North Aurora Dam
Modification Study

July 2025

ILLINOIS DEPARTMENT OF NATURAL RESOURCES 1925 2025

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North Aurora Dam Modification Study

North Aurora, Kane County, Illinois,

Certification

The State of Illinois

Illinois Department of Natural Resources

Office of Water Resources

December 2024

Project Modeler: Aaron Rotherham

Project Manager: Terra McParland

Final Approval: Wesley Cattoor

I Hereby certify that this study was prepared under my personal direction and that I am a Licensed Professional Engineer of Illinois.

Terra McParland ________________________________ 07/27/25 ____________________

Terra McParland, P.E. CFM Date

Illinois Registration No. 062.050924

My registration renewal date is November 30, 2025

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Acronyms and Abbreviations

Acronym	Definition
1D	One Dimensional
2D	Two Dimensional
Alt.	Alternative
Alts.	Alternatives
BOL	Bureau of Land
BOW	Bureau of Water
CaCO3	Calcium Carbonate
CERP	Comprehensive Environmental Review Process
cfs	Cubic Feet per Second
cfu	Colony Forming Units
Co	County
CY	Cubic Yard
DEM	Digital Elevation Model
DO	Dissolved Oxygen
e.g.	for example
EcoCAT	Ecological Compliance Assessment Tool
EIU	Eastern Illinois University
EQRS	Equivalent Round Structure
FIS	Flood Insurance Study
FRIP	Fox River Implementation Plan
FRSG	Fox River Study Group, Inc.
ft/s	Feet per Second
ft^2	Square Feet
FVPD	Fox Valley Park District
i.e.	that is
IDNR	Illinois Department of Natural Resources
IEPA	Illinois Environmental Protection Agency
IGA	Interagency Governmental Agreement
IL	Illinois
ILCS	Illinois Compiled Statute
INAI	Illinois Natural Areas Inventory
ISWS	Illinois State Water Survey
KCFPD	Kane County Forest Preserve District
LiDAR	Light Detection and Ranging
MAC	Maximum Allowable Concentration
mg/l	Milligrams per Liter
N	Nitrogen

Acronym	Definition
ng/l	Nanograms per Liter
NLCD	National Land Cover Dataset
NRHP	National Register of Historic Places
OWR	Office of Water Resources
PCBs	Polychlorinated Biphenyls
Q7-10	7-day 10 year
RCP	Reinforced Concrete Pipe
Rev.	Revised
SHPO	State Historic Preservation Office
SRO	Soil Remediation Objectives
SVOC	Semi-Volatile Organic Compounds
TACO	Tiered Approach to Corrective Action Objectives
TSS	Total Suspended Solids
ug/l	micrograms per liter
USACE	United States Army Corps of Engineers
USGS	United States Geological Survey
VOC	Volatile Organic Compounds
XS	Cross-section
yr	Year

EXECUTIVE SUMMARY

Background and Scope

Located 52 miles upstream of the Fox River's confluence with the Illinois River, the North Aurora Dam—a 375-foot-long, 9-foot-high concrete structure built in 1975—no longer serves its original purpose of powering a lumber mill. It poses safety risks due to a downstream hydraulic roller responsible for two deaths and multiple rescues, fragments fish habitats, and contributes to water quality issues, including sediment accumulation. The study scope included engineering reconnaissance, field surveys, hydraulic and sediment transport modeling, environmental assessments, and cost estimation to assess full and partial dam removal and other modification alternatives.

Key Findings

Safety and Ecology: The dam's hydraulic roller is a persistent public safety hazard, while its presence blocks fish passage across 3.5 river miles and degrades water quality through sediment trapping and reduced dissolved oxygen levels.

Sediment Contamination: Sampling revealed contaminated sediment upstream (e.g., SVOCs, metals, PCBs exceeding IEPA standards), requiring costly removal or capping if the dam is altered. Preliminary sediment transport modeling estimates 12,300–13,800 cubic yards of erodible material, with disposal costs potentially reaching $2.8–3.1 million.

Hydraulics: Full dam removal reduces upstream water depths by 5.35–6.41 feet (median to low flows) and increases velocities (1.1–3.6 ft/s), while partial removal retains some pool depth but limits ecological benefits.

Alternatives Analyzed

Ten alternatives were evaluated against a primary goal (public safety), secondary goals (ecological improvement, water quality, recreation), and local goals (mill race flow, minimal park/plaza disruption, tree preservation):

- **Full Dam Removal (Alt. 1)**: Eliminates safety risks and restores ecology but dries the mill race ($5.9M total, $1.1M without sediment removal).
- **Channel Options (Alts. 2–3)**: Add open channels to maintain mill race flow; costly and disruptive to park/plaza ($6.2–7.4M, $1.9-3.1M without sediment removal).
- **Culvert Options (Alts. 4–6)**: Replace mill race intake with culverts; balance flow maintenance and cost ($6.3–6.4M, $2.0-2.1M without sediment removal).
- **Riffle Options (Alts. 7–8)**: Add rock features to maintain water to mill race; Alt. 8 maximizes flow but costs more ($5.9–6.8M, $1.6-2.5M without sediment removal).
- **Partial Dam Removal (Alt. 9)**: Retains some pool and flow but fails ecological goals ($6.1M, $1.2M without sediment removal).

- **Add Ramp Only (Alt. 10)**: Adds downstream slope to reduce scour impacts ; no removal, lowest cost ($1.1M), but minimal benefits and does not include dam removal for safety.
- Costs include construction, engineering (27.5% of construction), and sediment removal, with sediment costs (59–80% of totals) driving variability. Full removal options generally meet all primary/ secondary goals, while partial removal and no-removal options do not.

Recommendations

IDNR recommends **full dam removal**, aligning with state policies prioritizing safety, ecological restoration, and recreation. Preferred options for further consideration by the Village of North Aurora are:

- Alternative 4 – Lowered Culvert: Moderate mill race flow, minimal tree removal, moderate cost ($6.6M).
- Alternative 6 – Straight Culvert: Best mill race flow, moderate tree removal, moderate cost ($6.5M).

Both meet all primary/secondary goals, maintain mill race flow, and minimize plaza impacts, though park/parking disruptions occur. **Alternative 10 (Add Ramp Only)** is an optional fallback if sediment removal costs ($2.8M) prove prohibitive or river easements are unattainable, despite not meeting the primary goal.

Next Steps

- **Sediment Testing**: Conduct depth-of-sediment probing and gradation analysis between North Aurora and Batavia dams to refine contamination extent. Additional chemical testing may be warranted if fines exceed 20%.
- **Permitting Coordination:** Continue communicating with regulatory agencies as the project proceeds to identify the permit application needs.
- **Monitoring**: Continue IDNR fish population surveys pre- and post-project; complete a Comprehensive Environmental Review Process (CERP) permit during design.
- **Sponsorship**: Once the Village makes an alternative selection, the Village or Fox Valley Park District must enter an InterAgency Governmental Agreement with IDNR to proceed.

Final selection for the Village hinges on sediment cost refinement and Village priorities to balance ecological benefits against economic feasibility.

PURPOSE AND AUTHORITY

This report summarizes the findings of a strategic dam modification study for the North Aurora Dam on the Fox River to investigate providing environmental benefits through river connectivity, enhancing the recreational use of navigable rivers and reducing the public safety hazards associated with the dam. This study was prepared under the authorization granted to the Illinois Department of Natural Resources (IDNR) under the 20 ILCS 805/805-100 Conservation of Fish and Game; and 20 ILCS 805/805-105 Conservation of Fauna and Flora.

SCOPE

The Village of North Aurora included dam removal as part of its 2020-2021 strategic plan. In late 2014, the Village Board approved a proposal to remove the dam, but the project was put on hold after funding for dam removal projects was cut at the state level. Funding is once again available, so the first step is to prepare a study to evaluate dam removal options to determine the most effective alternative for this location.

The scope of this study included the following elements:

- Conducting an engineering reconnaissance of the North Aurora Dam and the surrounding area
- Conducting detailed field surveys of the Fox River in the vicinity of the North Aurora Dam
- Preparing maps and related drawings
- Establishing low flow and flood discharge rates for the study and developing computer models to estimate corresponding water surface elevations at various locations in the watershed
- Collecting riverbank and riverbed material samples to determine grain size distributions
- Conducting chemical analysis on collected river material samples
- Developing a sediment transport model to evaluate sediment erosion
- Defining potential dam modification/dam removal safety improvements
- Defining ecological, recreational, and public safety benefits of each plan of improvements
- Determining the costs of potential dam modification/dam removal safety improvements
- Investigating archaeological and biological resources in the project vicinity for assessment of potential impacts of the various dam modifications
- Estimating the impacts to cultural resources, wetlands, and threatened and endangered species
- Preparing recommendations and a project report

PREVIOUS STUDIES

1. CTE AECOM. *Evaluation of Public Safety at Run-of-River Dams*. July 2007.

   The purpose of this study was to evaluate the public safety of Illinois run-of-river dams and propose conceptual structural options to improve safety. This report included the North Aurora Dam. The options investigated for the North Aurora Dam with their respective costs are listed below.

• Temporary Rock Fill	$850,000
• Full Channel Bypass	Deemed Infeasible
• Riffle Pool	$7,220,000
• In-Stream Bypass Channel	$1,610,000
• Dam Face Modification	$3,860,000
• Dam Removal	$1,550,000

2. Victor Santucci and Stephen Gephard. *Fox River Fish Passage Feasibility Study.* April 2003.

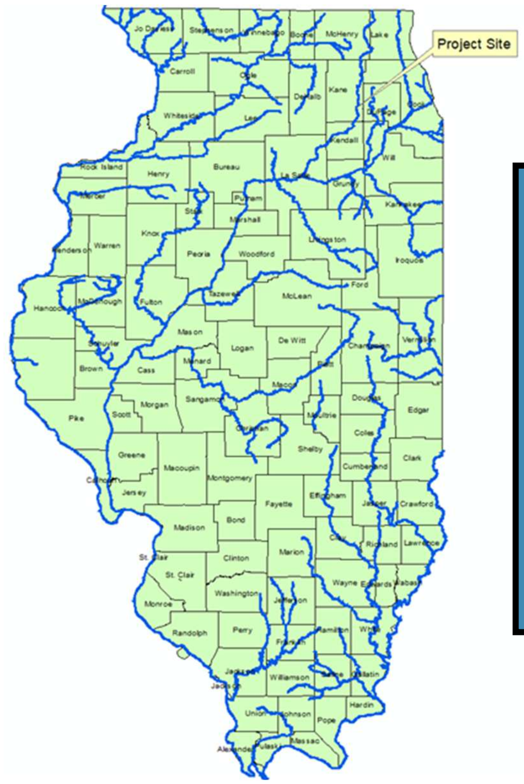
   This report presents the results of a two-year study of approximately 100 miles of river and mainstem dams located between McHenry and Dayton, Illinois. The report provides information to assist stakeholders in making informed decisions regarding dam removal or modification projects on the river and includes sediment accumulation estimates.

3. WBK Engineering. *Mill Race Pedestrian Bridge Study*. November 2018.

   A structural inspection of the existing mill race pedestrian bridge and its supporting piers to evaluate rehabilitation or replacement options.

INTRODUCTION

The Fox River originates in southeastern Wisconsin and runs 115 miles in Illinois before it joins the Illinois River at Ottawa. The North Aurora Dam is located on the Fox River approximately 52 miles upstream of the confluence with the Illinois River (**Figure 1**). The North Aurora Dam is located in Section 4 of Township 38 North, Range 08 East of the 3rd Principal Meridian. The North Aurora Dam is at 41.807186, -88.324536 Decimal Degrees. Including the North Aurora Dam, fourteen dams are located on the Fox River in Illinois. The dam is located within the Village of North Aurora (Village) which has a population of 18,261 according to the 2020 census. North Aurora is located in southeastern Kane County bordered by Aurora to the south and east, Batavia to the north, and lies about 40 minutes west of the City of Chicago. The Fox River runs north to south through the Village. North Aurora Riverfront Park and North Aurora Island Park are located near the dam.



North Aurora Dam Modifications

Fox River

North Aurora, IL

Kane County

Figure 1. North Aurora Dam Location Map

Dam Overview

The earliest known construction of a dam on the Fox River at North Aurora was in 1833. The construction of the dam was for the purpose of providing power to the sawmill of John Peter Schneider. A replacement dam was constructed in 1916 which stood until a breach occurred in 1974. A new dam was constructed in 1975 by the State of Illinois which remains today (**Figure 2**). The dam is located at river mile 52.6 immediately north of the Illinois Route 56 Bridge.

Figure 2. North Aurora Dam Photo, Looking Downstream (IDNR)

The North Aurora Dam is a concrete, broad crested weir with a stair-stepped face and a spillway length of 375 feet at an elevation of 646.0 feet and a height of 9 feet (see **Figure 3** for construction photo). The dam foundation was constructed using steel sheet pile and H-piles driven to bedrock. Three 12” deep steps approximately 8’ long make up the downstream top portion of the dam. The length of upstream impoundment is approximately 2 miles. The North Aurora Dam is provisionally classified as a Class II dam by the Department of Natural Resources based on the determination that failure of the dam would have moderate potential for causing loss of life or significant property damage.

Figure 3. Dam Under Construction, West Abutment and Crest (Village of North Aurora, 1975)

The original purpose of the dam was to power the equipment used to process lumber harvested from the surrounding area. Schneider's Mill was one of the first structures in the area and produced the building materials used in North Aurora's original houses and businesses. A Sponsorship Agreement was entered on December 30, 1974, whereby the State of Illinois reconstructed the dam with the Fox Valley Park District (then named Fox River Valley Pleasure Driveway and Park District) serving as the sponsor who accepted all costs related to the dam and its maintenance after completion. Like many other dams on the Fox River, the North Aurora Dam no longer serves its original function. In fact, the dam currently serves no utilitarian purpose other than to form a pool above the dam (see **Figure 4**).

Dam inspections were completed by IDNR on October 11, 2013, June 30, 2021 and December 10, 2024. The dam is considered in overall good condition or rating 4 on a 5-point scale. An earlier inspection was completed by CTE on January 9, 2007, where it was also noted as in good condition overall. The most recent inspection report and photographs have been included in **Appendix I**. The following was noted during the inspections:

- At the time of the first IDNR visit, there were several logs impinged on the dam.
- Sediment had settled downstream of the dam making an island.
- The west abutment appears to be in good condition but woody vegetation on the upstream side of the abutment needed to be removed. A portion of the west abutment appears to be undermining but stability was not a concern at that time.
- The east abutment was in good condition, but woody vegetation and weeds need to be removed in areas adjacent to the abutment.
- The articulated erosion control blocks adjacent to the east abutment was in moderate condition. Areas showing erosion need additional armoring.
- There are some areas of the crest (mainly the first two steps) that are spalling due to cavitation.
- Railings were all in good condition.
- A roller was visible from 0-20' downstream of the dam.
- Some of the abutment joints need to be filled with appropriate joint compound.
- The dam warning sign is obscured by vegetation which needs to be removed.
- A hole has developed in the middle of the spillway crest.

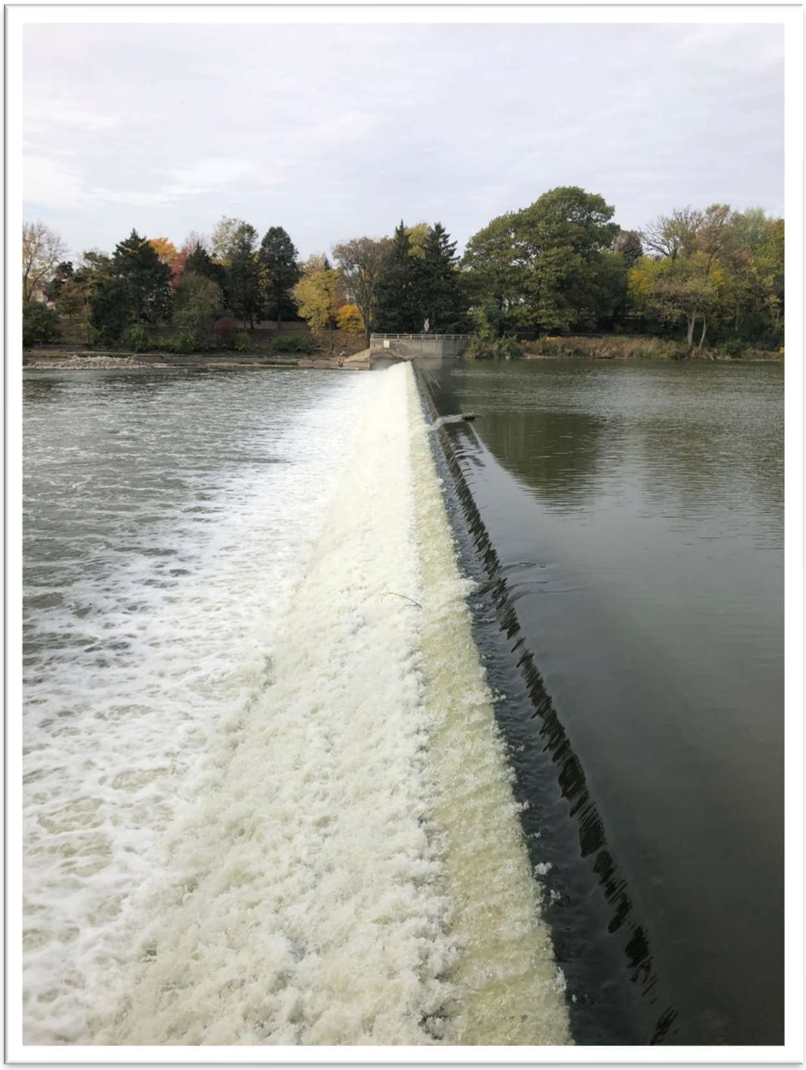


Figure 4. North Aurora Dam View from East Abutment Looking West (IDNR)

Since the first inspection, additional shoreline stabilization with riprap has installed on the west bank. **Figure 5** depicts the current (2020) condition of both abutments.

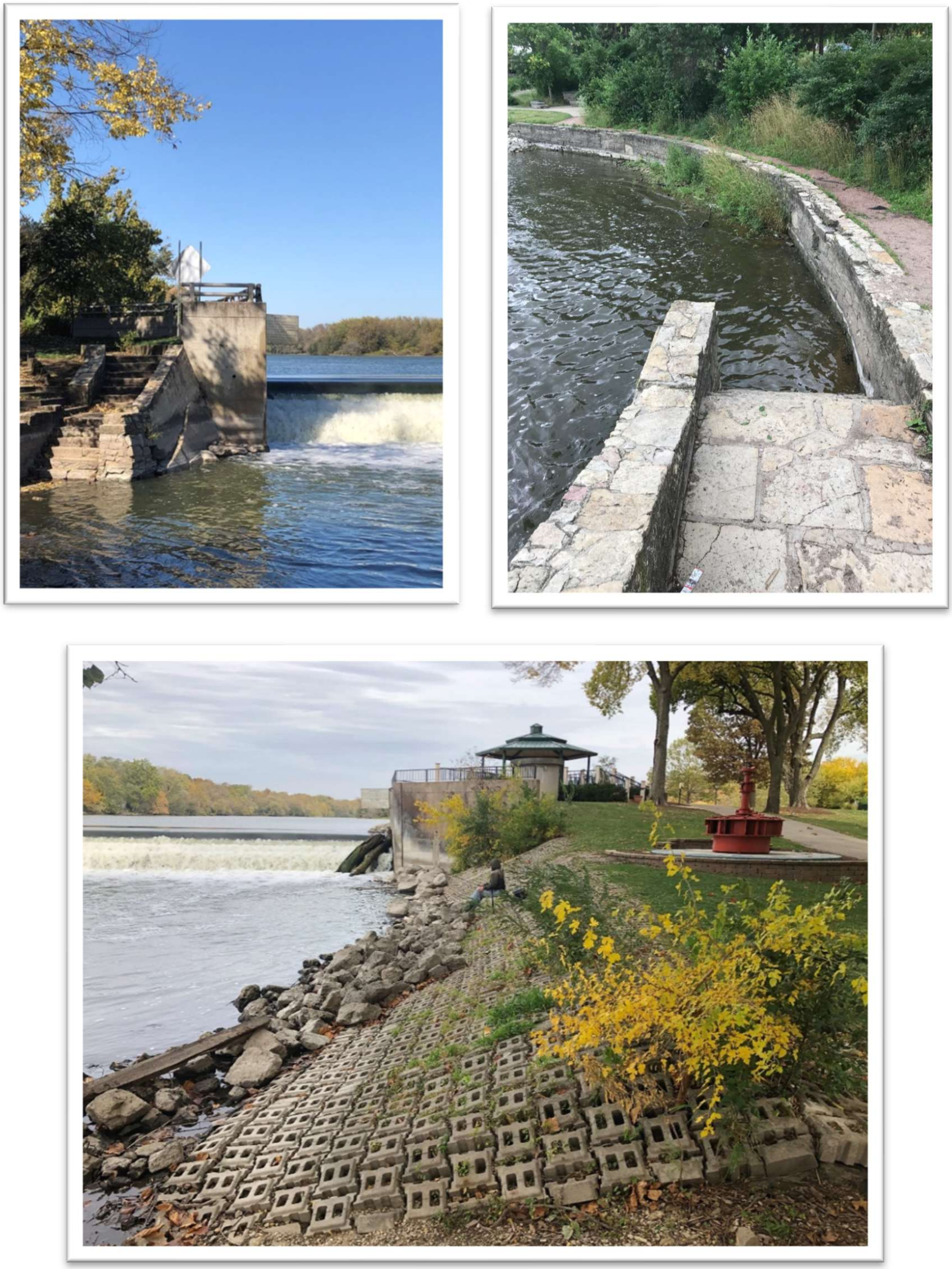


Figure 5. West (Top Photo) and East (Lower Photo) Abutments (IDNR, 2020 and 2021)

The North Aurora Dam site is often used by the public for recreation. A system of trails and public parks in the vicinity of the dam provide access to the site. Fishing is common in the scour hole located immediately downstream of the dam (**Figure 6**). The west abutment contains a stairwell that is used as portage for canoes and kayaks. However, this portage is potentially unsafe due to its proximity to the roller downstream of the dam. Pedestrian and bike trails line the river on both sides of the river.

Figure 6. Anglers on the Downstream Island (IDNR)

Surrounding Area

The majority of the land surrounding, upstream and downstream of the dam is owned by either the Fox Valley Park District (FVPD), the Kane County Forest Preserve District (KCFPD).

Figure 7 outlines ownership in the vicinity of the dam between the North Aurora and Batavia dams and also indicates how many parcels are owned by each entity. Information obtained from the county assessor's office about the river front parcels is summarized as follows:

- 134 parcels
- 32 unique owners
- 6 public owners (Village of North Aurora, Fox Valley Park District, Kane Co. Forest Preserve District, Batavia Park District, City of Batavia and United States of America)
- 25 unique private owners owning 36 parcels

Specific ownership information is provided in **Appendix A**.

The North Aurora Riverfront Park is located on the east bank of the Fox River adjacent to the dam. Amenities have been added to the park through the years. Currently, the Riverfront Park contains gazebos, picnic tables, historic and educational interpretation, fishing access, water features and a nature-based play area. The areas adjacent to the river upstream and downstream of the dam include paved walking and biking paths. The North Aurora Island Park is located downstream of the dam and adjacent to the mill race channel. It contains parking, a playground, restrooms and trails.

The Village Hall was constructed in the 1950's near the old lumber mill location. Based on review of historical aerial mapping, the area north of the Hall was filled sometime after 1972 and a parking area was constructed after 1984. The North Aurora Riverfront Park is located adjacent to the Village Hall. The

Village plans to enhance the Riverfront Park Plaza in the next few years (see **Figure 8** for conceptual layout) so any modifications to the dam should try to avoid conflicts, when possible.

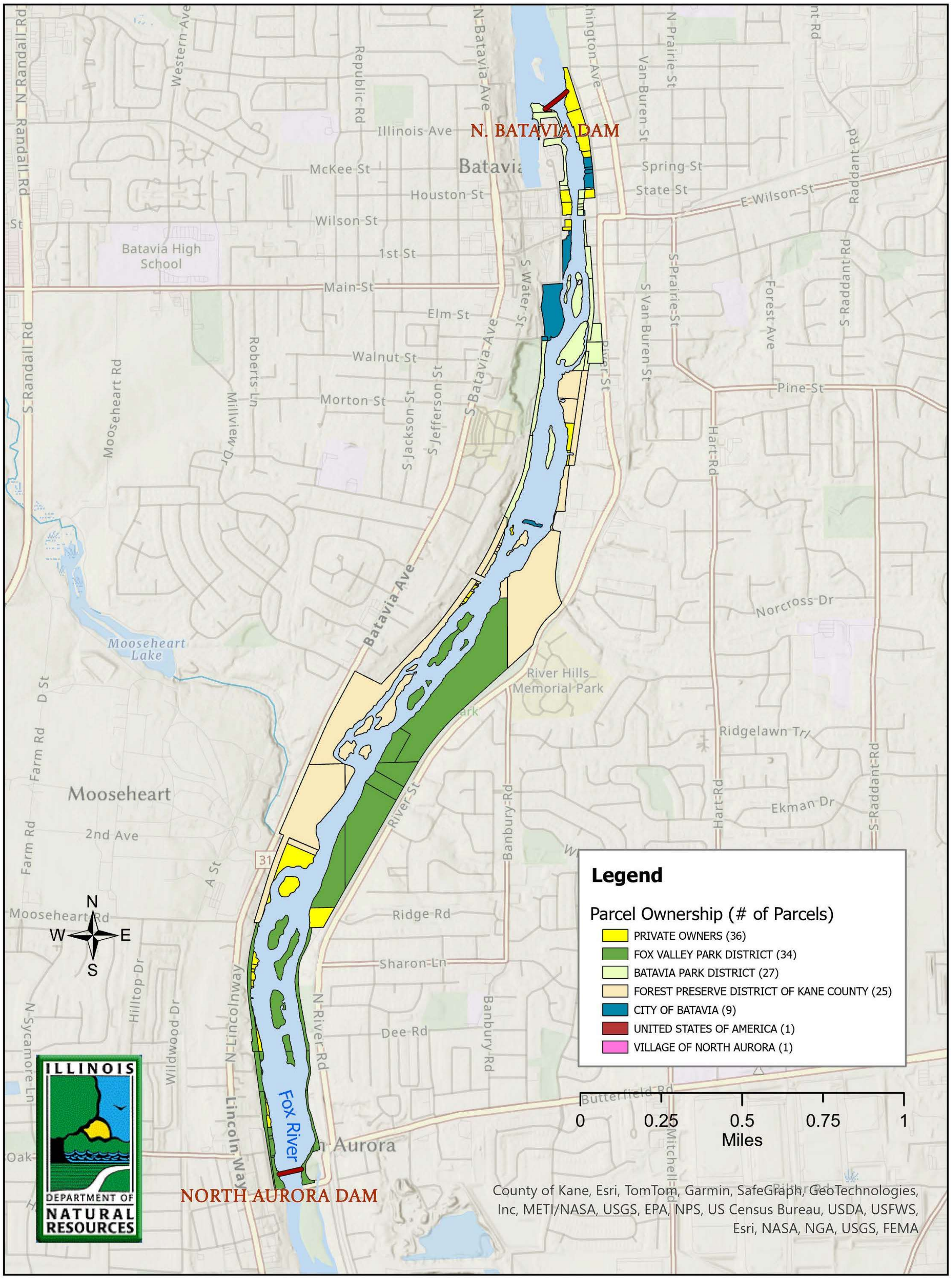


Figure 7. Ownership of Land near North Aurora Dam

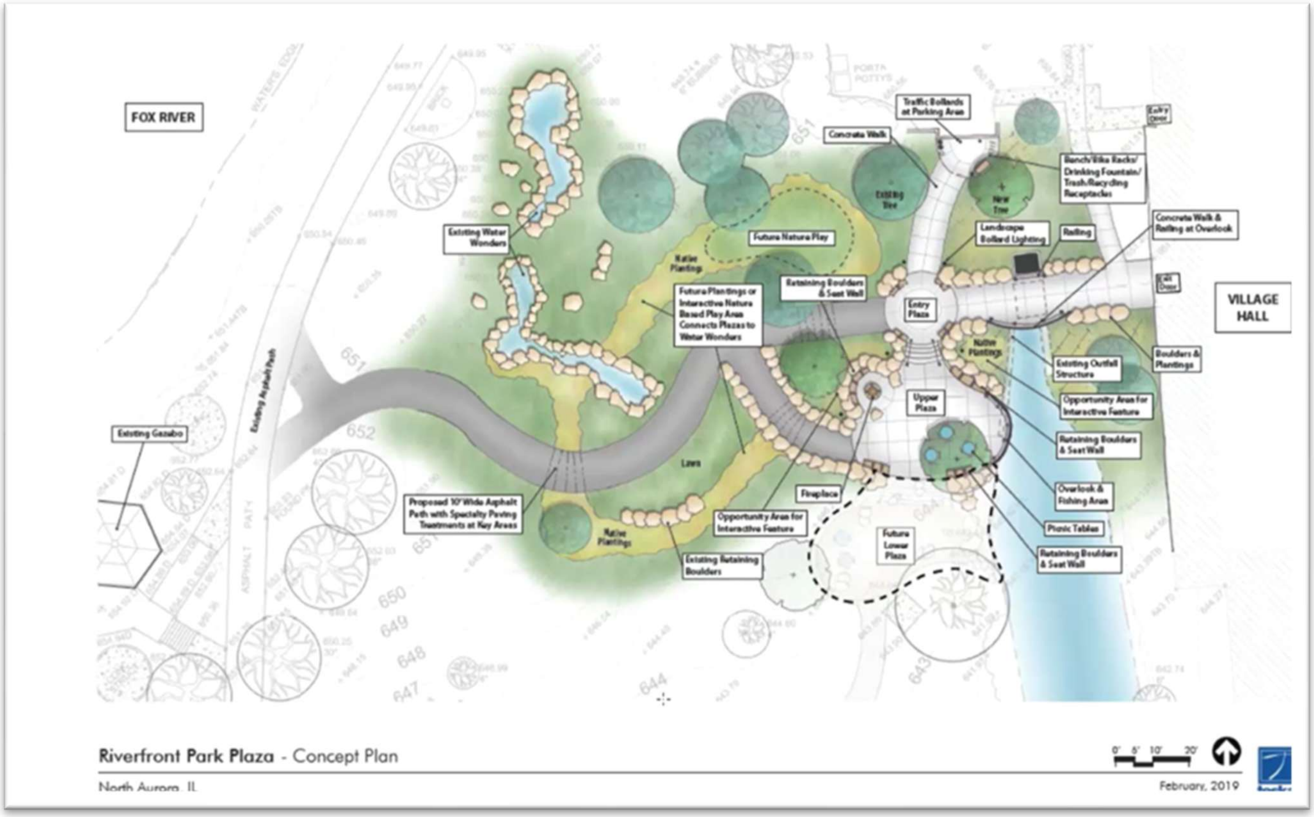


Figure 8. Future Riverfront Park Plaza Plans (Village of North Aurora, 2021)

Mill Race Overview

Next to the dam is a mill race which runs south underneath State Street and joins the river about 600 feet below the dam. Water is fed to the mill race from a 54" diameter reinforced concrete pipe (RCP) intake that runs under the Village Hall parking lot to a water control structure located near the Village Hall where it eventually empties into the mill race. (see **Figure 9** and **Figure 10**). A 6' x 8' vertical flow sluice gate is located on the north side of the mill race structure which serves as inflow control to the mill race. Rip rap lines the downstream mill race channel within the Park and the channel continues south where homes line the eastern shoreline of the channel. Local drainage from the parking lot and the surrounding area also enters the mill race.

The condition of the mill race water control structure and pedestrian bridge was evaluated by WBK Engineering, Inc. in 2018 as part of the Riverfront Park Plaza development project. In previous park updates, a pedestrian bridge which connects the Village Hall to the Park had been constructed on top of the existing mill race concrete structure. Due to the overall fair to poor condition of the original mill race structure, it was determined that all vehicles should be prohibited from the bridge.

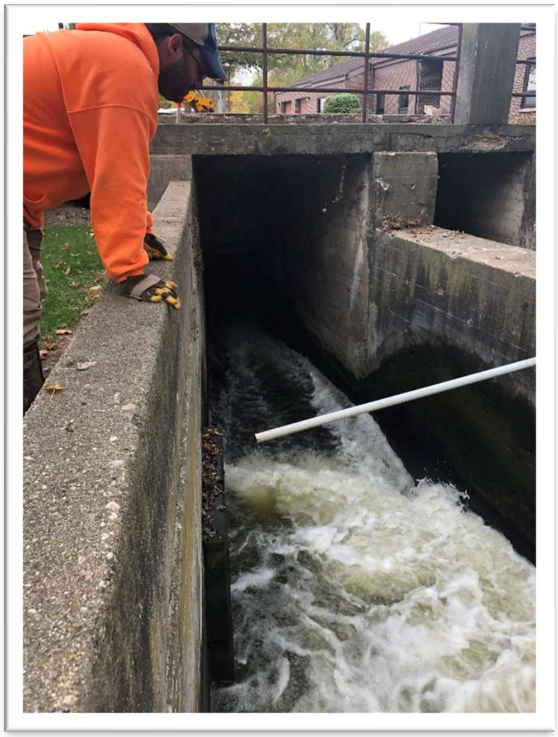


Figure 9. Mill Race Structure and Pedestrian Bridge (Top of Photo) (IDNR, 2020)

Figure 10. Water Leaving Mill Race Structure Looking Upstream (IDNR, 2020)

Since the mill race intake flows under gravity, flow varies in the mill race depending on the elevation or head of the water at the intake and by how much the sluice gate at the water control structure is open. Historical flows for the mill race are not available but we know it increases proportionately with the flows (or surface elevation) of the Fox River. The gate control valve support pins have malfunctioned so the gate cannot be opened completely. Therefore, the Village generally keeps the gate set at the height where the pins begin to bend. On June 8, 2022, the discharge from the existing mill race water control structure was measured at the bridge on State Street after all obstructions had been cleared from the intake and the outlet box. Flow in the Fox River at that time was estimated to be 1,140 cfs which is approximately 200 cfs above June's median flow for this location. Water was overtopping the dam during the visit. The existing conditions hydraulic model projected that flow should have been 126 cfs that day but actual flow was 92 cfs or about a 25% reduction due to the partially open water control structure.

The Village prefers that flow be maintained in the mill race so this parameter has been selected as one of the goals for the project. The project goals are discussed further later in the report.

WATERSHED ASSESSMENT

The Fox River runs 202 miles through both Wisconsin and Illinois. The Illinois segment of the Fox River watershed is 1,700 square miles at the North Aurora Dam and runs through McHenry, Lake, DeKalb, Kane, Cook, DuPage, LaSalle, Lee, Kendall, Will and Grundy Counties plus a portion of southeastern Wisconsin. When the river enters Illinois, it widens into a series of 15 interconnected lakes called the Chain O'Lakes. The water surface elevation of the Chain O'Lakes is regulated by Stratton Dam. The Fox River watershed is comprised of 31 tributary sub-watersheds from Stratton Dam to the Illinois River confluence along with the main river stem contributing watershed. The communities within the Fox River watershed include, among others, Fox Lake, McHenry, Algonquin, Elgin, Saint Charles, Geneva, Batavia, North Aurora, Aurora, Montgomery, Yorkville and Ottawa. The Fox River watershed contains about 12 percent of Illinois' population. **Figure 11** illustrates the watershed near the North Aurora Dam.

The Fox River watershed is approximately 105 miles long by 38 miles wide upstream of the dam and consists of three major segments. The upland portion of the watershed is relatively flat with lakes and wetlands until it hits the Stratton Dam. The watershed narrows as it flows through Kane County and becomes hilly with bluffs until it hits Geneva. The watershed widens again past Geneva and becomes relatively flat. The upland area is urbanized from Stratton Dam to Montgomery and becomes predominantly rural until it hits Ottawa. Overall, land cover is 50% cropland, 17.3% urban/built-up, 17% grassland, 10.3% upland and bottomland forest, and 5.4% non-forested wetlands and other water (Friends of the Fox River, 2003).

The Fox River is used for recreation, serves as a public water supply, and receives stormwater and wastewater from adjacent communities. The population of the Fox River watershed is increasing. The population growth now and into the future will impact the water demand and assimilation capacity of the Fox River.

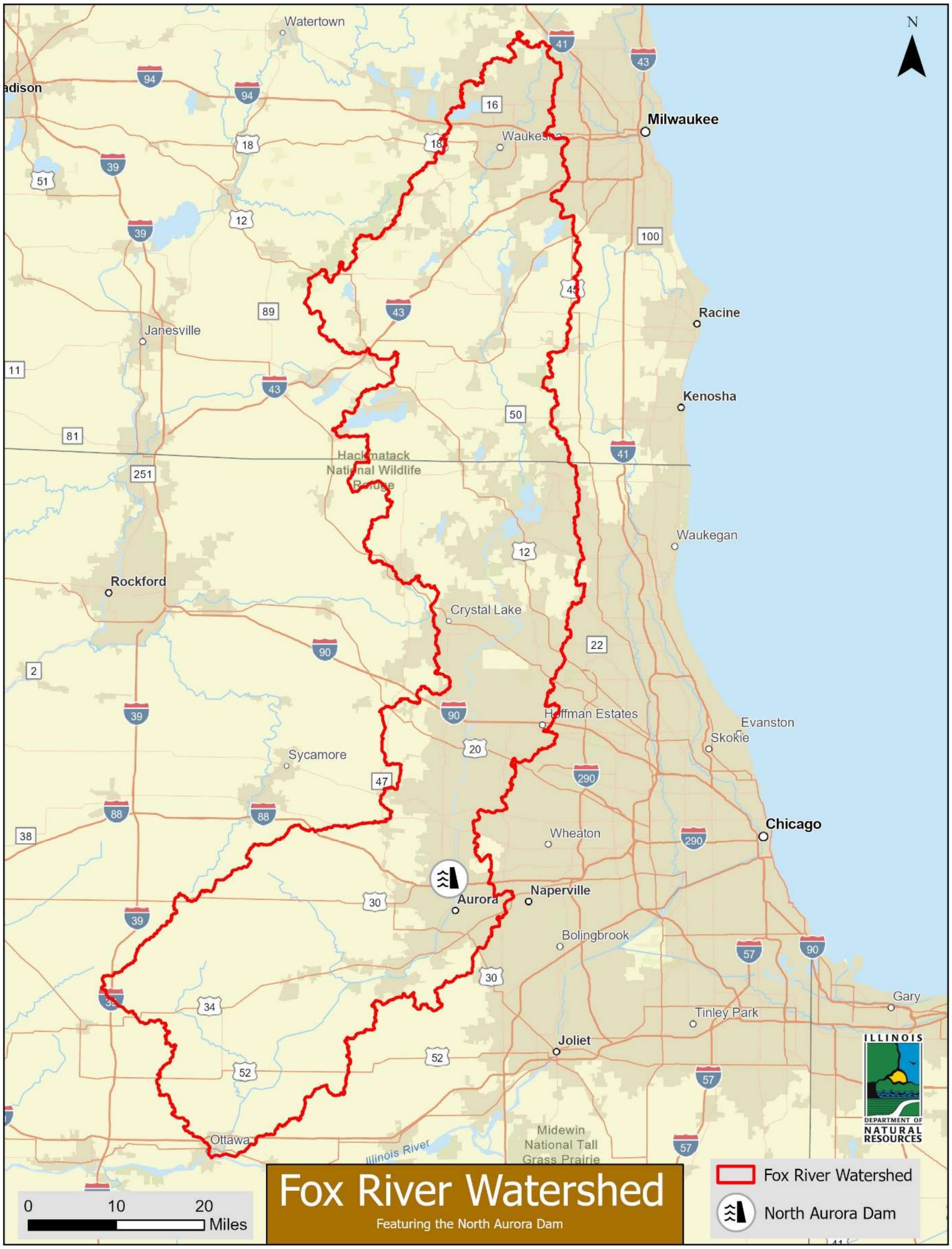


Figure 11. Fox River Watershed

In 1999, the Fox River was listed as the 7th most endangered river in the country as published by American Rivers. This designation brought additional attention to the river and its watershed by EPA and stakeholder groups. According to the *Illinois Water Quality Report* 2002 (IEPA, 2002), the entire length of the Fox River was listed as impaired and is part of the 303(d) list of impaired water for exceeding state water quality standards for total phosphorus, pH, total suspended solids, mercury, polychlorinated biphenyls (PCB) and fecal coliform. Dams are known contributors to water quality concerns in rivers, specifically sedimentation, low dissolved oxygen and elevated nutrient levels and those impacts have been documented in the Fox River (Santucci and Gephard, 2003). The water quality concerns led to the formation of the Fox River Study Group, Inc. (FRSG) in 2001. The FRSG has worked since then to collect water quality data and have developed a multi-phased approach for watershed modeling and planning for the Fox River from the Stratton Dam to the Illinois River confluence. As part of this effort, the Fox River Implementation Plan (FRIP) was developed and is currently being implemented. The Plan initiatives include dam removal to help restore water quality and biodiversity along with phosphorus reduction investment which also increases dissolved oxygen levels. Dam removal was considered the most important recommendation of the FRIP, and the removal of the North Aurora dam was targeted in the first group to be removed. Additional information about the overall Fox River Watershed can be found in reports developed for this effort (http://ilrdss.sws.uiuc.edu/fox/).

ISSUES

While dams can be used to provide flood control, hydropower, water supply or recreational opportunities, they can also provide detrimental impacts to the environment since they change the way a natural river functions. For example, dams can trap sediment, bury spawning rock riverbeds, reduce floodplain benefits, reduce fish passage, and impact other water related fauna.

Specifically, North Aurora Dam currently fragments the Fox River by creating a barrier that denies fish and other aquatic organisms, including threatened species, access to roughly 3.5 river miles of quality spawning and rearing habitat in the Fox River, not including Mill Creek and Mooseheart Lake.

The dam also is a life safety hazard. Due to the hydraulic spillway conditions, high tailwater and poor riverbed protection below the dam, a submerged hydraulic jump occurs at the downstream face of the dam. The turbulent forces generated by the hydraulic roller has eroded a scour hole in the original bed material at the base of the dam. These rollers typically pull in, hold and push objects underwater, including people, which often leads to emergency rescues or drownings. Two accidental deaths and multiple successful rescues by North Aurora first responders have been reported at North Aurora Dam.

In addtion, the mill race channel running throught the park is steep and during high flow events, can run very fast and could be a danger to park attendees or if anyone attempts to portage at that location.

There is a whirlpool at the mill race inlet in Fox River (see **Figure 12**). While the inlet is fenced at the shoreline with warning signage, there are no warning signs for river users (**Figure 13**).

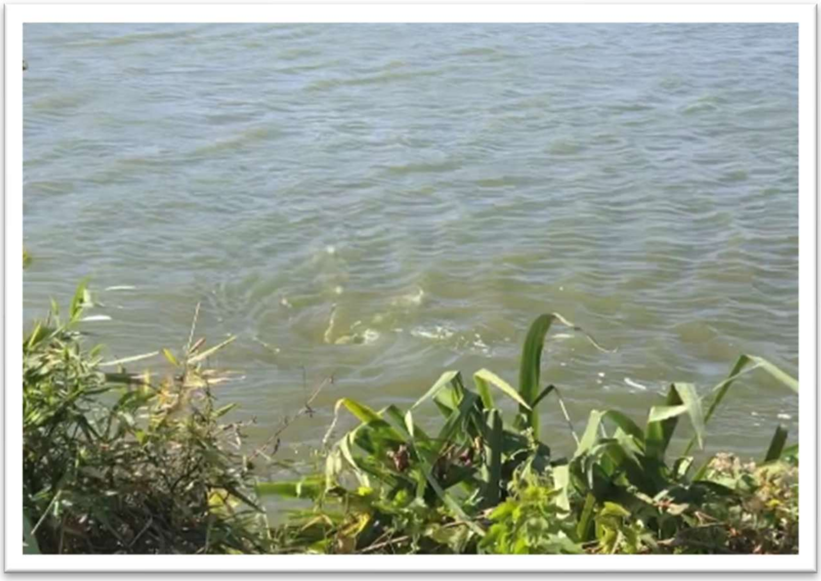


Figure 12. Mill Race Intake Vortex

Figure 13. Mill Race Intake Fencing

HYDROLOGY

Table 1 summarizes range of flows found in Fox River near the North Aurora Dam, computed in cubic feet per second (cfs). These flows were determined using multiple sources to adequately examine a full spectrum of flows from drought to flood conditions. The 7-day 10-year (Q7-10) drought flowrates at the 80%, 50% and 10% daily exceedance were obtained from the Illinois State Water Survey (ISWS) Streamflow Assessment Model website. Flows for the 50%, 20%, 10%, 4%, 2%, 1% and 0.2% (2-yr, 5-yr, 10-yr, 25-yr, 50-yr, 100-yr and 500-yr) annual events were determined utilizing the USGS StreamStats website. These levels were compared to the Flood Insurance Study (FIS) completed for Kane Co (revised June 2, 2015).

Table 1. Fox River Flow Summary Table (cfs)

River		Drought	Daily Exceedance			Annual Exceedance						
		Q7-10	80%	50%	10%	50% (2-yr)	20% (5-yr)	10% (10-yr)	4% (25-yr)	2% (50-yr)	1% (100-yr)	0.2% (500-yr)
	Streamstats	161.7	455	855	2,633	7,650	9,970	11,500	13,400	14,800	16,200	19,500
Fox	FIS							8,565		12,770	14,350	18,760
		Recent Drought **188**		*Median Flow* **1,283**					*Recent Flood*	**12,970**		

To obtain further understanding about flows near the North Aurora Dam, the most recent flood and drought flow conditions were evaluated using readings taken at the closest USGS stream gage, Montgomery, IL. Since the drainage basin area at North Aurora was slightly smaller than that found at Montgomery, the flows at that gage were reduced by 2% proportionately to their watershed sizes. The most recent drought occurred in the North Aurora area in June 2021 with the lowest flow recorded at 188 cfs. This matches closely with the 7-day, 10-year drought of record. The flood scenario, 12,970 cfs, is based on the flows recorded on May 18, 2020. This level is near the 2% (50-yr) recurrence. Both of these flows correlated well with the values determined by ISWS Streamflow Assessment Model and USGS StreamStats. The annual median flow based near the dam on the USGS StreamStats was 1,283 cfs using readings taken from 2002 to 2024.

Generally, when comparing flows in a river with and without a dam, the highest impacts to the river depth are found during lower flows. During floods and high flow events, the impacts to the river depths are mostly the same with and without the dam. Therefore, low and median flows were selected for the alternative comparisons found later in this report. The high flow (1% or 100-yr) was used to determine the extent of the dam impact which is discussed later in the report. The Streamstats high flow value of 16,200 cfs was selected since it is considered more conservative for estimating the extent of the dam impact. **Table 2** summarizes the flows used in the hydraulic modeling portion of the project.

Table 2. Modeling Flow Inputs (cfs)

	Low (Drought)	Median	High (1% or 100-yr)
Fox River Flow	188	1,283	16,200

HYDRAULICS

The Hydrologic Engineering Center's HEC-RAS software, created by the U.S. Army Corps of Engineers (USACE), was utilized to create the computer model of the Fox River. This hydraulic computer model was created to replicate the Fox River conditions that would physically occur during specified flow events. An existing conditions scenario was developed in the model to ensure the model was accurately determining water surfaces used for the comparison of the alternatives. Then, multiple alternative models were developed to predict water surface impacts of the various dam modification options.

To create the HEC-RAS model, data such as ground cover, ground elevations and structure configurations were collected from the field and entered into the model. Additionally, water surface elevations collected throughout the modeled stream reach and flow measurements were estimated from stream gage records.

Model Configuration

A hydraulic model of this area was originally developed as a one-dimensional (1D), steady flow model using older software called HEC-2 which was used for regulatory and flood insurance purposes. For this study, the most recent software, HEC-RAS version 6.4.1, was used to generate a new two-dimensional (2D) steady flow model. The HEC-RAS 2D model starts at approximately 895 ft upstream of the Interstate 88 bridge, extends 1.3 miles upstream, and contains two bridges downstream of the dam. The first downstream bridge over the Fox River is located approximately 250' from the dam and it was modeled using arches and four elongated piers. The bridge over the mill race is located approximately 300' downstream of the outlet structure and is modeled as a simple beam type bridge between two abutments.

To determine the extent of the dam's impact on the water surface elevation and river depth, a 1D reach was combined with the new 2D portion. This added another 1.4 miles to the upstream limit of the model. **Figure 14** shows the extent of the 1D (northern) and 2D (southern) areas used to model the river system. The 2D model contains 1,459 individual cells with an average size of 3,554 ft^2 each (see **Figure 15** for excerpt of the 2D model with cell boundaries). The 1D portion includes six cross sections. Using the combined 1D and 2D model, the dam ceases to have an impact approximately 500 ft downstream of the northern most cross-section (or 10,000' upstream from the dam) during the high flow event (16,200 cfs). In other words, water surface elevations or depths upstream of that location are not impacted by the dam at North Aurora.

OWR conducted a river and bathymetry survey in September 2021 which provided the data for the 2D portion of the model. This survey data was merged with statewide LiDAR (Light Detection and Ranging) Digital Elevation Model (DEM) data, updated in 2021, for the surrounding terrain. The 1D reach cross section data and bridge data was copied from the original HEC-2 model.

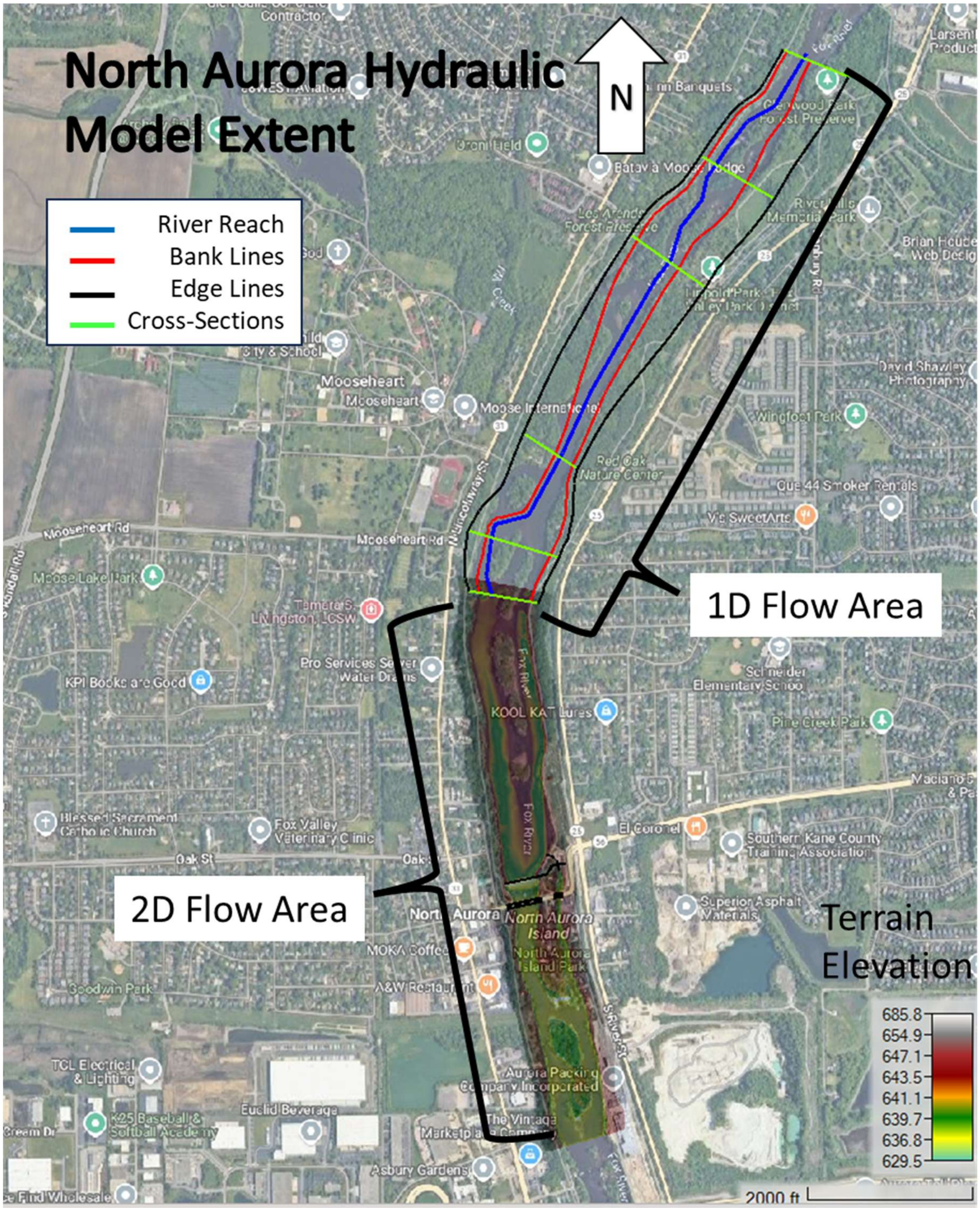


Figure 14. HEC-RAS 1D and 2D Model Extents

Figure 15. Closeup View of 2D Model Showing Cell Size

Existing Model

The existing conditions model was run using the three profiles corresponding to the various flow rates listed previously in **Table 2.** Existing condition water surface profiles for the 2D channel reaches modeled are illustrated in **Figure 16**. The model boundary conditions were a flow hydrograph for the upstream boundary and a normal depth slope of 0.00112 ft/ft for the downstream starting water surface elevations. The North Aurora Dam was modeled as an inline structure with a weir coefficient of

3.88. The Manning's n-values utilized in the model were based on the land cover layer from 2019 (National Land Cover Dataset, NLCD) and 0.035 for the channel value based on the original HEC-2 model. The NLCD data was edited at some locations to align with the cell boundaries.

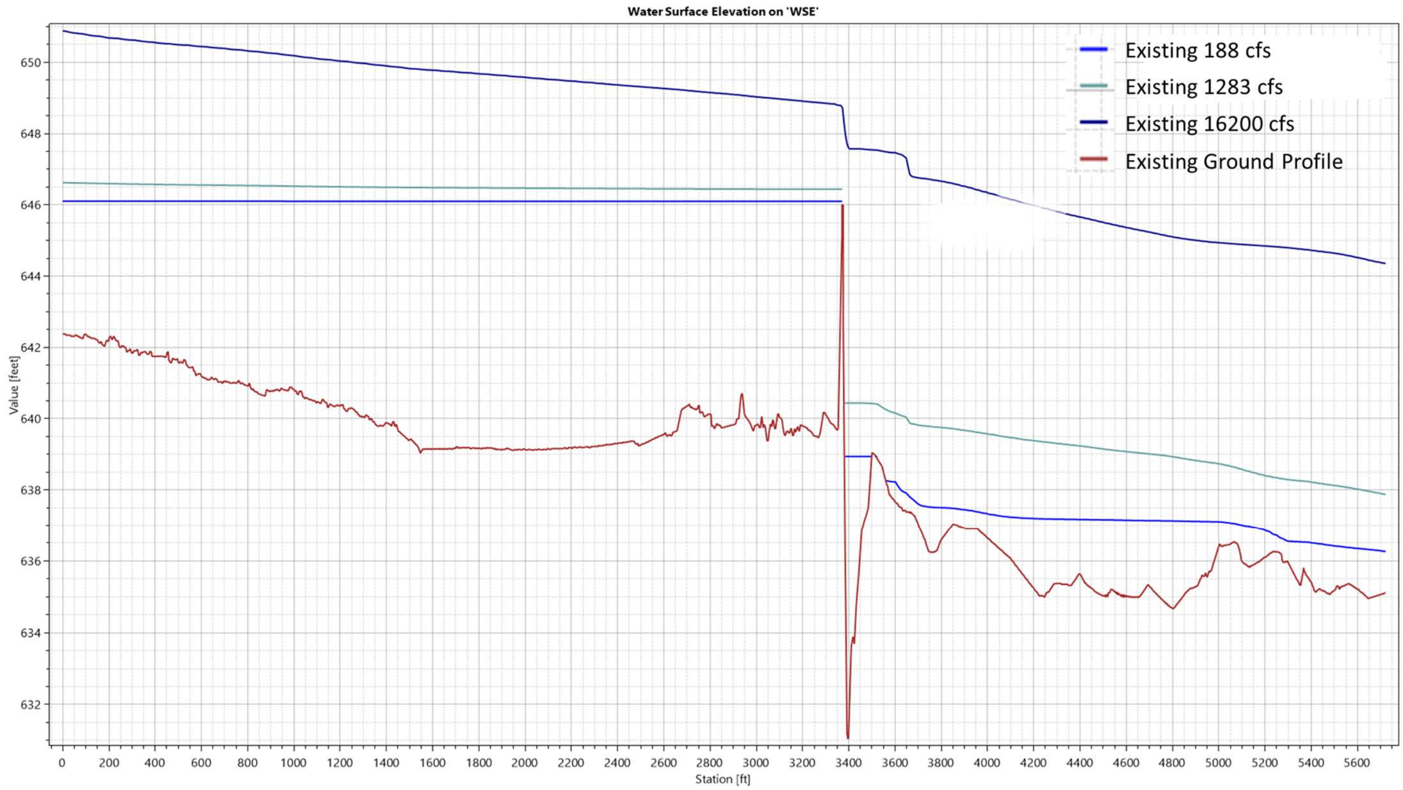


Figure 16. Fox River Water Profiles near North Aurora Dam

The existing conditions model can be used to illustrate what the river conditions look like now and provides a baseline of parameters to compare dam modification alternatives. For comparison purposes, model reading data was obtained at two reference locations:

1. Fox River immediately upstream of the dam
2. Mill Race on the State Street Bridge

These are denoted on **Figure 17** as a red star and blue star, respectively. The existing water surface elevations and water depths at the reference location upstream of the dam are provided in **Table 3** along with the mill race flows and velocities for all three of the river flow conditions.

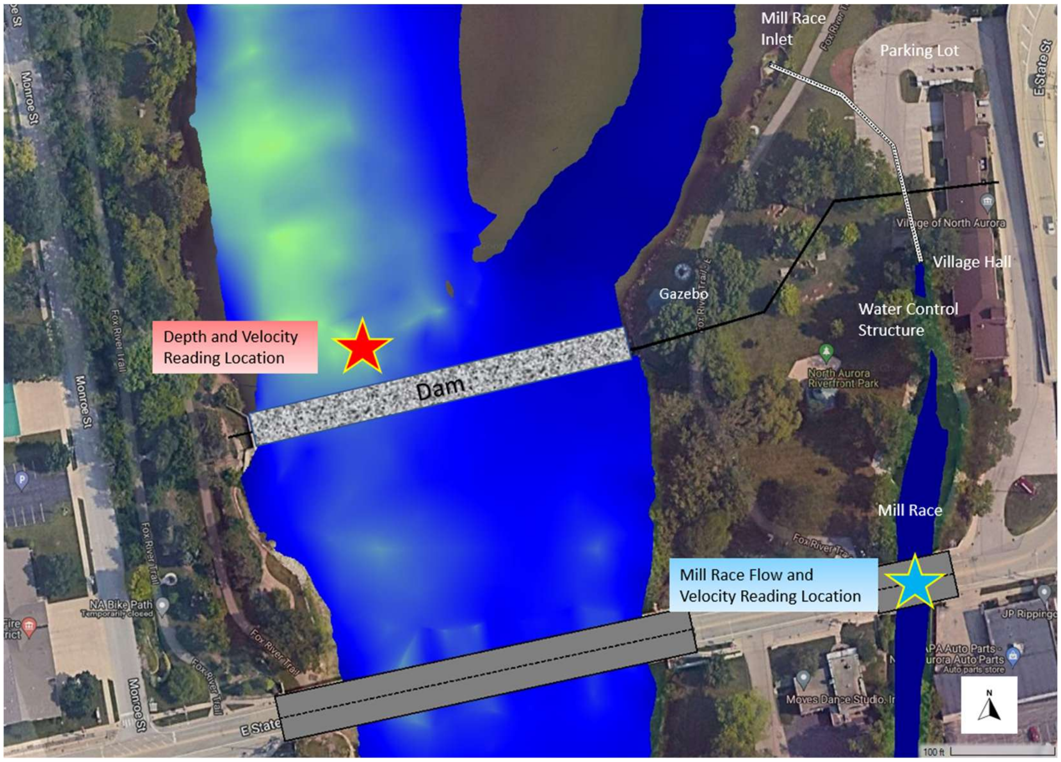


Figure 17. Model Output Reading Locations for Comparisons

Table 3. Existing Conditions at Reference Location

Flow (cfs)	Water Surface Elevation	Water Depth	Mill Race Flow	Mill Race Velocity
Low Flow (188)	646.1’	6.73’	83.4 cfs	1.30 ft/s
Median Flow (1,283)	646.44’	7.08’	89.0 cfs	1.31 ft/s
Peak Flow (16,200)	650.7’	11.34’	1733.0 cfs	5.20 ft/s

Since the Village and the downstream residents would prefer to keep the mill race flowing, if possible, the existing model was used to determine the mill race flow at the most recent drought condition. As illustrated above, when the river flow is 188 cfs, the flow in the mill race was determined to be 83.4 cfs at a velocity of about 1.3 ft/s.

See **Appendix B** for further existing and proposed hydraulic modeling assumption information.

Model Calibration Analysis

Model calibration analysis determines the model accuracy from the modeled result to field measured values. Unfortunately, there is no nearby stream gauge flow data available to match to the surveyed water elevation. Based on observations from the Village, high rainfall and flooding events were closely replicated when water overtopped the low-lying area of the park. **Figure 18** illustrates the varying river depths or inundation for each baseline model run at the low, median and high flows. This existing conditions inundation map shows the expected minimal depths of water in the mill race during drought events and the flooding in the park during high flows. Based on this information, the existing conditions model appears to match the flooding and drought conditions, and the mill race flow variances experienced at this location.

SEDIMENT SAMPLING

Two rounds of sampling were completed for the North Aurora project and will be referenced as Round 1 and Round 2, herein. In September 2020 a *Sediment Analysis Report* was completed by Michael Baker International for samples obtained by Wang Engineering in June 2020 (see **Appendix C** for the Round 1 report). The purpose of the sampling was to determine the composition and depth of the accumulated sediment in the pool upstream of the dam and to aid in evaluating what course of action will be needed for handling the accumulated sediment. Specifically, if there is any contamination, the sediment might need to be removed or encapsulated.

Four soil borings were taken at different locations upstream of the dam (see **Figure 19**, left) for grain size analysis. The average depth of the borings was 10.9’ and was comprised of approximately 41.9% fines, 45.8% sand and 12.3% gravel. The average depth of accumulated sediment for the four sample locations was 3’ with the deepest being 6.5’ at the boring located by the entrance to the intake pipe for the mill race. A sand layer was found under the accumulated sediment followed by gravel. In a previous study, *Fox River Fish Passage Feasibility Study* (2000), sediment accumulation was estimated to be about 57,000 cubic yards behind the dam in depths varying from 0 to 8 feet. The new borings appear to generally agree with the previous results. Sediment probing was completed by IDNR in 2019 and accumulated sediment depths compared well with those that were completed for the 2000 report.

Five sediment samples were collected to complete chemical analysis for possible sediment contamination at the same locations as the borings (two were taken at ND-01). The samples were analyzed for suspended solids, volatile organic compounds (VOC), semi-volatile organic compounds (SVOC), inorganics/metals, polychlorinated biphenyls (PCB), and pH and compared to the Illinois Environmental Protection Agency (IEPA) Tiered Approach to Corrective Action Objectives (TACO) Tier 1 standards.

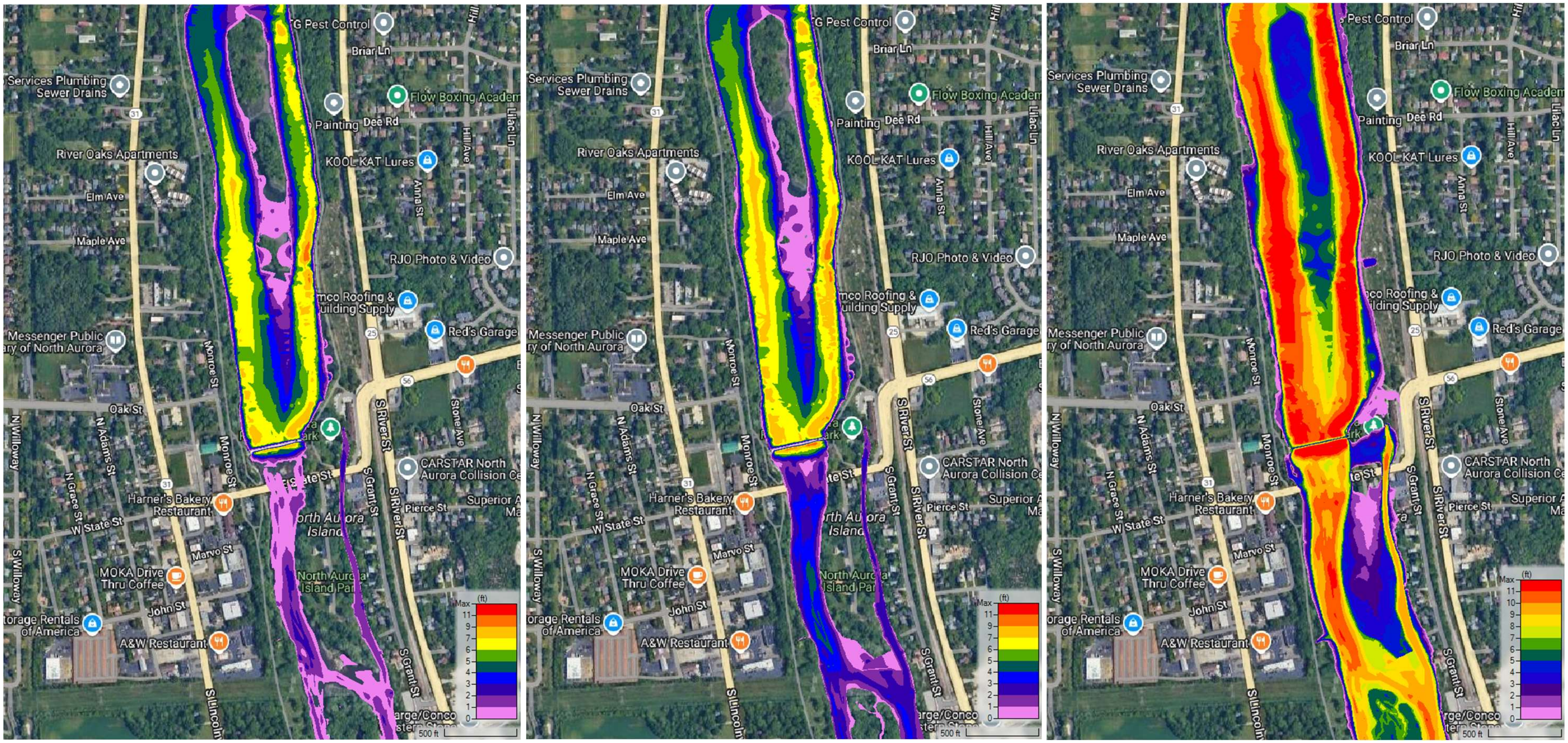


Figure 18. Existing water depths at 188 cfs, 2,683 cfs and 16,200 cfs

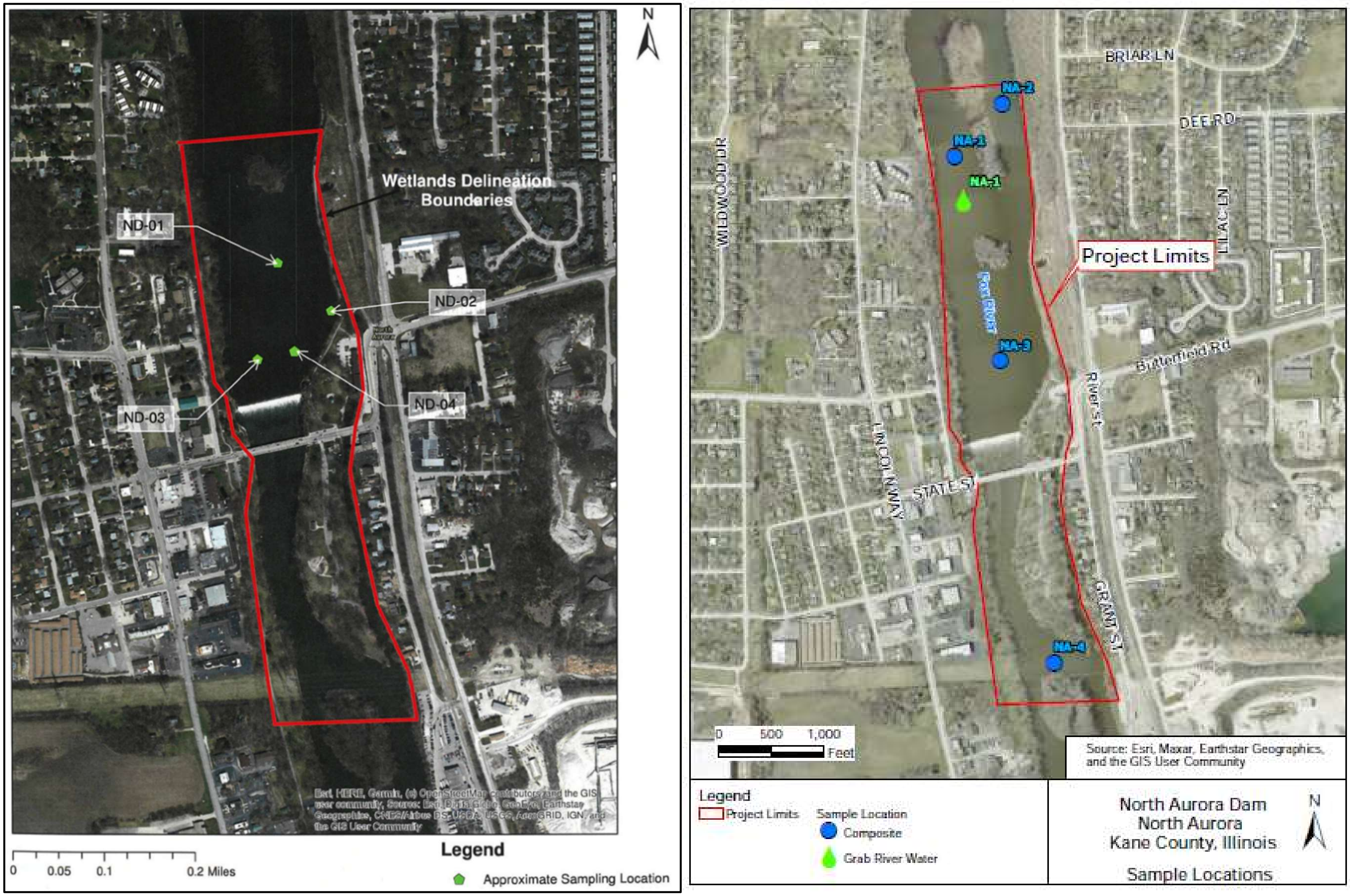


Figure 19. Sediment Sampling Locations (Round 1 – left and Round 2 -right)

All samples had high concentrations of suspended solids (above the Maximum Allowable Concentration – MAC) and a high percentage of fine particles which indicates potential for mobilization of sediments following dam removal. Mobilization is generally acceptable as long as the samples are not contaminated. However, Sample ND-01 (upper 4 feet), located approximately 200 yds upstream of the dam and 80 yds west of the east bank, tested positive for a total of four SVOCs and two inorganics that exceed ILEPA TACO Soil Remediation Objectives (SRO) and MAC. This sample is considered contaminated and if removed during construction, would need to be disposed in an approved landfill. However, material removed during construction will likely be the material located closest to the dam (ND-04 and ND-05) which was not considered contaminated.

These results were shared with both the IL Environmental Protection Agency's (IEPA) Bureau of Land (BOL) and Bureau of Water (BOW) to find out the implications of these results to the project. The BOL will regulate the material that is removed during construction and will follow the TACO and MAC limits as described above for determining disposal requirements. The BOW will permit the project under Section 401 (Water Quality Certification) and has developed a new guideline for Material Analysis for Dredge and Fill Activities (Rev. 12/21). A copy can be found in **Appendix C** and includes a list of limits for comparing the results. IEPA also provided a list of 303(d) impaired parameters in the Fox River in the vicinity of the North Aurora dam with limits. Using this new testing protocol for testing supernatants (i.e., the liquid overlying sediment samples) instead of the sediment, additional samples (Round 2) were taken at locations further upstream of the dam (see **Figure 19,** right). These areas were determined by a preliminary sediment transport model as where sediment is likely to move (see next discussion regarding the sediment transport model). In December 2023 a second *Sediment Analysis Report* was completed by Michael Baker International for these new samples obtained by Wang Engineering in November 2023 (see **Appendix C** for the report).

Three upstream and one downstream composite samples and one river water (background) sample were taken. The three upstream samples had greater-than-or-equal-to 20% passing through a No. 230 sieve so supernatant analysis was completed as denoted in IEPA's guidance. The depth of the borings was 3' and was comprised of approximately 31.5% fines, 50.3% sand and 18.1% gravel which is similar to those borings taken in Round 1. The percentage of fines ranged from 35.6% to 50% for the new composite samples. The new gradations were used as inputs in the refined sediment transport model.

Supernatant PCBs, metals, and wet chemistry results (NA-1, NA-2, and NA-3) exceeded background water and dredge minimum values parameters for several parameters. **Table 4** outlines the BOW limits along with the results from the samples (exceedances are in red).

Table 4. Round 2 Sampling Results

Parameter	Minimum	NA-1	NA-2	NA-3	Background	units
Arsenic	50 ug/l	5.8	18	8.7	1.3	ug/l
Barium	500 ug/l	290	820	490	98	ug/l
Cadmium	1 ug/l	2.1	6.4	2.5	ND	ug/l
Chromium (hexavalent, grab)	10 ug/l	<0.01	<0.01	<0.01	ND	ug/l
Chromium (total)	50 ug/l	20	84	35	ND	ug/l
Copper	5 ug/l	31	130	56	1.6	ug/l
Cyanide (total) (grab not to exceed 24 hours)	5.0 ug/L	<10	<10	<10	ND	ug/l
Fluoride	0.1 mg/L	0.21	0.21	0.21	0.14	mg/l
Iron (total)	500 ug/l	16,000	61,000	29,000	370	ug/l
Iron (Dissolved)	0.5 mg/L					
Lead	50 ug/l	2	120	45	0.65	ug/l
Manganese	500 ug/l	1500	1500	1500	25	ug/l
Mercury (grab)**	.001 ug/l	0.2	0.2	0.2	ND	ug/l
Nickel	5 ug/l	16	63	27	1.7	ug/l
Oil (hexane soluble or equivalent) (Grab Sample only)	5.0 mg/L					
Phenols (grab)	0.005 mg/L	0.014	0.013	0.012	0.013	mg/l
Selenium	5 ug/l	0.9	2.6	1.7	ND	ug/l
Silver (total)	3 ug/l	0.4	1.4	0.6	ND	ug/l
Zinc	25 ug/l	120	470	200	ND	ug/l
Polychlorinated Biphenyls (PCBs) (total)	0.001 ug/L	0.017	0.014	0.014	ND	ug/l
Ammonia-Nitrogen (as N)	0.02 mg/L	1.8	7.6	7.7	ND	mg/l
Total Suspended Solids (TSS)	1.0 mg/L	420	1400	1100	13	mg/l
Total Volatile Solids (TVS)	1.0 mg/L	250	1100	480	200	mg/l
pH	0.1 S.U.	7.4	7.3	7.4	8.2	S.U.
Hardness (as CaCO3)	1.0 mg/L	450	1100	670	360	mg/l

As previously discussed, the Fox River upstream of the North Aurora Dam is on the latest 303(d) list of impaired waters for exceeding state water quality standards for the following impairments.

