized as a result of the several rehabilitation projects completed by the Town during the last two (2) decades.

3.6. Residential Building Inspections

Residential building inspections were performed under a previous B&L project in 2000 in order to determine how many residences may have private side inflow sources connected to the public sewer and are therefore contributing to the I/I problem in Sewer District No. 1. Although building inspections were not completed under this study, investigation programs completed within the Town’s gravity sewers serving the Avenues reaffirmed that the mains and manholes are generally in good structural condition, and that little has changed in the past 20 years on private side plumbing.

A map of Sewer District No. 1, depicting any houses that were noted in the 2000 study inspections to have floor drains, foundation drains, perimeter drains, roof drains, and sump pumps connected to the sanitary sewer collection system, is included as Figure 4. Disconnection of private side inflow sources cannot effectively occur, or be enforced by the Town unless and until adequate stormwater collection systems are constructed along the Avenues. The following notable observations can be made from the inspections:

- It is unlikely that the newer subdivisions and homes within Subareas 6 and 7 were constructed and approved by the Town Planning Board and Codes Officer with floor drains, perimeter drains, foundation drains, roof drains, and sump pumps connected to the sanitary sewer. Seasonal I-I from these two (2) Subareas is therefore anticipated to be minimal.
- The most common connection to the collection system within the older homes on the Avenues is the floor/footing drains. Removing these from the sanitary sewer system under a “sewer separation project” poses an extreme challenge due to the age and depth of these sub-basement floor building sewers. Significant investments in both public and private side sewers would be required. Floor drain connections are generally prevalent along most of Owasco Road, as well as the “Avenues” north of Hazelhurst Avenue.

3.7. Manhole Inspections

Sanitary sewer manholes were inspected by B&L in October of 2020 in an effort to identify and record defects that could be potential sources of I-I, and to estimate the amount of extraneous flow that would be expected from identified deficiencies. Additionally, the manhole inspections were used to verify manhole locations, pipe sizes, and flow direction of the collection system. A manhole inspection report was completed for each inspected manhole and all defects and sources of observed/potential I-I were noted; photos were taken of each manhole. Only manholes that were accessible (not paved over) and able to be located in SD1 subareas No. 1 – to No.7 were inspected. Manholes along the recently replaced interceptor sewer were not inspected. Detailed results of manhole inspections are included as Appendix D and summarized in the table below.

Table 3-3 Manhole Inspection Summary

Description	No. of Manholes
Total No. MHs in SD1, Sub-Areas 1-7	253
Total No. MHs Inspected	164 (65%)
Total No. MHs with Deficiencies	84 (51%)
Total No. of MHs inspected without or minor deficiencies	80 (49%)
Total No. MHs with Evidence of I-I	18 (11%)

The following notable observations can be made from the inspections:

- In general, block and brick manholes were in significantly worse condition compared to precast concrete manholes. Block manholes were especially present in the older sub areas (No. 1- No. 5).
- A significant number of manholes had “rain” or “inflow” dishes/inserts installed in the top of the manholes. Many of these rain dishes were deficient (broken or had holes in them) and in need of replacement. Rain dishes are only required where surface flow is at risk of entering the top of manholes as inflow.
- Aside from flow entering through the top of a manhole, the most common source of manhole I-I appears to be in the chimney, or upper corbel section of the manholes. In sub areas No. 1 – No. 5, a majority of the sewer manholes were located in the road. Snow plowing over manholes can cause expedited chimney/frame deterioration due to plow impact, or from roadway freeze/thaw cycles.

3.8. Flow Monitoring

A flow monitoring program was completed during the period October 12, 2020 to January 12, 2021 using ECHO™ Flow Meters, manufactured by ADS® Environmental Services. The ECHO™ device is a portable level sensor which utilizes a wireless network for communication. It is equipped with a narrow-beam ultrasonic level sensor to monitor collection system performance (i.e., depth of channel flow) on a continual basis without the need for confined space entry. Multiple ECHO™ monitor units, pictured below, were installed within targeted collection system manholes in an effort to identify those subareas, or mini-systems which are contributing elevated levels of wet-weather inflow and rainfall induced infiltration (RII), and base infiltration within the Owasco Sewer District No. 1 collection system.



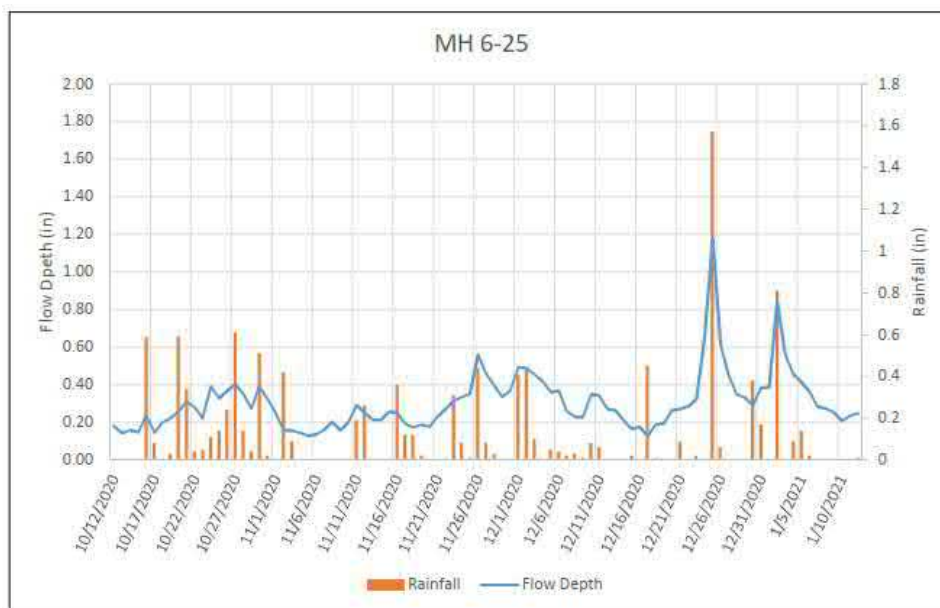
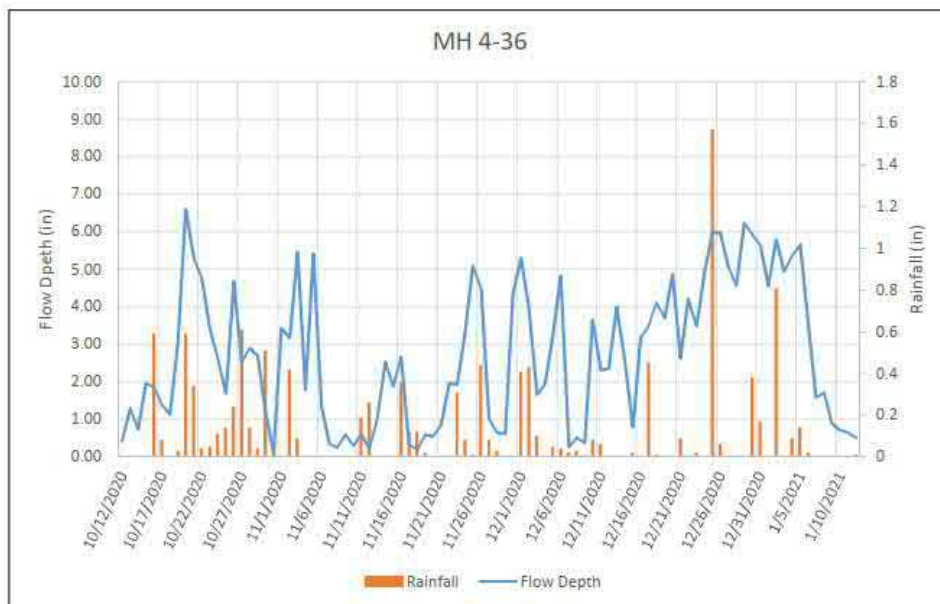
Manhole with ECHO™ Installed

For the Owasco SD No. 1 collection system, a total of four (4) Echo Flow Meters were installed in the following manholes during the noted period.

<u>MH #</u>	<u>Period in Service</u>
1-4	October 12, 2020 to January 12, 2021
4-36	October 12, 2020 to January 12, 2021
5-20	October 12, 2020 to January 12, 2021
6-25	October 12, 2020 to January 12, 2021

A rain gauge, located in the City of Auburn, was used during the flow monitoring period for recording precipitation events and daily rainfall amounts. Total precipitation over the 92 day monitoring period was 11.13 inches. Significant precipitation events occurred on October 27, 2020 with 0.61 inches of rain, December 25, 2020 with 1.57 inches of rain, and January 2, 2021 with 0.81 inches of rain. Appendix E contains graphs depicting the data collected from the ECHO level sensors during this study. The following notable observations were made:

- Levels in manhole 6-25 only varied during the heaviest rain events. Manhole 6-25 receives nearly all flow from of Sub-areas 6 and 7. This confirms that Sub-areas 6 and 7, which are newer homes served by PVC pipes, do not significantly contribute to the I-I problems in Sewer District No. 1 as compared to the older Sub-areas 1-5.
- Based on a review of sewer depth levels in manhole 4-36, it is clear that rain events, even small events, significantly increase flows from Sub-area No. 4.
- The Echo sensors placed in subarea's No. 1 and No. 5 took in smaller service areas. Data from these sensors do trend with precipitation data, but to a lesser degree than the larger Sub-area No. 4.



3.9. Wet-Weather Flow Observations

Wet-weather flow observations consisted of visually inspecting the sanitary sewer system and opening manholes during/following a wet-weather event. These observations assisted in detecting inflow and narrowed down the areas of the collection system under the most influence of I-I. The following observations were made during a nighttime wet-weather flow observation visit which was conducted on May 4, 2021. Figure 5 also summarizes various wet-weather flow observations.

- Sub-Area 3
 - Active leaking in MHs 21, 26, 35A, 36, 44, and 54.
 - Flows increased significantly downstream of MH 35A along 1st Avenue.

- Elevated “clean water” flows were observed within manholes on 2nd, 3rd, 4th, and Bristol Avenue.
- Sub-Area 4
 - MH 5 had inflow dish on bottom of manhole and that was restricting flow in the channel. Significant flow coming from MHs 7 and 8.
 - Active leaking around frames of MHs 35 and 36.
 - Flows increase significantly between MHs 35 and 36.
 - Flows from Aldrich Avenue into MH 22 were observed to be closer to expected nighttime flows.
 - Flows remained consistently higher than expected along all of French Avenue.
- Sub-Area 5
 - Minimal flow observed in MH 8 serving Eastwood Avenue and Letchworth Street.
 - 1/2-inch of water ponding on top of MHs 21 and 22.
 - Elevated “clean water” flows were observed in MHs 8, 20, and 21 along Stryker Avenue.
 - MH 20 observed to have active leak (2-3 GPM).

3.10. Smoke Testing

Smoke testing was conducted to identify sources of direct and indirect inflow throughout the sanitary sewer system. Pressurized smoke was blown into the sewer system to simulate a rainfall event and was observed escaping through defects within the sanitary sewer system. Pipe/manhole defects and cross-connections are considered to be “indirect” and “direct” inflow sources, respectively. Examples of “indirect” and “direct” inflow sources are as follows:

Indirect Inflow Sources:

- Deteriorated corbel
- Private cleanout defects
- Cracked/broken pipe sections

Direct Inflow Sources:

- Leaking manhole cover
- Storm sewer connection to sanitary sewer
- Private sump pump/perimeter drain/foundation or floor drain/roof gutter downspout connections to sanitary sewer

On May 3, 2021, B&L staff strategically placed the smoke machine at 21 sanitary sewer manholes across Sewer District No. 1 such that the majority of areas with suspected I-I issues could be smoke tested. Smoke testing observations are detailed in Appendix F and notable items are summarized below:

- Four (4) residential cleanouts at or below grade without caps; potential “yard drain” direct inflow sources.
- Smoke in basement of 33 Stryker Avenue, 14 Van Duyne Avenue, 16 Van Duyne Avenue, and 26 4th Avenue (reported by homeowners).
- One (1) sump pump directly connected at 5 Bristol Avenue.

- Two (2) catch basins/drainage structures possibly connected to the sanitary sewer system on Adams Avenue and Van Duyne Avenue. Three (3) additional catch basin structures believed to be indirectly connected (i.e., through cracked piping and stone) on Owasco Road, 3rd Avenue, and Bristol Avenue.
- Two (2) locations where sewer piping is likely cracked near intersections of Owasco Road and 1st Avenue and Owasco Road and Stryker Avenue.
- One (1) smoke from roof gutter at 25 Aldrich Avenue.

3.11. Closed-Circuit Televising (CCTV) Observations

Closed Circuit Television (CCTV) inspection of sanitary sewers serving Sub-areas 1 through 5 was performed by Town DPW staff within pipe sections isolated through manhole inspections, night-time inspections, flow monitoring and smoke testing, and based on information from previous sewer rehab projects. These areas largely consist of antiquated vitrified clay tile, much of which dates back to the 1930s. Approximately 1,000 LF of sewer main was televised on April 28, 2021 and April 30, 2021. CCTV videos for each section of sewer televised were reviewed by B&L to identify problem areas and recommended rehabilitation methods. Common defects observed during CCTV inspections consisted of the following:

- Offset pipe joint with active infiltration
- Longitudinal and circumferential cracks
- Dips in pipes creating standing water and likely sediment deposits
- Active leaking around lateral pipe penetrations

Although only a small portion of the system was televised, it can be assumed that the majority of clay piping in Sewer District No. 1 will show similar deficiencies. This will result in most of Sub-areas Nos. 1 through 5 of Sewer District No. 1 requiring rehabilitation. Appendix G contains a map of televised areas and a list of deficiencies with select photos of significant structural defects or active infiltration.

4.0 SUMMARY OF EXISTING CONDITIONS AND NEED FOR A CAPITAL PROJECT

The Town of Owasco sanitary sewer system serving the “Avenues” area of Sewer District No. 1 is generally in “poor” condition due to its age. Based on various historical data review and 2020/2021 field investigations, existing conditions and issues are generally summarized as follows:

- The older gravity sanitary collection system in Sewer District No. 1 Sub-area Nos. 1-5 continues to experience excessive levels of inflow and infiltration. This has resulted in several sanitary sewer overflows (SSO's) and discharge of raw sewage to the Owasco Outlet.
- Significant “private” side I-I is caused by cross-connected footing, foundation, roof gutter, and basement drains from the older homes in Sewer District No. 1 Subarea Nos. 1-5.
- I-I from Sewer District No. 1 costs the Town of Owasco between \$320,000 and \$451,000 in City treatment charges during a typical year.
- There are several antiquated block manholes located in Sewer District No. 1 Subarea Nos. 1-5 that require rehabilitation.
- The majority of piping in Sub Areas Nos. 1-5 in SD1 is 1930's vintage VCT piping that is in need of rehabilitation or replacement as it has exceeded 80-years in service and has reached the end of its useful service life.
- Sewer District No. 1 Subarea Nos. 6-9 and Sewer District Nos. 2 and 3 are much newer and do not appear to experience excessive amounts of I-I.

The Town of Owasco has a significant need for a capital improvement project in Sewer District No. 1 Subarea Nos. 1-5 to improve the structural condition of its 80-year old collection system and to reduce I-I for the following reasons:

- *Health and Sanitary* – Elevated levels of I-I have led to sewer backups and raw sewage overflows to the Owasco Outlet. The lowest points of the Owasco collection system are adjacent to the Owasco outlet. During sewer overflows, untreated sewage flows directly into the outlet as shown in the photo below. This is a serious health and environmental concern. The location of these overflows are in extremely close proximity to Owasco Lake, an “Impaired” waterbody on the NYSDECs Priority Waterbody List (PWL), and occur within residential yards. Elevated Town flows also compound capacity issues and CSO's within the City of Auburn conveyance system downstream of the Town's connection near Swift Street.



Manhole along Owasco Interceptor Overflowing into Owasco Outlet

- *Aging Infrastructure* - The majority of Sub-area Nos. 1-5 is approximately 80 years old and consists of vitrified clay tile sewer mains with block manholes. This infrastructure has significant age related deterioration and is approaching the failure stage. If asset renewal/replacement improvements are not completed, sewer collapses and basement backups may start to occur on a more frequent basis.
- *Energy and Waste* - The excessive amounts of I-I entering the sanitary sewer collection system results in operation of the Archie Street and Van Duyne wet-weather pump stations, as well as the equalization tank and appurtenances. This effectively increases power use and costs to Town Sewer District customers.
- *Financial* - I-I from Sewer District No. 1 costs the Town of Owasco between \$320,000 and \$451,000 in City treatment charges during a typical year. This averages to over \$300/EDU. If issues are not corrected, problems will become worse and the cost of sewer will continue to increase to unaffordable and unsustainable levels.
- *Future Development and Protection of Owasco Lake* - Large sections near and along Owasco Lake are un-sewered and contribute to Owasco Lake being listed as an "Impaired" waterbody on the NYSDECs Priority Waterbody List (PWL). Unless Owasco can reduce I-I, future "smart growth" development within the lakeshore district areas will be unlikely. Considering the lake is also used as the drinking water source for many nearby communities, properly treating sanitary waste from the surrounding area is a major concern.
- *Storm and Flood Resiliency* - With Climate Change causing an increase in the frequency and intensity of major storm events in recent years, the severity of I/I within the Owasco collection system will only be magnified, increasing the risk of SSOs, sewer collapses, basement flooding, and accelerated deterioration of aging assets. I-I reduction is critical to the resiliency and sustainability of existing infrastructure.

5.0 ALTERNATIVE ANALYSIS

Alternatives evaluated in this section explore potential improvements to the sanitary sewer collection system. The following alternatives have been evaluated:

- No Action Alternative
- Alternative No. 1 – Sewer Rehabilitation and Public Side I-I Reduction
- Alternative No. 2 – Sewer Rehabilitation and Replacement focused on Private Side Sewer Separation

5.1. No Action

This alternative provides a baseline comparison for all other alternatives and consists of the “do-nothing” alternative. This alternative provides the lowest initial cost; however, taking no action in maintaining the Town’s existing infrastructure would result in the continued degradation of the Town’s collection system, and will degrade the quality of service provided to Sewer District customers while increasing their annual user costs. If no action is taken the following is likely to occur:

- Structural condition of mainline gravity sewer piping and manholes will continue to worsen, potentially leading to collapses and major sewer back-ups
- Inflow and Infiltration levels will increase from current levels
- Unmeasurable reactionary spending for sewage treatment and sewer repairs
- Further degradation and impairment of nearby waterways from sanitary sewer overflows

Taking no action is unsustainable and could result in a breach of the Town’s contract with the City of Auburn and NYSDEC fines for sanitary overflows. For these reasons, this alternative is not recommended and should not be considered by the Town of Owasco.

5.2. Alternative No. 1 - Sewer Rehabilitation and Public Side I-I Reduction

The results of extensive field investigations revealed aging and failing sanitary sewerage infrastructure that is in need of rehabilitation. This alternative would be inclusive of repairing or replacing mainline sewer infrastructure and manholes to extend their useful lives another 30+ years and reducing public side inflow and infiltration. Considering this alternative would not be focused on installing infrastructure to allow for significant private side I-I reduction, minimal I-I reduction (approximately 5% to 10% reduction for SD1 areas) would be anticipated. Various public side I-I reduction and wet weather management improvements have been previously completed by the Town within Sewer District No. 1 under several projects which resulted in minor wet-weather flow reductions. A figure displaying the overall extent of the required improvements under this alternative is included as Figure 6.

5.2.1. Manhole Rehabilitation

Manhole deficiencies were discussed in Section 3.0 and Appendix D of this report. This Section provides an overview of manhole rehabilitation techniques that can be used to address various deficiencies. These recommendations should be followed unless the existing sewer main is being replaced on either side of the manhole, or the structural

condition has deteriorated to such a level that rehabilitation costs would exceed the cost of installing a new, precast concrete manhole, frame and cover. A Manhole Rehabilitation Recommendation Table is attached as Appendix H.

- Deficiency: Low Lying Manhole Cover
 - i. Manholes with locations noted to be buried in grass, paved over, or located in low lying areas are noted in this section. Manholes noted to be only slightly low with minimal inflow are not noted in this section and do not require rehabilitation.
 - a. Paved Over Manholes
 - a. Sub Area No. 1: 5, 18, 27, 34
 - b. Sub Area No. 3: 37, 38
 - c. Sub Area No. 4: 17
 - d. Sub Area No. 5: 15
 - e. Sub Area No. 6: 13, 45
 - f. Sub Area No. 7: 36
 - b. Buried Manholes
 - a. Sub Area No. 2: 4, 8, 9, 10, 14
 - b. Sub Area No. 3: 1, 2, 3, 5, 8, 23, 25, 32, 35
 - c. Sub Area No. 4: 6, 15, 15A
 - d. Sub Area No. 5: 26
 - e. Sub Area No. 6: 26, 32
 - f. Sub Area No. 7: 3, 4, 6, 7, 8, 14, 15, 23, 26, 35
 - c. Low Lying Manholes
 - a. Sub Area No. 2: 11
 - b. Sub Area No. 6: 27, 41
 - c. Sub Area No. 7: 10, 12 13
 - ii. Recommended Rehabilitation Action: Raise Manhole Cover. Operators should raise low lying or buried/paved over manhole covers to or above the surrounding grade so that stormwater cannot pond on or flow over into the manhole covers. Almost every inspected manhole cover had open pick holes and none of them were water tight. As noted in the table below, ponding or heavily flowing water over any low lying manhole cover can lead to direct inflow. The most effective method for correcting this deficiency is to raise the top of the manhole. The picture below shows workers raising the top of a manhole cover with a manhole riser ring within a paved area.



Manhole 7-13: Low Lying Manhole Cover



Manhole Riser Ring
(Source: Brenneman Excavating Inc.)

Table 5-1: Approximate Inflow Contributions from Manhole Covers*

Water Head over Cover	One 1.5-inch Open Pick Hole (gpm)	Inflow (gpd)
1/16-inch	10	14,400
1/4-inch	15	21,600
1/2-inch	19	27,360
1-inch	26	37,440
4-inch	40	57,600

*Source: "A Report on Inflow of Surface Water through Manhole Covers" by Neenah Foundry Company.

- iii. Alternative to Recommendation: Install a Rain Dish or Water Tight Gasketed Cover. Two (2) alternatives to the recommended rehabilitation method would be to install an inflow dish (pictured below) or a water tight gasketed manhole cover. Installing inflow dishes stops or significantly slows water from entering through the cover of the manhole, and is an economically feasible alternative to reducing the impact of inflow. However, these dishes make the manholes difficult to access for operators and over time cracked/broken dishes have fallen into manholes causing sewer backups and significant issues.



Typical Inflow Dish
(Source: Cretex Inflow Dishes)

Use of a water tight, gasketed manhole cover is another alternative to stopping or significantly slowing water from entering through the cover of the manhole, but once again this rehabilitation method makes it very difficult for operators to access the manholes. Often times, once installed, if the manhole

cover is ever removed, it is never properly reinstalled. If practical, the best rehabilitation method to this deficiency is raising the top of the manhole cover flush with or slightly above surrounding grade.

- Deficiency: Inflow Dish in need of Replacement
 - i. Manhole Numbers:
 - a. Sub Area No. 1: 2, 11, 12, 14, 21, 26, 33, 35
 - b. Sub Area No. 2: 1, 3, 7, 11, 12
 - c. Sub Area No. 3: 20, 24, 27, 34, 41, 42, 43, 44, 45, 48, 49, 51, 52, 53, 54
 - d. Sub Area No. 4: 4, 5, 7, 9, 12, 13, 14, 24, 25, 29, 35, 36
 - e. Sub Area No. 5: 1, 6, 7, 24
 - f. Sub Area No. 6: 7, 8
 - g. Sub Area No. 7: 24, 28, 29, 34
 - ii. The Town has previously installed several rain flow dishes in low lying manholes or manholes susceptible to surface flooding. Many of these dishes have been cracked or broken and some have fallen into manholes. These inflow dishes no longer work as intended.
 - iii. Recommended Rehabilitation Action: Replace Rain Inflow Dish or Install Water Tight Gasketed Cover.

- Deficiency: Leaking Near Frame or Deteriorated Chimney/Corbel Section
 - i. Manhole Numbers:
 - a. Sub Area No. 1: 0, 2, 3, 13, 14, 16, 21, 22, 25, 33, 35
 - b. Sub Area No. 2: 2, 3, 6, 11
 - c. Sub Area No. 3: 18, 19, 20, 26, 27, 28, 31, 34, 43, 44, 46, 47
 - d. Sub Area No. 4: 2, 8, 9, 19, 20, 29, 32, 33, 36
 - e. Sub Area No. 5: 3, 5, 12, 13, 14, 18
 - f. Sub Area No. 6: 7, 8, 38, 39, 40, 44
 - g. Sub Area No. 7: 10, 17, 34
 - ii. Recommended Rehabilitation Action: Remove loose material and cementitious patch any large voids and install manhole chimney seal. It is recommended that a flexible product designed specifically for manhole chimneys such as Sauereisen ChimneySeal F88 (pictured below) be applied.



Manhole Chimney Seal

- Deficiency: Offset Manhole Frame and Cover
 - i. Manhole Numbers:
 - a. Sub Area No. 1: 2
 - b. Sub Area No. 2: 6
 - c. Sub Area No. 4: 21
 - d. Sub Area No. 5: 4, 16, 27
 - e. Sub Area No. 6: 33
 - f. Sub Area No. 7: 1
 - ii. Recommended Rehabilitation Method: Remove and Reset Frame.
 - iii. Alternative to Recommendation: There is no sensible alternative to the above listed rehabilitation recommendation.



Manhole 5-27: Offset Frame

- Deficiency: Leak at Joint, Void, or Pipe Penetration
 - i. Manhole Numbers:
 - a. Sub Area No. 1: 4, 12, 13, 26
 - b. Sub Area No. 2: 6
 - c. Sub Area No. 3: 19, 31, 34, 47
 - d. Sub Area No. 4: 2, 28, 32
 - e. Sub Area No. 5: 12, 23

- f. Sub Area No. 6: 7
 - ii. Recommended Rehabilitation Action: Remove loose material and cementitious patch any voids and around penetrations. Inject specialized grout material to stop active leaks prior to installing cementitious patch.
 - iii. Alternative to Recommendation: If a manhole contains several deficiencies at the time of repair (i.e., multiple leaking joints/holes in manhole), for minimal additional investment it may be beneficial to install a cementitious coating on the entire inside of the manhole. Essentially, a grout sealant would be applied/injected in advance of the coating to plug and stop active leaks. The manhole would then generally be cleaned using a high pressure power washer to maximize the life of the coating system. The manhole walls, corbel, and bench would then be spin casted with a cementitious coating system.
- Deficiency: Bench/Trough Deposits in Manhole
 - i. Manhole Numbers:
 - a. Sub Area No. 1: 11, 14, 29
 - b. Sub Area No. 2: 7, 12
 - c. Sub Area No. 3: 42, 47
 - d. Sub Area No. 4: 3, 4, 5, 13, 19, 20, 21
 - e. Sub Area No. 5: 1, 6, 9, 11
 - f. Sub Area No. 6: 7, 31, 34
 - g. Sub Area No. 7: 9, 16, 19
 - ii. Recommended Rehabilitation Method: Clean Manhole. Assuming the noted deposits are the result of normal system operation and lower velocities, operators should heavy clean the pipes and manholes to remove deposits in advance of any trenchless sewer rehabilitation, and to prevent future sewage blockages/backups.
 - iii. Alternative to Recommendation: There is no sensible alternative to the above listed rehabilitation recommendation.
- Deficiency: Multiple leaking joints, cracks in manhole walls, or significantly deficient manhole wall sections
 - i. Manhole Numbers:
 - a. Sub Area No. 1: 12, 13, 31
 - b. Sub Area No. 2: 6, 11
 - c. Sub Area No. 3: 34, 42, 43
 - d. Sub Area No. 4: 32
 - e. Sub Area No. 5: 6
 - f. Sub Area No. 6: 12



Manhole 2-14: Deposits on Bench/Channel

- ii. Recommended Rehabilitation Method: A cementitious coating can seal leaking walls/joints, provide structural support, and significantly extend the life of block/brick structures. Construction practices include first applying/ injecting a grout sealant to plug and stop active leaks in advance of the coating. The manhole would then generally be cleaned using a high pressure power washer to maximize the life of the coating system. The manhole walls, corbel, and bench would then be spin casted with a cementitious coating system. The finished product would look similar to the manhole pictured below, and provide a monolithic structural liner within the manhole.



Cementitious Manhole Coating System

(Source: Camden Group Inc.)

5.2.2. Sewer Mainline Rehabilitation Methods

As detailed in Section 3, there is a significant amount of 80-year old VCT piping that has cracked or settled and is in need of rehabilitation in Subarea Nos. 1 through 5. Although more televising should be completed during Preliminary Design, it can be assumed that most manhole-to-manhole reaches in these subareas contain cracks, deformed pipe sections, and numerous pipe joint offsets and leaking lateral connections with active infiltration.

The condition of the piping and the severity of the defects will dictate whether piping can be rehabilitated using a Cured-in-Place Pipe (CIPP) Liner or if it requires conventional open-cut replacement. A significant cost savings can be realized for CIPP lining compared to open-cut replacement.

Prior to completing a capital improvement project, the Town should televise all remaining areas of the collection system of Sewer District No. 1. Based on the condition of the piping that was televised, B&L made assumptions and estimated the total amount of improvements required. Based on the review of the available sewer investigation program data, it is believed that approximately:

- 90% of the 35,700 LF in subareas Nos. 1 – 5 will require rehabilitation
- 75% of the 32,500 LF requiring rehabilitation can be CIPP lined, while the remaining 25% of the 32,500 LF of the sewer main will require open-cut replacement
- One open-cut spot repair will be required every 500 LF of sewer main to receive CIPP Lining

The estimated linear feet and cost of improvements is subject to change based on the results of future televising to be completed during the Preliminary Design Phase of the collection system rehabilitation project.

5.2.2.1 Cured-in-Place (CIPP) Liner

CIPP lining is a “trenchless” rehabilitation method that can quickly correct sewer main deficiencies while eliminating the majority of surface restoration. This process is generally completed following repair of any major pipe defects (major cracks, offset joints, dips in pipe) via conventional open-cut methods and cleaning the sewer main using jetting, mechanical cutting, or chemical root treatment. The CIPP rehabilitation system is described in more detail below.

- Repair Piping Defects: It is important to note that the CIPP liner assumes the shape of the host pipe before hardening. Any dips, defects, or protrusion into the pipe will remain after the liner is installed. It is therefore critical to repair any areas that are deteriorated or deformed and may negatively impact the CIPP liner system. These repairs are typically completed by open-cut excavation and replacing the settled or damaged section of sewer main with new SDR35 PVC sewer main matching the nominal diameter of the original main indicated to be replaced. The repaired section of piping will still receive a CIPP liner.
- Heavy Cleaning, Root Cutting, and Chemical Treatment: A critical step in preparing a sewer main for CIPP lining is to properly clean the piping prior to lining to ensure a near watertight seal between the pipe liner and the existing “host” pipe. If roots are present, root cutting must occur to remove potential blockages and ensure proper expansion of the liner. Since root cutting promotes root growth, it is further recommended that all roots be treated with a root killing foam (i.e., ROOTX®) prior to lining. ROOTX® is an EPA accepted herbicide combined with water and a foaming agent, meant to inhibit new root growth.