- Total Phosphorus - 0.05 mg/L (35 IAC Section 302.205)
- Total Suspended Solids (TSS) – Level listed in IEPA Guideline
- Aldrin – 0.001 mg/L (SUBPART C: Public and Food Processing Water Supply Standards)
- Dieldrin – 0.001 mg/L (SUBPART C: Public and Food Processing Water Supply Standards)
- Endrin – 0.0002 mg/L (SUBPART C: Public and Food Processing Water Supply Standards)
- Heptachlor – 0.0001 mg/L (SUBPART C: Public and Food Processing Water Supply Standards)
- Mercury – Level listed in IEPA Guideline
- Mirex – No criteria listed for Illinois; Ohio uses 0.72 ng/L as a Human Noncarcinogenic Criteria like HTC in Illinois
- PCBs – Level listed in IEPA Guideline
- Toxaphene – 0.2 ng/L acute and 730 ng/L chronic (derived criteria)
- Fecal Coliform – geometric mean of 200 colony forming units (cfu) per 100 ml

IEPA provided limits and the associated standards for the parameters that were not already included in Appendix A of the IEPA guidance document. Neither the first nor second round of testing assessed all the above303(d) parameters but since the samples are considered contaminated with respect to the IEPA Guidance document, no further testing was deemed needed for these parameters.

As part of the first sediment evaluation, a desktop review was conducted and identified potential sources of sediment contamination upstream of the dam and within the Fox River watersheds. In general, potential contaminant sources upstream of the dam include Fox River303(d) water quality impairments and potential releases from historic non-compliance of nearby facilities.

A second discussion was held with IEPA BOW to share the results from the second round of testing. At this time, IEPA indicates that these samples are considered contaminated and sediment that is deemed to move after the dam is removed will require removal or capping to reduce impacts related to sediment erosion. Next, a sediment transport model was developed to determine where erosion occurs and if those areas are contaminated.

SEDIMENT TRANSPORT

Model

Sediment transport modeling was completed on the Fox River utilizing the sediment transport capabilities in the Hydrologic Engineering Center's HEC-RAS (version 6.5) modeling software. Particle size gradation inputs were defined using the material samples collected in the field for both the first and the second Sediment Analysis Reports (2020 and 2023). The first results were used to develop a preliminary sediment model to help inform where the second round of samples should be taken. The second round of sampling consisted of four composite locations, with three upstream of the dam and one downstream. The sediment model extends from just downstream of the dam in Batavia to just downstream of the dam in North Aurora. Historical one-dimensional modeling was available for the reach between the two dams, so these additional cross sections and data were pulled into the sediment transport model. The extent of the dam's hydraulic impacts was discussed previously and are illustrated on **Figure 20** to compare with the extent of the sediment transport model. The hydraulic impacts to the river from the North Aurora Dam are less than half the extent evaluated for sediment transport.

The sediment sampling results were used as inputs for the sediment profile near North Aurora dam. The sediment profile further upstream of the dam was assumed to match the profile found downstream of the dam. HEC-RAS interpolated the sediment profiles between the defined locations. Since the HEC-RAS program could not generate individual layers for a 1D model, it was assumed that all grain sizes measured in the second round of sampling were distributed proportionately through the entire sample. This gradation was entered into the hydraulic model to perform the sediment transportation calculations. Due to the lack of sediment concentration data, the boundary condition for the sediment concentration was assumed to be an equilibrium load for the most upstream cross section.

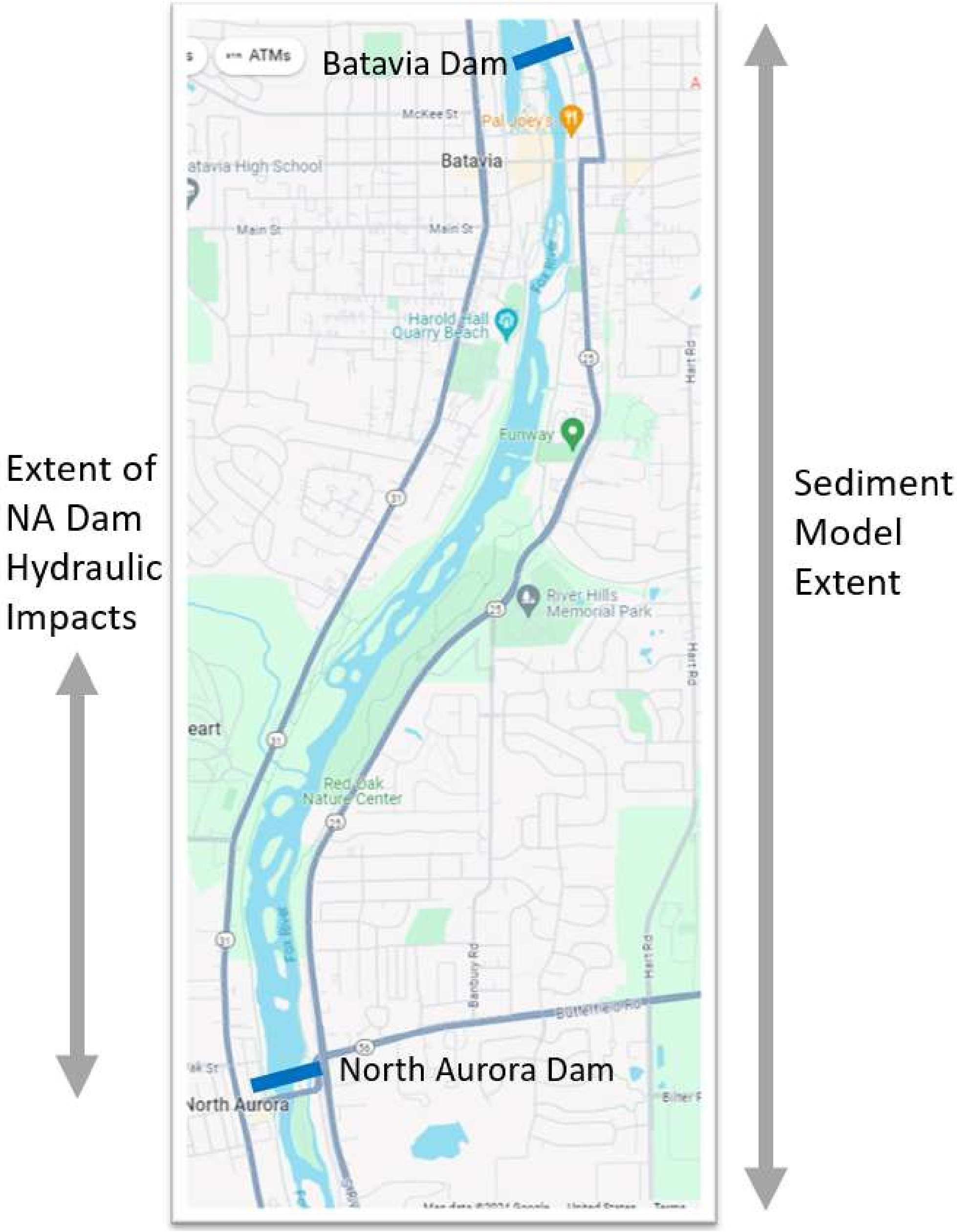


Figure 20. Hydraulic Impact and Sediment Model Extents

Based on guidance from the IEPA, the 25% exceedance average for July, August, and September (855 cfs) was used to simulate the possible conditions during construction; the 5-year flow event (6,743 cfs) was used to simulate a significant event once construction was completed. Please note that the 5-year flow is 5.25 times larger than the average flow for the river. Since vegetation is expected to grow quickly in the river in areas where the depth is decreased sufficiently, the sediment model's land coverage input assumptions were revised as needed to represent the 5-year scenario. The 5-year event duration was based on gage reading at Montgomery Dam for a similar event. The scenario begins at 1500 cfs, peaks at 6,743 after 96 hours, and returns to 1,500 cfs on the eighth day.

Erosion

Results from the sediment transport model were mapped (see **Figure 21**) to illustrate erosion extents after the dam was removed (in red) compared to where the material erodes with the dam in place (blue) for the 5-year flow condition. The erodible material could potentially transport downstream so there is concern that potentially contaminated materials could move after the dam is removed. Modeling indicates that erosion occurs in different locations after the dam is removed compared to when the dam is in place.

In conversations with IEPA, the worst-case situation would be that all of the modeled erodible material would need to be removed or capped before dam removal if it is all assumed to all be contaminated as indicated in the second round of sampling. However, the samples were taken at locations that did not show erosion after the dam is removed. IEPA suggests that further grain size analysis could be completed to determine if all the projected erodible areas contain fines. Since coarser material does not hold onto contaminants like fine material does, if the material contains less than 20% fines, it can be assumed to be non-contaminated. Since contaminated sediment is very expensive to dredge and properly dispose or cap in place, further sediment testing and refined sediment modeling using those results are needed to determine final costs for the dam modification at North Aurora.

Cross sections were evaluated at a few locations throughout the river to compare sediment levels at the low and 5-year events with and without the dam (see **Figure 22**). At Cross Section (XS) 479 for both flow conditions, material accumulates after the dam is removed since the existing scour hole will be filling. As you move upstream (XS 5195), there was insignificant change during the low flow event and a little erosion with the 5-year event.

Since the cost is high for sediment removal or capping, it was proposed that partial dam removal might require less sediment removal compared to the full removal. First, the trap efficiencies (volume) were calculated for when the dam was in place (90.5%), partially removed (60.3%) and fully removed (24.0%). These results match expectations that the dam is trapping sediment upstream, and that less sediment will be trapped overall when the dam is both partially and fully removed. However, this analysis does not provide information about where the sediment will erode.

Therefore, the total volumes of erodible material with the dam, without the dam and for the partially removed dam were calculated next to be used for projecting costs of removal or capping as discussed later in this report. The volumes were calculated by comparing the amount of sediment at each cross section. When the difference between the two cross sections was negative, it indicated erosion had occurred. All areas of erosion were summed and compared to each other for both the low and 5-year flow conditions (see **Figure 23**). The low flow condition has very little erosion when the dam is in place but has about 700 CY of erosion during the 5-year condition. This shows that a little erosion already occurs with the dam in place which matches the 90% trapping efficiency results. When the dam is fully removed, the amount of erosion varies between 5,000 and 12,300 CY for the two flow conditions.

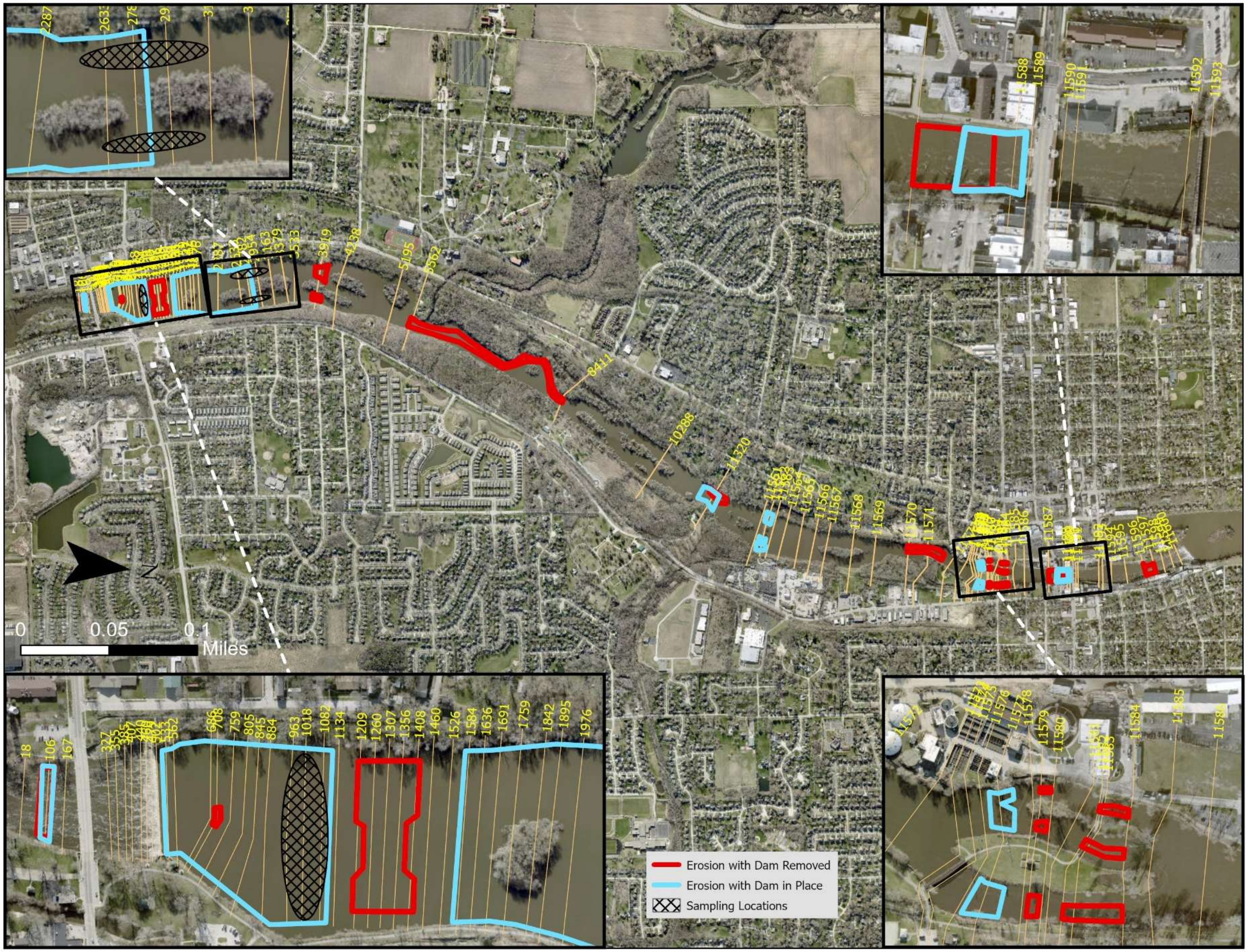


Figure 21. Areas of Erosion between North Aurora (left) and Batavia (right) Dams at the 5-Year Event

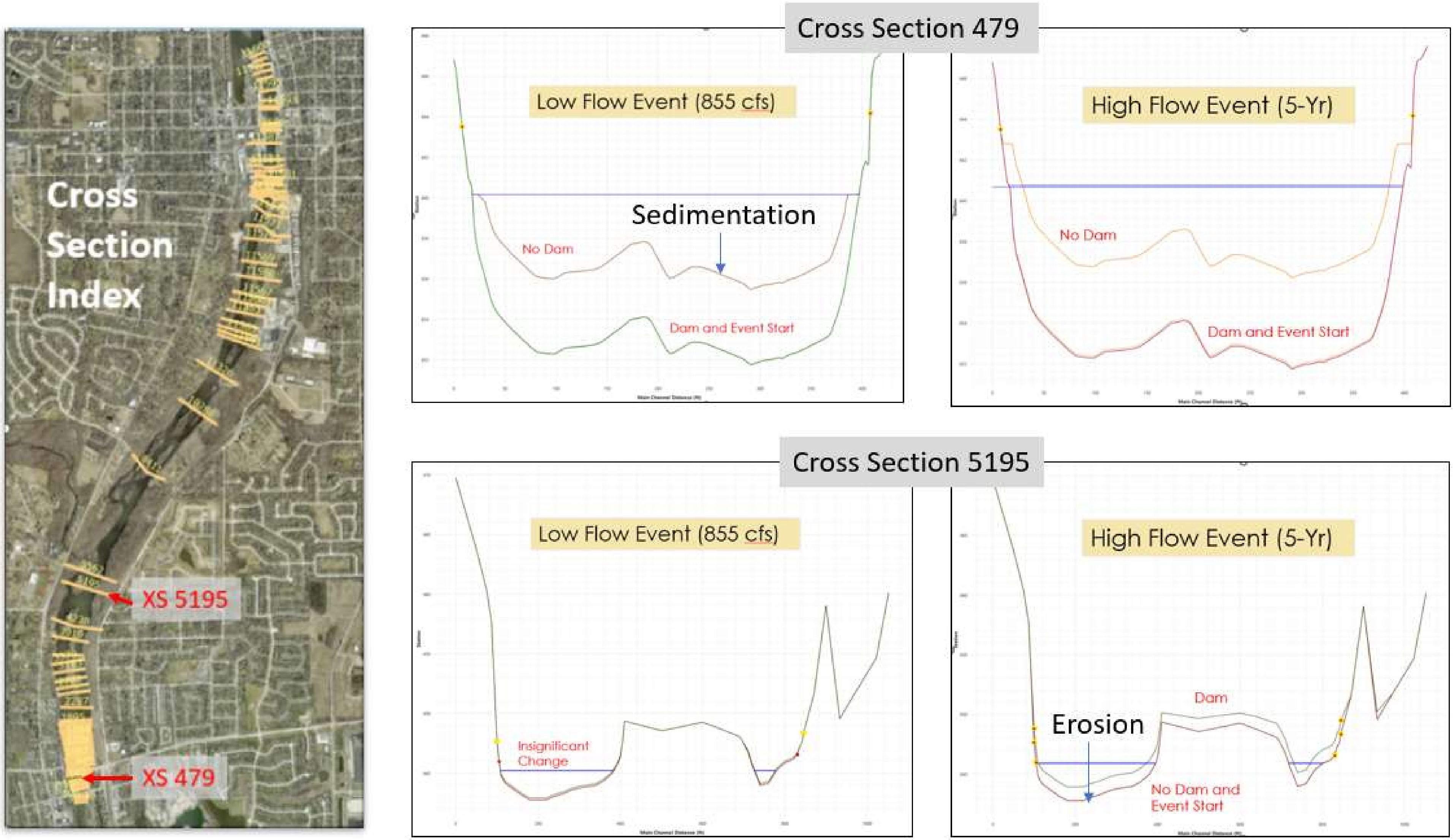


Figure 22. Example Cross Sectional Sedimentation and Erosion for each Flow Event

For the partial dam removal, the erosion is less (2,000 CY) than at the low flow but higher (13,800 CY) than the 5-year flow for the total dam removal. Overall, larger volumes (about 18 times more) of sediment are expected to erode at both the low and 5-year flow scenarios after the dam is fully or partially removed compared to the existing conditions with the dam in place.

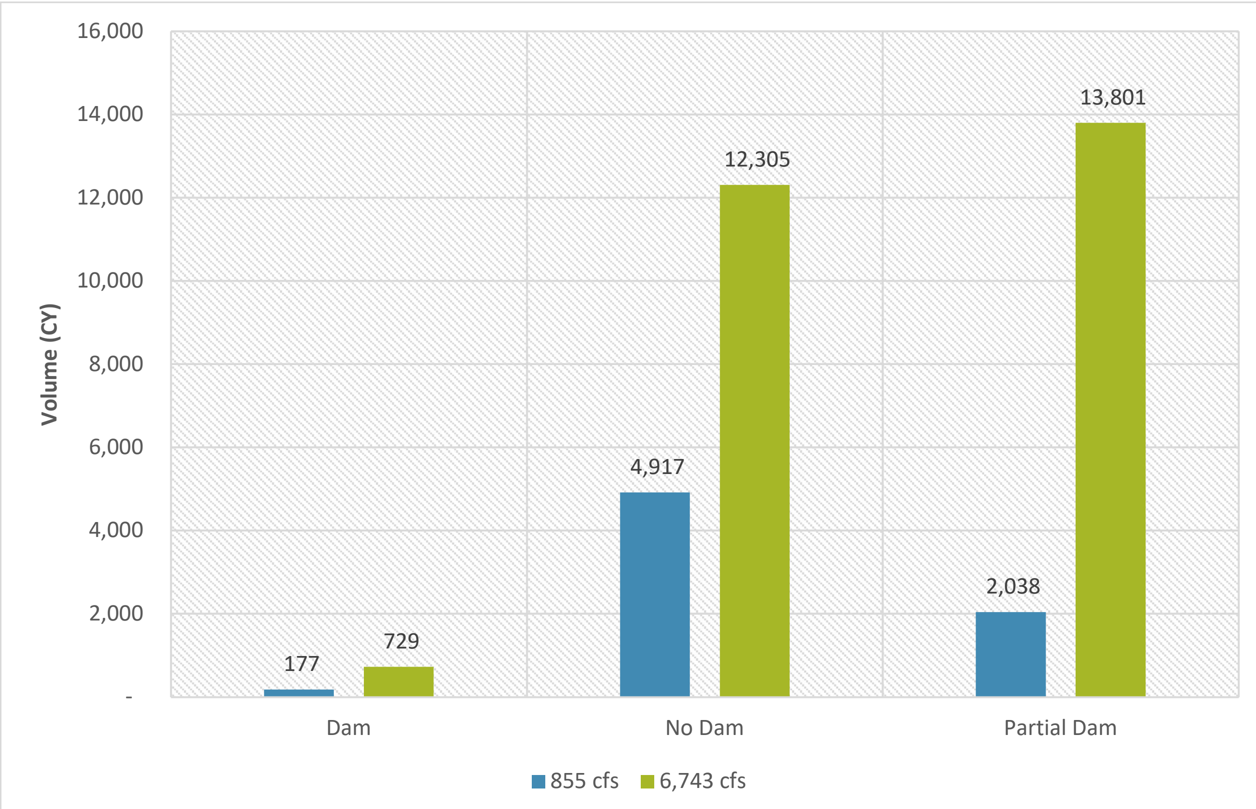


Figure 23. Volume of Projected Erosion for Low and 5-Year Flows

Another way to evaluate the sediment transport potential was to evaluate the velocity changes with and without the dam. **Figure 24** illustrates the levels of velocity changes for both the low and 5-year flow events for the full and partial dam removal alternatives. Overall, velocities only changed between -1 and +2 ft/s (green, yellow and orange) for most of the modeled stretch during the lower flow scenario for the full and partial dam removals. For the full removal and 5-yr. flow, velocities increase the most on the west side of the river near the dam (red and maroon areas). The partial dam removal and 5-yr. flow option indicates that velocities are increasing on both the west and east channels.

During the low event, the erosion was determined to be less for the partial dam removal compared to the full dam removal. However, higher levels of erosion were indicated after partial removal compared to full removal for the 5-year event. Further evaluation of the results shows that the majority of the flow and velocity changes occur in the western channel when the dam is fully removed so erosion occurs mostly in that channel. When the dam is partially removed, the upstream water surfaces are higher, so the flows and velocities increase in both the western and eastern channels during the 5-year event thereby increasing the erosion potential.

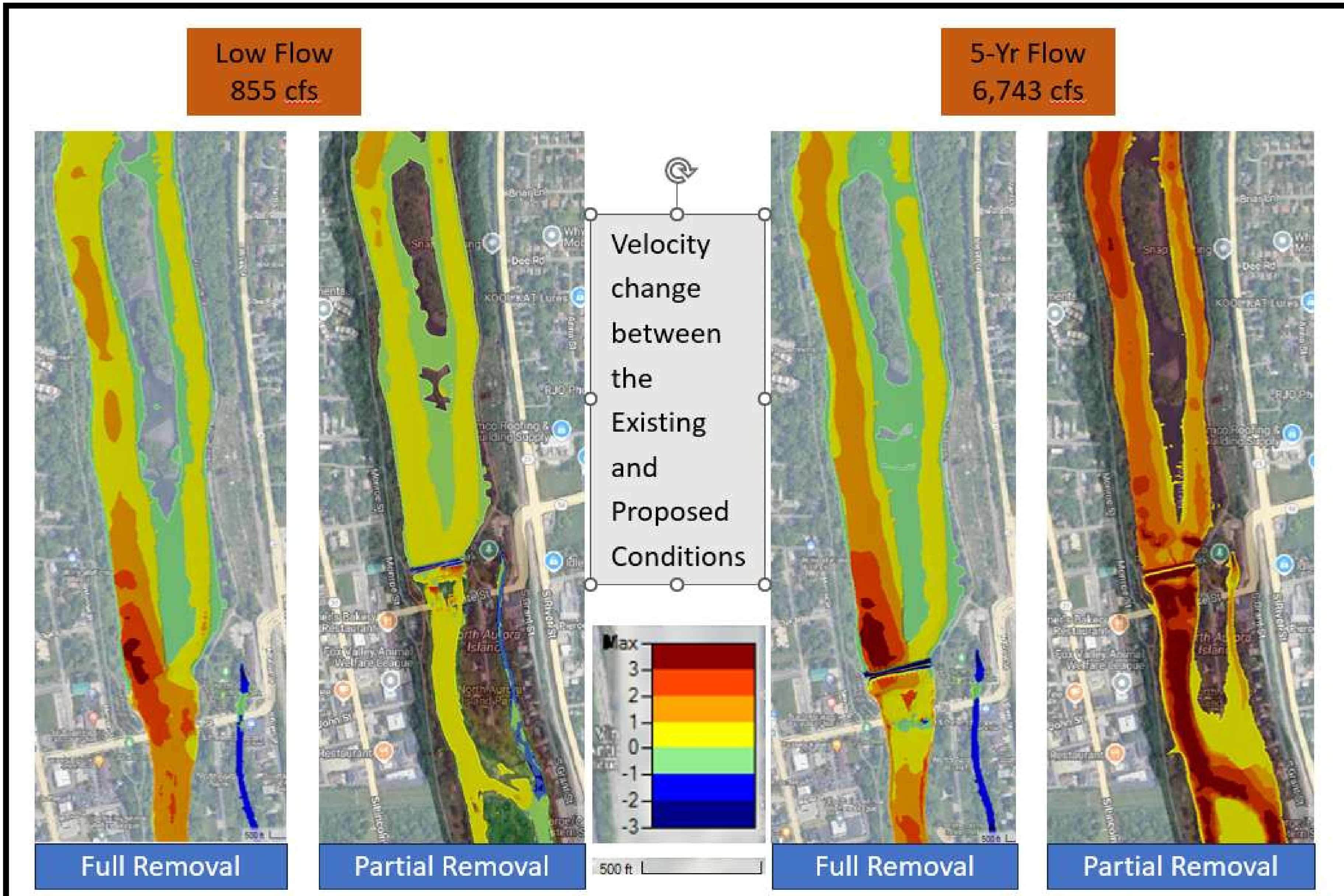


Figure 24. Changes in Velocities after Dam Removal

All in all, the velocity changes are not large (>5 ft/s) for either flow event which means projected erosion rates are similar for both full and partial dam removal. This result was verified by looking at the similar total erosion volumes (12.3k and 13.8k CY). Collectively, these results indicate that the partial dam removal does not reduce the erosion potential for the 5-year flow and will not reduce sediment removal costs.

ENVIRONMENTAL INVENTORY AND ASSESSMENT

As part of the Strategic Planning Study, environmental resources including fisheries, wetlands, endangered species, and cultural resources were assessed. To assure compliance with Illinois environmental regulations, a Comprehensive Environmental Review Process (CERP) was conducted by the IL Department of Natural Resources to identify all environmental resources in the vicinity of the dams and to highlight any environmental concerns that could potentially be associated with dam modifications. The CERP was approved with the following restrictions on 1/12/2023:

T&E Species, Natural Areas, Nature Preserves	• Planning should proceed. As previously discussed, final project plans will inform forthcoming CERP restrictions.
Wetlands	• As final plans come into scope, extent of equipment in stream, seasonal timing of the project and final design plans will be necessary for re-review to inform potential T&E restrictions and/or wetland mitigation.
Cultural Resources	• No restrictions
Other (Contaminants, Wildlife, Federal Nexus, etc.)	• Please note this project was reviewed for planning purposes. A final review once plans are developed is required.

The next sections provide summaries of the existing environmental resources that were assessed for this report.

Fish Sampling

In 2022 IDNR conducted a status report of fish on the Fox River Watershed (see **Table 5**). The upstream sampling location was at Batavia, IL and the downstream location was Aurora, IL. Based on the report, the river sampling was conducted using pulsed DC boat electrofishing. Both locations had a sampling time of 60 min.

Table 5. Fish Sampling Results (Catch per Unit Effort) for Selected Sportfish

Sampling	2022 Upstream	2022 Downstream
#Species	41	41
Largemouth Bass	5	9
Smallmouth Bass	93	57
Bluegill	32	28
Channel Catfish	20	6
Flathead Catfish	0	0
Walleye	1	1
Fish Abundance	151	101

Since the 2017 sampling, the fish abundance has decreased by about 51% and 77% for the upstream and downstream locations, respectively. Throughout the entire reach of the Fox River, about 47% of its length is impounded (Santucci et al, 2005). As discussed, impounded areas have less habitat and decreased water quality conditions. The dams in North Aurora and Batavia also fragment the river, limiting fish access to foraging and spawning areas while also inhibiting seasonal migration (IDNR, 2022). In general, dams negatively impact fish passage and removal has been shown to increase species and abundance throughout a river stretch. If the dam is removed, it will be beneficial to compare these numbers after the dam is removed to illustrate the impacts related to better fish passage and water quality.

Wetlands

A copy of the National Wetlands Inventory Map is included (see **Figure 25**), which shows the wetland areas and types within the area of impact. The National Wetlands Inventory can be used as an initial wetlands review to determine if further evaluation is needed. Besides the islands in the main river, there is an area along the upstream eastern shoreline denoted as wetlands. Since wetlands are indicated, a specific wetlands delineation was obtained for the study area.

The wetlands delineation study was undertaken by Kabbes Engineering, Inc. in September 2020 (see **Appendix D** for the entire study including detailed wetland maps).

Based on the wetlands delineation, there are eight total wetlands within the project boundary comprising a total of 2.853 acres. Please note that the area of Wetland 6 was only determined within the project boundary and actual acreage of that island is larger than documented in the wetlands report. Wetlands 1, 5, 7 and 8 are located upstream and Wetlands 2, 3 4 and 6 are located downstream of the dam. **Table 6** provides a summary of the wetlands and **Figure 26** outlines the locations.

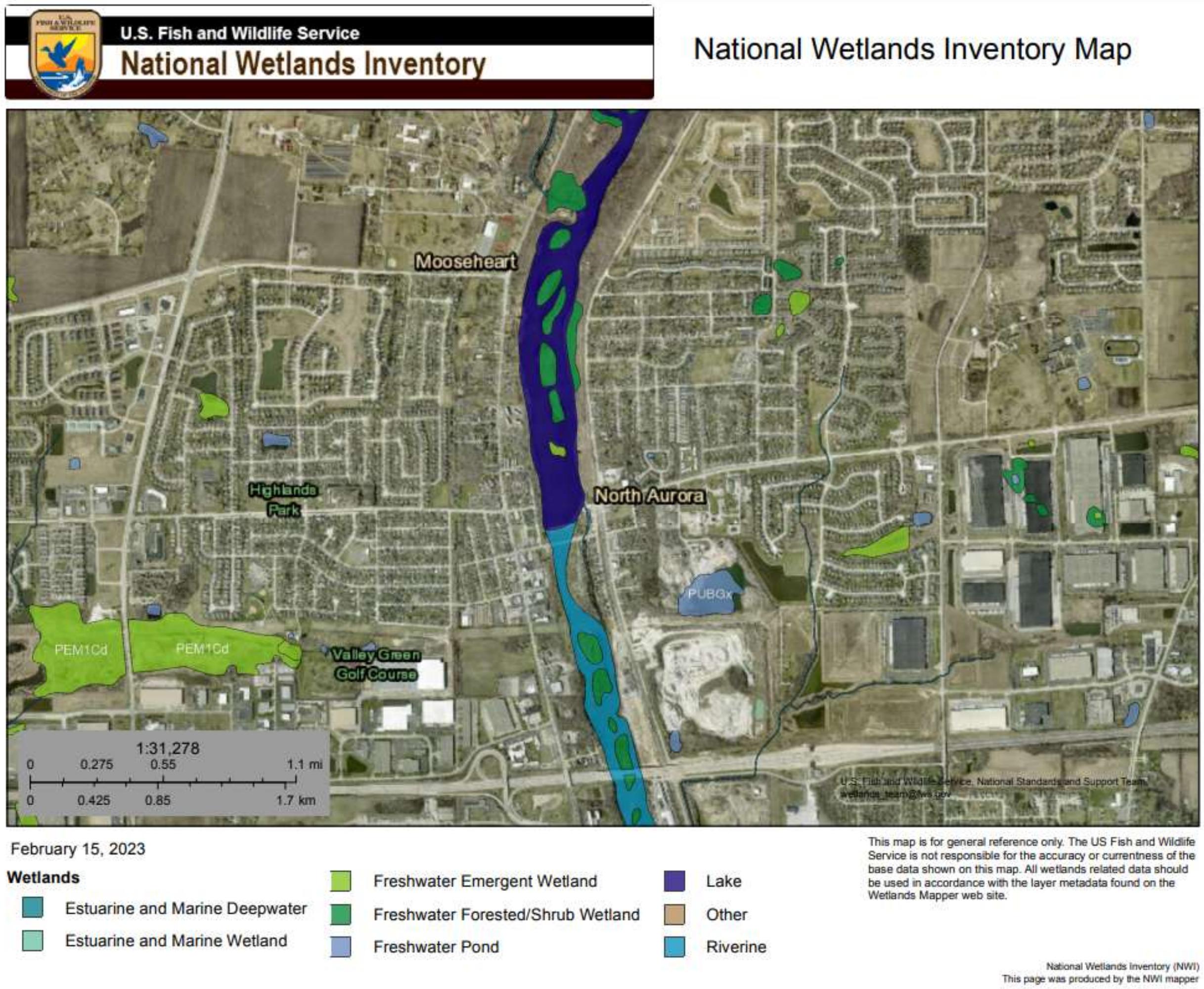


Figure 25. Wetlands Map of North Aurora Dam Area

Table 6. Summary of Delineated Wetlands

Wetland	Jurisdictional?	Wetland Type	Wetland Area (Acres)
1	Yes	Forested/Emergent	0.149
2	Yes	Forested/Emergent	0.160
3	Yes	Emergent	0.009
4	Yes	Forested/Emergent	0.086
5	Yes	Emergent	0.820
6	Yes	Forested/Emergent	1.474
7	Yes	Emergent	0.058
8	Yes	Forested/Emergent	0.097
		Total	**2.853**

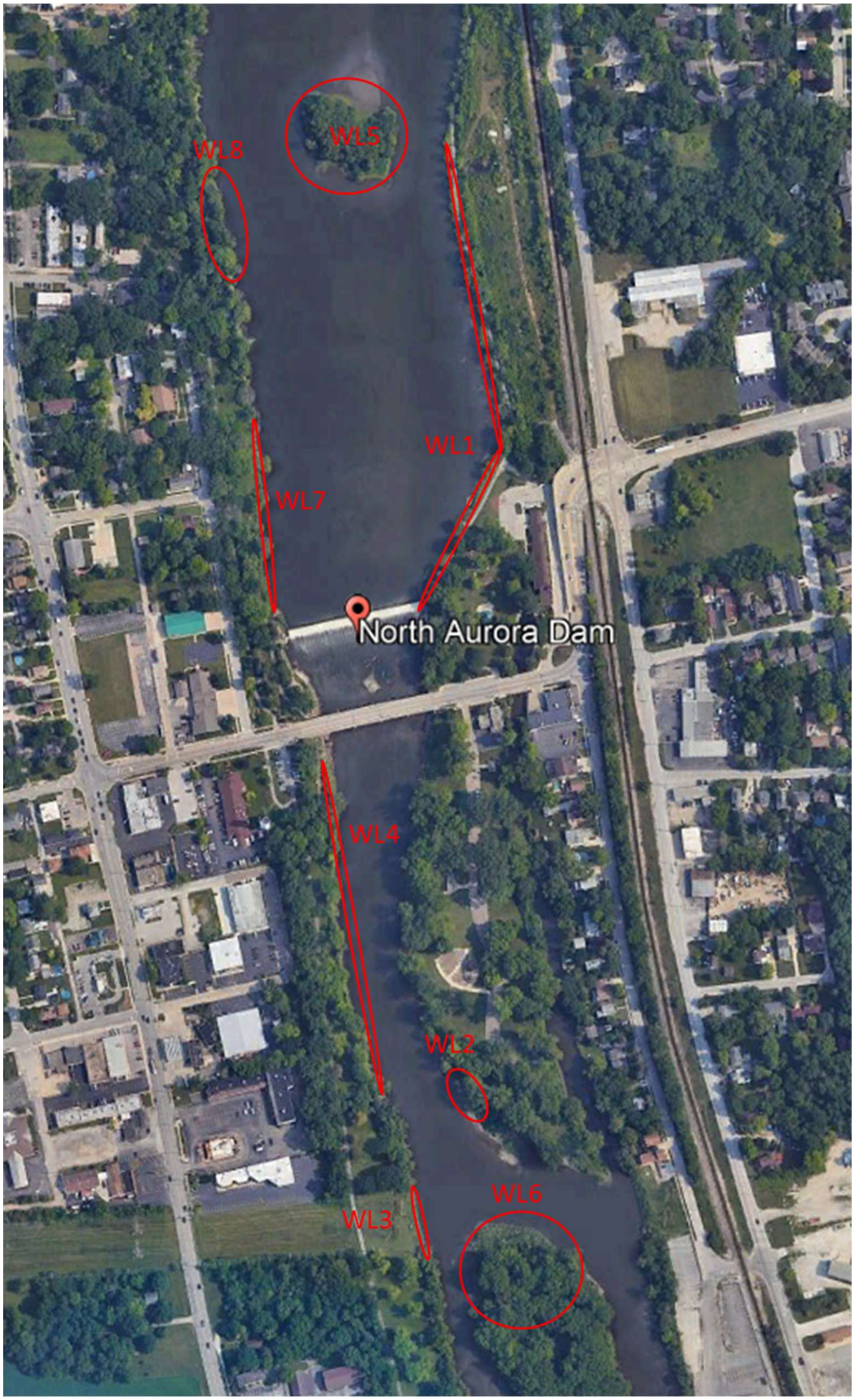


Figure 26. 2020 Wetlands Delineation

Wetland 1, located on the east bank, is considered to be forested/emergent wetland with high floristic quality, positive wetland hydrology and hydric soil. Wetland 5, the island immediately upstream of the dam, is considered to be emergent wetland with low floristic quality, positive wetland hydrology and hydric soil. Wetlands 7 & 8 are both on the west bank. Wetland 7 is considered to be emergent wetland with low floristic quality, positive wetland hydrology and hydric soil. Wetland 8 is considered to be forested/emergent wetland with moderate floristic quality, positive wetland hydrology and hydric soil.

After the dam is removed, the river depths upstream of the dam will be shallower and might impact the shoreline and island wetlands. The wetlands delineation results will need to be included as part of the permitting process if the project proceeds and the permitting authorities will determine what, if any, wetlands mitigation would be needed. Dam removals improve low quality lake wetlands upstream of the dam by converting it to high quality riverine wetlands. Dam removals can also improve the quality of wetlands by increasing oxygen levels and reducing sediment deposition. Therefore, mitigation is inherent in dam removals. The downstream wetlands are not expected to be impacted once the dam is removed. The hydraulic model indicates that the downstream river depths will only vary +/- 0.05’ after the dam is removed at the median flow.

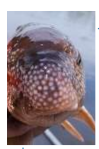
Endangered Species

An initial review using the Ecological Compliance Assessment Tool (EcoCAT) indicates that the following protected resources may be in the vicinity of the project location as documented on 4/20/22. The EcoCAT tool pulls information from the Illinois Natural Heritage Database for selected areas.

Bigeye Shiner (*Notropis boops*)

False Bugbane *(Cimicifuga racemosa)*

Greater Redhorse (*Moxostoma valenciennesi*)



River Redhorse (*Moxostoma carinatum*)

Rusty Patched Bumble Bee (*Bombus affinis*)

Shadbush (*Amelachier interior*)

Snowberry (*Symphoricarpos albus var. albus*)

The Illinois Natural Heritage Database also shows that Mooseheart Ravine is part of the Illinois Natural Areas Inventory (INAI). These sites are considered high quality natural areas, habitats of endangered species or contain other significant natural features. Pending results from the final CERP review, a conservation plan for the care and handling of threatened or endangered species during project implementation might need to be developed. The plan would vary depending on the extent of the instream work, potential timing of the work, and the requirements outlined in the final CERP.

Cultural Resources

Based on review of the project area by Departments' Cultural Resources Coordinator, completion of any of these alternatives are not anticipated to adversely impact any known cultural resources.

Historical Impacts

The project information was reviewed by the State Historic Preservation Office (SHPO) to see if any of the work related to the proposed dam removal would impact any structures that are eligible for the National Register of Historic Places (NRHP). The nearby West Street Bridge has been determined to NRHP eligible, but no work is expected at that location. Upon review of photos and information provided by OWR, it has been determined that the mill race structure does not retain sufficient integrity to be listed on the NRHP. At this time, dam modifications can proceed but if the project scope changes, the changes should be shared with the SHPO.

IDENTIFYING ALTERNATIVES

Each dam modification alternative was evaluated with respect to the following primary and secondary goals:

Primary Goal:

✓ Public safety

Secondary Goals:

- Ecological improvement to the river for fish passage and aquatic habitat
- Improves water quality in river (increases dissolved oxygen)
- Recreational opportunities including safe non-motorized boat passage

Initial discussions with Village administrators indicated that a few local goals were also requested:

Local Goals:

- Maintain some flow to the mill race during average river conditions
- Minimize impacts to the existing Park amenities
- Minimize impacts to the future Plaza renovation plans
- Minimize tree removal
- Minimize parking lot impacts

Primary Goal

PUBLIC SAFETY

The most significant reason for modifying the North Aurora Dam is to reduce or eliminate the public safety concerns related to the submerged hydraulic roller that forms at the dam under various flow conditions. All alternatives must address this concern to eliminate the potential loss of life from the roller for all the reviewed flow conditions. Public safety is of paramount concern for all run of the river dams in the state, so this is the primary goal.

Secondary Goals

AQUATIC PASSAGE

Dams prevent fish migration and limits access to spawning habitat and food. To improve the ecological integrity of the dam site and the river system connectivity, fish passage considerations were evaluated for each alternative. All the options, except for the Partial Dam Removal (Alt. 9) and Add Ramp Only (Alt. 10), allow local fish species to traverse the river without inducing stress and/or discouraging migration, such as velocity barriers, turbulence barriers and the necessity to climb, jump and/or pass through hidden orifices. The channel alternatives, allow for unimpeded passage through the mill race as well.

WATER QUALITY

Dams create upstream pools whereby the water is slower moving and is deeper. In other words, dams alter natural river flow characteristics. This in turn can create areas where the water temperatures increase which can affect sensitive species. The slower water also can lead to algal blooms and decreased dissolved oxygen (DO) levels. Dams can trap sediment upstream and bury rock riverbeds where fish and other aquatic species spawn. By trapping logs and other habitat features behind the dam, natural creation of river habitat (riffles and pools) downstream are impacted.

RECREATION

In developing alternatives, consideration was given to improve recreational activities by providing safe non-motorized boat passage, more fishing opportunities and greater accessibility to natural areas. Improvements to fish habitat upstream of the dam would be considered during further development of a selected alternative and are beyond the scope of this report.

Local Goals

MAINTAIN MILL RACE FLOWS

It was determined early on in the discussions with the Village administrators that if dam removal was pursued, it would be ideal to maintain flow in the mill race located adjacent to the dam both for the

Park aesthetics and for the residents that are located along the downstream portion of the mill race. Therefore, keeping flow in the mill race when the Fox River is at average flow conditions was added as a local goal.

MINIMIZE IMPACTS TO PARK

The Village has added many amenities over the years to the Park located adjacent to the dam. Therefore, each alternative was also evaluated with respect to whether the existing park amenities would be disturbed and to what level. Impacts evaluated included the parking lot, stormwater collection system and the park sidewalks.

MINIMIZE IMPACTS TO PLAZA DEVELOPMENT

The Village plans to enhance the Riverfront Park Plaza in the next few years (see **Figure 8** for a conceptual layout) so each alternative was also evaluated to determine if it impacted the future renovation plans and to what level. If the Plaza improvements occur before the dam modification project, coordination of both projects will be necessary.

MINIMIZE TREE REMOVAL

Since the park is a natural area for the public to relax and recreate, trees serve an important function to enhance the visitor experience. Ideally, the dam removal project will minimize removal of the existing trees, so this was added as another local goal.

STUDY ALTERNATIVES

Ten alternatives were developed for the North Aurora Dam. Eight of the alternatives consist of completely removing the dam, one includes the partial removal of the dam and for the last one, the dam was not removed.

Figure 27 illustrates the locations and configurations of each alternative on the site while also outlining some of the existing site features that are referenced in the alternative's discussion. The ten alternatives include:

1. Full Dam Removal
2. Channel Routed for Parking
3. Channel South of Gazebo
4. Deeper Culvert at Existing Location
5. New Culvert Routed around Parking
6. New Straight Culvert
7. One Riffle at Intake
8. Multiple Riffles
9. Partial Dam Removal
10. Add Ramp Only

The first alternative includes dam removal and no changes to the mill race inlet. Since mill race flows are preferred, most of the remaining alternatives include changes to the mill race intake to determine which intake configuration would be most effective for keeping flow to the mill race after the dam is removed. Alternatives 2 through 8 include various methods for keeping flow to the mill race including:

- open channel or culvert
- two channel inlet locations
- culvert routing (under or avoid parking lot)
- adding riffle(s) in the river

Alternatives 2 and 3 include installation of a new channel to bring water to the mill race. A new culvert is proposed for keeping the mill race flowing in Alternatives 4 through 6. Alternatives 7 and 8 propose adding riffles (rock features) in the river at various locations to help bring additional water to the mill race inlet after the dam is removed. A riffle is a relatively shallow length of stream where the water is turbulent and flows faster. Plus, it raises the pool a little immediately upstream of the riffle potentially allowing more water to be captured at the mill race inlet. The riffle alternatives compare the impact of adding a single riffle at the intake versus several riffles throughout the reach.

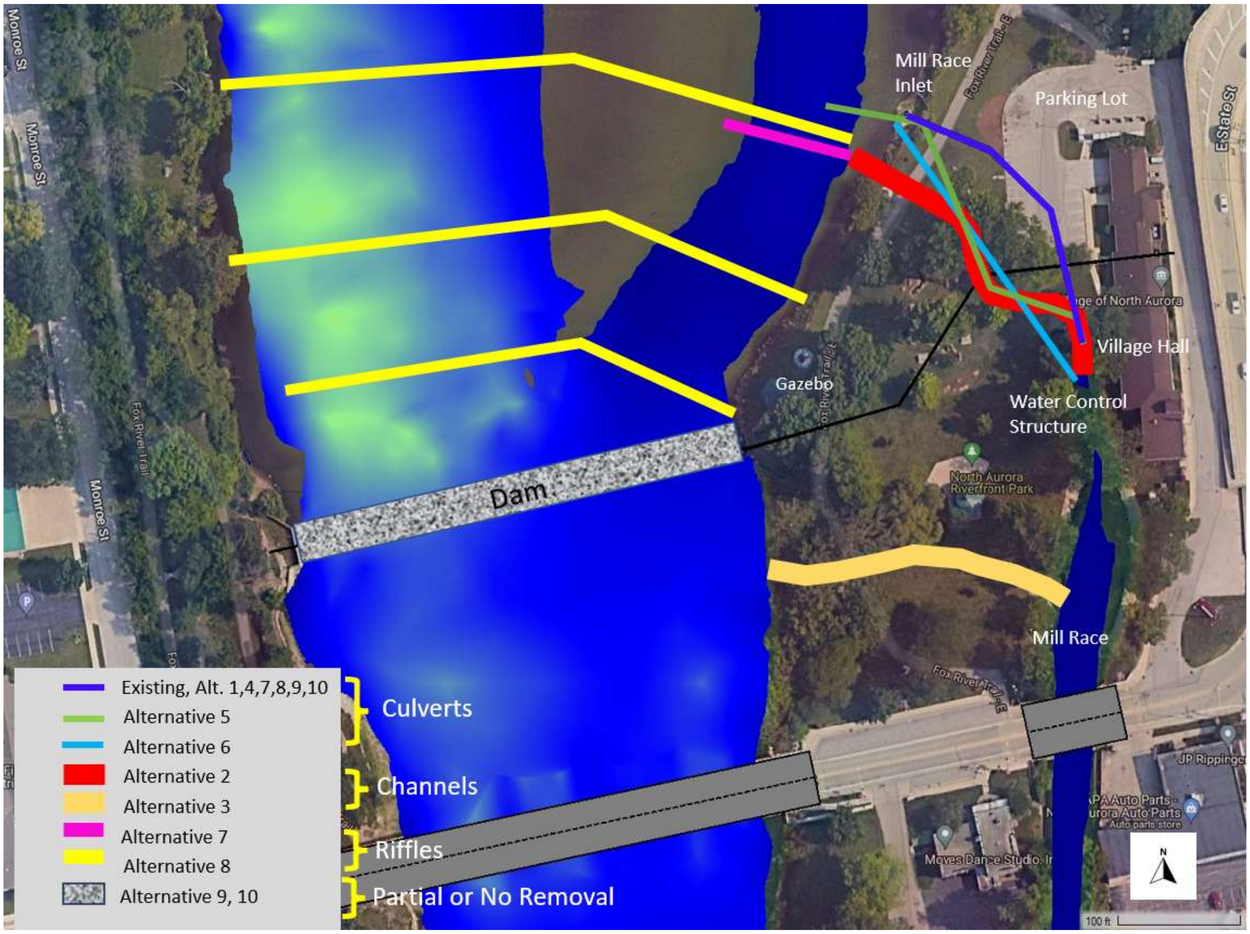


Figure 27. Existing Site Plan Showing Relative Locations of Each Alternative

The ninth alternative evaluates partial dam removal which allows some pool to remain upstream to keep water flow to the mill race and for some recreational uses. This option was also used to compare sediment removal costs compared to full removal and whether higher flows will be maintained at the mill race.

The tenth alternative includes work to add a rock ramp downstream of the dam and not remove the dam. The last alternative was added to provide an option where upstream potentially contaminated sediment would not require removal.

Hydraulic modeling results for each alternative are provided in the next section. The modeling results were compared at the low (188 cfs) and median (1,283 cfs) flow conditions for each alternative as outlined in the Hydrology Section. As noted previously, the largest impacts to the upstream river stretch (e.g., river depths and velocities) will occur during the low flow river conditions so those values were used for the alternative comparison discussions. It is also helpful to see what the impacts of dam removal will be at average flow conditions, so those results are also provided in the report body. The alternatives were not compared at the high flow condition since the dam has negligible impacts at those flows and there would have been minimal, if any, differences.

Each alternative was compared to the existing conditions model to see the impacts in the Fox River and the mill race for the following parameters:

- water depths
- velocities
- mill race flows
- mill race velocities

The water depth and velocity reading were taken at a location upstream of the dam as previously shown by the red star on **Figure 18**. That location was selected as a representation of what that area might look like after the dam is removed for comparative purposes. The mill race flow and velocity readings were taken at a location on the State Street Bridge as shown on that same figure with the blue star. These results are summarized for each alternative for the low and median flow conditions.

For each alternative, inundation maps are provided in the body of the report showing the river and mill race depths compared to the existing conditions map for the **low flow** condition. Additional inundation maps showing the range of river depths at the low and median flow conditions for each alternative are provided in **Appendix E.**

After the model analysis, the overall benefits and consequences of each alternative are listed along with cost summaries. Detailed costs for each alternative can be found in **Appendix F**.

Alternative 1 – Full Dam Removal

DESCRIPTION

This alternative includes the full dam removal of the North Aurora Dam and no changes to the existing mill race intake culvert (see **Figure 28**). Since bank stabilization is created by the two dam abutments, the abutments and nearby retaining walls will remain in place to maintain stabilization of the east and west banks. An access road, cofferdam, traffic control and signage will be required during construction along with erosion control, and concrete removal.

Some form of construction access will be required. One option would be to utilize the existing shoreline bike/hike path and reinforce it with timber matting to avoid damage during construction. This method was assumed for purposes of this report. Specific construction access methods will be determined by the construction contractor and will be approved at that time. Once the dam is removed, the upstream and downstream shorelines will not be modified which will allow natural revegetation. It was assumed that all the concrete, including the steps, will be demolished. The riprap used to construct the causeway will be used to partially fill the scour hole to minimize construction debris removal costs. Pieces of clean concrete (i.e., no metal or rebars) from the dam demolition could also be used fill in the scour hole. Steel sheet pile and H-piles are part of the dam foundation and will require full removal. Since the majority of the bedrock is less than 7’ below the bottom of the dam, it is assumed full-depth pile removal is safer and more cost effective than cutting off the piles in-situ.

Figure 29 shows a cross section view and a profile view for this alternative compared to existing conditions. The profile shows the scour hole as being filled with the causeway, potential construction debris and accumulated sediment over time.

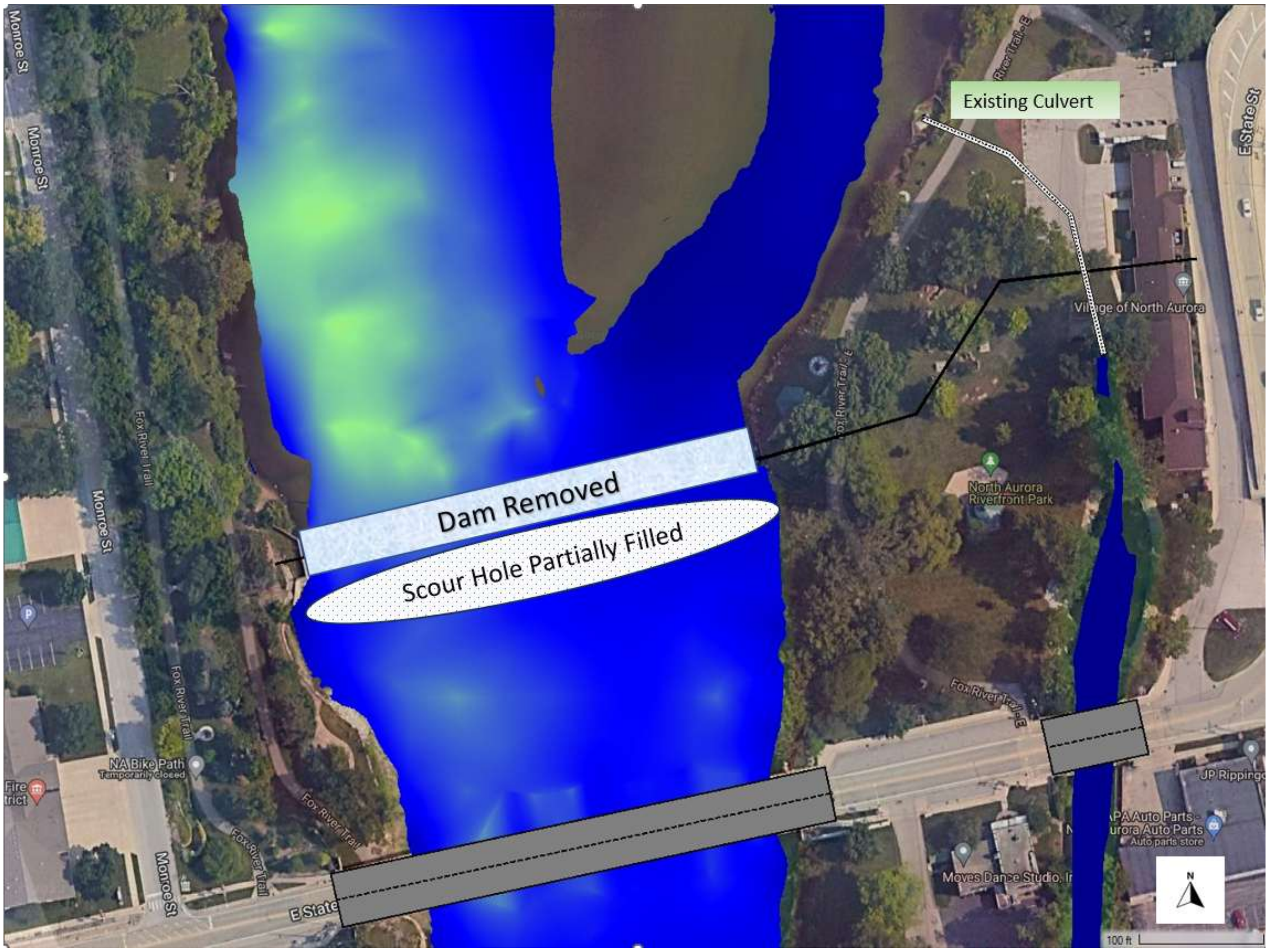


Figure 28. Alternative 1 - Full Dam Removal

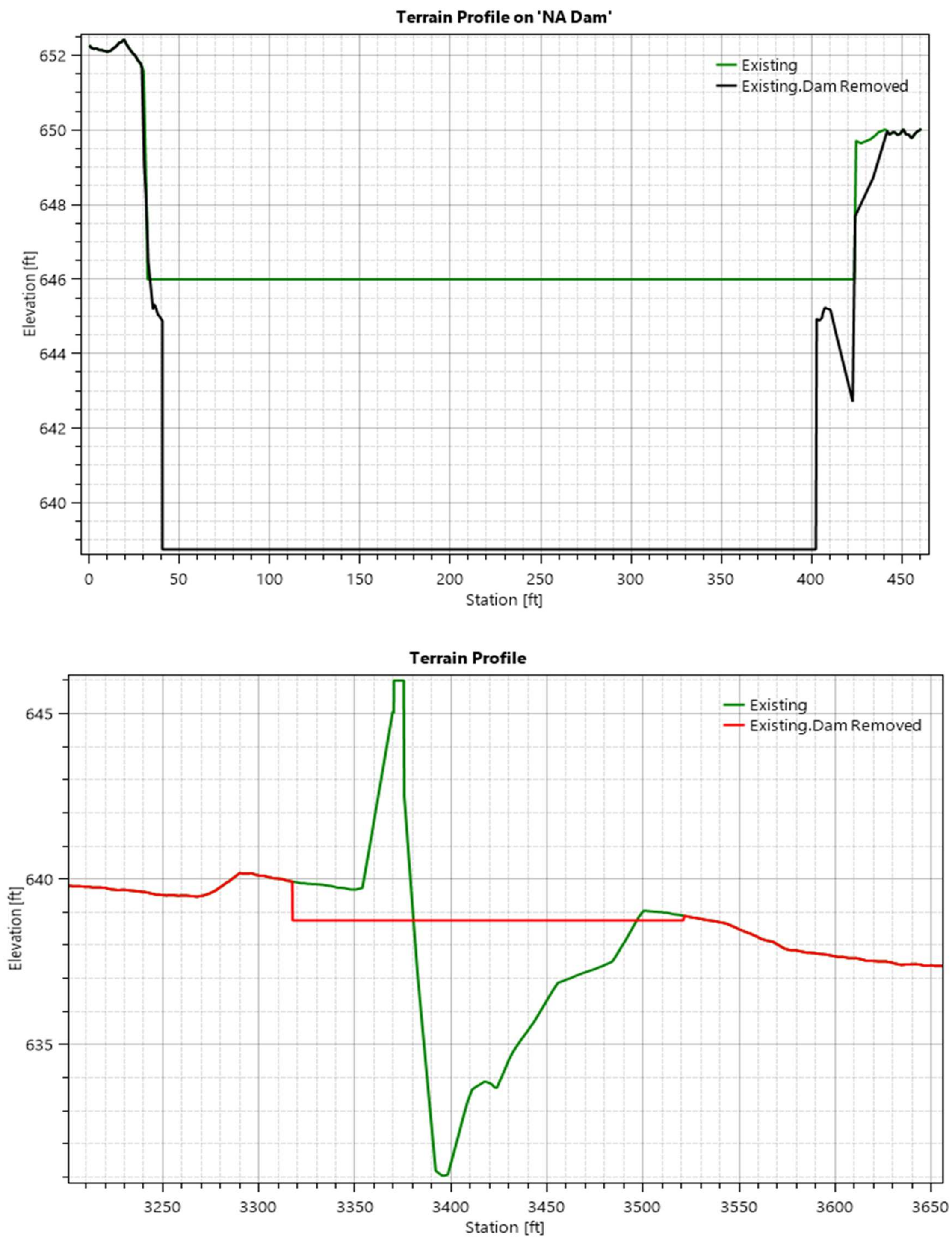


Figure 29. Alt. 1 - Full Dam Removal Cross Section and Profile

MODELING RESULTS

Table 7 provides a summary of the changes in water depth, velocities, mill race flows and mill race velocities for Alternative 1 compared to the baseline existing conditions model.

Table 7. Modeling Results for Alternative 1 – Full Dam Removal

	188 cfs			1,283 cfs		
	Existing	Alt 1	Difference	Existing	Alt 1	Difference
Water Depth (ft)	6.73	0.51	-6.22	7.08	1.73	-5.35
Velocities (ft/s)	0.05	1.53	1.48	0.46	3.60	3.14
Mill Race Flow (cfs)	83.36	0.0	-83.36	89.05	0.0	-89.05
Mill Race Velocities (ft/s)	1.30	0.0	-1.30	1.31	0.0	-1.31

During the low river condition, the depth of water is reduced by 6.22' immediately upstream of the dam for Alternative 1. As expected, the differences in water depth are a bit smaller for the median flow condition since the low flow condition is the worst-case scenario.

The velocities increased to 1.53 and 3.60 ft/s at that same location after the dam is removed for the low and median river flow scenarios, respectively. Velocities are expected to increase upstream after a dam is removed since the river's depths have decreased (i.e., less pool upstream) and the same amount of water will be flowing through the system. Flow (ft^3/s) is a function of the river velocity (ft/s), depth (ft) and width (ft) at any point (see the following equation).

$$\text{Flow} = \text{Velocity} \times \text{depth} \times \text{width}$$

So, if the depth or width decreases, the velocity will increase since the flow is the same before and after the dam is removed.

Figure 30 is an inundation map that illustrates the depth changes both upstream and downstream before and after dam removal throughout the reach during the low flow condition. This figure can be used to give the community an idea of how the river will appear upstream during the lowest river flow conditions if the dam is removed and is considered the worst-case impacts. Additional inundation depth maps for all three river flow scenarios flows for Alternative 1 are provided in **Appendix E**. Modeling results for the average and high river flow conditions were calculated for each alternative but inundation mapping will not be provided in the body of the report since those impacts are less severe. Also, since there are minimal depth changes between the high flow scenario for all remaining dam removal alternatives (2 to 8), inundation maps for those alternatives are provided in **Appendix E** for the low and median flows only.

When the dam is removed and no other site changes are made, the flow to the mill race at both the low and median flow conditions is zero. For the low flow condition, this is illustrated in the inundation map where dry areas are shown through the mill race. While water may eventually flow into the mill race at very high flows in the main river, it is likely that the mill race will be dry during much of the year.

Low Flow Conditions

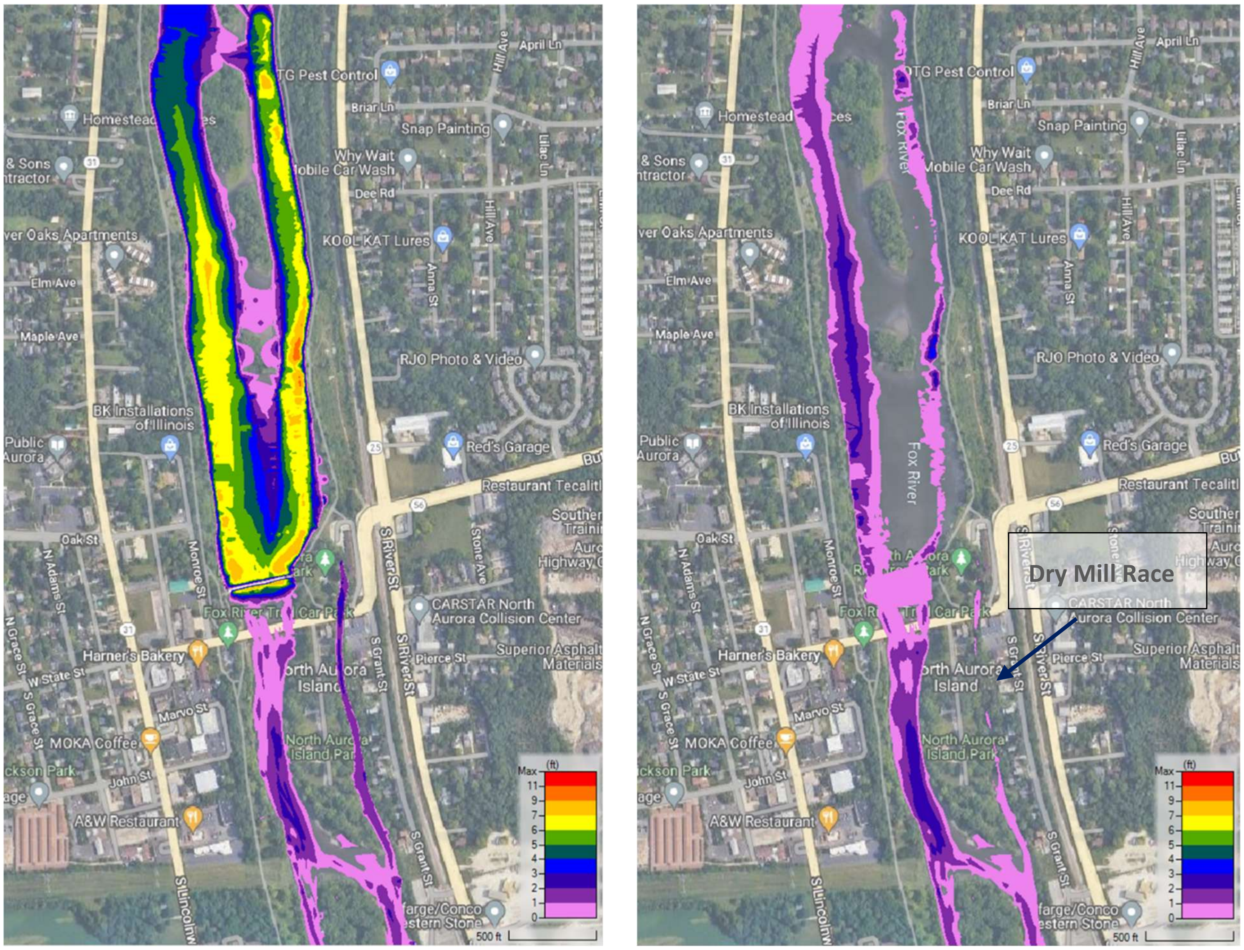


Figure 30. Inundation Map Showing Depths for Alt. 1 (right) Compared to the Baseline

Figure 31 shows the river and mill race velocities both before and after dam removal for both the low and median flow conditions. Darker colors indicate slower velocities. With the dam in place, the velocities upstream are slower due to the ponding effect from the dam. After the dam is removed, the extent of inundation will decrease upstream of the dam, but the velocities will increase. This is because there is the same amount of water flowing through a smaller width of river. After the dam is removed, the highest velocity (~2.5 ft/s for low and ~4.5 ft/s for the median flow conditions) is in the western stretch of the river since the majority of flow is running through that narrowed river section. In general, velocities greater than 5 ft/s can cause erosion, sediment transport and negatively affect stream life and habitats. Since the velocities after dam removal are less than the threshold, full dam removal is expected to be acceptable for long-term stream health.

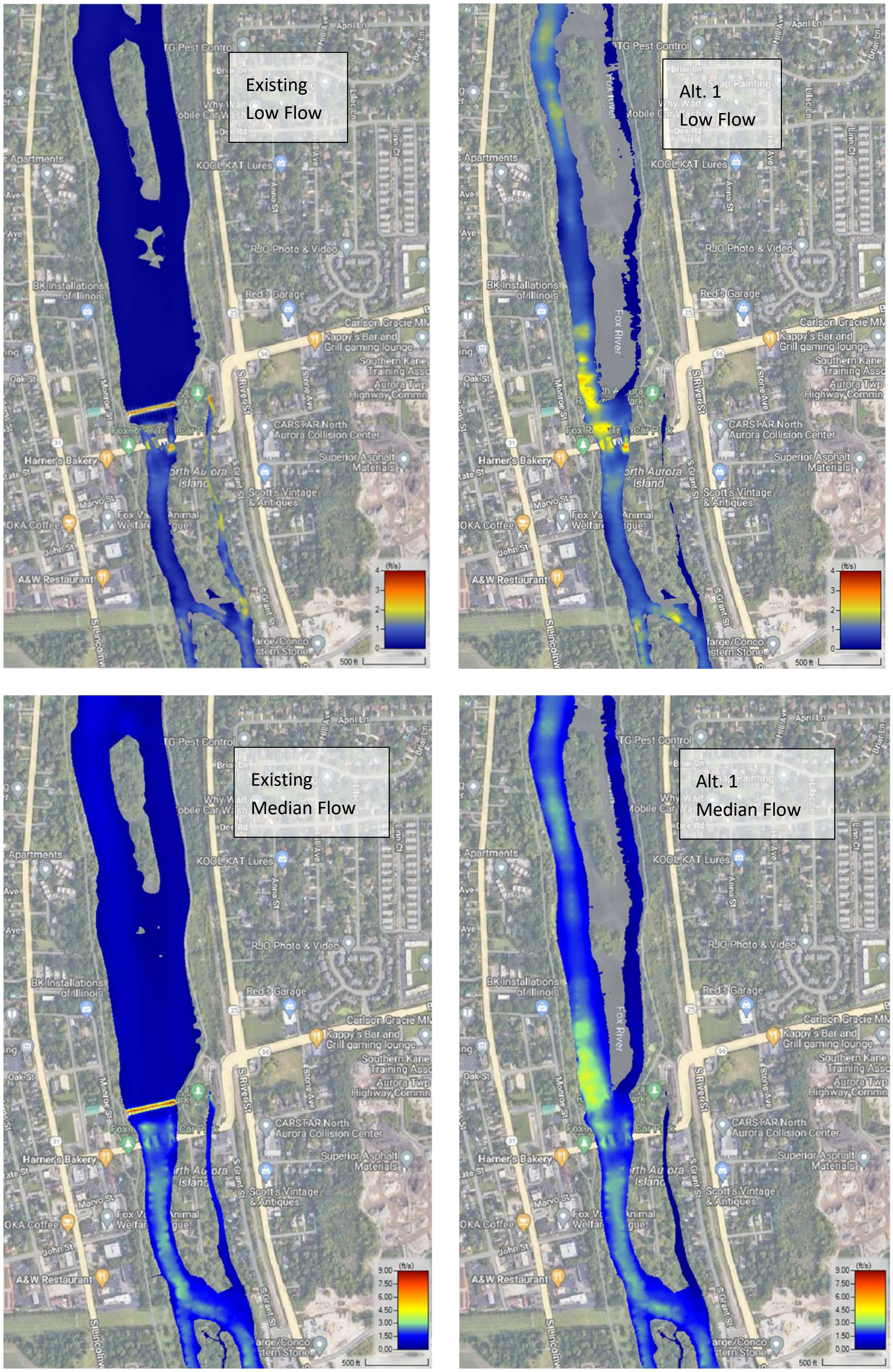


Figure 31. Velocity Maps for Alt. 1 Compared to the Baseline for Low and Median Flows

Another way to illustrate the impacts of the velocity changes before and after the dam removal is by overlaying the before and after velocities and calculating the difference. **Figure 32** shows the velocity differential for all three flow conditions to better illustrate magnitudes of velocity changes. The largest velocity changes occur at the median flow event and none of the differentials were greater than 3 ft/s. This indicates that full dam removal will not impact overall river velocities much. Velocity comparison and differential maps for this alternative only are provided in **Appendix E** before and after the dam removal for all three river flow scenarios at a larger scale for better viewing.

Please note that the velocities and differentials were calculated for the remaining alternatives but are not provided in the discussion for each alternative. Like Alternative 1, Alternatives 2 through 8 all include full dam removal, but each includes various methods to maintain flow to the mill race. Maintaining mill race flows does not appear to alter velocities much compared to the velocities illustrated for Alternative 1 so additional maps for each of those alternatives are not provided in the report or the Appendix since variations were so small. Velocities for the partial dam removal compared to those for the full removal were found to be slightly less in the west channel and slightly more in the east channel upstream with minimal changes downstream of the dam.

ALTERNATIVE SUMMARY

The overall positive and negative consequences associated with removing the dam are summarized below and are the same for all the full dam removal options (Alternatives 1 to 8). The primary and secondary goals to remove the dam at this location are to improve public safety, restore fish passage and habitat, and restore boat passage in the river which this alternative meets. In addition, overall water quality will increase in the river since the sediment will no longer accumulate and negatively impact dissolved oxygen (DO) and nutrient levels. When the dam is removed, the upstream pool will be eliminated and water depths in that area will be lower which will impact motorized boating in that reach. For all dam removal options, mill race flows will be decreased during the low and median flow conditions since the upstream pool and head above the mill race intake will be reduced. In summary:

Pros

- Restores public safety at dam
- Restores fish passage & aquatic ecosystems
- Improves water quality in river
- Boat portage no longer required

Cons

- Reduces upstream pool
- Reduces motorized boating above dam
- Reduces Mill Race Flows at low and median flow conditions

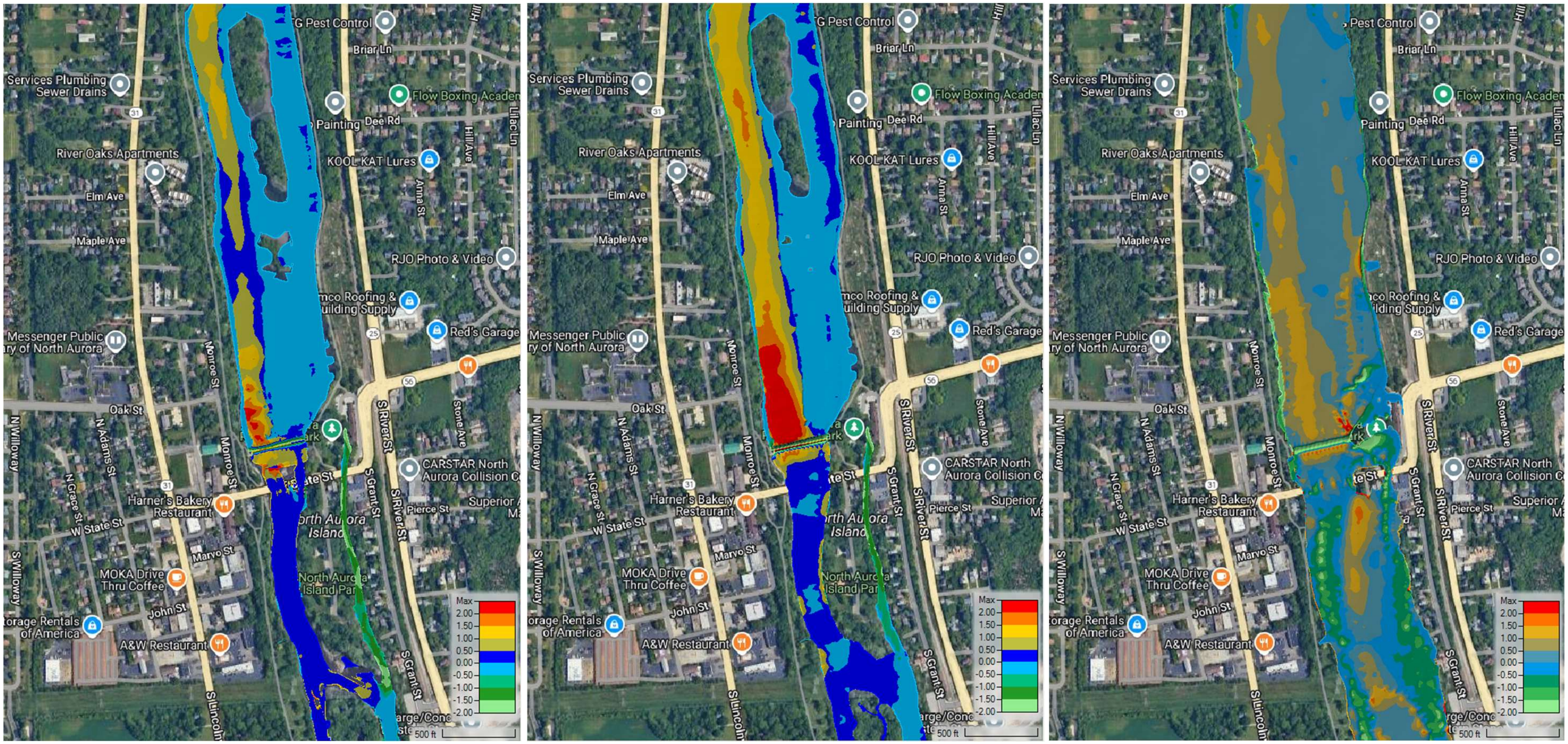


Figure 32. Velocity differentials at 188 cfs, 2,683 cfs and 16,200 cfs

The remaining alternatives (besides Alternative 9 - Partial Dam Removal and Alternative 10 – Fill Scour Hole) all assume full dam removal so it assumed that the positive and negative attributes listed above are the same for Alternatives 1 to 8 and will not be repeated for each of the individual alternative discussions.