- iii. Installing Cured-In-Place Pipe (CIPP) Liner: The cured-in-place pipe lining system will address the pipe defects through the use of a resin impregnated liner within pipes of suitable condition and slope for full-length trenchless rehabilitation. The resin impregnated liner (either ambient, ultraviolet light, or high-temperature cured) assumes the shape of the host pipe before hardening, resulting in a near watertight seal at the defect and pipe-to-liner interface. The liner cures to a thickness of 1/4- inch (thickness varies with depth of sewer, structural reinforcement needs), minimizing the creation of edges and providing a structurally sound conduit of lower roughness coefficient (“n”) within the host pipe. Where service connections occur within the liner area, a robotic cutter is used to open the liner wall internally at the lateral. It should be noted that a number of capped, inactive laterals were observed during CCTV investigations, some of which had active infiltration. It is proposed that the liner not be cut out for these capped laterals.

It should be noted that the annular space between host pipe and cured liner still has the potential, albeit significantly reduced, to convey infiltration that may enter at pipe defects, connections to manholes, lateral cut-ins, or through lateral pipe joints. CIPP installers will therefore typically install a donut-style gasket at either end of the CIPP liner to prevent migration of annular space water back into the manhole. CIPP liners do not reduce private side infiltration.



CIPP Liner cured within ductile iron “host” pipe

(Source: Perma-Liner Industries, LLC)

5.2.2.2 Open-Cut Replacement of Sewer Main

Open cut replacement would be utilized in piping that is not in suitable condition to CIPP line. Under these situations, the existing sewer main would be open-cut replaced with new appropriately sized SDR35 PVC piping. Any active sewer laterals would be reconnected to the new sewer main. Manholes would be installed at any change in slope or change in direction and located no more than 400 feet apart. This rehabilitation method would cause significant surface disturbance requiring an extensive restoration effort; however, the new system would be defect free.

5.2.3. Additional I-I Reduction Improvements

In addition to mainline sewer rehabilitation and manhole rehabilitation, it is recommended that several other minor I-I deficiencies that were discovered during our field investigations be corrected. These deficiencies include:

- Disconnecting the sump pump that discharges to the sanitary sewer at 5 Bristol Avenue
- Disconnecting the cross-connected stormwater pipes that discharges to the sanitary sewer at 29 3rd Avenue and 56 Van Duyne Avenue
- Disconnecting roof gutter downspouts connected to the sanitary sewer system at 25 Aldrich Avenue
- Raise or cap cleanouts below grade at:
 - 8 Van Duyne Avenue
 - 20 Van Duyne Avenue
 - 67 1st Avenue
 - 78 Hazelhurst Avenue
- Mandating homeowners to separate storm/sanitary private laterals where easily implemented in locations that private stormwater laterals can be discharged to grade or to an existing drainage system without flooding concerns (i.e. along the Owasco Outlet).

5.2.4. Green Infrastructure

Per NYSEFC guidelines and general climate smart engineering practices, it is critical to look for opportunities to implement green infrastructure when redirecting stormwater flows from sanitary sewer facilities. This alternative does not provide any notable opportunities for using GI practices to reduce I/I as the majority of targeted I/I reduction will be addressed using trenchless rehabilitation methods within existing infrastructure.

5.3. Alternative No. 2 - Sewer Rehabilitation and Replacement focused on Private Side Sewer Separation

This alternative would focus on repairing or replacing mainline sewer infrastructure to maximize total inflow and infiltration reduction, in addition to extending the useful service life of the collection system. It is anticipated that the improvements considered under this alternative

would significantly reduce I-I (approximately 50% reduction for SD1). However, in order to do this, a significant amount of private side I-I reduction practices would be required through sewer separation.

Private side inflow and infiltration is largely caused by the configuration of original building sewers and basement plumbing within the older residential structures that occupy the Avenues. During original construction, sanitary building laterals were designed to serve the basement level, such that the pipe was installed beneath the basement floor at a deep enough elevation to accept foundation drains, floor drains, and perimeter drains. Where sumps holes and/or sump pumps are present, owners are able to simply connect the sump pump discharge pipe to their basement plumbing above the floor slab. Where roof gutters have been connected to building sewers, homeowners have typically run downspouts into their basements and connected to the interior basement plumbing.

Effective removal of private side I-I sources can only be accomplished by separating the stormwater and groundwater inflow sources from the sanitary building services at each residential property. To do so, the Town would need to construct a dedicated separate stormwater collection system (where one does not currently exist) to convey clean water flows from basement floor drains, foundation drains, sump pumps, and roof gutter down spouts.

5.3.1. General Description of Alternative No. 2 Design

This alternative would generally be inclusive of the following improvements:

- Completion of internal and external building inspections of all houses within Sub-area Nos. 1 through 5 to visually inspect each basement's sanitary piping configuration and location, waste generating fixtures in the basement, and potential private inflow sources (floor drains, perimeter drains, foundation drains, sump pumps, roof gutter downspouts). Develop recommended sanitary/storm pipe separation schematic for each dwelling. The results of the Building Inspection Program will fully dictate the configuration and design of the sewer separation project on each Avenue, which could include:
 - Converting the existing sanitary sewer to a storm sewer with targeted structural rehabilitation, and construction of a new PVC sanitary sewer system with precast concrete manholes and new PVC sewer laterals extended to be easily connected to basement of a dwelling; or
 - Construction of new sanitary sewer and storm sewer collection systems with associated laterals extended to within approximately 10-feet of the dwelling, wherein the existing sanitary sewer would be abandoned in place. The new systems would each need to be deep enough to connect to existing building sewers to convey foundation drains to the designated storm sewer; the new sanitary sewer could be installed at a slightly shallower elevation to accept sanitary waste above the basement floor slab while still accommodating waste generating fixtures, such as washers or utility sinks, in the basement.

- Construction of new storm and/or sanitary collection pipes for most avenues in Sub-areas Nos. 1 through 5. New stormwater systems would discharge to existing roadside ditches, swales, existing stormwater culverts serving NY Route 38A, creeks or waterways, and/or the Owasco Outlet to convey storm flows. It is believed that the largest financial savings in treatment charges will occur for improvements completed in Sub-areas Nos. 1 through 5.
- Construction of new sanitary/storm lateral pipes extended to within approximately 10-feet (or other Board approved distance) for connection by private homeowners. It is envisioned that the Town will provide storm/sanitary infrastructure that will allow for sanitary and storm lateral separation, wherein the existing (deeper) lateral would be connected to the designated storm sewer system, and a new sanitary building sewer installed above the basement floor slab would connect to the new sanitary sewer system. It is further envisioned that it will be the responsibility of the private homeowner to complete the interior plumbing modifications to separate their sanitary waste pipes from the under-slab building sewer which would continue to serve basement floor and foundation drains, perimeter drains and sump pump if present. Town inspections will be required to verify homeowner compliance with sewer separation within an allotted connection period.
- Existing sanitary sewer manholes and structural defects within VCT mains that remain in service, likely within a converted storm sewer, will require rehabilitation as described in Alternative No. 1. Removal of infiltration sources that are not considered major structural defects will not be warranted if the repurposed sanitary sewer remains in service as a dedicated storm sewer.
- Additional I-I Reduction Improvements as described in Alternative No. 1, including mandating homeowners to separate storm/sanitary private laterals where easily implemented in locations that private stormwater laterals can be discharged to grade or to an existing drainage system without flooding concerns (i.e., along the Owasco Outlet).
- As a result of these improvements, it is likely that most Town roadways in the Avenues will require full-depth and full-width reconstruction due to significant disturbance from new mains and laterals.
- Since this project will require complete Town road reconstruction, it should be noted that the existing cast iron water mains serving the Avenues is antiquated and will soon need replacement. Although, water main replacement cannot generally be paid as part of a sewer project, consideration should be given to replacing the water main under a concurrent water project where road reconstruction is required.

It is envisioned that each of the Avenues will require slightly different improvements depending on proximity to drainage courses or stormwater conveyance infrastructure, topography, basement piping configurations/elevations, and condition of existing sanitary sewer mains. Based on current available information, it is not feasible to provide a definitive layout or concept plan of the sewer separation improvements that will be required. Therefore, it is suggested that internal building inspections be completed during the Preliminary Design Phase of a capital improvement project, which

itself could be “Phased” by Subarea and/or Avenue to fully assess sewer separation logistics, design challenges, construction costs, easement needs, and effectiveness in removing I-I. A Figure displaying the overall extent of the required improvements of this Alternative is included as Figure 7.

5.3.2. Homeowner Participation and Compliance Strategy

Homeowner participation is an essential part of this project and could be extraordinarily challenging. Homeowners may be resistant to working with the Town and/or spending “out of pocket” for private sanitary lateral separation. It is important to realize that the collective impacts of private inflow within the “combined” sewer laterals are the leading cause of sanitary overflows and the \$320,000 to \$451,000 the Town pays the City of Auburn for stormwater treatment charges during a typical year. Newer constructed homes are not likely to contribute to this expense as their sanitary laterals are separated. Therefore, the Town Board may want to consider adding an “Excessive Sewer Use Surcharge” (approximately \$500 to \$700 per year) to any homeowner that is located where infrastructure or drainage courses exist that would allow for sewer separation, but their sanitary lateral may still be combined. The following bullet points outline a potential strategy for achieving homeowner compliance with investing in private side sewer separation:

- The Town should hold several public informational meetings and/or Public Hearings to discuss the inflow/infiltration issues, user cost impacts and proposed improvement strategies. Several mailings to district residents should also be sent.
- An inventory of existing stormwater infrastructure and nearby drainage course should be completed to understand what areas of the Sewer District No. 1 may be readily able to separate sewer laterals (i.e., adequate stormwater infrastructure exists).
- Mandatory initial home inspections should be completed within target Sub-area Nos. 1 through 5 of Sewer District No. 1 where prior basement inspections have identified a high percentage of combined sewer laterals connected to the sanitary sewer system. Homeowner refusal of participating in the home inspection process could result in levying an Excessive Sewer Use Surcharge within their sewer bill. At the initial home inspection, Town and Engineering representatives can discuss what improvements are necessary for each household to separate their sanitary lateral (if not already separated). The Town can provide each homeowner with details on what work is required to separate their household’s sanitary waste once the desired location is identified for extension of new Town-owned sanitary and/or storm laterals.
- Residents that are located adjacent to existing infrastructure that allow for lateral separation should be given a specific time period to separate their sanitary laterals. The Town should inspect the sanitary separation to verify compliance. Failure to comply with lateral separation or verification inspection will result in the addition of an Excessive Sewer Use Surcharge to their sewer bill to cover City treatment costs of clean water.

- Various new storm/sanitary sewer construction will take place in Sewer District No. 1 that will facilitate building sewer separation and connection to a new sanitary and/or storm sewer lateral installed by the Town. Once infrastructure is available, residents that are located adjacent to new infrastructure that allow for lateral separation should be given a specific time period to separate their sanitary laterals and connect to the Town system(s). The Town should inspect the sanitary separation to verify compliance. Failure to comply with lateral separation or verification inspection will result in the addition of an Excessive Sewer Use Surcharge to their sewer bill.

5.3.3. A “Phased” Implementation Approach

Excluding the newly installed Owasco Interceptor Sewer, there is approximately 35,700 LF of sewer main in Sub-area Nos. 1 through 5 of Sewer District No. 1. The project would essentially involve completely reconstructing most Town roadways in Sub-area Nos. 1 through 5 with new sanitary, storm, and potentially water distribution infrastructure. The intent of this project would not only be to extend the life of antiquated infrastructure, but to significantly reduce the cost of I-I treatment and eliminate sanitary sewer overflows.

High level cost estimating for implementing this alternative would be as follows:

• Sanitary Sewer Improvements	\$150/LF
• Storm Sewer Improvements	\$150/LF
• Roadway Reconstruction	\$120/LF
• Miscellaneous Improvements	<u>\$60/LF</u>
• Total Construction Costs	\$480/LF
• Soft Costs (25%)	<u>\$120/LF</u>
• Total Project Cost	\$600/LF
• Total Cost with Water Main Replacement	\$700/LF
• Approximate Total Project Cost	\$25,000,000

Based on the high potential project cost of this alternative, as compared to standard trenchless rehabilitation practices, it would not be recommended to move forward with such an extensive project without “pilot testing” the effectiveness of this alternative on smaller sub-sections within Sewer District No. 1, Sub-area Nos. 1 through 5. A large factor that will determine the cost feasibility of implementing this alternative is sewer flow reduction and, more specifically, reducing the \$320,000 - \$451,000 spent per year on treatment of extraneous I/I. This cost reduction is equivalent to the annual debt service of a 30-year project costing \$7.65 million - \$10.8 million. For this reason, a phased implementation approach should be considered under this alternative.

As previously stated, based on current available information it is not feasible to provide an exact description of improvements for this entire alternative; however, a Phase 1 recommendation has been more specifically defined and is detailed on Figures 7A, 7B, and 7C. Once Phase 1 is implemented, the effectiveness of it could be studied and used

to determine if it is cost feasible for the Town to continue with such extensive I-I reduction methods. Areas included under Phase 1 were selected based on field investigation results, year 2000 home inspections, and the availability of nearby stormwater infrastructure or drainage ways. These areas front antiquated sewer mains in need of upgrades with many houses believed to have “combined” storm and sanitary laterals. Phase 1 of this alternative would be inclusive of improvements along the following streets:

- 950 LF along Third Avenue (Sub-area 3)
- 1,150 LF along Van Duyne Avenue from Owasco Road to Manhole 4-22 (Sub-area 4)
- 1,750 LF along Stryker Avenue from Zoar Street to Manhole 5-27 (Sub-area 5)

Phase 1 would be inclusive of approximately 10% of the entire required improvements in Sub-area Nos. 1 through 5. It is not feasible to guarantee the volumetric I-I reduction that could be achieved by implementing Phase 1, but an overall I-I reduction of at least 5% (equating to \$16,000 - \$23,000) and maximum I-I reduction of 10% (equating to \$32,000 - \$46,000) of yearly savings could be achievable. Should the effectiveness of implementing this phase satisfy the Town’s expectations, justification could be made for additional investigations and obtaining topographic survey of all of Sub-area Nos. 1 through 5, so that future phases of this alternative can be advance through final design toward shovel readiness and constructed as annual revenue savings are achieved.

5.3.4. Green Infrastructure

Per NYSEFC guidelines and general climate smart engineering practices, it is critical to look for opportunities to implement green infrastructure when redirecting stormwater flows from sanitary sewer facilities. This alternative does provide some opportunities for green infrastructure with the potential to implement stormwater treatment practices. Based on past excavations, soils in the project area are not very conducive to significant groundwater infiltration practices. It should also be noted that the project area is largely developed, with limited space to install green practices. However, during final design, the Town of Owasco (as a registered Climate Smart Community) is committed to exploring green treatment practices of roadway runoff and stormwater outfall discharges. The exact extent of practices that are feasible to be implemented will largely depend on final utility layout, available land/easements, and area topography.

6.0 SUMMARY & ALTERNATIVE COMPARISON

6.1. Feasible Alternatives Summary

Section 5 evaluated a “No Action” alternative in addition to two (2) improvement alternatives listed below. As stated in Section 5, doing nothing is not a feasible as significant structural issues would result from system neglect and levels of I/I will continue to increase. The two (2) improvement alternatives are summarized as follows:

- Alternative No. 1 – Sewer Rehabilitation and Public Side I-I Reduction - This alternative would be inclusive of repairing or replacing mainline sewer infrastructure and manholes to extend their useful lives another 30+ years and reducing public side inflow and infiltration. This alternative would include manhole rehabilitation and mostly “trenchless” CIPP lining for mainline rehabilitation. Open cut sewer main replacement would only occur when the sanitary main is significantly deteriorated or collapsing. This alternative would also include various minor and easily implemented additional inflow and infiltration reduction improvements. This program would essentially be a continuation of the three (3) prior sewer rehabilitation projects completed by the Town in tandem with its two (2) wet-weather pumping station/flow equalization projects and Interceptor replacement.
- Alternative No. 2 – Sewer Rehabilitation and Replacement focused on Private Side Sewer Separation - This alternative would be inclusive of mostly replacing mainline sewer infrastructure and manholes to extend their useful lives another 75 to 100 years and reducing both public/private side inflow and infiltration. Dedicated stormwater infrastructure would be constructed to convey flows from existing building sewers which may have basement floor drains, foundation drains, and gutter down spouts connected to them in order to permanently remove these private I-I sources from the sanitary sewer. Internal residential home inspections will be conducted to ensure sanitary flow is separated from stormwater flow at each house. The Town will work with Sewer District No. 1 homeowners to mandate lateral separation. As an added benefit, this alternative offers the opportunity for reconstruction of several Town roadways and may include installation of new water main to replace antiquated mains.

6.2. Non-Monetary Factors

The following table compares non-monetary factors for each feasible alternative:

Factor	Alt. No. 1: Sewer Rehabilitation and Public Side I-I Reduction	Alt. No. 2: Sewer Rehabilitation and Replacement focused on Private Side Sewer Separation
Impact on Existing Facility	- Bypass pumping required during rehabilitation - Nominal extraneous flow reduction anticipated	- Bypass pumping required during rehabilitation - Major flow reduction anticipated

WWTF Capacity	<ul style="list-style-type: none"> - Auburn Collection system often overflows during rain events below Owasco Interceptor connection - Nominal extraneous flow reduction anticipated, this project should create additional capacity 	<ul style="list-style-type: none"> - Auburn Collection system often overflows during rain events below Owasco Interceptor connection - Major flow reduction anticipated, this project should create additional capacity
Land Requirements	<ul style="list-style-type: none"> - No New Land Anticipated 	<ul style="list-style-type: none"> - Some land/strip easements may be required for drainage improvements and lateral separation
I-I Reduction	<ul style="list-style-type: none"> - Will slightly reduce impacts from public side I-I sources 	<ul style="list-style-type: none"> - Anticipated to significantly reduce impacts from private-side I-I sources
Storm & Flood Resiliency	<ul style="list-style-type: none"> - System will be slightly more resilient to storms and flooding as compared to current state 	<ul style="list-style-type: none"> - System will be significantly more resilient to storms and flooding as compared to current state - Project will likely eliminate sanitary sewer overflows once sewer separation along the Avenues and Interceptor is fully completed
Environmental Impacts	<ul style="list-style-type: none"> - Minor to no environmental impacts, could be considered a Type II Action under SEQR for rehabilitation in kind 	<ul style="list-style-type: none"> - Minor to no environmental impacts - May reduce and/or eliminate sanitary sewer overflows
Schedule & Constructability	<ul style="list-style-type: none"> - Project is constructible and could be easily implemented in a relatively short period of time, similar to prior Town sewer rehabilitation projects 	<ul style="list-style-type: none"> - Project is constructible and could be implemented over an 8 – 10 year period; may rely heavily of Sewer District resident support
Opportunities for Green Infrastructure	<ul style="list-style-type: none"> - Minimal opportunities 	<ul style="list-style-type: none"> - Likely significant green infrastructure opportunities which could be integrated into streetscape enhancements, must be further evaluated during final design
Local Government Efficiency	<ul style="list-style-type: none"> - No additional opportunities presented by needs. Owasco already sends sewage to the City of Auburn - Town project would focus on creating hydraulic capacity for future growth in Auburn WWTP service area 	<ul style="list-style-type: none"> - No additional opportunities presented by needs. Owasco already sends sewage to the City of Auburn - Offers substantially more opportunities to create sewage treatment capacity for Smart Growth

Community Objections	<ul style="list-style-type: none"> - Rate Increase may raise community objections - Residents impacted by noted roof drain and sump pump disconnections may not like being forced to disconnect I-I sources from sanitary system 	<ul style="list-style-type: none"> - Rate Increase may raise community objections - Sewer District No. 1 residents may oppose “forced” disconnection of private I-I sources from sanitary system. This alternative will mandate a significant amount of private side improvements in accordance with Town Local Law Chapter 116 Sewers, Part I, Article VI, Section 116-35 “Discharge of Unpolluted Water”.
Additional Benefits and Considerations	<ul style="list-style-type: none"> - No additional major benefits - Rehab of existing 80-year old assets has a significantly shorter life expectancy (as compared to installing new infrastructure) 	<ul style="list-style-type: none"> - Project includes new roadway and drainage infrastructure which provides a major added benefit to climate change and flood resiliency. New PVC sanitary piping system will be much more resistant to infiltration than 80-yr old VCT. - Replacement of antiquated water main could easily be added to project. Economy of scale cost savings - Life expectancy of new infrastructure will be significantly greater.

6.3. Alternative Capital Costs

The capital cost estimates for Alternative Nos. 1 and 2 are detailed in Appendix I and summarized in Table 6-1 below.

Table 6-1: Estimate of Probable Capital Cost

Line Item	Alt. No. 1	Alt. No. 2 (Complete Project)	Alt. No. 2: Phase 1 “Pilot” Areas
Construction Total	\$4,826,000	\$21,430,000 (without Water Main)	\$1,799,000
<i>Contingency (15% for Alt. No. 1, 30% for Alt No. 2, Phase 1)</i>	\$724,000	\$25,000,000 (with new Water Main)	\$540,000
<i>Est. Engineering, Legal, Admin. (25%)</i>	\$1,207,000		\$450,000
Total Estimated Project Capital Cost	\$6,757,000	\$25,000,000	\$2,789,000

6.4. Alternative Operation and Maintenance Costs

This project will not impact current operation and maintenance cost expenditures outside of reducing treatment charges via inflow/infiltration reduction. The Town of Owasco currently spends \$320,000 - \$451,000 per year on City of Auburn treatment of extraneous I-I. It is believed that Alternative No. 1 may reduce this cost by 5%-10%, while Alternative No. 2 may reduce this cost by 50+%.

6.5. Alternative Short-Lived Asset Replacement Costs

Short-lived assets (SLA) are items that are likely to fail and need replacement within the typical 20 to 30-year design life of a capital improvement project. Neither gravity sewer manholes, nor piping, are considered short-lived assets. PVC piping and precast manholes when newly installed will typically last well over 75 years.

6.6. Life-Cycle Cost Analysis

Life cycle costs inclusive of the project capital costs, estimated treatment cost reductions, and estimated grant funding have been extrapolated to cover the estimated 90-year operational life of Alternative No. 2. Capital costs are estimated in 2021 dollars.

Table 6-2: Life Cycle Cost Analysis

90 Year Life Cycle Cost Analysis	Alternative 1	Alternative No. 2
Initial Sewer Related Capital Project Cost	\$6,757,000	\$21,430,000
Estimated Amount of Grant	25%	50.0%
Total Project Cost Less Grant	\$5,067,750	\$10,715,000
Est. Yearly Debt Cost (1.5% @ 30 yr. term)	\$211,017	\$446,164
Operating Costs		
Est. Yearly I-I Treatment Costs	\$385,000	\$385,000
Est. Yearly I-I Reduction Savings (%)	7.5%	50%
Est. Yearly I-I Reduction Savings (\$)	\$28,875	\$192,500
Life Expectancy of Sanitary Improvements	30 Years	90 Years
Costs by Period		
Year 1 - 30 Annual Cost (2021 \$)	\$182,142	\$253,664
Total Cost Year 1 - 30 (2021 \$)	\$5,464,259	\$7,609,917
Year 31 - 60 Annual Cost (2021 \$)	\$182,142	(\$192,500)
Total Cost Year 31 - 60 (2021 \$)	\$5,464,259	(\$5,775,000)
Year 61 - 90 Annual Cost (2021 \$)	\$182,142	(\$192,500)
Total Cost Year 61 - 90 (2021 \$)	\$5,464,259	(\$5,775,000)
Total 90 Year Cost (2021 \$)	\$16,392,779	(\$3,940,082)
Payback Period		
Estimated Payback Period of Alternative No. 2	36 Years	

7.0 RECOMMENDED ALTERNATIVE

7.1. Basis of Selection

Alternative Nos. 1 and 2 were each evaluated on their ability to provide efficient and reliable wastewater collection in accordance with recognized design standards for a 30 to 90-year planning period. Additional long-term project goals and considerations included reducing I-I treatment costs, eliminating SSOs, and ensuring long term improvement to sustainability/reliability.

Based on discussion with the Town and monetary and non-monetary factors, it is believed that Alternative No. 2 offers the most cost effective and sustainable long-term solution to the Town of Owasco and its Sewer District residents, as well as the City of Auburn. It is the only alternative that will significantly reduce I-I. It will provide the Avenues with a large amount of new storm/sanitary piping that will last for 75-100 years without the need of major improvements. It will also be inclusive of roadway reconstruction affording the opportunity to enhance pedestrian safety and walkability, and stormwater management through green infrastructure streetscape enhancements.

As previously noted, based on the anticipated total cost of the project, it recommended that the Town initially plan, design, construct and monitor the effectiveness of I-I reduction with a "Phase 1" project inclusive of about 10% of the total required improvements focused on three (3) of its Avenues. A summary of the pros and cons of the alternatives evaluated, including non-monetary factors, is provided in Table 7-1.

Table 7-1: Comparison of Alternatives Table

Alternative	Pros	Cons
<p>Alt. No. 1: Sewer Rehabilitation and Public Side I-I Reduction</p>	<ul style="list-style-type: none"> • Lowest initial capital cost • Minimal Private resident participation • Easily Implemented 	<ul style="list-style-type: none"> • Minor I-I reduction expected • Town will continue to pay significantly for City Treatment of I-I • Shorter Improvement Life Expectancy • No Drainage Improvements • Does not address root cause of I-I and infrastructure deficiencies • May not eliminate SSO's
<p>Alt. No. 2: Sewer Rehabilitation And Replacement Focused On Private Side Sewer Separation</p>	<ul style="list-style-type: none"> • Significant I-I reduction expected • Significant treatment cost reduction anticipated • Long Improvement Life Expectancy 75-100 years • Added benefit of roadway and Drainage improvements with Green Infrastructure opportunities • If water main improvements are included, next utility project will be ~50+ years away along areas improved • Pay Back Period 30-40 years • Likely to eliminate SSO's 	<ul style="list-style-type: none"> • Higher Capital Cost • Requires sewer district resident and participation for success • 8-10 year implementation time frame • Significant temporary disturbance to heavily populated roadways

8.0 PROJECT FINANCING

Funding scenarios have been developed for Phase 1 of the recommended project Alternative (Alt. 2). As detailed in Section 5.3, it is recommended that project effectiveness of Alternative Phase 1 be verified prior to constructing future phases. Similar project financing scenarios are likely to be available for future phases if success is proven in Phase 1.

8.1 Grant Funding and Project Financing Opportunities

Currently, there are several opportunities for a municipal sewer project to receive grant or low interest loan funding. Some opportunities this project may qualify for include:

- NYSEFC Clean Water State Revolving Fund (CWSRF) Program: The NYSEFC CWSRF program provides grant and loan funding for qualifying municipal sewer projects. Grants and loans are awarded based on the community's financial status indicated by a municipality's 2017 Median Household Income (MHI) combined with the need/environmental impacts of the proposed project. In review of the Owasco's 2017 MHI of \$84,430, the Town does not financially qualify for Hardship financing or grant directly through NYSEFC. The Town is; however, eligible for subsidized interest rates as long as the project scores high enough on the State's Intended Use Plan (IUP) (i.e., above the subsidy funding line). Based on the current scope of the project and water quality impacts to the Owasco Outlet, it is likely that the project may score above the subsidy funding line.
- New York Water Infrastructure Improvement Act Grants (WIIA): The WIIA program distributes grants through NYSEFC for clean and drinking water projects. Eligible clean water rehabilitation or replacement projects could receive up to \$5,000,000 of grant or 25% of the total project cost. Priority will be given to water projects that demonstrate a public health need and hardship communities. This project could receive a WIIA grant for 25% of the net total project costs which would account for any other grants received.
- USDA Rural Development (RD) Water and Environmental Program (WEP) Grants: The USDA WEP program provides grant funding and low interest loans to eligible drinking water, clean water, and stormwater projects. The proposed project meets the eligibility criteria for the USDA RD WEP program and based on the 2010 MHI should qualify for a 38-year loan with a market category interest rate (currently 2.25%).
- NYSDEC Water Quality Improvement Project (WQIP) Grant Program: The NYSDEC WQIP program provides funding to capital projects that directly address documented water quality issues. Since the NYSDEC classifies Owasco Lake as an Impaired Waterbody with suspected impairment sources of sanitary waste and municipal discharges, Owasco would have a good chance at being awarded a WQIP grant. The WQIP grant could provide up to \$10,000,000 or 80% of the cost of construction in grant funding.

- Congressional Community Project Funding: Grant funding was also be available through congressional earmark community project funding. This project would qualify for a State and Tribal Assistance Grant (STAG) through the U.S. Department of Interior. Grant funding can be obtained on a yearly basis by applying directly to the Town's House of Representatives Congressman or a NYS Senator. Final grant awards can be as much as 80% of the project costs and will be decided by the House Appropriations Committee.

8.1.1. Plausible Funding Scenarios

Based on the funding opportunities described in Section 7.1, annual user cost impacts of the proposed sewer project were reviewed under four plausible funding scenarios. The Town should consult with a fiscal advisor regarding these and other potential funding options prior to moving forward with the project. The following four (4) funding scenarios were analyzed:

- Scenario No. 1: EFC 1.5% Long Term Market Rate Loan and 25% Grant – Under this scenario the Town would receive a 30 year 1.5% interest rate loan through the NYSEFC CWSRF program and 25% grant through WIIA, WQIP, or Community Project Funding.
- Scenario No. 2: EFC 1.5% Long Term Market Rate Loan and 50% Grant – Under this scenario the Town would receive a 30 year 1.5% interest rate loan through the NYSEFC CWSRF program and 50% grant through WIIA, WQIP, or Community Project Funding.
- Scenario No. 3: EFC 1.5% Long Term Market Rate Loan and 75% Grant – Under this scenario the Town would receive a 30 year 1.5% interest rate loan through the NYSEFC CWSRF program and 75% grant through WIIA, WQIP, or Community Project Funding.
- Scenario No. 4: EFC 1.5% Long Term Market Rate Loan – Under this scenario the Town would receive a 30 year 1.5% interest rate loan through the NYSEFC CWSRF program.

8.2. Annual User Costs

The impact on annual user cost as a result of this project will largely be dependent on the actual project financing and grant, if any, received by the Town of Owasco in addition to yearly treatment cost savings from I-I reduction. Appendix J provides a detailed outline of the financing options. Table 8-1 summarizes annual user cost impacts as a result of the recommended *Phase 1 of Alternative No. 2* under the four (4) different funding scenarios described above. Annual user costs of future phases of Alternative 2 should be analyzed in more detail after Phase 1 is completed based on the success of I-I reduction.

Table 8-1: Summary of Impacts on Annual User Cost

Financing	Total Cost of Phase I	Total Grant	Estimated Annualized Cost	Potential Yearly Treatment Cost Savings	Additional Annual Cost per EDU
Scenario No. 1: 1.5% CWSRF EFC Loan and 25% Grant	\$3,199,000	\$799,750	\$99,903	(\$19,250)	\$86
Scenario No. 2: 1.5% CWSRF EFC Loan and 50% Grant		\$1,599,500	\$66,602	(\$19,250)	\$51
Scenario No. 3: 1.5% CWSRF EFC Loan and 75% Grant		\$2,399,250	\$33,301	(\$19,250)	\$15
Scenario No. 4: 1.5% CWSRF EFC Loan		\$0	\$133,204	(\$19,250)	\$122

"The information contained herein IS NOT INTENDED TO BE AND DOES NOT INCLUDE advice or recommendations with respect to the issuance, structure, timing, terms or any other aspect of municipal securities, municipal derivatives, guaranteed investment contracts or investment strategies. Any opinions, advice, information or recommendations contained herein are understood by the recipients to be strictly *engineering* opinions, advice, information or recommendations. Barton & Loguidice is not a "municipal advisor" as defined by 15 U.S.C. 78o-4 or the related rules of the Securities and Exchange Commission. The parties to whom this information is being provided should determine independently whether they require the services of a municipal advisor."