The rest of this discussion will pull out the consequences specific to Alternative 1. Besides the general safety, ecosystem and boating improvement benefits listed above, one of the local goals of the project was to keep the mill race flowing at average flow scenarios. Water flowing through the mill race adds a water feature within the park and also provides waterfront to several homes located downstream of the park. Unfortunately, for this alternative, the mill race will dry up during most of the year. Other local goals were to minimize impacts to the proposed Plaza and the existing park. Since the mill race inlet is not adjusted in any way for this alternative, the Park and New Plaza will also not be impacted. Other considerations for each alternative included whether trees needed to be removed and if the parking lot or stormwater system would be impacted. The parking lot, stormwater system and trees are not impacted by this alternative.

Pros

- No impact to the new Plaza
- No tree removal required
- No open channel hazard or new culvert bridges needed
- No impacts to parking lot, stormwater collection system or sidewalks
- Lower Mill Race flooding levels during high events
- Lowest cost alternative

Cons

- No flow to Mill Race during majority of the year
- Continue use of existing damaged mill race flow control

PROJECTED COSTS

The projected cost for Alternative 1 Full Dam Removal is listed below.

- Temporary fencing and construction staking
- Construction signs and traffic control
- Seeding, fertilizer and mulch for areas disturbed during construction
- Timber matting for site access
- Riprap for causeway construction
- Concrete demolition and disposal
- Sheet pile and H-pile demolition and disposal
- Contaminated material disposal for areas disturbed during construction

- Construction field office (6 months) and mobilization fees (6%)
- Contaminated sediment removal and disposal of upstream erodible areas

Contingency and engineering cost assumptions will be the same for all alternatives (Alts. 1-10) so this discussion will not be repeated for each alternative. An estimating contingency of 15% has been assumed for this stage of the project. Once an alternative is selected and the project moves forward, the project will be divided into design and construction phases. Plans and specifications for the project will be developed and any additional testing will be completed during the design phase. Design phase services have been estimated to be 20% of the construction costs. Testing for further sediment analysis has been assumed to be $50,000 for all alternatives. Construction phase engineering costs were projected to be 7.5% of the construction total.

It was assumed that all the sediment modeled as erodible is contaminated and will require removal. As previously discussed, contaminated sediment removal volumes and erodible areas are considered preliminary and will require additional testing to confirm quantities and associated costs.

The Dam Removal Total is the summation of the construction and engineering costs. This alternative is the lowest cost dam removal alternative because no additional work is completed to keep the mill race flowing.

Construction Cost - $4.6 million

Engineering Cost - $1.3 million

Land Rights - $0.03 million

Total Project Cost - $5.9 million

Alternative 2 – Channel Routed for Parking

DESCRIPTION

This alternative includes full dam removal and modifications to the mill race river intake system. The dam removal construction work will be the same as that described in Alternative 1. In this option, the existing culvert that brings flow to the mill race would be abandoned and a new open channel would be installed.

The new channel will start approximately 50 feet to the southwest of the current culvert location. It will cross the Fox River Trail at 90 degrees and then curve to match the perimeter of the parking lot where it will connect to the mill race at the current outlet location (see **Figure 33**). The entire outlet structure will be removed allowing for a smooth transition into the mill race. However, with no permanent control structure, a temporary device will be required to shut off flow for periodic maintenance purposes... The proposed 10’ deep channel has a 12’ flat bottom. Other channel configurations and cross sections are possible and will be refined and optimized during the design if this alternative is selected. The vertical portions of the channel would consist of concrete walls with a cap anchored to sheet pile to stabilize the channel banks. Due to the depth of the channel inside a park, handrails will be required for safety. The alternative would include a 12' x 7' box culvert to serve as a pedestrian bridge over the channel tying into the existing trail and will require minor tree removal along the channel.

Figure 34 shows a cross section view and a profile view for this alternative compared to existing conditions.

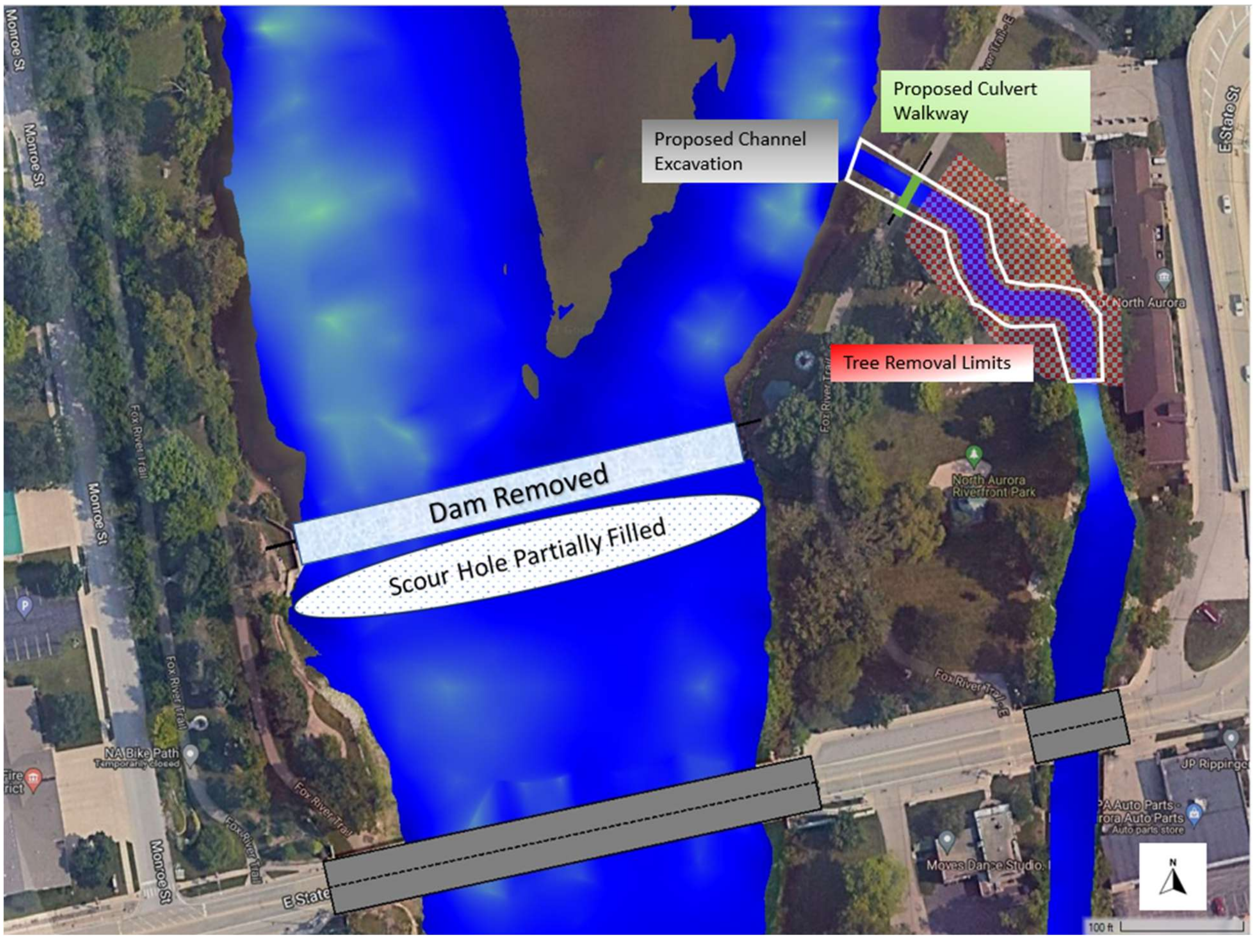
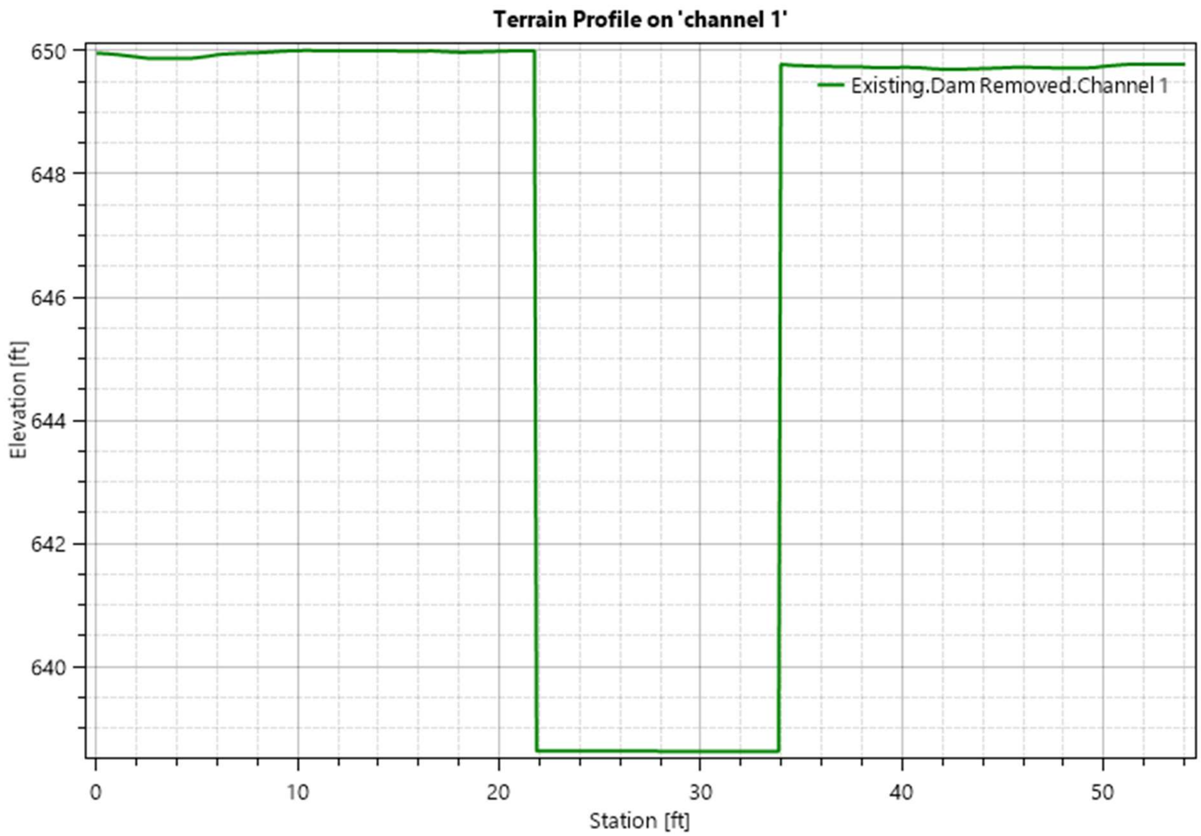


Figure 33. Alternative 2 - Channel Routed for Parking



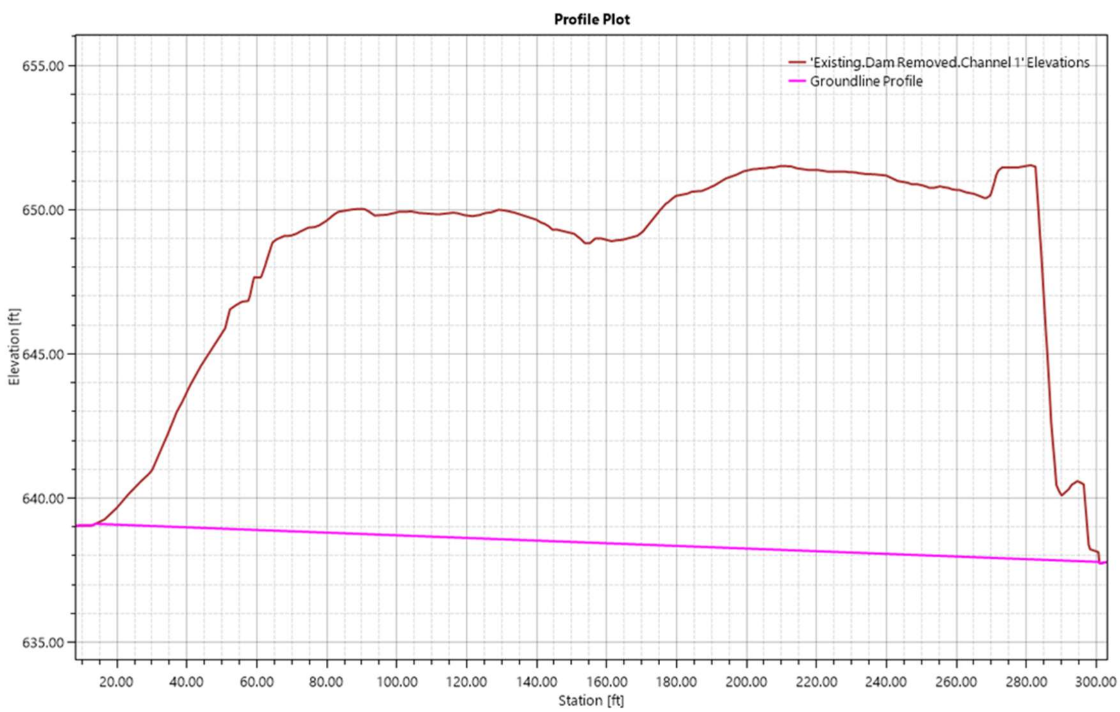


Figure 34. Alt. 2 - Channel Routed for Parking Cross Section and Profile

MODELING RESULTS

Table 8 provides a summary of the changes in water depth, velocities, mill race flows and mill race velocities for Alternative 2 compared to the baseline existing conditions model.

Table 8. Modeling Results for Alternative 2 - Channel Routed for Parking

	188 cfs			1,283 cfs		
	Existing	Alt 2	Difference	Existing	Alt 2	Difference
Water Depth (ft)	6.73	0.41	-6.32	7.08	1.47	-5.61
Velocities (ft/s)	0.05	1.11	1.06	0.46	2.39	1.93
Mill Race Flow (cfs)	83.36	12.6	-70.76	89.05	62.8	-26.25
Mill Race Velocities (ft/s)	1.30	0.39	-0.91	1.31	1.10	-0.21

During low flow condition, the depth of water is reduced by 6.32' immediately upstream of the dam for Alternative 2. Like Alternative 1, the differences in water depth are a bit smaller for the median flow condition since the low flow condition is the worst-case scenario.

The velocities increased to 1.11 and 2.39 ft/s at the location immediately upstream of the dam after the dam is removed during low and median river flows, respectively. Overall velocity changes throughout the rest of the reach are like those presented for Alternative 1 (see **Figure 32**).

Figure 35 is an inundation map that illustrates the depth changes both upstream and downstream before and after dam removal throughout the reach during the low flow condition. This map shows that the mill race continues to flow during low flow conditions. Additional inundation maps showing the depths and difference in depths for the low and median flow scenarios are provided in **Appendix E**.

When the dam is removed and the new inlet channel is constructed, the flow to the mill race at the low and median flow conditions is about 12.6 and 62.8 cfs, respectively. This alternative keeps flow to the mill race under low flow conditions, but it is about 85% lower than the current existing conditions. The mill race flow for the average river flow condition is about 29% lower. In general, during high flow conditions, the channel options bring higher flows to the mill race compared to culvert options. To maintain mill race flows, the proposed channels are deep with a large capacity thus increasing flows when the river is high. Further analysis will be required to optimize flows to the mill race during low flow conditions while also minimizing flooding in the mill race.

The velocities are much lower at the mill race during low flow conditions but not much lower during median events compared to the dam in place.

Low Flow Conditions

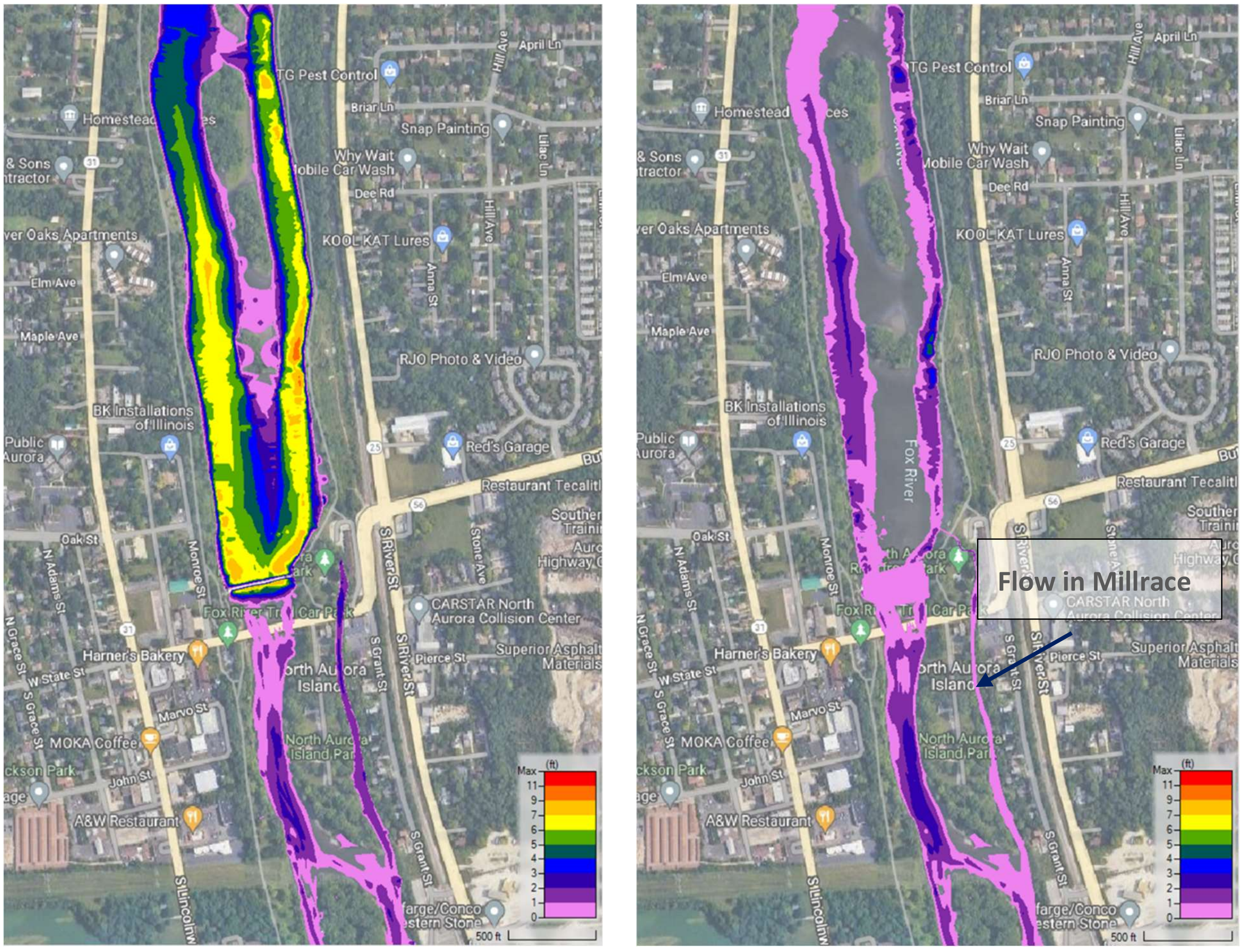


Figure 35. Inundation Map Showing Depths for Alternative 2 (right) Compared to the Baseline

ALTERNATIVE SUMMARY

The overall positive and negative consequences associated with this alternative are summarized below. Again, the general dam removal benefits have been outlined in the discussion for Alternative 1. This alternative meets the goal of the project to keep the mill race flowing at average flow scenarios, but the flow is less than at the existing conditions. This channel routing avoids the parking lot, but some trees will need to be removed along the channel. This alternative impacts the future Plaza layout since a new open channel will need to be accommodated. The open channel requires a 12’ x 7’ box culvert pedestrian bridge and surplus excavated material will likely need to be disposed off-site. By removing the water control structure, additional fish passage is allowed in the mill race if that is desired. However, this also eliminates any permanent flow control for the mill race.

Pros

- Maintains Mill Race flows
- No impacts to parking lot, stormwater collection system or sidewalks

Cons

- Impacts to the new Plaza
- Tree removal required
- Open channel hazard (deepest) and requires a new culvert bridge
- No permanant channel flow control
- Most expensive alternative

PROJECTED COSTS

The projected cost for Alternative 2 - Channel Routed for Parking is listed below. The costs associated with the full dam removal were outlined in the cost discussion for Alternative 1. The additional costs for this alternative are related to the excavation of the channel, mill race outlet structure removal, culvert bridge, railing and sheet pile/concrete wall installation. This alternative costs about 1.9 times more than only removing the dam (Alternative 1, removing sediment disposal costs for comparative purposes) due to the costs associated with the new channel. This channel depth is much greater than proposed for Alternative 3, so it has higher construction costs. Overall, this channel alternative is higher than all the culvert alternatives. This cost is the highest of all the alternatives.

- Construction Cost - $5.7 million
- Engineering Cost - $1.6 million
- Land Rights - $0.03 million
- Total Project Cost -$7.4 million

Alternative 3 – Channel South of Gazebo

DESCRIPTION

This alternative includes full dam removal and modifications to the mill race river inlet. This alternative is similar to Alternative 2 except the channel is routed south of the existing gazebo. This route was selected since flooding generally occurs in this vicinity during high flows. By placing a channel where the natural flooding occurs, the sheet flooding impacts to the Park could potentially be reduced. Plus, the channel depth is less for this location.

The dam removal construction work will be the same as that described in Alternative 1. Like Alternative 2, the existing culvert would be abandoned and a new channel will be installed. The channel would start approximately 80 feet downstream of the east dam abutment, which is currently washing out just west of the picnic table. It will meander through the low-lying area of the riverfront park and connect to the mill race approximately 200’ downstream of the existing outlet structure (see

Figure 36) which would be removed. Again, no permanent water control will be available with this option. The proposed 5’ deep channel has a 5’ flat bottom with a 3:1 side slope and a width of approximately 38’ at the top of the channel. Other channel configurations and cross sections are possible and will be refined and optimized during the design if this alternative is selected. This channel at 5’ deep is shallower than the 12’ deep channel proposed in Alternative 2. The slopes and bottom would be lined with riprap but would not require vertical wall protection. A 5’ x 3’ box culvert would be used to serve as a pedestrian bridge over the channel. A portion of the two sidewalks in the Park, south of the new channel, would need to be reconfigured. The area from the existing water control structure to where the proposed channel meets the mill race will dry out and will need to be filled and regraded.

Figure 37 shows a cross section view and a profile view for this alternative compared to existing conditions.

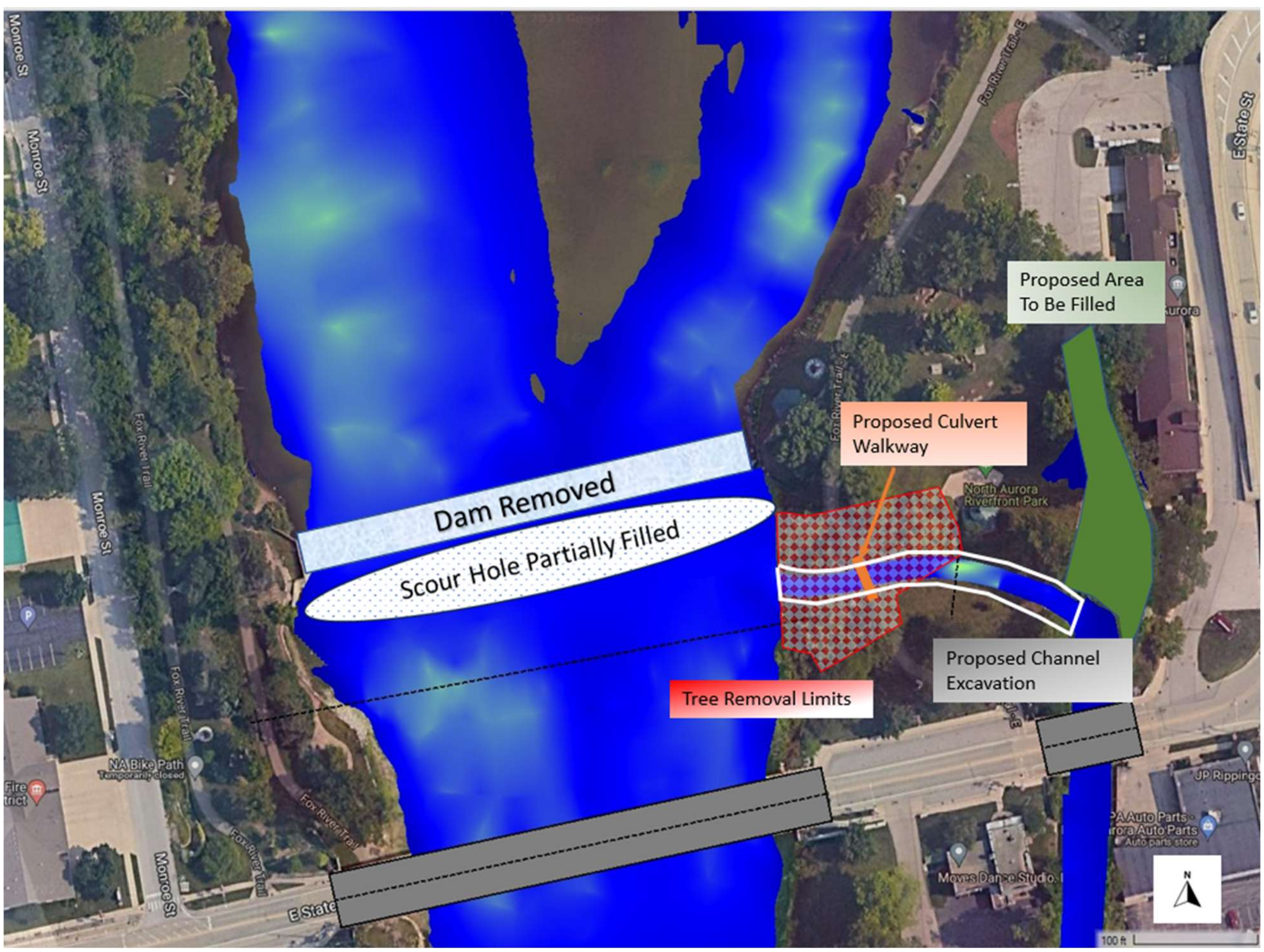
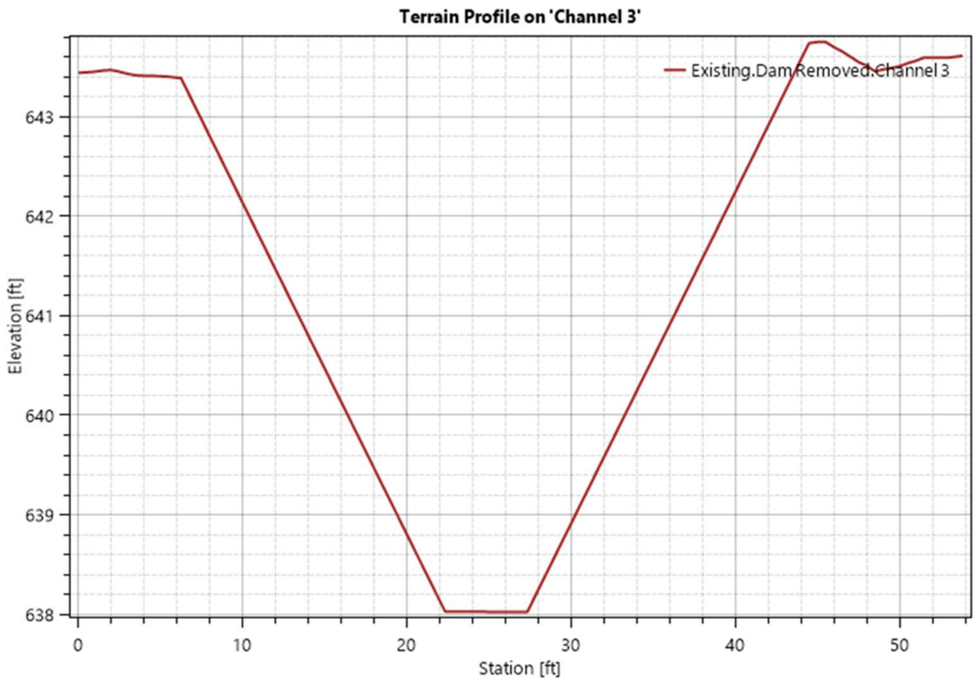


Figure 36. Alternative 3 - Channel South of Gazebo



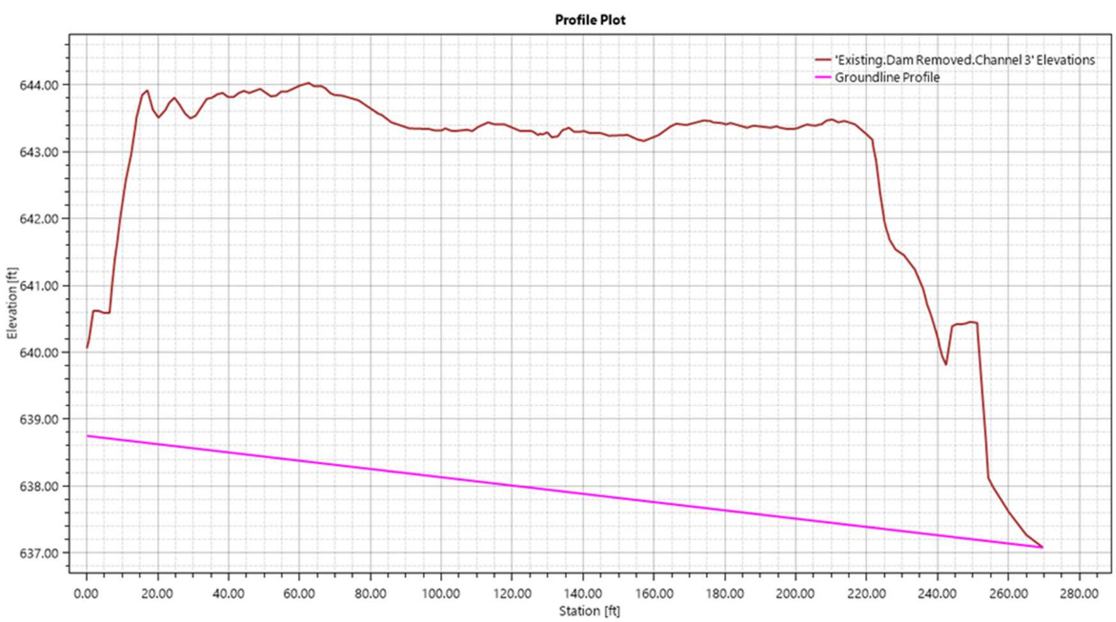


Figure 37. Alt. 3 - Channel South of Gazebo Cross Section and Profile

MODELING RESULTS

Table 9 provides a summary of the changes in water depth, velocities, mill race flows and mill race velocities for Alternative 3 compared to the baseline model.

Table 9. Modeling Results for Alternative 3 - Channel South of Gazebo

	188 cfs			1,283 cfs		
	Existing	Alt 3	Difference	Existing	Alt 3	Difference
Water Depth (ft)	6.73	0.38	-6.35	7.08	1.53	-5.55
Velocities (ft/s)	0.05	1.22	1.17	0.46	2.77	2.31
Mill Race Flow (cfs)	83.36	2.1	-81.26	89.05	15.1	-79.95
Mill Race Velocities (ft/s)	1.30	0.10	-1.2	1.31	0.46	-0.85

During low river flow conditions, the depth of water is reduced by 6.35' immediately upstream of the dam for Alternative 3 compared to the existing conditions. Like the previous alternatives, the differences in water depth are a bit smaller for the median flow condition since the low flow condition is the worst-case scenario.

The velocities increased to 1.22 and 2.77 ft/s at the location immediately upstream of the dam after the dam is removed during low and median river flows, respectively. Overall velocity changes throughout the rest of the reach are similar to those presented for Alternative 1 (see **Figure 32**).

Figure 38 is an inundation map that illustrates the depth changes both upstream and downstream before and after dam removal throughout the reach during the low flow condition. This map shows that the mill race continues to flow during low flow conditions. The water depths are almost the same as those from the other channel option (Alternative 2). Additional inundation maps showing the differences in depths and velocities for both the low and median flows are provided in **Appendix E**.

When the dam is removed and the new inlet channel is constructed, the flow to the mill race at the low and median flow conditions is about 2.1 and 15.1 cfs, respectively. This alternative keeps flow to the mill race under low flow conditions, but it is about 97% lower than the current existing conditions. The mill race flow for the average river flow condition is about 83% lower. This channel configuration brings much lower flow during low and median river flow conditions compared to the first channel location (Alternative 2). The mill race flows are limited by the smaller size of the culvert pedestrian bridge for this channel alternative.

The velocities are much lower at the mill race during low flow conditions and somewhat lower during median events compared to the dam in place. Mill race velocity levels are lower than for the other channel configuration.

Low Flow Conditions

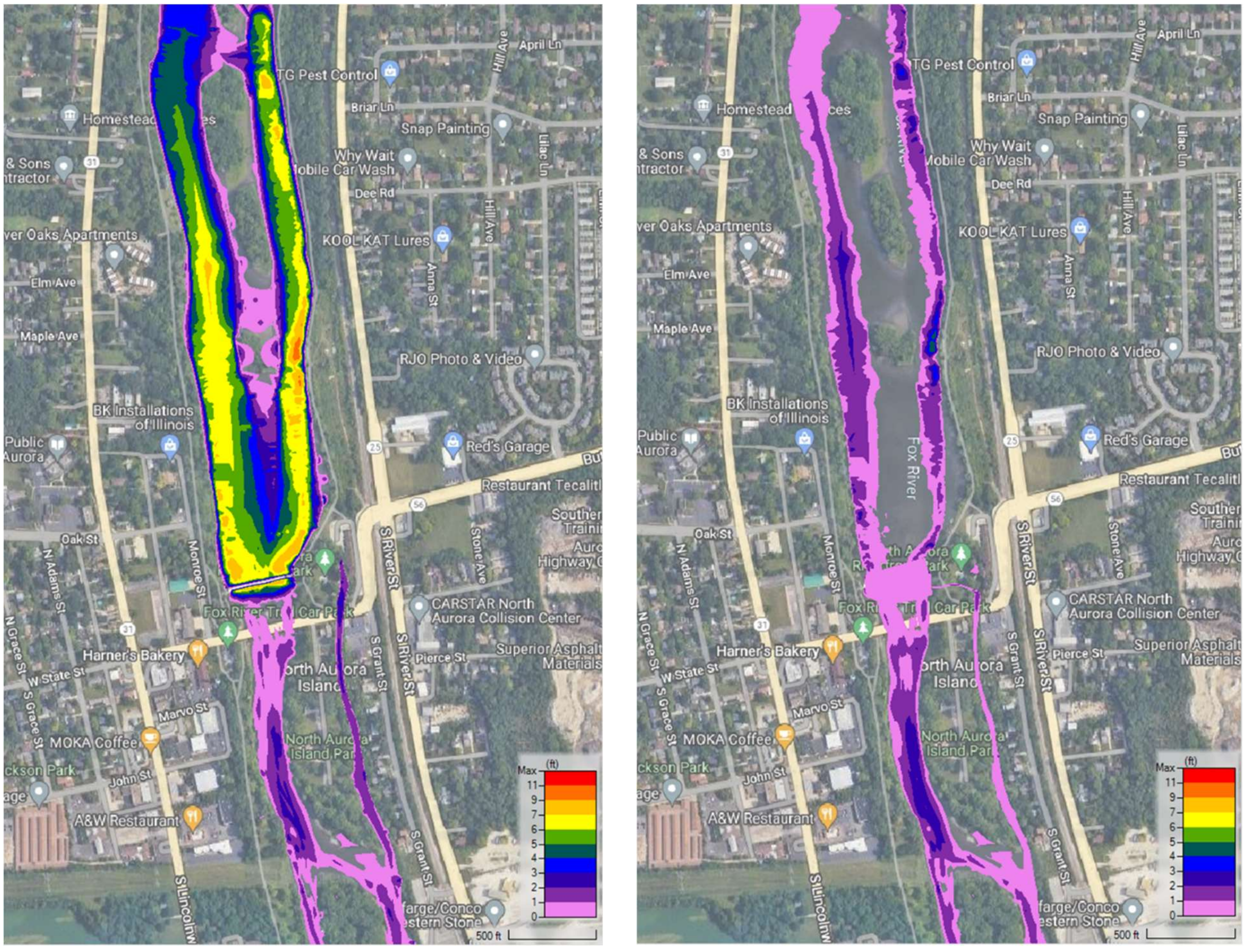


Figure 38. Inundation Map Showing Depths for Alternative 3 (right) Compared to the Baseline

ALTERNATIVE SUMMARY

The overall positive and negative consequences associated with this alternative are summarized below. Again, the general dam removal benefits have been outlined in the discussion for Alternative 1. This alternative meets the goal to keep the mill race flowing at average flow scenarios, but the flow is less than at the existing conditions. This channel routing avoids the parking lot. Trees will still need to be removed but less than needed for Alternative 2. Impacts are greater for the new Plaza since much of the overlooking water features will be filled in. The open channel requires a 5’ x 3’ box culvert pedestrian bridge, and some sidewalk reconfiguration is needed south of the new channel. Due to the lack of depth in the channel, flow to the mill race is substantially impacted. The culvert bridge is smaller than that needed for the first channel alternative since the channel depth is less and it crosses a sidewalk in this location compared to the wider bike/hike trail. By removing the water control structure, additional fish passage is allowed in the mill race if that is desired. However, this also eliminates permanent flow control for the mill race. Compared to Alternative 2, this channel is less deep requiring less overall excavation. Since some of the mill race requires fill, surplus materials can be reused on site.

Pros

- Maintains Mill Race flows
- No impacts to parking lot or stormwater collection system
- Less Deep Channel
- Less expensive than culvert alternatives

Cons

- Impacts to the new Plaza
- Tree removal required
- Open channel hazard and requires a new culvert bridge
- Requires sidewalk repairs
- Portion of Mill Race filled in
- No permanent Mill Race flow control

PROJECTED COSTS

The projected cost for Alternative 3 - Channel South of Gazebo is listed below. The costs associated with the full dam removal were outlined in the cost discussion for Alternative 1. The additional costs are related to the excavation of the channel, mill race outlet structure removal, culvert bridge and riprap for channel lining. This alternative costs about 1.2 times more than only removing the dam (Alternative 1, removing sediment disposal costs for comparative purposes) The cost of this channel is about half of the other channel configuration (Alt. 2) since the channel is much shallower, needs less bank protection and requires a smaller culvert bridge.

- Construction Cost - $4.8 million
- Engineering Cost - $1.4 million
- Land Rights - $0.03 million
- Total Project Cost- $6.2 million

Alternative 4 – Deeper Culvert at Existing Location

DESCRIPTION

The first alternative (dam removal only) showed that the mill race would dry up in both low and average river flow conditions when using the existing culvert inlet. The next few alternatives evaluate options to bring water to the mill race using new culvert layouts and configurations. The 54” diameter existing culvert runs under the parking lot and was originally designed to bring water to the mill race when the water was pooled behind the dam. When those pool levels go down after the dam is removed, the culvert will either need to be larger, a different shape, deeper or laid out differently to still bring water to the mill race.

Before culvert alternatives were selected, an initial review was taken to determine the optimal culvert sizing and shape while also comparing costs. Circular, arch, box and ellipse shapes were all part of the original evaluation. The initial review indicated that use a concrete Arch Pipe (58x36 or 48” Equivalent Round Structure [EQRS]) was optimal (see **Appendix G** for further data). This pipe shape and size was chosen based on its ability to convey more water at lower flows than a round pipe. Also, the 48” EQRS was cheaper than the 54” EQRS with minimal difference in flows at the low flow condition. However, if a new culvert is selected, culvert sizing and shape will be further refined and optimized during design.

Alternative 4 includes full dam removal and construction of a new deeper culvert in the same route as the existing culvert (see **Figure 39**). The upstream and downstream inverts will be lowered 2.53’ (elevation 638.1’) and 2.5’ (elevation 637.8’), respectively. This alternative requires cutting a channel in the river upstream of the inlet to divert flow from the river channel to this deeper culvert (as illustrated in this example). Another option would be to extend the new culvert farther out into the river, but it would need to be marked for recreational safety. For all culvert alternatives, the mill race water control structure will be replaced and the new culvert will discharge into the mill race. Village staff can decide if water control is needed in the new mill race intake system but for purposes of this report, costs have been included. A flared end section will be added to the discharge point which will empty onto a new layer of riprap to prevent erosion in the mill race. The existing culvert will need to be removed and the new culvert will be installed in the same configuration as the current culvert.

Figure 39. Alternative 4 - Deeper Culvert at Existing Location

The culvert replacement under the parking lot will require some asphalt repair work and a new parking area stormwater collection intake located at the southern drop inlet location. Instead of an inlet box with a smaller pipe tying into the control structure, the parking lot would drain directly into the manhole of the new culvert. It would be located where the culvert changes direction to line up with the mill race. This new inlet structure will consist of a manhole with an open grate lid to connect the north inlet with the mill race flow from the river while retaining stormwater drainage for the parking lot.

MODELING RESULTS

Table 10 provides a summary of the changes in water depth, velocities, mill race flows and mill race velocities for Alternative 4 compared to the baseline existing conditions model.

Table 10. Modeling Results for Alternative 4 - Deeper Culvert at Existing Location

	188 cfs			1,283 cfs		
	Existing	Alt 4	Difference	Existing	Alt 4	Difference
Water Depth (ft)	6.73	0.35	-6.38	7.08	1.54	-5.54
Velocities (ft/s)	0.05	1.13	1.08	0.46	2.89	2.43
Mill Race Flow (cfs)	83.36	17.85	-65.51	89.05	59.18	-29.87
Mill Race Velocities (ft/s)	1.30	0.51	-0.79	1.31	1.01	-0.30

During low river flow conditions, the depth of water is reduced by 6.38' immediately upstream of the dam for Alternative 4 compared to the existing conditions. Similar to the previous alternatives, the differences in water depth are a bit smaller for the median flow condition since the low flow condition is the worst-case scenario.

The velocities increased to 1.13 and 2.89 ft/s at the location immediately upstream of the dam after the dam is removed during low and median river flows, respectively. Overall velocity changes throughout the rest of the reach are like those presented for Alternative 1 (see **Figure 32**).

Figure 40 is an inundation map that illustrates the depth changes both upstream and downstream before and after dam removal throughout the reach during the low flow condition. This map shows that the mill race continues to flow during low flow conditions. The water depths are almost the same as those from the channel options (Alts. 2 and 3). Additional inundation maps showing the depths and difference in depths for both the low and median flows are provided in **Appendix E**.

When the dam is removed and the new inlet culvert is constructed, the flow to the mill race at the low and median flow conditions is about 17.8 and 59.1 cfs, respectively. This alternative keeps flow to the mill race under low flow conditions, but it is about 79% lower than the current existing conditions. The mill race flow for the average river flow condition is about 34% lower. This culvert configuration brings more flow during low river flow conditions compared to the channel configurations. During median flow conditions, the culvert brings about the same flow as the first open channel option and much more than the second channel configuration. Since the culvert inlet is deeper, more driving head is available to the mill race during the low flow condition compared to the channel options. The culvert size limits the amount of flow during higher river flow conditions since the flow is contained within the pipe walls. Therefore, the open channels in theory can carry more flow during higher flow conditions. However, the open channel flows are limited though by the size of the culvert pedestrian bridge in both cases. If a culvert alternative is selected, the sizing can be increased to carry additional flow to the mill race if requested by the community but at a higher cost than outlined herein.

The velocities are lower at the mill race during low flow conditions but not much lower during median events compared to the dam in place. The velocities for both low and median flow options are generally a bit higher at the model reading location compared to the first open channel option and much higher than the second.

Low Flow Conditions

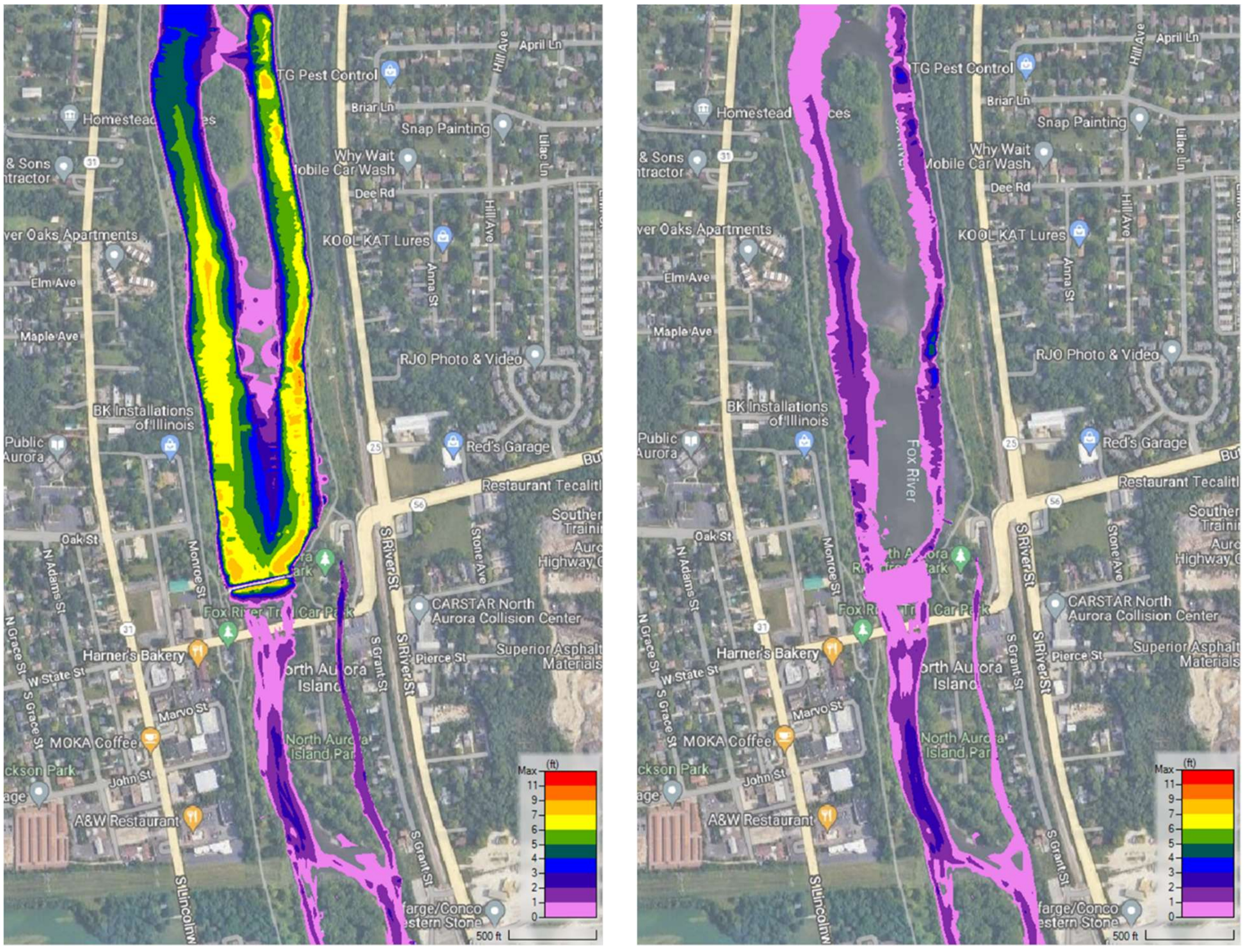


Figure 40. Inundation Map Showing Depths for Alternative 4 (right) Compared to the Baseline

ALTERNATIVE SUMMARY

The overall positive and negative consequences associated with this alternative are summarized below. Again, the general dam removal benefits have been outlined in the discussion for Alternative 1. This alternative meets the goal to keep the mill race flowing at average flow scenarios. This culvert routing does not avoid the parking lot at all. The old culvert will need to be removed/disposed and the parking lot will require repair. Trees will still need to be removed but to a lesser extent than the channel routed for parking (Alternative 2). There are no impacts to the future Plaza or park space. Compared to channel construction options, no culvert bridge is need and there will be no open channel safety hazards. Since a new water control structure is added, maintenance will be easier compared to the open channels. However, there will be minor parking area stormwater modifications required.

Pros

- Maintains Mill Race flows (slightly more flow at low river flow conditions)
- Minimal impacts to new Plaza
- No open channel hazard or new culvert bridge needed
- No sidewalk repair
- Less surplus material to haul (no channel excavation)
- New Mill Race flow control

Cons

- Tree removal required (minor)
- Impacts to parking lot and stormwater collection system

PROJECTED COSTS

The estimated cost for Alternative 4 – Deeper Culvert at Existing Location is listed below. The costs associated with the full dam removal were outlined in the cost discussion for Alternative 1. The additional costs are related to the construction of the culvert, removal of the old culvert, mill race outlet structure removal/replacement and stormwater modifications. This alternative costs about 1.3 times more than only removing the dam (Alternative 1, removing sediment disposal costs for comparative purposes) since a new culvert is added to keep the mill race flowing. This culvert option is less expensive compared to the first open channel alternative and about the same cost as the second. The total cost lies between the costs for the other two culvert alternatives.

- Construction Cost - $4.9 million
- Engineering Cost - $1.4 million
- Land Rights - $0.03 million
- Total Project Cost - $6.4 million

Alternative 5 – New Culvert Routed around Parking

DESCRIPTION

This next alternative was selected to compare the mill race flows and the costs of a new culvert routed around to the parking lot. Alternative 5 includes full dam removal and construction of a new 48” EQRS culvert (see **Figure 41**). The upstream and downstream inverts will be at elevation 638.75’ and elevation 638.4’), respectively. The upstream culvert invert was chosen to maintain flow to the mill race and downstream invert was to keep the same slope as the existing culvert. This alternative requires extending the new culvert farther out into the river (as illustrated in this example). Another option would be to cut a channel in the river upstream of the inlet to divert flow from the river channel to this new culvert. If the culvert is extended, some form of marking would be required for safety. Like Alternative 4, the new culvert will discharge directly into the mill race using a flared end section and riprap to prevent erosion. A new water control structure will be added to facilitate pipeline maintenance. This culvert replacement work will interfere with a minor section of the existing culvert that will need to be removed and minimal asphalt repair work will be required. However, both of these impacts are less with this alternative compared to the first culvert layout. To avoid the parking lot, the culvert bends in three locations which will require three new closed lid manholes. The existing south stormwater inlet in the parking lot will be tied into the third new manhole closest to the mill race. No other parking lot stormwater collection changes are required.

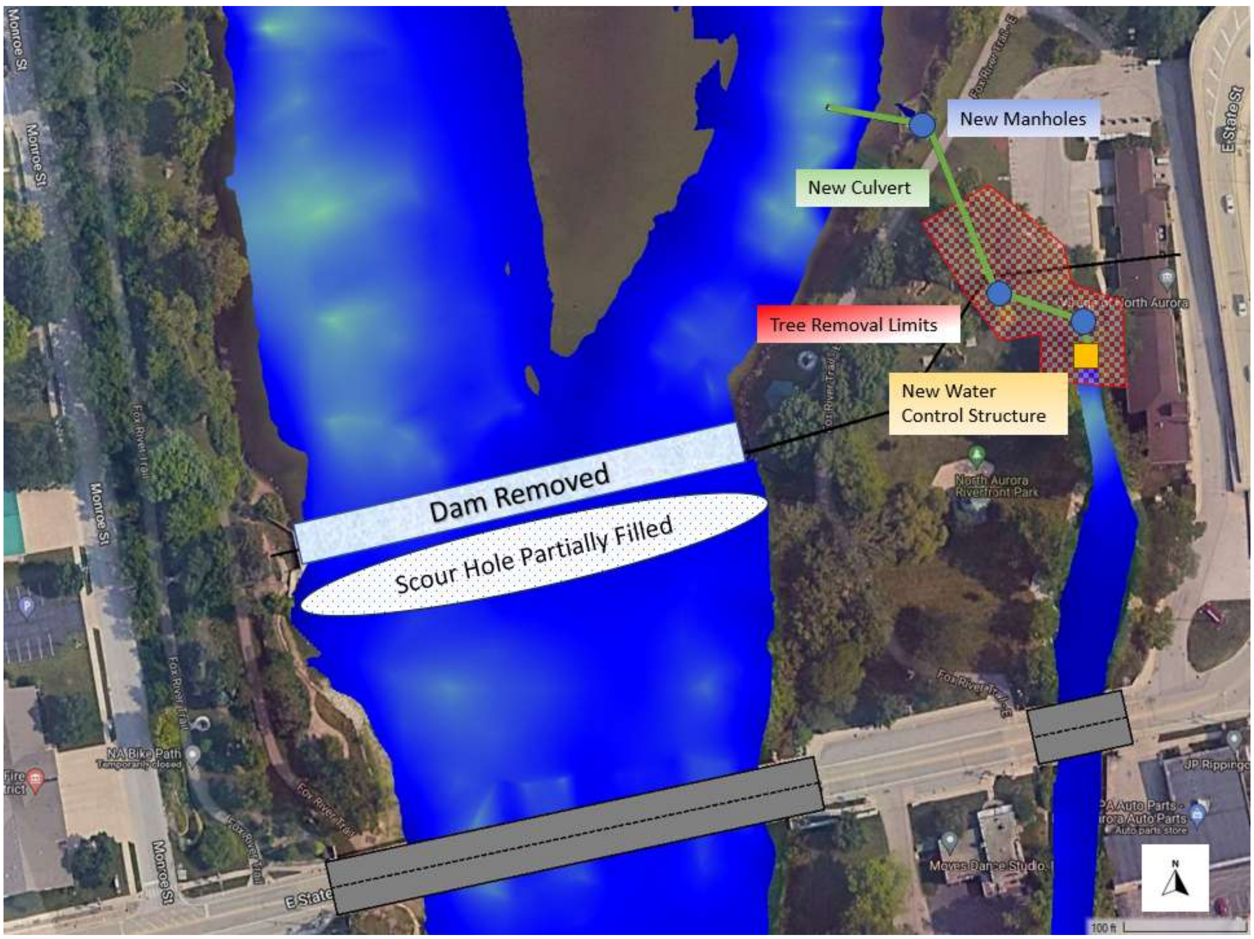


Figure 41. Alternative 5 - New Culvert Routed around Parking

MODELING RESULTS

Table 11 provides a summary of the changes in water depth, velocities, mill race flows and mill race velocities for Alternative 5 compared to the baseline existing conditions model.

Table 11. Modeling Results for Alternative 5 - New Culvert Routed around Parking

	188 cfs			1,283 cfs		
	Existing	Alt 5	Difference	Existing	Alt 5	Difference
Water Depth (ft)	6.73	0.35	-6.38	7.08	1.53	-5.55
Velocities (ft/s)	0.05	1.18	1.13	0.46	2.80	2.34
Mill Race Flow (cfs)	83.36	13.51	-69.85	89.05	54.6	-34.45
Mill Race Velocities (ft/s)	1.30	0.435	-0.865	1.31	1.002	-0.308

During the low flow condition, the depth of water is reduced by 6.38' immediately upstream of the dam for Alternative 5 compared to the existing conditions. Like the previous alternatives, the differences in water depth are a bit smaller for the median flow condition since the low flow condition is the worst-case scenario.

The velocities increased to 1.18 and 2.8 ft/s at the location immediately upstream of the dam after the dam is removed during low and median river flows, respectively. Overall velocity changes throughout the rest of the reach are similar to those presented for Alternative 1 (see **Figure 32**).

Figure 42 is an inundation map that illustrates the depth changes both upstream and downstream before and after dam removal throughout the reach during the low flow condition. This map shows that the mill race continues to flow during low flow conditions. The water depths are almost the same as those from the channel options and the first culvert configuration. Additional inundation maps showing the depths and difference in depths for both the low and median flows are provided in **Appendix E**.

When the dam is removed and the new inlet culvert is constructed, the flow to the mill race at the low and median flow conditions is about 13.5 and 54.6 cfs, respectively. This alternative keeps flow to the mill race under low flow conditions, but it is about 84% lower than the current existing conditions. The mill race flow for the average river flow condition is about 39% lower. As previously discussed, the culvert size limits the amount of flow during higher river flow conditions compared to the open channel options. However, if a culvert alternative is selected, the sizing can be increased to carry additional flow if requested by the community but at a higher cost than outlined herein.

The velocities are lower at the mill race during low flow conditions and median river flow events compared to the dam in place. The velocities are generally a bit higher compared to the two open channel options and the same as the first culvert configuration.

Low Flow Conditions

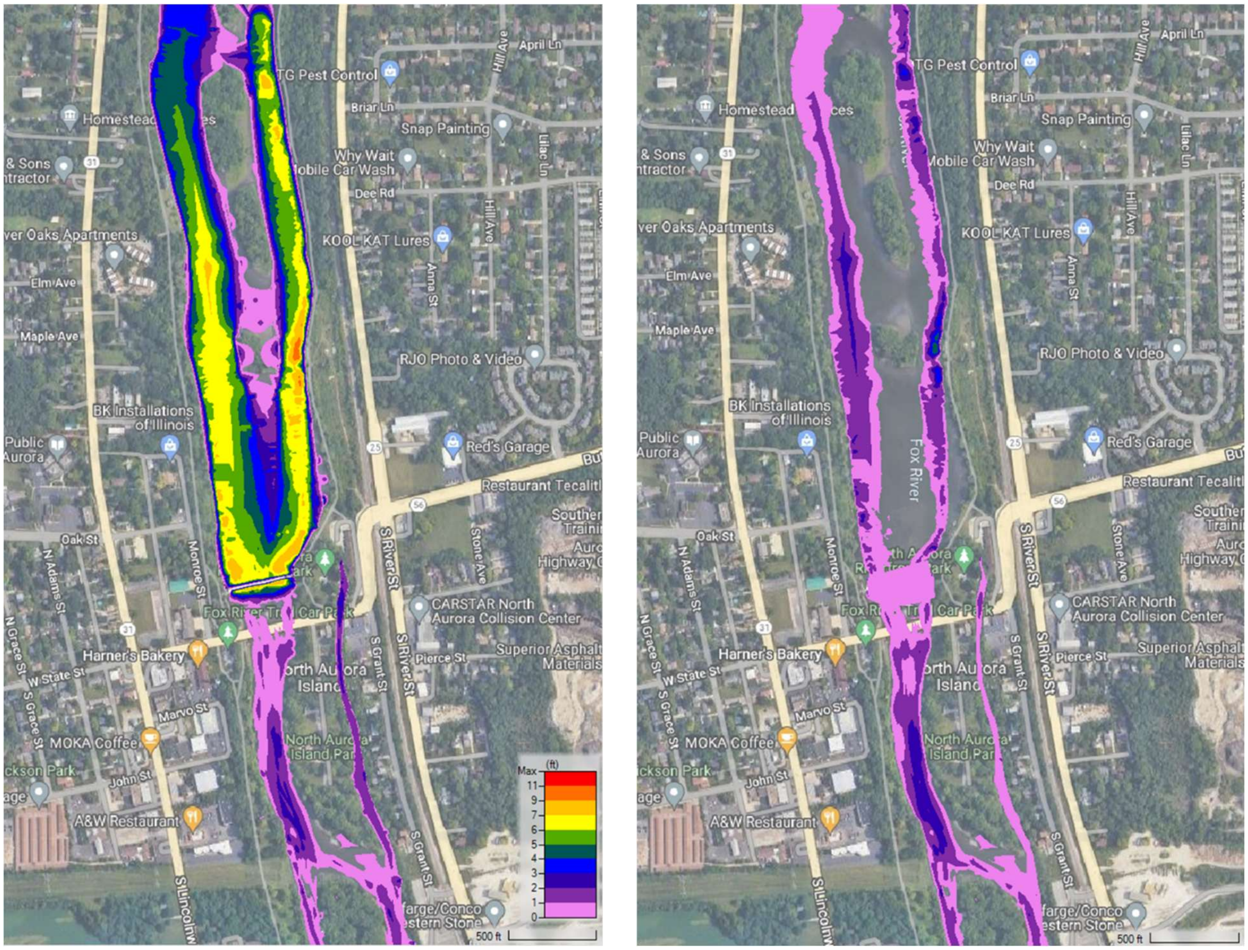


Figure 42. Inundation Map Showing Depths for Alternative 5 (right) Compared to the Baseline

ALTERNATIVE SUMMARY

The overall positive and negative consequences associated with this alternative are summarized below. Again, the general dam removal benefits have been outlined in the discussion for Alternative 1. This alternative meets the goal to keep the mill race flowing at average flow scenarios, but the flow is less than at the existing conditions. This culvert configuration avoids impacting the parking lot except for a small area. Most of the existing culvert can remain in place. Minimal changes are required for the parking lot stormwater collection system. Since a new water control structure is added, maintenance will be easier compared to the open channels. Trees will need to be removed. There are no impacts to the future Plaza or park space. Compared to channel construction, no new culvert bridge is needed and there will be no open channel safety hazards.

Pros

- Maintains Mill Race flows (slightly more flow at low river flow conditions)
- Minimal impacts to the new Plaza
- No open channel hazard or new footbridges needed
- Minimal impacts to the parking lot, stormwater collection system or sidewalks
- Less surplus material (no channel excavation)
- New Mill Race flow control
- Can abandon existing culvert so no removal costs

Cons

- Tree removal required
- 3 new manholes needed

PROJECTED COSTS

The estimated cost for Alternative 5 – New Culvert Routed around Parking is listed below. The costs associated with the full dam removal were outlined in the cost discussion for Alternative 1. The additional costs are related to the construction of the culvert, mill race outlet structure removal/replacement and stormwater modifications. This alternative costs about 1.3 times more than only removing the dam (Alternative 1) since a new culvert is added to keep the mill race flowing. This culvert option is less expensive compared to the first open channel alternative and a little more than the second. It is the highest cost culvert alternative, but it is just a little more costly compared to the first and third alternatives.

- Construction Cost - $5.0 million
- Engineering Cost - $1.4 million
- Land Rights - $0.03 million
- Total Project Cost - $6.4 million

ALTERNATIVE 6 – NEW STRAIGHT CULVERT

DESCRIPTION

This alternative consists of removing the dam and replacing the existing culvert with a 48” EQRS arch pipe. The upstream invert is at 638.1’ and the downstream invert is lowered to 637.8’. For this alternative, the pipe inlet is located slightly southwest of the current culvert location and the outlet would be just south of the current concrete outlet structure. This would allow for the culvert to be placed in a straight line and have no obstructions (see **Figure 43**) with the hope to reduce pipeline flow losses due to directional changes. A channel would also be cut from the center of the river to the inlet, or the new culvert could be extended. This option is very similar to the previous culvert alternatives and will include a flared end section and new water control structures. Minimal existing culvert removal will be required along with the minimal parking lot repairs. No new manholes are required since the pipeline is straight. Trees will need to be removed for this configuration. The existing parking lot stormwater collection system will tie into the new water control structure similar to how it does now.

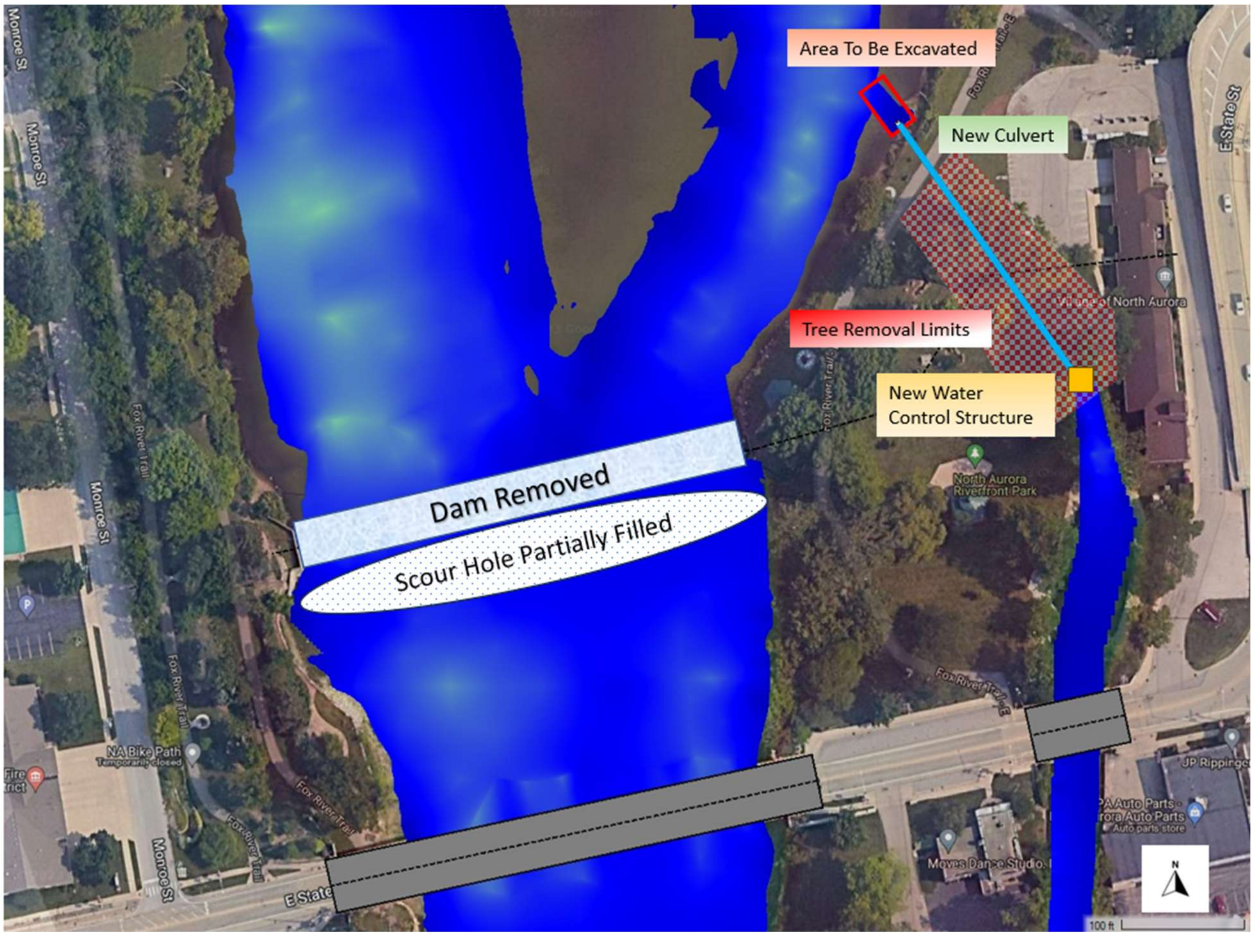


Figure 43. Alternative 6 - New Straight Culvert

MODELING RESULTS

Table 12 provides a summary of the changes in water depth, velocities, mill race flows and mill race velocities for Alternative 6 compared to the baseline existing conditions model.

Table 12. Modeling Results for Alternative 6 - New Straight Culvert

	188 cfs			1,283 cfs		
	Existing	Alt 6	Difference	Existing	Alt 6	Difference
Water Depth (ft)	6.73	0.35	-6.38	7.08	1.54	-5.54
Velocities (ft/s)	0.05	1.13	1.08	0.46	2.43	2.34
Mill Race Flow (cfs)	83.36	25.39	-57.97	89.05	65.93	-23.12
Mill Race Velocities (ft/s)	1.30	0.638	-0.662	1.31	1.076	-0.234

During the low flow condition, the depth of water is reduced by 6.38' immediately upstream of the dam for Alternative 6 compared to the existing conditions. Like the previous alternatives, the differences in water depth are a bit smaller for the median flow condition since the low flow condition is the worst-case scenario.

The velocities increased to 1.13 and 2.43 ft/s at the location immediately upstream of the dam after the dam is removed during low and median river flows, respectively. Overall velocity changes throughout the rest of the reach are similar to those presented for Alternative 1 (see **Figure 32**).

Figure 44 is an inundation map that illustrates the depth changes both upstream and downstream before and after dam removal throughout the reach during the low flow condition. This map shows that the mill race continues to flow during low flow conditions. The water depths are almost the same as those from the channel options and the other culvert configurations. Additional inundation maps showing the depths and difference in depths for both the low and median flows are provided in **Appendix E**.

When the dam is removed and the new inlet channel is constructed, the flow to the mill race at the low and median flow conditions is about 25.4 and 65.9 cfs, respectively. This alternative keeps flow to the mill race under low flow conditions, but it is about 70% lower than the current existing conditions. The mill race flow for the average river flow condition is about 26% lower. While less than with the dam in place, this culvert configuration brings the most flow during low and median river flow conditions compared to channel or other culvert options. Flow rates are higher when flowing through a straight pipe as opposed to those with bends. As previously discussed, the culvert size limits the amount of flow during higher river flow conditions compared to the open channel options. However, if a culvert alternative is selected, the sizing can be increased to carry additional flow if requested by the community but at a higher cost than outlined herein.

The velocities are lower at the mill race during low flow conditions but not much lower during median events compared to the dam in place. The velocities are generally a bit higher compared to the two open channel options and the other culvert configurations since more flow is entering the system.

Low Flow Conditions

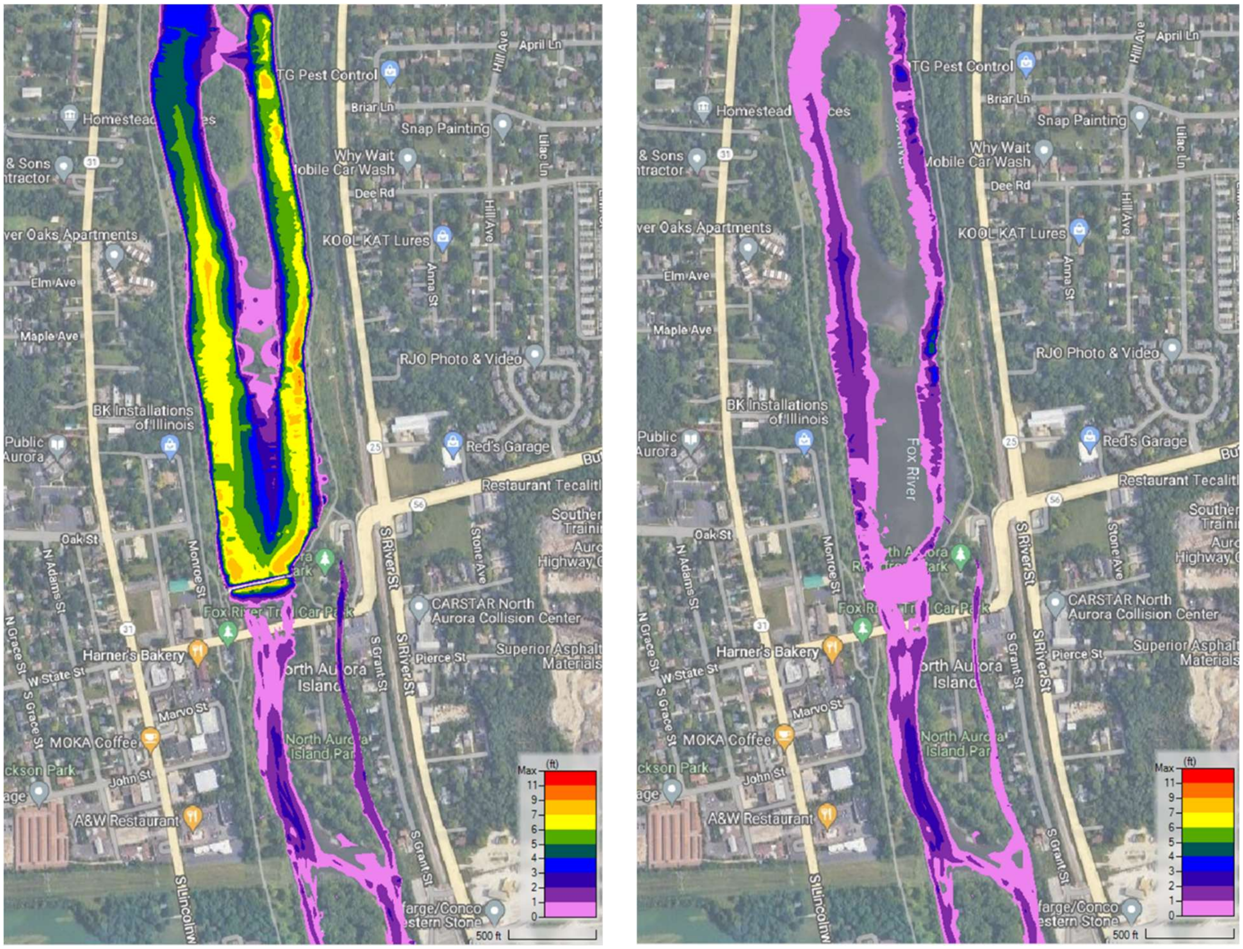


Figure 44. Inundation Map Showing Depths for Alternative 6 (right) Compared to the Baseline

ALTERNATIVE SUMMARY

The overall positive and negative consequences associated with this alternative are summarized below. Again, the general dam removal benefits have been outlined in the discussion for Alternative 1. This alternative meets the goal to keep the mill race flowing at average flow scenarios, but the flow is less than at the existing conditions. This culvert configuration avoids impacting the parking lot except for a small area. Most of the existing culvert can remain in place. Minimal changes are required for the parking lot stormwater collection system. Since a new water control structure is added, maintenance will be easier compared to the open channels. More trees will need to be removed compared to the first culvert option. There are no impacts to the future Plaza or park space. Compared to channel construction, no culvert bridge is needed and there will be no open channel safety hazards.

Pros

- Maintains Mill Race flows (most at low river flow conditions of all culverts)
- Minimal impacts to the new Plaza
- No open channel hazard or new culvert bridge needed
- Minimal impacts to parking lot, stormwater collection system or sidewalks
- Less surplus material (no channel excavation)
- New Mill Race flow control
- Can abandon existing culvert so no removal costs
- Least costly culvert option

Cons

- Tree removal required

PROJECTED COSTS

The estimated cost for Alternative 6 – New Straight Culvert is listed below. The costs associated with the full dam removal were outlined in the cost discussion for Alternative 1. The additional costs are related to the construction of the culvert, mill race outlet structure removal/replacement and stormwater modifications. This alternative costs about 1.25 times more than only removing the dam (Alternative 1) since a new culvert is added to keep the mill race flowing. This culvert option is less expensive compared to the first and a just little more than the second open channel option. It is the least costly culvert alternative.