9.0 ENVIRONMENTAL REVIEW

Ground disturbance resulting from the project could potentially impact environmental resources. Most impacts would likely be temporary and largely confined to Town owned property or maintained/developed road right-of-ways or along sewer laterals. Further details regarding potential environmental impacts related to the proposed improvements are described below.

9.1. Wetlands and Surface Waters

The NYSDEC Environmental Resource Mapper and U.S. Fish and Wildlife Service's National Wetlands Inventory (NWI) were reviewed to determine the presence of mapped wetlands within the project area. Based on available information, none of the project locations will be located in the vicinity of the wetlands.

9.2. Threatened and Endangered Species

A review of the USFWS Information for Planning and Conservation (IPaC) system indicated that the project area does not include any endangered species. There are four (4) Migratory Birds that are within range of, and may occur in the Town. This includes; Bald Eagle (*Haliaeetus leucocephalus*), Bobolink (*Dolichonyx oryzivorus*), Canada Warbler (*Cardellina canadensis*), and Wood Thrush (*Hylocichla mustelina*). It is unlikely that the proposed project will endanger these migratory birds as there is no land clearing. No critical habitat was identified within the project limits. A review of the NYS Environmental Resource Mapper and New York Nature Explorer databases did not list any state-listed species in the Town of Owasco.

9.3. Cultural and Historic Resources

An initial review of the NYS Historic Preservation Office (SHPO) Cultural Resource Information System (CRIS) indicated that there are some areas in the Town of Owasco that are part of the National Register Building Sites; however, the proposed project will not be in proximity to these buildings. Consultation with SHPO will continue throughout the project design phase to avoid and mitigate potential cultural resource impacts.

9.4. Environmental Permit Summary

Exact permitting needs would be further explored during the project's final design stage. The following permits could be required dependent on final environmental impacts:

- USACE Section 404 Clean Water Act Permit - Temporary and/or permanent disturbances involving disturbance to wetlands or surface waters that qualify as Waters of the United States.
- NYSDEC Section 401 Water Quality Certification - Temporary and/or permanent disturbances to wetlands or surface waters that qualify as Waters of the United States.
- NYSDEC Plan Approval.
- NYSDOT Highway Work Permit.

9.5. Smart Growth

The recommended CIP is consistent with Smart Growth principles and practices as it proposes to improve the design service life, reliability and integrity of existing infrastructure. A completed NYSEFC Smart Growth form is included in Appendix K.

10.0 RECOMMENDATIONS FOR PROJECT IMPLEMENTATION

It is recommended that this report be presented to Town of Owasco Sewer District No. 1 residents, the NYSDEC, and potential funding agencies outlined herein and then move forward with Phase 1 of Alternative No. 2. Additional steps and timeframes for project implementation would generally include the following:

<u>Project Schedule Milestone Item</u>	<u>Completion Date</u>
Submit Engineering Report to NYSEFC/NYSDEC	July 2021
Environmental Review	September 2021
Final 2021-22 CWSRF IUP Project Listing	October 2021
Submit Full CWSRF funding application to NYSEFC	Fall 2021
Close on Short Term Financing for Alt. 2, Phase 1	Early 2022
Apply for Grant Funding for Alt. 2, Phase 1	2022-2023
Design of Alt. 2, Phase 1	2022-2023
Construction of Alt. 2, Phase 1	2023 - 2024
Evaluation of Alt. 2 Phase 1 Effectiveness	2024
Complete Additional Phases of Alt. 2	2025-2030

11.0 CONCLUSION

Results from this engineering evaluation indicate that Alternative No. 2 represents the most cost effective long-term solution for collection system asset renewal and I/I reduction within the Town of Owasco sanitary collection system. This alternative would be inclusive of mostly replacing mainline sewer infrastructure and manholes to extend their useful lives another 75 to 100 years and reducing both public/private side inflow and infiltration. Dedicated stormwater infrastructure will be constructed to convey flows from basement floor drains, foundation drains, and gutter down spouts in order to permanently remove these private side I-I sources from the dedicated sanitary sewer system. Internal residential home inspections will be conducted to ensure sanitary flow is separated from stormwater flow at each house. The Town will work with private homeowners in the Phase 1 targeted areas to mandate lateral separation.

The estimated probable project cost of the recommended capital improvement project is \$3,199,000 (in 2023 dollars), which will be distributed over the Sewer District No. 1 user base of the sanitary sewer system. User costs to fund these improvements will vary depending on financing terms and amount of grant funding received. The additional annual charge to pay the debt service of the proposed capital project is estimated to be between \$3.75/EDU and \$30.50/EDU per quarter depending on the final funding package.

See Appendix L for EFC Engineering Report Certification Form.

12.0 REFERENCES

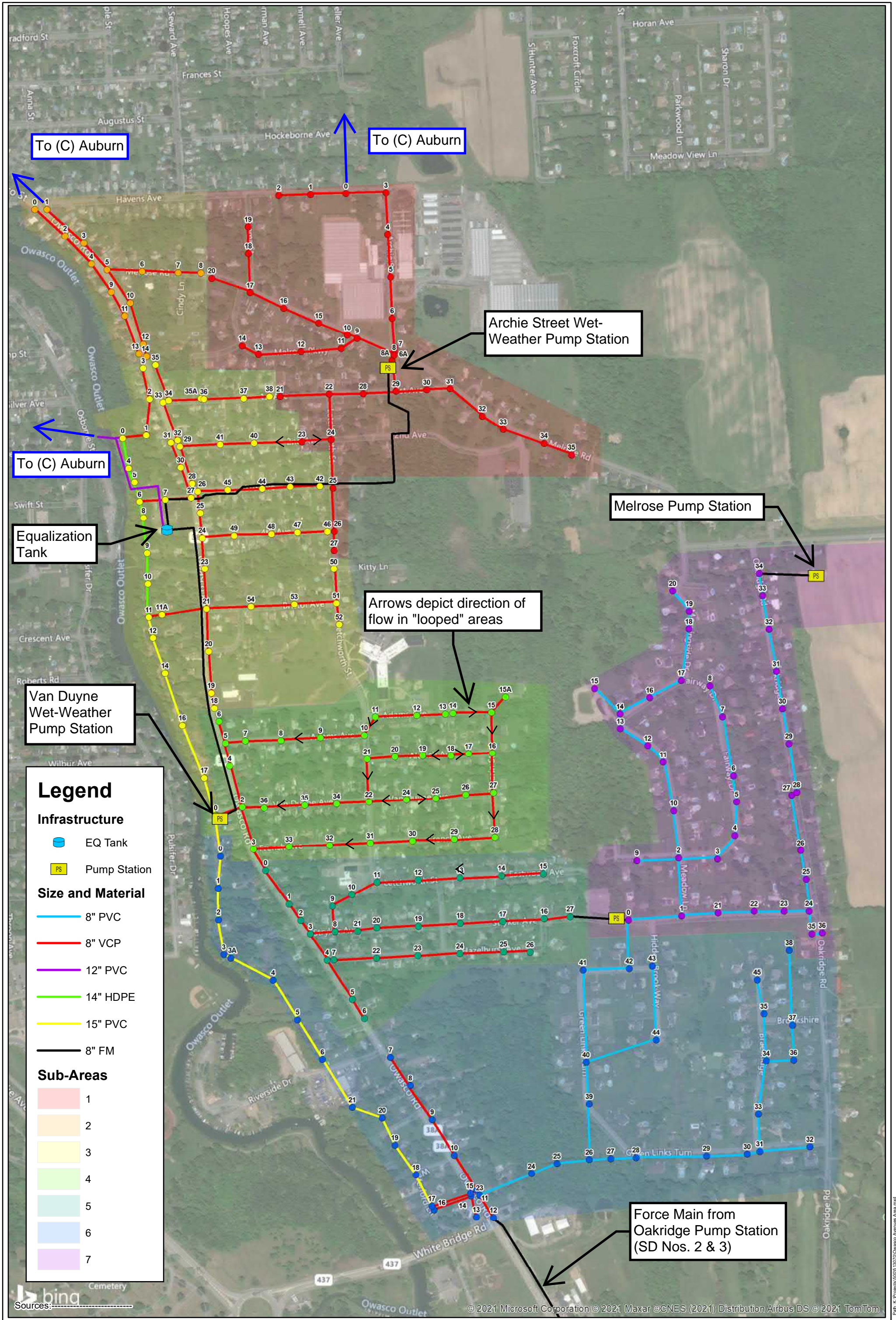
EPA. (2016, September 16). *Enforcement and Compliance History On-Line*. Retrieved September 16, 2016, from Detailed Facility Report: <https://echo.epa.gov/effluent-charts#NY0153206>

NEIWPCC. (2011). *Guides for the Design of Wastewater Treatment Works*. Lowell: New England Interstate Water Pollution Control Commission

U.S. Census Bureau. (2014). *American Fact Finder*. Retrieved May 5, 2016, from http://factfinder.census.gov/faces/nav/jsf/pages/community_facts.xhtml#

Figures

Figure 1
Avenues Area Existing Collection System



To (C) Auburn

To (C) Auburn

Archie Street Wet-Weather Pump Station

To (C) Auburn

Melrose Pump Station

Equalization Tank

Arrows depict direction of flow in "looped" areas

Van Duyme Wet-Weather Pump Station

Legend

Infrastructure

- EQ Tank
- Pump Station

Size and Material

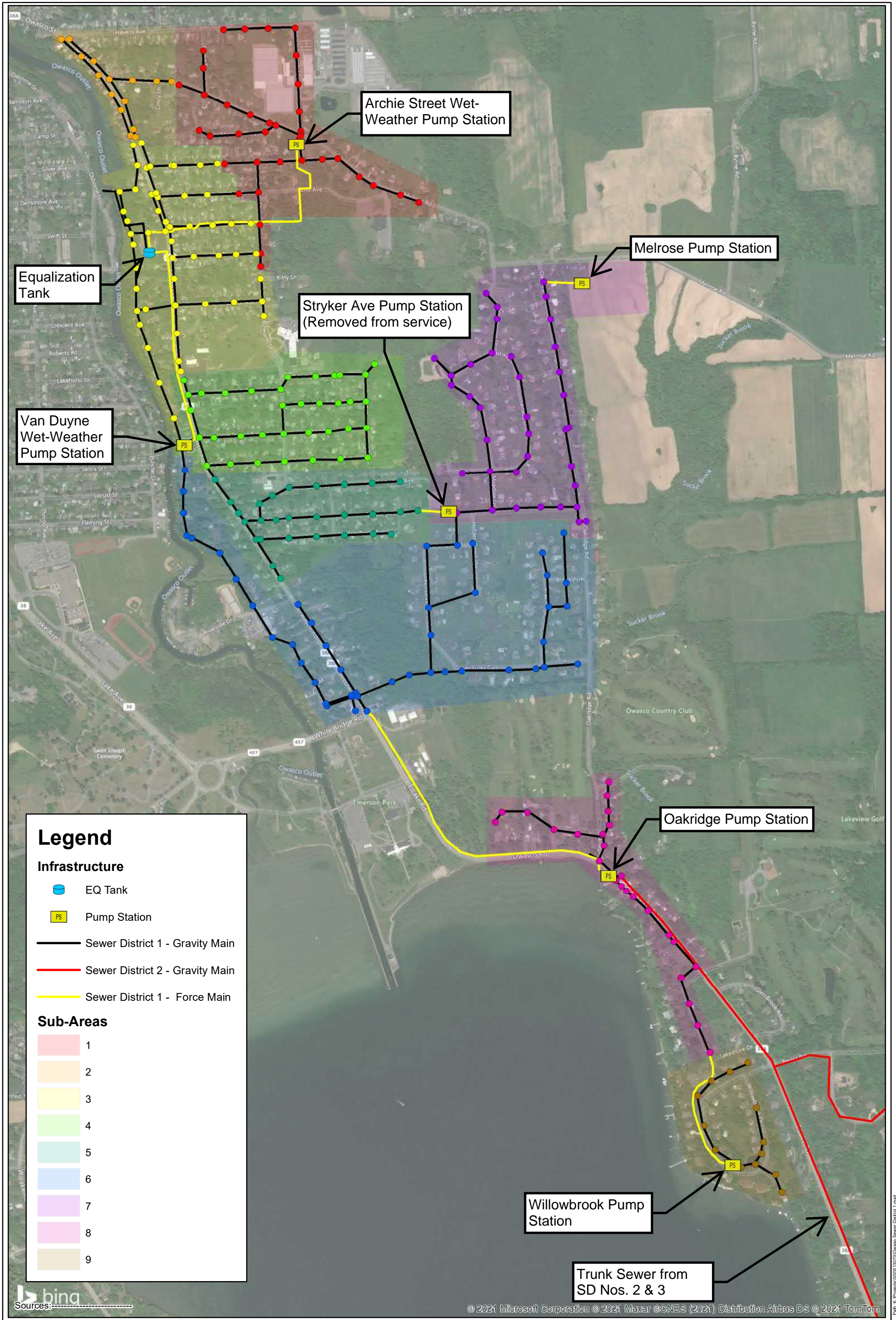
- 8" PVC
- 8" VCP
- 12" PVC
- 14" HDPE
- 15" PVC
- 8" FM

Sub-Areas

- 1
- 2
- 3
- 4
- 5
- 6
- 7

Force Main from Oakridge Pump Station (SD Nos. 2 & 3)

Figure 2
Sewer District No. 1 Existing Collection System



Equalization Tank

Archie Street Wet-Weather Pump Station

Melrose Pump Station

Stryker Ave Pump Station (Removed from service)

Van Duyne Wet-Weather Pump Station

Oakridge Pump Station

Willowbrook Pump Station

Trunk Sewer from SD Nos. 2 & 3

Legend

Infrastructure

- EQ Tank
- Pump Station
- Sewer District 1 - Gravity Main
- Sewer District 2 - Gravity Main
- Sewer District 1 - Force Main

Sub-Areas

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9

Sources: bing

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1 inch = 900 feet

Town of Owasco
Sewer District No. 1
 Cayuga County New York

Figure
 2
 Project No.
 513.070

Path: K:\Projects\513070\Owasco Sewer District 1.mxd

Figure 3
Sanitary System Process Flow Diagram

Figure 3 : Hydraulic Flow Schematic

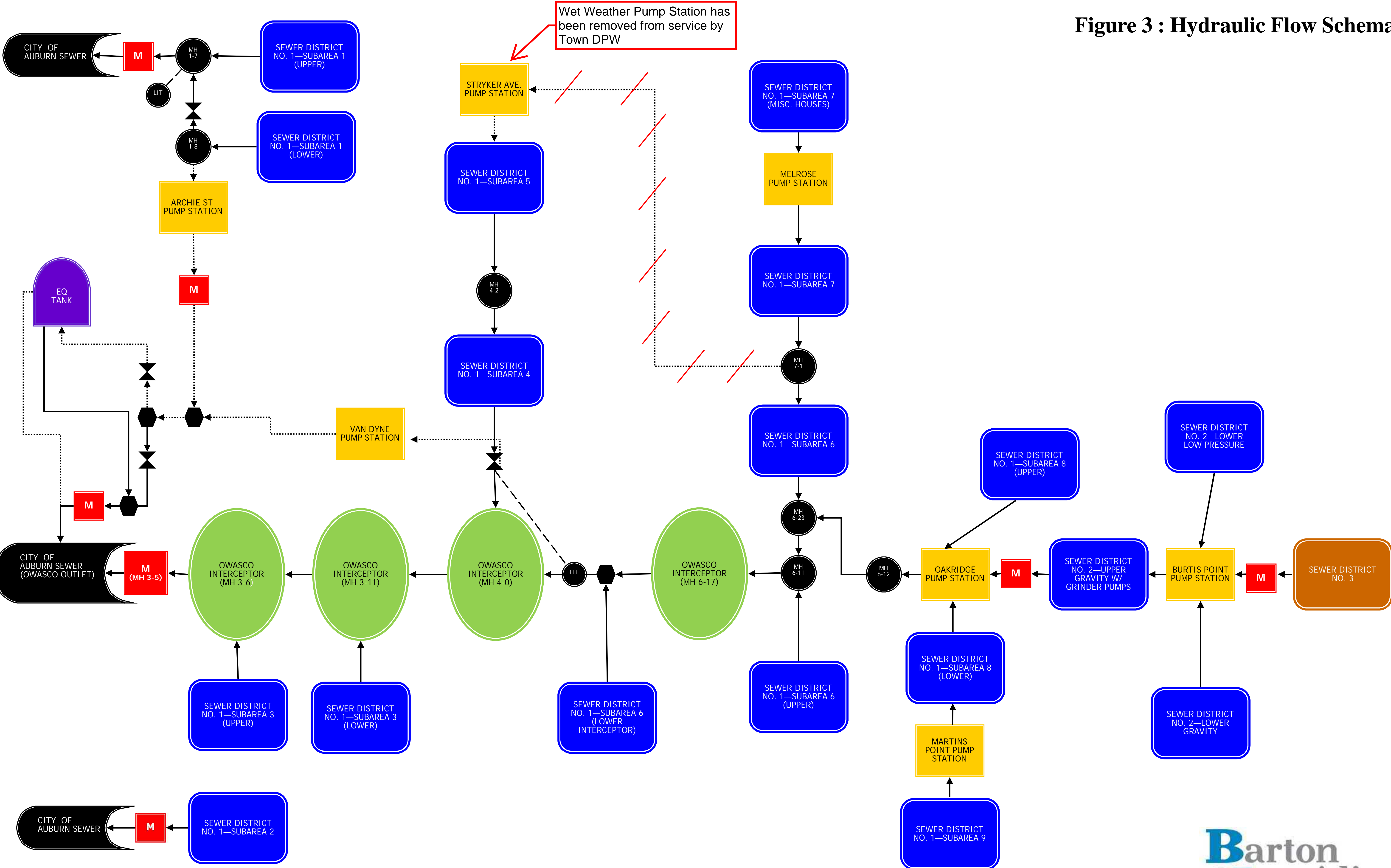
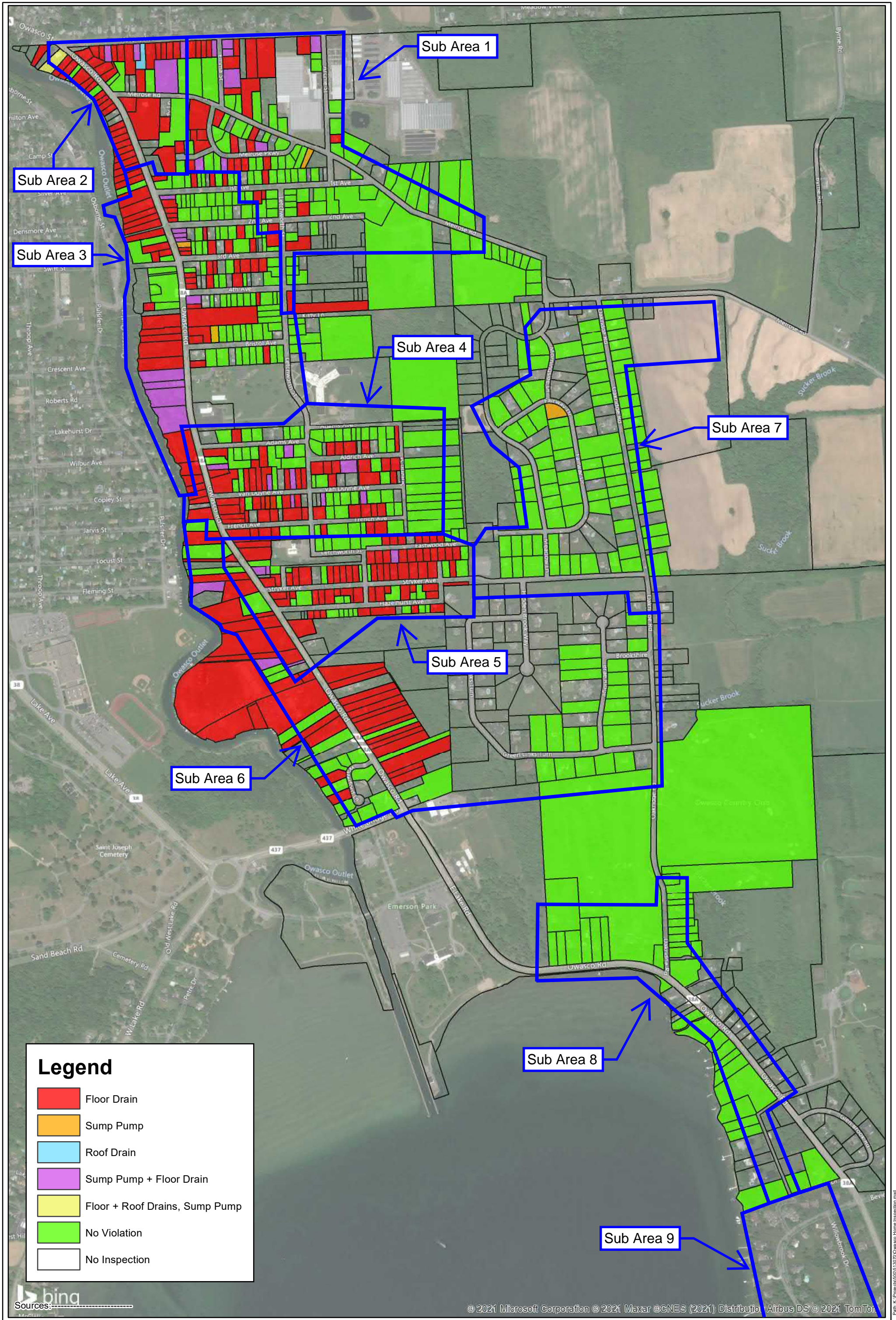


Figure 4
Home Inspection Summary



Legend

■	Floor Drain
■	Sump Pump
■	Roof Drain
■	Sump Pump + Floor Drain
■	Floor + Roof Drains, Sump Pump
■	No Violation
■	No Inspection

Sources:

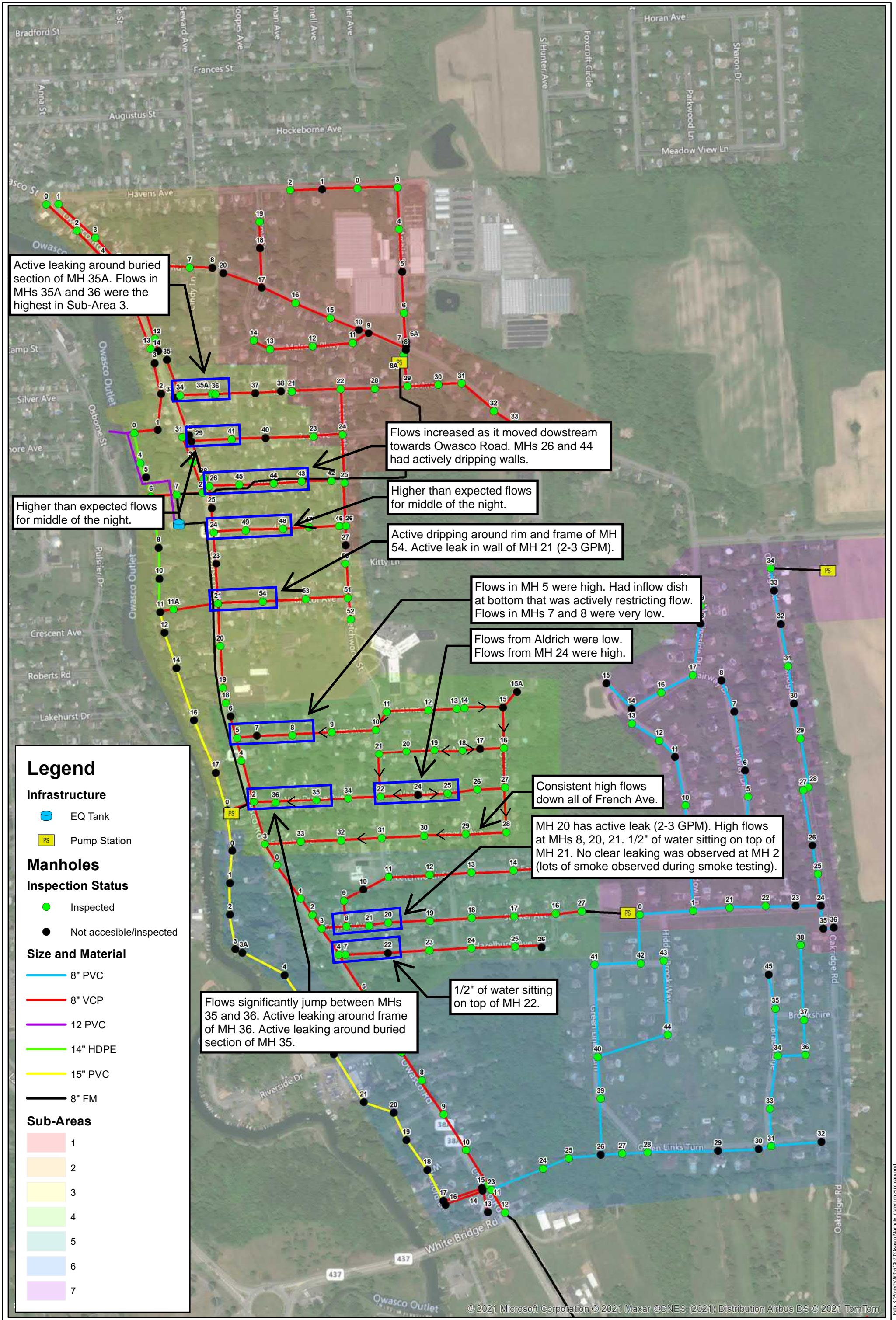


1 inch = 800 feet

Town of Owasco
Home Inspection Summary
 Cayuga County New York
 5/12/2021

Figure
 4
 Project
 No. 513.070

Figure 5
Wet Weather/Night-time Flow Observations



Active leaking around buried section of MH 35A. Flows in MHs 35A and 36 were the highest in Sub-Area 3.

Flows increased as it moved downstream towards Owasco Road. MHs 26 and 44 had actively dripping walls.

Higher than expected flows for middle of the night.

Higher than expected flows for middle of the night.

Active dripping around rim and frame of MH 54. Active leak in wall of MH 21 (2-3 GPM).

Flows in MH 5 were high. Had inflow dish at bottom that was actively restricting flow. Flows in MHs 7 and 8 were very low.

Flows from Aldrich were low. Flows from MH 24 were high.

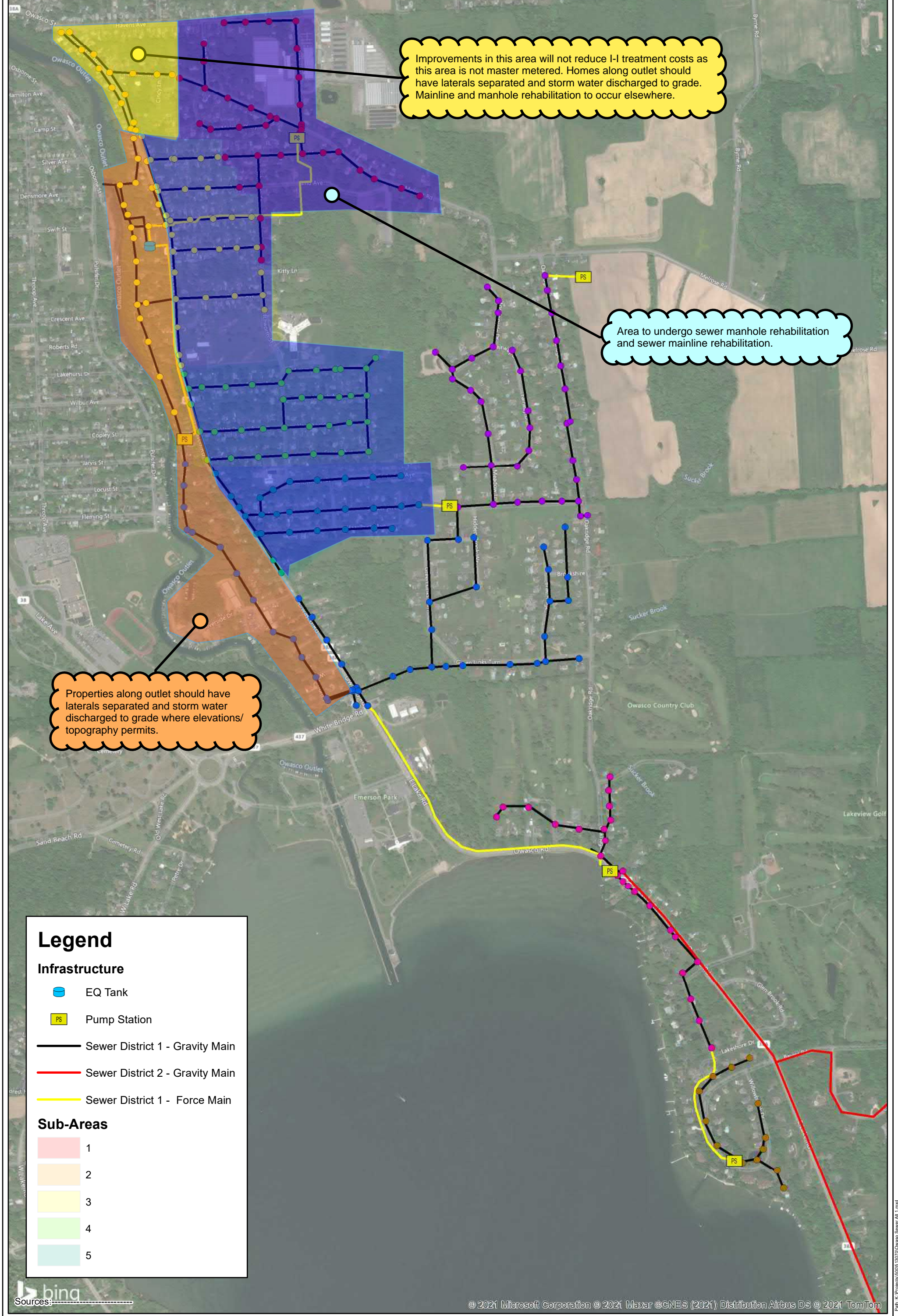
Consistent high flows down all of French Ave.

MH 20 has active leak (2-3 GPM). High flows at MHs 8, 20, 21. 1/2" of water sitting on top of MH 21. No clear leaking was observed at MH 2 (lots of smoke observed during smoke testing).

Flows significantly jump between MHs 35 and 36. Active leaking around frame of MH 36. Active leaking around buried section of MH 35.

1/2" of water sitting on top of MH 22.

Figure 6
Improvements Alternative No. 1



Improvements in this area will not reduce I-I treatment costs as this area is not master metered. Homes along outlet should have laterals separated and storm water discharged to grade. Mainline and manhole rehabilitation to occur elsewhere.

Area to undergo sewer manhole rehabilitation and sewer mainline rehabilitation.

Properties along outlet should have laterals separated and storm water discharged to grade where elevations/topography permits.