- Construction Cost - $4.9 million
- Engineering Cost - $1.4 million
- Land Rights - $0.03 million
- Total Project Cost- $6.3 million

Alternative 7 – One Riffle at Intake

DESCRIPTION

This alternative proposes adding a riffle (rock feature) in the river downstream of the intake to help bring additional water to the mill race inlet. This alternative includes a single riffle located immediately downstream of the existing culvert. Riffles occur naturally in streams and help promote healthy aquatic habitat by improving the oxygenation of the water when water flow is agitated by rock formations. Riffles can also be man-made by adding rock features in a stream. A riffle is typically a relatively shallow increase in the channel bed over the span of the channel cross section. This causes water to be turbulent and flow faster. The riffle can raise the water surface upstream of the riffle. For this alternative, the riffle will create a higher water surface upstream of the mill race inlet during lower flows which provides additional flow to the culvert. The riffle would extend northwest approximately 280' crossing the eastern portion of the river and have an elevation of 642' compared to the channel bottom at 639.26' (see **Figure 45**) but these dimensions and elevation would be refined during design. This elevation was selected to match the invert elevation of the existing mill race invert. It was assumed that riprap (Class A5) would be used to build the riffles. Riffle rock size will be optimized during the design phase. For purposes of this evaluation, it was assumed that no changes are made to mill race inlet or inlet culvert so the impacts of only adding the riffle could be determined. .

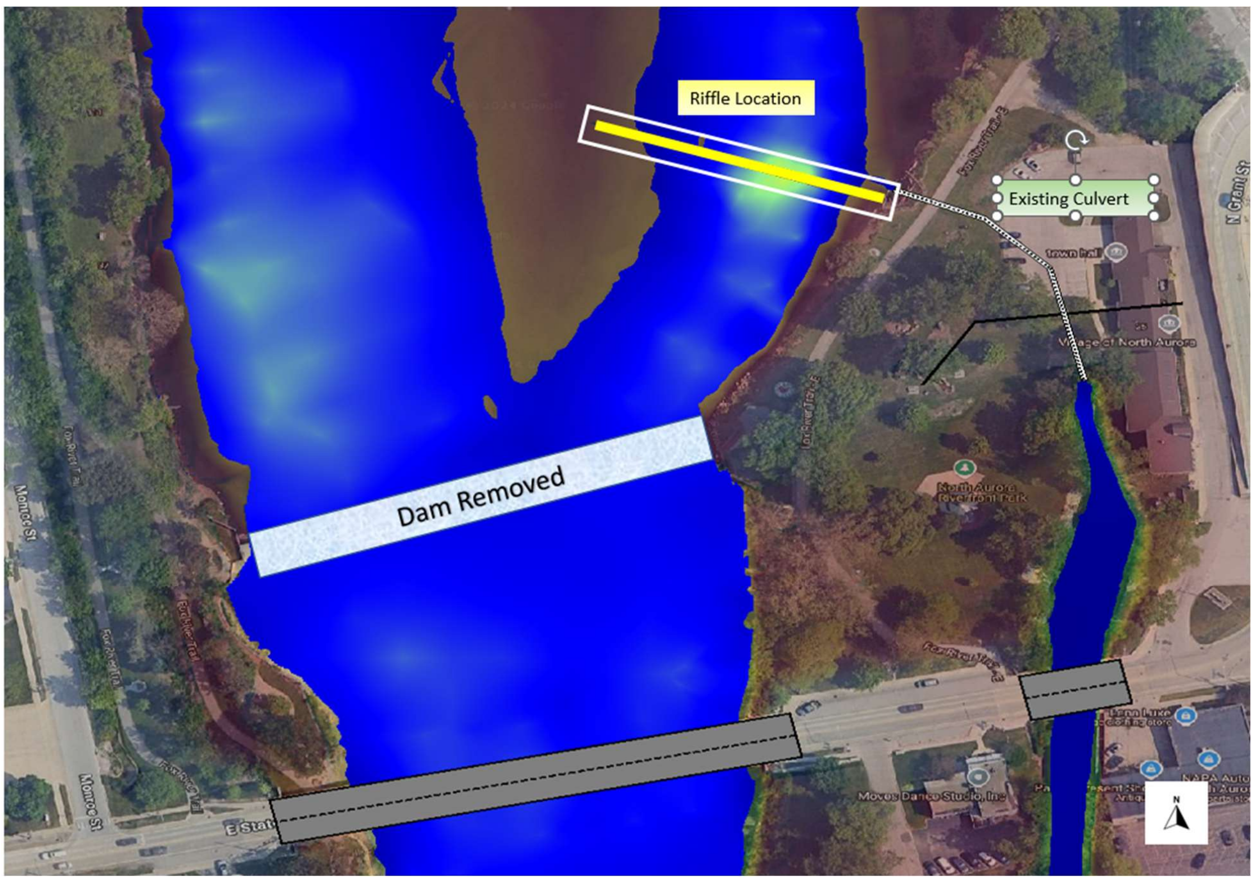


Figure 45. Alternative 7 - One Riffle at Intake

MODELING RESULTS

Table 13 provides a summary of the changes in water depth, velocities, mill race flows and mill race velocities for Alternative 7 compared to the baseline existing conditions model.

Table 13. Modeling Results for Alternative 7 - One Riffle at Intake

	188 cfs			1,283 cfs		
	Existing	Alt 7	Difference	Existing	Alt 7	Difference
Water Depth (ft)	6.73	0.32	-6.41	7.08	1.56	-5.52
Velocities (ft/s)	0.05	1.29	1.24	0.46	2.88	2.42
Mill Race Flow (cfs)	83.36	18.2	-65.16	89.05	25.8	-63.25
Mill Race Velocities (ft/s)	1.30	0.34	-0.96	1.31	0.45	-0.86-

During the low flow condition, the depth of water is reduced by 6.41' immediately upstream of the dam for Alternative 7 compared to the existing conditions. Like the previous alternatives, the differences in water depth are a bit smaller for the median flow condition since the low flow condition is the worst-case scenario.

The velocities increased to 1.29 and 2.88 ft/s at the location immediately upstream of the dam after the dam is removed during low and median river flows, respectively. Overall velocity changes throughout the rest of the reach are similar to those presented for Alternative 1 (see **Figure 32**).

Figure 46 is an inundation map that illustrates the depth changes both upstream and downstream before and after dam removal throughout the reach during the low flow condition. This map shows that the mill race continues to flow during low flow conditions. The water depths are about the same as those from the channel options and the culvert configurations. Additional inundation maps showing the depths and difference in depths for both the low and median flows are provided in **Appendix E**.

When the dam is removed and the riffle is added, the flow to the mill race at the low and median flow conditions is about 18.20 and 25.80 cfs, respectively. This alternative keeps flow to the mill race under low flow conditions, but it is about 78% lower than the current existing conditions. The mill race flow for the median river flow condition is about 71% lower. This riffle configuration brings about the same flow during low flow conditions as the culvert options and more than the open channel options. In general, it appears that the single riffle does not bring as much water to the mill race as the other alternatives during median flow conditions.

The velocities are lower at the mill race during low flow and median events compared to the dam in place and the culvert configurations. Mill race velocities are about the same as the open channel options at the low flow condition. At the median condition, velocities are about half of the other alternatives except for the second open channel option where they are about the same.

Low Flow Conditions

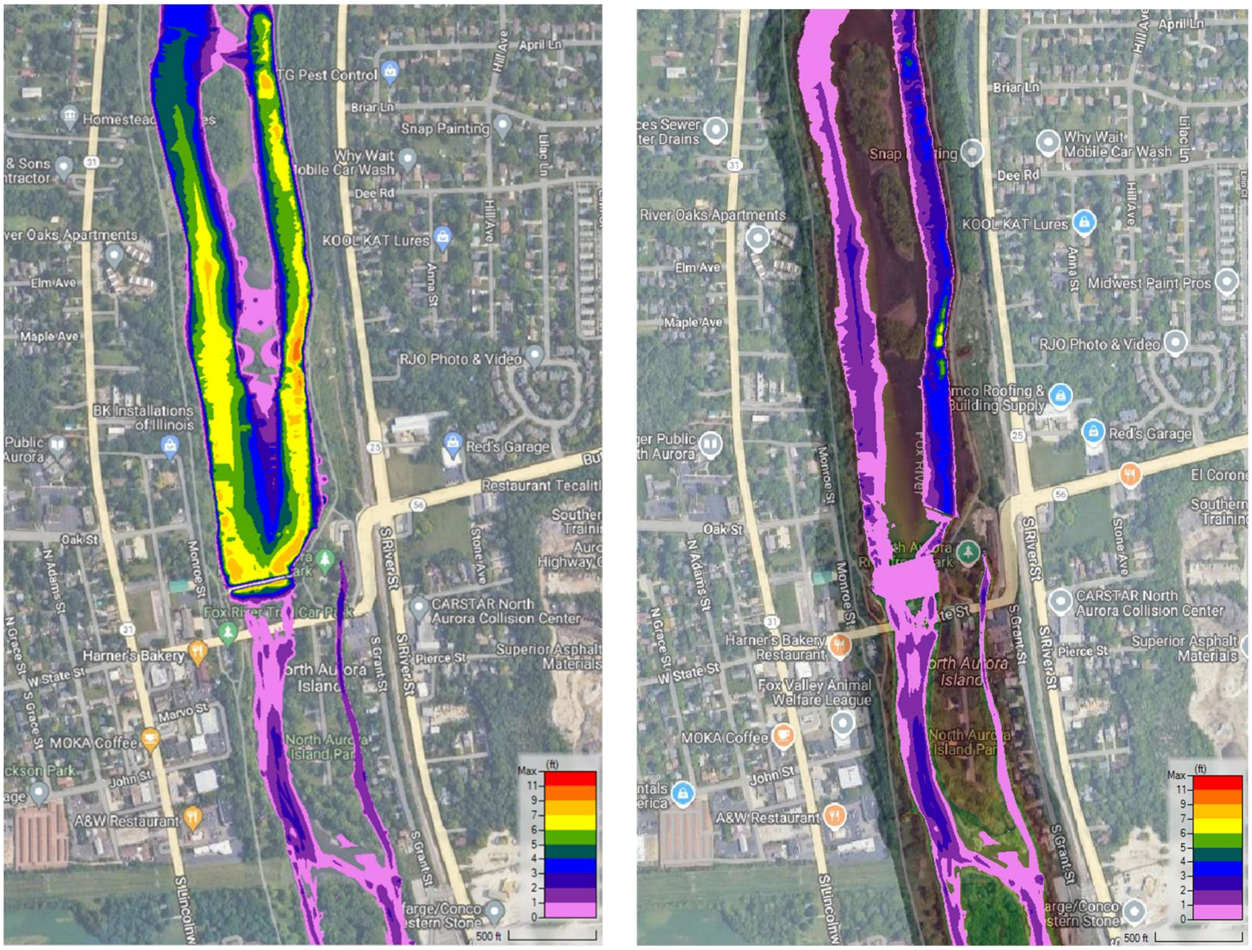


Figure 46. Inundation Map Showing Depths for Alternative 7 (right) Compared to the Baseline

ALTERNATIVE SUMMARY

The overall positive and negative consequences associated with this alternative are summarized below. Again, the general dam removal benefits have been outlined in the discussion for Alternative 1. This alternative meets the goal to keep the mill race flowing at average flow scenarios. However, this riffle alternative will not keep the mill race flowing as much during average river conditions compared to the open channel and culvert options so it will appear dryer compared to the other alternatives. There are no changes to the existing mill race inlet or inlet culvert or associated disruptions to the trees, parking lot, Plaza or stormwater system. Compared to channel construction, no new culvert bridge is needed and there will be no open channel safety hazards.

Pros

- Maintains Mill Race flows
- No impacts to the new Plaza
- No tree removal
- No open channel hazard or new culvert bridge needed
- No impacts to parking lot, stormwater collection system or sidewalks
- Less surplus material (no channel excavation)
- Lowest cost riffle option

Cons

- Limited flow to Mill Race during low and median flow conditions
- Reuses existing damaged Mill Race flow control

PROJECTED COSTS

The estimated cost for Alternative 7 – One Riffle at Intake is listed below. The costs associated with the full dam removal were outlined in the cost discussion for Alternative 1. This alternative costs almost the same as only removing the dam (Alternative 1) since only rip rap costs are added to create the riffle. This option is less expensive compared to the open channel alternatives and culverts.

Construction Cost - $4.6 million

Design Cost - $1.3 million

Land Rights - $0.03 million

Total Project Costs- $5.9 million

Alternative 8 – Multiple Riffles

DESCRIPTION

This alternative consists of adding three riffles upstream of the current dam location. (see **Figure 47**). The results from this alternative will be used to compare the effects of having more than one riffle to the mill race flows. By adding multiple riffles, the upstream pool will be slightly elevated at various locations compared to adding a single riffle (Alt. 7). The upstream most riffles cross both the east and west sides of the downstream portion of the island at an elevation of 646'. The next riffle is approximately 150' downstream at an elevation of 644'. The downstream most riffle is located another

100’ further downstream and is at an elevation of 642’. The riffle heights for each location were selected to decrease by 2’ as you move downstream. This layout tried to replicate upstream pool depths. The riffle located near the mill race intake is at the same elevation as the existing dam and 3.5’ higher than the single riffle. Riffle numbers, locations, material size, dimensions and heights would be optimized during design. The riffles will be constructed using similar materials and sizes as proposed in the previous alternative. For purposes of this evaluation, it was assumed the no changes are made to the inlet to the mill race so the impacts of only adding the riffle could be determined.

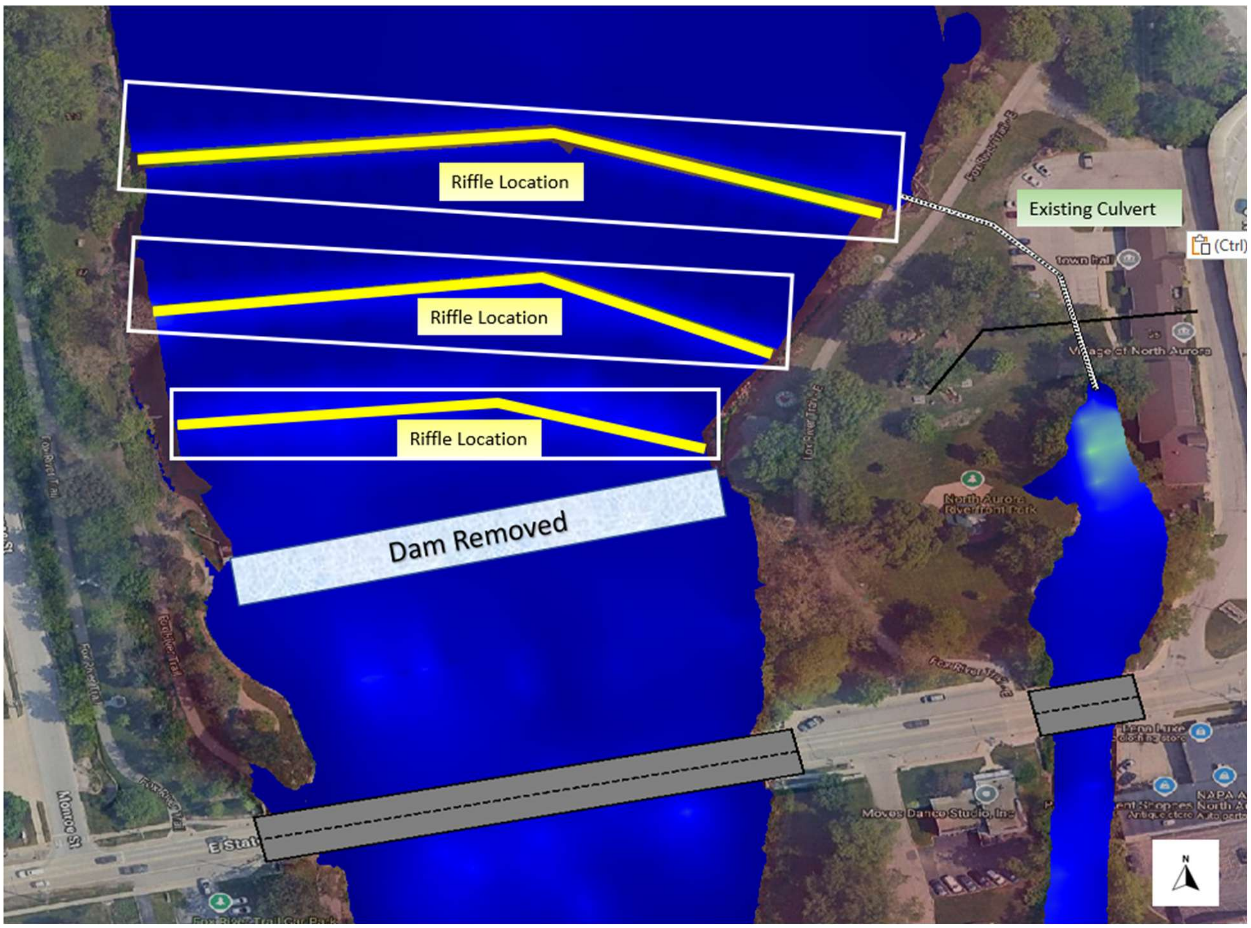


Figure 47. Alternative 8 - Multiple Riffles

MODELING RESULTS

Table 14 provides a summary of the changes in water depth, velocities, mill race flows and mill race velocities for Alternative 8 compared to the baseline existing conditions model.

Table 14. Modeling Results for Alternative 8 - Multiple Riffles

	188 cfs			1,283 cfs		
	Existing	Alt 8	Difference	Existing	Alt 8	Difference
Water Depth (ft)	6.73	0.37	-6.36	7.08	1.48	-5.60
Velocities (ft/s)	0.05	1.73	1.68	0.46	3.15	2.69
Mill Race Flow (cfs)	83.36	83.1	-0.26	89.05	88.6	-0.45
Mill Race Velocities (ft/s)	1.30	1.04	-0.26	1.31	1.01	-0.30

During the low flow condition, the depth of water is reduced by 6.36' immediately upstream of the dam for Alternative 8 compared to the existing conditions. Similar to the previous alternatives, the differences in water depth are a bit smaller for the median flow condition since the low flow condition is the worst-case scenario.

The velocities increased to 1.73 and 3.15 ft/s at the location immediately upstream of the dam after the dam is removed during low and median river flows, respectively. Velocity increases are a bit more than the other alternatives. Overall velocity changes throughout the rest of the reach are like those presented for Alternative 1 (see **Figure 32**).

Figure 48 is an inundation map that illustrates the depth changes both upstream and downstream before and after dam removal throughout the reach during the low flow condition. This map shows that the mill race continues to flow during low flow conditions. The water depths in the east channel are a bit deeper than those from the channel options and the other culvert configurations. Additional inundation maps showing the depths and difference in depths for both the low and median flows are provided in **Appendix E.**

When the dam is removed and the riffles are added, the flow to the mill race at the low and median flow conditions is about 83.19 and 88.6 cfs, respectively. This alternative brings almost as much flow to the mill race under low and median river flow conditions as the current existing conditions. The multiple riffle configuration brings much more flow compared to all the other dam removal options for both the low and median river flow conditions.

The velocities just a little lower at the mill race during both low flow conditions and median events compared to the dam in place. The velocities are the highest of all the alternatives at the low river flow condition. At the median flow event, the velocities are about the same as the first open channel option and the culvert configurations.

ALTERNATIVE SUMMARY

The overall positive and negative consequences associated with this alternative are summarized below. Again, the general dam removal benefits have been outlined in the discussion for Alternative 1. This alternative exceeds the goal to keep the mill race flowing at average flow scenarios. Additional riffles in this configuration bring the highest flows to the mill race of all the dam removal alternatives for both flow conditions. There are no changes to the existing mill race inlet culvert or associated disruptions to the trees, parking lot, Plaza or stormwater system. Compared to channel construction, no new culvert bridge is needed and there will be no open channel safety hazards. Riffles in the main river body might increase kayaking and canoeing experiences for those that like to boat across the riffles.

Low Flow Conditions

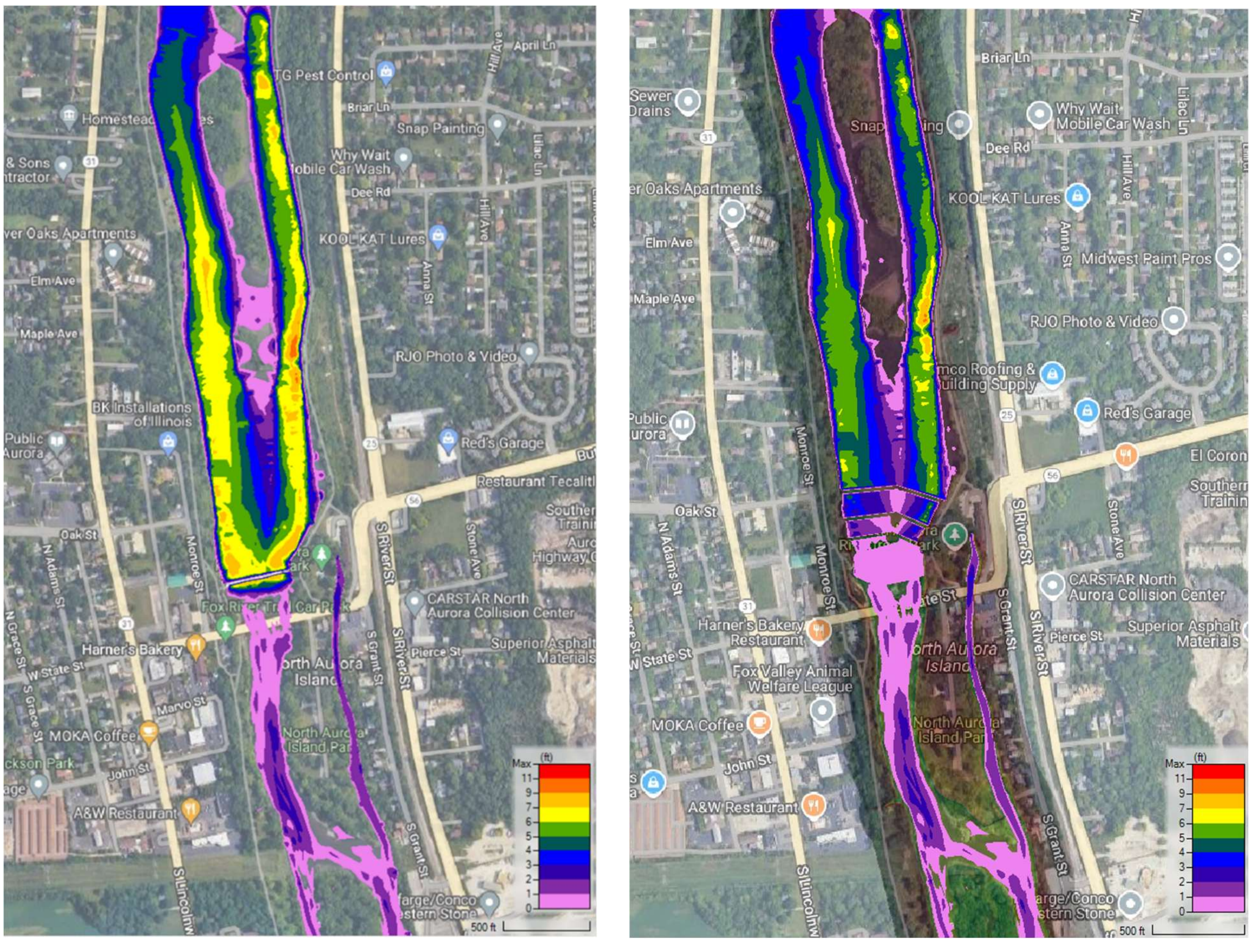


Figure 48. Inundation Map Showing Depths for Alternative 8 (right) Compared to the Baseline

Pros

- Maintains Mill Race flows
- No impacts to the new Plaza
- No tree removal
- No open channel hazard or new culvert bridge needed
- No impacts to parking lot, stormwater collection system or sidewalks
- Less surplus material (no channel excavation)
- Increased kayaking and canoeing experiences across riffles
- Most flow to the Mill Race compared to the single riffle, culverts and open channels

Cons

- Reuses existing damaged Mill Race flow control
- Lower water quality upstream of riffles compared to full dam removal

PROJECTED COSTS

The estimated cost for Alternative 8 – Multiple Riffles is listed below. The costs associated with the full dam removal were outlined in the cost discussion for Alternative 1. This alternative costs about 1.5 times more as only removing the dam (Alternative 1) since only rip rap costs are added to create the riffles but costs more than the single riffle alternative. This option costs more than the culvert and second open channel configuration and less than the first open channel option compared to the open channel alternatives and culverts.

- Construction Cost - $5.2 million
- Design Cost - $1.5 million
- Land Rights- $0.03 million
- Total Project Costs- $6.8 million

Alternative 9 – Partial Dam Removal

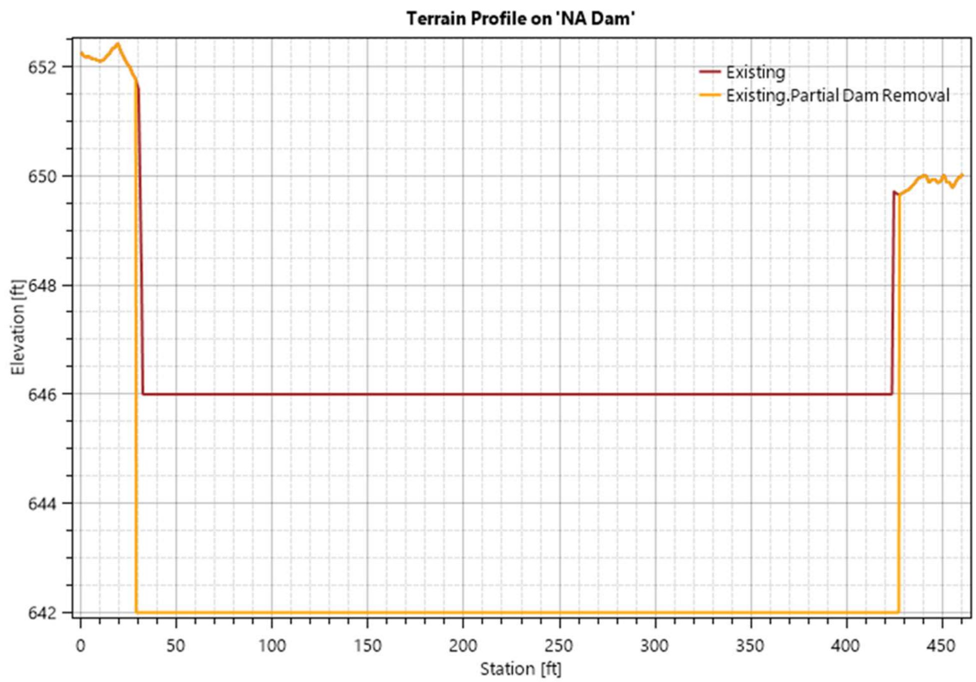
DESCRIPTION

Instead of adding a new inlet channel, culvert or riffles to keep the mill race flowing, another option is to partially remove the dam. This alternative consists of removing the dam down to an elevation of 642’ which is a little above the mill race inlet culvert (see **Figure 49**) and adding a riprap slope downstream of the dam face and partially filling in the scour hole. Safety concerns are partially addressed by adding a

10:1 riprap slope along the remaining downstream face of the dam. The sloped face will serve to reduce the potential for generating a new scour hole which will increase safety. This alternative was proposed as a method to possibly reduce the quantity of sediment removal compared to full removal prior to the dam modification work. This will allow mill race flow to continue. All the same dam removal construction tasks would be required except that less concrete would be removed, and the dam base would remain in place. For purposes of this evaluation, it was assumed the no changes are made to the inlet to the mill race so the impacts of partial dam removal only could be determined.

Figure 50 shows a cross section view and a profile view for this alternative compared to existing conditions.

Figure 49. Alternative 9 - Partial Dam Removal



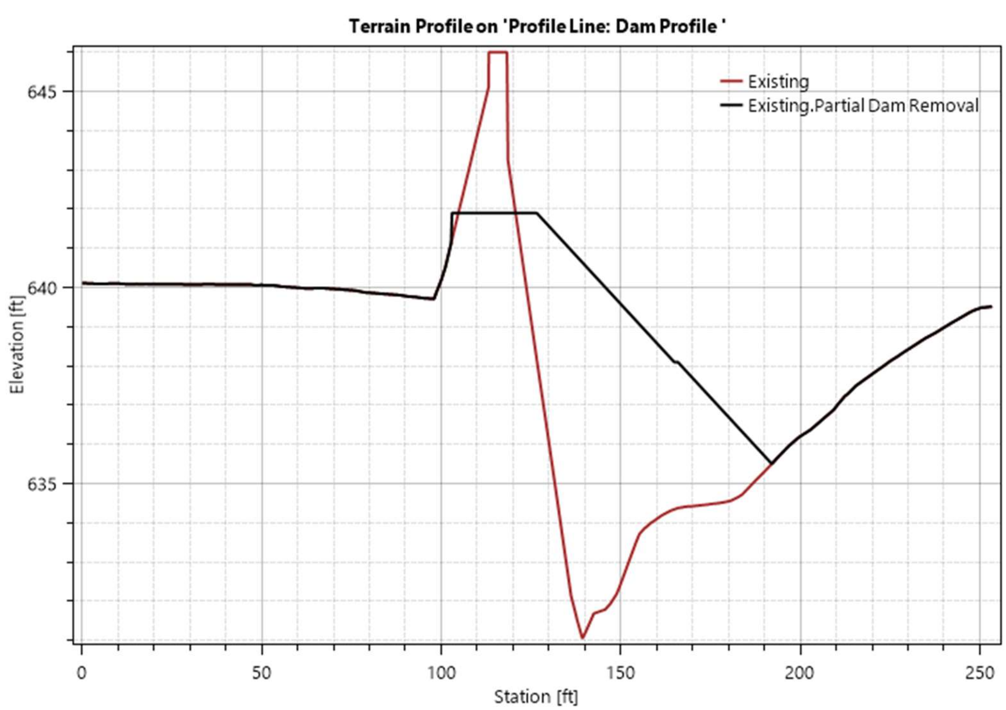


Figure 50. Alt. 3 - Partial Dam Removal Cross Section and Profile

MODELING RESULTS

Table 15 provides a summary of the changes in water depth, velocities, mill race flows and mill race velocities for Alternative 3 compared to the baseline existing conditions model.

Table 15. Modeling Results for Alternative 9 - Partial Dam Removal

	188 cfs			1,283 cfs		
	Existing	Alt 9	Difference	Existing	Alt 9	Difference
Water Depth (ft)	6.73	2.91	-3.82	7.08	3.60	-3.13
Velocities (ft/s)	0.05	0.18	0.13	0.46	1.02	0.56
Mill Race Flow (cfs)	83.36	15.3	-68.06	89.05	30.6	-58.45
Mill Race Velocities (ft/s)	1.30	0.49	-0.81	1.31	0.71	-0.60

During the low flow condition, the depth of water is reduced by 3.82’ immediately upstream of the dam for Alternative 9 compared to the existing conditions. The water depth differences are a bit smaller for the median flow condition since the low flow condition is the worst-case scenario. The depth is about 2.5’ deeper at the low flow and 2’ deeper at the median flow compared to the no dam only option (Alt. 1), channel (Alts. 2 and 3) and culvert (Alts. 4 to 6) options at the location immediately upstream of the dam.

The velocities increased to 0.18 and 1.02 ft/s at the location immediately upstream of the dam after the dam is partially removed during low and median river flows, respectively. The velocities at the model reading location are slightly more compared to the full dam removal option but less than the other alternatives.

Figure 51 is an inundation map that illustrates the depth changes both upstream and downstream before and after dam removal throughout the reach during the low flow condition. This map shows that the mill race continues to flow during low flow conditions. The upstream water depths are deeper than those from the channel, the culvert and riffle configurations. Additional inundation maps showing the depths and difference in depths for both the low and median flows are provided in **Appendix E**.

When the dam is partially removed, the flow to the mill race at the low and median flow conditions is about 15.3 and 30.6 cfs, respectively. This alternative keeps flow to the mill race under low flow conditions, but it is about 82% lower than the current existing conditions. The mill race flow for the average river flow condition is about 66% lower. The partial dam removal brings about the same flow during low flow conditions but less at the median river flow conditions compared to the culvert and second open channel option.

The mill race velocities are generally the same as the two open channel options, less than the culvert configurations and the multiple riffles but more than the single riffle option for both river flow conditions.

Low Flow Conditions

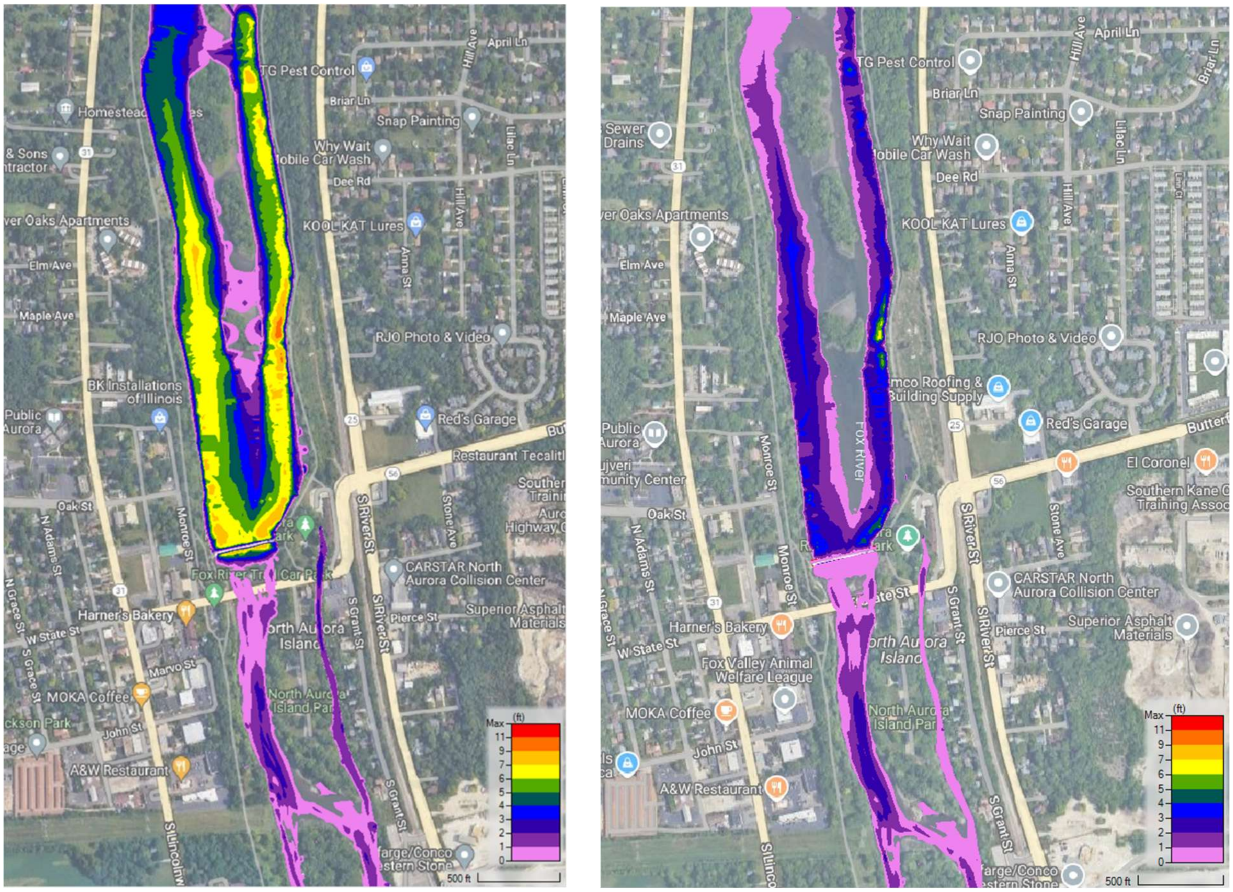


Figure 51. Inundation Map Showing Depths for Alternative 9 (right) Compared to the Baseline

ALTERNATIVE SUMMARY

The overall positive and negative consequences associated with this alternative are summarized below. Partial dam removal does not completely meet all the primary and secondary project goals. Public safety is improved, but not completely restored since the dam remains partially in place. Fish passage and aquatic ecosystems are not restored since the dam still blocks passage. Dissolved oxygen levels are only partially improved compared to full removals. The upstream pool is maintained which might allow upstream motorized boating, but further depth analysis is required before that can be determined. This alternative meets the goal to keep the mill race flowing at average flow scenarios. There are no changes to the existing mill race inlet or inlet culvert or associated disruptions to the trees, parking lot, Plaza or stormwater system. Compared to channel construction, no new culvert bridge is needed and there will be no open channel safety hazards.

Pros

- Maintains Mill Race flows
- No impacts to the new Plaza
- No tree removal required
- No open channel hazard or new culvert bridge needed
- No impacts to parking lot, stormwater collection system or sidewalks
- Less surplus material and debris (no channel excavation and less concrete removal)
- Upstream pool partially maintained
- Possible continued use of motorized boats above dam
- Second least expensive option

Cons

- Public safety not completed addressed
- Fish passage and aquatic ecosytems not restored
- Water quality in river (increases DO) not fully restored
- Reuses existing damaged Mill Race flow control

PROJECTED COSTS

The estimated cost for Alternative 9 – Partial Dam Removal is listed below. The costs associated with the full dam removal were outlined in the cost discussion for Alternative 1. Partial dam removal tasks are very similar but the concrete removal quantities are less and the sheet pile foundation will not be removed. Additional costs are required for the rip rap added along the downstream remaining face of the dam. This alternative costs less than removing the entire dam (Alternative 1). However, this alternative does not completely meet the primary and secondary goals for the project. State funding is less for projects that do not meet primary restoration goals so the Village might have to pay more to complete this alternative. This option is the second least expensive alternative.

- Construction Cost - $4.7 million
- Design Cost - $1.3 million
- Land Rights- $0.03 million
- Total Project Cost- $6.1 million

Alternative 10 – Add Ramp Only

DESCRIPTION

Due to the uncertainty and high costs related to potential contaminated sediment removal, this last alternative was added to provide one option that will not require sediment disposal. If the dam is not removed (see **Figure 52**), it is assumed that no new sediment will erode or require removal.

Dam safety concerns are partially addressed by adding a 10:1 riprap slope along the downstream face of the dam below the steps. The sloped face will serve to reduce the potential for generating a new scour hole which will increase safety. This will allow mill race flow to continue at current levels. For purposes of this evaluation, it was assumed there are no changes are made to the inlet to the mill race.

Figure 53 shows a cross section view and a profile view for this alternative compared to existing conditions.

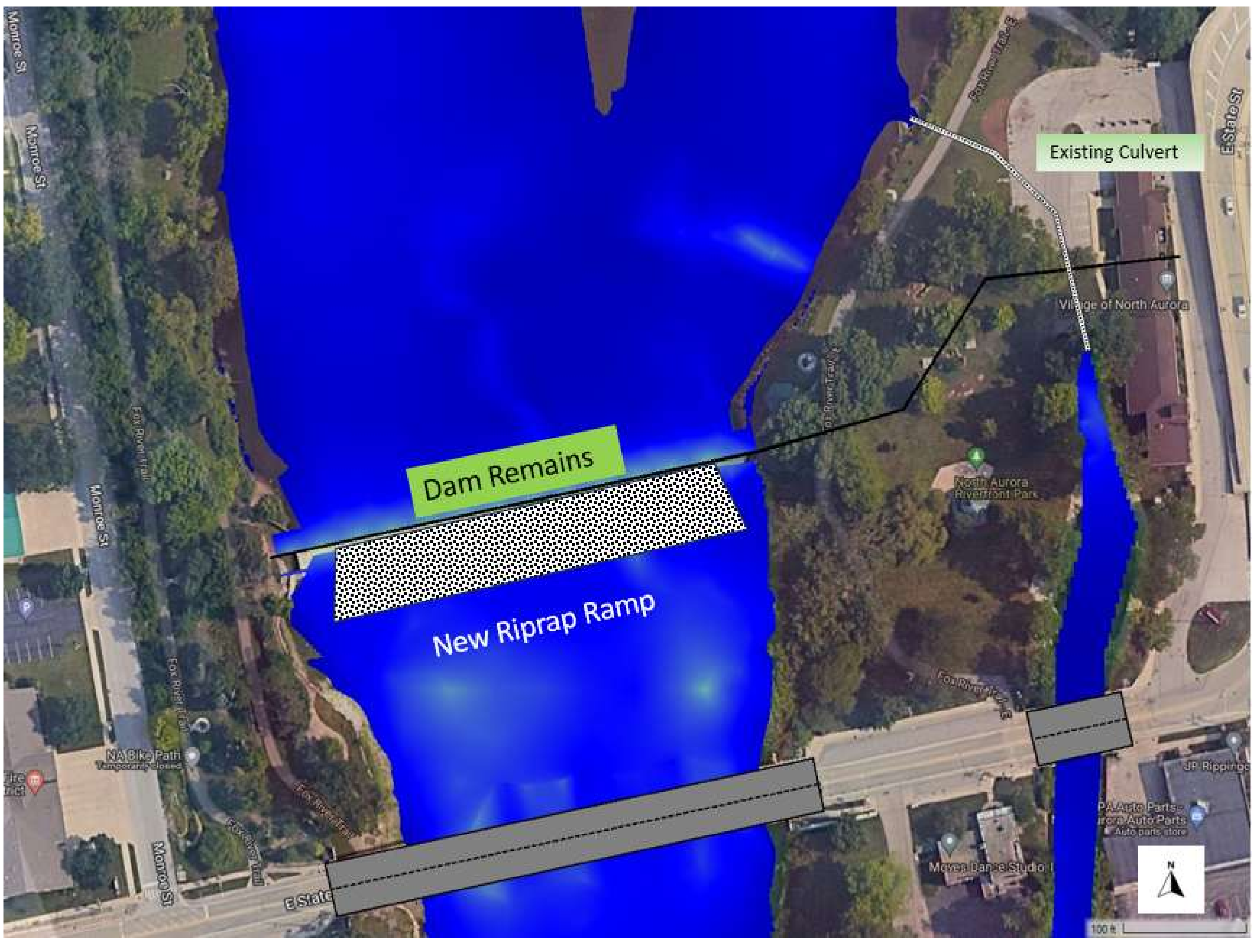
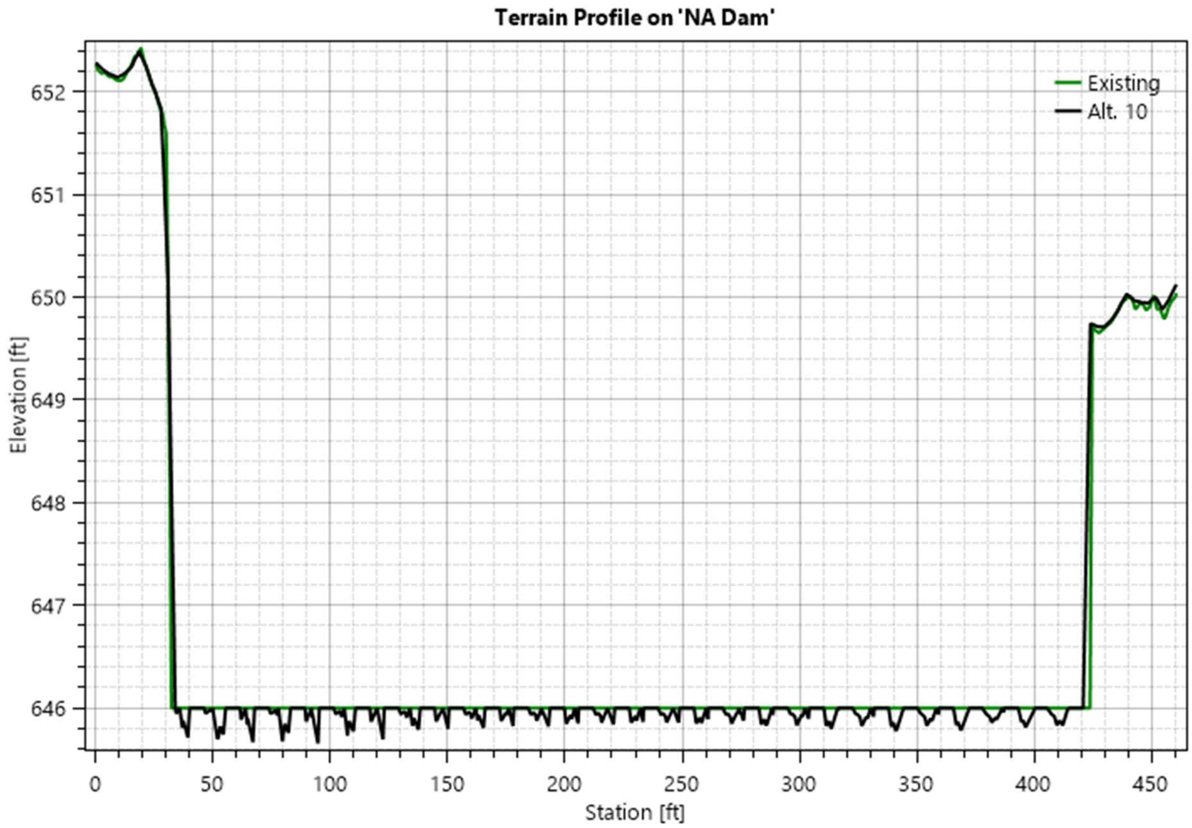


Figure 52. Alternative 10 – Add Ramp Only



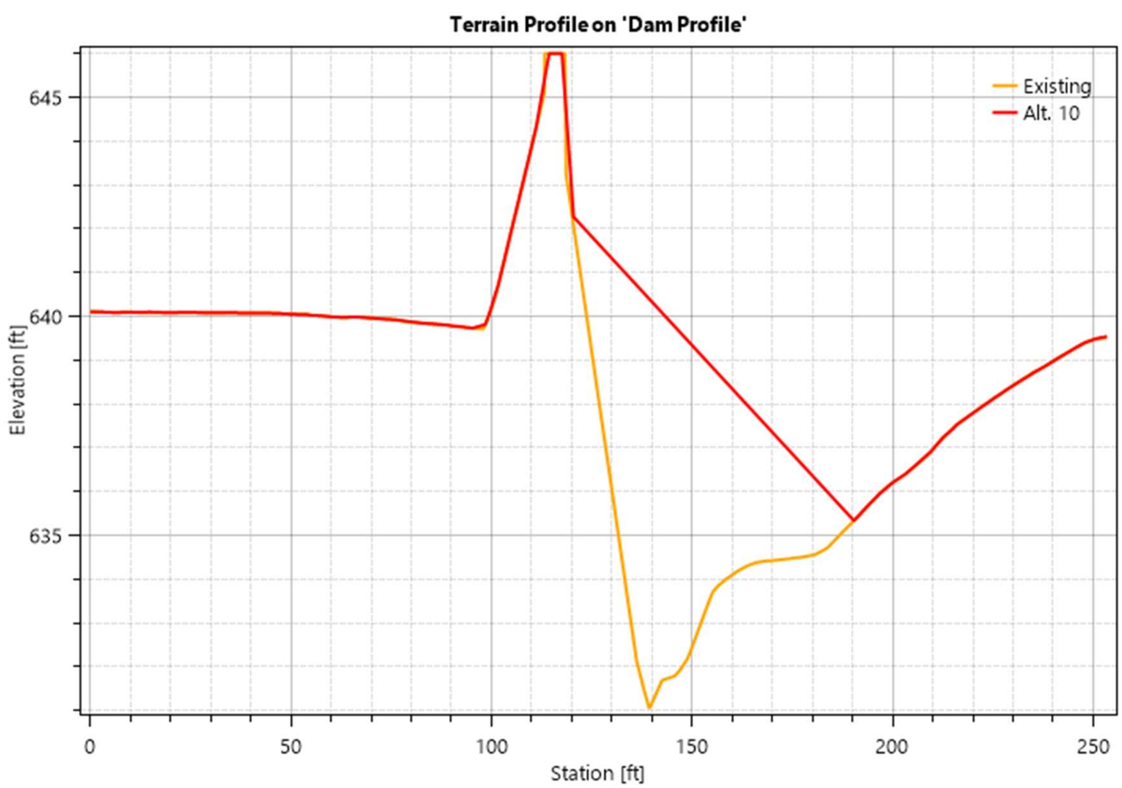


Figure 53. Alt. 10 – Fill Scour Hole Cross Section and Profile

MODELING RESULTS

Table 16 provides a summary of the changes in water depth, velocities, mill race flows and mill race velocities for Alternative 3 compared to the baseline existing conditions model.

Table 16. Modeling Results for Alternative 10 – Add Ramp Only

	188 cfs			1,283 cfs		
	Existing	Alt 10	Difference	Existing	Alt 10	Difference
Water Depth (ft)	6.73	6.83	0.1	7.08	7.54	0.46
Velocities (ft/s)	0.05	0.05	0.0	0.46	0.43	-0.03
Mill Race Flow (cfs)	83.36	84.88	1.52	89.05	96.97	7.92
Mill Race Velocities (ft/s)	1.30	0.98	-0.32	1.31	1.04	-0.27

During the low and median flow conditions, the depth of water increases by 0.1'and 0.46', respectively, immediately upstream of the dam for Alternative 9 compared to the existing conditions. The ramp serves to increase the pool depths slightly upstream of the dam. As expected, the velocities barely changed at the location immediately upstream of the dam since it is not removed.

The inundation map for this alternative is the same as presented for the existing conditions (see **Figure 30**, left) since the dam is not removed.

When the ramp is added and the dam is not removed, the flow to the mill race at the low and median flow conditions is about 84.88 and 96.97 cfs, respectively. This alternative keeps flow to the mill race under low and median flow conditions at rates slightly higher than current existing conditions. Again, the ramp serves to increase the upstream pool and driving head to mill race which brings more flow.

The velocities are a little lower at the mill race during low and median flow conditions compared to the existing conditions since the mill race flows are higher. The velocities are just a little less than those found for the multiple riffles and are higher than the rest of the alternatives.

ALTERNATIVE SUMMARY

The overall positive and negative consequences associated with this alternative are summarized below. By not removing the dam, none of the primary and secondary project goals are fully met. Public safety is improved by the downstream ramp, but not completely restored. Fish passage and aquatic ecosystems are not restored since the dam still blocks passage. Dissolved oxygen levels are not improved. The upstream pool is maintained which allows upstream motorized boating. This alternative does meet the goal to keep the mill race flowing at average flow scenarios. There are no changes to the existing mill race inlet or inlet culvert or associated disruptions to the trees, parking lot, Plaza or stormwater system. Compared to channel construction, no new culvert bridge is needed and there will be no open channel safety hazards. The largest benefit of this alternative is that if the dam is not removed, the upstream sediment does not need to be removed. If the cost of the sediment removal is found to be cost prohibitive, this is the only option that does not include that added cost.

Pros

- Maintains Mill Race flows
- No impacts to the new Plaza
- No tree removal required
- No open channel hazard or new culvert bridge needed
- No impacts to parking lot, stormwater collection system or sidewalks
- Less surplus material and debris (no channel excavation and less concrete removal)
- Upstream pool maintained
- Continued use of motorized boats above dam
- Least expensive option
- No sediment removal required

Cons

- Public safety not completed addressed
- Fish passage and aquatic ecosytems not restored
- Water quality in river (increases DO) not restored
- Reuses existing damaged Mill Race flow control

PROJECTED COSTS

The estimated cost for Alternative 10 – Add Ramp Only is listed below. The only cost for this option is to construct the downstream 10:1 ramp. A causeway will be required for this work and other general construction tasks such as temporary fencing, seeding disturbed areas and site access. This alternative is the lowest cost alternative since the dam is not removed at all. However, this alternative does not completely meet the primary and secondary goals for the project. State funding is less than for projects that do not meet primary restoration goals so the Village might be responsible for paying a portion to complete this alternative. This option is the least expensive alternative.

Construction Cost - $0.8 million

Design Cost - $0.2 million

Land Rights - $0

Total Project Cost- $1.1 million

COMPARISON OF ALTERNATIVES

Ten alternatives were reviewed in detail to compare the impacts of full and partial removal of the North Aurora dam to the Fox River and surrounding area. The first alternative includes full dam removal but no modifications to the mill race intake system which was found to dry up the mill race under low and median flow conditions. The next five alternatives compared replacing the mill race intake with either open channels (Alts. 2 and 3) or newly reconfigured culverts (Alts. 4 to 6) as methods to keep water flowing to the mill race. The next two alternative evaluated adding riffles to the main river to keep the pool and head above the intake to continue feeding the mill race. The ninth alternative reviewed the impacts of removing only a portion of the dam. The last alternative looked at adding a rock ramp only downstream of the dam. Since the dam is not removed, there will be no need to remove potentially contaminated sediment.

All the alternatives were evaluated to compare the results before and after dam modifications specifically for the following parameters:

- Water depths
- Water velocities at the dam and throughout the modeled stretch
- Mill race flows
- Sediment handling
- Projected costs
- Primary and secondary goals
- Local goals

The water depth and velocity readings were taken at a location upstream of the dam as previously shown by the red star on **Figure 18**. The mill race flow readings were taken at a location at on the State Street Bridge as shown on that same figure with the blue star.

In all but the last two alternatives, full dam removal was proposed and the main differences between the options were implementing various methods for keeping the mill race flowing. The results from the various methods (open channels, culverts, and riffles) do not have significant impacts to the river flows so most of the alternatives had very small variances in the compared measurements for water depths, velocities and mill race flows. They are compared below but please note that none of the differences were significant.

Depth Comparison

The depth comparison maps show what the river will look like during low, and median events so the community can visualize what their area might look like after the dam is removed. **Figure 54** summarizes the water depths at a location immediately upstream of the dam in the center of the river for all ten alternatives. Depths for the channel, culvert and riffle alternatives (Alts. 2 to 8) are about 95% and 78% of what is currently found in the river at the upstream location during the low and median flow conditions, respectively. Partial dam removal (Alt. 9) has the deepest water depths at the upstream location for the low and median flow conditions, but they are still 57% and 49% of the current depth, respectively. The Rock Ramp Only (Alt. 10) depths are the same as the existing conditions since the dam is not removed. Each alternative discussion provides an inundation map illustrating the depths before and after dam removal throughout the river stretch for the lowest flow condition.

This information can be used by those that want to determine how recreational or boating activities might be altered after the dam is removed. Some people might want deeper depths to allow activities to continue and some might want shallower water levels to allow new activities. All in all, depths don't vary much from one another so no one alternative stands out as the optimal choice either way with respect to river depths. However, this data can be used to verify depths if a certain depth goal is desired.

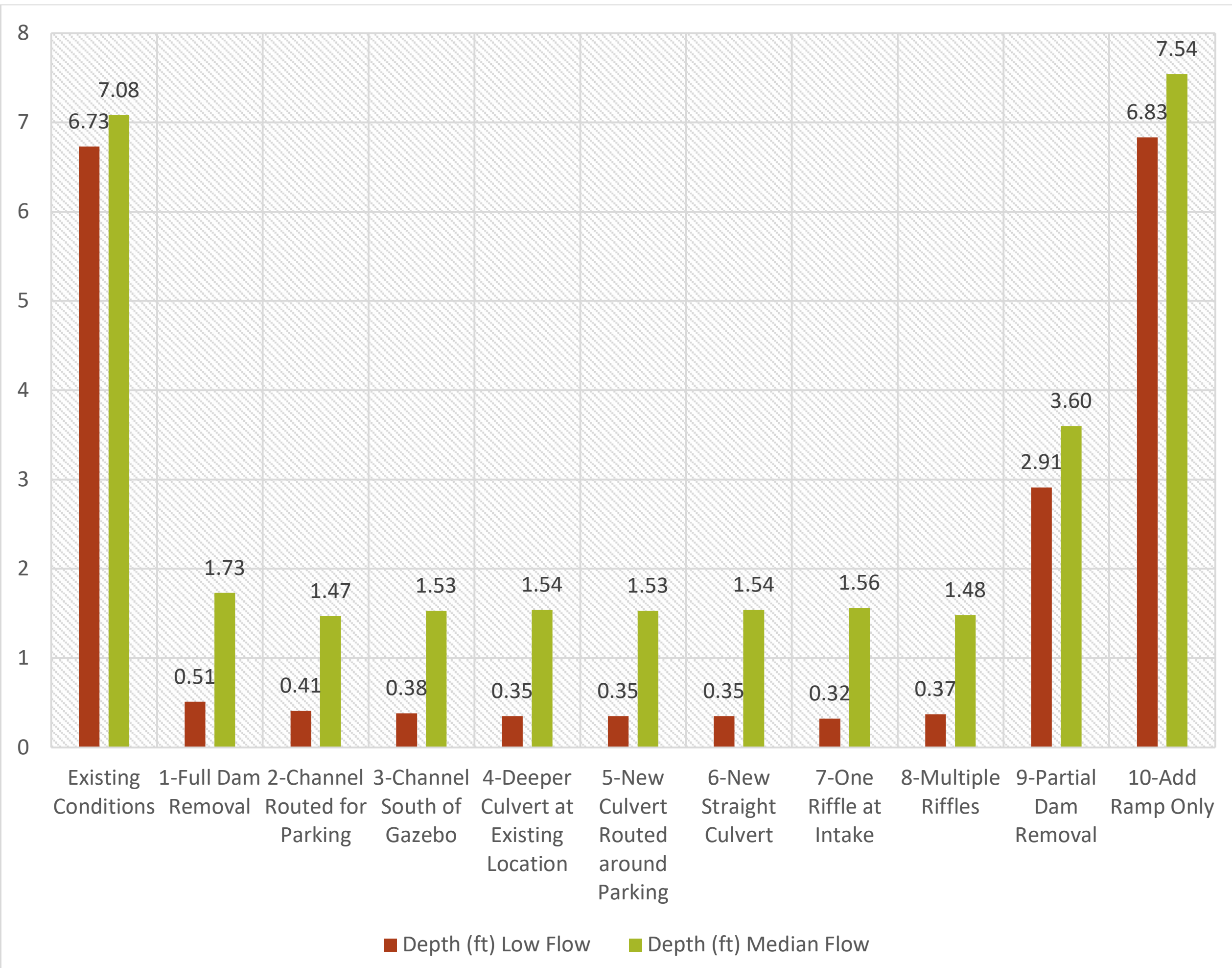


Figure 54. Depth Comparison Immediately Upstream of Dam

Velocity Comparison

Since the primary goal is to increase safety at the dam, velocities with and without the dam are also important. Reduced velocities translate to increased safety, so those values were compared immediately upstream of the dam. Velocities less than 5 ft/s mean there will be less potential for scour which should increase overall ecosystem health in the river. With the dam in place (Alts 1 and 10), the average velocity at this location is 0.05 fts/s and 0.445 ft/s for the low and median flow conditions (see **Figure 55**). On average, velocity levels were about 1.3 ft/s and 2.86 ft/s for all alternatives (Alts. 1 to 8) when the dam was fully removed at low and median flow conditions. The velocity for the partial dam removal is about double levels when the dam is in place for the low and median flows. The partial dam removal (Alt. 9) increases the velocity the least since upstream pools generally slow down water and the pool is not completely eliminated. The remaining alternatives exhibit similar velocities changes after the dam is removed with none standing out as the best or worst.

When reviewing the entire stretch of the rivers, velocities never exceed 5 ft/s before or after the dam is removed. All velocities after the dam are removed are considered safe and good for long-term stream health since they are all less than 5 ft/s.

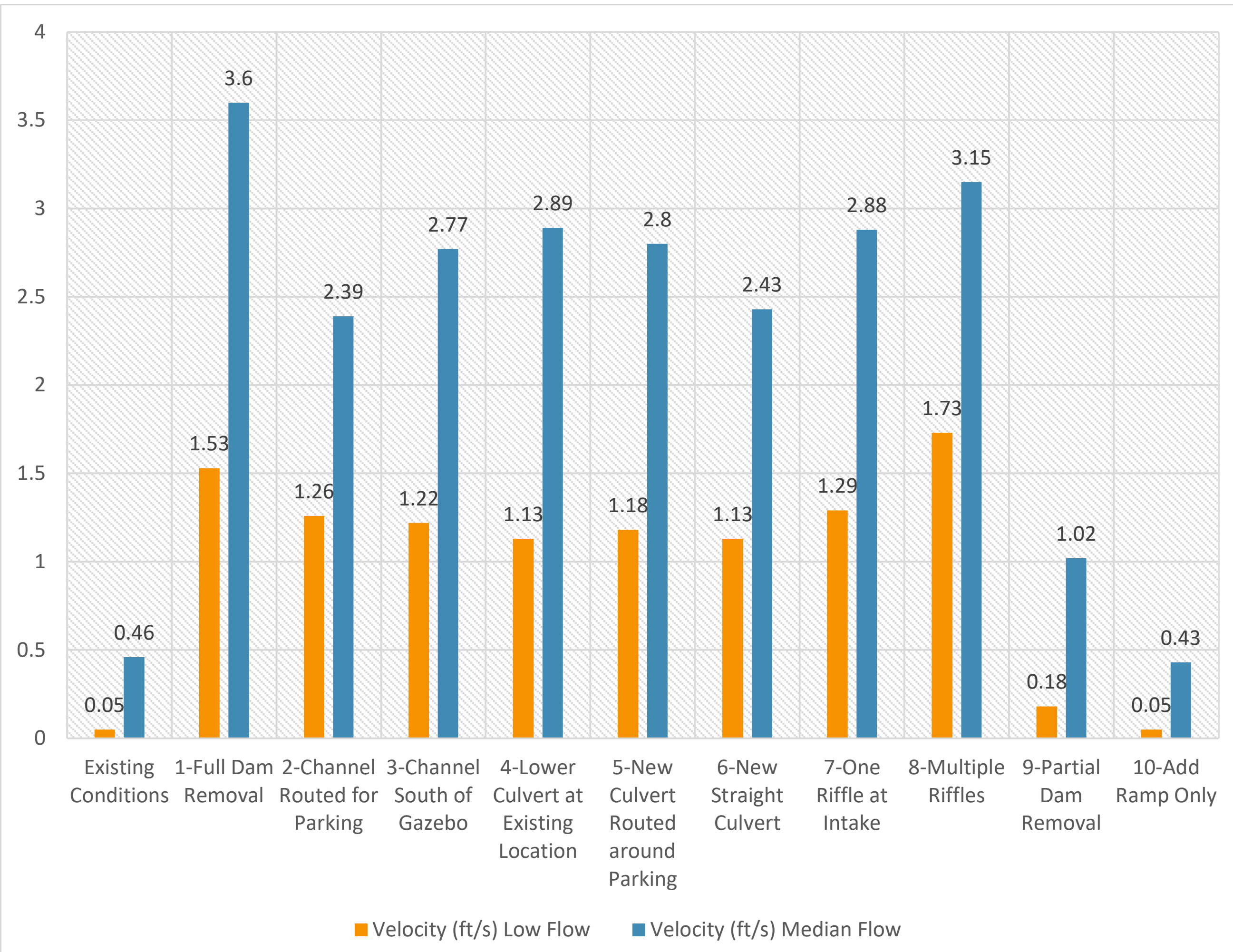


Figure 55. Velocity Comparison Immediately Upstream of the Dam

Mill Race Flow Comparison

A local goal of this project was to keep the mill race flowing after the dam is removed so those values were compared (see **Figure 56**). Before the dam is removed, flows to the mill race are 83 and 89 cfs for the low and median flow conditions respectively. Full dam removal with no modifications to the mill race intake result in no flow to the mill race. For the remaining alternatives that include full dam removal (Alts. 2 to 8), the flow to the mill race ranges from 2 cfs (97% reduction) to 83 cfs (no reduction) during the low flow condition for an average reduction of 70%. The channel options and the partial dam removal have the most reduced mill race flows at the low flow condition.

For the median flow condition, all five alternative inlet configurations (Alts. 2 to 6) bring about the same flows to the mill race for an average 40% reduction. The channel south of the gazebo and the single riffle option have much lower mill race flows for the median flow condition compared to the others with an average 77% reduction in flows. The partial dam removal option brings about 66% less flow to the mill race.

If the goal is to maximize mill race flows at the low river flow condition, the multiple riffles and culverts appear to be much better than the single riffle options and slightly better than the open channel options. The lower elevation culvert (Alt. 4) and the straight culvert (Alt. 6) configuration bring the highest flows to the mill race for the low flow condition.

Sediment Handling

IEPA generally allows either capping or removal for handling contaminated sediment in a river. Capping includes placing several layers of varying sizes of rip rap and gravel over the top of potentially erodible areas to keep them in place. When evaluating this option, to not disturb the existing river flows and depths, it was assumed that the depth of material used to cap the bottom would need to be removed to compensate for the capping layers (assumed 12” gravel and 8” rip rap). The material that is removed would be considered potentially contaminated so would need to be disposed properly. Costs to remove the material, provide the layers of capping material and properly dispose the material was found to be cost prohibitive (~$13 million if all erodible material requires capping) so capping was deemed not suitable for this project.

For purposes of this report, it is assumed that the total calculated volume eroding during the 5-year flow condition will need to be removed or capped since that is the worst-case estimate. it is assumed that the amount of material to be removed is about 12,300 CY for the full dam removal and about 13,800 CY for the partial dam removal based on calculations described earlier in the report. For estimating sediment removal costs, it was assumed that hydraulic dredging would be used, and that the material would be disposed in a designated hazardous material landfill.

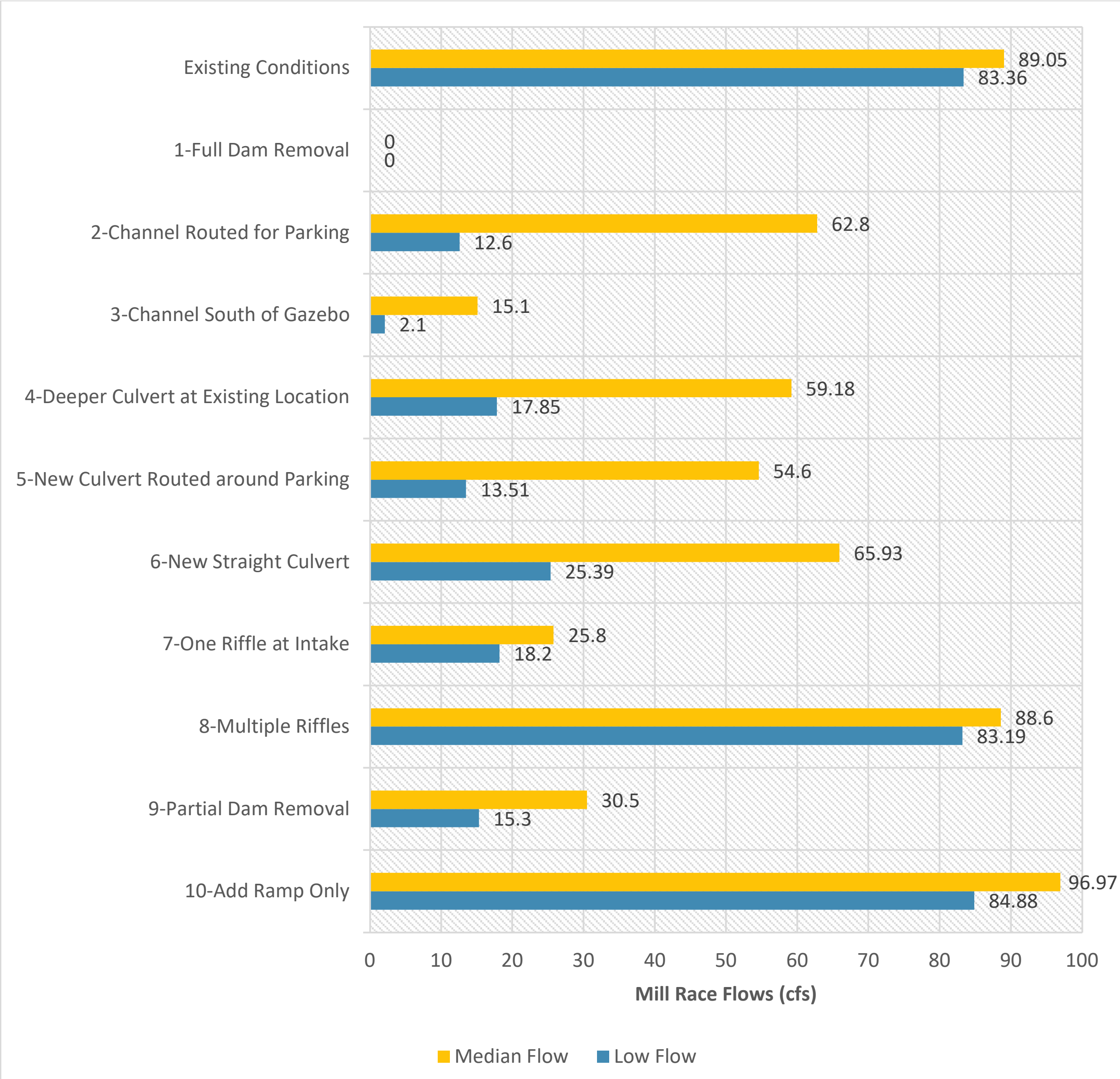


Figure 56. Mill Race Flows Before and After Dam Removal

If the material is removed from the river, permission will need to be obtained from the landowners along the river. In Illinois, land ownership extends from the river frontage to the thalweg (i.e., deepest part of the river). Therefore, easements will likely need to be purchased from all private owners where sediment is assumed needing to be removed. Overlaying Kane County parcel information on the erodible sediment map shows that 8 private parcels are impacted (7 unique owners). The overlaid private land area was determined to be 1.43 acres for which land rights (easements) will be required. Since this is a one-time easement, it was assumed to have a value of $22,500 or ¼ of the average sale price of land in Kane Co ($90,000/acre, LandSearch, 2024). The privately owned area of erodible sediment is about 11% of all the calculated erodible areas. These costs have been included in the alternative costs. It has been assumed that the public entities will permit IDNR-OWR access to remove the contaminated sediment. Unfortunately, if any one of the private entities do not agree to the terms and the contaminated material is not removed, the dam removal will likely not be able to be permitted or move forward.

Sediment removal costs were estimated as follows:

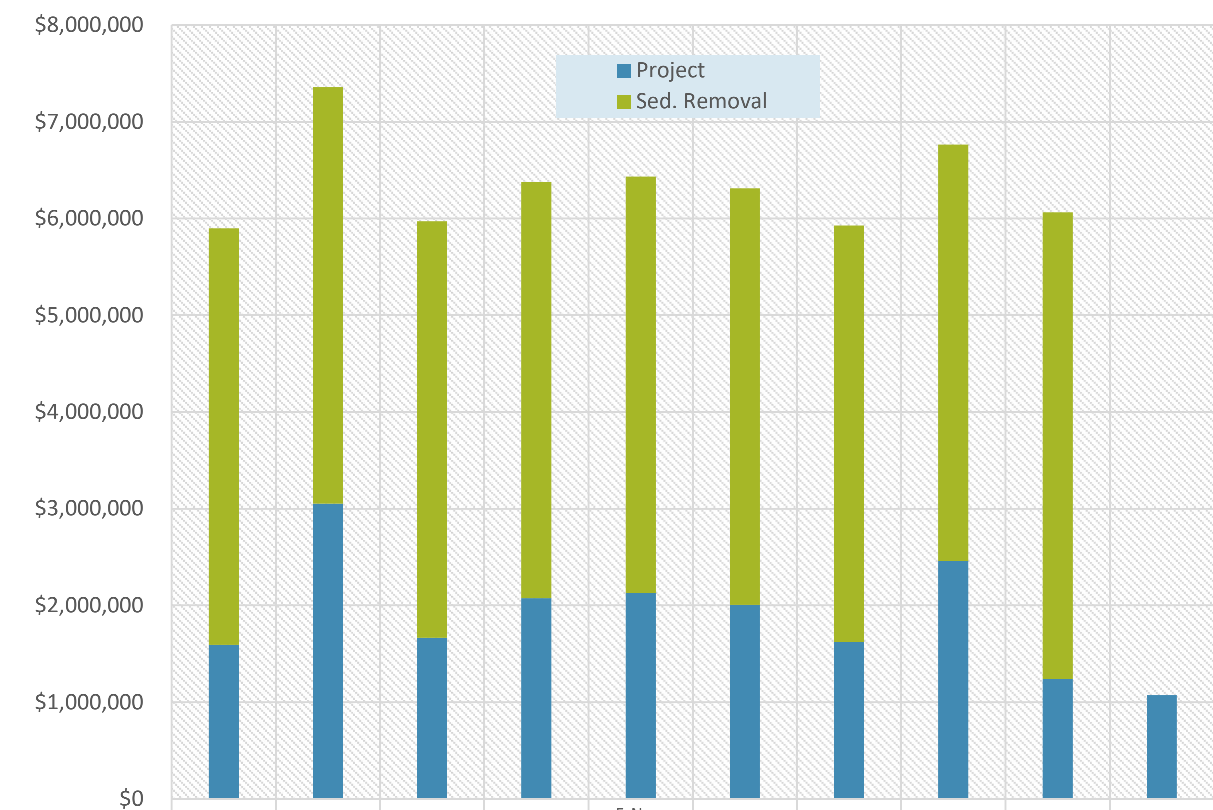
- Full Dam Removal
    - $2.8 million sediment dredging and disposal
    - $0.03 million river easements
- Partial Dam Removal
    - $3.1 million sediment dredging and disposal
    - $0.03 million river easements

As mentioned previously, further gradation testing is required to determine how much of the sediment modeled as eroding is fine material. Only fine material is considered to be contaminated and required to be removed from the system. The additional gradation results will be input into the sediment model to refine the quantities. This effort can be completed during the design phase. However, these results can also be used by the Village to help select which alternative to pursue so they could also be completed before the design phase. Ideally, the removal costs are less than this initial sediment transport model indicates. However, the costs might end up being higher using the additional field data. Unfortunately, if the final determined sediment removal cost is deemed cost prohibitive, the alternatives with dam removal might not be able to be funded. Therefore, an alternative was added (Alt. 10 – Add Ramp Only) that did not include dam removal.

Cost Comparison

The summary below (see **Figure 57**) provides a comparison of estimated total costs for the various alternatives. The summary illustrates the total costs along with the portion of the total costs that are associated with the dam modification work and those related to the sediment removal work.

For full and partial dam removal alternatives, the total costs vary from $5.9 to 7.3 million, with sediment removal costs ranging from $4.3 to 4.8 million and project only costs ranging from $1.1 to $3.0 million. Estimated sediment removal costs are substantial and range from 59% to 80% of the total costs. The total costs and project costs have been ranked from the least to most costly (see **Figure 58**) for comparative purposes.



	1-Full Dam Removal	2-Channel Routed for Parking	3-Channel South of Gazebo	4-Deeper Culvert at Existing Location	5-New Culvert Routed around Parking	6-New Straight Culvert	7-One Riffle at Intake	8-Multiple Riffles	9-Partial Dam Removal	10-Add Ramp Only
Sed. Removal	$4,303,925	$4,303,825	$4,303,925	$4,303,925	$4,303,925	$4,303,925	$4,303,925	$4,303,825	$4,823,125	$0
Project	$1,594,100	$3,053,500	$1,667,700	$2,074,700	$2,129,600	$2,006,700	$1,623,100	$2,459,600	$1,239,500	$1,072,900
Total $	$5,898,025	$7,357,325	$6,171,625	$6,378,625	$6,433,525	$6,310,625	$5,927,025	$6,763,425	$6,062,625	$1,072,900

Figure 57. Alternative Total Cost Comparison

Total cost comparisons are helpful when determining which alternatives are least costly. As expected, the lowest total cost alternative is to not remove the dam at all (Alt. 10). Next, the full dam removal without mill race modifications (Alt. 1) and the single riffle option (Alt 7) are fairly similar in cost and less than $6.0 million. The partial dam removal (Alt. 9) and channel south of the gazebo (Alt 3) are the next least costly. The straight (Alt 6) and deeper culvert (Alt 4) are both slightly less than the total cost for the new culvert routed around the parking lot (Alt 5). Multiple Riffles (Alt 8) and the deeper channel option (Alt. 2) have the highest total costs.