Legend

Infrastructure

- EQ Tank
- Pump Station
- Sewer District 1 - Gravity Main
- Sewer District 2 - Gravity Main
- Sewer District 1 - Force Main

Sub-Areas

- 1
- 2
- 3
- 4
- 5

Sources: bing

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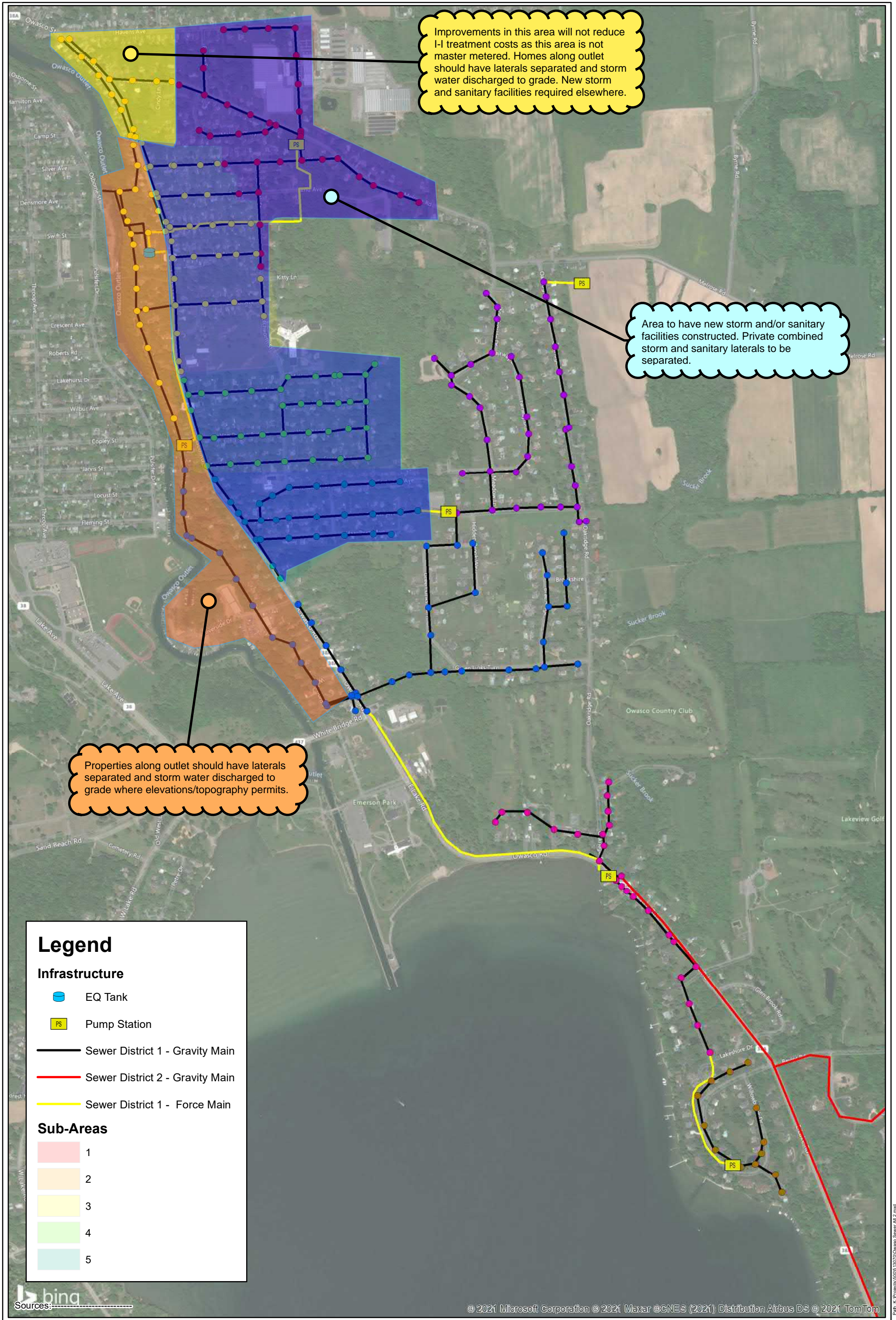


1 inch = 900 feet

Town of Owasco
Alternative No. 1 Improvements
 Cayuga County New York

Figure
 6
 Project
 No. 513.070

Figure 7
Improvements Alternative No. 2



Improvements in this area will not reduce I-I treatment costs as this area is not master metered. Homes along outlet should have laterals separated and storm water discharged to grade. New storm and sanitary facilities required elsewhere.

Area to have new storm and/or sanitary facilities constructed. Private combined storm and sanitary laterals to be separated.

Properties along outlet should have laterals separated and storm water discharged to grade where elevations/topography permits.

Legend

Infrastructure

- EQ Tank
- Pump Station
- Sewer District 1 - Gravity Main
- Sewer District 2 - Gravity Main
- Sewer District 1 - Force Main

Sub-Areas

- 1
- 2
- 3
- 4
- 5

Sources: bing

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1 inch = 900 feet

Town of Owasco
Alternative No. 2 Improvements
 Cayuga County
 6/11/2021
 New York

Figure
 7
 Project
 No.
 513.070

Note: Most Existing Infrastructure Not Shown for Clarity.
Individual house laterals connected to new pipes not shown for clarity (would include 1 new sanitary and 1 new storm lateral)

Sanitary/Storm infrastructure/laterals will be provided to each home for ease of lateral separation.

New Sanitary Sewer Main - Connect to Existing Manhole at Owasco Road

Storm Catch Basin

Sanitary Manhole

Storm Manhole

Streetscape Opportunity: Complete full-depth/full width reconstruction of 3rd Ave. Install new curbing and sidewalks

New Storm Sewer and Outfall to Owasco Outlet

New Water Main & Service Transfers - To be connected to existing main at each end

Equalization Tank & Control Building

Sources: bing

Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community, © 2021 Microsoft Corporation © 2021 Maxar © CNES (2021) Distribution Airbus DS © 2021 TomTom

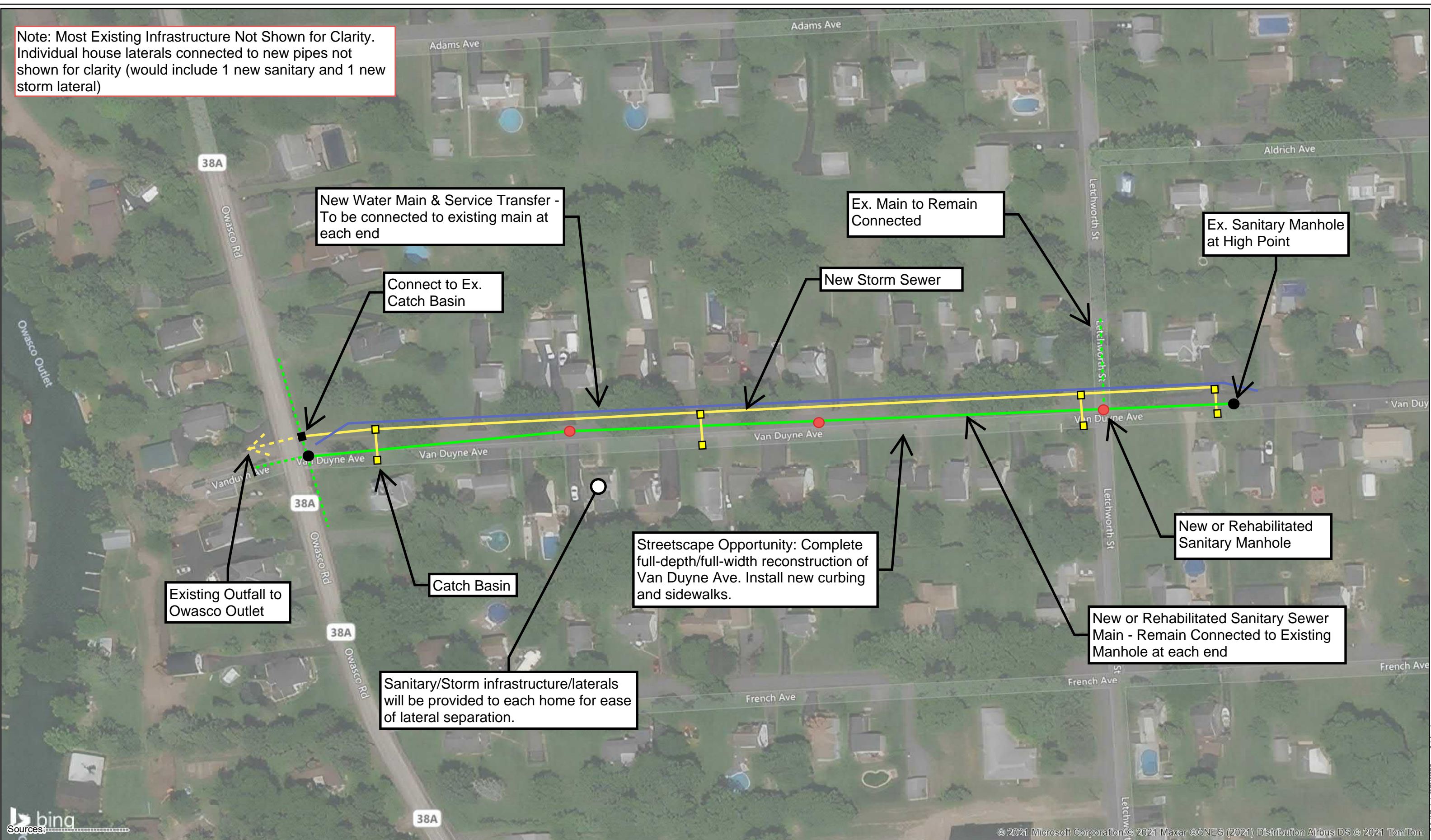


1 inch = 150 feet

Town of Owasco
Alternative No. 2 - Phase 1
Sub Area 3 - 3rd Avenue
Cayuga County 6/11/2021 New York

Figure
7A
Project
No.
513.070

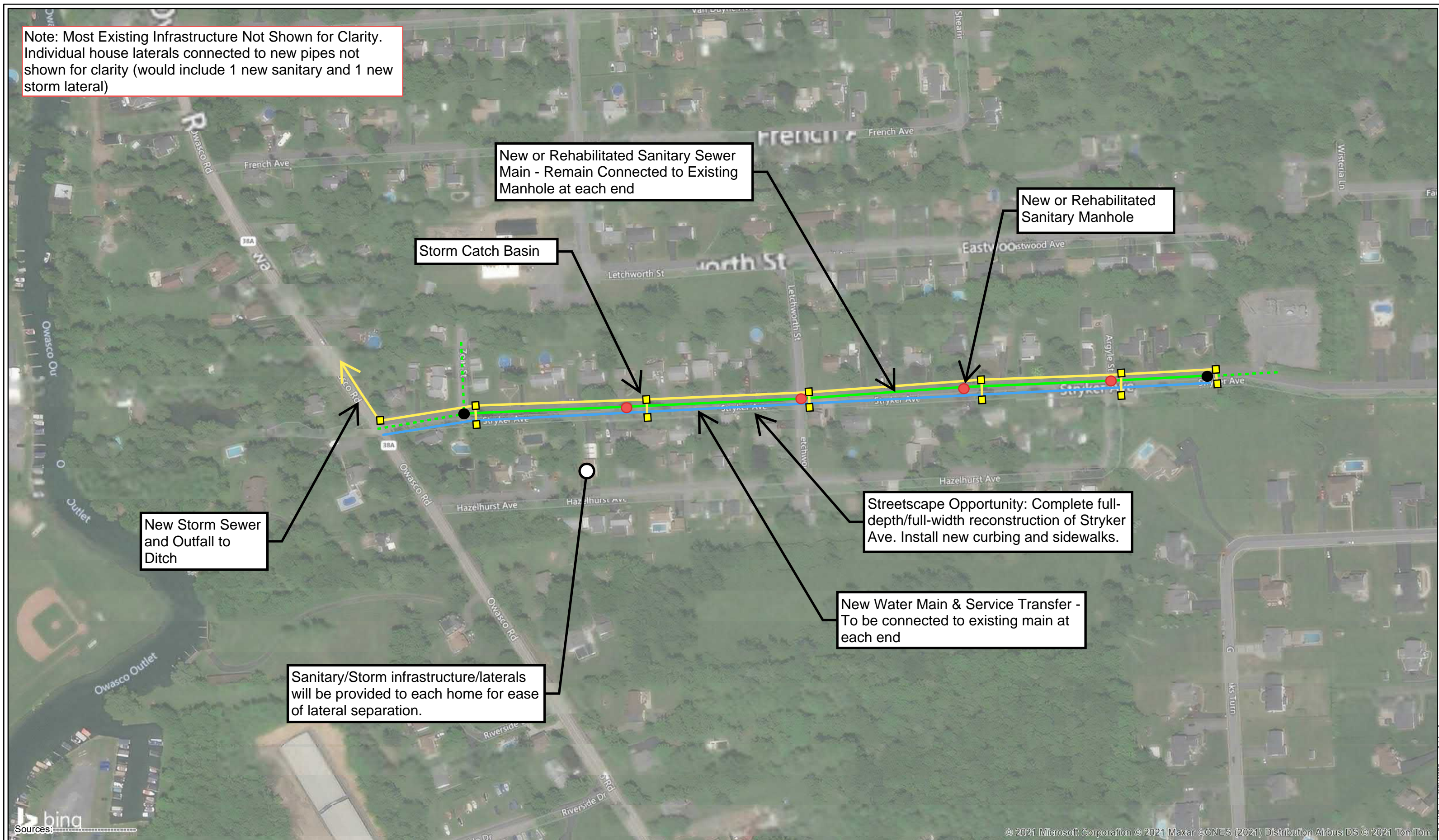
Note: Most Existing Infrastructure Not Shown for Clarity. Individual house laterals connected to new pipes not shown for clarity (would include 1 new sanitary and 1 new storm lateral)



Sources: bing

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Note: Most Existing Infrastructure Not Shown for Clarity. Individual house laterals connected to new pipes not shown for clarity (would include 1 new sanitary and 1 new storm lateral)



New or Rehabilitated Sanitary Sewer Main - Remain Connected to Existing Manhole at each end

Storm Catch Basin

New or Rehabilitated Sanitary Manhole

New Storm Sewer and Outfall to Ditch

Streetscape Opportunity: Complete full-depth/full-width reconstruction of Stryker Ave. Install new curbing and sidewalks.

New Water Main & Service Transfer - To be connected to existing main at each end

Sanitary/Storm infrastructure/laterals will be provided to each home for ease of lateral separation.

Appendices

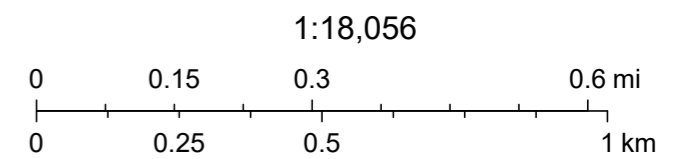
Appendix A
Environmental Resource Mapping

Town of Owasco Environmental Resource Mapper



October 27, 2020

- State Regulated Freshwater Wetlands (Outside of the Adirondack Park)
- State Regulated Wetland Checkzone i
- Significant Natural Communities
- Natural Communities Near This Location i
- Rare Plants or Animals
- ★ Unique Geological Features
- Waterbody Classifications for Rivers/Streams
- Waterbody Classifications for Lakes



Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

Soil Map—Cayuga County, New York



Map Scale: 1:14,500 if printed on A portrait (8.5" x 11") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84



Natural Resources
Conservation Service

Web Soil Survey
National Cooperative Soil Survey

10/26/2020
Page 1 of 3

MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

Special Point Features



Blowout



Borrow Pit



Clay Spot



Closed Depression



Gravel Pit



Gravelly Spot



Landfill



Lava Flow



Marsh or swamp



Mine or Quarry



Miscellaneous Water



Perennial Water



Rock Outcrop



Saline Spot



Sandy Spot



Severely Eroded Spot



Sinkhole



Slide or Slip



Sodic Spot



Spoil Area



Stony Spot



Very Stony Spot



Wet Spot



Other



Special Line Features

Water Features



Streams and Canals

Transportation



Rails



Interstate Highways



US Routes



Major Roads



Local Roads

Background



Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Cayuga County, New York

Survey Area Data: Version 17, Jun 11, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

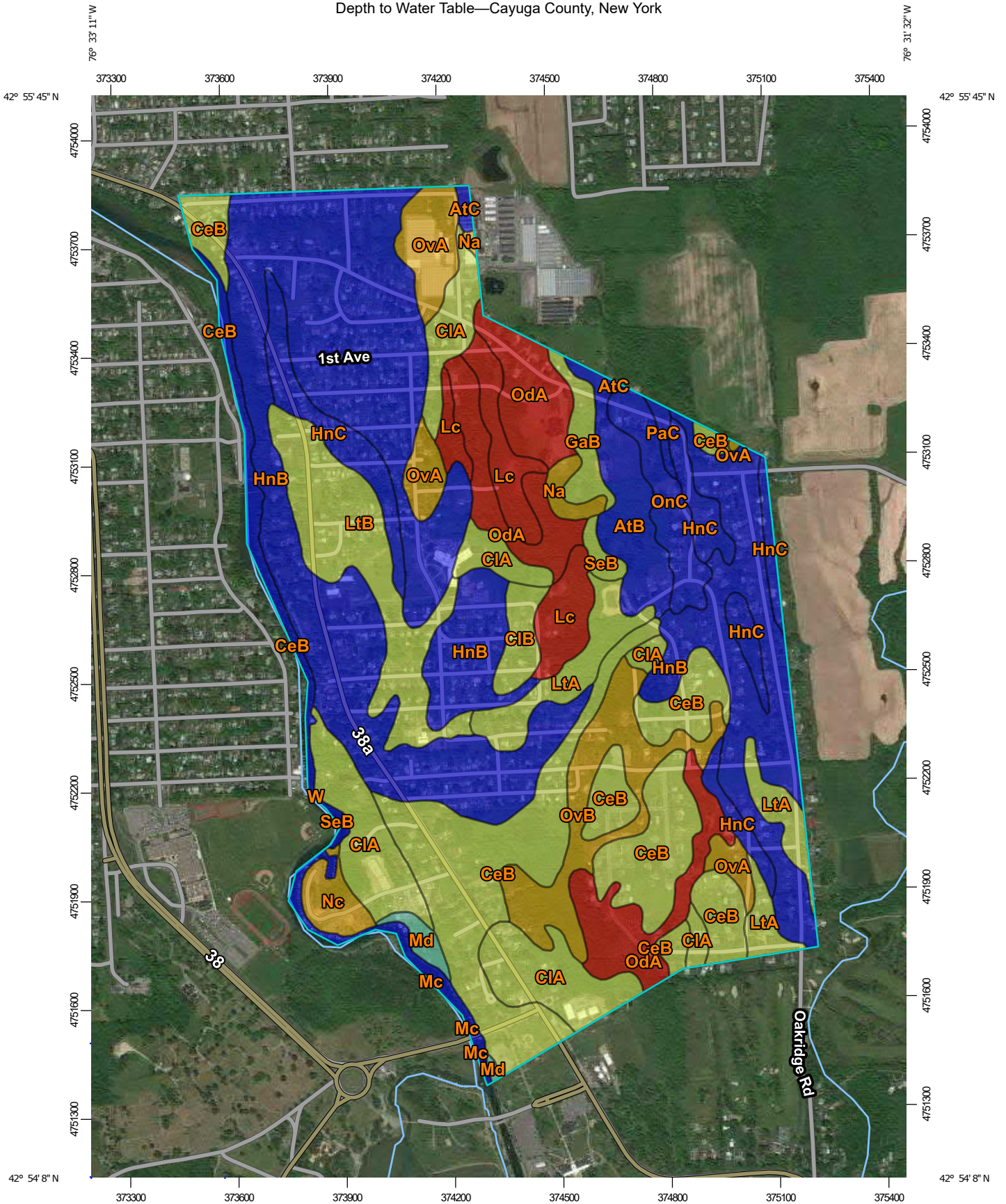
Date(s) aerial images were photographed: Jun 18, 2011—Oct 10, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
AtB	Arkport fine sandy loam, 1 to 6 percent slopes	18.7	2.8%
AtC	Arkport fine sandy loam, 6 to 12 percent slopes	1.4	0.2%
CeB	Cazenovia silt loam, 2 to 8 percent slopes	102.8	15.2%
CIA	Collamer silt loam, 0 to 2 percent slopes	55.4	8.2%
CIB	Collamer silt loam, 2 to 6 percent slopes	6.9	1.0%
GaB	Galen fine sandy loam, 2 to 6 percent slopes	7.1	1.1%
HnB	Honeoye silt loam, 3 to 8 percent slopes	220.0	32.5%
HnC	Honeoye silt loam, 8 to 15 percent slopes	31.5	4.6%
Lc	Lakemont silty clay loam, 0 to 3 percent slopes	23.5	3.5%
LtA	Lima silt loam, 0 to 3 percent slopes	24.6	3.6%
LtB	Lima silt loam, 3 to 8 percent slopes	38.0	5.6%
Mc	Made land, sanitary land fill	0.1	0.0%
Md	Made land, tillable	3.3	0.5%
Na	Niagara fine sandy loam	4.0	0.6%
Nc	Niagara and Canandaigua silt loams	6.9	1.0%
OdA	Odessa silt loam, 0 to 3 percent slopes	50.0	7.4%
OnC	Ontario loam, 8 to 15 percent slopes	13.9	2.0%
OvA	Ovid silt loam, 0 to 2 percent slopes	20.2	3.0%
OvB	Ovid silt loam, 2 to 6 percent slopes	28.0	4.1%
PaC	Palmyra gravelly sandy loam, 8 to 15 percent slopes	1.7	0.2%
SeB	Schoharie silt loam, 2 to 6 percent slopes	2.6	0.4%
W	Water	17.0	2.5%
Totals for Area of Interest		677.6	100.0%

Depth to Water Table—Cayuga County, New York
































Map Scale: 1:14,500 if printed on A portrait (8.5" x 11") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84



MAP LEGEND

Area of Interest (AOI)	 Not rated or not available
 Area of Interest (AOI)	
Soils	Water Features
Soil Rating Polygons	 Streams and Canals
 0 - 25	Transportation
 25 - 50	 Rails
 50 - 100	 Interstate Highways
 100 - 150	 US Routes
 150 - 200	 Major Roads
 > 200	 Local Roads
 Not rated or not available	Background
	 Aerial Photography
Soil Rating Lines	
 0 - 25	
 25 - 50	
 50 - 100	
 100 - 150	
 150 - 200	
 > 200	
 Not rated or not available	
Soil Rating Points	
 0 - 25	
 25 - 50	
 50 - 100	
 100 - 150	
 150 - 200	
 > 200	

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
 Web Soil Survey URL:
 Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Cayuga County, New York
 Survey Area Data: Version 17, Jun 11, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 18, 2011—Oct 10, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Depth to Water Table

Map unit symbol	Map unit name	Rating (centimeters)	Acres in AOI	Percent of AOI
AtB	Arkport fine sandy loam, 1 to 6 percent slopes	>200	18.7	2.8%
AtC	Arkport fine sandy loam, 6 to 12 percent slopes	>200	1.4	0.2%
CeB	Cazenovia silt loam, 2 to 8 percent slopes	69	102.8	15.2%
CIA	Collamer silt loam, 0 to 2 percent slopes	54	55.4	8.2%
CIB	Collamer silt loam, 2 to 6 percent slopes	54	6.9	1.0%
GaB	Galen fine sandy loam, 2 to 6 percent slopes	54	7.1	1.1%
HnB	Honeoye silt loam, 3 to 8 percent slopes	>200	220.0	32.5%
HnC	Honeoye silt loam, 8 to 15 percent slopes	>200	31.5	4.6%
Lc	Lakemont silty clay loam, 0 to 3 percent slopes	0	23.5	3.5%
LtA	Lima silt loam, 0 to 3 percent slopes	54	24.6	3.6%
LtB	Lima silt loam, 3 to 8 percent slopes	54	38.0	5.6%
Mc	Made land, sanitary land fill	137	0.1	0.0%
Md	Made land, tillable	137	3.3	0.5%
Na	Niagara fine sandy loam	31	4.0	0.6%
Nc	Niagara and Canandaigua silt loams	31	6.9	1.0%
OdA	Odessa silt loam, 0 to 3 percent slopes	20	50.0	7.4%
OnC	Ontario loam, 8 to 15 percent slopes	>200	13.9	2.0%
OvA	Ovid silt loam, 0 to 2 percent slopes	38	20.2	3.0%
OvB	Ovid silt loam, 2 to 6 percent slopes	38	28.0	4.1%
PaC	Palmyra gravelly sandy loam, 8 to 15 percent slopes	>200	1.7	0.2%
SeB	Schoharie silt loam, 2 to 6 percent slopes	76	2.6	0.4%

Map unit symbol	Map unit name	Rating (centimeters)	Acres in AOI	Percent of AOI
W	Water	>200	17.0	2.5%
Totals for Area of Interest			677.6	100.0%

Description

"Water table" refers to a saturated zone in the soil. It occurs during specified months. Estimates of the upper limit are based mainly on observations of the water table at selected sites and on evidence of a saturated zone, namely grayish colors (redoximorphic features) in the soil. A saturated zone that lasts for less than a month is not considered a water table.

This attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

Rating Options

Units of Measure: centimeters

Aggregation Method: Dominant Component

Component Percent Cutoff: None Specified

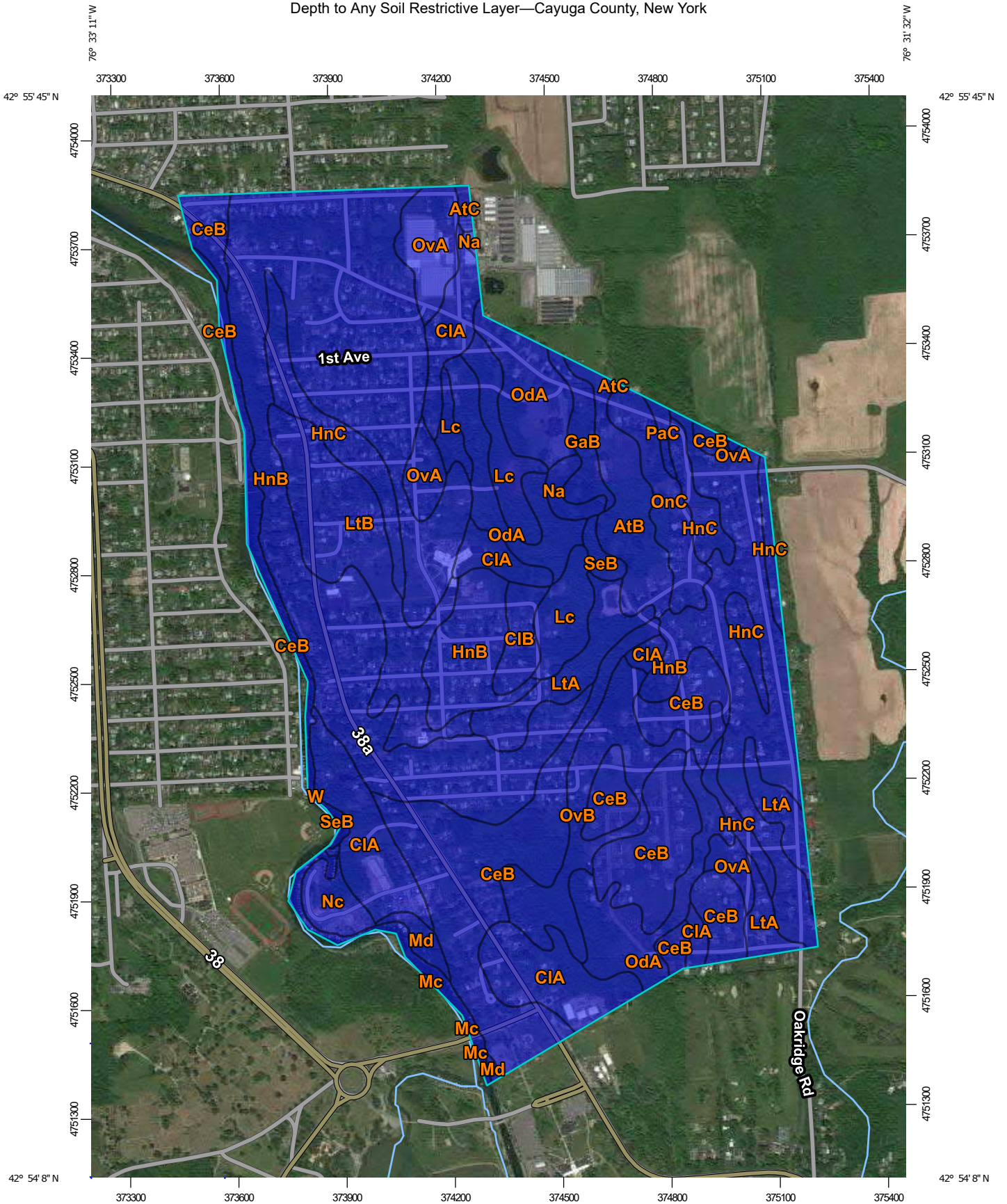
Tie-break Rule: Lower

Interpret Nulls as Zero: No

Beginning Month: January

Ending Month: December


Depth to Any Soil Restrictive Layer—Cayuga County, New York



Map Scale: 1:14,500 if printed on A portrait (8.5" x 11") sheet.










MAP LEGEND








Area of Interest (AOI)
 Area of Interest (AOI)

Soils







Soil Rating Polygons


-  0 - 25
-  25 - 50
-  50 - 100
-  100 - 150
-  150 - 200
-  > 200
-  Not rated or not available

Soil Rating Lines


-  0 - 25
-  25 - 50
-  50 - 100
-  100 - 150
-  150 - 200
-  > 200
-  Not rated or not available

Soil Rating Points






-  0 - 25
-  25 - 50
-  50 - 100
-  100 - 150
-  150 - 200
-  > 200

 Not rated or not available


Water Features

-  Streams and Canals

Transportation

-  Rails
-  Interstate Highways
-  US Routes
-  Major Roads
-  Local Roads

Background

-  Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
 Web Soil Survey URL:
 Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Cayuga County, New York
 Survey Area Data: Version 17, Jun 11, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 18, 2011—Oct 10, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Depth to Any Soil Restrictive Layer

Map unit symbol	Map unit name	Rating (centimeters)	Acres in AOI	Percent of AOI
AtB	Arkport fine sandy loam, 1 to 6 percent slopes	>200	18.7	2.8%
AtC	Arkport fine sandy loam, 6 to 12 percent slopes	>200	1.4	0.2%
CeB	Cazenovia silt loam, 2 to 8 percent slopes	>200	102.8	15.2%
CIA	Collamer silt loam, 0 to 2 percent slopes	>200	55.4	8.2%
CIB	Collamer silt loam, 2 to 6 percent slopes	>200	6.9	1.0%
GaB	Galen fine sandy loam, 2 to 6 percent slopes	>200	7.1	1.1%
HnB	Honeoye silt loam, 3 to 8 percent slopes	>200	220.0	32.5%
HnC	Honeoye silt loam, 8 to 15 percent slopes	>200	31.5	4.6%
Lc	Lakemont silty clay loam, 0 to 3 percent slopes	>200	23.5	3.5%
LtA	Lima silt loam, 0 to 3 percent slopes	>200	24.6	3.6%
LtB	Lima silt loam, 3 to 8 percent slopes	>200	38.0	5.6%
Mc	Made land, sanitary land fill	>200	0.1	0.0%
Md	Made land, tillable	>200	3.3	0.5%
Na	Niagara fine sandy loam	>200	4.0	0.6%
Nc	Niagara and Canandaigua silt loams	>200	6.9	1.0%
OdA	Odessa silt loam, 0 to 3 percent slopes	>200	50.0	7.4%
OnC	Ontario loam, 8 to 15 percent slopes	>200	13.9	2.0%
OvA	Ovid silt loam, 0 to 2 percent slopes	>200	20.2	3.0%
OvB	Ovid silt loam, 2 to 6 percent slopes	>200	28.0	4.1%
PaC	Palmyra gravelly sandy loam, 8 to 15 percent slopes	>200	1.7	0.2%
SeB	Schoharie silt loam, 2 to 6 percent slopes	>200	2.6	0.4%

Map unit symbol	Map unit name	Rating (centimeters)	Acres in AOI	Percent of AOI
W	Water	>200	17.0	2.5%
Totals for Area of Interest			677.6	100.0%

Description

A "restrictive layer" is a nearly continuous layer that has one or more physical, chemical, or thermal properties that significantly impede the movement of water and air through the soil or that restrict roots or otherwise provide an unfavorable root environment. Examples are bedrock, cemented layers, dense layers, and frozen layers.