Figure 58. Total Cost and Project Only Cost Rankings

If sediment removal costs change due to better data or changes in the requirements, it is also useful look at the projects individually when selecting which alternative is most economical. Since the sediment removal costs are so high, it skews the individual project costs for the lowest cost alternatives. When looking at the project only costs, the first and last six rankings do not change. However, the partial dam removal (Alt 9) costs quite a bit less than the full dam removal without mill race modifications (Alt. 1). Similarly, the full dam removal without mill race modifications and the single riffle (Alt. 7) are now the nearly the same in cost.

The dam removal costs estimated in the Fox River study (CTE/AECOM, 2007) was $1.74 million (escalated from 2007 to 2024), which was fairly close to the full dam removal only alternative (Alt. 1). That study did not include the costs for removing any upstream sediment.

On average, sediment removal costs are about two times the cost of the dam modification work alone. As has been discussed, sediment removal costs are preliminary for this report and will require additional gradation testing, sediment transport modeling and possibly chemical testing to better refine quantities of material that will need to be removed. Unfortunately, erodible sediment volumes might end up being even larger than initially estimated, but ideally, they will be lower. Final decisions about whether this project can move forward, and which alternative is optimal, will hinge on those results.

When comparing costs alone, the lowest cost options appear to be optimal. However, additional characteristics such as meeting the primary, secondary and local goals also need to be considered.

Goal Comparison

Next, primary, secondary goals and local goals were compared to determine which alternative is optimal (see **Table 17**). The table designates whether the alternative meets the goals with a check (yes) or an x (no) if not. More than one check or x indicates that alternative is a bit better or worse than the others. It also designates whether the mill race flows are maintained and the larger number of water drops indicates which alternatives maintain the most flows. The previously reviewed rankings for total cost and project cost are presented numerically ranked from lowest (1) to highest (10) cost. Looking at all criteria collectively, the last column indicates which alternatives should be considered for selection.

The existing dam does not meet our primary and secondary goals of public safety, aquatic passage or water quality. Recreational goals are only partially met since some recreation is better with a pool upstream of the dam (motorized boating), but some are less (non-motorized boating). The Village requested some local goals also be considered such as keeping the mill race flowing, minimal impacts to the future Plaza or park property and minimal tree removal. However, the mill race flows at the low flow condition are higher than for any of the dam removal alternatives.

PRIMARY AND SECONDARY GOALS

All alternatives meet the four primary and secondary goals except for the partial dam removal option (Alt. 9) and add ramp only (Alt. 10). The multiple riffle option provides additional recreational opportunities for kayaking and canoeing by making higher velocity areas for the boats to pass over. Therefore, the first eight alternatives are equally viable with respect to meeting the primary and secondary project goals. The partial dam removal option is the least optimal alternative since it does not completely meet two of the four primary and secondary goals. The last alternative (no dam removal) partially meets safety concerns after a ramp is installed to reduce future scour potential. However, it does not meet the other primary and secondary goals.

Does Not Meet All Goals: Partial Dam Removal (Alt. 9) Add Ramp Only (Alt. 10)

Table 17. Alternative Comparison Matrix

		Primary Goals	Secondary Goals			Local Goals				Cost Comparison		
No.	Alternative	Public Safety	Aquatic Passage	Water Quality	Recreation	Mill Race Flows	Minimal Plaza Impacts	Minimal Park Impacts	No Tree Impacts	Total Cost Rank (1 lowest)	Project Cost Rank (1 lowest)	Recommended?
	Existing Conditions	✗	✗	✗	--	💧💧💧💧💧						
1	**Full Dam Removal**	✓	✓	✓	✓	No Flow	✓	✓	✓	2	3	✗
2	**Channel Routed for Parking**	✓	✓	✓	✓	💧💧	✗	✗	✗✗	10	10	✗
3	**Channel S. of Gazebo**	✓	✓	✓	✓	💧 Lowest	✗	✗✗	✗	5	5	✗
4	**Deeper Culvert at Existing Location**	✓	✓	✓	✓	💧💧💧	✓	✗	✗	7	7	✓
5	**New Culvert Routed for Parking**	✓	✓	✓	✓	💧💧	✓	✗	✗✗	8	8	✗
6	**New Straight Culvert**	✓	✓	✓	✓	💧💧💧💧	✓	✗	✗	6	6	✓
7	**One Riffle at Intake**	✓	✓	✓	✓	💧💧💧	✓	✓	✓	3	4	✗
8	**Multiple Riffles**	✓	✓	✓	✓✓	💧💧💧💧💧	✓	✓	✓	9	9	✗
9	**Partial Dam Removal**	--	✗	--	✗	💧💧	✓	✓	✓	4	2	✗
10	**Add Ramp Only**	--	✗	✗	✗	💧💧💧💧💧	✓	✓	✓	1	1	✓ (Option)

✓	Yes
✗	No/None
✗✗	Worse Impacts
--	Partial/Minimal
✓✓	Improved
💧	Least
💧💧	Low
💧💧💧	Moderate
💧💧💧💧	High
💧💧💧💧💧	Most

LOCAL GOALS

KEEP MILL RACE FLOWS

All alternatives continue to provide flows to the mill race except for the dam removal only (Alt. 1) option. If the dam is not removed (Alt. 10), the mill race flows are completely maintained. The channel intake south of the gazebo (Alt. 3) provides the lowest flows to the mill race and the multiple riffles (Alt. 8). The deep culvert, straight culvert and partial removal alternatives provide the next most flow to the mill race with the straight culvert (Alt. 6) carrying the most of the three.

Does Not Meet Goal: Dam Removal Only (Alt. 1)

MINIMIZE NEW PLAZA IMPACTS

The channel alternatives do not minimize impacts to the new Plaza. The channel located south of the gazebo probably impacts the Plaza the most since much of the water feature that the Plaza overlooks, will be filled in. The rest of the alternatives have minimal, if any, impacts to the new Plaza.

Does Not Meet Goal: Channel options (Alts. 2 and 3)

MINIMIZE PARK IMPACTS

Mill race intake changes require some modifications to existing infrastructure at the park including the parking lot, the stormwater collection system, sidewalks and whether a work is required to allow full park and trail access. The culvert intake options impact the parking lot and stormwater collection systems at various levels. Both channel options require a new culvert bridge and the second also requires sidewalk repairs. The second channel option appears to impact the park the most since it is the only configuration where a portion of the mill race will be filled in. The remaining alternatives (riffles and partial removal) do not impact the park infrastructure at all.

Does Not Meet Goal: Culvert options (Alts. 4 to 6) and channel options (Alts. 2 and 3)

MINIMIZE TREE REMOVAL

The dam removal only (Alt. 1), riffle (Alts. 7 and 8), the partial dam removal (Alt. 9) and the no dam removal (Alt. 10) options do not require any trees to be removed since no park infrastructure is impacted. Tree removal could be considered a park impact, but it was pulled out to compare the magnitudes of the specific tree removal impacts. Of those that require tree removal, the channel and culvert routed for parking (Alts. 2 and 5) require the most tree removal. The channel south of the gazebo and the straight culvert (Alts. 3 and 6) each have moderate tree removal requirements. The lowered culvert option requires the least of those that require tree removal.

Does Not Meet Goal: Channel/culvert routed for parking (Alts. 2 and 5), channel S. of the gazebo (Alt. 3) and straight culvert (Alt. 6)

RECOMMENDATIONS

Recommended Alternatives

The Illinois Department of Natural Resources, Office of Water Resources (IDNR/OWR) recommends full dam removal for the North Aurora Dam on the Fox River. This recommendation is based on the Department's established policies for state owned or controlled dams which indicate high preferences for public safety, ecological improvements and development of recreational opportunities, while giving full attention to economics. This recommended measure will eliminate public safety liability concerns created by the dam, restore ecological connectivity to these rivers, improve recreational use of these rivers, and essentially eliminate the city's future dam maintenances costs. Eight of the ten alternatives include full dam removal.

When selecting which alternative is best, each was compared with respect to meeting primary goals, secondary goals, local goals and minimizing cost. The following two culvert options recommended for further consideration by the Village. Since some of the intake modifications do not affect outcome very much, more than one is recommended. Both meet all four primary and secondary goals, maintain mill race flows the most, and have minimal new Plaza impacts. Additional rationale is outlined below:

- **Alternative 4 – Lowered Culvert**
    - Moderate flow to mill race
    - Minimal tree removal
    - Moderate cost
- **Alternative 6 – Straight Culvert**
    - Best flow to the mill race
    - Moderate tree removal
    - Moderate cost

The dam removal only option (Alt. 1) is not recommended because the mill race will dry out. The channel routed for parking (Alt. 2) is the most expensive, so it was not recommended. The channel S. of the gazebo (Alt. 3) brought little flow to the mill race and creates the largest impacts to the park by filling in part of the mill race. The culvert routed for the parking lot (Alt. 5) was not selected since it brings less flow to the mill race and requires more tree removal than the other similar priced culvert options. The single riffle option (Alt. 7) was not recommended since it does not carry much flow to the mill race. Multiple riffles (Alt. 8) bring the most flow to the mill race but it was the second most expensive alternative. The partial dam removal (Alt. 9) was not selected since it does not meet two of the secondary project goals. The option to not remove the dam (Alt. 10) is not recommended since it doesn't meet any of the secondary goals, but information was presented to provide one alternative where sediment did not need to be removed.

Sediment removal costs need to be further refined before a final alternative can be selected. As mentioned, if minimal fine material is found after additional sediment probes/samples are taken, the material will be found to be non-contaminated and will not require removal. If the gradation is deemed fine, IEPA will assume the sediment contains the same materials as found in the samples taken for this report and will require removal and proper disposal. In addition to further gradation analysis, additional chemical analysis could be completed to determine whether specific erodible sediment is contaminated. Due to the high costs related to sediment removal and disposal, the entire project might be deemed cost prohibitive and none of the preferred alternatives will be viable. The last alternative is recommended as optional for further evaluation if, upon further testing, the contaminated sediment removal is deemed to be too expensive or if private owners do not agree to easements in the river. This alternative is not preferred but it might be the only viable choice.

- **Option - Alternative 10 – Add Ramp Only**
    - Best flow to the mill race
    - No tree removal
    - Lowest cost
    - Does not address secondary goals

It will be key to select an alternative that meets all the primary and secondary goals and most of the local goals while also minimizing sediment removal quantities. The Village should take the results outlined in this report to determine how they would like to proceed.

Remaining Tasks

ADDITIONAL TESTING

IDNR will perform field work in the Fox River from North Aurora Dam upstream to the Batavia Dam. Depth of sediment (DOR) testing will be completed to better determine silt levels in the river. Core samples will be taken of the material and sent to the IDOT testing lab to determine gradation/particle size analysis. If the material can be shown to contain less than 20% fines, it will be considered non-contaminated and will not require removal. If the material is deemed fine and if the refined model indicates certain areas are erodible, additional chemical testing could be completed to determine if the specific material is contaminated. Chemical testing is expensive (~$5k per sample) but if targeted samples are taken and found to be uncontaminated, the cost savings to the project will be great. However, the material could also be found to be contaminated like the samples taken for this report. Further decisions will be required by IDNR, IEPA and the Village about the appropriate testing path moving forward.

PERMITTING COORDINATION

Dam removal projects require permits by regulatory agencies having authority which generally include USACE, IEPA and IDNR. Typically, Illinois uses a joint permit application process to streamline the authorization process. This allows the applicant to submit one application which is reviewed by all three agencies. Initial meetings have been held with all three agencies to determine if there were any potential issues that would not allow this project to proceed. Initial discussions have not indicated any fine, IEPA will assume the sediment contains the same materials as found in the samples taken for this report and will require removal and proper disposal. In addition to further gradation analysis, additional chemical analysis could be completed to determine whether specific erodible sediment is contaminated. Due to the high costs related to sediment removal and disposal, the entire project might be deemed cost prohibitive and none of the preferred alternatives will be viable. The last alternative is recommended as optional for further evaluation if, upon further testing, the contaminated sediment removal is deemed to be too expensive or if private owners do not agree to easements in the river. This alternative is not preferred but it might be the only viable choice.

- **Option - Alternative 10 – Add Ramp Only**
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It will be key to select an alternative that meets all the primary and secondary goals and most of the local goals while also minimizing sediment removal quantities. The Village should take the results outlined in this report to determine how they would like to proceed.

Remaining Tasks

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IDNR will perform field work in the Fox River from North Aurora Dam upstream to the Batavia Dam. Depth of sediment (DOR) testing will be completed to better determine silt levels in the river. Core samples will be taken of the material and sent to the IDOT testing lab to determine gradation/particle size analysis. If the material can be shown to contain less than 20% fines, it will be considered non-contaminated and will not require removal. If the material is deemed fine and if the refined model indicates certain areas are erodible, additional chemical testing could be completed to determine if the specific material is contaminated. Chemical testing is expensive (~$5k per sample) but if targeted samples are taken and found to be uncontaminated, the cost savings to the project will be great. However, the material could also be found to be contaminated like the samples taken for this report. Further decisions will be required by IDNR, IEPA and the Village about the appropriate testing path moving forward.

PERMITTING COORDINATION

Dam removal projects require permits by regulatory agencies having authority which generally include USACE, IEPA and IDNR. Initial meetings have been held with all three agencies to determine if there were any potential issues that would not allow this project to proceed. Initial discussions have not indicated any reason the project cannot move forward. However, no agency has formally reviewed the project and will only be able to provide comments when they officially review the application.

As indicated in the sediment transport section of the report, coordination with IEPA will continue as additional sediment gradation information is obtained and sediment transport modeling is refined. This information will provide additional information to IEPA when they review the permit application.

The USACE was contacted to determine whether the mill race flow needs to be maintained after the dam is removed. Per conversations with the USACE staff assigned to this project, changes to the mill race flow will be a loss of an aquatic resource. However, the stream loss would be mitigated by the positive outcomes related to the dam removal. Therefore, the USACE will not require that flow be maintained in the mill race. It was noted that public or other local entity support might push for the mill race flows to be maintained though.

USACE Permit applicability determinations will be made when the permit application has been submitted. Generally, dam removal projects fall under Nationwide Permit 53. Some aspects of the alternatives (i.e., filling the mill race or culvert replacement work) may not fall within the nationwide permit and might be covered under other nationwide permits or will require individual permits. In general, nationwide permits are easier to apply for compared to individual permits.

MONITORING

The state of Illinois keeps a database of all documented locations and quantities of threatened or endangered species. IDNR fisheries biologist have sampled fish upstream and downstream of the dam. It is expected that IDNR fisheries staff will continue monitoring the Fox River fish populations every five years. If the dam is removed, it would be beneficial to compare the abundance of fish and number of species before and after removal. A complete CERP permit will be required during the design phase of any dam modification project. The permit requirements might dictate the need for additional fish, mussel or macroinvertebrate monitoring before and after the dam is removed.

PROJECT SPONSORSHIP DETAILS

Prior to implementation of any jointly funded dam modification measures, a local sponsor must enter into an InterAgency Governmental Agreement (IGA) to participate in the project with IDNR, Office of Water Resources. The Village of North Aurora or the Fox Valley Park District could be such a sponsor. As a potential project sponsor, the local sponsor will be requested to obtain all local permits necessary to construct the project, pay for all state and federal permits, acquire all land rights required for the construction, pay for any utility relocations required by the project, take ownership of the dam, operate and maintain the project, and pay any construction cost of enhancements requested by the Village. The IDNR/OWR is prepared to commit to finalizing all planning, design and construction documents, overseeing the bid process, supervising construction, obtaining all state and federal permits and paying for all construction costs directly related to the agreed upon project.

IDNR has developed a guidance document for public dam removal projects which outlines the prioritization of projects within the state and the general process moving forward. The guidance document can be found on IDNR's website (Dam Removal Guidance Document) and can be found in **Appendix H**. Please note that the version found on the website will always be the most current.

Table 18 shows the typical cost breakdown between IDNR and the Village of North Aurora for each of the alternatives based on Office of Water Resources guidelines for dam removals. Green values indicate potential costs for the Village for each alternative but final design factors might alter these assignments. For Alternatives 1 thru 6, OWR covers 100% of the design and construction costs since they meet the primary safety goal with full dam removal. Alternatives 7 thru 10 require local funds to be contributed since they do not achieve all the dam removal goals. Costs will likely vary when the project moves forward and will need to be adjusted as needed.

	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7	Alt. 8	Alt. 9	Alt. 10
	Dam Rem.	Open Ch. 1	Open Ch 2	Culvert 1	Culvert 2	Culvert 3	1 Riffle	Mult Riffle	Partial	No Rem.
Sediment Sampling	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000	$0
Engineering	$1,254,300	$1,569,000	$1,313,300	$1,358,000	$1,369,800	$1,343,300	$1,260,600	$1,441,000	$1,289,800	$231,400
Construction (OWR)	$4,561,100	$5,705,700	$4,775,700	$4,938,000	$4,981,100	$4,884,700	$2,750,280	$3,143,880	$2,814,120	$504,900
Construction (Local)	$0	$0	$0	$0	$0	$0	$1,833,520	$2,095,920	$1,876,080	$336,600
Easements	$32,625	$32,625	$32,625	$32,625	$32,625	$32,625	$32,625	$32,625	$32,625	$0
OWR Total	$5,865,400	$7,324,700	$6,139,000	$6,346,000	$6,400,900	$6,278,000	$2,750,280	$3,143,880	$2,814,120	$504,900
Local Total *	$32,625	$32,625	$32,625	$32,625	$32,625	$32,625	$3,176,745	$3,619,545	$3,248,505	$568,000
** Note: Does not include cost of permit fees*										

Table 18. Alternative Dam Removal Payment Responsibility

REFERENCES

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RESOURCES

Additional information about the overall Fox River Watershed can be found in reports developed by the Fox River Study Group (http://ilrdss.sws.uiuc.edu/fox/).

Appendix A

Parcel Information

PIN	PIN_1	GNIS	Township	TaxCode	UseCode	TaxName	SiteAddres	SiteCity	SiteState	SiteZip
1222257011		424246	BATAVIA	BA931	0060	10 SHUMWAY LLC	10 S SHUMWAY AVE	BATAVIA	IL	60510
1227251001		424246	BATAVIA	BA005	0060	BATAVIA OVERSEAS CLUB INC	645 S RIVER ST	BATAVIA	IL	60510
1222257010		424246	BATAVIA	BA931	0060	BATAVIA SHOPPING PLAZA INC	2 - 8 W WILSON ST	BATAVIA	IL	60510
1233403022		424246	BATAVIA	BA103	0030	COLE TAYLOR BANK SUCCESSOR TRUSTEE	357 N LINCOLNWAY	NORTH AURORA	IL	60542
1233403003		424246	BATAVIA	BA103	0030	COLE TAYLOR BANK SUCCESSOR TRUSTEE				
1233454002		424246	BATAVIA	BA103	0030	DANCE, NIGEL P & DAVID T				
1227203003		424246	BATAVIA	BA003	0030	DAVIES, MICHAEL T				
1504202030		424246	AURORA	AU934	0040	EWO LTD	145 N LINCOLNWAY	NORTH AURORA	IL	60542
1233403002		424246	BATAVIA	BA103	0030	FITZPATRICK PROPERTIES LLC	N LINCOLNWAY	NORTH AURORA	IL	60542
1233454016		424246	BATAVIA	BA103	0040	GOBLET, CHRISTOPHER P TR, TRUSTEE	275 N LINCOLNWAY	NORTH AURORA	IL	60542
1504203003		424246	AURORA	AU934	0040	GRANTER, ANITA 2014 TR, TRUSTEE	127 MONROE ST	NORTH AURORA	IL	60542
1233403007		424246	BATAVIA	BA103	0030	KELLEY, EDWARD A & JOAN A				
1233403006		424246	BATAVIA	BA103	0030	KELLY, FRANKIE C & JACALYN				
1222203003		424246	BATAVIA	BA931	0080	LASALLE NATIONAL BANK				
1215456001		424246	BATAVIA	BA931	0080	LASALLE NATIONAL BANK				
1222203001		424246	BATAVIA	BA931	0080	LASALLE NATIONAL BANK	325 N RIVER ST	BATAVIA	IL	60510
1222203002		424246	BATAVIA	BA931	0080	LASALLE NATIONAL BANK	335 N RIVER ST	BATAVIA	IL	60510
1227180005		424246	BATAVIA	BA003	0030	LENZINI, JAMES R REVOC LIV TR, TRUSTEE				
1233200025		424246	BATAVIA	BA003	8000	LOYAL ORDER OF MOOSE				
1233200025		424246	BATAVIA	BA003	8000	LOYAL ORDER OF MOOSE				
1233200025		424246	BATAVIA	BA003	8000	LOYAL ORDER OF MOOSE				
1227180001		424246	BATAVIA	BA003	0030	MCNISH, MICHELLE E & EDDY, SCOTT T				
1227180006		424246	BATAVIA	BA003	0030	MCNISH, MICHELLE E & EDDY, SCOTT T				
1227180007		424246	BATAVIA	BA003	0030	MCNISH, MICHELLE E & EDDY, SCOTT T				
1227176026		424246	BATAVIA	BA003	0040	NOVAK, JUSTIN & GRAVELINE, ALYSSA	1255 WOODLAND AVE	BATAVIA	IL	60510
1227251016		424246	BATAVIA	BA005	0060	OLD SECOND NATIONAL BANK AURORA				
1227251016		424246	BATAVIA	BA005	0060	OLD SECOND NATIONAL BANK AURORA				
1504203002		424246	AURORA	AU934	0030	PROFECTUS REALTY III LLC	MONROE ST	NORTH AURORA	IL	60542
1222203038		424246	BATAVIA	BA931	0060	RIVER STREET BUILDINGS LLC				
1233200010		424246	BATAVIA	BA103	0040	SMITH, KENNETH C & PATRICIA M JOINT DCLR OF TR	2501 S RIVER RD	BATAVIA	IL	60510
1233403019		424246	BATAVIA	BA103	0030	STARRETT, PETER J & SUSAN S				
1233403021		424246	BATAVIA	BA103	0030	STARRETT, PETER J & SUSAN S				
1227303001		424246	BATAVIA	BA003	0030	SYKSTUS, WILLIAM & CHRISTINE	1242 WOODLAND AVE	BATAVIA	IL	60510
1227180003		424246	BATAVIA	BA003	0030	SYKSTUS, WILLIAM & CHRISTINE				
1222202021		424246	BATAVIA	BA932	0060	TRUST # 8002359646 & TSICHLIS, JOHN	33 N ISLAND AVE	BATAVIA	IL	60510
1222202015		424246	BATAVIA	BA932	0060	VANTELL GROUP LLC	34 N ISLAND AVE	BATAVIA	IL	60510
1227251032		424246	BATAVIA	BA005	0060	WINDMILL CITY ENTERTAINMENT INC	1335 S RIVER ST	BATAVIA	IL	60510
1222203004		424246	BATAVIA	BA931	8000	BATAVIA CITY OF				
1222203018		424246	BATAVIA	BA931	8000	BATAVIA CITY OF				

PIN	PIN_1	GNIS	Township	TaxCode	UseCode	TaxName	SiteAddres	SiteCity	SiteState	SiteZip
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1227203002		424246	BATAVIA	BA005	8000	BATAVIA CITY OF				
1215455001		424246	BATAVIA	BA903	8000	BATAVIA PARK DISTRICT				
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1227203006		424246	BATAVIA	BA005	8000	BATAVIA PARK DISTRICT				
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PIN	PIN_1	GNIS	Township	TaxCode	UseCode	TaxName	SiteAddres	SiteCity	SiteState	SiteZip
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1227303015		424246	BATAVIA	BA003	8000	FOREST PRESERVE DISTRICT OF KANE COUNTY				
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1233200022		424246	BATAVIA	BA003	8000	FOREST PRESERVE DISTRICT OF KANE COUNTY				
1234100001		424246	BATAVIA	BA010	8000	FOREST PRESERVE DISTRICT OF KANE COUNTY				
1227326001		424246	BATAVIA	BA037	8000	FOX VALLEY PARK DISTRICT	1400 N RIVER RD	NORTH AURORA	IL	60542
1227351001		424246	BATAVIA	BA036	8000	FOX VALLEY PARK DISTRICT				
1227351002		424246	BATAVIA	BA036	8000	FOX VALLEY PARK DISTRICT				
1227351003		424246	BATAVIA	BA036	8000	FOX VALLEY PARK DISTRICT				
1227351004		424246	BATAVIA	BA036	8000	FOX VALLEY PARK DISTRICT				
1227351004		424246	BATAVIA	BA036	8000	FOX VALLEY PARK DISTRICT				
1227352001		424246	BATAVIA	BA037	8000	FOX VALLEY PARK DISTRICT				
1233200009		424246	BATAVIA	BA103	8000	FOX VALLEY PARK DISTRICT	930 N RIVER RD	NORTH AURORA	IL	60542
1233403011		424246	BATAVIA	BA103	8000	FOX VALLEY PARK DISTRICT				
1233403012		424246	BATAVIA	BA103	8000	FOX VALLEY PARK DISTRICT				
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PIN	PIN_1	GNIS	Township	TaxCode	UseCode	TaxName	SiteAddres	SiteCity	SiteState	SiteZip
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1234100003		424246	BATAVIA	BA103	8000	FOX VALLEY PARK DISTRICT	2118 S RIVER ST	BATAVIA	IL	60510
1234100004		424246	BATAVIA	BA103	8000	FOX VALLEY PARK DISTRICT				
1504203001		424246	AURORA	AU934	8000	FOX VALLEY PARK DISTRICT	FOX RIVER	NORTH AURORA	IL	60542
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1504226021		424246	AURORA	AU934	8000	FOX VALLEY PARK DISTRICT				
1233454001		424246	BATAVIA	BA103	8000	NORTH AURORA VILLAGE OF				
1215455002		424246	BATAVIA	BA903	8000	UNITED STATES OF AMERICA				
1233200008		424246	BATAVIA	BA003	0060	UNKNOWN				

Appendix B

Model Assumptions and Details

Copies of and additional information about the Hydraulic and Sediment Transport Models can be obtained from IDNR- OWR (Aaron.Rotherham2@Illinois.gov, 217-782-4615).

Hydraulic Model Assumptions

- Due to the lack of gage data, flow from the Montgomery gage was reduced by just under 2% based on the reduction of the watershed area
- 2D Terrain was created by combining bathymetry (OWR, 08/2021) with Lidar data (Illinois Geospatial Data Clearinghouse, 2017)
- Flow to the mill race must be maintained during low and median Fox River flows
- Low flow conditions based on the minimum flow of the 06/2021 event (188 cfs)
- Median flow based on the median of daily median flows at the Montgomery gage for the year (xx cfs)
- 100 yr event flows are from streamstats (16,200 cfs), which is higher than the FIS 100 yr event (14,350 cfs)
- Manning's n values are the same for all alternatives:

Land Use	Mannings n	% Impervious
NoData	0.04	0
Grassland Herbaceous	0.04	0
Open Water	0.04	100
Barren Land Rock-Sand-Clay	0.04	0
Developed, Open Space	0.035	0
Developed, Low Intensity	0.08	20
Developed, Medium Intensity	0.10	40
Developed, High Intensity	0.12	60
Deciduous Forest	0.10	0
Cultivated Crops	0.05	0
Woody Wetlands	0.15	50
Emergent Herbaceous Wetlands	0.08	75

- 1D cross-sections from HEC2 data added to 2D portion to reach full length of impact
- Bridge data was converted from HEC2 data
- Mill race flow was adjusted to account for blockage from the existing gate control structure not functioning properly. The flow was partially blocked to a depth of 1.28 ft based on the June 2022 flow data collected at the State St. bridge over the mill race.
- The proposed culverts using the existing outflow structure are also adjusted to have flow partially blocked.
- Due to the lack of data, calibration was based on photographs and local input.
- Both channel alternatives use box culverts instead of foot-bridges.
- Diffusion wave was used for all scenarios due to lack of data and shorter run times.
- All culvert alternatives using the existing water control structure use the parameters below; new culverts have a "Depth Blocked" of 0.
    - Culvert Size

Culvert Name	Shape	Rise	Span
Mill Race	Circular	4.5	4.5

    - FHWA Chart # 1 - Concrete Pipe Culvert
    - FHWA Scale # 3 - Groove end entrance; pipe projecting from fill
    - Solution Criteria = Highest U.S. EG
    - Culvert Parameters

Water Control Structure	Length	Top n	Bottom n	Depth Blocked	Ent Loss Coeff.	Exit Loss Coeff.
Reuse	258.23	0.013	0.013	1.28	0.20	1.0
New	258.23	0.013	0.013	0	0.20	1.0

- Upstream Elevation = 640.63
- Downstream Elevation = 640.3

- The three flow events were run for a duration of 100 hours at a constant flow to ensure stability and equilibrium through the entire system: Low Flow=188 cfs, Median Flow=1283 cfs 100 yr Flow=16200 cfs.

Sediment Transport Model Assumptions

- Six scenarios were run for the sediment transport model – Existing, Partial Dam Removal, and Full Dam Removal and 2 flow events (855 cfs – low and 6743 cfs 5-year event).
- The low flow model is mimicking how the sediment will transport immediately after the dam is removed. The 5-year event represents what the river might look like over time after the dam is removed.
- Manning's n values are the same as used for the hydraulic model for all three layouts during the low flow event.
- Manning's n values along the banks were adjusted based on WSE during the median flow, to simulate vegetative growth before the 5-year event, emergent wetland=0.08 and woody wetlands=0.1
- Cross-sections encompassed by the 2D terrain from the hydraulic model were created using the terrain data
- Cross-sections upstream of the 2D terrain were taken from georeferenced HEC2 data going up to the dam at Batavia
- All sediment profiles were taken using results from the sampling outlined in the December 2023 Sediment Analysis Report.
- Cross-sections 11600 to 11320 are given sediment profiles matching Sample #4 taken downstream of the North Aurora dam since they are located immediately downstream of the Batavia Dam so will be of similar makeup.
- Cross-sections 3379 to 1209 are given sediment profiles averaged from Samples #1 & #2
- Cross-sections 963 to 562 are given sediment profiles matching Sample #3
- All cross-sections not included above are HEC-RAS interpolations of the sediment profiles between the areas to create transition zones from one sediment profile to the next moving downstream
- Cross-sections located in the scour hole are given sediment profiles of RR5 for Dam Removed and Partial Removal during the 5-year event
- Cross-sections located downstream of the scour hole, for the 5-year event full and partial removal, are given sediment profiles taken from Sample #4
- Cross-sections located in the scour hole for the full and partial removal low flow events are given sediment profiles taken from Sample #4 to simulate the conditions during construction
- All cross-sections downstream of the dam for existing, both 5-year and low flow events, are given sediment profiles taken from Sample #4
- Model Inputs:
    - All six scenarios use the Equilibrium Load boundary condition
    - For the cohesive sediments, use Krone/Partheniades with shear-stresses based on sediment testing from the Mississippi River(Particle Erosion: τ_c=0.02 lb/ft^2,M=0.03 lb/ft^2/hr; Mass Wasting Erosion: τ_{mw}=0.04 lb/ft^2, M_{mw}=0.05 lb/ft^2/hr) as stated in the following USACE publication: Dahl, Travis & Gibson, Stanford & Heath, Ronald & Nygaard, Christopher. (2019). HEC-RAS unsteady flow and sediment model of the Mississippi River: Tarbert Landing to the Gulf. 10.21079/11681/31782.
    - For non-cohesive sediments, Laursen (Copeland) is the transport function, Copeland (EX7) is the sorting method, and Rubey is the fall velocity method
    - Veneer is used for channel deposition and erosion and overbank deposition
    - Averaged (Centered) transport energy slope method is used for the 1D computational options input category.
- Sediment warmup periods of 14 days are used for gradation and bathymetry to allow enough time for the system to stabilize
- Level 4 output using volume was chosen for data analysis due to IEPA standard regarding the volume of sediment being transported, thus requiring the "Longitudinal Cumulative Volume Change" display
- All other options remain the default settings

- For most cross sections, n values were 0.08 for the banks and 0.04 for the river bottom. For areas with woody wetlands and where the current islands are located, 0.15 was used . For areas with medium development, 0.1 was used which is located between cross-sections 1636 and 1584. For the 2D portions of the model, n values were obtained using the land area coverage terrain. Values ranged from 0.04 to .015.
- Weir Data for each Layout
  - Description: Partial Dam Removal

E.G. Elev (ft)	645.69	Weir Sta Lft (ft)	13.00
W.S. Elev (ft)	645.55	Weir Sta Rgt (ft)	404.60
Q Total (cfs)	6743.00	Min El Weir Flow (ft)	642.01
Q Weir (cfs)	6743.00	Wr Top Wdth (ft)	391.59
Weir Max Depth (ft)	3.69	Weir Coef (ft^1/2)	2.600
Weir Avg Depth (ft)	3.48	Weir Flow Area (sq ft)	1364.63
Weir Submerg	0.62		

  - Description: Existing

E.G. Elev (ft)	649.52	Weir Sta Lft (ft)	11.01
W.S. Elev (ft)	649.47	Weir Sta Rgt (ft)	406.38
Q Total (cfs)	6743.00	Min El Weir Flow (ft)	646.01
Q Weir (cfs)	6743.00	Wr Top Wdth (ft)	395.37
Weir Max Depth (ft)	3.52	Weir Coef (ft^1/2)	2.600
Weir Avg Depth (ft)	3.50	Weir Flow Area (sq ft)	1384.43
Weir Submerg	0.00		

Appendix C

Sediment Reports and IEPA Sampling Guidance Document

Digital copies of both sediment analysis reports can be obtained from IDNR-OWR (Terra.McParland@illinois.gov, 217-524-9113).

Appendix D

Wetlands Report

Digital copies of the Wetlands report can be obtained from IDNR-OWR (Terra.McParland@illinois.gov, 217-524-9113).

Appendix E

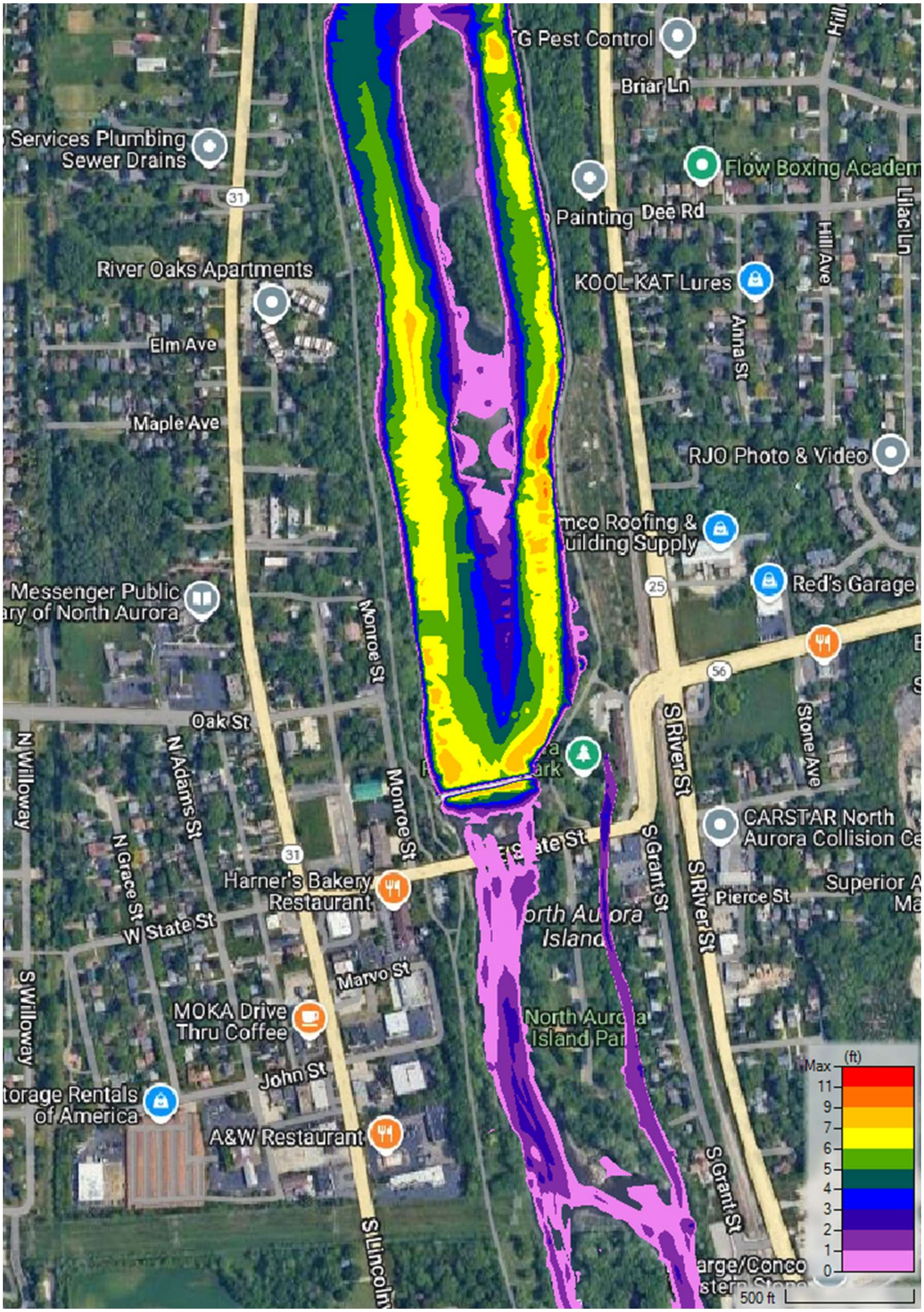
Additional Inundation and Velocity Maps

Alternatives 1-10

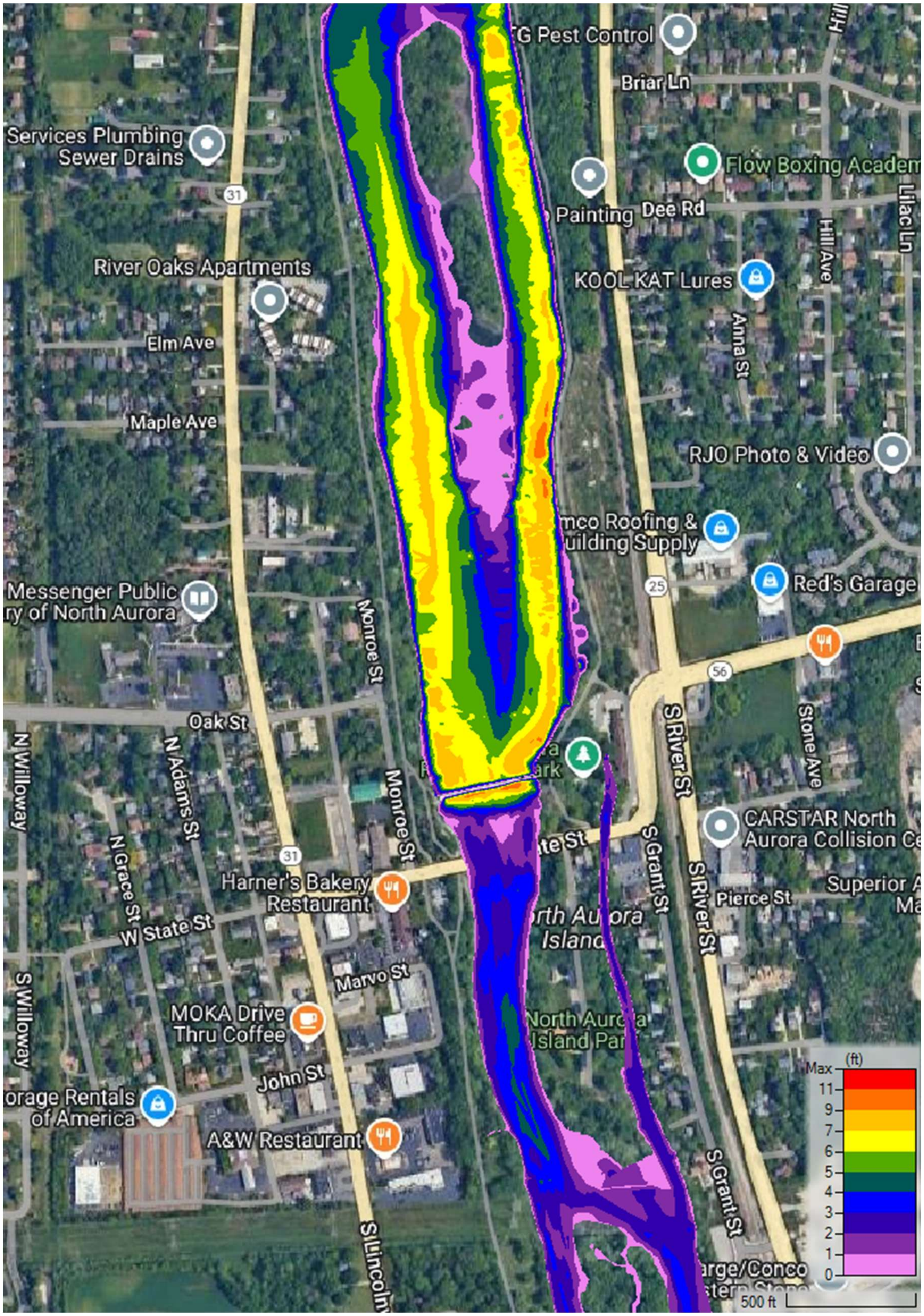
Water Depths

and

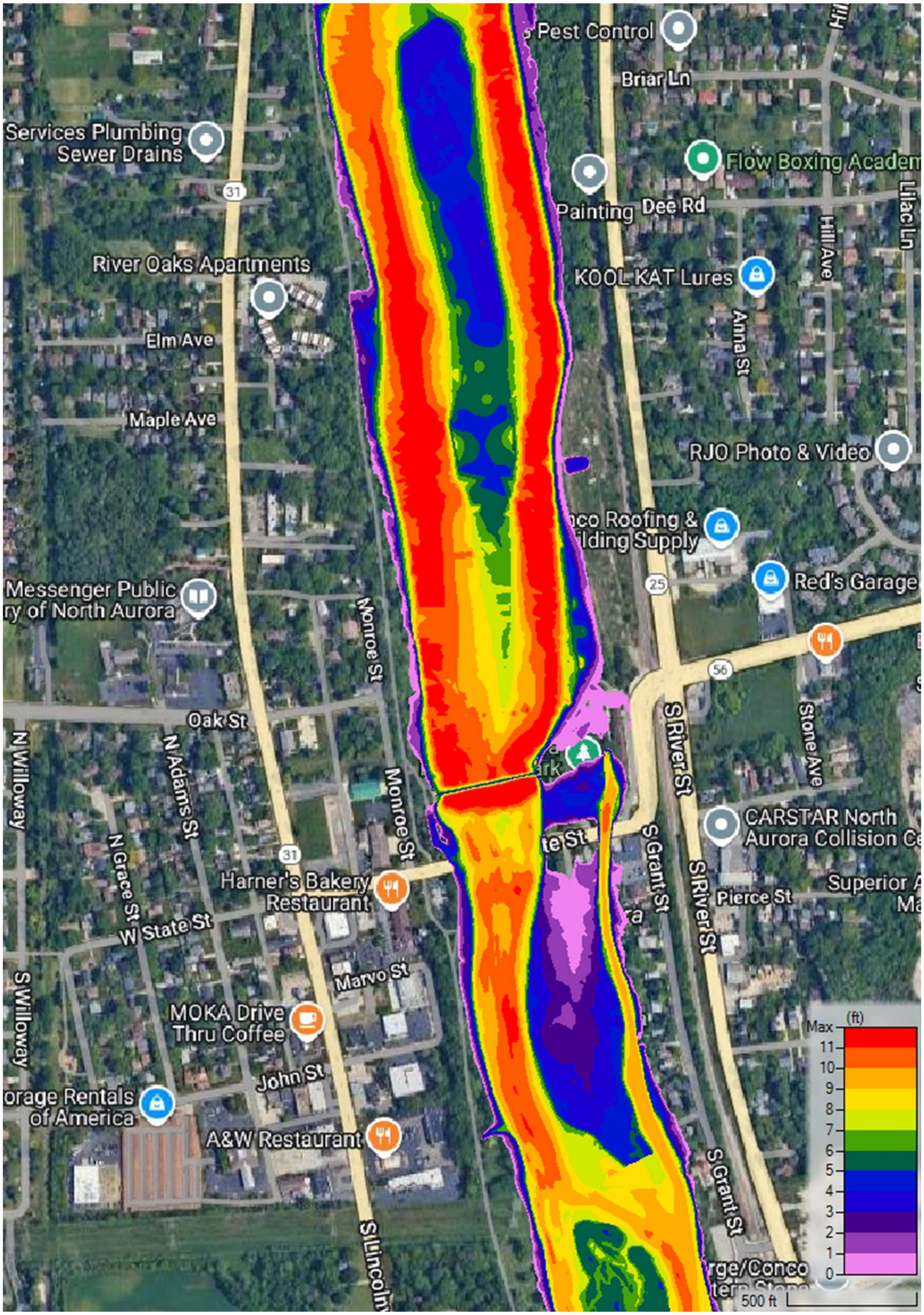
Change in Water Depths from Existing



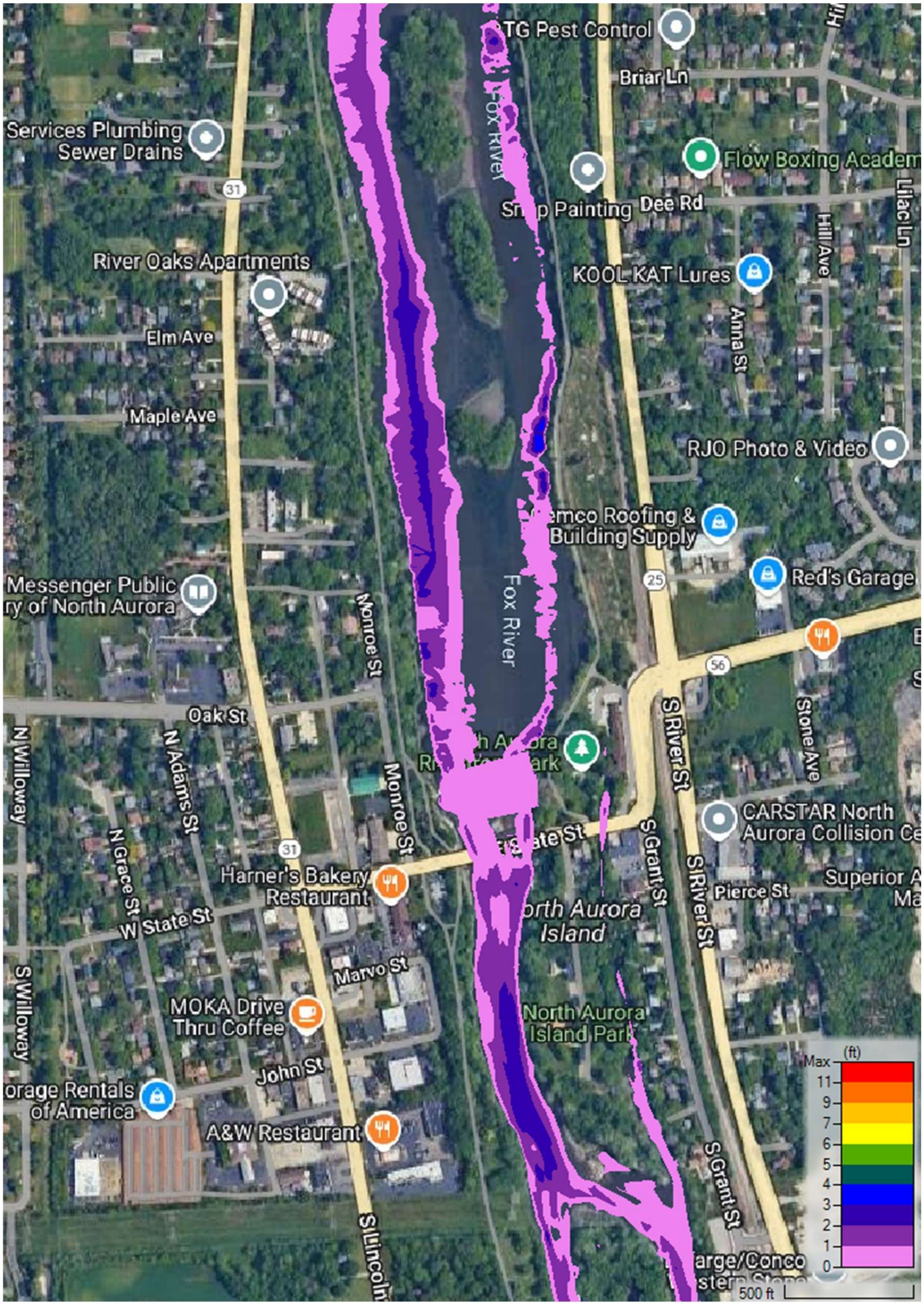
Existing Depth at 188 cfs



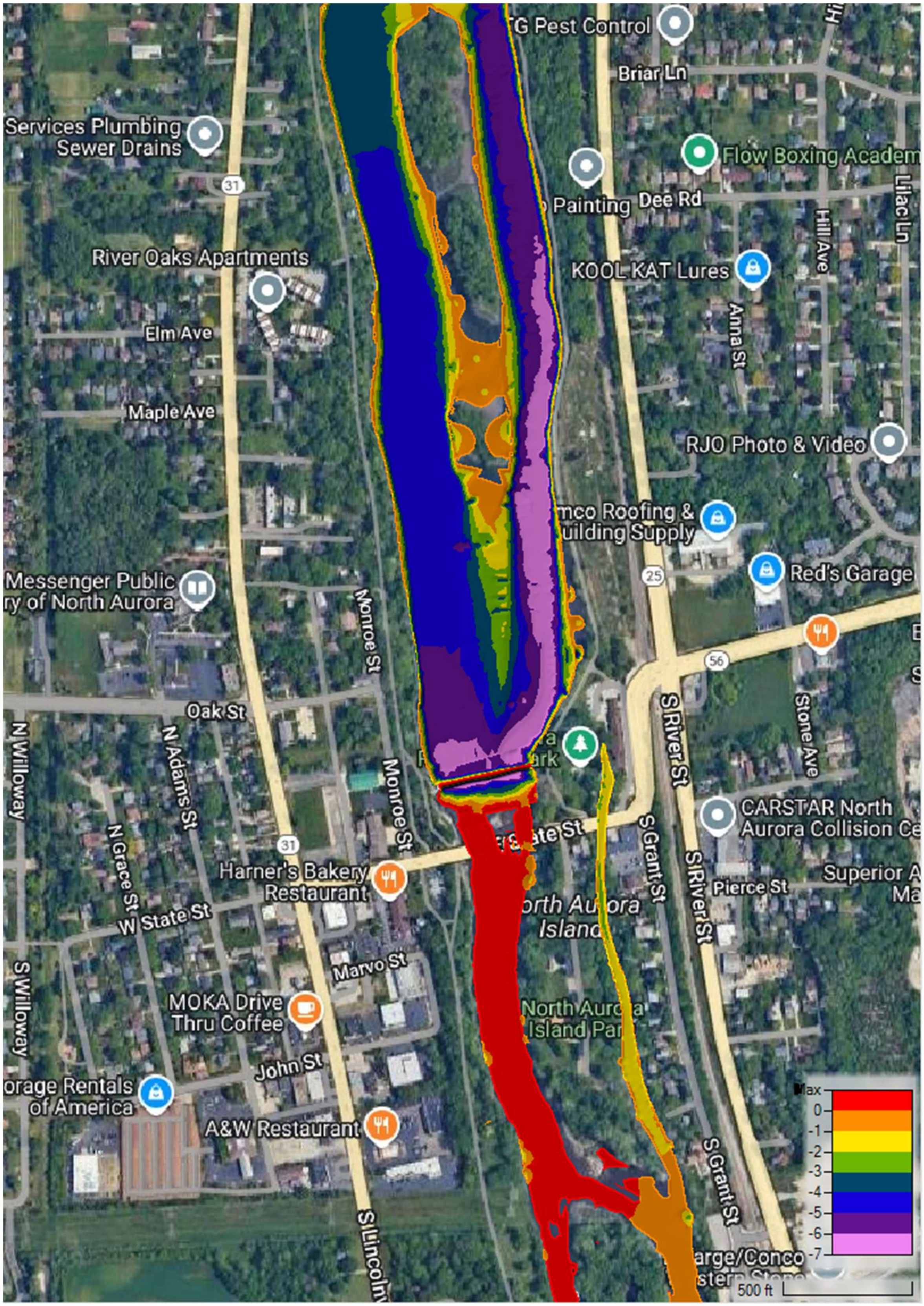
Existing Depth at 1283 cfs



Existing Depth at 16200 cfs



Alternative 1 Depth at 188 cfs



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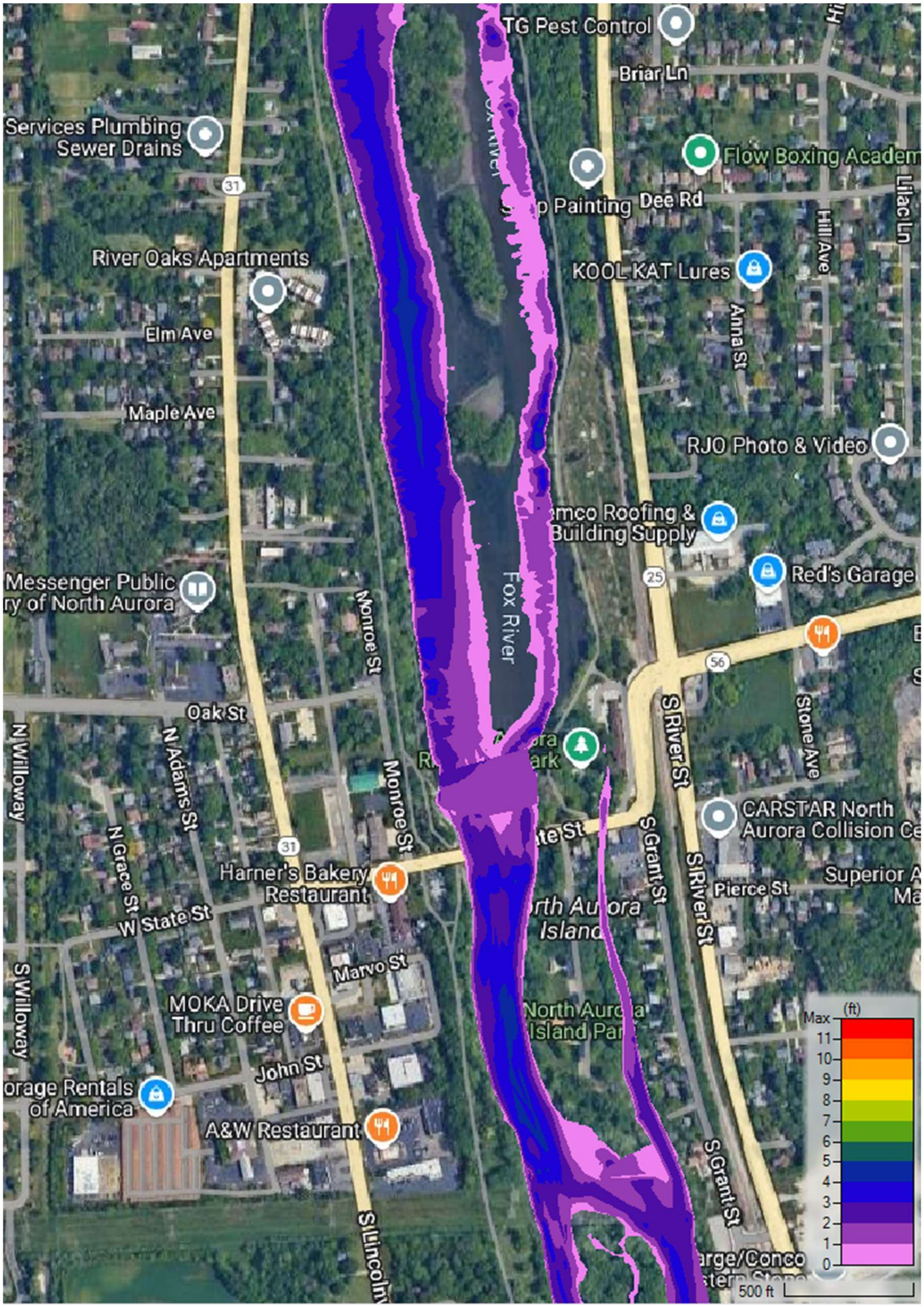

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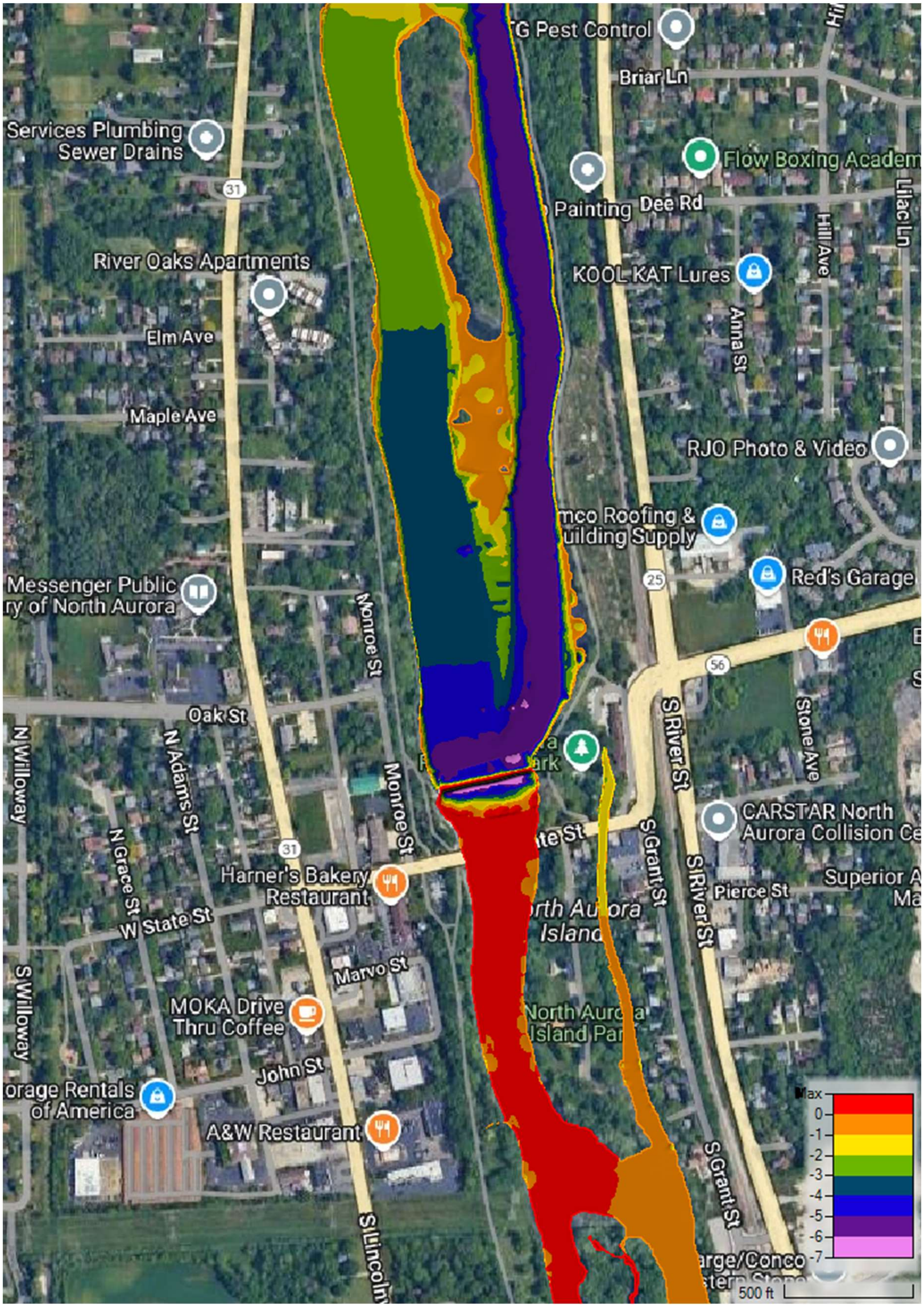

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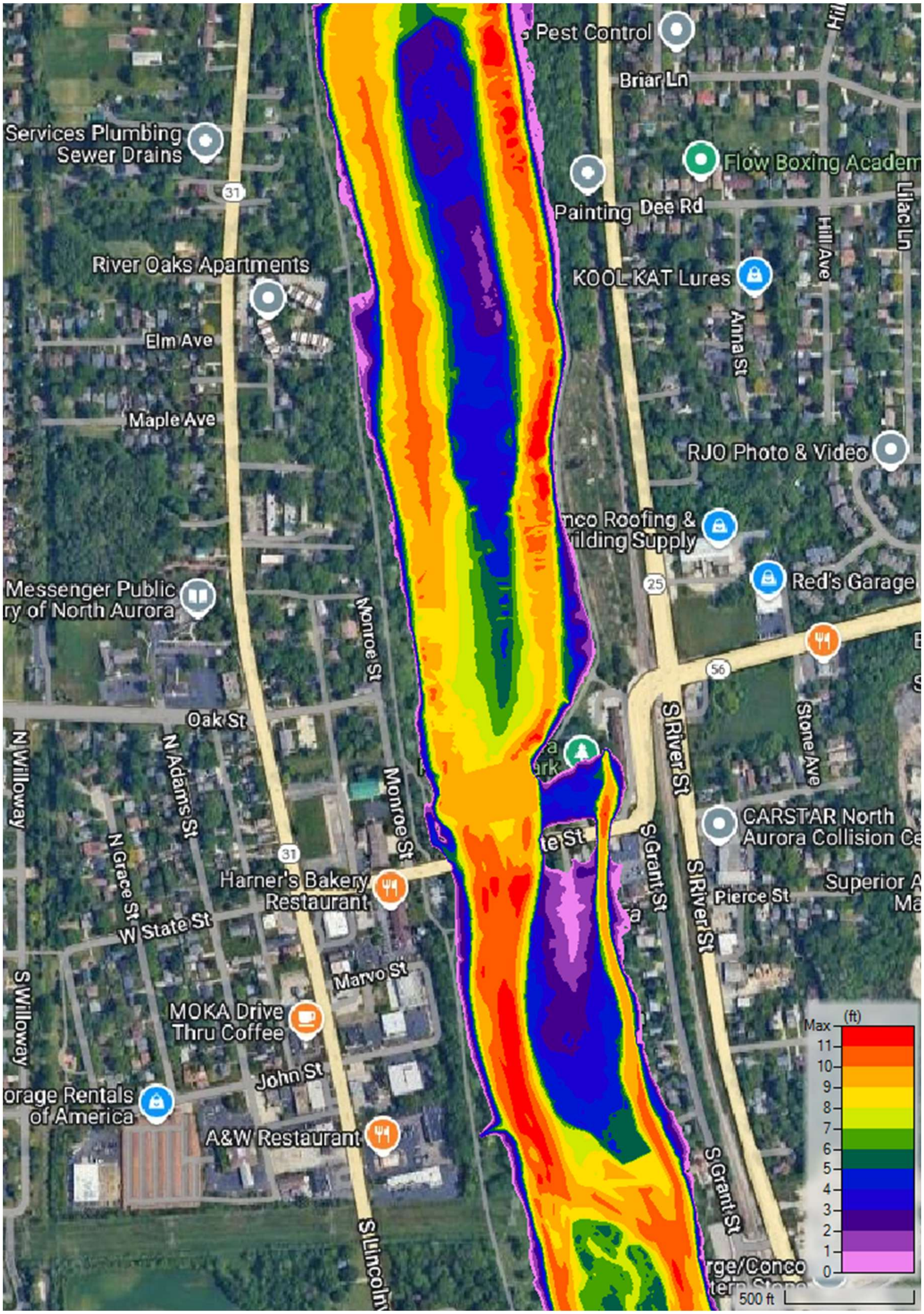

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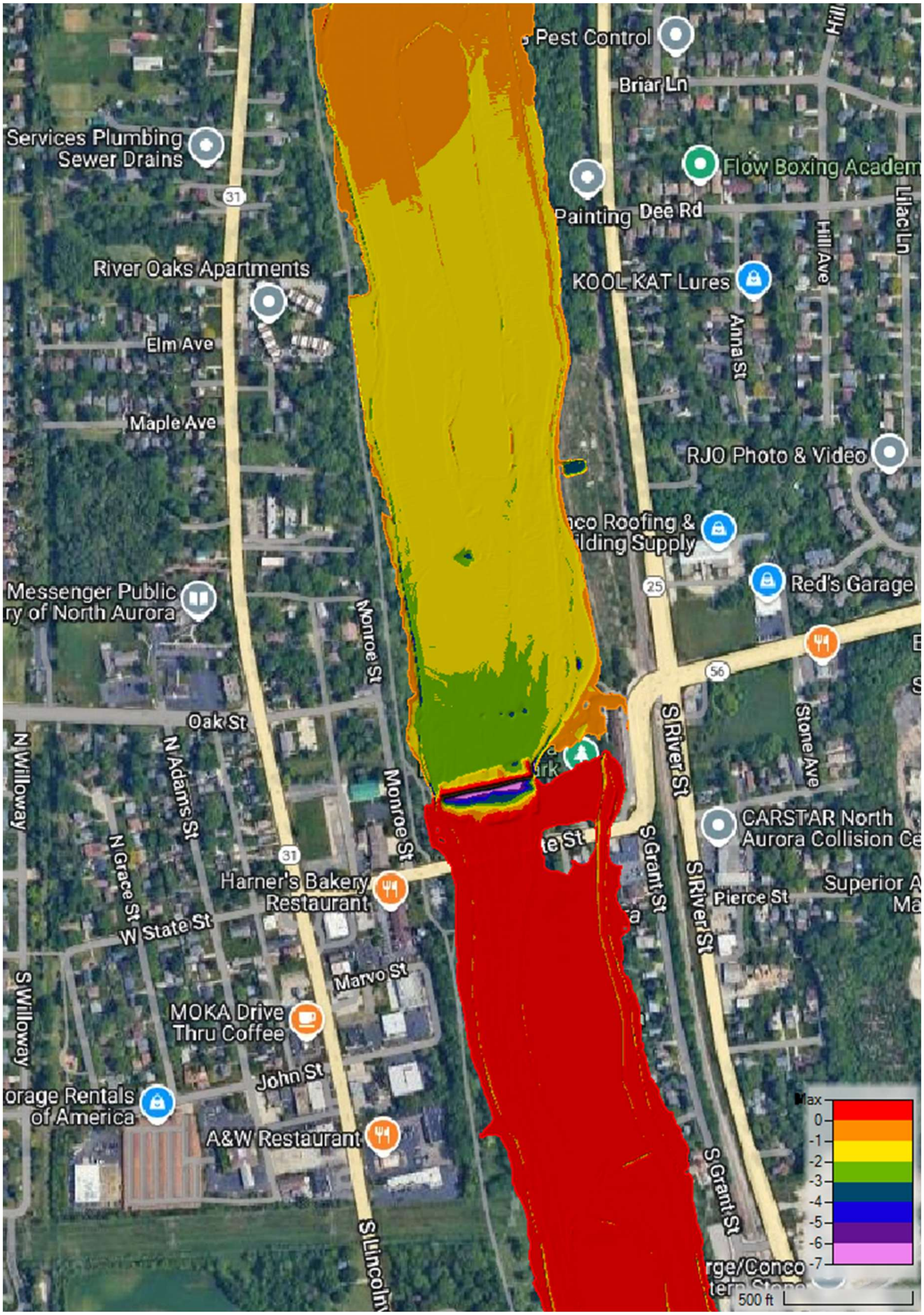

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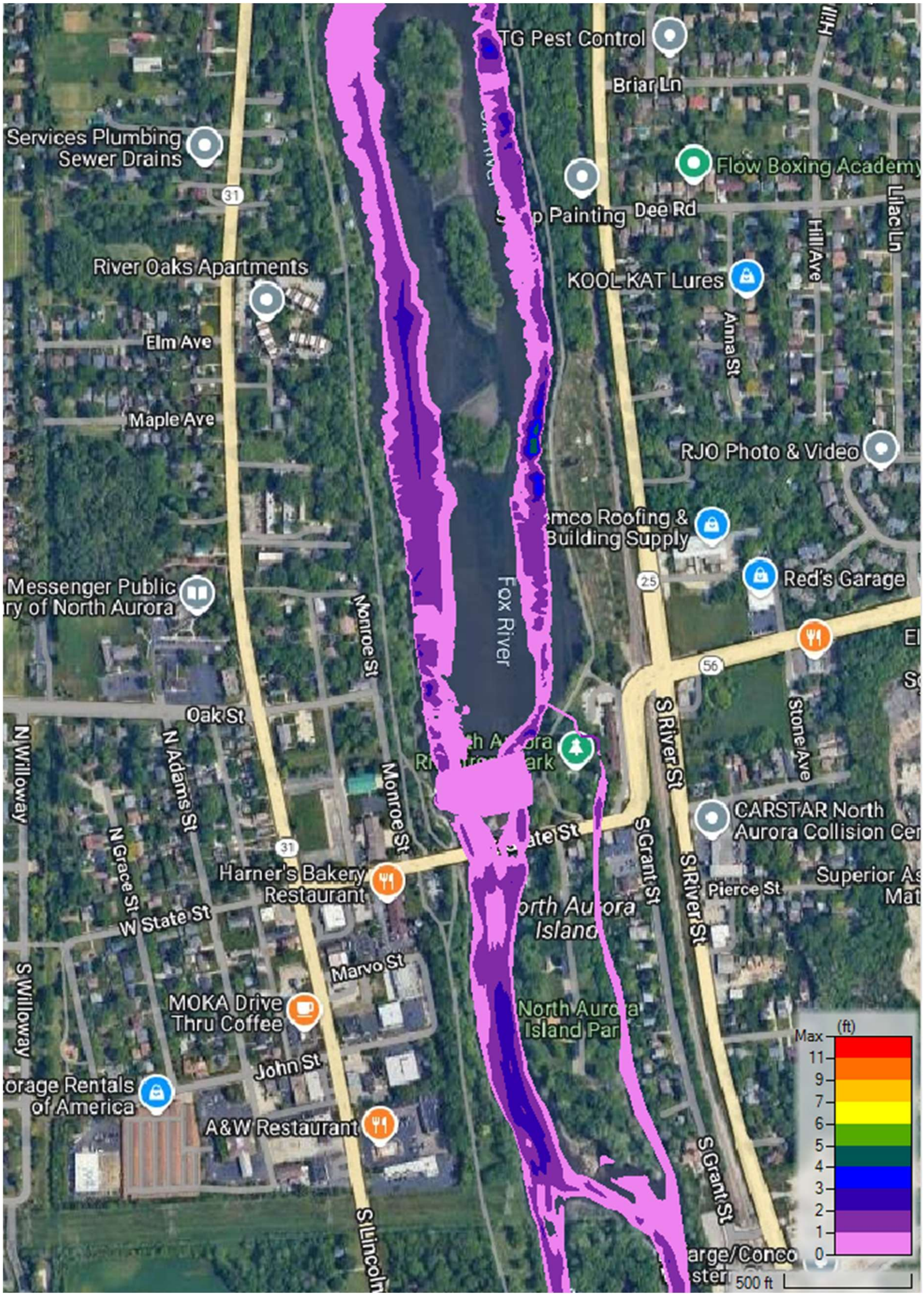
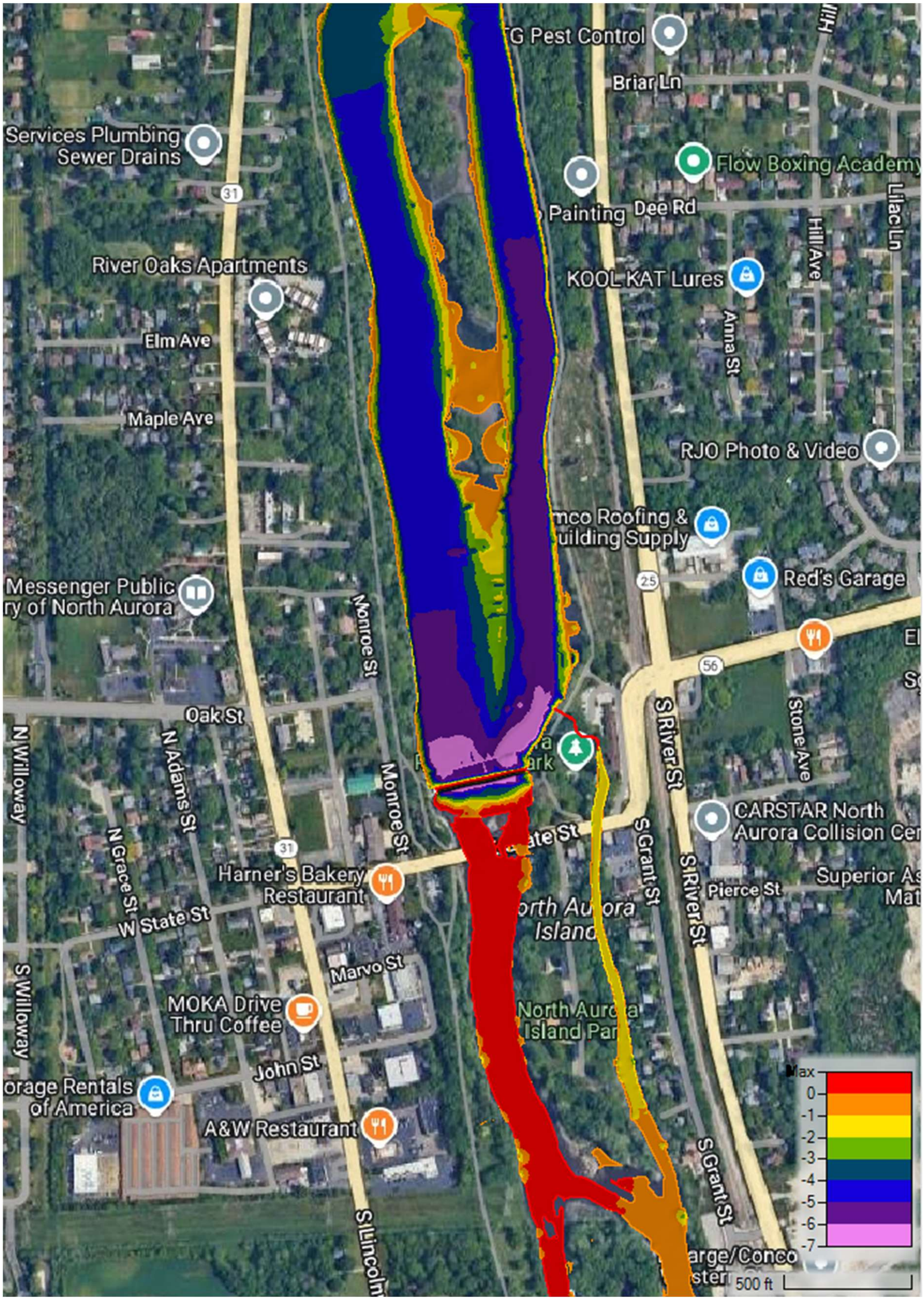


Alternative 2 Depth at 188 cfs



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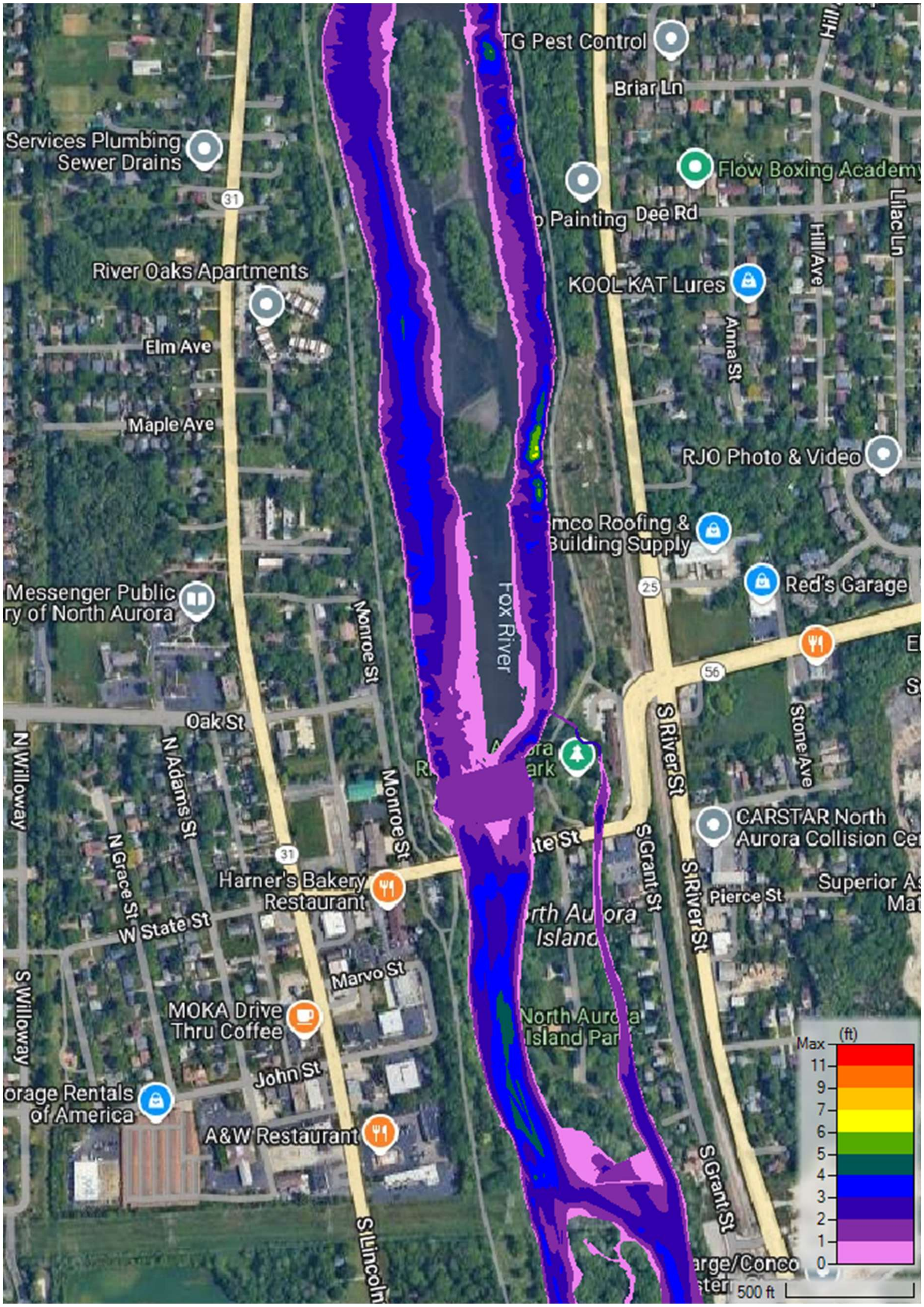

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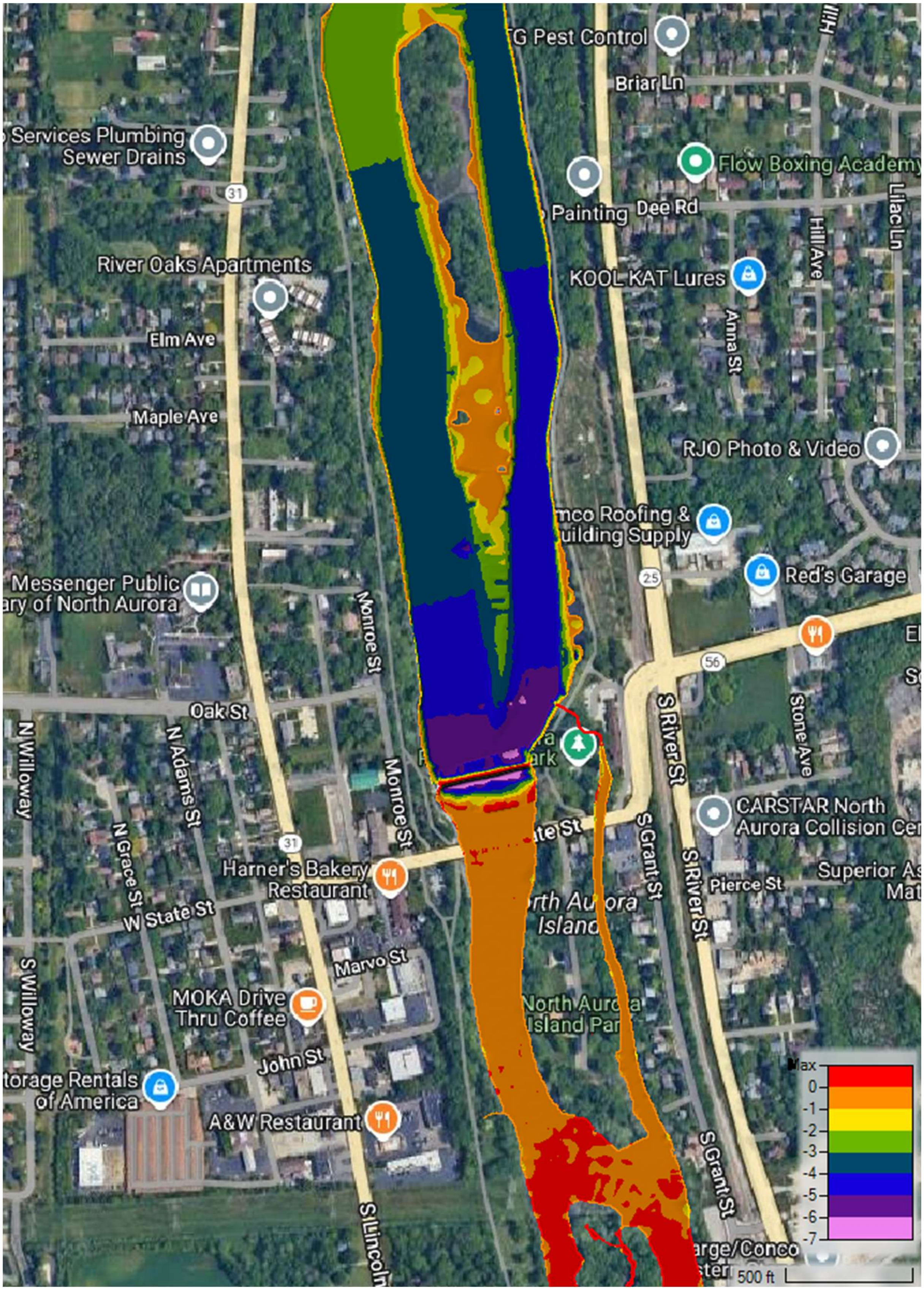

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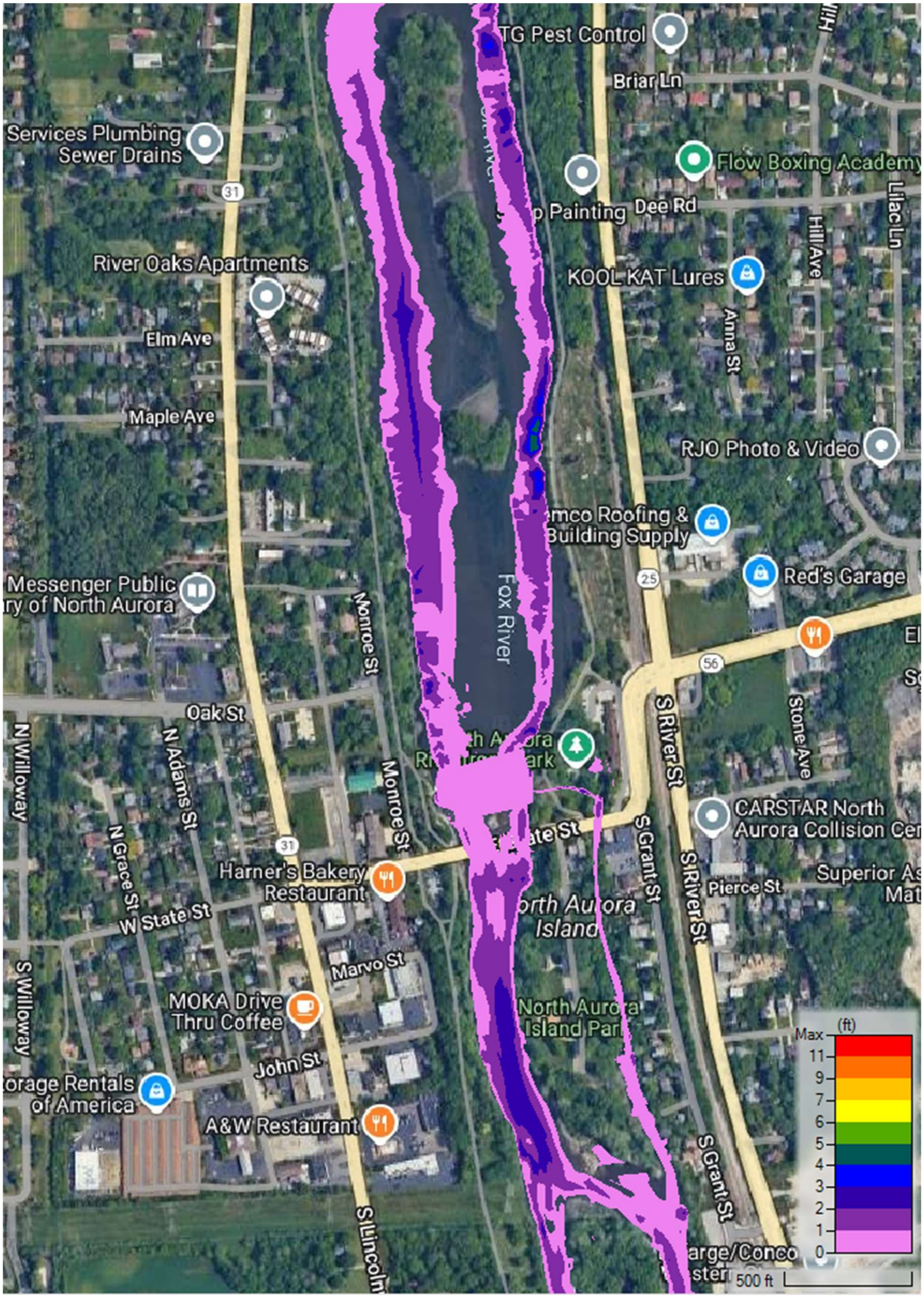

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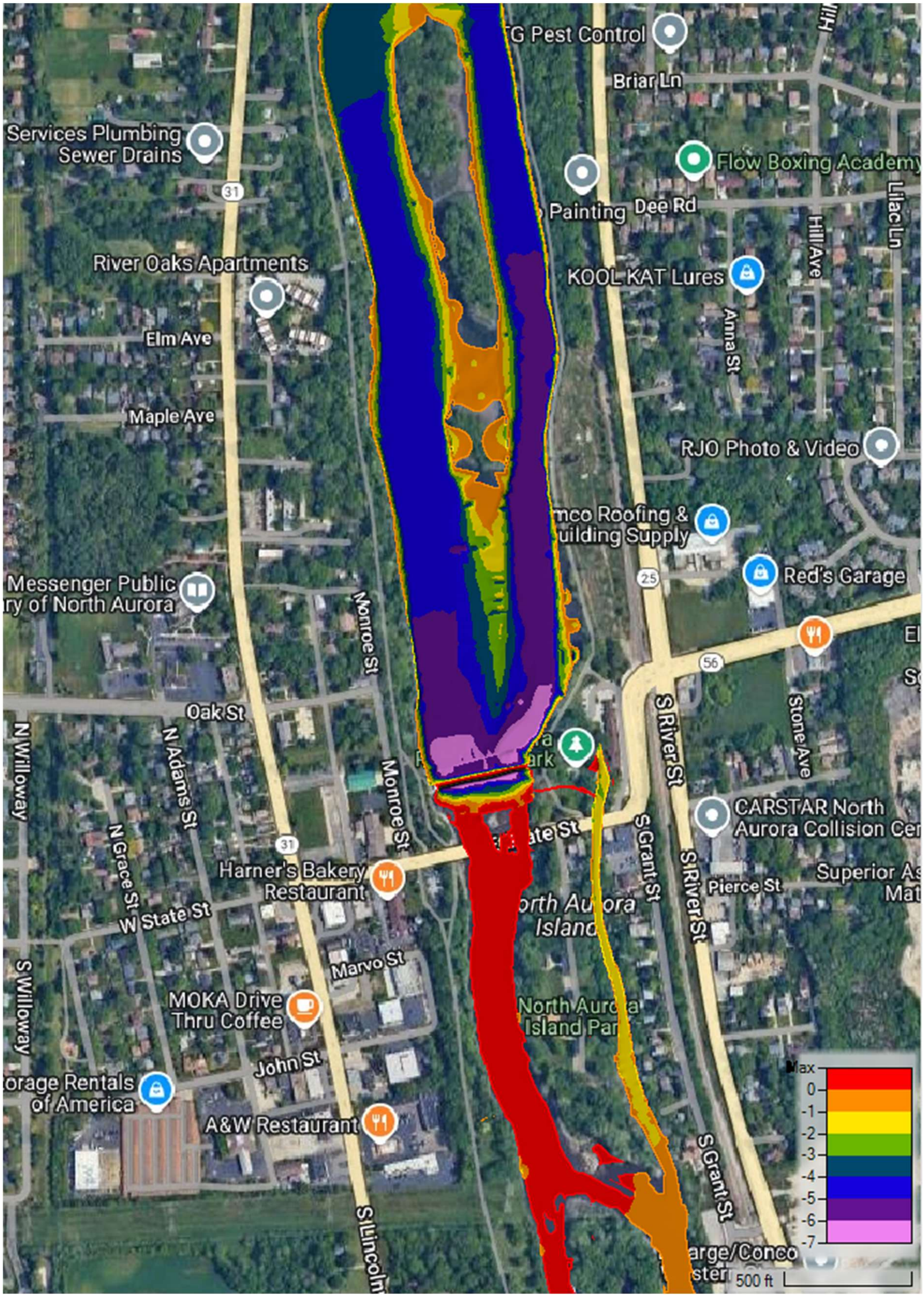

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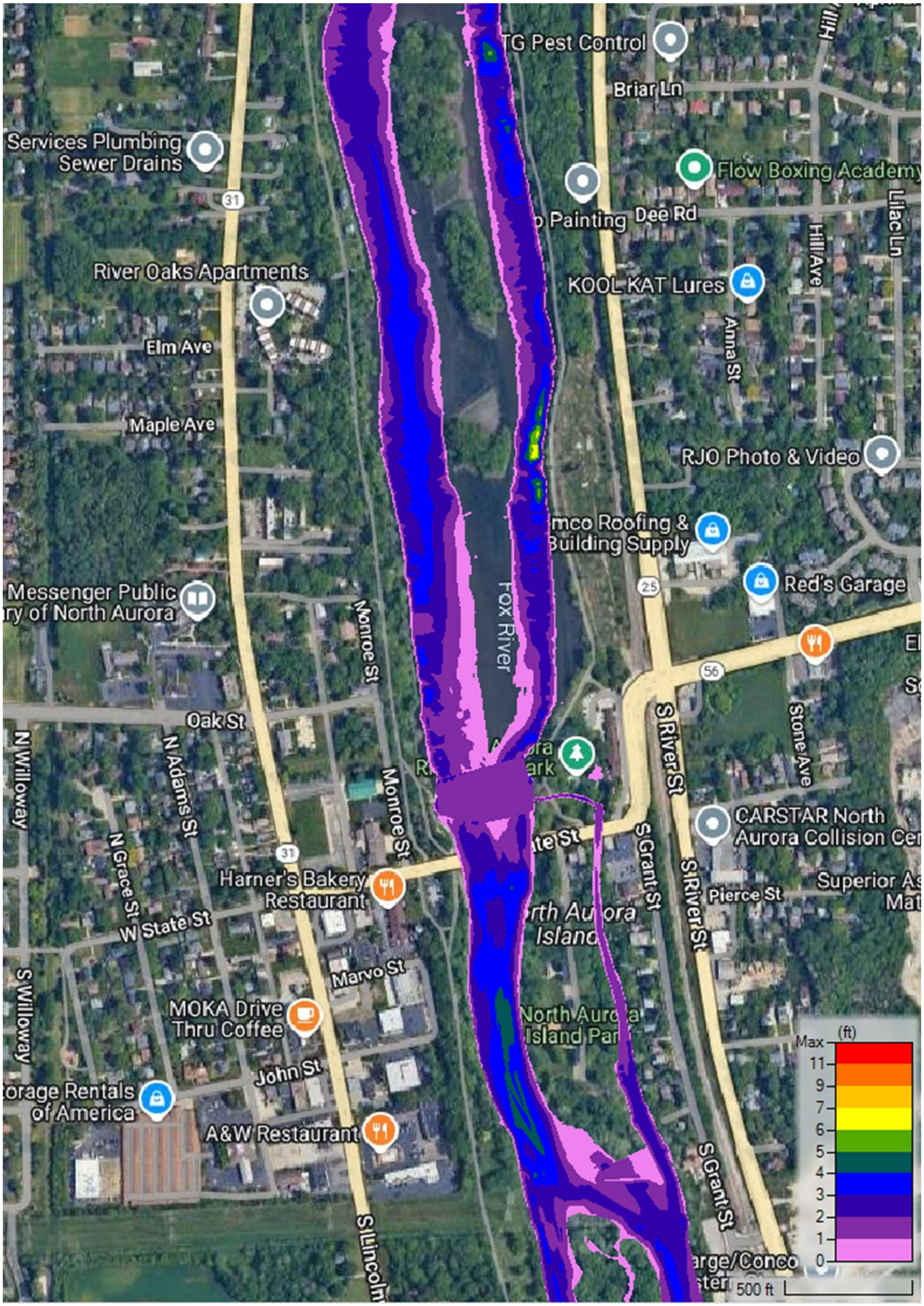

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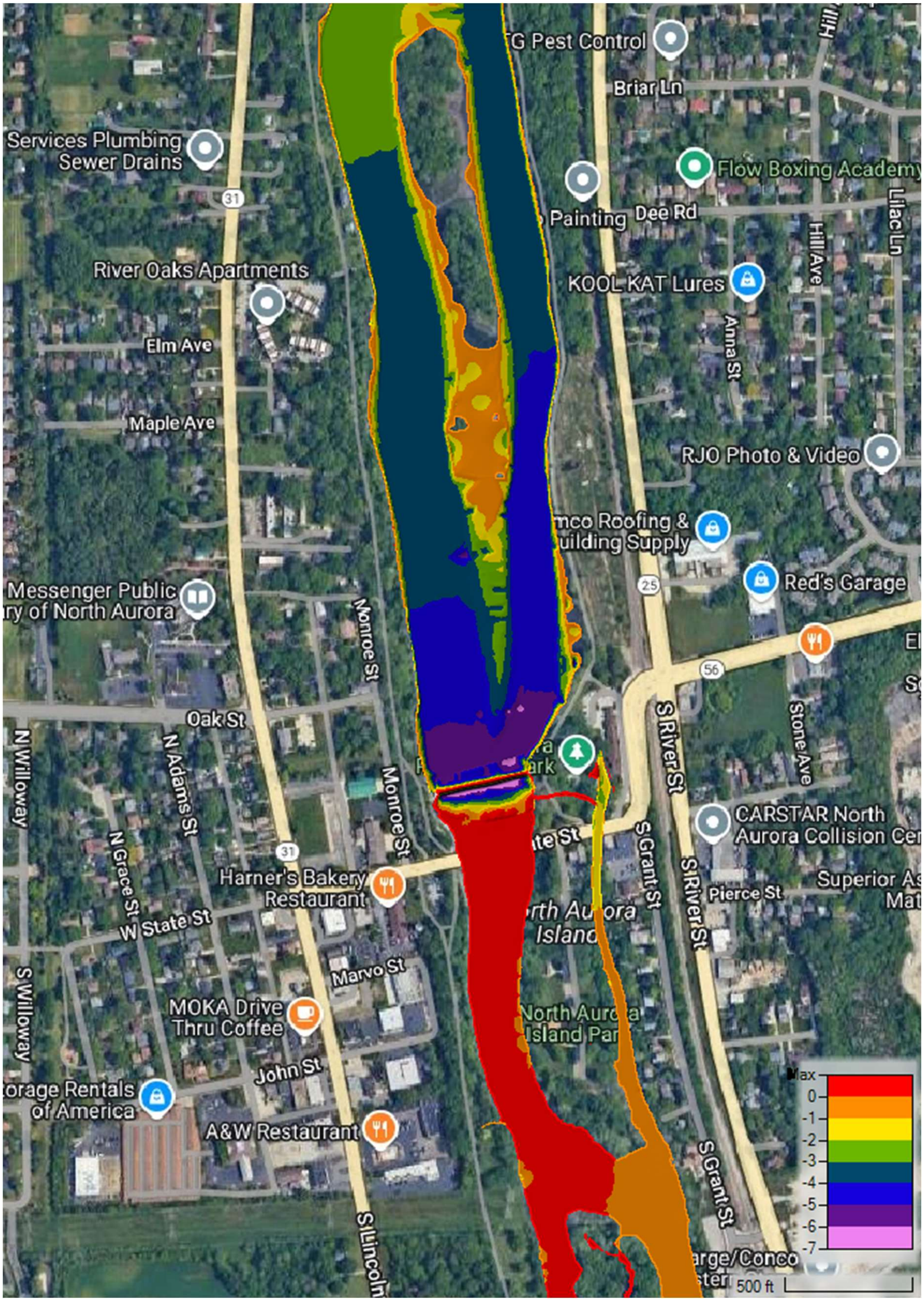

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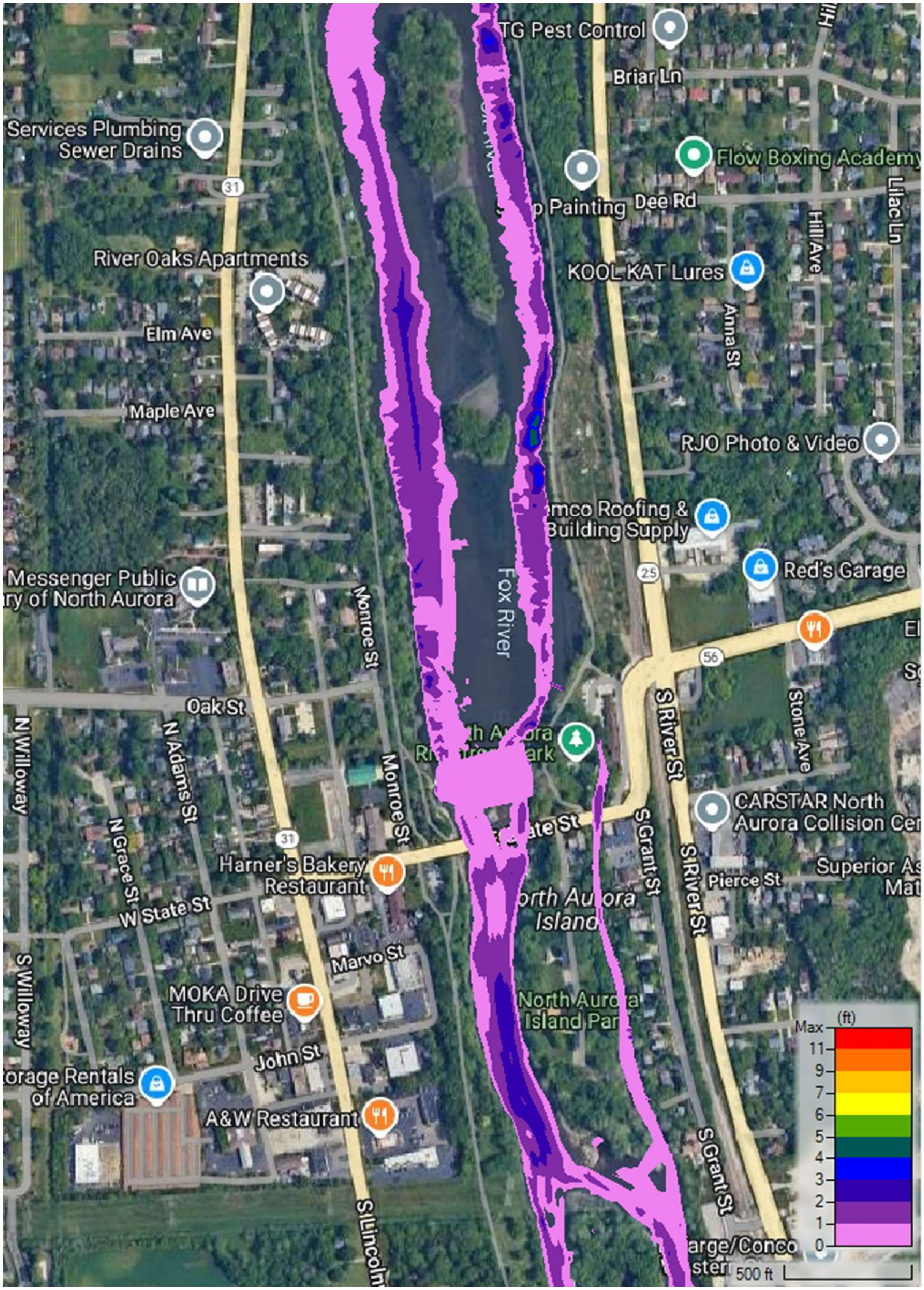

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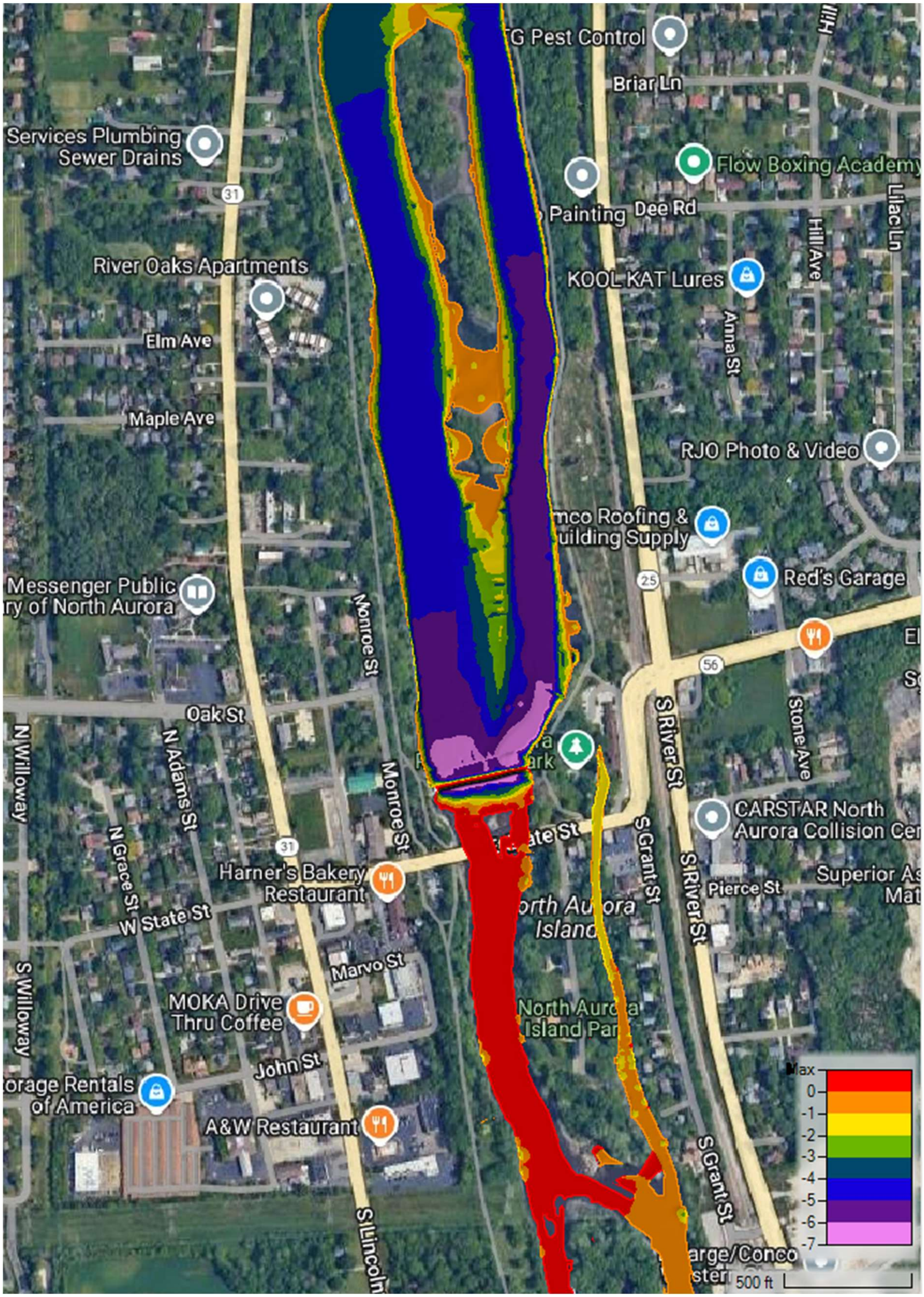

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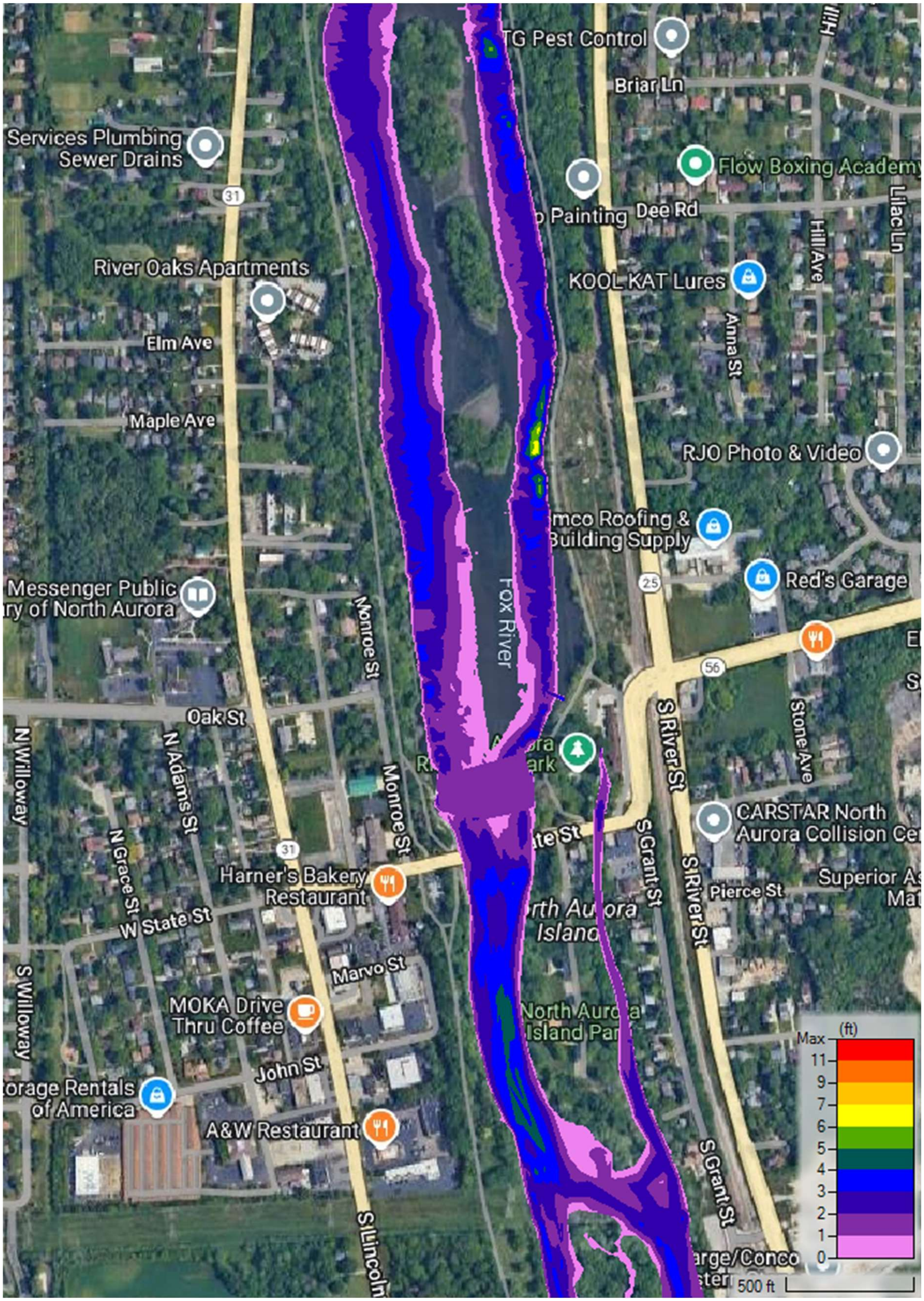
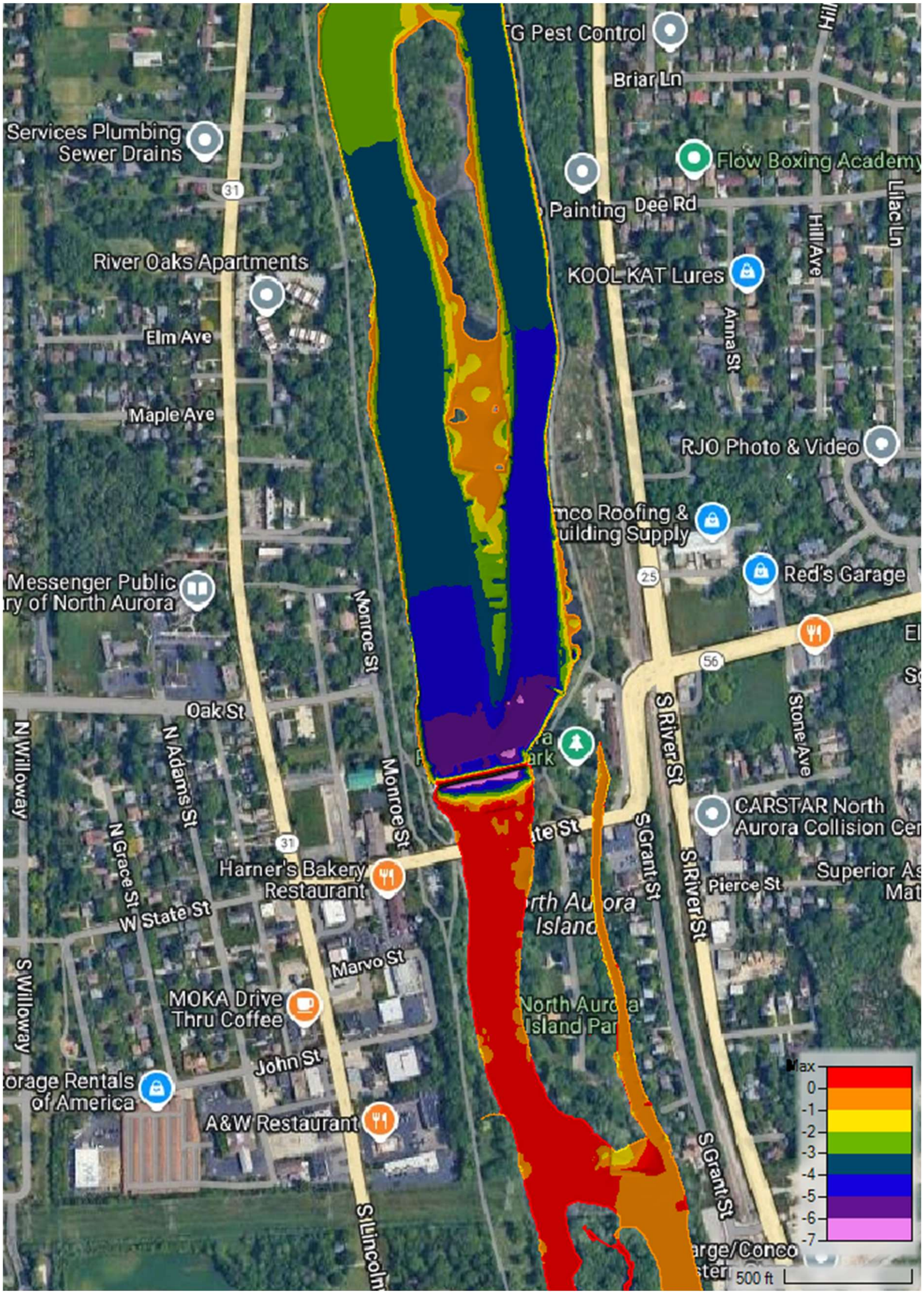


Alternative 4 Depth at 1283 cfs



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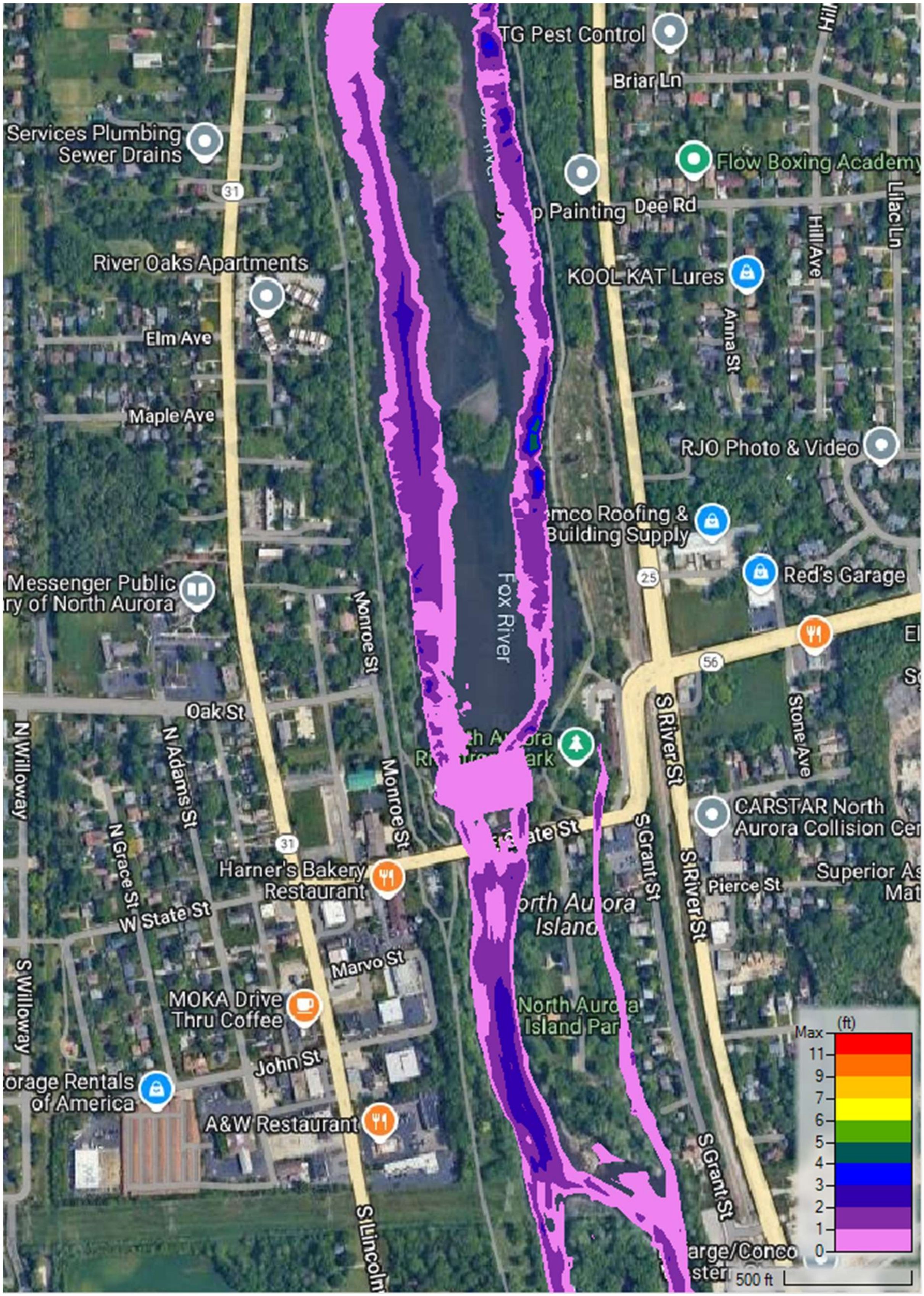

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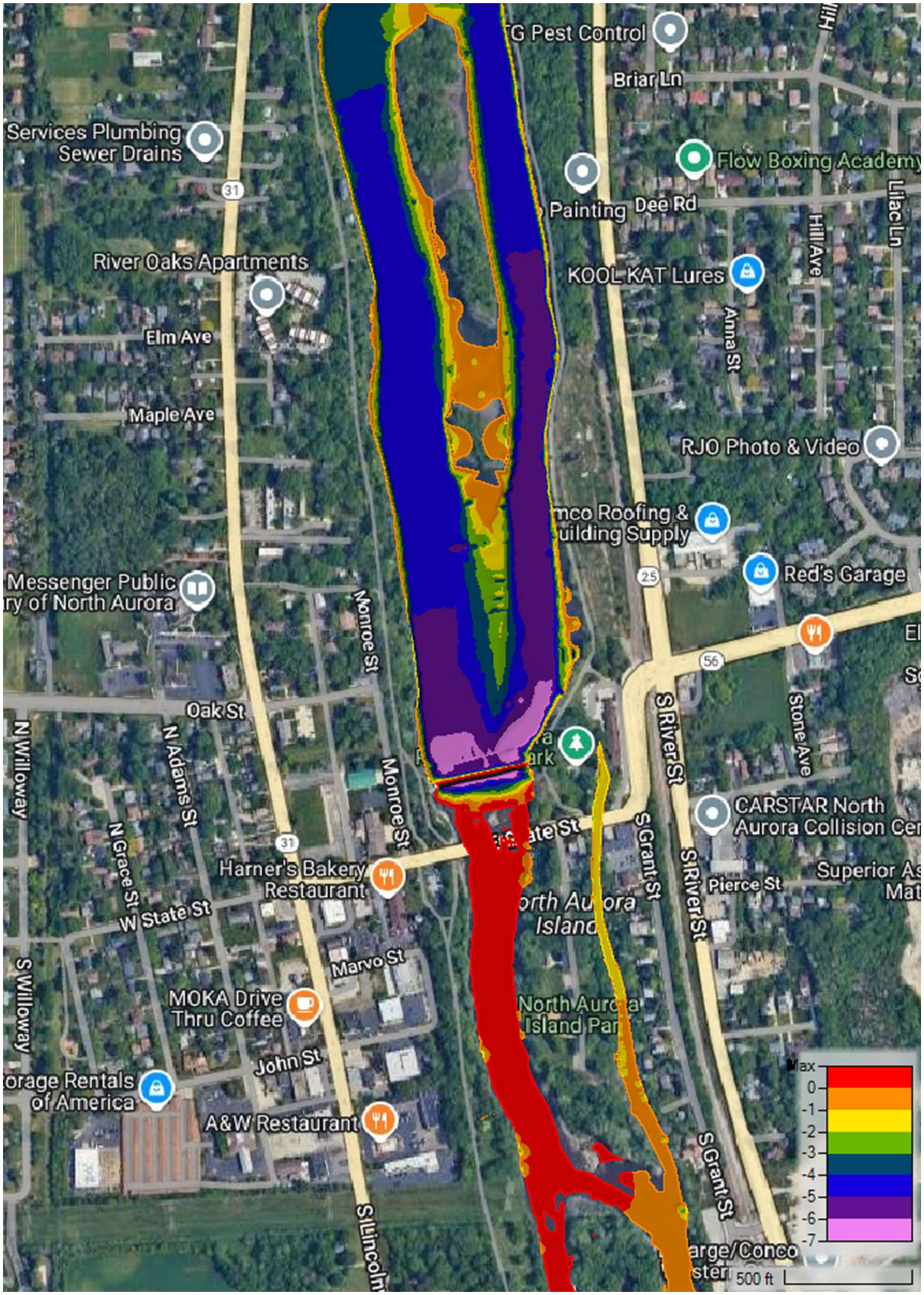

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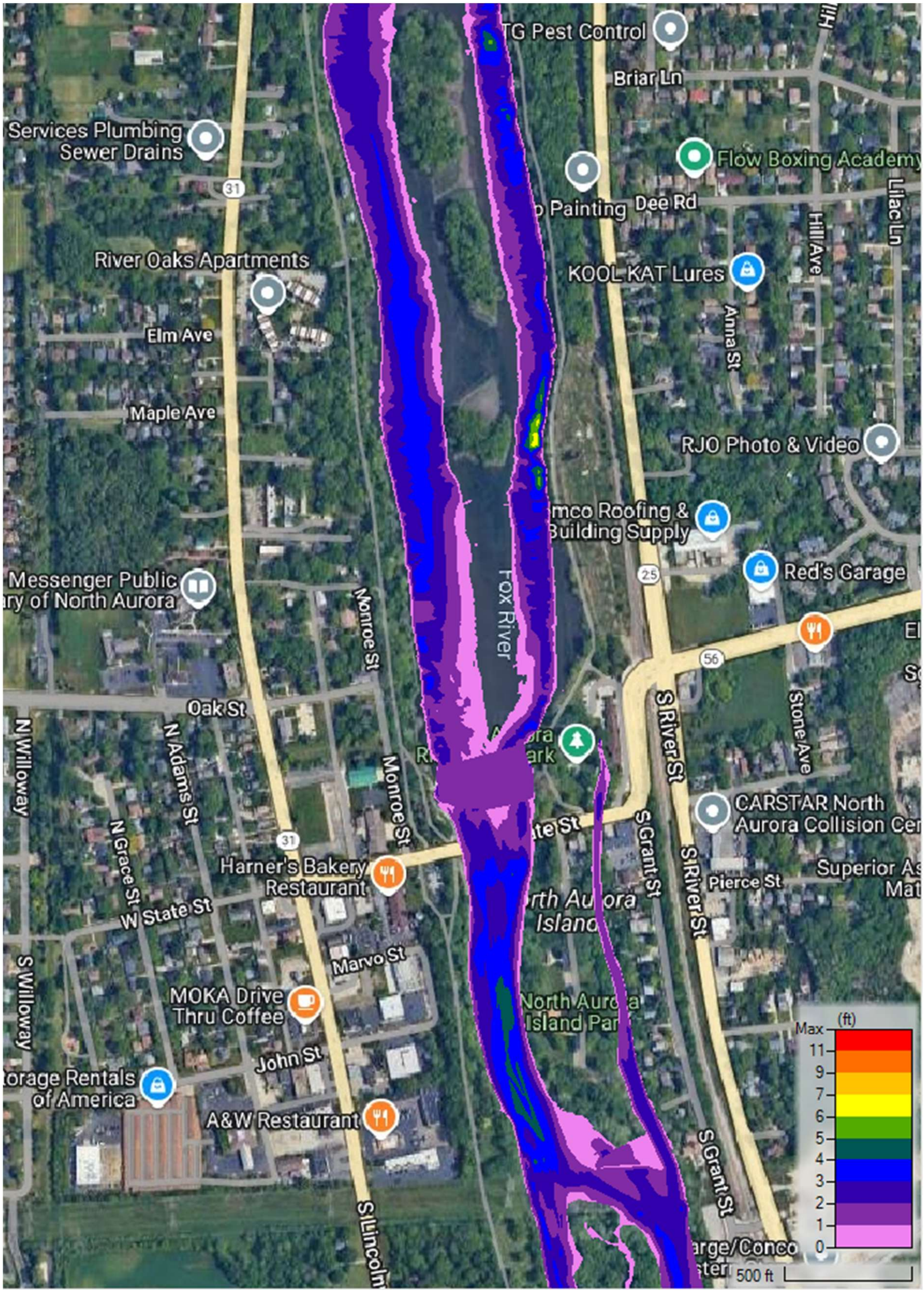

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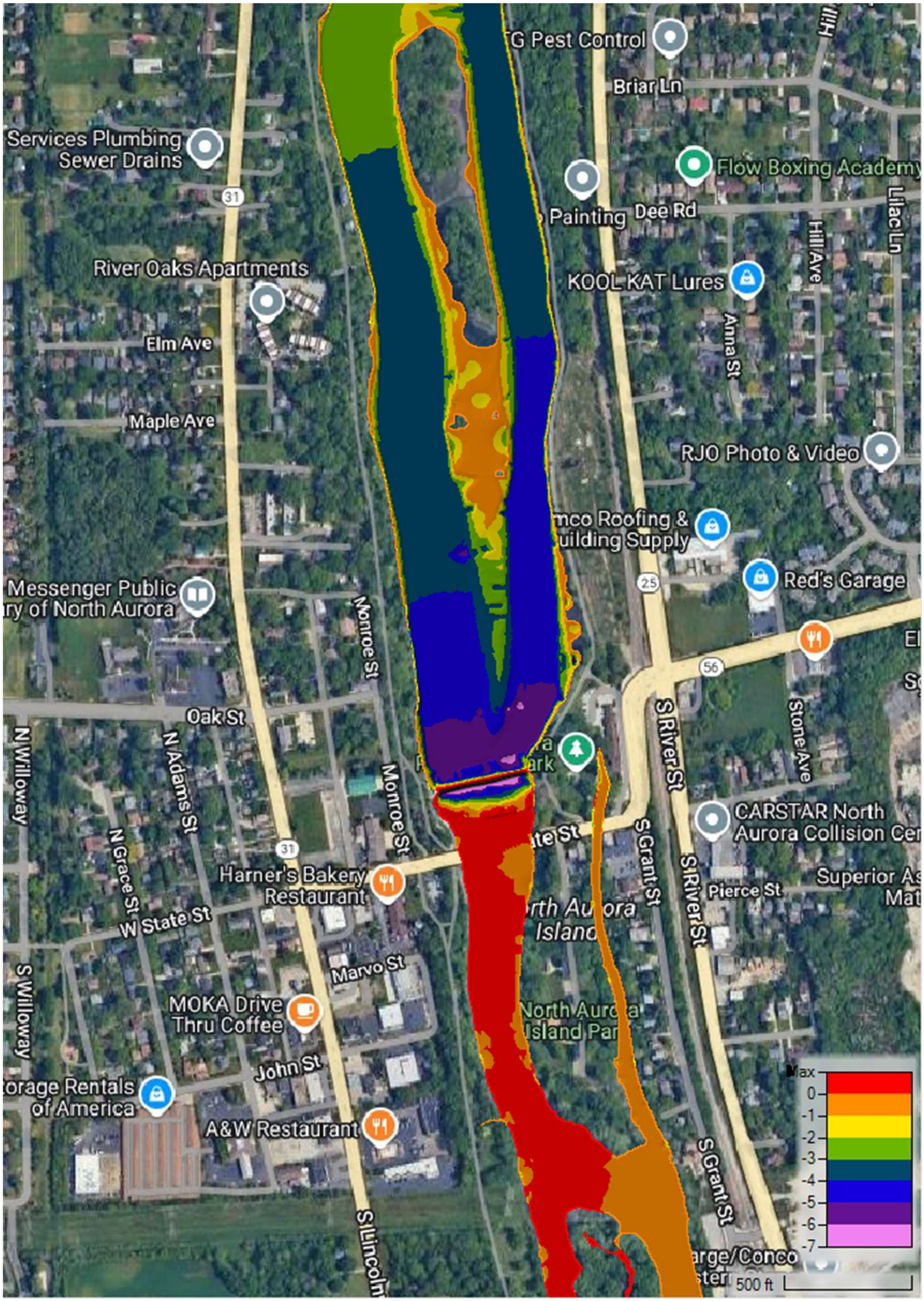

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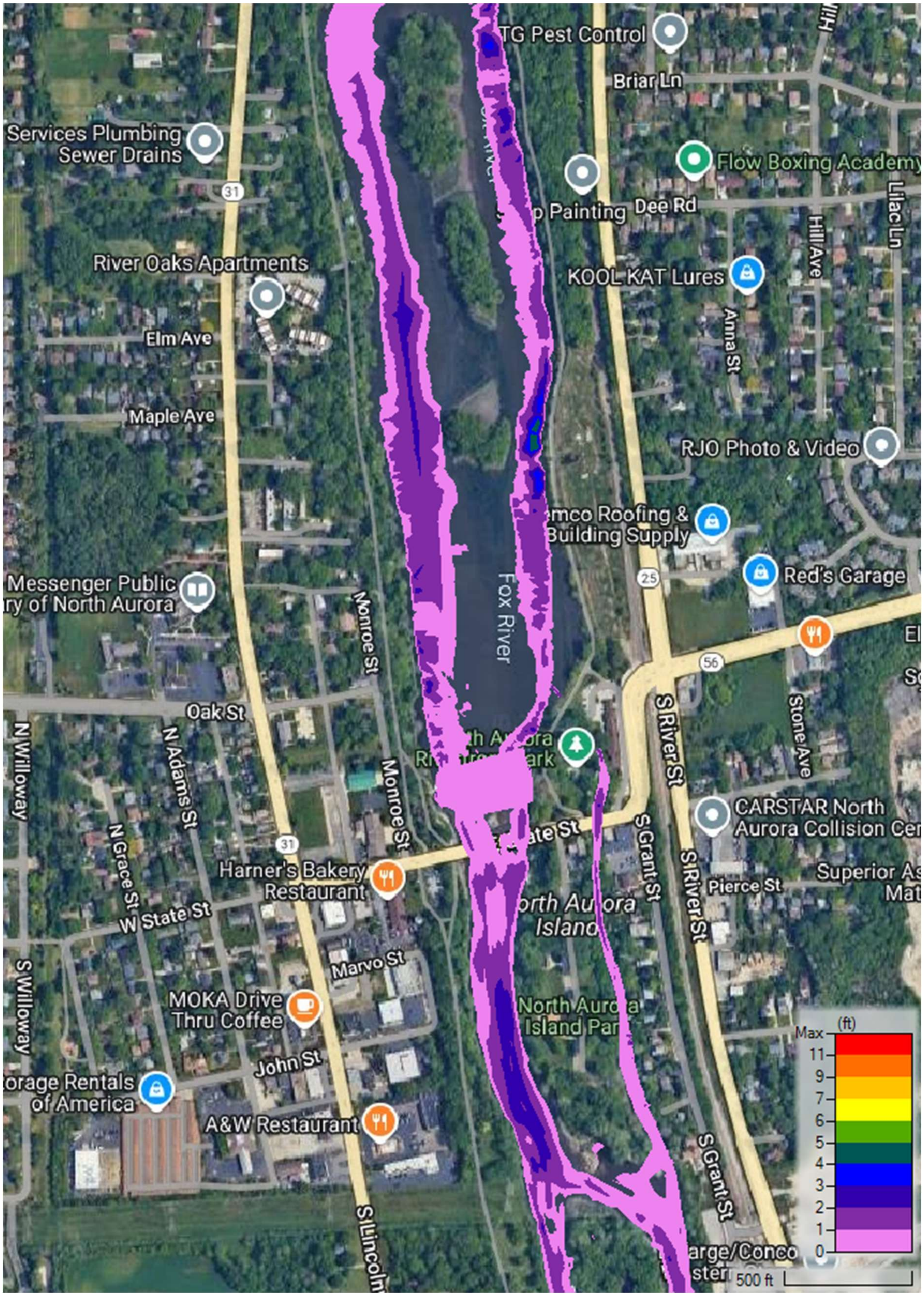

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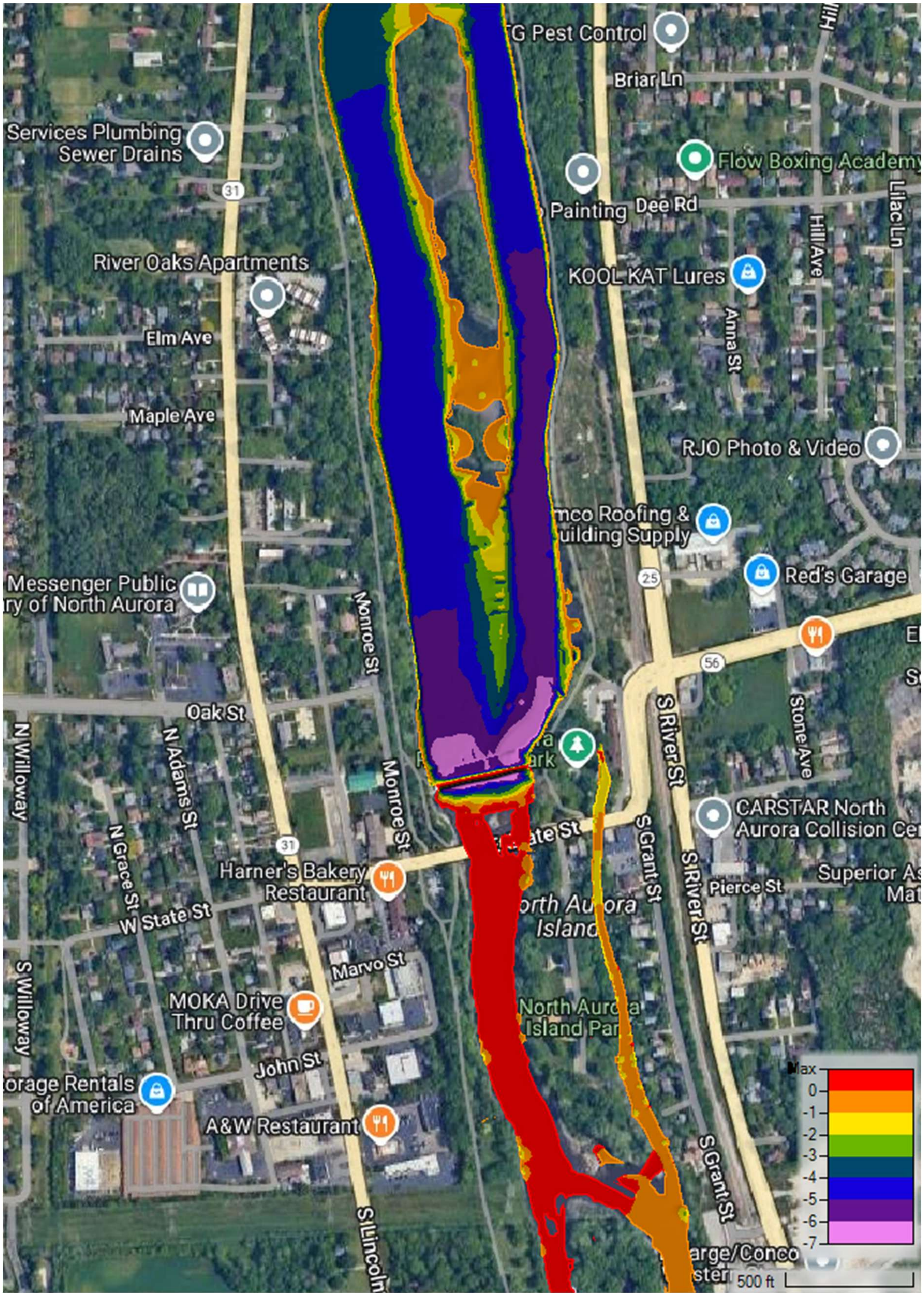

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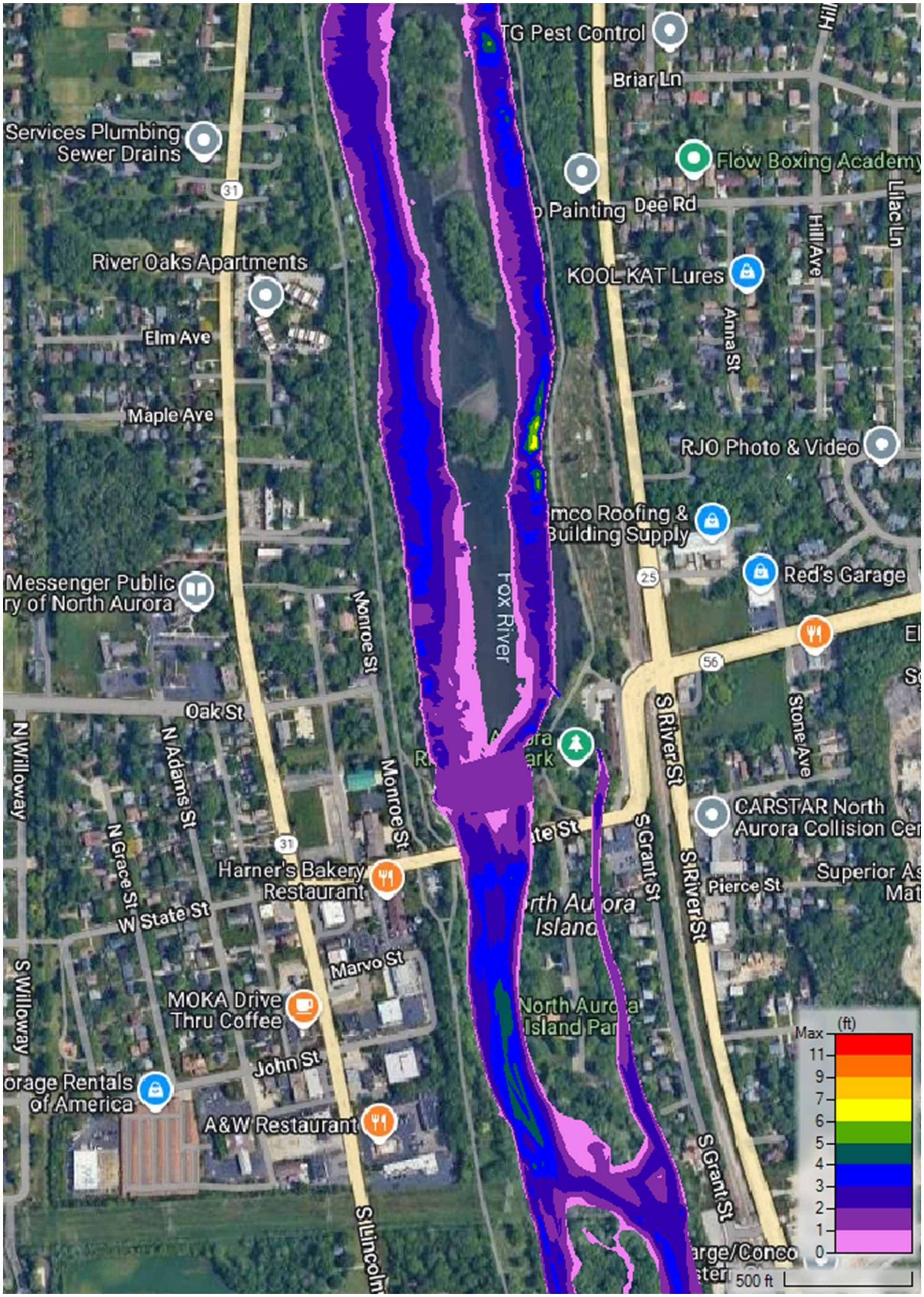

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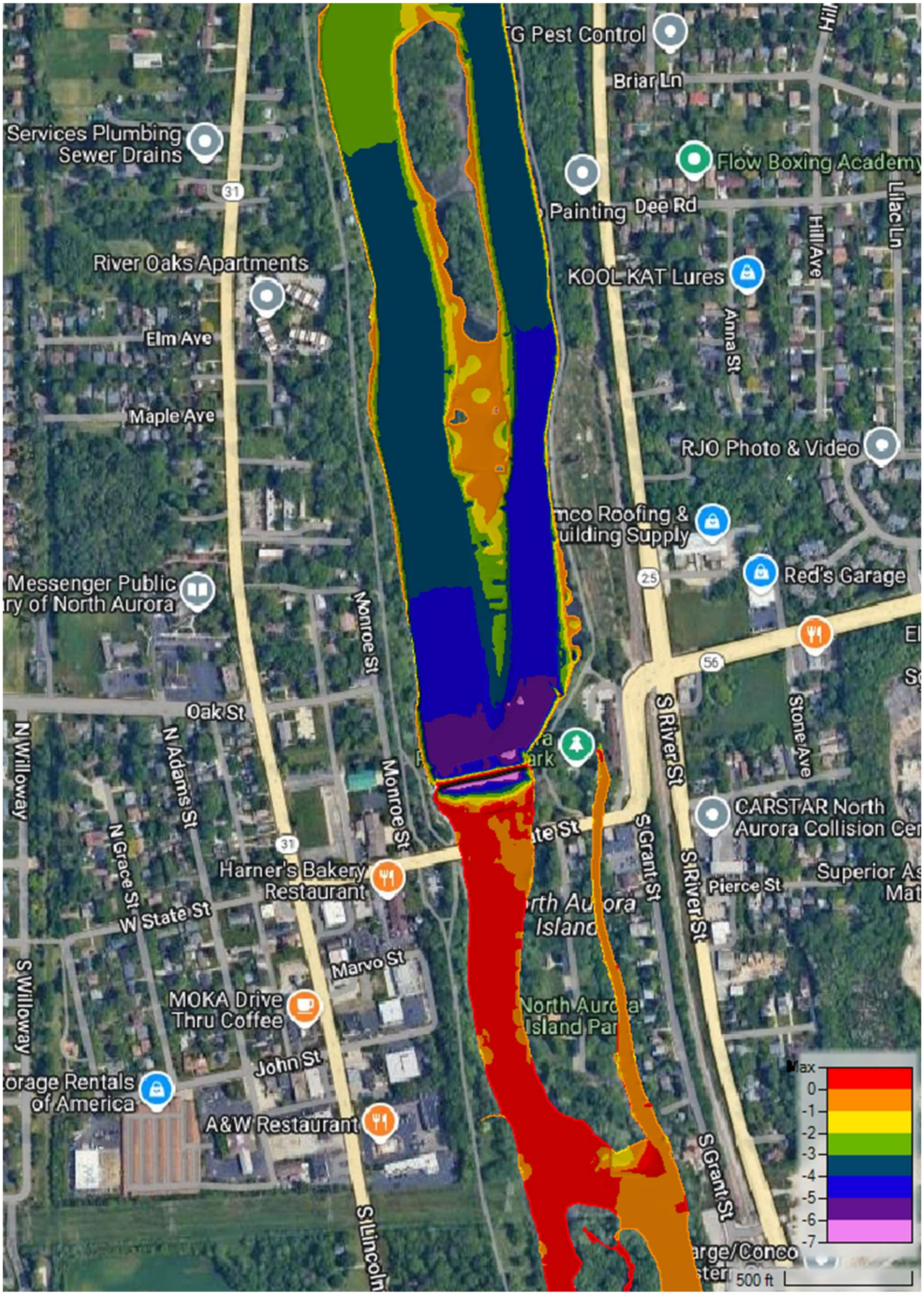
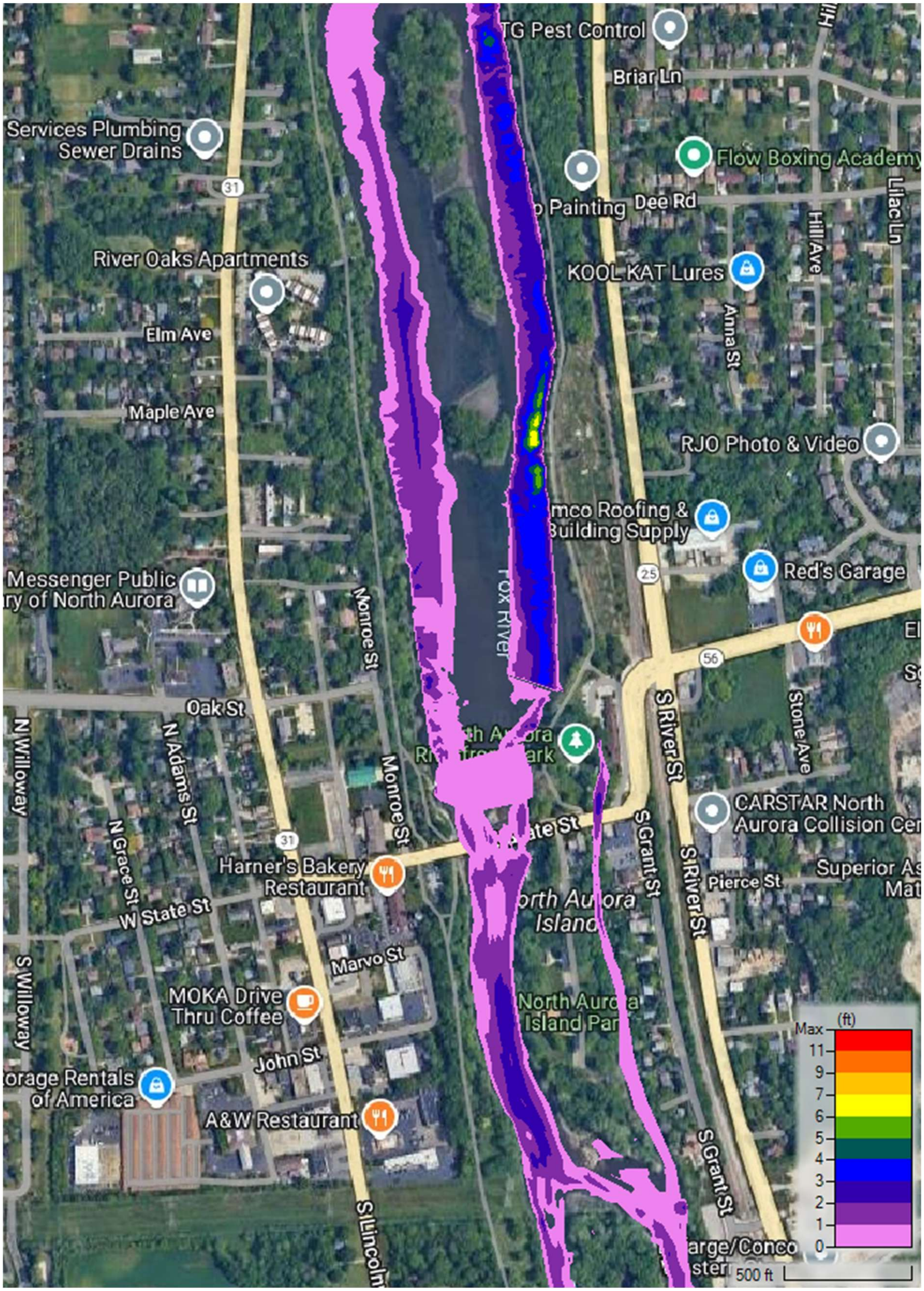


Alternative 6 Change in Depth at 1283 cfs



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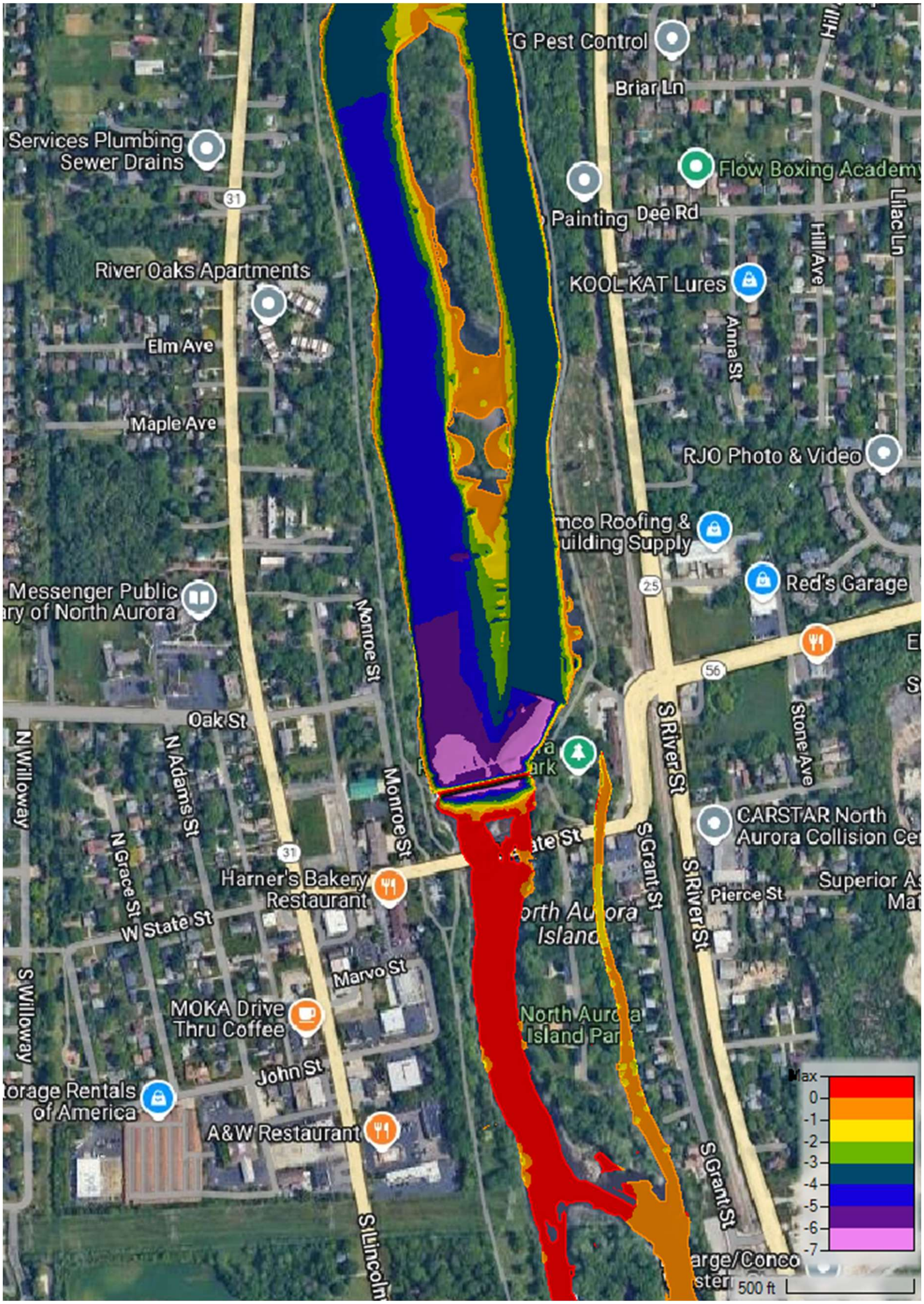