This theme presents the depth to any type of restrictive layer that is described for each map unit. If more than one type of restrictive layer is described for an individual soil type, the depth to the shallowest one is presented. If no restrictive layer is described in a map unit, it is represented by the "> 200" depth class.

This attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

Rating Options

Units of Measure: centimeters

Aggregation Method: Dominant Component

Component Percent Cutoff: None Specified

Tie-break Rule: Lower

Interpret Nulls as Zero: No



October 26, 2020

Wetlands

- Estuarine and Marine Deepwater
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

Owasco Lake (0706-0009)

Impaired

Waterbody Location Information

Revised: 05/01/2018

Water Index No: Ont 66-12-43-P212
Hydro Unit Code: Owasco Lake (0414020113)
Water Type/Size: Lake/Reservoir 6796.9 Acres
Description: entire lake

Water Class: AA(T)
Drainage Basin: Oswego-Seneca-Oneida
Reg/County: 7/Cayuga (6)

Water Quality Problem/Issue Information

Uses Evaluated	Severity	Confidence
Water Supply	Threatened	Suspected
Public Bathing	Impaired	Known
Recreation	Stressed	Known
Aquatic Life	Fully Supported	Known
Fish Consumption	Unassessed	-
Conditions Evaluated		
Habitat/Hydrology	Fair	
Aesthetics	Poor	

Type of Pollutant(s) (CAPS indicate Major Pollutants/Sources that contribute to an Impaired/Precluded Uses)
Known: Algal Plant Growth, Nutrients (Phosphorus), PATHOGENS, Sediment and turbidity
Suspected: ---
Unconfirmed: ---

Source(s) of Pollutant(s)
Known: Agriculture, WILDLIFE/OTHER SOURCES
Suspected: **Municipal Discharges**, On-Site/Septic Systems, Soil Erosion, Streambank Erosion
Unconfirmed: ---

Management Information

Management Status: Verification of Problem Severity Needed
Lead Agency/Office: DOW/BWAM
IR/305(b) Code: Impaired Water Requiring a TMDL (IR Category 5)
Impaired Water, Pollution not a Pollutant (IR Category 4c)

Further Details

Overview

Owasco Lake is assessed as an impaired waterbody due to primary contact recreation use that is impaired by pathogens.

Use Assessment

Owasco Lake is a Class AA(T) waterbody, required to support and protect the best uses as a water supply source for drinking, culinary or food processing purposes, primary and secondary contact recreation, and fishing. The lake is also designated as a cold water (trout) fishery.

This classification also means that the quality of the water is to be maintained in order to allow for its use as a drinking water source with disinfection and additional treatment only to remove naturally present impurities. Water from Owasco Lake is used for human consumption and limited irrigation. The City of Auburn, the Town of Owasco, and some lakefront property owners draw water from the lake. In total approximately 55% of Cayuga County's population obtain their drinking water from the lake. In 2016, the combined users drew more than 1.7 billion gallons of water from the lake, serving more than 46,000 residents of Cayuga County. (Cayuga County Health Department, City of Auburn

Drinking Water Report, Town of Owasco Drinking Water Report, 2016).

NYSDEC's water supply use evaluation focuses on the lake water prior to treatment, and does not reflect the quality distributed for use after treatment. Monitoring of water quality at the tap is conducted by local water suppliers and public health agencies. That being said, water supply use in Owasco Lake is threatened due to the elevated chlorophyll/algae levels that create the potential for the formation of disinfection by-products (DBPs) in finished potable water and make treatment to meet drinking water standards more difficult. DBPs are formed when disinfectants such as chlorine used in water treatment plants react with natural organic matter (i.e., decaying vegetation) present in the source water. DBPs in drinking water can include trihalomethanes (TTHMs), haloacetic acids (HAAs), bromate, and chlorite. Currently municipal water systems drawing from the Lake – City of Auburn and Town of Owasco – do not exceed the MCLs for TTHMs or HAAs. However municipal systems that purchase water from these primary suppliers have exceeded the MCL for DBPs periodically over the past few years.

Microcystin, a toxic chemical associated with harmful algal blooms (HABs) has been detected in trace amounts in the source waters and on rare occasions in the finished water from Owasco Lake. The City of Auburn and Town of Owasco use activated carbon to address taste and odor complaints likely associated with excessive algae. Per the classification regulations, the use of activated carbon filtration for Class AA is limited to removing naturally occurring impurities, and this need for additional treatment may indicate water supply use may be impaired. Toxins have not exceeded levels of concern within the distribution system (Cayuga County Health Department and DEC/DOW, BWAM, October 2014, DEC/DOW, BWAM/LMAS, April 2018)

Primary contact recreation use is impaired due to the temporary/occasional closures of public beaches for swimming from 2014 through 2017, as a result of the occurrence of HABs. In 2000, Owasco Lake was found to be impaired due to primary contact recreation use impairment from elevated pathogen indicators from wildlife, however due to the age of the data (more than 10 years old) those impacts cannot be confirmed and additional sampling is needed to verify current conditions (DEC/DOW, BWAM/SBU, April 2018).

Fishing use is fully supported in Owasco Lake. The lake supports an excellent fishery with a variety of species, including lake trout, walleye, northern pike, smallmouth bass and panfish. The lake is actively managed for sport fishing. (DEC/DFWMR, Region 7, October 2014)

There are no health advisories limiting the consumption of fish from this waterbody (beyond the general advice for all waters). However due to the uncertainty as to whether the lack of a waterbody-specific health advisory is based on actual sampling, fish consumption use is noted as unassessed. (NYS DOH Health Advisories and DEC/DOW, BWAM, April 2018)

Impacts from habitat and hydrologic modification are also thought to contribute to the weed and algal growth and the impact on recreational uses. Zebra mussel infestation of the lake has increased lake clarity. The increased clarity allows for greater penetration of light which supports plant growth in the lake. In addition mussels filter particulate-bound phosphorus and release soluble phosphorus that is more readily available for plant growth. In addition to Zebra mussels, Asian clam have established in the northern end of Owasco Lake and it is likely that Quagga mussels are now present. Hydrologic modification of the inlet in 1948 and 1961 by the Army Corps of Engineers to bypass the Owasco Flats wetland complex at the southern end of the lake is also likely contributing to the water quality impacts on the lake. The value of wetlands in providing a buffer to reduce the runoff of pollutants into waters is well established. Conversely the loss of these wetlands results in increased loads, particularly during wet-weather high flow events. (Finger Lakes Institute, January 2006)

Water Quality Information

In 2017, two sites were monitored on Owasco Lake through NYSDEC's Citizens Statewide Lake Assessment Program (CSLAP) from June through September. Major trophic state indicators were monitored and show that in the open water, Owasco Lake continues to be mesotrophic (moderately biologically productive). Phosphorus, chlorophyll and clarity measurements were somewhat elevated but typically fall below levels that would suggest impacts to recreational uses.

Shoreline monitoring and sampling results show that HABs Surveillance areas of the lake shore are often elevated for both cyanobacteria and toxins at times in the summer and into the fall. In 2017, Owasco Lake was on the HABS

Notification List for 13 weeks. The blooms observed were localized but did become widespread at times, also consistent with observations in previous years. (DEC/DOW, BWAM/LMAS, March 2018).

In 2016, low levels of microcystin (a toxin associated with blue-green algae) were detected in the treated drinking water for the City of Auburn and Town of Owasco. The toxins were below the EPA Health Advisory of 0.3 micrograms per liter for the most sensitive population (children). This was the first reported detection of microcystin toxin in New York State treated drinking water. In 2017, monitoring for the microcystin toxin was conducted at the City of Auburn and Town Owasco Water Treatment Plants from July through early November. No samples of finished water were found to have microcystin concentrations above the detection limit in 2017. (Cayuga County Health Department 2017).

Source Assessment

Nutrient and sediment sources to the Lake include point sources such as wastewater treatment facilities and non-point sources such as runoff from agricultural activities (both animal and crop agriculture), onsite/septic systems, soil erosion, stream bank erosion, fertilized lawns and golf courses, roadside ditches and construction activities. (DEC/DOW, BWAM, October 2014)

Owasco Inlet has been identified as a significant source of nutrients (phosphorus) and sediment to the south end of the Owasco Lake, both of which contribute to aquatic vegetation growth. A 2011 biological assessment of the Inlet revealed elevated nutrient impacts in the stream, though impacts attributed the Groton (V) municipal discharge were shown to be greatly reduced since the plant upgrade to reduce phosphorus. Other nonpoint sources remain as contributing sources. (DEC/DOW, BWAM/SBU and Region 7, December 2014).

Waterfowl (geese and gulls) has been identified as the primary source of pathogen indicators at the north end of the lake. Pathogen indicators from agricultural runoff was noted as a secondary source, while human and pet sources were considered to be minor. (Cayuga County WQMA, January 2000)

Management Actions

This waterbody is considered a highly-valued water resource due to its drinking water supply classification and as a multi-use waterbody. On December 21, 2017, New York State Governor Andrew Cuomo announced a \$65 million initiative to combat harmful algal blooms in Upstate New York. Owasco Lake was identified for inclusion in this initiative as it is vulnerable to HABs. (DEC/DOW, BWRM, April 2018).

DEC has worked with municipalities to address phosphorus loads to the southern Lake via Owasco Inlet. In 2008 DEC worked with the Village of Groton to install improved phosphorus treatment at its WWTP. Since then the village has significantly reduced the amount of phosphorous being discharged from its facility. The only other significant point source discharge in the watershed is the Village of Moravia Sewage Treatment Plant. (DEC/DOW, Region 7, October 2014)

Owasco Lake benefits from a very engaged network of local stakeholders. This network – which includes the Owasco Lake Watershed Management Council, Owasco Watershed Lake Association, Cayuga County Health and Human Services, Cayuga County Planning and Economic Development, Cayuga County Water Quality Management Agency, Cayuga County Soil and Water District and Cornell Cooperative Extension of Cayuga County – oversees a comprehensive watershed approach necessary to reduce nutrients and other pollutants from various contributors throughout the watershed. Some of the highlights of these efforts include the Cayuga County septic system inspection program, the Owasco Lake Watershed Inspection Program staffed with a Watershed Specialist and Seasonal Inspectors, the Owasco Flats Project to reconnect the Inlet with its floodplain and wetlands and provide riparian buffer, and an active and concerned lake association led by the Owasco Lake Watershed Management Council. (OLWA and DEC/DOW, Region 7, October 2014)

Section 303(d) Listing

Owasco Lake is included on the current (2016) NYS Section 303(d) List of Impaired/TMDL Waters. The waterbody is included on Part 3a for pathogens. Impacts/impairments due to pathogen levels need to be verified in light of the reduced frequency of pathogen-related beach closures. In addition, Owasco Lake is categorized as an IR Category 4c waterbody that is Impaired due to the frequent occurrence and spacial extent of harmful algal blooms but a TMDL is not needed because the impairment is due to pollution rather than a pollutant.

Segment Description

This segment includes the entire area of the Lake.

Owasco Outlet, Upper, and tribs (0706-0001)

MinorImpacts

Waterbody Location Information

Revised: 07/12/2007

Water Index No: Ont 66-12-43
Hydro Unit Code: 04140201/330 **Str Class:** C
Waterbody Type: River
Waterbody Size: 12.6 Miles
Seg Description: stream and tribs, from Throopsville to Owasco Lake

Drain Basin: Oswego-Seneca-Oneida
Seneca/Clyde Rivers
Reg/County: 7/Cayuga Co. (6)
Quad Map: AUBURN (J-14-2)

Water Quality Problem/Issue Information

(CAPS indicate MAJOR Use Impacts/Pollutants/Sources)

Use(s) Impacted	Severity	Problem Documentation
Aquatic Life	Stressed	Known
Recreation	Stressed	Known

Type of Pollutant(s)

Known: NUTRIENTS (phosphorus)
Suspected: D.O./Oxygen Demand
Possible: Water Level/Flow

Source(s) of Pollutant(s)

Known: ---
Suspected: COMB. SEWER OVERFLOW (Auburn), MUNICIPAL (Auburn WWTP), URBAN/STORM RUNOFF, Agriculture
Possible: ---

Resolution/Management Information

Issue Resolvability: 1 (Needs Verification/Study (see STATUS))
Verification Status: 4 (Source Identified, Strategy Needed)
Lead Agency/Office: ext/WQCC
TMDL/303d Status: n/a

Resolution Potential: Medium

Further Details

Aquatic life support and recreational uses in this portion of Owasco Outlet are known to experience minor impacts due to nutrient enrichment and other pollutants from various nonpoint and urban/municipal and industrial sources.

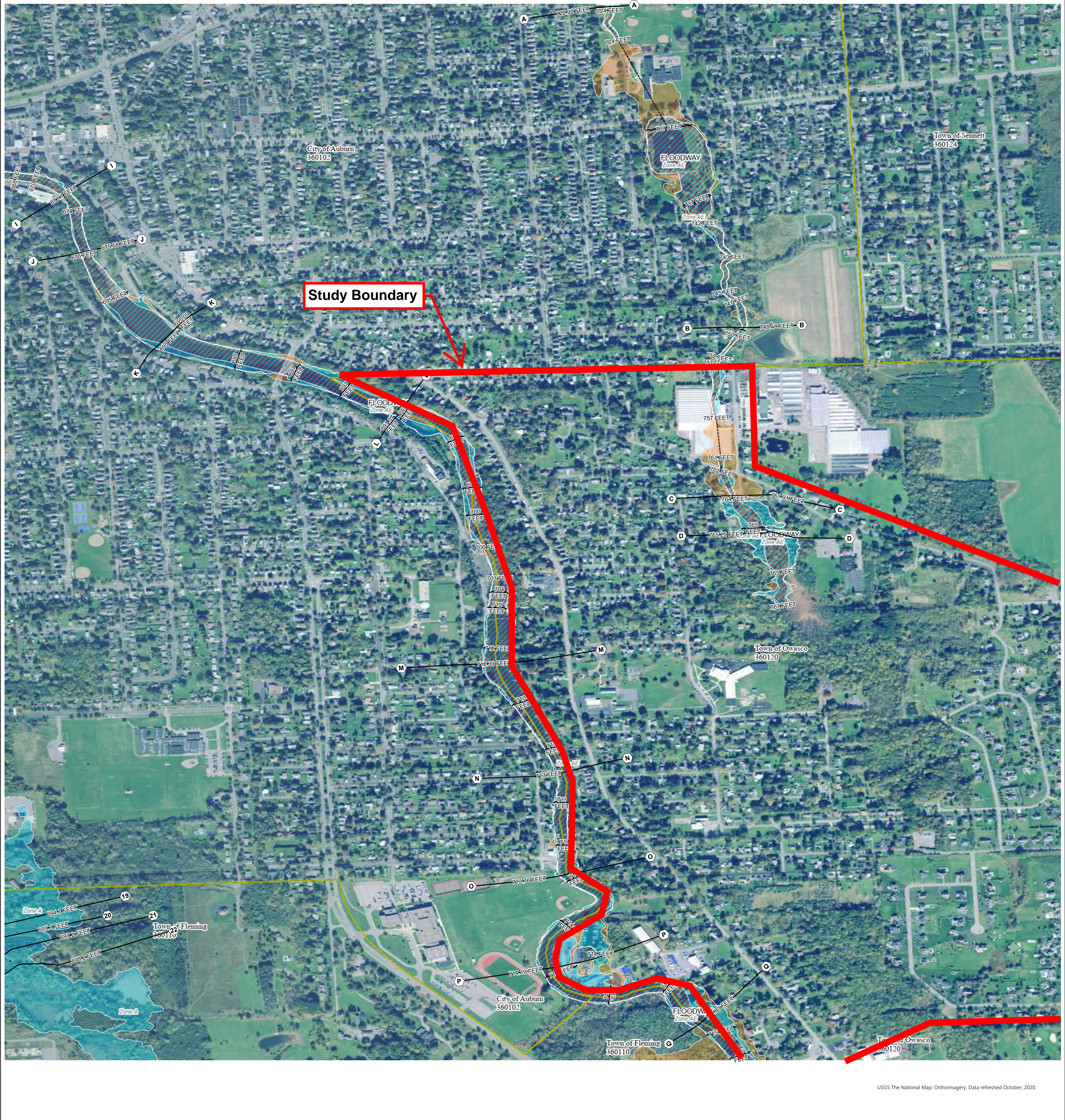
A biological (macroinvertebrate) survey of Owasco Outlet at multiple sites along its entire length from the mouth to Owasco Lake was conducted in 2002. Sampling results indicated slightly impacted quality conditions at all six sites, including the three sites within this reach. Results of Impact Source Determination analysis identified the most likely primary sources influencing the fauna as being nutrients and urban municipal or industrial runoff. Water quality at the two sites below the Auburn WWTP improved from moderately impacted in 1990 to slightly impacted. This improvement can be attributed to the 1995 upgrade of the WWTP to include activated sludge treatment, phosphorus removal, post-aeration and UV disinfection. Impacts at the site above the treatment plant also improved. Previous impacts attributed to CSOs and urban sources in Auburn were not as pronounced in the 2002 sample, although it is not

certain if this is the result of changes to the sewer system. Although aquatic life is supported in the stream, nutrient biotic evaluation indicates the level of eutrophication is sufficient to stress aquatic life support. (DEC/DOW, BWAM/SBU, June 2005)

Concerns have also been raised regarding the impact of water level and flow fluctuations in the outlet due to operation of hydroelectric dam at outlet of the lake. There is a conflict over how dam should be operated - lake residents want water level high in lake, but flow maintenance is needed downstream.

This segment includes the portion of the stream and all tribs from unnamed trib (-7) in Throopsville to Owasco Lake. The waters of this portion of the stream are Class C. Tribs to this reach/segment are Class C,C(T). Lower Owasco Outlet and Owasco Lake are listed separately.

Appendix B
FEMA Flood Zone Map



USGS The National Map: Orthoimagery, Data refreshed October, 2020.

FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR DRAFT FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS	Without Base Flood Elevation (BFE) Zone A, V, AE, AH, VE, AR
	With BFE or Depth Zone AE, AO, AH, VE, AR
	Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD	0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
	Future Conditions 1% Annual Chance Flood Hazard Zone X
	Area with Reduced Flood Risk due to Levee See Notes Zone X
	Area with Flood Risk due to Levee Zone D
OTHER AREAS	NO SCREEN Area of Minimal Flood Hazard Zone X
	Effective LOMRs
	Area of Undetermined Flood Hazard Zone D
GENERAL STRUCTURES	Channel, Culvert, or Storm Sewer
	Levee, Dike, or Floodwall
	20.2 Cross Sections with 1% Annual Chance
	17.5 Water Surface Elevation
	8 Coastal Transect
	Coastal Transect Baseline
	Profile Baseline
	Hydrographic Feature
OTHER FEATURES	Base Flood Elevation Line (BFE)
	Limit of Study
	Jurisdiction Boundary

NOTES TO USERS

For information and questions about this Flood Insurance Rate Map (FIRM), available products associated with this FIRM, including historic versions, the current map date for each FIRM panel, how to order products, or the National Flood Insurance Program (NFIP) in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-6627) or visit the FEMA Flood Map Service Center website at <https://msc.fema.gov>. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the website.

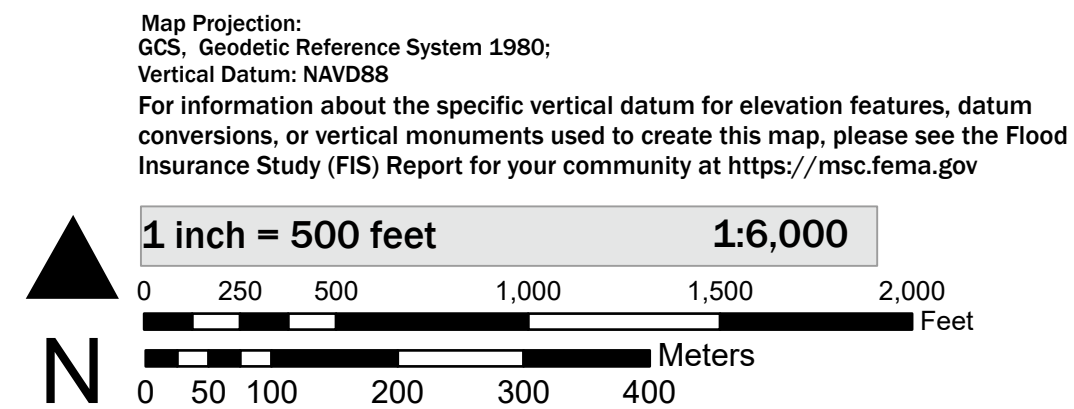
Communities annexing land on adjacent FIRM panels must obtain a current copy of the adjacent panel as well as the current FIRM Index. These may be ordered directly from the Flood Map Service Center at the number listed above.

For community and countywide map dates, refer to the Flood Insurance Study Report for this jurisdiction. To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620. This information was derived from NAIP, dated April 11, 2018.

Basemap information shown on this FIRM was provided in digital format by USDA, Farm Service Agency (FSA). This map was exported from FEMA's National Flood Hazard Layer (NFHL) on 10/27/2020 8:28 AM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time. For additional information, please see the Flood Hazard Mapping Updates Overview Fact Sheet at <https://www.fema.gov/media-library/assets/documents/118418>

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards. This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date.

SCALE

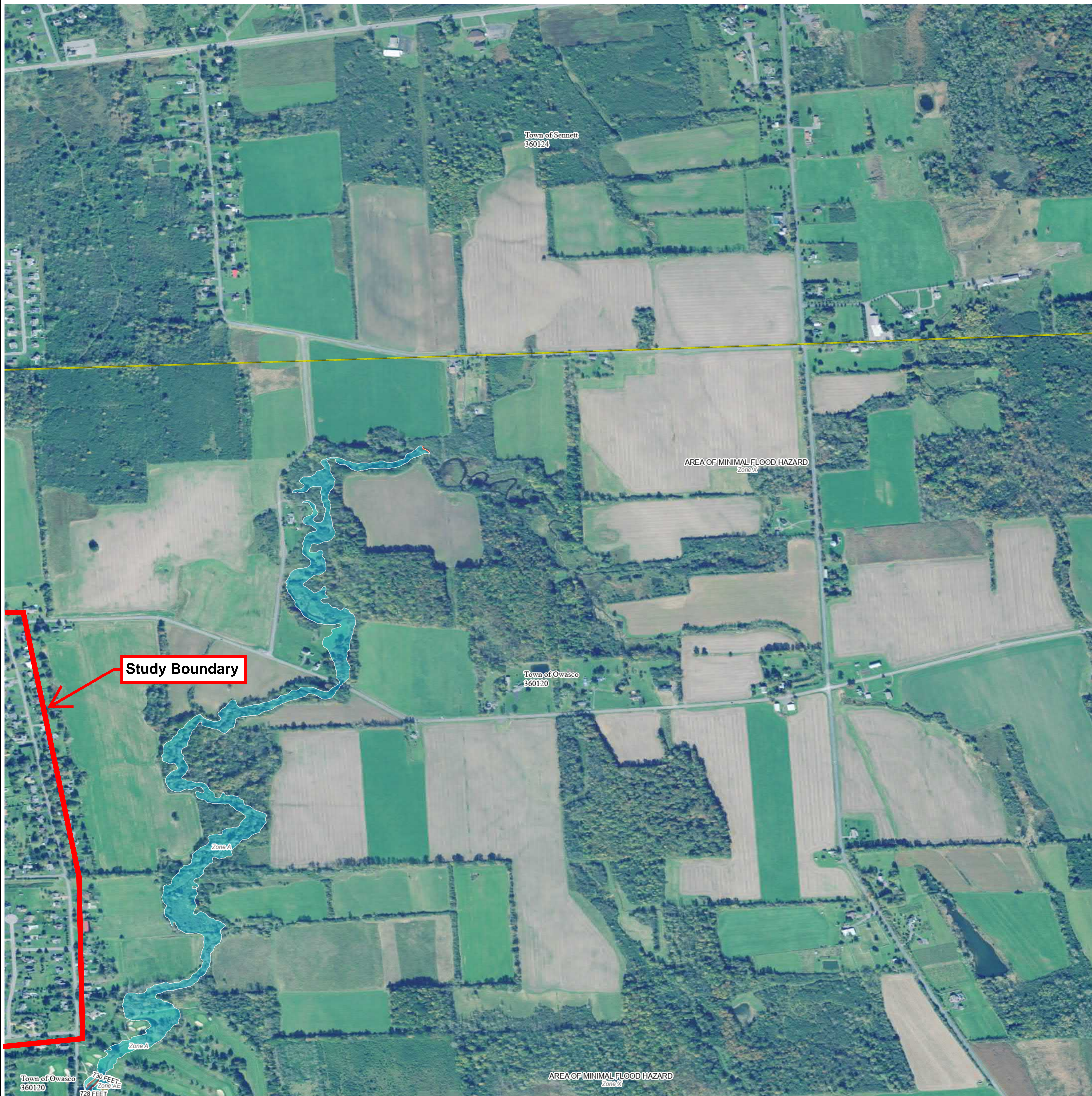


NATIONAL FLOOD INSURANCE PROGRAM
FLOOD INSURANCE RATE MAP

CAYUGA COUNTY, NEW YORK
AND INCORPORATED AREAS
PANEL 316 OF 635

Panel Contains:

COMMUNITY	NUMBER	PANEL
CITY OF AUBURN	360102	0316
TOWN OF FLEMING	360110	0316
TOWN OF OWASCO	360120	0316
TOWN OF SENNETT	360124	0316



FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR DRAFT FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS	Without Base Flood Elevation (BFE) Zone A, V, A99
	With BFE or Depth Zone AE, AO, AH, VE, AR
	Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD	0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
	Future Conditions 1% Annual Chance Flood Hazard Zone X
	Area with Reduced Flood Risk due to Levee See Notes Zone X
	Area with Flood Risk due to Levee Zone D
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	Effective LOMRs
	Area of Undetermined Flood Hazard Zone D
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	Levee, Dike, or Floodwall
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	17.5 Water Surface Elevation
	8 Coastal Transect
	Coastal Transect Baseline
	Profile Baseline
	Hydrographic Feature
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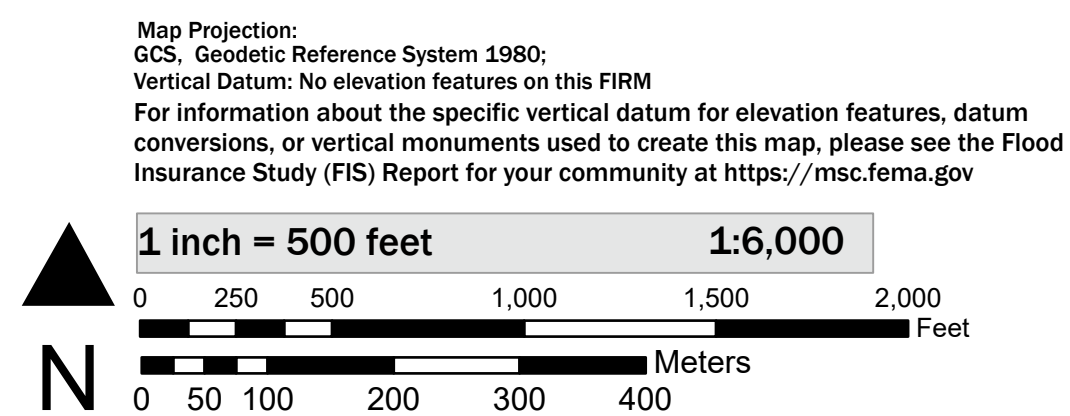
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This map was exported from FEMA's National Flood Hazard Layer (NFHL) on 1/28/2021 8:05 AM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time. For additional information, please see the Flood Hazard Mapping Updates Overview Fact Sheet at <https://www.fema.gov/media-library/assets/documents/118418>

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SCALE



NATIONAL FLOOD INSURANCE PROGRAM
FLOOD INSURANCE RATE MAP

CAYUGA COUNTY, NEW YORK
AND INCORPORATED AREAS
PANEL 317 OF 635

Panel Contains:

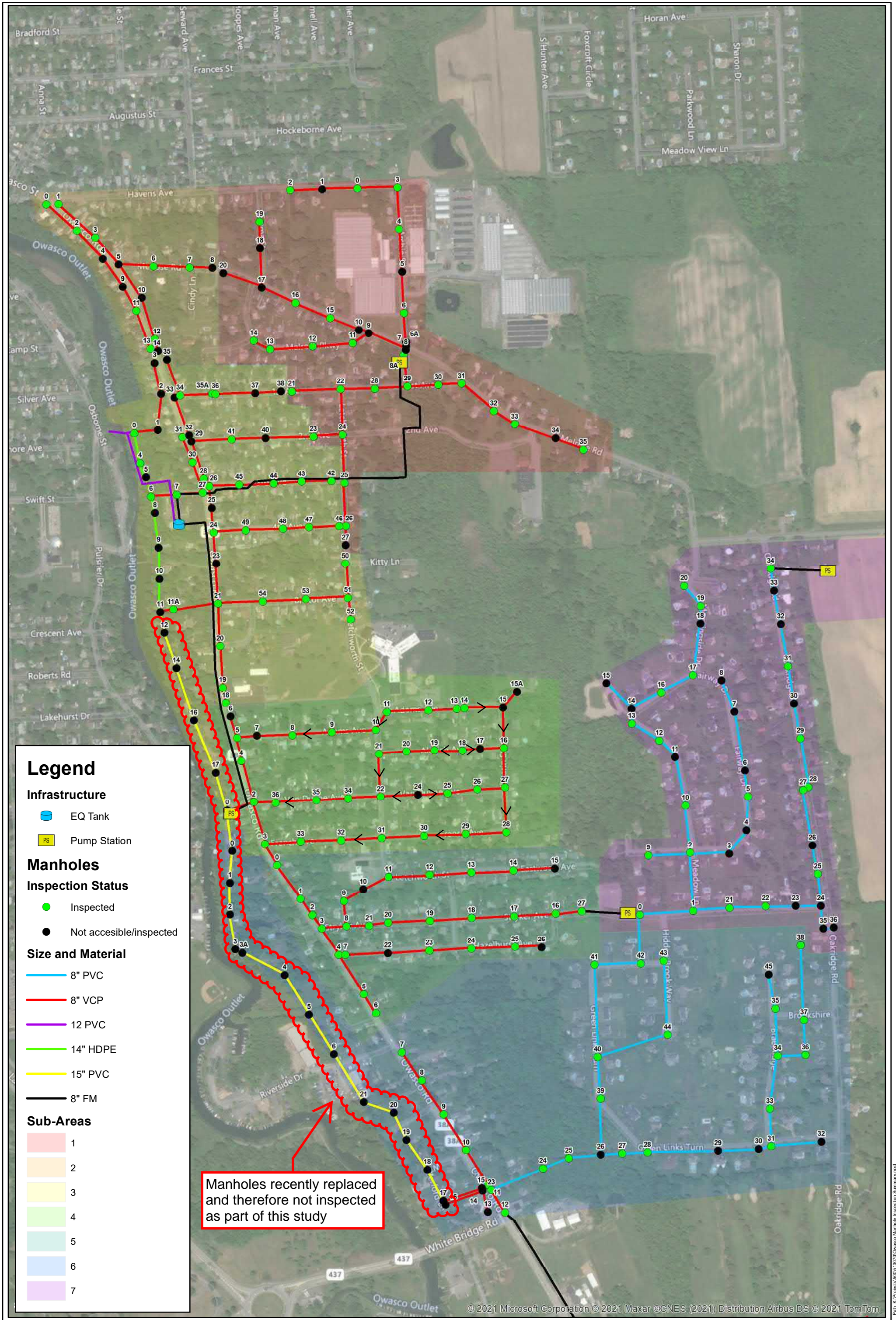
COMMUNITY	NUMBER	PANEL
TOWN OF OWASCO	360120	0317
TOWN OF SENNETT	360124	0317

Appendix C
NYSDEC Sanitary Sewer Overflow Reports

Town of Owasco Inflow and Infiltration Reduction Improvements
Appendix C - NYSDEC SSO Reports