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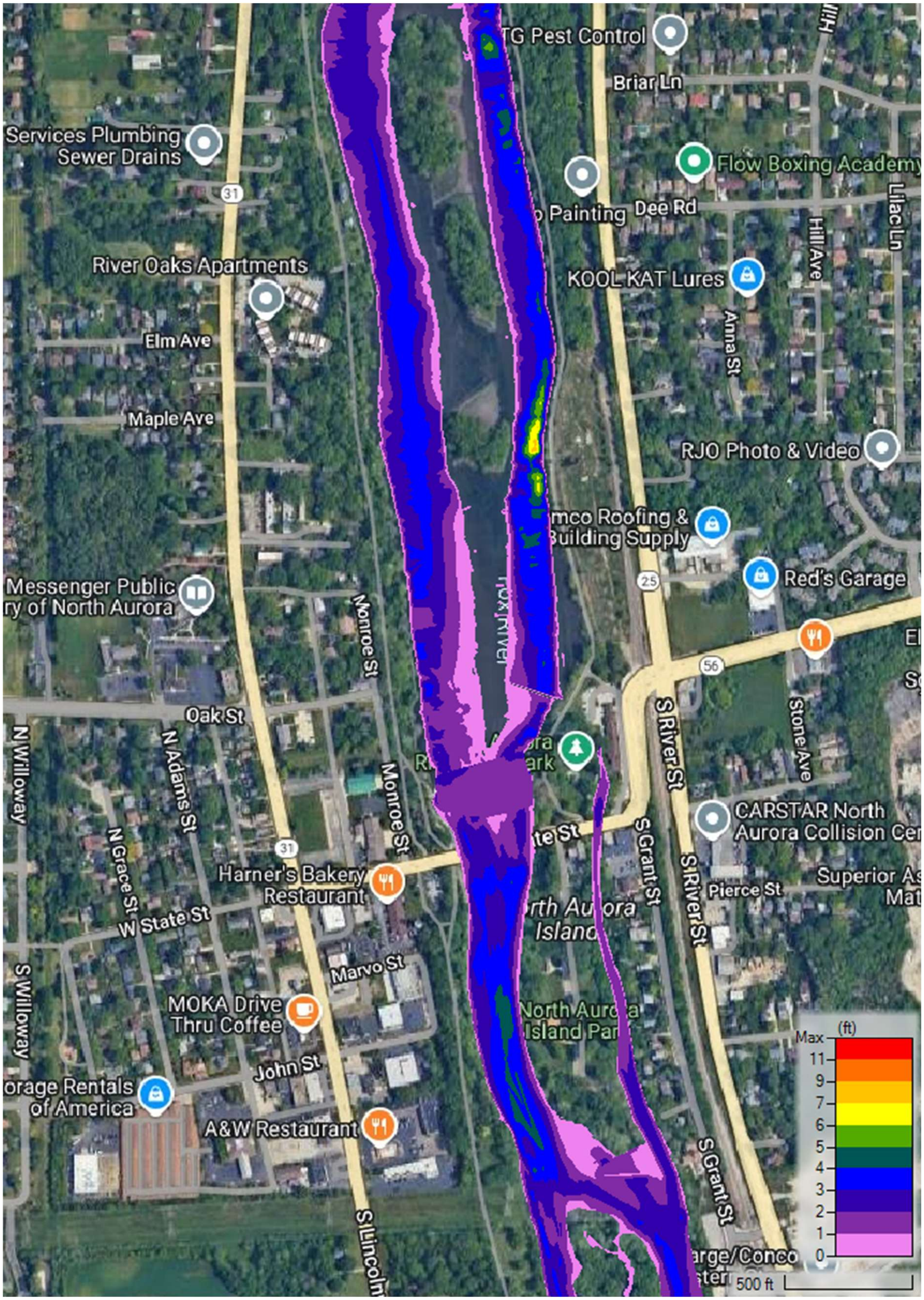

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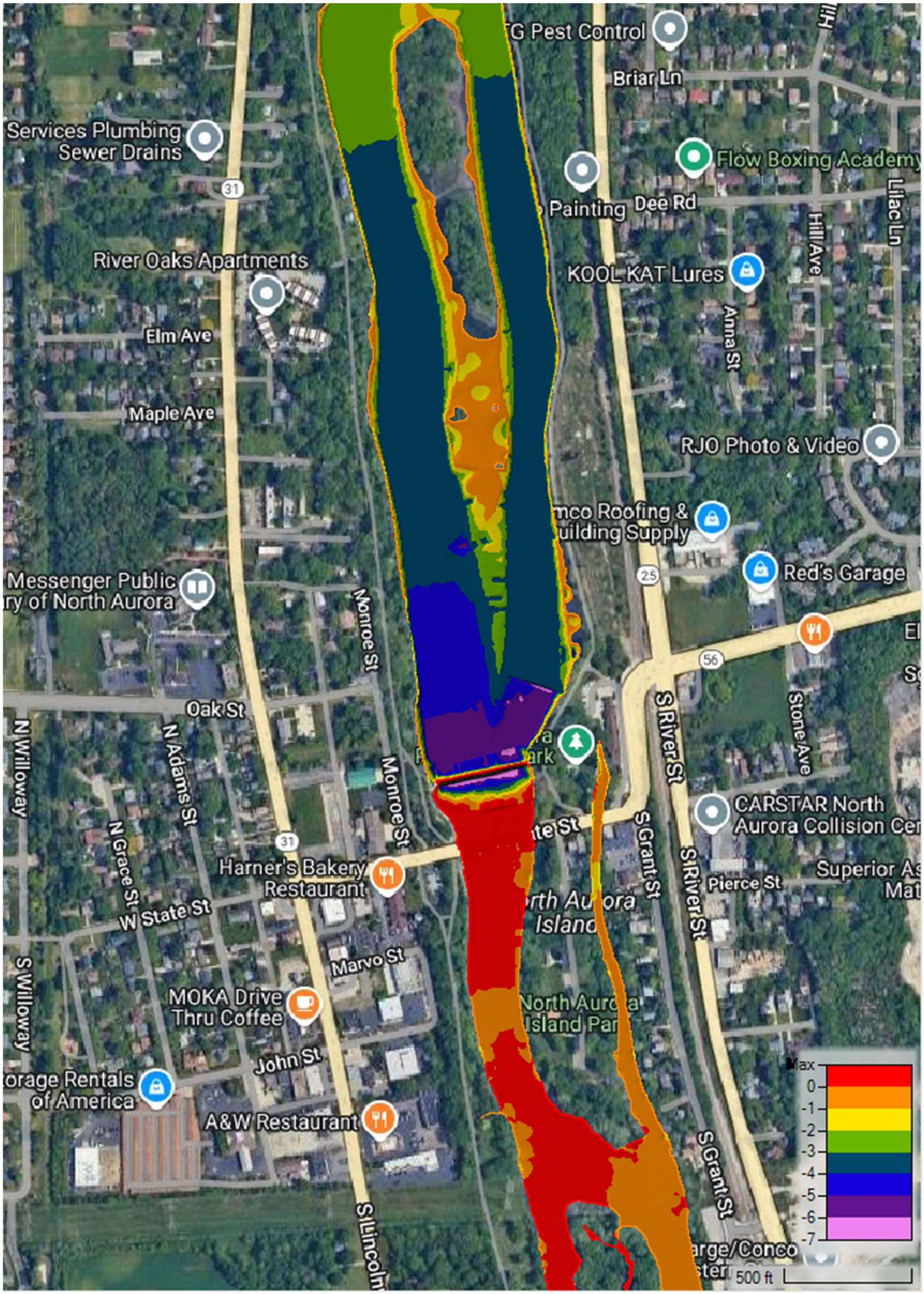

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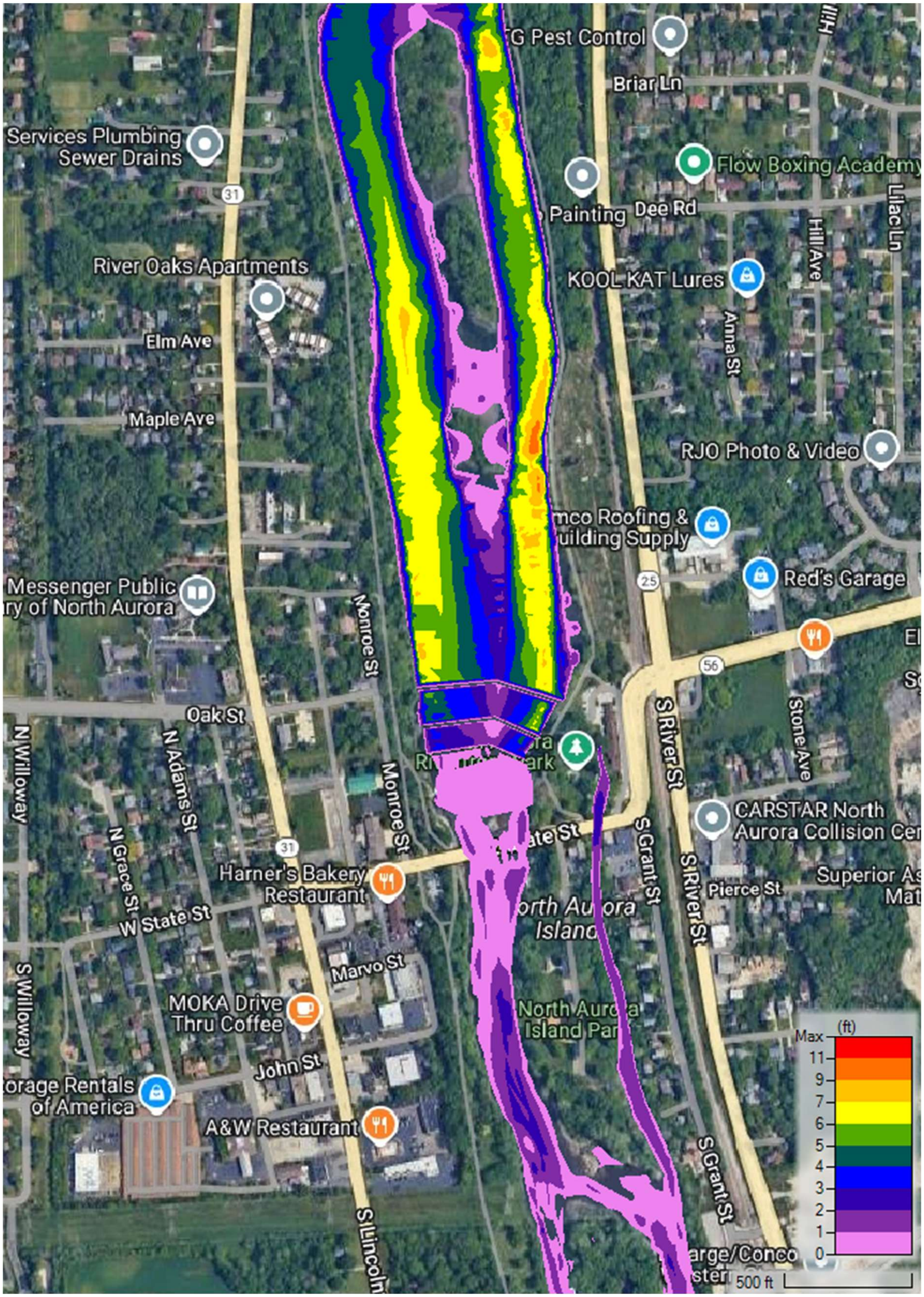
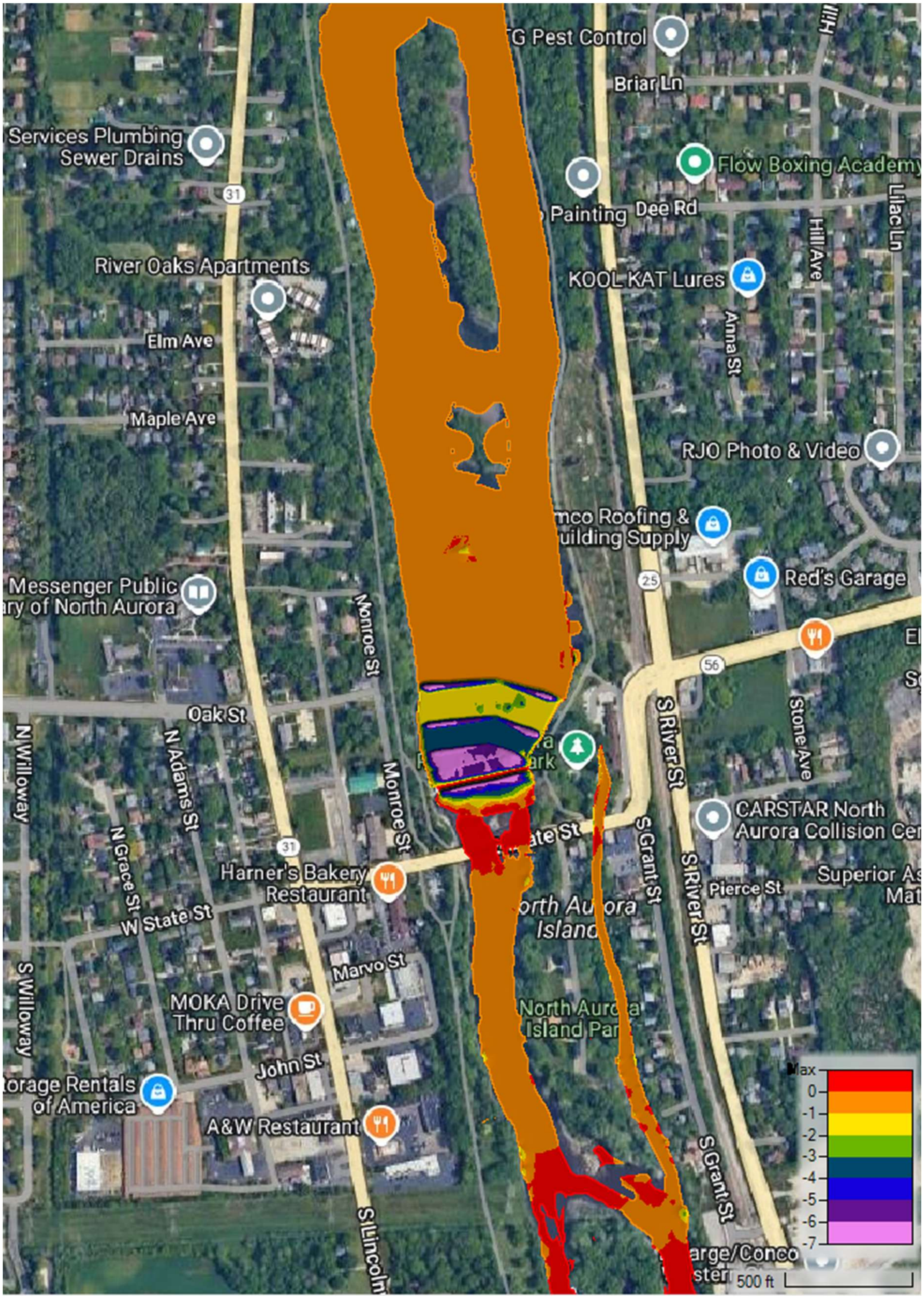


Alternative 8 Depth at 188 cfs



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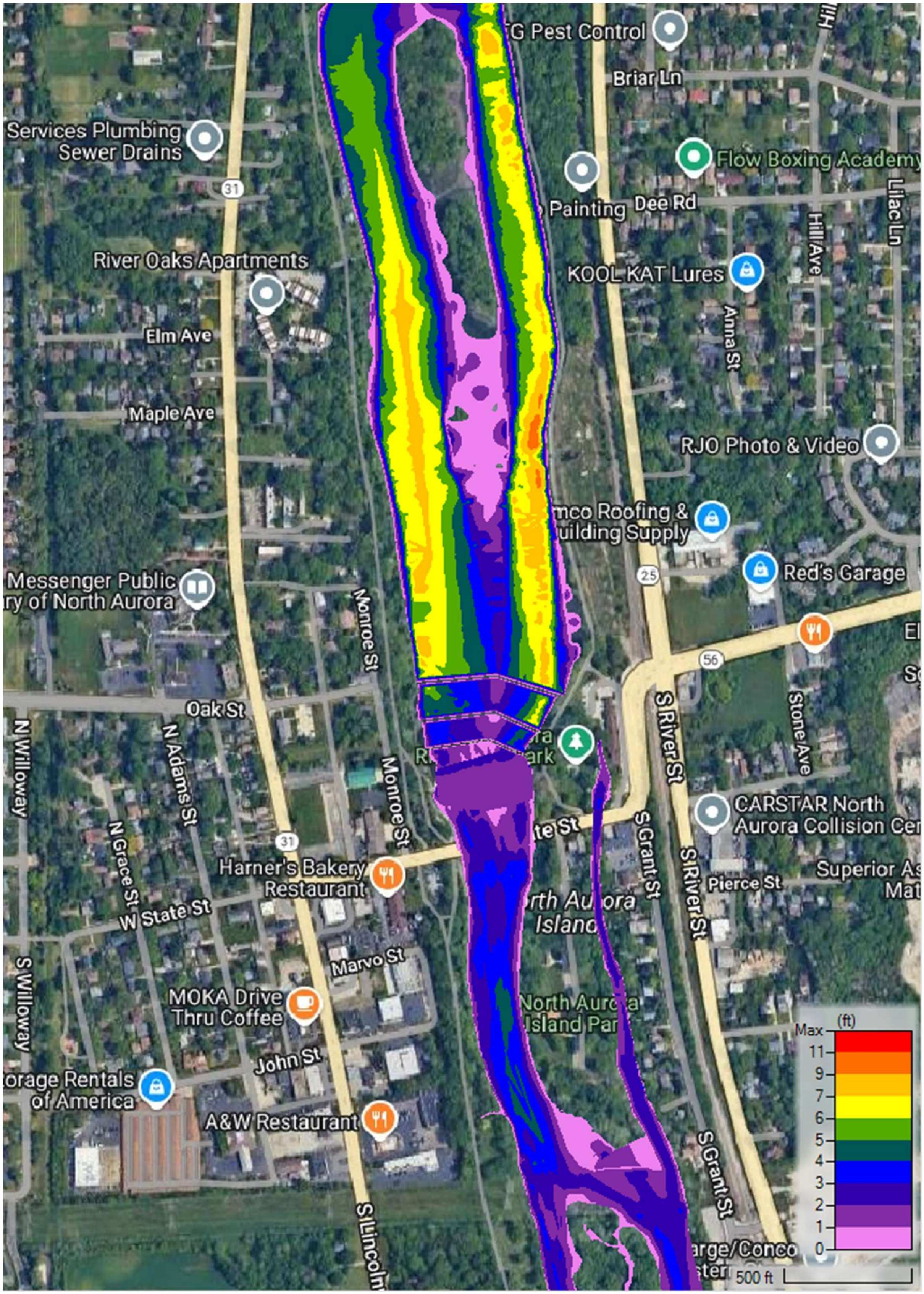

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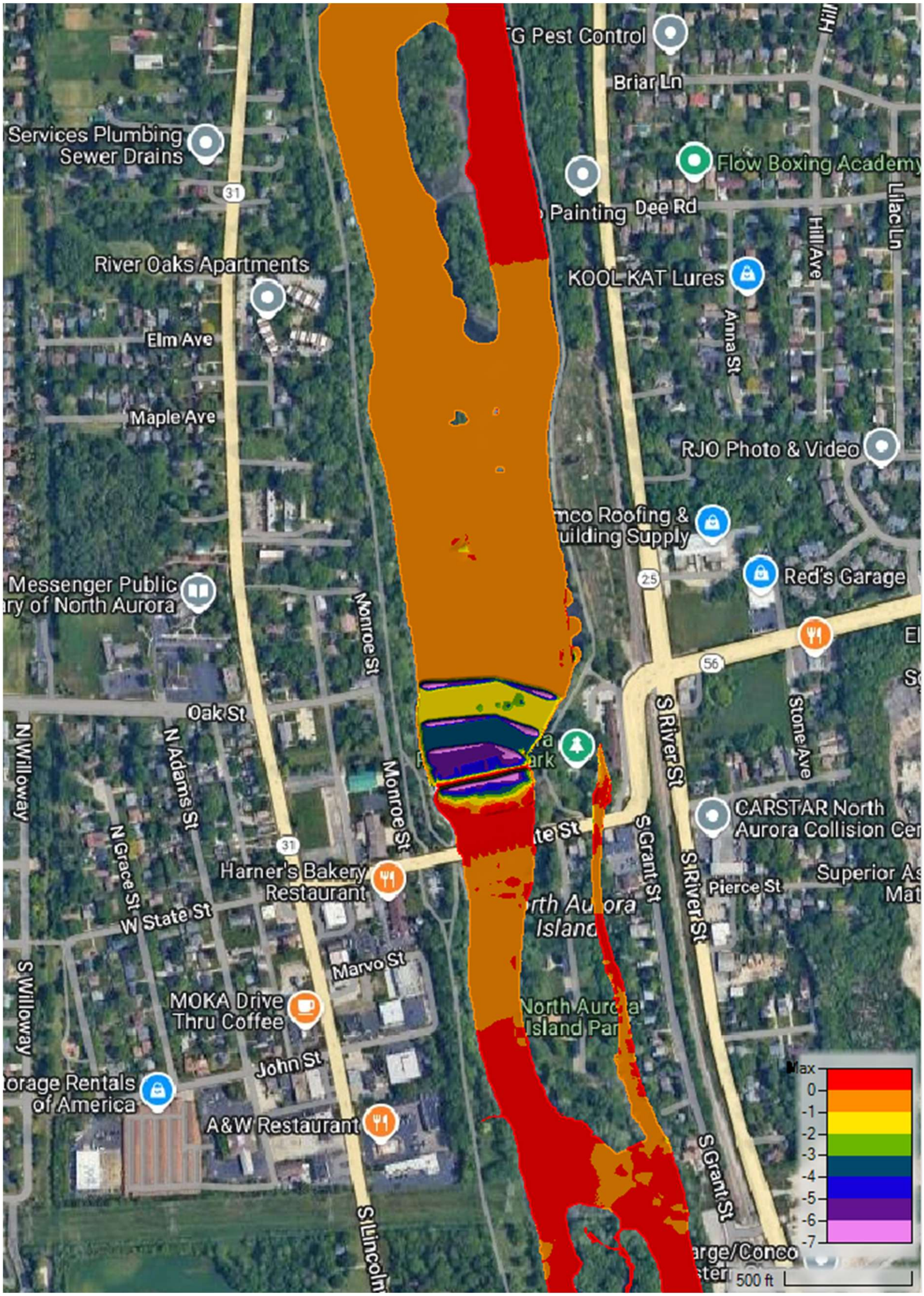

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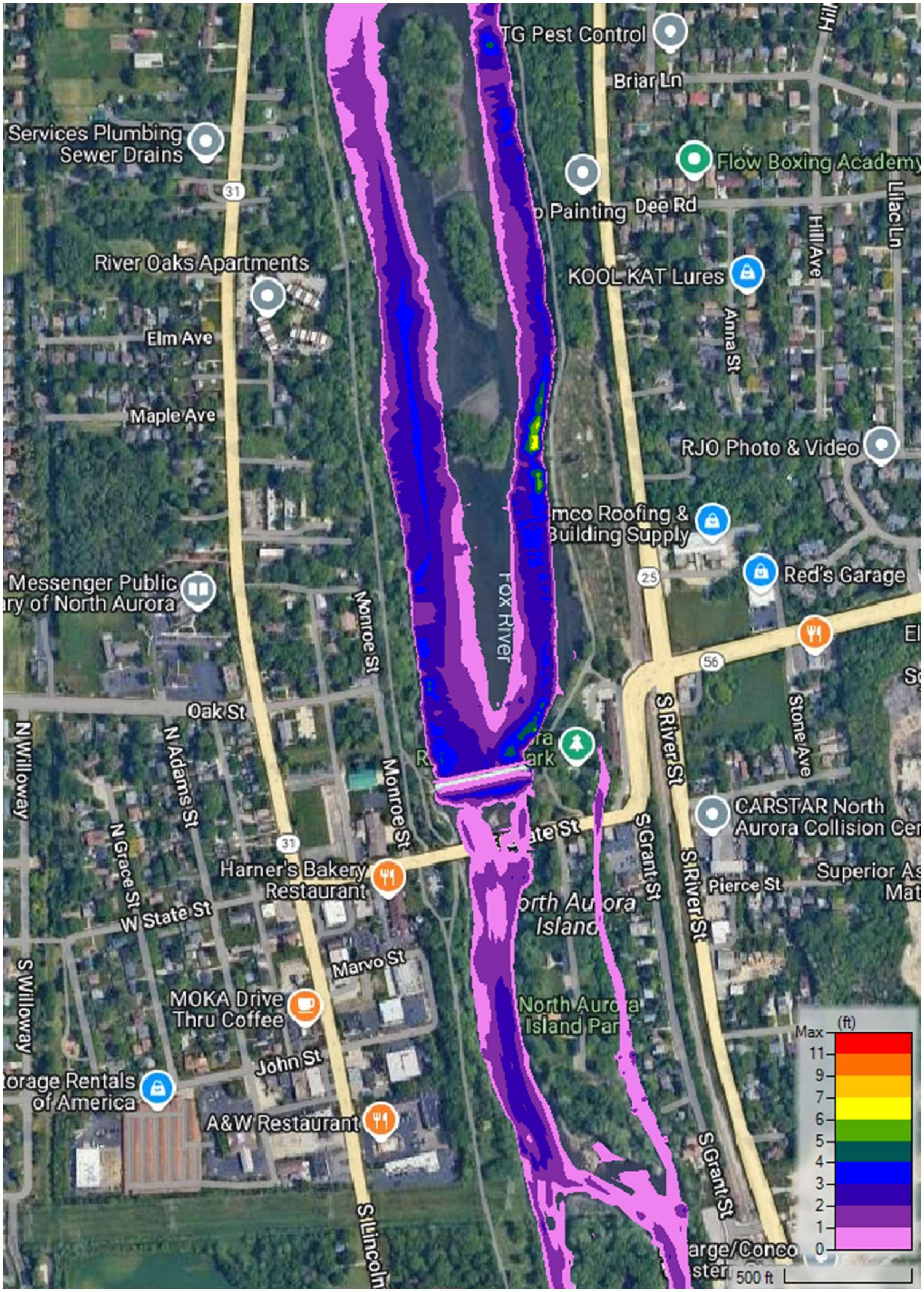

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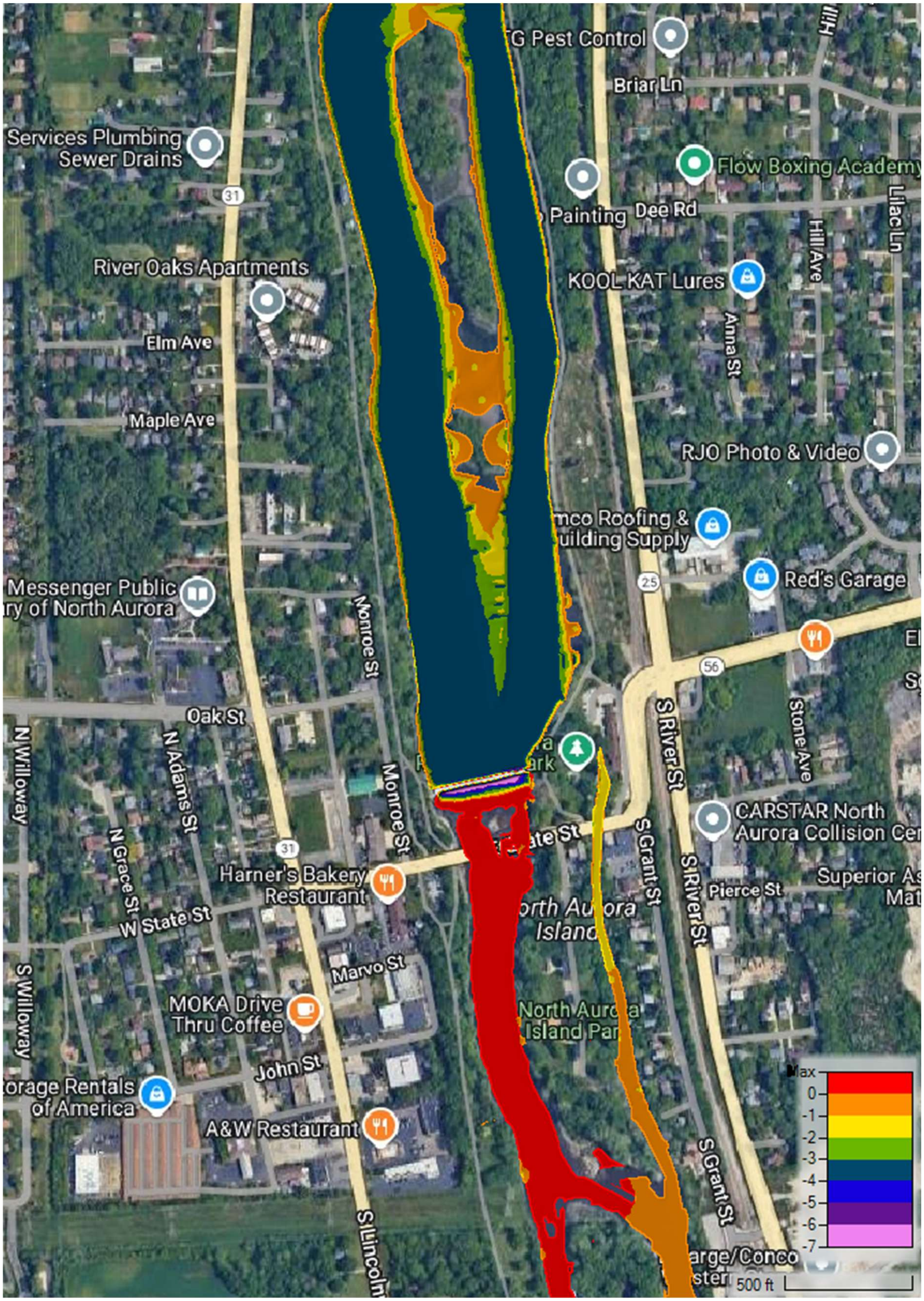

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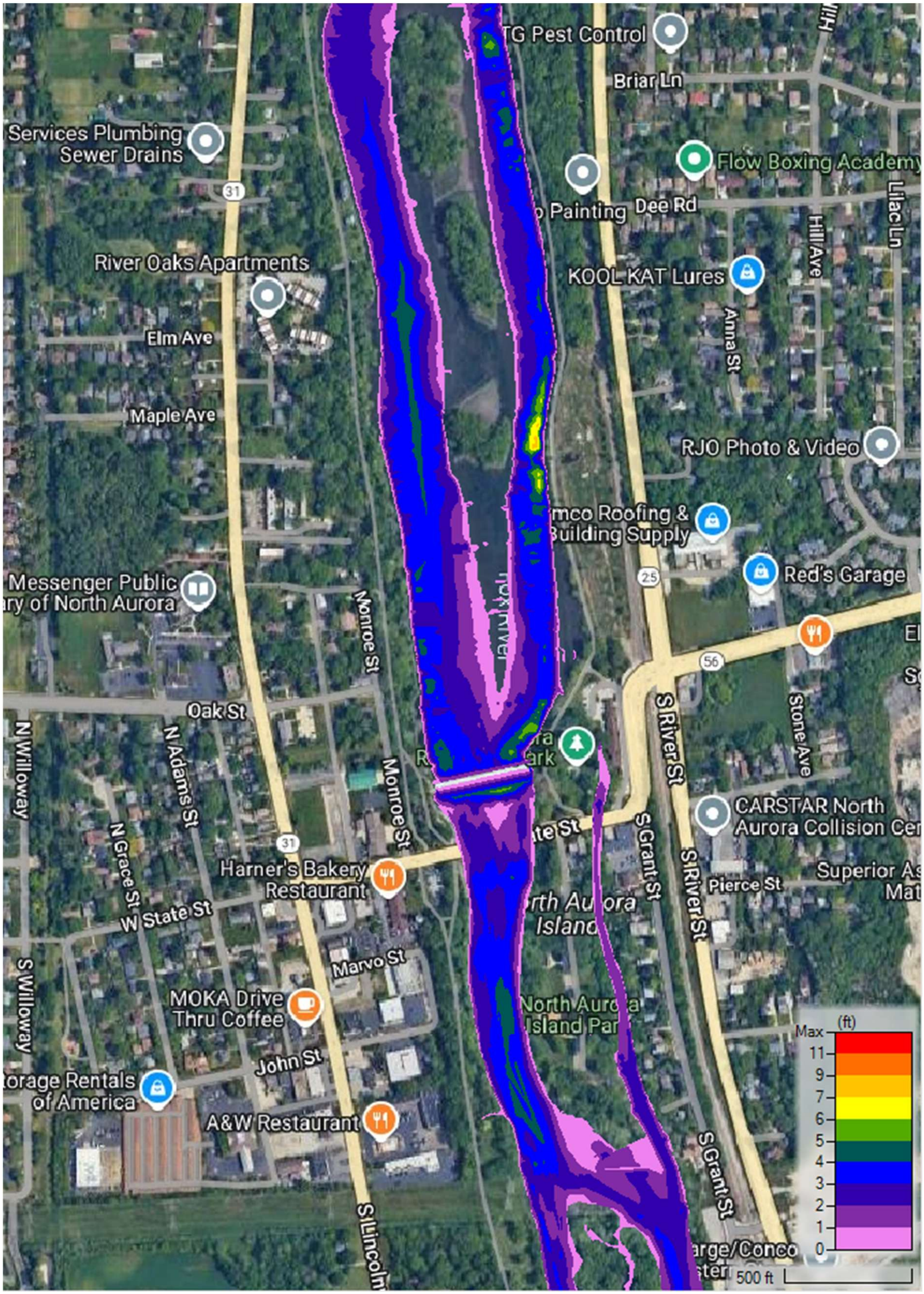

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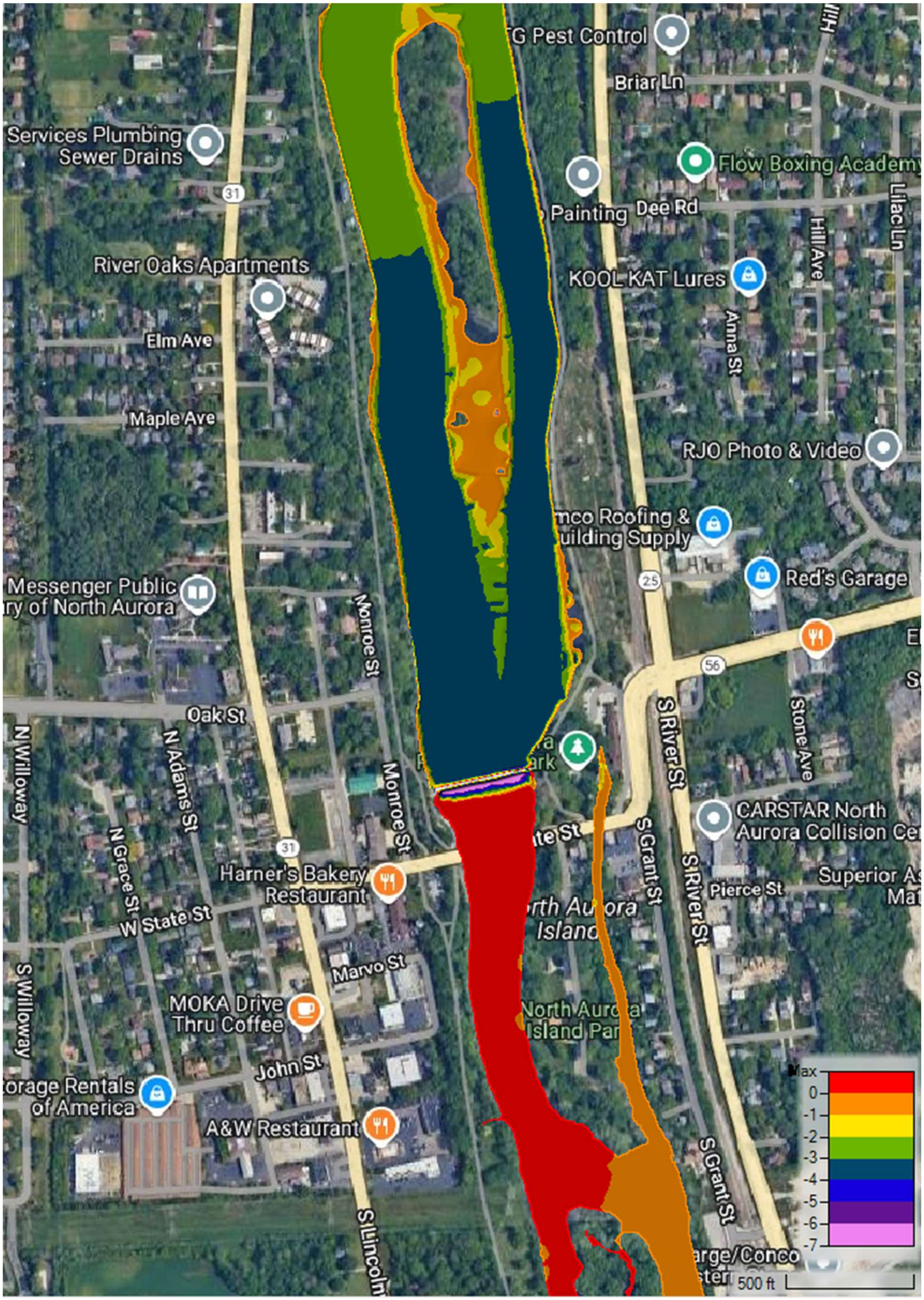

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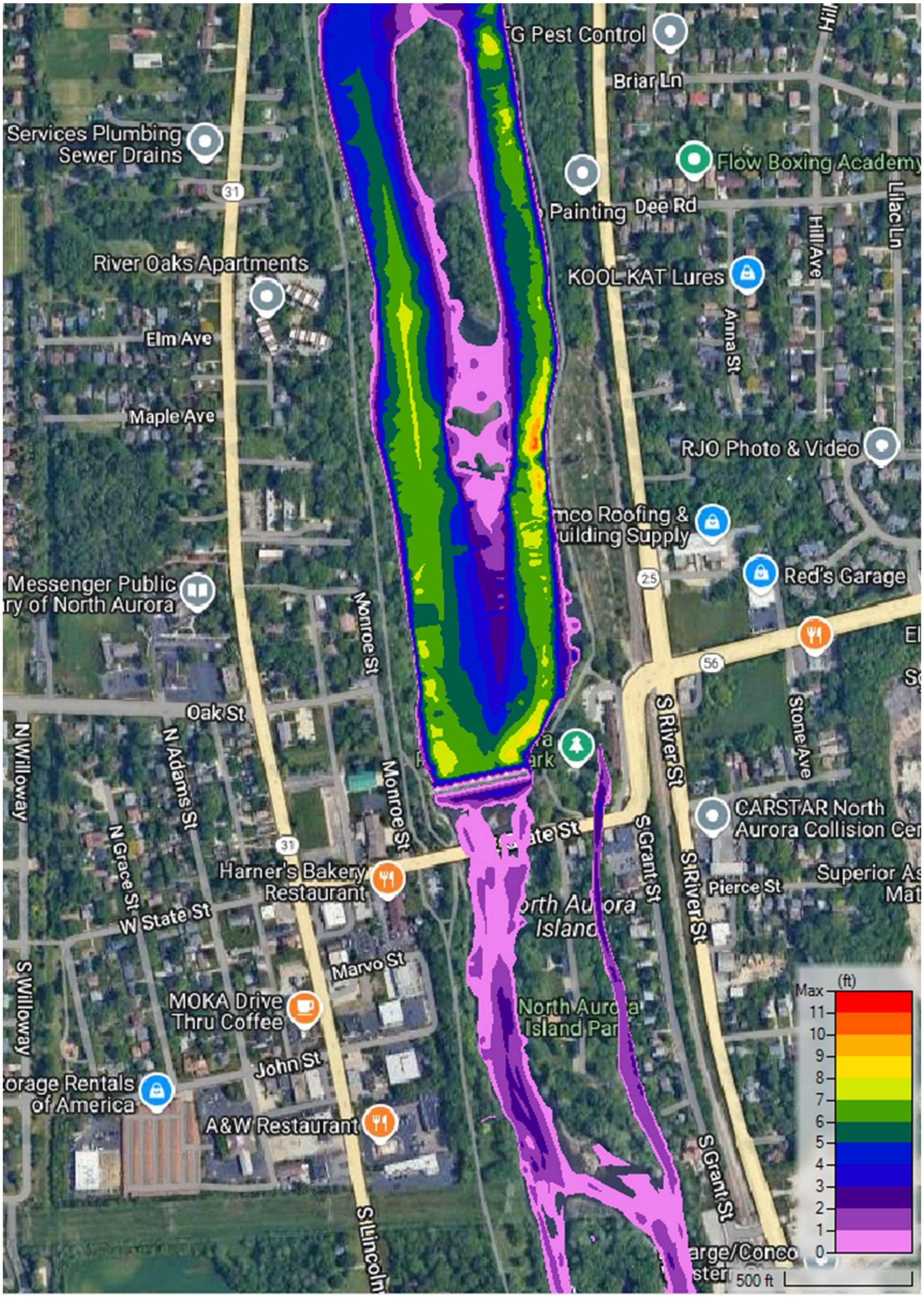
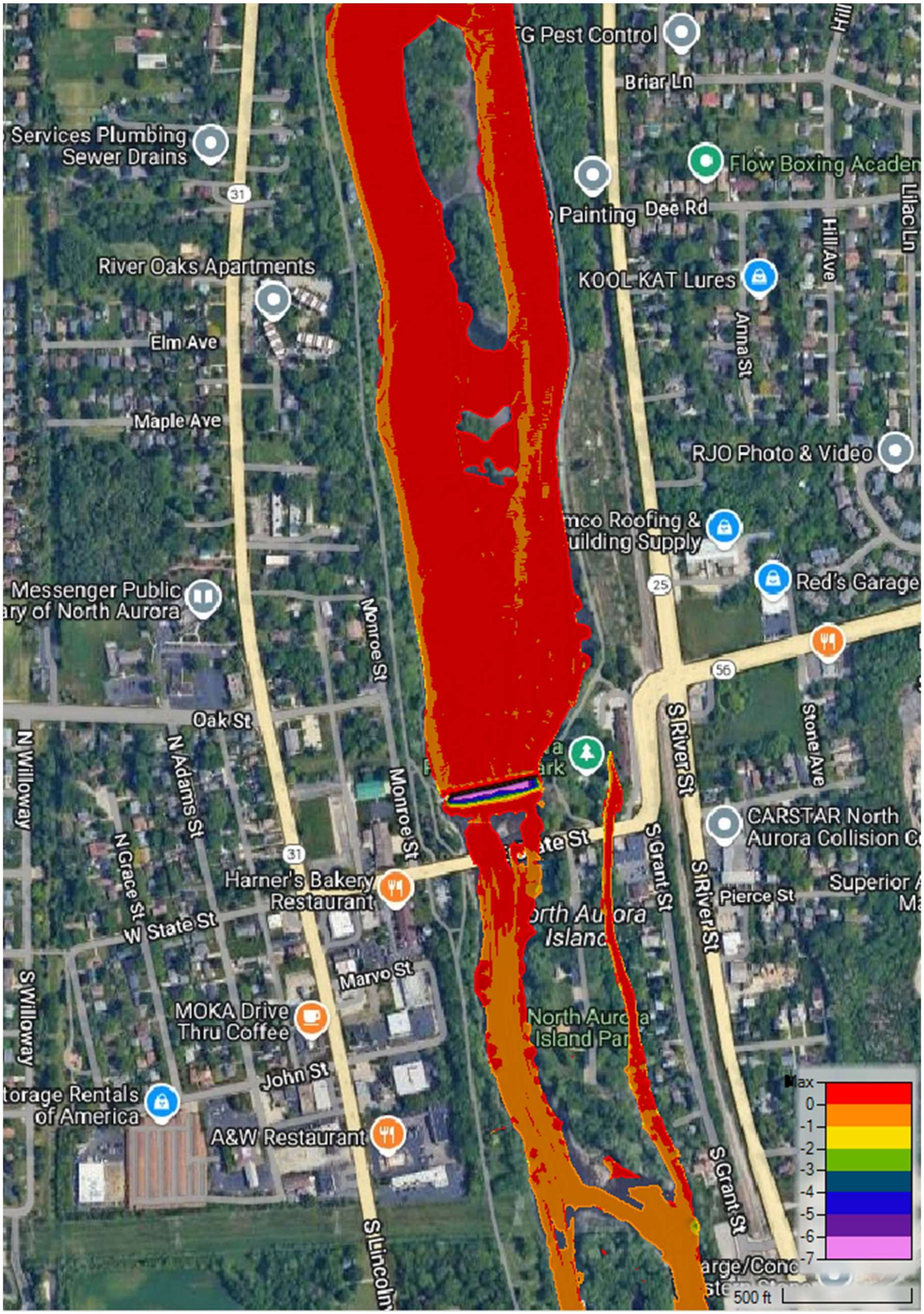


Alternative 10 Depth at 188 cfs



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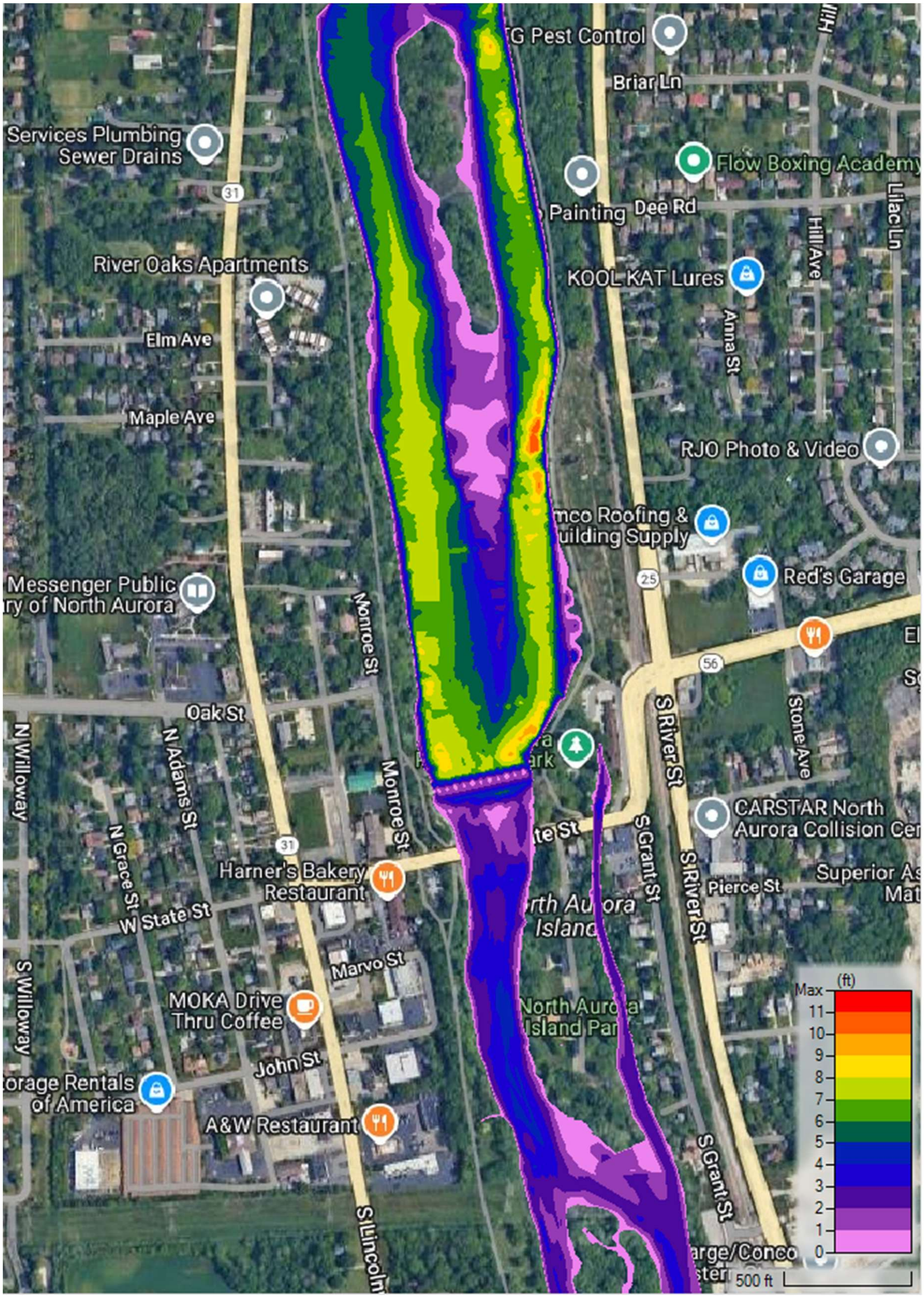
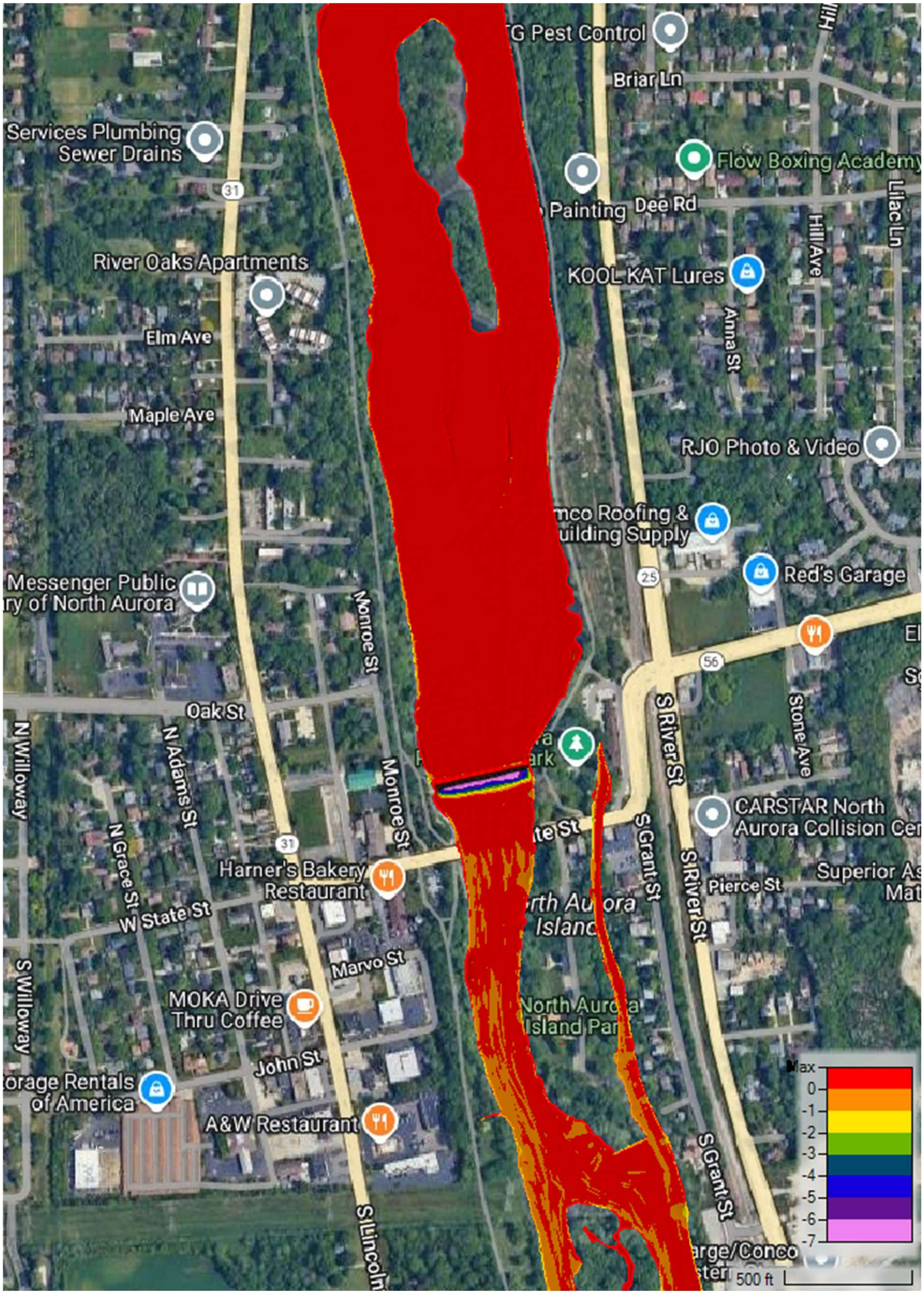


Alternative 10 Depth at 1283 cfs



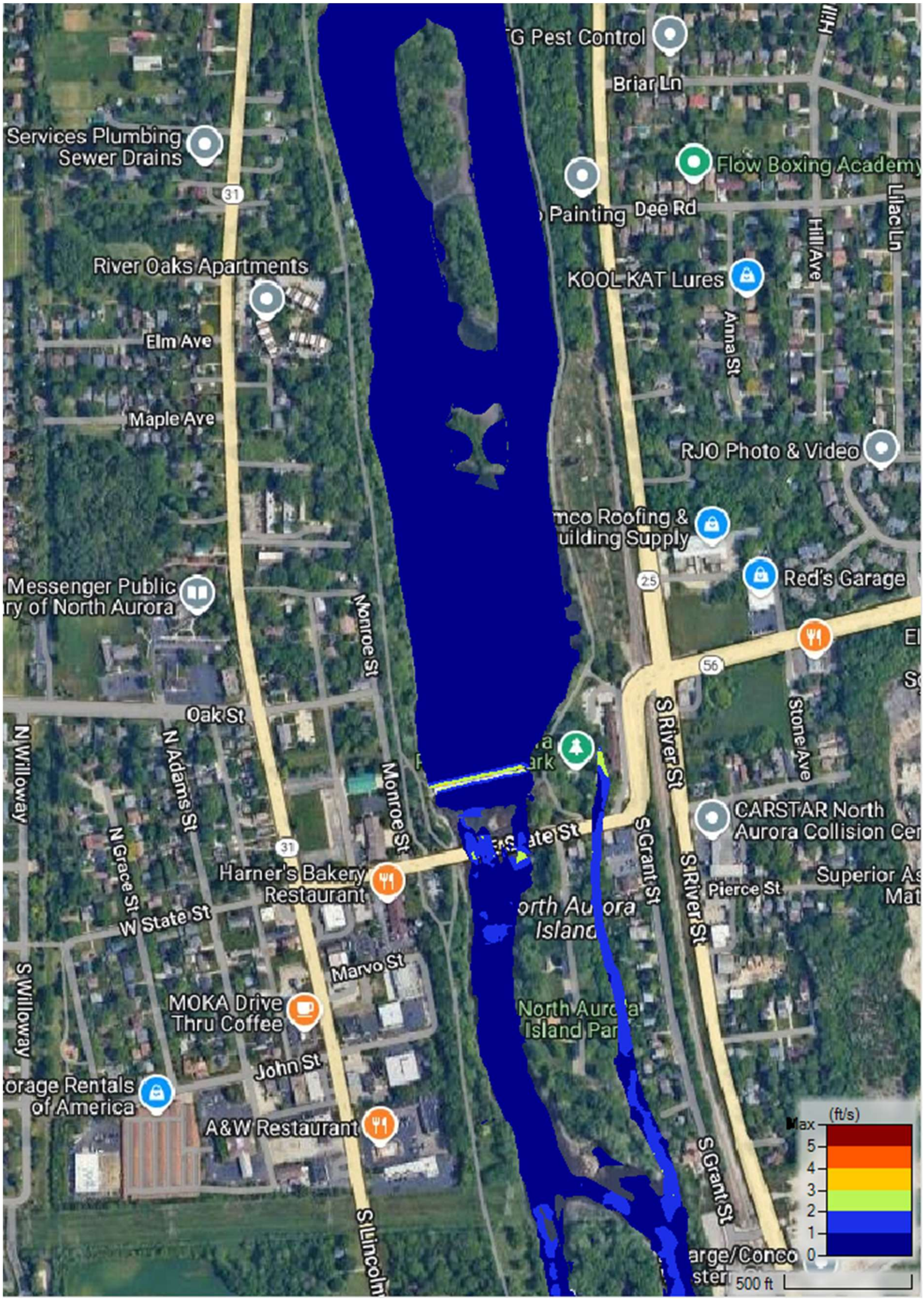
Alternative 10 Change in Depth at 1283 cfs

Alternatives 1-10

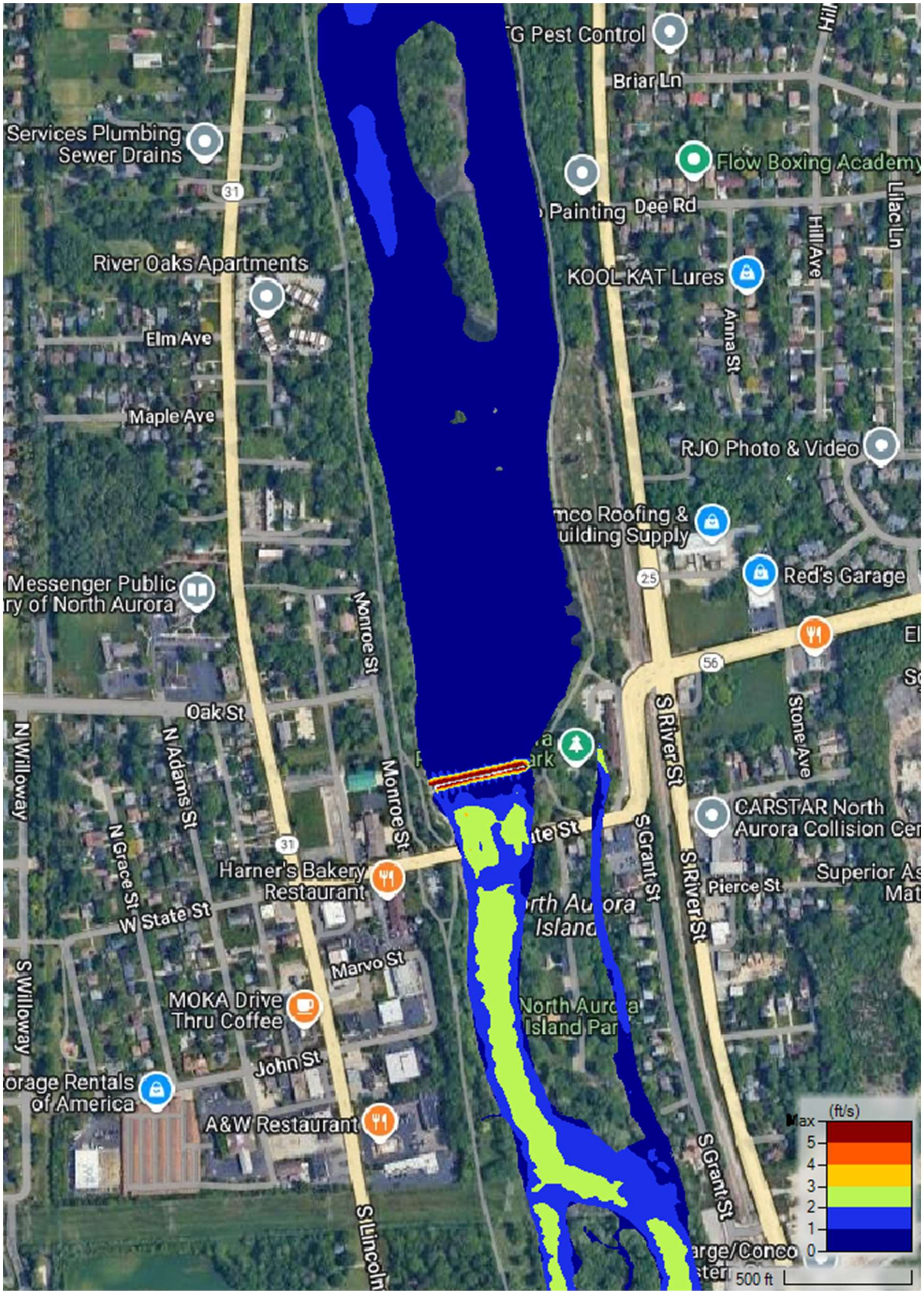
Velocities

and

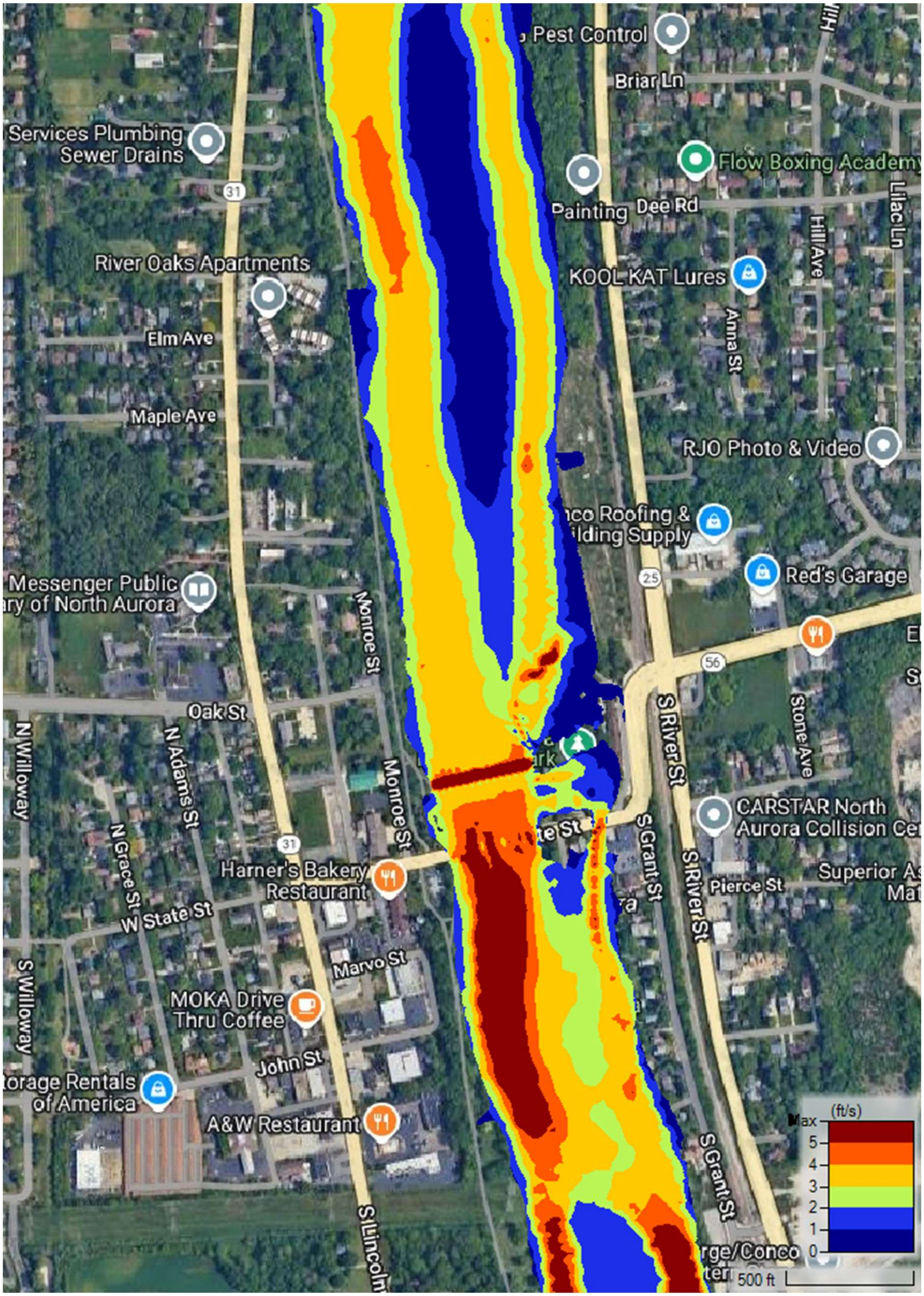
Change in Velocities from Existing



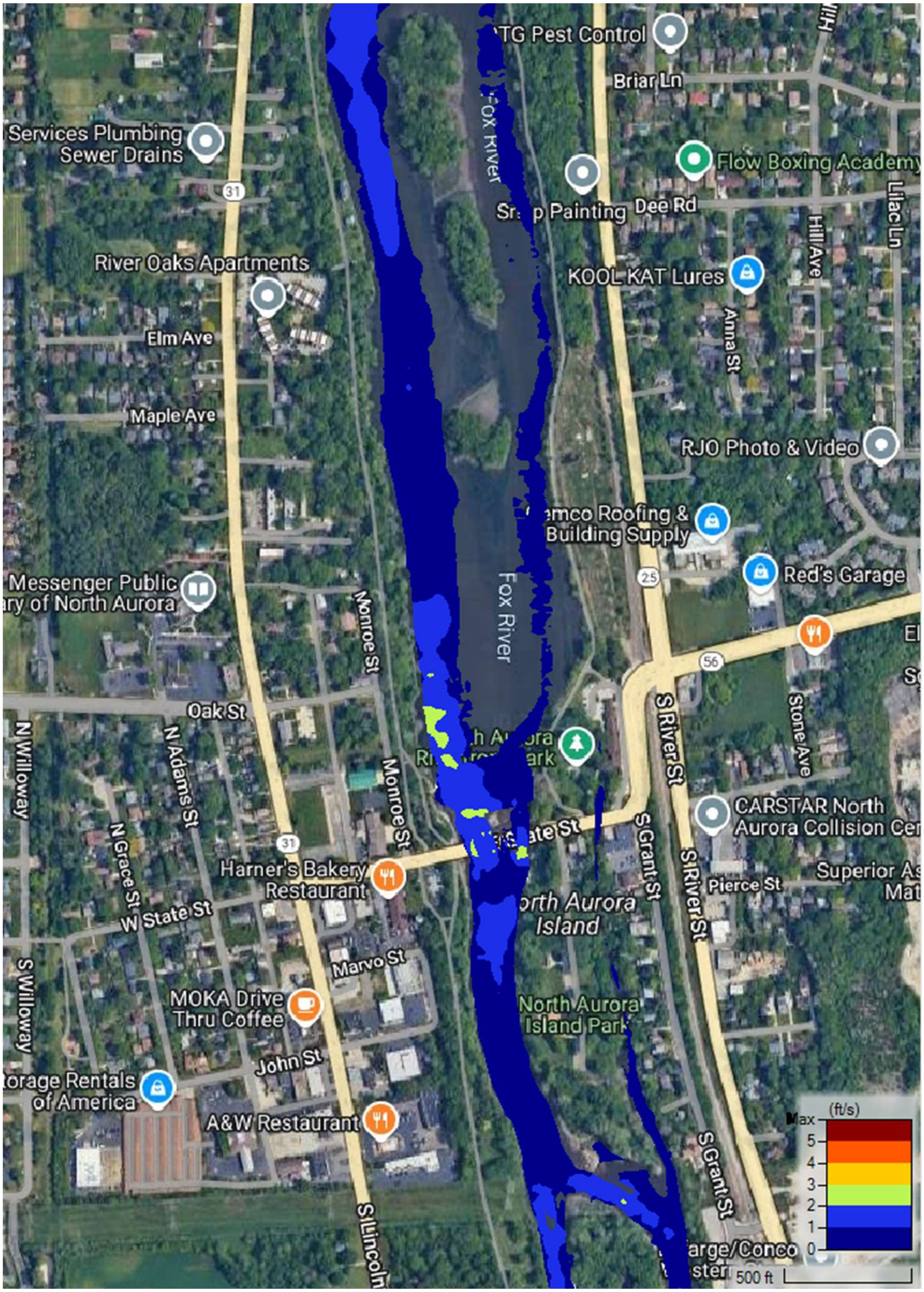
Existing Velocity at 188 cfs



Existing Velocity at 1283 cfs



Existing Velocity at 16200 cfs



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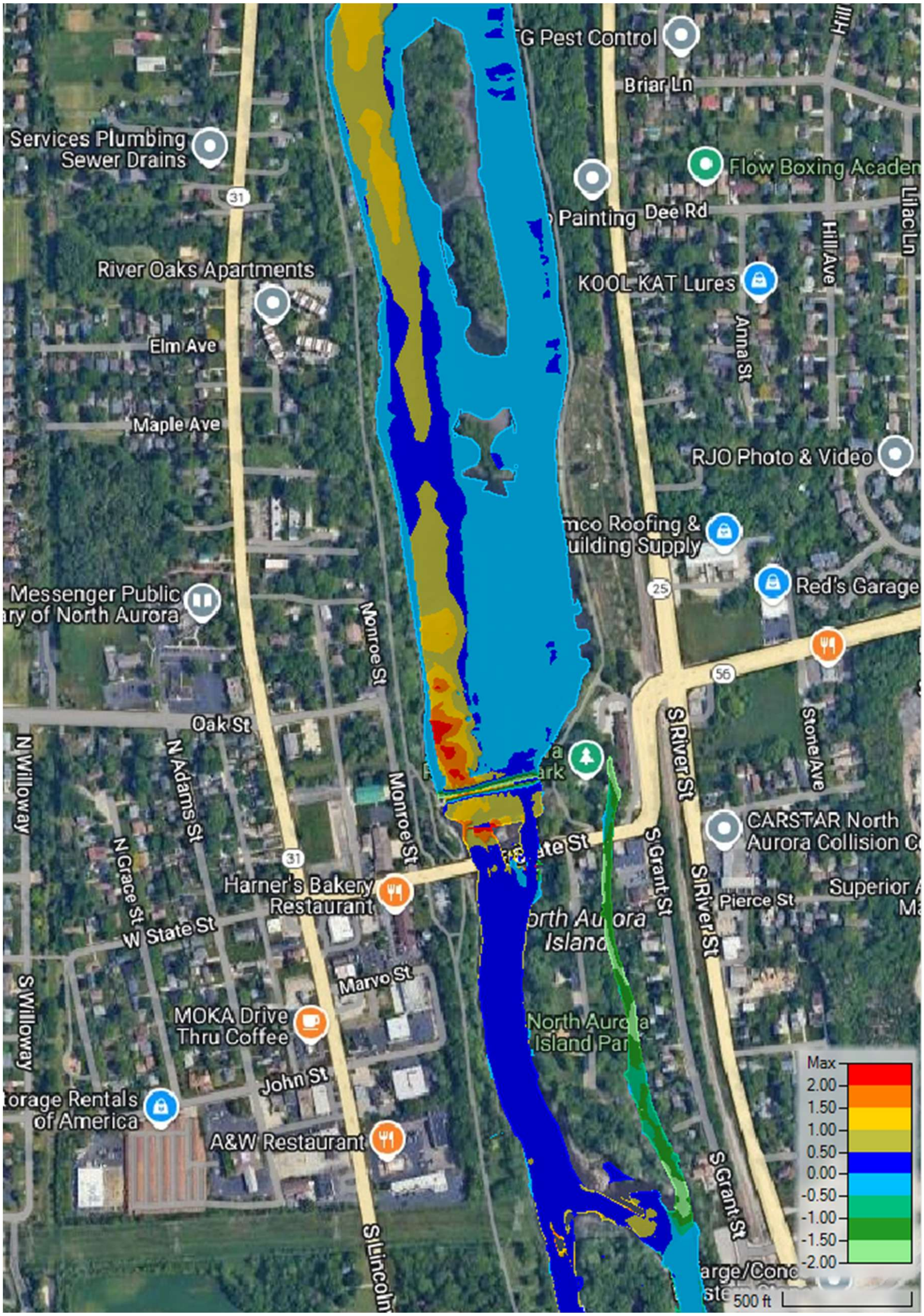

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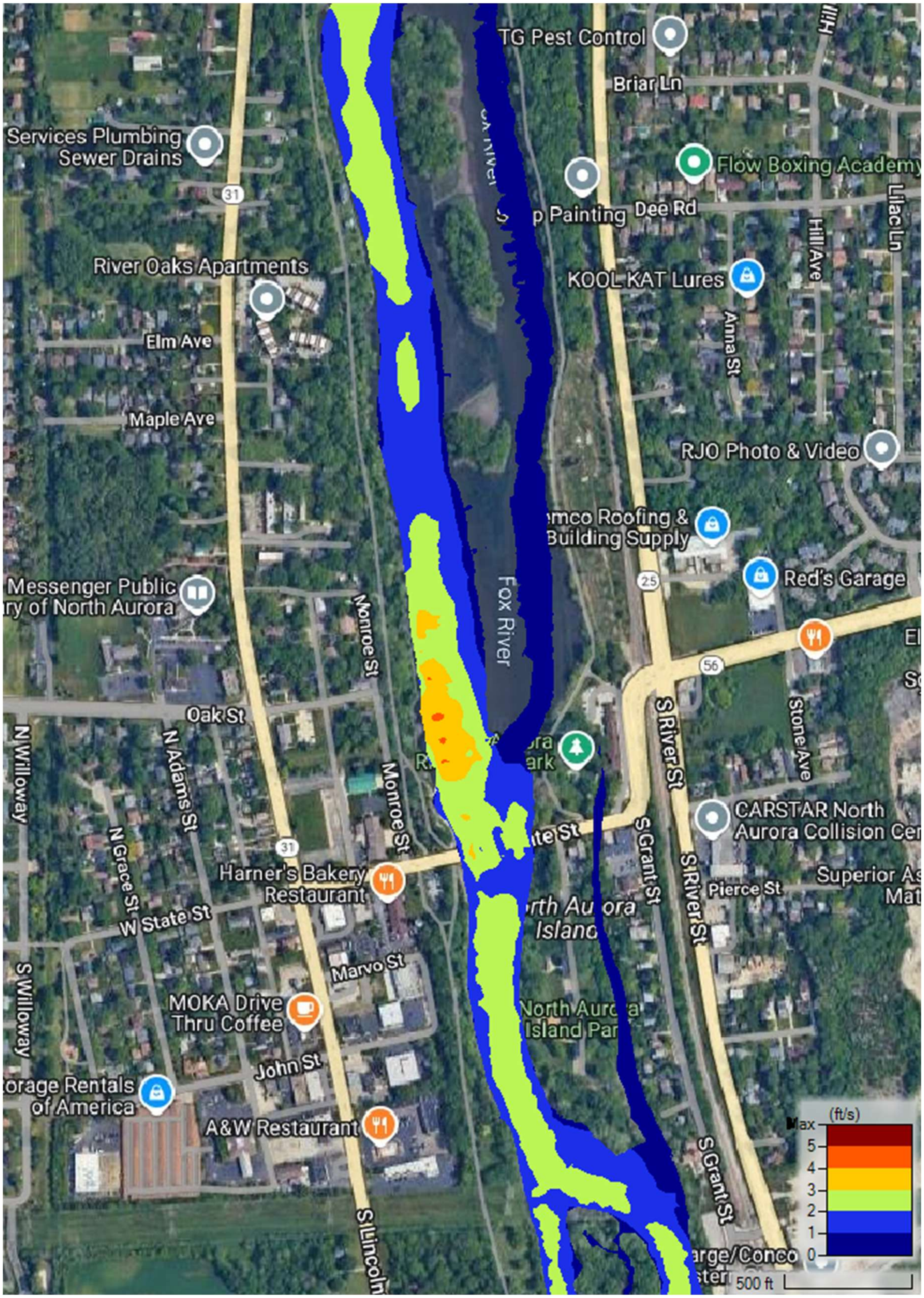
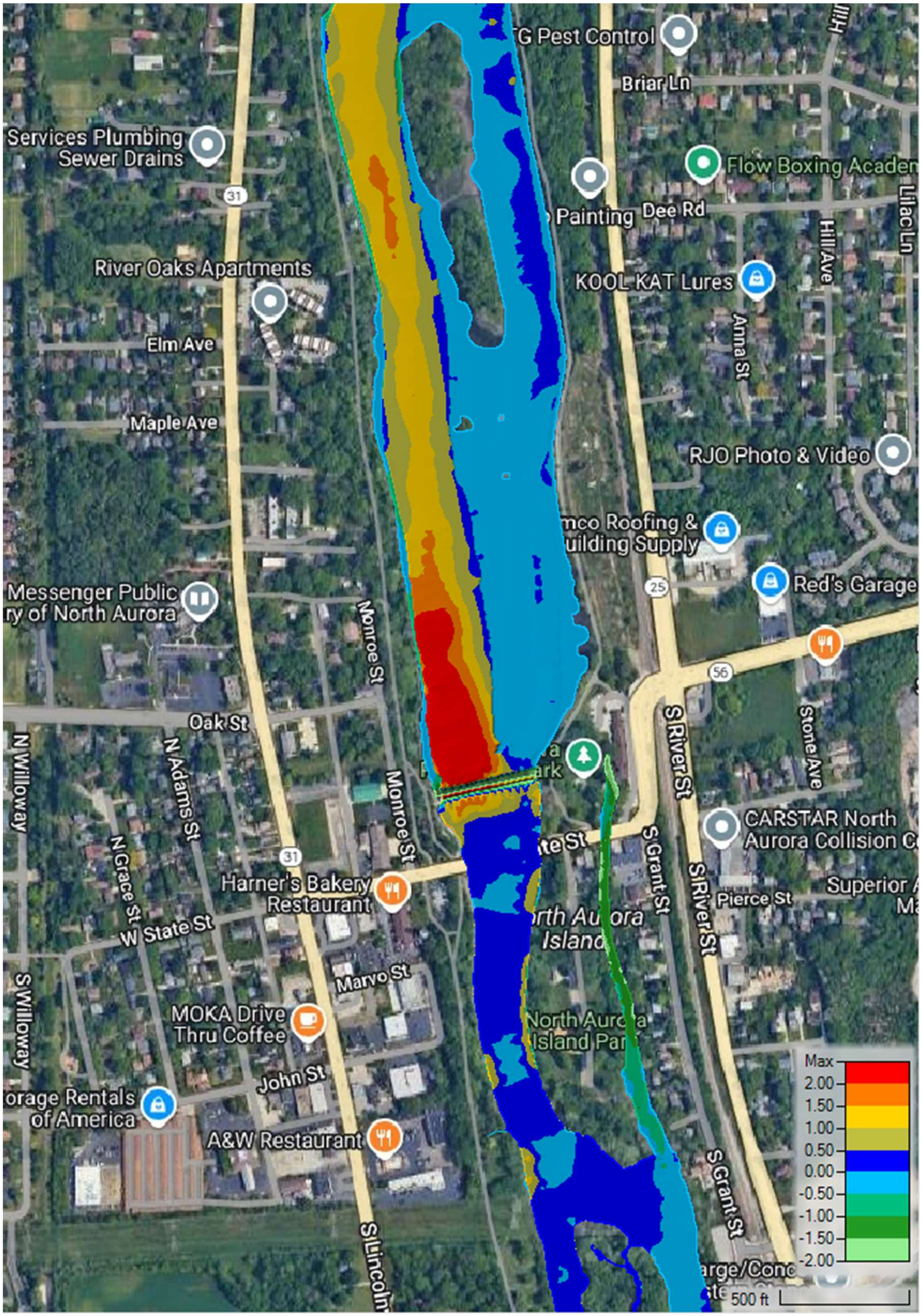