Facility Name	Start Time	Address	Location Description	Affected Water Body	Treated State	Volume (gal)	Reason Description
(T) Owasco	1/12/2018	7147 Owasco Road	Manhole overflow	Owasco Outlet	Untreated	100	Insufficient system capacity
(T) Owasco	4/20/2019	2 Bristol Avenue	Manhole overflow	Owasco Outlet	Untreated	600	Blockage
(T) Owasco	10/31/2019	7159 Owasco Road	Residential home	Owasco Outlet	Untreated	Unknown	Heavy rain
(T) Owasco	4/30/2020	7160 Owasco Road	Residential home	Owasco Outlet	Untreated	Unknown	Heavy rain

Appendix D
Summary of Manhole Inspections



Manholes recently replaced and therefore not inspected as part of this study

Legend

Infrastructure

- EQ Tank
- Pump Station

Manholes

Inspection Status

- Inspected
- Not accesible/inspected

Size and Material

- 8" PVC
- 8" VCP
- 12 PVC
- 14" HDPE
- 15" PVC
- 8" FM

Sub-Areas

- 1
- 2
- 3
- 4
- 5
- 6
- 7



1 inch = 600 feet

Town of Owasco
Manhole Inspection Summary
 Cayuga County
 6/9/2021
 New York

Figure
 D
 Project
 No. 513.070

Town of Owasco Inflow and Infiltration Study
Manhole Inspection Table

Town of Owasco Manhole Inspection Table													
MH #	Location	Invert Depth	Inches from Grade	Num. of Pick Holes	Frame Condition	Frame Offset	Leaking (Cover or Lid/Frame/Joints)	Corbel/Wall Material	Corbel/Wall Condition	Bench Condition	Channel Condition	I/I Evidence	Comments / General Observations
1-0	Road	12' 4"	0"	0	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	Yes	Deteriorated riser. Wall has streaks under setps
1-1	Road	-	0"	5	-	-	-	-	-	-	-	-	Unable to open cover
1-2	Road	8' 2"	0"	5	Acceptable	2"	None	Block	Acceptable	Acceptable	Acceptable	Yes	Inflow dish. Dead end MH. Deteriorated riser with streaking on walls. Previously lined
1-3	Road	11' 4"	0"	5	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	No	Sediment on riser. Lateral in MH. Previously lined
1-4	Road	10' 4"	0"	5	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	Yes	Very wet bench, potential leak under steps. Streaks on walls. Previously lined
1-5		-	-	-	-	-	-	-	-	-	-	-	Unable to locate, likely paved over
1-6	Road	8' 3"	0"	5	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	No	Buildup of deposits on riser/frame. MH in overall acceptable condition. Previously lined. Damp walls
1-6A	Road	-	0"	0	-	-	-	-	-	-	-	-	Unable to open cover
1-7	Road	-	0"	0	-	-	-	-	-	-	-	-	Unable to open, too much traffic in road
1-8	Road	-	0"	0	-	-	-	-	-	-	-	-	Unable to open, too much traffic in road
1-8A	Grass	10'-0"	1"	0	Acceptable	0"	None	Precast	Acceptable	Acceptable	Acceptable	No	Right before PS. MH in overall acceptable condition
1-9	Road	-	0"	4	-	-	-	-	-	-	-	-	Unable to open older cover
1-10	Road	-	0"	0	-	-	-	-	-	-	-	-	Unable to open newer cover
1-11	Road	7' 8"	0"	5	Acceptable	0"	None	Block	Acceptable	Acceptable	Debris	No	Inflow dish on bottom. Lateral in MH. Previously lined
1-12	Road	7' 6"	0"	4	Acceptable	0"	None	Brick	Poor	Acceptable	Acceptable	No	Inflow dish. Damp walls in MH
1-13	Road	7' 8"	0"	5	Acceptable	0"	None	Brick	Acceptable	Acceptable	Acceptable	No	Sediment buildup on riser. Wet bench, not deemed significant I/I
1-14	Road	7' 8"	0"	5	Acceptable	0"	None	Block	Acceptable	Poor	Poor	No	Defromed bench/channel. Deterioration of riser/frame. Inflow dish. Previously lined
1-15	Road	11' 3"	0"	5	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	No	Water in manhole, not significant. Sediment on riser. Previously lined
1-16	Road	11' 0"	0"	1	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	Yes	Sediment on riser/frame. Previously lined
1-17	Road	-	0"	1	-	-	-	-	-	-	-	-	Unable to open cover
1-18	-	-	-	-	-	-	-	-	-	-	-	-	Unable to locate, likely paved over
1-19	Road	-	0"	1	Poor	0"	None	Block	Acceptable	Acceptable	Acceptable	Yes	Streaking along wall joints, very wet bench, potential leaks at wall/bench joint. Previous lining is peeling off
1-20	Road	-	0"	1	-	-	-	-	-	-	-	-	Unable to open, too much traffic in road

Town of Owasco Inflow and Infiltration Study
Manhole Inspection Table

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1-21	Road	8' 8"	0"	5	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	No	Dead end MH. Deterioration of riser. Inflow dish. Previously lined
1-22	Road	12' 4"	0"	3	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	No	Cracking and deterioration on riser/frame. Wet spots on walls. Previously lined
1-23	Road	8' 6"	0"	5	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	No	Very dry. MH located on top of a hill, flows both ways
1-24	Road	8' 8"	0"	5	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	No	Block MH with lining in past. MH in acceptable condition. Previously lined
1-25	Road	10' 8"	0"	5	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	No	Lateral in MH. Frame/riser joint deterioration. Wet bench, not significant
1-26	Road	10' 2"	0"	3	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	Yes	Wet bench, probably from I/I. Leak around influent pipe
1-27	-	-	-	-	-	-	-	-	-	-	-	-	Unable to locate, likely paved over
1-28	Road	10' 0"	0"	3	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	No	Soil on riser. MH in overall acceptable condition
1-29	Road	9' 7"	0"	5	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	No	Soil on brick riser. Previously lined
1-30	Road	8' 10"	0"	3	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	No	Soil on brick riser. Previously lined
1-31	Road	7' 6"	0"	5	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	No	Lining on riser starting to deteriorate. MH in overall acceptable condition
1-32	Driveway	7' 0"	0"	3	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	No	Old, dead pipe on wall, possibly from nearby storm culvert. Previously lined
1-33	Grass	9' 0"	0"	5	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	No	Water could flow over top of or pond on MH. Deterioration on wall
1-34	-	-	-	-	-	-	-	-	-	-	-	-	Unable to locate, likely paved over
1-35	Shoulder	6' 10"	0"	5	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	No	Dead end MH with plugged pipe in one direction. 8" PVC penetration on wall. Potential for ponding. Wet bench
2-0	Grass	5' 6"	0"	5	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	No	Unknown pipe through MH. Deterioration on frame/riser joint
2-1	Grass	7' 6"	0"	5	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	No	Inflow dish. Potential for ponding
2-2	Driveway	6' 10"	0"	5	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	Yes	Leak around lateral. Brick riser leaking. Wet bench
2-3	Driveway	8' 8"	0"	5	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	Yes	Brick riser leaking. Potential for ponding/runoff. Wet bench and walls
2-4	-	-	-	-	-	-	-	-	-	-	-	-	Unable to locate, likely buried
2-5	Road	-	0"	0	Acceptable	0"	None	-	Acceptable	Acceptable	Acceptable	No	Unable to open cover
2-6	Road	5' 7"	0"	5	Acceptable	0"	None	Block	Acceptable	Debris	Acceptable	No	Lateral in MH. Lining rehab starting to deteriorate, may have created leak. Frame/ riser joint in poor condition
2-7	Shoulder	4' 10"	0"	5	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	No	MH quite dry, but ponding/runoff possible. Inflow dish in bottom

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Manhole Inspection Table

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2-8	-	-	-	-	-	-	-	-	-	-	-	-	Unable to locate, likely buried
2-9	-	-	-	-	-	-	-	-	-	-	-	-	Unable to locate, likely buried
2-10	-	-	-	-	-	-	-	-	-	-	-	-	Unable to locate, likely buried
2-11	Grass/Sidewalk	7' 8"	0"	5	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	No	Possible ponding/runoff. Leaking joints. Inflow dish
2-12	Grass	5' 3"	0"	5	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	No	Very dry. Inflow dish at bottom
2-13	Driveway	8' 6"	0"	5	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	No	Dead end MH with lateral in channel. Sediment on frame. Potential for ponding
2-14	-	-	-	-	-	-	-	-	-	-	-	-	Unable to locate, likely buried
3-0	Grass	3' 6"	0"	5	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	No	Crosses creek. MH in overall acceptable condition
3-1	-	-	-	-	-	-	-	-	-	-	-	-	Unable to locate, likely buried
3-2	-	-	-	-	-	-	-	-	-	-	-	-	Unable to locate, likely buried
3-3	-	-	-	-	-	-	-	-	-	-	-	-	Unable to locate, likely buried
3-4	Gravel	7' 0"	0"	0	Acceptable	0"	None	Precast	Acceptable	Acceptable	Acceptable	No	MH in overall acceptable condition
3-5	-	-	-	-	-	-	-	-	-	-	-	-	Unable to locate, likely buried
3-6	Gravel	11' 0"	0"	5	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	No	Dead pipe high up on wall. MH in overall acceptable condition
3-7	Road	7' 6"	0"	5	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	No	MH in overall acceptable condition
3-8	-	-	-	-	-	-	-	-	-	-	-	-	Unable to locate, likely buried
3-9	-	-	-	-	-	-	-	-	-	-	-	-	Located on interceptor, not inspected
3-10	-	-	-	-	-	-	-	-	-	-	-	-	Located on interceptor, not inspected
3-11	-	-	-	-	-	-	-	-	-	-	-	-	Located on interceptor, not inspected
3-11A	Grass	7' 6"	0"	5	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	No	MH in overall acceptable condition
3-12	-	-	-	-	-	-	-	-	-	-	-	-	Located on interceptor, not inspected
3-14	-	-	-	-	-	-	-	-	-	-	-	-	Located on interceptor, not inspected
3-16	-	-	-	-	-	-	-	-	-	-	-	-	Located on interceptor, not inspected

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3-17	-	-	-	-	-	-	-	-	-	-	-	-	Located on interceptor, not inspected
3-18	Shoulder	8' 2"	0"	1	Deteriorated	0"	None	Block	Acceptable	Acceptable	Acceptable	No	Dead end MH. Pipe through MH. Lateral from house. Previously Lined
3-19	Shoulder	8' 6"	0"	1	Deteriorated	2"	None	Block	Acceptable	Acceptable	Acceptable	No	Pipe through MH. Deteriorated brick riser. Leaking around lateral. Previously lined
3-20	Driveway	8' 6"	0"	0	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	Yes	Potential for ponding. Inflow dish. Frame/riser wet. Wet walls
3-21	Road	8' 0"	0"	5	Acceptable	0"	None	Block	Damp	Acceptable	Acceptable	No	Soil buildup around riser. Previously lined
3-23	-	-	-	-	-	-	-	-	-	-	-	-	Unable to locate, likely buried
3-24	Road	4' 8"	0"	1	Sediment buildup	0"	None	Block	Wet	Acceptable	Acceptable	No	Inflow dish. Previously lined
3-25	-	-	-	-	-	-	-	-	-	-	-	-	Unable to locate, likely buried
3-26	Road	6' 8"	0"	4	Sediment buildup	0"	None	Block	Acceptable	Acceptable	Acceptable	No	Sediment on frame/riser. Previously lined
3-27	Road	12' 6"	0"	5	Acceptable	0"	None	Block	Wet	Acceptable	Acceptable	No	Water getting in through cover from the road. Sediment buildup on riser. Cover is loose fitting
3-28	Driveway	6' 0"	0"	4	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	No	Plugged pipe to create dead end MH. Frame/riser seal beginning to peel off. Previously lined
3-29	Road	-	0"	5	-	-	-	-	-	-	-	-	Unable to open cover. Potential for ponding
3-30	Grass	9' 0"	0"	5	Acceptable	0"	None	Block	Damp	Acceptable	Acceptable	No	MH in overall acceptable condition
3-31	Grass	8' 0"	0"	5	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	No	Brick riser without grout. Pipe drops from road
3-32	-	-	-	-	-	-	-	-	-	-	-	-	Unable to locate, likely buried
3-33	Road	-	0"	5	-	-	-	-	-	-	-	-	Unable to open cover
3-34	Shoulder	6' 0"	0"	5	Acceptable	0"	None	Block	Damp	Acceptable	Acceptable	No	Potential for ponding. Small roots penetrating through wall. Slight frame/riser deterioration. Previously lined
3-35	-	-	-	-	-	-	-	-	-	-	-	-	Unable to locate, likely buried
3-35A	Shoulder	6' 6"	0"	5	Acceptable	2"	None	Block	Acceptable	Acceptable	Acceptable	No	MH in overall acceptable condition
3-36	Road	6' 0"	0"	3	Acceptable	0"	None	Block	Damp	Acceptable	Acceptable	No	MH in overall acceptable condition. Previously lined
3-37	-	-	-	-	-	-	-	-	-	-	-	-	Unable to locate, likely paved over
3-38	-	-	-	-	-	-	-	-	-	-	-	-	Unable to locate, likely paved over
3-40	Road	-	0"	5	-	-	-	-	-	-	-	-	Unable to open cover

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3-41	Road	8' 4"	0"	5	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	No	Influent pipe drops in. Inflow dish. MH in overall acceptable condition
3-42	Road	8' 2"	0"	3	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	No	Cementitious lining peeling off wall. Small pipe running through manhole. Inflow dish
3-43	Road	6' 6"	0"	2	Acceptable	0"	None	Block	Wet	Acceptable	Acceptable	No	Cementitious lining peeling off wall. Inflow dish
3-44	Road	7' 0"	0"	5	Acceptable	0"	None	Block	Wet	Acceptable	Acceptable	No	Streaking on walls. Possibly leaking joints. Inflow dish. Previously lined
3-45	Road	10' 0"	0"	3	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	No	Streaking on walls. Influent pipe drops in. Inflow dish
3-46	Road	8' 0"	0"	4	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	No	Dead end MH. Brick riser with soil buildup
3-47	Road	8' 8"	0"	4	Acceptable	0"	None	Block	Wet	Acceptable	Acceptable	No	Soil buildup on riser. Water and leak around lateral
3-48	Road	8' 4"	0"	5	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	No	Drop from influent pipe. Brick riser. Inflow dish
3-49	Road	8' 5"	0"	5	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	No	Brick riser. Inflow dish. MH in overall acceptable condition
3-50	Road	8' 4"	0"	5	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	No	May be high point in sewer, flowing both ways
3-51	Road	9' 1"	0"	4	Acceptable	0"	None	Block	Acceptable	Damp	Acceptable	No	Soil on riser. Inflow dish. Previously lined
3-52	Road	7' 10"	0"	3	Acceptable	0"	None	Block	Acceptable	Damp	Acceptable	No	Dead end MH. Inflow dish. MH in overall acceptable condition
3-53	Road	6' 5"	0"	4	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	No	Inflow dish. MH in overall acceptable condition
3-54	Road	8' 0"	0"	5	Acceptable	0"	None	Block	Acceptable	Damp	Acceptable	No	Brick riser already grouted. Influent pipe drops in. Inflow dish
4-0	-	-	-	-	-	-	-	-	-	-	-	-	Located on interceptor, not inspected
4-2	Road	10' 2"	0"	5	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	Yes	Three abandoned pipes on wall. Lateral in MH. Wet walls
4-3	Road	9' 0"	0"	5	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	No	Hose connection in MH. Pipe drops in from east
4-4	Driveway	7' 0"	0"	5	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	No	Broken inflow dish. Wet bench
4-5	Road	7' 10"	0"	2	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	No	Inflow dish on bottom of MH, blocking the channel
4-6	Grass	-	-	-	-	-	-	-	-	-	-	-	Unable to open, buried
4-7	Road	-	0"	5	-	-	-	-	-	-	-	-	Lots of water on inflow dish, unable to remove and inspect
4-8	Road	8' 6"	0"	5	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	No	Possible plugged sump pump lines. Lots of deterioration of brick riser
4-9	Road	9' 4"	0"	5	Acceptable	1"	None	Block	Acceptable	Acceptable	Acceptable	No	Inflow dish. Deteriorated frame with sediment buildup

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4-10	Road	8' 1"	0"	2	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	No	Wet spots on wall, most likely not I/I issue
4-11	Road	11' 0"	0"	4	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	No	Lateral from nearby school. MH in overall acceptable condition. Previously lined
4-12	Road	7' 9"	0"	2	Acceptable	0"	None	Block	Acceptable	Debris	Acceptable	No	Inflow dish. Previously lined. Wet walls, likely not I/I
4-13	Road	10' 6"	0"	2	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	No	Dead end MH. Inflow dish. Bricks on bench
4-14	Road	11' 2"	0"	3	Acceptable	0"	None	Block	Acceptable	Debris	Acceptable	No	Dead end MH. Inflow dish. Wet on bench
4-15	-	-	-	-	-	-	-	-	-	-	-	-	Unable to locate, likely buried
4-15A	-	-	-	-	-	-	-	-	-	-	-	-	Unable to locate, likely buried
4-16	Road	9' 4"	0"	4	Acceptable	0"	None	Block	Debris	Acceptable	Acceptable	No	Wet walls and bench, likely not an I/I issue
4-17	-	-	-	-	-	-	-	-	-	-	-	-	Unable to locate, likely paved over
4-18	Road	8' 6"	0"	3	Acceptable	0"	None	Block	Acceptable	Acceptable	Debris	No	Low flow. Wet riser and walls
4-19	Road	8' 1"	0"	1	Acceptable	0"	None	Block	Acceptable	Debris	Acceptable	No	Deteriorated frame/riser. Lots of debris on bench. Wet walls
4-20	Road	8' 0"	0"	4	Acceptable	0"	None	Block	Acceptable	Very Dirty	Acceptable	No	Leaking around riser/frame. Lateral drops in MH. Previously lined
4-21	Road	11' 0"	0"	5	Acceptable	0"	None	Block	Acceptable	Dirty	Acceptable	No	Frame/riser deteriorated. Leaking hole on wall. Pipe drops in MH. Previously lined
4-22	Road	11' 0"	0"	4	Sediment buildup	0"	None	Block	Acceptable	Acceptable	Acceptable	No	Streaking on walls. Wet walls. Previously lined
4-24	Road	-	0"	4	-	-	-	-	-	-	-	-	Unable to remove inflow dish
4-25	Road	8' 0"	0"	1	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	No	Streaks on walls and wet bench. Inflow dish with hole. Previously lined
4-26	Road	5' 10"	0"	5	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	No	Previously lined. Wet bench
4-27	Road	-	0"	5	Acceptable	0"	None	Block	Acceptable	Debris	Acceptable	No	Wet walls and bench. Previously lined
4-28	Road	7' 6"	0"	5	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	No	Possible leak around lateral. Previously lined
4-29	Road	8' 6"	0"	1	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	Yes	Brick riser with sediment buildup. Inflow dish
4-30	Road	9' 10"	0"	2	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	Yes	Damp walls with streaks
4-31	Road	13' 6"	0"	4	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	No	Wet walls, no streaking
4-32	Road	8' 10"	0"	4	Acceptable	0"	None	Block	Hole	Very Dirty	Acceptable	Yes	Block of wall fell onto bench. Minor deterioration of rest of wall

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4-33	Road	7' 0"	0"	1	Acceptable	0"	None	Block	Deteriorated	Debris	Acceptable	Yes	Sediment buildup on bench. Streaking and deterioration of walls
4-34	Road	8' 2"	0"	2	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	No	Large drop pipe on wall. Wet bench
4-35	Road	7' 10"	0"	2	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	No	Potential for ponding. Wet walls
4-36	Road	11' 5"	0"	5	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	No	Sediment on frame/riser. Inflow dish. Staining on joints
5-0	Shoulder	8' 5"	0"	5	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	No	Pipe in manhole. Staining on wall. Wet bench, likely not I/I
5-1	Driveway	8' 1"	0"	5	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	No	Inflow dish at bottom. Deteriorated walls
5-2	Grass	8' 2"	0"	5	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	No	Concrete protrusion
5-3	Road	6' 7"	0"	0	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	No	Sediment buildup on frame. Pipe high up on east wall
5-4	Road	8' 4"	0"	4	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	No	Frame/riser deteriorated. Previously lined
5-5	Driveway	8' 3"	0"	5	Acceptable	0"	Joints	Block	Poor	Acceptable	Acceptable	No	Step cracking on walls
5-6	Shoulder	6' 0"	0"	5	Acceptable	0"	None	Blck	Acceptable	Acceptable	Acceptable	No	Pipe through MH. Dead end MH. Deteriorated walls. Broken inflow dish
5-7	Road/Grass	8' 9"	-1"	1	Acceptable	0"	None	Blck	Acceptable	Acceptable	Acceptable	No	Wet on riser/frame. Inflow dish
5-8	Road	9' 4"	0"	0	Acceptable	0"	None	Blck	Acceptable	Acceptable	Acceptable	No	Sediment on frame. High flow
5-9	Road	6' 2"	0"	4	Acceptable	0"	None	Blck	Acceptable	Acceptable	Acceptable	No	Soil buildup on frame. Deposits on bench. Previously lined
5-10	-	-	-	-	-	-	-	-	-	-	-	-	Unable to inspect due to fence around church property
5-11	Road	8' 2"	0"	5	Acceptable	0"	None	Block	Acceptable	Acceptable	Poor	No	Debris on bench. No channel
5-12	Shoulder	7' 7"	0"	4	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	Yes	Soil buildup on frame. Previously lined. Leaking lateral
5-13	Road	9' 6"	0"	3	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	Yes	Leak on one side of wall. Streaks on walls. Debris on bottom of MH. Previously lined
5-14	Road	7' 8"	0"	0	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	Yes	Multiple layers of brick risers. Lots of sediment on riser. Previously lined
5-15	Road	-	-	-	-	-	-	-	-	-	-	-	Unable to inspect, paved over
5-16	Road	8' 0"	0"	4	Acceptable	2"	None	Block	Acceptable	Acceptable	Acceptable	No	Bench deposits. Potential leak on wall. Previously lined
5-17	Road	10' 0"	0"	4	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	No	Hose connection in MH
5-18	Road	8' 2"	0"	4	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	No	Loose brick riser. Bench deposits. Sediment on frame. Previously lined

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Town of Owasco Manhole Inspection Table													
MH #	Location	Invert Depth	Inches from Grade	Num. of Pick Holes	Frame Condition	Frame Offset	Leaking (Cover or Lid/Frame/Joints)	Corbel/Wall Material	Corbel/Wall Condition	Bench Condition	Channel Condition	I/I Evidence	Comments / General Observations
5-19	Road	9' 9"	0"	4	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	No	Hose connection in MH. Previously lined
5-20	Road	8' 9"	0"	4	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	No	Soil buildup on frame. High flow. Previously lined
5-21	Road	9' 3"	0"	4	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	No	Sediment on frame. High flow
5-22	Road	-	0"		Acceptable	0"	None	-	Acceptable	Acceptable	Acceptable	No	Paved over
5-23	Grass	8' 1"	0"	4	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	No	Possible leak near influent pipe. Previously lined
5-24	Grass	8' 1"	0"	4	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	No	Inflow dish
5-25	Driveway	10' 7"	0"	4	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	No	Bench deposits. Previously lined
5-26	-	-	-	-	-	-	-	-	-	-	-	-	Unable to locate, likely buried
5-27	Road	8' 7"	0"	4	Acceptable	2"	None	Block	Acceptable	Acceptable	Acceptable	No	Bench deposits. Previously lined
6-0	-	-	-	-	-	-	-	-	-	-	-	-	Located on interceptor, not inspected
6-1	-	-	-	-	-	-	-	-	-	-	-	-	Located on interceptor, not inspected
6-2	-	-	-	-	-	-	-	-	-	-	-	-	Located on interceptor, not inspected
6-3	-	-	-	-	-	-	-	-	-	-	-	-	Located on interceptor, not inspected
6-3A	-	-	-	-	-	-	-	-	-	-	-	-	Located on interceptor, not inspected
6-4	-	-	-	-	-	-	-	-	-	-	-	-	Located on interceptor, not inspected
6-5	-	-	-	-	-	-	-	-	-	-	-	-	Located on interceptor, not inspected
6-6	-	-	-	-	-	-	-	-	-	-	-	-	Located on interceptor, not inspected
6-7	Grass	7' 8"	0"	5	Acceptable	0"	None	Block	Roots	Acceptable	Acceptable	No	Inflow dish. Roots in MH from lateral penetration. Dead end MH
6-8	Driveway	7' 8"	0"	5	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	No	Brick riser may leak. Inflow dish
6-9	Grass	7' 10"	2"	5	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	No	Located next to storm ditch
6-10	Grass	7' 6"	1"	5	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	No	Some debris on bottom
6-11	Grass	8' 2"	3"	5	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	No	MH in overall acceptable condition. Previously lined
6-12	Parking Lot	9' 6"	0"	0	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	No	Old lining completely falling off

Town of Owasco Inflow and Infiltration Study
Manhole Inspection Table

Town of Owasco Manhole Inspection Table													
MH #	Location	Invert Depth	Inches from Grade	Num. of Pick Holes	Frame Condition	Frame Offset	Leaking (Cover or Lid/Frame/Joints)	Corbel/Wall Material	Corbel/Wall Condition	Bench Condition	Channel Condition	I/I Evidence	Comments / General Observations
6-13	-	-	-	-	-	-	-	-	-	-	-	-	Unable to locate, likely paved over
6-14	-	-	-	-	-	-	-	-	-	-	-	-	Located on interceptor, not inspected
6-15	-	-	-	-	-	-	-	-	-	-	-	-	Located on interceptor, not inspected
6-16	-	-	-	-	-	-	-	-	-	-	-	-	Located on interceptor, not inspected
6-17	-	-	-	-	-	-	-	-	-	-	-	-	Located on interceptor, not inspected
6-18	-	-	-	-	-	-	-	-	-	-	-	-	Located on interceptor, not inspected
6-19	-	-	-	-	-	-	-	-	-	-	-	-	Located on interceptor, not inspected
6-20	-	-	-	-	-	-	-	-	-	-	-	-	Located on interceptor, not inspected
6-21	-	-	-	-	-	-	-	-	-	-	-	-	Located on interceptor, not inspected
6-23	Driveway	10' 0"	0"	0	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	No	MH in overall acceptable condition. Previously lined
6-24	Grass	5' 3"	2"	0	Acceptable	0"	None	Precast	Acceptable	Acceptable	Acceptable	No	MH in overall acceptable condition
6-25	Dirt Road	4' 11"	0"	0	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	No	Soil buildip on frame/riser
6-26	-	-	-	-	-	-	-	-	-	-	-	-	Unable to locate, likely buried
6-27	Gravel	3' 4"	-4"	0	Acceptable	0"	None	Block	Acceptable	Acceptable	Acceptable	No	Some deposits on bench
6-28	Grass	7' 0"	1"	0	Acceptable	1"	None	Precast	Acceptable	Acceptable	Acceptable	No	Some debris on bench
6-29	Grass	-	-1"	0	-	-	-	-	-	-	-	-	Unable to open cover
6-30	Grass	-	0"	0	-	-	-	-	-	-	-	-	Unable to open cover
6-31	Grass	6' 10"	1"	0	Acceptable	0"	None	Precast	Acceptable	Acceptable	Acceptable	No	Some deposits in channel
6-32	-	-	-	-	-	-	-	-	-	-	-	-	Unable to locate, likely buried in landscaping
6-33	Grass	7' 10"	2"	0	Acceptable	2"	None	Precast	Cracking	Acceptable	Acceptable	No	Large crack near rim
6-34	Grass	5' 0"	-1"	0	Acceptable	0"	None	Precast	Acceptable	Acceptable	Acceptable	No	MH in overall acceptable condition
6-35	Grass	5' 6"	-1"	0	Acceptable	0"	None	Precast	Acceptable	Acceptable	Acceptable	No	MH in overall acceptable condition
6-36	Grass	7' 0"	6"	0	Acceptable	0"	None	Precast	Acceptable	Deposits	Deposits	No	Lateral in manhole

Town of Owasco Inflow and Infiltration Study
Manhole Inspection Table

Town of Owasco Manhole Inspection Table													
MH #	Location	Invert Depth	Inches from Grade	Num. of Pick Holes	Frame Condition	Frame Offset	Leaking (Cover or Lid/Frame/Joints)	Corbel/Wall Material	Corbel/Wall Condition	Bench Condition	Channel Condition	I/I Evidence	Comments / General Observations
6-37	Grass	5' 2"	0"	0	Acceptable	0"	None	Precast	Acceptable	Acceptable	Acceptable	No	Damp bench after rainfall. Some deposits
6-38	Grass	3' 3"	6"	0	Acceptable	0"	None	Precast	Acceptable	Acceptable	Acceptable	No	Dead end MH. Bench is wet. Frame may leak
6-39	Road	5' 5"	0"	0	Poor	0"	Frame	Precast	Acceptable	Acceptable	Acceptable	No	Wet frame. Sediment on frame
6-40	Grass	8' 0"	-1"	0	Acceptable	0"	Joints	Precast	Acceptable	Acceptable	Acceptable	No	Wet walls on one side. Wall/bench joint potentiall leaking
6-41	Grass	8' 10"	-2"	0	Acceptable	0"	None	Precast	Acceptable	Sediment buildup	Acceptable	No	Laterals drops in
6-42	Grass	9' 4"	0"	0	Acceptable	0"	None	Precast	Acceptable	Acceptable	Acceptable	No	Possibly plugged. Deposits in channel
6-43	Grass	9' 0"	2"	0	Acceptable	0"	None	Precast	Acceptable	Acceptable	Acceptable	No	Two laterals in MH. Effectively a dead end MH.
6-44	Road	8' 10"	0"	0	Acceptable	0"	Frame	Precast	Acceptable	Acceptable	Deposits	No	Wet walls. Sediment on frame
6-45	-	-	-	-	-	-	-	-	-	-	-	-	Unable to locate, likely paved over
7-0	Grass	11' 3"	1"	0	Acceptable	0"	None	Precast	Acceptable	Acceptable	Acceptable	No	Sand bags in bottom. Doghouse manhole
7-1	Grass	4' 6"	2"	4	Acceptable	0"	None	Precast	Acceptable	Acceptable	Acceptable	No	Raised to avoid drain pipe. Sediment on frame. Some cracking on concrete frame/rim
7-2	Grass	8' 3"	0"	0	Acceptable	0"	None	Precast	Acceptable	Acceptable	Acceptable	No	Some water on bench. Adjacent to storm catch basin
7-3	-	-	-	-	-	-	-	-	-	-	-	-	Unable to locate, likely buried in landscaping
7-4	-	-	-	-	-	-	-	-	-	-	-	-	Unable to locate, likely buried
7-5	Grass	5' 8"	0"	4	Acceptable	0"	None	Precast	Acceptable	Acceptable	Acceptable	No	MH in overall acceptable condition
7-6	-	-	-	-	-	-	-	-	-	-	-	-	Unable to locate, likely buried
7-7	-	-	-	-	-	-	-	-	-	-	-	-	Unable to locate, likely buried
7-8	-	-	-	-	-	-	-	-	-	-	-	-	Unable to locate, likely buried
7-9	Grass	8' 1"	0"	0	Acceptable	0"	None	Precast	Acceptable	Acceptable	Acceptable	No	Debris in influent pipe. Missing steps
7-10	Grass	15' 0"	-3"	4	Acceptable	0"	None	Precast	Acceptable	Acceptable	Acceptable	No	MH below grade. Leaking around frame
7-11	Road	-	0"	4	-	-	-	-	-	-	-	-	Unable to open cover
7-12	Grass	10' 0"	-3"	4	Acceptable	0"	None	Precast	Acceptable	Acceptable	Acceptable	Yes	Backed up in channel
7-13	Grass/Shoulder	6' 6"	-12"	0	Acceptable	0"	None	Precast	Acceptable	Acceptable	Acceptable	No	Well below surrounding grade on shoulder. Potential for ponding

Town of Owasco Inflow and Infiltration Study
Manhole Inspection Table

Town of Owasco Manhole Inspection Table													
MH #	Location	Invert Depth	Inches from Grade	Num. of Pick Holes	Frame Condition	Frame Offset	Leaking (Cover or Lid/Frame/Joints)	Corbel/Wall Material	Corbel/Wall Condition	Bench Condition	Channel Condition	I/I Evidence	Comments / General Observations
7-14	-	-	-	-	-	-	-	-	-	-	-	-	Unable to locate, likely buried in landscaping
7-15	-	-	-	-	-	-	-	-	-	-	-	-	Unable to locate, likely buried
7-16	Grass	6' 10"	0"	4	Acceptable	0"	None	Precast	Deteriorated	Acceptable	Acceptable	No	Debris in channel
7-17	Road	5' 4"	0"	4	Acceptable	0"	None	Precast	Soil buildup	Acceptable	Acceptable	No	Soil on frame. Loose brick risers. Previously lined
7-18	Grass	-	0"	0	-	-	-	-	-	-	-	-	Unable to open cover
7-19	Road	8' 2"	0"	4	Acceptable	0"	None	Precast	Acceptable	Acceptable	Acceptable	No	Low flow. Soil on risers. Bench deposits
7-20	Grass	5' 6"	0"	4	Acceptable	0"	None	Precast	Acceptable	Acceptable	Acceptable	No	Lateral in manhole
7-21	Grass	5' 6"	0"	4	Acceptable	0"	None	Precast	Acceptable	Acceptable	Acceptable	No	Pipe from bottom. Previously lined
7-22	Grass	8' 5"	0"	4	Acceptable	0"	None	Precast	Acceptable	Acceptable	Acceptable	No	MH in overall acceptable condition. Previously lined
7-23	-	-	-	-	-	-	-	-	-	-	-	-	Unable to locate, likely buried
7-24	Grass	-	0"	4	-	-	-	-	-	-	-	-	Unable to remove inflow dish
7-25	Grass	6' 3"	0"	4	Acceptable	0"	None	Precast	Acceptable	Acceptable	Acceptable	No	Previously lined
7-26	-	-	-	-	-	-	-	-	-	-	-	-	Unable to locate, likely buried
7-27	Grass	7' 3"	0"	4	Acceptable	0"	None	Precast	Acceptable	Acceptable	Acceptable	No	
7-28	Shoulder	5' 6"	0"	0	Acceptable	0"	None	Precast	Acceptable	Some sediment	Acceptable	No	Potential for ponding. Streaks on walls
7-29	Shoulder	8' 2"	0"	0	Acceptable	0"	None	Precast	Acceptable	Some sediment	Acceptable	No	Potential for ponding. Streaks on walls
7-30	Road	8' 4"	0"	0	Acceptable	0"	None	Precast	Acceptable	Acceptable	Acceptable	No	
7-31	Shoulder	9' 5"	0"	0	Acceptable	0"	None	Precast	Acceptable	Acceptable	Acceptable	No	Stand pipe not connected to anything. Streaks on walls
7-32	Road	-	0"	0	-	-	-	-	-	-	-	-	Unable to open cover
7-33	Road	-	0"	0	-	-	-	-	-	-	-	-	Unable to open cover
7-34	Shoulder	7' 1"	0"	0	Acceptable	0"	Frame	Precast	Acceptable	Acceptable	Acceptable	No	Deteriorated frame. Pump station discharges into MH. Sediment on frame. Cover doesn't fit tight
7-35	-	-	-	-	-	-	-	-	-	-	-	-	Unable to locate, likely buried
7-36	-	-	-	-	-	-	-	-	-	-	-	-	Unable to locate, likely paved over

Manhole No. 1-0

- Possible abandoned lateral up wall
- Unknown hose connection
- Deteriorated riser
- Streaking on wall under steps, possible leak



Manhole No. 1-2

- Lots of streaking on walls showing evidence of I/I
- Inflow dish with holes
- Deteriorated riser



Manhole No. 1-4

- Very wet bench, potential active leak at wall/bench connection
- Streaking on walls from single wall joint



Manhole No. 1-11

- Inflow dish has fallen to bottom of manhole
- Channel in poor condition



Manhole No. 1-12

- Lots of water sitting on bench, most likely from streaking down walls
- Brick manhole with lots of sediment buildup around walls



Manhole No. 1-14

- Bench and channel in poor condition
- Inflow dish with holes
- Deteriorated riser



Manhole No. 1-26

- Water leaking in through joints and pipe penetrations



Manhole No. 1-32

- Abandoned pipe on wall, possible from nearby storm culvert



Manhole No. 2-2

- Leak around lateral penetration up the wall
- Water leaking through brick riser



Manhole No. 2-3

- Water leaking through brick riser
- Potential for ponding from road runoff



Manhole No. 2-6

- Past lining starting to deteriorate
- Frame/riser in poor condition
- Leak on bench



Manhole No. 2-11

- Potential for ponding
- Leak at wall joints
- Deteriorated and leaking walls



Manhole No. 3-20

- Potential for ponding
- Leaking through frame/riser



Manhole No. 3-27

- Loose fitting cover with water able to flow in
- Sediment buildup on frame/riser



Manhole No. 3-34

- Roots penetrating through frame and walls
- Deterioration of frame



Manhole No. 3-42

- Unknown pipe through manhole
- Past lining deteriorated
- Inflow dish with holes



Manhole No. 3-43

- Past lining fully deteriorated



Manhole No. 3-47

- Large sediment buildup on riser/frame joint
- Active leak around lateral penetration (not pictured)



Manhole No. 4-2

- Three abandoned pipes along wall
- Frame/riser in poor condition



Manhole No. 4-19

- Debris on bench
- Deteriorated frame/riser



Manhole No. 4-20

- Leaking around riser
- Debris on bench and channel



Manhole No. 4-32

- Block from wall has fallen onto bench
- Deterioration of rest of wall



Manhole No. 5-13

- Streaking from leak on wall
- Lots of debris on bench



Manhole No. 5-14

- Sediment buildup on layers of risers
- Previous lining deteriorating



Manhole No. 6-7

- Roots penetrating through walls around lateral
- Sediment buildup around frame/riser



Manhole No. 6-12

- Receives force main from Sewer District 2
- Old lining falling completely peeling off
- Bench and channel in poor condition



Manhole No. 6-33

- Large crack in frame
- Frame offset ~2 inches

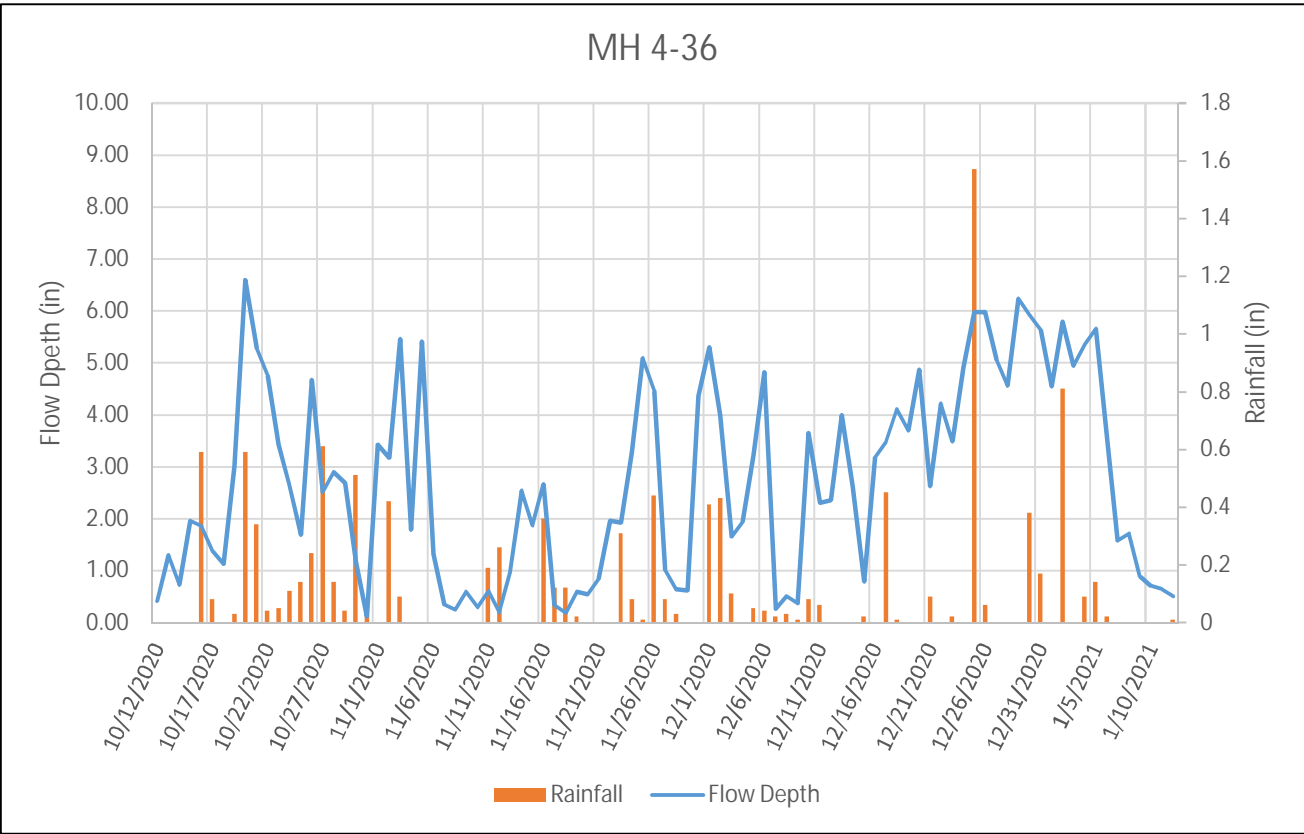
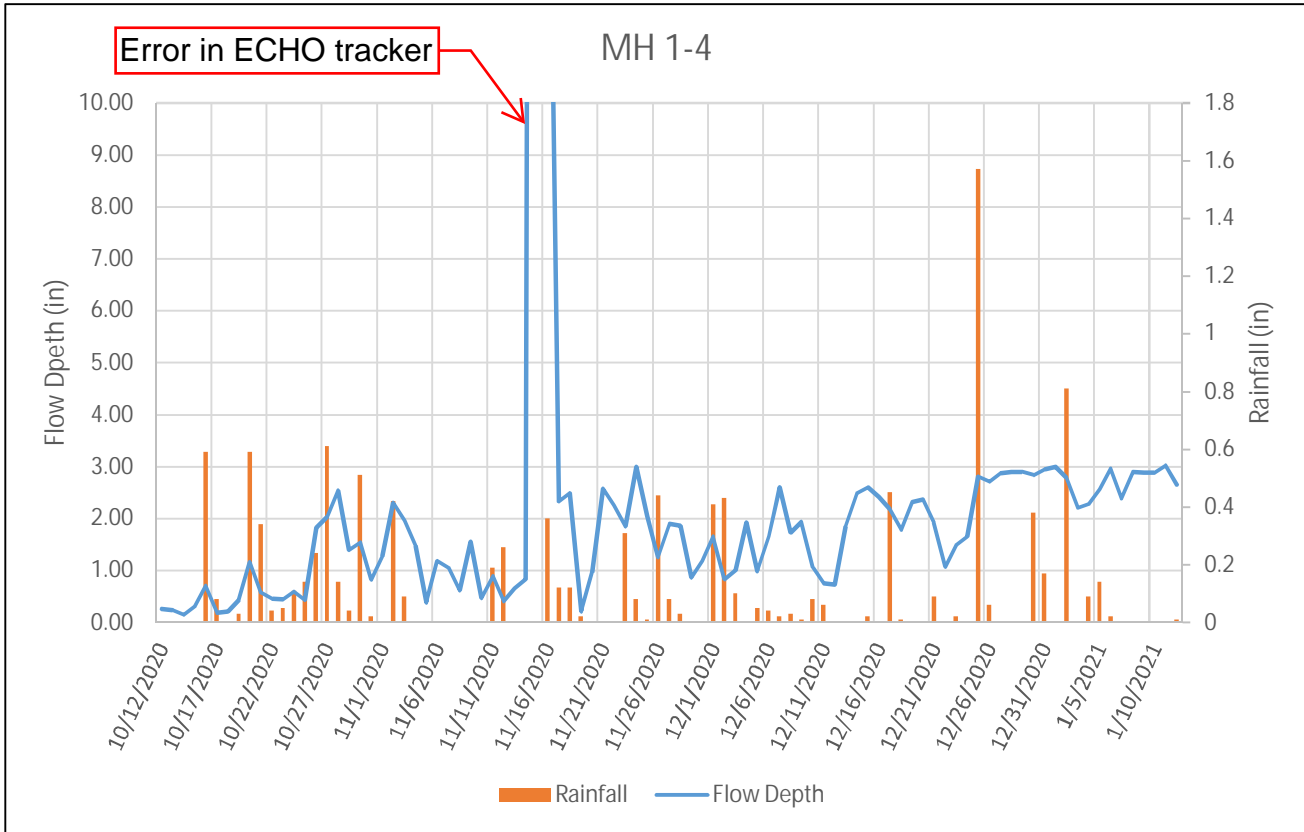


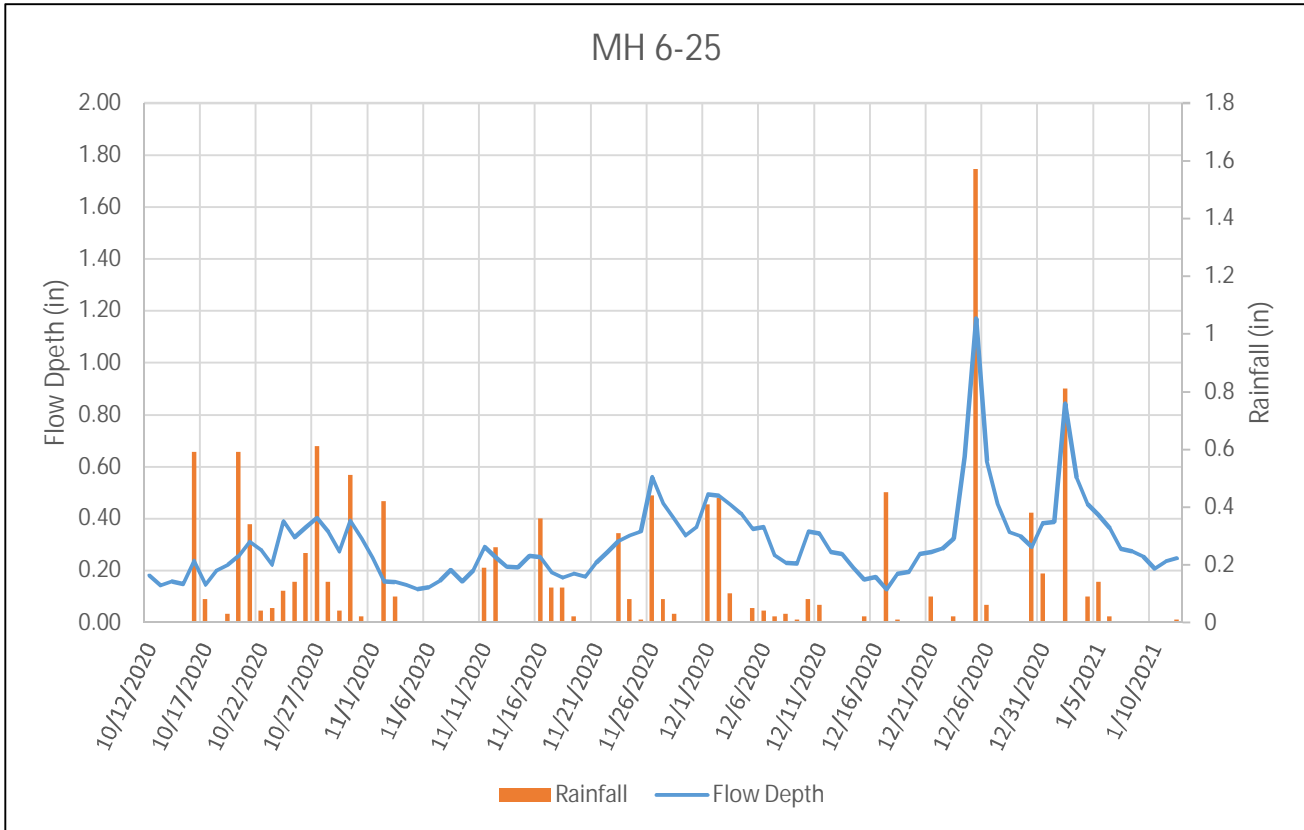
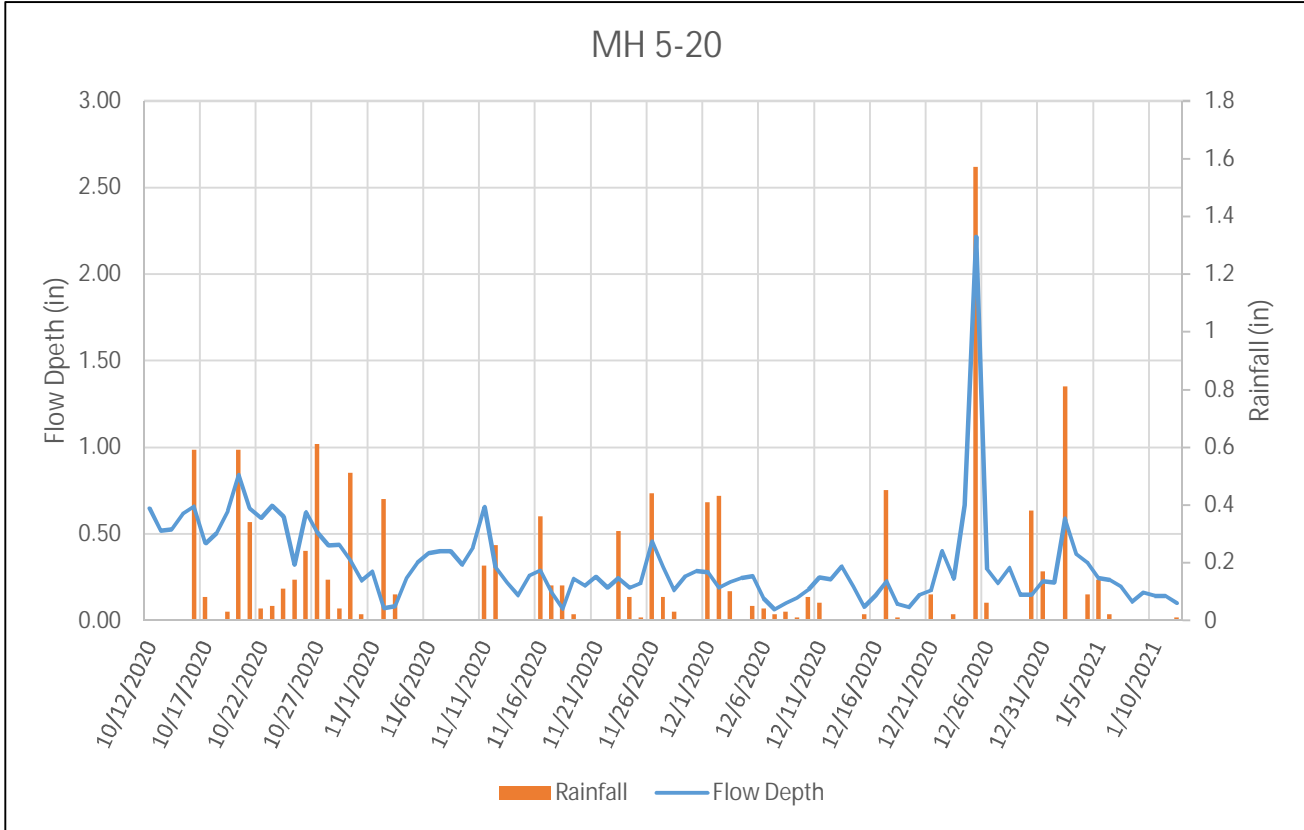
Manhole No. 6-40

- Streaking below steps, potential active leak at bench/wall joint
- Leaking around joints of wall/corbel

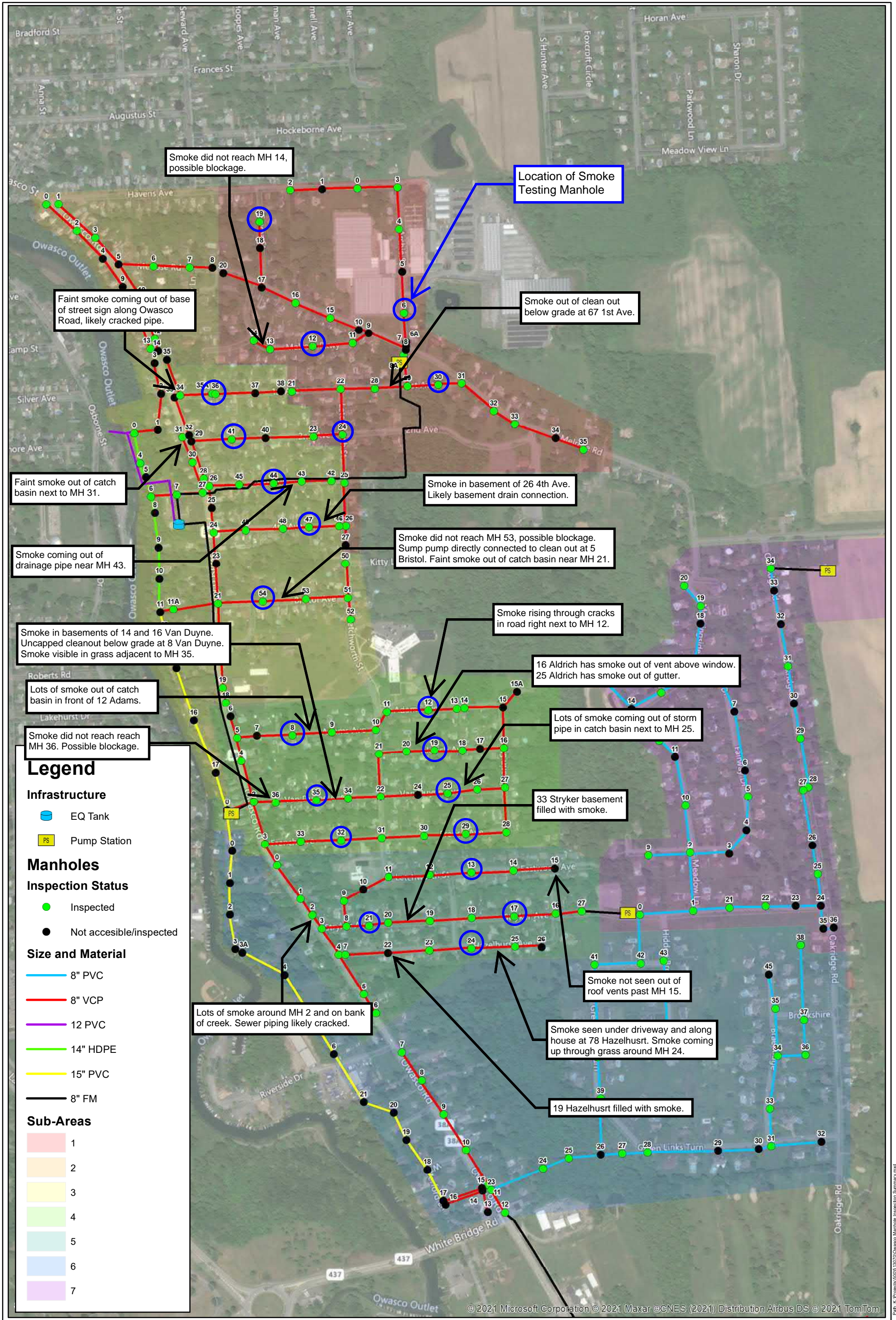


Appendix E
ECHO Flow Monitoring Data





Appendix F
Smoke Testing Observations



Smoke did not reach MH 14, possible blockage.

Location of Smoke Testing Manhole

Faint smoke coming out of base of street sign along Owasco Road, likely cracked pipe.

Smoke out of clean out below grade at 67 1st Ave.

Faint smoke out of catch basin next to MH 31.

Smoke in basement of 26 4th Ave. Likely basement drain connection.

Smoke coming out of drainage pipe near MH 43.

Smoke did not reach MH 53, possible blockage. Sump pump directly connected to clean out at 5 Bristol. Faint smoke out of catch basin near MH 21.

Smoke in basements of 14 and 16 Van Duyne. Uncapped cleanout below grade at 8 Van Duyne. Smoke visible in grass adjacent to MH 35.

Smoke rising through cracks in road right next to MH 12.

Lots of smoke out of catch basin in front of 12 Adams.

16 Aldrich has smoke out of vent above window. 25 Aldrich has smoke out of gutter.

Smoke did not reach MH 36. Possible blockage.

Lots of smoke coming out of storm pipe in catch basin next to MH 25.

Legend

Infrastructure

- EQ Tank
- PS Pump Station

Manholes

Inspection Status

- Inspected
- Not accessible/inspected

Size and Material

- 8" PVC
- 8" VCP
- 12 PVC
- 14" HDPE
- 15" PVC
- 8" FM

Sub-Areas

- 1
- 2
- 3
- 4
- 5
- 6
- 7

Lots of smoke around MH 2 and on bank of creek. Sewer piping likely cracked.

33 Stryker basement filled with smoke.

Smoke not seen out of roof vents past MH 15.

Smoke seen under driveway and along house at 78 Hazelhurst. Smoke coming up through grass around MH 24.

19 Hazelhurst filled with smoke.

Sub-Area 3

7308 Owasco Road - Faint smoke from base of street sign. Likely from crack in sewer pipe.



29 3rd Ave - Smoke from pipe in drainage pipe near MH 43. Possible connection to sewer piping.



7291 Owasco Rd - Faint smoke from catch basin next to MH 31.

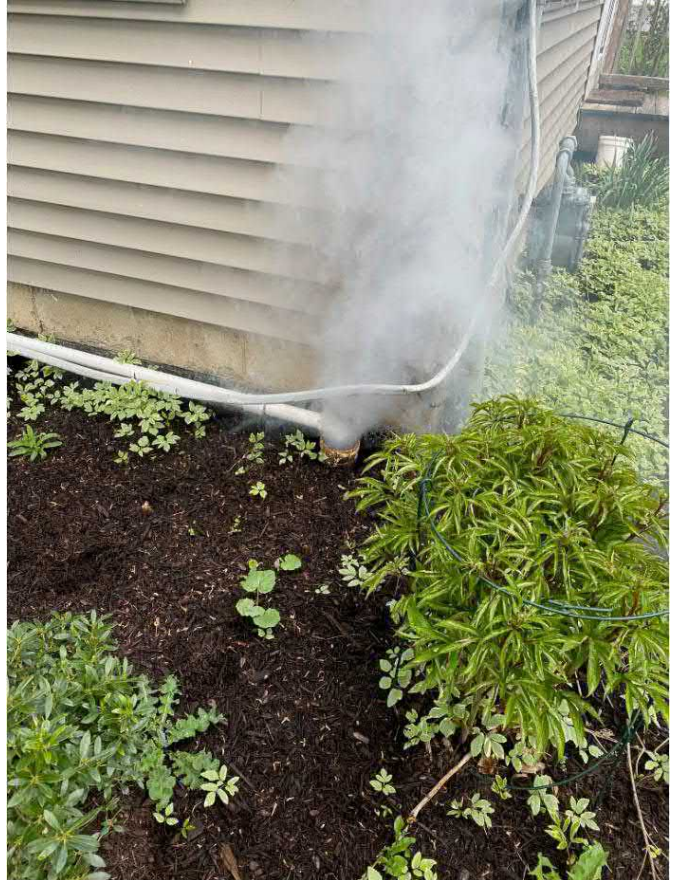


Sub-Area 3

7218 Owasco Rd - Faint smoke from catch basin next to MH 21.



5 Bristol Ave - Sump pump directly connected to cleanout at grade in front landscaping.



Sub-Area 1

67 1st Ave - Uncapped cleanout below grade.



Sub-Area 4

20 Van Duyne Ave - Uncapped cleanout at grade next to front steps.



Sub-Area 4

12 Adams Ave - Lots of smoke out of catch basin in front yard.



58 Adams Ave - Faint smoke from cracks in asphalt. Likely some sort of leak around frame in MH 12.



16 Aldrich Ave - Smoke out of vent above window.



Sub-Area 4

56 Van Duyne Ave - Lots of smoke out of catch basin in front yard. Smoke looks to be coming directly out of storm pipe. Possible connection to sewer piping.



8 Van Duyne Ave - Uncapped cleanout below grade in side yard.



12 Van Duyne Ave - Smoke leaking out of ground next to MH 35.



Sub-Area 5

7074 Owasco Rd - Smoke coming out of hole around MH 2. Smoke out of poorly covered opening at bank of nearby creek.



78 Hazelhurst Ave - Uncapped cleanout at grade in front landscaping. Smoke escaping under driveway. Likely a leak in MH 25.