Alternative 1 Velocity at 1283 cfs



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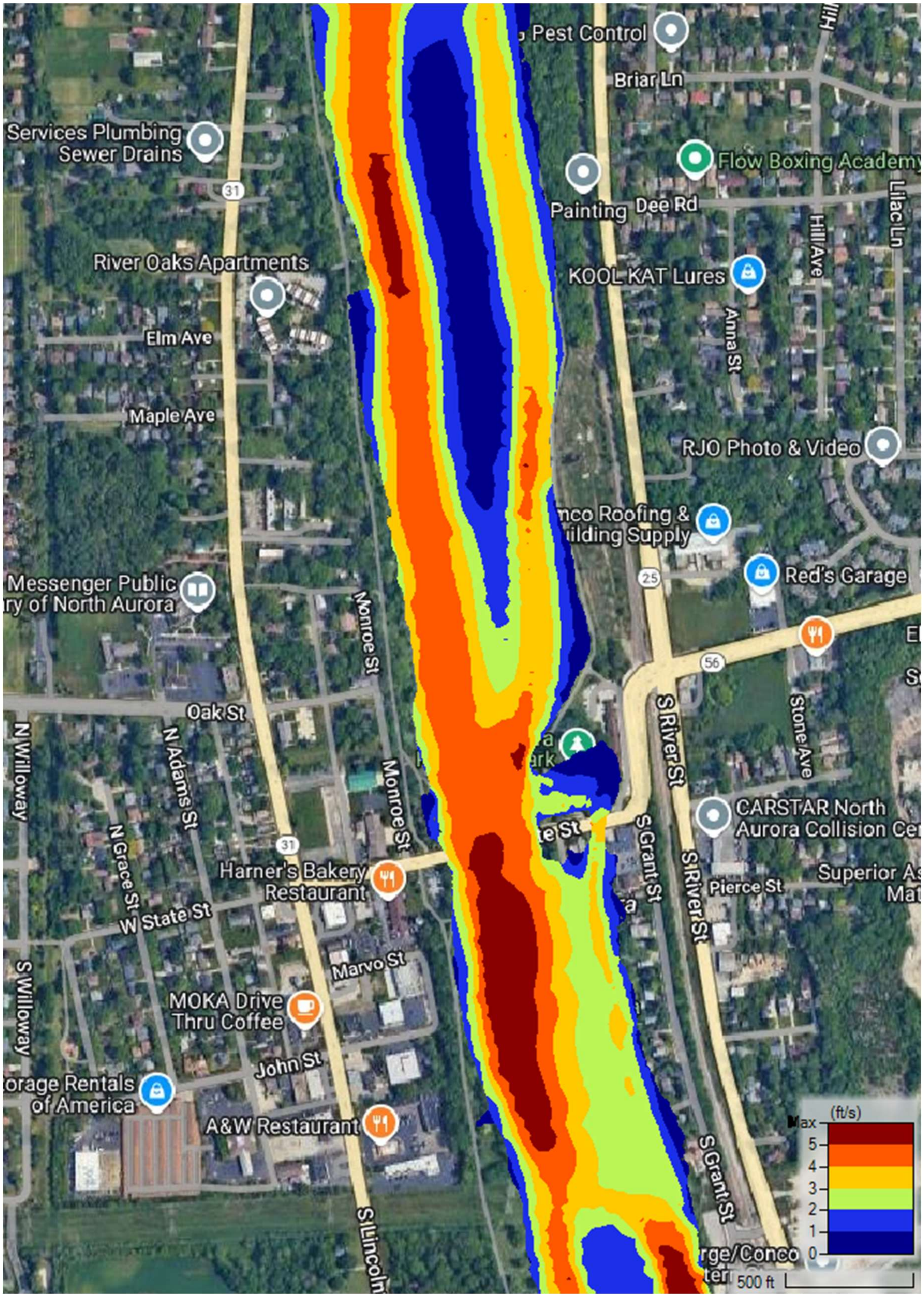
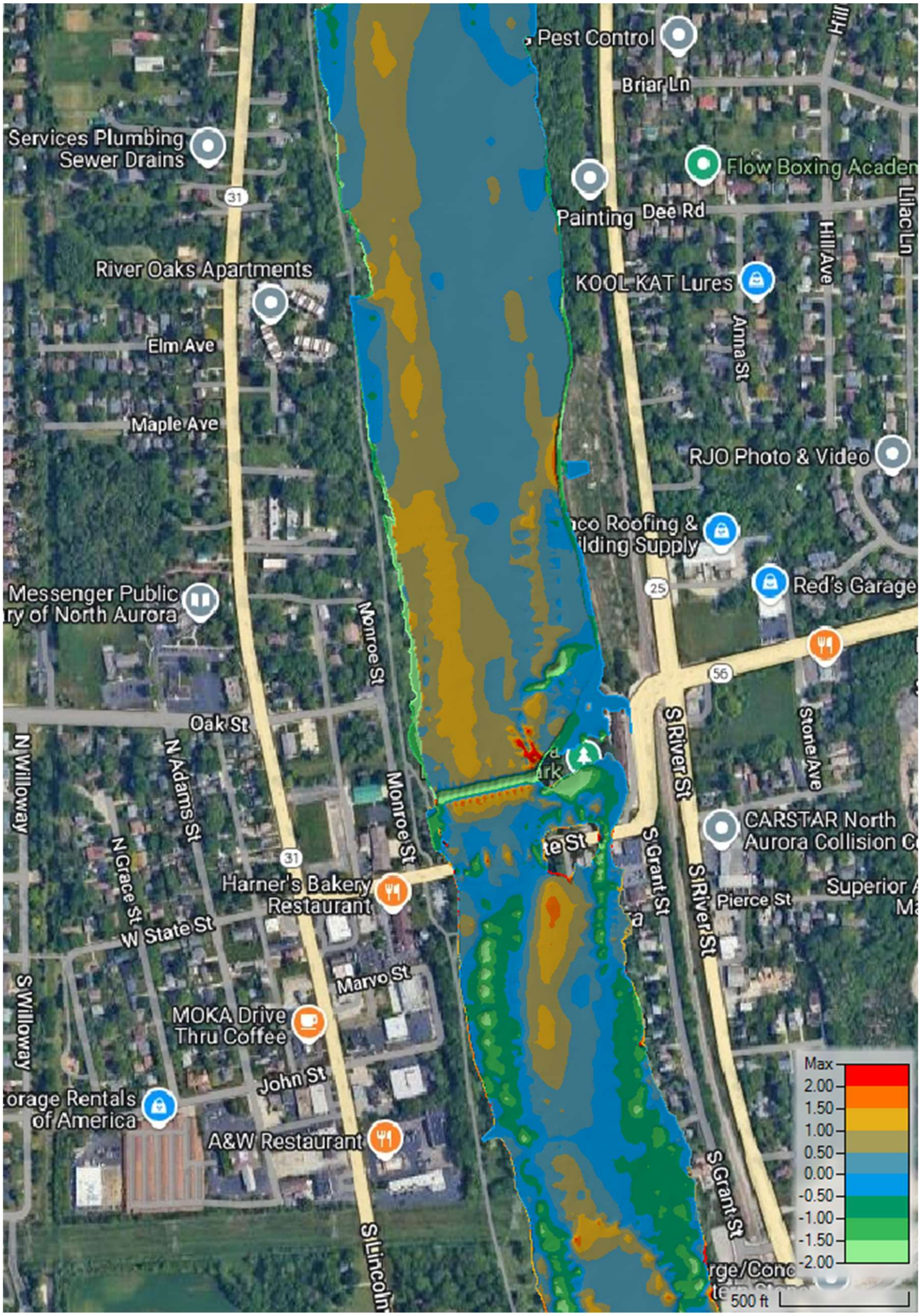
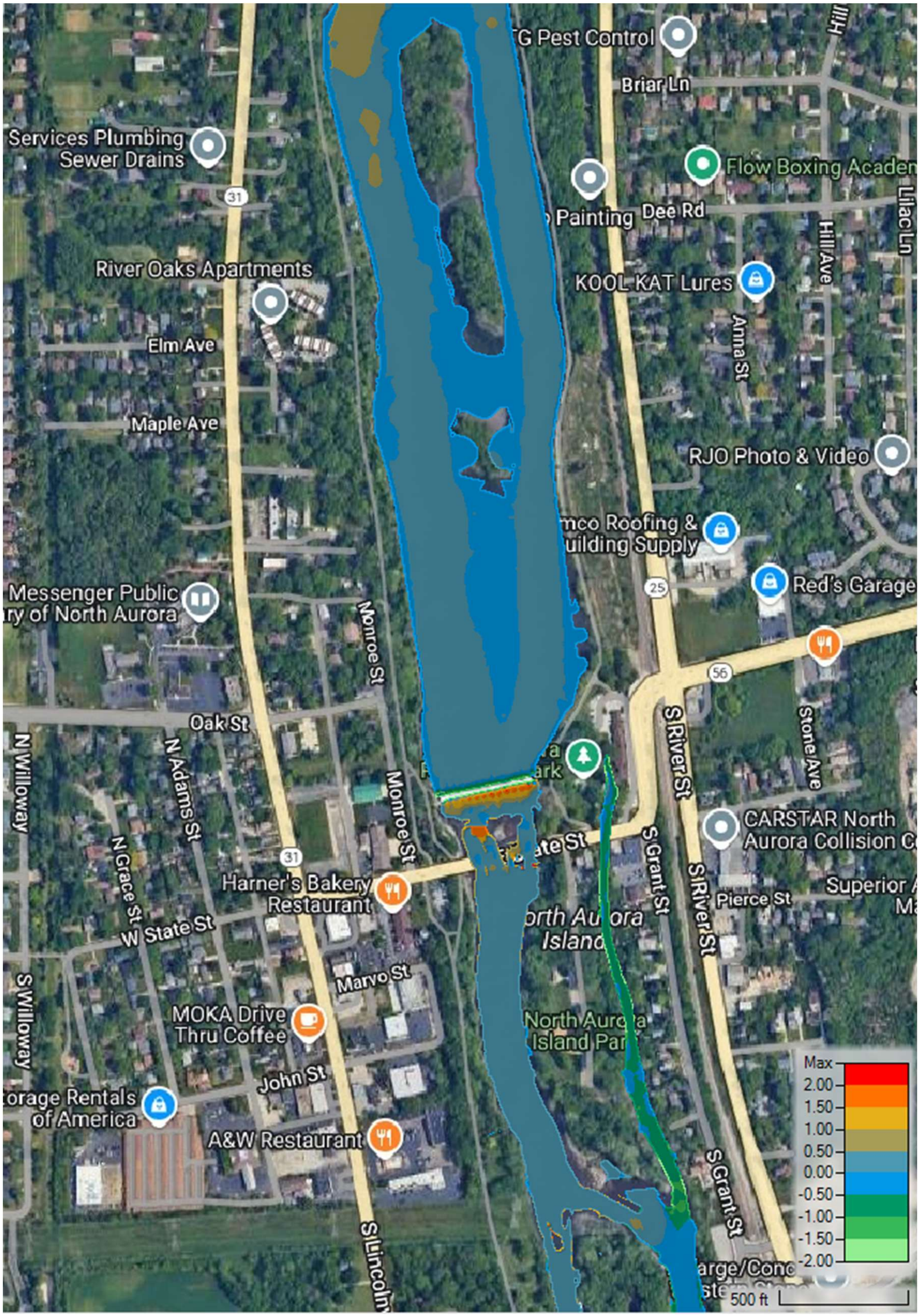


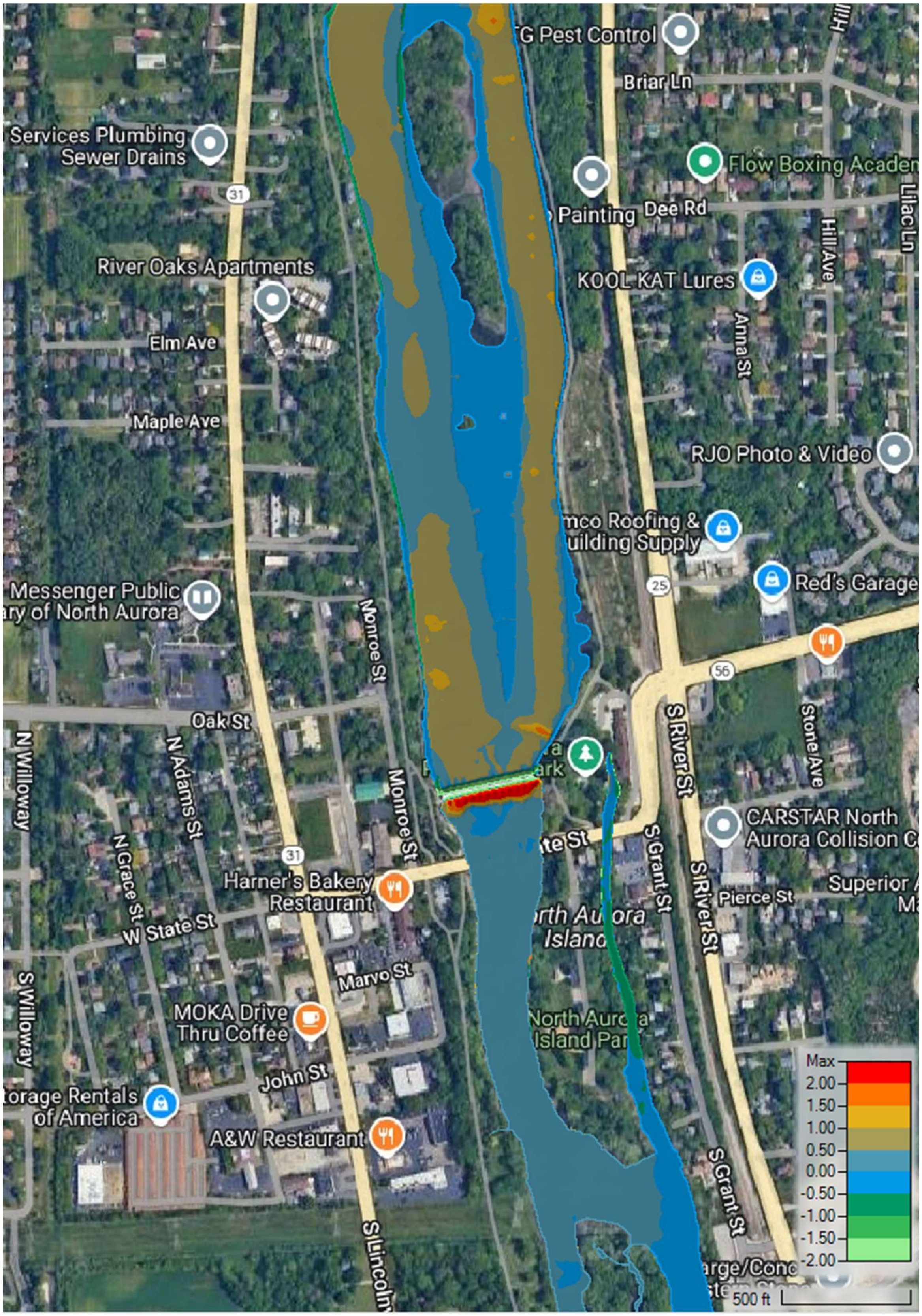
Alternative 1 Velocity at 16200 cfs



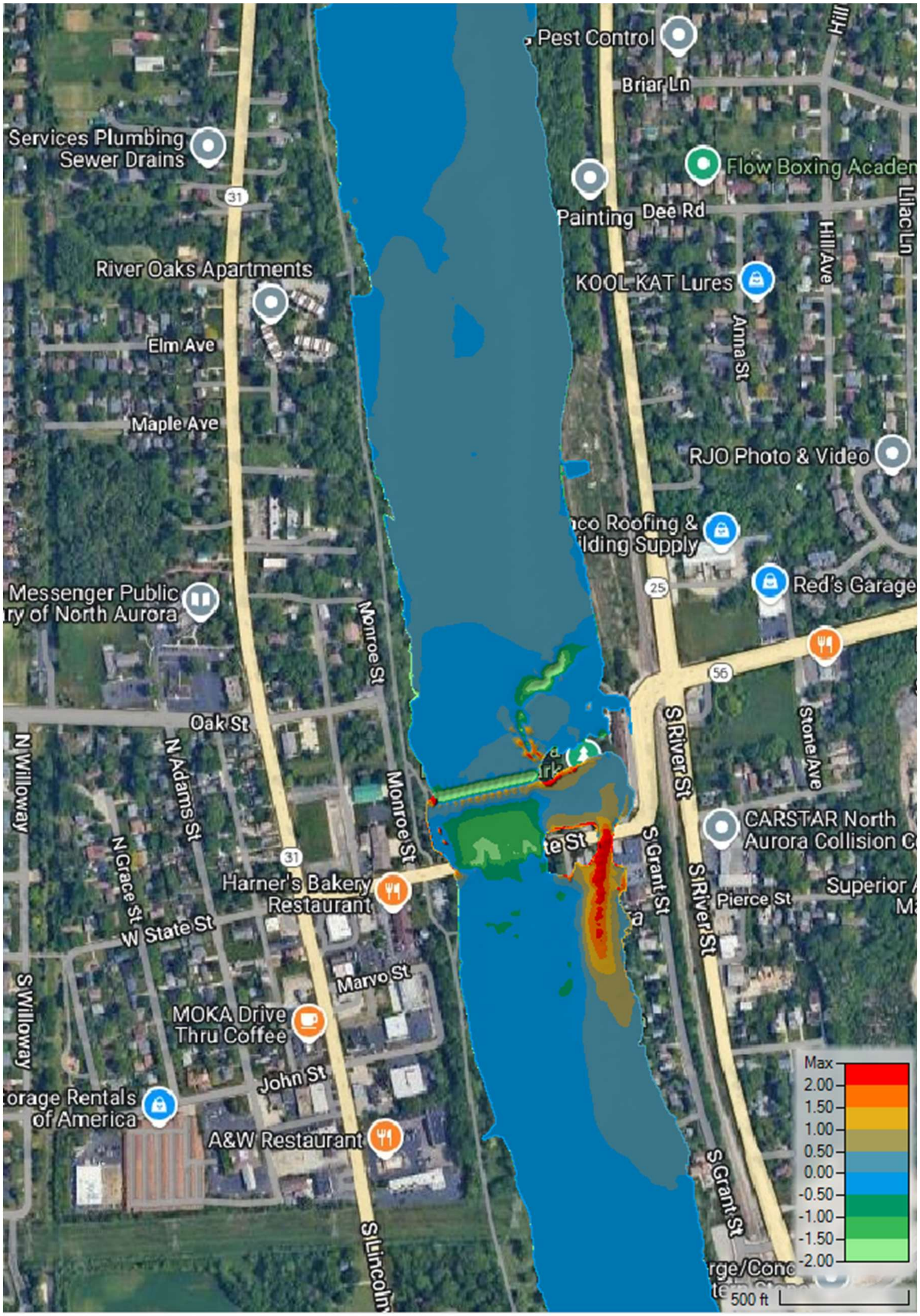
Alternative 1 Change in Velocity 16200 cfs



Alternative 9 Change in Velocity at 188 cfs



Alternative 9 Change in Velocity at 1283 cfs



Alternative 9 Change in Velocity at 16200

Appendix F

Detailed Cost Projections

North Aurora Alternative 1 - Full Dam Removal

		Cost Estimate			
		Kane County			***12/9/2024***
PAY ITEM #	**ITEM DESCRIPTION**	**UNITS**	**UNIT PRICE***	**QUANTITY**	**COST**
20101000	TEMPORARY FENCE	FOOT	$8.70	776	$7,300
25000100	SEEDING CL 1	ACRE	$3,500.00	0.55	$2,100
25000400	NITROGEN FERT NUTR	POUND	$3.30	49.50	$200
25000500	PHOSPHORUS FERT NUTR	POUND	$5.00	49.50	$300
25000600	POTASSIUM FERT NUTR	POUND	$ 3.30	49.50	$200
25100115	MULCH METHOD 2	ACRE	$2,600.00	0.55	$1,500
28000400	PERIMETER EROS BAR	FOOT	$4.09	850	$3,800
28100207	STONE DUMPING RIPRAP, CLASS A4	TONS	$86.00	3,176	$295,800
28100209	STONE DUMPING RIPRAP, CLASS A5(Scour Hole Cap)	TONS	$94.00	0	$0
50102400	CONC REM	CU YD	$140.00	1,535	$232,700
NR105001	CONSTRUCTION STAKING	L SUM	$8,875.00	1	$9,600
NR512001	SHEET PILE REMOVAL	SQ FT	$10.50	2,685	$30,500
NR513000	TIMBER MATTING	SQ YD	$13.00	1,900	$26,700
NR704001	TRAFFIC CONTROL AND PROTECTION, SPECIAL	L SUM	$12,840.20	1	$13,900
NR720001	WOOD INFORMATION SIGNS	EACH	$16,733.33	2	$36,200
X0325410	PILE REMOVAL	FOOT	$50.00	3,699	$200,300
669xxxxx	SPL WASTE DISPOSL	CU YD	$ 225.00	555	$124,900
	CONTAMINATED SED. DREDGING AND DISPOSAL	CU YD	$ 225.00	12,305	$2,768,600
				SUBTOTAL	**$3,754,600**
		OTHER			
	Contingencies	%	15%	1	$563,200
67000500	ENGR FIELD OFFICE B	CAL MO	$3,000.00	6	$18,000
Approx.	Mobilization	%	6%	1	$225,300
				SUBTOTAL	**$806,500**
	CONSTRUCTION COSTS				**$4,561,100**
		ENGINEERING COSTS			
	Design Engineering	%	20%	1	$912,200
	Construction Supervision	%	7.5%	1	$342,100
	Additional Sediment Testing	L SUM	$50,000.00	1	$50,000
				SUBTOTAL	**$1,304,300**
		LAND RIGHTS & UTILITY RELOCATIONS			
	Easements for Sediment Removal	AC	$ 22,500.00	1.45	$32,625
					$0
					$0
				SUBTOTAL	**$32,625**
	TOTAL PROJECT COST				**$5,898,025**
	COST WITHOUT CONTAMINATED SED. REMOVAL				$1,594,100

* Costs were escalated from 2022 to 2025 using Consumer Price Index (CPI) recommended factors

North Aurora Alternative 2 - Channel Routed for Parking Lot

Cost Estimate

Kane County *12/9/2024*

PAY ITEM #	ITEM DESCRIPTION	UNITS	UNIT PRICE	QUANTITY	COST
20100110	TREE REMOV 6-15	UNIT	$28.00	120	$3,600
20100210	TREE REMOV OVER 15	UNIT	$38.00	208	$8,600
20101000	TEMPORARY FENCE	FOOT	$8.70	776	$7,300
20300100	CHANNEL EXCAVATION	CU YD	$55.67	1,335	$80,500
25000100	SEEDING CL 1	ACRE	$ 3,500.00	0.55	$2,100
25000400	NITROGEN FERT NUTR	POUND	$3.30	49.5	$200
25000500	PHOSPHORUS FERT NUTR	POUND	$5.00	49.5	$300
25000600	POTASSIUM FERT NUTR	POUND	$3.30	49.5	$200
25100115	MULCH METHOD 2	ACRE	$2,600.00	0.55	$1,500
28000400	PERIMETER EROS BAR	FOOT	$4.09	850	$3,800
28100107	STONE RIPRAP CL A4(Mill Race)	SQ YD	$85.00	333	$30,600
28100207	STONE DUMPING RIPRAP, CLASS A4(Causeway)	TONS	$86.00	3,176	$295,800
28100209	STONE DUMPING RIPRAP, CLASS A5(Scour Hole Cap)	TONS	$94.00	0	$0
28200200	FILTER FABRIC	SQ YD	$5.00	333	$1,800
50102400	CONC REM	CU YD	$140.00	1,535	$232,700
50102400	CONC REM(Mill Race)	CU YD	$140.00	184	$27,900
50300225	CONC STRUCT	CU YD	$ 825.00	140	$125,100
50500505	STUD SHEAR CONNECTORS	EACH	$ 8.53	6,000	$55,400
52200015	PERM SHT PILING	SQ FT	$ 34.50	10,800	$403,500
NR105001	CONSTRUCTION STAKING	L SUM	$ 8,875.00	1	$9,600
NR512001	SHEET PILE REMOVAL	SQ FT	$ 10.50	2,685	$30,500
NR513000	TIMBER MATTING	SQ YD	$ 13.00	1,900	$26,700
NR704001	TRAFFIC CONTROL AND PROTECTION, SPECIAL	L SUM	$ 12,840.20	1	$13,900
NR720001	WOOD INFORMATION SIGNS	EACH	$ 16,733.33	2	$36,200
X0325410	PILE REMOVAL	FOOT	$ 50.00	3,699	$200,300
54011207	PCBC 12X7	FOOT	$ 1,200.00	12	$15,600
669xxxxx	SPL WASTE DISPOSL	CU YD	$ 225.00	555	$124,900
50900805	PEDESTRIAN RAIL	FOOT	$ 350.00	505	$191,400
35501308	HMA BASE CSE 6	SQ YD	$ 65.00	16	$1,100
20800150	TRENCH BACKFILL	CU YD	$ 65.00	13	$900
	CONTAMINATED SED. DREDGING AND DISPOSAL	CU YD	$ 225.00	12,305	$2,768,600
				SUBTOTAL	**$4,700,600**
		OTHER			
	Contingencies (15%)	%	15%	1	$705,100
67000500	ENGR FIELD OFFICE B	CAL MO	$3,000.00	6	$18,000
Approx.	Mobilization (6% subtotal)	%	6%	1	$282,000
				SUBTOTAL	**$1,005,100**
	CONSTRUCTION COSTS				**$5,705,700**
		ENGINEERING COSTS			
	Design Engineering	%	20%	1	$1,141,100
	Construction Supervision	%	7.5%	1	$427,900
	Additional Sediment Testing	L SUM	$50,000.00	1	$50,000
				SUBTOTAL	**$1,619,000**
		LAND RIGHTS & UTILITY RELOCATIONS			
	Easements for Sediment Removal	AC	$ 22,500.00	1.45	$32,625
					$0
					$0
				SUBTOTAL	**$32,625**
	TOTAL PROJECT COST				**$7,357,325**
	COST WITHOUT CONTAMINATED SED. REMOVAL				$3,053,500

* Costs were escalated from 2022 to 2024 using Consumer Price Index (CPI) recommended factors

North Aurora Alternative 3 - Channel South of the Gazebo

Cost Estimate

Kane County *12/9/2024*

PAY ITEM #	ITEM DESCRIPTION	UNITS	UNIT PRICE	QUANTITY	COST
20100110	TREE REMOV 6-15	UNIT	$28.00	30	$900
20100210	TREE REMOV OVER 15	UNIT	$38.00	144	$5,900
20101000	TEMPORARY FENCE	FOOT	$8.70	776	$7,300
20300100	CHANNEL EXCAVATION	CU YD	$55.67	1,045	$63,000
25000100	SEEDING CL 1	ACRE	$ 3,500.00	0.55	$2,100
25000400	NITROGEN FERT NUTR	POUND	$3.30	49.5	$200
25000500	PHOSPHORUS FERT NUTR	POUND	$5.00	49.5	$300
25000600	POTASSIUM FERT NUTR	POUND	$3.30	49.5	$200
25100115	MULCH METHOD 2	ACRE	$2,600.00	0.55	$1,500
28000400	PERIMETER EROS BAR	FOOT	$4.09	850	$3,800
28100107	STONE RIPRAP CL A4 (Mill Race Channel)	SQ YD	$86.00	986	$91,800
28100207	STONE DUMPING RIPRAP, CLASS A4(Causeway)	TONS	$86.00	3,176	$295,800
28100209	STONE DUMPING RIPRAP, CLASS A5(Scour Hole Cap)	TONS	$94.00	0	$0
28200200	FILTER FABRIC	SQ YD	$5.00	986	$5,300
50102400	CONC REM	CU YD	$140.00	1,535	$232,700
NR105001	CONSTRUCTION STAKING	L SUM	$8,875.00	1	$9,600
NR512001	SHEET PILE REMOVAL	SQ FT	$ 10.50	2,685	$30,500
NR513000	TIMBER MATTING	SQ YD	$ 13.00	1,900	$26,700
NR704001	TRAFFIC CONTROL AND PROTECTION, SPECIAL	L SUM	$ 12,840.20	1	$13,900
NR720001	WOOD INFORMATION SIGNS	EACH	$ 16,733.33	2	$36,200
X0325410	PILE REMOVAL	FOOT	$ 50.00	3,699	$200,300
54010503	PCBC 5X3	FOOT	$ 450.00	12	$5,800
669xxxxx	SPL WASTE DISPOSL	CU YD	$ 225.00	555	$124,900
35501308	HMA BASE CSE 6	SQ YD	$ 65.00	40	$2,800
20800150	TRENCH BACKFILL	CU YD	$ 65.00	27	$1,900
	CONTAMINATED SED. DREDGING AND DISPOSAL	CU YD	$ 225.00	12,305	$2,768,600
				SUBTOTAL	**$3,932,000**
		OTHER			
	Contingencies (15%)	%	15%	1	$589,800
67000500	ENGR FIELD OFFICE B	CAL MO	$3,000.00	6	$18,000
Approx.	Mobilization (6% subtotal)	%	6%	1	$235,900
				SUBTOTAL	**$843,700**
	CONSTRUCTION COSTS				**$4,775,700**
		ENGINEERING COSTS			
	Design Engineering	%	20%	1	$955,100
	Construction Supervision	%	7.5%	1	$358,200
	Additional Sediment Testing	L SUM	$50,000.00	1	$50,000
				SUBTOTAL	**$1,363,300**
		LAND RIGHTS & UTILITY RELOCATIONS			
	Easements for Sediment Removal	AC	$ 22,500.00	1.45	$32,625
					$0
					$0
				SUBTOTAL	**$32,625**
	TOTAL PROJECT COST				**$6,171,625**
	COST WITHOUT CONTAMINATED SED. REMOVAL				$1,867,700

* Costs were escalated from 2022 to 2024 using Consumer Price Index (CPI) recommended factors

North Aurora Alternative 4 - Deeper Culvert at Existing Location

Cost Estimate

Kane County *12/9/2024*

PAY ITEM #	ITEM DESCRIPTION	UNITS	UNIT PRICE	QUANTITY	COST
20100110	TREE REMOV 6-15	UNIT	$28.00	20	$600
20100210	TREE REMOV OVER 15	UNIT	$38.00	86	$3,500
20101000	TEMPORARY FENCE	FOOT	$8.70	776	$7,300
20800150	TRENCH BACKFILL	CU YD	$50.00	256	$13,900
25000100	SEEDING CL 1	ACRE	$ 3,500.00	0.55	$2,100
25000400	NITROGEN FERT NUTR	POUND	$3.30	49.5	$200
25000500	PHOSPHORUS FERT NUTR	POUND	$5.00	49.5	$300
25000600	POTASSIUM FERT NUTR	POUND	$3.30	49.5	$200
25100115	MULCH METHOD 2	ACRE	$2,600.00	0.55	$1,500
28000400	PERIMETER EROS BAR	FOOT	$4.09	850	$3,800
28100207	STONE DUMPING RIPRAP, CLASS A4(Causeway)	TONS	$86.00	3,176	$295,800
28100209	STONE DUMPING RIPRAP, CLASS A5(Scour Hole Cap)	TONS	$94.00	0	$0
40604060	HMA SC IL-9.5 D N50	TON	$225.00	18	$4,400
50102400	CONC REM	CU YD	$140.00	1,535	$232,700
50102400	CONC REM (MILL RACE)	CU YD	$140.00	184	$27,900
55102000	STORM SEWER REM 54	FOOT	$59.00	218	$13,900
60224446	MAN TA 7 DIA T1F OL	EACH	$ 14,625.00	1	$15,800
550A0780	STORM SEW CL A 3 EQRS 48	FOOT	$ 400.00	283	$122,600
NR105001	CONSTRUCTION STAKING	L SUM	$ 8,875.00	1	$9,600
NR512001	SHEET PILE REMOVAL	SQ FT	$ 10.50	2,685	$30,500
NR513000	TIMBER MATTING	SQ YD	$ 13.00	1,900	$26,700
NR704001	TRAFFIC CONTROL AND PROTECTION, SPECIAL	L SUM	$ 12,840.20	1	$13,900
NR720001	WOOD INFORMATION SIGNS	EACH	$ 16,733.33	2	$36,200
X0325410	PILE REMOVAL	FOOT	$ 50.00	3,699	$200,300
50300225	CONC STRUCT(OUTFLOW)	CU YD	$ 825.00	22	$19,200
NR6070xx	SLUICE GATE, HEAVY 72”x48”	EACH	$ 71,000.00	1	$76,900
50800105	REINFORCEMENT BARS	POUND	$ 3.70	3,200	$12,800
669xxxxx	SPL WASTE DISPOSL	CU YD	$ 225.00	555	$124,900
	CONTAMINATED SED. DREDGING AND DISPOSAL	CU YD	$ 225.00	12,305	$2,768,600
				SUBTOTAL	**$4,066,100**
			OTHER		
	Contingencies (15%)	%	15%	1	$609,900
67000500	ENGR FIELD OFFICE B	CAL MO	$3,000.00	6	$18,000
Approx.	Mobilization (6% subtotal)	%	6%	1	$244,000
				SUBTOTAL	**$871,900**
	CONSTRUCTION COSTS				**$4,938,000**
			ENGINEERING COSTS		
	Design Engineering	%	20%	1	$987,600
	Construction Supervision	%	7.5%	1	$370,400
	Additional Sediment Testing	L SUM	$50,000.00	1	$50,000
				SUBTOTAL	**$1,408,000**
			LAND RIGHTS & UTILITY RELOCATIONS		
	Easements for Sediment Removal	AC	$ 22,500.00	1.45	$32,625
					$0
					$0
				SUBTOTAL	**$32,625**
	TOTAL PROJECT COST				**$6,378,625**
	COST WITHOUT CONTAMINATED SED. REMOVAL				$2,074,700

* Costs were escalated from 2022 to 2024 using Consumer Price Index (CPI) recommended factors

North Aurora Alternative 5 - New Culvert Routed for Parking Lot					
Cost Estimate					
Kane County					*12/9/2024*
PAY ITEM #	**ITEM DESCRIPTION**	**UNITS**	**UNIT PRICE**	**QUANTITY**	**COST**
20100110	TREE REMOV 6-15	UNIT	$28.00	76	$2,300
20100210	TREE REMOV OVER 15	UNIT	$38.00	208	$8,600
20101000	TEMPORARY FENCE	FOOT	$8.70	776	$7,300
20800150	TRENCH BACKFILL	CU YD	$50.00	36	$1,900
25000100	SEEDING CL 1	ACRE	$ 3,500.00	0.55	$2,100
25000400	NITROGEN FERT NUTR	POUND	$3.30	49.5	$200
25000500	PHOSPHORUS FERT NUTR	POUND	$5.00	49.5	$300
25000600	POTASSIUM FERT NUTR	POUND	$3.30	49.5	$200
25100115	MULCH METHOD 2	ACRE	$2,600.00	0.55	$1,500
28000400	PERIMETER EROS BAR	FOOT	$4.09	850	$3,800
28100207	STONE DUMPING RIPRAP, CLASS A4	TONS	$86.00	3,176	$295,800
28100209	STONE DUMPING RIPRAP, CLASS A5(Scour Hole Cap)	TONS	$94.00	0	$0
40604060	HMA SC IL-9.5 D N50	TON	$225.00	3	$600
50102400	CONC REM	CU YD	$140.00	1,535	$232,700
50102400	CONC REM(Mill Race)	CU YD	$140.00	184	$27,900
55102000	STORM SEWER REM 54	FOOT	$59.00	75	$4,800
60224446	MAN TA 7 DIA T1F CL	EACH	$ 14,625.00	3	$47,500
550A0050	STORM SEW CL A 1 12	FOOT	$ 96.40	36	$3,800
550A0780	STORM SEW CL A 3 EQRS 48	FOOT	$ 400.00	325	$140,800
NR105001	CONSTRUCTION STAKING	L SUM	$ 8,875.00	1	$9,600
NR512001	SHEET PILE REMOVAL	SQ FT	$ 10.50	2,685	$30,500
NR513000	TIMBER MATTING	SQ YD	$ 13.00	1,900	$26,700
NR704001	TRAFFIC CONTROL AND PROTECTION, SPECIAL	L SUM	$ 12,840.20	1	$13,900
NR720001	WOOD INFORMATION SIGNS	EACH	$ 16,733.33	2	$36,200
X0325410	PILE REMOVAL	FOOT	$ 50.00	3,699	$200,300
50300225	CONC STRUCT(Outflow)	CU YD	$ 825.00	22	$19,200
NR6070xx	Sluice Gate, Heavy, 72”x48”	EACH	$ 71,000.00	1	$76,900
50800105	REINFORCEMENT BARS	POUND	$ 3.70	3,200	$12,800
669xxxxx	SPL WASTE DISPOSL	CU YD	$ 225.00	555	$124,900
	CONTAMINATED SED. DREDGING AND DISPOSAL	CU YD	$ 225.00	12,305	$2,768,600
				SUBTOTAL	**$4,101,700**
OTHER					
	Contingencies (15%)	%	15%	1	$615,300
67000500	ENGR FIELD OFFICE B	CAL MO	$3,000.00	6	$18,000
Approx.	Mobilization (6% subtotal)	%	6%	1	$246,100
				SUBTOTAL	**$879,400**
	CONSTRUCTION COSTS				**$4,981,100**
ENGINEERING COSTS					
	Design Engineering	%	20%	1	$996,200
	Construction Supervision	%	7.5%	1	$373,600
	Additional Sediment Testing	L SUM	$50,000.00	1	$50,000
				SUBTOTAL	**$1,419,800**
LAND RIGHTS & UTILITY RELOCATIONS					
	Easements for Sediment Removal	AC	$ 22,500.00	1.45	$32,625
					$0
					$0
				SUBTOTAL	**$32,625**
	TOTAL PROJECT COST				**$6,433,525**
	COST WITHOUT CONTAMINATED SED. REMOVAL				$2,129,600

* Costs were escalated from 2022 to 2024 using Consumer Price Index (CPI) recommended factors

North Aurora Alternative 6 - New Straight Culvert

Cost Estimate

Kane County *12/9/2024*

PAY ITEM #	ITEM DESCRIPTION	UNITS	UNIT PRICE	QUANTITY	COST
20100110	TREE REMOV 6-15	UNIT	$28.00	52	$1,600
20100210	TREE REMOV OVER 15	UNIT	$38.00	172	$7,100
20101000	TEMPORARY FENCE	FOOT	$8.70	776	$7,300
20800150	TRENCH BACKFILL	CU YD	$50.00	36	$1,900
25000100	SEEDING CL 1	ACRE	$ 3,500.00	0.55	$2,100
25000400	NITROGEN FERT NUTR	POUND	$3.30	49.5	$200
25000500	PHOSPHORUS FERT NUTR	POUND	$5.00	49.5	$300
25000600	POTASSIUM FERT NUTR	POUND	$3.30	49.5	$200
25100115	MULCH METHOD 2	ACRE	$2,600.00	0.55	$1,500
28000400	PERIMETER EROS BAR	FOOT	$4.09	850	$3,800
28100207	STONE DUMPING RIPRAP, CLASS A4(Causeway)	TONS	$86.00	3,176	$295,800
28100209	STONE DUMPING RIPRAP, CLASS A5(Scour Hole Cap)	TONS	$94.00	0	$0
40604060	HMA SC IL-9.5 D N50	TON	$225.00	3	$600
50102400	CONC REM	CU YD	$140.00	1,535	$232,700
50102400	CONC REM(Mill Race)	CU YD	$140.00	184	$27,900
55102000	STORM SEWER REM 54	FOOT	$59.00	75	$4,800
60224446	STORM SEW CL A 1 12	FOOT	$ 96.40	36	$3,800
550A0780	STORM SEW CL A 3 EQRS 48	FOOT	$ 400.00	256	$110,900
NR105001	CONSTRUCTION STAKING	L SUM	$ 8,875.00	1	$9,600
NR512001	SHEET PILE REMOVAL	SQ FT	$ 10.50	2,685	$30,500
NR513000	TIMBER MATTING	SQ YD	$ 13.00	1,900	$26,700
NR704001	TRAFFIC CONTROL AND PROTECTION, SPECIAL	L SUM	$ 12,840.20	1	$13,900
NR720001	WOOD INFORMATION SIGNS	EACH	$ 16,733.33	2	$36,200
X0325410	PILE REMOVAL	FOOT	$ 50.00	3,699	$200,300
50300225	CONC STRUCT(Outflow)	CU YD	$ 825.00	22	$19,200
NR6070xx	Sluice Gate, Heavy, 72"x48"	EACH	$ 71,000.00	1	$76,900
50800105	REINFORCEMENT BARS	POUND	$ 3.70	3,200	$12,800
669xxxxx	SPL WASTE DISPOSL	CU YD	$ 225.00	555	$124,900
	CONTAMINATED SED. DREDGING AND DISPOSAL	CU YD	$ 225.00	12,305	$2,768,600
				SUBTOTAL	**$4,022,100**
			OTHER		
	Contingencies (15%)	%	15%	1	$603,300
67000500	ENGR FIELD OFFICE B	CAL MO	$3,000.00	6	$18,000
Approx.	Mobilization (6% subtotal)	%	6%	1	$241,300
				SUBTOTAL	**$862,600**
	CONSTRUCTION COSTS				**$4,884,700**
			ENGINEERING COSTS		
	Design Engineering	%	20%	1	$976,900
	Construction Supervision	%	7.5%	1	$366,400
	Additional Sediment Testing	L SUM	$50,000.00	1	$50,000
				SUBTOTAL	**$1,393,300**
			LAND RIGHTS & UTILITY RELOCATIONS		
	Easements for Sediment Removal	AC	$ 22,500.00	1.45	$32,625
					$0
					$0
				SUBTOTAL	**$32,625**
	TOTAL PROJECT COST				**$6,310,625**
	COST WITHOUT CONTAMINATED SED. REMOVAL				$2,006,700

* Costs were escalated from 2022 to 2024 using Consumer Price Index (CPI) recommended factors

North Aurora Alternative 7 - One Riffle at Intake					
Cost Estimate					
		Kane County			*12/9/2024*
PAY ITEM #	**ITEM DESCRIPTION**	**UNITS**	**UNIT PRICE**	**QUANTITY**	**COST**
20101000	TEMPORARY FENCE	FOOT	$8.70	776	$7,300
25000100	SEEDING CL 1	ACRE	$3,500.00	0.55	$2,100
25000400	NITROGEN FERT NUTR	POUND	$3.30	49.5	$200
25000500	PHOSPHORUS FERT NUTR	POUND	$5.00	49.5	$300
25000600	POTASSIUM FERT NUTR	POUND	$ 3.30	49.5	$200
25100115	MULCH METHOD 2	ACRE	$2,600.00	0.55	$1,500
28000400	PERIMETER EROS BAR	FOOT	$4.09	850	$3,800
28100209	STONE DUMPING RIPRAP, CLASS A5(Riffle)	TONS	$94.00	185	$18,800
28100209	STONE DUMPING RIPRAP, CLASS A5(Scour Hole Cap)	TONS	$94.00	0	$0
28100207	STONE DUMPING RIPRAP, CLASS A4(Causeway)	TONS	$86.00	3,176	$295,800
50102400	CONC REM	CU YD	$140.00	1,535	$232,700
NR105001	CONSTRUCTION STAKING	L SUM	$8,875.00	1	$9,600
NR512001	SHEET PILE REMOVAL	SQ FT	$10.50	2,685	$30,500
NR513000	TIMBER MATTING	SQ YD	$13.00	1,900	$26,700
NR704001	TRAFFIC CONTROL AND PROTECTION, SPECIAL	L SUM	$12,840.20	1	$13,900
NR720001	WOOD INFORMATION SIGNS	EACH	$16,733.33	2	$36,200
X0325410	PILE REMOVAL	FOOT	$50.00	3,699	$200,300
669xxxxx	SPL WASTE DISPOSL	CU YD	$ 225.00	555	$124,900
	CONTAMINATED SED. DREDGING AND DISPOSAL	CU YD	$ 225.00	12,305	$2,768,600
				SUBTOTAL	**$3,773,400**
OTHER					
	Contingencies (15%)	%	15%	1	$566,000
67000500	ENGR FIELD OFFICE B	CAL MO	$3,000.00	6	$18,000
Approx.	Mobilization (6% subtotal)	%	6%	1	$226,400
				SUBTOTAL	**$810,400**
	CONSTRUCTION COSTS				**$4,583,800**
ENGINEERING COSTS					
	Design Engineering	%	20%	1	$916,800
	Construction Supervision	%	7.5%	1	$343,800
	Additional Sediment Testing	L SUM	$50,000.00	1	$50,000
				SUBTOTAL	**$1,310,600**
LAND RIGHTS & UTILITY RELOCATIONS					
	Easements for Sediment Removal	AC	$ 22,500.00	1.45	$32,625
					$0
					$0
				SUBTOTAL	**$32,625**
	TOTAL PROJECT COST				**$5,927,025**
	COST WITHOUT CONTAMINATED SED. REMOVAL				$1,623,100

* Costs were escalated from 2022 to 2024 using Consumer Price Index (CPI) recommended factors

North Aurora Alternative 8 - Multiple Riffles

Cost Estimate

Kane County *12/9/2024*

PAY ITEM #	ITEM DESCRIPTION	UNITS	UNIT PRICE	QUANTITY	COST
20101000	TEMPORARY FENCE	FOOT	$8.70	776	$7,300
25000100	SEEDING CL 1	ACRE	$3,500.00	0.55	$2,100
25000400	NITROGEN FERT NUTR	POUND	$3.30	49.5	$200
25000500	PHOSPHORUS FERT NUTR	POUND	$5.00	49.5	$300
25000600	POTASSIUM FERT NUTR	POUND	$ 3.30	49.5	$200
25100115	MULCH METHOD 2	ACRE	$2,600.00	0.55	$1,500
28000400	PERIMETER EROS BAR	FOOT	$4.09	850	$3,800
28100209	STONE DUMPING RIPRAP, CLASS A5(Riffles)	TONS	$94.00	5,512	$561,000
28100209	STONE DUMPING RIPRAP, CLASS A5(Scour Hole Cap)	TONS	$94.00	0	$0
28100207	STONE DUMPING RIPRAP, CLASS A4(Causeway)	TONS	$86.00	3,176	$295,800
50102400	CONC REM	CU YD	$140.00	1,535	$232,700
NR105001	CONSTRUCTION STAKING	L SUM	$8,875.00	1	$9,600
NR512001	SHEET PILE REMOVAL	SQ FT	$10.50	2,685	$30,500
NR513000	TIMBER MATTING	SQ YD	$13.00	1,900	$26,700
NR704001	TRAFFIC CONTROL AND PROTECTION, SPECIAL	L SUM	$12,840.20	1	$13,900
NR720001	WOOD INFORMATION SIGNS	EACH	$16,733.33	2	$36,200
X0325410	PILE REMOVAL	FOOT	$50.00	3,699	$200,300
669xxxxx	SPL WASTE DISPOSL	CU YD	$ 225.00	555	$124,900
	CONTAMINATED SED. DREDGING AND DISPOSAL	CU YD	$ 225.00	12,305	$2,768,600
				SUBTOTAL	**$4,315,600**
			OTHER		
	Contingencies (15%)	%	15%	1	$647,300
67000500	ENGR FIELD OFFICE B	CAL MO	$3,000.00	6	$18,000
Approx.	Mobilization (6% subtotal)	%	6%	1	$258,900
				SUBTOTAL	**$924,200**
	CONSTRUCTION COSTS				**$5,239,800**
			ENGINEERING COSTS		
	Engineering (20%)	%	20%	1	$1,048,000
	Construction Supervision (7.5%)	%	7.5%	1	$393,000
	Additional Sediment Testing	L SUM	$50,000.00	1	$50,000
				SUBTOTAL	**$1,491,000**
			LAND RIGHTS & UTILITY RELOCATIONS		
	Easements for Sediment Removal	AC	$ 22,500.00	1.45	$32,625
					$0
					$0
				SUBTOTAL	**$32,625**
	TOTAL PROJECT COST				**$6,763,425**
	COST WITHOUT CONTAMINATED SED. REMOVAL				$2,459,600

* Costs were escalated from 2022 to 2024 using Consumer Price Index (CPI) recommended factors

North Aurora Alternative 9 - Partial Dam Removal					
Cost Estimate					
Kane County					*12/9/2024*
PAY ITEM #	**ITEM DESCRIPTION**	**UNITS**	**UNIT PRICE**	**QUANTITY**	**COST**
20101000	TEMPORARY FENCE	FOOT	$8.70	776	$7,300
25000100	SEEDING CL 1	ACRE	$3,500.00	0.55	$2,100
25000400	NITROGEN FERT NUTR	POUND	$3.30	49.5	$200
25000500	PHOSPHORUS FERT NUTR	POUND	$5.00	49.5	$300
25000600	POTASSIUM FERT NUTR	POUND	$ 3.30	49.5	$200
25100115	MULCH METHOD 2	ACRE	$2,600.00	0.55	$1,500
28000400	PERIMETER EROS BAR	FOOT	$4.09	850	$3,800
28100209	STONE DUMPING RIPRAP, CLASS A5(10:1 Slope)	TONS	$94.00	2,780	$283,000
28100207	STONE DUMPING RIPRAP, CLASS A4(Causeway)	TONS	$86.00	3,176	$295,800
50102400	CONC REM	CU YD	$140.00	498	$75,500
NR105001	CONSTRUCTION STAKING	L SUM	$8,875.00	1	$9,600
NR513000	TIMBER MATTING	SQ YD	$13.00	1,900	$26,700
NR704001	TRAFFIC CONTROL AND PROTECTION, SPECIAL	L SUM	$12,840.20	1	$13,900
NR720001	WOOD INFORMATION SIGNS	EACH	$16,733.33	2	$36,200
	CONTAMINATED SED. DREDGING AND DISPOSAL	CU YD	$ 225.00	13,801	$3,105,200
				SUBTOTAL	**$3,861,300**
OTHER					
	Contingencies (15%)	%	15%	1	$579,200
67000500	ENGR FIELD OFFICE B	CAL MO	$3,000.00	6	$18,000
Approx.	Mobilization (6% subtotal)	%	6%	1	$231,700
				SUBTOTAL	**$828,900**
	CONSTRUCTION COSTS				**$4,690,200**
ENGINEERING COSTS					
	Design Engineering	%	20%	1	$938,000
	Construction Supervision	%	7.5%	1	$351,800
	Additional Sediment Testing	L SUM	$50,000.00	1	$50,000
				SUBTOTAL	**$1,339,800**
LAND RIGHTS & UTILITY RELOCATIONS					
	Easements for Sediment Removal	AC	$ 22,500.00	1.45	$32,625
					$0
					$0
				SUBTOTAL	**$32,625**
	TOTAL PROJECT COST				**$6,062,625**
	COST WITHOUT CONTAMINATED SED. REMOVAL				$1,239,500

* Costs were escalated from 2022 to 2024 using Consumer Price Index (CPI) recommended factors

North Aurora Alternative 10 - Add Ramp Only

Cost Estimate

		Kane County			*12/9/2024*
PAY ITEM #	**ITEM DESCRIPTION**	**UNITS**	**UNIT PRICE**	**QUANTITY**	**COST**
20101000	TEMPORARY FENCE	FOOT	$8.70	776	$7,300
25000100	SEEDING CL 1	ACRE	$3,500.00	0.55	$2,100
25000400	NITROGEN FERT NUTR	POUND	$3.30	49.5	$200
25000500	PHOSPHORUS FERT NUTR	POUND	$5.00	49.5	$300
25000600	POTASSIUM FERT NUTR	POUND	$ 3.30	49.5	$200
25100115	MULCH METHOD 2	ACRE	$2,600.00	0.55	$1,500
28000400	PERIMETER EROS BAR	FOOT	$4.09	850	$3,800
28100209	STONE DUMPING RIPRAP, CLASS A5(10:1 Slope)	TONS	$94.00	2,780	$283,000
28100207	STONE DUMPING RIPRAP, CLASS A4 (Causeway)	TONS	$86.00	3,176	$295,800
NR105001	CONSTRUCTION STAKING	L SUM	$8,875.00	1	$9,600
NR513000	TIMBER MATTING	SQ YD	$13.00	1,900	$26,700
NR704001	TRAFFIC CONTROL AND PROTECTION, SPECIAL	L SUM	$12,840.20	1	$13,900
NR720001	WOOD INFORMATION SIGNS	EACH	$16,733.33	2	$36,200
				SUBTOTAL	**$680,600**
		OTHER			
	Contingencies (15%)	%	15%	1	$102,100
67000500	ENGR FIELD OFFICE B	CAL MO	$3,000.00	6	$18,000
Approx.	Mobilization (6% subtotal)	%	6%	1	$40,800
				SUBTOTAL	**$160,900**
	CONSTRUCTION COSTS				**$841,500**
		ENGINEERING COSTS			
	Design Engineering	%	20%	1	$168,300
	Construction Supervision	%	7.5%	1	$63,100
				SUBTOTAL	**$231,400**
		LAND RIGHTS & UTILITY RELOCATIONS			
					$0
					$0
					$0
				SUBTOTAL	**$0**
	TOTAL PROJECT COST				**$1,072,900**
	COST WITHOUT CONTAMINATED SED. REMOVAL				$1,072,900

* Costs were escalated from 2022 to 2024 using Consumer Price Index (CPI) recommended factors

Appendix G

Culvert Sizing Comparison

Culvert Type	Size	188 cfs	1700 cfs	12970 cfs	Invert US	Invert DS	Price/LF	EQRS	
Existing Cond.	54"	122.0	137.0	163.0	640.6	640.3			
Adj. Existing		94.1	94.1	94.1	640.6	640.3			**Cost
Circular	54"	13.86	53.41	100.70	638.1	637.8	$ 134.47		$ 34,962.20
	60"	14.62	58.41	102.68	638.1	637.8	$ 153.89		$ 40,011.40
	72"	15.28	65.12	151.35	638.1	637.8	$ 206.80		$ 53,768.00
Pipe Arch	58x36	15.30	53.18	55.15	638.1	637.8	$ 140.04	48	$ 36,410.40
	65x40	15.89	62.02	88.35	638.1	637.8	$ 162.62	54	$ 42,281.20
	73x45	17.74	63.46	103.12	638.1	637.8	$ 186.10	60	$ 48,386.00
	87x63	19.04	83.69	158.94	638.1	637.8	$ 250.09	72	$ 65,023.40
Box	72x36	*	79.09	*	638.1	637.8	$ 287.39		$ 74,721.40
	72x48	*	76.65	*	638.1	637.8	$ 391.29		$ 101,735.40
	84x36	*	83.29	*	638.1	637.8	$ 314.83		$ 81,855.80
Ellipse	60x38	15.15	59.26	61.10	638.1	637.8	$ 207.25	48	$ 53,885.00
	68x43	15.64	65.75	80.89	638.1	637.8	$ 241.05	54	$ 62,673.00
	76x48	16.20	72.24	103.18	638.1	637.8	$ 280.65	60	$ 72,969.00

* No further evaluation conducted due to increase in cost

** Length of culvert is assumed to be 240 feet for this comparison

Appendix H

IDNR Dam Removal Guidance

IDNR/OWR PUBLIC DAM REMOVAL PROGRAM
LOCAL GOVERNMENT PARTICIPATION GUIDANCE

This document provides general guidance to local governments ("Local Governments") owning or having within their jurisdiction run of the river dams in seeking assistance from the IL Department of Natural Resources, Office of Water Resources ("IDNR/OWR") for construction, design or studies pertaining to the removal or modification of such dams.

This document also provides general guidance to Local Governments when IDNR/OWR approaches Local Governments for removal or modification of run of the river dams within their government jurisdiction. [Note: This document does not require IDNR/OWR to approach Local Governments for removal or modification of State-Owned run of the river dams. IDNR/OWR has complete discretion whether to approach Local Governments in such cases.]

<u>These guidelines are not to be taken as absolutes. Each potential project is unique and will be addressed on a case by case basis.</u>

1. PRIORITIZATION OF PROJECTS

IDNR/OWR project participation prioritization will generally be determined in the order as listed below. For those projects in the same category, priority will be given to project sites with greatest history of public safety risk. IDNR/OWR <u>will prioritize full dam removal except in site specific special circumstances</u>.

A. <u>State Owned Dams on Public Water</u>

B. <u>Publicly Owned Dams on Public Water</u>

C. <u>Publicly Owned Dams on Non-Public Water</u>

D. <u>Privately Owned Dams not accepted</u>

Note: IDNR/OWR cannot participate in projects involving privately owned dams. Optionally, the private owner may consider a transfer of ownership of the dam to a Local Government to potentially receive assistance from IDNR/OWR.

2. GENERAL PROCESS

The following process will generally be followed between IDNR/OWR and Local Governments in considering removal or modification of run of the river dams:

A. In the case where IDNR/OWR approaches a Local Government for removal or modification of a State-owned run of the river dam, the Local Government may agree to work with IDNR/OWR to consider such removal or modification or may object to such removal or modification.

    i. If the Local Government agrees to work with IDNR/OWR to consider dam removal or modification, the Local Government and IDNR/OWR will proceed to jointly work through the dam removal or modification process set forth in the following Sections C and D.

    ii. If the Local Government opposes IDNR/OWR's proposed dam removal or modification, IDNR/OWR may at its sole discretion either:

        a. proceed with the dam removal or modification process set forth in the following Sections C and D on its own; or

        b. offer to work with the Local Government to seek legislation for the transfer of dam ownership to the Local Government. (Should the Local Government refuse the transfer of dam ownership, IDNR/OWR will proceed with the dam removal or modification process set forth in the following Sections C and D on its own.)

B. In the case where a Local Government approaches IDNR/OWR for removal or modification of a state-owned or publicly-owned run of the river dam or where IDNR/OWR approaches a Local Government for removal or modification of a publicly-owned run of the river dam and the Local Government agrees to work with IDNR/OWR to consider dam removal or modification, , the Local Government and IDNR/OWR will proceed to jointly work through the dam removal or modification process set forth in the following Sections C and D.

C. IDNR/OWR and the Local Government will first work together to perform a Strategic Study of the subject dam to evaluate alternatives and ultimately select the alternative that will be the final Project. A Memorandum of Understanding (MOU) will be executed between IDNR/OWR and the Local Government to define duties and responsibilities of each party during the Strategic Study Phase. Please see Part 3. STRATEGIC STUDY PHASE for further information.

D. At the end on the Strategic Study Phase, if IDNR/OWR and the Local Government agree on a final Project, the Project will be moved forward to Project planning, design, construction, and eventual ownership conveyance (where applicable), operation and maintenance ("Project Phase"). An Intergovernmental Agreement (IGA) will be executed between IDNR/OWR and the Local Government defining the duties and responsibilities of each party for the Project Phase. Please see Part 4. PROJECT PHASE for further information.

[Note: In the case where a Local Government does not agree to a final Project on a State-owned dam, IDNR/OWR may move forward to the Project Phase absent such agreement.]

E. The IDNR/OWR dam removal program is conducted pursuant to the statutory authority of 615 ILCS 5/12 Rivers, Lakes, and Streams Act, 20 ILCS 805/805-100 Conservation of Fish and Game, and 20 ILCS 805/805-105 Conservation of Fauna and Flora. Funding has been appropriated to the IDNR/OWR for this program pursuant to applicable statutory appropriation. Should such funding become unavailable, IDNR/OWR obligations under the dam removal program will cease as required by Illinois statute.

3. STRATEGIC STUDY PHASE

At the Strategic Study Phase, IDNR/OWR and the Local Government will work together to perform a Strategic Study of the subject dam to evaluate alternatives and ultimately select the alternative that will be the final Project. [Note: In certain circumstances, IDNR/OWR in its sole discretion may determine to bypass all or part of this Strategic Study Phase.]

A Memorandum of Understanding (MOU) will be executed between IDNR/OWR and the Local Government to define duties and responsibilities of each party during the Strategic Study Phase.

IDNR/OWR first final Project preference is full dam removal. IDNR/OWR next final Project preference is partial dam removal. If full or partial removal is not feasible as determined by IDNR/OWR for a site-specific constraint (i.e. water supply), IDNR/OWR will consider a safety modification for final Project.

Final Projects may include betterments at Local Government's sole cost.

The Strategic Study is anticipated to investigate / address the following:

A. Topographic Survey – IDNR/OWR will conduct all ground & bathymetric surveys necessary for the project.
B. Sediment Sampling will be acquired at the cost to IDNR/OWR.
C. Wetland and Waters of the US delineation will be acquired at the cost to IDNR/OWR.
D. Property boundary information - The local sponsor shall provide all land right documentation for the estimated project boundary as delineated by IDNR/OWR.
E. Hydrology, hydraulics, conceptual plans and supporting documents shall be developed or caused to be developed at the cost to IDNR/OWR.
F. Applicable regulatory issues.
G. Site-specific constraint (i.e. water supply).
H. Safety Issues.
I. Betterments or other modifications (if applicable).

J. Other issues as determined by IDNR/OWR and the Local Government.
K. Evaluation of alternatives.
L. Selection of final Project.

4. PROJECT PHASE

Upon determination of a final Project, the Project will be moved forward to Project Phase which includes: planning, design, construction, and eventual ownership conveyance (where applicable), operation and maintenance. An Intergovernmental Agreement (IGA) will be executed between IDNR/OWR and the Local Government defining the duties and responsibilities of each party for the Project Phase.

A. Planning
  i. State and Federal Permits applications shall be developed and submitted by IDNR/OWR for all full or partial dam removals. Local permits will be acquired by Local Government. All non-dam removal alternative permits will be completed by Local Government. Permit fees will be provided by the dam owner.
  ii. Project Planning (permitting, detailed hydraulic computations) analysis shall be developed or caused to be developed by IDNR/OWR for all full or partial dam removals. Non-dam removal alternatives will be completed by and at the cost of the Local Government.
  iii. The Local Government is required to obtain rights to all properties necessary to construct, operate and maintain the project. As such, agreements may be required with other public entities. This effort will be the responsibility of the Local Government.

B. Project Design
  i. Project plans, specifications, project advertisement, and contract award will be provided or caused to be provided at 100% cost to IDNR for all full and partial dam removals.
  ii. Plans, specifications, project advertisement, and contract award will be conducted at the cost of the Local Government for non-dam removal projects.

C. Project Construction
  i. Full or Partial Dam Removals. Construction funding provided by IDNR/OWR will be limited to 100% of the estimated cost of a full dam removal alternative for full or partial removals.
  ii. Non-Dam Removals. Construction funding provided by IDNR/OWR will be limited to 60% of the estimated total cost of a full dam removal for projects that eliminate the Reverse Hydraulic Roller for all flow conditions.
  iii. Additional amenities to the project may be incorporated into the construction plans but the additional construction costs will be at the expense of the Local Government.
  iv. Construction inspection services may be provided by IDNR/OWR for all full or partial dam removals. Non-dam removal project construction inspection services will be at the expense of the Local Government.

D. Ownership Conveyance, Operation and Maintenance
  i. Local Government agrees to accept conveyance of any remaining structure(s) on site.
  ii. Local Government agrees to operate and maintain all remaining structure(s) on site in perpetuity.

Appendix I

December 2024 IDNR Dam Inspection Report

Dam Inspection Report

Name of Dam North Aurora Dam ID No. ______

Permit Number ______ Class of Dam III

Location Kane Section 4 Township 38N Range 217-558-6617

Owner State of Ilinois ______
Name Telephone Number (Day)

One Natural Resources Way ______
Street Telephone Number (Night)

Springfield 62702 County Sangamon
City Zip Code

Type of Dam Run of River

Type of Spillway Ogee

Date(s) Inspected 12/10/2024

Weather When Inspected Overcast

Temperature When Inspected 33 F

Pool Elevation When Inspected 646.2' Approx. .2' over the spillway

Tailwater Elevation When Inspected ______

JASON EUGENE REDDY
062-061279
LICENSED
PROFESSIONAL
ENGINEER
OF
ILLINOIS

Jason Reddy 1/3/25

Professional Engineer's Seal

Inspection Personnel:

Name	Title
Jason Reddy	Operations Engineer

The Department of Nautural Resources is requesting information that is necessary to accomplish the statutory purpose as outlined under the River, Lakes and Streams Act, 615 ILCS 5. Submittal of this information is REQUIRED. Failure to provide the required information could result in the initiation of non-compliance procedures as outlined in Section 3702.160 of the "Rules for Construction and Maintenance of Dams".

CONDITION CODES

NE - No evidence of a problem

GC - Good condition

MM - Item needing minor maintenance and/or repairs within the year, the safety or integrity of the item is not yet imperiled

IM - Item needing immediate maintenance to restore or ensure its safety or integrity

EC - Emergency condition which if not immediately repaired or other appropriate measures taken could lead to failure of the dam

OB - Condition requires regular observation to ensure that the condition does not become worse

NA - Not applicable to this dam

NI - Not inspected - list the reason for non-inspection under deficiencies

CONCRETE OR MASONRY DAMS

ITEM	CONDITION CODE	DEFICIENCIES	RECOMMENDED REMEDIAL MEASURES AND IMPLEMENTATION SCHEDULE
Seepage	NE		
Structure to Abutment/ Embankment Junctions	GC		
Water Passages	GC		
Foundation	GC		
Surface Cracks in Concrete Surfaces	MM	Some cracking was present on both abutments.	Cracks should be filled or sealed to prevent water infiltration into the concrete.
Structural Cracking	NE		
Vertical and Horizontal Alignment	GC		

CONCRETE OR MASONRY DAMS

(CONTINUED)

ITEM	CONDITION CODE	DEFICIENCIES	RECOMMENDED REMEDIAL MEASURES AND IMPLEMENTATION SCHEDULE
Monolith Joints	GC		
Contruction Joints	MM	Joint Filler has been lost from construction joints on the abutments.	Backer rod and joint filler should be placed in these joints.
Spalling of Concrete	OB	A hole has developed in the middle of the spillway crest.	This area should be monitored. If the area continues to deteriorate, concrete repairs may need to be performed.
Filters, Drains, etc.	GC		
Riprap	MM	Woody Vegetation growing around abutments and in slope protection	Woody vegetation should be cut and cleared from these areas and should be periodically treated to prevent unwanted vegetative growth.
Other (Name)			

IF THE DAM IS GATED - Fill out the portion of the Principal Spillway Form related to Gated Spillways

PRINCIPAL SPILLWAY
APPROACH CHANNEL

ITEM	CONDITION CODE	DEFICIENCIES	RECOMMENDED REMEDIAL MEASURES AND IMPLEMENTATION SCHEDULE
Debris	OB	Some trees and debris caught on the spillway	Typical condition for run of river dams. Future high water events should clear this debris from the spillway.
Side Slope Stability	GC		
Slope Protection	MM	Some Woody Vegetation growing in slope protection near the left abutment.	Woody vegetation should be cut and cleared from these areas and should be periodically treated to prevent unwanted vegetative growth.
Other (Name)			
Other			
Other			
Other			

PRINCIPAL SPILLWAY

☐ Drop Inlet Spillway ☑ Overflow Spillway Structure ☐ Gated

ITEM	CONDITION CODE	DEFICIENCIES	RECOMMENDED REMEDIAL MEASURES AND IMPLEMENTATION SCHEDULE
Erosion, Spalling, Cavitation	NE		
Structure to Embankment Junction	GC		
Drains	GC		
Seepage Around or Into Structure	NE		
Surface Cracks	NE		
Structural Cracks	NE		

IF THE SPILLWAY IS GATED FILL OUT THE GATES SECTION

PRINCIPAL SPILLWAY

(Continued)

☐ Drop Inlet Spillway ☑ Overflow Spillway Structure ☐ Gated

ITEM	CONDITION CODE	DEFICIENCIES	RECOMMENDED REMEDIAL MEASURES AND IMPLEMENTATION SCHEDULE
Alignment of Abutment Walls	GC		
Construction Joints	GC		
Filter and Filter Drains	GC		
Trash Racks	NA		
Bridge and Piers	NA		
Differential Settlement	NE		
Other (Name)			

IF THE SPILLWAY IS GATED FILL OUT THE GATES SECTION

OUTLET WORKS
IF SEPARATE FROM PRINCIPAL SPILLWAY STRUCTURE

ITEM	CONDITION CODE	DEFICIENCIES	RECOMMENDED REMEDIAL MEASURES AND IMPLEMENTATION SCHEDULE
Erosion, Spalling, Cavitation	NE		
Joint Separation	NA		
Seepage Around or Into Conduit	NA		
Intake Structure	GC		Intake pipe for the mill race was hard to observe. Appeared to be in good condition and water was flowing through the mill race.
Outlet Structure	GC		
Outlet Channel	GC		
Riprap	GC		
Other (Name)			
Other			

SUMMARY OF MAINTENANCE DONE AND/OR

REPAIRS MADE SINCE THE LAST INSPECTION

DATE OF PRESENT INSPECTION 12/10/24

DATE OF LAST INSPECTION 6/30/21

1. EARTH EMBANKMENT DAMS

2. CONCRETE MASONRY DAMS

3. PRINCIPAL SPILLWAY

The City of North Aurora maintains the dam, abutments, mill race and park as part of their agreement. Grass and vegetation in the area is regularly mowed, and seed/erosion blankets appear to have been used in areas where erosion was repaired or grass had died.

4. OUTLET WORKS

5. EMERGENCY SPILLWAY

Owner's Maintenance Statement

I, ______________________________________, owner of ________________ dam,

Dam Identification Number ________________, in ________________ County,

am maintaining the dam in accordance with the accepted maintenance plan which is part of

Permit Number ____________.

North Aurora is responsible for maintenance of the dam.

____
Signature

____
Date

Owner's Operation and Maintenance Plan Statement

I, ______________________________________, owner of ________________ dam,

Dam Identification Number ________________, in ________________ County,

have reviewed the operation and maintenance plan including the Emergency Action Plan (EAP),

which is part of, Permit Number _________________.

I _____ have enclosed the appropriate revisions or

N/A _____ have determined that no revisions to the plan are necessary.

____
Signature

____
Date

The Department of Nautural Resources is requesting information that is necessary to accomplish the statutory purpose as outlined under the River, Lakes and Streams Act, 615 ILCS 5. Submittal of this information is REQUIRED. Failure to provide the required information could result in the initiation of non-compliance procedures as outlined in Section 3702.160 of the "Rules for Construction and Maintenance of Dams".

Office of Water Resources
Division of Project Implementation
Surveillance Report

Date: **12-10-2024**

Stream: **Fox River** County: **Kane**

Contract Designation: **FR 269**

Location: **North Auora** Mayor:

Sponsorship Agreement: **Fox River Park Dist.** Agreement Date:12/30/74

Description of Improvement: **Dam, abutments, and riprap**

Inspection Party: **Jason Reddy**

Comments:

Woody vegetation present around the abutments and in the slope protection on the embankments needs to be removed from these areas. There are some cracks present on the abutments, and repair/sealing of the cracks should be considered to prevent water infiltration from damaging the concrete. A hole has developed on the face of the spillway near its center where two sections of concrete form a joint. This hole was not noted and does not appear to have been present during the 2021 inspection. It is a new development since the previous inspection. These area should be monitored and if the concrete continues to deteriorate, action to repair the spillway may need to be taken.

Left Abutment.

Grass and vegetation around in the park and around the abutments is well maintained. There is some small woody vegetation growing in the downstream embankment erosion control blocks and around the abutment. Woody vegetation can damage riprap and concrete structures and should be cut and removed from these areas. Areas that can't be regularly mowed should be periodically treated to control unwanted woody vegetation.

Left Abutment

Joint filler has been lost from the construction joints of the abutment. Backer rod and an appropriate joint filler should be used to fill the joints. Some minor surface cracking has also been noted on the abutment. These cracks should be sealed to prevent water from infiltrating the cracks.

Right Abutment

Upstream of the abutment has woody vegetation growing around the abutment. Woody vegetation should be cut and cleared from the abutments.

Right Abutment

Joint filler has been lost from the construction joints of the abutment. Backer rod and an appropriate joint filler should be used to fill the joints. Cracks in the concrete are beginning to develop and water infiltrating the cracks is starting to cause the concrete to pop during freeze thaw cycles. These cracks should be sealed with appropriate concrete crack fillers to prevent water infiltration into the concrete.

Right Abutment

Some minor spalling of concrete was found in this area where the abutment was cut to accommodate construction of the canoe bypass walls. Continue to monitor this area for signs of deterioration. No source of the rust stains could be identified. There is a chance that rust staining is coming from water and air exposure to the rebar in the concrete. Continue to monitor this area for signs of deterioration.

A hole has formed on the face of the dam in the center of the spillway at the joint between two sections. This hole was not present during the 2021 inspection. While this spalling concrete is not an immediate concern, this area should be regularly monitored. If the concrete in this area continues to deteriorate remedial actions may be necessary to repair this concrete.

The mill race is a separate project from the dam and abutments, and appears to be in good condition without signs of major erosion along the banks. While not critical, removing these trees from the vicinity of the abutment walls for the old gate and bridge might want to be considered so that the tree roots do not damage the concrete walls or rip-rap.