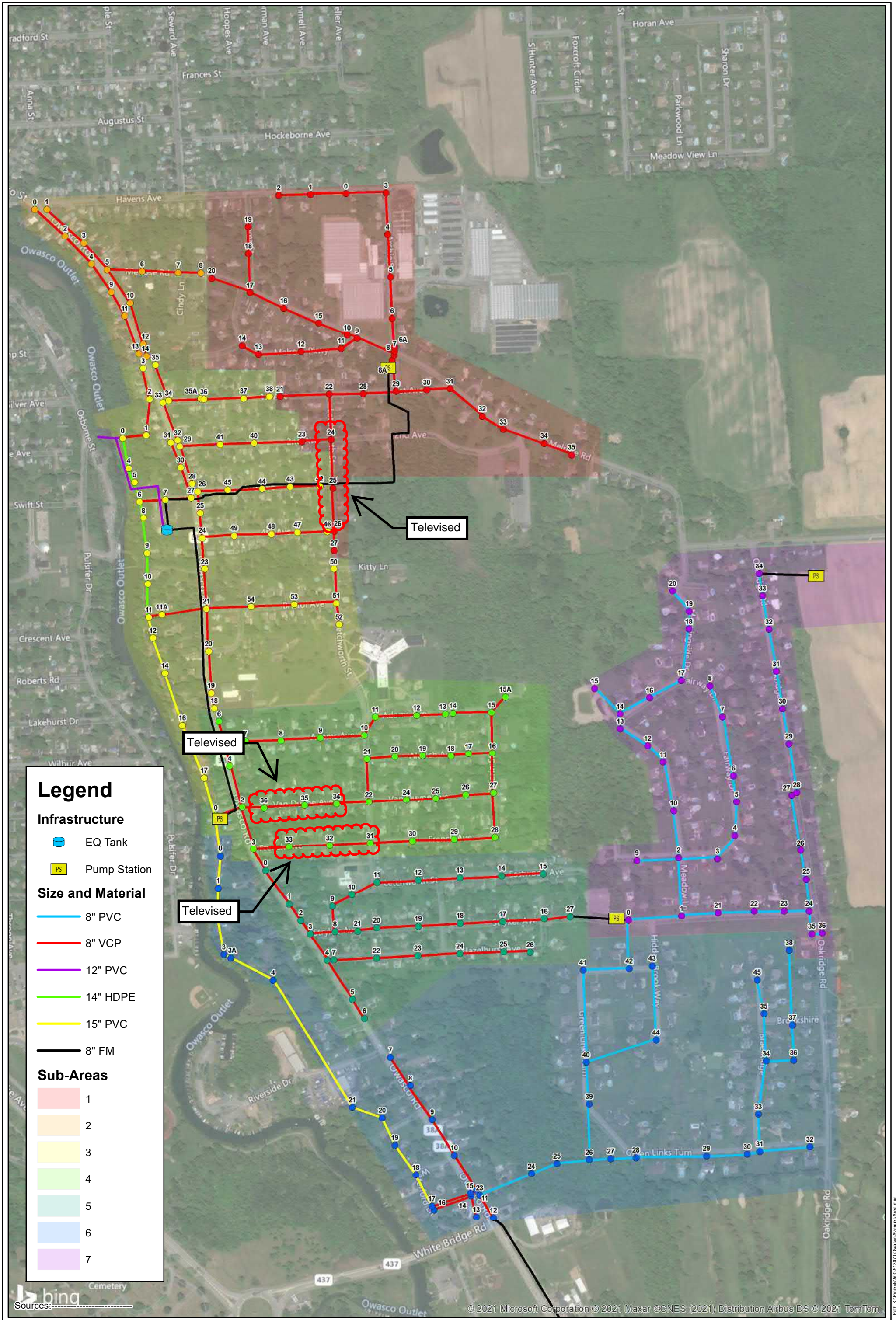


Sub-Area 5

62 Hazelhust - Faint smoke from ground near MH 24. Likely cracked sewer pipe.



Appendix G
CCTV Reports



Legend

Infrastructure

- EQ Tank
- Pump Station

Size and Material

- 8" PVC
- 8" VCP
- 12" PVC
- 14" HDPE
- 15" PVC
- 8" FM

Sub-Areas

- 1
- 2
- 3
- 4
- 5
- 6
- 7

Sources: bing

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1 inch = 600 feet

Town of Owasco
CCTV Observations
 Cayuga County New York

Figure
 G
 Project
 No. 513.070

4/23/2021

Manhole 1-25 to 1-24

- Several sections of full circumferential cracking (6)
- Joint offset at 91' from MH 1-25
- Longitudinal cracking (6)



Manhole 1-25 to 1-24 (cont.)



Manhole 1-26 to 1-25

- Spot crack 170' from MH 1-26
- Active leak around penetration of lateral (254')
- Dip in pipe right before MH 1-25

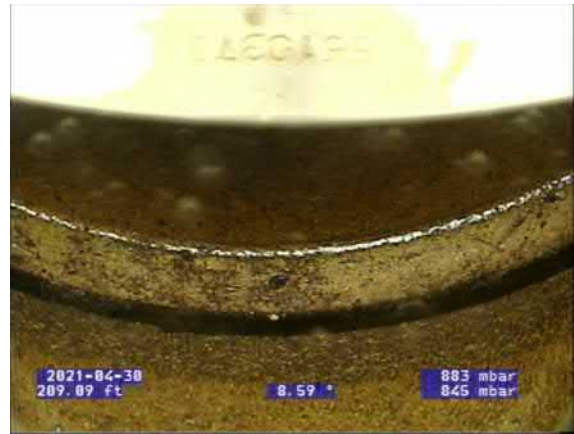


Manhole 4-32 to 4-33

- Offset joints with active leaking (23)
- Mineral buildup at joint 8' from MH 4-32
- Spot crack 255' from MH 4-32



Manhole 4-32 to 4-33 (cont.)



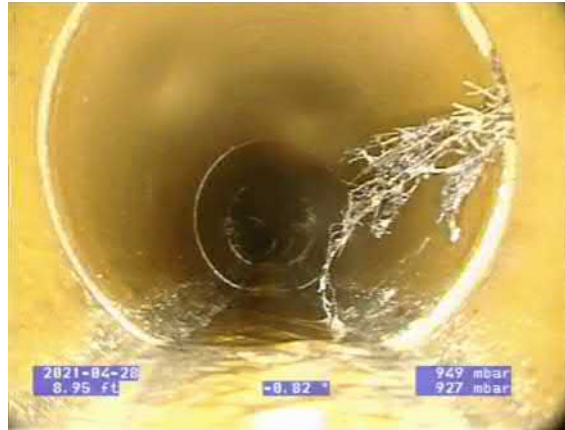
Manhole 4-34 to 4-35

- Debris in pipe 28' from MH 4-34
- Survey abandoned at 46'



Manhole 4-35 to 4-36

- Active leak at offset joint at 6'
- Roots breaking in at offset joint at 9'
- Survey abandoned at 42' due to a root blockage



Appendix H
Manhole Rehabilitation Recommendation Table

**TOWN OF OWASCO INFLOW AND INFILTRATION STUDY
RECOMMENDED MANHOLE REHABILITATION PROGRAM**

MH #	Street Location	New Inflow Dish	Manhole Chimney Seal	Raise Manhole	Remove & Reset/New Frame	Clean Manhole Bench/Channel	Seal Leak/Penetrations	Cementitious Lining
1-0	Road		X					
1-1	Road - Unable to Open							
1-2	Road	X	X		X			
1-3	Road		X					
1-4	Road						X	
1-5	Unable to Locate - Paved Over							
1-6	Road							
1-6A	Road - Unable to Open							
1-7	Road - Unable to Open							
1-8	Road - Unable to Open							
1-8A	Grass							
1-9	Road - Unable to Open							
1-10	Road - Unable to Open							
1-11	Road	X				X		
1-12	Road	X					X	X
1-13	Road		X				X	X
1-14	Road	X	X			X		
1-15	Road							
1-16	Road		X					
1-17	Road - Unable to Open							
1-18	Unable to Locate - Paved Over							
1-19	Road		X					
1-20	Road - Unable to Open							
1-21	Road	X	X					
1-22	Road		X					
1-23	Road							
1-24	Road							
1-25	Road		X					
1-26	Road	X					X	

**TOWN OF OWASCO INFLOW AND INFILTRATION STUDY
RECOMMENDED MANHOLE REHABILITATION PROGRAM**

MH #	Street Location	New Inflow Dish	Manhole Chimney Seal	Raise Manhole	Remove & Reset/New Frame	Clean Manhole Bench/Channel	Seal Leak/Penetrations	Cementitious Lining
1-27	Unable to Locate - Paved Over							
1-28	Road							
1-29	Road					X		
1-30	Road							
1-31	Road							X
1-32	Driveway							
1-33	Grass	X						
1-34	Unable to Locate - Paved Over							
1-35	Shoulder	X						
2-0	Grass							
2-1	Grass	X						
2-2	Driveway		X					
2-3	Driveway	X	X					
2-4	Unable to Locate - Buried							
2-5	Road - Unable to Open							
2-6	Road		X		X		X	X
2-7	Shoulder	X				X		
2-8	Unable to Locate - Buried							
2-9	Unable to Locate - Buried							
2-10	Unable to Locate - Buried							
2-11	Grass/Sidewalk	X	X	X				X
2-12	Grass	X				X		
2-13	Driveway							
2-14	Unable to Locate - Buried							
3-0	Grass							
3-1	Unable to Locate - Buried							
3-2	Unable to Locate - Buried							
3-3	Unable to Locate - Buried							
3-4	Gravel							

**TOWN OF OWASCO INFLOW AND INFILTRATION STUDY
RECOMMENDED MANHOLE REHABILITATION PROGRAM**

MH #	Street Location	New Inflow Dish	Manhole Chimney Seal	Raise Manhole	Remove & Reset/New Frame	Clean Manhole Bench/Channel	Seal Leak/Penetrations	Cementitious Lining
3-5	Unable to Locate - Buried							
3-6	Gravel							
3-7	Road							
3-8	Unable to Locate - Buried							
3-9	On Interceptor - Not Inspected							
3-10	On Interceptor - Not Inspected							
3-11	On Interceptor - Not Inspected							
3-11A	Grass							
3-12	On Interceptor - Not Inspected							
3-14	On Interceptor - Not Inspected							
3-16	On Interceptor - Not Inspected							
3-17	On Interceptor - Not Inspected							
3-18	Shoulder		X					
3-19	Shoulder		X				X	
3-20	Driveway	X	X					
3-21	Road							
3-23	Unable to Locate - Buried							
3-24	Road	X						
3-25	Unable to Locate - Buried							
3-26	Road		X					
3-27	Road	X	X					
3-28	Driveway		X					
3-29	Road - Unable to Open							
3-30	Grass							
3-31	Grass		X				X	
3-32	Unable to Locate - Buried							
3-33	Road - Unable to Open							
3-34	Shoulder	X	X				X	X
3-35	Unable to Locate - Buried							

**TOWN OF OWASCO INFLOW AND INFILTRATION STUDY
RECOMMENDED MANHOLE REHABILITATION PROGRAM**

MH #	Street Location	New Inflow Dish	Manhole Chimney Seal	Raise Manhole	Remove & Reset/New Frame	Clean Manhole Bench/Channel	Seal Leak/Penetrations	Cementitious Lining
3-35A	Shoulder							
3-36	Road							
3-37	Unable to Locate - Paved Over							
3-38	Unable to Locate - Paved Over							
3-40	Road - Unable to Open							
3-41	Road	X						
3-42	Road	X				X		X
3-43	Road	X	X					X
3-44	Road	X	X					
3-45	Road	X						
3-46	Road		X					
3-47	Road		X			X	X	
3-48	Road	X						
3-49	Road	X						
3-50	Road							
3-51	Road	X						
3-52	Road	X						
3-53	Road	X						
3-54	Road	X						
4-0	On Interceptor - Not Inspected							
4-2	Road		X				X	
4-3	Road					X		
4-4	Driveway	X				X		
4-5	Road	X				X		
4-6	Grass - Unable to Open							
4-7	Road - Unable to Open	X						
4-8	Road		X					
4-9	Road	X	X					
4-10	Road							

**TOWN OF OWASCO INFLOW AND INFILTRATION STUDY
RECOMMENDED MANHOLE REHABILITATION PROGRAM**

MH #	Street Location	New Inflow Dish	Manhole Chimney Seal	Raise Manhole	Remove & Reset/New Frame	Clean Manhole Bench/Channel	Seal Leak/Penetrations	Cementitious Lining
4-11	Road							
4-12	Road	X						
4-13	Road	X				X		
4-14	Road	X						
4-15	Unable to Locate - Buried							
4-15A	Unable to Locate - Buried							
4-16	Road							
4-17	Unable to Locate - Paved Over							
4-18	Road							
4-19	Road		X			X		
4-20	Road		X			X		
4-21	Road				X	X		
4-22	Road							
4-24	Road - Unable to Open	X						
4-25	Road	X						
4-26	Road							
4-27	Road							
4-28	Road						X	
4-29	Road	X	X					
4-30	Road							
4-31	Road							
4-32	Road		X				X	X
4-33	Road		X					
4-34	Road							
4-35	Road	X						
4-36	Road	X	X					
5-0	Shoulder							
5-1	Driveway	X				X		
5-2	Grass							

**TOWN OF OWASCO INFLOW AND INFILTRATION STUDY
RECOMMENDED MANHOLE REHABILITATION PROGRAM**

MH #	Street Location	New Inflow Dish	Manhole Chimney Seal	Raise Manhole	Remove & Reset/New Frame	Clean Manhole Bench/Channel	Seal Leak/Penetrations	Cementitious Lining
5-3	Road		X					
5-4	Road				X			
5-5	Driveway		X					
5-6	Shoulder	X				X		X
5-7	Road/Grass	X						
5-8	Road							
5-9	Road					X		
5-10	Unable to Inspect - Gated Off							
5-11	Road					X		
5-12	Shoulder		X				X	
5-13	Road		X					
5-14	Road		X					
5-15	Unable to Inspect - Paved Over							
5-16	Road				X			
5-17	Road							
5-18	Road		X					
5-19	Road							
5-20	Road							
5-21	Road							
5-22	Road							
5-23	Grass						X	
5-24	Grass	X						
5-25	Driveway							
5-26	Unable to Locate - Buried							
5-27	Road				X			
6-0	On Interceptor - Not Inspected							
6-1	On Interceptor - Not Inspected							
6-2	On Interceptor - Not Inspected							
6-3	On Interceptor - Not Inspected							

**TOWN OF OWASCO INFLOW AND INFILTRATION STUDY
RECOMMENDED MANHOLE REHABILITATION PROGRAM**

MH #	Street Location	New Inflow Dish	Manhole Chimney Seal	Raise Manhole	Remove & Reset/New Frame	Clean Manhole Bench/Channel	Seal Leak/Penetrations	Cementitious Lining
6-3A	On Interceptor - Not Inspected							
6-4	On Interceptor - Not Inspected							
6-5	On Interceptor - Not Inspected							
6-6	On Interceptor - Not Inspected							
6-7	Grass	X	X			X	X	
6-8	Driveway	X	X					
6-9	Grass							
6-10	Grass							
6-11	Grass							
6-12	Parking Lot							X
6-13	Unable to Locate - Paved Over							
6-14	On Interceptor - Not Inspected							
6-15	On Interceptor - Not Inspected							
6-16	On Interceptor - Not Inspected							
6-17	On Interceptor - Not Inspected							
6-18	On Interceptor - Not Inspected							
6-19	On Interceptor - Not Inspected							
6-20	On Interceptor - Not Inspected							
6-21	On Interceptor - Not Inspected							
6-23	Driveway							
6-24	Grass							
6-25	Dirt Road							
6-26	Unable to Locate - Buried							
6-27	Gravel			X				
6-28	Grass							
6-29	Grass - Unable to Open							
6-30	Grass - Unable to Open							
6-31	Grass					X		
6-32	Unable to Locate - Buried							

**TOWN OF OWASCO INFLOW AND INFILTRATION STUDY
RECOMMENDED MANHOLE REHABILITATION PROGRAM**

MH #	Street Location	New Inflow Dish	Manhole Chimney Seal	Raise Manhole	Remove & Reset/New Frame	Clean Manhole Bench/Channel	Seal Leak/Penetrations	Cementitious Lining
6-33	Grass				X			
6-34	Grass					X		
6-35	Grass							
6-36	Grass							
6-37	Grass							
6-38	Grass		X					
6-39	Road		X					
6-40	Grass		X					
6-41	Grass			X				
6-42	Grass							
6-43	Grass							
6-44	Road		X					
6-45	Unable to Locate - Paved Over							
7-0	Grass							
7-1	Grass				X			
7-2	Grass							
7-3	Unable to Locate - Buried							
7-4	Unable to Locate - Buried							
7-5	Grass							
7-6	Unable to Locate - Buried							
7-7	Unable to Locate - Buried							
7-8	Unable to Locate - Buried							
7-9	Grass					X		
7-10	Grass		X	X				
7-11	Road - Unable to Open							
7-12	Grass			X				
7-13	Grass/Shoulder			X				
7-14	Unable to Locate - Buried							
7-15	Unable to Locate - Buried							

**TOWN OF OWASCO INFLOW AND INFILTRATION STUDY
RECOMMENDED MANHOLE REHABILITATION PROGRAM**

MH #	Street Location	New Inflow Dish	Manhole Chimney Seal	Raise Manhole	Remove & Reset/New Frame	Clean Manhole Bench/Channel	Seal Leak/Penetrations	Cementitious Lining
7-16	Grass					X		
7-17	Road		X					
7-18	Grass - Unable to Open							
7-19	Road					X		
7-20	Grass							
7-21	Grass							
7-22	Grass							
7-23	Unable to Locate - Buried							
7-24	Grass - Unable to Open	X						
7-25	Grass							
7-26	Unable to Locate - Buried							
7-27	Grass							
7-28	Shoulder	X						
7-29	Shoulder	X						
7-30	Road							
7-31	Shoulder							
7-32	Road - Unable to Open							
7-33	Road - Unable to Open							
7-34	Shoulder	X	X					
7-35	Unable to Locate - Buried							
7-36	Unable to Locate - Paved Over							
		50	50	6	8	24	15	11
		\$200	\$800	\$2,000	\$1,000	\$200	\$1,500	\$4,000
		\$10,000	\$40,000	\$12,000	\$8,000	\$4,800	\$22,500	\$44,000
		\$141,300						

Appendix I
Estimate of Probable Project Cost

Alternative No. 1 - Sewer Rehabilitation and Public Side I/I Reduction

ITEM NO.	DESCRIPTION	QTY	UNIT	UNIT PRICE	TOTAL
1	Manhole Rehabilitation	1	LS	\$141,300	\$141,300
2	Cured-In-Place Pipe Lining (CIPP)	24,100	LF	\$50	\$1,205,000
3	Open Cut Spot Repair	50	EA	\$12,500	\$625,000
4	Open Cut Sewer Replacement	8,100	LF	\$250	\$2,025,000
5	Sewer Lateral Improvements	1	LS	\$100,000	\$100,000
6	Additional I-I Reduction Improvements	1	LS	\$50,000	\$50,000
7	Miscellaneous Additional Improvements	1	LS	\$200,000	\$200,000
<i>Subtotal:</i>					\$4,347,000
				Mobilization/Demobilization/General Conditions: 5%	\$218,000
				Inflation to 2023 Dollars @ 6%	\$261,000
Subtotal Construction Costs:					\$4,826,000
				Engineering/Legal/Administrative Costs: 25%	\$1,207,000
				Construction Contingency: 15%	\$724,000
TOTAL PROJECT COST					\$6,757,000

Alternative No. 2 - Sewer Rehabilitation and Replacement focused on Private Side Sewer Separation

ITEM NO.	DESCRIPTION	QTY	UNIT	UNIT PRICE	TOTAL
1	Sanitary Sewer Improvements	35,700	LF	\$150	\$5,355,000
2	Storm Sewer Improvements	35,700	LF	\$150	\$5,355,000
3	Roadway Reconstruction	35,700	LF	\$120	\$4,284,000
4	Miscellaneous Improvements	35,700	LF	\$60	\$2,142,000
<i>Approximate Total Construction (Include Contingency):</i>					\$17,140,000
				Soft Costs (Engineering/Legal/Administrative Costs): 25%	\$4,290,000
APPROX. TOTAL SEWER RELATED PROJECT COST					\$21,430,000
ITEM NO.	DESCRIPTION	QTY	UNIT	UNIT PRICE	TOTAL
5	Water Main Replacement	35,700	LF	\$100	\$3,570,000
APPROX. TOTAL PROJECT COST WITH WATER MAIN REPLACEMENT					\$25,000,000

Alternative No. 2 - Phase No. 1

ITEM NO.	DESCRIPTION	QTY	UNIT	UNIT PRICE	TOTAL
<i>Third Avenue - Sub Area 3</i>					
1	Sanitary Sewer Rehabilitation or Replacement	900	LF	\$100	\$90,000
2	Storm Sewer Construction	1,100	LF	\$100	\$110,000
3	Roadway Improvements	1,000	LF	\$100	\$100,000
4	Route 38A Bore	1	LS	\$30,000	\$30,000
5	New Outlet Outfall	1	LS	\$45,000	\$45,000
6	Miscellaneous Improvements	1	LS	\$50,000	\$50,000
Subtotal					\$425,000
<i>Van Duyne Avenue - Sub Area 4</i>					
1	Sanitary Sewer Rehabilitation or Replacement	1,200	LF	\$100	\$120,000
2	Storm Sewer Construction	1,350	LF	\$100	\$135,000
3	Roadway Improvements	1,200	LF	\$100	\$120,000
4	Miscellaneous Improvements	1	LS	\$75,000	\$75,000
Subtotal					\$450,000
<i>Stryker Avenue - Sub Area 5</i>					
1	Sanitary Sewer Rehabilitation or Replacement	1,750	LF	\$100	\$175,000
2	Storm Sewer Construction	2,100	LF	\$100	\$210,000
3	Roadway Improvements	1,900	LF	\$100	\$190,000
4	Route 38A Bore	1	LS	\$30,000	\$30,000
5	New Outlet Outfall	1	LS	\$40,000	\$40,000
6	Miscellaneous Improvements	1	LS	\$100,000	\$100,000
Subtotal					\$745,000
<i>Subtotal:</i>					<i>\$1,620,000</i>
				Mobilization/Demobilization/General Conditions: 5%	\$81,000
				Inflation to 2023 Dollars @ 6%	\$98,000
				Subtotal Construction Costs:	\$1,799,000
				Engineering/Legal/Administrative Costs: 25%	\$450,000
				Construction Contingency: 30%	\$540,000
TOTAL SEWER RELATED PROJECT COST					\$2,789,000
ITEM NO.	DESCRIPTION	QTY	UNIT	UNIT PRICE	TOTAL
1	New Water Main Additional Cost	4,100	LF	\$100	\$410,000
TOTAL PROJECT COST WITH NEW WATER MAIN					\$3,199,000

Appendix J
Project Financing

Alternative 2 : Phase 1 - Total Cost	\$3,199,000
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	Scenario No. 1: 1.5% CWSRF EFC Loan and 25% Grant	Scenario No. 2: 1.5% CWSRF EFC Loan and 50% Grant	Scenario No. 3: 1.5% CWSRF EFC Loan and 75% Grant	Scenario No. 4: 1.5% CWSRF EFC Loan
Rate	1.500%	1.500%	1.500%	1.500%
Term Length	30	30	30	30
% of Grant	25%	50%	75%	0%
Total Grant	\$799,750	\$1,599,500	\$2,399,250	\$0
Annualized Project Cost	\$99,903	\$66,602	\$33,301	\$133,204
Number of EDU's in Sewer District No. 1	933			
Additional Yearly Debt Cost for Users due to Capital Project	\$107	\$71	\$36	\$143
Avg. Annual Cost of I-I Treatment	\$385,000			
Estimated I/I Reduction	5%			
Est. Avg. I-I Treatment Savings	\$19,250			
Annualized Project Costs Minus I-I Savings	\$80,653	\$47,352	\$14,051	\$113,954
Estimated Total Annual Cost Increase Per User	\$86	\$51	\$15	\$122

"The information contained herein IS NOT INTENDED TO BE AND DOES NOT INCLUDE advice or recommendations with respect to the issuance, structure, timing, terms or any other aspect of municipal securities, municipal derivatives, guaranteed investment contracts or investment strategies. Any opinions, advice, information or recommendations contained herein are understood by the recipients to be strictly engineering opinions, advice, information or recommendations. Barton & Loguidice is not a "municipal advisor" as defined by 15 U.S.C. 78o-4 or the related rules of the Securities and Exchange Commission. The parties to whom this information is being provided should determine independently whether they require the services of a municipal advisor."

Appendix K
Smart Growth Assessment Form



Smart Growth Assessment Form

This form should be completed by an authorized representative of the applicant, preferably the project engineer or other design professional.¹

Section 1 – General Applicant and Project Information

Applicant: Town of Owasco

Project No.: TBD

Project Name: Town of Owasco Inflow and Infiltration Reduction Evaluation

Is project construction complete? Yes, date: No

Please provide a brief project summary in plain language including the location of the area the project serves:

The Town of Owasco sanitary sewer collection system has significant issues as a result of inflow and infiltration due to age related deterioration of sewer main and manholes. This report identifies sources of inflow and infiltration and provides recommendations for rehabilitation of the collection system.

Section 2 – Screening Questions

A. Prior Approvals

- Has the project been previously approved for Environmental Facilities Corporation (EFC) financial assistance? Yes No
- If yes to A(1), what is the project number(s) for the prior approval(s)? Project No.:
- If yes to A(1), is the scope of the previously-approved project substantially the same as the current project? Yes No

If your responses to A(1) and A(3) are both yes, please proceed to Section 5, Signature.

B. New or Expanded Infrastructure

- Does the project involve the construction or reconstruction of new or expanded infrastructure? Yes No

Examples of new or expanded infrastructure include, but are not limited to:

- (i) The addition of new wastewater collection/new water mains or a new wastewater treatment system/water treatment plant where none existed previously;
- (ii) An increase of the State Pollutant Discharge Elimination System (SPDES) permitted flow capacity for an existing wastewater treatment system; and OR

¹ If project construction is complete and the project was not previously financed through EFC, an authorized municipal representative may complete and sign this assessment.

- (iii) An increase of the permitted water withdrawal or the permitted flow capacity for the water treatment system such that a Department of Environmental Conservation (DEC) water withdrawal permit will need to be obtained or modified, or result in the Department of Health (DOH) approving an increase in the capacity of the water treatment plant.

If your response to B(1) is no, please proceed to Section 5, Signature.

Section 3 –Smart Growth Criteria

Your project must be consistent with all relevant Smart Growth criteria. For each question below please provide a response and explanation.

1. Does the project use, maintain, or improve existing infrastructure?
 Yes No

Explain your response:

This project will improve the existing sanitary sewer collection system and provide dedicated storm water infrastructure where it currently does not exist.

2. Is the project located in a (1) municipal center, (2) area adjacent to a municipal center, or (3) area designated as a future municipal center, as such terms are defined herein (please select one response)?

Yes, my project is located in a municipal center, which is an area of concentrated and mixed land uses that serves as a center for various activities, including but not limited to: central business districts, main streets, downtown areas, brownfield opportunity areas (see www.dos.ny.gov for more information), downtown areas of local waterfront revitalization program areas (see www.dos.ny.gov for more information), areas of transit-oriented development, environmental justice areas (see www.dec.ny.gov/public/899.html for more information), and hardship areas (projects that primarily serve census tracts or block numbering areas with a poverty rate of at least twenty percent according to the latest census data).

Yes, my project is located in an area adjacent to a municipal center which has clearly defined borders, is designated for concentrated development in the future in a municipal or regional comprehensive plan, and exhibits strong land use, transportation, infrastructure, and economic connections to an existing municipal center.

Yes, my project is located in an area designated as a future municipal center in a municipal or comprehensive plan and is appropriately zoned in a municipal zoning ordinance

No, my project is not located in a (1) municipal center, (2) area adjacent to a municipal center, or (3) area designated as a future municipal center.

Explain your response and reference any applicable plans:

This project is located in a densely developed neighborhood area of the Town of Owasco, directly outside of the limits of the City of Auburn.

3. Is the project located in a developed area or an area designated for concentrated infill development in a municipally-approved comprehensive land use plan, local waterfront revitalization plan, and/or brownfield opportunity area plan?

Yes No

Explain your response and reference any applicable plans:

The project is located in a densely developed neighborhood area of the Town of Owasco.

4. Does the project protect, preserve, and enhance the State's resources, including surface and groundwater, agricultural land, forests, air quality, recreation and open space, scenic areas, and significant historic and archaeological resources?

Yes No

Explain your response:

The project will enhance the State's resources by providing dedicated stormwater system to an area where it currently does not exist. This will prevent the overflows in the sanitary sewer system by eliminating combined sewer laterals.

5. Does the project foster mixed land uses and compact development, downtown revitalization, brownfield redevelopment, the enhancement of beauty in public spaces, the diversity and affordability of housing in proximity to places of employment, recreation and commercial development, and the integration of all income and age groups?

Yes No

Explain your response:

The project will enhance public spaces by preventing the sanitary sewer overflows that the Town currently deals with. Many of these overflows occur at manholes located directly next to the Owasco Outlet. Development will be encouraged by providing newly separated sanitary and stormwater collection systems.

6. Does the project provide mobility through transportation choices including improved public transportation and reduced automobile dependency?

Yes No N/A

Explain your response:

This project is focused on the improvement of sanitary and stormwater collection systems.

7. Does the project involve coordination between State and local government, intermunicipal planning, or regional planning?

Yes No

Explain your response and reference any applicable plans:

This project will incorporate state and local agencies throughout design and construction for proper permitting and approvals.

8. Does the project involve community-based planning and collaboration?

Yes No

Explain your response and reference any applicable plans:

Informational public meetings will be held during the design process to discuss proposed improvement strategies.

9. Does the project support predictability in building and land use codes?

Yes No N/A

Explain your response:

No new buildings will be built under this project.

10. Does the project promote sustainability by adopting measures such as green infrastructure techniques, decentralized infrastructure techniques, or energy efficiency measures?

Yes No

Explain your response and reference any applicable plans:

This project will increase energy efficiency of pump stations and other treatment equipment by reducing I and sanitary sewer overflows. Existing sanitary sewers will be repurposed to manage stormwater flows.

11. Does the project mitigate future physical climate risk due to sea-level rise, storm surges, and/or flooding, based on available data predicting the likelihood of future extreme weather events, including hazard risk analysis data, if applicable?

Yes No

Explain your response and reference any applicable plans:

This project will reduce the amount of sanitary sewer overflows that occur during high rainfall weather events.


Section 4 – Miscellaneous

1. Is the project expressly required by a court or administrative consent order? Yes No

If yes, and you have not previously provided the applicable order to EFC/DOH, please submit it with this form.

Section 5 – Signature

By signing below, you agree that you are authorized to act on behalf of the applicant and that the information contained in this Smart Growth Assessment is true, correct and complete to the best of your knowledge and belief.

Applicant: Town of Owasco	Phone Number:
Name and Title of Signatory:	
Signature: 	Date: 6/16/2021

Appendix L
Engineering Report Certification

Engineering Report Certification

During the preparation of this Engineering Report, I have studied and evaluated the cost and effectiveness of the processes, materials, techniques, and technologies for carrying out the proposed project or activity for which assistance is being sought from the New York State Clean Water State Revolving Fund. In my professional opinion, I have recommended for selection, to the maximum extent practicable, a project or activity that maximizes the potential for efficient water use, reuse, recapture, and conservation, and energy conservation, taking into account the cost of constructing the project or activity, the cost of operating and maintaining the project or activity over the life of the project or activity, and the cost of replacing the project and activity.

Title of Engineering Report: Town of Owasco Inflow and Infiltration Study

Date of Report: July 2021

Professional Engineer's Name: Kenneth M. Knutsen, P.E.

Signature:

Date:

The experience to
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